

# Staley Property Residential Subdivision

## Traffic Impact Study

*Prepared on behalf of:*

**In Site Engineering P.C.**

March 2025



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*Prepared for submittal to:*



*for the project:*

## Staley Property Residential Subdivision

*on behalf of:*

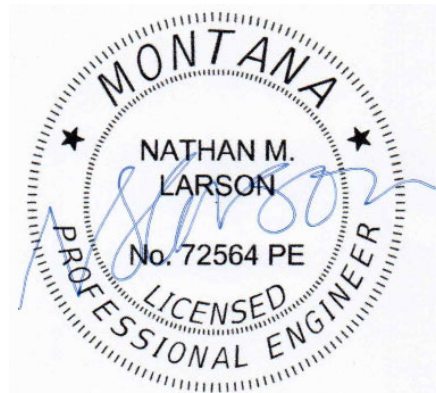
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- A: Raw Traffic Count Data
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- D: Intersection Cost Participation Calculations
- E: Traffic Signal Warrant Analysis for 64<sup>th</sup> at Hesper

Cover Photos by 406 Traffic:

Upper right: Intersection signage, 72<sup>nd</sup> at Hesper  
 Bottom: Site as of Winter 2025, panoramic centered on southeast view from 72<sup>nd</sup> at O'Donnell

# 1 INTRODUCTION

This report documents the Traffic Impact Study conducted for the Staley Property Residential Subdivision project in unincorporated Yellowstone County, west of Billings. It is situated on multiple existing lots in Section 18, Township 01 S, R25 E. The study documented here was conducted as required by Yellowstone County Subdivision Regulations Section 4.6.C.4.B, in concert with In Site Engineering, P.C.

## 1.1 PROJECT SITE AND STUDY AREA

The site location is shown in **Exhibit 1** along with the intersections studied. The study intersections were identified in direct coordination with County staff. The five existing study intersections for this project are:

1. S 72<sup>nd</sup> St W at King Avenue West
2. S 72<sup>nd</sup> St W at O'Donnell Lane
3. S 72<sup>nd</sup> St W at Hesper Road
4. S 68<sup>th</sup> St W at Hesper Road
5. S 64<sup>th</sup> St W at Hesper Road

The project's proposed new access to S 72<sup>nd</sup> Street West was also studied with respect to intersection operations after the project is open. The other two proposed access points will be at the existing intersection of S 71<sup>st</sup> Street West with O'Donnell Lane and a new intersection with 68<sup>th</sup> Street. These local intersections are not examined separately in this study for two reasons. First, O'Donnell Lane and 68<sup>th</sup> Street are largely private and unlikely to carry significant non-project through traffic. Second, all traffic from this proposed subdivision is expected to use those intersections (and the project's new primary access south of O'Donnell) to access the arterial network directly. To that end, project-generated traffic was assigned to the existing 72<sup>nd</sup> at O'Donnell and 68<sup>th</sup> at Hesper intersections, respectively.

From here forward in this report, study intersections are generally referred to only by their distinguishing street names (e.g., "72<sup>nd</sup> at Hesper") for the sake of brevity.

## 1.2 ZONING AND LAND-USE CONTEXT

The project site and all study intersections are outside of the existing city limits and planning jurisdictions of both Laurel and Billings. The proposed development is to be located on what is currently rural, non-qualified agricultural land. Being outside of any city limits, no zoning restrictions are in place for this area. All of the adjacent land uses are either agricultural or rural residential, though the nearby Elder Grove School and Yellowstone Boys and Girls Ranch lie to the southeast and southwest of the project site respectively. These educational facilities are likely to attract some site traffic, but most project trips will come from the greater Billings area to the east, the city of Laurel to the southwest, and Interstate 90 to the east and the south.

## 1.3 PROJECT DESCRIPTION

The proposed project is a new single-family residential subdivision west of Billings. New local streets, as yet unnamed, will be built completely within the project site, and they will connect to one new site access onto S 72<sup>nd</sup> Street West, one existing access east of the 72<sup>nd</sup> at O'Donnell intersection, and one existing access north of the 68<sup>th</sup> at Hesper intersection. There are no plans to implement any turning restrictions at any of the proposed site access points. No access will be provided to the parts of either O'Donnell or 68<sup>th</sup> that are private.

A total of 93 lots will be platted. While these lots are expected to be sold and developed in two phases, this study considers only the full buildout of the project. The private park on the eastern part of the site is for Staley subdivision residents and their guests, and will not generate outside traffic at site access points. **Exhibit 2** shows the site plan and proposed access point locations for the proposed subdivision.

Exhibit 1. Overall Site Location and Study Intersections

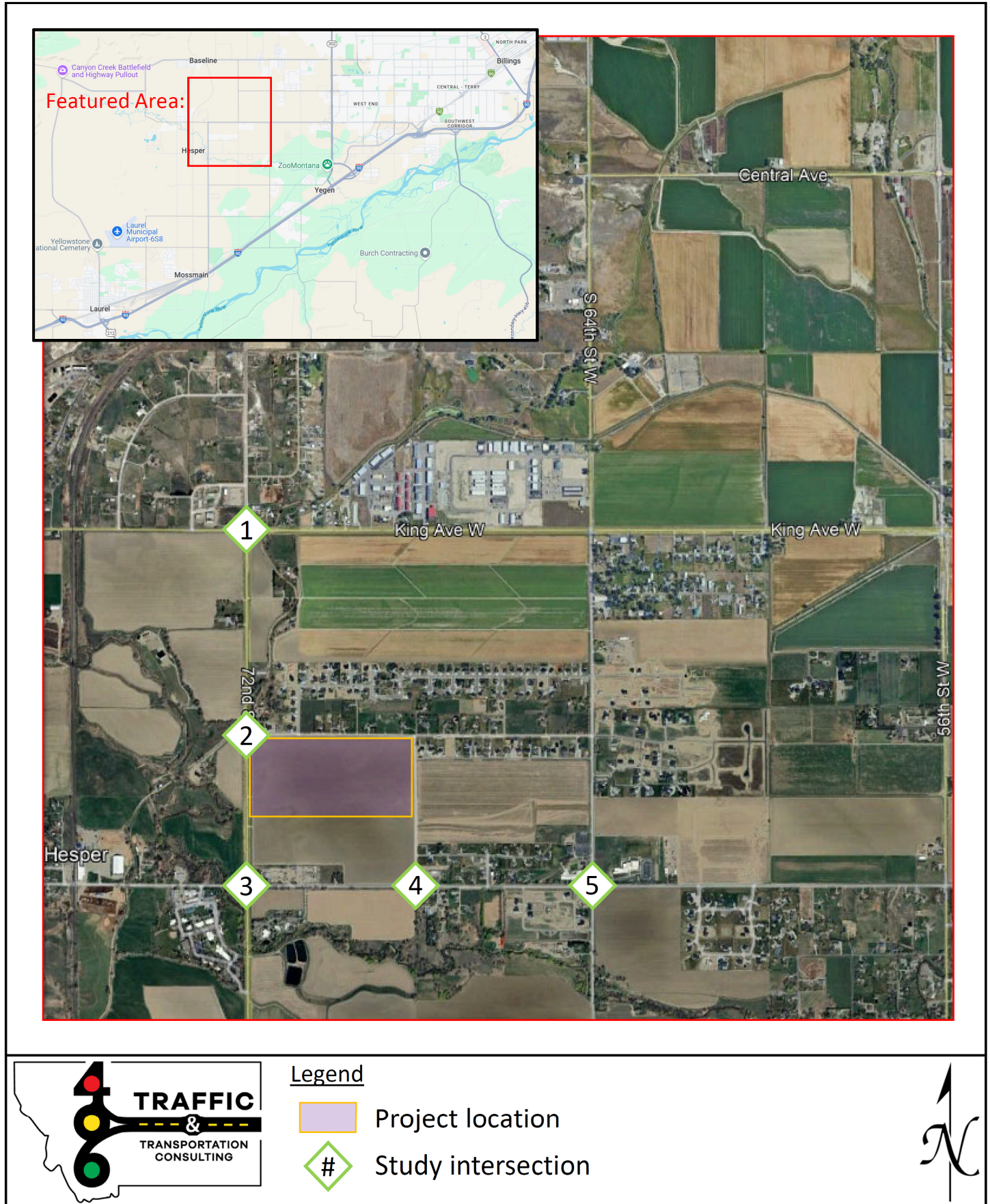


Exhibit 2. Site Plan



Source: In Site Engineering, 2/27/2025

1.4 ANALYSIS METHODS AND REFERENCES

Operational performance was analyzed at the study intersections using the industry-standard methods presented in the USDOT’s Highway Capacity Manual (HCM), published in its modern form as Transportation Research Board Special Report 209. The Synchro software package, version 12, was employed as both a data repository and a capacity analysis tool. Reports for each intersection were generated using Synchro’s application of the assumptions of the HCM’s 7<sup>th</sup> edition, which is the most recent at the time of this study. The HCM methodology for intersection capacity analysis produces delay estimates for each turning movement (or “lane group”, when multiple turning movements operate from the same lane). As indicated in **Exhibit 3**, these delay estimates are assigned Level of Service (LOS) grades that range from A (best) to F (worst). It’s also important to note that for unsignalized intersections with only side-street stop sign control, LOS for the intersection is represented by the LOS for the worst lane group, which are most often on the stop-controlled side street approach. “T” intersections with side-street stop control also fall under this category.

Exhibit 3. LOS Definitions

LOS	Delay, seconds per vehicle
A	0 - 10.0
B	10.1 - 15.0
C	15.1 - 25.0
D	25.1 - 35.0
E	35.1 - 50.0
F	50.1 or more

Source: HCM 7<sup>th</sup> Edition

Operations impacts are determined by whether LOS relates to acceptability standards. According to the Yellowstone County subdivision regulations, the County employs a peak hour intersection LOS standard of C or better. If the future LOS at any intersection or approach is predicted to be lower than C, traffic mitigation measures such as turning lanes, roundabouts, all-way stops, or traffic signals may be required. Yellowstone County has required a signal warrant analysis for the 64<sup>th</sup> at Hesper intersection to be included in this study (see Appendix E).

## 2 EXISTING AND BASE CONDITIONS

### 2.1 STREETS AND INTERSECTIONS

**S 72<sup>nd</sup> Street West** is a rural north-south major collector with one travel lane in each direction. Its speed limit is 55 mph near its intersection with Hesper Road, 45 mph to the north of King Avenue West, and 60 mph elsewhere in the study area. For those not using Interstate 90 to the south, it serves as part of the primary “backroad” route between Laurel and Billings, connecting to King Avenue West and to Neibauer Road to the south of the study area. At its southern terminus after crossing over railroad tracks, it turns into Old US 10, which in turn connects to Interstate 90 and Laurel’s Main Street. There is an exclusive right-turn lane at its intersection with King Avenue West, where right-turning vehicles only need to yield to eastbound traffic, unlike left-turning or through moving vehicles which are required to stop. There are no sidewalks or other multimodal facilities on 72<sup>nd</sup>.

**Hesper Road** is an east-west local road with one travel lane in each direction. Its default speed limit is 45 mph to the west of 64<sup>th</sup> and 50 mph to the east of it, but school zones mandate that these speed limits be lower on weekdays. The speed limit is 15 mph from 7:30 a.m. to 5 p.m. on school days near its intersection at 64<sup>th</sup> because Elder Grove School and Elder Grove Middle School are nearby. Its speed limit is 25 mph to the west of a bridge over Canyon Creek from 8 a.m. to 5 p.m. on school days due to its proximity to the Yellowstone Boys and Girls Ranch, which is at the southwest corner of the intersection with 72<sup>nd</sup> at Hesper. It connects these education facilities, local farms and residential neighborhoods, and the unincorporated Hesper community to Shiloh Road and Gabel Road in the southwestern Billings area. Short sidewalk segments connect the two schools on either side of 64<sup>th</sup>, but no other multimodal facilities are located on Hesper in the study area.

**S 64<sup>th</sup> Street West** is a rural north-south local road with one travel lane in each direction, though it was analyzed as a collector in this study. Its default speed limit is 50 mph within the study area, but the school zone near Elder Grove School calls for nearby speed limits to be lower. For traffic approaching the school zone from the north and from the south, the speed limit is gradually lowered from 50 mph to 45 mph, then to 35 mph, and finally to 15 mph from 7:30 a.m. to 5 p.m. on school days to the north of Hesper Road. The school zone’s 15 mph signs are equipped with solar-augmented dynamic speed displays. 64<sup>th</sup> St W connects Elder Grove School and local farms and neighborhoods to east-west routes such as King Avenue West, Grand Avenue at its northern terminus, and Neibauer Rd, which turns into Shiloh Road to the east. S 64<sup>th</sup> St W turns into Laurel Airport Road at its southern terminus. It is usually not part of the preferred non-interstate route between Billings and Laurel because of its lower speed limits, particularly in the school zone near Elder Grove School. A pedestrian crosswalk crosses the northern leg of its Hesper intersection, but no other multimodal facilities are located on 64<sup>th</sup> in the study area.

**King Avenue West**, in the study area, is an east-west rural major collector with one travel lane in each direction and a speed limit of 60 mph. From 88<sup>th</sup> St eastward, it collects traffic from north-south routes between Billings and Laurel. It connects small residential neighborhoods, farms, and some industrial developments with the greater Billings area where it becomes one of the city’s busiest commercial corridors before intersecting Interstate 90 and transitioning to Mallowney Lane. There are no sidewalks or other multimodal facilities on King Avenue in the study area.

**O’Donnell Lane** is an east-west local road with unmarked travel lanes and no posted speed limit. It becomes narrow and unpaved to the east of its intersection with S 71<sup>st</sup> St W. Presently, it largely serves as an access road linking the Skycrest Estates subdivision and a few other private residences to 72<sup>nd</sup>. It also intersects 64<sup>th</sup> to the east of the study area, but this unpaved road segment is for private residents only and is not intended for through traffic. It is gated and signed as such at both 71<sup>st</sup> and 64<sup>th</sup>.

