TRAFFIC IMPACT STUDY

For

Schmidt Property
El Paso County, Colorado
PCD File No. P-22-022

September 2022
Revised:
January 2023

Prepared for:

N.E.S. Inc.
619 N Cascade Avenue, Suite 200
Colorado Springs, CO 80903

Prepared by:

SM ROCHA, LLC
TRAFFIC AND TRANSPORTATION CONSULTANTS

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Project Engineer / Manager:
Mike Rocha, Principal
Brandon Wilson, EIT
Megan Bock, EIT

Engineer in Responsible Charge:
Fred Lantz, PE

22-061691

Traffic Engineer's Statement

The attached traffic report and supporting information were prepared under my responsible charge and they comport with the standard of care. So far as is consistent with the standard of care, said report was prepared in general conformance with the criteria established by the County for traffic reports.

01/06/2023

Fred Lantz, P.E. #23410 Date

Developer's Statement

I, the Developer, have read and will comply with all commitments made on my behalf within this report.

Turkey Canon Quarry Inc Date
20 Boulder Crescent St 2nd Floor
Colorado Springs, CO 80903-3300

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I. Introduction

Project Overview

This traffic impact study is provided as a planning document and addresses the capacity, geometric, and control requirements associated with the development entitled Schmidt Property.

This traffic impact study has been revised to address County review comments made to the previous version regarding additional analyses on roadway improvements and safety as well as updates to site access locations.

This assumed residential development consists of an estimated 714 dwelling units. The 31.44-acre development is located along the south side of (future) Marksheffel Road and near the southwest corner of Vollmer Road intersection with Tahiti Drive in El Paso County, Colorado.

Study Area Boundaries

The study area to be examined in this analysis encompasses Vollmer Road near the existing intersection with Tahiti Drive and future Marksheffel Road as well as primary site access.

Consistent with Section B.2.3.B of Appendix B – Transportation Impact Study Guidelines from the County's Engineering Criteria Manual (ECM)[1], the study area did not include the Vollmer Road intersections with Black Forest Road, Cowpoke Road, nor Dry Needle Place since the development's trip distribution pattern does not anticipate much, if any, site traffic traveling to/from these intersections.

Figure 1 illustrates location of the site and study intersections.

Site Description

Land for the development is currently vacant and surrounded by a mix of commercial, residential, and open space land uses.

The rezone development is conceptual and is subject to change. However, for purposes of this analysis, the development assumes the new construction of approximately 714 multifamily residential dwelling units. It should be noted that the land use density described is estimated based on an assumed maximum density allowed per zoning (30 dwelling units per acre) in relation to the known acreage allocated for development at this time.

[1] El Paso County Engineering Criteria Manual, El Paso County, October 2020.

Considering the conceptual nature of the development, future access will likely include multiple access drives along future Brush Top Road (extended). These access locations are subject to change and therefore were not considered within this analysis. For purposes of this analysis, primary points of entry to the overall development area are envisioned at the following locations:

- One full-movement access which will serve as the west leg of the intersection of Marksheffel Road and Vollmer Road.
- One full-movement access on Marksheffel Road at northwest corner of development site (approximately 1,480 feet west of Vollmer Road, measured from centerline). This access is intended to serve as the future collector roadway (Brush Top Road) connection between Marksheffel Road and Trails at Forest Meadows Subdivision.
- One right-in / right-out access on the north side of the property onto Marksheffel Road
- One full-movement access onto Vollmer Road on the southeast side of the property.

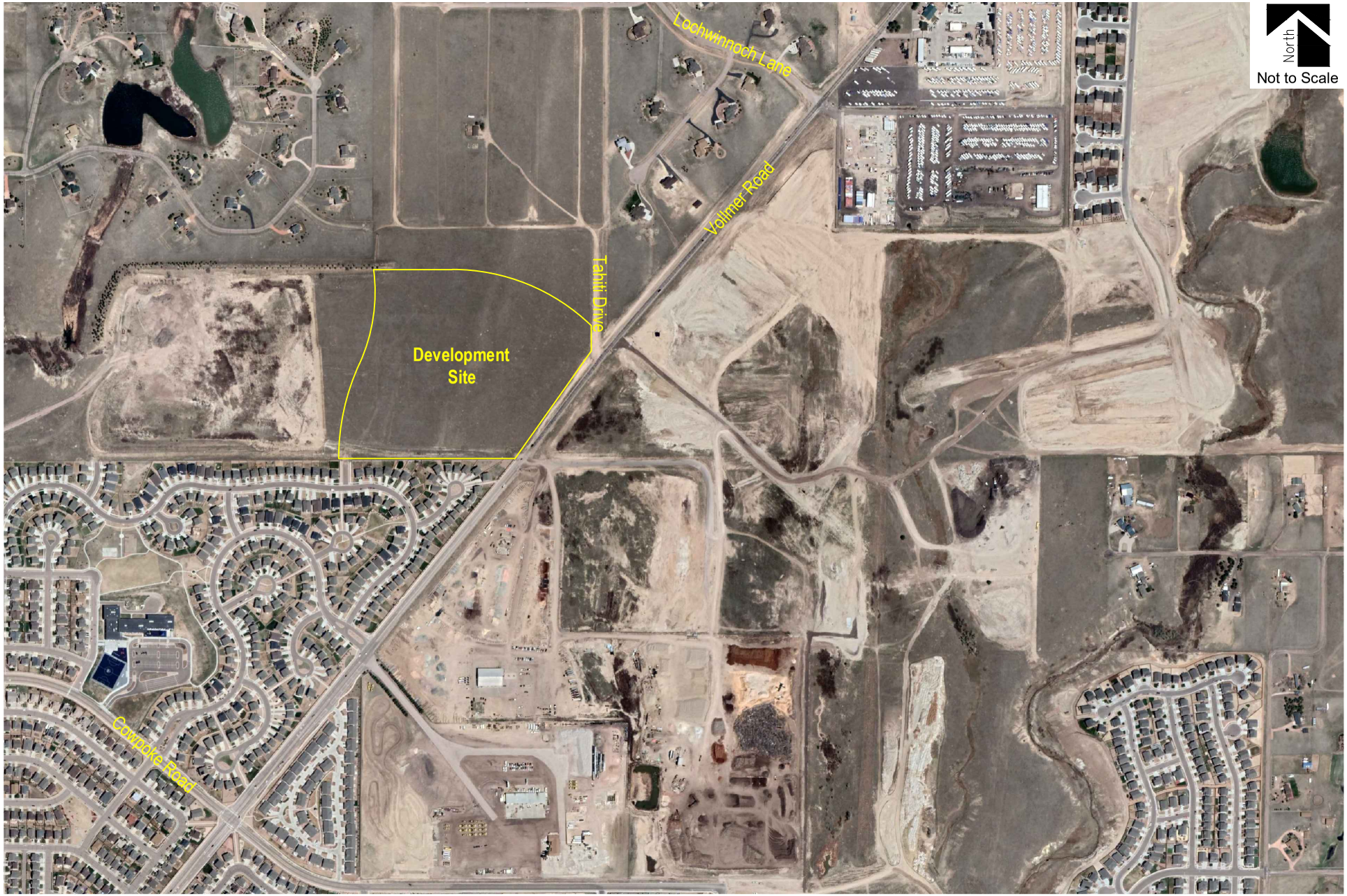
This access will need to be approved through City of Colorado Springs Traffic Engineering

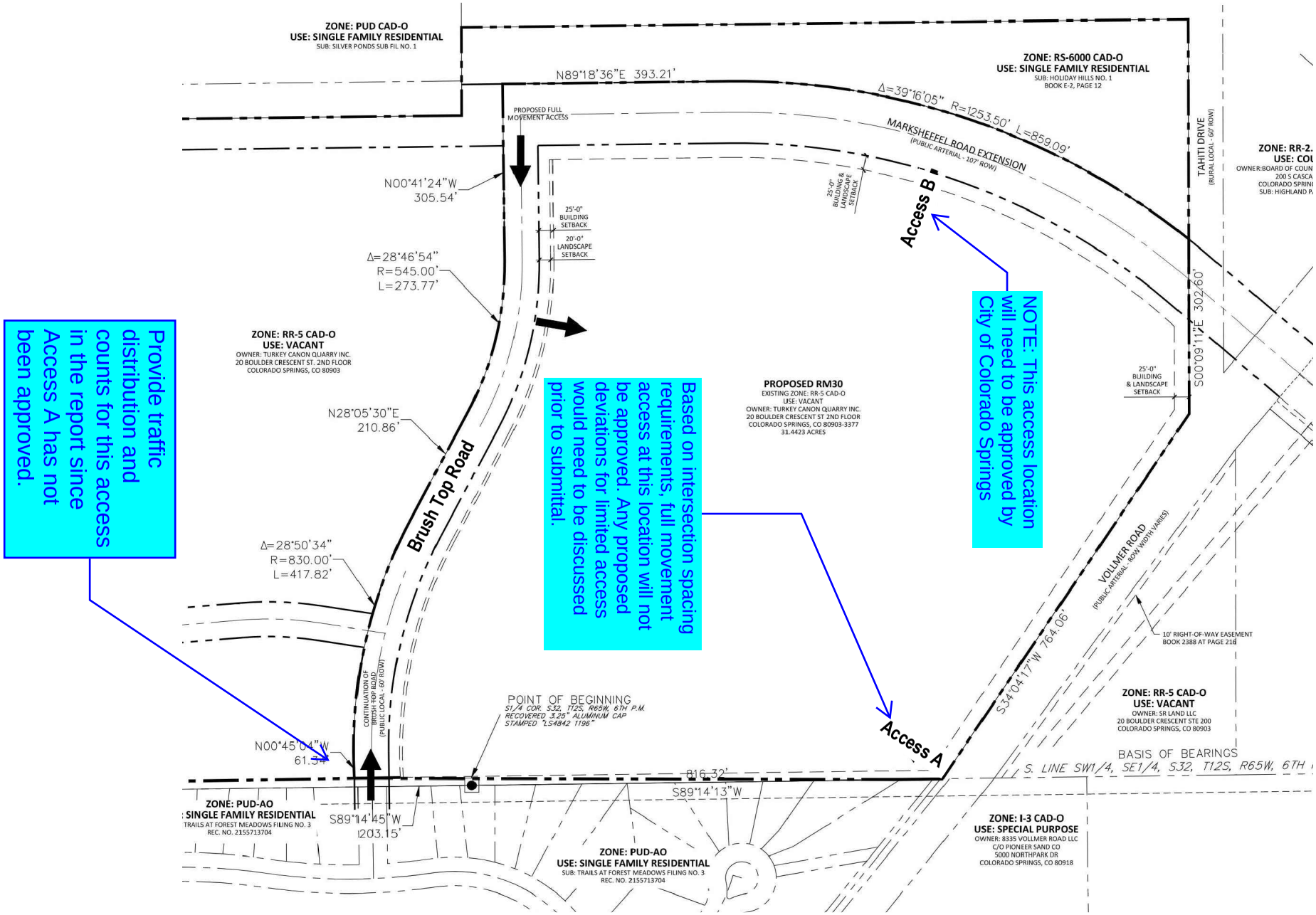
It is anticipated that development construction would be phased with completion by end of Year 2040. However, specific phasing details are undefined at this time. For purposes of this analysis, initial development phasing is assumed to include the new construction of 480 multifamily residential dwelling units completed by Year 2027. Development buildout is expected to be completed by Year 2040 and include completed construction of the total 714 dwelling units.

General site and access locations are shown on Figure 1.

A conceptual site plan, as prepared by NES Inc., is shown on Figure 2. This plan is provided for illustrative purposes only.

Based on intersection spacing requirements, full movement access at this location will not be approved. Any proposed deviations for limited access would need to be discussed prior to submittal.


