



FIRGROVE ELEMENTARY  
TRAFFIC IMPACT ANALYSIS

*Pierce County, WA*



Prepared for: Mr. Mike Meadows  
Puyallup School District

March 2016

FIRGROVE ELEMENTARY  
TRAFFIC IMPACT ANALYSIS

*TABLE OF CONTENTS*

I.	Introduction .....	3
II.	Project Description .....	3
III.	Existing Conditions .....	6
IV.	Future Traffic Demand.....	10
V.	Conclusions and Mitigation.....	18

*LIST OF TABLES*

1.	Accident History.....	9
2.	Project Trip Generation .....	10
3.	2022 Level of Service .....	17
4.	Sight Distance .....	18

*LIST OF FIGURES*

1.	Vicinity Map & Roadway System.....	4
2.	Site Plan .....	5
3.	Existing Peak Hour Volumes.....	8
4.	AM Trip Distribution .....	13
5.	PM Trip Distribution.....	14
6.	2022 Background Peak Hour Volumes .....	15
7.	2022 Peak Hour Volumes with Project.....	16

# FIRGROVE ELEMENTARY TRAFFIC IMPACT ANALYSIS

## *I. INTRODUCTION*

This report summarizes traffic impacts related to the Firgrove Elementary project. The general goals of this impact study concentrate on 1) the assessment of existing roadway conditions and intersection congestion, 2) forecasts of newly generated project traffic, 3) estimations of future delay, and 4) recommendations for mitigation. Preliminary tasks include the detailed collection of roadway information, road improvement information, and peak hour traffic counts. A level of service analysis for existing traffic conditions is then made to determine the present degree of intersection congestion. Based on this analysis, forecasts of future traffic levels on the surrounding street system are found. Following this forecast, the future service levels for the key intersections are investigated. As a final step, applicable conclusions and possible on-site or off-site mitigation measures are defined.

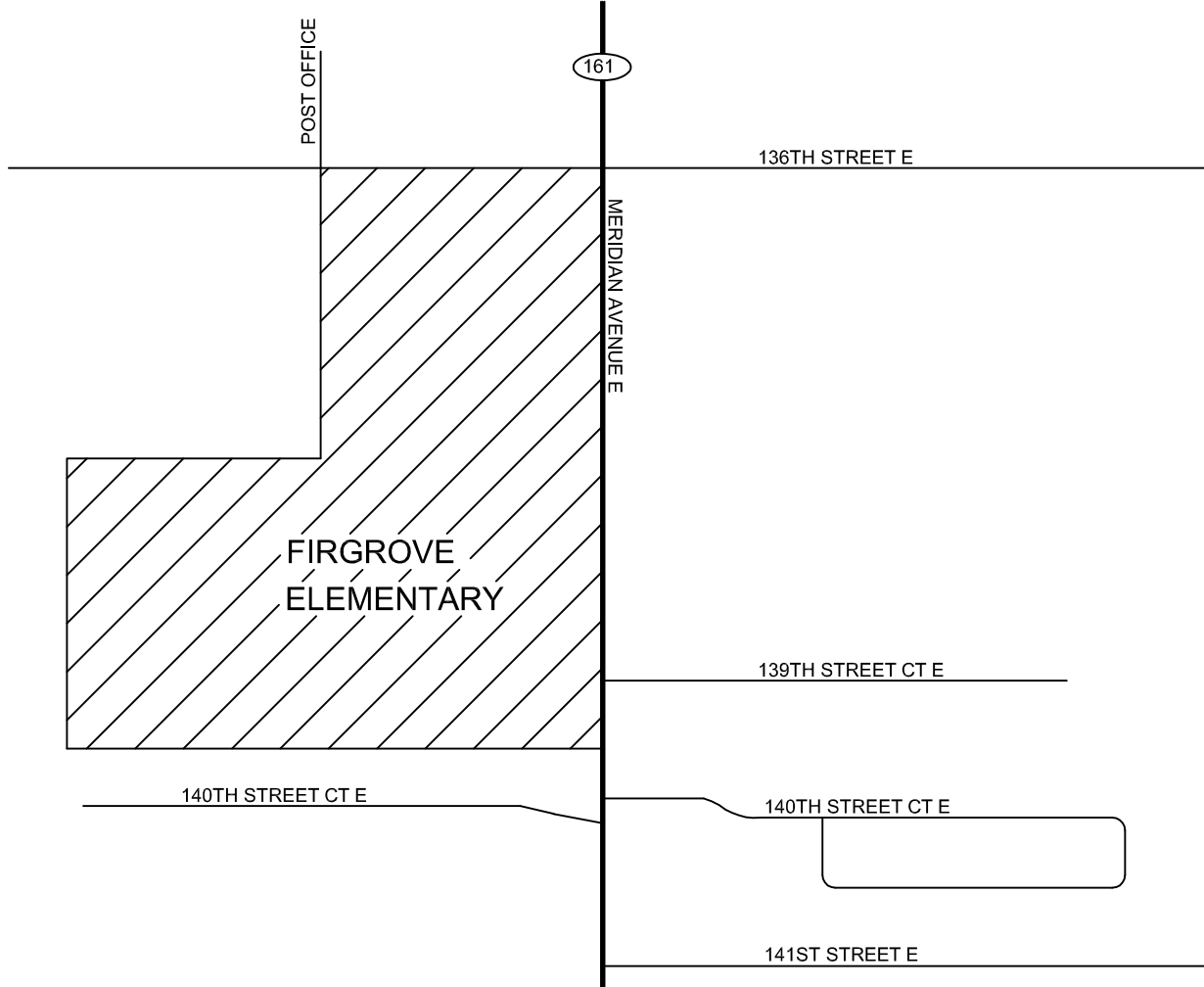
## *II. PROJECT DESCRIPTION*

The proposed project is a replacement of the existing Firgrove Elementary school to update the aging facility. The original school was constructed in 1930's with the main building constructed in the 1970's. The existing buildings total approximately 47 thousand square feet in addition to 11 portables to house the 2015-16 enrolment of 647 students (OSIP, 2017). The site is located on the southwest corner of the Meridian Avenue East & 136th Street East intersection and shares roughly a 40 acre site with Ballou Junior High to the northwest. The new proposed facility will allow capacity for up to 730 students and is expected to begin construction in 2018 with school in session in 2019.

For the first year of operations, the new Firgrove facility will house the existing Pope Elementary student population (2015-16 student count: 593; OSIP, 2017) while Pope Elementary receives a remodel to their existing facility. As the two elementary schools will meet in one location for one year, and to reduce potential operational conflicts, the Puyallup school district intends on implementing an offset schedule (approximately 45 minutes – 1 hour apart).

The existing Firgrove Elementary currently accesses off Meridian Avenue East via 4 existing entrances and 1 shared access extending south from 136th Street East (easternmost access shared with Ballou Junior High). Student drop-off/pick-up access to the site is proposed via two entrances extending west from Meridian Avenue East; the northern access as an inbound only and the southern access as an outbound only. Subsequent to the first year as school operations normalize (Firgrove attendance only) the northern access will shift southerly allowing for commercial property fronting Meridian Avenue East. A bus access will be available extending south from 136th Street East. Approximately 132 parking stalls will be provided with the new school.

This study analyzes the school operating at full-capacity at a five-year horizon date of 2022. Figure 1 on the following page shows the general site location along with the local street network servicing the vicinity. The site plan showing the proposed design schematic is given in Figure 2.

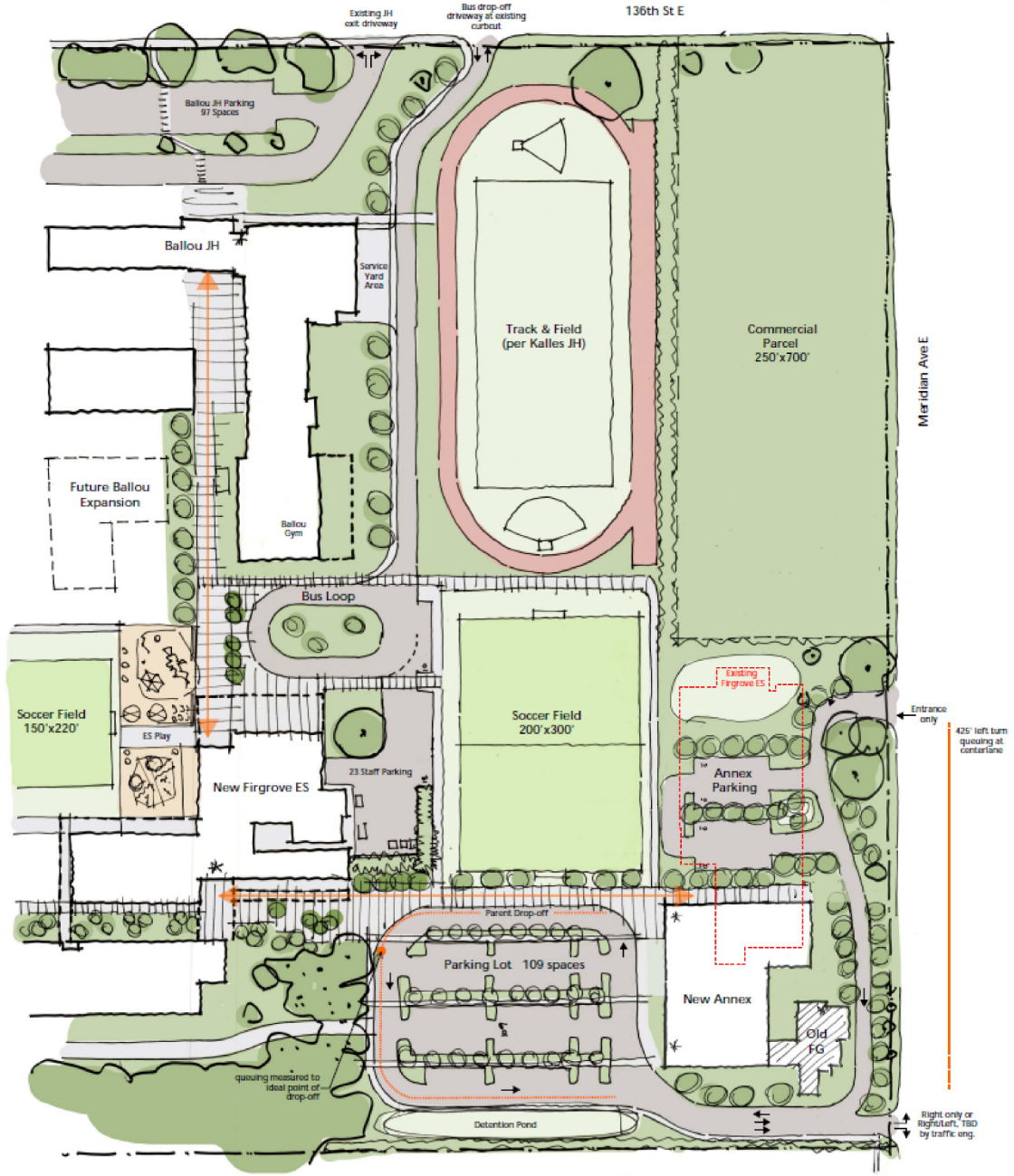


FIRGROVE ELEMENTARY



VICINITY MAP & ROADWAY SYSTEM

FIGURE 1



### III. EXISTING CONDITIONS

#### A. Surrounding Roadway System

The key streets near the site are described below.

Meridian Avenue East (SR-161): is a north-south state route that borders the east side of the school. The road cross sections typically consists of two travel lanes in each direction and a center two-way left-turn lane. The roadway has a posted speed limit of 35 mph in the vicinity. School zone speed signs of 20 mph when children are present are located along the roadway approximately 185 feet to the north and south of the Meridian Avenue E & 136th Street East intersection. MUTCD “S1-1” School Zone Sign paired with “W16-7P” (near intersection) or “W16-9P” (further from intersection) were located to the north and south of 136th Street E, allowing adequate time in alerting drivers of the school area. Roadside treatment consist of curb/gutter/sidewalk and marked crosswalks are available.

136th Street East: is an east-west collector arterial that borders the north side of the district property. The road cross section typically consists of one travel lane in each direction and a center two-way left-turn lane west of Meridian Avenue East and one travel lane in each direction to the east. The roadway has a posted speed limit of 35 mph with a reduced school speed zone of 20 mph when children are present. Shoulders are a mix of curb/gutter/sidewalk or grass/gravel with no on-street parking in the vicinity. Sidewalks are available along the majority of the north side of the roadway and on the south side from where 136th Street East intersects Meridian Avenue East to the easternmost Ballou Junior High School access and continues west of the westernmost Ballou access. A marked pedestrian crosswalk is available approximately 850 feet west Meridian Avenue E, providing a safe sanctuary for a mid-block crossing.