**S 68<sup>th</sup> Street West** is an unpaved north-south local road with no posted speed limit. It currently serves as an access road for the Lackman subdivision. It intersects Elder Grove Lane and O’Donnell Lane to the north, but

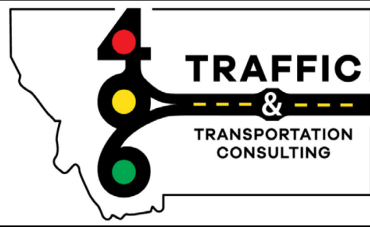
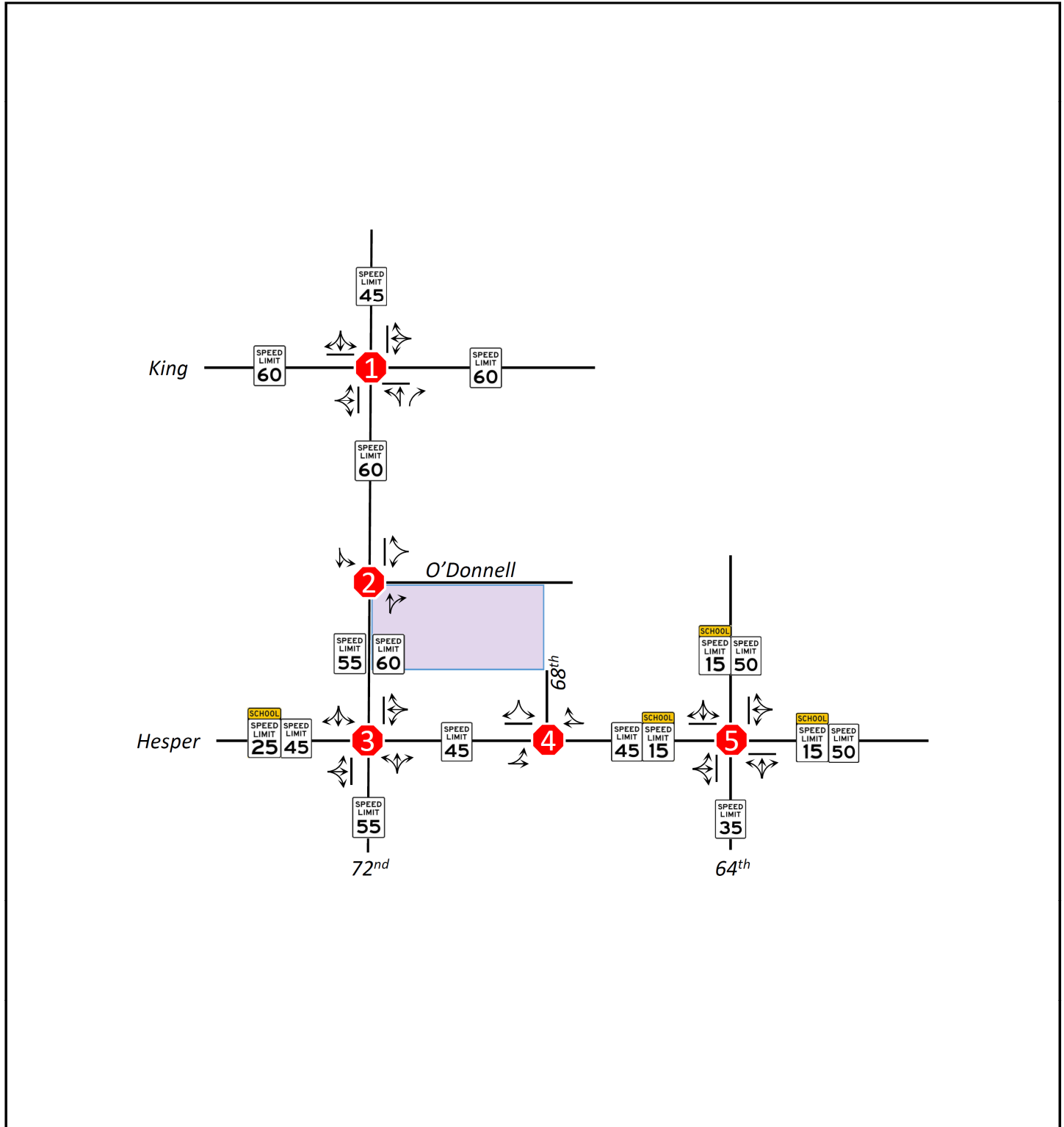
access to the adjacent private properties north of the vicinity of this subdivision's proposed site access was blocked by a farm gate until recently.

No signal-controlled intersections currently exist within the study area; all five study intersections are currently stop-controlled. The intersections of 72<sup>nd</sup> at King and 64<sup>th</sup> at Hesper are all-way stop-controlled, while the other three study intersections are two-way stop-controlled. There are suspended flashing signal heads at both all-way stop-controlled intersections, as well as at the intersection of 72<sup>nd</sup> at Hesper. Note that T-intersections with a stop sign at only one leg of the intersection are also considered two-way stop-controlled. **Exhibit 4** shows traffic control and lane arrangements schematically at each existing intersection, as well as posted speed limits on selected road segments.

## 2.2 HISTORICAL TRAFFIC VOLUMES

Daily traffic information was gathered from the Montana Department of Transportation's (MDT's) public-facing data resource, the Transportation Data Management System. The MDT either collects or estimates traffic counts at multiple locations in the study area from which their annualized average daily traffic (AADT) data was used in this study. Three locations provided meaningful traffic information, but for two of them, MDT has only reported data starting with 2018 counts, and those counts showed some outlying values. For this reason, volumes were examined over the past six years available (2019 through 2024) for a historical perspective. These locations are on 72<sup>nd</sup> south of King, on King east of 72<sup>nd</sup>, and on 64<sup>th</sup> north of Hesper. The historical AADT volumes at these locations are shown in **Exhibit 5**.

Exhibit 4. Road and Intersection Basics



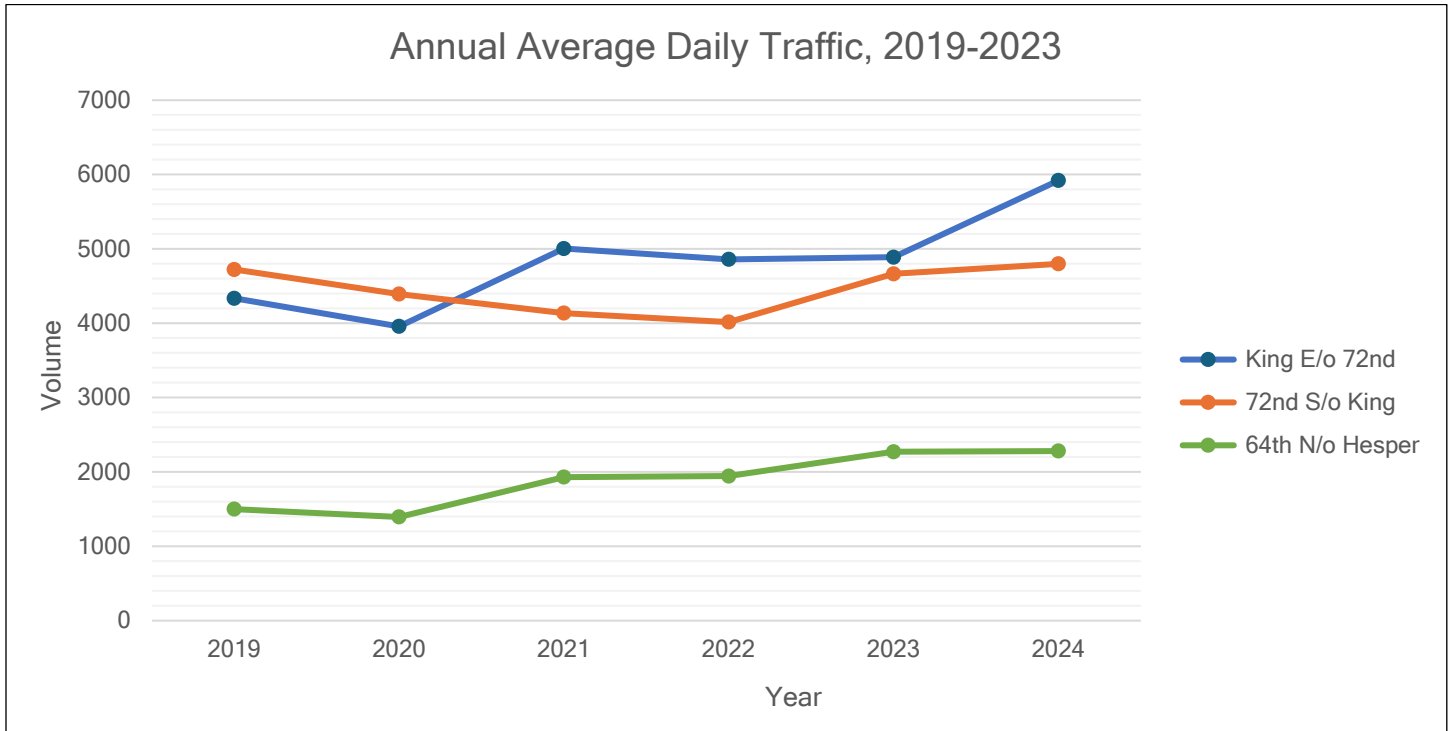
Legend

- # Study intersection (stop)
- Lane group with stop sign
- Lane group without stop sign

- Project Site
- Speed Limit (Selected Locations)



**Exhibit 5. Historical AADT**



Source: MDT Transportation Data Management System: retrieved 2/25/2025

A few trends can be discerned from these data. The COVID-19 pandemic caused a slight decrease in traffic in 2020, but at two of the three locations traffic levels rebounded in 2021 to exceed pre-pandemic levels. Recovery has taken longer at the 72<sup>nd</sup> count location. Based on these counts, an annual average traffic growth rate of 4.25% per year was used for this project’s traffic. This growth rate was applied to all existing volumes in order to estimate short-term future traffic and assess potential project impacts to intersection operations.

**2.3 RECENT TRAFFIC COUNTS**

The study intersections were counted for this project from 7-9 a.m. and from 4-6 p.m. at four of the five study intersections on Wednesday, February 13, 2025 using Miovision cameras. The fifth, 64<sup>th</sup> at Hesper, was counted from 7 a.m. to 7 p.m. to support the required examination of traffic signal warrants there. Counts were summarized for analysis in 15-minute increments. Based on total entering volume (TEV), the AM peak hour was identified from these counts as starting at 7:15 a.m. The PM peak hour started at 4 p.m. for most intersections and at 3 p.m. for the 64<sup>th</sup> at Hesper intersection, where the Elder Grove schools are located. This finding is consistent with the school release time occurring about an hour before the traditional afternoon commute traffic peak. The raw count data for each intersection is provided in **Appendix A**.

Counts at all three study intersections were adjusted for seasonal variation using the MDT’s 2023 seasonal adjustment factors for a February Thursday on (a) urban rural collectors and (b) rural minor arterial/major collectors in MDT financial district 5, which are 1.026 and 1.262, respectively. Existing annualized traffic volumes based on these counts are shown in **Exhibit 6**. (MDT’s 2024 AADT counts are grown by one year to match this study’s existing 2025 traffic counts.)

**2.4 PROJECTED TRAFFIC WITHOUT THE PROPOSED DEVELOPMENT**

Using the aforementioned 4.25% annual growth rate, existing peak hour traffic was projected four years into the future (2029). This future study year was chosen to reflect the time needed for permitting, site preparation, utility work, lot sales, and the construction and occupancy of the homes themselves, along with an additional year to account for traffic generated by the project to stabilize. **Exhibit 7** shows 2029 Background traffic.

Exhibit 6. Existing Annualized Traffic Volumes

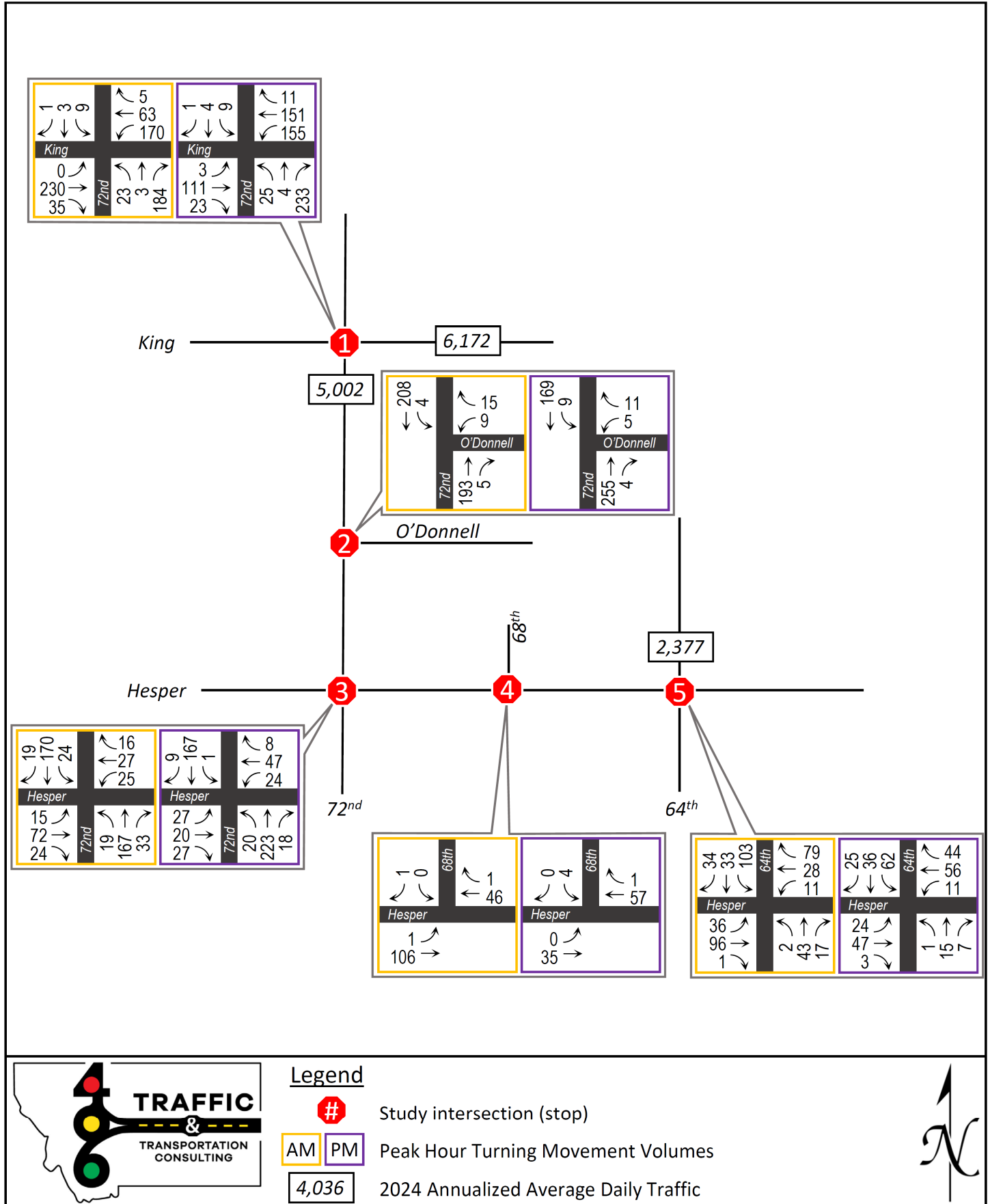
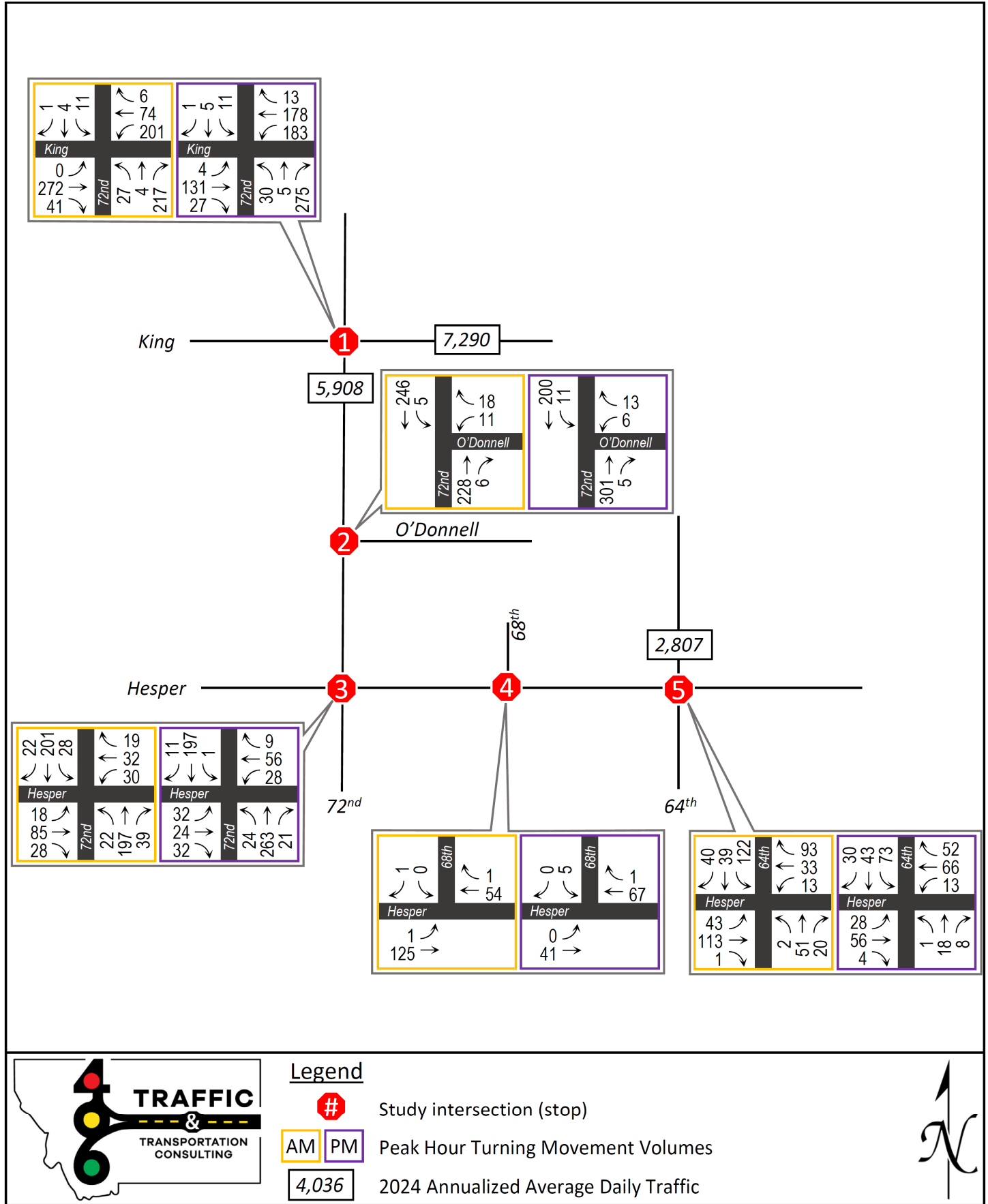