Lochwinnoch Lane
Vollmer Road
Tahiti Drive
Development Site
Cowpoke Road
North
Not to Scale


North
Not to Scale
ZONE: PUD CAD-O
USE: SINGLE FAMILY RESIDENTIAL
SUB: SILVER PONDS SUB FIL NO. 1
N89°18'36"E 393.21'
ZONE: RS-6000 CAD-O
USE: SINGLE FAMILY RESIDENTIAL
SUB: HOLIDAY HILLS NO. 1
BOOK E-2, PAGE 12
Δ=39°16'05" R=1253.50' L=859.09'
MARKSHEFFEL ROAD EXTENSION
(PUBLIC ARTERIAL - 107' ROW)
PROPOSED FULL MOVEMENT ACCESS
TAHITI DRIVE
(RURAL LOCAL - 60' ROW)
N00°41'24"W
305.54'
25'-0" BUILDING SETBACK
20'-0" LANDSCAPE SETBACK
25'-0" BUILDING & LANDSCAPE SETBACK
Access B
Δ=28°46'54"
R=545.00'
L=273.77'
ZONE: RR-5 CAD-O
USE: VACANT
OWNER: TURKEY CANON QUARRY INC.
20 BOULDER CRESCENT ST. 2ND FLOOR
COLORADO SPRINGS, CO 80903
PROPOSED RM30
EXISTING ZONE: RR-5 CAD-O
USE: VACANT
OWNER: TURKEY CANON QUARRY INC.
20 BOULDER CRESCENT ST 2ND FLOOR
COLORADO SPRINGS, CO 80903-3377
31.4423 ACRES
S00°09'11"E 302.60'
25'-0" BUILDING & LANDSCAPE SETBACK
N28°05'30"E
210.86'
Brush Top Road
Δ=28°50'34"
R=830.00'
L=417.82'
VOLLMER ROAD
(PUBLIC ARTERIAL - ROW WIDTH VARIES)
S34°04'17"W 764.06'
10' RIGHT-OF-WAY EASEMENT
BOOK 2388 AT PAGE 216
ZONE: RR-5 CAD-O
USE: VACANT
OWNER: SR LAND LLC
20 BOULDER CRESCENT STE 200
COLORADO SPRINGS, CO 80903
CONTINUATION OF BRUSH TOP ROAD
(PUBLIC LOCAL - 60' ROW)
POINT OF BEGINNING
S1/4 COR. S32, T12S, R65W, 6TH P.M.
RECOVERED 3.25" ALUMINUM CAP
STAMPED "LS 4842 1196"
N00°45'04"W
61.54'
Access A
816.32'
S89°14'13"W
BASIS OF BEARINGS
S. LINE SW1/4, SE1/4, S32, T12S, R65W, 6TH
ZONE: PUD-AO
SINGLE FAMILY RESIDENTIAL
TRAILS AT FOREST MEADOWS FILING NO. 3
REC. NO. 2155713704
S89°14'45"W
1203.15'
ZONE: PUD-AO
USE: SINGLE FAMILY RESIDENTIAL
SUB: TRAILS AT FOREST MEADOWS FILING NO. 3
REC. NO. 2155713704
ZONE: I-3 CAD-O
USE: SPECIAL PURPOSE
OWNER: 8335 VOLLMER ROAD LLC
C/O PIONEER SAND CO
5000 NORTHPARK DR
COLORADO SPRINGS, CO 80918
Provide traffic distribution and counts for this access in the report since Access A has not been approved.
Based on intersection spacing requirements, full movement access at this location will not be approved. Any proposed deviations for limited access would need to be discussed prior to submittal.
NOTE: This access location will need to be approved by City of Colorado Springs

Indicate if any ROW needs to be dedicated for Vollmer Road improvements

Existing and Committed Surface Transportation Network

Within the study area, Vollmer Road is the primary roadway that will accommodate traffic to and from the proposed development. The secondary roadways include Tahiti Drive, and Marksheffel Road. A brief description of each roadway, based on the County's 2040 Major Transportation Corridors Plan (MTCP)[2] and Engineering Criteria Manual (ECM)[3], is provided below:

Vollmer Road is a north-south rural roadway having two through lanes (one lane in each direction) with shared turn lanes at the intersection within the study area. Vollmer Road provides a posted speed limit of 45 MPH. Pursuant to the County's MTCP it is understood that Vollmer Road is envisioned to be a minor arterial roadway with four through lanes upon build-out.

Tahiti Drive (at time of this study) is a north-south rural unpaved roadway having two through lanes (one lane in each direction) with shared turn lanes at the intersection within the study area. Tahiti Drive is unclassified in County's MTCP. However, per Standard Drawing 2-10 of the County ECM and the roadway's estimated ROW width, Tahiti Drive is assumed to be classified as a local roadway with a posted speed limit of 45 MPH. It is anticipated that Tahiti Drive will be closed as part of this proposed development and as area development occurs to allow for construction of Marksheffel Road (extension) to the west of Vollmer Road.

Marksheffel Road is a future east-west principal arterial roadway having a build-out cross-section of six through lanes (three lanes in each direction) with exclusive turn lanes at intersections within the study area pursuant to the County's MTCP. Marksheffel Road is anticipated to provide a posted speed limit of 45 MPH based on the County ECM. It is understood that ownership and maintenance of Marksheffel Road will be assumed by the City of Colorado Springs and specific design requirements are therefore to be pursuant to the City's engineering standards and specifications. For analysis purposes, and to remain consistent with assumptions made in previously approved traffic reports within the area, it is assumed that Marksheffel Road will be constructed as a four-lane roadway ending at Vollmer Road by Year 2027. It is uncertain as to when build-out for Marksheffel Road to six through lanes may occur depending on continued area development. Therefore, Year 2040 analysis conditions assume Marksheffel to remain a four-lane roadway and will be extended west of Vollmer Road. This assumption provides for a conservative analysis.

The Marksheffel Road cross-section will consist of four 11-foot wide through lanes, a 12-foot wide center turn lane, and two six-foot wide shoulders. In addition, a 10-foot-wide trail will be constructed along the south side of Marksheffel Road as well as a six-foot wide sidewalk on the north side of Marksheffel Road.

Existing study intersections operate under a stop-controlled condition. A stop-controlled intersection is defined as a roadway intersection where vehicle rights-of-way are controlled by one or more "STOP" signs. If is however understood that the future intersections of Marksheffel Road with Vollmer Road will be signalized upon surrounding area build-out or when signal warrants are met. For analysis purposes signalization is assumed to occur by Year 2040.

[2] El Paso County 2016 Major Transportation Corridors Plan Update, Felsburg Holt & Ullevig, December 2016.
[3] El Paso County Engineering Criteria Manual, El Paso County, December 2016.

II. Existing Traffic Conditions

Morning (AM) and afternoon (PM) peak hour traffic counts were collected at the intersection of Vollmer Road with Tahiti Drive. Counts were collected on March 24, 2022, with AM peak hour counts being collected during the period of 7:00 a.m. to 9:00 a.m. and PM peak hour counts being collected during the period of 4:00 p.m. to 6:00 p.m.

Average daily traffic (ADT) 24-hour traffic volumes shown for Vollmer Road were obtained from the City of Colorado Springs Web Mapping Application Traffic Counts data map.

Collected and referenced counts representing existing traffic volumes and existing intersection geometry are shown on Figure 3. Traffic count data is included for reference in Appendix A.

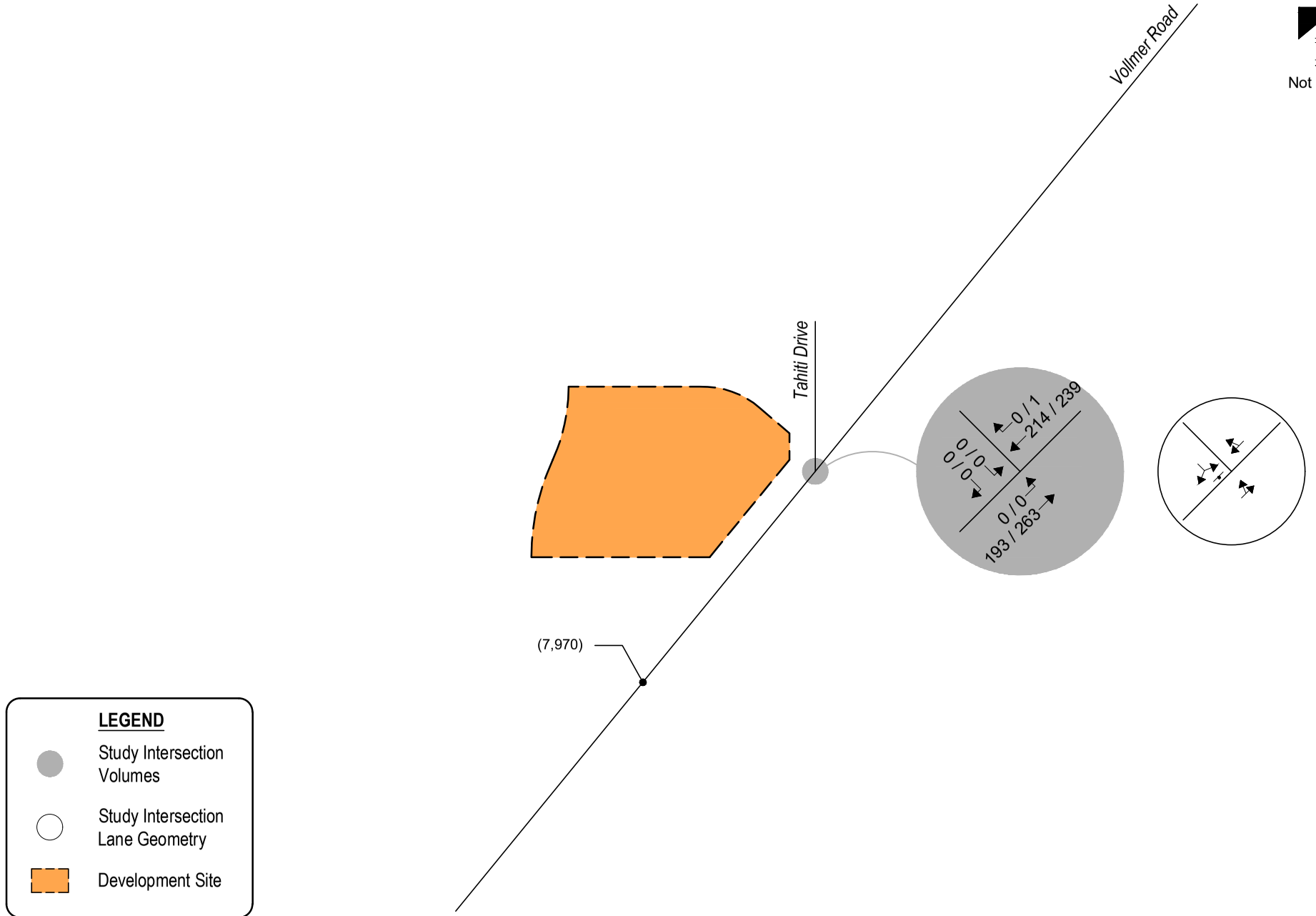


Figure 3
EXISTING TRAFFIC
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

Peak Hour Intersection Levels of Service – Existing Traffic

The Signalized and Unsignalized Intersection Analysis techniques, as published in the Highway Capacity Manual (HCM), 6th Edition, by the Transportation Research Board and as incorporated into the SYNCHRO computer program, were used to analyze the study intersections for existing and future traffic conditions. These nationally accepted techniques allow for the determination of intersection level of service (LOS) based on the congestion and delay of each traffic movement.

Level of service is a method of measurement used by transportation professionals to quantify a driver's perception of travel conditions that include travel time, number of stops, and total amount of stopped delay experienced on a roadway network. The HCM categorizes level of service into a range from "A" which indicates little, if any, vehicle delay, to "F" which indicates a level of operation considered unacceptable to most drivers. These levels of service grades with brief descriptions of the operating condition, for unsignalized and signalized intersections, are included for reference in Appendix B and have been used throughout this study.

The level of service analyses results for existing conditions are summarized in Table 1.

Intersection capacity worksheets developed for this study are provided in Appendix C.

Table 1 – Intersection Capacity Analysis Summary – Existing Traffic

INTERSECTION	LEVEL OF SERVICE	
LANE GROUPS	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Tahiti Drive (Stop-Controlled)		
Northeastbound Left and Through	A	A
Southbound Left and Right	A	A

Key: Stop-Controlled Intersection: Level of Service

Existing Traffic Analysis Results

Under existing conditions, operational analysis shows that the unsignalized intersection of Vollmer Road with Tahiti Drive has turning movement operations at LOS A during both the morning and afternoon peak traffic hours.

III. Future Traffic Conditions Without Proposed Development

Background traffic is the traffic projected to be on area roadways without consideration of the proposed development. Background traffic includes traffic generated by development of vacant parcels in the area.

To account for projected traffic from adjacent developments not yet built, Year 2027 and Year 2040 background traffic conditions utilize estimated peak hour and 24-hour daily traffic volumes from the traffic study prepared for Rhetoric Development[4] and approved area traffic studies, as provided by the County's Electronic Development Application Review Program (EDARP). This referenced traffic study includes traffic generation for the surrounding development area (primarily Sterling Ranch) as analyzed by various traffic engineering consultants.

Total traffic volumes as defined in Figures 7 and 8 of the 2022 Rhetoric Development traffic study were used to define background traffic conditions for purposes of this analysis. As reference, population growth estimates provided by the Pikes Peak Area Council of Governments' (PPACG) 2045 Long Range Transportation Plan[5], estimates an annual growth rate of approximately two percent for the immediate development area.

Pursuant to the proposed and committed area roadway improvements discussed in Section I, Year 2027 background traffic conditions assume the completion of Marksheffel Road east of Vollmer Road. For analysis purposes, and to remain consistent with intersection geometry assumptions utilized in previous traffic reports, study intersections were analyzed as stop-controlled conditions. Vollmer Road is assumed to be widened in the southbound direction to provide two th
Drive intersection is anticipated to be closed with existing traffic volumes
the north.

Include discussion on where Business Drive came from and what it's configuration is, as it's shown under future conditions analysis - Background traffic

Year 2040 background traffic conditions assume the completion of Marksheffel Road to the west of Vollmer Road, and the intersection of Marksheffel Road with Vollmer Road is assumed to be signalized. Widening of Vollmer Road to provide four through lanes (two lanes in each direction) is also assumed.

Future Year 2040 signal timing parameters for the intersections of Marksheffel Road with Vollmer Road were assumed based on the possible signal head configuration and allowable movements, and pursuant to typical signal timing data described within the County's ECM. Timings were used throughout this study to the best extent possible to remain consistent with typical County signal coordination plans.

