2500 Carlisle Blvd
Traffic Impact Study

Draft Report

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Prepared for:

Equiterra Regenerative Design

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EXECUTIVE SUMMARY

This report details the procedures and findings of a Traffic Impact Study (TIS) performed by Lee Engineering for Equiterra Regenerative Design. This report and the analyses contained herein were performed for a proposed mixed land use development at 2500 Carlisle Blvd within Albuquerque (CABQ), NM. All analyses and items contained herein conform to scoping meeting held on May 4, 2021. Scoping meeting notes and forms are located in Appendix A.

BACKGROUND

Analysis procedures, conclusions, and recommendations for this study were developed according to the *ITE Trip Generation Manual 10th Edition, and Highway Capacity Manual 6th Edition*. Construction is anticipated to begin in 2021, with full completion of the development in 2022. The development is to be constructed in one single phase. Turning movement counts for the following study intersections were collected for 9 hours in 3-periods: 6:00 AM-9:00 AM (morning), 11:00 AM-2:00 PM (mid-day), and 3:00 PM-6:00 PM (evening) on May 18 and May 20, 2021:

- Carlisle Blvd & Menaul Blvd
- Carlisle Blvd & North Driveway 1 (right-in, right-out only)
- Carlisle Blvd & North Driveway 2 (right-in, right-out only)
- Carlisle Blvd & Prospect Ave South Driveway 3 (full access)
- Carlisle Blvd & Cutler Ave, Carlisle Blvd & I-40 North Ramp (WB)
- Carlisle Blvd & I-40 South Ramp (EB)
- Menaul & Solano Dr
- Prospect Ave & Morningside Dr

Analysis procedures included in this report were performed for the following scenarios:

- Existing Conditions (2021)
- Background - No Build (2022)
- Full Build – Complete Construction (2022)

SUMMARY OF RECOMMENDATIONS

As discussed in previous sections, potential improvements are listed here as follows:

- Carlisle Blvd & Menaul Blvd
    - The development is observed to have minimal effect on the intersection and is currently experiencing QSR issues during existing conditions. It is recommended that Carlisle Blvd & Menaul Blvd be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.
- For Carlisle Blvd & I-40 North Ramp (WB)
    - The development is observed to have minimal effect on the WB approach and it is currently experiencing QSR issues during existing conditions. Queueing issues for the WB approach can be attributed to cycle delays and a limitation of HCS software when analyzing shared exclusive turn lane with more than three lane groups. Westbound through traffic appears to contribute to queueing issues, though the movement was observed to serve very minimal traffic with various 15-minute periods of zero vehicles during peak hours. Furthermore, a wide single-lane off-ramp for the westbound approach likely provides side-by-side stacking of vehicles, thereby providing separated approach movements. It is recommended that Carlisle Blvd & I-40 North Ramp (WB) intersection be

re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.

- For Carlisle Blvd & I-40 North Ramp (WB)
  - No capacity or queueing issues are observed for this intersection. However, because of this intersection's proximity and connected functionality to the intersection of Carlisle Blvd & I-40 North Ramp (WB), it is recommended that this intersection be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.
- North Driveway 1 (shared easement with existing development to use for fast-food restaurant)
  - Right turn auxiliary lane is recommended.
    - It is noted that existing right-of-way and utilities may prevent or hinder construction of an auxiliary lane. Additional research is required to determine right-of-way and utility impacts.
  - Potential driveway reconstruction with CABQ required curb returns.
- North Driveway 2
  - Recommended to close this driveway to meet CABQ required driveway spacing and provide adequate deceleration length for the auxiliary lane at the driveway to the north.
- South Full Access Driveway 3 (Prospect)
  - Right turn auxiliary lane is recommended.
    - It is noted that existing right-of-way and utilities may prevent or hinder construction of an auxiliary lane. Additional research is required to determine right-of-way and utility impacts.
  - Driveway reconstruction with CABQ required curb returns.
  - Existing landscape concrete wall on both sides of the driveway entrance connects to curb return and presents pedestrian access and safety issues. It is recommended to remove the existing landscape wall and reconstruct curb ramps, sidewalks and landscaping to accommodate ADA compliance.

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INTRODUCTION

This report details the procedures and findings of a Traffic Impact Study (TIS) performed by Lee Engineering for Equiterra Regenerative Design. This report and the analyses contained herein were performed for a proposed mixed land use development at 2500 Carlisle Blvd within Albuquerque (CABQ), NM. All analyses and items contained herein conform to scoping meeting held on May 4, 2021. Scoping meeting notes and forms are located in Appendix A. Analysis procedures, conclusions, and recommendations for this study were developed according to the *ITE Trip Generation Manual 10th Edition, and Highway Capacity Manual 6th Edition*.

Construction is anticipated to begin in 2021, with full completion of the development in 2022. The development is to be constructed in one single phase.

Analysis procedures included in this report were performed for the following scenarios:

1. Existing Conditions (2021)
2. Background - No Build (2022)
3. Full Build – Complete Construction (2022)

PROJECT LOCATION & SITE PLAN

The proposed development is to be located at 2500 Carlisle Blvd at the southeast corner of Carlisle Blvd and Menaul Blvd with CABQ, NM. The development lies just north of Interstate 40. The project area is bound by existing development. Figure 1 shows the study locations and surrounding the area. Figure 2 shows the proposed site plan.

The proposed development contains the following elements:

- Additional apartments (8 dwelling units)
- 2000 sq. ft. fast-food restaurant
- 3000 sq. ft. retail space
- Gas station with 12-vehicle fueling positions

SITE ACCESS

Access to the development is granted or available via three existing driveways off Carlisle Blvd. The most southern access between the proposed gas station and apartments is a full access driveway. The other two driveways can only be accessed traveling NB on Carlisle Blvd and are right-in, right-out driveways, with one being a share access easement with existing retail. A review of compliance with CABQ DPM at proposed access points was conducted, as well as driveway access. Details of the review are included in the subsequent section of this report.

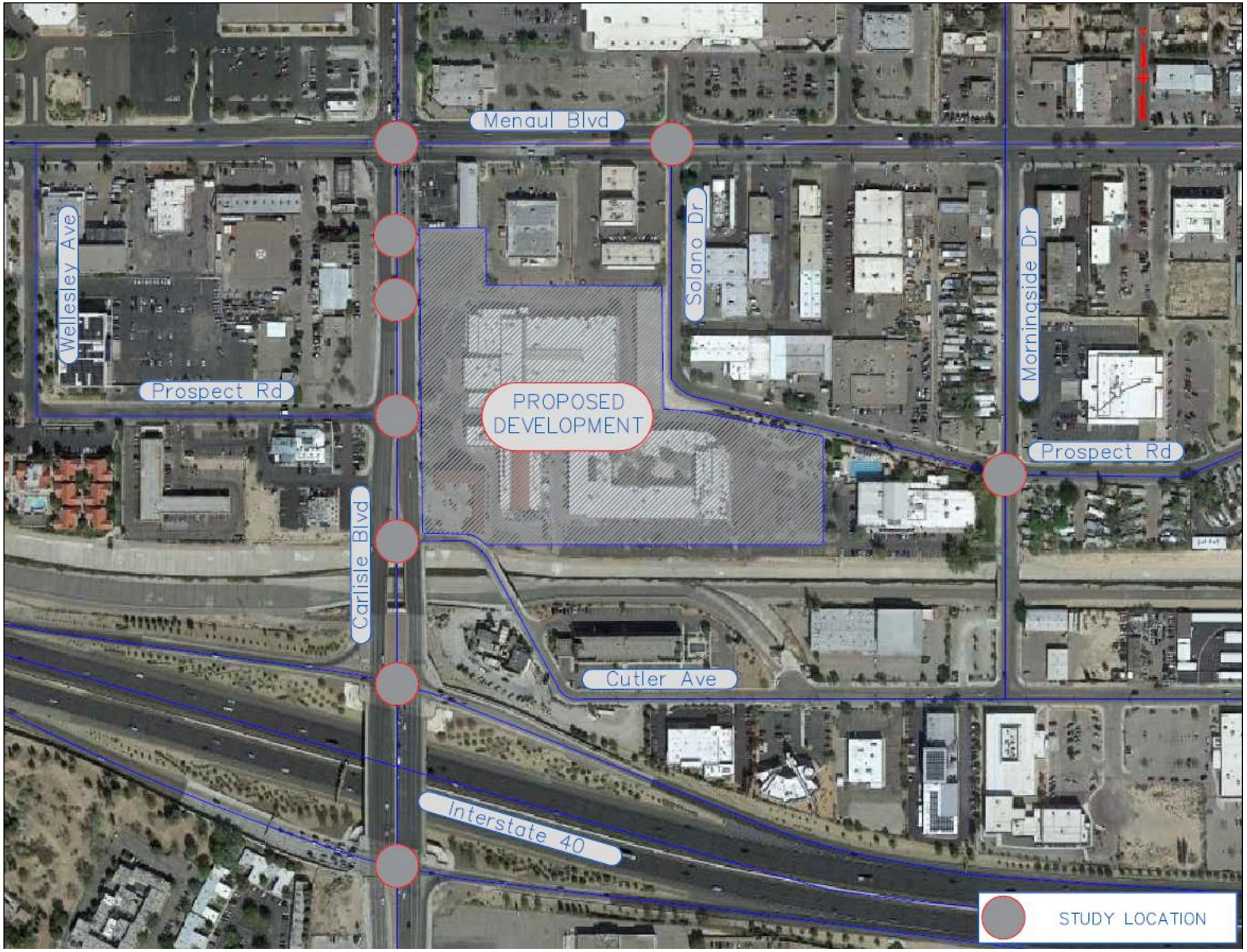

Figure 1. Vicinity Map

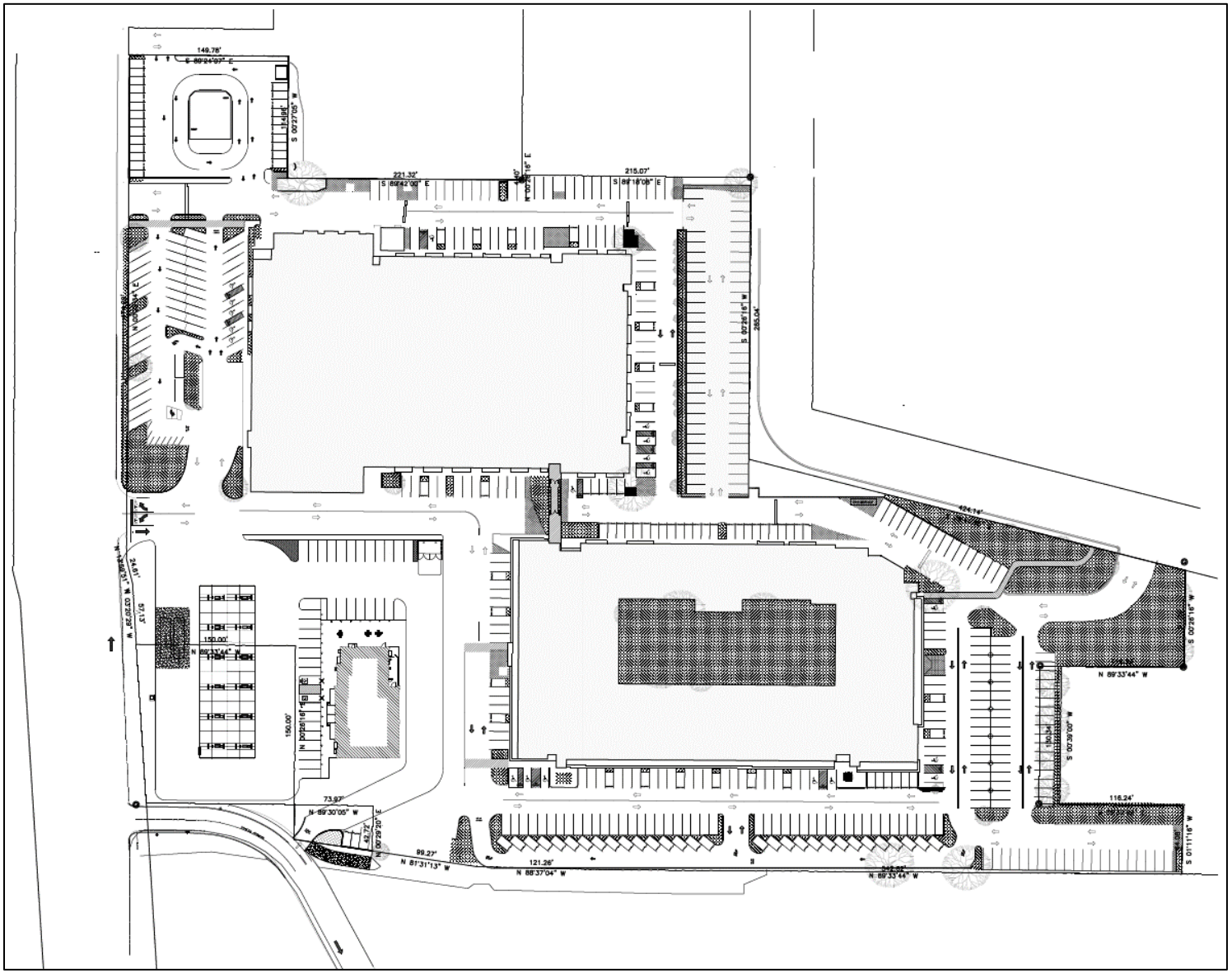

Figure 2. Site Plan

Study Area, Area Land Use, and Streets

STUDY AREA

The study area is presumed to be bounded by Carlisle Blvd, Menaul Blvd, and Solano Dr. The following intersections and access driveways were identified and served as the study intersections for this study:

- Carlisle Blvd & Menaul Blvd
- Carlisle Blvd & Access North Driveway 1; shared with existing development (right-in, right-out only)
- Carlisle Blvd & Access North Driveway 2; (right-in, right-out only)
- Carlisle Blvd & Prospect Ave South Driveway 3; (full access)
- Carlisle Blvd & Cutler Ave
- Carlisle Blvd & I-40 WB
- Carlisle Blvd & I-40 EB
- Menaul & Solano Dr
- Prospect Ave & Morningside Dr

AREA LAND USE

The development lies just north of Interstate 40. The development is to be located on Carlisle Blvd south of Menaul Blvd intersection. The project area is bound by existing development. Adjacent to and surrounding the project site are land uses consisting of the following:

- Commercial: Some land use is commercial in nature, with commercial developments north of the site and throughout the Carlisle Blvd corridor. These developments include Walgreens, Mattress Firm, and Firestone Tire Shop.
- Hospitality and Service: Several hotels/motels exist along the study area corridors, as well as a handful of sit-down and fast-food restaurants.
- Residential: East of the study area exists multi-family housing and apartments. Other developments in the area include a charter high school adjacent to the duplex housing development.
- Other development west of the site is New Mexico State Police Department

STREETS

The following details the characteristics and features of streets included in the study area:

Carlisle Blvd is a six-lane raised median divided roadway currently classified by MRCOG as a Minor Arterial running north and south. Travel lanes are approximately 12 feet wide, with three through lanes in each direction. The roadway has dedicated westbound and eastbound auxiliary left-turn lanes at Prospect Ave with about 150 ft of storage. Street incorporates curb, gutter, and sidewalks on both sides of the roadway. Within the project area, the posted speed is 35 MPH. MRCOG traffic count data (2018) reports average weekday traffic in the study area to be between 25,000 to 27,000 vehicles per day.

Menaul Blvd is a six-lane raised median divided roadway, currently classified by MRCOG as a Principal Arterial and runs east and west. Travel lanes are approximately 12-feet wide, with three through lanes in each direction. The roadway has several auxiliary left-turn lanes at minor road intersections in the study area. Street incorporates curb, gutter, and sidewalk on both sides of the roadway. Within the project area, the posted speed is 35 MPH. The most recently available MRCOG traffic count data (2018) reports the average weekday traffic in the study area to be 24,000 to 31,000 vehicles per day.

Cutler Ave is a one-lane, one-way minor collector roadway near Carlisle Blvd. Roadway becomes two-lane on the east side of the bridge that crosses the Embudo Chanel. Travel lanes are approximately 15-feet wide, and the roadway is undivided with no striping. Street incorporates curb, gutter, and sidewalk on both sides of the roadway. Within the project area, the posted speed is 25 MPH. MRCOG traffic count data for Cutler Ave could not be found.