Exhibit 7. Projected 2029 Background Traffic Volumes



### 3 TRIP GENERATION AND DISTRIBUTION

#### 3.1 TRIP GENERATION

Trip generation rates, or equations as applicable, are from the Institute of Transportation Engineers (ITE) Trip Generation package’s 11<sup>th</sup> edition. ITE trip generation data, when aggregated across enough varied sites, produce both simple average rates and best-fit equations, either linear or logarithmic, to help the analyst derive proper estimates for their situation. Equations are generally preferred over rates when both are available, especially for larger sites where trip generation per unit of land use can diminish with increasing project size.

Three types of adjustments to trip generation were evaluated for this project. First, a discount is sometimes taken to reflect internal capture where multiple uses are present in a single project site. All of the project site’s lots will be for homes, so no such discount is taken for this single-use project. Second, modal reductions are sometimes taken where facilities and services for walking, cycling, and transit are more robust than in a “general urban/suburban” environment in which most ITE uses are studied. No such facilities exist near the project site, so no modal reductions are applied. Finally, some land uses attract trips that were already using the adjacent or nearby road network by virtue of improved convenience over a similar site that would have been used before. These are called “pass-by” and “diverted-linked” trips. Pass-by trips are those on streets bordering the site, while diverted-linked trips are those that might go slightly out of their way to stop at the establishment on their way to their destination. These reductions do not apply to this project because peak-hour travelers do not tend to make discretionary stops at residences like these on their way to somewhere else.

The summary of projected trip generation for the project is provided in **Exhibit 8**. Note that in/out splits are only meaningful for peak hour traffic.

**Exhibit 8. Trip Generation**

ITE 210: Single-Family Detached Home	Daily	AM Peak Hour		PM Peak Hour	
	Equation/rate	Equation/rate	In / Out	Equation/rate	In / Out
X = 93 Dwelling Units	$\text{Ln}(T)=0.92\text{Ln}(X)+2.68$	$\text{Ln}(T)=0.91\text{Ln}(X)+0.12$	25%/75%	$\text{Ln}(T)=0.94\text{Ln}(X)+0.27$	63%/37%
Trips (T):	944	70	18 / 52	93	59 / 34

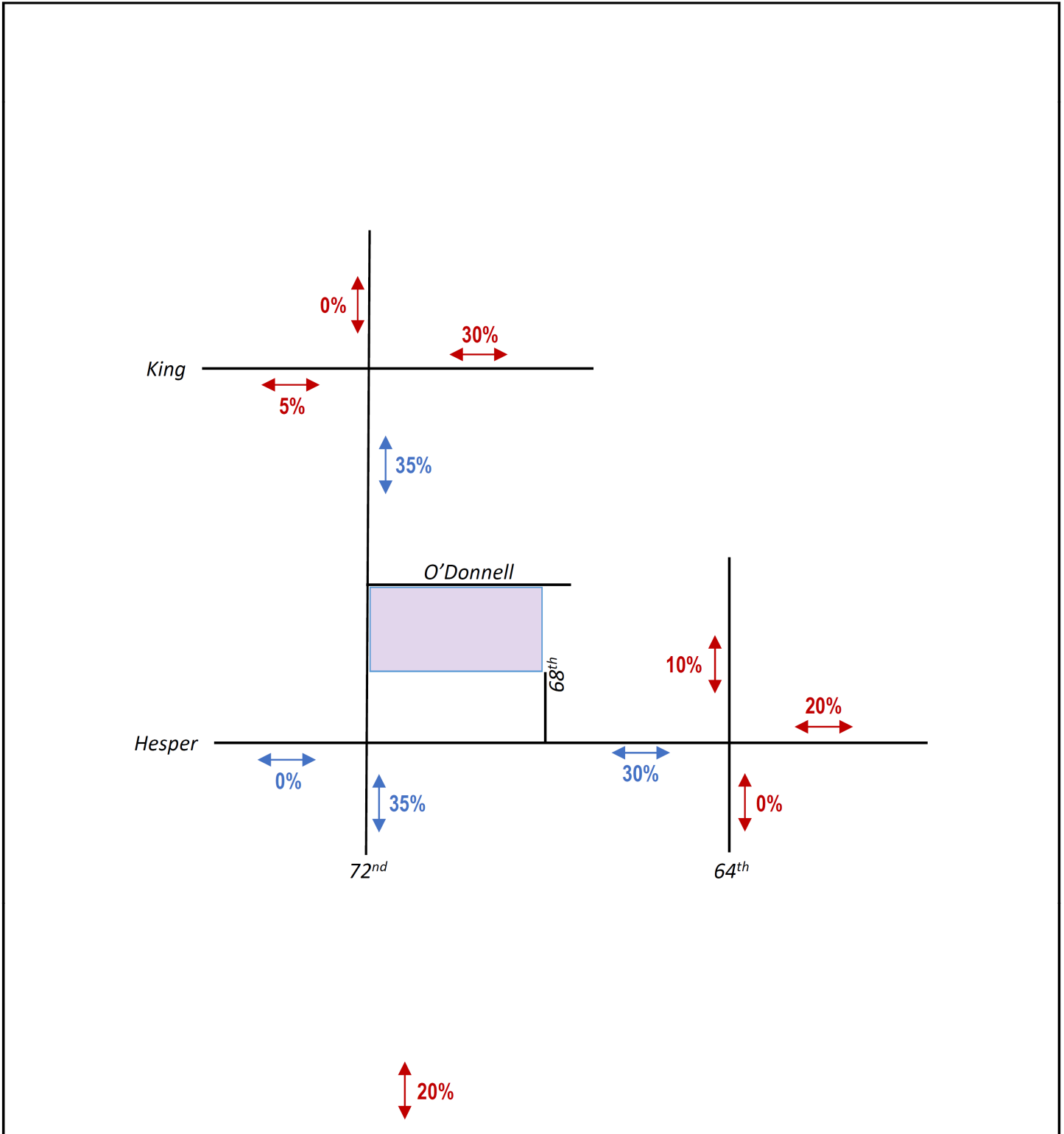
Source: Equations from ITE Trip Generation, 11<sup>th</sup> Edition.

#### 3.2 TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution has been estimated for the roads surrounding the project site in percentages that add to 100%. Trip distribution and assignment estimates were developed by considering the site’s location relative to regional roadways and other major trip generators. Farther from the site, traffic eventually disperses in smaller percentages to other routes. No project trips were assigned to Hesper Road east of 72<sup>nd</sup> or to 64<sup>th</sup> south of Hesper Road because there are no major trip generators in those directions. Trip distribution percentages are shown in **Exhibit 9**.

The project-generated trips presented as peak hour intersection turning movement volumes are shown in **Exhibit 10**, and the estimated total intersection volumes with the project are shown in **Exhibit 11**. These total intersection volumes were calculated by adding the new project trips to the 2029 background trips.

**Exhibit 9. Distribution of Project Trips**



Legend

- 25% Primary Trip Assignment Percentage
- 10% Secondary Trip Assignment Percentage

Project Site



Exhibit 10. Project Trip Assignment

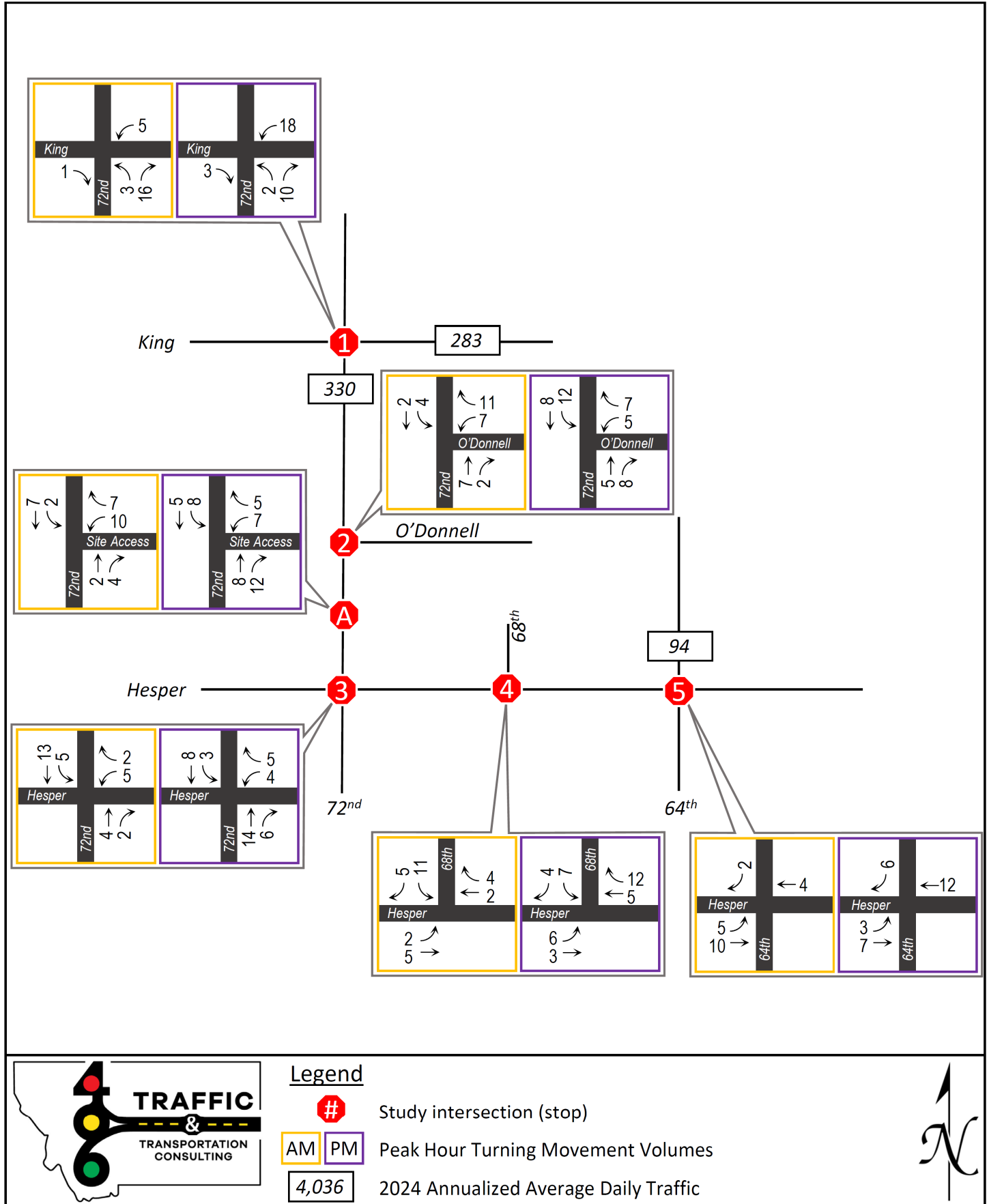
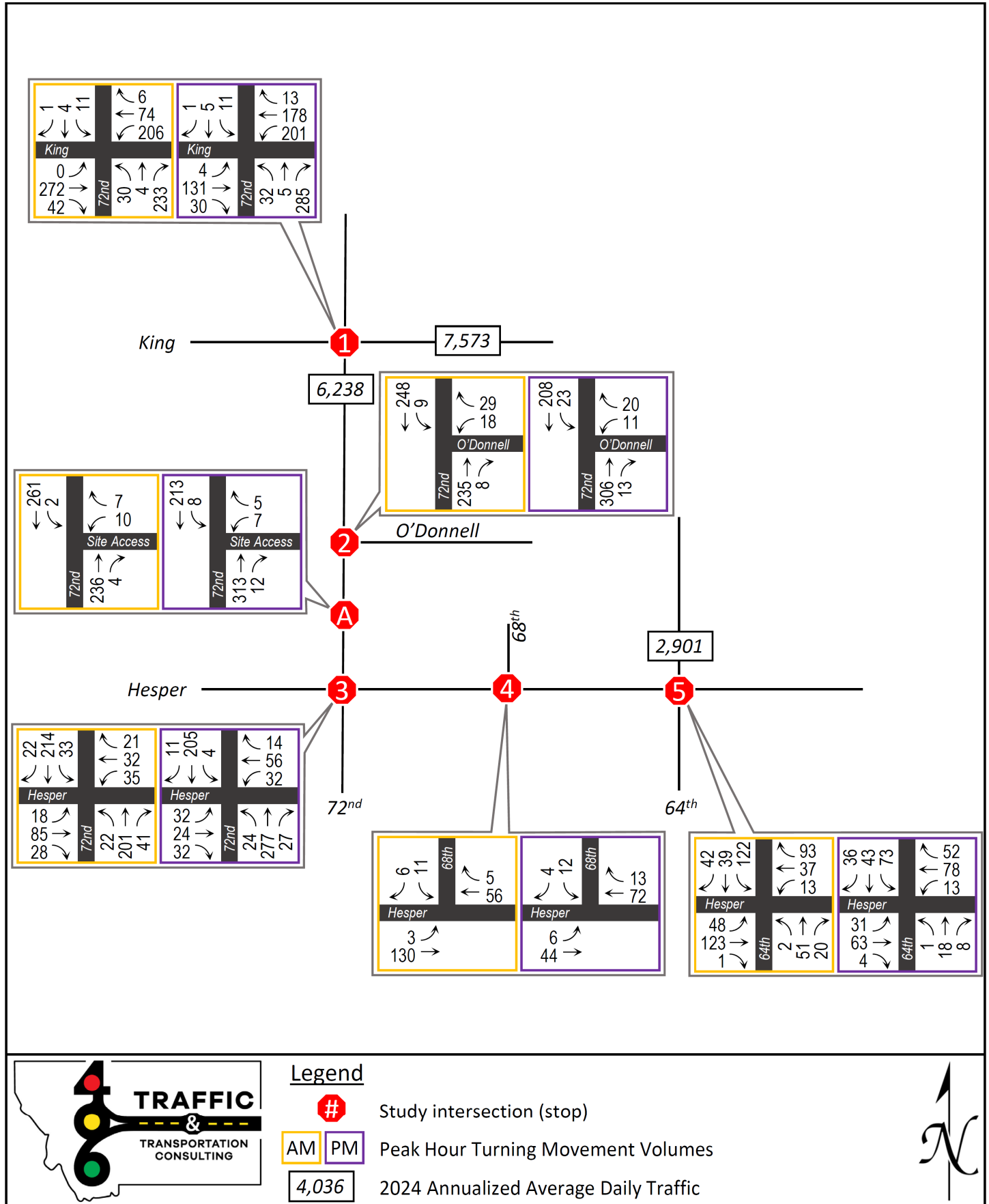


Exhibit 11. 2029 Total Traffic with Project



## 4 TRAFFIC ANALYSIS RESULTS

### 4.1 INTERSECTION OPERATIONS

As mentioned earlier, all study intersections operate with stop control in all scenarios. The peak hour intersection Level of Service (LOS) and delay results with and without the project are shown in **Exhibit 12**. Analysis software results are provided in Appendix B.

