PLANNING & INSPECTIONS DEPARTMENT
Joshua L. Grant, Manager

To: Board of County Commissioners
Planning Board

From: Jeremiah Combs, Planner

Date: July 15, 2024

Re: TIA Appeal #2024-1
DCA Properties of Denver, LLC, applicant
Parcel ID# 80791 and 80792

The following information is for use by the Lincoln County Board of Commissioners at their meeting/public hearing on August 5, 2024.

Request

The applicant is appealing the denial of a Traffic Impact Analysis (TIA) for a proposed school expansion located at the end of Charter Lane about 300 feet west of N.C. 16 Business in Catawba Springs Township. The TIA did not demonstrate compliance with the Level of Service standards in the Lincoln County UDO (see the determination letter on the following page). Below is a summary of the Level of Service standards:

1. Where proposed development lowers any intersection leg impacted by said development below a Grade "C", the developer will be required to provide those transportation improvements necessary to retain a Grade "C".
2. Where an existing intersection is rated below Grade "C" prior to any proposed development, the developer will be required to maintain existing transportation levels for any/all legs impacted. Final intersection grades shall include the impact of the proposed development.
3. Where a new access or street is proposed, the TIA shall provide a Level of Service analysis for all individual movements where the proposed street(s) intersect an existing street. Intersecting street(s) with movements at an identified Level of Service below Grade "C" shall be deemed to not be in compliance with the established TIA standards.

The applicant has prepared an amendment to the special use permit (SUP #455) that was approved in February 2022 for the school expansion. Unless this appeal is approved, the TIA must be modified to demonstrate compliance with the Level of Service standards before a public hearing can be scheduled for that amendment.

DEVELOPMENT SERVICES
Andrew C. Bryant, Director

To: Sean Coldren, PE, Civil Project Manager – CES Group Engineers, LLP
Business Customer Sales and Service

From: Andrew C. Bryant, Director, Development Services ACB

Re: Traffic Impact Analysis Review & Determination

Date: July 1, 2024

Staff has completed their review of the Traffic Impact Analysis for the Denver Christian Academy Expansion prepared by David Hyder, PE, Engineering Director of J.M. Teague Engineering & Planning, dated February 28, 2024. The study in its Conclusion did not recommend any offsite improvement be made to accommodate the impacts of the expansion of the charter school. The Lincoln County Unified Development Ordinance in §9.8 Traffic Impact Analysis sets certain standards for Level of Service which require maintenance of Level of Service from the Background with No-Build conditions to the Background with Build condition (with recommended improvements). The traffic impact analysis that was provided did not recommend any improvements and saw reductions in Level of Service in both Phase 1 and Phase 2 expansions at the intersection of Charter Ln. and NC16 Business from D to F in Phase 1 and from E to F in Phase 2.

Based on this reduction in Level of Service the application is Denied. §9.8.8 authorize the modification of the application to minimize traffic related impacts. Those modifications may include:

A. A reduction in the projected vehicle trips per day;
B. The dedication of additional right-of-way;
C. The rerouting of traffic and a proposed access and egress point;
D. Other modification determined to be necessary.

In addition to those options the applicant also has a right to Appeal this decision subject to the provisions of §9.8.10. This appeal is heard by the Lincoln County Board of County Commissioners. They may grant the appeal if they determine that the applicant has satisfactorily mitigated adverse traffic effects of additions traffic from the project has an insignificant effect on the County's roads.

Appeal Application (Traffic Impact Analysis)

Lincoln County Planning and Inspections Department
115 W. Main St., Lincolnton, NC 28092
Phone: (704) 736-8440

Part I

Applicant Name DCA Properties of Denver LLC

Applicant Address PO Box 2189 Denver, NC 28037

Applicant Phone Number 704.408.0080

Property Owner's Name DCA Properties of Denver LLC

Property Owner's Address PO Box 2189 Denver, NC 28037

Property Owner's Phone Number 704.408.0080

Part II

Property Location 2243 N Highway 16 Business Denver, NC 28037

Property ID # (10 digits) 4604438532 Property Size 5.133

Parcel # (5 digits) 80841 Deed Book(s) 3174 Page(s) 944

Part III

Date of Director's decision:

July 1, 2024

Summary of Director's decision:

Application is denied based upon reductions in levels of service at Charter Lane & NC 16 Hwy Business

Briefly describe your reasons for seeking an appeal of decision:

This ruling affects traffic exiting the property, not traffic entering the property. NCDOT and the traffic engineer do not have issues with our traffic flow. Therefore, we appeal the Lincoln Co. decision. The likely result of this decision is to halt traffic* exiting the school, similar to Rocky Springs Elem. and Lincoln Charter, which will create more backup traffic on Hwy 16 Business.

*(halting traffic on Hwy 16 Business)

As an alternative, a DCA staff member can stage the release of traffic onto Charter Lane.

$200 APPLICATION FEE MUST BE RECEIVED BEFORE PROCESSING AN APPEAL REQUEST

I hereby certify that all of the information provided for this application and attachments is true and correct to the best of my knowledge.

DCA Properties of Denver, LLC
Applicant

7/3/2024
Date

DCA Properties of Denver, LLC
Owner

7/3/2024
Date

These pages to be completed by County

Application #: _____ Date of Application: _____

FINDINGS OF FACT

1. The applicant has satisfactorily mitigated adverse traffic impacts of their project or the additional traffic from the project has an insignificant impact on the County's roads.

   Yes _____ No _____

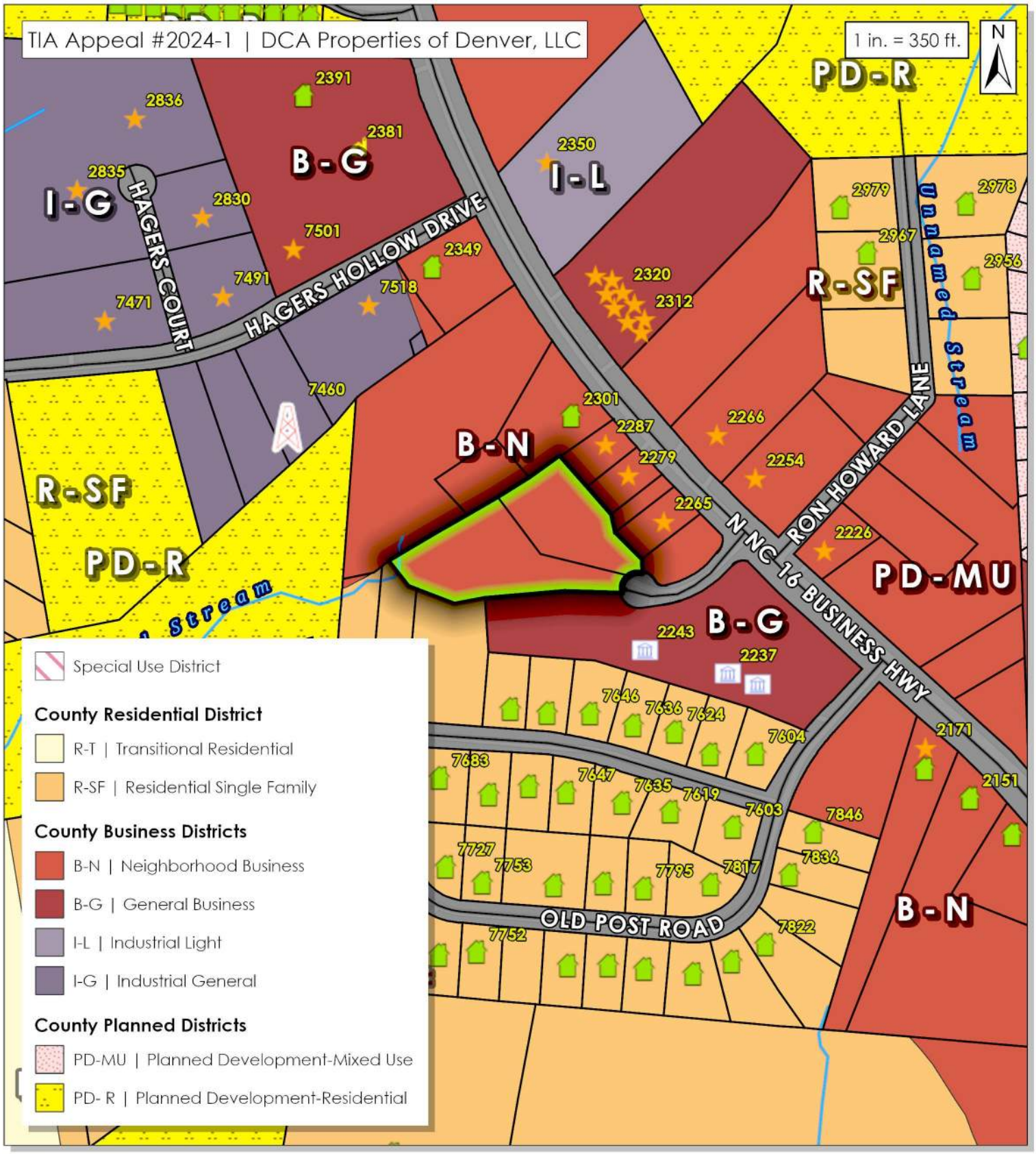
   Factual reasons cited by the Board:

   _____
   _____
   _____

Based on the Findings of Fact, the following action was taken on _____ by the Lincoln County Board of County Commissioners after a public hearing was held and duly advertised:

_____

_____



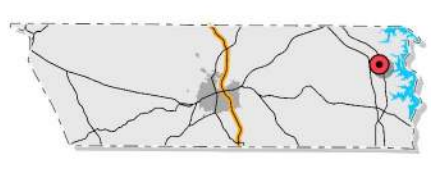
Lincoln County
Planning & Inspections
115 W. Main St
3rd Floor
Lincolnton, NC 28092

Parcel ID # 80791 & 80792

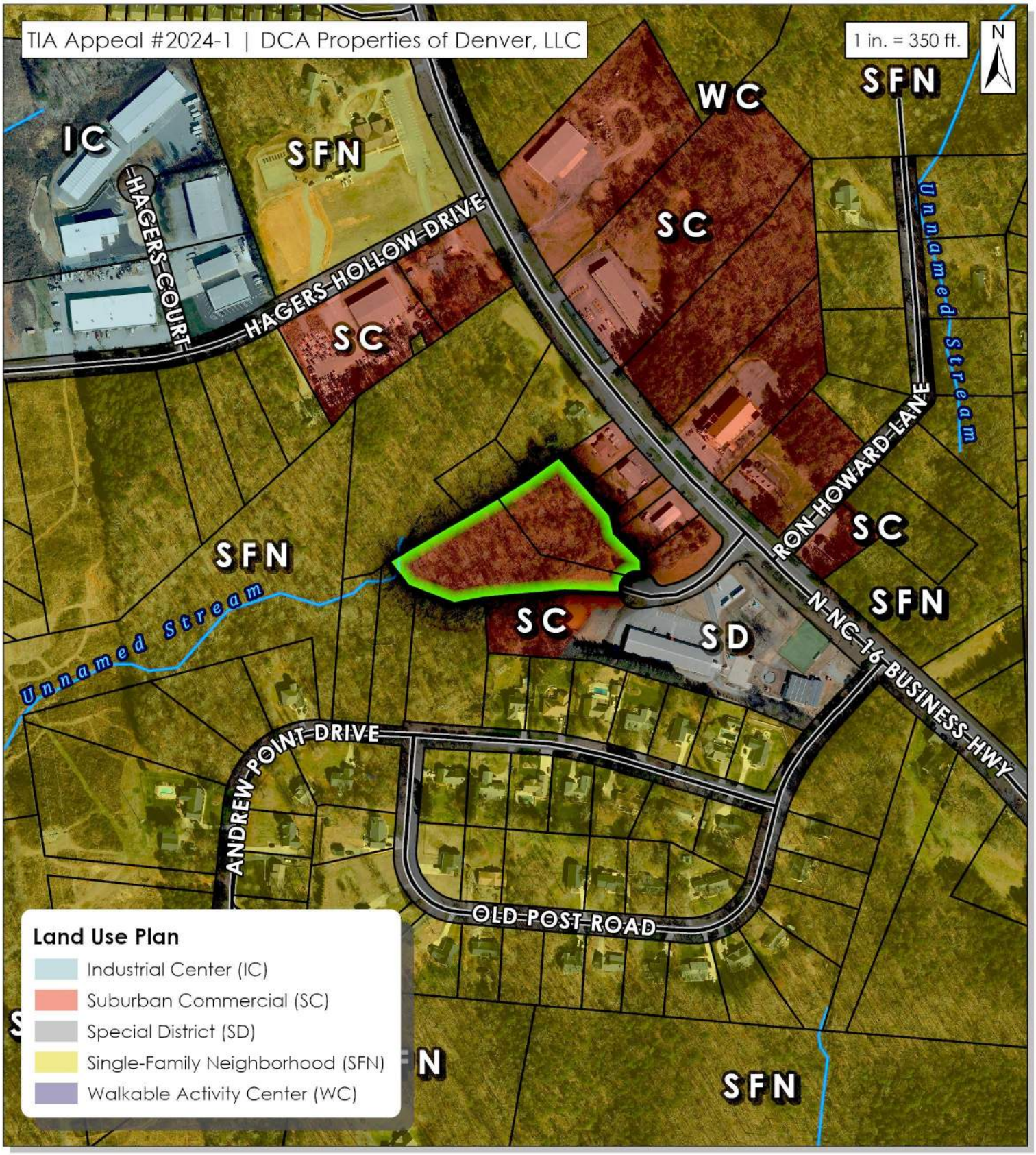
- Property Location(s)

See Attached Application for Parcel Information

LOCATION MAP



Property Location(s)



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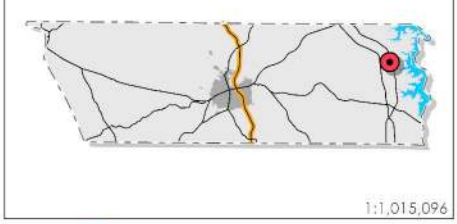


Property Location(s)

J.M. TEAGUE
Engineering & Planning
— Est. 2010 —

1155 N. Main Street
Waynesville, NC 28786
(P) 828.456.8383
(F) 828.456.8797
www.jmteagueengineering.com

Denver Christian Academy Expansion
Traffic Impact Analysis

Located in

Denver, North Carolina

Prepared For:

The Denver Christian Academy
Mike Kiser
fmlkiser@bellsouth.net
P.O. Box 2189
Denver, NC 28037

Prepared By:
David Hyder, P.E., Engineering Director
J.M. Teague Engineering & Planning
david@jmteagueengineering.com
828.456.838313

February 28, 2024

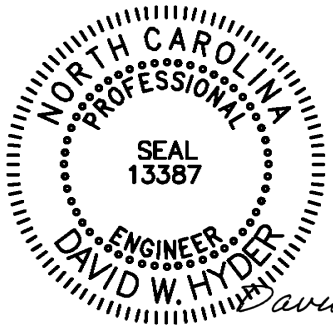
JMTE #: WAYN 1445

Denver Christian Academy
Traffic Impact Analysis

Denver, North Carolina

Documentation Prepared by:

1155 North Main Street
Waynesville, NC 28786
828-456-8383



David W. Hyder

David W. Hyder, P.E.

February 28, 2024

Contents

LIST OF ABBREVIATIONS

AADT	Annual average daily traffic
ADT	Average Daily Traffic
AM	Morning peak period
ARMs	*Access and Roadside Management Standards* (South Carolina)
CBD	Central Business District
CIP	Capital Improvement Program
DOT	Department of Transportation
Driveway Manual	*Policy on Street and Drive Access to North Carolina Highways*
FAI	Functional Area of the Intersection:
FC	Functional Classification
ft. or ‘	Foot
HCM	Highway Capacity Manual
in. or ”	Inch
KSF	Thousand Square Feet
LOS	Level of Service
LUC	Land Use Code
MSTA	Municipal School Transportation Assistance
MUTCD	Manual On Uniform Traffic Control Devices
NCDOT	The North Carolina Department of Transportation
PHF	Peak Hour Factor (a measure of traffic variability)
PM	Afternoon peak period
q	Flow rate (vehicle/hour)
Q	Queue Length in feet
Q95	95th Percentile Queue in feet
RIRO	Right-in/Right-out
sec.	Second
SimTraffic	A traffic simulation extension of the Synchro Package that randomly simulates intersection operations
STIP	State Transportation Improvement Program
Subdivision Roads	Subdivision Roads Minimum Construction Standards (NCDOT)
SYNCHRO	A dedicated analysis package that implements the HCM
T	Trips
TWLTL	Two-way Left Turn Lane
v/c	V over C or the volume to capacity ratio

INTRODUCTION

The Denver Christian Academy wishes to add student capacity at their campus located at 2243 NC 16 Business in Denver, North Carolina. The School proposed to add 277 students and 50 staff positions in two phases. Lincoln County and Division 12 of the North Carolina Department of Transportation (NCDOT) has requested a Traffic Impact Analysis (TIA) for this expansion. Lincoln County requires a Traffic Impact Analysis for all projects, which can be anticipated to generate at least 100 peak hour trips generated based on the latest edition of the Institute of Transportation Engineers (ITE) *Trip Generation Manual*. Information related to TIA scoping is included on page 5 and in Appendix A.