Projected background traffic volumes and intersection geometry for Years 2027 and 2040 are shown on Figure 4 and Figure 5, respectively.

[4] Rhetoric Site Traffic Impact Study, SM Rocha, LLC, September 2022.
[5] Moving Forward 2045: Pikes Peak Area Regional Transportation Plan, PPACG, January 2020.

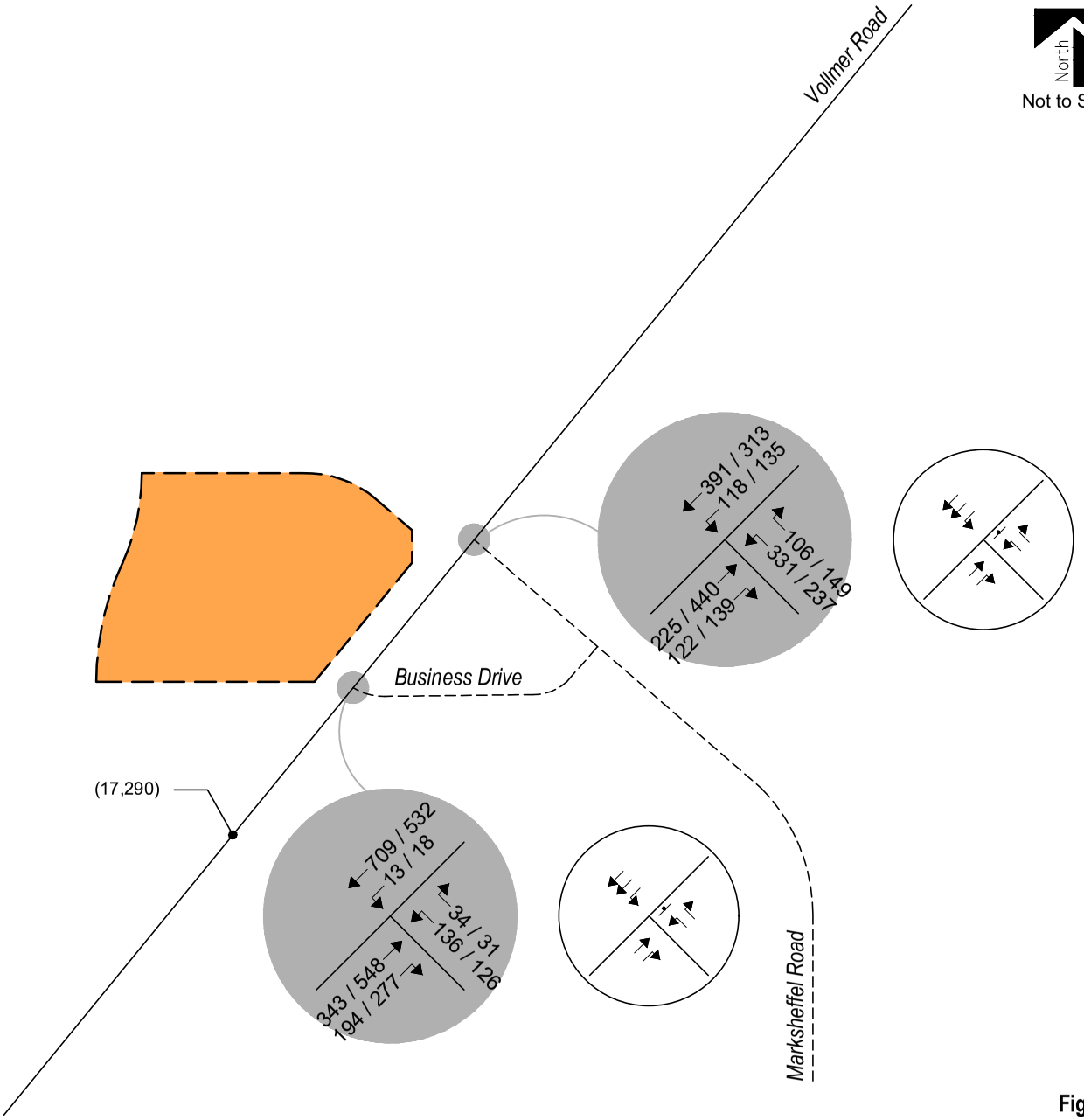


Figure 4
BACKGROUND TRAFFIC - YEAR 2027
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

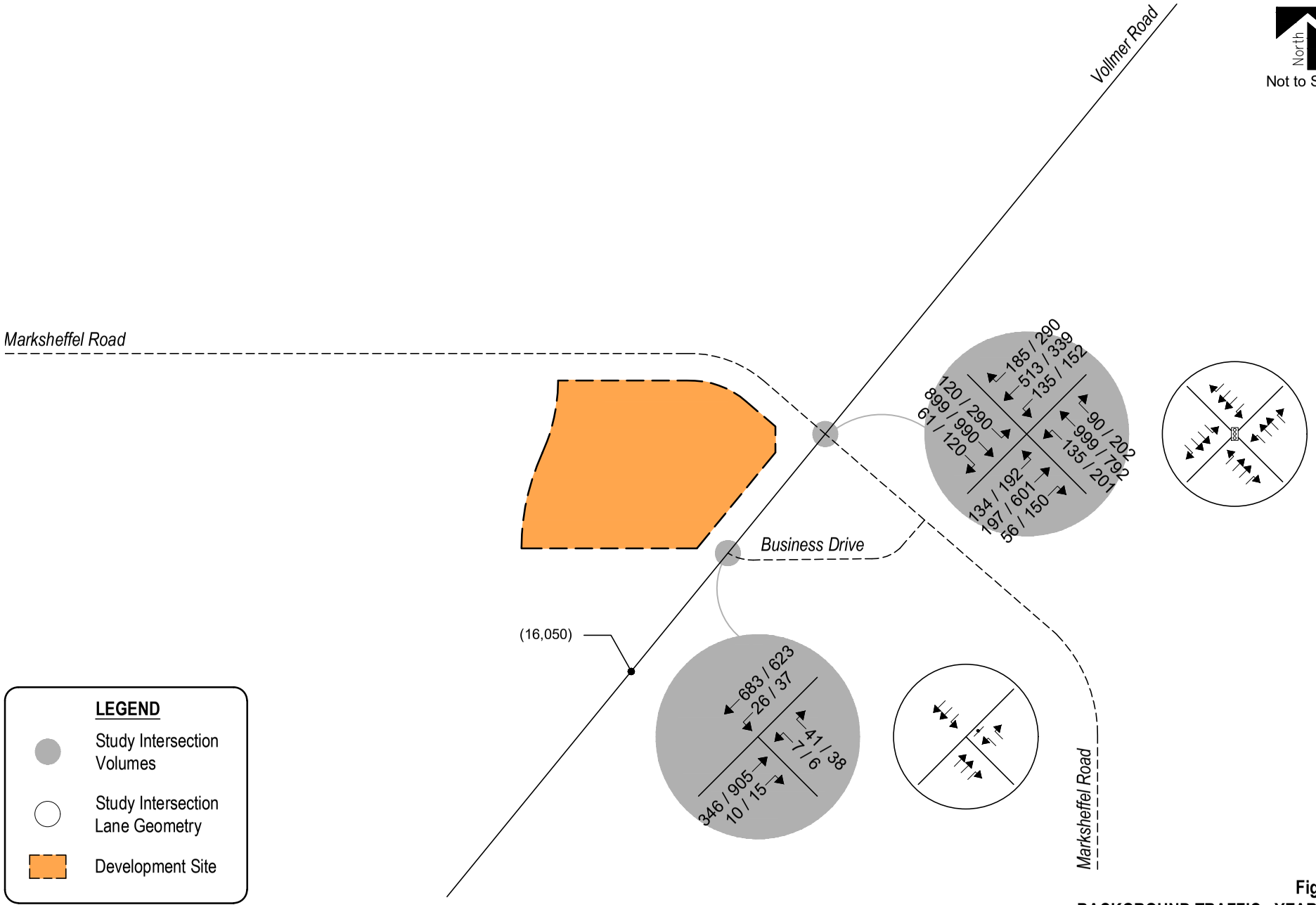


Figure 5
BACKGROUND TRAFFIC - YEAR 2040
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

Peak Hour Intersection Levels of Service – Background Traffic

As with existing traffic conditions, the operations of study intersections were analyzed under background conditions, without the proposed development, using the SYNCHRO computer program.

Background traffic level of service analysis results for Year 2027 are listed in Table 2. Year 2040 operational results are summarized in Table 3.

Definitions of levels of service are given in Appendix B. Intersection capacity worksheets are provided in Appendix C.

Table 2 – Intersection Capacity Analysis Summary – Background Traffic – Year 2027

INTERSECTION	LEVEL OF SERVICE	
LANE GROUPS	AM PEAK HOUR	PM PEAK HOUR
Vollmer Road / Marksheffel Road (Stop-Controlled)		
Westbound Left	F	F
Westbound Right	B	B
Southbound Left	A	A
Vollmer Road / Business Drive (Stop-Controlled)		
Westbound Left	C	D
Westbound Right	B	B
Southbound Left	A	A

Key: Stop-Controlled Intersection: Level of Service

Background Traffic Analysis Results – Year 2027

Year 2027 background traffic analysis indicates that the unsignalized intersection of Vollmer Road with Marksheffel Road has turning movement operations at or better than LOS B during both the AM and PM peak traffic hours. Exceptions would include the westbound left turning movement which operates at LOS F during either peak traffic hour. The LOS F operations are attributed to the through traffic volume along Vollmer Road and the stop-controlled nature of the intersection. In order to provide mitigation for the poor operations along the minor road approach, signalization is an option which is anticipated to achieve acceptable levels of service.

The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the AM peak traffic hour and LOS D or better for the PM peak traffic hour.

Table 3 – Intersection Capacity Analysis Summary – Background Traffic – Year 2040

INTERSECTION LANE GROUPS	LEVEL OF SERVICE AM PEAK HOUR	 PM PEAK HOUR
Vollmer Road / Marksheffel Road (Signalized)	C (31.2)	D (36.9)
Vollmer Road / Business Drive (Stop-Controlled)		
Westbound Left	C	E
Westbound Right	A	B
Southbound Left	A	B

Key: Signalized Intersection: Level of Service (Control Delay in sec/veh)
Stop-Controlled Intersection: Level of Service

Background Traffic Analysis Results – Year 2040

By Year 2040 and without the proposed development, the study intersection of Vollmer Road with Marksheffel Road experiences overall LOS C operations during the AM peak traffic hour and LOS D during the PM peak traffic hour. indicate the intersection analysis assumes signalization

The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the morning peak traffic hour and LOS B for the afternoon peak traffic hour. Exceptions would include the westbound left turning movement which operates at LOS E during the afternoon peak traffic hour. The LOS E operation is attributed to the through traffic volume along Vollmer Road and the stop-controlled nature of the intersection.

It is to be noted that it is not uncommon for unsignalized movements to or from an arterial roadway, in urban areas, to operate with noticeable delays during peak traffic hours. It is, however, likely that turn movements will operate better than the results obtained with this HCM Two-Way Stop-Control (TWSC) level of service analysis would indicate, as the HCM analysis may not accurately account for the effect of vehicle platooning and gaps caused by upstream signals. The upstream signal control on Vollmer Road at Marksheffel Road will tend to create additional gaps in the traffic stream for turning movements at Business Drive which will most likely provide mitigation to the LOS E operation projected during the afternoon peak traffic hour.

IV. Proposed Project Traffic

Trip Generation

Standard traffic generation characteristics compiled by the Institute of Transportation Engineers (ITE) in their report entitled Trip Generation Manual, 11th Edition, were applied to the assumed land use in order to estimate average daily traffic (ADT), AM Peak Hour, and PM Peak Hour vehicle trips. A vehicle trip is defined as a one-way vehicle movement from a point of origin to a point of destination.

The ITE land use code 220 (Multifamily Housing (Low-Rise)) was used for estimating trip generation because of its best fit to the assumed land use description.

As actual land uses, densities, or site plans within the Schmidt Property become defined over time, it is expected that traffic generation characteristics considered within this study will need to be updated by more specific traffic analyses or studies to help assess what, if any, transportation improvements are needed to mitigate potential traffic impacts.

Trip generation rates used in this study are presented in Table 4.

Table 4 – Trip Generation Rates

ITE			TRIP GENERATION RATES						
			24	AM PEAK HOUR			PM PEAK HOUR		
CODE	LAND USE	UNIT	HOUR	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
220	Multifamily Housing (Low-Rise)	DU	6.74	0.10	0.30	0.40	0.32	0.19	0.51

Key: DU = Dwelling Units

Table 5 illustrates projected ADT, AM Peak Hour, and PM Peak Hour traffic volumes likely generated by the assumed development upon build-out.

Table 5 – Trip Generation Summary

ITE			TOTAL TRIPS GENERATED						
			24	AM PEAK HOUR			PM PEAK HOUR		
CODE	LAND USE	SIZE	HOUR	ENTER	EXIT	TOTAL	ENTER	EXIT	TOTAL
220	Multifamily Housing (Low-Rise)	714 DU	4,812	69	217	286	229	135	364
		Total:	*4,812*	*69*	*217*	*286*	*229*	*135*	*364*

Key: DU = Dwelling Units
Note: All data and calculations above are subject to being rounded to nearest value.