#### Exhibit 12. Intersection LOS and Delay Results

Intersection	Traffic Control	LOS (delay, seconds/vehicle)			TWSC Worst Lane Group*	
		Existing	Future Background	Future With Project		
AM Peak	1. 72 <sup>nd</sup> at King	AWSC	B (11.8)	B (14.3)	B (14.8)	-
	2. 72 <sup>nd</sup> at O'Donnell	TWSC	B (10.4)	B (10.9)	B (11.3)	WB
	3. 72 <sup>nd</sup> at Hesper	TWSC	C (15.5)	C (18.8)	C (20.3)	EB/WB**
	4. 68 <sup>th</sup> at Hesper	TWSC	A ( 8.6)	A ( 8.7)	A ( 9.7)	SB
	5. 64 <sup>th</sup> at Hesper	AWSC	B (12.3)	C (16.0)	C (17.2)	-
	6. 72 <sup>nd</sup> at New Access	TWSC	-	-	B (11.5)	WB
PM Peak	1. 72 <sup>nd</sup> at King	AWSC	B (11.3)	B (13.8)	B (14.7)	-
	2. 72 <sup>nd</sup> at O'Donnell	TWSC	B (10.6)	B (11.2)	B (11.7)	WB
	3. 72 <sup>nd</sup> at Hesper	TWSC	B (14.7)	C (17.0)	C (18.0)	WB
	4. 68 <sup>th</sup> at Hesper	TWSC	A ( 9.2)	A ( 9.3)	A ( 9.5)	SB
	5. 64 <sup>th</sup> at Hesper	AWSC	A ( 9.6)	A ( 9.9)	B (10.3)	-
	6. 72 <sup>nd</sup> at New Access	TWSC	-	-	B (12.0)	WB

\* Worst lane group is the one that determines the intersection LOS at a Two-Way Stop Controlled intersection.

\*\* In the AM peak for 72<sup>nd</sup> at Hesper, the EB approach is worst for both conditions without the project, while WB is worst with the project.

The results in the table indicate that traffic generated by the project would result in peak intersection delays of LOS C or better. The highest-delay result found is projected to occur in the AM peak hour for the 72<sup>nd</sup> at Hesper intersection, where multiple traffic movements would see slightly increased volumes from the project. However, estimated future-year delay is still well within the LOS range. With all intersections projected to operate within the peak hour LOS standard documented previously in Section 1.4, no mitigations are necessary to reduce the delay impacts of project-generated traffic.

### 4.2 AUXILIARY TURN LANES

MDT turn lane analysis was conducted for all turning movements with 40 or more right turning vehicles or 20 or more left turning vehicles on the free-flowing legs of public roads at study intersections and site access points. This analysis was conducted in accordance with the MDT *Traffic Engineering Manual*, Section 28.4.1, using the peak hour total traffic volumes shown previously in Exhibit 10 of this report. For left turn analysis, the MDT chart for a 60 mph design speed was used despite some roadway segments in the study area having current 50 mph posted speed limits because posted speed can vary from design speed. The turning movement conditions that qualified and were subject to this analysis are indicated in **Exhibit 13**, as defined by their peak hour and approach direction.

#### Exhibit 13. Locations Qualified for Auxiliary Turn Lane Analysis

Intersection	Right Turns (40+ vph)		Left Turns (20+ vph)	
	AM Peak	PM Peak	AM Peak	PM Peak
2. 72 <sup>nd</sup> at O'Donnell	-	-	-	SB
3. 72 <sup>nd</sup> at Hesper	NB	-	NB, SB	NB
4. 68 <sup>th</sup> at Hesper	-	-	-	-
6. (A) New Access to 72 <sup>nd</sup>	-	-	-	-

None of the six total AM inbound movements at the site access points (considered for this analysis as intersections 2, 4, and 6) qualified for turn lane analysis, and in the PM only one, the SB left at O'Donnell would exhibit a qualifying volume. None of them met MDT's standard for consideration of new turn lanes. The remainder of the qualifying turn lane conditions in the future would occur for the 72<sup>nd</sup> at Hesper intersection, and none of those would meet the standard for new turn lanes either. However, the AM peak hour SB left turn would be close, and with additional future growth in non-project, would be expected to warrant consideration in 6-7 years. Completed charts for these auxiliary right- and left-turn lane analyses are provided in Appendix C.

## 5 CRASH HISTORY ANALYSIS

Information reported in this crash history analysis includes the total number of reported crashes, injuries, and fatalities, the crash frequencies, crash rates, and severity indices, and the types of collisions at each of the five study intersections. Crash data were acquired from MDT for the 5-year time frame from January 1, 2019 through December 31, 2023, the most recent such period for which crash data were available at the time of this study.

### 5.1 CRASH FREQUENCY

The following formula was used to calculate crash frequencies for each of the five study intersections, where CF = crash frequency measured in crashes per year:

$$CF = \frac{\text{Total Crashes within time period}}{\text{Time Period}}$$

### 5.2 CRASH RATE

Crash rates, measured in crashes per million entering vehicles, were computed using the following formula, where CF = crash frequency measured in crashes per year, and DEV = daily entering volume:

$$\text{Crash Rate} = \left( \frac{CF}{365} \div DEV \right) \times 1,000,000$$

The crash frequency is divided by 365 days per year to approximate the average number of crashes per day.

In order to calculate the crash rate, the project's field data for peak hour entering volume needed to be converted to a daily average. The average daily entering volumes for the study period were calculated using the following formula, where DEV = daily entering volume, Peak Hour TEV = the total entering volume during the study's current highest peak hour, GrowthFactor = the estimated average annual growth rate assumed for this study based on MDT historical data, and k = an average K-Factor from MDT's public-facing traffic count database system for the same three locations where historic AADT is reported:

$$DEV = \frac{\text{Peak Hour TEV} \times k}{\text{GrowthFactor}^3}$$

Because of the unusually high portion of daily trips taking place during the peak hour at the intersection of 64<sup>th</sup> at Hesper, and because of the intersection's close proximity to the traffic counting location on 64<sup>th</sup>, the K-factor used in calculating the daily entering volume at this intersection is derived solely from the traffic counting location on 64<sup>th</sup>.

The Peak Hour TEV is divided by the annual growth rate cubed (to represent three years of growth) and multiplied by a K-Factor to estimate the average daily entering volumes across the five-year period from which crash data is available. For this calculation, the average DEV is assumed to have occurred in 2021, the middle year of that period.

### 5.3 CRASH SEVERITY INDEX

The formula below was used to calculate the crash severity index for each of the five study intersections, where K = the number of fatal crashes, ABC = the number of crashes involving an injury of any severity, and PDO = the number of property damage only crashes:

$$\text{Severity Index} = \frac{(8 \times K) + (3 \times ABC) + (1 \times PDO)}{\text{Total Crashes}}$$

This formula assigns a weight to each crash severity. For example, an injury crash is considered three times as severe as a PDO crash in this calculation. These weighting coefficients are used by MDT and were provided by a Yellowstone County designee for use in this study.

### 5.4 CRASH ANALYSIS SUMMARY

Exhibit 14 tabulates the results of the study area crash history analysis.

#### Exhibit 14. Crash History Analysis Results

<b>Reported Crash Types, Injuries, and Fatalities:</b>					
Study Intersection	72 <sup>nd</sup> at King	72 <sup>nd</sup> at O'Donnell	72 <sup>nd</sup> at Hesper	68 <sup>th</sup> at Hesper	64 <sup>th</sup> at Hesper
Right angle	2		7		1
Fixed Object	4		1		
Roll Over	1		1		
Wild Animal		1	1		
Rear-End			1		
Left Turn, Opposite Direction			1		
Total Reported Crashes	7	1	12	0	1
Total Number of Fatalities	0	0	0	0	0
Total Number of Injuries	0	0	5	0	0
<b>Crash Severities, Frequencies, and Rates:</b>					
Study Intersection	72 <sup>nd</sup> at King	72 <sup>nd</sup> at O'Donnell	72 <sup>nd</sup> at Hesper	68 <sup>th</sup> at Hesper	64 <sup>th</sup> at Hesper
Property Damage Only Crashes	7	1	8		1
Suspected Minor Injury Crashes			3		
Suspected Serious Injury Crashes					
Fatal Crashes					
Unknown			1		
Crash Frequency (crashes/year)	1.4	0.2	2.4	-	0.2
Daily Entering Volume, crash study midpoint year	5744	3565	4808	1228	2320
Crash Rate (crashes per million entering vehicles)	0.67	0.15	1.37	-	0.24
Severity Index	1.0	1.0	1.5	0.0	1.0

The highest crash frequency, crash rate, and severity index occurred at the intersection of 72<sup>nd</sup> at Hesper. It is the only study intersection where crashes involving injuries occurred, and it is where the most PDO crashes occurred during the 5-year study period. Right-angle crashes were the most frequent type of collision to occur at this intersection. These collisions are often related to the failure of a side-street driver to properly yield the right of way when facing a stop sign. Two of the crashes that involved minor injuries were right-angle collisions, while the other was a left-turn, opposite direction collision. The crash of unknown severity at the intersection of 72<sup>nd</sup> at Hesper was also a right-angle collision and was treated as a PDO crash because no recorded injuries or fatalities were associated with it. The only crash that occurred at the intersection of 72<sup>nd</sup> at O'Donnell involved a wild animal, so it was not directly related to an intersection conflict. No crashes were reported at the intersection of 68<sup>th</sup> at Hesper, and no fatal crashes or serious injuries were reported at any of the five study intersections during the 5-year time period.

## 6 INTERSECTION COST PARTICIPATION

The net new trips identified in this report are subject to examination under Yellowstone County's cost participation program to the extent that they would travel through studied intersections. Cost participation has been estimated for the three public-street intersections in this study under the assumptions that (a) the peak with the highest percentage of trips added to the intersection's critical volume governs contribution and (b) site traffic must result in an increase of 2% in total critical-movement volume, after project trips are considered, to be subject to cost participation. Once it is demonstrated that an intersection is eligible, the applicant pays the entire percentage, not just the marginal part above 2%, unless another arrangement is made with the County. **Exhibit 15** shows the intersection cost participation summary for project trips.

### Exhibit 15. Intersection Cost Participation

Intersection	AM	PM	Value in Higher Peak, if 2% or Greater
1. 72 <sup>nd</sup> at King	0.7%	1.7%	-%
2. 72 <sup>nd</sup> at O'Donnell	1.6%	1.9%	-%
2. 72 <sup>nd</sup> at Hesper	1.5%	1.8%	-%
4. 68 <sup>th</sup> at Hesper	1.4%	1.6%	-%
5. 64 <sup>th</sup> at Hesper	0.8%	1.3%	-%
<b>Total Participation %:</b>			<b>0%</b>
<b>x \$500,000</b>			<b>\$0</b>

None of the intersections studied would experience a high enough critical-movement volume increase due to the project to require participation in the cost of future improvements. The detailed cost participation calculations for project trips are provided in Appendix D.

## 7 CONCLUSIONS AND RECOMMENDATIONS

The Staley Property Residential Subdivision project has been studied in accordance with Yellowstone County TIS guidelines and the latest traffic engineering industry standards and references for traffic impact analysis. Because no traffic impacts are indicated with respect to the County's LOS C standard for peak hour intersection operations, no mitigations for traffic operations are recommended as a result of this project. All intersections with two-way stop control were examined with respect to MDT warrants for auxiliary turn lanes, and no turn lanes were found to be warranted with or without this project in the study timeframe. Under the background traffic growth assumptions used here, a southbound left turn lane on 72<sup>nd</sup> at Hesper Road has been shown to be warranted a few years after this subdivision opens, and is therefore recommended for the County's independent consideration. No intersection cost participation is indicated by the traffic analysis documented in this report.

This concludes the Staley Residential Traffic Impact Study.

