TRAFFIC IMPACT STUDY

To: **El Paso County**

From: **Eli Farney, PE, PTOE**

Date: **April 04, 2023**

Vollmer RV Storage

Lot A Mcclintock Station ~ 6.75 Miles East of I-25
El Paso County, CO

Owner/Developer:
Scott Belknap
3603 First Light Drive
Castle Rock , CO 80109

Prepared By:

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J·R ENGINEERING

PPR2245

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1 - Executive Summary

JR Engineering has prepared a comprehensive Traffic Impact Study (TIS) for the proposed Vollmer RV Storage site, on the southeast side of Vollmer Road approximately two miles east of Black Forest Road in El Paso County, Colorado.

The contents of this TIS include the objectives stated in **Table 1**:

Table 1 – Traffic Impact Study Objectives

Traffic Impact Study Objectives
2020 Existing Traffic Operations
2024 Opening Day Traffic Analysis
2045 Future Traffic Analysis

The methodology, content, and findings of this TIS are consistent with the following documents:

- **El Paso County** – Engineering Criteria Manual-*Appendix B (Transportation Impact Study Guidelines)*

This TIS falls under the Transportation Memorandum category, since it is a small development with under 500 daily trips, and there are no expected increase in pedestrian and bicycle traffic volumes associated with the development of the site. The Study Area will include the existing intersection of Vollmer Place with Vollmer Road that will serve as the access point for the proposed site.

Key Findings of this Traffic Impact Study:

- **Intersection Analysis – Existing Conditions** – Traffic operations in the southwest and northeast directions are satisfactory per the Traffic Impact Study for Woodmen View Storage.

- **Intersection Analysis – Opening Day** – Traffic operations in the southwest and northeast directions of Vollmer Road are expected to operate at Level of Service A or B with the proposed development traffic.

- **Intersection Analysis – 2045 Condition** – Traffic operations in the southwest and northeast directions of Vollmer Road are expected to operate at Level of Service A or B with the proposed development traffic.

2 - Introduction

JR Engineering (JR) has completed a review of the existing, Opening Day, and Future 2045 traffic operations along Vollmer road at the intersection of Vollmer Place. The proposed driveway access point for the RV storage facility will be off of Vollmer Place. **Figure 1** shows a vicinity map of the proposed site.

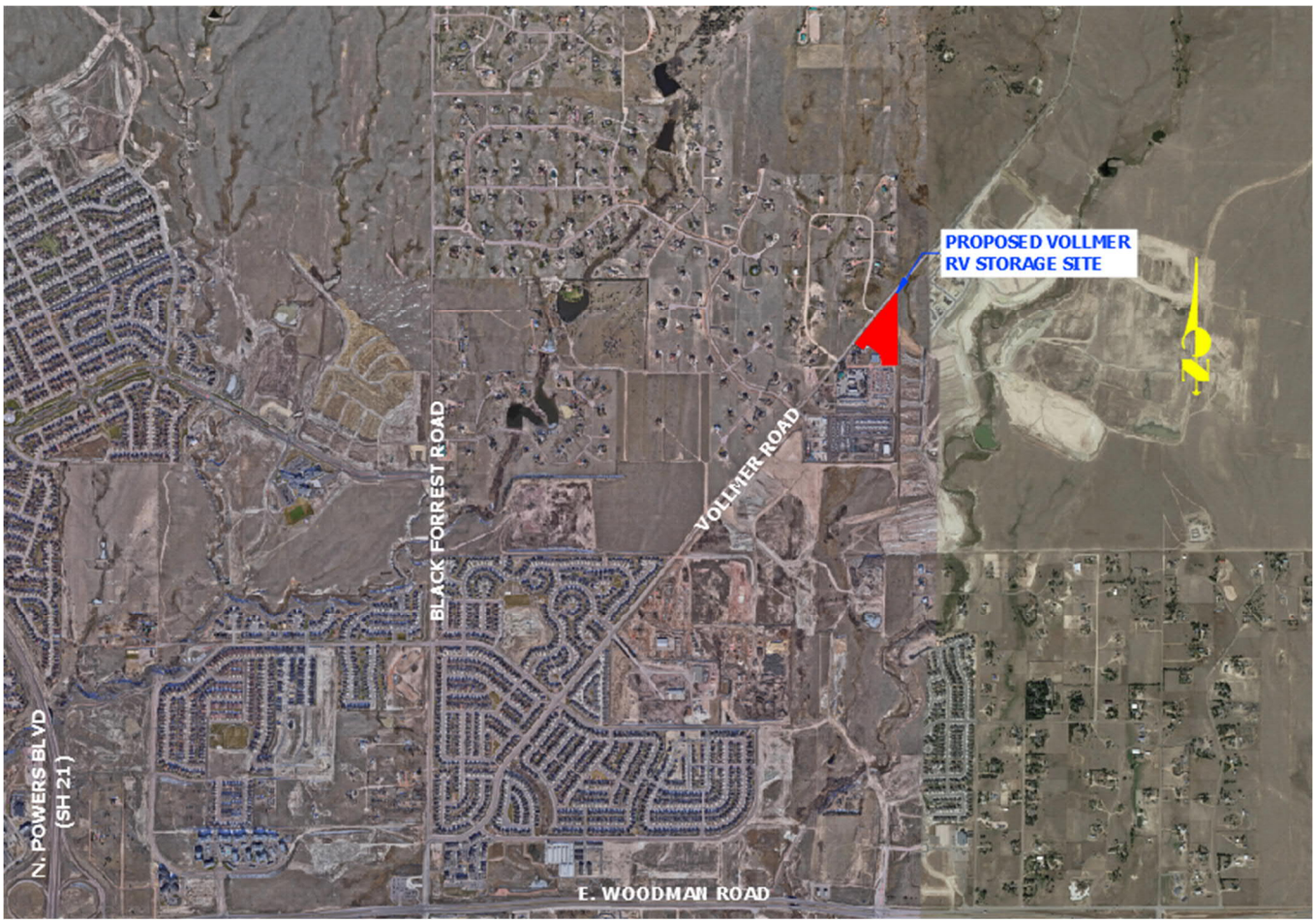


Figure 1: Proposed Vollmer RV Storage Facility - Vicinity Map

Facility Details

The proposed Vollmer RV Storage facility has a service area of 6.9 acres. The primary function of this facility is to store reactional vehicles (RV's). Total parking space for the site will not exceed 250 RV spots.

Public Input

There is no public or neighborhood input issues that have been reported in association with the development of this site.

Proposed Site Plan & Study Intersection

Figure 2 shows the proposed Site Plan and Study Intersection location.

Figure 2: Site Plan and Study Intersection Location

2 – Existing Conditions

Existing Traffic Volumes

Existing through movement traffic counts were taken from Homestead North Phase 1 Update Traffic Impact Study by LSC Transportation Consultants, Inc. dated August 2021(Homestead North TIS). According to the Homestead North TIS the figure below shows the tube count location. Applicable excerpts, including traffic counts, from this report can be found in Appendix 1.

- **Through Movement Tube Counts** – Vollmer Road at Dines (North East of site access)
  - Collected by LSC in May 2020

Figure 3: Through Movement Tube Count Location

Traffic count data is available in **Appendix 1**.

COVID-19 Traffic Volumes

According to the Homestead North TIS existing traffic counts were adjusted by LSC to account for COVID-19 related restrictions. "…volumes are estimates by LSC, based on the 2020 peak-hour counts and the ratio of peak-hour to daily traffic volumes from 24- hour counts conducted on Vollmer Road..." For more information on traffic adjustments made by LSC see referenced material in Appendix 1.

Existing Traffic Volumes

There are no existing major intersections adjacent to the proposed development. Glider Loop intersects Vollmer Road on the northeast side to the north of the studied intersection at Vollmer Place. Glider Loop serves approximately 20 residential homes.

From the Traffic Impact Study for Woodmen View Storage dated August 10th 2004 the existing intersection has the following volumes below that are generated by the two existing homes, the existing industrial parcel, and the Woodmen View Storage site that all have access off of Vollmer Place.