Also Include summary of trips generated by initial 480 units

Upon build-out, Table 5 illustrates that the assumed development has the potential to generate approximately 4,812 daily vehicle trips with 286 of those occurring during the morning peak hour and 364 during the afternoon peak hour.

Adjustments to Trip Generation Rates

A development of this type is not likely to attract trips from within area land uses nor pass-by or diverted link trips from the adjacent roadway system, therefore no trip reduction was taken in this analysis.

Trip Distribution

The initial and overall directional distribution of site-generated traffic was determined based on the location of development site within the County, proposed and existing area land uses, allowed turning movements, and available roadway network. Directional distribution used for analysis also complies with the referenced Rhetoric Development traffic study and previously approved traffic studies for the adjacent ongoing development areas.

Trip distribution patterns for the initial phase of development are shown on Figure 6A.

Overall, long-term, trip distribution patterns for development build-out are shown on Figure 6B.

Trip Assignment

The construction of this development is assumed to be phased with the initial phase being completed by 2027 and entailing an approximate 16-acre portion of residential (480 dwelling units) area located immediately adjacent to future Marksheffel Road.

Traffic assignment is how generated and distributed vehicle trips are expected to be loaded onto the available roadway network.

Applying trip distribution patterns to site-generated traffic provides the initial site-generated trip assignments for Year 2027 shown on Figure 6A, and overall trip assignments Year 2040 are shown on Figure 6B.

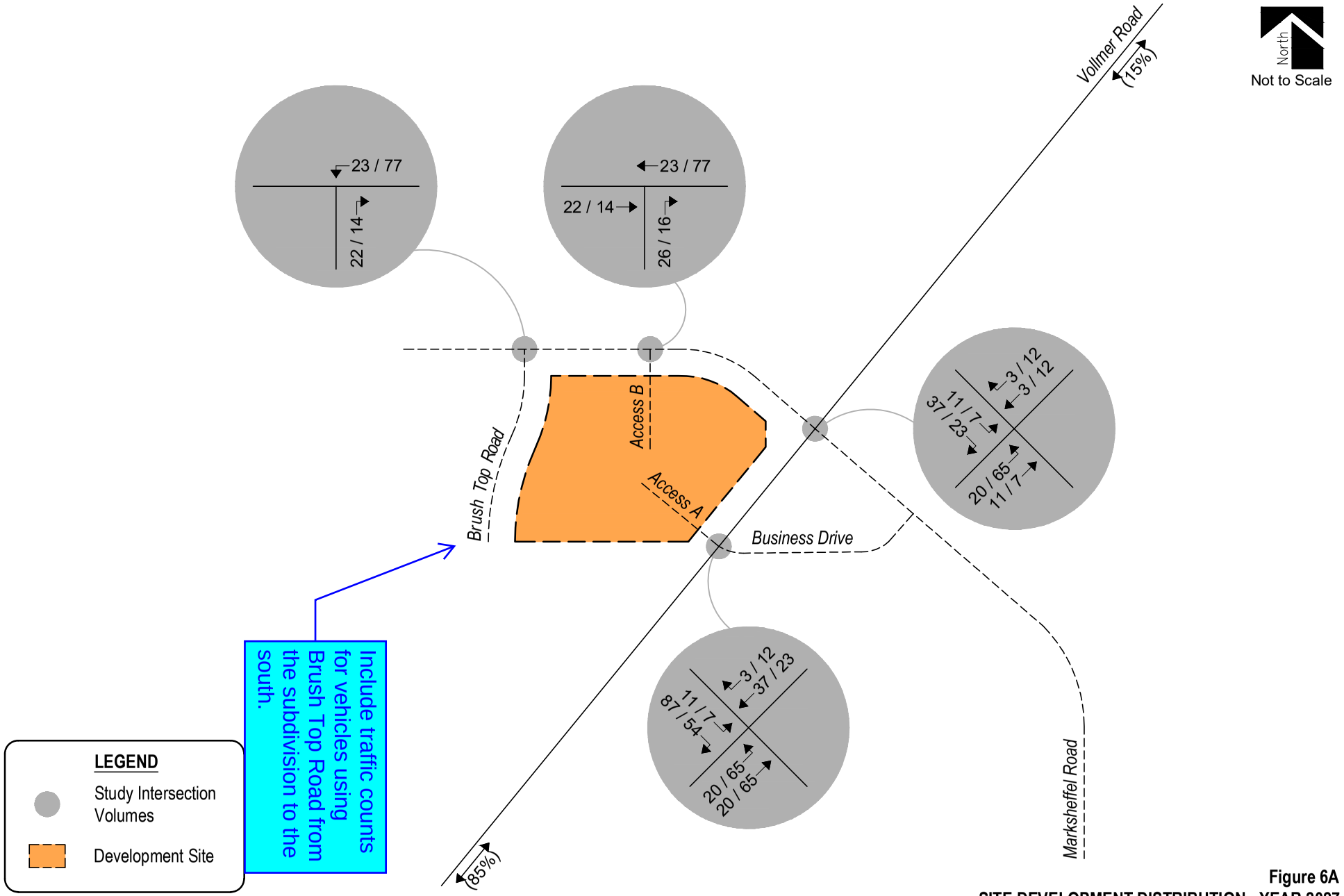


Figure 6A
SITE DEVELOPMENT DISTRIBUTION - YEAR 2027
(%) : Overall
SITE-GENERATED
AM / PM Peak Hour

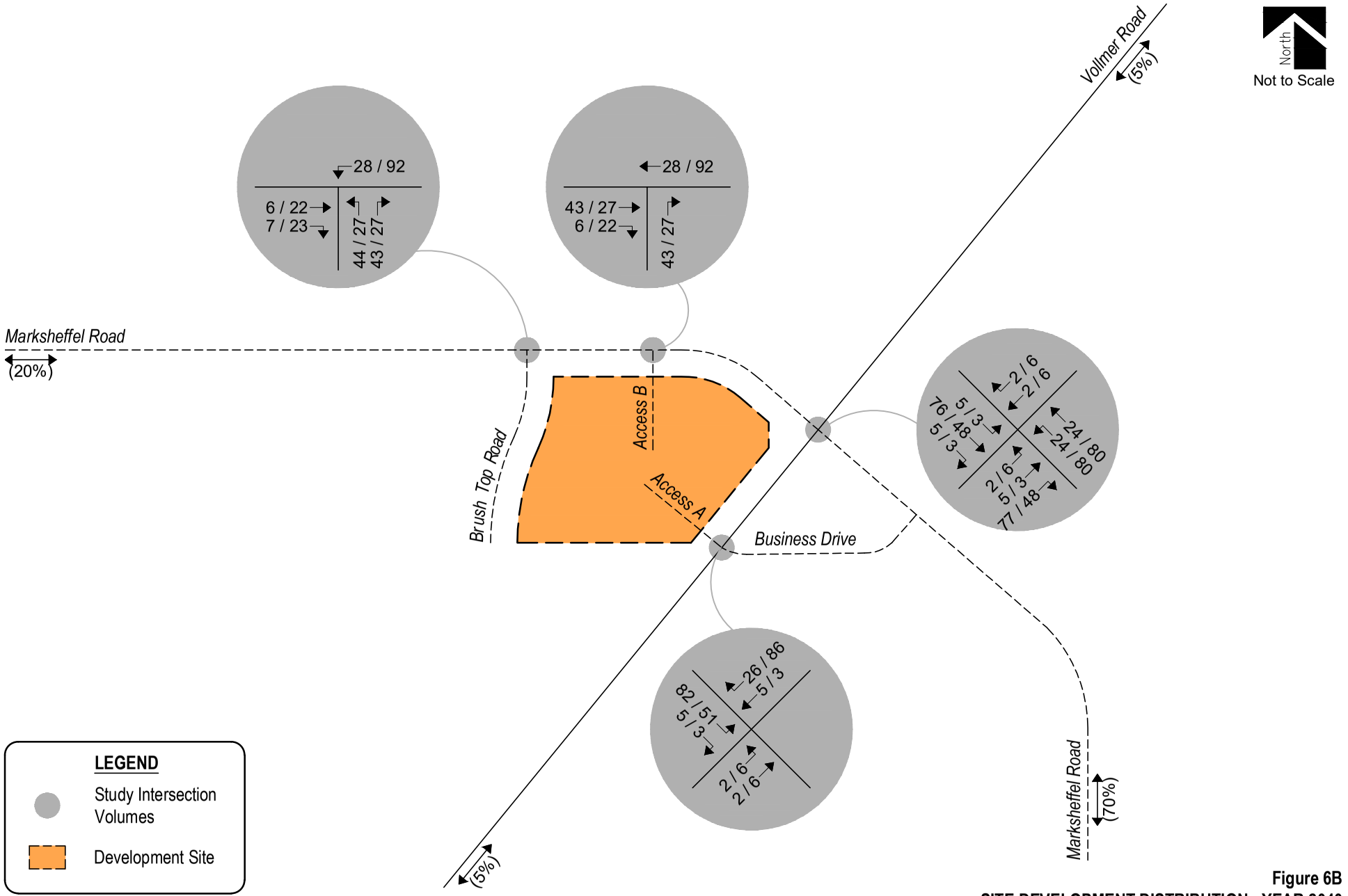


Figure 6B
SITE DEVELOPMENT DISTRIBUTION - YEAR 2040
(%) : Overall
SITE-GENERATED
AM / PM Peak Hour

V. Future Traffic Conditions With Proposed Developments

Total traffic is the traffic projected to be on area roadways with consideration of the proposed development. Total traffic includes background traffic projections for Years 2027 and 2040 with consideration of site-generated traffic. For analysis purposes, it was assumed that development construction would be completed by end of Year 2040.

Pursuant to area roadway improvement discussions provided in Section III, Year 2027 and Year 2040 total traffic conditions assume no additional roadway improvements to accommodate regional transportation demands than that described for each background analysis year. Roadway improvements associated with site development are expected to be limited to site access and frontage as required by the governing agency. An exception is Marksheffel Road where the construction of a partial roadway section (two through lanes with shared center turn lane) is envisioned with the initial phase of site development.

Projected Year 2027 total traffic volumes and intersection geometry are shown in Figure 7. Figure 8 shows projected total traffic volumes and intersection geometry for Year 2040.

Total Traffic Auxiliary Lane Analysis

Auxiliary lanes for site development accesses were based on the County's ECM.

Considering development build-out, an evaluation of auxiliary lane requirements, pursuant to Section 2.3.7 of the County's ECM, reveals that southbound right turn deceleration lanes along Vollmer Road at Marksheffel Road and Access A are required since the southbound right turn ingress volumes exceed the 25 vehicles per hour threshold. Dedicated right turn lanes were also assumed along the future, ultimate section of Marksheffel Road at Vollmer Road, Access B, and (future) Brush Top Road.

Section 2.3.7 of the County's ECM also concludes that exclusive left turn deceleration lanes are required along ultimate Marksheffel Road at Vollmer Road and Brush Top Road, as well as along Vollmer Road at Marksheffel Road, since the projected left turn ingress volumes exceed the County's threshold of 10 vehicles per hour. Dedicated left turn lanes were also assumed along Vollmer Road at Access A.

Due to the conservative analysis performed throughout this study and the conceptual nature of assumed site development, it is expected that auxiliary lane requirements evaluated within this study will need to be updated by more specific traffic analyses or studies as actual area development occurs, to help assess if transportation improvements are needed to meet the County's vehicle volume thresholds.

Unresolved: List ECM criteria for stacking, storage, and taper for every affected auxiliary lane and access. State whether criteria can be met, if criteria cannot be met state that and provide modifications to meet criteria.