A TIA is a planning document intended to evaluate the potential transportation impacts of a proposed development project. The impact on traffic flow, congestion, safety, and other related factors in the surrounding area. The TIA helps identify needed transportation improvements or mitigation measures that will help accommodate the increased traffic generated by the project. The TIA aids decision-makers in making informed choices related to land use and development, ensuring that the project aligns with transportation goals and minimizes adverse effects on the transportation infrastructure.

The project consists of two phases. Phase 1 consists of adding 127 students and 42 staff positions at the main campus by 2025. Phase 2 consists of adding 150 students, 8 staff positions and relocating the high school students from the satellite campus to the main campus by the year 2027.

Trip generation for Phase 1 and Phase 2 considers the existing student body and the additional students for each phase (page 35). The Denver Christian Academy maintains a staggered bell schedule and this bell schedule is accounted for in the trip generation.

The analysis shows that all School queuing can be contained on campus and that no improvements are needed on NC 16 Business to accommodate school traffic. No offsite mitigations are proposed. However, a proposed signal to be constructed by another developer is noted in the listed mitigations (page 76).

Figure 1 shows the project location and the intersections studied in this analysis. Intersections are numbered in blue ovals.

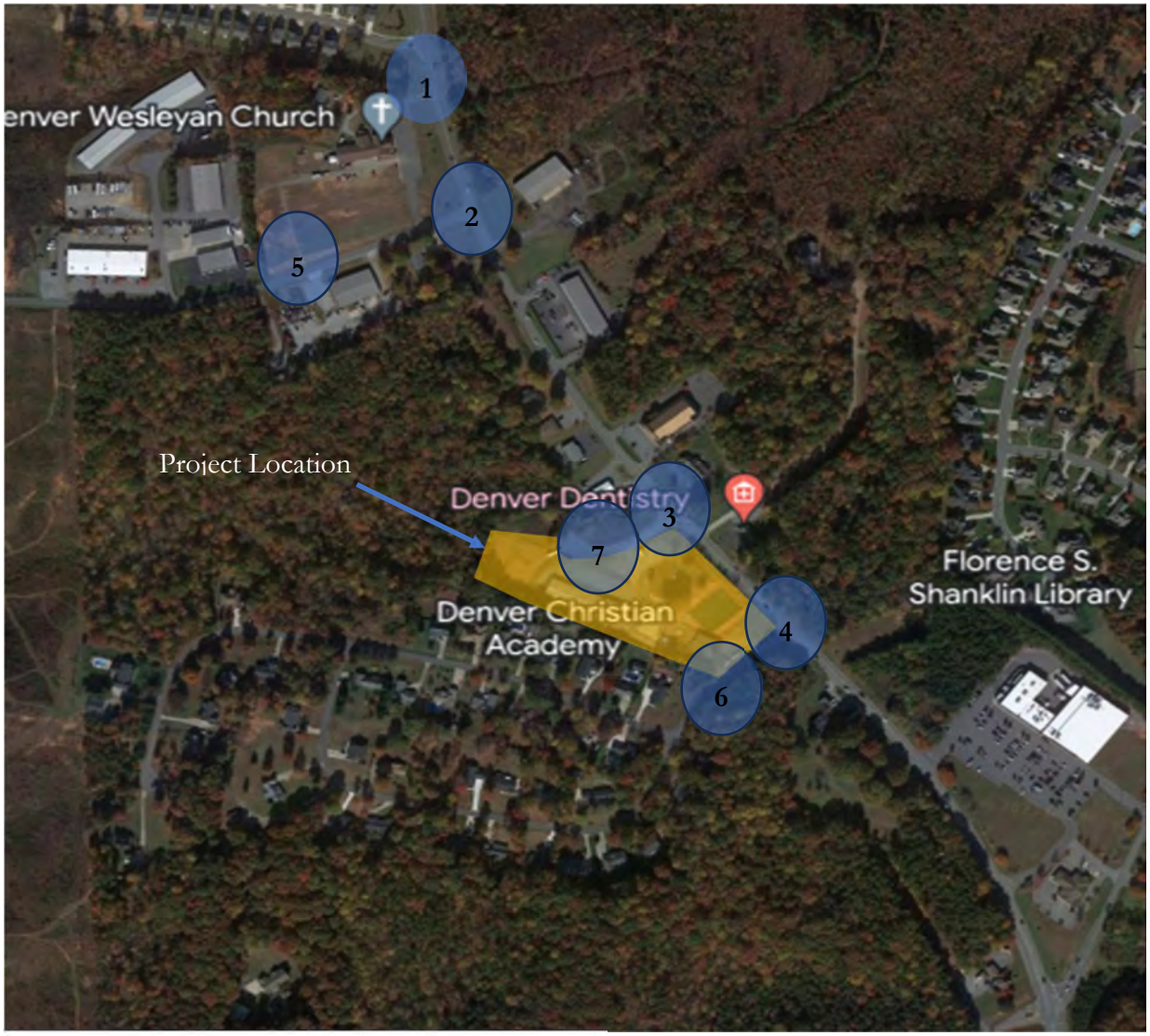


Figure 1: Proposed Development Site

PROJECT DESCRIPTION

The Denver Christian Academy wishes to add to the existing campus 277 students and 50 staff positions as part of the expansion located at 2243 NC 16 Business on 6.3 acres of land in Denver, North Carolina. The expansion consists of two buildings containing ten (10) elementary school classrooms, four (4) preschool classrooms, and a gymnasium. The site has one access point on NC 16 Business and one access on Old Post Road. Figure 2 shows the proposed site plan with existing driveways numbered Access 1, Access 2, and Access 3, while proposed new accesses are lettered New Access A and New Access B. Also shown is the Phase 1 Building Addition and the New Building proposed for Phase 2. When Phase 2 is complete Denver Christian Academy will have consolidated all instructional to this site.

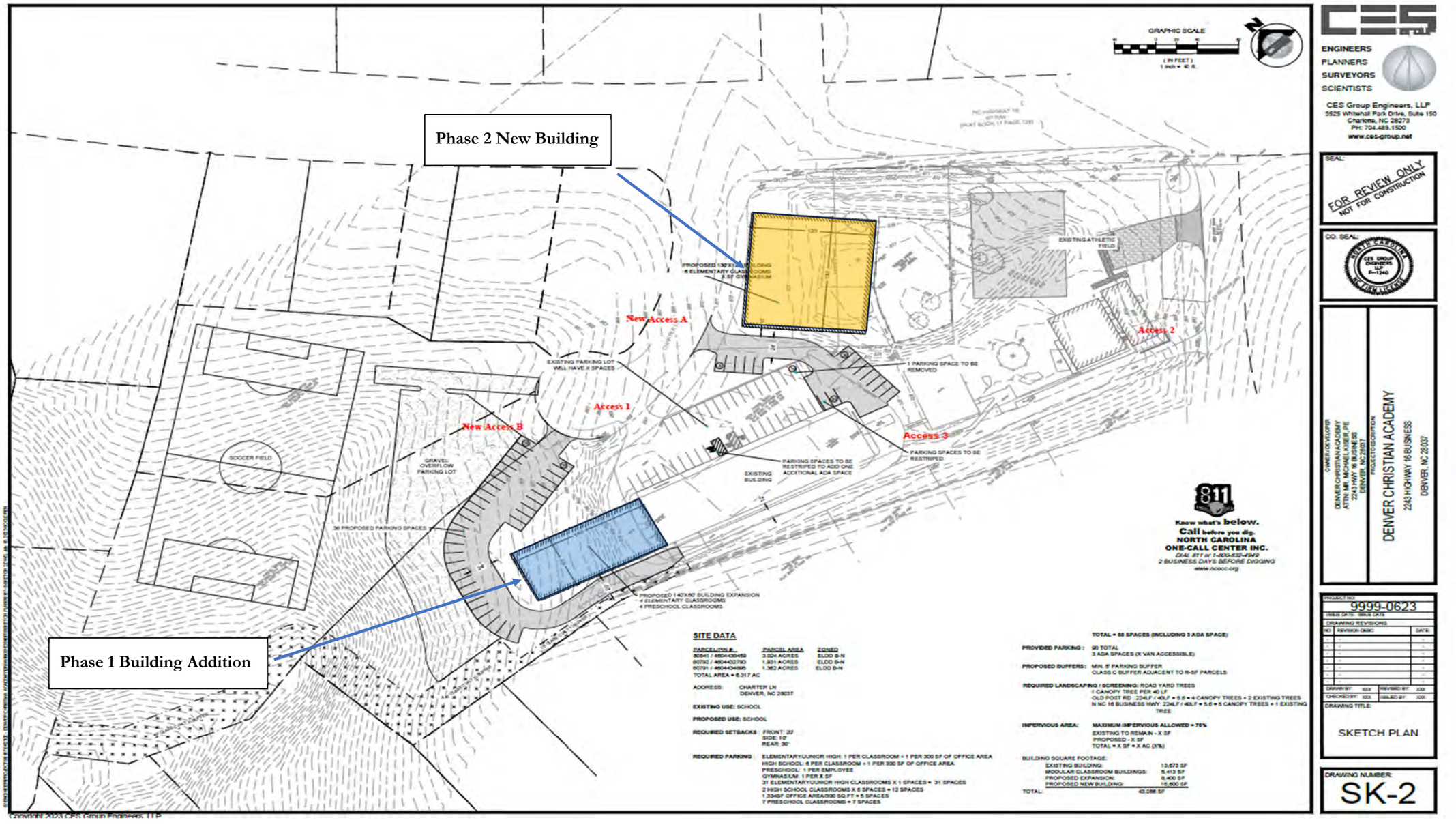


Figure 2: Site Plan - Denver Christian Academy (Source: CES Group Engineers, LLP)

PROJECT SCHEDULE AND STAGES

The Denver Christian Academy expansion comprises two phases. In Phase 1 the Denver Christian Academy will add 127 students and 42 staff positions. Phase 1 includes Also, as part of Phase 1 is the expansion of the main building by 8,400 square feet, including 14 preschool classrooms and 8 elementary school classrooms (grades K-6) in 2025.

In Phase 2 the campus will add 150 students and 8 staff positions. A new (15,000 square foot) building south of Charter Lane off Highway 16 will house 7th through 12th grade, plus a gym by 2027.

AGENCY COORDINATION

Before beginning the TIA, J. M. Teague Engineering and Planning (JMTE) coordinated with The Denver Christian Academy, the North Carolina Department of Transportation (Division 12, District 3), NCDOT and the Municipal School Transportation Assistance (MTSA), and Lincoln County to establish the project limits, growth rates, background conditions, and other parameters. The NCDOT approved the scope for this project on September 5, 2023.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION REQUIREMENTS

The NCDOT requires Traffic Impact Analysis under the following conditions:

☐ Estimated daily trips exceed 3,000 trips per day,

☒ Estimated daily trips exceed the City's TIA trip threshold (see below),

☒ The project is in a known STIP or local CIP project #U-6144 (see page 33 Effect of State DOT Projects for more information),

for more Information),

☐ The project includes a rezoning request,

☐ The proposed site access is within 1,000 feet of an interchange,

☐ The Applicant requests a new or modified control of access break, or

☐ The Applicant requests a new or modified control of access break.

Denver Christian Academy meets the second and third elements of the NCDOT checklist. NCDOT Division 12 has requested a TIA.

LOCAL ORDINANCE REQUIREMENTS

Section 9.8. of the Lincoln County Unified Development Ordinance sets out the following requirements for a Traffic Impact Analysis:

> "A Traffic Impact Analysis shall be required for all projects, which can be anticipated to generate at least 100 peak hour trips generated based on the latest edition of the Institute of Transportation Engineers (ITE) *Trip Generation Manual*. Denver Academy is expected to generate 628 AM Peak Hour trips and 466 PM Peak Hour trips."

Deviations from the Approved Scope

There are no deviations from the approved scope and no mitigations require revising the trip generation or evaluating alternative intersection geometry.

Analysis Requirements

The analysis requirements have been agreed upon between the Development Team, North Carolina Department of Transportation and Lincoln County. Table 1 summarizes the key parameters of the analysis. The paragraphs following Table 1 provide additional explanations as needed.

Table 1: Summary of Analysis Parameters

Parameter	Selected Value	Notes
Annual Growth Rate (%/yr.)	2%	Per NCDOT
Calculated Growth Factor	Phase 1: 1.04 Phase 2: 1.08	Calculated using the compound interest formula
Base Year	2023	Per Scoping
Project Phases	2	Per Denver Christian Academy
Horizon Year(s)	Phase 1: 2025 Phase 2: 2027	Per Denver Christian Academy
Peak Hour Factor	Varies. See Table 2	Per NCDOTs Municipal & School Transportation Assistance Guidance
Minimum Synchro Volume	4	Per NCDOTs Capacity Analysis Guidance

Per MSTA guidance, school access points have a Peak Hour Factor (PHF) of 0.5. Adjacent peripheral intersections have a hybrid PHF of 0.75, with non-impacted intersections using a PHF of 0.9. Please refer to Figure 4 for Intersection number locations. Table 2 shows the Peak Hour Factors for each intersection and movement.

Table 2: Peak Hour Factors

Intersection Number	Intersection Name	Movement	Peak Hour Factor
1	NC 16 Business & Wesleyan Church Entrance	Eastbound Left and Right	0.90
		North and Southbound	0.75
2	NC 16 Business & Hagers Hollows Drive	Eastbound Left and Right	0.90
		North and Southbound	0.75
3	NC 16 Business & Charter Lane	Eastbound Left and Right, Northbound Left, and Southbound Right	0.50
		North and Southbound Thru	0.75
4	NC 16 Business & Old Post Road	Eastbound Left and Right Northbound Left, and Southbound Right	0.50
		North and Southbound Thru	0.75
5	Hagers Hollow Dr. & Wesleyan Church Entrance	Entire intersection	0.90
6	Old Post Rd & Access 1	Entire intersection	0.50
7	Charter Lane & Access 2	Entire intersection	0.50

Figure 3 shows the historic traffic growth at the NCDOT traffic count station on NC 16 Business Denver area, NC. As shown traffic volume has been flat or declining in this section of NC 16 Business. In consultation with the NCDOT and Lincoln County a two (2.0) percent per year growth rate was selected for this TIA.

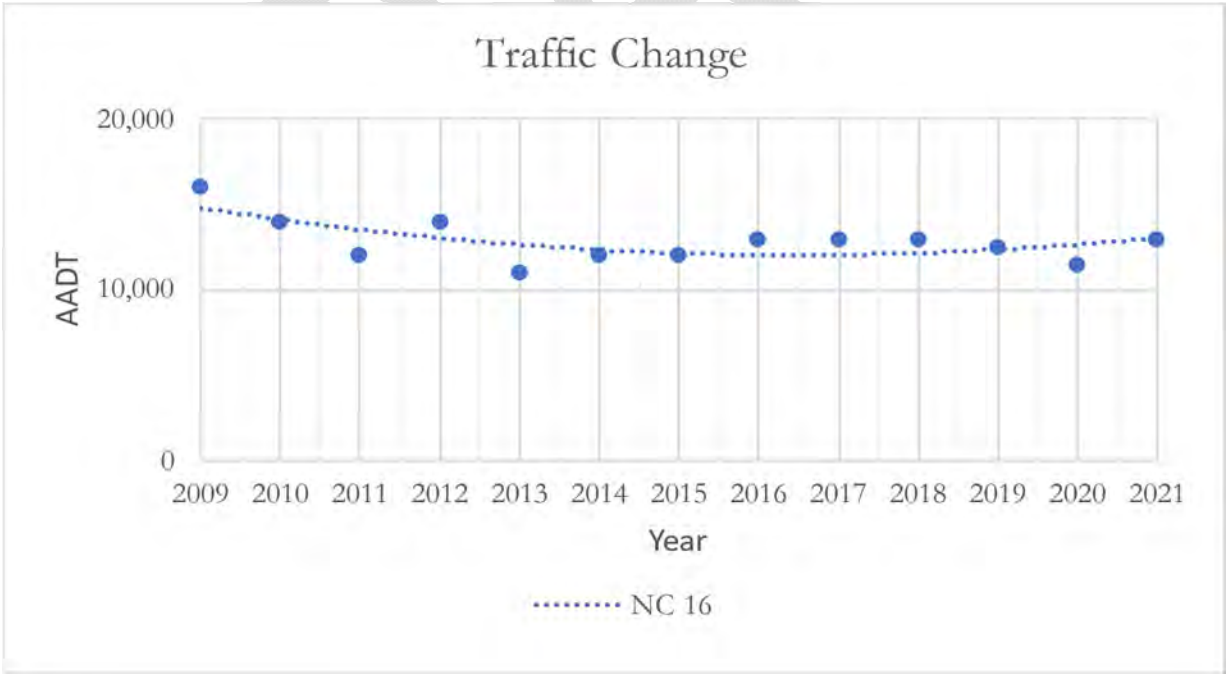


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Figure 3: Change in Traffic

EXISTING CONDITIONS

This section of the report describes the existing conditions in the project area. It discusses nearby land uses, the purpose of the street network, traffic control devices, other modes of travel, site safety.

NEARBY LAND-USES

The land use near the project is a mix of residential and commercial uses. The residential is composed of single-family housing in subdivisions. The commercial consists of services including medical offices, grocery stores, restaurants, and convenience stores.

EXISTING ROADWAY NETWORK

The functional classification describes the function of the roadway. The higher classes should provide mobility (speed) of travel and the lower classes should provide property access. The hierarchy of the functional classifications are Interstate, Freeway, Arterial, Collectors, and Locals. Table 3: Existing Roadway Network shows the Functional Classification of each road in the project area.