#### B. Existing Peak Hour Volumes and Patterns

Field data for this study was collected in November of 2016 while school was still in session. Generally, the highest volumes of traffic associated with the school in the AM occur within the hour that parents drop their children off before the morning bell. Conversely, the highest vehicular volumes observed in the PM occur within the hour that parents queue at the school, shortly before/after the dismissal bell. For these stated reasons, the traffic counts conducted in this study were carefully scheduled to ensure peak vehicular times were captured. The bell schedule in effect at the time of the field study was obtained from the Puyallup School District 2016-17 Bell Schedule which indicates the following:

- Bus Arrival: 8:20 AM
- Warning: 8:30 AM
- Tardy: 8:35 AM
- Dismissal: 2:56 PM
- Bus Leaves: 3:03 PM

The schedule above indicates a regular school day schedule which occur Tuesday – Friday with no other events, late start, or early release planned. Monday finishes similarly but begins an hour late.

The traffic counts were conducted at the following intersections:

1. Meridian Avenue East & Ballou Junior High (easternmost access)/Post Office  
7:30 – 9:00 AM  
2:30 – 4:00 PM
2. Meridian Avenue East & 139th Street Ct East  
7:30 – 9:00 AM  
2:30 – 4:00 PM

Figure 3 on the following page shows the existing AM peak hour and PM peak hour. The full-length counts are attached in the appendix for reference.

### C. Roadway Improvements

A review of a 2017-2022 Pierce County 6-Year Transportation Improvement Program indicates that improvement projects are currently planned in the vicinity of the site. A description of the nearest projects is provided below.

#### *136 St E (Map ID: 636)*

This project intends on completing the sidewalk linkage along 136th Street East. The project will construct sidewalk/curb/gutter from 160 feet west of 98th Avenue Ct E to 450 feet west of Meridian Avenue East for a total length of 0.18 miles. The project has a total estimated cost of \$570,000 and is currently fully funded.

#### *94 Av E (Map ID: 363)*

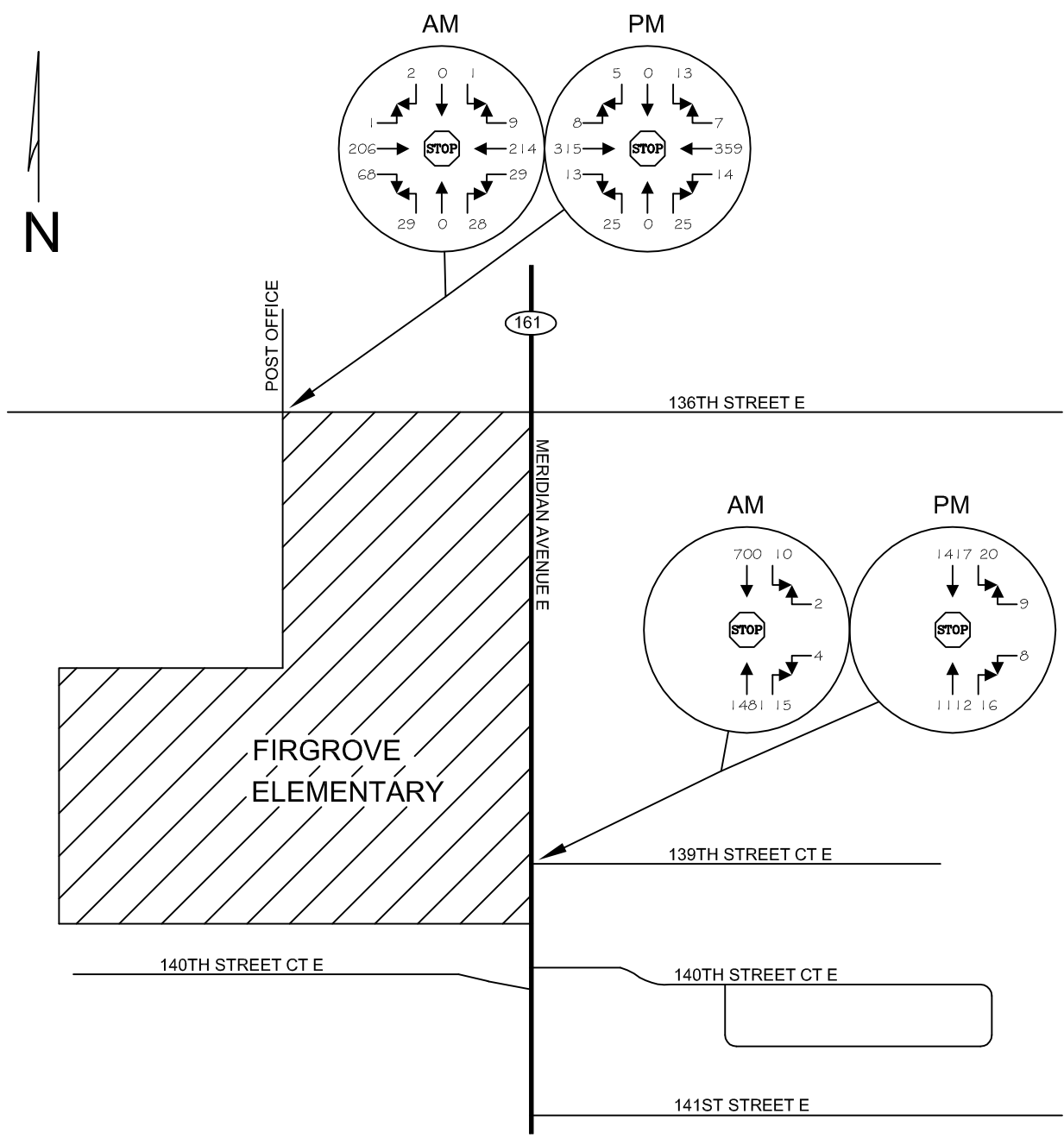
This project plans on reconstructing the existing 94th Avenue East roadway to widen and provide additional lanes. The project limits are from 850 feet south of 144th Street East to 300 feet south of 137th Street East for a total length of 0.45 miles. The project is not fully funded and the estimated cost is “to be determined”.

#### *94 Av E / 152 St E (Map ID: 339)*

The scope of this project plans on installing a traffic signal and construct turn lane(s) at the 94th Avenue East & 152nd Street East intersection. The project has an estimated cost of \$2,500,000 and is currently not fully funded.

### E. Pedestrian and Bicycle Activity

Pedestrian and bicycle activity was observed on the nearby street segments studied for this project. Observations were made during the peak hour movement counts and during other site visits. A moderate amount of pedestrian activity was observed, however, inclement weather during field visits may have deterred a number of children from walking. A figure reflecting the current walking area for Firgrove Elementary is provided in the appendix; the map was provided by the Puyallup School District. The surrounding area typically consists of adequate pedestrian facilities in the form of sidewalks, marked crosswalks (at major intersections and on 136th Street East in front of Ballou Junior High frontage), and crossing guards. Further, as stated in the Roadway Improvements section, a transportation improvement project is planned to complete the missing sidewalk linkage along 136th Street East across the Ballou Junior High frontage.



FIRGROVE ELEMENTARY



F. Public Transit

A review of the Pierce Transit regional bus schedule indicates that the nearest service route is via Route 402 with stops along Meridian Avenue East. It is expected that little, if any, public transit will be utilized and that the majority of students will use school buses provided by the district. Bus routes are well established and not expected to change. Existing bus traffic was captured in the field counts.

G. Accident History

A safety analysis of the local surrounding roadways was conducted to determine potential, if any, safety hazards with respect to roadway and intersection design. A list of the recorded accidents for the primary intersections and roadways surrounding the school site was obtained from the WSDOT *Transportation Data, GIS and Modeling Office*. The list covered accidents from the most recent three full years starting from the beginning of 2014 and through the end of 2016. Table 1 below summarizes the accident totals per year.

**Table 1**  
Accident History  
2014-2016 (WSDOT)

Roadway	2014	2015	2016	Avg. per Year
<b>136th Street East at 94th Avenue East</b>	6	5	2	4.3
<b>136th Street East Between 94th Avenue East &amp; Meridian Avenue East</b>	1	0	1	0.7
<b>Meridian Avenue East at 136th Street East</b>	1	10	9	6.7
<b>Meridian Avenue East Between 136th Street East &amp; 144th Street East</b>	0	0	0	0
<b>Meridian Avenue East at 144th Street East</b>	4	11	13	9.3
<b>Total Accidents per Year</b>	<b>12</b>	<b>26</b>	<b>25</b>	<b>21</b>

Reviewing descriptions from the report summaries indicates the most common type of accident occurrence was in the form of: rear-end collision (31) followed by entering intersection at an angle (16). The remaining accidents were a combination of sideswipes, backing movements, and/or obstructing a stationary object. These aforementioned accidents can typically be caused by driver inattentiveness, following too closely, exceeding safe speed limits, and a number of other driver induced factors as opposed to intersection safety and design. No fatalities or pedestrian/bicycle injuries were recorded. Given the high amount of vehicular volumes found on the roadways of interest and the number of accidents summarized in Table 1, no safety issues are anticipated with the increase of project-generated traffic.

IV. FUTURE TRAFFIC DEMAND

A. School Traffic Generation & Flow

Plans are to house the existing Pope Elementary students using the now existing Firgrove Elementary school buildings once new Firgrove opens and while the Pope remodel takes place. During the first year of operations, it is understood that congestion and queueing issues may develop. To mitigate these operational concerns, the morning bell for Pope is scheduled approximately 45 minutes to 1 hour prior to the morning bell for Firgrove. Having the offset starting times would allow for increased efficiency and reduce potential conflicts as peak congestion with respect to schools typically lasts for 20-30 minutes (morning drop-off and afternoon pick-up).

Student counts were obtained from the Office of Superintendent of Public Instruction (OSPI) Washington State Report Card for the 2015-16 year and are as follows:

Pope Elementary (May 2016): 593 Students

Firgrove Elementary (May 2016): 647 Students

Project Remodel Capacity: 730 Students (net difference of +83 students)

This analysis assumes and reflects the new school operating at full-capacity.

A.1 Trip Generation

The estimated trip generation data for this analysis was derived from the Institute of Transportation Engineer's publication *Trip Generation*, 9th edition. The designated land use for this site is defined as Elementary School (LUC 520). ITE average rates were used. Table 2 below depicts the projected school peak hour trips assuming full-capacity operations of 730 students.

**Table 2**  
Project Trip Generation  
730 Students

<b>Time Period</b>	<b>Volume</b>
<b>AWDT</b>	<b>943 vpd</b>
AM Peak Inbound	183 vph
AM Peak Outbound	146 vph
<b>AM Peak Total</b>	<b>329 vph</b>
PM Peak Inbound	95 vph
PM Peak Outbound	109 vph
<b>PM Peak Total</b>	<b>204 vph</b>

(vpd: vehicles per day; vph: vehicles per hour)

## B. Distribution & Assignment

The pattern by which project trips disperse on the roadway network is highly variable and largely depends on driver behavior and psychological factors. Nonetheless, general estimations of traffic distribution are needed to determine the impacts of a project on the nearby roadway network. Peak hour trips are expected to follow the general pattern shown in Figure 4 for the AM peak hour and Figure 5 for the PM peak hour. The rationale of the distribution percentages are based on existing field access observations, the Firgrove Elementary School attendance area, and existing count data. Firgrove Elementary future attendance area is not anticipated to significantly change, and therefore, the distribution patterns are expected to remain similar in the future.

## C. Access and Circulation Plan

### Parent/Visitor Access:

- Meridian Avenue East: Northern Entrance – Inbound Only
- Meridian Avenue East: Southern Entrance – Outbound Only

### Bus/Staff Access:

- 136th Street East

Subsequent to the first year of operations (housing Pope & Firgrove Elementary concurrently) the northern inbound access from Meridian Avenue East will shift southerly some distance (to be determined) to solidify the site plan and maximize the proposed commercial property parcel frontage.

Parents will enter the site by way of Meridian Avenue East at the northern inbound entrance and travel southbound to enter the queue with the drop-off/pick-up zone at the northern edge of the parking lot. The proposed layout and configuration allows for flexibility with respect to operational adjustments regarding queueing lengths. The wide isles of said parking lot allow for additional queueing lanes if necessary.