- Average Daily Trips (ADT) = 110 trips
- AM Entering Site = 5 trips
- AM Exiting Site = 8 trips
- PM Entering Site = 8 trips
- PM Exiting Site = 4 trips

Traffic Impact Study for Woodmen View Storage excerpts are available in **Appendix 1**.

2020 Existing Traffic Volumes and Lane Geometry

Figure 4 shows the existing lane geometry and traffic volumes during the AM and PM peak hours.

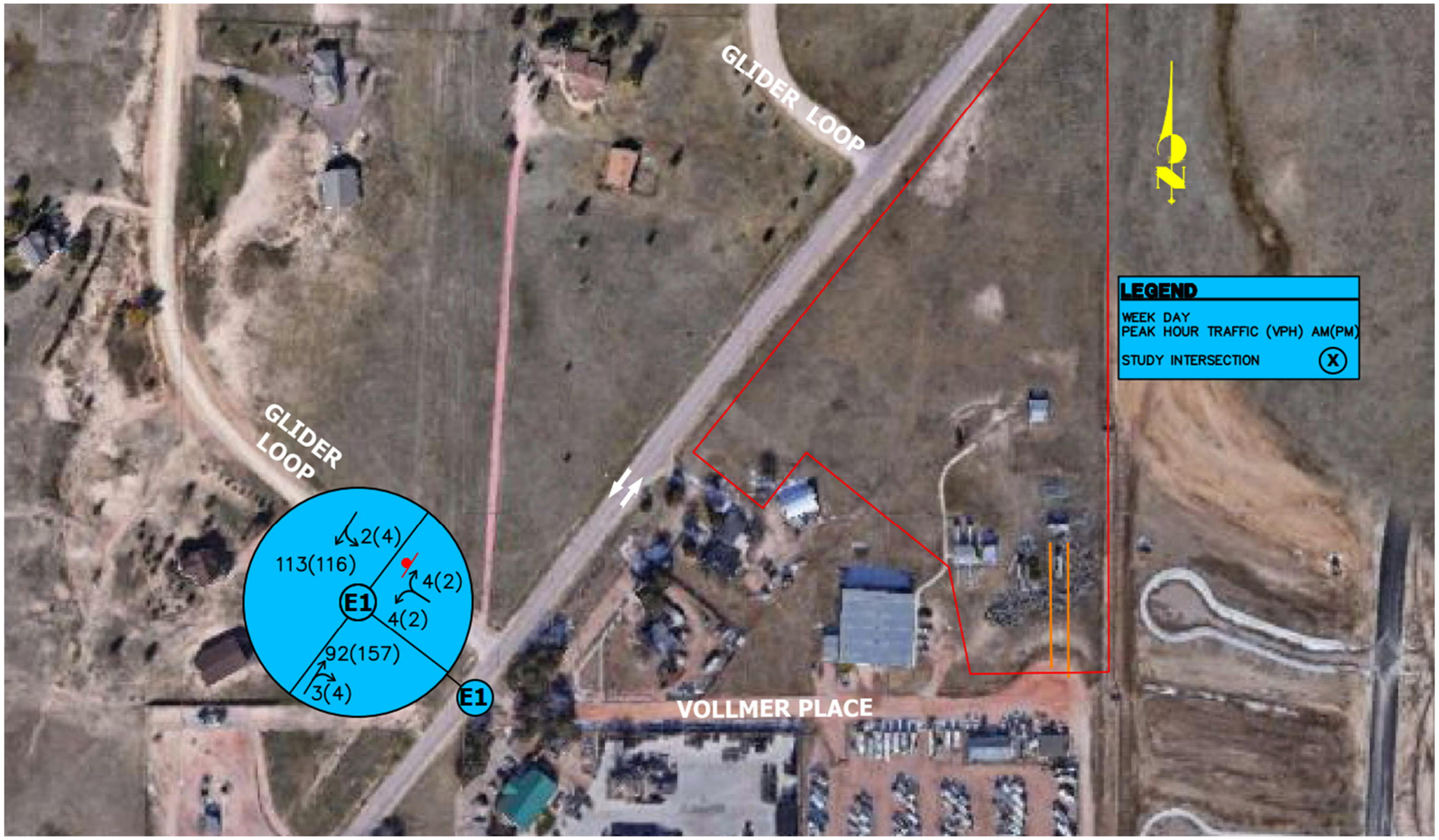


Figure 4: 2021 Existing Traffic Volume

3 – Proposed Conditions

Traffic Growth Forecast

Based on the El Paso County Engineering Criteria Manual standards, an opening day and a future condition analysis are required.

Based on traffic volume forecasts, a standard 2.0% annual growth was assumed from 2020 to 2045. This growth rate was used to determine 2045 background traffic volumes. Homestead North TIS through movements at the intersection of Briargate Parkway and Vollmer Road were used to determine traffic volumes and patterns along Vollmer Road in the future. Homestead North TIS values were for 2040, therefore additional growth was accounted for using a standard 2.0% annual growth rate to obtain 2045 values.

Trip Distribution

Traffic split appears to be around 50/50 due to very low site generated traffic volumes. Based on location of the site it is assumed that slightly more people will be entering and exiting the site to the southwest because the City of Colorado Springs is located to the southwest of the site.

Trip Generation

Trips to and from the site were estimated using ITE Trip Generation manual using Land Use Code 151 for Mini-warehouse.
Trip Estimate Based on ITE Trip Generation Manual 10th Edition

The ADT and turning movement counts were estimated using the standard ITE Land Use Code 151 for Mini-warehouse based on number units (parking spaces). This was determined to be the closest land use type contained in the ITE Trip Generation Manual for the proposed RV storage site. No adjustments were made for internal capture nor pass-by trips.

The proposed RV storage facility area of 6.9 acres produces the following volumes based on ITE:

- Average Daily Trips (ADT) = 54 trips
- AM Entering Site = 2 trips
- AM Exiting Site = 2 trips
- PM Entering Site = 3 trips
- PM Exiting Site = 3 trips

The total volumes below are produced from the existing traffic with the proposed RV storage volumes added:

- Average Daily Trips (ADT) = 164 trips
- AM Entering Site = 7 trips
- AM Exiting Site = 10 trips
- PM Entering Site = 11 trips
- PM Exiting Site = 7 trips

Per the El Paso County Engineering Criteria Manual section 2.2.7 Vollmer Place does not meet the 200 ADT, which would require the road to be paved.

The Trip Generation report is included in **Appendix 2**.

Site-Generated Traffic Volumes and Distributions

Figure 5 shows the traffic volumes generated by the proposed development.

Figure 5: Site-Generated Traffic Volumes

2024 Opening Day – Total Traffic Volumes

Figure 6 shows the 2024 Opening Day total traffic volumes during the AM and PM peak hours.

Figure 6: Opening Day 2023 Total Traffic Volumes

2045 Future– Total Traffic Volumes

Figure 7 shows the 2045 future total traffic volumes during the AM and PM peak hours.

Figure 7: Future 2045 Total Traffic Volumes

5 – Traffic Evaluation – Level of Service & Queue Lengths

Analysis Methodology

The premise of the Traffic Analysis methodology is as follows:

1. Estimate traffic volumes generated by the development
2. Input estimated volumes into Synchro and analyze the Study Intersection during peak hours
3. Determine operating Level of Service for the Study Intersection during peak hours

The Study intersection was analyzed using the HCM 6th Edition methodology for the 2024 Opening Day and future 2045 scenarios. No major operational concerns are anticipated for these scenarios. The Synchro report for both analysis is included in **Appendix 3**.

Peak Hour Definition

Based on the traffic counts, **Table 2** shows the peak hours for Vollmer Road.

Table 2 – Peak Hour Definition

Peak Hour	Hours
Morning (AM Peak)	7:30 a.m. to 8:30 a.m.
Evening (PM Peak)	4:30 p.m. to 5:30 p.m.

Study Intersection – Opening Day 2024 Level of Service

The intersections were analyzed for the 2024 Opening Day scenario. **Table 3** indicates the 2024 Level of Service for the intersection.