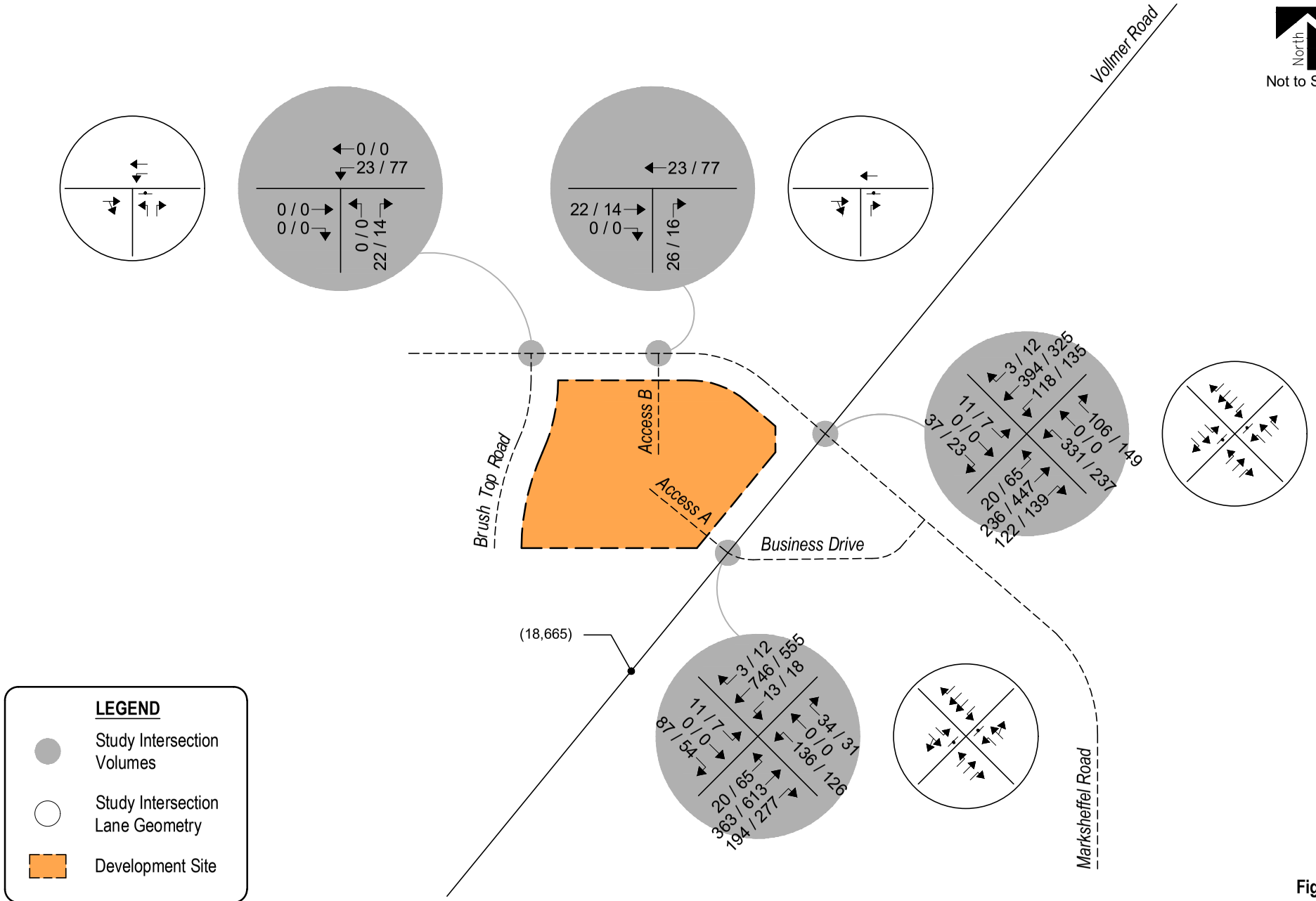


Figure 7
TOTAL TRAFFIC - YEAR 2027
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

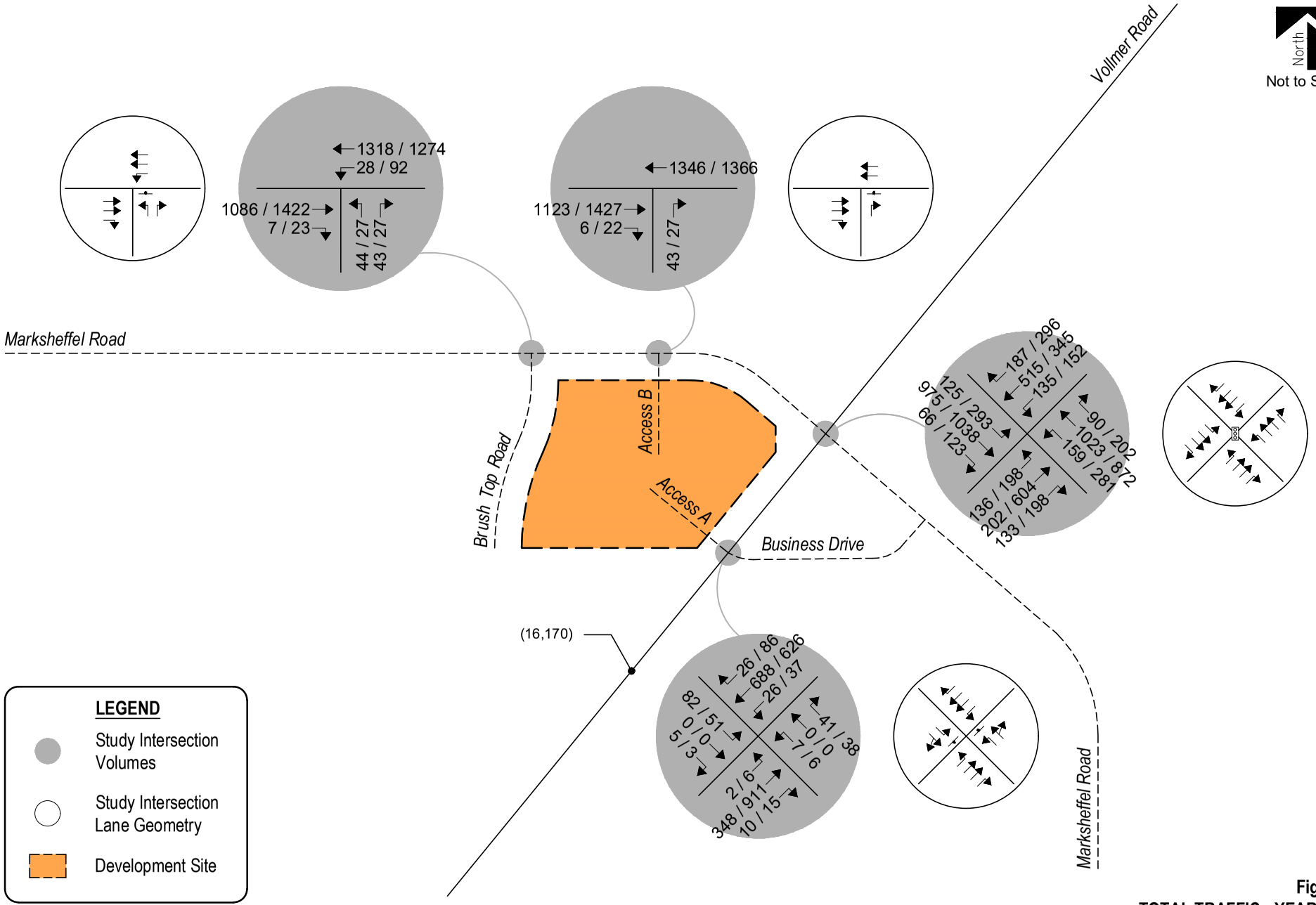


Figure 8
TOTAL TRAFFIC - YEAR 2040
Volumes & Intersection Geometry
AM / PM Peak Hour
(ADT) : Average Daily Traffic

VI. Project Impacts

The analyses and procedures described in this study were performed in accordance with the latest HCM and are based upon the worst-case conditions that occur during a typical weekday upon build-out of site development and analyzed land uses. Therefore, study intersections are likely to operate with traffic conditions better than those described within this study, which represent the peak hours of weekday operations only.

Peak Hour Intersection Levels of Service – Total Traffic

As with background traffic, the operations of the study intersections were analyzed under projected total traffic conditions using the SYNCHRO computer program. Total traffic level of service analysis results for Years 2027 and 2040 are summarized in Table 6 and Table 7, respectively.

Definitions of levels of service are given in Appendix B. Intersection capacity worksheets are provided in Appendix C.

Table 6 – Intersection Capacity Analysis Summary – Total Traffic – Year 2027

INTERSECTION LANE GROUPS	LEVEL OF SERVICE AM PEAK HOUR	 PM PEAK HOUR
Vollmer Road / Marksheffel Road (Stop-Controlled)		
Eastbound Left	D	F
Eastbound Through	A	A
Eastbound Right	A	A
Westbound Left	F	F
Westbound Through	A	A
Westbound Right	B	B
Northbound Left	A	A
Southbound Left	A	A
Vollmer Road / Access A / Business Drive (Stop-Controlled)		
Eastbound Left	E	F
Eastbound Through and Right	B	B
Westbound Left	F	F
Westbound Through and Right	B	B
Northbound Left	A	A
Southbound Left	A	B
Marksheffel Road / Access B (Stop-Controlled)		
Northbound Right	A	A
Marksheffel Road / Brush Top Road (Stop-Controlled)		
Westbound Left	A	A
Northbound Left	A	A
Northbound Right	A	A

Key: Stop-Controlled Intersection: Level of Service

Table 7 – Intersection Capacity Analysis Summary – Total Traffic – Year 2040

INTERSECTION LANE GROUPS	LEVEL OF SERVICE AM PEAK HOUR	 PM PEAK HOUR
Vollmer Road / Marksheffel Road (Signalized)	C (28.8)	D (37.8)
Vollmer Road / Access A / Business Drive (Stop-Controlled)		
Eastbound Left	E	F
Eastbound Through and Right	B	B
Westbound Left	C	E
Westbound Through and Right	A	B
Northbound Left	A	A
Southbound Left	A	B
Marksheffel Road / Access B (Stop-Controlled)		
Northbound Right	B	C
Marksheffel Road / Brush Top Road (Stop-Controlled)		
Westbound Left	B	C
Northbound Left	F	F
Northbound Right	B	C

Key: Signalized Intersection: Level of Service (Control Delay in sec/veh)
Stop-Controlled Intersection: Level of Service

Total Traffic Analysis Results Upon Development Build-Out

Table 7 illustrates how, by Year 2040 and upon assumed development build-out, the signalized intersection of Vollmer Road with Marksheffel Road shows an overall LOS C operation during the morning peak traffic hour and LOS D operation during the afternoon peak traffic hour. Compared to the background traffic analysis, the traffic generated by the proposed development is not expected to significantly change the operations of the study intersection.

The stop-controlled intersection of Vollmer Road with Access A projects turning movement operations at LOS C or better during the AM peak traffic hour and LOS B or better during the PM peak traffic hour. Exceptions include the eastbound and westbound left turning movements which operate at LOS E and F during their respective peak traffic hours. The LOS E and F operations are attributed to the through traffic volume along Vollmer Road and the stop-controlled nature of the intersection.

The stop-controlled intersection of Marksheffel Road with Access B expects turning movement operations at LOS B during the AM peak traffic hour and LOS C during the PM peak traffic hour.

The stop-controlled intersection of Marksheffel Road with Brush Top Road is projected to have morning and afternoon peak traffic hour turning movement operations at or better than LOS C. Exceptions would include the northbound left turning movement which operates at LOS F during either peak traffic hour. The LOS F operations are attributed to the through traffic volume along Marksheffel Road and the stop-controlled nature of the intersection. This poor operation occurs for the minor leg approach and is not expected to negatively impact the operations of Marksheffel Road. While signalization is a potential mitigating solution, it is recommended that as actual land uses and densities become defined within the overall area, intersection operational analyses will need to be updated to help assess if transportation improvements are needed to mitigate potential traffic impacts.

Queue Length Analysis

Queue lengths for the study intersections were analyzed using Year 2040 total traffic conditions. The analysis yields estimate of 95th percentile queue lengths, which have only a five percent probability of being exceeded during the analysis time period. An average vehicle length of 25 feet was assumed. Queue lengths were modeled and are included with the Synchro worksheets in Appendix C.

Table 8 summarizes the 95th percentile queue results in comparison to the projected storage requirements for turn movements within study area for Year 2040.

As Table 8 shows, all turn lane lengths into the site have sufficient storage to accommodate future traffic volumes. However, at the Vollmer Road intersection with Marksheffel Road, left turning movements are projected to have 95th percentile queuing that exceed existing turn lane lengths.

Due to the conservative analysis performed throughout this study and the conceptual nature of assumed site development, it is expected that vehicle queue lengths evaluated within this study will need to be updated by more specific traffic analyses or studies as actual area development occurs, to help assess if transportation improvements are needed.

Table 8 – Turn Lane Queues and Storage Requirements – Total Traffic – Year 2040

Intersection	Turn Movement		Existing Turn Lane Length (feet)	AM Peak Hour 95th Percentile Queue Length (feet)	PM Peak Hour 95th Percentile Queue Length (feet)	Recommended Turn Lane Length (feet)
Signalized Intersections						
Vollmer Road / Marksheffel Road	EB	L	155'	72'	264'	265'
		T	-	378'	419'	-
		R	155'	0'	33'	155'
	WB	L	155'	130'	320'	320'
		T	-	396'	344'	-
		R	155'	13'	46'	155'
	NB	L	155'	121'	201'	205'
		T	-	95'	326'	-
		R	155'	49'	73'	155'
	SB	L	155'	114'	173'	175'
		T	-	239'	165'	-
		R	155'	58'	96'	155'
Stop-Controlled Intersections						
Vollmer Road / Access A	EB	L	115'	60'	58'	115'
		T,R	-	0'	0'	-
	WB	L	-	3'	5'	-
		T,R	-	5'	8'	-
	NB	L	155'	0'	0'	155'
		T	-	0'	0'	-
		R	155'	0'	0'	155'
	SB	L	155'	3'	5'	155'
		T	-	0'	0'	-
		R	155'	0'	0'	155'
Marksheffel Road / Access B	EB	T	-	0'	0'	-
		R	155'	0'	0'	155'
	WB	T	-	0'	0'	-
	NB	R	-	10'	8'	-
Marksheffel Road / Brush Top Road	EB	T	-	0'	0'	-
		R	155'	0'	0'	155'
	WB	L	155'	5'	23'	155'
		T	-	0'	0'	-
	NB	L	115'	98'	100'	115'
		R	-	8'	8'	-

Note: Turn Lane Length does not include taper length.