## D. Queueing

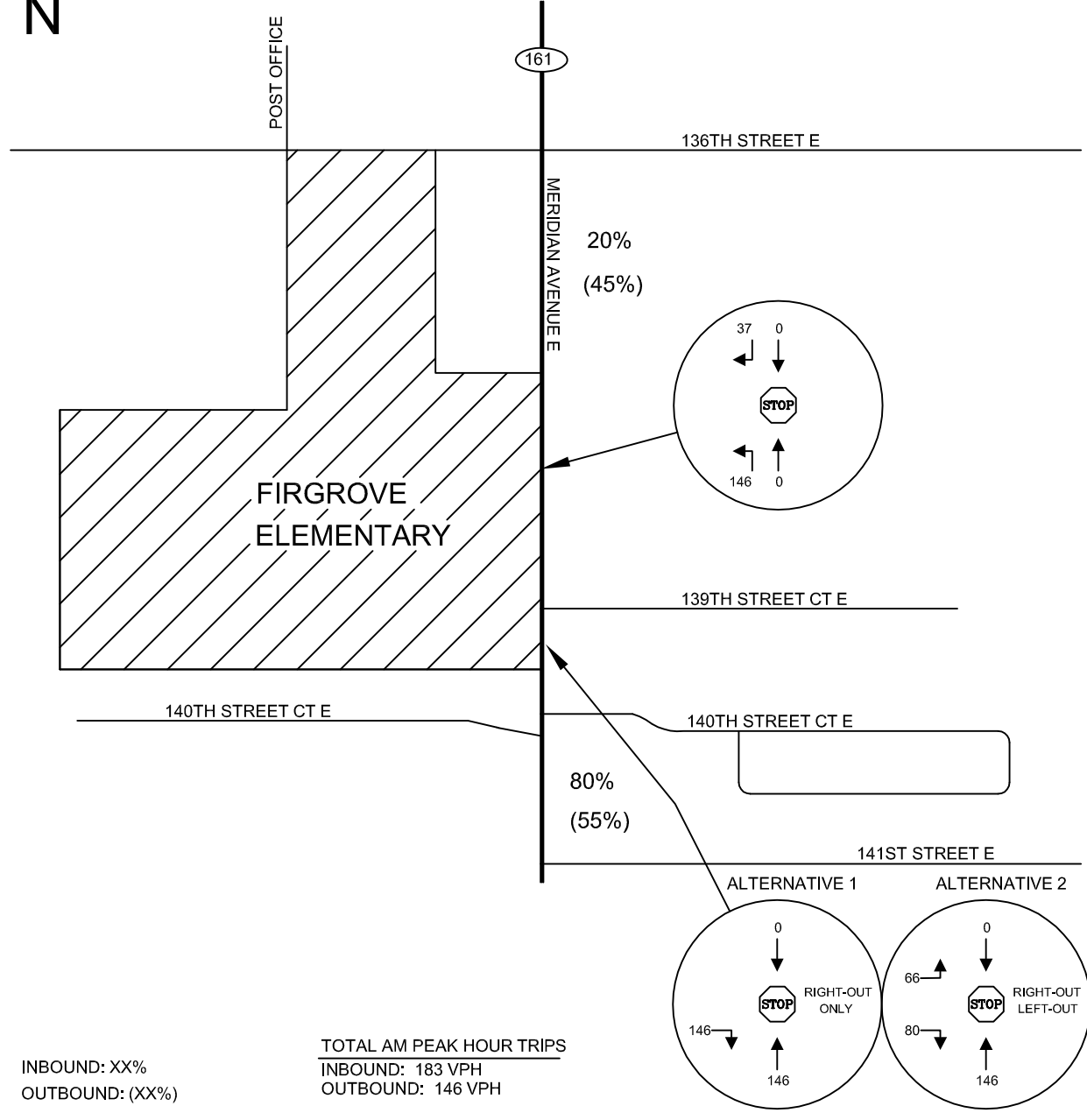
Based on a queueing analysis performed on February 28, 2017 at a nearby school with similar student enrollment (Edgerton Elementary School, 757 students per contact with school staff), approximately 74 vehicles were found queued in the drop-off zone, drive isles, and surrounding roadways. The study is attached in the appendix for reference. Observations also indicated a number of parents utilizing open parking stalls when waiting for the dismissal bell. As differentiating an actual number of parents in parking stalls for student pick-up is difficult to quantify, an estimated additional 20-30 cars were assumed for a total of 94-104 vehicles.

Assuming Firgrove will operate similarly to Edgerton, and given comparable student populations (Firgrove capacity of 730; Edgerton enrollment of 757), and allowing for a ten percent error margin, the projected queueing demand for Firgrove Elementary would therefore be 114 vehicles (104 vehicles x 1.1 margin of error). Vehicles typically require 20 to 25 linear feet to comfortably queue, with the former being more likely at school settings. Parents are generally cognizant of the limited space and tend to fill the gaps between cars. As the new parking lot with the increased stall count (~109 visitor stalls) is not anticipated

to 74 vehicles (114 total vehicles – 40 parked vehicles). Given a 20 foot demand per vehicles and 74 queued vehicles, the recommended length equates to 1,480 linear feet. Based on the site plan, shown in Figure 2, approximately over 1,500 linear feet is available (including drive isles and shifting northern inbound entrance south approximately 300 feet). No spillover on Meridian Avenue East is anticipated. It should also be taken into consideration that many parents may utilize the existing school bus routes to avoid driving on Meridian Avenue East. Actual queueing demands may be lower subsequent to the school remodel.

#### E. Future Traffic Volumes With and Without the Project

A horizon year of 2022 was chosen for the future study period to determine any impact during peak hours of travel. The future 2022 background traffic volumes were derived by applying a 3 percent compound annual growth rate to the existing traffic volumes shown in Figure 3. The 2022 background volumes are shown in Figure 6 while Figure 7 represents the future background volumes in addition to the school entrances and school-generated traffic.