Table 3 – Stop Controlled Intersection Level of Service – **2023 Opening Day**

One-Way Stop Controlled Intersection	Direction	Opening Day Traffic LOS	
		AM Peak Hour	PM Peak Hour
1 –Vollmer Road & Vollmer Place	NW	B	B
	SW	A	A

Study Intersection – Opening Day 2024 Queue Lengths

The intersection was analyzed for queue lengths in the 2023 Opening Day scenario. **Table 4** below indicates the 95th percentile queue length for each of the approaches of the intersection.

Table 4 – 95th Percentile Queue Lengths – **2024 Opening Day**

Intersection	Approach/ Movement	AM 95th Percentile Queue (feet)	PM 95th Percentile Queue (feet)	Recommended Storage Length for Turn Lanes (feet)
1 –Vollmer Road & Vollmer Place	NW	<25	<25	N/A
	SW	<25	<25	N/A

Study Intersection –Future 2045 Level of Service

The intersections were analyzed for the 2045 scenario. **Table 5** indicates the 2045 Level of Service for the intersection.

Table 5 – Stop Controlled Intersection Level of Service – **2045**

One-Way Stop Controlled Intersection	Direction	Opening Day Traffic LOS	
		AM Peak Hour	PM Peak Hour
1 –Vollmer Road & Vollmer Place	NW	B	B
	SW	A	A

Study Intersection Future 2045 Queue Lengths

The intersection was analyzed for queue lengths in the 2045 scenario. **Table 6** below indicates the 95th percentile queue length for each of the approaches of the intersection.

Table 6 – 95th Percentile Queue Lengths – **2045**

Intersection	Approach/ Movement	AM 95th Percentile Queue (feet)	PM 95th Percentile Queue (feet)	Recommended Storage Length for Turn Lanes (feet)
1 –Vollmer Road & Vollmer Place	NW	<25	<25	N/A
	SW	<25	<25	N/A

6 – Improvement Analysis

Roadway & Intersection Modifications

Vollmer road is a **two-lane Arterial Roadway** with sparse development. The need for acceleration and deceleration lanes was determined based on the CDOT Access Code.

The following evaluations were considered:

- Right turn Acceleration Lane out of Site
- Right turn Deceleration Lane into Site
- Left-Turn Lane into Site
- Left turn Acceleration Lane out of Site

State of Colorado Highway Access Code – Turn Lane Requirements Check

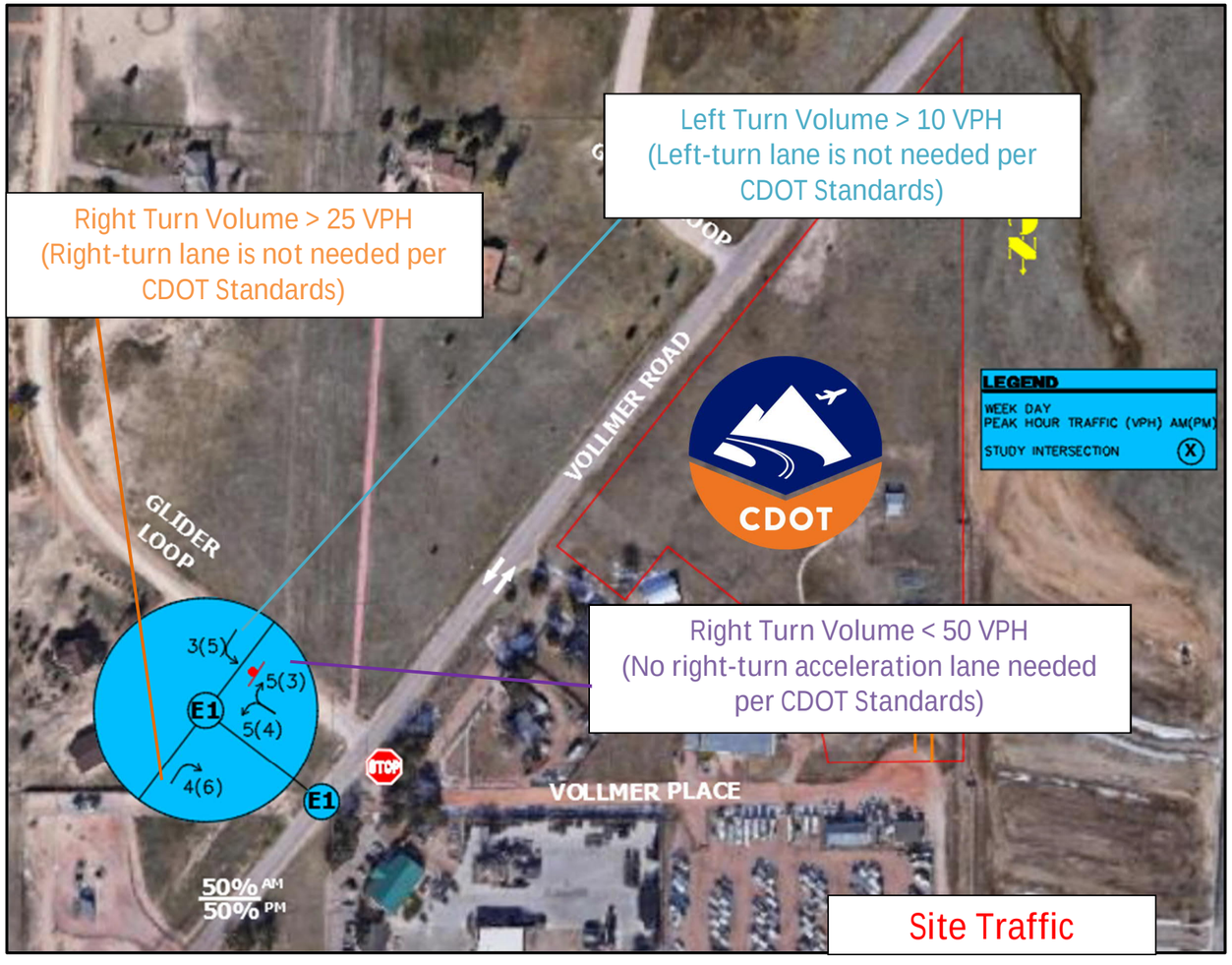
In addition to the El Paso County Engineering Criteria Manual, the Colorado Department of Transportation (CDOT) Highway Access Code was also used to determine if left and right turn lanes are needed to support the turning movements to the site.

Vollmer Road is a CATEGORY R-B – Rural Highway based on CDOT access code.

Table 7 – CDOT Requirements for Auxiliary Lanes

Auxiliary Lane Type	CDOT Volume Threshold	Proposed Volume (Peak Hours)	Notes
Right-Turn Acceleration Lane (Leaving Site)	< 50 VPH	5 VPH (AM) 3 VPH (PM)	Not Needed
Right-Turn Deceleration Lane (Entering Site)	< 25 VPH	4 VPH (AM) 6 VPH (PM)	Not Needed
Left-Turn Deceleration Lane (Entering Site)	< 10 VPH	3 VPH (AM) 5 VPH (PM)	Not Needed
+ Left-Turn Acceleration Lane (Leaving Site)	Various Factors	5 VPH (AM) 4 VPH (PM)	Not anticipated to be needed based on low turning volumes and through volumes

Table 7 above indicates the CDOT requirements for auxiliary lanes with a comparison to the volumes proposed for this project.



7 – Conclusion

The proposed development along Vollmer Road is expected to have no significant impact on traffic operations. Below is a summary of the findings of this TIS.

Conclusions

- **Intersection Analysis – 2024 Opening Day Conditions** – Traffic is expected to operate with minimal operational issues in the Opening Year 2024, with all approaches operating at LOS A or B.

- **Intersection Analysis – 2045 Future Conditions** – Traffic is expected to operate with minimal operational issues in 2045, with all approaches operating at LOS A or B.

- **Pedestrian and Bicycle Facilities**

    - There are no sidewalks or bike lanes adjacent to the site. No increase in foot or bike traffic is expected with the development of this site, and therefore no bike or pedestrian paths were analyzed.

- **Turn Lane Improvements**

    - No turn lanes will be required with the development of this site due to a small number of turning movements per hour.

APPENDIX 1

Referenced Material

Homestead North Phase 1

Updated Traffic Impact Study

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AUGUST 4, 2021

LSC Transportation Consultants
Prepared by: Kirstin D. Ferrin, P.E.
Reviewed by: Jeffrey C. Hodsdon, P.E.