Pedestrian Circulation & Safety Analysis

In accordance with Section B.2.4.B of the County's ECM, an assessment to pedestrian connectivity and safety was considered. However, it is emphasized that the site plan analyzed throughout this study is conceptual and details of pedestrian circulation and connectivity have not been determined. As actual site plans within the overall development become defined over time, it is assumed that an evaluation of pedestrian circulation and connectivity may need to be evaluated.

With the assumption that future site plans are designed per the County's ECM, and pursuant to the Federal Highway Administration's (FHWA) Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations[6], pedestrian safety is not expected to be of concern. Moreover, traffic calming and pedestrian crossing treatments are not applicable, and traffic calming is not recommended for the proposed conditions.

Unresolved: Legacy Peak Elementary and The Center for Modern Learning is within 2 miles of the property's boundary. Per ECM Appendix B.4 school routing plans shall be developed per the MUTCD between the project and school. Include all schools within 2 miles of the property's boundary.

Unresolved: Per ECM Section B.2.4.A include discussion on safety and accident analysis

[6] Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations, Federal Highway Administration, July 2018.

Recommended Improvements

Table 9 illustrates the recommended roadway and intersection control improvements associated with the proposed Schmidt Property development and adjacent area.

Table 9 – Recommended Improvements Summary

IMPROVEMENT	TYPE	TIMING	RESPONSIBILITY
Signalization of Marksheffel Road / Vollmer Road	Traffic Signal	When Warranted	Developments and other trip generators within the overall area
Widen Vollmer Road to four-lane cross-section	Roadway Segment	Shown on MTCP by 2040	Master Planned
Construct extension of Marsheffel Road to Vollmer Road	Roadway Segment	Shown on MTCP by 2040	Master Planned
Construct west leg of Vollmer Road and Marsheffel Road intersection	Roadway Segment	Shown on MTCP by 2040	Master Planned
Construct south leg of Marksheffel Road and Brush Top Road intersection	Roadway Segment	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct southbound right turn lane along Vollmer Road at Marksheffel Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned
Construct southbound right turn lane along Vollmer Road at Access A	Auxiliary Lane	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct eastbound right turn lane along Marksheffel Road at Vollmer Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned
Construct eastbound right turn lane along Marksheffel Road at Brush Top Road	Auxiliary Lane	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct westbound left turn lane along Marksheffel Road at Vollmer Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned
Construct westbound left turn lane along Marksheffel Road at Brush Top Road	Auxiliary Lane	With Final Plat Application(s) / Site Development	Applicant / Developer
Construct northbound left turn lane along Vollmer Road at Marksheffel Road	Auxiliary Lane	Shown on MTCP by 2040	Master Planned

Recommended improvements, as shown in Table 9 above, may be reimbursable under the County's MTCP and include roadway widening improvements and auxiliary lane improvements along Vollmer Road and Marksheffel Road.

Indicate that Marksheffel improvements would be through City.

VII. Conclusion

This traffic impact study is provided as a planning document and addressed the capacity, geometric, and control requirements associated with the development entitled Schmidt Property. This assumed residential development consists of an estimated 714 dwelling units. The 31.44-acre development is located along the south side of (future) Marksheffel Road and near the southwest corner of the Vollmer Road intersection with Tahiti Drive in El Paso County, Colorado.

The study area examined in this analysis encompassed Vollmer Road near the existing intersection with Tahiti Drive and future Marksheffel Road as well as primary site access.

Analysis was conducted for critical AM Peak Hour and PM Peak Hour traffic operations for existing traffic conditions, Year 2027 and Year 2040 background traffic conditions, and Year 2027 and Year 2040 total traffic conditions.

Analysis of existing traffic conditions indicates that the unsignalized intersection of Vollmer Road with Tahiti Drive has turning movement operations at LOS A during both peak traffic hours.

Without the proposed development, Year 2027 background operational analysis shows that the unsignalized intersection of Vollmer Road with Marksheffel Road has turning movement operations at or better than LOS B during both peak traffic hours. Exceptions would include the westbound left turning movement which operates at LOS F during either peak traffic hour. In order to provide mitigation for the poor operations along the minor road approach, signalization is an option which is anticipated to provide acceptable levels of service. The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the AM peak traffic hour and LOS D or better for the PM peak traffic hour.

By Year 2040 and without the proposed development, the study intersection of Vollmer Road with Marksheffel Road experiences overall LOS C operations during the AM peak traffic hour and LOS D during the PM peak traffic hour. The stop-controlled intersection of Vollmer Road with Business Drive expects turning movement operations at or better than LOS C for the morning peak traffic hour and LOS B for the afternoon peak traffic hour. Exceptions would include the westbound left turning movement which operates at LOS E during the afternoon peak traffic hour.

Analysis of future traffic conditions indicates that the addition of site-generated traffic is expected to create minimal impact to traffic operations for the existing and surrounding roadway system upon roadway and intersection control improvements assumed within this analysis. With all conservative assumptions defined in this analysis, study intersections are projected to operate at future levels of service comparable to Year 2040 background traffic conditions. Proposed site accesses have long-term operations at LOS C or better during peak traffic periods and upon build-out. Exceptions include the eastbound and westbound left turning movements at the Vollmer Road and Access A intersection, as well as the northbound left turning movements at the intersection of Marksheffel Road and Brush Top Road, which operate at LOS E and F during their respective peak traffic hours.

This site is subject to the El Paso County Road Impact Fee Program (Resolution 19-471), as amended. An option for payment will be selected at the final land use approval stage.

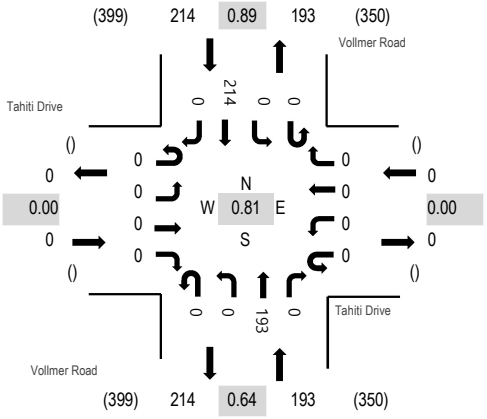
APPENDIX A

Traffic Count Data

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

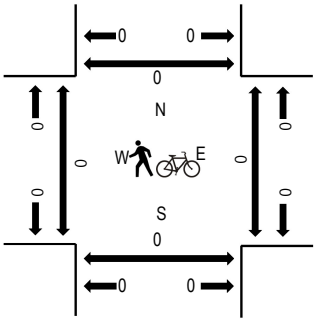
Location: 3 Vollmer Road & Tahiti Drive AM
Date: Thursday, March 24, 2022
Peak Hour: 07:45 AM - 08:45 AM
Peak 15-Minutes: 07:45 AM - 08:00 AM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



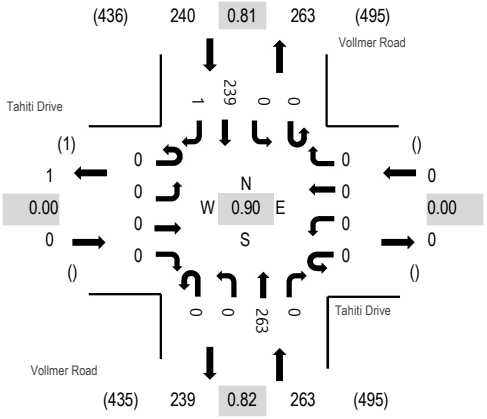
Traffic Counts

Interval Start Time	Tahiti Drive Eastbound				Tahiti Drive Westbound				Vollmer Road Northbound				Vollmer Road Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
7:00 AM	0	0	0	0	0	0	0	0	0	0	42	0	0	0	30	0	72	374	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	33	0	0	0	47	0	80	400	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	41	0	0	0	55	0	96	400	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	75	0	0	0	51	0	126	407	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	37	0	0	0	61	0	98	375	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	34	0	0	0	46	0	80		0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	47	0	0	0	56	0	103		0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	41	0	0	0	53	0	94		0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	350	0	0	0	399	0	749		0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	193	0	0	0	214	0	407		0	0	0	0

ALL TRAFFIC DATA SERVICES
(303) 216-2439
www.alltrafficdata.net

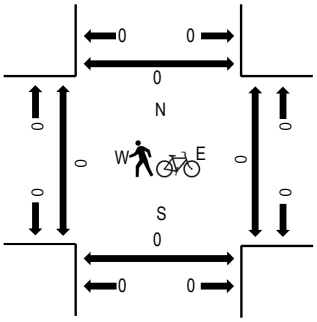
Location: 3 Vollmer Road & Tahiti Drive PM
Date: Thursday, March 24, 2022
Peak Hour: 04:00 PM - 05:00 PM
Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour - All Vehicles



Note: Total study counts contained in parentheses.

Peak Hour - Pedestrians/Bicycles on Crosswalk



Traffic Counts

Interval Start Time	Tahiti Drive Eastbound				Tahiti Drive Westbound				Vollmer Road Northbound				Vollmer Road Southbound					Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	Total		West	East	South	North
4:00 PM	0	0	0	0	0	0	0	0	0	0	66	0	0	0	73	1	140	503	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	68	0	0	0	52	0	120	467	0	0	0	0
4:30 PM	0	0	0	0	0	0	0	0	0	0	49	0	0	0	63	0	112	463	0	0	0	0
4:45 PM	0	0	0	0	0	0	0	0	0	0	80	0	0	0	51	0	131	453	0	0	0	0
5:00 PM	0	0	0	0	0	0	0	0	0	0	55	0	0	0	49	0	104	428	0	0	0	0
5:15 PM	0	0	0	0	0	0	0	0	0	0	62	0	0	0	54	0	116		0	0	0	0
5:30 PM	0	0	0	0	0	0	0	0	0	0	54	0	0	0	48	0	102		0	0	0	0
5:45 PM	0	0	0	0	0	0	0	0	0	0	61	0	0	0	45	0	106		0	0	0	0
Count Total	0	0	0	0	0	0	0	0	0	0	495	0	0	0	435	1	931		0	0	0	0
Peak Hour	0	0	0	0	0	0	0	0	0	0	263	0	0	0	239	1	503		0	0	0	0

APPENDIX B

Level of Service Definitions

The following information can be found in the Highway Capacity Manual, Transportation Research Board, 2016: Chapter 19 – Signalized Intersections and Chapter 20 – Two-Way Stop Controlled Intersections.

Automobile Level of Service (LOS) for Signalized Intersections

Levels of service are defined to represent reasonable ranges in control delay.

LOS A

Describes operations with a control delay of 10 s/veh or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

LOS B

Describes operations with control delay between 10 and 20 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with LOS A.

LOS C

Describes operations with control delay between 20 and 35 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual *cycle failures* (i.e., one or more queued vehicles are not able to depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

LOS D

Describes operations with control delay between 35 and 55 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

LOS E

Describes operations with control delay between 55 and 80 s/veh and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

LOS F

Describes operations with control delay exceeding 80 s/veh or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

Level of Service (LOS) for Unsignalized TWSC Intersections

Level of Service (v/c ≤ 1.0)	Average Control Delay (s/veh)
A	0 - 10
B	> 10 - 15
C	> 15 - 25
D	> 25 - 35
E	> 35 - 50
F	> 50

APPENDIX C

Capacity Worksheets

Intersection	
Int Delay, s/veh	0

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	193	214	0
Future Vol, veh/h	0	0	0	193	214	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	210	233	0

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	443	233	233	0	-	0
Stage 1	233	-	-	-	-	-
Stage 2	210	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	572	806	1335	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	825	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	572	806	1335	-	-	-
Mov Cap-2 Maneuver	572	-	-	-	-	-
Stage 1	806	-	-	-	-	-
Stage 2	825	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	1335	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0

Movement	SBL	SBR	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	263	239	1
Future Vol, veh/h	0	0	0	263	239	1
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	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	286	260	1

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	547	261	261	0	-	0
Stage 1	261	-	-	-	-	-
Stage 2	286	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	498	778	1303	-	-	-
Stage 1	783	-	-	-	-	-
Stage 2	763	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	498	778	1303	-	-	-
Mov Cap-2 Maneuver	498	-	-	-	-	-
Stage 1	783	-	-	-	-	-
Stage 2	763	-	-	-	-	-

Approach	SB	NE	SW
HCM Control Delay, s	0	0	0
HCM LOS	A		

Minor Lane/Major Mvmt	NEL	NET	SBLn1	SWT	SWR
Capacity (veh/h)	1303	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	0	-	-
HCM Lane LOS	A	-	A	-	-
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	27.5

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	331	106	225	122	118	391
Future Vol, veh/h	331	106	225	122	118	391
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	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	360	115	245	133	128	425

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	714	245	0	0	378	0
Stage 1	245	-	-	-	-	-
Stage 2	469	-	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219	-
Pot Cap-1 Maneuver	382	793	-	-	1179	-
Stage 1	795	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 340	793	-	-	1179	-
Mov Cap-2 Maneuver	~ 340	-	-	-	-	-
Stage 1	795	-	-	-	-	-
Stage 2	532	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	78.9	0	2
HCM LOS	F		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	340	793	1179	-
HCM Lane V/C Ratio	-	-	1.058	0.145	0.109	-
HCM Control Delay (s)	-	-	100.9	10.3	8.4	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	12.9	0.5	0.4	-