Solano Dr is a two-lane undivided minor collector roadway, runs north and south, then turns into Prospect Ave as it changes direction to run west and east. Travel lanes are approximately 17-feet wide, and the roadway is undivided with no striping. Street incorporates curb, gutter, and sidewalk on both sides of the roadway. The posted speed is not signed; therefore, by the City ordinance, the speed limit is 25 MPH. MRCOG traffic count data for Solano Dr could not be found.

Prospect Ave is a two-lane undivided minor collector roadway segment that runs east and west between Carlisle Blvd and Wellesley Ave. Travel lanes are approximately 20-feet wide, and the roadway is undivided with no striping. Street incorporates curb, gutter, and sidewalk on both sides of the roadway. The posted speed is not signed; by the City ordinance, the speed limit is 25 MPH. MRCOG traffic count data for Prospect Ave could not be found.

Morningside Dr is a two-lane undivided and unclassified, presumed to be a local roadway segment that runs north and south between Menaul Blvd and Cutler Ave. Travel lanes are approximately 20-feet wide, and the roadway is undivided with no striping. Street incorporates curb, gutter, and sidewalk on both sides of the roadway. The posted speed is not signed; by the City ordinance, the speed limit is 25 MPH. MRCOG traffic count data for Morningside Dr could not be found.

I-40 North Ramp is a one-lane one-way Interstate off-ramp (exit 160) roadway that runs westbound and transitions into three lanes at Carlisle Blvd signalized intersection. Travel lanes are approximately 12-feet wide, with a posted speed of 40 MPH.

I-40 South Ramp is a two-lane one-way Interstate off-ramp (exit 160) roadway that runs eastbound and transitions into five lanes at Carlisle Blvd signalized intersection. Travel lanes are approximately 12-feet wide, with a posted speed of 45 MPH.

INTERSECTIONS

The following details the traffic control and characteristics of existing intersections in the study area:

Carlisle Blvd & Menaul Blvd is a 4-legged signalized intersection maintained by the City of Albuquerque. The signal operates with time-of-day coordination. Pedestrian crosswalks exist at all approaches of the intersection.

Carlisle Blvd & Prospect is an unsignalized two-way stop control intersection maintain by the City of Albuquerque. Pedestrian crosswalks are unmarked on both sides of minor roadway.

Carlisle Blvd & I-40 North/South Off Ramp is a signalized Interstate Diamond Interchange maintained by the City of Albuquerque. The signals operate with time-of-day coordination. Pedestrian crosswalks exist at all approaches of the intersection. It is important to note right turn on red is not allowed except for the southbound channelized right-turn movement.

Menaul Blvd & Solano Dr is an unsignalized two-way stop control intersection maintain by the City of Albuquerque. Pedestrian crosswalks are unmarked on both sides of minor roadway.

Prospect Ave & Morningside Dr is an unsignalized two-way stop control intersection maintain by the City of Albuquerque. Pedestrian crosswalks are unmarked on both sides of minor roadway.

TRANSIT

Currently, two bus routes are present in the study area. Route 8 operates every day with stops every 30 minutes in the westbound and eastbound directions on Menaul Blvd. Route 5 operates every day with stops every 30 mins in the northbound and southbound directions on Carlisle Blvd with a bus stop east of the proposed development between North Driveway 1 and North Driveway 2.

Multimodal Connectivity

Currently, bicycle facilities are not present immediately near the development. Sidewalks exist on both sides of all streets in compliance with CABQ DPM within the study area. It is noted that sidewalks and curb ramps were not assessed for ADA compliance.

Current Adjacent Projects

The nearby Kmart Redevelopment project has been proposed at the northeast corner of Indian School Rd and Carlisle Blvd, just south of I-40. The proposed development is a 50,000 sq. ft. supermarket, 2,200 sq. ft. fast-food restaurant w/ drive-thru window, and 67,710 sq. ft. shopping center. Development is to be constructed in one phase and to be completed by 2021.

ANALYSIS OF EXISTING CONDITIONS

Data Collection

Turning movement counts for the study intersections at Carlisle Blvd & Menaul Blvd, Carlisle Blvd & North Driveway 1 (right-in, right-out only), Carlisle Blvd & North Driveway 2 (right-in, right-out only), Carlisle Blvd & Prospect Ave South Driveway 3 (full access), Carlisle Blvd & Cutler Ave, Carlisle Blvd & I-40 North Ramp (WB), Carlisle Blvd & I-40 South Ramp (EB), Menaul & Solano Dr, and Prospect Ave & Morningside Dr were collected for 9 hours in 3-periods: 6:00 AM-9:00 AM (morning), 11:00 AM-2:00 PM (mid-day), and 3:00 PM-6:00 PM (evening) on May 18 and May 20, 2021.

Traffic data from a 2019 Congestion Management Study at the I-40 interchange was used to establish a COVID-19 adjustment factor, as necessary. The 2019 turning movement counts were forecasted to the current year (2021) using data from MRCOG projected travel demand growth rates (see growth rate section for rates & details) prior to comparison to current year (2021) traffic counts. Newly collected traffic data at Carlisle Blvd & I-40 interchange, in coordination with adjusted 2019 Congestion Management Study traffic data, determined an adjustment factor was needed to account for reduced traffic volumes during the COVID-19 pandemic. Factors were determined for the AM and PM peak hours and applied to all study intersections. Factors were determined for the AM and PM peak hours to be 1.20 and 1.04 and applied to all study intersections. Adjustment factor calculation tables are located in appendix. Table 1 below shows the peak hours for each intersection used in the analysis. Adjusted current year turning movement counts, lane geometry, and traffic control for the study intersections are presented in Figure 3. Full turning movement count sheets can be found in Appendix B.

Table 1: Intersection Peak Hours

Intersection	Data Collection Date	AM Peak Hour	PM Peak Hour
Carlisle Blvd & Menaul Blvd	5/18/2021	7:45-8:45 AM	3:45-4:45 PM
Carlisle Blvd & Access North Dwy 1	5/18/2021		
Carlisle Blvd & Access North Dwy 2	5/18/2021		
Carlisle Blvd & Prospect Ave (Full-Access Dwy 3)	5/18/2021		
Carlisle Blvd & Cutler Ave	5/18/2021		
Carlisle Blvd & I-40 WB	5/20/2021		
Carlisle Blvd & I-40 EB	5/20/2021		
Menaul Blvd & Solano Dr	5/18/2021		
Prospect Ave & Morningside Dr	5/18/2021		

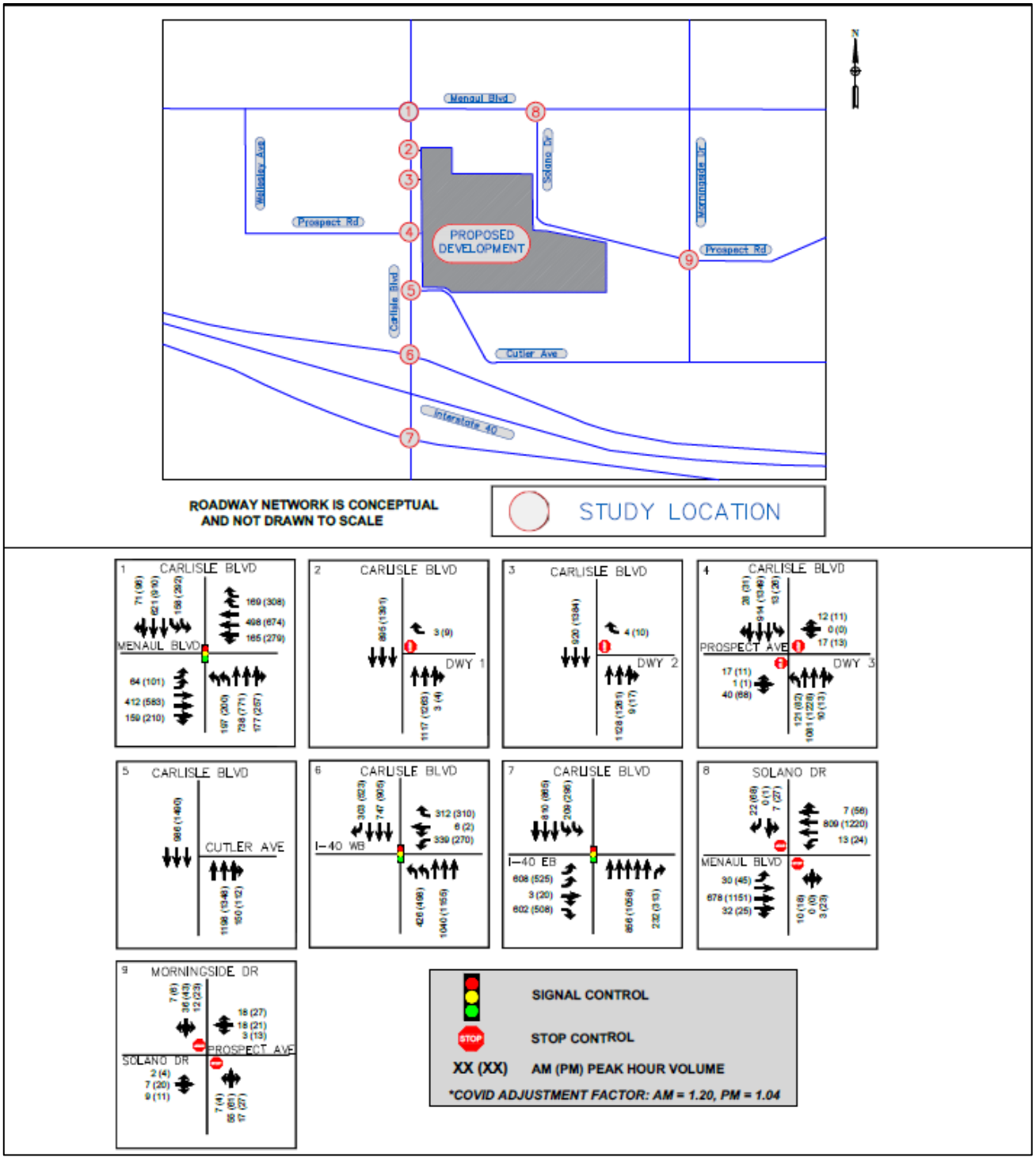

Figure 3. Existing (Adjusted) 2021 Turning Movement Counts

Level of Service and Capacity Analysis

Intersection Analysis Methodology

Intersection Capacity and Level of Service (LOS) analysis were performed according to the methods and procedures provided in the *Highway Capacity Manual, 6th Edition (HCM6).* Highway Capacity software was used to facilitate the analysis. Per the Highway Capacity Manual, LOS is presented as a letter grade (A through F) based on the calculated average delay for an intersection or movement. Delay is calculated as a function of several variables, including signal phasing operations, cycle length, traffic volumes, and opposing traffic volumes, but is a measurement of the average wait time a driver can expect when moving through an intersection. Factors such as total cycle time (for all movements), queueing restrictions, and vehicle volumes can affect measurements of delay, especially for lower volume movements and side streets. Generally, these factors are only realized when delays reach or exceed LOS E thresholds. In such cases, a narrative is offered in subsequent sections specific to the individual movement in question.

Table 2 below, reproduced from the Highway Capacity Manual, shows delay thresholds and the associated Level of Service assigned to delay ranges. Generally, a LOS of D or better is considered an acceptable level of service.

Table 2: LOS Criteria and Descriptions for Signalized Intersections

Level of Service	Average Control Delay (sec/vehicle)	General Description (Signalized Intersections)
A	≤10	Free flow
B	>10 – 20	Stable flow (slight delays)
C	>10 – 35	Stable flow (acceptable delays)
D	>35 – 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 – 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

Unsignalized intersection LOS is divided into two intersection types: all-way stop-controlled and two-way stop-controlled. All-way stop-controlled intersection LOS is expressed in terms of the average vehicle delay of all the movements. Two-way stop-controlled intersection LOS is defined in terms of the average vehicle delay of an individual movement. Table 3 shows LOS criteria for unsignalized intersections.

Table 3: LOS Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤10
B	>10 – 15
C	>15 – 25
D	>25 – 35
E	>35 – 50
F	>50

Based on procedures outlined in the Highway Capacity Manual, intersection delay and LOS for study intersections are reported as the delay and level of service for the worst-case movement. Per HCM6 procedures, peak hour factors obtained from collected traffic counts for the intersections were used in the existing conditions analysis and all other scenarios. Queues are reported for queue measurements falling within the 95th percentile. It should be noted that 95th percentile queues are statistically expected to occur during only 5% of the peak hour's sign cycles. It is also noted that un-reported average queueing at an intersection would statistically be much shorter than 95th percentile queueing.

Analysis of Signalized Intersections

The tables below summarizes AM and PM peak hour intersection capacity, LOS analysis, and queueing performed for adjusted existing 2021 conditions for the signalized intersections at Carlisle Blvd & Menaul Blvd, Carlisle Blvd & I-40 WB/EB Interchange (North Ramp and South Ramp). Per HCM6 procedures, peak hour factors obtained from collected traffic counts for the intersections were used in the existing conditions analysis and all other scenarios. Existing signal timings for signalized intersections provided by CABQ were used in each analysis scenario unless otherwise stated. Queueing is reported as a ratio Que Storage Ratio (QSR) for signalized intersections and indicates the ratio of demand to capacity based on possible lengths of waiting vehicles during "red" times for specific movements. A multi-period analysis was used for signalized intersections. Detailed capacity output sheets can be found in Appendix D.

CAPACITY ANALYSIS OF SIGNALIZED INTERSECTIONS

Table 4 below presents a capacity analysis for all the signalized study intersections as a whole. Analyses for individual intersections showing each movement are summarized in Table 5 through Table 10.

Table 4: 2021 Existing Intersection Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd					
2021 AM Existing			2021 PM Existing		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	32.2	C	3:45	38.1	D
8:00	31.5	C	4:00	39.8	D
8:15	29.8	C	4:15	37.7	D
8:30	31.9	C	4:30	38.2	D
Carlisle Blvd & I-40 WB (North Ramp)					
2021 AM Existing			2021 PM Existing		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	26.2	C	3:45	22.0	C
8:00	27.6	C	4:00	19.5	B
8:15	22.4	C	4:15	19.3	B
8:30	22.6	C	4:30	21.2	C
Carlisle Blvd & I-40 EB (South Ramp)					
2021 AM Existing			2021 PM Existing		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	26.4	C	3:45	25.6	C
8:00	30.0	C	4:00	25.6	C
8:15	24.7	C	4:15	26.8	C
8:30	25.5	C	4:30	25.5	C

From the table above, the following is summarized:

Carlisle Blvd & Menaul Blvd

- Capacity Analysis:
  - Under existing conditions, the intersection as a whole is observed to operate at an acceptable level of service in both the AM and PM peak hours.

Carlisle Blvd & I-40 WB (North Ramp)

- Capacity Analysis:
  - Under existing conditions, the intersection as a whole is observed to operate at an acceptable level of service in both the AM and PM peak hours.

Carlisle Blvd & I-40 EB (South Ramp)

- Capacity Analysis:
  - Under existing conditions, the intersection as a whole is observed to operate at an acceptable level of service in both the AM and PM peak hours.