LSC #204380
SP-20-008

Study Area Access Plan

The access plan for the current study area is generally consistent with the access plan shown in the master traffic report. The following summarizes the changes:

- The Sterling Ranch access to Briargate Parkway just east of Vollmer Road (Wheatland Drive) was previously shown as a right-in/right-out-only intersection in the Sketch Plan. The south leg is now proposed as a three-quarter-movement (left-in/right-in/right-out-only) access. A deviation request for this access point has been submitted and approved. The north leg that will serve Homestead North Phase 1 is still proposed to be restricted to right-in/right-out only.
- An additional right-in-only access (Jane Kirkham Drive) is proposed from northbound Vollmer Road between Briargate Parkway and the first full-movement site access. The applicant is requesting this access to reduce the out-of-direction travel to the southern portion of the development for motorists arriving from the south, west, or southwest. As there is not sufficient intersection spacing for an eastbound left turn from Briargate Parkway (Stapleton) at Wheatland Drive, this access would be a good alternative to improve to accessibility to the southern portion of the site. Future residents in the southern portion of the site would not need to travel about one-quarter mile up Vollmer, turn right at Sam Bass Drive, and backtrack through the north portion of the subdivision to reach the homes in the southern portion. The right-in-only connection would have a northbound right-turn deceleration lane on Vollmer and very minimal impact to Vollmer operations as only the right-in turning movement would be allowed.

These changes to the plan will result in some localized shifts in intersection turning movements shown in the master traffic study long-term traffic projections, but nothing significant requiring an update to the master study.

CURRENTLY PROPOSED LAND USE AND ACCESS

Land Use and Vehicle Access

Homestead North Phase 1 is planned to include 147 lots for single-family homes. A full-movement site access (Sam Bass Drive) is proposed to Vollmer Road about 1,410 feet north of Briargate Parkway and 1,370 feet south of Poco Road. An additional right-in-only access (Jane Kirkham Drive) is proposed to Vollmer Road 704 feet north of Briargate Parkway and about 704 feet south of Sam Bass Drive. An access is also proposed to Briargate Parkway750 feet east of Vollmer Road aligning with Wheatland Drive. In the short term, full-movement access will be allowed at this intersection, as only a half section of Briargate Parkway is planned to be constructed between Vollmer Road and Wheatland Drive. Once Briargate Parkway is widened to the full Principal Arterial cross-section **and** the roadway is extended east of Wheatland, the north leg serving Homestead North will be restricted to right-in/right-out only and the south leg will be restricted to three-quarter movements (left-in/right-in/right-out only). In the future, Homestead North Phase 1 will also have access through future Homestead North phases and the Retreat at TimberRidge to Poco Road.

Sight Distance Analysis

Figure 3 shows a sight distance analysis at the future intersection of Vollmer Road/Sam Bass Drive. Based on a design speed of 40 miles per hour (mph) and the criteria contained in Table 2-21 of the *El Paso County Engineering Criteria Manual* (ECM), the required intersection sight distance at the future intersections is 445 feet. Based on the criteria contained in Table 2-17 of the ECM, the required stopping sight distance approaching this intersection is 305 feet. As shown in Figure 4, the future intersection analyzed will meet the criteria.

Pedestrian and Bicycle Access

There are no existing schools within two miles of the site. However, there are planned future school sites within the Sterling Ranch Master Plan area south of Briargate Parkway. There are planned sidewalks on Vollmer Road and Briargate Parkway adjacent to the site. School crossings will be needed at the intersection of Briargate Parkway/Vollmer Road. School crossings should not be allowed at the intersection of Briargate Parkway/Wheatland Drive.

EXISTING ROAD AND TRAFFIC CONDITIONS

The adjacent streets are shown in Figure 1 and are described below. Copies of the *2016 El Paso County Major Transportation Corridors Plan (MTCP), 2040 Roadway Plan,* and *2016 MTCP 2060 Corridor Preservation Plan* with the site location identified on each of them have been attached to this report.

Vollmer Road is currently a five-lane urban street within the City of Colorado Springs limits between Black Forest Road and Cowpoke Road; and a two-lane, rural, paved roadway north of Cowpoke Road extending to north of Hodgen Road. In the southbound direction, Vollmer Road has a posted speed limit of 45 miles per hour (mph). South of Cowpoke Road, Vollmer Road has a 40-mph posted speed limit. The *2040 El Paso County Major Transportation Corridors Plan* (MTCP) and the Sterling Ranch master traffic study show Vollmer Road as a four-lane Urban Minor Arterial adjacent to the site. Vollmer Road is planned to transition to a 2-lane Rural Minor Arterial north of Poco Road. In the interim, auxiliary turn lanes will be completed on Vollmer Road at Briargate Parkway as part of the Homestead at Sterling Ranch Filing No. 2 development.

Marksheffel Road is a Principal Arterial extending north from the City of Fountain to Woodmen Road. Marksheffel Road is planned to ultimately be widened to six lanes and extended north and west from Woodmen Road to connect to Research Parkway at Black Forest Road. Marksheffel Road is shown as a six-lane Principal Arterial through the Sterling Ranch Master Plan area on the El Paso County MTCP.

Briargate Parkway is a six-lane, Principal Arterial that extends east from I-25 to Grand Lawn Circle (about one-half mile east of Powers Boulevard). Briargate Parkway/Stapleton Road is planned ultimately to extend to Towner Drive. The section of Briargate Parkway between Vollmer Road

and the first Sterling Ranch access (Wheatland Drive) is planned to be constructed in the short term as a partial cross-section with the Homestead at Sterling Ranch Filing No. 2 development.

Poco Road is an existing gravel road which extends east for about three-quarters of a mile from Lochwinnoch Lane to Vollmer Road. Poco Road is planned to be extended east of Vollmer Road as an Urban Local Road to serve the Retreat at Timber Ridge Filing No. 1 (PCD-SF-19-009).

Existing Traffic Volumes

Figure 4 shows the existing (2020) peak-hour traffic volumes at the intersections of Dines/Vollmer. The traffic volumes shown for the intersection of Dines/Vollmer were based on traffic counts conducted by LSC in May 2020. These traffic counts were conducted at a time when COVID-19 pandemic-related restrictions were in place. However, traffic counts conducted at the intersection of Black Forest Road/Vollmer Road in December 2019 (pre-pandemic) and repeated during the same week that the Dines/Vollmer counts were conducted indicate only minor impacts to traffic volumes on Vollmer Road due to these restrictions. The traffic count sheets are attached.

Figure 4 also shows the daily traffic volumes on Vollmer Road in the vicinity of the site. These volumes are estimates by LSC, based on the 2020 peak-hour counts and the ratio of peak-hour to daily traffic volumes from 24-hour traffic counts conducted on Vollmer Road just south of Poco Road by LSC in 2017.

BACKGROUND (BASELINE) CONDITIONS

Background traffic is the traffic estimated to be on the adjacent roadways and at adjacent intersections without the proposed development's trip generation of site-generated traffic volumes. Background traffic includes the through traffic and the traffic generated by nearby developments, but assumes zero traffic generated by Homestead North Phase 1.

Figure 5 shows the projected short-term background traffic volumes at the key area intersections. The short-term background volumes assume a half section of Briargate Parkway has been constructed between Vollmer Road and Wheatland Drive and that full-movement access is permitted at the intersection of Briargate/Wheatland. The short-term background traffic includes the existing traffic volumes (from Figure 3) plus increases in through traffic due to regional growth, plus traffic estimated to be generated by buildout of the Homestead at Sterling Ranch Filings 1 and 2, Branding Iron at Sterling Ranch Filings 1 and 2, Sterling Ranch Filing No. 2, Sterling Ranch Phase 2, and the Retreat at TimberRidge Filing No. 1 to be located generally northeast of the intersection of Vollmer Road and Poco Road.