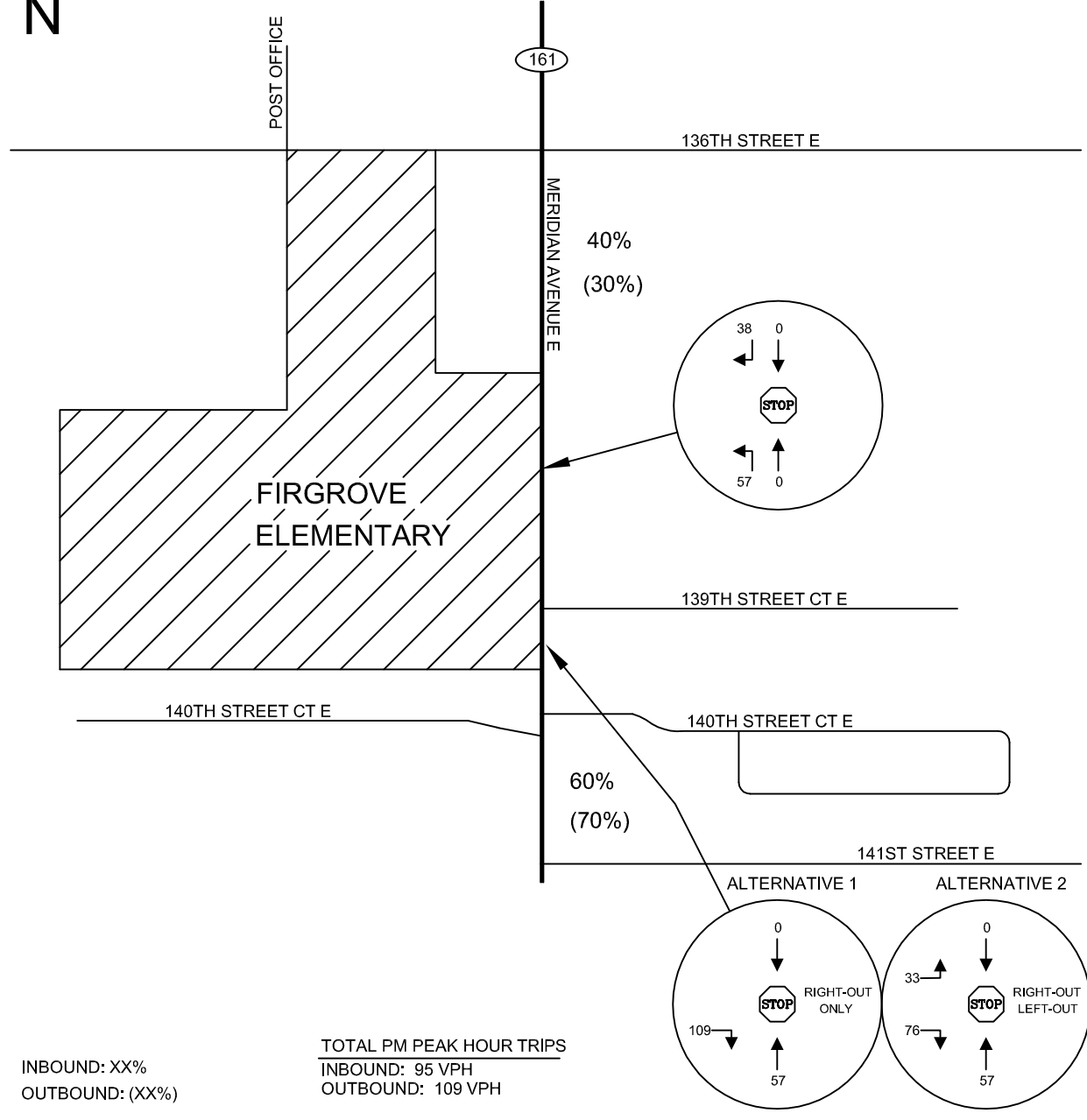


FIRGROVE ELEMENTARY

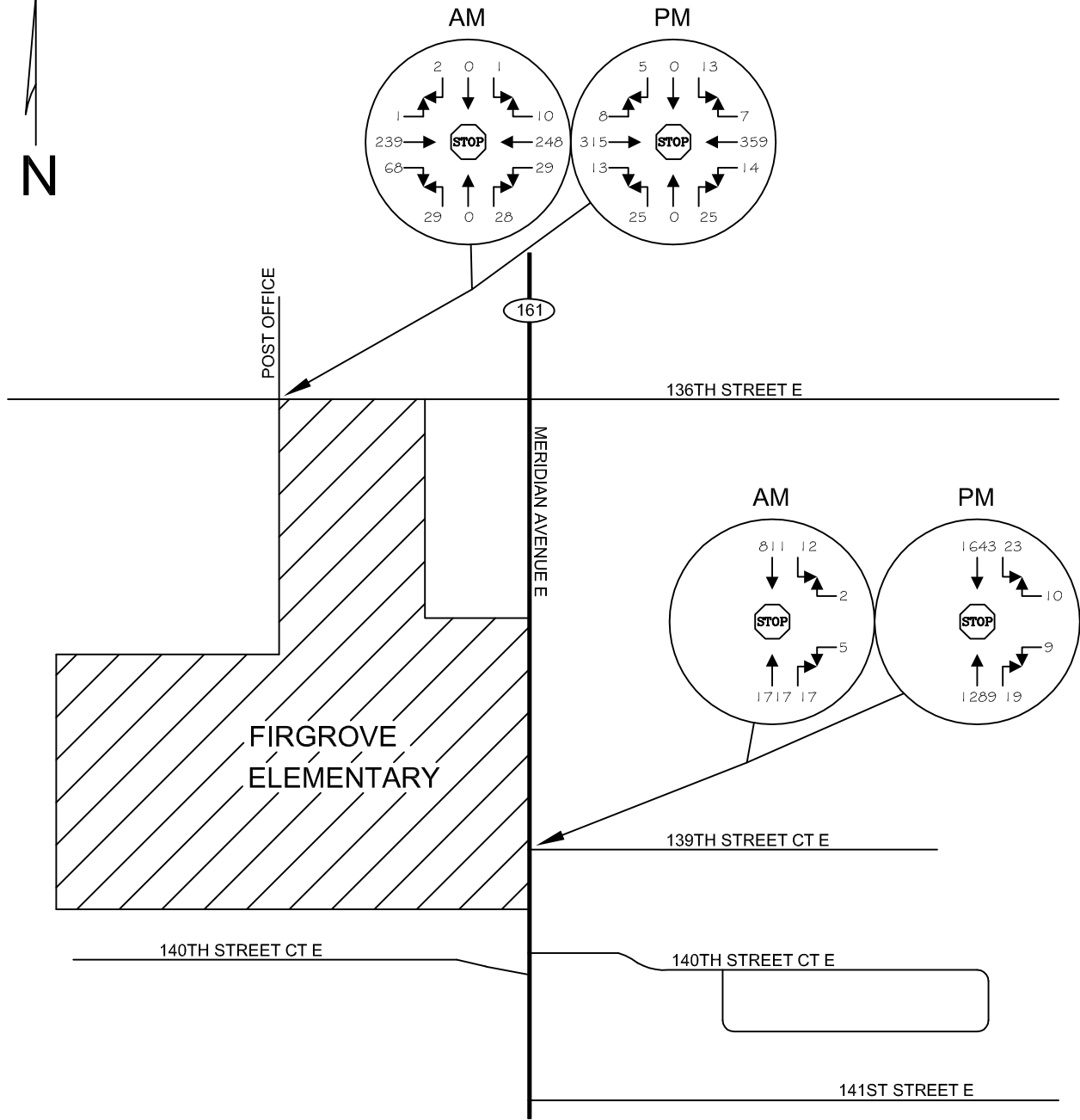


AM TRIP DISTRIBUTION & ASSIGNMENT

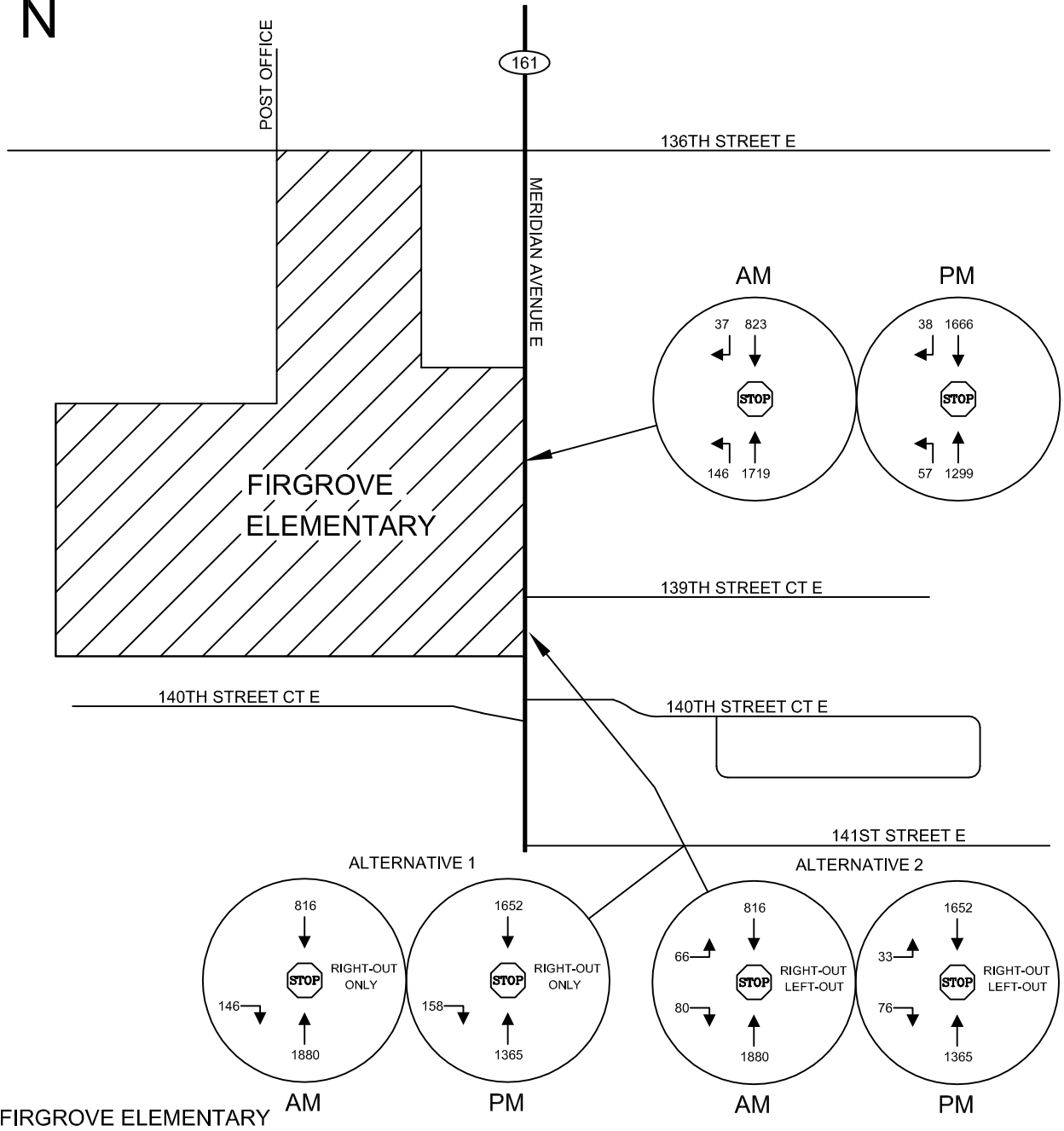
FIGURE 4



FIRGROVE ELEMENTARY



FIRGROVE ELEMENTARY





## F. Future Level of Service

Future peak hour delays were determined through the use of the *Highway Capacity Manual 2010*. Capacity analysis is used to determine level of service (LOS) which is an established measure of congestion for transportation facilities. LOS is defined for a variety of facilities including intersections, freeways, arterials, etc. A complete definition of level of service and related criteria can be found in the HCM.

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

The range for intersection level of service is LOS A to LOS F with the former indicating the best operating conditions with low control delays and the latter indicating the worst conditions with heavy control delays. Detailed descriptions of intersection LOS are given in the 2010 Highway Capacity Manual. Level of service calculations were made through the use of the Synchro 9 program, which follows procedures of the HCM for unsignalized intersections. Level of service results and accompanying approach delays are shown below in Table 3. These results reflect 2022 future traffic conditions with project trips added to the street system.

**Table 3**  
*2022 Level of Service with School Remodel (Full-Capacity)*  
*Delays given in seconds per vehicle*

Intersection	Control	Approach	AM Peak Hour		PM Peak Hour	
			LOS	Delay	LOS	Delay
Meridian Avenue East & North Entrance	TWSC	Northbound LT	B	12.0	C	20.5
Meridian Avenue East & South Entrance (Alternative 1: Right-Out Only)	TWSC	Eastbound RT	C	16.3	E	40.6
(Alternative 2: Right- and Left-Out)		Eastbound	E	35.1	E	49.9

(TWSC: Two-Way Stop Control)

LOS is expected to operate with delays up to LOS C at the northern inbound entrance during the critical peak hours of operations.

The southern entrance was analyzed under two alternatives: Alternative 1: Right-out only and Alternative 2: Right- and Left-out. Alternative 1 results in delays up to LOS E (40.6 seconds) for the PM peak hour; Alternative 2 results in delays up to LOS E (49.9 seconds). It should also be noted that the school

The southern entrance was analyzed under two alternatives: Alternative 1: Right-out only and Alternative 2: Right- and Left-out. Alternative 1 results in delays up to LOS E (40.6 seconds) for the PM peak hour; Alternative 2 results in delays up to LOS E (49.9 seconds). It should also be noted that the school entrances are bracketed between two signalized intersections (136th Street East to the north and 144th Street East to the south) which creates periods of gaps in vehicular flow. These artificial gaps allow a greater number of outbound trips to occur periodically. Field visits and observations indicated routine gaps along Meridian Avenue East; sample photos depicting observed gaps during the PM peak hour are attached in the appendix for reference. These gaps will aid in alleviating queueing back-ups and potentially reduce overall experience delays.

G. Access Sight Distance

Assessments of the proposed access driveways were made to determine whether or not adequate entering sight distance (ESD) can be provided for project traffic. Sight distance requirements were obtained from Pierce County’s *Manual on Design Guidelines and Specifications for Road and Bridge Construction*.

**Table 4**  
*Entering Sight Distance (ESD)*  
*Measurements given in feet*

Roadway	Direction	Posted Speed Limit	Recommended	Available
<b>Meridian Avenue E</b>	North/South	35 mph	415	>500
<b>136th Street E</b>	East/West	35 mph	415	>500

Based on preliminary examinations of the proposed access locations, sight distance appears to be met. Meridian Avenue East and 136th Street East have minor vertical grade (< 2%) and no horizontal curvature, offering a clear sight of visibility. No safety issues are anticipated or detected with the proposed access layout and locations.

V. CONCLUSIONS AND MITIGATION

The proposed project is a replacement to update the existing aging Firgrove Elementary School. The new facility allows for a more efficient design and layout configuration. Current student population is approximately 647 students based on the 2015-16 student enrollment count. A design schematic is shown in Figure 2. The new school would allow for a maximum capacity of 730 students. This study analyzed operations under future conditions with a five year horizon assuming the school at full-capacity.

For the first year of operations, the new Firgrove Elementary school will house the existing student Pope Elementary student population (approximately 593 students) for one year while the Pope Elementary receives a remodel. The school district is actively seeking an optimal offset arrival/dismissal schedule to

avoid potential operational conflicts with the two schools. Approximately 45 minutes to an hour of offset is proposed, allowing sufficient time to clear student drop-off/pick up traffic. With said offset schedule, no congestion or traffic related issues are anticipated.

Access to the school is proposed via one inbound northerly entrance and one southerly outbound entrance. Due to the high vehicular volumes found on Meridian Avenue East, it is suggested to allow outbound right-turns only at the southern entrance during the school peak hours. This would reduce queueing backups that would occur as left-turn egress from the site would experience heavy delays. A flagger, or other mitigating measure, can be sent out to the field during peak times to cone off the left-turn lane requiring right out only. Off-peak times would still allow for a left-turn egress from the site. A bus/staff access is proposed with an entrance extending south from 136th Street East near the current access providing parent pick-up and drop-off for Firgrove.

Future delays with the school remodel are summarized in Table 3. During the AM peak hour, delays are expected to be in the LOS C or better range; during the PM peak hour, delays are expected to be in the LOS E or better range (assuming Alternative 1: Right-out only at southern access). Field observations indicates artificial gaps created by the signalized intersections to the north and south of the proposed access locations, allowing times of greater inbound/outbound movements to occur. Given the driveway design and parking lot configuration, no queueing issues are anticipated to spillover to Meridian Avenue East. The proposed layout allows flexibility in operations should more queueing be needed.

Based on the above, proposed mitigation is as follows:

1. During peak school hours, implement a mitigating strategy (e.g. flagger, cones, etc.) at the southern entrance to allow right-turns only. Left-turn may still be allowed during off-peak times.
2. Subsequent to the new school opening, the district will monitor and modify as needed to provide the safest and most efficient operational flow in terms on student drop-off/pick-up queueing with the new layout and design.
3. Implement an offset bell schedule for the first year of operations while Pope Elementary occupies the old Firgrove facility while their building is remodeled. A recommended offset of 45 minutes to 1 hour is proposed as peak congestion with respect to schools generally take 20-30 minutes to clear.
4. Design a southbound right-turn pocket or right-turn taper in accordance with WSDOT standards at the northerly inbound entrance on Meridian Avenue East to allow efficient ingress while quickly removing decelerating right-turn vehicles from the through lane of travel. A recommended taper or pocket length per WSDOT would be 100 linear feet based on the 35 mph posted speed limit found on Meridian Avenue East.

FIRGROVE ELEMENTARY  
TRAFFIC IMPACT ANALYSIS

APPENDIX

## LEVEL OF SERVICE

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

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

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

### Level-of-Service definitions

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

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

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

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

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

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

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

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

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

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

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

*Signalized Intersections - Level of Service*

<u>Level of Service</u>	<u>Control Delay per Vehicle (sec)</u>
A	$\leq 10$
B	$> 10$ and $\leq 20$
C	$> 20$ and $\leq 35$
D	$> 35$ and $\leq 55$
E	$> 55$ and $\leq 80$
F	$> 80$

*Unsignalized Intersections - Level of Service*

<u>Level of Service</u>	<u>Average Total Delay per Vehicle (sec)</u>
A	$\leq 10$
B	$> 10$ and $\leq 15$
C	$> 15$ and $\leq 25$
D	$> 25$ and $\leq 35$
E	$> 35$ and $\leq 50$
F	$> 50$

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

*AWSC Intersections - Level of Service*

<u>Level of Service</u>	<u>Average Total Delay per Vehicle (sec)</u>
A	$\leq 10$
B	$> 10$ and $\leq 15$
C	$> 15$ and $\leq 25$
D	$> 25$ and $\leq 35$
E	$> 35$ and $\leq 50$
F	$> 50$

Detailed Average Rate Trip Calculations  
For 730 Students of Elementary School(520) - [R]

Project: Firgrove Elementary  
Phase:

Open Date:  
Analysis Date:

Description:

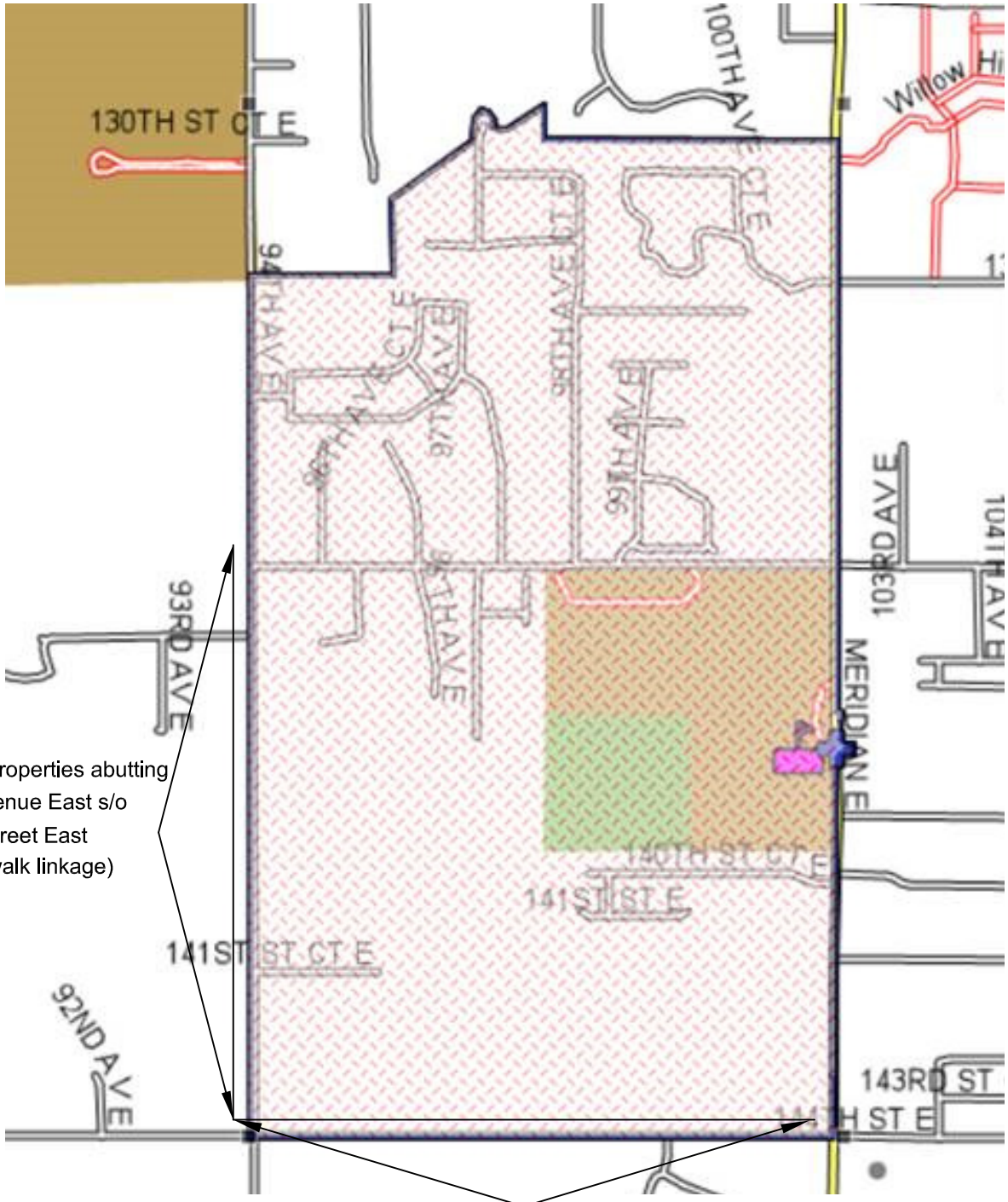
	Average Rate	Standard Deviation	Adjustment Factor	Driveway Volume
Avg. Weekday 2-Way Volume	1.29	1.26	1.00	942
7-9 AM Peak Hour Enter	0.25	0.00	1.00	183
7-9 AM Peak Hour Exit	0.20	0.00	1.00	146
7-9 AM Peak Hour Total	0.45	0.70	1.00	329
4-6 PM Peak Hour Enter	0.07	0.00	1.00	51
4-6 PM Peak Hour Exit	0.08	0.00	1.00	59
4-6 PM Peak Hour Total	0.15	0.40	1.00	110
AM Pk Hr, Generator, Enter	0.25	0.00	1.00	183
AM Pk Hr, Generator, Exit	0.20	0.00	1.00	146
AM Pk Hr, Generator, Total	0.45	0.70	1.00	329
PM Pk Hr, Generator, Enter	0.13	0.00	1.00	95
PM Pk Hr, Generator, Exit	0.15	0.00	1.00	109
PM Pk Hr, Generator, Total	0.28	0.54	1.00	204
Saturday 2-Way Volume	0.00	0.00	1.00	0
Saturday Peak Hour Enter	0.00	0.00	1.00	0
Saturday Peak Hour Exit	0.00	0.00	1.00	0
Saturday Peak Hour Total	0.00	0.00	1.00	0
Sunday 2-Way Volume	0.00	0.00	1.00	0
Sunday Peak Hour Enter	0.00	0.00	1.00	0
Sunday Peak Hour Exit	0.00	0.00	1.00	0
Sunday Peak Hour Total	0.00	0.00	1.00	0

Note: A zero indicates no data available.

Source: Institute of Transportation Engineers  
Trip Generation Manual, 9th Edition, 2012

TRIP GENERATION 2013, TRAFFICWARE, LLC





Exclude properties abutting  
94th Avenue East s/o  
136th Street East  
(no sidewalk linkage)

Exclude properties abutting 144th Street East  
(no sidewalk linkage)

FIRGROVE ELEMENTARY



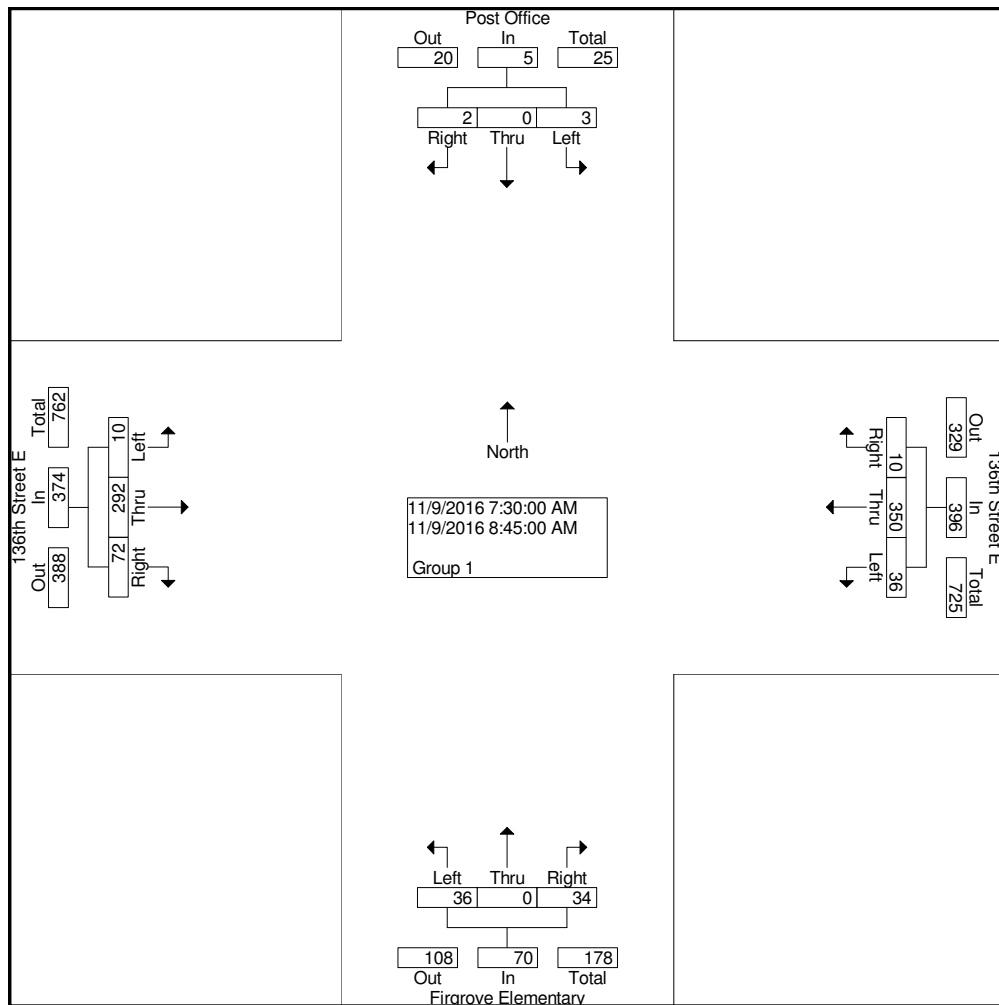
FIRGROVE ELEMENTARY WALK AREA

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

File Name : 3858a  
 Site Code : 3858  
 Start Date : 11/9/2016  
 Page No : 1

Groups Printed- Group 1

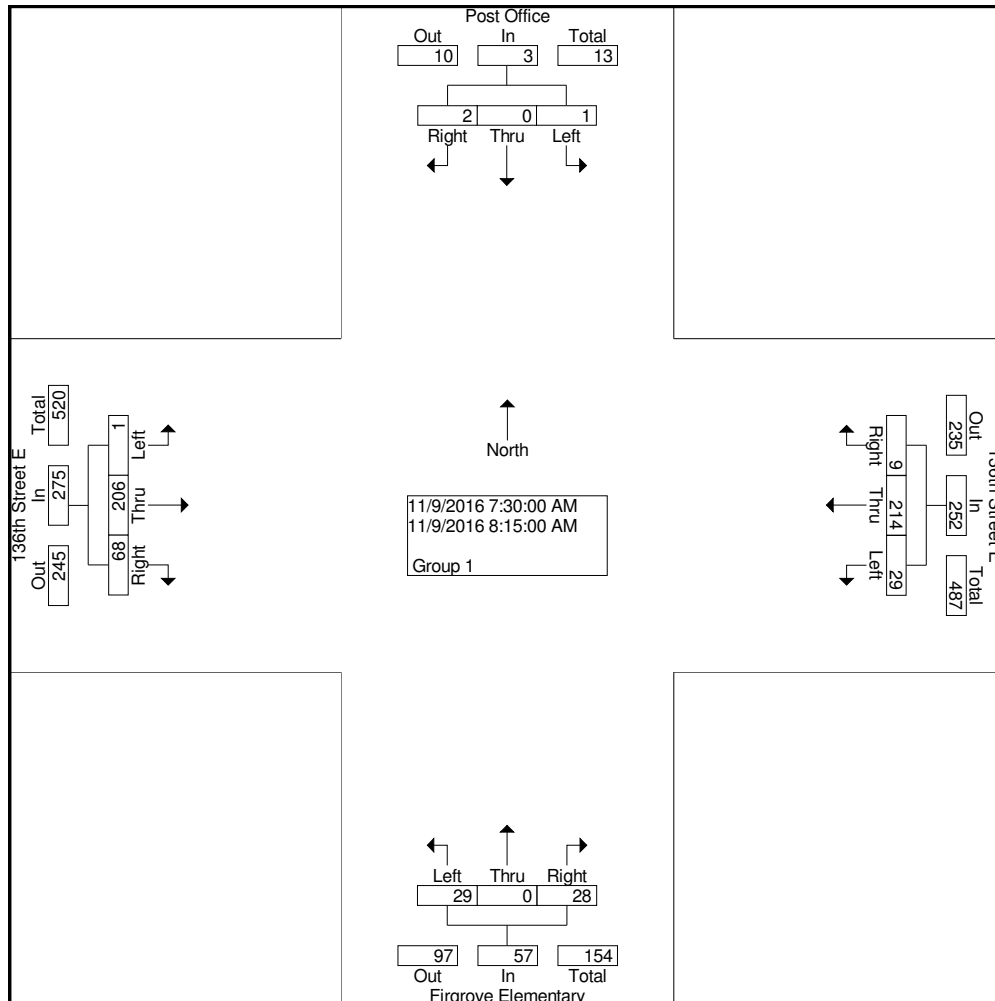
Start Time	Post Office Southbound			136th Street E Westbound			Firgrove Elementary Northbound			136th Street E Eastbound			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:30 AM	0	0	0	3	81	4	4	0	4	8	81	1	186
07:45 AM	0	0	0	2	37	1	0	0	1	2	39	0	82
Total	0	0	0	5	118	5	4	0	5	10	120	1	268
08:00 AM	2	0	0	4	47	6	3	0	6	11	44	0	123
08:15 AM	0	0	1	0	49	18	21	0	18	47	42	0	196
08:30 AM	0	0	0	1	51	6	6	0	6	2	41	1	114
08:45 AM	0	0	2	0	85	1	0	0	1	2	45	8	144
Total	2	0	3	5	232	31	30	0	31	62	172	9	577
Grand Total	2	0	3	10	350	36	34	0	36	72	292	10	845
Apprch %	40.0	0.0	60.0	2.5	88.4	9.1	48.6	0.0	51.4	19.3	78.1	2.7	
Total %	0.2	0.0	0.4	1.2	41.4	4.3	4.0	0.0	4.3	8.5	34.6	1.2	



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

File Name : 3858a  
 Site Code : 3858  
 Start Date : 11/9/2016  
 Page No : 2

Start Time	Post Office Southbound				136th Street E Westbound				Firgrove Elementary Northbound				136th Street E Eastbound				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour From 07:30 AM to 08:45 AM - Peak 1 of 1																	
Intersection	07:30 AM																
Volume	2	0	1	3	9	214	29	252	28	0	29	57	68	206	1	275	587
Percent	66.7	0.0	33.3		3.6	84.9	11.5		49.1	0.0	50.9		24.7	74.9	0.4		
08:15																	
Volume	0	0	1	1	0	49	18	67	21	0	18	39	47	42	0	89	196
Peak Factor	0.749																
High Int.	08:00 AM																
Volume	2	0	0	2	07:30 AM				08:15 AM				07:30 AM				
Peak Factor	0.375				0.716				0.365				0.764				