CARLISLE BLVD & MENAUL BLVD

Table 5: 2021 AM Existing Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	53.4	29.5	30.8	51.5	27.8	29.2	52.0	28.6	30.4	52.0	26.1	27.2
8:00	55.7	28.4	29.4	51.6	24.8	25.8	51.6	27.9	29.4	51.9	25.8	26.6
8:15	55.4	26.7	27.6	52.7	24.8	25.7	51.2	23.7	24.6	53.4	26.0	26.7
8:30	54.0	27.5	28.6	52.6	25.6	26.6	50.9	27.0	28.2	51.6	26.6	27.4
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	0.64	0.36	0.37	0.76	0.41	0.42	0.71	0.54	0.54	0.73	0.40	0.40
8:00	0.55	0.28	0.30	0.76	0.31	0.33	0.74	0.49	0.49	0.74	0.33	0.34
8:15	0.56	0.27	0.29	0.68	0.30	0.31	0.76	0.33	0.34	0.64	0.31	0.31
8:30	0.61	0.32	0.33	0.69	0.29	0.30	0.78	0.41	0.42	0.75	0.32	0.33
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	D	C	C	D	C	C	D	C	C	D	C	C
8:00	E	C	C	D	C	C	D	C	C	D	C	C
8:15	E	C	C	D	C	C	D	C	C	D	C	C
8:30	D	C	C	D	C	C	D	C	C	D	C	C
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL (250')	EBT	EBR	WBL (250')	WBT	WBR	NBL (300')	NBT	NBR	SBL (250')	SBT	SBR
7:45	0.24	-	-	0.50	-	-	0.33	-	-	0.42	-	-
8:00	0.10	-	-	0.49	-	-	0.39	-	-	0.44	-	-
8:15	0.11	-	-	0.32	-	-	0.43	-	-	0.24	-	-
8:30	0.19	-	-	0.34	-	-	0.48	-	-	0.48	-	-

Table 6: 2021 PM Existing Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	58.3	30.1	31.5	57.3	26.6	27.8	56.4	38.0	41.2	62.6	33.8	35.7
4:00	58.3	33.5	35.5	62.4	28.5	30.4	56.7	38.9	42.3	65.7	33.7	35.3
4:15	58.1	30.1	31.4	59.2	26.9	29.7	56.6	36.9	40.1	58.6	33.7	35.5
4:30	58.0	31.9	33.5	62.7	28.7	30.4	56.6	35.9	38.6	58.6	34.5	36.7
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	0.65	0.40	0.41	0.80	0.39	0.40	0.77	0.61	0.62	0.84	0.54	0.54
4:00	0.65	0.51	0.52	0.84	0.50	0.51	0.80	0.61	0.62	0.86	0.49	0.49
4:15	0.66	0.36	0.38	0.82	0.40	0.48	0.76	0.62	0.62	0.81	0.54	0.54
4:30	0.67	0.41	0.43	0.84	0.50	0.50	0.76	0.57	0.58	0.81	0.58	0.59
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	E	C	C	E	C	C	E	D	D	E	C	D
4:00	E	C	D	E	C	C	E	D	D	E	C	D
4:15	E	C	C	E	C	C	E	D	D	E	C	D
4:30	E	C	C	E	C	C	E	D	D	E	C	D
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL (250')	EBT	EBR	WBL (250')	WBT	WBR	NBL (300')	NBT	NBR	SBL (250')	SBT	SBR
3:45	0.27	-	-	0.67	-	-	0.45	-	-	0.88	-	-
4:00	0.27	-	-	0.87	-	-	0.54	-	-	1.00	-	-
4:15	0.29	-	-	0.76	-	-	0.43	-	-	0.73	-	-
4:30	0.30	-	-	0.88	-	-	0.42	-	-	0.73	-	-

From the tables above, the following is summarized:

Carlisle Blvd & Menaul Blvd

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for AM peak hour with the exception of the eastbound left turn for two multi-peak periods (LOS E). In the PM peak hour, all left turn movements are observed to operate at LOS E for all four multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.

- Queueing Analysis:
  - Under existing conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours except for the southbound left turn in the PM peak hour, which shows a QSR equal to or greater than 1 for one multi-peak period.

Carlisle Blvd & I-40 WB (North Ramp)

Table 7: 2021 AM Existing Capacity Analysis Summary at Carlisle Blvd & I-40 WB (North Ramp)

Carlisle Blvd & I-40 WB (North Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	41.0	41.7	51.3	55.2	16.0	-	-	13.7	-
8:00	-	-	-	38.8	0.0	60.0	54.4	19.9	-	-	14.0	-
8:15	-	-	-	40.1	40.3	51.7	54.7	14.0	-	-	8.6	-
8:30	-	-	-	40.4	40.6	51.5	54.6	13.8	-	-	9.7	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	0.59	0.64	0.85	0.85	0.29	-	-	0.43	-
8:00	-	-	-	0.67	0.00	0.91	0.82	0.35	-	-	0.37	-
8:15	-	-	-	0.42	0.43	0.85	0.81	0.28	-	-	0.31	-
8:30	-	-	-	0.47	0.48	0.85	0.82	0.29	-	-	0.36	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	D	D	D	E	B	-	-	B	-
8:00	-	-	-	D	-	E	D	B	-	-	B	-
8:15	-	-	-	D	D	D	D	B	-	-	A	-
8:30	-	-	-	D	D	D	D	B	-	-	A	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR	WBL (350')	WBT	WBR (350')	NBL (350')	NBT (350')	NBR	SBL	SBT	SBR
7:45	-	-	-	0.66	-	0.88	0.93	0.78	-	-	-	-
8:00	-	-	-	0.90	-	1.29	0.69	0.89	-	-	-	-
8:15	-	-	-	0.44	-	0.82	0.69	0.74	-	-	-	-
8:30	-	-	-	0.50	-	0.83	0.75	0.75	-	-	-	-

Table 8: 2021 PM Existing Capacity Analysis Summary at Carlisle Blvd & I-40 WB (North Ramp)

Carlisle Blvd & I-40 WB (North Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	44.2	-	68.6	53.6	5.4	-	-	14.6	-
4:00	-	-	-	40.2	40.5	66.1	51.6	3.6	-	-	13.4	-
4:15	-	-	-	51.7	-	61.7	50.9	5.6	-	-	10.8	-
4:30	-	-	-	60.8	-	58.7	52.0	3.3	-	-	12.3	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	0.64	-	0.92	0.89	0.37	-	-	0.45	-
4:00	-	-	-	0.33	0.35	0.90	0.87	0.32	-	-	0.51	-
4:15	-	-	-	0.77	-	0.87	0.86	0.31	-	-	0.44	-
4:30	-	-	-	0.88	-	0.85	0.87	0.26	-	-	0.50	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	D	-	E	D	A	-	-	B	-
4:00	-	-	-	D	D	E	D	A	-	-	B	-
4:15	-	-	-	D	-	E	D	A	-	-	B	-
4:30	-	-	-	E	-	E	D	A	-	-	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR	WBL (350')	WBT	WBR (350')	NBL (350')	NBT (350')	NBR	SBL	SBT	SBR
3:45	-	-	-	0.84	-	1.26	0.84	0.35	-	-	-	-
4:00	-	-	-	0.41	-	1.14	0.78	0.21	-	-	-	-
4:15	-	-	-	0.88	-	0.94	0.78	0.36	-	-	-	-
4:30	-	-	-	1.11	-	0.94	0.82	0.17	-	-	-	-

From the tables above, the following is summarized:

Carlisle Blvd & I-40 WB (North Ramp)

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours with the exception of the westbound right turn and northbound left turn in the AM for one multi-peak period (LOS E). In the PM peak hour, the westbound left turn is operating at LOS E for one multi-peak period, and the westbound right turn is operating at LOS E for all four multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.

- Queueing Analysis:
  - Under existing conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours except for the westbound right turn in the AM peak hour, which shows a QSR greater than 1. In the PM peak hour, westbound left turn for one multi-peak period and westbound right turn for two multi-peak periods show a QSR greater than 1.

CARLISLE BLVD & I-40 EB (SOUTH RAMP)

Table 9: 2021 AM Existing Capacity Analysis Summary at Carlisle Blvd & I-40 EB (South Ramp)

Carlisle Blvd & I-40 EB (South Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	46.2	-	48.3	-	-	-	-	7.5	8.4	54.5	15.4	-
8:00	50.0	-	51.5	-	-	-	-	7.8	9.1	54.5	17.9	-
8:15	45.2	34.3	45.2	-	-	-	-	6.1	6.6	54.4	13.4	-
8:30	43.9	33.8	46.3	-	-	-	-	7.7	8.6	57.2	14.3	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	0.80	-	0.82	-	-	-	-	0.20	0.27	0.76	0.32	-
8:00	0.86	-	0.87	-	-	-	-	0.18	0.31	0.77	0.30	-
8:15	0.75	0.02	0.74	-	-	-	-	0.18	0.19	0.73	0.32	-
8:30	0.73	0.01	0.77	-	-	-	-	0.21	0.26	0.80	0.37	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	D	-	D	-	-	-	-	A	A	D	B	-
8:00	D	-	D	-	-	-	-	A	A	D	B	-
8:15	D	C	D	-	-	-	-	A	A	D	B	-
8:30	D	C	D	-	-	-	-	A	A	E	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR (700')	WBL	WBT	WBR	NBL	NBT (800')	NBR (450')	SBL (350')	SBT (350')	SBR
7:45	-	-	0.46	-	-	-	-	0.07	0.18	0.40	0.67	-
8:00	-	-	0.50	-	-	-	-	0.07	0.22	0.40	0.69	-
8:15	-	-	0.38	-	-	-	-	0.06	0.11	0.34	0.55	-
8:30	-	-	0.40	-	-	-	-	0.08	0.17	0.52	0.63	-

Table 10: 2021 PM Existing Capacity Analysis Summary at Carlisle Blvd & I-40 EB (South Ramp)

Carlisle Blvd & I-40 EB (South Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	47.2	36.9	46.1	-	-	-	-	8.7	9.8	55.0	18.3	-
4:00	45.5	37.6	47.8	-	-	-	-	8.5	10.3	54.4	19.2	-
4:15	47.9	36.3	43.5	-	-	-	-	8.1	9.4	56.6	22.3	-
4:30	43.6	37.3	48.2	-	-	-	-	9.1	10.6	55.1	14.9	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	0.73	0.04	0.69	-	-	-	-	0.27	0.32	0.81	0.31	-
4:00	0.66	0.05	0.73	-	-	-	-	0.24	0.39	0.82	0.34	-
4:15	0.76	0.03	0.60	-	-	-	-	0.22	0.33	0.79	0.51	-
4:30	0.60	0.08	0.75	-	-	-	-	0.22	0.34	0.82	0.36	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	D	D	D	-	-	-	-	A	A	D	B	-
4:00	D	D	D	-	-	-	-	A	B	D	B	-
4:15	D	D	D	-	-	-	-	A	A	E	C	-
4:30	D	D	D	-	-	-	-	A	B	E	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR (700')	WBL	WBT	WBR	NBL	NBT (800')	NBR (450')	SBL (350')	SBT (350')	SBR
3:45	-	-	0.39	-	-	-	-	0.12	0.25	0.56	0.73	-
4:00	-	-	0.40	-	-	-	-	0.10	0.32	0.58	0.82	-
4:15	-	-	0.34	-	-	-	-	0.09	0.25	0.51	0.84	-
4:30	-	-	0.42	-	-	-	-	0.09	0.27	0.60	0.72	-

From the tables above, the following is summarized:

Carlisle Blvd & I-40 EB (South Ramp)

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours with the exception of the southbound left turn in the AM peak hour for one multi-peak period & in the PM peak hours for two multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.
- Queueing Analysis:
  - Under existing conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours.

Analysis of Stop Controlled Intersections

Table 11 below summarizes stop-controlled intersection capacity, LOS analysis, and queuing results performed for existing conditions for the unsignalized intersections. Queueing is reported as the number of vehicles in the queue for stop-controlled intersections. It is important to note that due to the roadway configuration and absence of traffic control at Carlisle Blvd and Cutler Ave, HCS capacity analysis could not be performed. Detailed capacity output sheets can be found in Appendix D.

Table 11: 2021 Existing Stop-Control Capacity Analysis Summary

Carlisle Blvd & North Driveway 1								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
WBR	0.01	15.1	C	0.00	0.03	15.9	C	0.10
Carlisle Blvd & North Driveway 2								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
WBR	0.01	15.2	C	0.00	0.03	16.1	C	0.10
Carlisle Blvd & Prospect Ave Driveway 3								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL/T/R	0.35	33.5	D	1.50	0.55	53.0	F	2.80
WBL/T/R	0.47	92.9	F	1.90	0.29	62.3	F	1.10
NBL	0.41	22.1	C	1.90	0.37	28.8	D	1.60
SBL	0.05	16.8	C	0.20	0.09	18.1	C	0.30
Menaul Blvd & Solano Dr								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL	0.08	13.6	B	0.30	0.16	19.9	C	0.60
WBL	0.03	11.2	B	0.10	0.07	15.7	C	0.20
NBL/T/R	0.07	21.1	C	0.20	0.26	33.8	D	1.00
SBL/T	0.05	25.3	D	0.10	0.34	66.9	F	1.30
SBR	0.06	13.6	B	0.20	0.21	18.2	C	0.80
Prospect Ave & Morningside Dr								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL/T/R	0.00	7.3	A	0.00	0.00	7.3	A	0.00
WBL/T/R	0.00	7.3	A	0.00	0.01	7.3	A	0.00
NBL/T/R	0.10	9.6	A	0.40	0.13	10.0	B	0.40
SBL/T/R	0.07	9.6	A	0.20	0.11	10.3	B	0.40

From the tables above, the following is summarized:

Carlisle Blvd & North Driveway 1 (Right-in/Right-out)

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
- Queueing Analysis:
  - Under existing conditions, 95th percentile lengths at the intersection are observed to be operating at acceptable levels during the AM and PM peak hours.

Carlisle Blvd & North Driveway 2 (Right-in/Right-out)

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
- Queueing Analysis:
  - Under existing conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

Carlisle Blvd & Prospect Ave; Driveway 3 (Full Access)

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for AM hours except for the westbound approach in the AM. In the PM peak hour, the westbound approach and eastbound approach are observed to operate at LOS F. It is noted that the v/c ratio for these movements indicates that the movements do not exceed capacity and is therefore attributed to gap-delays for the movements.
- Queueing Analysis
  - Under existing conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

Menaul Blvd & Solano Dr

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours except for the shared southbound through/left approach in the PM peak hour. It is noted that the v/c ratio for this movement indicates that the movement does not exceed capacity and is therefore attributed to gap delays for the movement.
- Queueing Analysis
  - Under existing conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

Prospect Ave & Morningside Dr

- Capacity Analysis:
  - Under existing conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
- Queueing Analysis
  - Under existing conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

ANALYSIS OF FUTURE CONDITIONS

The following sections detail the methods and calculations used to obtain traffic volumes for each analysis scenario. This process used the following tools as described below: Traffic Projections and Site Trip Distributions & Assignment. Figures at the end of this section show the resulting traffic volumes determined for each analysis scenario.

TRAFFIC PROJECTIONS

Construction is anticipated to begin in 2021, with full completion of the development in 2022. To forecast existing traffic volumes to future analysis background conditions, loading values from the 2016 & 2040 (updated) travel demand models were provided by MRCOG. These models were then compared, using AM and PM peak hour directional volumes (AMPH LOAD & PMPH LOAD) to calculate anticipated growth rates for individual roadways within the study area. To facilitate a conservative analysis, roadways calculated to have a yearly growth rate of less than 1% were analyzed with a 1% per year growth rate. Growth rates were then converted to growth factors for the specific analysis scenarios. Growth factors used in the analysis are shown in Table 12. Values provided by MRCOG are reproduced verbatim below. Growth factors were then applied to the 2021 adjusted conditions turning movement volumes to forecast future volumes.