Figure 6 shows the projected 2040 background traffic volumes at the key area intersections. 2040 background traffic volume estimates were based on 2040 volume projections in the *El Paso County Major Transportation Corridors Plan* (MTCP) and previous work completed in the area by LSC,

including the *Sterling Ranch Updated Traffic Impact Analysis* by LSC (dated June 5, 2008) and the *Retreat at TimberRidge Updated Traffic Impact Analysis* by LSC (dated January 25, 2018). The 2040 background traffic volumes assume buildout of the Sterling Ranch development, including future phases of Homestead North, and buildout of the Retreat at TimberRidge. The 2040 background traffic assumes Briargate Parkway/Stapleton Road has been constructed between Black Forest Road and Towner Avenue and that the intersection of Briargate/Wheatland is restricted to a three-quarter movement (left-in/right-in/right-out only) for the south leg and right-in/right-out only for the north leg. The 2040 background traffic also assumes a connection between the intersection of Wheatland/Briargate and Poco Road through the Homestead North area.

TRIP GENERATION

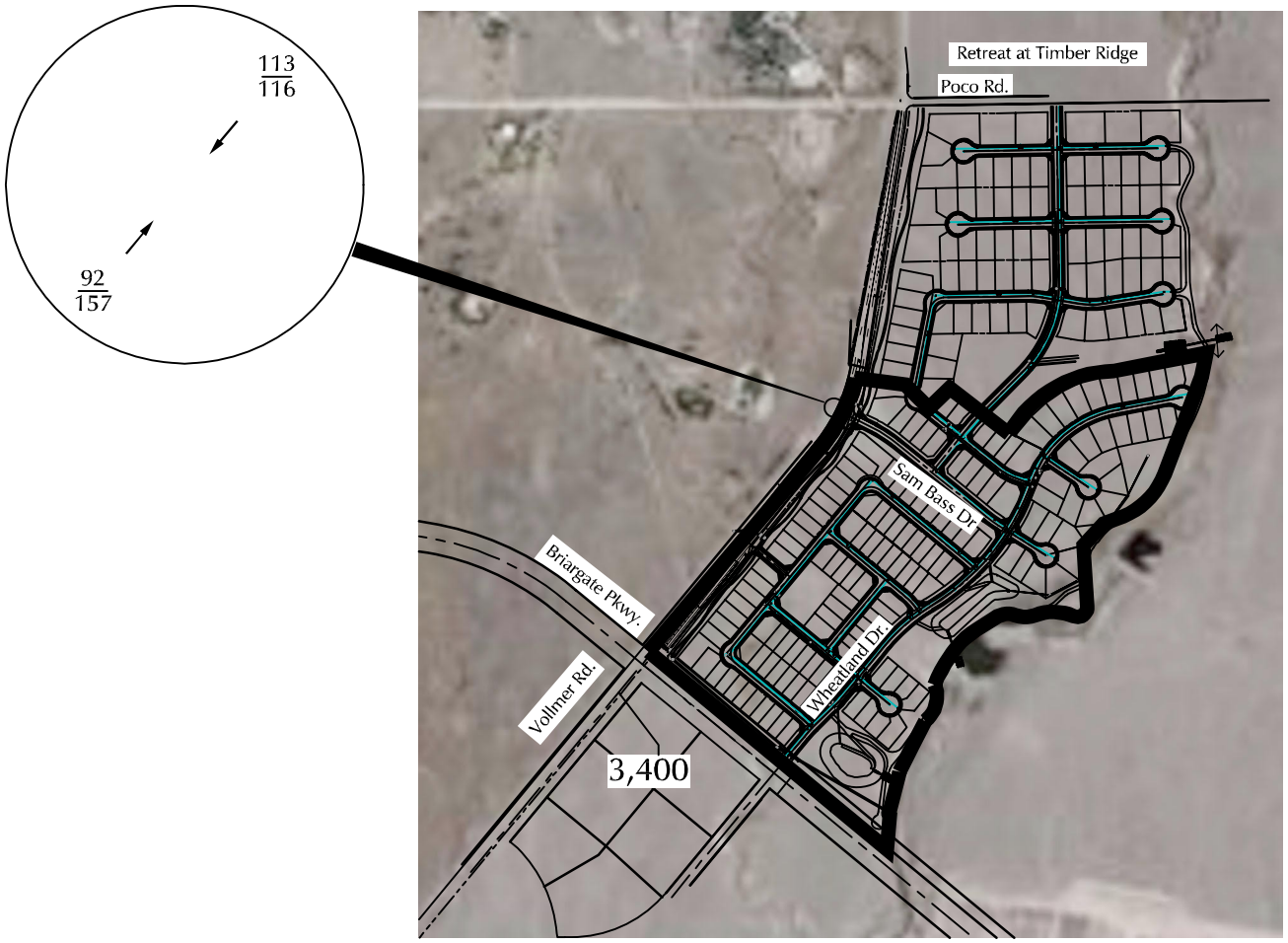
The site-generated vehicle trips were estimated using the nationally published trip-generation rates from *Trip Generation, 10th Edition*, 2017 by the Institute of Transportation Engineers (ITE). Table 1 shows the trip-generation estimates.

Homestead North Phase 1 is projected to generate about 1,388 new external vehicle-trips on the average weekday, with about half entering and half exiting the site during a 24-hour period. During the morning peak hour, which generally occurs for one hour between 6:30 and 8:30 a.m., about 27 vehicles would enter and 82 vehicles would exit the site. During the afternoon peak hour, which generally occurs for one hour between 4:15 and 6:15 p.m., about 92 vehicles would enter and 54 vehicles would exit the site.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of the site-generated traffic volumes on the street and roadway system serving the site is one of the most important factors in determining the site's traffic impacts. The specific short-term and long-term distribution estimates are shown in Figure 7. The directional distribution estimates are based on the following factors: the location of the site with respect to the Colorado Springs metropolitan area, the planned access system for the site, the street and roadway system serving the site, the land uses proposed for the site, and the distribution of existing traffic volumes at the intersection of Dines Boulevard/Vollmer. The short-term distribution estimate assumes only the short section of Briargate Parkway between Vollmer Road and Wheatland Drive has been constructed in the vicinity of the site and the long-term distribution estimate assumes full buildout of the future roadway network in the vicinity of the site.

When the distribution percentages (from Figure 7) are applied to the trip-generation estimates (from Table 1), the resulting site-generated traffic volumes can be determined. Figures 8 and 9 show the short-term and 2040 site-generated traffic volume estimate for Homestead North Phase 1. The short-term site-generated traffic volumes assume the intersection of Briargate/Wheatland as an interim full-movement intersection. The long-term site-generated traffic volumes assume the north leg of this intersection has been restricted to right-in/right-out only.



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Approximate Scale
NTS

LEGEND:

$\frac{XX}{XX}$ = $\frac{\text{AM Weekday Peak-Hour Traffic (vehicles per hour)}}{\text{PM Weekday Peak-Hour Traffic (vehicles per hour)}}$ Based on counts by LSC May 2020

XXX = Average Weekday Traffic (vehicles per day) Estimate by LSC

Note: Counts may be impacted by restrictions due to the COVID-19 pandemic.