Table 3 summarizes the nearby street network including Road Name, Functional Classification, AADT, and Posted Speed Limit. According to North Carolina General Statute 20-141(b) public roadways without a posted speed limit are assumed to have a 55 mile per hour speed limit.

Table 3: Existing Roadway Network

Roadway	Functional Classification	AADT (2021)	Posted Speed Limit
NC 16 Business	Minor Arterial	13,000	45 mph
Charter Lane	Local	NA	Not posted
Old Post Road	Local	NA	Not Posted
Hagers Hollow Dr.	Local	NA	Not Posted

TRAFFIC CONTROL DEVICES

As shown in

Table 4 (following), all intersections in the study area are stop controlled.

Table 4: Traffic Control Devices

Synchro Intersection Number	Major Street	Minor Street	Traffic Control	Phases	Notes
1	NC 16 Business	Wesleyan Church Entrance	Stop	NA	Stop Controlled
2	NC 16 Business	Hagers Hollow Dr.	Stop	NA	Stop Controlled
3	NC 16 Business	Charter Lane	Stop	NA	Stop Controlled
4	NC 16 Business	Old Post Road	Stop	NA	Stop Controlled
5	Hagers Hollow Dr.	Wesleyan Church Entrance	Stop	NA	Stop Controlled

INTERSECTION GEOMETRY

Figure 4 on page 11, shows the available turn lanes at each studied intersection. Through lanes are assumed to be continuous between intersections and are not dimensioned. Turn lanes are measured from the stop bar to the approximate beginning of the taper. Dimensions are given to the nearest vehicle length (25 feet).

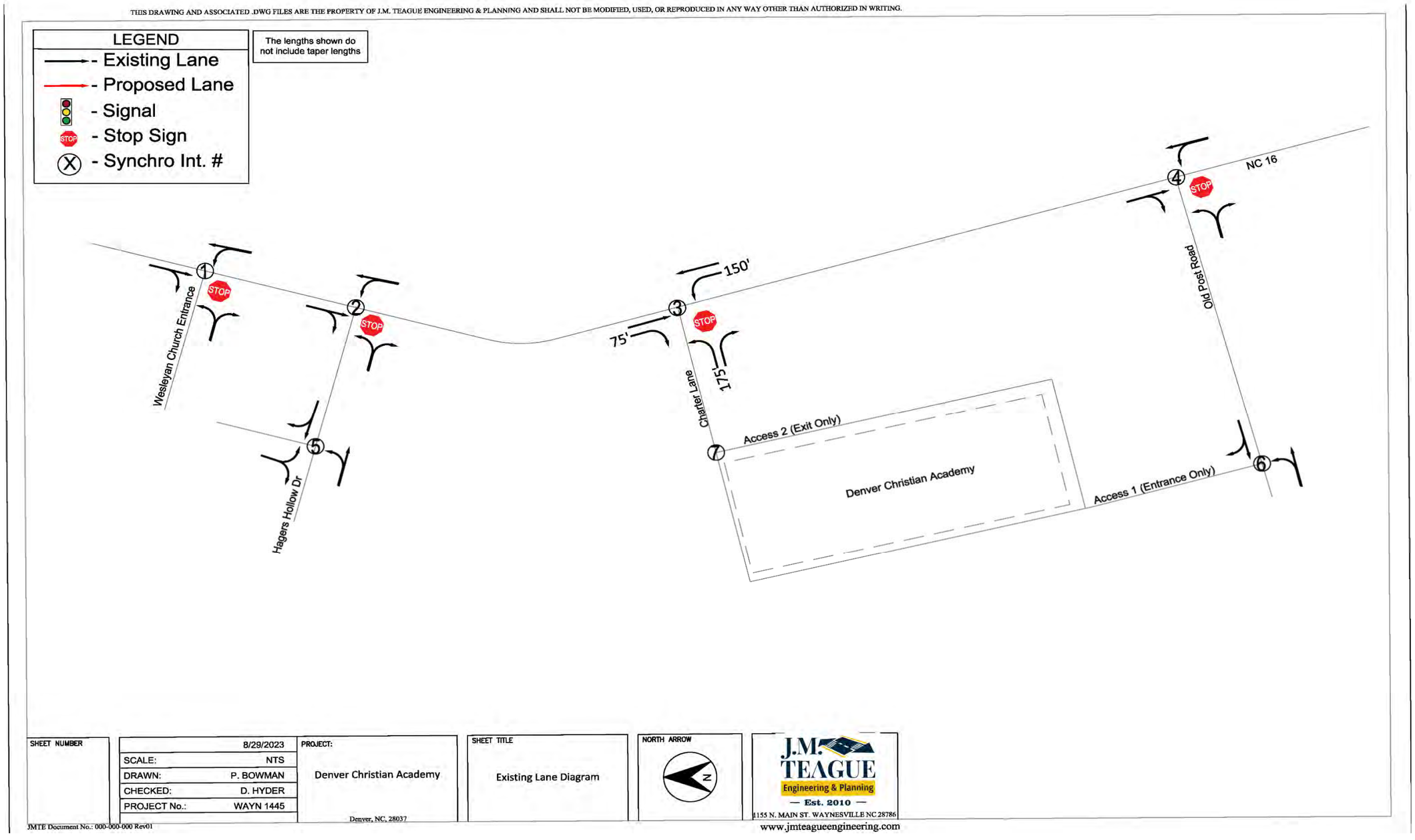


Figure 4: Existing Lane Diagram (2023)

SAFETY

For this review, safety is composed of roadway or street safety, and emergency response. There are no safety improvements recommended as part of this report.

CRASH REVIEW

The NCDOT's Planning Level Scoring Data for the years 2018-2022 are included in Appendix D. This map gives NC 16 Business a score of 78 with 30 total crashes, none of which were fatal. This map also gives Old Post Road a score of 0 with no crashes reported from 2018-2022.

SIGHT DISTANCE

Page 29 of *Policy on Street and Driveway Access to North Carolina Highways (2003),* requires a sight distance of one hundred (100) feet per 10 miles per hour in each direction for a passenger vehicle to safely cross a two-lane street. A street with a forty-five (45) mile per posted speed limit needs four-hundred fifty (450) feet of sight distance in either direction at all the intersections. As observed on a site visit, and shown in Figure 5, the sight distance for Intersection 3 appears to exceed four-hundred-fifty feet. As observed on a site visit, and shown in Figure 6 the sight distance for Intersection 4 appears to exceed four-hundred-fifty feet. It will be Denver Christian Academy's responsibility to ensure that the sight distance is adequate during construction and once construction is complete. Pictures in Figures 5 and 6 are from Google Earth and do not represent the view from a vehicle set back from the intersection.

Looking left toward Denver, NC

Looking right away from Denver, NC

Figure 5: Intersection 3 NC-16 and Charter Lane Location (Source: Google Earth)

Looking left toward Denver, NC

Looking right away from Denver, NC

Figure 6: Intersection 4 NC-16 and Old Post Rd. (Source Google Earth)

FIRE & EMERGENCY VEHICLE ACCESS

The site plan shows there is access from each end of the internal roadways. Charter Lane is more than twenty-six feet wide in front of the Denver Christian Academy and the rear access from Old Post Road varies from 12 feet to 20 feet wide. The rear access is a one-way road, and its width does not meet minimum width of 26 feet for Fire apparatus per Section D103 of the Uniform Fire Code mainly due to the property boundary. The driveway cross-sections shown on the site plan provide adequate emergency response.

ALTERNATIVE MODES OF TRAVEL

This section of the report discusses the alternative modes of travel near the Denver Christian Academy such as bicycle, pedestrian, and transit. No sidewalks or bicycle facilities are located near the project. There are no fixed transit routes within the study area. No Bus Routes or shelters are present in the project area.

TRAVEL DEMAND

The flow diagram above shows the general process of developing the estimated traffic used in the TIA. This section of the report discusses each component of traffic development to give the reader a sense of the process.

EXISTING TRAFFIC

The existing traffic is the travel demand upon the street system today. Existing traffic is estimated from traffic counts taken at the site. The existing traffic is used to estimate the peak travel periods in the area, the variability of the traffic within the peak period, and the through movements and turning movements at each intersection. A TIA intends to estimate conditions on a "typical day" in a project's horizon year. To meet this intent the traffic counts are taken midweek with school in session.
Figure 7 summarizes traffic counts taken on October 4, 2023, and December 12, 2023.

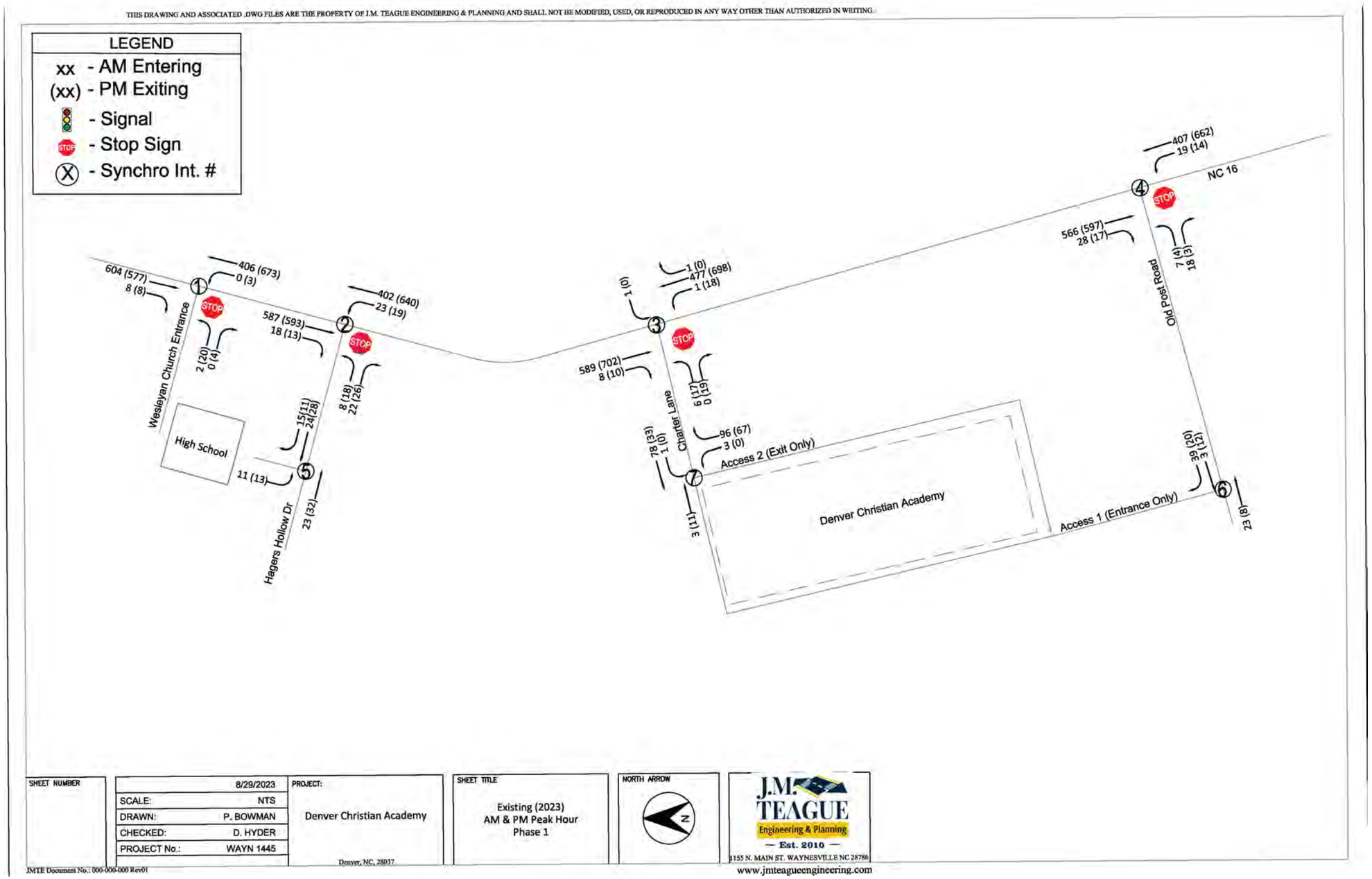


Figure 7: Base (2023) AM & PM Peak Hour Traffic

PEAK PERIOD TRAFFIC VOLUMES

Traffic can be expressed as Average Daily Traffic (ADT) or peak period traffic. In both the TIA and street design processes, it is more useful to focus on identifying peak period traffic—the time when street demand is highest. Typically, the peak hour of travel represents around ten percent of daily traffic on a street. There are two peak periods each day. In the morning when students arrive at Denver Christian Academy, and in the evening when students are leaving school. Refer to Table 5 for the AM and PM Peak Periods at the existing study intersections.

Table 5: Peak Periods at Existing Study Intersection

Synchro Intersection Number	Major Street	Minor Street	AM Peak Period	PM Peak Period
1	NC 16 Business	Wesleyan Church North Entrance	7:05 AM – 8:05 AM	2:50 PM – 3:50 PM
2	NC 16 Business	Hagers Hollow Drive	7:05 AM – 8:05 AM	3:30 PM – 4:30 PM
3	NC 16 Business	Charter Lane	7:55 AM – 8:55 AM	2:05 PM - 3:05 AM
4	NC 16 Business	Old Post Road	7:05 AM – 8:05 AM	2:50 PM – 3:50 PM
5	Hagers Hollow Drive	Wesleyan Church Southern Driveway	7:00 AM – 8:00 AM	3:05 PM – 4:05 PM
6	Old Post Rd.	Denver Academy East Driveway	7:05 AM – 8:05 AM	3:10 PM – 4:10 PM
7	Charter Lane	Exit Only Driveway	7:20 AM – 8:20 AM	3:15 PM – 4:15 PM

NATURAL GROWTH

Natural growth is traffic that will be present on the surrounding roadway network in the build-out year of the project caused by population growth in the region. The project has two phases and two horizon years as shown in Table 1. Phase 1 will be complete in 2025 and Phase 2 will be complete in 2027. The traffic volumes in Figure 8 result from multiplying the base year traffic volumes from Figure 7 by 1.04. The traffic volumes in Figure 9 result from multiplying the traffic volumes in Figure 7 by 1.08. The equation is used is below.

$$G = (1 + i)^n$$

REASONABLY FORESEEABLE DEVELOPMENTS IN THE AREA

A reasonably foreseeable project is one that has already been approved by the appropriate board (e.g., City Council or County Commission) and that should be completed before the Denver Christian Academy is completed. The scoping process discovered one previously approved development along NC 16 Business. The project is named Villages of Denver. The traffic associated with the Villages of Denver mitigation by signalizing Intersection 2: Old Post Road and NC 16 Business are included in the background traffic and build-out traffic for Phase 1 and Phase 2, see Figure 10.

BACKGROUND TRAFFIC

Background traffic is composed of the traffic caused by natural growth and the traffic added to the network by reasonably foreseeable developments in the project area. Figure 11 shows the background traffic for Phase 1. Figure 12 shows the background traffic for phase 2.