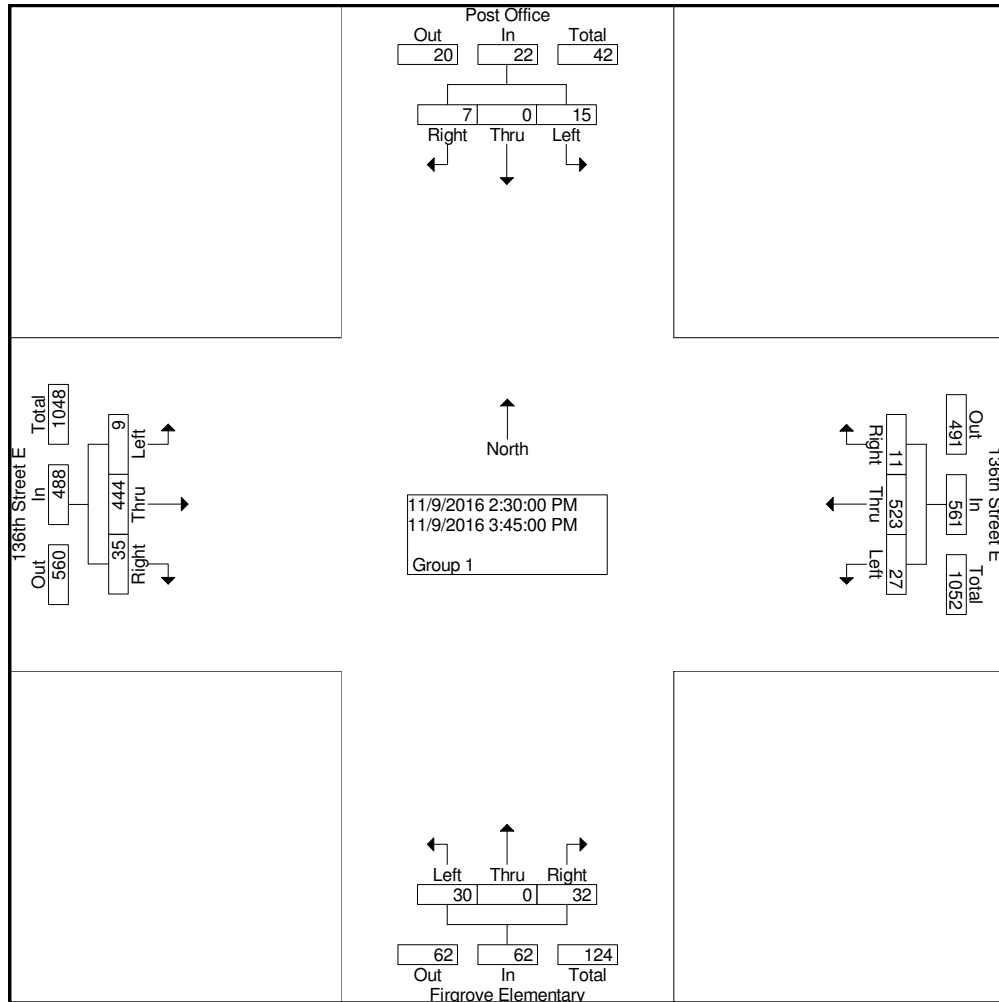


Heath & Associates, Inc.  
 2214 Tacoma Road  
 Puyallup, WA 98371

File Name : 3858b  
 Site Code : 00003858  
 Start Date : 11/9/2016  
 Page No : 1

Groups Printed- Group 1

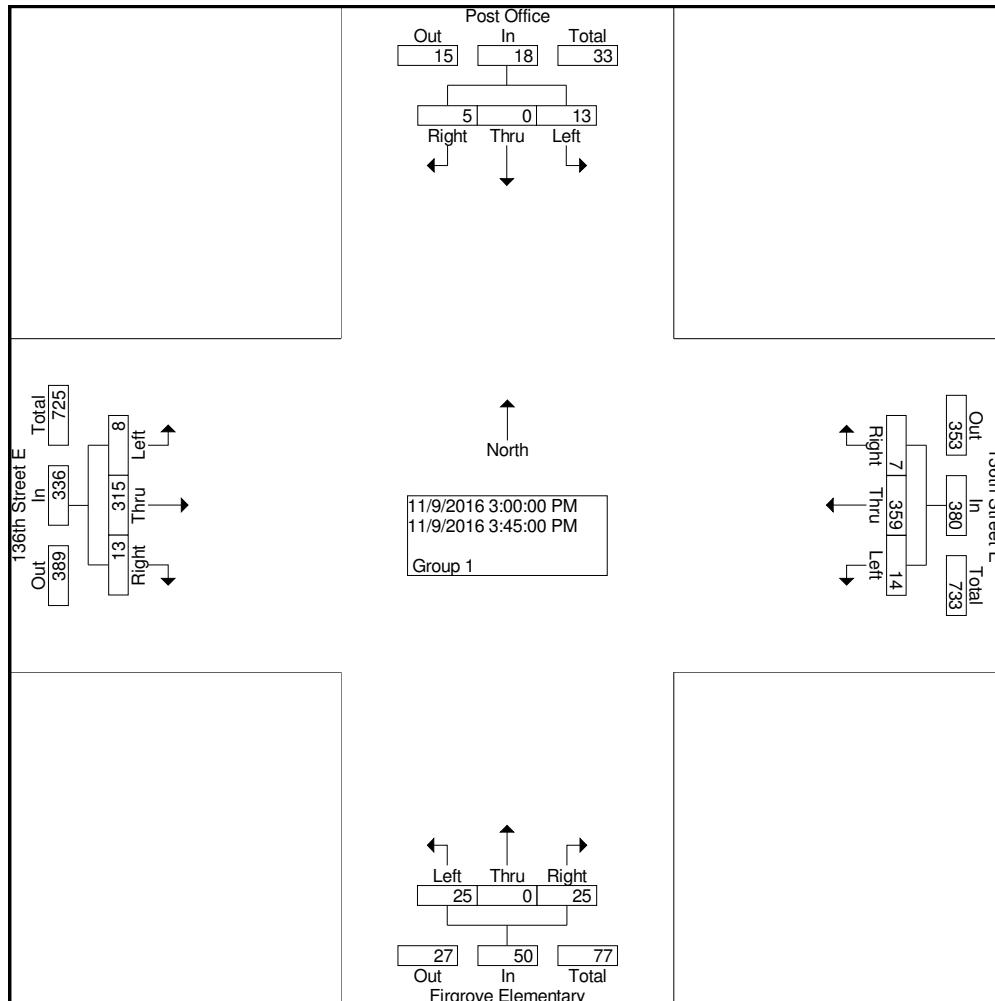
Start Time	Post Office Southbound			136th Street E Westbound			Firgrove Elementary Northbound			136th Street E Eastbound			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
02:30 PM	1	0	2	2	93	6	3	0	1	7	59	1	175
02:45 PM	1	0	0	2	71	7	4	0	4	15	70	0	174
Total	2	0	2	4	164	13	7	0	5	22	129	1	349
03:00 PM	1	0	3	3	89	6	19	0	22	11	85	3	242
03:15 PM	1	0	0	2	100	2	3	0	1	0	71	1	181
03:30 PM	1	0	9	1	72	2	2	0	1	1	77	3	169
03:45 PM	2	0	1	1	98	4	1	0	1	1	82	1	192
Total	5	0	13	7	359	14	25	0	25	13	315	8	784
Grand Total	7	0	15	11	523	27	32	0	30	35	444	9	1133
Apprch %	31.8	0.0	68.2	2.0	93.2	4.8	51.6	0.0	48.4	7.2	91.0	1.8	
Total %	0.6	0.0	1.3	1.0	46.2	2.4	2.8	0.0	2.6	3.1	39.2	0.8	



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

File Name : 3858b  
 Site Code : 00003858  
 Start Date : 11/9/2016  
 Page No : 2

Start Time	Post Office Southbound				136th Street E Westbound				Firgrove Elementary Northbound				136th Street E Eastbound				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour From 02:30 PM to 03:45 PM - Peak 1 of 1																	
Intersection	03:00 PM																
Volume	5	0	13	18	7	359	14	380	25	0	25	50	13	315	8	336	784
Percent	27.8	0.0	72.2		1.8	94.5	3.7		50.0	0.0	50.0		3.9	93.8	2.4		
03:00 Volume	1	0	3	4	3	89	6	98	19	0	22	41	11	85	3	99	242
Peak Factor	0.810																
High Int.	03:30 PM																
Volume	1	0	9	10	2	100	2	104	19	0	22	41	11	85	3	99	
Peak Factor	0.450				0.913				0.305				0.848				