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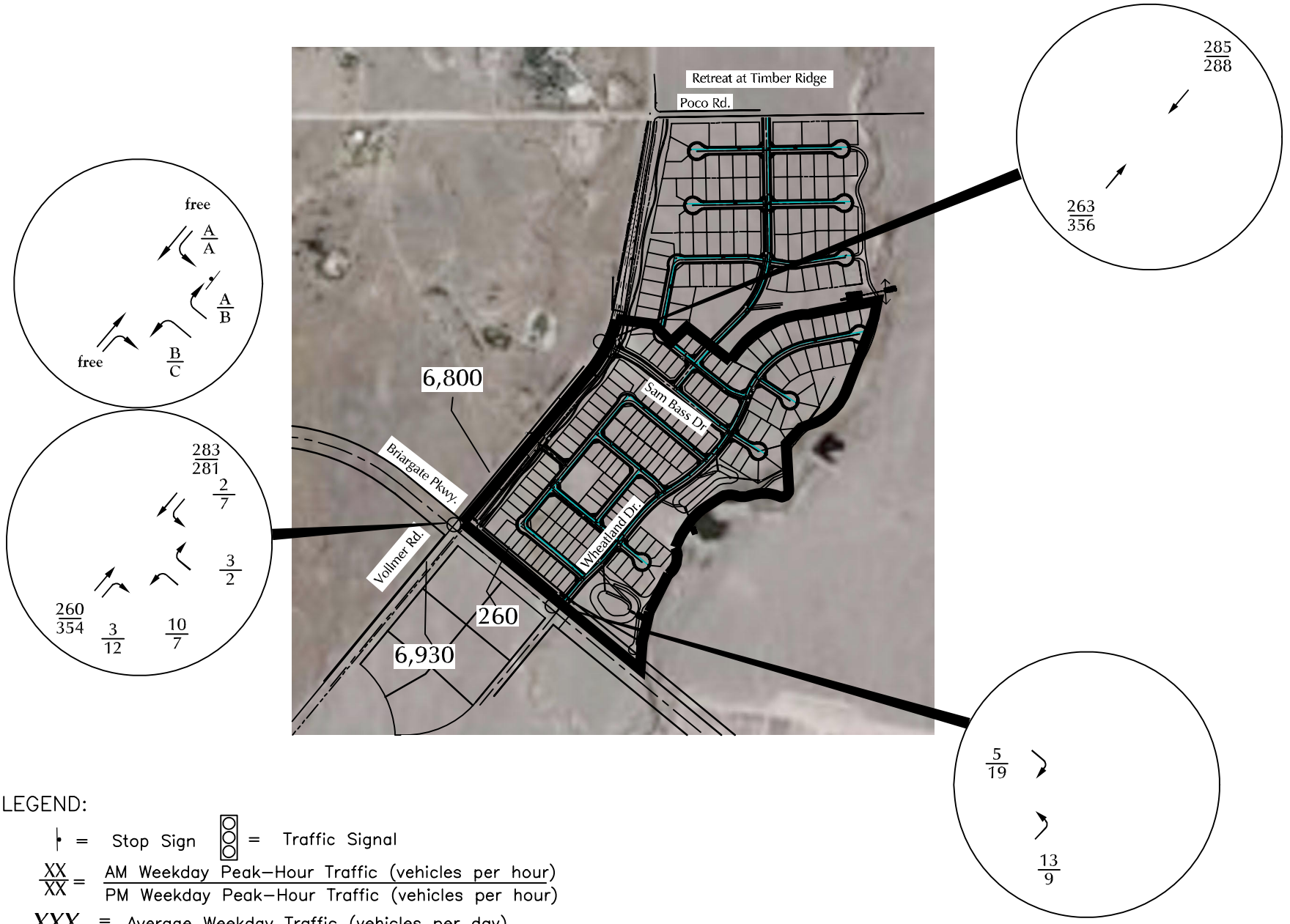
Figure 4

Existing Traffic

Homestead North Phase 1 (LSC #204380)



LEGEND:

= Stop Sign = Traffic Signal

$\frac{XX}{XX}$ = AM Weekday Peak–Hour Traffic (vehicles per hour) / PM Weekday Peak–Hour Traffic (vehicles per hour)

XXX = Average Weekday Traffic (vehicles per day)

$\frac{A}{B}$ = AM Individual Movement Peak–Hour Level of Service / PM Individual Movement Peak–Hour Level of Service

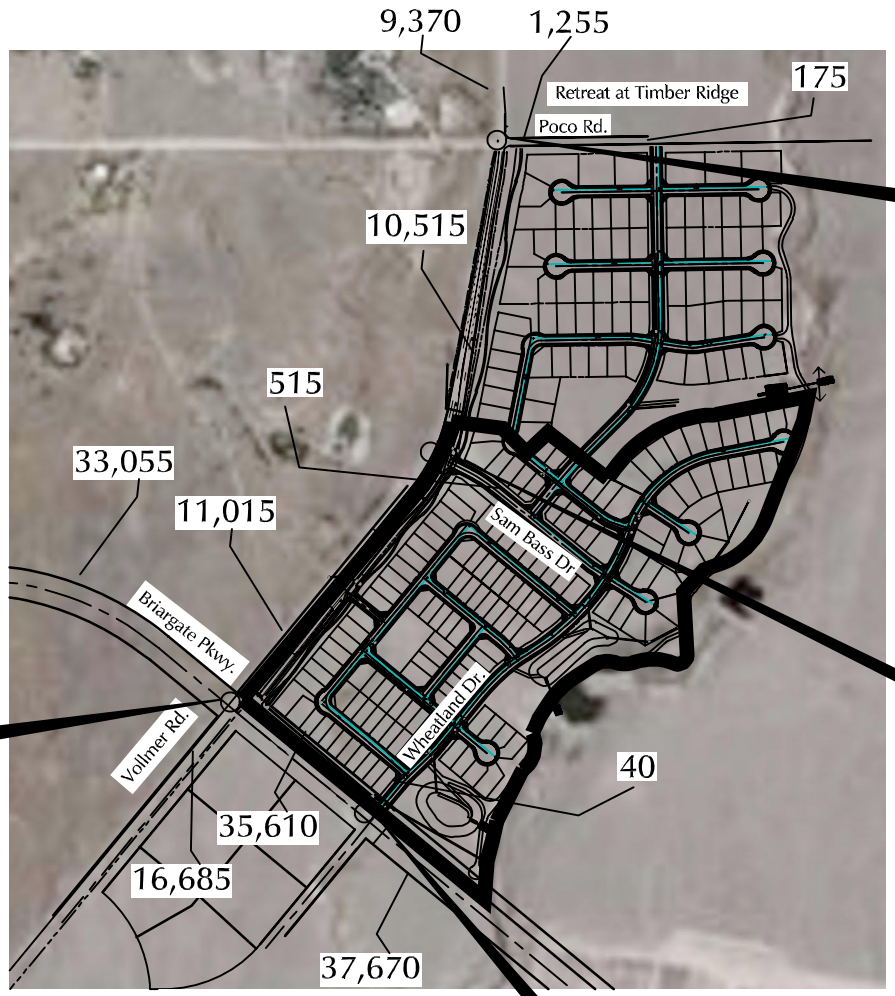
$\frac{C}{D}$ = AM Entire Intersection Peak–Hour Level of Service / PM Entire Intersection Peak–Hour Level of Service

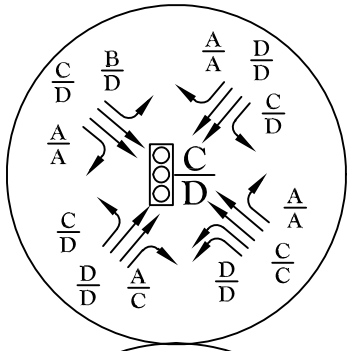
LSC TRANSPORTATION CONSULTANTS, INC.

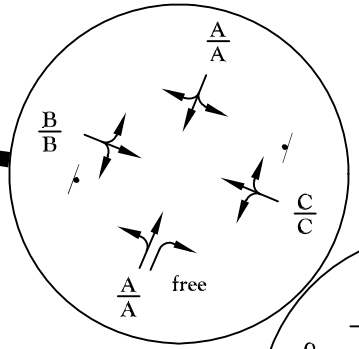
Figure 5

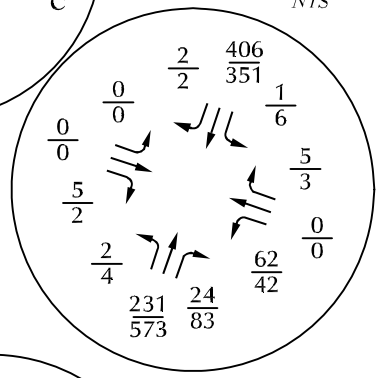
Short-term Background Traffic

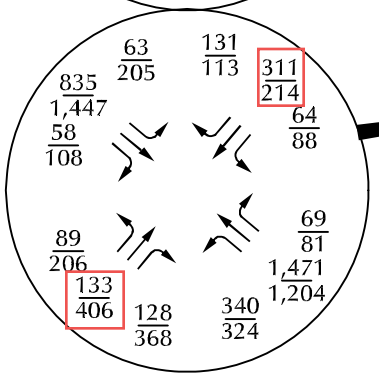
Homestead North Phase 1 (LSC #204380)