### Appendix A: Raw Traffic Count Data

**Study Name** 72nd Street & King Avenue  
**Start Date** 2/13/2025  
**Start Time** 7:00 AM  
**Site Code**  
**Project** 406 Yellowstone County Counts

Type Classification	Road Totals				72nd St W Southbound				King Avenue W Westbound				72nd St W Northbound				King Avenue W Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U				
7:00 AM	0	0	2	0	0	5	20	0	30	0	4	0	5	48	0	0				
7:15 AM	0	1	2	0	1	5	31	0	33	0	3	0	11	46	0	0				
7:30 AM	0	0	3	0	0	11	41	0	47	1	1	0	8	64	0	0				
7:45 AM	0	0	0	0	0	13	34	0	38	1	8	0	5	46	0	0				
8:00 AM	1	1	2	0	3	21	29	0	28	0	6	0	4	26	0	0				
8:15 AM	0	2	2	0	1	15	21	0	26	0	1	0	4	27	0	0				
8:30 AM	0	0	2	0	0	25	25	0	27	0	1	0	4	28	0	0				
8:45 AM	0	0	0	0	0	13	15	0	23	0	3	0	3	24	0	0				
4:00 PM	1	0	3	0	2	27	25	0	54	0	5	0	6	28	0	0				
4:15 PM	0	2	1	0	3	31	31	0	49	0	7	0	6	28	2	0				
4:30 PM	0	1	1	0	2	24	29	0	39	2	4	0	4	18	0	0				
4:45 PM	0	0	2	0	2	38	38	0	43	1	4	0	2	14	0	0				
5:00 PM	0	0	1	0	1	27	45	0	26	1	3	0	6	22	0	0				
5:15 PM	0	0	4	0	2	38	38	0	34	0	6	0	1	20	0	0				
5:30 PM	0	0	1	0	3	31	27	0	41	0	3	0	7	12	0	0				
5:45 PM	1	1	0	0	1	28	36	0	35	0	5	0	3	15	0	0				

**Study Name 72nd St & O'Donnell Lane**

**Start Date 2/13/2025**

**Start Time 7:00 AM**

**Site Code**

**Project 406 Yellowstone County Counts**

**Type Road  
Classification Totals**

Start Time	72nd St W Southbound				O'Donnell Lane Westbound				72nd St W Northbound				O'Donnell Lane Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM		25	1	0	0		4	0	0	37		0				
7:15 AM		41	2	0	5		2	0	1	37		0				
7:30 AM		52	0	0	3		1	0	1	39		0				
7:45 AM		37	0	0	3		2	0	2	45		0				
8:00 AM		35	1	0	1		2	0	0	32		0				
8:15 AM		25	2	0	0		1	0	1	23		0				
8:30 AM		28	2	0	0		0	0	1	34		0				
8:45 AM		18	0	0	2		0	0	1	20		0				
4:00 PM		29	0	0	3		2	0	2	66		0				
4:15 PM		37	2	0	3		0	0	0	47		0				
4:30 PM		35	1	0	1		1	0	1	41		0				
4:45 PM		33	4	0	2		1	0	0	48		0				
5:00 PM		52	0	0	0		3	0	2	29		0				
5:15 PM		35	0	0	1		2	0	2	39		0				
5:30 PM		33	0	0	0		1	0	1	46		0				
5:45 PM		36	4	0	0		3	0	2	33		0				

**Study Name** Hesper Road & 72nd Street  
**Start Date** 2/13/2025  
**Start Time** 7:00 AM  
**Site Code**  
**Project** 406 Yellowstone County Counts

**Type Road**  
**Classification Totals**

Start Time	S 72nd St W Southbound				Hesper Road Westbound				S 72nd St W Northbound				Hesper Road Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	1	27	1	0	2	5	4	0	5	27	0	0	3	17	8	0
7:15 AM	1	34	4	0	2	2	4	0	5	28	1	0	5	11	6	0
7:30 AM	7	39	7	0	1	2	2	0	10	36	3	0	4	20	3	0
7:45 AM	4	33	6	0	5	9	8	0	8	37	4	0	5	20	2	0
8:00 AM	3	29	2	0	5	8	6	0	3	31	7	0	5	6	1	0
8:15 AM	4	26	0	0	0	6	1	0	0	21	10	0	4	4	4	0
8:30 AM	5	19	1	0	0	2	1	0	7	28	3	0	5	5	5	0
8:45 AM	4	14	1	0	0	1	2	0	1	17	5	0	2	8	2	0
4:00 PM	2	22	0	0	2	10	7	0	4	58	2	0	8	10	7	0
4:15 PM	1	41	0	0	0	9	3	0	5	42	2	0	8	0	6	0
4:30 PM	1	33	1	0	4	10	5	0	1	35	6	0	2	4	3	0
4:45 PM	3	36	0	0	0	8	4	0	4	42	6	0	3	2	5	0
5:00 PM	6	46	0	0	0	7	7	0	4	29	6	0	2	7	3	0
5:15 PM	1	35	1	0	3	11	3	0	1	38	3	0	3	2	2	0
5:30 PM	1	30	3	0	1	5	7	0	6	35	5	0	2	3	4	0
5:45 PM	6	29	1	0	1	7	2	0	5	36	4	0	5	0	2	0

**Study Name** Hesper Road & 68th Street  
**Start Date** 2/13/2025  
**Start Time** 7:00 AM  
**Site Code**  
**Project** 406 Yellowstone County Counts

**Type Road**  
**Classification Totals**

Start Time	S 68th St W Southbound				Hesper Road Westbound				S 68th St W Northbound				Hesper Road Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	1		0	0	0	10		0						22	0	0
7:15 AM	0		0	0	0	6		0						20	0	0
7:30 AM	0		0	0	0	5		1						31	1	0
7:45 AM	0		0	0	1	24		0						30	0	0
8:00 AM	1		0	0	0	15		0						9	0	0
8:15 AM	0		0	0	0	8		0						5	0	0
8:30 AM	0		0	0	0	2		0						7	1	0
8:45 AM	0		0	0	0	3		0						7	1	0
4:00 PM	0		1	0	0	20		0						13	0	0
4:15 PM	0		3	0	0	9		0						8	0	0
4:30 PM	0		0	0	1	13		0						7	0	0
4:45 PM	0		0	0	0	14		0						6	0	0
5:00 PM	0		0	0	0	10		0						9	0	0
5:15 PM	0		0	0	0	18		0						6	0	0
5:30 PM	1		0	0	0	11		0						11	0	0
5:45 PM	0		0	0	0	10		0						7	0	0

**Study Name** Hesper Road & 64th Street  
**Start Date** 2/13/2025  
**Start Time** 7:00 AM  
**Site Code**  
**Project** 406 Yellowstone County Counts

**Type Road**  
**Classification Totals**

Start Time	64th St W Southbound				Hesper Road Westbound				64th St W Northbound				Hesper Road Eastbound			
	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U	Right	Thru	Left	U
7:00 AM	0	3	11	0	3	11	1	0	1	4	0	0	0	21	1	0
7:15 AM	2	2	12	0	6	4	4	0	4	3	0	0	0	21	3	0
7:30 AM	3	4	14	0	12	3	2	0	6	11	1	0	1	26	9	0
7:45 AM	14	13	50	0	54	14	3	0	5	19	0	0	0	34	21	0
8:00 AM	14	13	24	0	5	6	2	0	2	9	1	0	0	13	2	0
8:15 AM	1	5	4	0	3	8	2	0	0	6	0	0	0	5	1	0
8:30 AM	1	4	3	0	2	1	1	0	3	4	0	0	1	4	2	0
8:45 AM	2	6	4	0	1	2	0	0	2	5	0	0	0	6	3	0
3:00 PM	5	6	10	0	13	10	2	0	2	7	0	0	1	14	13	0
3:15 PM	15	19	42	0	18	24	6	0	2	2	0	0	2	5	4	0
3:30 PM	2	5	5	0	7	11	2	0	3	3	0	0	0	11	3	0
3:45 PM	2	5	3	0	5	10	1	0	0	3	1	0	0	16	3	0
4:00 PM	4	7	6	0	6	20	1	0	2	9	1	0	1	16	1	0
4:15 PM	3	5	3	0	5	9	6	0	2	1	0	0	1	7	1	0
4:30 PM	2	11	4	0	7	12	0	0	2	5	1	0	0	4	3	0
4:45 PM	1	7	3	0	9	14	2	0	2	4	1	0	0	7	3	0
5:00 PM	4	6	2	0	7	12	4	0	0	8	2	0	1	9	1	0
5:15 PM	3	4	5	0	13	19	3	0	4	4	1	0	2	3	4	0
5:30 PM	4	6	2	0	5	8	1	0	2	11	0	0	0	9	3	0
5:45 PM	2	5	5	0	3	16	2	0	2	3	0	0	1	8	2	0

## **Appendix B: Analysis Software Output**

### Scenario Order:

Existing AM

Existing PM

Future Background AM

Future Background PM

Future With Project AM

Future With Project PM

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	0	230	35	170	63	5	23	3	184	9	3	1
Future Vol, veh/h	0	230	35	170	63	5	23	3	184	9	3	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	3	3	3	4	4	4	0	0	0
Mvmt Flow	0	280	43	207	77	6	28	4	224	11	4	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	12.2	12.2	10.9	9.4
HCM LOS	B	B	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	88%	0%	0%	71%	69%
Vol Thru, %	12%	0%	87%	26%	23%
Vol Right, %	0%	100%	13%	2%	8%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	26	184	265	238	13
LT Vol	23	0	0	170	9
Through Vol	3	0	230	63	3
RT Vol	0	184	35	5	1
Lane Flow Rate	32	224	323	290	16
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.058	0.34	0.455	0.427	0.027
Departure Headway (Hd)	6.621	5.461	5.071	5.3	6.184
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	542	660	714	679	578
Service Time	4.354	3.194	3.071	3.329	4.232
HCM Lane V/C Ratio	0.059	0.339	0.452	0.427	0.028
HCM Control Delay, s/veh	9.8	11	12.2	12.2	9.4
HCM Lane LOS	A	B	B	B	A
HCM 95th-tile Q	0.2	1.5	2.4	2.1	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	9	15	193	5	4	208
Future Vol, veh/h	9	15	193	5	4	208
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	5	5	3	3	3	3
Mvmt Flow	10	17	214	6	4	231

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	457	217	0	0	220
Stage 1	217	-	-	-	-
Stage 2	240	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.13
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.227
Pot Cap-1 Maneuver	556	815	-	-	1343
Stage 1	812	-	-	-	-
Stage 2	793	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	554	815	-	-	1343
Mov Cap-2 Maneuver	554	-	-	-	-
Stage 1	812	-	-	-	-
Stage 2	790	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.41	0	0.15
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	693	34
HCM Lane V/C Ratio	-	-	0.039	0.003
HCM Ctrl Dly (s/v)	-	-	10.4	7.7
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection												
Int Delay, s/veh	5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	15	72	24	25	27	16	19	167	33	24	170	19
Future Vol, veh/h	15	72	24	25	27	16	19	167	33	24	170	19
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	5	5	5	2	2	2	4	4	4	2	2	2
Mvmt Flow	17	84	28	29	31	19	22	194	38	28	198	22

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	519	541	209	553	533	213	220	0	0	233	0	0
Stage 1	265	265	-	258	258	-	-	-	-	-	-	-
Stage 2	254	277	-	295	276	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	463	444	824	444	453	827	1338	-	-	1335	-	-
Stage 1	734	684	-	747	695	-	-	-	-	-	-	-
Stage 2	744	676	-	713	682	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	403	425	824	332	433	827	1338	-	-	1335	-	-
Mov Cap-2 Maneuver	403	425	-	332	433	-	-	-	-	-	-	-
Stage 1	717	668	-	733	681	-	-	-	-	-	-	-
Stage 2	680	663	-	588	666	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	15.51		15.15		0.67		0.87	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	151	-	-	471	434	199	-	-
HCM Lane V/C Ratio	0.017	-	-	0.274	0.182	0.021	-	-
HCM Ctrl Dly (s/v)	7.7	0	-	15.5	15.1	7.8	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0.7	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	1	106	46	1	0	1
Future Vol, veh/h	1	106	46	1	0	1
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	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	1	1	4	4	0	0
Mvmt Flow	1	154	67	1	0	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	68	0	-	0	224 67
Stage 1	-	-	-	-	67 -
Stage 2	-	-	-	-	157 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1539	-	-	-	769 1002
Stage 1	-	-	-	-	960 -
Stage 2	-	-	-	-	877 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1539	-	-	-	768 1002
Mov Cap-2 Maneuver	-	-	-	-	768 -
Stage 1	-	-	-	-	959 -
Stage 2	-	-	-	-	877 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.07	0	8.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	17	-	-	-	1002
HCM Lane V/C Ratio	0.001	-	-	-	0.001
HCM Ctrl Dly (s/v)	7.3	0	-	-	8.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	12.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	36	96	1	11	28	79	2	43	17	103	33	34
Future Vol, veh/h	36	96	1	11	28	79	2	43	17	103	33	34
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Heavy Vehicles, %	8	8	8	3	3	3	3	3	3	1	1	1
Mvmt Flow	69	185	2	21	54	152	4	83	33	198	63	65
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	12.7	11	10.1	13.8
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	27%	9%	61%
Vol Thru, %	69%	72%	24%	19%
Vol Right, %	27%	1%	67%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	62	133	118	170
LT Vol	2	36	11	103
Through Vol	43	96	28	33
RT Vol	17	1	79	34
Lane Flow Rate	119	256	227	327
Geometry Grp	1	1	1	1
Degree of Util (X)	0.189	0.406	0.333	0.497
Departure Headway (Hd)	5.719	5.72	5.282	5.468
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	624	627	678	657
Service Time	3.785	3.775	3.338	3.516
HCM Lane V/C Ratio	0.191	0.408	0.335	0.498
HCM Control Delay, s/veh	10.1	12.7	11	13.8
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	0.7	2	1.5	2.8

Intersection	
Intersection Delay, s/veh	11.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	3	111	23	155	151	11	25	4	233	9	4	1
Future Vol, veh/h	3	111	23	155	151	11	25	4	233	9	4	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	5	5	5	1	1	1	2	2	2	9	9	9
Mvmt Flow	3	123	26	172	168	12	28	4	259	10	4	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	9.6	12.7	10.6	9.2
HCM LOS	A	B	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	86%	0%	2%	49%	64%
Vol Thru, %	14%	0%	81%	48%	29%
Vol Right, %	0%	100%	17%	3%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	29	233	137	317	14
LT Vol	25	0	3	155	9
Through Vol	4	0	111	151	4
RT Vol	0	233	23	11	1
Lane Flow Rate	32	259	152	352	16
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.056	0.365	0.216	0.485	0.026
Departure Headway (Hd)	6.218	5.074	5.112	4.958	6.05
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	571	702	693	719	595
Service Time	4.007	2.862	3.211	3.038	4.05
HCM Lane V/C Ratio	0.056	0.369	0.219	0.49	0.027
HCM Control Delay, s/veh	9.4	10.8	9.6	12.7	9.2
HCM Lane LOS	A	B	A	B	A
HCM 95th-tile Q	0.2	1.7	0.8	2.7	0.1

Intersection						
Int Delay, s/veh	0.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	5	11	255	4	9	169
Future Vol, veh/h	5	11	255	4	9	169
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	6	13	290	5	10	192

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	505	292	0	0	294
Stage 1	292	-	-	-	-
Stage 2	213	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	531	752	-	-	1273
Stage 1	762	-	-	-	-
Stage 2	828	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	526	752	-	-	1273
Mov Cap-2 Maneuver	526	-	-	-	-
Stage 1	762	-	-	-	-
Stage 2	820	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.58	0	0.4
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	663	91
HCM Lane V/C Ratio	-	-	0.027	0.008
HCM Ctrl Dly (s/v)	-	-	10.6	7.9
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection												
Int Delay, s/veh	3.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	27	20	27	24	47	8	20	233	18	1	167	9
Future Vol, veh/h	27	20	27	24	47	8	20	233	18	1	167	9
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	0	0	0	2	2	2	1	1	1
Mvmt Flow	31	23	31	27	53	9	23	265	20	1	190	10