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

Intersection	
Int Delay, s/veh	25

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	237	149	440	139	135	313
Future Vol, veh/h	237	149	440	139	135	313
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	0	-	150	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	258	162	478	151	147	340

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	942	478	0	0	629	0
Stage 1	478	-	-	-	-	-
Stage 2	464	-	-	-	-	-
Critical Hdwy	6.63	6.23	-	-	4.13	-
Critical Hdwy Stg 1	5.43	-	-	-	-	-
Critical Hdwy Stg 2	5.83	-	-	-	-	-
Follow-up Hdwy	3.519	3.319	-	-	2.219	-
Pot Cap-1 Maneuver	276	586	-	-	951	-
Stage 1	623	-	-	-	-	-
Stage 2	600	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	~ 233	586	-	-	951	-
Mov Cap-2 Maneuver	~ 233	-	-	-	-	-
Stage 1	623	-	-	-	-	-
Stage 2	507	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	88.2	0	2.9
HCM LOS	F		

Minor Lane/Major Mvmt	NET	NER	NWLn1	NWLn2	SWL	SWT
Capacity (veh/h)	-	-	233	586	951	-
HCM Lane V/C Ratio	-	-	1.106	0.276	0.154	-
HCM Control Delay (s)	-	-	135.1	13.5	9.5	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	11.5	1.1	0.5	-

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

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	120	899	61	135	999	90	134	197	56	135	513	185
Future Volume (vph)	120	899	61	135	999	90	134	197	56	135	513	185
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.126			0.103			0.241			0.618		
Satd. Flow (perm)	235	3539	1583	192	3539	1583	449	3539	1583	1151	3539	1583
Satd. Flow (RTOR)			142			142			142			201
Lane Group Flow (vph)	130	977	66	147	1086	98	146	214	61	147	558	201
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	15.0	40.0	40.0	15.0	40.0	40.0	15.0	30.0	30.0	15.0	30.0	30.0
Total Split (%)	15.0%	40.0%	40.0%	15.0%	40.0%	40.0%	15.0%	30.0%	30.0%	15.0%	30.0%	30.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	43.8	34.0	34.0	51.2	38.8	38.8	31.5	20.9	20.9	31.3	20.8	20.8
Actuated g/C Ratio	0.44	0.34	0.34	0.51	0.39	0.39	0.32	0.21	0.21	0.31	0.21	0.21
v/c Ratio	0.55	0.81	0.10	0.47	0.79	0.14	0.55	0.29	0.14	0.35	0.76	0.41
Control Delay	23.0	36.6	0.3	22.1	33.5	1.9	29.4	33.7	0.6	23.8	44.1	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.0	36.6	0.3	22.1	33.5	1.9	29.4	33.7	0.6	23.8	44.1	7.3
LOS	C	D	A	C	C	A	C	C	A	C	D	A
Approach Delay		33.0			29.9			27.4			32.7	
Approach LOS		C			C			C			C	
Queue Length 50th (ft)	41	295	0	47	326	0	62	60	0	63	175	0
Queue Length 95th (ft)	80	376	0	108	#469	14	104	90	0	104	227	55
Internal Link Dist (ft)		548			642			667			525	
Turn Bay Length (ft)	150		150	150		150	150		150	150		150
Base Capacity (vph)	260	1203	631	313	1373	700	275	849	487	428	849	532
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.81	0.10	0.47	0.79	0.14	0.53	0.25	0.13	0.34	0.66	0.38

Intersection Summary

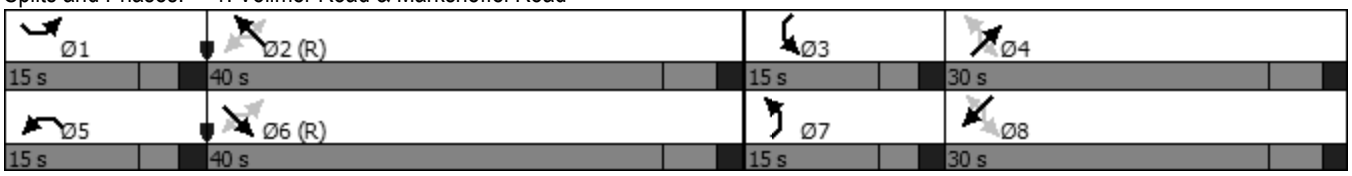
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.81

Intersection Signal Delay: 31.2	Intersection LOS: C
Intersection Capacity Utilization 74.2%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	290	990	120	201	792	202	192	601	150	152	339	290
Future Volume (vph)	290	990	120	201	792	202	192	601	150	152	339	290
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.176			0.093			0.338			0.189		
Satd. Flow (perm)	328	3539	1583	173	3539	1583	630	3539	1583	352	3539	1583
Satd. Flow (RTOR)			118			151			131			315
Lane Group Flow (vph)	315	1076	130	218	861	220	209	653	163	165	368	315
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	25.0	50.0	50.0	20.0	45.0	45.0	20.0	35.0	35.0	15.0	30.0	30.0
Total Split (%)	20.8%	41.7%	41.7%	16.7%	37.5%	37.5%	16.7%	29.2%	29.2%	12.5%	25.0%	25.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	63.2	44.0	44.0	60.7	43.3	43.3	41.4	26.6	26.6	33.5	22.6	22.6
Actuated g/C Ratio	0.53	0.37	0.37	0.51	0.36	0.36	0.34	0.22	0.22	0.28	0.19	0.19
v/c Ratio	0.81	0.83	0.20	0.68	0.67	0.33	0.60	0.83	0.36	0.77	0.55	0.57
Control Delay	34.6	41.3	6.5	40.0	36.7	11.6	35.6	54.7	12.4	52.4	47.4	8.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	34.6	41.3	6.5	40.0	36.7	11.6	35.6	54.7	12.4	52.4	47.4	8.9
LOS	C	D	A	D	D	B	D	D	B	D	D	A
Approach Delay		36.9			33.0			44.0			34.1	
Approach LOS		D			C			D			C	
Queue Length 50th (ft)	127	395	6	114	310	37	115	252	20	89	136	0
Queue Length 95th (ft)	#251	485	47	#238	388	102	177	318	77	#168	185	79
Internal Link Dist (ft)		573			633			652			528	
Turn Bay Length (ft)	150		150	150		150	150		150	150		150
Base Capacity (vph)	420	1297	655	320	1277	667	365	855	481	216	707	568
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.83	0.20	0.68	0.67	0.33	0.57	0.76	0.34	0.76	0.52	0.55

Intersection Summary

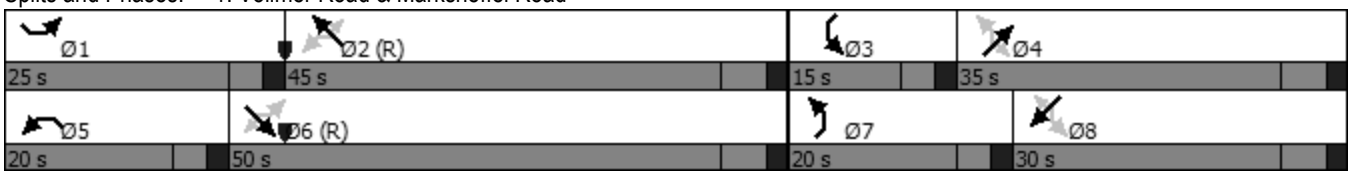
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.83

Intersection Signal Delay: 36.9	Intersection LOS: D
Intersection Capacity Utilization 81.9%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road



Intersection	
Int Delay, s/veh	83.7

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	22	0	124	331	0	106	39	225	122	118	391	7
Future Vol, veh/h	22	0	124	331	0	106	39	225	122	118	391	7
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	235	-	235	235	-	235	235	-	150	150	-	235
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	0	135	360	0	115	42	245	133	128	425	8

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1134	1143	213	798	1018	245	433	0	0	378	0	0
Stage 1	681	681	-	329	329	-	-	-	-	-	-	-
Stage 2	453	462	-	469	689	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.53	6.93	7.33	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.53	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.53	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	3.319	3.519	4.019	3.319	2.219	-	-	2.219	-	-
Pot Cap-1 Maneuver	168	199	793	~ 290	237	793	1125	-	-	1179	-	-
Stage 1	407	449	-	683	646	-	-	-	-	-	-	-
Stage 2	585	564	-	545	446	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	128	171	793	~ 215	203	793	1125	-	-	1179	-	-
Mov Cap-2 Maneuver	128	171	-	~ 215	203	-	-	-	-	-	-	-
Stage 1	392	400	-	658	622	-	-	-	-	-	-	-
Stage 2	481	543	-	403	397	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	14.9	276.6	0.8	1.9
HCM LOS	B	F		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWL	SWT	SWR
Capacity (veh/h)	1125	-	-	215	-	793	128	-	793	1179	-	-
HCM Lane V/C Ratio	0.038	-	-	1.673	-	0.145	0.187	-	0.17	0.109	-	-
HCM Control Delay (s)	8.3	-	-	$ 361.9	0	10.3	39.5	0	10.5	8.4	-	-
HCM Lane LOS	A	-	-	F	A	B	E	A	B	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	23.8	-	0.5	0.7	-	0.6	0.4	-	-

Notes

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

Intersection	
Int Delay, s/veh	8.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	46	0	0	146
Future Vol, veh/h	0	0	46	0	0	146
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	235	-	155	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	50	0	0	159

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	101	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	100	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	898	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	924	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	870	1084
Mov Cap-2 Maneuver	-	-	-	-	814	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	895	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.3	8.9
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	1084	-	-	1622	-
HCM Lane V/C Ratio	-	0.146	-	-	0.031	-
HCM Control Delay (s)	0	8.9	-	-	7.3	-
HCM Lane LOS	A	A	-	-	A	-
HCM 95th %tile Q(veh)	-	0.5	-	-	0.1	-

Intersection	
Int Delay, s/veh	110.8

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Vol, veh/h	14	0	77	237	0	149	131	440	139	135	313	23
Future Vol, veh/h	14	0	77	237	0	149	131	440	139	135	313	23
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	235	-	235	235	-	235	235	-	150	150	-	235
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	15	0	84	258	0	162	142	478	151	147	340	25

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1553	1547	170	1226	1421	478	365	0	0	629	0	0
Stage 1	634	634	-	762	762	-	-	-	-	-	-	-
Stage 2	919	913	-	464	659	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.53	6.93	7.33	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.53	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.53	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.519	4.019	3.319	3.519	4.019	3.319	2.219	-	-	2.219	-	-
Pot Cap-1 Maneuver	84	114	845	~ 145	136	586	1192	-	-	951	-	-
Stage 1	435	472	-	396	413	-	-	-	-	-	-	-
Stage 2	324	351	-	548	460	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	49	85	845	~ 105	101	586	1192	-	-	951	-	-
Mov Cap-2 Maneuver	49	85	-	~ 105	101	-	-	-	-	-	-	-
Stage 1	383	399	-	349	364	-	-	-	-	-	-	-
Stage 2	207	309	-	417	389	-	-	-	-	-	-	-

Approach	SE	NW	NE	SW
HCM Control Delay, s	24.9	$ 463.7	1.6	2.7
HCM LOS	C	F		

Minor Lane/Major Mvmt	NEL	NET	NER	NWLn1	NWLn2	NWLn3	SELn1	SELn2	SELn3	SWL	SWT	SWR
Capacity (veh/h)	1192	-	-	105	-	586	49	-	845	951	-	-
HCM Lane V/C Ratio	0.119	-	-	2.453	-	0.276	0.311	-	0.099	0.154	-	-
HCM Control Delay (s)	8.4	-	-	$ 746.8	0	13.5	108.6	0	9.7	9.5	-	-
HCM Lane LOS	A	-	-	F	A	B	F	A	A	A	-	-
HCM 95th %tile Q(veh)	0.4	-	-	23.2	-	1.1	1.1	-	0.3	0.5	-	-

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

Intersection	
Int Delay, s/veh	7.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	0	0	154	0	0	91
Future Vol, veh/h	0	0	154	0	0	91
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	235	-	155	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	167	0	0	99

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1	0	335	1
Stage 1	-	-	-	-	1	-
Stage 2	-	-	-	-	334	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1622	-	660	1084
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	725	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1622	-	592	1084
Mov Cap-2 Maneuver	-	-	-	-	587	-
Stage 1	-	-	-	-	1022	-
Stage 2	-	-	-	-	650	-

Approach	EB	WB	NB
HCM Control Delay, s	0	7.5	8.7
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	1084	-	-	1622	-
HCM Lane V/C Ratio	-	0.091	-	-	0.103	-
HCM Control Delay (s)	0	8.7	-	-	7.5	-
HCM Lane LOS	A	A	-	-	A	-
HCM 95th %tile Q(veh)	-	0.3	-	-	0.3	-