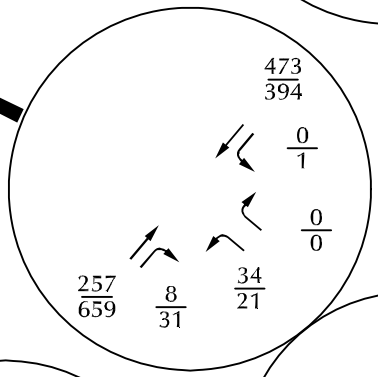


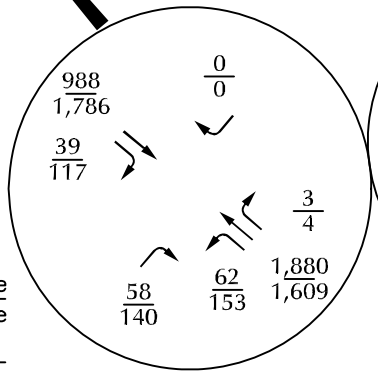


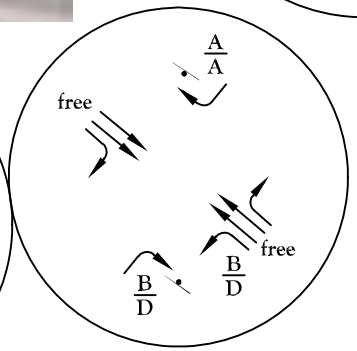


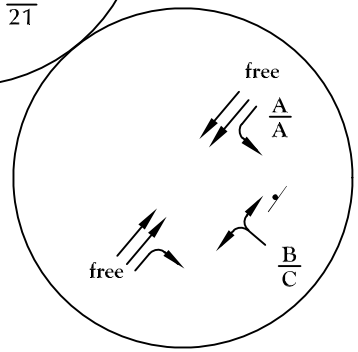












Approximate Scale
NTS

LEGEND:

= Stop Sign = Traffic Signal

$\frac{XX}{XX}$ = $\frac{\text{AM Weekday Peak-Hour Traffic (vehicles per hour)}}{\text{PM Weekday Peak-Hour Traffic (vehicles per hour)}}$

XXX = Average Weekday Traffic (vehicles per day)

$\frac{A}{B}$ = $\frac{\text{AM Individual Movement Peak-Hour Level of Service}}{\text{PM Individual Movement Peak-Hour Level of Service}}$

$\frac{C}{D}$ = $\frac{\text{AM Entire Intersection Peak-Hour Level of Service}}{\text{PM Entire Intersection Peak-Hour Level of Service}}$

LSC TRANSPORTATION CONSULTANTS, INC.

Figure 6

2040 Background Traffic

Homestead North Phase 1 (LSC #204380)

Calibre ENGINEERING

TRAFFIC IMPACT STUDY

FOR

WOODMEN VEIW STORAGE

July 8, 2004

Prepared for:

Woodmen View Storage

Prepared by:

Calibre Engineering, Inc.
8000 South Lincoln Street, Unit 206, Littleton, CO 80122
303-730-0434 fax 303-730-1139
Municipal Engineering Development Master Planning

B. Study Area Land Use

- Off-site adjacent development consists of Rural Residential and Industrial Districts.
- A new residential development exists just southwest on Vollmer Road, and an existing residential development just northwest, these access Vollmer Road directly.
- Existing Industrial site is directly north and on the east-north portion of the site, it accesses Vollmer Road.
- Area to the east is zoned RR3 however is not developed.
- An existing batch plant is located half way between Black Forest and Vollmer Place, which contributes a large portion of the trips from Black Forest to the plant.
- See also attached zoning map.
- No other developments affecting Vollmer Place have been identified for this study.

C. Site Accessibility

- Vollmer Road is a north/south diagonal roadway from Black Forest to Burgess and on.
- Vollmer Road is a two lane, asphalt paved road, within County jurisdiction.
- Vollmer Road has an ADT of 5283 at Black Forest and 2837 at Burgess, obtained from the County. Peak rates have also been shown.
- Vollmer Place "tees" at Vollmer Road and runs approximately ¼ mile to a cul-de-sac.
- Vollmer Place is a two lane, gravel road, within County jurisdiction.
- A local roadway connects the existing homes located on the northeast corner of the intersection and also has access to Vollmer Road.
- Vollmer Place has a projected ADT of 110.

IV. PROJECTED TRAFFIC

A. Site Traffic

- Trip generation for Vollmer Place is shown in table and assumptions are as follows:
  - A local roadway connects the existing homes located on the northeast corner of the intersection and also has access to Vollmer Road. Traffic generation, for the purposes of this study, were accounted at the Vollmer Place intersection.
  - Existing Industry located on north showed 8 vehicles and was adjusted to 10 employees.
  - Generation rates for Recreation Storage sites have not been accounted for in the latest Trip Generation manual. Rates for the site were projected from another site located in Douglas County, with similar characteristics. Both sites only have one access point.

- Data is shown in the appendix and was projected as follows:
  - 10-percent of stalls are daily trips, for peak season.
  - Peak trips are constant before and after a holiday, as shown.
  - Trips in winter months declines, however was not used for this analysis.

Woodmen View Storage - Site Trip Generation

Vollmer RV Storage: 54

WEEKDAY

Land Use		Unit	Quantity	Daily	AM Peak Hour			PM Peak Hour		
County	ITE				In	Out	Total	In	Out	Total
Planned Industrial District	110	Employee	10	30	4	1	5	1	3	4
Rural Residential District	210	DU	2	19	0	2	2	2	0	2
Planned Heavy Industrial District (Site)	*	Stall	610	61	1	5	6	5	1	6
TOTAL				~~110~~	~~5~~	~~8~~	**13**	~~8~~	~~4~~	**12**

2 2 3 3

164 7 10 11 7

SATURDAY

Land Use		Unit	Quantity	Daily	Peak Hour		
County	ITE				In	Out	Total
Planned Industrial District	110	Employee	10	5	0	0	0
Rural Residential District	210	DU	2	20	1	1	2
Planned Heavy Industrial District (Site)	*	Stall	610	61	3	6	9
TOTAL				**86**	**4**	**7**	**11**

SUNDAY

Land Use		Unit	Quantity	Daily	Peak Hour		
County	ITE				In	Out	Total
Planned Industrial District	110	Employee	10	3	0	0	0
Rural Residential District	210	DU	2	20	1	1	2
Planned Heavy Industrial District (Site)	*	Stall	610	61	6	3	9
TOTAL				**84**	**7**	**4**	**11**

- Trip distribution was projected as follows:
  - 100-percent of Vollmer Place traffic is distributed to Vollmer Road intersection.
  - Vollmer Road is distributed with 80-percent southwest and 20-percent northeast.
  - Projected trips at intersection are shown in TWSC-Unsignalized Intersection Worksheet.
  - AM Peak was used for analysis because it showed the highest levels.

B. Through Traffic

- No through traffic occurs on Vollmer Place or the site.

V. TRAFFIC ANALYSIS

A. Site Access

- One access is located on the northeast portion of the site.
- Vehicles will access the site through a security-controlled gate.
- Accesses from adjacent parcels are as shown on attached exhibits.

B. Level of Service

- Vollmer Road/Place intersection has been calculated using the Highway Capacity Manual, worksheets have been included in the appendix.
- 80-percent heavy vehicles have been used for the left turn at Vollmer Place.
- Level of Service for left turns are as follows:
  - Southbound Vollmer Road to eastbound Vollmer Place LOS A.
  - Westbound Vollmer Place to southbound Vollmer Place LOS B.

C. Traffic Signals

- No traffic signals are located on Vollmer Place or Road, within the study area.

D. Site Circulation

- One access is located on the northeast portion of the site.
- Vehicles will access the site through a security-controlled gate.
- Accesses from adjacent parcels are as shown on attached exhibits.
- 24-foot drive isles have been designed for one or two way operation that will achieve site circulation and manoeuvring of all vehicles.
- Most trailers and vehicles will be backed into their stalls and the parking has been designed so you could back into either side.
- Turning movements are not projected to be an issue because vehicles will be able to utilize all of the 24-feet for turning and any delay to oncoming vehicles will be minimal due to the low volumes projected within the site.