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	534	528	195	524	523	275	200	0	0	285	0	0
Stage 1	197	197	-	320	320	-	-	-	-	-	-	-
Stage 2	337	331	-	203	202	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.1	6.5	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.5	4	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	455	454	844	467	462	769	1372	-	-	1283	-	-
Stage 1	802	736	-	696	656	-	-	-	-	-	-	-
Stage 2	675	644	-	803	738	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	389	445	844	419	452	769	1372	-	-	1283	-	-
Mov Cap-2 Maneuver	389	445	-	419	452	-	-	-	-	-	-	-
Stage 1	802	735	-	682	643	-	-	-	-	-	-	-
Stage 2	600	631	-	749	737	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	13.53		14.71		0.57		0.04	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	131	-	-	506	460	10	-	-
HCM Lane V/C Ratio	0.017	-	-	0.166	0.195	0.001	-	-
HCM Ctrl Dly (s/v)	7.7	0	-	13.5	14.7	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.6	0.7	0	-	-

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	35	57	1	4	0
Future Vol, veh/h	0	35	57	1	4	0
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	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	70	70	70	70
Heavy Vehicles, %	3	3	0	0	0	0
Mvmt Flow	0	50	81	1	6	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	83	0	-	0	132 82
Stage 1	-	-	-	-	82 -
Stage 2	-	-	-	-	50 -
Critical Hdwy	4.13	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.227	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1508	-	-	-	867 983
Stage 1	-	-	-	-	946 -
Stage 2	-	-	-	-	978 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1508	-	-	-	867 983
Mov Cap-2 Maneuver	-	-	-	-	867 -
Stage 1	-	-	-	-	946 -
Stage 2	-	-	-	-	978 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0	0	9.18
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1508	-	-	-	867
HCM Lane V/C Ratio	-	-	-	-	0.007
HCM Ctrl Dly (s/v)	0	-	-	-	9.2
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	9.2
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	24	47	3	11	56	44	1	15	7	62	36	25
Future Vol, veh/h	24	47	3	11	56	44	1	15	7	62	36	25
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Heavy Vehicles, %	6	6	6	3	3	3	13	13	13	3	3	3
Mvmt Flow	41	81	5	19	97	76	2	26	12	107	62	43
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	9	9	8.3	9.6
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	32%	10%	50%
Vol Thru, %	65%	64%	50%	29%
Vol Right, %	30%	4%	40%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	23	74	111	123
LT Vol	1	24	11	62
Through Vol	15	47	56	36
RT Vol	7	3	44	25
Lane Flow Rate	40	128	191	212
Geometry Grp	1	1	1	1
Degree of Util (X)	0.055	0.173	0.239	0.278
Departure Headway (Hd)	4.964	4.877	4.503	4.724
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	718	734	794	759
Service Time	3.019	2.923	2.546	2.767
HCM Lane V/C Ratio	0.056	0.174	0.241	0.279
HCM Control Delay, s/veh	8.3	9	9	9.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.6	0.9	1.1

Intersection	
Intersection Delay, s/veh	14.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	0	272	41	201	74	6	27	4	217	11	4	1
Future Vol, veh/h	0	272	41	201	74	6	27	4	217	11	4	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	3	3	3	4	4	4	0	0	0
Mvmt Flow	0	332	50	245	90	7	33	5	265	13	5	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	15.3	15	12.6	10.1
HCM LOS	C	B	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	87%	0%	0%	72%	69%
Vol Thru, %	13%	0%	87%	26%	25%
Vol Right, %	0%	100%	13%	2%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	31	217	313	281	16
LT Vol	27	0	0	201	11
Through Vol	4	0	272	74	4
RT Vol	0	217	41	6	1
Lane Flow Rate	38	265	382	343	20
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.073	0.427	0.568	0.535	0.037
Departure Headway (Hd)	6.971	5.815	5.353	5.616	6.737
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	513	617	672	641	528
Service Time	4.728	3.571	3.401	3.665	4.824
HCM Lane V/C Ratio	0.074	0.429	0.568	0.535	0.038
HCM Control Delay, s/veh	10.3	12.9	15.3	15	10.1
HCM Lane LOS	B	B	C	B	B
HCM 95th-tile Q	0.2	2.1	3.6	3.2	0.1

Intersection						
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	11	18	228	6	5	246
Future Vol, veh/h	11	18	228	6	5	246
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	5	5	3	3	3	3
Mvmt Flow	12	20	253	7	6	273

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	541	257	0	0	260
Stage 1	257	-	-	-	-
Stage 2	284	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.13
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.227
Pot Cap-1 Maneuver	497	775	-	-	1299
Stage 1	779	-	-	-	-
Stage 2	757	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	494	775	-	-	1299
Mov Cap-2 Maneuver	494	-	-	-	-
Stage 1	779	-	-	-	-
Stage 2	753	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	10.95	0	0.16
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	638	36
HCM Lane V/C Ratio	-	-	0.051	0.004
HCM Ctrl Dly (s/v)	-	-	10.9	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0

Intersection												
Int Delay, s/veh	6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	85	28	30	32	19	22	197	39	28	201	22
Future Vol, veh/h	18	85	28	30	32	19	22	197	39	28	201	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	5	5	5	2	2	2	4	4	4	2	2	2
Mvmt Flow	21	99	33	35	37	22	26	229	45	33	234	26

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	610	637	247	651	627	252	259	0	0	274	0	0
Stage 1	312	312	-	303	303	-	-	-	-	-	-	-
Stage 2	299	326	-	348	324	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	402	391	785	382	400	787	1294	-	-	1289	-	-
Stage 1	692	652	-	706	664	-	-	-	-	-	-	-
Stage 2	704	643	-	668	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	336	370	785	258	379	787	1294	-	-	1289	-	-
Mov Cap-2 Maneuver	336	370	-	258	379	-	-	-	-	-	-	-
Stage 1	672	633	-	690	648	-	-	-	-	-	-	-
Stage 2	629	628	-	524	630	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	18.83		18.5		0.67		0.88	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	149	-	-	411	360	197	-	-
HCM Lane V/C Ratio	0.02	-	-	0.371	0.262	0.025	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	18.8	18.5	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	1	0.1	-	-

Intersection						
Int Delay, s/veh	0.1					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	↷
Traffic Vol, veh/h	1	125	54	1	0	1
Future Vol, veh/h	1	125	54	1	0	1
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	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	1	1	4	4	0	0
Mvmt Flow	1	181	78	1	0	1

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	80	0	-	0	263 79
Stage 1	-	-	-	-	79 -
Stage 2	-	-	-	-	184 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1525	-	-	-	730 987
Stage 1	-	-	-	-	949 -
Stage 2	-	-	-	-	852 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1525	-	-	-	730 987
Mov Cap-2 Maneuver	-	-	-	-	730 -
Stage 1	-	-	-	-	948 -
Stage 2	-	-	-	-	852 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.06	0	8.65
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	14	-	-	-	987
HCM Lane V/C Ratio	0.001	-	-	-	0.001
HCM Ctrl Dly (s/v)	7.4	0	-	-	8.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	16
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	43	113	1	13	33	93	2	51	20	122	39	40
Future Vol, veh/h	43	113	1	13	33	93	2	51	20	122	39	40
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Heavy Vehicles, %	8	8	8	3	3	3	3	3	3	1	1	1
Mvmt Flow	83	217	2	25	63	179	4	98	38	235	75	77
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	16.2	13.4	11.6	19.2
HCM LOS	C	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	27%	9%	61%
Vol Thru, %	70%	72%	24%	19%
Vol Right, %	27%	1%	67%	20%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	73	157	139	201
LT Vol	2	43	13	122
Through Vol	51	113	33	39
RT Vol	20	1	93	40
Lane Flow Rate	140	302	267	387
Geometry Grp	1	1	1	1
Degree of Util (X)	0.25	0.527	0.436	0.642
Departure Headway (Hd)	6.411	6.285	5.877	5.978
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	559	574	612	603
Service Time	4.464	4.328	3.924	4.017
HCM Lane V/C Ratio	0.25	0.526	0.436	0.642
HCM Control Delay, s/veh	11.6	16.2	13.4	19.2
HCM Lane LOS	B	C	B	C
HCM 95th-tile Q	1	3.1	2.2	4.6

Intersection	
Intersection Delay, s/veh	13.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	4	131	27	183	178	13	30	5	275	11	5	1
Future Vol, veh/h	4	131	27	183	178	13	30	5	275	11	5	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	5	5	5	1	1	1	2	2	2	9	9	9
Mvmt Flow	4	146	30	203	198	14	33	6	306	12	6	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	10.7	16.3	12.5	9.8
HCM LOS	B	C	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	86%	0%	2%	49%	65%
Vol Thru, %	14%	0%	81%	48%	29%
Vol Right, %	0%	100%	17%	3%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	35	275	162	374	17
LT Vol	30	0	4	183	11
Through Vol	5	0	131	178	5
RT Vol	0	275	27	13	1
Lane Flow Rate	39	306	180	416	19
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.071	0.463	0.277	0.611	0.034
Departure Headway (Hd)	6.606	5.46	5.542	5.291	6.523
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	543	660	648	682	547
Service Time	4.344	3.197	3.583	3.323	4.582
HCM Lane V/C Ratio	0.072	0.464	0.278	0.61	0.035
HCM Control Delay, s/veh	9.9	12.8	10.7	16.3	9.8
HCM Lane LOS	A	B	B	C	A
HCM 95th-tile Q	0.2	2.5	1.1	4.2	0.1

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	6	13	301	5	11	200
Future Vol, veh/h	6	13	301	5	11	200
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	7	15	342	6	13	227

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	597	345	0	0	348
Stage 1	345	-	-	-	-
Stage 2	252	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	469	703	-	-	1217
Stage 1	722	-	-	-	-
Stage 2	794	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	463	703	-	-	1217
Mov Cap-2 Maneuver	463	-	-	-	-
Stage 1	722	-	-	-	-
Stage 2	785	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.18	0	0.42
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	604	94
HCM Lane V/C Ratio	-	-	0.036	0.01
HCM Ctrl Dly (s/v)	-	-	11.2	8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection												
Int Delay, s/veh	4.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	32	24	32	28	56	9	24	263	21	1	197	11
Future Vol, veh/h	32	24	32	28	56	9	24	263	21	1	197	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	0	0	0	2	2	2	1	1	1
Mvmt Flow	36	27	36	32	64	10	27	299	24	1	224	13

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	618	610	230	605	604	311	236	0	0	323	0	0
Stage 1	232	232	-	365	365	-	-	-	-	-	-	-
Stage 2	385	377	-	240	239	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.1	6.5	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.5	4	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	400	408	807	413	415	734	1331	-	-	1243	-	-
Stage 1	768	710	-	658	627	-	-	-	-	-	-	-
Stage 2	636	614	-	768	712	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	325	397	807	358	404	734	1331	-	-	1243	-	-
Mov Cap-2 Maneuver	325	397	-	358	404	-	-	-	-	-	-	-
Stage 1	768	710	-	642	611	-	-	-	-	-	-	-
Stage 2	548	598	-	705	711	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	15.46		16.95		0.6		0.04	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	138	-	-	443	406	9	-	-
HCM Lane V/C Ratio	0.02	-	-	0.225	0.26	0.001	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	15.5	17	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	1	0	-	-

Intersection						
Int Delay, s/veh	0.4					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↶	↷		↶	
Traffic Vol, veh/h	0	41	67	1	5	0
Future Vol, veh/h	0	41	67	1	5	0
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	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	70	70	70	70
Heavy Vehicles, %	3	3	0	0	0	0
Mvmt Flow	0	59	96	1	7	0

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	97	0	-	0	155 96
Stage 1	-	-	-	-	96 -
Stage 2	-	-	-	-	59 -
Critical Hdwy	4.13	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.227	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1490	-	-	-	841 965
Stage 1	-	-	-	-	932 -
Stage 2	-	-	-	-	969 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1490	-	-	-	841 965
Mov Cap-2 Maneuver	-	-	-	-	841 -
Stage 1	-	-	-	-	932 -
Stage 2	-	-	-	-	969 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0	0	9.32
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1490	-	-	-	841
HCM Lane V/C Ratio	-	-	-	-	0.008
HCM Ctrl Dly (s/v)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Intersection Delay, s/veh	9.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	28	56	4	13	66	52	1	18	8	73	43	30
Future Vol, veh/h	28	56	4	13	66	52	1	18	8	73	43	30
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Heavy Vehicles, %	6	6	6	3	3	3	13	13	13	3	3	3
Mvmt Flow	48	97	7	22	114	90	2	31	14	126	74	52
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	9.5	9.7	8.7	10.5
HCM LOS	A	A	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	32%	10%	50%
Vol Thru, %	67%	64%	50%	29%
Vol Right, %	30%	5%	40%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	88	131	146
LT Vol	1	28	13	73
Through Vol	18	56	66	43
RT Vol	8	4	52	30
Lane Flow Rate	47	152	226	252
Geometry Grp	1	1	1	1
Degree of Util (X)	0.067	0.213	0.293	0.342
Departure Headway (Hd)	5.194	5.058	4.674	4.887
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	682	704	763	730
Service Time	3.281	3.128	2.737	2.951
HCM Lane V/C Ratio	0.069	0.216	0.296	0.345
HCM Control Delay, s/veh	8.7	9.5	9.7	10.5
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.2	0.8	1.2	1.5

Intersection	
Intersection Delay, s/veh	14.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	0	272	42	206	74	6	30	4	233	11	4	1
Future Vol, veh/h	0	272	42	206	74	6	30	4	233	11	4	1
Peak Hour Factor	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Heavy Vehicles, %	2	2	2	3	3	3	4	4	4	0	0	0
Mvmt Flow	0	332	51	251	90	7	37	5	284	13	5	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	15.8	15.6	13.2	10.2
HCM LOS	C	C	B	B

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	88%	0%	0%	72%	69%
Vol Thru, %	12%	0%	87%	26%	25%
Vol Right, %	0%	100%	13%	2%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	34	233	314	286	16
LT Vol	30	0	0	206	11
Through Vol	4	0	272	74	4
RT Vol	0	233	42	6	1
Lane Flow Rate	41	284	383	349	20
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.081	0.462	0.579	0.553	0.037
Departure Headway (Hd)	7.021	5.858	5.445	5.705	6.848
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	509	614	659	631	519
Service Time	4.781	3.617	3.499	3.759	4.944
HCM Lane V/C Ratio	0.081	0.463	0.581	0.553	0.039
HCM Control Delay, s/veh	10.4	13.6	15.8	15.6	10.2
HCM Lane LOS	B	B	C	C	B
HCM 95th-tile Q	0.3	2.4	3.7	3.4	0.1

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	18	29	235	8	9	248
Future Vol, veh/h	18	29	235	8	9	248
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	5	5	3	3	3	3
Mvmt Flow	20	32	261	9	10	276

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	561	266	0	0	270
Stage 1	266	-	-	-	-
Stage 2	296	-	-	-	-
Critical Hdwy	6.45	6.25	-	-	4.13
Critical Hdwy Stg 1	5.45	-	-	-	-
Critical Hdwy Stg 2	5.45	-	-	-	-
Follow-up Hdwy	3.545	3.345	-	-	2.227
Pot Cap-1 Maneuver	484	766	-	-	1288
Stage 1	772	-	-	-	-
Stage 2	748	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	479	766	-	-	1288
Mov Cap-2 Maneuver	479	-	-	-	-
Stage 1	772	-	-	-	-
Stage 2	741	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.3	0	0.27
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	623	63
HCM Lane V/C Ratio	-	-	0.084	0.008
HCM Ctrl Dly (s/v)	-	-	11.3	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0