Table 12: Growth Rate Method

Roadway			MRCOG 2016 Model "Peak Hour Load"	MRCOG 2040 Model "Peak Hour Load"	Yearly Growth Rate	Average Yearly Growth	Growth Rate for Analysis
Carlisle Blvd South of I-40 (NB)	AM	PH	1610	1745	0.34%	0.57%	1.00%
	PM	PH	1911	1986	0.16%		
Carlisle Blvd South of I-40 (SB)	AM	PH	1720	1922	0.46%		
	PM	PH	1782	1989	0.46%		
Carlisle Blvd I-40 Overpass (NB)	AM	PH	1641	1861	0.53%		
	PM	PH	1551	1900	0.85%		
Carlisle Blvd I-40 Overpass (SB)	AM	PH	1358	1381	0.07%		
	PM	PH	1521	1654	0.35%		
Carlisle Blvd North of I-40 (NB)	AM	PH	1767	1914	0.33%		
	PM	PH	1456	1805	0.90%		
Carlisle Blvd North of I-40 (SB)	AM	PH	1114	1228	0.41%		
	PM	PH	1548	1731	0.47%		
Carlisle Blvd South of Menaul Blvd (NB)	AM	PH	1440	1607	0.46%		
	PM	PH	1221	1517	0.91%		
Carlisle Blvd South of Menaul Blvd (SB)	AM	PH	926	1003	0.33%		
	PM	PH	1187	1383	0.64%		
Carlisle Blvd North of Menaul Blvd (NB)	AM	PH	1204	1471	0.84%		
	PM	PH	1139	1471	1.07%		
Carlisle Blvd North of Menaul Blvd (SB)	AM	PH	1032	1252	0.81%		
	PM	PH	1154	1485	1.06%		
Menaul Blvd West of Carlisle Blvd (WB)	AM	PH	654	754	0.59%	1.72%	
	PM	PH	468	603	1.06%		
Menaul Blvd West of Carlisle Blvd (EB)	AM	PH	369	494	1.22%		
	PM	PH	777	1009	1.09%		
Menaul Blvd East of Carlisle Blvd (WB)	AM	PH	294	499	2.23%		
	PM	PH	280	481	2.28%		
Menaul Blvd East of Carlisle Blvd (EB)	AM	PH	351	624	2.43%		
	PM	PH	636	988	1.85%		
Menaul Blvd East of Solano Dr (WB)	AM	PH	372	586	1.91%		
	PM	PH	275	451	2.08%		
Menaul Blvd East of Solano Dr (EB)	AM	PH	341	586	2.28%		
	PM	PH	723	1054	1.58%		
Prospect Ave West of Carlisle Blvd (WB)	AM	PH	110	123	0.47%	0.51%	
	PM	PH	120	130	0.33%		
Prospect Ave West of Carlisle Blvd (EB)	AM	PH	62	77	0.91%		
	PM	PH	120	130	0.33%		
I-40 EB West of Carlisle Blvd (EB)	AM	PH	1444	1685	0.65%	0.32%	
	PM	PH	1179	1466	0.91%		
I-40 EB East of Carlisle Blvd (EB)	AM	PH	1050	1027	-0.09%		
	PM	PH	1277	1216	-0.20%		
I-40 WB East of Carlisle Blvd (WB)	AM	PH	1155	1107	-0.18%	-0.05%	
	PM	PH	1048	948	-0.42%		
I-40 WB West of Carlisle Blvd (WB)	AM	PH	785	901	0.58%		
	PM	PH	1170	1120	-0.18%		

Trip Generation

Trip generation for the development was performed using the procedures and methodologies provided in the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 10th Edition.* The land-use categories Multifamily Low-Rise Housing (ITE 220), Super Convenience Market/Gas Station (ITE 960), Fast Food Restaurant with Drive-Through Window (ITE 934), and Variety Store (ITE 814) were used to generate trips for the development. Trips were calculated using rates for daily, AM peak hour, and PM peak hour generators. The development is to consist of one single phase. The trips generated by each land use are shown below in the tables. Site trips for the development site were generated using data and procedures according to the ITE Trip Generation Manual. Due to the nature of this development, pass-by trips were calculated per the ITE Trip Generation Manual 10th Edition and assigned to new project trips. The net site generated trips (gross trips generated minus pass-by trips), shown as primary trips, were added to background traffic volumes to create the build-out traffic volumes.

Table 13 and Table 14 below show expected unadjusted trips, pass-by trips, and primary trips generated by the development.

Table 13: Development Trip Generation

Use	Units		TRIP GENERATION							PEAK HOUR TRIPS				
			Daily Rate	AM Peak			PM Peak			Daily	AM Peak		PM Peak	
				Rate	Enter	Exit	Rate	Enter	Exit		In	Out	In	Out
ITE 220 - Multifamily Housing (Low-Rise), Peak Hour of Generator	8	Dwelling Units	7.32	0.56	28%	72%	0.67	59%	41%	59	2	4	4	3
ITE 960 - Super Convenience Market/Gas Station, Peak Hour of Generator	12	Fueling Stations	230.52	28.08	50%	50%	22.96	50%	50%	2766	168	169	138	138
ITE 934 - Fast Food Restaurant with Drive-Through Window, Peak Hour of Generator	2	1000 Sq. Ft GFA	470.95	50.97	52%	48%	51.36	51%	49%	942	53	49	52	51
ITE 814 - Variety Store, Peak Hour of Generator	3	1000 Sq. Ft GFA	63.47	4.52	50%	50%	7.42	50%	50%	190	7	7	11	11
Total Trips										3957	230	229	205	203

Table 14: Net Development Trip Generation

Use	AM Peak		PM Peak	
	In	Out	In	Out
Multifamily Housing	2	4	4	3
Gas Station	168	169	138	138
Fast Food	53	49	52	51
Variety Store	7	7	11	11
Unadjusted Total Trips	230	229	205	203
Pass-By Trips (Calculated by ITE Trip Generation Manual 10th Edition)				
Use	Rates		AM Peak		PM Peak	
	AM	PM	In	Out	In	Out
Gas Station	76%	76%	128	128	105	105
Fast Food	49%	50%	26	26	26	26
Total Pass-By Trips			154	154	131	131
Primary Trips			76	74	74	72

TRIP DISTRIBUTION AND ASSIGNMENT

Trip Distribution was determined based on the analysis of existing intersection demand characteristics within the study area. Overall, trips were distributed within the roadway network to and from the development based on the proportions of existing turning movement counts/demands. Trip routing was based on logical trip attractions and destinations for commercial-based trips. The figures below show the trip distribution and assignment for the development of each analysis scenario. Trips were then assigned to the background roadway networks to create build-out volumes and are shown in the figures below.