VI. IMPROVEMENT ANALYSIS

A. Improvements to accommodate Base Traffic

- No improvements are anticipated at this time.
- Ultimate build out of the site will not reach the 200 ADT, stated in the Pre-application meeting, which would necessitate the road to be paved.

APPENDIX 2

Trip Generation Report

Detailed Land Use Data

For 3 Storage Units (100s) of MWAREHOUSE 1

(151) Mini-Warehouse

Project: Vollmer RV

Open Date: 3/30/2023

Analysis Date: 3/30/2023

Day / Period	Total Trips	Pass-By Trips	Avg Rate	Min Rate	Max Rate	Std Dev	Avg Size	% Enter	% Exit	Use Eq.	Equation	R2
Weekday Average Daily Trips	54	0	17.96	12.25	33.33	4.13	5	50	50	False	T = 18.86(X) - 4.09	0.96
Source : Trip Generation Manual 10th Edition												
Weekday AM Peak Hour of Adjacent Street Traffic	4	0	1.39	0.81	1.7	0.33	6	51	49	False	T = 1.98(X) - 3.79	0.98
Source : Trip Generation Manual 10th Edition												
Weekday PM Peak Hour of Adjacent Street Traffic	6	0	1.95	0.92	8.33	1.4	5	50	50	False	T = 1.52(X) + 2.02	0.61
Source : Trip Generation Manual 10th Edition												

Trip Generation Summary

Alternative: Alternative 1
Phase:
Project: Vollmer RV

Open Date: 3/30/2023
Analysis Date: 3/30/2023

ITE	Land Use		Weekday Average Daily Trips *	Enter	Exit	Total	Weekday AM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total	Weekday PM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total
151	MWAREHOUSE 1			27	27	54		2	2	4		3	3	6
	3	Storage Units (100s)												
Unadjusted Volume				27	27	54		2	2	4		3	3	6
Internal Capture Trips				0	0	0		0	0	0		0	0	0
Pass-By Trips				0	0	0		0	0	0		0	0	0
Volume Added to Adjacent Streets				27	27	54		2	2	4		3	3	6

Total Weekday Average Daily Trips Internal Capture = 0 Percent
Total Weekday AM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent
Total Weekday PM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent

* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 10th Edition

APPENDIX 3

Synchro Report

Lane Group	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	5	5	260	4	3	283
Future Volume (vph)	5	5	260	4	3	283
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.932		0.998			
Flt Protected	0.976					
Satd. Flow (prot)	1694	0	1859	0	0	1863
Flt Permitted	0.976					
Satd. Flow (perm)	1694	0	1859	0	0	1863
Link Speed (mph)	20		45			45
Link Distance (ft)	200		1492			272
Travel Time (s)	6.8		22.6			4.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	5	283	4	3	308
Shared Lane Traffic (%)						
Lane Group Flow (vph)	10	0	287	0	0	311
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 27.3%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.3

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	5	5	260	4	3	283
Future Vol, veh/h	5	5	260	4	3	283
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	5	5	283	4	3	308

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	599	285	0	0	287	0
Stage 1	285	-	-	-	-	-
Stage 2	314	-	-	-	-	-
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	465	754	-	-	1275	-
Stage 1	763	-	-	-	-	-
Stage 2	741	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	464	754	-	-	1275	-
Mov Cap-2 Maneuver	464	-	-	-	-	-
Stage 1	763	-	-	-	-	-
Stage 2	739	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	11.4	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	574	1275	-
HCM Lane V/C Ratio	-	-	0.019	0.003	-
HCM Control Delay (s)	-	-	11.4	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Lane Group	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	4	3	354	6	5	281
Future Volume (vph)	4	3	354	6	5	281
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.942		0.998			
Flt Protected	0.972					0.999
Satd. Flow (prot)	1706	0	1859	0	0	1861
Flt Permitted	0.972					0.999
Satd. Flow (perm)	1706	0	1859	0	0	1861
Link Speed (mph)	20		45			45
Link Distance (ft)	200		1492			272
Travel Time (s)	6.8		22.6			4.1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	3	385	7	5	305
Shared Lane Traffic (%)						
Lane Group Flow (vph)	7	0	392	0	0	310
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 29.0%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.2

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	4	3	354	6	5	281
Future Vol, veh/h	4	3	354	6	5	281
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	4	3	385	7	5	305

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	704	389	0	0	392	0
Stage 1	389	-	-	-	-	-
Stage 2	315	-	-	-	-	-
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	403	659	-	-	1167	-
Stage 1	685	-	-	-	-	-
Stage 2	740	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	401	659	-	-	1167	-
Mov Cap-2 Maneuver	401	-	-	-	-	-
Stage 1	685	-	-	-	-	-
Stage 2	736	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	12.6	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	482	1167	-
HCM Lane V/C Ratio	-	-	0.016	0.005	-
HCM Control Delay (s)	-	-	12.6	8.1	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0	0	-

Lane Group	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	5	5	146	4	3	342
Future Volume (vph)	5	5	146	4	3	342
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.932		0.997			
Flt Protected	0.976					
Satd. Flow (prot)	1694	0	1857	0	0	1863
Flt Permitted	0.976					
Satd. Flow (perm)	1694	0	1857	0	0	1863
Link Speed (mph)	20		50			50
Link Distance (ft)	200		1492			272
Travel Time (s)	6.8		20.3			3.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	5	5	159	4	3	372
Shared Lane Traffic (%)						
Lane Group Flow (vph)	10	0	163	0	0	375
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 30.4%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.3

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	5	5	146	4	3	342
Future Vol, veh/h	5	5	146	4	3	342
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	5	5	159	4	3	372

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	539	161	0	0	163	0
Stage 1	161	-	-	-	-	-
Stage 2	378	-	-	-	-	-
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	503	884	-	-	1416	-
Stage 1	868	-	-	-	-	-
Stage 2	693	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	501	884	-	-	1416	-
Mov Cap-2 Maneuver	501	-	-	-	-	-
Stage 1	868	-	-	-	-	-
Stage 2	691	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	10.7	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	640	1416	-
HCM Lane V/C Ratio	-	-	0.017	0.002	-
HCM Control Delay (s)	-	-	10.7	7.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Lane Group	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (vph)	4	3	447	6	5	236
Future Volume (vph)	4	3	447	6	5	236
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.942		0.998			
Flt Protected	0.972					0.999
Satd. Flow (prot)	1706	0	1859	0	0	1861
Flt Permitted	0.972					0.999
Satd. Flow (perm)	1706	0	1859	0	0	1861
Link Speed (mph)	20		50			50
Link Distance (ft)	200		1492			272
Travel Time (s)	6.8		20.3			3.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	4	3	486	7	5	257
Shared Lane Traffic (%)						
Lane Group Flow (vph)	7	0	493	0	0	262
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free

Intersection Summary			
Area Type:	Other		
Control Type: Unsignalized			
Intersection Capacity Utilization 33.9%		ICU Level of Service A	
Analysis Period (min) 15			

Intersection	
Int Delay, s/veh	0.2

Movement	NWL	NWR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Vol, veh/h	4	3	447	6	5	236
Future Vol, veh/h	4	3	447	6	5	236
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	4	3	486	7	5	257

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	757	490	0	0	493	0
Stage 1	490	-	-	-	-	-
Stage 2	267	-	-	-	-	-
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	375	578	-	-	1071	-
Stage 1	616	-	-	-	-	-
Stage 2	778	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	373	578	-	-	1071	-
Mov Cap-2 Maneuver	373	-	-	-	-	-
Stage 1	616	-	-	-	-	-
Stage 2	774	-	-	-	-	-

Approach	NW	NE	SW
HCM Control Delay, s	13.3	0	0.2
HCM LOS	B		

Minor Lane/Major Mvmt	NET	NER	NWLn1	SWL	SWT
Capacity (veh/h)	-	-	440	1071	-
HCM Lane V/C Ratio	-	-	0.017	0.005	-
HCM Control Delay (s)	-	-	13.3	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-