Intersection												
Int Delay, s/veh	6.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	18	85	28	35	32	21	22	201	41	33	214	22
Future Vol, veh/h	18	85	28	35	32	21	22	201	41	33	214	22
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	86	86	86	86	86	86	86	86	86	86	86	86
Heavy Vehicles, %	5	5	5	2	2	2	4	4	4	2	2	2
Mvmt Flow	21	99	33	41	37	24	26	234	48	38	249	26

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	642	671	262	684	660	258	274	0	0	281	0	0
Stage 1	338	338	-	309	309	-	-	-	-	-	-	-
Stage 2	303	333	-	375	351	-	-	-	-	-	-	-
Critical Hdwy	7.15	6.55	6.25	7.12	6.52	6.22	4.14	-	-	4.12	-	-
Critical Hdwy Stg 1	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.15	5.55	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.545	4.045	3.345	3.518	4.018	3.318	2.236	-	-	2.218	-	-
Pot Cap-1 Maneuver	383	374	770	363	383	781	1277	-	-	1281	-	-
Stage 1	670	635	-	701	660	-	-	-	-	-	-	-
Stage 2	700	639	-	646	632	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	315	352	770	239	361	781	1277	-	-	1281	-	-
Mov Cap-2 Maneuver	315	352	-	239	361	-	-	-	-	-	-	-
Stage 1	646	612	-	685	644	-	-	-	-	-	-	-
Stage 2	623	624	-	501	610	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	19.96		20.33		0.66		0.97	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	145	-	-	391	336	217	-	-
HCM Lane V/C Ratio	0.02	-	-	0.39	0.305	0.03	-	-
HCM Ctrl Dly (s/v)	7.9	0	-	20	20.3	7.9	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.8	1.3	0.1	-	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	3	130	56	5	11	6
Future Vol, veh/h	3	130	56	5	11	6
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	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	69	69	69	69	69	69
Heavy Vehicles, %	1	1	4	4	0	0
Mvmt Flow	4	188	81	7	16	9

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	88	0	-	0	282 85
Stage 1	-	-	-	-	85 -
Stage 2	-	-	-	-	197 -
Critical Hdwy	4.11	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.209	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1514	-	-	-	712 980
Stage 1	-	-	-	-	944 -
Stage 2	-	-	-	-	841 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1514	-	-	-	710 980
Mov Cap-2 Maneuver	-	-	-	-	710 -
Stage 1	-	-	-	-	941 -
Stage 2	-	-	-	-	841 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.17	0	9.72
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	41	-	-	-	787
HCM Lane V/C Ratio	0.003	-	-	-	0.031
HCM Ctrl Dly (s/v)	7.4	0	-	-	9.7
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	17.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	48	123	1	13	37	93	2	51	20	122	39	42
Future Vol, veh/h	48	123	1	13	37	93	2	51	20	122	39	42
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Heavy Vehicles, %	8	8	8	3	3	3	3	3	3	1	1	1
Mvmt Flow	92	237	2	25	71	179	4	98	38	235	75	81
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	18.1	14.2	12	20.5
HCM LOS	C	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	3%	28%	9%	60%
Vol Thru, %	70%	72%	26%	19%
Vol Right, %	27%	1%	65%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	73	172	143	203
LT Vol	2	48	13	122
Through Vol	51	123	37	39
RT Vol	20	1	93	42
Lane Flow Rate	140	331	275	390
Geometry Grp	1	1	1	1
Degree of Util (X)	0.258	0.586	0.46	0.664
Departure Headway (Hd)	6.614	6.374	6.025	6.127
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	540	566	597	589
Service Time	4.681	4.425	4.08	4.177
HCM Lane V/C Ratio	0.259	0.585	0.461	0.662
HCM Control Delay, s/veh	12	18.1	14.2	20.5
HCM Lane LOS	B	C	B	C
HCM 95th-tile Q	1	3.8	2.4	4.9

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		TT			TT
Traffic Vol, veh/h	10	7	236	4	2	261
Future Vol, veh/h	10	7	236	4	2	261
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	4	4	3	3
Mvmt Flow	11	8	268	5	2	297

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	572	270	0	0	273
Stage 1	270	-	-	-	-
Stage 2	301	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.13
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.227
Pot Cap-1 Maneuver	485	773	-	-	1285
Stage 1	780	-	-	-	-
Stage 2	755	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	484	773	-	-	1285
Mov Cap-2 Maneuver	484	-	-	-	-
Stage 1	780	-	-	-	-
Stage 2	754	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.51	0	0.06
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	572	14
HCM Lane V/C Ratio	-	-	0.034	0.002
HCM Ctrl Dly (s/v)	-	-	11.5	7.8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection	
Intersection Delay, s/veh	14.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕	↕		↕	
Traffic Vol, veh/h	4	131	30	201	178	13	32	5	285	11	5	1
Future Vol, veh/h	4	131	30	201	178	13	32	5	285	11	5	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	5	5	5	1	1	1	2	2	2	9	9	9
Mvmt Flow	4	146	33	223	198	14	36	6	317	12	6	1
Number of Lanes	0	1	0	0	1	0	0	1	1	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	2	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	1	1	1
HCM Control Delay, s/veh	10.9	17.8	13.1	10
HCM LOS	B	C	B	A

Lane	NBLn1	NBLn2	EBLn1	WBLn1	SBLn1
Vol Left, %	86%	0%	2%	51%	65%
Vol Thru, %	14%	0%	79%	45%	29%
Vol Right, %	0%	100%	18%	3%	6%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	37	285	165	392	17
LT Vol	32	0	4	201	11
Through Vol	5	0	131	178	5
RT Vol	0	285	30	13	1
Lane Flow Rate	41	317	183	436	19
Geometry Grp	5	5	2	2	4a
Degree of Util (X)	0.076	0.487	0.286	0.648	0.035
Departure Headway (Hd)	6.687	5.537	5.624	5.355	6.647
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	536	649	638	675	536
Service Time	4.43	3.279	3.672	3.391	4.716
HCM Lane V/C Ratio	0.076	0.488	0.287	0.646	0.035
HCM Control Delay, s/veh	10	13.5	10.9	17.8	10
HCM Lane LOS	A	B	B	C	A
HCM 95th-tile Q	0.2	2.7	1.2	4.8	0.1

Intersection						
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	11	20	306	13	23	208
Future Vol, veh/h	11	20	306	13	23	208
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	13	23	348	15	26	236

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	644	355	0	0	363	0
Stage 1	355	-	-	-	-	-
Stage 2	289	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	441	693	-	-	1202	-
Stage 1	714	-	-	-	-	-
Stage 2	765	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	430	693	-	-	1202	-
Mov Cap-2 Maneuver	430	-	-	-	-	-
Stage 1	714	-	-	-	-	-
Stage 2	746	-	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	11.74	0	0.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	569	179
HCM Lane V/C Ratio	-	-	0.062	0.022
HCM Ctrl Dly (s/v)	-	-	11.7	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1

Intersection												
Int Delay, s/veh	4.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	32	24	32	32	56	14	24	277	27	4	205	11
Future Vol, veh/h	32	24	32	32	56	14	24	277	27	4	205	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	3	3	3	0	0	0	2	2	2	1	1	1
Mvmt Flow	36	27	36	36	64	16	27	315	31	5	233	13

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	649	648	239	640	639	330	245	0	0	345	0	0
Stage 1	248	248	-	385	385	-	-	-	-	-	-	-
Stage 2	401	400	-	256	255	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.1	6.5	6.2	4.12	-	-	4.11	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.5	4	3.3	2.218	-	-	2.209	-	-
Pot Cap-1 Maneuver	381	388	797	391	396	716	1321	-	-	1219	-	-
Stage 1	753	699	-	642	615	-	-	-	-	-	-	-
Stage 2	623	600	-	753	700	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	303	376	797	336	385	716	1321	-	-	1219	-	-
Mov Cap-2 Maneuver	303	376	-	336	385	-	-	-	-	-	-	-
Stage 1	750	696	-	626	599	-	-	-	-	-	-	-
Stage 2	531	584	-	688	697	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Ctrl Dly, s/v	16.22		18		0.57		0.14	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	129	-	-	420	392	32	-	-
HCM Lane V/C Ratio	0.021	-	-	0.238	0.296	0.004	-	-
HCM Ctrl Dly (s/v)	7.8	0	-	16.2	18	8	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.9	1.2	0	-	-

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Traffic Vol, veh/h	6	44	72	13	12	4
Future Vol, veh/h	6	44	72	13	12	4
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	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	70	70	70	70	70	70
Heavy Vehicles, %	3	3	0	0	0	0
Mvmt Flow	9	63	103	19	17	6

Major/Minor	Major1	Major2	Minor2		
Conflicting Flow All	121	0	-	0	192 112
Stage 1	-	-	-	-	112 -
Stage 2	-	-	-	-	80 -
Critical Hdwy	4.13	-	-	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	2.227	-	-	-	3.5 3.3
Pot Cap-1 Maneuver	1460	-	-	-	801 946
Stage 1	-	-	-	-	918 -
Stage 2	-	-	-	-	948 -
Platoon blocked, %		-	-	-	
Mov Cap-1 Maneuver	1460	-	-	-	796 946
Mov Cap-2 Maneuver	-	-	-	-	796 -
Stage 1	-	-	-	-	912 -
Stage 2	-	-	-	-	948 -

Approach	EB	WB	SB
HCM Ctrl Dly, s/v	0.9	0	9.46
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	216	-	-	-	829
HCM Lane V/C Ratio	0.006	-	-	-	0.028
HCM Ctrl Dly (s/v)	7.5	0	-	-	9.5
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Intersection Delay, s/veh	10.3
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	31	63	4	13	78	52	1	18	8	73	43	36
Future Vol, veh/h	31	63	4	13	78	52	1	18	8	73	43	36
Peak Hour Factor	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58	0.58
Heavy Vehicles, %	6	6	6	3	3	3	13	13	13	3	3	3
Mvmt Flow	53	109	7	22	134	90	2	31	14	126	74	62
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay, s/veh	9.9	10.1	8.8	10.9
HCM LOS	A	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	4%	32%	9%	48%
Vol Thru, %	67%	64%	55%	28%
Vol Right, %	30%	4%	36%	24%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	98	143	152
LT Vol	1	31	13	73
Through Vol	18	63	78	43
RT Vol	8	4	52	36
Lane Flow Rate	47	169	247	262
Geometry Grp	1	1	1	1
Degree of Util (X)	0.07	0.241	0.325	0.361
Departure Headway (Hd)	5.423	5.125	4.751	4.962
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	665	694	750	718
Service Time	3.423	3.209	2.829	3.041
HCM Lane V/C Ratio	0.071	0.244	0.329	0.365
HCM Control Delay, s/veh	8.8	9.9	10.1	10.9
HCM Lane LOS	A	A	B	B
HCM 95th-tile Q	0.2	0.9	1.4	1.6

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	7	5	313	12	8	213
Future Vol, veh/h	7	5	313	12	8	213
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	8	6	356	14	9	242

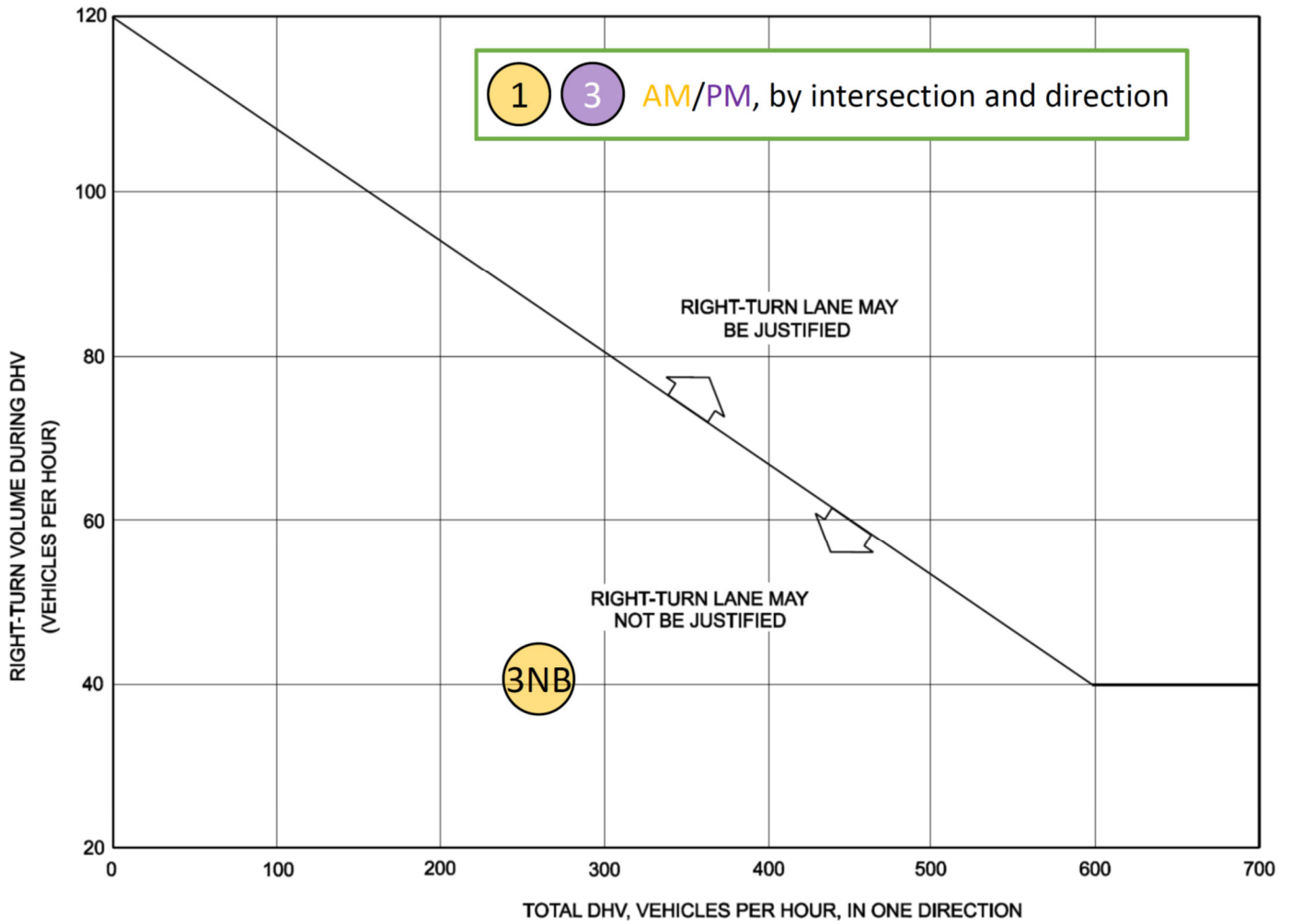
Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	623	363	0	0	369
Stage 1	363	-	-	-	-
Stage 2	260	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	453	687	-	-	1195
Stage 1	709	-	-	-	-
Stage 2	788	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	449	687	-	-	1195
Mov Cap-2 Maneuver	449	-	-	-	-
Stage 1	709	-	-	-	-
Stage 2	781	-	-	-	-

Approach	WB	NB	SB
HCM Ctrl Dly, s/v	12.04	0	0.29
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	525	65
HCM Lane V/C Ratio	-	-	0.026	0.008
HCM Ctrl Dly (s/v)	-	-	12	8
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.1	0