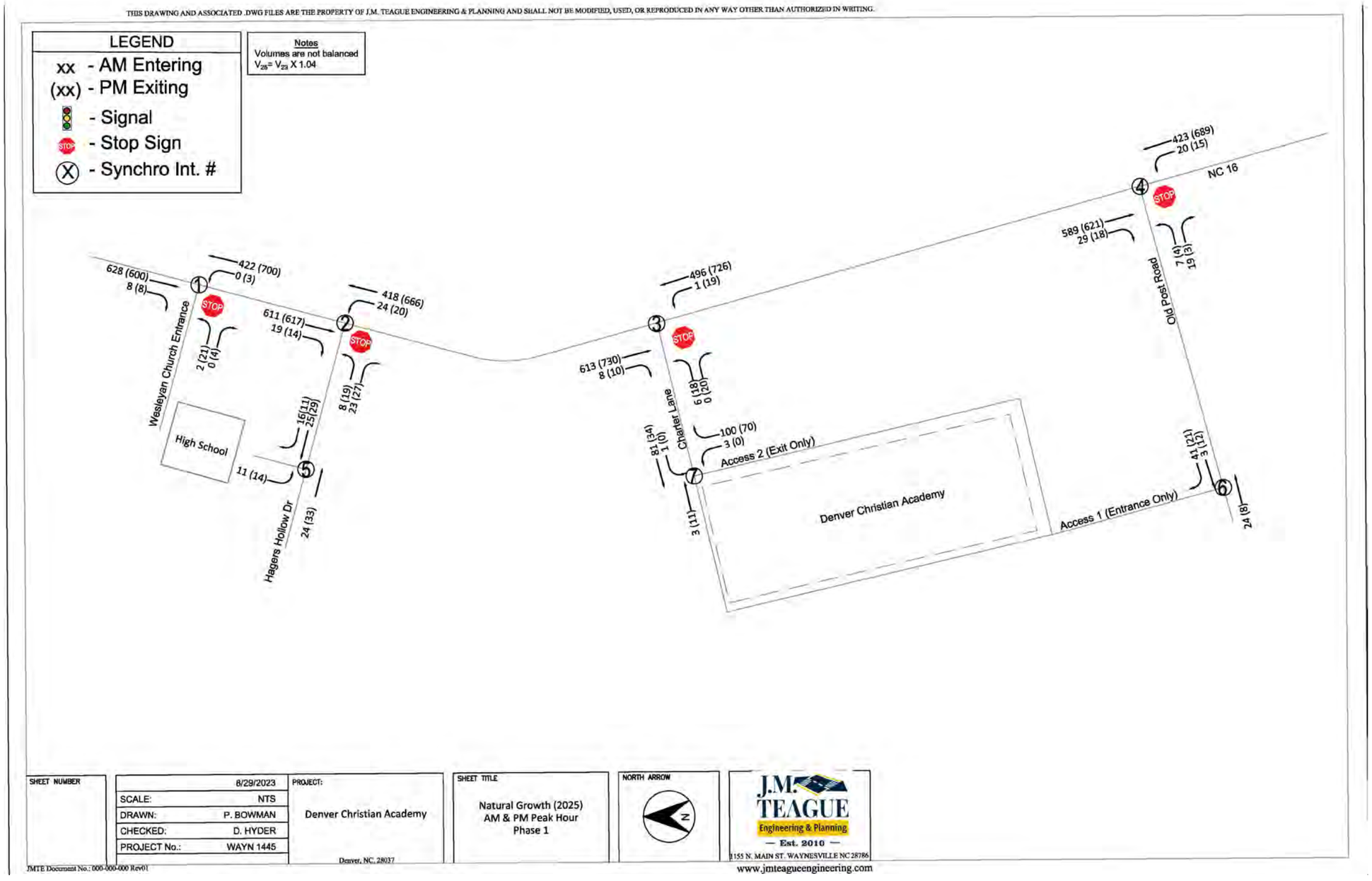


Figure 8: Natural Growth (2025) AM & PM Peak Hour Phase 1

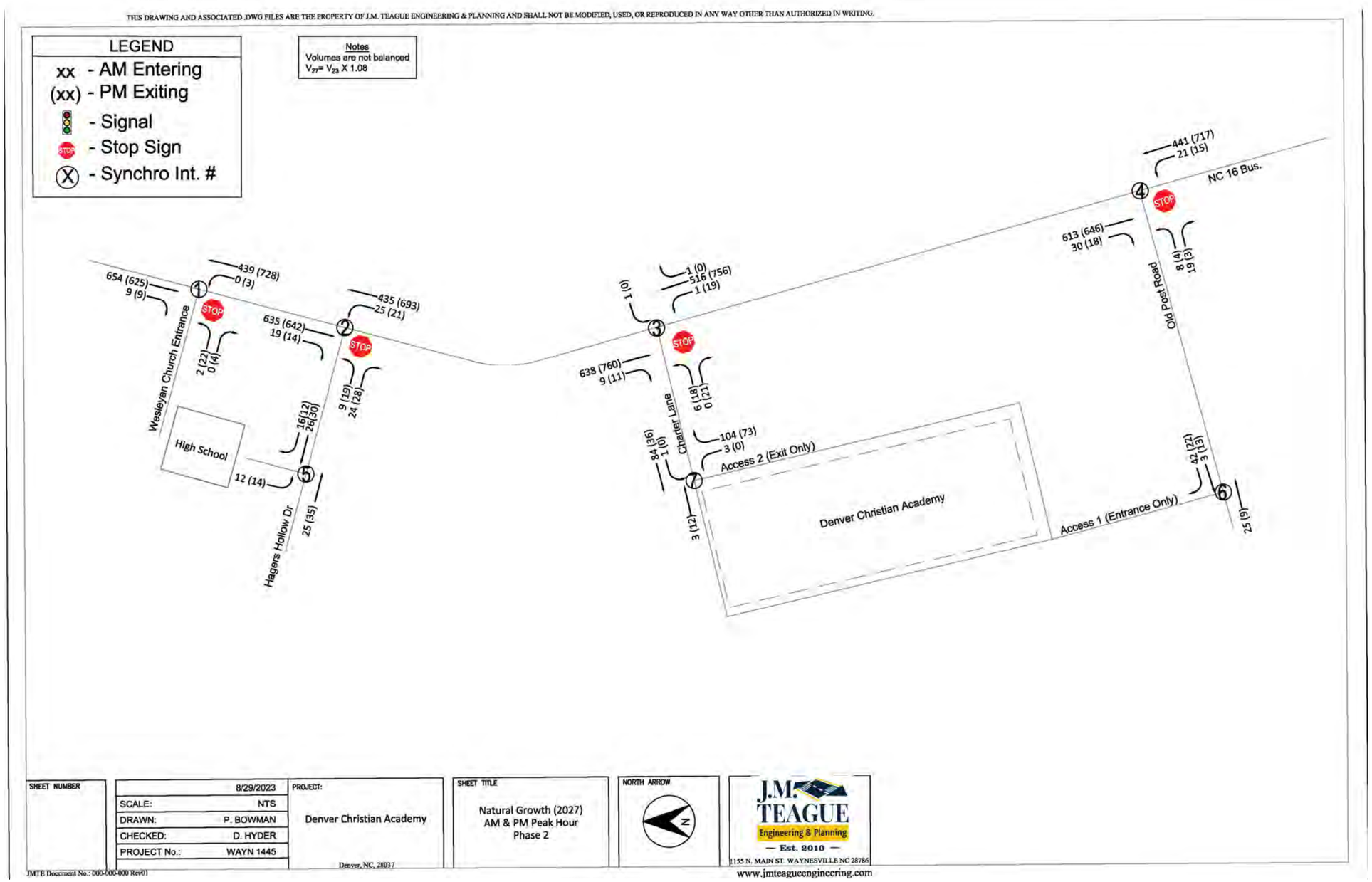


Figure 9: Natural Growth (2027) AM & PM Peak Hour Phase 2

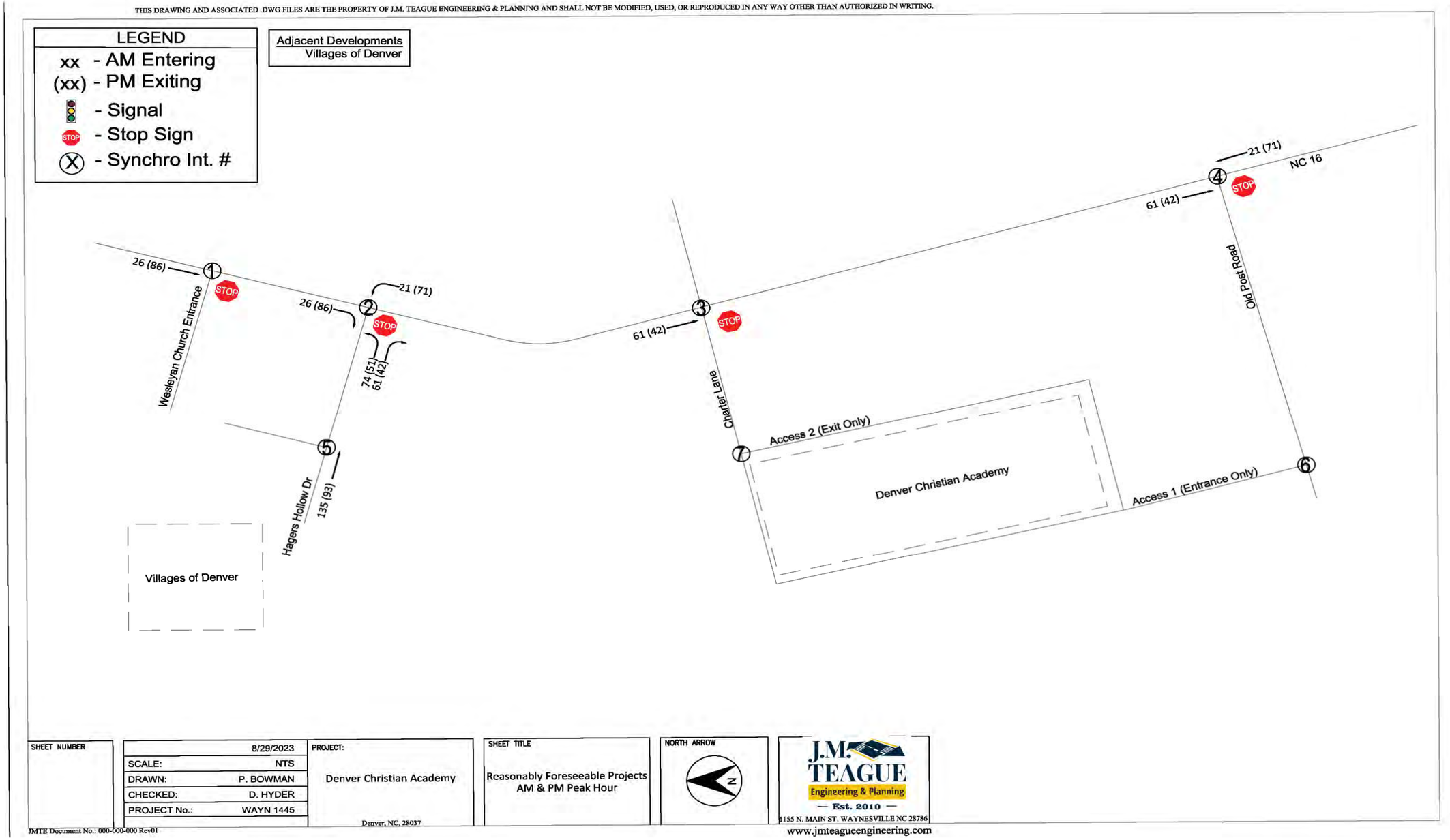


Figure 10: Reasonably Foreseeable Development Trip Assignment

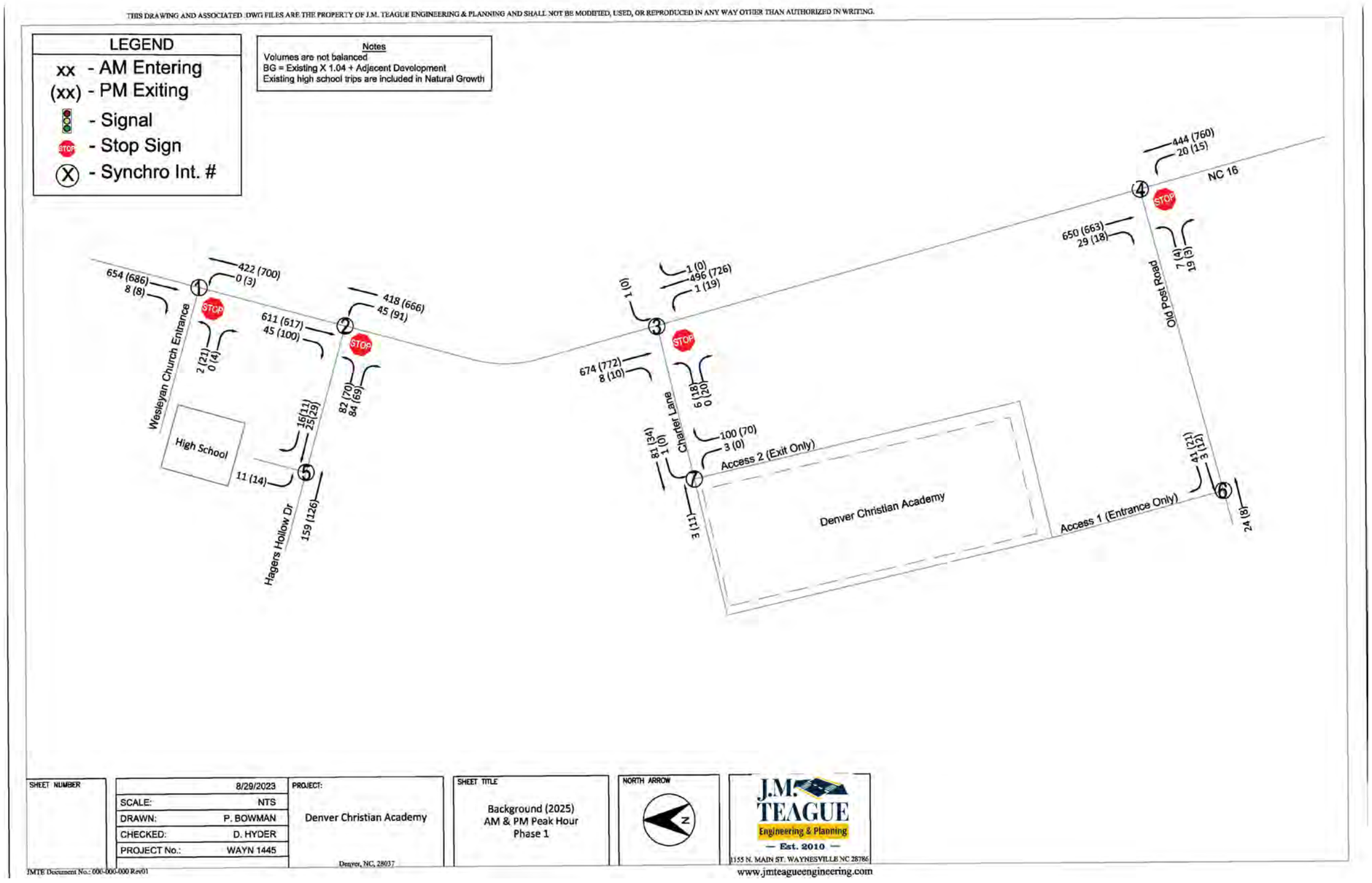


Figure 11: Phase 1 (2023) Background AM & PM Peak Hour Traffic

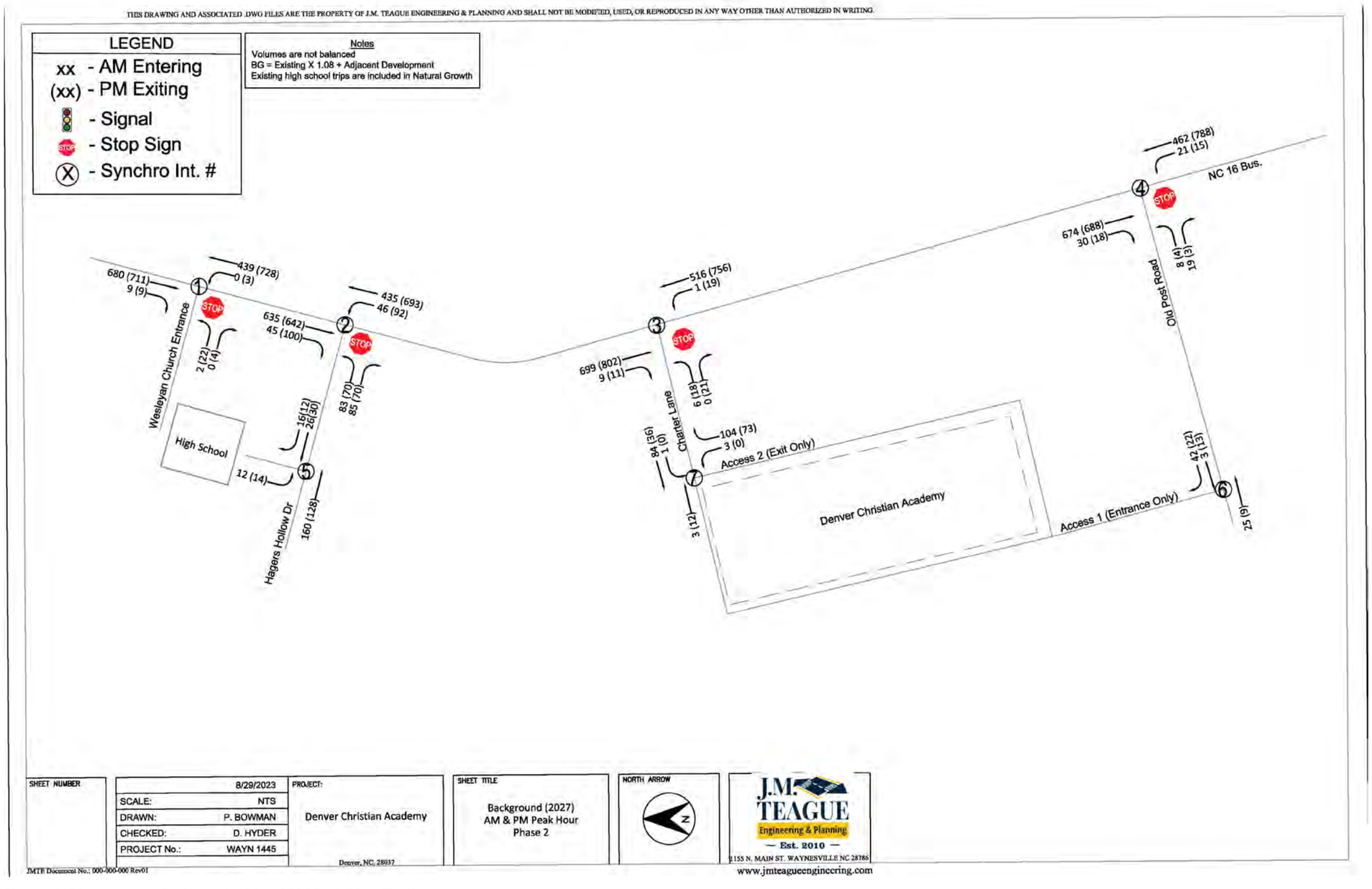


Figure 12: Phase 2 (2027) Background AM and PM Peak Hour Traffic

EFFECT OF STATE TRANSPORTATION IMPROVEMENT PROGRAM (STIP)

The North Carolina Department of Transportation has one STIP (#U6144) planned in the project area. However, this project remains unfunded, and no date of construction has been set. Figure 13 shows the NCDOT STIP Projects near the Denver Christian Academy.