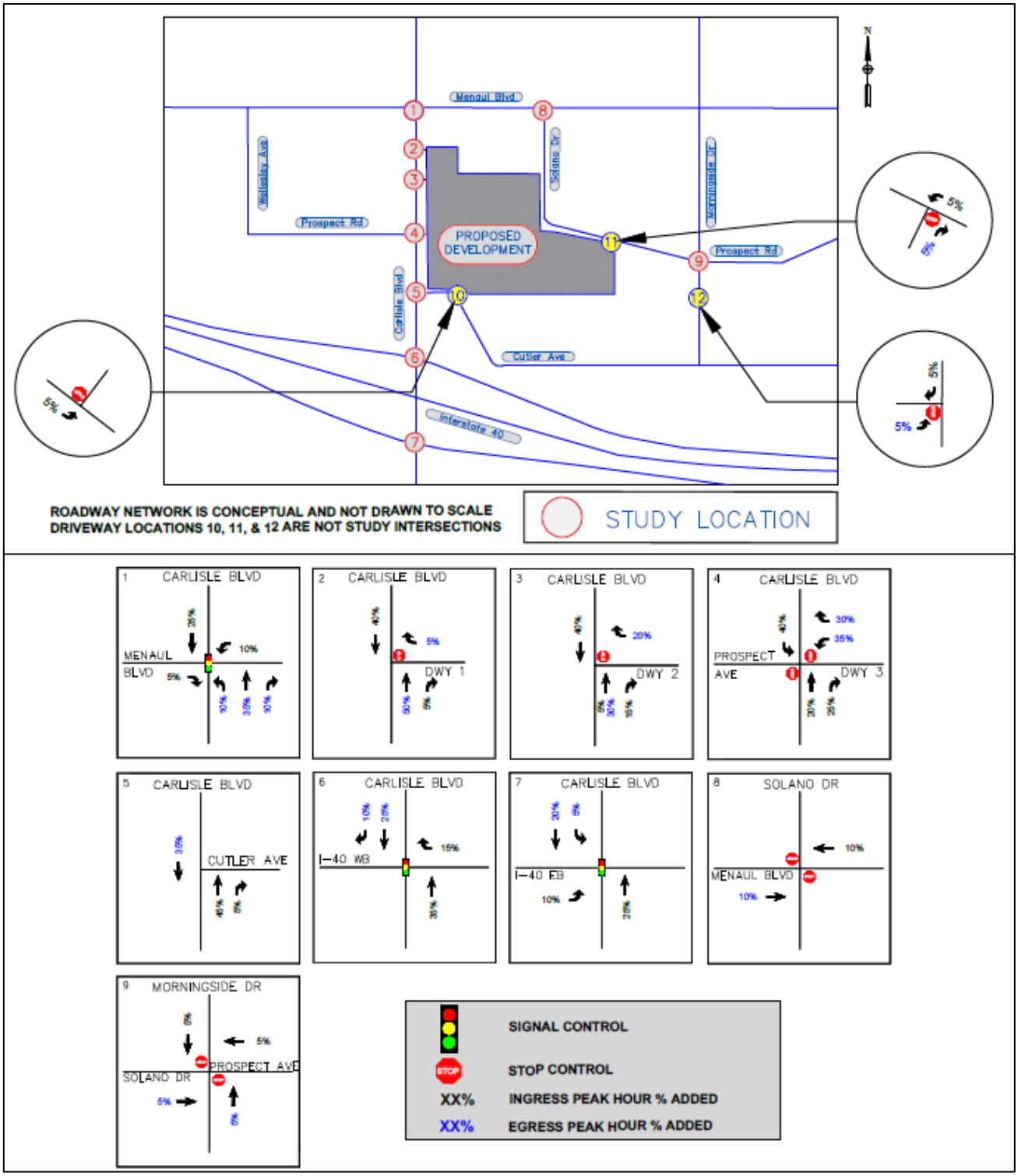

Figure 4. Trip Distribution

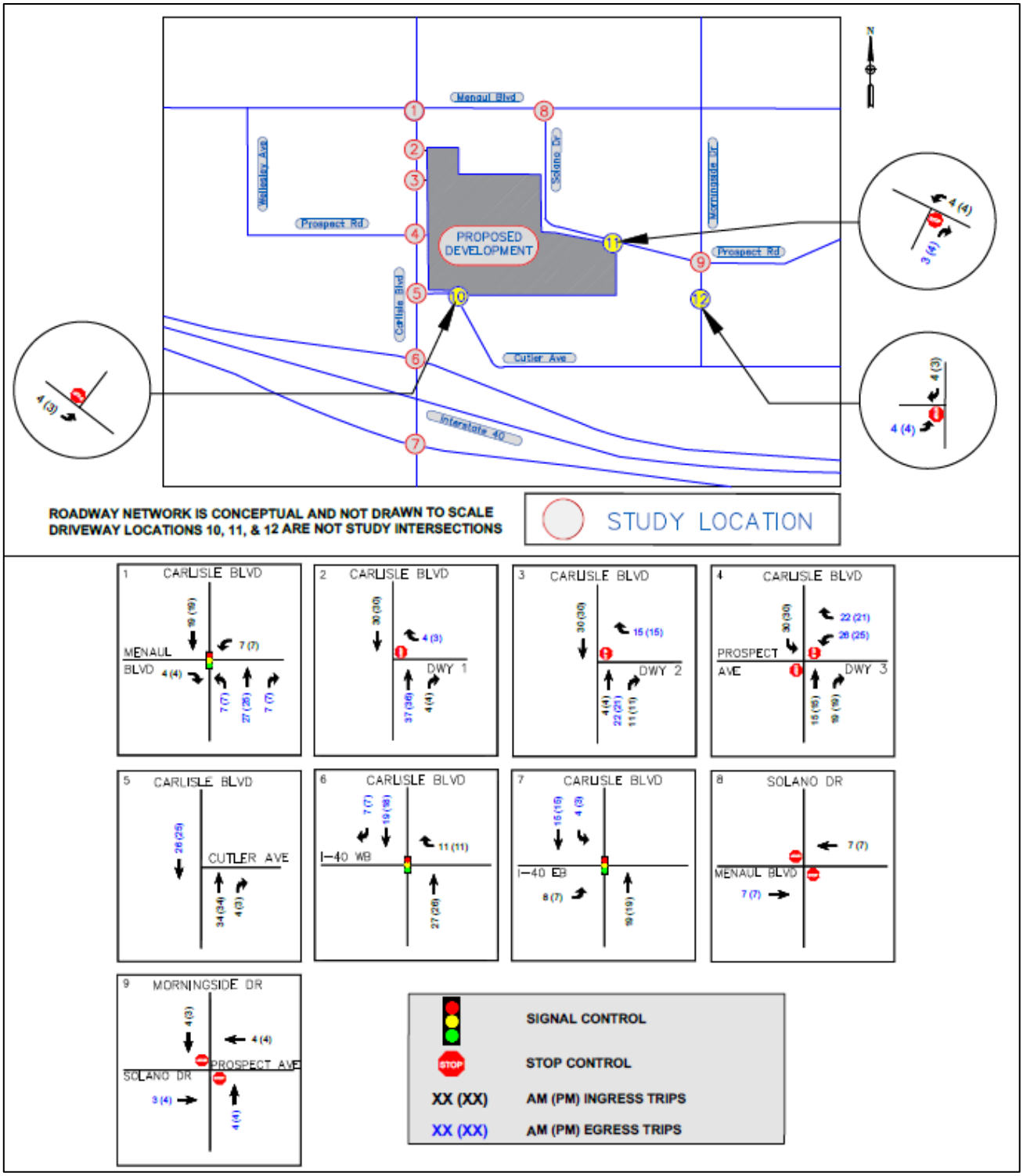

Figure 5. Primary Trips Assignment

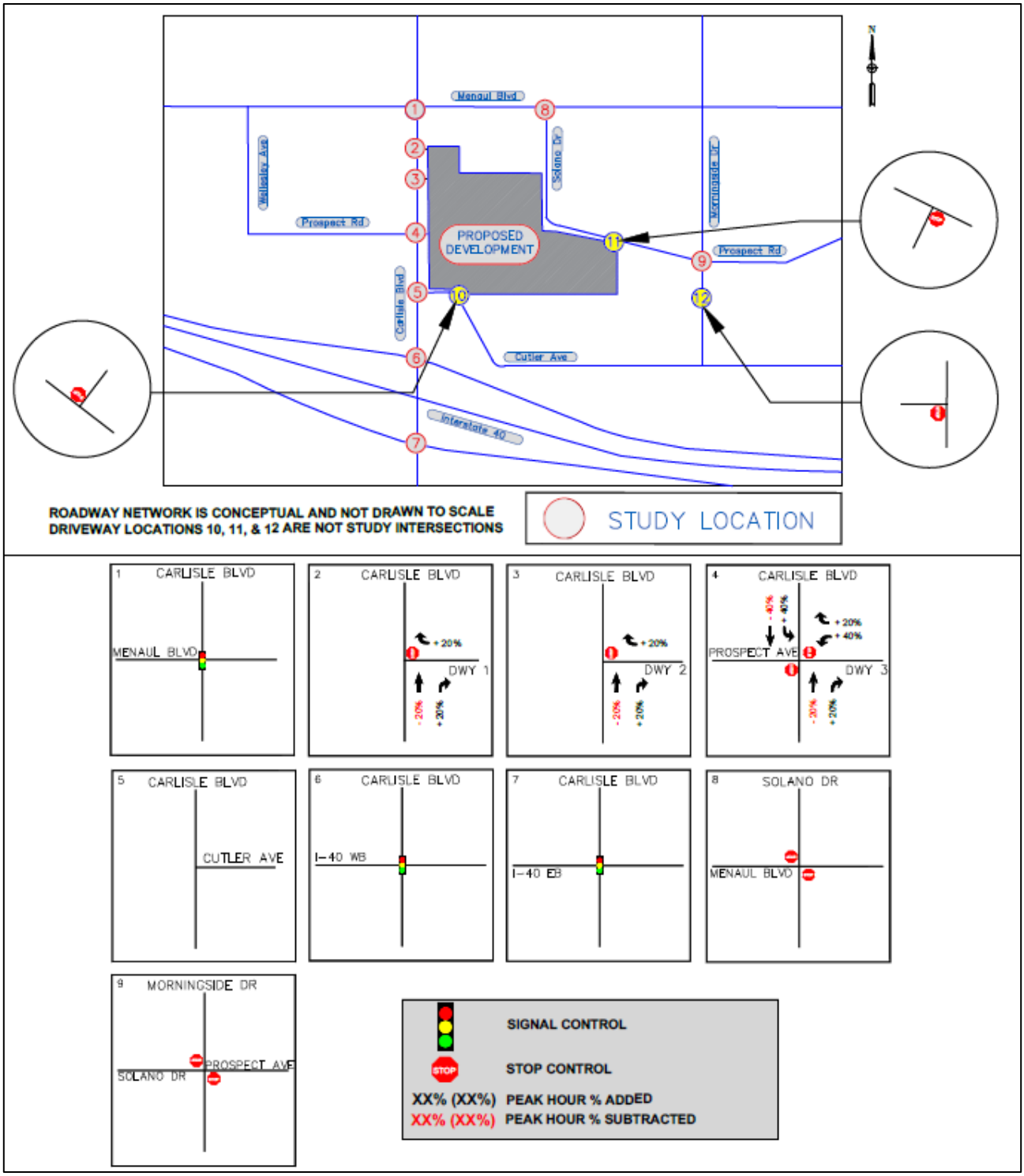

Figure 6. Pass-by Trip Distribution

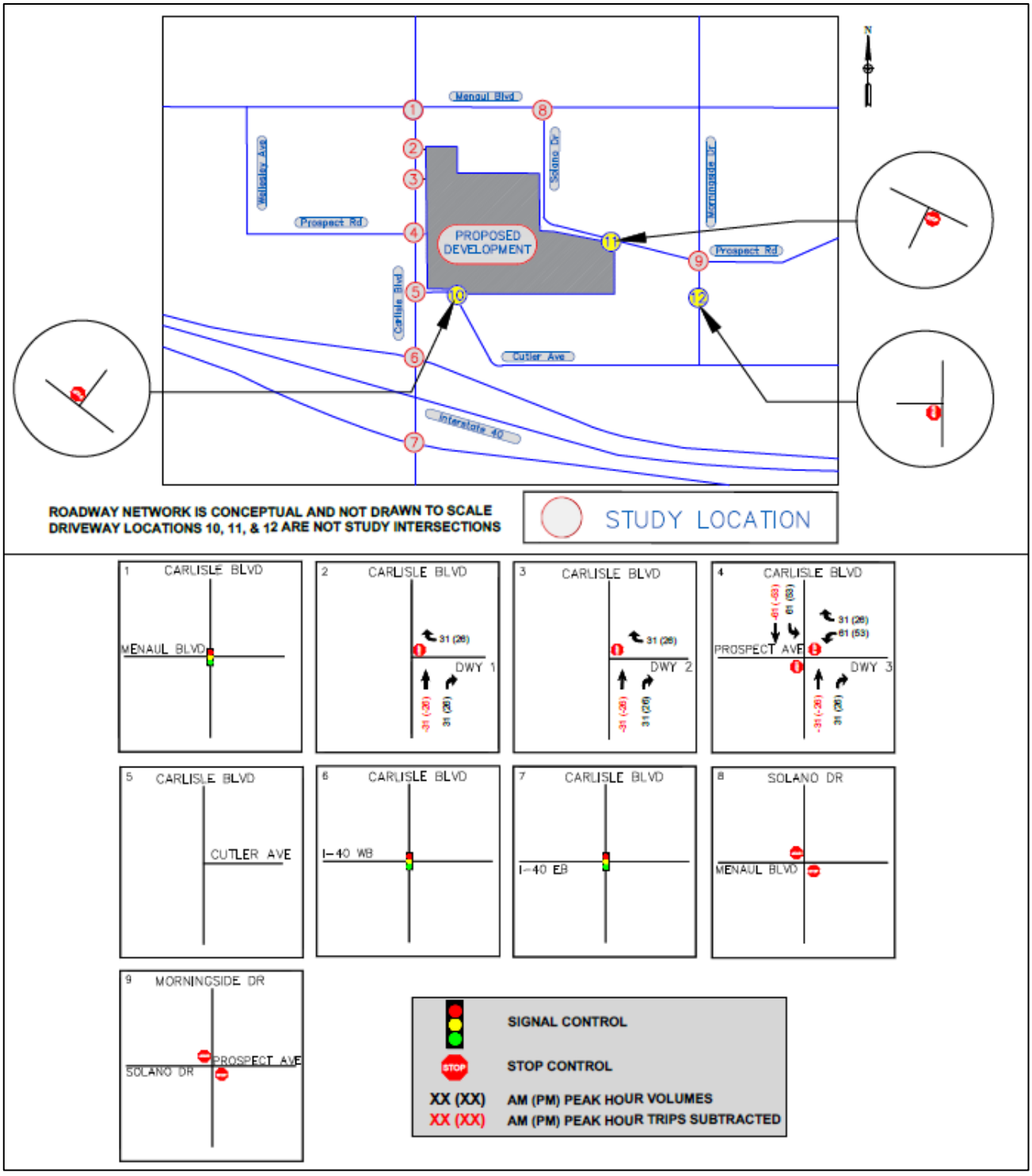

Figure 7. Pass-by Trips Assignment

Traffic Volume Calculations

Traffic volumes used in the analysis were calculated based on the following:

1. Existing Conditions: direct turning movement counts from 2021 adjusted
2. Background 2022: 2022 growth rate applied to existing adjusted conditions
3. Full Build-out 2022: Background 2022 traffic volumes plus primary site trips and pass-by trips

As stated above, build-out traffic volumes were calculated using the growth rates and factors detailed in previous sections. Primary site trips and pass-by trips were added to study intersections with direct access to the proposed development. Figure 8 through Figure 9 show the traffic volumes used for each individual analysis scenario.

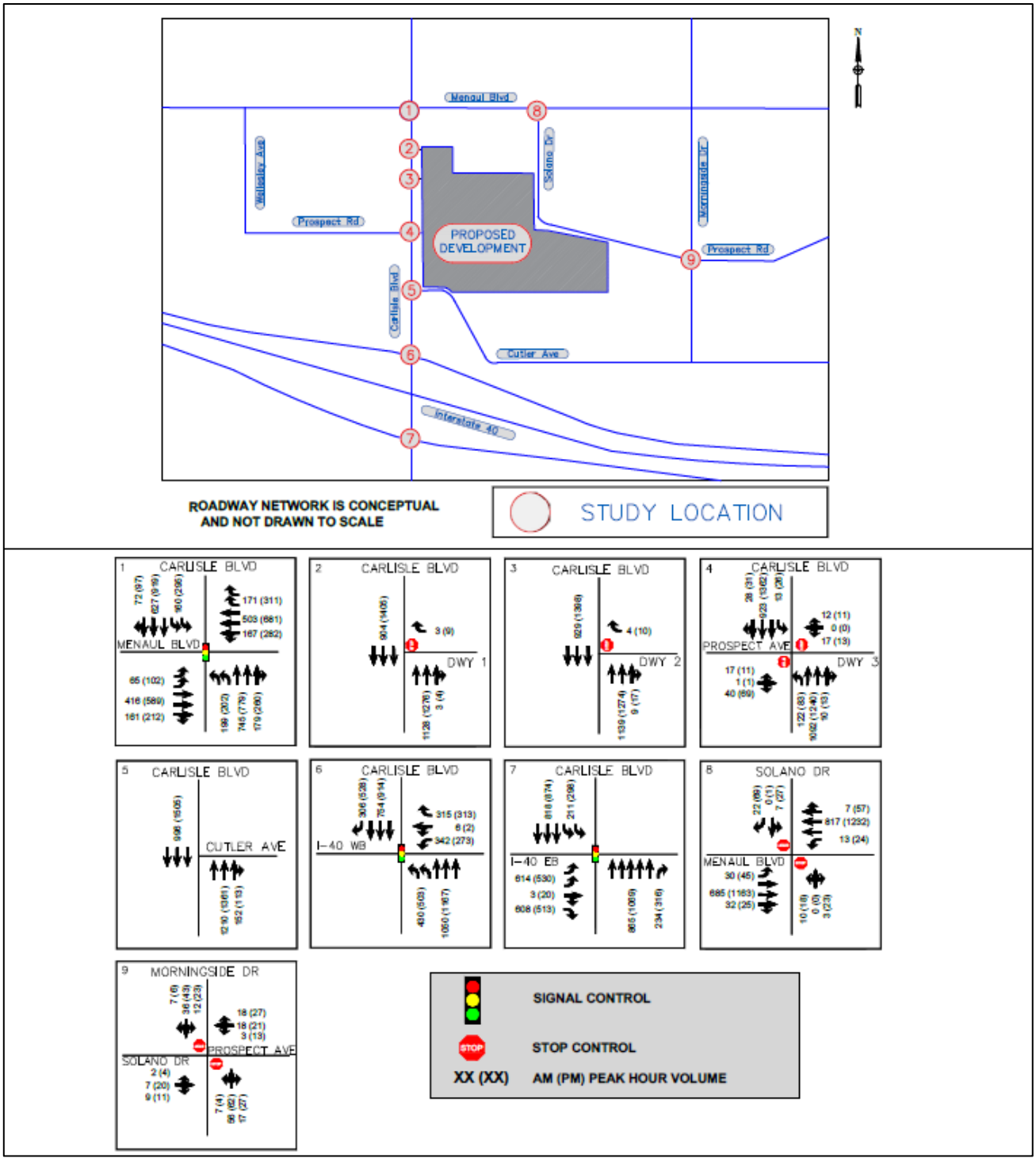

Figure 8. Background 2022 Turning Movement Traffic Volumes

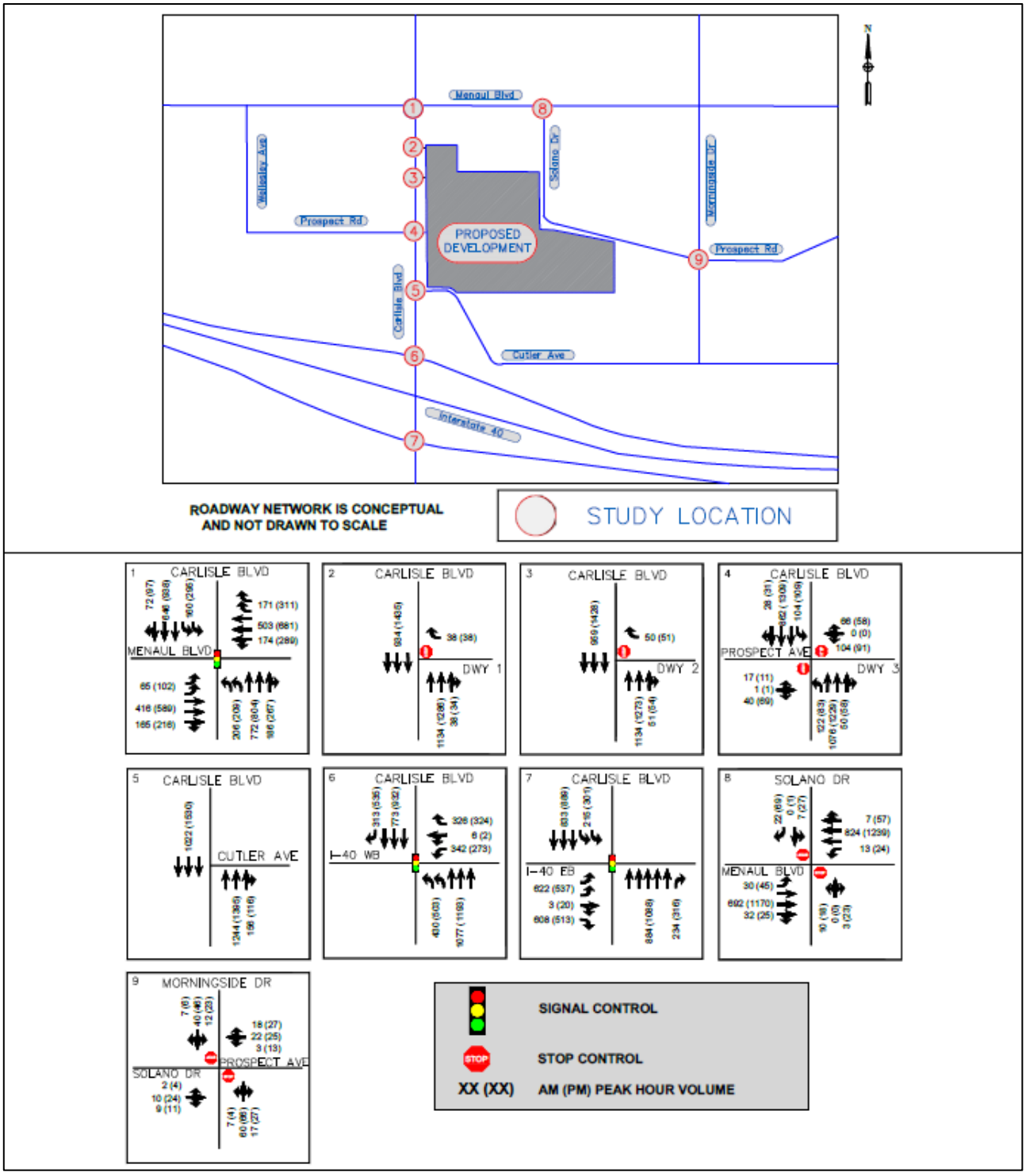

Figure 9. Full Build-Out 2022 Traffic Volumes

TRAFFIC ANALYSIS OF BUILD-OUT YEAR

As performed for existing conditions, a LOS, capacity, and queuing analysis was performed for all future analysis scenarios using the same procedures and assumptions. Signal timings used in the existing conditions analysis were retained and used for background conditions and build-out year condition analysis.

2022 Conditions

The tables below summarizes intersection capacity, LOS analysis, and queueing performed for 2022 Background and Full Build-Out conditions for the signalized intersections at Carlisle Blvd & Menaul Blvd, Carlisle Blvd & I-40 WB/EB Interchange (North Ramp and South Ramp). Detailed capacity output sheets can be found in Appendix D.

CAPACITY ANALYSIS OF SIGNALIZED INTERSECTIONS

Table 15 and Table 16 below presents a capacity analysis for all the signalized study intersections as a whole for 2022 conditions. Analyses for individual intersections showing each movement are summarized in Table 17 through Table 28.

Table 15: 2022 Background Intersection Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd					
2022 AM Background			2022 PM Background		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	32.2	C	3:45	38.3	D
8:00	31.5	C	4:00	40.1	D
8:15	29.9	C	4:15	37.9	D
8:30	31.9	C	4:30	38.4	D
Carlisle Blvd & I-40 WB (North Ramp)					
2022 AM Background			2022 PM Background		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	26.4	C	3:45	22.1	C
8:00	27.8	C	4:00	19.8	B
8:15	22.5	C	4:15	19.6	B
8:30	22.6	C	4:30	21.5	C
Carlisle Blvd & I-40 EB (South Ramp)					
2022 AM Background			2022 PM Background		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	26.6	C	3:45	25.6	C
8:00	30.3	C	4:00	25.7	C
8:15	24.7	C	4:15	25.5	C
8:30	25.5	C	4:30	25.5	C

Table 16: 2022 Full Build-Out Intersection Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd					
2022 AM Full Build-Out			2022 PM Full Build-Out		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	32.4	C	3:45	38.6	D
8:00	31.7	C	4:00	40.4	D
8:15	30.0	C	4:15	38.2	D
8:30	32.1	C	4:30	38.7	D
Carlisle Blvd & I-40 WB (North Ramp)					
2022 AM Full Build-Out			2022 PM Full Build-Out		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	26.5	C	3:45	22.5	C
8:00	27.9	C	4:00	20.1	B
8:15	22.5	C	4:15	19.7	B
8:30	22.7	C	4:30	21.8	C
Carlisle Blvd & I-40 EB (South Ramp)					
2022 AM Full Build-Out			2022 PM Full Build-Out		
Time-Period	Delay	LOS	Time-Period	Delay	LOS
7:45	26.6	C	3:45	25.7	C
8:00	30.4	C	4:00	25.8	C
8:15	24.7	C	4:15	25.5	C
8:30	25.6	C	4:30	25.5	C

From the tables above, the following is summarized:

Carlisle Blvd & Menaul Blvd

- Capacity Analysis:
  - Under 2022 Background conditions, the intersection is observed to operate at an acceptable level of service in both the AM and PM peak hours.
  - Under Full Build-Out conditions, the intersection is observed to operate at an acceptable level of service in both the AM and PM peak hours.