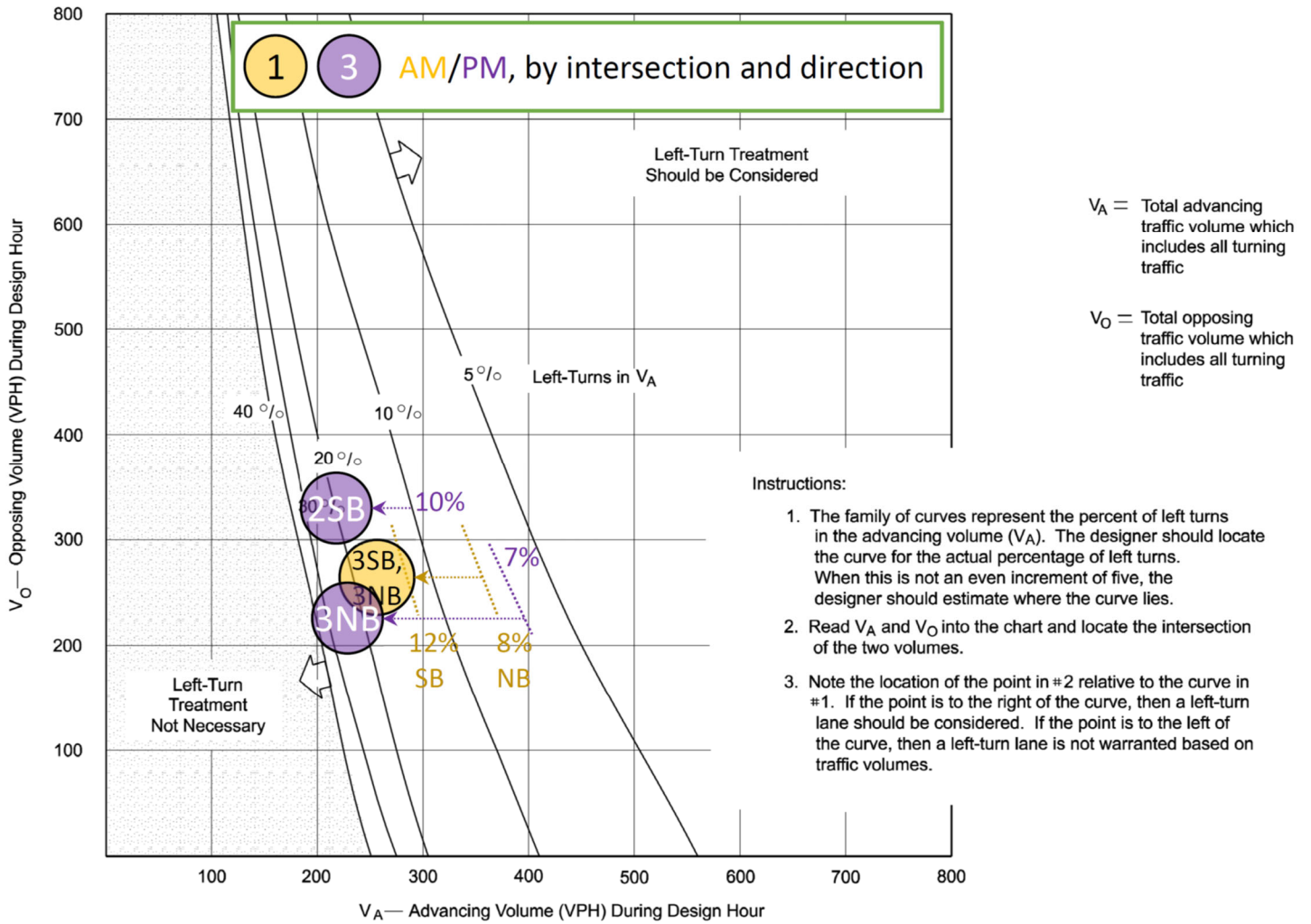
### Appendix C: Auxiliary Turn Lane Analysis Charts

Right Turn Lane Analysis Chart (using MDT Design Manual, Figure 28.4A)



*Note: For highways with a design speed below 50 mph (80 km/h) with a DHV < 300 and where right turns are > 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.*

Left Turn Lane Analysis Chart (using MDT Design Manual, Figure 28.4C)



## Appendix D: Intersection Cost Participation Calculations

### Yellowstone County Cost Participation Worksheet: Staley Residential

Whether a movement pair is **critical** is based on Project traffic

#### 1: 72nd at King

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in this movement			
WB L	1	5	5	18	18
WB T	1	No project traffic in these movements			
EB L	1	No project traffic in these movements			
NB T	1	No project traffic in these movements			
SB L	1	No project traffic in these movements			
SB T	1	No project traffic in these movements			
NB L	1	3	3	2	2
Project Critical Lane Volume		8		20	
Critical Lane Capacity		1200		1200	
% Increase		0.7%		1.7%	
Max % Increase		1.7%			

#### 2: 72nd at O'Donnell

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in this movement			
WB L	1	7	7	5	5
WB T	1	No project traffic in these movements			
EB L	1	No project traffic in these movements			
NB T	1	7	7	5	5
SB L	1	4	4	12	12
SB T	1	2	2	8	8
NB L	1	No project traffic in this movement			
Project Critical Lane Volume		18		22	
Critical Lane Capacity		1140		1140	
% Increase		1.6%		1.9%	
Max % Increase		1.9%			

(does not meet the 2% threshold)

#### 3: 72nd at Hesper

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	No project traffic in this movement			
WB L	1	5	5	4	4
WB T	1	No project traffic in these movements			
EB L	1	No project traffic in these movements			
NB T	1	4	4	14	14
SB L	1	5	5	3	3
SB T	1	13	13	8	8
NB L	1	No project traffic in this movement			
Project Critical Lane Volume		18		21	
Critical Lane Capacity		1200		1200	
% Increase		1.5%		1.8%	
Max % Increase		1.8%			

#### 4: 68th at Hesper

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	5	5	3	3
WB L	1	No project traffic in this movement			
WB T	1	2	2	5	5
EB L	1	2	2	6	6
NB T	1	No project traffic in this movement			
SB L	1	11	11	7	7
SB T	1	No project traffic in these movements			
NB L	1	No project traffic in these movements			
Project Critical Lane Volume		16		18	
Critical Lane Capacity		1140		1140	
% Increase		1.4%		1.6%	
Max % Increase		1.6%			

#### 5: 64th at Hesper

Lane Group (critical)	Lanes	AM Peak Hour		PM Peak Hour	
		Vproject	Per Lane	Vproject	Per Lane
EB T	1	10	10	7	7
WB L	1	No project traffic in this movement			
WB T	1	4	4	12	12
EB L	1	5	5	3	3
NB T	1	No project traffic in these movements			
SB L	1	No project traffic in these movements			
SB T	1	No project traffic in these movements			
NB L	1	No project traffic in these movements			
Project Critical Lane Volume		10		15	
Critical Lane Capacity		1200		1200	
% Increase		0.8%		1.3%	
Max % Increase		1.3%			

## Appendix E: Traffic Signal Warrant Analysis for 64<sup>th</sup> at Hesper

Traffic signal warrant analysis of the 2029 “With Project” condition was conducted using the procedures documented in the 11<sup>th</sup> edition of the Manual on Uniform Traffic Control Devices, the most recent available at the time of this study. Traffic data informing this analysis was collected at the same time as counts for the rest of this study, and covered 12 consecutive hours (7 a.m. through 7 p.m.) on a Thursday when both schools at the intersection were fully open and no road use restrictions, such as those due to construction or maintenance, were observed on the approaching or surrounding roadways. Of the nine warrants available, none were met. A summary of the data, thresholds, and determinations is provided on the following page. Additional details and highlights include:

- MUTCD warrant analysis relies heavily on the concept of “major” and “minor” streets, and is generally (though not explicitly) geared toward examining whether two-way stop controlled (TWSC) intersections might be operating under conditions where a traffic signal should be considered. This intersection has already met warrants for all-way stop control (AWSC) and has been controlled that way for some time. To that end, both vehicles and pedestrians seeking to cross the “major” street at this intersection do not experience the delays and potential dangers that would be present at a TWSC intersection.
- For Warrant 2, Four-Hour Volume, the major street (Hesper) volume is too low to graph the relationship between it and the minor volume. If the graph were to be extended to capture lower volumes, the estimated minor street volume is far below the approximate minor-street minimum to meet the warrant.
- Warrant 3, Peak Hour, is specifically indicated in the MUTCD as being applicable “only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or [HOV] facilities that attract or discharge large numbers of vehicles over a short time.” While the definition of “large” in the context of such uses could render it debatable here due to the rural, low-volume nature of the study area, we believe that the location of the Elder Grove schools on the northwest and northeast corners of this intersection justifies the inclusion of this warrant in the analysis. Both vehicular and pedestrian activity at the intersection are very clearly and heavily dependent on school hours.
- Warrant 4, Pedestrian Volume, “is intended for application where the traffic volume on a major street is so heavy that pedestrians experience excessive delay in crossing the major street,” per the MUTCD. AWSC removes this delay by requiring all vehicles to stop at the intersection and yield to pedestrians crossing. In addition, 95% of pedestrian activity observed in the 12-hour count period is in the north crosswalk, crossing 64<sup>th</sup>, which is the minor street.
- Warrant 5, School Crossing, “is intended for application where the fact that schoolchildren cross the major street is the principal reason to consider installing a traffic control signal,” per the MUTCD. As with Warrant 4, most if not all schoolchildren here are already using a crossing that is governed by the existing intersection traffic control, and that crossing is, by the definition of the MUTCD, a crossing of the minor street rather than the major one. The MUTCD also indicates that “[b]efore a decision is made to install a traffic control signal, consideration should be given to the implementation of other remedial measures, such as warning signs and flashers, school speed zones, school crossing guards, or a grade-separated crossing.” Warning signs, overhead flashing beacons, crossing guards during school start/end periods, and school speed zones are already in use at the intersection.
- Warrant 7, Crash Experience, was examined in detail using the five-year crash history data received for this TIS from MDT. Only one crash was reported at this intersection during those five years. It was a right-angle collision, which qualifies it in part for consideration under this warrant, but it occurred during construction when a ‘flagger, law enforcement, crossing guard, etc.’ was present, and the crash did not include either injuries or pedestrians. We believe that the scarcity of crashes indicates the effectiveness of the traffic control and supplemental warning device regime in place at the intersection now.

While no signal warrants are projected to be met using the information in this TIS, further engineering study of this intersection could be warranted if changes occur in the assumptions employed.

**Traffic Signal Needs Analysis Summary: S 68th Street West at Hesper Road**

Scenario: Future (2029) with Staley Residential Subdivision	
Analysis Date: 3/21/2025	Conducted by: 406 Traffic & Transportation Consulting
Major Street: Hesper Road (E/W), has 1 lane	Minor Street 1: S. 64th Street West (N/S), has 1 lane
Speed Limit: 45 mph	Number of Approaches: 4

**Traffic Volumes**

Hour:	1	2	3	4	5	6	7	8	9	10	11	12
Start Time:	7:00 AM	8:00 AM	9:00 AM	10:00 AM	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Hesper EB:	164	44	43	30	32	34	43	52	86	53	52	35
Hesper WB:	140	40	25	37	55	70	64	101	131	109	111	68
64th NB:	65	38	26	22	35	31	23	30	28	36	44	19
64th SB:	153	97	30	38	47	55	34	32	143	67	58	22
Total Entering Volume:	522	219	124	127	169	190	164	215	388	265	265	144
TEV Rank:	1	5	12	11	8	7	9	6	2	3	3	10
Use for:	Warrant 3			Warrant 1			Warrant 2					
Major, Both Directions:	304	84	68	67	87	104	107	153	217	162	163	103
Minor, Higher Direction:	153	97	30	38	47	55	34	32	143	67	58	22

**Warrants**

											Met?
1 Eight-Hour Vehicular Volume (either condition)	<i>Condition A: Large Volume of Intersecting Traffic</i>					<i>or Condition B: Interruption of Continuous Traffic</i>					No
	Major (Both Dir.)		Minor (Higher Dir.)		Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	87	350 <sup>c</sup>	47	105 <sup>c</sup>	No	87	525 <sup>c</sup>	47	53 <sup>c</sup>	No	
2 Four-Hour Vehicular Volume	<i>MUTCD Figure 4C-2 for speed over 40 mph</i>					<i>Major Street volume too low to appear on Figure 4C-2</i>					No
	Major (Both Dir.)		Minor (Higher Dir.)		Met?						
	Value	Minimum	Value	Minimum	Met?						
	162	N/A	67	N/A	No						
3 Peak Hour* (either condition)	<i>Condition A (must meet all three subconditions)</i>					<i>or Condition B (MUTCD Figure 4C-4)</i>					No
			Value	Minimum	Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
			Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	1. Veh-Hrs of Delay		1.2	4	No	304	N/A	153	~310	No	
2. Minor Volume		153	75	Yes							
3. Total Ent. Volume		522	800	No							
4 Pedestrian Volume (either criterion)	<i>Criterion A: Four-hour (MUTCD Figure 4C-7)</i>					<i>or Criterion B: One Hour (MUTCD Figure 4C-8)</i>					No
	Major (Both Dir.)		Pedestrians		Met?	Major (Both Dir.)		Pedestrians		Met?	
	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	162	N/A	0 Peds	N/A	No	304	N/A	7 Peds	N/A	No	
5 School Crossing	Very few (if any) students cross the major street. The minor street crossing used is already stop-controlled. All intersection approaches are already well-signed with school zone speed restrictions.										No
6 Coordinated Signal System	No signals in the roadway network nearby.										No
7 Crash Experience ** Condition A not evaluated (all conditions)	<i>Condition B, 1-year Period (Table 4C-4)</i>					<i>and Condition C, 80% of Warrant 1 [Condition A]</i>					No
	Angle+Ped Crashes		or Fatal+Injury A+P		Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?	
	Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?	
	1	4	1	3	No	87	400	47	120	No	
	<i>or Condition B, 3-year Period (Table 4C-5)</i>					<i>or Condition C, 80% of Warrant 1 [Condition B]</i>					
Angle+Ped Crashes		or Fatal+Injury A+P		Met?	Major (Both Dir.)		Minor (Higher Dir.)		Met?		
Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?		
1	6	1	4	No	87	600	47	60	No		
					<i>or Condition C, 80% of Warrant 4</i>						
Four Hour Ped		One Hour Ped		Met?	Four Hour Ped		One Hour Ped		Met?		
Value	Minimum	Value	Minimum	Met?	Value	Minimum	Value	Minimum	Met?		
					0 Peds	N/A	7 Peds	N/A	No		
8 Roadway Network	No second major route present and no need indicated to concentrate traffic at this location.										No
9 Intersection Near Grade Xing	No railroad grade crossing nearby.										No

Warrants Met: 0  
**Recommendation: No Signal**

**Notes:**

- c: Warrant 1 minimum values used for "70%" to account to reflect major-street speed over 40 mph
- \* Warrant 3, Peak Hour, is indicated by the MUTCD as follows: "This signal warrant should be applied only in unusual cases, such as office complexes, manufacturing plants, industrial complexes, or high-occupancy vehicle facilities that attract or discharge large numbers of vehicles over a short time."
- \*\* No trial of alternatives with observance and enforcement has been attempted at this location.