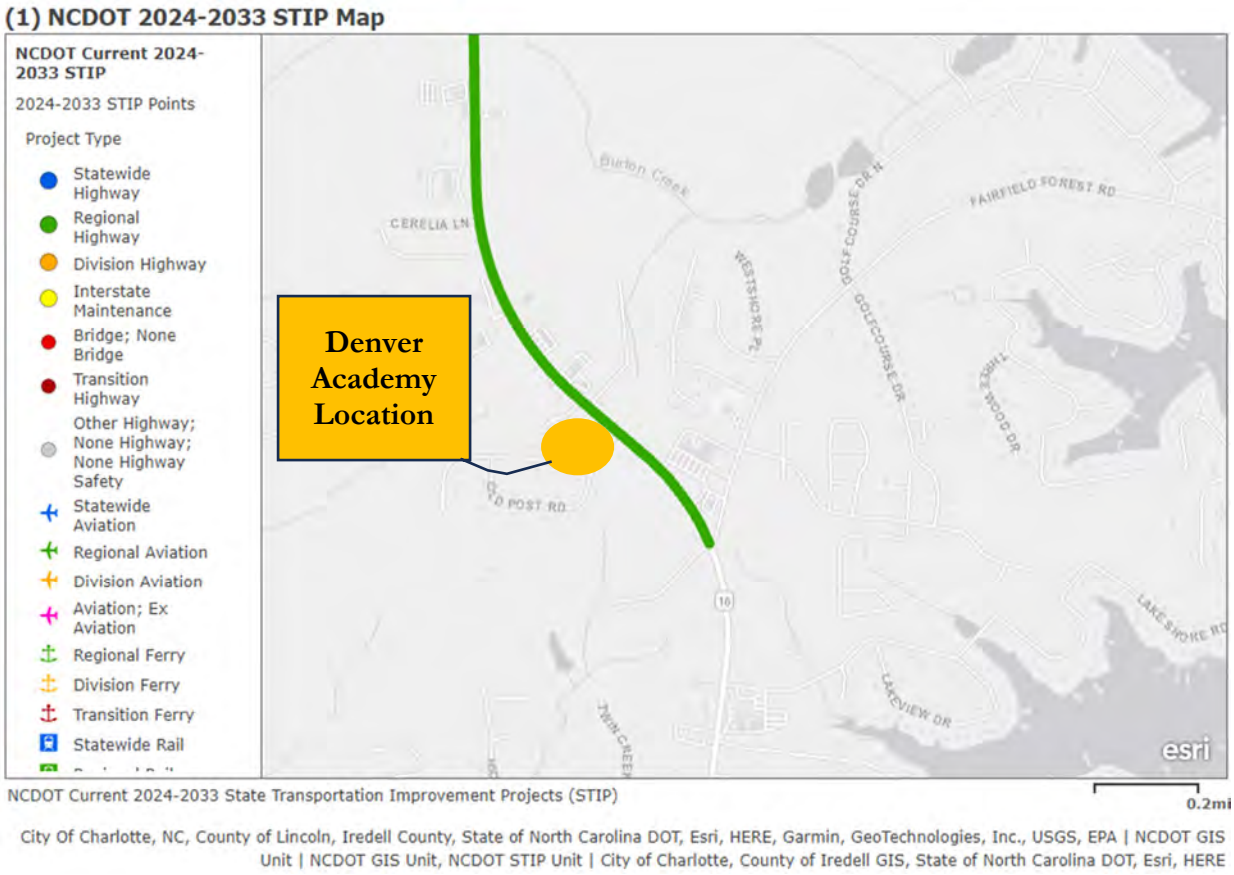


Figure 13: NCDOT STIP Projects (2024-2033) (Source: NCDOT)

SITE TRAFFIC

Site traffic is the traffic that the proposed project is expected to contribute to traffic in the area.

TRIP DISTRIBUTION

Trip distribution involves allocating project traffic throughout the road network as it enters and exits the site. The pathway is assigned to illustrate the traffic's movement through the study area intersections. For this development, trip distribution was estimated by considering existing traffic volume patterns within the surrounding roadway network, population densities, the proposed development's location, and engineering judgment.

The estimated trip distribution is based on the following assumptions:

- The trip distribution for the project will align with the existing trip distribution in the project area.
- The percentage of trips at the study area boundary roughly approximates the percentage of trips to and from the site.
- On a typical day, inbound site trips balance outbound site trips.
- A reasonable origin-to-destination matrix can be estimated under these assumptions.

To estimate trip distribution, the following steps were taken:

1. Estimate the percentage of site trips (origins) using each access point (driveway).
2. Estimate the percentage of site trips exiting the project area at each network boundary based on historic traffic counts.
3. Develop an unbalanced "seed" matrix using information from steps 1 and 2.
4. Use a double constraint method to balance the trip percentages in the matrix, ensuring that the sum of the rows equals the sum of the columns, resulting in Table 6.

Table 6: Trip Distribution Final Balanced Matrix

Location	AADT		NC 16 BUS. N Enter	NC 16 BUS. N Exit	NC 16 BUS. S Enter	NC 16 BUS. S Exit
			12,500		13,000	
	Enter	Exit				
Old Post Access 1	67%	0%	33%	0%	34%	0%
Charter Ln Access 2	33%	100%	16%	50%	17%	50%
Entering/Exiting %			49%	50%	51%	50%

Once the balanced trip matrix is complete the trips from Trip Generation may be assigned to the network. Table 6 shows the trip distribution percentages as applied to the street network.

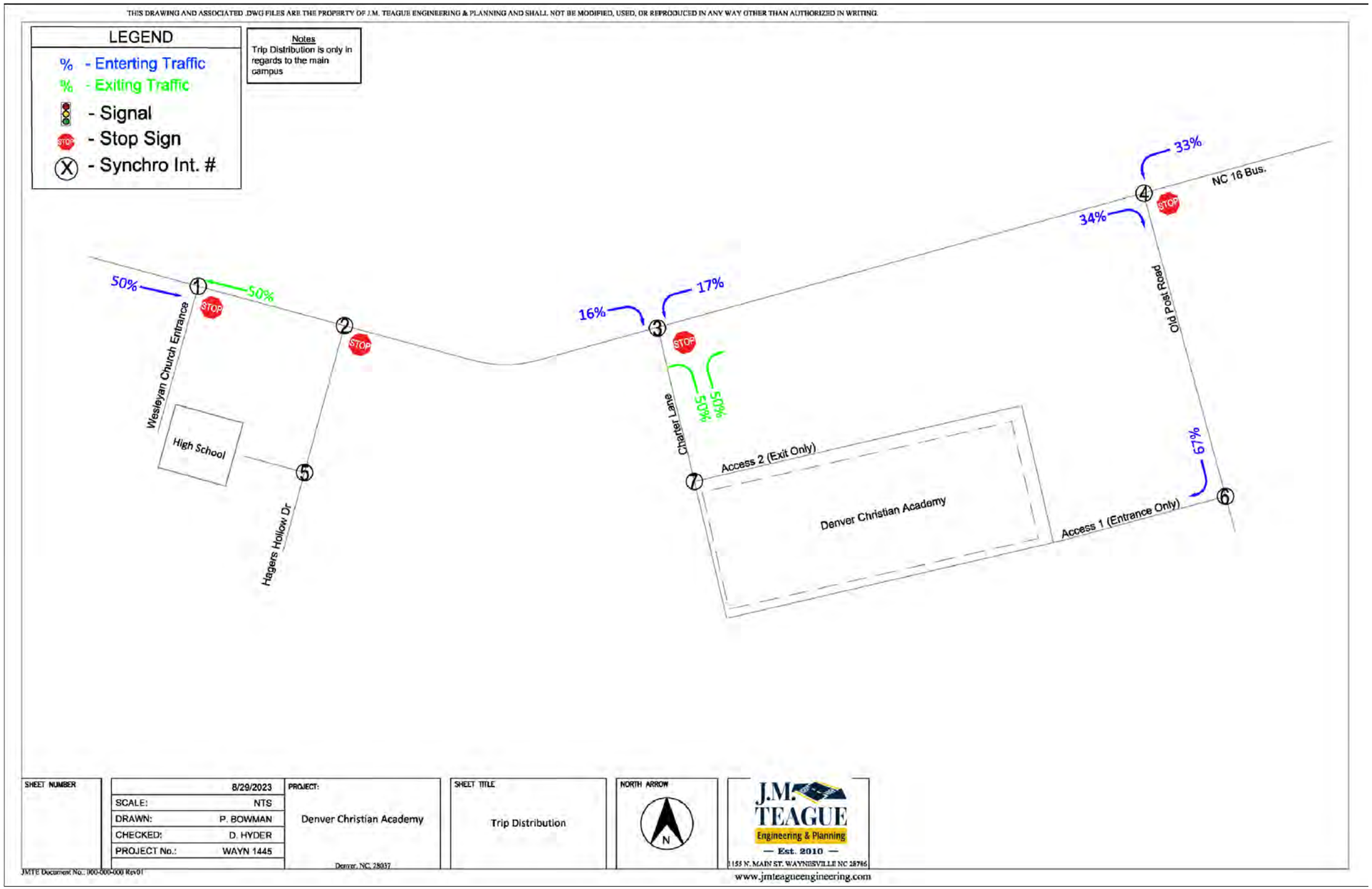


Figure 14: Trip Distribution for Denver Christian Academy

TRIP GENERATION

Vehicle trips and internal queuing at schools are correlated to the size of the student population. Table 7 shows the expected student population for Phase 1 and Phase 2 of the Denver Christian Academy expansion.

Table 7: Student Population Change

Current, Phase & Added Student Population					
	Current	Phase 1	Phase 2	Increase Phase 1	Increase Phase 2
Total	298	467	625	169	327

JMTE used the NCDOT Municipal and School Transportation Assistance spreadsheet to estimate the added trips for 169 students for Phase 1 and 327 students for Phase 2. Table 8 shows the trips used for each analysis year.

Table 8: Student Trip Generation (per MSTA Guidance)

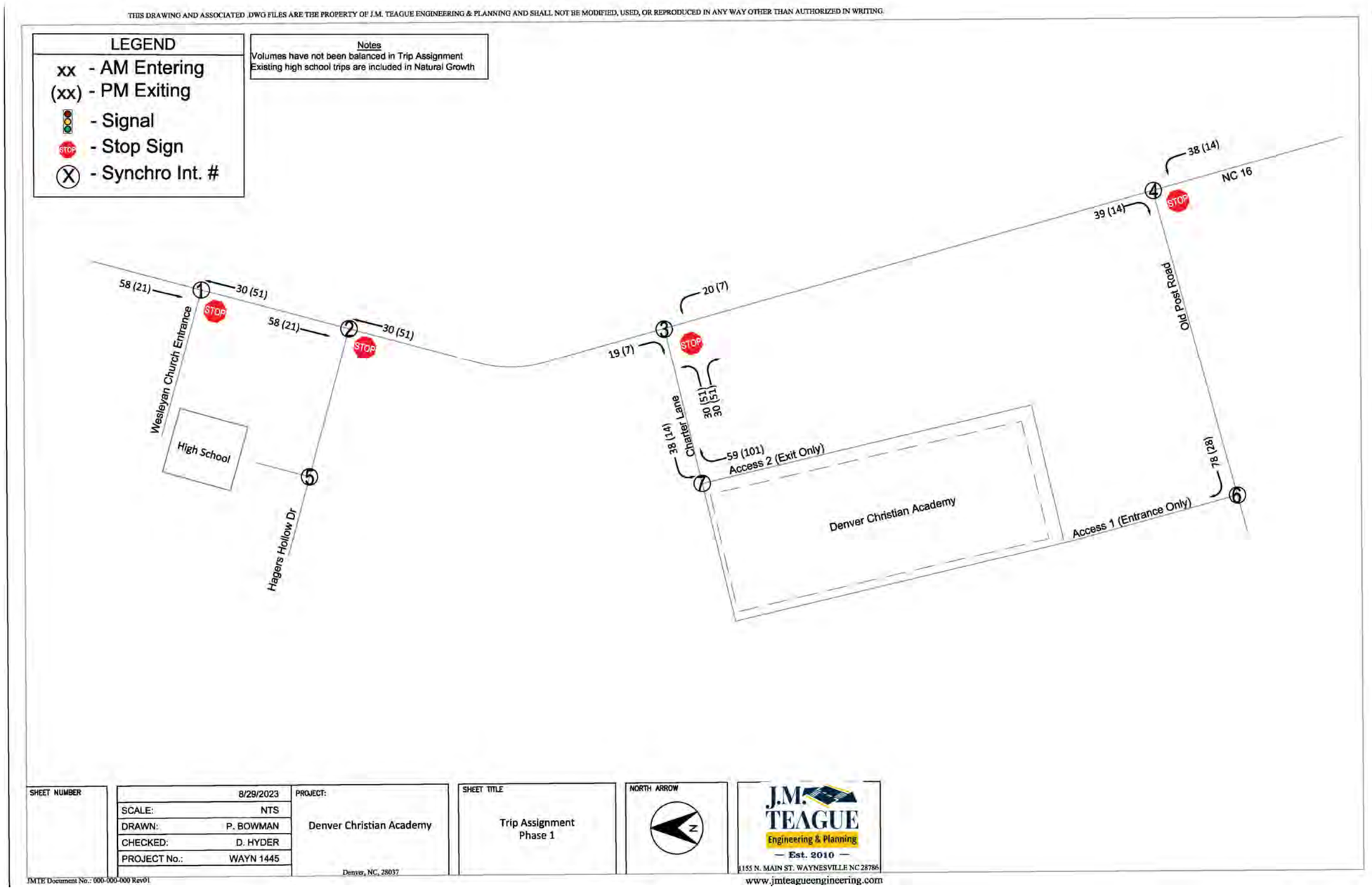
Phase	**Proposed Land Use**	**Units**	**Size**	**AM Peak Hour**			**PM Peak Hour**		
				Enter	**Exit**	**Total**	**Enter**	**Exit**	**Total**
1	Priv School (K-12)	Students/Staff	169	116	59	175	42	101	143
2	Priv School (K-12)	Students/Staff	327	202	120	322	82	172	254
			Total	318	179	497	124	273	397

TRIP ASSIGNMENT

In trip assignment the trips from the trip generation step are assigned to the network using the percentages in Figure 14. Figure 15 shows the peak period trips assignments for 2025 (Phase 1). Figure 11 shows the trip assignments for 2027 (Phase 2).

BUILD-OUT TRAFFIC

Build-out traffic is all traffic that will be present on the surrounding roadway network when each phase of the project is complete and fully occupied. Figure 17 shows build out for 2025 (Phase 1). Figure 18 shows the build out traffic for 2027 (Phase 2).



SHEET NUMBER	8/29/2023	PROJECT:	SHEET TITLE	NORTH ARROW	J.M. TEAGUE Engineering & Planning — Est. 2010 —
	SCALE: NTS	Denver Christian Academy	Trip Assignment Phase 1	N	1155 N. MAIN ST. WAYNESVILLE NC 28786
	DRAWN: P. BOWMAN				www.jmteagueengineering.com
	CHECKED: D. HYDER				
	PROJECT No.: WAYN 1445	Denver, NC, 28037			