Carlisle Blvd & I-40 WB (North Ramp)

- Capacity Analysis:
  - Under 2022 Background conditions, the intersection is observed to operate at an acceptable level of service in both the AM and PM peak hours.
  - Under Full Build-Out conditions, the intersection is observed to operate at an acceptable level of service in both the AM and PM peak hours.

Carlisle Blvd & I-40 EB (South Ramp)

- Capacity Analysis:
  - Under 2022 Background conditions, the intersection is observed to operate at an acceptable level of service in both the AM and PM peak hours.

- Under Full Build-Out conditions, the intersection is observed to operate at an acceptable level of service in both the AM and PM peak hours.

CARLISLE BLVD & MENAUL BLVD

Table 17: 2022 AM Background Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	53.4	29.6	31.0	51.5	27.9	29.3	52.0	28.7	30.6	52.0	26.2	27.2
8:00	55.7	28.5	29.5	51.6	24.9	25.8	51.6	27.9	29.5	51.9	25.9	26.7
8:15	55.4	26.7	27.6	52.7	24.8	25.7	51.2	23.7	24.6	53.4	26.1	26.8
8:30	54.0	27.5	28.7	52.6	25.6	26.6	50.8	27.0	28.2	51.6	26.8	27.6
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	0.64	0.36	0.38	0.76	0.42	0.43	0.71	0.54	0.55	0.73	0.40	0.41
8:00	0.55	0.29	0.31	0.76	0.32	0.33	0.74	0.49	0.50	0.74	0.34	0.34
8:15	0.56	0.27	0.29	0.68	0.30	0.32	0.76	0.33	0.34	0.64	0.31	0.32
8:30	0.61	0.32	0.34	0.69	0.29	0.31	0.78	0.41	0.42	0.75	0.33	0.33
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	D	C	C	D	C	C	D	C	C	D	C	C
8:00	E	C	C	D	C	C	D	C	C	D	C	C
8:15	E	C	C	D	C	C	D	C	C	D	C	C
8:30	D	C	C	D	C	C	D	C	C	D	C	C
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL (250')	EBT	EBR	WBL (250')	WBT	WBR	NBL (300')	NBT	NBR	SBL (250')	SBT	SBR
7:45	0.24	-	-	0.51	-	-	0.33	-	-	0.42	-	-
8:00	0.10	-	-	0.49	-	-	0.39	-	-	0.44	-	-
8:15	0.11	-	-	0.32	-	-	0.44	-	-	0.24	-	-
8:30	0.19	-	-	0.34	-	-	0.49	-	-	0.48	-	-

Table 18: 2022 PM Background Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	58.3	30.3	31.8	57.7	26.7	27.9	56.4	38.3	41.7	63.0	33.9	35.8
4:00	58.3	33.7	35.8	62.7	28.6	30.6	57.0	39.3	42.8	66.1	33.9	35.6
4:15	58.1	30.3	31.6	59.6	27.0	29.9	56.6	37.2	40.6	58.9	33.7	35.6
4:30	58.0	32.1	33.6	63.0	28.8	30.6	56.6	36.2	39.0	58.9	34.6	36.8
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	0.65	0.40	0.42	0.81	0.39	0.40	0.77	0.62	0.63	0.85	0.54	0.54
4:00	0.65	0.52	0.52	0.84	0.51	0.52	0.80	0.62	0.63	0.87	0.49	0.50
4:15	0.66	0.37	0.38	0.82	0.40	0.48	0.76	0.63	0.63	0.82	0.54	0.54
4:30	0.67	0.42	0.43	0.85	0.50	0.51	0.76	0.58	0.59	0.82	0.59	0.59
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	E	C	C	E	C	C	E	D	D	E	C	D
4:00	E	C	D	E	C	C	E	D	D	E	C	D
4:15	E	C	C	E	C	C	E	D	D	E	C	D
4:30	E	C	C	E	C	C	E	D	D	E	C	D
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL (250')	EBT	EBR	WBL (250')	WBT	WBR	NBL (300')	NBT	NBR	SBL (250')	SBT	SBR
3:45	0.27	-	-	0.69	-	-	0.45	-	-	0.89	-	-
4:00	0.27	-	-	0.88	-	-	0.55	-	-	1.01	-	-
4:15	0.29	-	-	0.77	-	-	0.43	-	-	0.74	-	-
4:30	0.30	-	-	0.90	-	-	0.42	-	-	0.74	-	-

Table 19: 2022 AM Full Build-Out Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	53.4	29.8	31.2	51.4	27.9	29.3	51.9	29.0	31.0	52.0	26.5	27.6
8:00	55.7	28.7	29.8	51.5	24.9	25.8	51.4	28.2	29.9	51.9	26.2	27.0
8:15	55.4	27.0	27.9	52.6	24.8	25.7	51.1	24.0	24.9	53.4	26.3	27.1
8:30	54.0	27.7	29.0	52.4	25.6	26.6	50.7	27.3	28.5	51.6	27.0	27.9
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	0.64	0.37	0.38	0.77	0.42	0.43	0.72	0.56	0.56	0.73	0.41	0.42
8:00	0.55	0.30	0.31	0.76	0.32	0.33	0.75	0.51	0.51	0.74	0.35	0.35
8:15	0.56	0.28	0.29	0.69	0.30	0.32	0.77	0.35	0.36	0.64	0.32	0.33
8:30	0.61	0.32	0.34	0.70	0.29	0.31	0.78	0.43	0.44	0.75	0.34	0.34
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	D	C	C	D	C	C	D	C	C	D	C	C
8:00	E	C	C	D	C	C	D	C	C	D	C	C
8:15	E	C	C	D	C	C	D	C	C	D	C	C
8:30	D	C	C	D	C	C	D	C	C	D	C	C
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL (250')	EBT	EBR	WBL (250')	WBT	WBR	NBL (300')	NBT	NBR	SBL (250')	SBT	SBR
7:45	0.24	-	-	0.52	-	-	0.35	-	-	0.42	-	-
8:00	0.10	-	-	0.51	-	-	0.41	-	-	0.44	-	-
8:15	0.11	-	-	0.34	-	-	0.45	-	-	0.24	-	-
8:30	0.19	-	-	0.36	-	-	0.50	-	-	0.48	-	-

Table 20: 2022 PM Full Build-Out Capacity Analysis Summary at Carlisle Blvd & Menaul Blvd

Carlisle Blvd & Menaul Blvd												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	58.3	30.4	31.9	58.0	26.7	27.9	56.3	38.7	42.3	63.0	34.4	36.4
4:00	58.3	34.0	36.2	63.3	28.6	30.6	57.7	39.7	43.4	66.1	34.4	36.1
4:15	58.1	30.4	31.8	59.9	27.0	29.9	56.4	37.6	41.1	58.9	34.2	36.2
4:30	58.0	32.3	33.9	63.6	28.8	30.6	56.5	36.6	39.5	58.9	35.1	37.5
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	0.65	0.41	0.42	0.81	0.39	0.40	0.78	0.64	0.64	0.85	0.56	0.56
4:00	0.65	0.52	0.53	0.85	0.51	0.52	0.81	0.64	0.64	0.87	0.51	0.51
4:15	0.66	0.37	0.39	0.82	0.40	0.48	0.77	0.64	0.65	0.82	0.56	0.56
4:30	0.67	0.42	0.43	0.85	0.50	0.51	0.77	0.60	0.60	0.82	0.60	0.60
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	E	C	C	E	C	C	E	D	D	E	C	D
4:00	E	C	D	E	C	C	E	D	D	E	C	D
4:15	E	C	C	E	C	C	E	D	D	E	C	D
4:30	E	C	C	E	C	C	E	D	D	E	D	D
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL (250')	EBT	EBR	WBL (250')	WBT	WBR	NBL (300')	NBT	NBR	SBL (250')	SBT	SBR
3:45	0.27	-	-	0.70	-	-	0.47	-	-	0.89	-	-
4:00	0.27	-	-	0.91	-	-	0.57	-	-	1.01	-	-
4:15	0.29	-	-	0.78	-	-	0.45	-	-	0.74	-	-
4:30	0.30	-	-	0.92	-	-	0.44	-	-	0.74	-	-

From the tables above, the following is summarized:

Carlisle Blvd & Menaul Blvd

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for AM peak hour with the exception of the eastbound left turn for two multi-peak periods (LOS E). In the PM peak hour, all left turn movements are observed to operate at LOS E for all four multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for AM peak hour with the exception of the eastbound left turn for two multi-peak periods (LOS E). In the PM peak hour, all left turn movements are observed to operate at LOS E for all four multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.
- Queueing Analysis:
  - Under 2022 Background conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours except for the southbound left turn in the AM peak hour, which show a QSR greater than 1 for one multi-peak period.
  - Under Full Build-Out conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours except for the southbound left turn in the AM peak hour, which show a QSR greater than 1 for one multi-peak period.

CARLISLE BLVD & I-40 WB (NORTH RAMP)

Table 21: 2022 AM Background Capacity Analysis Summary at Carlisle Blvd & I-40 WB (North Ramp)

Carlisle Blvd & I-40 WB (North Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	40.8	41.5	51.5	55.4	16.1	-	-	14.0	-
8:00	-	-	-	38.9	0.0	60.2	54.7	20.2	-	-	14.2	-
8:15	-	-	-	39.9	40.1	51.9	54.7	14.0	-	-	8.8	-
8:30	-	-	-	40.3	40.4	51.7	54.6	13.9	-	-	9.9	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	0.59	0.63	0.85	0.85	0.29	-	-	0.44	-
8:00	-	-	-	0.68	0.00	0.92	0.82	0.36	-	-	0.38	-
8:15	-	-	-	0.42	0.43	0.85	0.81	0.29	-	-	0.32	-
8:30	-	-	-	0.47	0.48	0.85	0.82	0.30	-	-	0.36	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	D	D	D	E	B	-	-	B	-
8:00	-	-	-	D	-	E	D	C	-	-	B	-
8:15	-	-	-	D	D	D	D	B	-	-	A	-
8:30	-	-	-	D	D	D	D	B	-	-	A	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR	WBL (350')	WBT	WBR (350')	NBL (350')	NBT (350')	NBR	SBL	SBT	SBR
7:45	-	-	-	0.67	-	0.89	0.93	0.78	-	-	-	-
8:00	-	-	-	0.91	-	1.30	0.69	0.90	-	-	-	-
8:15	-	-	-	0.44	-	0.83	0.69	0.74	-	-	-	-
8:30	-	-	-	0.51	-	0.84	0.75	0.75	-	-	-	-

Table 22: 2022 PM Background Capacity Analysis Summary at Carlisle Blvd & I-40 WB (North Ramp)

Carlisle Blvd & I-40 WB (North Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	44.2	-	69.0	53.4	5.6	-	-	14.9	-
4:00	-	-	-	40.0	40.3	66.4	51.4	4.2	-	-	13.8	-
4:15	-	-	-	51.9	-	61.9	51.7	5.6	-	-	11.1	-
4:30	-	-	-	61.0	-	59.0	53.0	3.3	-	-	12.7	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	0.64	-	0.92	0.89	0.37	-	-	0.46	-
4:00	-	-	-	0.33	0.35	0.90	0.88	0.32	-	-	0.52	-
4:15	-	-	-	0.78	-	0.87	0.86	0.31	-	-	0.45	-
4:30	-	-	-	0.88	-	0.85	0.87	0.26	-	-	0.51	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	D	-	E	D	A	-	-	B	-
4:00	-	-	-	D	D	E	D	A	-	-	B	-
4:15	-	-	-	D	-	E	D	A	-	-	B	-
4:30	-	-	-	E	-	E	D	A	-	-	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR	WBL (350')	WBT	WBR (350')	NBL (350')	NBT (350')	NBR	SBL	SBT	SBR
3:45	-	-	-	0.85	-	1.27	0.84	0.36	-	-	-	-
4:00	-	-	-	0.42	-	1.15	0.78	0.24	-	-	-	-
4:15	-	-	-	0.89	-	0.95	0.80	0.36	-	-	-	-
4:30	-	-	-	1.12	-	0.96	0.83	0.17	-	-	-	-

Table 23: 2022 AM Full Build-Out Capacity Analysis Summary at Carlisle Blvd & I-40 WB (North Ramp)

Carlisle Blvd & I-40 WB (North Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	40.3	41.0	51.9	55.7	16.6	-	-	14.5	-
8:00	-	-	-	38.1	-	61.2	54.6	20.3	-	-	14.7	-
8:15	-	-	-	39.5	39.6	52.3	54.7	14.2	-	-	9.1	-
8:30	-	-	-	39.8	39.9	52.2	54.7	14.0	-	-	10.3	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	0.58	0.62	0.85	0.85	0.30	-	-	0.45	-
8:00	-	-	-	0.66	-	0.92	0.83	0.37	-	-	0.39	-
8:15	-	-	-	0.41	0.42	0.86	0.81	0.30	-	-	0.33	-
8:30	-	-	-	0.46	0.47	0.85	0.82	0.31	-	-	0.37	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	-	-	-	D	D	D	E	B	-	-	B	-
8:00	-	-	-	D	-	E	D	C	-	-	B	-
8:15	-	-	-	D	D	D	D	B	-	-	A	-
8:30	-	-	-	D	D	D	D	B	-	-	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR	WBL (350')	WBT	WBR (350')	NBL (350')	NBT (350')	NBR	SBL	SBT	SBR
7:45	-	-	-	0.66	-	0.92	0.94	0.81	-	-	-	-
8:00	-	-	-	0.90	-	1.34	0.69	0.92	-	-	-	-
8:15	-	-	-	0.44	-	0.86	0.70	0.76	-	-	-	-
8:30	-	-	-	0.50	-	0.87	0.75	0.76	-	-	-	-

Table 24: 2022 PM Full Build-Out Capacity Analysis Summary at Carlisle Blvd & I-40 WB (North Ramp)

Carlisle Blvd & I-40 WB (North Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	43.3	-	70.2	54.7	5.7	-	-	15.5	-
4:00	-	-	-	39.4	39.6	67.4	52.2	4.3	-	-	14.4	-
4:15	-	-	-	50.7	-	62.5	51.4	6.1	-	-	11.5	-
4:30	-	-	-	60.9	-	61.6	53.0	3.8	-	-	12.8	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	0.63	-	0.92	0.89	0.38	-	-	0.47	-
4:00	-	-	-	0.32	0.34	0.91	0.88	0.33	-	-	0.53	-
4:15	-	-	-	0.76	-	0.88	0.87	0.32	-	-	0.46	-
4:30	-	-	-	0.88	-	0.87	0.87	0.27	-	-	0.52	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	-	-	-	D	-	E	D	A	-	-	B	-
4:00	-	-	-	D	D	E	D	A	-	-	B	-
4:15	-	-	-	D	-	E	D	A	-	-	B	-
4:30	-	-	-	E	-	E	D	A	-	-	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR	WBL (350')	WBT	WBR (350')	NBL (350')	NBT (350')	NBR	SBL	SBT	SBR
3:45	-	-	-	0.85	-	1.32	0.85	0.37	-	-	-	-
4:00	-	-	-	0.41	-	1.20	0.79	0.25	-	-	-	-
4:15	-	-	-	0.88	-	0.98	0.79	0.40	-	-	-	-
4:30	-	-	-	1.12	-	1.00	0.84	0.20	-	-	-	-

From the tables above, the following is summarized:

Carlisle Blvd & I-40 WB (North Ramp)

- Capacity Analysis:

- Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours, with the exception of the westbound right turn and northbound left turn in the AM for one multi-peak period (LOS E). In the PM peak hour, the westbound left turn is operating at LOS E for one multi-peak period, and the westbound right turn is operating at LOS E for all four multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.
- Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours with the exception of the westbound right turn and northbound left turn in the AM for one multi-peak period (LOS E). In the PM peak hour, the westbound left turn is operating at LOS E for one multi-peak period, and the westbound right turn is operating at LOS E for all four multi-peak periods. It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.

- Queueing Analysis:
  - Under 2022 Background conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours except for the westbound right turn for one multi-peak period in the AM peak hour, which shows a QSR greater than 1. In the PM peak hour, westbound left turn for one multi-peak period and westbound right turn for two multi-peak periods show a QSR greater than 1.
  - Under Full Build-Out conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours except for the westbound right turn for one multi-peak period in the AM peak hour, which shows a QSR greater than 1. In the PM peak hour, westbound left turn for one multi-peak period and westbound right turn for three multi-peak periods show a QSR equal to or greater than 1.