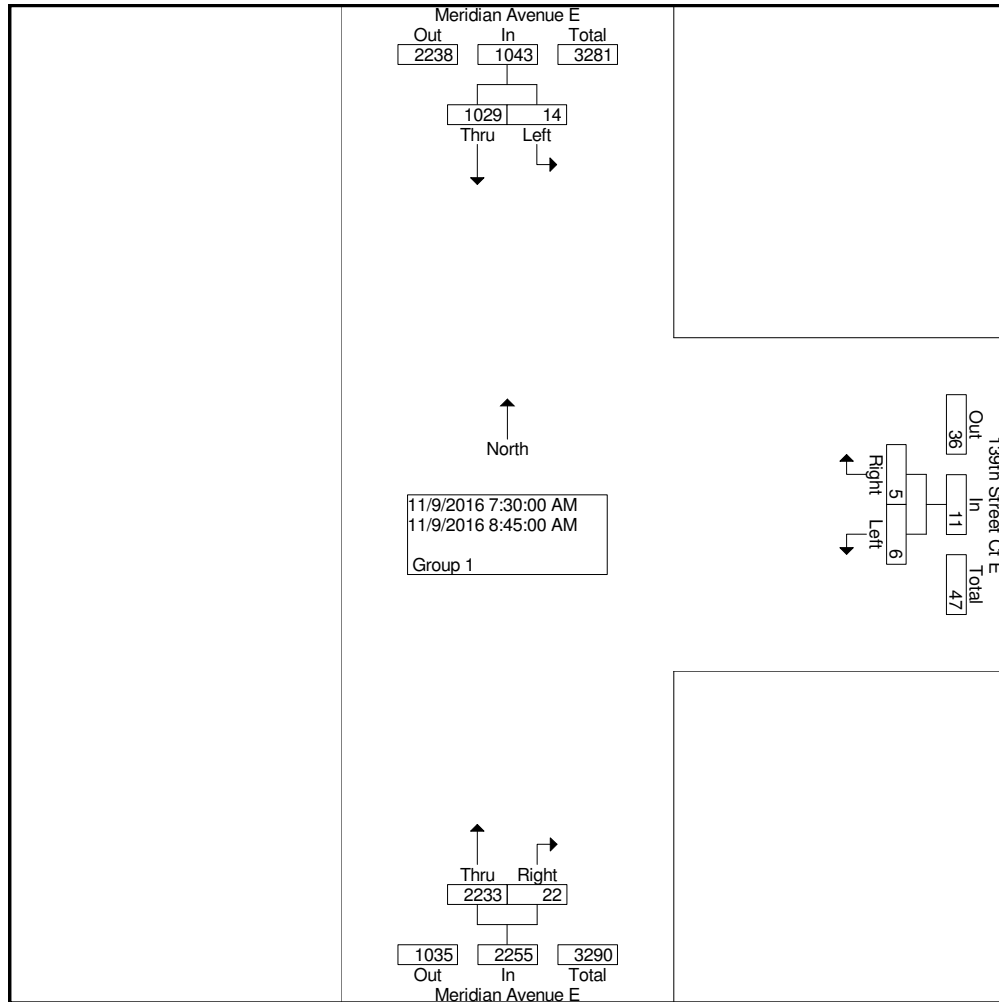


Heath & Associates, Inc.  
 2214 Tacoma Road  
 Puyallup, WA 98371

File Name : 3858c  
 Site Code : 3858  
 Start Date : 11/9/2016  
 Page No : 1

Groups Printed- Group 1

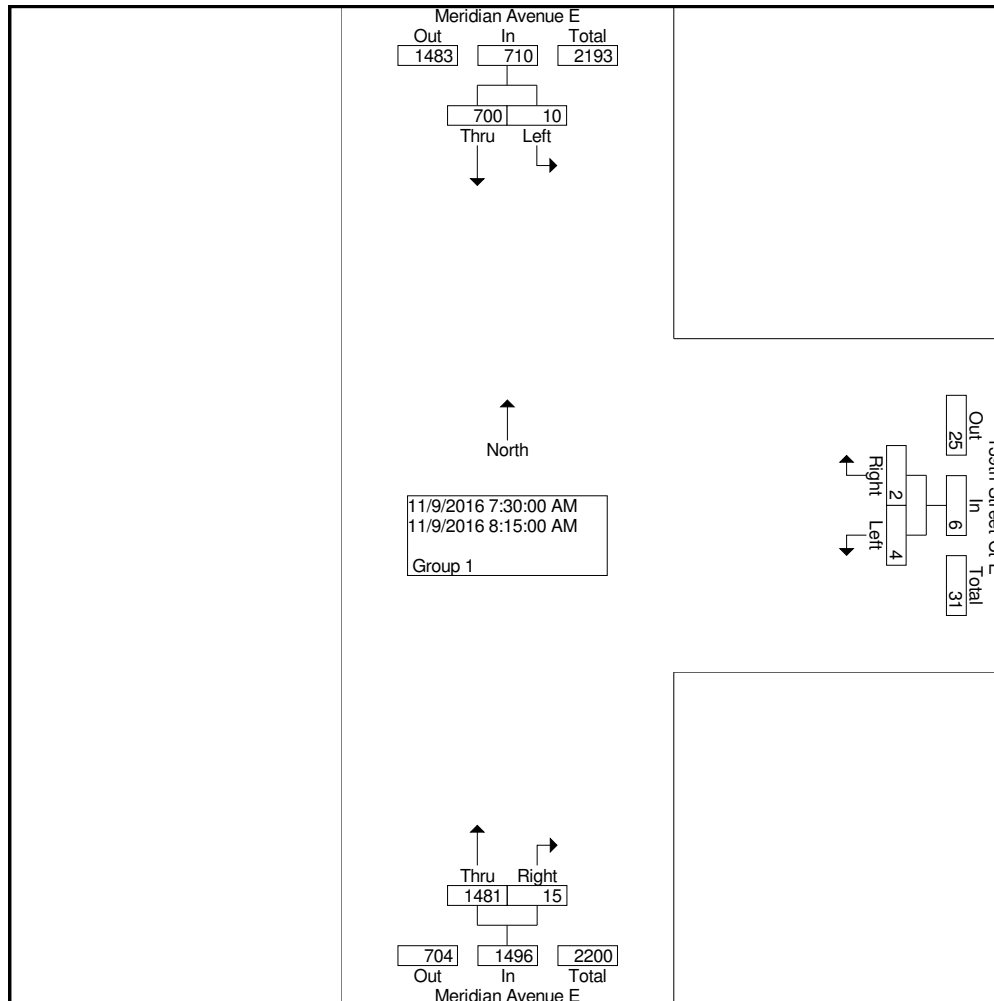
Start Time	Meridian Avenue E Southbound			139th Street Ct E Westbound			Meridian Avenue E Northbound			Eastbound			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
07:30 AM	0	194	3	0	0	1	4	442	0	0	0	0	644
07:45 AM	0	183	0	0	0	1	6	386	0	0	0	0	576
Total	0	377	3	0	0	2	10	828	0	0	0	0	1220
08:00 AM	0	146	4	1	0	0	4	340	0	0	0	0	495
08:15 AM	0	177	3	1	0	2	1	313	0	0	0	0	497
08:30 AM	0	163	3	0	0	1	2	393	0	0	0	0	562
08:45 AM	0	166	1	3	0	1	5	359	0	0	0	0	535
Total	0	652	11	5	0	4	12	1405	0	0	0	0	2089
Grand Total	0	1029	14	5	0	6	22	2233	0	0	0	0	3309
Apprch %	0.0	98.7	1.3	45.5	0.0	54.5	1.0	99.0	0.0	0.0	0.0	0.0	
Total %	0.0	31.1	0.4	0.2	0.0	0.2	0.7	67.5	0.0	0.0	0.0	0.0	



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

File Name : 3858c  
 Site Code : 3858  
 Start Date : 11/9/2016  
 Page No : 2

Start Time	Meridian Avenue E Southbound				139th Street Ct E Westbound				Meridian Avenue E Northbound				Eastbound				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour From 07:30 AM to 08:45 AM - Peak 1 of 1																	
Intersection	07:30 AM																
Volume	0	700	10	710	2	0	4	6	15	1481	0	1496	0	0	0	0	2212
Percent	0.0	98.6	1.4		33.3	0.0	66.7		1.0	99.0	0.0		0.0	0.0	0.0		
07:30																	
Volume	0	194	3	197	0	0	1	1	4	442	0	446	0	0	0	0	644
Peak Factor																	
High Int.	07:30 AM				08:15 AM				07:30 AM				7:15:00 AM				
Volume	0	194	3	197	1	0	2	3	4	442	0	446					0.859
Peak Factor	0.901				0.500				0.839								

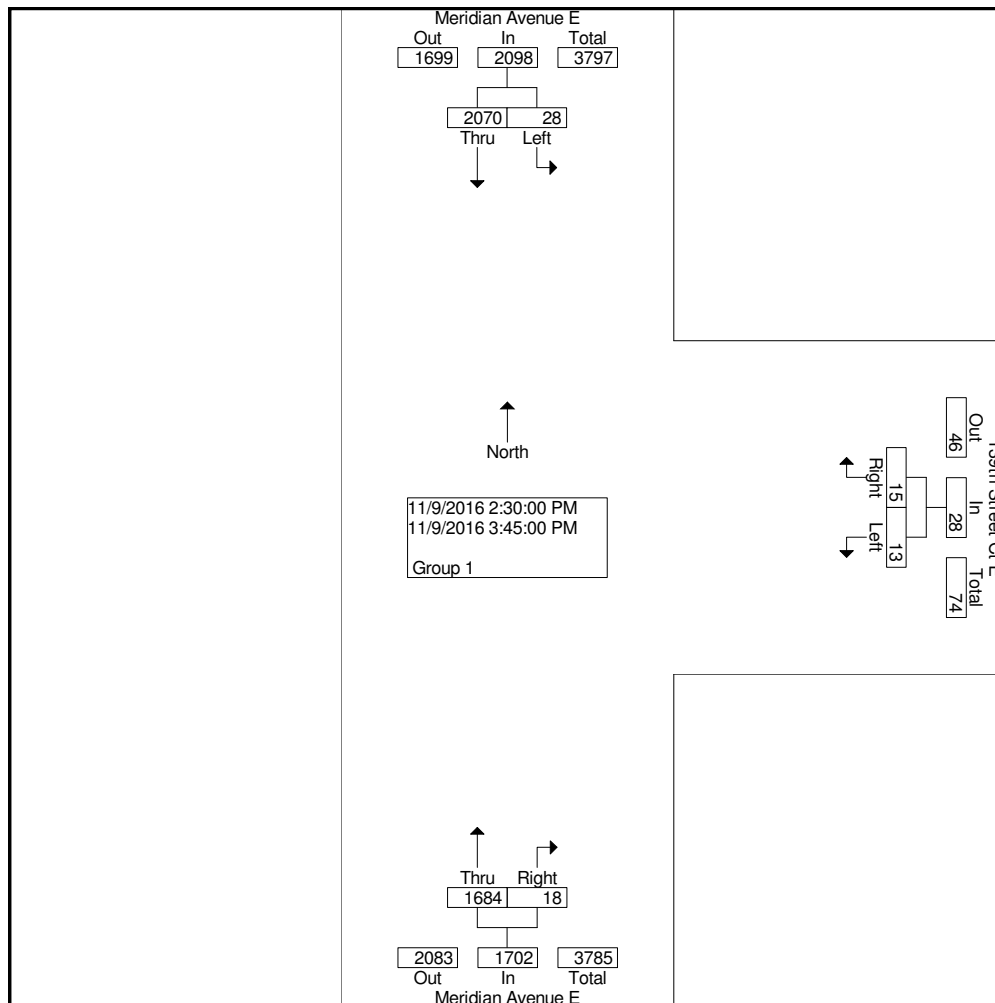


Heath & Associates, Inc.  
 2214 Tacoma Road  
 Puyallup, WA 98371

File Name : 3858d  
 Site Code : 00003858  
 Start Date : 11/9/2016  
 Page No : 1

Groups Printed- Group 1

Start Time	Meridian Avenue E Southbound			139th Street Ct E Westbound			Meridian Avenue E Northbound			Eastbound			Int. Total
	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	
Factor	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
02:30 PM	0	328	3	5	0	3	1	305	0	0	0	0	645
02:45 PM	0	325	5	1	0	2	1	267	0	0	0	0	601
Total	0	653	8	6	0	5	2	572	0	0	0	0	1246
03:00 PM	0	334	2	0	0	1	1	279	0	0	0	0	617
03:15 PM	0	358	5	2	0	0	2	297	0	0	0	0	664
03:30 PM	0	397	6	0	0	4	6	279	0	0	0	0	692
03:45 PM	0	328	7	7	0	3	7	257	0	0	0	0	609
Total	0	1417	20	9	0	8	16	1112	0	0	0	0	2582
Grand Total	0	2070	28	15	0	13	18	1684	0	0	0	0	3828
Apprch %	0.0	98.7	1.3	53.6	0.0	46.4	1.1	98.9	0.0	0.0	0.0	0.0	
Total %	0.0	54.1	0.7	0.4	0.0	0.3	0.5	44.0	0.0	0.0	0.0	0.0	

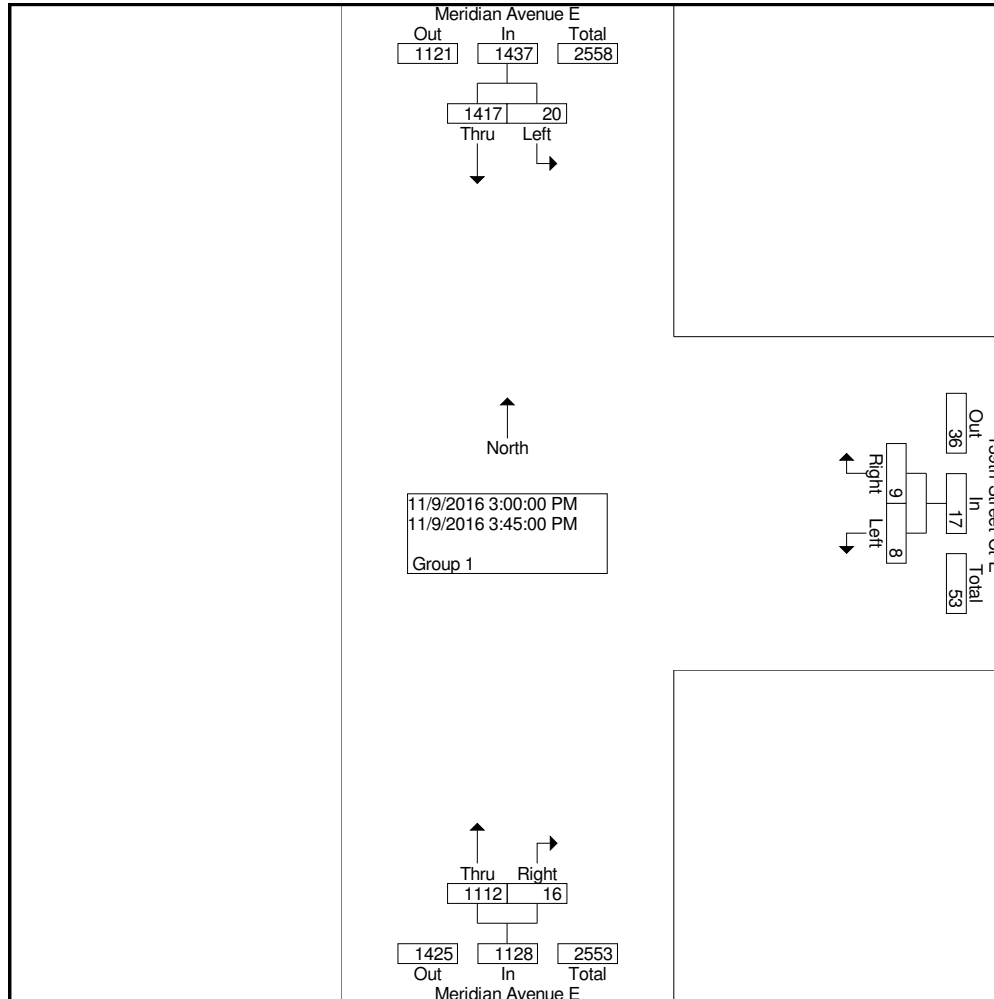




Heath & Associates, Inc.  
 2214 Tacoma Road  
 Puyallup, WA 98371

File Name : 3858d  
 Site Code : 00003858  
 Start Date : 11/9/2016  
 Page No : 2

Start Time	Meridian Avenue E Southbound				139th Street Ct E Westbound				Meridian Avenue E Northbound				Eastbound				Int. Total
	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	
Peak Hour From 02:30 PM to 03:45 PM - Peak 1 of 1																	
Intersection	03:00 PM																
Volume	0	1417	20	1437	9	0	8	17	16	1112	0	1128	0	0	0	0	2582
Percent	0.0	98.6	1.4		52.9	0.0	47.1		1.4	98.6	0.0		0.0	0.0	0.0		
03:30																	
Volume	0	397	6	403	0	0	4	4	6	279	0	285	0	0	0	0	692
Peak Factor	0.933																
High Int.	03:30 PM																
Volume	0	397	6	403	03:45 PM				03:15 PM				2:15:00 PM				
Peak Factor	0.891								0.425				0.943				



## Edgerton Elementary Queueing Collection

### **I. Description**

Date of Data Collection:

Tuesday February 28, 2017 with normal operations.