JMTE Document No.: 000-000-000 Rev01

Figure 15: Phase 1 (2025) Site Trip Generation AM & PM Ingress & Egress

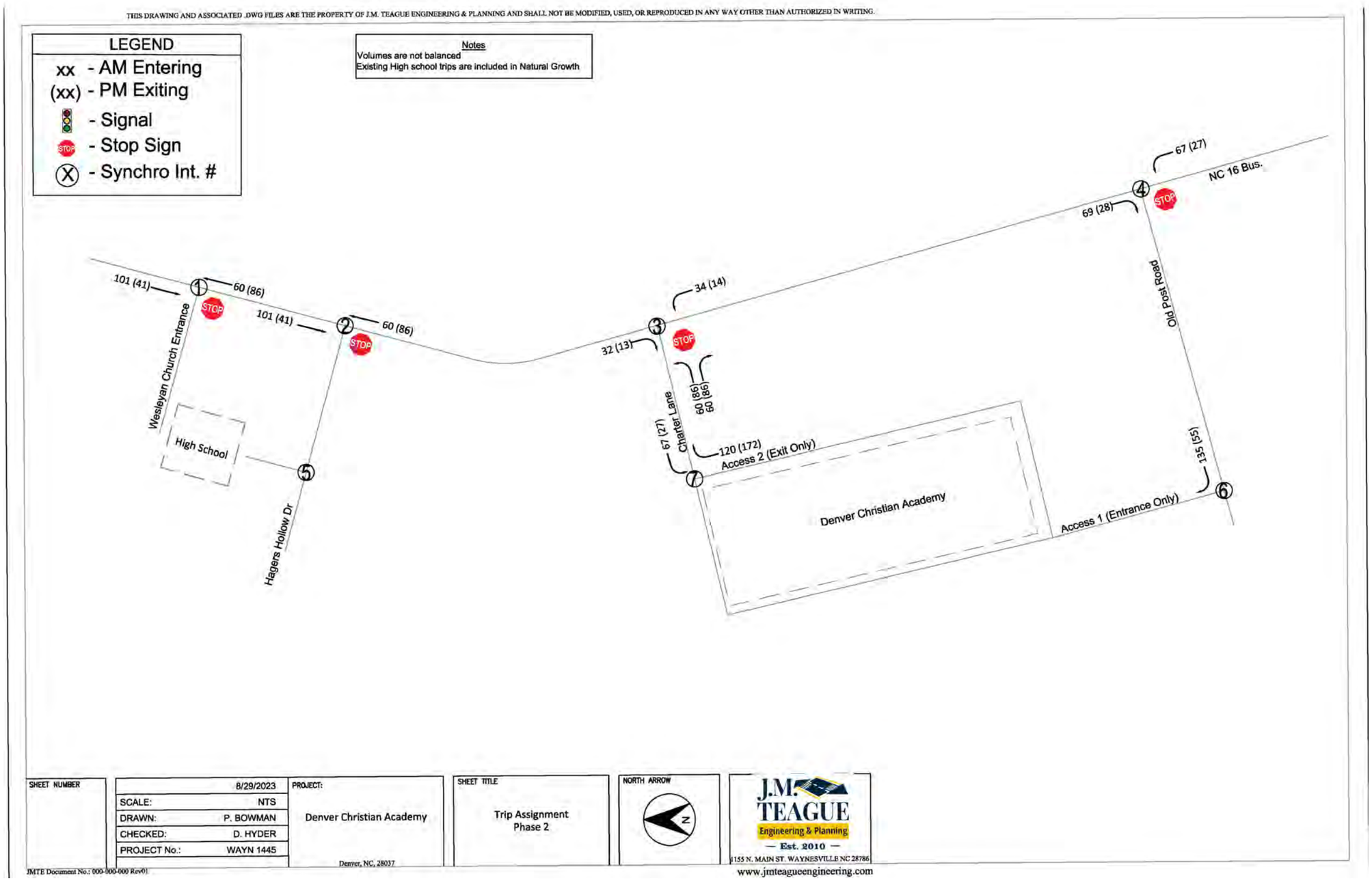


Figure 16: Phase 2 (2027) Site Trip Generation AM & PM Ingress & Egress

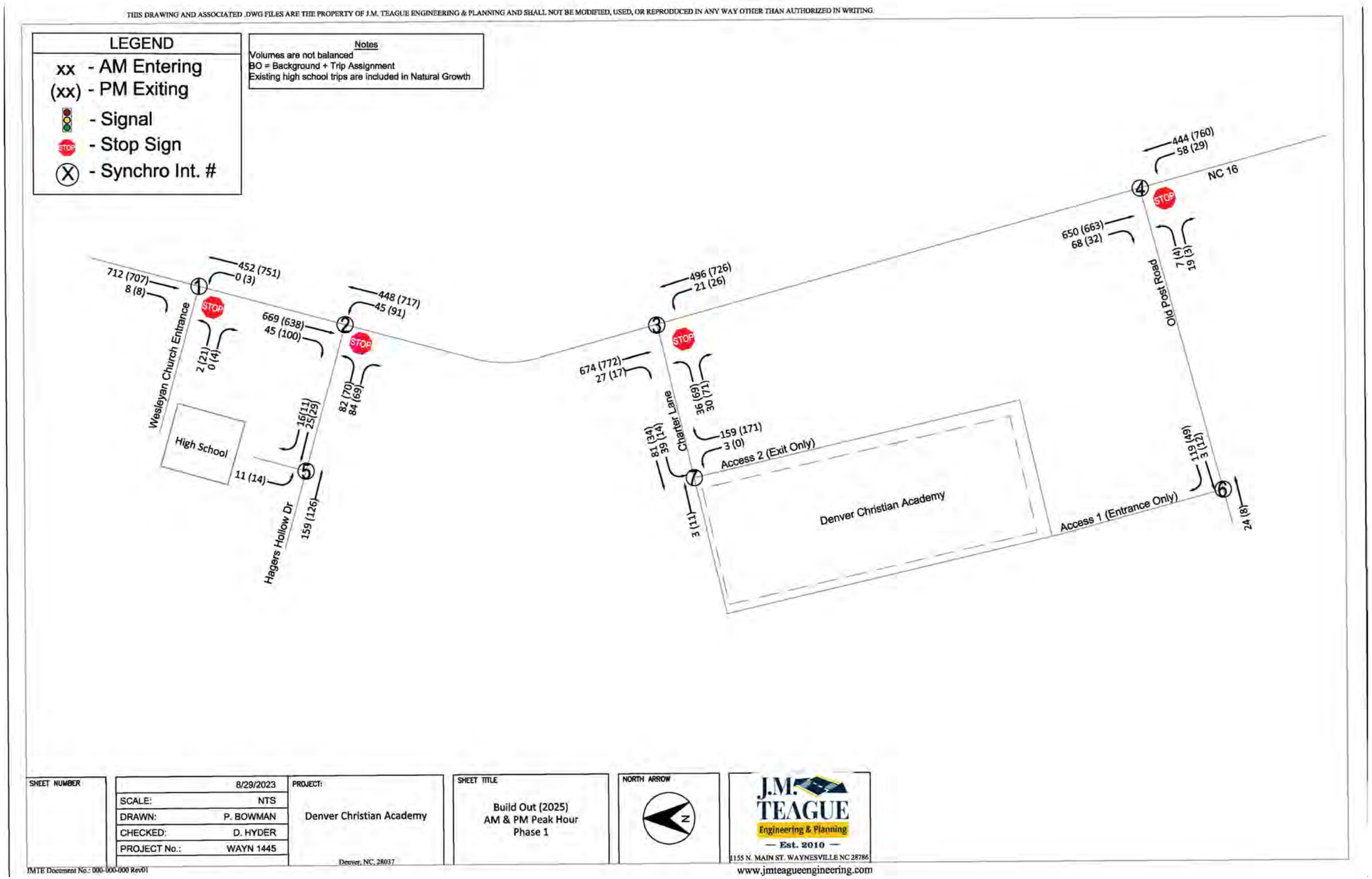


Figure 17: Build Out (2025) AM & PM Peak Hour Traffic (Phase 1)

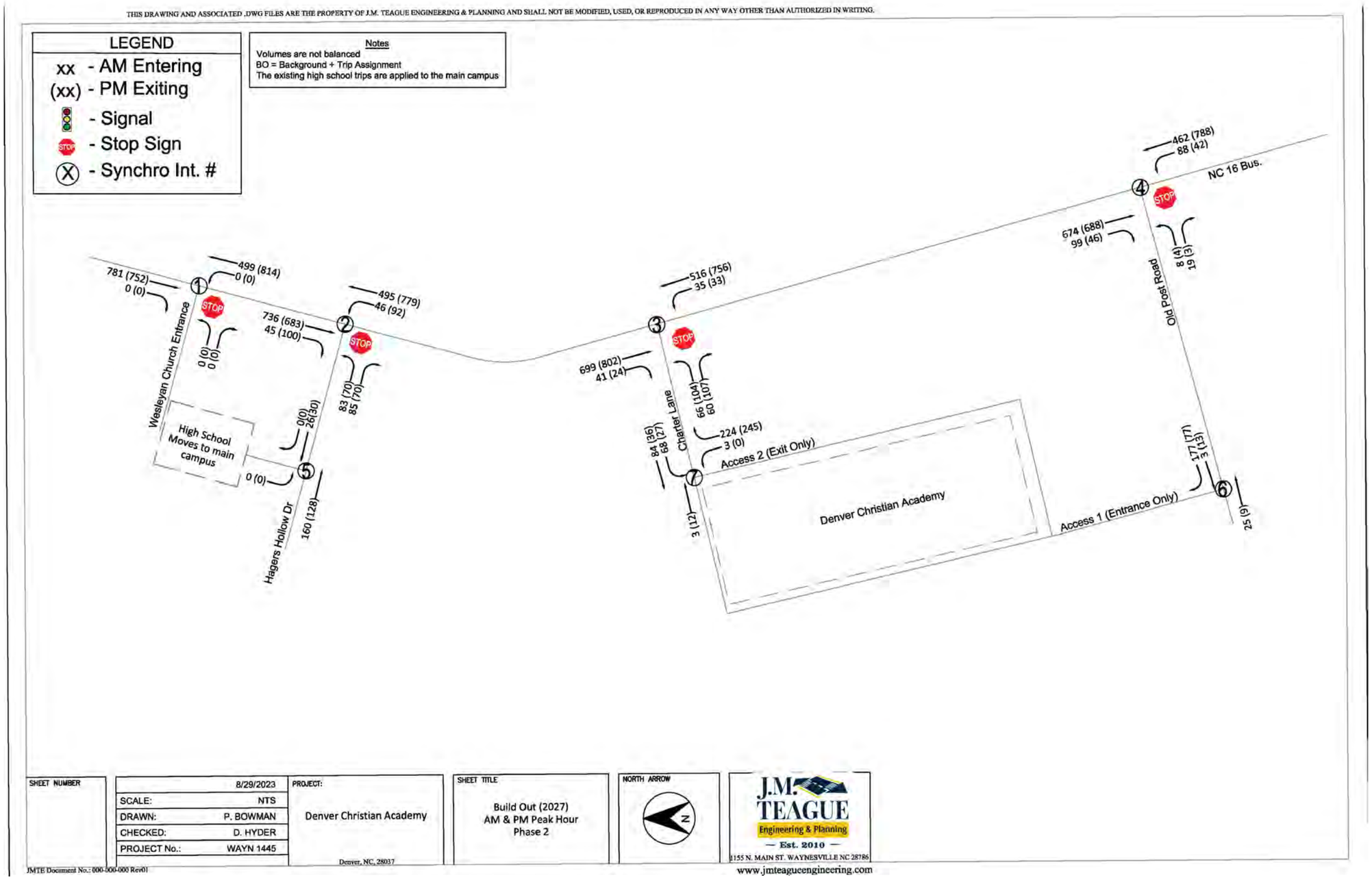


Figure 18: Build Out (2027) AM & PM Peak Hour Traffic (Phase 2)

OPERATIONAL AND CAPACITY ANALYSIS

The analysis for background conditions is based on methodologies presented in NCDOT's Congestion Management Capacity Analysis Guidelines. To estimate the background LOS, delay, v/c ratio, and queue at the study intersections, the background traffic was analyzed using existing lane configurations and traffic control conditions. The Peak Hour Factor (PHF) varies by intersection, (see Table 2), in accordance with NCDOT guidelines. Based on HCM and NCDOT guidance, the free-flow movements/approaches were not analyzed for background conditions.

TRAFFIC CAPACITY DISCUSSION

The HCM defines capacity as "the maximum hourly rate at which persons or vehicles can reasonably be expected to traverse a point during a given period under prevailing roadway, traffic, and control conditions." Level of Service (LOS) is a term used to describe different driving conditions concerning traffic congestion. It is defined as a "qualitative measure describing operational and perceptional conditions within a traffic stream." LOS "A" represents free-flow traffic conditions with no congestion. LOS "F" represents severely impacted traffic flow due to vehicle congestion. LOS is generally determined by the total "Control Delay" experienced by drivers. Control delay is vehicle delay that is ultimately caused by the traffic control device. This includes deceleration delay, queue move-up time delay, stopped delay, and acceleration delay. Figure 19 shows typical delays associated with each Level of Service for intersections.

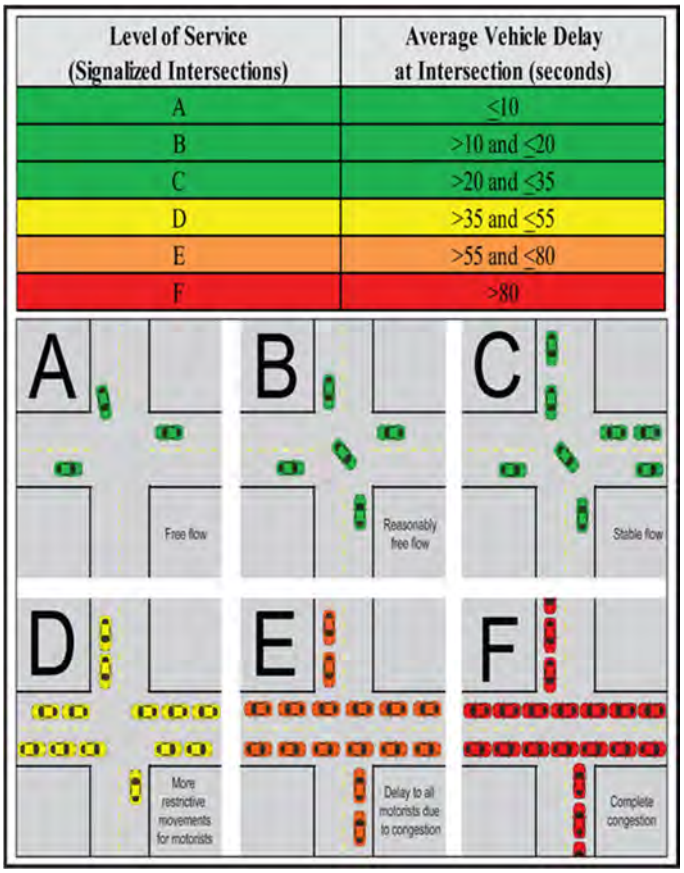


Figure 19: Level of Service

The Highway Capacity Manual analysis for unsignalized intersections can project delays on the minor side street, thus it is recommended to use LOS measurements as a comparative tool rather than a design tool. The 95th percentile queue is the vehicle queue (backup) that has a 5% probability of being exceeded during the analysis period. At unsignalized intersections, p_0 (queue-free percent) is the probability of there being no backup.

The Q_{95} is the greater of the queue reported from SYNCHRO or SIMTRAFFIC. The existing traffic volumes from the AM & PM peak hours were analyzed using existing lane configurations and traffic control conditions. Since existing turning movement count data was collected, the existing Peak Hour Factor (PHF) was used for analyzing existing conditions. Based on HCM and NCDOT guidance, the free-flow movements/approaches were not analyzed for existing conditions. The capacity analysis (Synchro) reports for the existing conditions are in Appendix B.

THRESHOLDS FOR IDENTIFYING MITIGATIONS

The NCDOT's Driveway Manual provides the following guidelines for assessing intersection performance and needed mitigations.

> "The applicant shall be required to identify mitigation improvements to the roadway network if at least one of the following conditions exists when comparing base network conditions to project conditions:
>
> - The total average delay at an intersection or individual approach increases by 25% or greater, while maintaining the same LOS, Policy On Street And Driveway Access to North Carolina Highways Page 22 July 2003,
> - the Level of Service degrades by at least one level,
> - or Level of Service is "F," for turning lanes, mitigation improvements shall be identified when the analysis indicates that the 95th percentile queue exceeds the storage capacity of the existing alone. The District Engineer will be responsible for the final determination of mitigation improvements required to be constructed by the applicant."
> - MSTA requires that the school queue be contained on campus.

MEASURES OF EFFECTIVENESS

For ease of use, the operational and capacity analysis for each intersection is treated separately. Each intersection includes a table showing the morning and evening LOS, delay, and queuing for the background, build-out, and mitigation at that location.

LEVEL OF SERVICE

The LOS is reported using letters A, B, C, D, E, or F for each movement. "A" is the highest or best while "F" is the lowest or worst.

DELAY

The Delay (in seconds) was calculated for the studied intersections by approach and lane movement for each of the existing, background, and build-out cases. The traffic volumes from the AM & PM peak hours were analyzed using existing lane configurations and traffic control conditions.

The difference between the background and build cases is shown in the Difference column. Percent Change is shown in the righthand column and calculated as:

$$\%Change = \left(\frac{Difference}{Background\ Delay}\right) \times 100$$

Movements with a percent change in delay above twenty-five percent are shown highlighted in red.

QUEUEING

Queuing analyses were performed to determine the effect of the build-out traffic on intersection traffic queues. Turning movements at which the queues exceed the available storage are noted in the queuing table for each intersection.

ANALYSIS RESULTS

The next section of this report presents the analysis of each intersection and driveway. The intersection numbers are consistent with the numbers used in the Synchro analysis.

NOTE: In some cases, the LOS may improve from the background case to full build-out. This is because the Synchro modeling system that is used randomizes the trip distribution to create real world scenarios. Some intersections where no build-out traffic is added may improve the delay therefore improving the LOS.

INTERSECTION 1: NC 16 BUSINESS & WESLEYAN CHURCH ENTRANCE (PHASE 1)

Figure 20: NC 16 Business & Wesleyan Church Entrance shows the intersection of NC 16 Business & Wesleyan Church Entrance.

Table 9 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 10 shows that of NC 16 Business & Wesleyan Church Entrance operates at a LOS A, C, or E in the background case. This intersection remains the same during the build-out case.

Table 11 shows the queuing for each analyzed case, period, and approach.