CARLISLE BLVD & I-40 EB (SOUTH RAMP)

Table 25: 2022 AM Background Capacity Analysis Summary at Carlisle Blvd & I-40 EB (South Ramp)

Carlisle Blvd & I-40 EB (South Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	46.5	-	48.7	-	-	-	-	7.7	8.6	54.8	15.7	-
8:00	50.5	-	52.2	-	-	-	-	7.9	9.3	54.9	17.8	-
8:15	45.2	34.2	45.3	-	-	-	-	6.2	6.6	54.4	13.5	-
8:30	43.9	33.8	46.3	-	-	-	-	7.9	8.7	57.6	14.4	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	0.80	-	0.83	-	-	-	-	0.21	0.27	0.77	0.32	-
8:00	0.87	-	0.87	-	-	-	-	0.19	0.32	0.78	0.30	-
8:15	0.76	0.02	0.74	-	-	-	-	0.18	0.19	0.73	0.32	-
8:30	0.73	0.01	0.77	-	-	-	-	0.21	0.26	0.80	0.37	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	D	-	D	-	-	-	-	A	A	D	B	-
8:00	D	-	D	-	-	-	-	A	A	D	B	-
8:15	D	C	D	-	-	-	-	A	A	D	B	-
8:30	D	C	D	-	-	-	-	A	A	E	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR (700')	WBL	WBT	WBR	NBL	NBT (800')	NBR (450')	SBL (350')	SBT (350')	SBR
7:45	-	-	0.46	-	-	-	-	0.07	0.18	0.41	0.68	-
8:00	-	-	0.51	-	-	-	-	0.07	0.23	0.41	0.69	-
8:15	-	-	0.38	-	-	-	-	0.06	0.11	0.34	0.56	-
8:30	-	-	0.40	-	-	-	-	0.08	0.18	0.53	0.63	-

Table 26: 2022 PM Background Capacity Analysis Summary at Carlisle Blvd & I-40 EB (South Ramp)

Carlisle Blvd & I-40 EB (South Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	47.2	36.8	46.1	-	-	-	-	8.8	9.9	55.0	18.4	-
4:00	45.4	37.5	47.8	-	-	-	-	8.6	10.6	54.1	19.3	-
4:15	47.9	36.3	43.4	-	-	-	-	8.3	9.6	56.5	16.7	-
4:30	43.6	37.2	48.2	-	-	-	-	9.3	10.8	55.1	14.7	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	0.74	0.04	0.69	-	-	-	-	0.28	0.33	0.81	0.31	-
4:00	0.66	0.05	0.73	-	-	-	-	0.25	0.40	0.82	0.34	-
4:15	0.76	0.03	0.60	-	-	-	-	0.23	0.33	0.79	0.32	-
4:30	0.60	0.08	0.75	-	-	-	-	0.22	0.34	0.82	0.36	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	D	D	D	-	-	-	-	A	A	D	B	-
4:00	D	D	D	-	-	-	-	A	B	D	B	-
4:15	D	D	D	-	-	-	-	A	A	E	B	-
4:30	D	D	D	-	-	-	-	A	B	E	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR (700')	WBL	WBT	WBR	NBL	NBT (800')	NBR (450')	SBL (350')	SBT (350')	SBR
3:45	-	-	0.39	-	-	-	-	0.12	0.26	0.56	0.74	-
4:00	-	-	0.40	-	-	-	-	0.10	0.32	0.58	0.83	-
4:15	-	-	0.34	-	-	-	-	0.09	0.26	0.51	0.69	-
4:30	-	-	0.43	-	-	-	-	0.09	0.28	0.61	0.72	-

Table 27: 2022 AM Full Build-Out Capacity Analysis Summary at Carlisle Blvd & I-40 EB (South Ramp)

Carlisle Blvd & I-40 EB (South Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	47.1	-	48.6	-	-	-	-	7.8	8.7	55.2	15.5	-
8:00	51.3	-	52.1	-	-	-	-	8.0	9.4	55.7	17.8	-
8:15	45.4	34.1	45.0	-	-	-	-	6.3	6.7	54.4	13.7	-
8:30	44.3	33.8	46.3	-	-	-	-	7.9	8.8	57.9	14.4	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	0.81	-	0.83	-	-	-	-	0.21	0.27	0.77	0.32	-
8:00	0.88	-	0.87	-	-	-	-	0.19	0.32	0.78	0.30	-
8:15	0.76	0.02	0.74	-	-	-	-	0.19	0.19	0.73	0.33	-
8:30	0.74	0.01	0.77	-	-	-	-	0.21	0.27	0.80	0.39	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
7:45	D	-	D	-	-	-	-	A	A	E	B	-
8:00	D	-	D	-	-	-	-	A	A	E	B	-
8:15	D	C	D	-	-	-	-	A	A	D	B	-
8:30	D	C	D	-	-	-	-	A	A	E	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR (700')	WBL	WBT	WBR	NBL	NBT (800')	NBR (450')	SBL (350')	SBT (350')	SBR
7:45	-	-	0.46	-	-	-	-	0.08	0.19	0.42	0.69	-
8:00	-	-	0.51	-	-	-	-	0.07	0.23	0.43	0.70	-
8:15	-	-	0.38	-	-	-	-	0.06	0.11	0.35	0.57	-
8:30	-	-	0.40	-	-	-	-	0.08	0.18	0.53	0.64	-

Table 28: 2022 PM Full Build-Out Capacity Analysis Summary at Carlisle Blvd & I-40 EB (South Ramp)

Carlisle Blvd & I-40 EB (South Ramp)												
Delay (s/veh)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	47.3	36.6	45.8	-	-	-	-	9.0	10.1	54.9	18.7	-
4:00	45.6	37.5	47.7	-	-	-	-	8.8	10.7	54.0	19.6	-
4:15	48.0	36.1	43.2	-	-	-	-	8.4	9.7	56.6	16.9	-
4:30	43.8	37.1	48.1	-	-	-	-	9.4	10.9	55.1	14.8	-
V/C												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	0.74	0.04	0.69	-	-	-	-	0.28	0.33	0.81	0.32	-
4:00	0.67	0.05	0.73	-	-	-	-	0.25	0.40	0.82	0.35	-
4:15	0.77	0.03	0.60	-	-	-	-	0.23	0.33	0.79	0.33	-
4:30	0.61	0.08	0.75	-	-	-	-	0.22	0.34	0.82	0.36	-
Level of Service (LOS)												
Time-Period	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
3:45	D	D	D	-	-	-	-	A	B	D	B	-
4:00	D	D	D	-	-	-	-	A	B	D	B	-
4:15	D	D	D	-	-	-	-	A	A	E	B	-
4:30	D	D	D	-	-	-	-	A	B	E	B	-
95th Percentile Queue Storage Ratio (QSR)												
	Movement (Storage Length Present)											
Time-Period	EBL	EBT	EBR (700')	WBL	WBT	WBR	NBL	NBT (800')	NBR (450')	SBL (350')	SBT (350')	SBR
3:45	-	-	0.39	-	-	-	-	0.12	0.26	0.57	0.75	-
4:00	-	-	0.40	-	-	-	-	0.11	0.33	0.58	0.85	-
4:15	-	-	0.34	-	-	-	-	0.09	0.26	0.52	0.71	-
4:30	-	-	0.43	-	-	-	-	0.10	0.28	0.61	0.73	-

From the tables above, the following is summarized:

Carlisle Blvd & I-40 EB (South Ramp)

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours, with the exception of the southbound left turn in the AM peak hour for one multi-peak period and in the PM peak hours for two multi-peak periods (LOS E). It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours with the exception of the southbound left turn in the AM peak hour for three multi-peak periods and in the PM peak hours for two multi-peak periods (LOS E). It is noted that the v/c ratios for these movements do not indicate that the movements exceed capacity.
- Queueing Analysis:
  - Under 2022 Background conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours.
  - Under Full Build-Out conditions, 95th percentile Queue Storage Ratios (QSR) at the intersection are observed to be accommodated by existing storage lengths during the AM and PM peak hours.

Analysis of Stop Controlled Intersections

Table 29 and Table 30 below summarizes stop-controlled intersection capacity, LOS analysis, and queuing results performed for 2022 background and full build-out conditions for the unsignalized intersections. Queueing is reported as the number of vehicles in the queue for stop-controlled intersections. It is important to note that due to the existing roadway configuration at Carlisle Blvd & Cutler Ave, HCS capacity analysis could not be performed due to all approaches considered to be free-flowing and the absence of a traffic control. Detailed capacity output sheets can be found in Appendix D.

Table 29: 2022 Background Stop-Control Capacity Analysis Summary

Carlisle Blvd & North Driveway 1								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
WBR	0.01	15.2	C	0.00	0.03	16.1	C	0.10
Carlisle Blvd & North Driveway 2								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
WBR	0.01	15.3	C	0.00	0.03	16.2	C	0.10
Carlisle Blvd & Prospect Ave Driveway 3								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL/T/R	0.36	34.6	D	1.50	0.57	56.0	F	2.90
WBL/T/R	0.49	98.6	F	2.00	0.31	65.6	F	1.10
NBL	0.41	22.5	C	2.00	0.38	29.7	D	1.70
SBL	0.05	17.0	C	0.20	0.09	18.3	C	0.30
Menaul Blvd & Solano Dr								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL	0.08	13.7	B	0.30	0.17	20.2	C	0.60
WBL	0.03	11.2	B	0.10	0.07	15.9	C	0.20
NBL/T/R	0.07	21.4	C	0.20	0.26	34.6	D	1.00
SBL/T	0.05	25.6	D	0.10	0.35	69.3	F	1.30
SBR	0.06	13.7	B	0.20	0.21	18.4	C	0.80
Prospect Ave & Morningside Dr								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL/T/R	0.00	7.3	A	0.00	0.00	7.3	A	0.00
WBL/T/R	0.00	7.3	A	0.00	0.01	7.3	A	0.00
NBL/T/R	0.11	9.7	A	0.40	0.13	10.0	B	0.40
SBL/T/R	0.07	9.6	A	0.20	0.11	10.3	B	0.40

Table 30: 2022 Full Build-Out Stop-Control Capacity Analysis Summary

Carlisle Blvd & North Driveway 1								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
WBR	0.13	17.0	C	0.40	0.12	17.7	C	0.40
Carlisle Blvd & North Driveway 2								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
WBR	0.16	17.5	C	0.60	0.17	18.4	C	0.60
Carlisle Blvd & Prospect Ave Driveway 3								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL/T/R	1.10	258.4	F	5.50	0.92	152.2	F	5.30
WBL/T/R	-	-	-	-	-	-	-	-
NBL	0.38	20.4	C	1.70	0.36	27.3	D	1.60
SBL	0.45	28.6	D	2.20	0.46	30.2	D	2.20
Menaul Blvd & Solano Dr								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL	0.08	13.8	B	0.30	0.17	20.4	C	0.60
WBL	0.03	11.3	B	0.10	0.07	16.0	C	0.20
NBL/T/R	0.07	21.6	C	0.20	0.26	35.1	E	1.00
SBL/T	0.05	25.9	D	0.10	0.35	70.8	F	1.40
SBR	0.06	13.7	B	0.20	0.21	18.5	C	0.80
Prospect Ave & Morningside Dr								
Movement	AM				PM			
	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)	v/c	Delay (s/veh)	LOS	95th Percentile Queue (veh)
EBL/T/R	0.00	7.3	A	0.00	0.00	7.3	A	0.00
WBL/T/R	0.00	7.3	A	0.00	0.01	7.3	A	0.00
NBL/T/R	0.11	9.7	A	0.40	0.14	10.2	B	0.50
SBL/T/R	0.08	9.7	A	0.30	0.11	10.4	B	0.40

From the tables above, the following is summarized:

Carlisle Blvd & North Driveway 1 (Right-in/Right-out)

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
- Queueing Analysis:
  - Under 2022 Background conditions, 95th percentile lengths at the intersection are observed to be operating at acceptable levels during the AM and PM peak hours.
  - Under Full Build-Out conditions, 95th percentile lengths at the intersection are observed to be operating at acceptable levels during the AM and PM peak hours.

Carlisle Blvd & North Driveway 2 (Right-in/Right-out)

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
- Queueing Analysis:
  - Under 2022 Background conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.
  - Under Full Build-Out conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

Carlisle Blvd & Prospect Ave; Driveway 3 (Full Access)

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for AM hours except for the westbound approach in the AM (LOS F). In the PM peak hour, the westbound approach and eastbound approach are observed to operate at LOS F. It is noted that the v/c ratio for these movements indicates that the movements do not exceed capacity and is therefore attributed to gap-delays for the movements.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for AM hours except for the eastbound approach in the AM LOS F. It is noted that due to high volumes for adjacent left turn movements on Carlisle Blvd, HCS is unable to compute capacity for westbound approach. The westbound approach is assumed to have worse delays than background conditions and therefore is observed to operate at LOS F. In the PM peak hour, eastbound approach is observed to operate at LOS F. Similar to AM conditions, westbound approach is assumed to operate at LOS F. It is also noted that the v/c ratio for these movements indicates that the movements do not exceed capacity except for the westbound approach in the PM peak hour.
- Queueing Analysis
  - Under 2022 Background conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.
  - Under Full Build-Out conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

Menaul Blvd & Solano Dr

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours except for the southbound approach in the PM peak hour (LOS F). It is noted that the v/c ratio for this movement indicates that the movement does not exceed capacity and is therefore attributed to gap delays for the movement.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours except for the northbound and southbound approaches in the PM peak hour LOS E and LOS F. It is noted that the v/c ratio for this movement indicates that the movement does not exceed capacity and is therefore attributed to gap-delays for the movement.
- Queueing Analysis
  - Under 2022 Background conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.
  - Under Full Build-Out conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

Prospect Ave & Morningside Dr

- Capacity Analysis:
  - Under 2022 Background conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
  - Under Full Build-Out conditions, individual movements are observed to operate at an acceptable Level of Service (LOS) for both AM and PM peak hours.
- Queueing Analysis
  - Under 2022 Background conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.
  - Under Full Build-Out conditions, queuing is observed to be accommodated by existing storage lengths and driveway site storage during AM and PM peak hours.

CAPACITY MITIGATIONS AND STREET IMPROVEMENTS

As shown in the above section, a few capacity queueing issues are observed for all conditions within the study area. The following provides a summary of the queueing issues as well as recommended mitigations for the study intersections.

For Carlisle Blvd & Menaul Blvd, capacity and queueing issues are summarized as follows:

- Southbound Left Turn QSR in the PM peak hour.

The development is observed to have minimal effect on the intersection and is currently experiencing QSR issues during existing conditions. It is recommended that Carlisle Blvd & Menaul Blvd be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.

For Carlisle Blvd & I-40 North Ramp (WB), capacity and queueing issues are summarized as follows:

- Westbound Right Turn QSR in the AM and PM peak hours.

- Westbound Left Turn QSR in the PM peak hour.

The development is observed to have minimal effect on the WB approach and it is currently experiencing QSR issues during existing conditions. Queueing issues for the WB approach can be attributed to cycle delays and a limitation of HCS software when analyzing shared exclusive turn lane with more than three lane groups. Westbound through traffic appears to contribute to queueing issues, though the movement was observed to serve very minimal traffic with various 15-minute periods of zero vehicles during peak hours. Furthermore, a wide single-lane off-ramp for the westbound approach likely provides side-by-side stacking of vehicles, thereby providing separated approach movements. It is recommended that Carlisle Blvd & I-40 North Ramp (WB) intersection be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.

Carlisle Blvd & Prospect Ave (Full Access Dwy 3)

- Westbound shared Left/Through/Right LOS in the AM and PM peak hours.
- Eastbound shared Left/Through/Right LOS in the PM peak hour.

No recommendations are made as the LOS issues for the WB and EB movements were observed to be experiencing LOS issues during existing conditions. In addition, issues for the WB and EB approaches can be attributed to gap delays for the movements.