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	129	1052	70	135	1047	90	137	197	56	135	513	188
Future Volume (vph)	129	1052	70	135	1047	90	137	197	56	135	513	188
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.118			0.103			0.241			0.618		
Satd. Flow (perm)	220	3539	1583	192	3539	1583	449	3539	1583	1151	3539	1583
Satd. Flow (RTOR)			142			142			142			204
Lane Group Flow (vph)	140	1143	76	147	1138	98	149	214	61	147	558	204
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	15.0	40.0	40.0	15.0	40.0	40.0	15.0	30.0	30.0	15.0	30.0	30.0
Total Split (%)	15.0%	40.0%	40.0%	15.0%	40.0%	40.0%	15.0%	30.0%	30.0%	15.0%	30.0%	30.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	43.9	34.0	34.0	51.1	38.6	38.6	31.5	20.9	20.9	31.3	20.8	20.8
Actuated g/C Ratio	0.44	0.34	0.34	0.51	0.39	0.39	0.32	0.21	0.21	0.31	0.21	0.21
v/c Ratio	0.60	0.95	0.12	0.47	0.83	0.14	0.56	0.29	0.14	0.35	0.76	0.42
Control Delay	26.1	49.4	0.4	22.1	35.7	1.9	29.7	33.7	0.6	23.8	44.1	7.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.1	49.4	0.4	22.1	35.7	1.9	29.7	33.7	0.6	23.8	44.1	7.3
LOS	C	D	A	C	D	A	C	C	A	C	D	A
Approach Delay		44.3			31.8			27.5			32.6	
Approach LOS		D			C			C			C	
Queue Length 50th (ft)	44	370	0	47	351	0	64	60	0	63	175	0
Queue Length 95th (ft)	94	#510	2	108	#507	14	105	90	0	104	227	56
Internal Link Dist (ft)		1526			642			667			525	
Turn Bay Length (ft)	150		150	150		150	150		150	150		150
Base Capacity (vph)	255	1203	631	312	1367	698	275	849	487	428	849	534
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.55	0.95	0.12	0.47	0.83	0.14	0.54	0.25	0.13	0.34	0.66	0.38

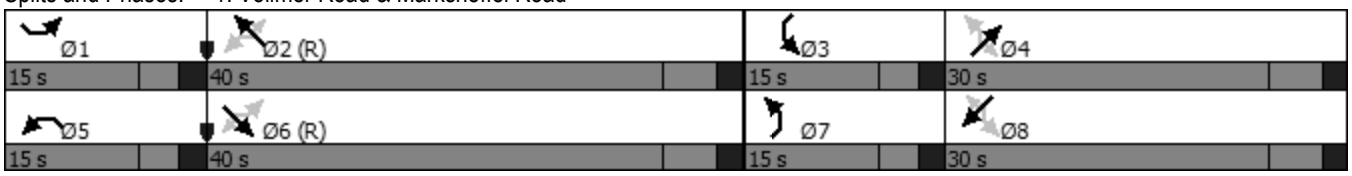
Intersection Summary
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
Natural Cycle: 75
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.95

Intersection Signal Delay: 35.7	Intersection LOS: D
Intersection Capacity Utilization 76.7%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road



Intersection	
Int Delay, s/veh	6.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Vol, veh/h	1080	15	54	1319	46	171
Future Vol, veh/h	1080	15	54	1319	46	171
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	235	235	-	155	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1174	16	59	1434	50	186

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1190	0	2009	587
Stage 1	-	-	-	-	1174	-
Stage 2	-	-	-	-	835	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	582	-	51	453
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	386	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	582	-	~ 46	453
Mov Cap-2 Maneuver	-	-	-	-	~ 46	-
Stage 1	-	-	-	-	256	-
Stage 2	-	-	-	-	347	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	78
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	46	453	-	-	582	-
HCM Lane V/C Ratio	1.087	0.41	-	-	0.101	-
HCM Control Delay (s)	299.5	18.4	-	-	11.9	-
HCM Lane LOS	F	C	-	-	B	-
HCM 95th %tile Q(veh)	4.6	2	-	-	0.3	-

Notes

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

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	295	1087	125	201	955	202	201	601	150	152	339	299
Future Volume (vph)	295	1087	125	201	955	202	201	601	150	152	339	299
Satd. Flow (prot)	1770	3539	1583	1770	3539	1583	1770	3539	1583	1770	3539	1583
Flt Permitted	0.091			0.096			0.333			0.190		
Satd. Flow (perm)	170	3539	1583	179	3539	1583	620	3539	1583	354	3539	1583
Satd. Flow (RTOR)			118			125			131			309
Lane Group Flow (vph)	321	1182	136	218	1038	220	218	653	163	165	368	325
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	1	6		5	2		7	4		3	8	
Permitted Phases	6		6	2		2	4		4	8		8
Detector Phase	1	6	6	5	2	2	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0	10.0	24.0	24.0
Total Split (s)	25.0	50.0	50.0	20.0	45.0	45.0	20.0	35.0	35.0	15.0	30.0	30.0
Total Split (%)	20.8%	41.7%	41.7%	16.7%	37.5%	37.5%	16.7%	29.2%	29.2%	12.5%	25.0%	25.0%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0	5.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	C-Max	Max	C-Max	C-Max	None	Min	Min	None	Min	Min
Act Effct Green (s)	64.7	44.0	44.0	60.0	41.8	41.8	41.6	26.6	26.6	33.3	22.4	22.4
Actuated g/C Ratio	0.54	0.37	0.37	0.50	0.35	0.35	0.35	0.22	0.22	0.28	0.19	0.19
v/c Ratio	0.91	0.91	0.21	0.68	0.84	0.35	0.62	0.83	0.36	0.77	0.56	0.59
Control Delay	61.9	47.7	7.1	39.7	44.4	14.8	36.5	54.7	12.4	52.3	47.6	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.9	47.7	7.1	39.7	44.4	14.8	36.5	54.7	12.4	52.3	47.6	10.6
LOS	E	D	A	D	D	B	D	D	B	D	D	B
Approach Delay		47.1			39.3			44.2			34.5	
Approach LOS		D			D			D			C	
Queue Length 50th (ft)	188	454	9	112	402	53	121	252	20	89	136	10
Queue Length 95th (ft)	#359	#588	51	#234	#525	120	185	318	77	#168	185	94
Internal Link Dist (ft)		1516			633			652			528	
Turn Bay Length (ft)	150		150	150		150	150		150	150		150
Base Capacity (vph)	365	1297	655	321	1232	632	363	855	481	216	707	563
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.91	0.21	0.68	0.84	0.35	0.60	0.76	0.34	0.76	0.52	0.58

Intersection Summary

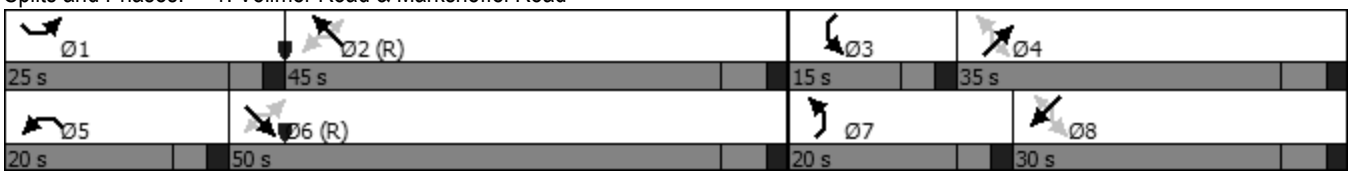
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NWTL and 6:SETL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 42.0	Intersection LOS: D
Intersection Capacity Utilization 86.1%	ICU Level of Service E
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Vollmer Road & Marksheffel Road



Intersection	
Int Delay, s/veh	15.6

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↱	↰	↑↑	↰	↱
Traffic Vol, veh/h	1400	48	181	1274	28	107
Future Vol, veh/h	1400	48	181	1274	28	107
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	235	235	-	155	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1522	52	197	1385	30	116

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1574	0	2609	761
Stage 1	-	-	-	-	1522	-
Stage 2	-	-	-	-	1087	-
Critical Hdwy	-	-	4.14	-	6.84	6.94
Critical Hdwy Stg 1	-	-	-	-	5.84	-
Critical Hdwy Stg 2	-	-	-	-	5.84	-
Follow-up Hdwy	-	-	2.22	-	3.52	3.32
Pot Cap-1 Maneuver	-	-	415	-	~ 20	348
Stage 1	-	-	-	-	166	-
Stage 2	-	-	-	-	285	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	415	-	~ 11	348
Mov Cap-2 Maneuver	-	-	-	-	~ 11	-
Stage 1	-	-	-	-	166	-
Stage 2	-	-	-	-	150	-

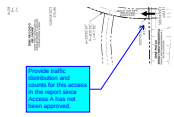
Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	$ 323.6
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	11	348	-	-	415	-
HCM Lane V/C Ratio	2.767	0.334	-	-	0.474	-
HCM Control Delay (s)	$ 1481.8	20.5	-	-	21.3	-
HCM Lane LOS	F	C	-	-	C	-
HCM 95th %tile Q(veh)	4.8	1.4	-	-	2.5	-

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

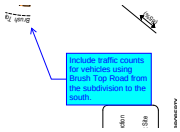
V2_Traffic Impact Study.pdf Markup Summary 2-6-2023

Carlos (2)



Subject: Callout
Page Label: 8
Author: Carlos
Date: 2/2/2023 12:44:28 PM
Status:
Color:
Layer:
Space:

Provide traffic distribution and counts for this access in the report since Access A has not been approved.



Subject: Callout
Page Label: 20
Author: Carlos
Date: 2/2/2023 5:31:49 PM
Status:
Color:
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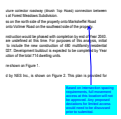
Space:

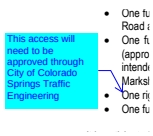
Include traffic counts for vehicles using Brush Top Road from the subdivision to the south.

CDurham (12)



Subject: Callout
Page Label: 6
Author: CDurham
Date: 2/1/2023 3:51:12 PM
Status:
Color:
Layer:
Space:

Based on intersection spacing requirements, full movement access at this location will not be approved. Any proposed deviations for limited access would need to be discussed prior to submittal.



Subject: Callout
Page Label: 6
Author: CDurham
Date: 1/31/2023 4:53:55 PM
Status:
Color:
Layer:
Space:

This access will need to be approved through City of Colorado Springs Traffic Engineering

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Subject: Callout
Page Label: 8
Author: CDurham
Date: 2/1/2023 10:15:53 AM
Status:
Color:
Layer:
Space:

NOTE: This access location will need to be approved by City of Colorado Springs

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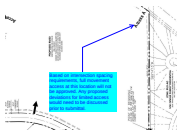
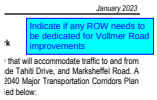


Subject: Callout
Page Label: 8
Author: CDurham
Date: 2/1/2023 3:50:55 PM
Status:
Color:
Layer:
Space:

Based on intersection spacing requirements, full movement access at this location will not be approved. Any proposed deviations for limited access would need to be discussed prior to submittal.



Subject: Text Box
Page Label: 9
Author: CDurham
Date: 2/1/2023 3:49:09 PM
Status:
Color:
Layer:
Space:

Indicate if any ROW needs to be dedicated for Vollmer Road improvements

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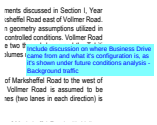
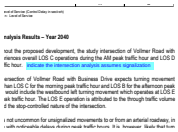


Subject: Text Box
Page Label: 13
Author: CDurham
Date: 1/31/2023 4:15:51 PM
Status:
Color:
Layer:
Space:

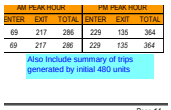
Include discussion on where Business Drive came from and what it's configuration is, as it's shown under future conditions analysis - Background traffic

---



Subject: Text Box
Page Label: 17
Author: CDurham
Date: 1/31/2023 4:17:54 PM
Status:
Color:
Layer:
Space:

indicate the intersection analysis assumes signalization

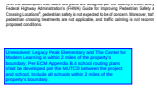


Subject: Text Box
Page Label: 18
Author: CDurham
Date: 1/31/2023 4:21:53 PM
Status:
Color:
Layer:
Space:

Also Include summary of trips generated by initial 480 units

Subject: Text Box
Page Label: 22
Author: CDurham
Date: 2/1/2023 10:23:34 AM
Status:
Color:
Layer:
Space:

Unresolved: List ECM criteria for stacking, storage, and taper for every affected auxiliary lane and access. State whether criteria can be met, if criteria cannot be met state that and provide modifications to meet criteria.



Subject: Text Box
Page Label: 29
Author: CDurham
Date: 2/1/2023 10:19:08 AM
Status:
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Unresolved: Legacy Peak Elementary and The Center for Modern Learning is within 2 miles of the property's boundary. Per ECM Appendix B.4 school routing plans shall be developed per the MUTCD between the project and school. Include all schools within 2 miles of the property's boundary.

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Page Label: 29
Author: CDurham
Date: 2/1/2023 10:19:14 AM
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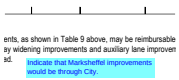
Unresolved: Per ECM Section B.2.4.A include discussion on safety and accident analysis



Subject: Text Box
Page Label: 30
Author: CDurham
Date: 2/1/2023 10:07:31 AM
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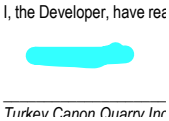
Indicate that Marksheffel improvements would be through City.

dsdrice (1)



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Author: dsdrice
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