Figure 20: NC 16 Business & Wesleyan Church Entrance

Table 9:Intersection 1 NC 16 Business & Wesleyan Church Entrance Traffic Volumes (Phase 1)

Intersection 1: NC 16 Bus. & Wesleyan Church Entrance (Phase 1)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Church Access	Eastbound	Left	2	2	0	2
AM	Church Access	Eastbound	Right	0	0	0	0
AM	Church Access	Eastbound	Through	0	0	0	0
AM	Church Access	Eastbound	U-Turn	0	0	0	0
AM	Church Access	Northbound	Left	0	0	0	0
AM	Church Access	Northbound	Right	0	0	0	0
AM	Church Access	Northbound	Through	406	422	30	452
AM	Church Access	Northbound	U-Turn	0	0	0	0
AM	Church Access	Southbound	Left	0	0	0	0
AM	Church Access	Southbound	Right	8	8	0	8
AM	Church Access	Southbound	Through	604	654	58	712
AM	Church Access	Southbound	U-Turn	0	0	0	0
AM	Church Access	Westbound	Left	0	0	0	0
AM	Church Access	Westbound	Right	0	0	0	0
AM	Church Access	Westbound	Through	0	0	0	0
AM	Church Access	Westbound	U-Turn	0	0	0	0
PM	Church Access	Eastbound	Left	20	21	0	21
PM	Church Access	Eastbound	Right	4	4	0	4
PM	Church Access	Eastbound	Through	0	0	0	0
PM	Church Access	Eastbound	U-Turn	0	0	0	0
PM	Church Access	Northbound	Left	3	3	0	3
PM	Church Access	Northbound	Right	0	0	0	0
PM	Church Access	Northbound	Through	673	700	51	751
PM	Church Access	Northbound	U-Turn	0	0	0	0
PM	Church Access	Southbound	Left	0	0	0	0
PM	Church Access	Southbound	Right	8	8	0	8
PM	Church Access	Southbound	Through	577	686	21	707
PM	Church Access	Southbound	U-Turn	0	0	0	0
PM	Church Access	Westbound	Left	0	0	0	0
PM	Church Access	Westbound	Right	0	0	0	0
PM	Church Access	Westbound	Through	0	0	0	0
PM	Church Access	Westbound	U-Turn	0	0	0	0

Table 10: Intersection 1 NC 16 Business & Wesleyan Church Entrance Comparison Table (Phase 1)

Intersection 1: NC 16 Bus. & Wesleyan Church Access (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	C	C		NONE		18.7	20.5	1.8		10%	
AM	Northbound	A	A		NONE		0.1	1	0.9		0%	
AM	Southbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	E	E		NONE		37.3	41.8	4.5		12%	
PM	Northbound	A	A		NONE		0.1	0	-0.1		-100%	
PM	Southbound	A	A		NONE		0	0	0		0%	

Table 11: Intersection 1 NC 16 Business & Wesleyan Church Entrance Queuing (Phase 1)

Intersection 1: NC 16 Bus. & Wesleyan Church Access (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Right	N/A	30	30	0
AM	Northbound	Left/Thru	N/A	29	40	11
AM	Southbound	Thru/Right	N/A	0	23	23
PM	Eastbound	Left/Right	N/A	48	47	-1
PM	Northbound	Left/Thru	N/A	40	47	7
PM	Southbound	Thru/Right	N/A	0	37	37

The Engineer recommends no mitigation at this intersection during Phase 1.

INTERSECTION 1-PHASE 2

Table 12 shows the traffic volumes for each analyzed case, period, and approach. It also shows how total volumes are developed. The Denver Christian Academy uses the Wesleyan Church for High School instruction. During Phase 2 this activity will be relocated to the Denver Christian Academy. To reflect this change the Engineer has assumed that the eastbound left, eastbound right, and southbound right movements are 0 for the Future Volume in this case.

Table 13 shows that of NC 16 Business & Wesleyan Church Entrance operates at a LOS A, C, or E in the background case. The LOS improves to a D in PM eastbound during the build out case.

Table 14 shows the queuing for each analyzed case, period, and approach.

Table 12: Intersection 1 NC 16 Business & Wesleyan Church Entrance Traffic Volumes (Phase 2)

Intersection 1: NC 16 Bus. & Wesleyan Church Entrance (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Church Access	Eastbound	Left	2	2	0	0
AM	Church Access	Eastbound	Right	0	0	0	0
AM	Church Access	Eastbound	Through	0	0	0	0
AM	Church Access	Eastbound	U-Turn	0	0	0	0
AM	Church Access	Northbound	Left	0	0	0	0
AM	Church Access	Northbound	Right	0	0	0	0
AM	Church Access	Northbound	Through	406	439	60	499
AM	Church Access	Northbound	U-Turn	0	0	0	0
AM	Church Access	Southbound	Left	0	0	0	0
AM	Church Access	Southbound	Right	8	9	0	0
AM	Church Access	Southbound	Through	604	680	101	781
AM	Church Access	Southbound	U-Turn	0	0	0	0
AM	Church Access	Westbound	Left	0	0	0	0
AM	Church Access	Westbound	Right	0	0	0	0
AM	Church Access	Westbound	Through	0	0	0	0
AM	Church Access	Westbound	U-Turn	0	0	0	0
PM	Church Access	Eastbound	Left	20	22	0	0
PM	Church Access	Eastbound	Right	4	4	0	0
PM	Church Access	Eastbound	Through	0	0	0	0
PM	Church Access	Eastbound	U-Turn	0	0	0	0
PM	Church Access	Northbound	Left	3	3	0	0
PM	Church Access	Northbound	Right	0	0	0	0
PM	Church Access	Northbound	Through	673	728	86	814
PM	Church Access	Northbound	U-Turn	0	0	0	0
PM	Church Access	Southbound	Left	0	0	0	0
PM	Church Access	Southbound	Right	8	9	0	0
PM	Church Access	Southbound	Through	577	711	41	752
PM	Church Access	Southbound	U-Turn	0	0	0	0
PM	Church Access	Westbound	Left	0	0	0	0
PM	Church Access	Westbound	Right	0	0	0	0
PM	Church Access	Westbound	Through	0	0	0	0
PM	Church Access	Westbound	U-Turn	0	0	0	0

Table 13: Intersection 1 NC 16 Business & Wesleyan Church Entrance Comparison Table (Phase 2)

Intersection 1: NC 16 Bus. & Wesleyan Church Access (Phase 2)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	C	C		NONE		19.3	23.2	3.9		20%	
AM	Northbound	A	A		NONE		0	0	0		0%	
AM	Southbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	E	D		IMPROVE		41.1	30.9	-10.2		-25%	
PM	Northbound	A	A		NONE		0.1	0	-0.1		-100%	
PM	Southbound	A	A		NONE		0	0	0		0%	

Table 14: Intersection 1 NC 16 Business & Wesleyan Church Entrance Queuing (Phase 2)

Intersection 1: NC 16 Bus. & Wesleyan Church Access (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Right	N/A	34	34	0
AM	Northbound	Left/Thru	N/A	16	130	114
AM	Southbound	Thru/Right	N/A	0	0	0
PM	Eastbound	Left/Right	N/A	47	74	27
PM	Northbound	Left/Thru	N/A	69	123	54
PM	Southbound	Thru/Right	N/A	18	0	-18

During Phase 2 the high school students will be moved to the main campus. This will remove the school traffic from this intersection. The Engineer recommends no mitigation at this intersection.

INTERSECTION 2: NC 16 BUSINESS & HAGERS HOLLOW DR. (PHASE 1)

Figure 21 shows the intersection of NC 16 Business & Hagers Hollow Dr.

Table 15 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 16 shows that the intersection of NC 16 Business & Charter Ln. operates at above LOS C on all approaches in the background case. The LOS on the northbound approach drops from LOS A to LOS B in PM peak in the build out case.

Table 17 shows the queuing for each analyzed case, period, and approach.

Figure 21: Intersection 2 NC 16 Business & Hagers Hollow Dr.

Table 15: Intersection 2 NC 16 Business & Hagers Hollow Dr. Traffic Volumes (Phase 1)

Intersection 2: NC 16 Bus. & Haggers Hollow Dr. (Phase 1)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Hagers Hollow Dr	Eastbound	Left	8	82	0	82
AM	Hagers Hollow Dr	Eastbound	Right	22	84	0	84
AM	Hagers Hollow Dr	Eastbound	Through	0	0	0	0
AM	Hagers Hollow Dr	Eastbound	U-Turn	0	0	0	0
AM	Hagers Hollow Dr	Northbound	Left	23	45	0	45
AM	Hagers Hollow Dr	Northbound	Right	0	0	0	0
AM	Hagers Hollow Dr	Northbound	Through	402	418	30	448
AM	Hagers Hollow Dr	Northbound	U-Turn	0	0	0	0
AM	Hagers Hollow Dr	Southbound	Left	0	0	0	0
AM	Hagers Hollow Dr	Southbound	Right	18	45	0	45
AM	Hagers Hollow Dr	Southbound	Through	587	611	58	669
AM	Hagers Hollow Dr	Southbound	U-Turn	0	0	0	0
AM	Hagers Hollow Dr	Westbound	Left	0	0	0	0
AM	Hagers Hollow Dr	Westbound	Right	0	0	0	0
AM	Hagers Hollow Dr	Westbound	Through	0	0	0	0
AM	Hagers Hollow Dr	Westbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Eastbound	Left	18	70	0	70
PM	Hagers Hollow Dr	Eastbound	Right	26	69	0	69
PM	Hagers Hollow Dr	Eastbound	Through	0	0	0	0
PM	Hagers Hollow Dr	Eastbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Northbound	Left	19	91	0	91
PM	Hagers Hollow Dr	Northbound	Right	0	0	0	0
PM	Hagers Hollow Dr	Northbound	Through	640	666	51	717
PM	Hagers Hollow Dr	Northbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Southbound	Left	0	0	0	0
PM	Hagers Hollow Dr	Southbound	Right	13	100	0	100
PM	Hagers Hollow Dr	Southbound	Through	593	617	21	638
PM	Hagers Hollow Dr	Southbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Westbound	Left	0	0	0	0
PM	Hagers Hollow Dr	Westbound	Right	0	0	0	0
PM	Hagers Hollow Dr	Westbound	Through	0	0	0	0
PM	Hagers Hollow Dr	Westbound	U-Turn	0	0	0	0

Table 16: Intersection 2 NC 16 Business & Hagers Hollow Dr. Comparison Table (Phase 1)

Intersection 2: NC 16 Bus. & Hagers Hollow Dr. (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	C	C		NONE		30.2	30.2	0		0%	
AM	Northbound	A	A		NONE		7.3	7.2	-0.1		-1%	
AM	Southbound	B	B		NONE		15.8	17.3	1.5		9%	
PM	Eastbound	C	C		NONE		29.7	29.7	0		0%	
PM	Northbound	A	B		DROP		9.9	10.2	0.3		3%	
PM	Southbound	B	B		NONE		15.9	16.5	0.6		4%	

Table 17: Intersection 2 NC 16 Business & Hagers Hollow Dr. Queuing (Phase 1)

Intersection 2: NC 16 Bus. & Hagers Hollow Dr. (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left	N/A	143	125	-18
AM	Eastbound	Right	100	119	117	-2
AM	Northbound	Thru	N/A	90	96	6
AM	Northbound	Left	150	128	135	7
AM	Southbound	Thru	N/A	78	171	93
AM	Southbound	Right	150	427	494	67
PM	Eastbound	Left	N/A	122	129	7
PM	Eastbound	Right	100	96	101	5
PM	Northbound	Thru	N/A	118	151	33
PM	Northbound	Left	150	240	273	33
PM	Southbound	Thru	N/A	181	214	33
PM	Southbound	Right	100	449	474	25

As shown in Table 16 the northbound PM approach drops from LOS A to LOS B in the build out case. However, delay on this approach only increases by 0.3 seconds per vehicle. The Engineer recommends no mitigation at this intersection.

INTERSECTION 2-PHASE 2

Table 18 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 19 shows that NC 16 Business & Charter Ln. operates at a LOS A, B, or C in the background case. This LOS remains the same in the build-out case.

Table 20 shows the queuing for each analyzed case, period, and approach.

Table 18: Intersection 2 NC 16 Business & Hagers Hollow Dr. Traffic Volumes (Phase 2)

Intersection 2: NC 16 Bus. & Haggers Hollow Dr. (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Hagers Hollow Dr	Eastbound	Left	8	83	0	83
AM	Hagers Hollow Dr	Eastbound	Right	22	85	0	85
AM	Hagers Hollow Dr	Eastbound	Through	0	0	0	0
AM	Hagers Hollow Dr	Eastbound	U-Turn	0	0	0	0
AM	Hagers Hollow Dr	Northbound	Left	23	46	0	46
AM	Hagers Hollow Dr	Northbound	Right	0	0	0	0
AM	Hagers Hollow Dr	Northbound	Through	402	435	60	495
AM	Hagers Hollow Dr	Northbound	U-Turn	0	0	0	0
AM	Hagers Hollow Dr	Southbound	Left	0	0	0	0
AM	Hagers Hollow Dr	Southbound	Right	18	45	0	45
AM	Hagers Hollow Dr	Southbound	Through	587	635	101	736
AM	Hagers Hollow Dr	Southbound	U-Turn	0	0	0	0
AM	Hagers Hollow Dr	Westbound	Left	0	0	0	0
AM	Hagers Hollow Dr	Westbound	Right	0	0	0	0
AM	Hagers Hollow Dr	Westbound	Through	0	0	0	0
AM	Hagers Hollow Dr	Westbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Eastbound	Left	18	70	0	70
PM	Hagers Hollow Dr	Eastbound	Right	26	70	0	70
PM	Hagers Hollow Dr	Eastbound	Through	0	0	0	0
PM	Hagers Hollow Dr	Eastbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Northbound	Left	19	92	0	92
PM	Hagers Hollow Dr	Northbound	Right	0	0	0	0
PM	Hagers Hollow Dr	Northbound	Through	640	693	86	779
PM	Hagers Hollow Dr	Northbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Southbound	Left	0	0	0	0
PM	Hagers Hollow Dr	Southbound	Right	13	100	0	100
PM	Hagers Hollow Dr	Southbound	Through	593	642	41	683
PM	Hagers Hollow Dr	Southbound	U-Turn	0	0	0	0
PM	Hagers Hollow Dr	Westbound	Left	0	0	0	0
PM	Hagers Hollow Dr	Westbound	Right	0	0	0	0
PM	Hagers Hollow Dr	Westbound	Through	0	0	0	0
PM	Hagers Hollow Dr	Westbound	U-Turn	0	0	0	0

Table 19: Intersection 2 NC 16 Business & Hagers Hollow Dr. Comparison Table (Phase 2)

Intersection 2: NC 16 Bus. & Hagers Hollow Dr. (Phase 2)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	C	C		NONE		30.2	30.2	0		0%	
AM	Northbound	A	A		NONE		7.3	7.3	0		0%	
AM	Southbound	B	B		NONE		16.4	19.6	3.2		20%	
PM	Eastbound	C	C		NONE		29.7	29.7	0		0%	
PM	Northbound	B	B		NONE		10.1	10.6	0.5		5%	
PM	Southbound	B	B		NONE		16.7	18.1	1.4		8%	

Table 20: Intersection 2 NC 16 Business & Hagers Hollow Dr. Queuing (Phase 2)

Intersection 2: NC 16 Bus. & Hagers Hollow Dr. (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left	N/A	149	120	-29
AM	Eastbound	Right	100	132	89	-43
AM	Northbound	Thru	N/A	88	86	-2
AM	Northbound	Left	150	170	161	-9
AM	Southbound	Thru	N/A	170	206	36
AM	Southbound	Right	150	455	642	187
PM	Eastbound	Left	N/A	105	121	16
PM	Eastbound	Right	100	87	88	1
PM	Northbound	Thru	N/A	125	122	-3
PM	Northbound	Left	150	257	320	63
PM	Southbound	Thru	N/A	248	250	2
PM	Southbound	Right	100	480	585	105

The Engineer recommends no mitigation at this intersection.

INTERSECTION 3: NC 16 BUSINESS & CHARTER LN. (PHASE 1)

Figure 22 shows the intersection of NC 16 Business & Charter Ln.

Table 21 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 22 shows that NC 16 Business & Charter Ln. operates at a LOS A, B, or D in the background case. This intersection drops to a C and F during the build-out case.

Table 23 shows the queuing for each analyzed case, period, and approach.

Figure 22: Intersection 3 NC 16 Business & Charter Ln.

Table 21: Intersection 3 NC 16 Business & Charter Ln. Traffic Volumes (Phase 1)

Intersection 3: NC 16 Bus. & Charter Ln. (Phase 1)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Charter Ln	Eastbound	Left	6	6	30	36
AM	Charter Ln	Eastbound	Right	0	0	30	30
AM	Charter Ln	Eastbound	Through	0	0	0	0
AM	Charter Ln	Eastbound	U-Turn	0	0	0	0
AM	Charter Ln	Northbound	Left	1	1	20	21
AM	Charter Ln	Northbound	Right	1	1	0	1
AM	Charter Ln	Northbound	Through	477	496	0	496
AM	Charter Ln	Northbound	U-Turn	0	0	0	0
AM	Charter Ln	Southbound	Left	0	0	0	0
AM	Charter Ln	Southbound	Right	8	8	19	27
AM	Charter Ln	Southbound	Through	589	674	0	674
AM	Charter Ln	Southbound	U-Turn	0	0	0	0
AM	Charter Ln	Westbound	Left	1	1	0	1
AM	Charter Ln	Westbound	Right	0	0	0	0
AM	Charter Ln	Westbound	Through	0	0	0	0
AM	Charter Ln	Westbound	U-Turn	0	0	0	0
PM	Charter Ln	Eastbound	Left	17	18	51	69
PM	Charter Ln	Eastbound	Right	19	20	51	71
PM	Charter Ln	Eastbound	Through	0	0	0	0
PM	Charter Ln	Eastbound	U-Turn	0	0	0	0
PM	Charter Ln	Northbound	Left	18	19	7	26
PM	Charter Ln	Northbound	Right	0	0	0	0
PM	Charter Ln	Northbound	Through	698	726	0	726
PM	Charter Ln	Northbound	U-Turn	0	0	0	0
PM	Charter Ln	Southbound	Left	0	0	0	0
PM	Charter Ln	Southbound	Right	10	10	7	17
PM	Charter Ln	Southbound	Through	702	772	0	772
PM	Charter Ln	Southbound	U-Turn	0	0	0	0
PM	Charter Ln	Westbound	Left	0	0	0	0
PM	Charter Ln	Westbound	Right	0	0	0	0
PM	Charter Ln	Westbound	Through	0	0	0	0
PM	Charter Ln	Westbound	U-Turn	0	0	0	0

Table 22: Intersection 3 NC 16 Business & Charter Ln. Comparison Table (Phase 1)

Intersection 3: NC 16 Bus & Charter Ln. (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	B	C		DROP		25.4	25.4	0		0%	
AM	Northbound	A	A		NONE		0.4	0.4	0		0%	
AM	Southbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	D	F		DROP		32.7	71.9	39.2		120%	
PM	Northbound	A	A		NONE		0.2	0.3	0.1		50%	
PM	Southbound	A	A		NONE		0	0	0		0%	

Table 23: Intersection 3 NC 16 Business & Charter Ln. Queuing (Phase 1)

Intersection 3: NC 16 Bus. & Charter Ln. (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left	175	23	68	45
AM	Eastbound	Right	N/A	15	48	33
AM	Northbound	Thru	N/A	6	39	33
AM	Northbound	Left	150	0	0	0
AM	Southbound	Thru	N/A	0	0	0
AM	Southbound	Right	75	0	0	0
PM	Eastbound	Left	175	54	110	56
PM	Eastbound	Right	N/A	32	76	44
PM	Northbound	Thru	N/A	42	50	8
PM	Northbound	Left	150	0	0	0
PM	Southbound	Thru	N/A	0	0	0
PM	Southbound	Right	75	0	0	0

As shown in Table 22, the AM level of service for the eastbound (from campus) approach in the AM drops to LOS C. In the PM, the level of service for this approach drops to LOS F. This The queue is entirely on Denver Christian Academy property (see page 76).