Menaul Blvd & Solano Dr

- Southbound shared Left/Through/Right LOS in the PM peak hour.

No recommendations are made as the LOS issues for the SB movement were observed to be experiencing LOS issues during existing conditions, and new development has little to no effect on movement. Furthermore, LOS issues are attributed to gap delays for the movement, and all queueing is contained within the driveway approach.

SPECIFIC SITE ACCESS ANALYSIS

SITE ACCESS ANALYSIS

ACCESS SPACING

Required minimum distances between commercial site access and intersections were analyzed using criteria defined in the CABQ DPM. Criteria was applied to two site access driveways, Driveway 1 and Driveway 2. Approximate distances from Driveway 1 to the adjacent intersection at Carlisle Blvd and Menaul Blvd were measured and from Driveway 2 to the adjacent intersection at Carlisle Blvd and Prospect Ave. CABQ and MRCOG data was used to define the functional class of streets used. Results of the analysis are shown below in Table 31.

Table 31: Commercial Site Access Analysis

Mininmum Distance Between Commercial Site Acess and Intersection						
Site Access Location	Major Street (Functional Class)	Cross Street (Functional Class)	Approach Distance to intersection (ft)	Minimum Approach Distance Required (ft)	Departure Distance to intersection (ft)	Minimum Departure Distance Required (ft)
Driveway 1 - (Right-In/Right-Out	Carlisle Blvd (Minor Arterial)	Menaul Blvd (Arterial)	150	200	-	-
Driveway 2 - (Right-in/Right-Out)	Carlisle Blvd (Minor Arterial)	Prospect Ave (Collector)	-	-	250	100

- North Driveway 1 (Right-In/Right-Out, shared easement with existing development)
    - Based on CABQ DPM criteria per Table 7.4.45, the minimum distance between commercial site access and intersection requires 200 ft. of approach distance. The most northern existing shared access driveway to be used for fast-food restaurant access measures at approximately 150 ft. from Menaul Blvd and Carlisle Blvd intersection.
- Driveway 2 (Right-In/Right-Out)
    - Based on CABQ DPM criteria per Table 7.4.45, the minimum distance between commercial site access and intersection requires 100 ft. of departure distance. Measured departure distance is approximately 250 ft from the intersection of Carlisle Blvd and Prospect Ave.

ACCESS POINTS PER SITE

The frontage of the project site was measured to be approximately 250 ft. Based on CABQ DPM Table 7.4.46, the maximum number of commercial site access points based on Carlisle Blvd (Minor Arterial) is required 1-2 access points per 200 ft of frontage.

CURB RETURN

Based on CABQ DPM access guidelines per section 7.4. (B)(5)(i) curb returns are recommended at all site access driveways for high-volume traffic generators and for developments with median access and 25 or more parking spaces. Driveway widths specified in CABQ DPM Table 7.4.47 require two-lane driveways entrances for Arterials to between 22-30 ft.

- North Driveway 1 (shared easement with existing development to use for fast-food restaurant)
    - Based on CABQ DPM criteria, curb returns are recommended for this access driveway. Designed elements are available in the CABQ DPM. Existing driveway width was measured to fall within the 22-30 ft range required for driveway entrances.

- North Driveway 2
    - Based on CABQ DPM criteria, curb returns are recommended for this access driveway. Designed elements are available in the CABQ DPM. Existing driveway width was measured to fall within the 22-30 ft range required for driveway entrances.

- South Full Access Driveway 3
    - Based on CABQ DPM criteria, curb returns are recommended for this access driveway. Designed elements are available in the CABQ DPM. Existing driveway width was measured to fall within the 22-30 ft range required for driveway entrances.
    - Existing landscape concrete wall on both sides of the driveway entrance connects to curb return and presents pedestrian access and safety issues. It is recommended to remove the existing landscape wall to accommodate ADA compliance.

Auxiliary Lane Analysis

CABQ DPM auxiliary lane warrants were reviewed for the site access driveway(s). It should be noted that only right-turn auxiliary lane analysis was conducted based on roadway configuration as auxiliary left-turn lanes already exist at all full-access driveway locations. DPM Table 7.4.67 was used to determine if right-turn auxiliary lanes would be warranted for site access points on Carlisle Blvd. DPM Tables 7.4.68 and 7.4.69 were used to determine deceleration length and taper length, if applicable. It is important to note 2022 Full Build-Out traffic volumes were used in the analysis. The results of this analysis are shown in Table 32.

Table 32: Auxiliary Lane Analysis

Turning Lane	Design Speed (mph)	Turning Volume per hour	Warrant Result	Minimum Storage Length Required (ft)	Minimum Lane Transition Length (ft)	Required Taper Length
Driveway 1 - (Right-In/Right-Out	35	38	Not Required	n/a	n/a	n/a
Driveway 2 - (Right-in/Right-Out)	35	54	Required	240-350	300-150 Reverse Curve	8:1
Driveway 3 - (Full Access Driveway)	35	58	Required	240-350	300-150 Reverse Curve	8:1

Based on the information presented in the above table**Error! Reference source not found.**, right turn auxiliary lanes are warranted at two of the site access driveways based on CABQ DPM criteria with the new site trips added to the existing network. The CABQ DPM states auxiliary right-turning lanes are warranted when the turning volumes exceed 50 vehicles for any given peak for roadways signed at 35 mph.

Site access Recommendations

- North Driveway 1 (shared easement with existing development to use for fast-food restaurant)
    - Curb returns are recommended for this access driveway. Designed elements are available in the CABQ DPM.
    - Though an auxiliary lane at this shared driveway is not warranted it is recommended to install right-turn deceleration lane based on suggestion of North Driveway 2 closure. North Driveway 1 is predicted to absorb the majority of projected traffic volumes from North Driveway 2 if closed-off. Furthermore, it is important to note the possibility of an access-sharing agreement is in place with existing development.
        - It is noted that existing right-of-way and utilities may prevent or hinder construction of an auxiliary lane. Additional research is required to determine right-of-way and utility impacts.
- North Driveway 2
    - Curb returns are recommended for this access driveway. Designed elements are available in the CABQ DPM.
    - Auxiliary lane is warranted at this site driveway; however, it is recommended to close this driveway and install right-turn deceleration lanes at both remaining site driveways.
- South Full Access Driveway 3
    - Based on CABQ DPM criteria, curb returns are recommended for this access driveway. Designed elements are available in the CABQ DPM.
    - It is recommended to reconstruct the existing landscape wall to accommodate ADA compliance.
    - It is recommended to install right-turn deceleration lane.
        - It is noted that existing right-of-way and utilities may prevent or hinder construction of an auxiliary lane. Additional research is required to determine right-of-way and utility impacts.

CRASH DATA SUMMARY

A detailed crash summary has been completed to summarize existing crash trends and to determine possible safety impacts to the study area. Aggregate crash data were obtained for the study area for the most recently available five years. This included the years 2014 to 2018. Crashes were then summarized by year, type, lighting conditions, severity, and cause. Table 33 shows the severity of the crashes. To compare and summarize trends, all crashes reported in the adjacent area near the project's access driveways were grouped by intersection or roadway segment. The following locations with crash data were summarized:

- Menaul Blvd and Carlisle Blvd Intersection
- Menaul Blvd Segment- Between Carlisle Blvd and Morningside Dr
- Carlisle Blvd Segment- Between I-40 and Menaul Blvd
- Solano Dr Segment- Between Menaul Blvd and Morningside Dr

Table 33. Crash Data Summary

Crash Summary		Menaul Blvd & Carlisle Blvd	Menaul Blvd Between Carlisle Blvd & Morningside Dr	Carlisle Blvd Between I-40 & Menaul Blvd	Solano Dr Between Menaul Blvd & Morningside Dr
	Total Crashes	182	37	28	3
By Year	2014	30	11	7	2
	2015	42	9	9	0
	2016	31	7	5	0
	2017	35	5	2	1
	2018	44	5	5	0
By Type	Fixed Object	2	1	0	0
	Unknown/Non-Collision	0	0	0	0
	Other Vehicle - All Others/Entering At Angle	0	0	0	0
	Other Vehicle - Both Going Straight/Entering At Angle	3	2	0	0
	Other Vehicle - Both Turn Left/Entering At Angle	1	0	0	0
	Other Vehicle - From Opposite Direction/All Others	106	19	16	1
	Other Vehicle - From Opposite Direction/Sideswipe Collision	0	0	0	0
	Other Vehicle - From Same Direction/All Others	20	4	7	1
	Other Vehicle - From Same Direction/Rear End Collision	21	4	1	0
	Other Vehicle - One Left Turn/Entering At Angle	10	3	2	0
	Other Vehicle - One Right Turn/Entering At Angle	8	1	0	0
	Other Vehicle - One Stopped/Entering At Angle	0	0	0	0
	Other Vehicle - One Vehicle/Backing From Other Than Driveway	0	0	0	0
	Other Vehicle - One Vehicle/Making A U-Turn	1	0	0	0
	Other Vehicle - One Vehicle/Parked Improper Location	0	0	0	0
	Other Vehicle - One Vehicle/Stopped Traffic	2	0	0	0
	Other Vehicle - One Vehicle/Forward From Parked Position	0	0	1	0
	Overturn/Rollover	2	0	0	0
	Parked Vehicle	3	1	0	1
	Pedalcyclist	0	1	0	0
	Pedestrian	3	1	1	0
	Vehicle on Other Road	0	0	0	0
	% Other Vehicle - From Opposite Direction/All Others	58%	51%	57%	33%
	% Other Vehicle - From Same Direction/All Others	11%	11%	25%	33%
By Lighting Conditions	Day	135	33	23	2
	Dawn/Dusk	6	0	0	0
	Dark	32	3	5	1
	Invalid Code/Not Specified	9	1	0	0
	% Day	74%	89%	82%	67%
By Severity	PDO	140	24	20	2
	Injury	42	13	8	1
	Fatality	0	0	0	0
	% Property Damage Only	77%	65%	71%	67%
	% Injury	23%	35%	29%	33%
By Cause	Alcohol/Drug Involved	3	1	1	0
	Avoid No Contact - Other	6	1	2	0
	Defective Steering	1	0	0	0
	Defective Tires	0	0	0	0
	Disregarded Traffic Signal	20	1	1	0
	Driver Inattention	44	5	8	2
	Driverless Moving Vehicle	0	0	0	0
	Drove Left Of Center	2	0	0	0
	Excessive Speed	5	0	1	0
	Failed to Yield Right of Way	26	16	8	0
	Following Too Closely	9	2	2	0
	Improper Backing/ Lane Change/ Overtaking/ Turn/ Driving	25	4	2	1
	Inadequate Brakes	3	0	0	0
	Missing Data	19	1	0	0
	None	4	6	2	0
	Other - No Driver Error	6	0	0	0
	Passed Stop Sign	0	0	0	0
	Pedestrian Error	2	0	1	0
	Road Defect	1	0	0	0
	Speed Too Fast for Conditions	6	0	0	0
	Traffic Control Not Functioning	0	0	0	0
	Vehicle Skidded Before Brake	0	0	0	0
	% Driver Inattention	*24%*	*14%*	*29%*	*67%*
	% Failed to Yield Right of Way	*14%*	*43%*	*29%*	*0%*
	% Improper Backing/ Lane Change/ Overtaking/ Turn/ Driving	*14%*	*11%*	*7%*	*33%*
	% Disregarded Traffic Signal	*11%*	*3%*	*4%*	*0%*

From the table shown above, the following observations are made:

- Menaul Blvd and Carlisle Intersection:
    - The two most common classifications of vehicle crashes are observed to be Other Vehicle – From Opposite Direction and Other Vehicle - From Same Direction.
    - For the years 2014 to 2018, 182 crashes were reported.
    - A majority of crashes for the intersections occurred during the daylight hours totaling 74% of crashes.
    - No fatal crashes were reported from 2014 to 2018, and 23% remaining crashes reported involved injuries.
    - The most common causes of crashes are observed to be Driver Inattention, Failed to Yield Right of Way, Improper Backing/Lane Change/Overtaking/Turns/Driving, and Disregarded Traffic Signal.
- Menaul Blvd Segment- Between Carlisle Blvd and Morningside Dr
    - The two most common classifications of vehicle crashes are observed to be Other Vehicle – From Opposite Direction and Other Vehicle - From Same Direction.
    - For the years 2014 to 2018, 37 crashes were reported.
    - A majority of crashes for the corridor occurred during the daylight hours totaling 89% of crashes.
    - No fatal crashes were reported from 2014 to 2018, and 35% remaining crashes reported involved injuries.
    - The most common causes of crashes are observed to be Failed to Yield Right of Way, Driver Inattention, Improper Backing/Lane Change/Overtaking/Turns/Driving, and Disregarded Traffic Signal.
- Carlisle Blvd Segment- Between I-40 and Menaul Blvd
    - The two most common classifications of vehicle crashes are observed to be Other Vehicle – From Opposite Direction and Other Vehicle - From Same Direction.
    - For the years 2014 to 2018, 28 crashes were reported.
    - A majority of crashes for the corridor occurred during the daylight hours totaling 82% of crashes.
    - No fatal crashes were reported from 2014 to 2018, and 29% remaining crashes reported involved injuries.
    - The most common causes of crashes are observed to be Driver Inattention, Failed to Yield Right of Way, Improper Backing/Lane Change/Overtaking/Turns/Driving, and Disregarded Traffic Signal.
- Solano Dr Segment- Between Menaul Blvd and Morningside Dr
    - Due to the small number of crashes at this location, there was not any commonality among the classification of vehicle crashes.
    - For the years 2014 to 2018, only three crashes were reported.
    - Two of the three crashes for the corridor occurred during the daylight hours totaling 67% of crashes.
    - No fatal crashes were reported from 2014 to 2018, and 33% remaining crashes reported involved injuries.

      Due to the small number of crashes at this location, there was not any commonality among the cause.

SUMMARY OF RECOMMENDATIONS

As discussed in previous sections, potential improvements are listed here as follows:

- Carlisle Blvd & Menaul Blvd
  - The development is observed to have minimal effect on the intersection and is currently experiencing QSR issues during existing conditions. It is recommended that Carlisle Blvd & Menaul Blvd be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.
- For Carlisle Blvd & I-40 North Ramp (WB)
  - The development is observed to have minimal effect on the WB approach and it is currently experiencing QSR issues during existing conditions. Queueing issues for the WB approach can be attributed to cycle delays and a limitation of HCS software when analyzing shared exclusive turn lane with more than three lane groups. Westbound through traffic appears to contribute to queueing issues, though the movement was observed to serve very minimal traffic with various 15-minute periods of zero vehicles during peak hours. Furthermore, a wide single-lane off-ramp for the westbound approach likely provides side-by-side stacking of vehicles, thereby providing separated approach movements. It is recommended that Carlisle Blvd & I-40 North Ramp (WB) intersection be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.
- For Carlisle Blvd & I-40 North Ramp (WB)
  - No capacity or queueing issues are observed for this intersection. However, because of this intersection's proximity and connected functionality to the intersection of Carlisle Blvd & I-40 North Ramp (WB), it is recommended that this intersection be re-timed upon opening of the development. Signal timings should be performed by a registered Professional Traffic Operations Engineer (PTOE) at least one month after the opening of the development.
- North Driveway 1 (shared easement with existing development to use for fast-food restaurant)
  - Right turn auxiliary lane is recommended.
    - It is noted that existing right-of-way and utilities may prevent or hinder construction of an auxiliary lane. Additional research is required to determine right-of-way and utility impacts.
  - Potential driveway reconstruction with CABQ required curb returns.
- North Driveway 2
  - Recommended to close this driveway to meet CABQ required driveway spacing and provide adequate deceleration length for the auxiliary lane at the driveway to the north.
- South Full Access Driveway 3 (Prospect)
  - Right turn auxiliary lane is recommended.
    - It is noted that existing right-of-way and utilities may prevent or hinder construction of an auxiliary lane. Additional research is required to determine right-of-way and utility impacts.
  - Driveway reconstruction with CABQ required curb returns.
  - Existing landscape concrete wall on both sides of the driveway entrance connects to curb return and presents pedestrian access and safety issues. It is recommended to remove the existing landscape wall and reconstruct curb ramps, sidewalks and landscaping to accommodate ADA compliance.