Weather:

Overcast; No rain.

Time:

2:45 PM – 3:30 PM

Location(s):

128th Avenue East & 164th Street East (North Access)

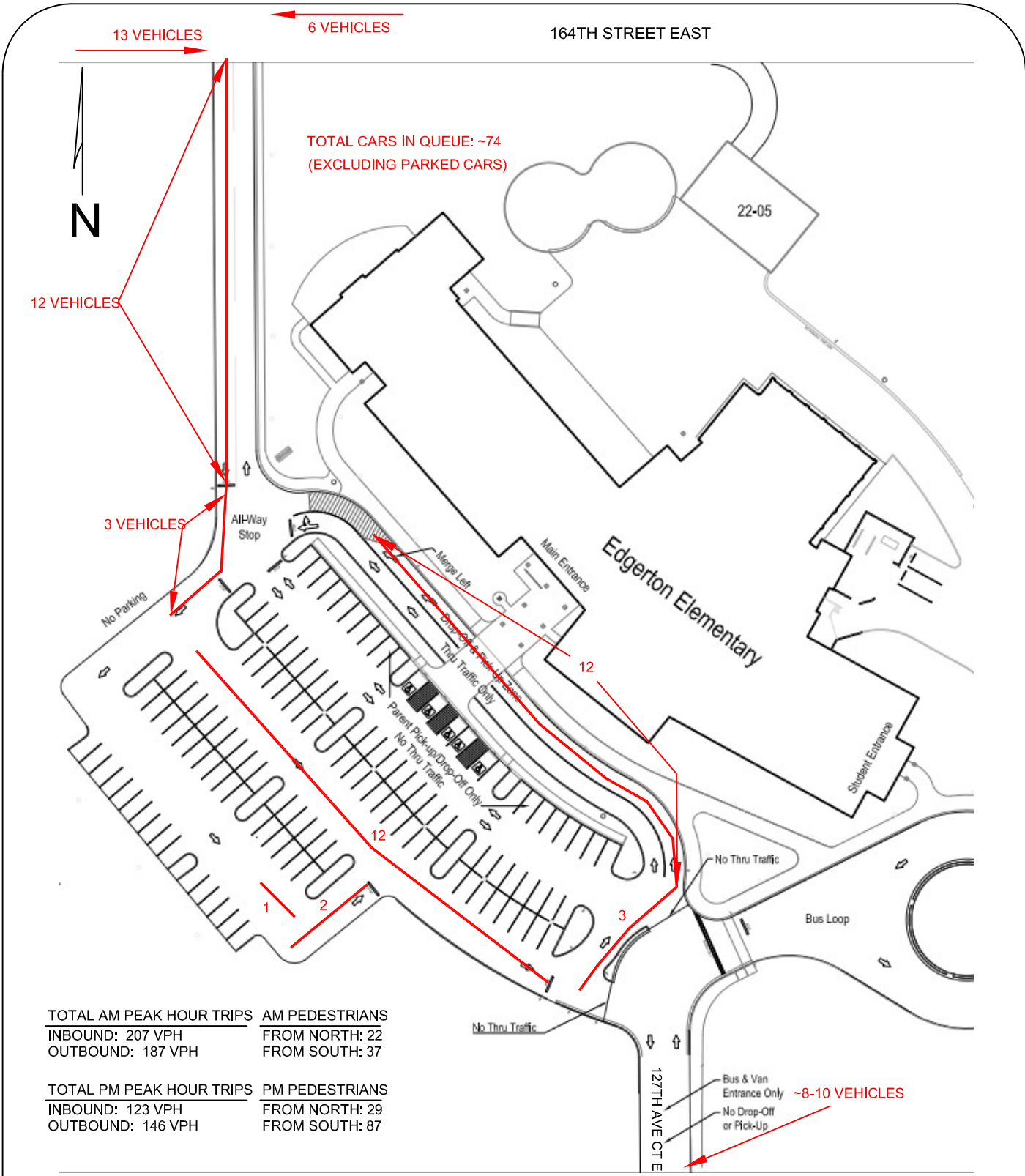
127th Avenue Ct East & 166th Street Ct E (South Access)

### **II. Queueing**

Parents were observed to enter the queue at approximately 2:50 PM. Cars were observed to be queueing at the primary student drop-off zone, parking lot drive isles, open parking stalls, 128th Avenue East, 164th Street East, and 127th Avenue Ct East. The peak demand occurred shortly after the dismissal bell (3:15-3:20 PM) and consisted of approximately 74 vehicles, excluding vehicles parked in open stalls. Figure 1 on the following page depicts the parking lot configuration and observed queues. A summary is provided below:

- School parking lot: 33 vehicles (excluding parking stalls)
- 128th Avenue East: 12 vehicles
- 164th Street East: 13 vehicles w/o 128th Avenue East  
6 vehicles e/o 128th Avenue East
- 127th Avenue Ct E: Approximately 8-10 vehicles
- Parking Stalls: 20-30 (estimation)

**Total queueing demand: ~94-104 vehicles.**



TOTAL CARS IN QUEUE: ~74  
(EXCLUDING PARKED CARS)

<u>TOTAL AM PEAK HOUR TRIPS</u>	<u>AM PEDESTRIANS</u>
INBOUND: 207 VPH	FROM NORTH: 22
OUTBOUND: 187 VPH	FROM SOUTH: 37

<u>TOTAL PM PEAK HOUR TRIPS</u>	<u>PM PEDESTRIANS</u>
INBOUND: 123 VPH	FROM NORTH: 29
OUTBOUND: 146 VPH	FROM SOUTH: 87



2:45 PM

Firgrove  
Elementary

Looking North



Looking South

Firgrove Southermost  
Entrance 2:50 PM

**Intersection**

Int Delay, s/veh 0.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	0	0	146	1719	823	37
Future Vol, veh/h	0	0	146	1719	823	37
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	500	-	-	100
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	60	84	90	60
Heavy Vehicles, %	0	0	0	3	3	0
Mvmt Flow	0	0	243	2046	914	62

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	2424	457	914 0
Stage 1	914	-	- -
Stage 2	1510	-	- -
Critical Hdwy	6.8	6.9	4.1 -
Critical Hdwy Stg 1	5.8	-	- -
Critical Hdwy Stg 2	5.8	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	27	556	754 -
Stage 1	356	-	- -
Stage 2	172	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	18	556	754 -
Mov Cap-2 Maneuver	86	-	- -
Stage 1	356	-	- -
Stage 2	117	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	0	1.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	754	-	-	-	-
HCM Lane V/C Ratio	0.323	-	-	-	-
HCM Control Delay (s)	12	-	0	-	-
HCM Lane LOS	B	-	A	-	-
HCM 95th %tile Q(veh)	1.4	-	-	-	-

**Intersection**

Int Delay, s/veh 1.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	0	146	0	1880	816	0
Future Vol, veh/h	0	146	0	1880	816	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	84	84	90	90
Heavy Vehicles, %	0	0	0	3	3	0
Mvmt Flow	0	243	0	2238	907	0

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	2026	453	907 0
Stage 1	907	-	- -
Stage 2	1119	-	- -
Critical Hdwy	6.8	6.9	4.1 -
Critical Hdwy Stg 1	5.8	-	- -
Critical Hdwy Stg 2	5.8	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	51	559	759 -
Stage 1	359	-	- -
Stage 2	278	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	51	559	759 -
Mov Cap-2 Maneuver	166	-	- -
Stage 1	359	-	- -
Stage 2	278	-	- -

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

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	759	-	559	-	-
HCM Lane V/C Ratio	-	-	0.435	-	-
HCM Control Delay (s)	0	-	16.3	-	-
HCM Lane LOS	A	-	C	-	-
HCM 95th %tile Q(veh)	0	-	2.2	-	-

**Intersection**

Int Delay, s/veh 2.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	66	80	0	1880	816	0
Future Vol, veh/h	66	80	0	1880	816	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	84	84	90	90
Heavy Vehicles, %	0	0	0	3	3	0
Mvmt Flow	110	133	0	2238	907	0

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	2026	453	907	0	-
Stage 1	907	-	-	-	-
Stage 2	1119	-	-	-	-
Critical Hdwy	6.8	6.9	4.1	-	-
Critical Hdwy Stg 1	5.8	-	-	-	-
Critical Hdwy Stg 2	5.8	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-
Pot Cap-1 Maneuver	~ 51	559	759	-	-
Stage 1	359	-	-	-	-
Stage 2	278	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	~ 51	559	759	-	-
Mov Cap-2 Maneuver	166	-	-	-	-
Stage 1	359	-	-	-	-
Stage 2	278	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	35.1	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	759	-	166	559	-	-
HCM Lane V/C Ratio	-	-	0.663	0.239	-	-
HCM Control Delay (s)	0	-	61.4	13.4	-	-
HCM Lane LOS	A	-	F	B	-	-
HCM 95th %tile Q(veh)	0	-	3.8	0.9	-	-

**Notes**

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



**Intersection**

Int Delay, s/veh 0.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	0	0	57	1299	1666	38
Future Vol, veh/h	0	0	57	1299	1666	38
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	500	-	-	100
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	60	94	89	60
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	0	0	95	1382	1872	63

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	2753	936	1872 0
Stage 1	1872	-	- -
Stage 2	881	-	- -
Critical Hdwy	6.8	6.9	4.1 -
Critical Hdwy Stg 1	5.8	-	- -
Critical Hdwy Stg 2	5.8	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	16	270	326 -
Stage 1	109	-	- -
Stage 2	370	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	11	270	326 -
Mov Cap-2 Maneuver	74	-	- -
Stage 1	109	-	- -
Stage 2	262	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	0	1.3	0
HCM LOS	A		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	326	-	-	-	-
HCM Lane V/C Ratio	0.291	-	-	-	-
HCM Control Delay (s)	20.5	-	0	-	-
HCM Lane LOS	C	-	A	-	-
HCM 95th %tile Q(veh)	1.2	-	-	-	-

**Intersection**

Int Delay, s/veh 2.1

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	0	109	0	1365	1652	0
Future Vol, veh/h	0	109	0	1365	1652	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	0	-	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	94	94	89	89
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	0	182	0	1452	1856	0

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	2582	928	1856 0
Stage 1	1856	-	- -
Stage 2	726	-	- -
Critical Hdwy	6.8	6.9	4.1 -
Critical Hdwy Stg 1	5.8	-	- -
Critical Hdwy Stg 2	5.8	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	21	274	330 -
Stage 1	112	-	- -
Stage 2	445	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	21	274	330 -
Mov Cap-2 Maneuver	88	-	- -
Stage 1	112	-	- -
Stage 2	445	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	40.6	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	330	-	274	-	-
HCM Lane V/C Ratio	-	-	0.663	-	-
HCM Control Delay (s)	0	-	40.6	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	0	-	4.3	-	-

**Intersection**

Int Delay, s/veh 2.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Traffic Vol, veh/h	33	76	0	1365	1652	0
Future Vol, veh/h	33	76	0	1365	1652	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	100	0	-	-	-	-
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	60	60	94	94	89	89
Heavy Vehicles, %	0	0	0	2	2	0
Mvmt Flow	55	127	0	1452	1856	0

Major/Minor	Minor2	Major1	Major2
Conflicting Flow All	2582	928	1856 0
Stage 1	1856	-	- -
Stage 2	726	-	- -
Critical Hdwy	6.8	6.9	4.1 -
Critical Hdwy Stg 1	5.8	-	- -
Critical Hdwy Stg 2	5.8	-	- -
Follow-up Hdwy	3.5	3.3	2.2 -
Pot Cap-1 Maneuver	~ 21	274	330 -
Stage 1	112	-	- -
Stage 2	445	-	- -
Platoon blocked, %			- -
Mov Cap-1 Maneuver	~ 21	274	330 -
Mov Cap-2 Maneuver	88	-	- -
Stage 1	112	-	- -
Stage 2	445	-	- -

Approach	EB	NB	SB
HCM Control Delay, s	49.9	0	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	330	-	88	274	-	-
HCM Lane V/C Ratio	-	-	0.625	0.462	-	-
HCM Control Delay (s)	0	-	98	29	-	-
HCM Lane LOS	A	-	F	D	-	-
HCM 95th %tile Q(veh)	0	-	2.9	2.3	-	-

**Notes**

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