The delay on the northbound approach increases by 50% from 0.2 seconds per vehicle to 0.3 seconds per vehicle and the approach continues to operate at LOS A.

The Engineer recommends no mitigation at this intercession. However, it is the Denver Christian Academy's responsibility to ensure at least 200 feet of on-campus storage for the eastbound approach.

INTERSECTION 3-PHASE 2

Table 24 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 25 shows that NC 16 Business & Charter Ln. operates at a LOS A, C, or E in the background case. This intersection drops to a LOS E and F during the build-out case.

Table 26 shows the queuing for each analyzed case, period, and approach.

Table 24: Intersection 3 NC 16 Business & Charter Ln. Traffic Volumes (Phase 2)

Intersection 3: NC 16 Bus. & Charter Ln. (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Charter Ln	Eastbound	Left	6	6	60	66
AM	Charter Ln	Eastbound	Right	0	0	60	60
AM	Charter Ln	Eastbound	Through	0	0	0	0
AM	Charter Ln	Eastbound	U-Turn	0	0	0	0
AM	Charter Ln	Northbound	Left	1	1	34	35
AM	Charter Ln	Northbound	Right	1	1	0	1
AM	Charter Ln	Northbound	Through	477	516	0	516
AM	Charter Ln	Northbound	U-Turn	0	0	0	0
AM	Charter Ln	Southbound	Left	0	0	0	0
AM	Charter Ln	Southbound	Right	8	9	32	41
AM	Charter Ln	Southbound	Through	589	699	0	699
AM	Charter Ln	Southbound	U-Turn	0	0	0	0
AM	Charter Ln	Westbound	Left	1	1	0	1
AM	Charter Ln	Westbound	Right	0	0	0	0
AM	Charter Ln	Westbound	Through	0	0	0	0
AM	Charter Ln	Westbound	U-Turn	0	0	0	0
PM	Charter Ln	Eastbound	Left	17	18	86	104
PM	Charter Ln	Eastbound	Right	19	21	86	107
PM	Charter Ln	Eastbound	Through	0	0	0	0
PM	Charter Ln	Eastbound	U-Turn	0	0	0	0
PM	Charter Ln	Northbound	Left	18	19	14	33
PM	Charter Ln	Northbound	Right	0	0	0	0
PM	Charter Ln	Northbound	Through	698	756	0	756
PM	Charter Ln	Northbound	U-Turn	0	0	0	0
PM	Charter Ln	Southbound	Left	0	0	0	0
PM	Charter Ln	Southbound	Right	10	11	13	24
PM	Charter Ln	Southbound	Through	702	802	0	802
PM	Charter Ln	Southbound	U-Turn	0	0	0	0
PM	Charter Ln	Westbound	Left	0	0	0	0
PM	Charter Ln	Westbound	Right	0	0	0	0
PM	Charter Ln	Westbound	Through	0	0	0	0
PM	Charter Ln	Westbound	U-Turn	0	0	0	0

Table 25: Intersection 3 NC 16 Business & Charter Ln. Comparison Table (Phase 2)

Intersection 3: NC 16 Bus & Charter Ln. (Phase 2)													
Background vs. Build-Out													
Period	Approach	LOS					Delay in Seconds				Percent Change		
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated	
AM	Eastbound	C	E		DROP		22.5	36.2	13.7		61%		
AM	Northbound	A	A		NONE		0.1	0.6	0.5		500%		
AM	Southbound	A	A		NONE		0	0	0		0%		
PM	Eastbound	E	F		DROP		35.4	170.2	134.8		381%		
PM	Northbound	A	A		NONE		0.2	0.4	0.2		100%		
PM	Southbound	A	A		NONE		0	0	0		0%		

Table 26: Intersection 3 NC 16 Business & Charter Ln. Queuing (Phase 2)

Intersection 3: NC 16 Bus. & Charter Ln. (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left	175	24	96	72
AM	Eastbound	Right	N/A	24	61	37
AM	Northbound	Thru	N/A	35	59	24
AM	Northbound	Left	150	0	0	0
AM	Southbound	Thru	N/A	0	10	10
AM	Southbound	Right	75	0	0	0
PM	Eastbound	Left	175	37	224	187
PM	Eastbound	Right	N/A	41	156	115
PM	Northbound	Thru	N/A	34	57	23
PM	Northbound	Left	150	0	0	0
PM	Southbound	Thru	N/A	0	9	9
PM	Southbound	Right	75	0	4	4

As shown in Table 25, the level of service on the eastbound approach (from campus) drops from LOS C to LOS E in the AM peak period, and from LOC E to LOS F during the PM peak. This approach is an on-campus approach and does not affect the public roadway.

As shown in Table 25, the level of service on the northbound approach operates at LOS A in all cases. The AM delay increases from 0.1 seconds per vehicle to 0.4 seconds per vehicle. Similarly, the PM northbound approach increases by 100%, and increases from 0.2 seconds per vehicle to 0.4 seconds per vehicle and the approach operates at a LOS A.

Because the poor LOS is entirely on campus the Engineer recommends no mitigation. However, it is the Denver Christian Academy's responsibility to ensure adequate stacking of 400 feet for the eastbound approach (see page 76).

Intersection 4: NC 16 Business & Old Post Road (Phase 1)

Figure 23 shows the intersection of NC 16 Business & Old Post Road

Table 27 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 28 shows that NC 16 and Old Post Rd. operates at a LOS A, C, or D in the background case. This intersection remains the same during the build out case

Table 29 shows the queuing for each analyzed case, period, and approach.

Figure 23: Intersection 4 NC 16 Business & Old Post Road

Table 27: Intersection 4 NC 16 Business & Old Post Road Traffic Volumes (Phase 1)

Intersection 4: NC 16 Bus. & Old Post Road (Phase 1)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Old Post Rd	Eastbound	Left	7	7	0	7
AM	Old Post Rd	Eastbound	Right	18	19	0	19
AM	Old Post Rd	Eastbound	Through	0	0	0	0
AM	Old Post Rd	Eastbound	U-Turn	0	0	0	0
AM	Old Post Rd	Northbound	Left	19	20	38	58
AM	Old Post Rd	Northbound	Right	0	0	0	0
AM	Old Post Rd	Northbound	Through	407	444	0	444
AM	Old Post Rd	Northbound	U-Turn	0	0	0	0
AM	Old Post Rd	Southbound	Left	0	0	0	0
AM	Old Post Rd	Southbound	Right	28	29	39	68
AM	Old Post Rd	Southbound	Through	566	650	0	650
AM	Old Post Rd	Southbound	U-Turn	0	0	0	0
AM	Old Post Rd	Westbound	Left	0	0	0	0
AM	Old Post Rd	Westbound	Right	0	0	0	0
AM	Old Post Rd	Westbound	Through	0	0	0	0
AM	Old Post Rd	Westbound	U-Turn	0	0	0	0
PM	Old Post Rd	Eastbound	Left	4	4	0	4
PM	Old Post Rd	Eastbound	Right	3	3	0	3
PM	Old Post Rd	Eastbound	Through	0	0	0	0
PM	Old Post Rd	Eastbound	U-Turn	0	0	0	0
PM	Old Post Rd	Northbound	Left	14	15	14	29
PM	Old Post Rd	Northbound	Right	0	0	0	0
PM	Old Post Rd	Northbound	Through	662	760	0	760
PM	Old Post Rd	Northbound	U-Turn	0	0	0	0
PM	Old Post Rd	Southbound	Left	0	0	0	0
PM	Old Post Rd	Southbound	Right	17	18	14	32
PM	Old Post Rd	Southbound	Through	597	663	0	663
PM	Old Post Rd	Southbound	U-Turn	0	0	0	0
PM	Old Post Rd	Westbound	Left	0	0	0	0
PM	Old Post Rd	Westbound	Right	0	0	0	0
PM	Old Post Rd	Westbound	Through	0	0	0	0
PM	Old Post Rd	Westbound	U-Turn	0	0	0	0

Table 28 Intersection 4 NC 16 Business & Old Post Road Comparison Table (Phase 1)

Intersection 4: NC 16 Bus. & Old Post Road (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	C	C		NONE		17.9	19.9	2		11%	
AM	Northbound	A	A		NONE		0.4	1.1	0.7		175%	
AM	Southbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	D	D		NONE		27.1	29	1.9		7%	
PM	Northbound	A	A		NONE		0.2	0.3	0.1		50%	
PM	Southbound	A	A		NONE		0	0	0		0%	

Table 29: Intersection 4 NC 16 Business & Old Post Road Queuing (Phase 1)

Intersection 4: NC 16 Bus. & Old Post Road (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Right	N/A	26	41	15
AM	Northbound	Left/Thru	N/A	60	150	90
AM	Southbound	Thru/Right	N/A	0	8	8
PM	Eastbound	Left/Right	N/A	29	27	-2
PM	Northbound	Left/Thru	N/A	96	137	41
PM	Southbound	Thru/Right	N/A	0	0	0

As shown in Table 26 the AM delay on the northbound approach increases from 0.4 seconds per vehicle to 1.1 seconds per vehicle (175%). In the PM peak the northbound delay increases from 0.3 seconds per vehicle to 0.3 seconds per vehicle. The northbound approach continues to operate at LOS a in all cases.

The Engineer recommends no mitigation at this intersection.

INTERSECTION 4-PHASE 2

Table 30 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 31 shows that NC 16 Business and Old Post Rd. operates at a LOS A, C, or D in the background case. The LOS remains the same during the build-out case.

Table 32 shows the queuing for each analyzed case, period, and approach.

Table 30: Intersection 4 NC 16 Business & Old Post Rd. Traffic Volumes (Phase 2)

Intersection 4: NC 16 Bus. & Old Post Road (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Old Post Rd	Eastbound	Left	7	8	0	8
AM	Old Post Rd	Eastbound	Right	18	19	0	19
AM	Old Post Rd	Eastbound	Through	0	0	0	0
AM	Old Post Rd	Eastbound	U-Turn	0	0	0	0
AM	Old Post Rd	Northbound	Left	19	21	67	88
AM	Old Post Rd	Northbound	Right	0	0	0	0
AM	Old Post Rd	Northbound	Through	407	462	0	462
AM	Old Post Rd	Northbound	U-Turn	0	0	0	0
AM	Old Post Rd	Southbound	Left	0	0	0	0
AM	Old Post Rd	Southbound	Right	28	30	69	99
AM	Old Post Rd	Southbound	Through	566	674	0	674
AM	Old Post Rd	Southbound	U-Turn	0	0	0	0
AM	Old Post Rd	Westbound	Left	0	0	0	0
AM	Old Post Rd	Westbound	Right	0	0	0	0
AM	Old Post Rd	Westbound	Through	0	0	0	0
AM	Old Post Rd	Westbound	U-Turn	0	0	0	0
PM	Old Post Rd	Eastbound	Left	4	4	0	4
PM	Old Post Rd	Eastbound	Right	3	3	0	3
PM	Old Post Rd	Eastbound	Through	0	0	0	0
PM	Old Post Rd	Eastbound	U-Turn	0	0	0	0
PM	Old Post Rd	Northbound	Left	14	15	27	42
PM	Old Post Rd	Northbound	Right	0	0	0	0
PM	Old Post Rd	Northbound	Through	662	788	0	788
PM	Old Post Rd	Northbound	U-Turn	0	0	0	0
PM	Old Post Rd	Southbound	Left	0	0	0	0
PM	Old Post Rd	Southbound	Right	17	18	28	46
PM	Old Post Rd	Southbound	Through	597	688	0	688
PM	Old Post Rd	Southbound	U-Turn	0	0	0	0
PM	Old Post Rd	Westbound	Left	0	0	0	0
PM	Old Post Rd	Westbound	Right	0	0	0	0
PM	Old Post Rd	Westbound	Through	0	0	0	0
PM	Old Post Rd	Westbound	U-Turn	0	0	0	0

Table 31: Intersection 4 NC 16 Business & Old Post Rd. Comparison Table (Phase 2)

Intersection 4: NC 16 Bus. & Old Post Road (Phase 2)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	C	C		NONE		19.3	23.9	4.6		24%	
AM	Northbound	A	A		NONE		0.4	1.6	1.2		300%	
AM	Southbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	D	D		NONE		28.8	33.3	4.5		16%	
PM	Northbound	A	A		NONE		0.2	0.5	0.3		150%	
PM	Southbound	A	A		NONE		0	0	0		0%	

Table 32: Intersection 4 NC 16 Business & Old Post Rd. Queuing (Phase 2)

Intersection 4: NC 16 Bus. & Old Post Road (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Right	N/A	48	44	-4
AM	Northbound	Left/Thru	N/A	114	161	47
AM	Southbound	Thru/Right	N/A	0	14	14
PM	Eastbound	Left/Right	N/A	28	26	-2
PM	Northbound	Left/Thru	N/A	89	306	217
PM	Southbound	Thru/Right	N/A	0	0	0

As shown in Table 31, the AM delay on the increases from 0.4 seconds per vehicle to 1.6 seconds per vehicle and the PM period delay increases from 0.2 seconds per vehicle to 0.5 seconds per vehicle. The approach operates at LOS A for all periods and approaches. The Engineer recommends no mitigation at this intersection.

INTERSECTION 5: HAGERS HOLLOW DR. & WESLEYAN CHURCH ACCESS (PHASE 1)

Figure 24 shows the intersection of Hagers Hollow Dr. & Wesleyan Church Access

Table 33 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 34 shows that of Hagers Hollow Dr. & Wesleyan Church operates at a LOS A in the background case. The LOS remains the same after the build-out case is complete.

Table 34 shows the queuing for each analyzed case, period, and approach.

Figure 24: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Access

Table 33: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Traffic Volumes (Phase 1)

Intersection 5: Hagers Hollow Dr. & Wesleyan Church Entrance							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Church Access	Eastbound	Left	0	0	0	0
AM	Church Access	Eastbound	Right	0	0	0	0
AM	Church Access	Eastbound	Through	23	159	0	159
AM	Church Access	Eastbound	U-Turn	0	0	0	0
AM	Church Access	Northbound	Left	0	0	0	0
AM	Church Access	Northbound	Right	0	0	0	0
AM	Church Access	Northbound	Through	0	0	0	0
AM	Church Access	Northbound	U-Turn	0	0	0	0
AM	Church Access	Southbound	Left	11	11	0	11
AM	Church Access	Southbound	Right	0	0	0	0
AM	Church Access	Southbound	Through	0	0	0	0
AM	Church Access	Southbound	U-Turn	0	0	0	0
AM	Church Access	Westbound	Left	0	0	0	0
AM	Church Access	Westbound	Right	15	16	0	16
AM	Church Access	Westbound	Through	24	25	0	25
AM	Church Access	Westbound	U-Turn	0	0	0	0
PM	Church Access	Eastbound	Left	0	0	0	0
PM	Church Access	Eastbound	Right	0	0	0	0
PM	Church Access	Eastbound	Through	32	126	0	126
PM	Church Access	Eastbound	U-Turn	0	0	0	0
PM	Church Access	Northbound	Left	0	0	0	0
PM	Church Access	Northbound	Right	0	0	0	0
PM	Church Access	Northbound	Through	0	0	0	0
PM	Church Access	Northbound	U-Turn	0	0	0	0
PM	Church Access	Southbound	Left	13	14	0	14
PM	Church Access	Southbound	Right	0	0	0	0
PM	Church Access	Southbound	Through	0	0	0	0
PM	Church Access	Southbound	U-Turn	0	0	0	0
PM	Church Access	Westbound	Left	0	0	0	0
PM	Church Access	Westbound	Right	11	11	0	11
PM	Church Access	Westbound	Through	28	29	0	29
PM	Church Access	Westbound	U-Turn	0	0	0	0

Table 34: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Comparison Table (Phase 1)

Intersection 5: Hagers Hollow Dr. & Wesleyan Church Access (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	A	A		NONE		0.2	0.2	0		0%	
AM	Southbound	A	A		NONE		9.5	9.5	0		0%	
AM	Westbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	A	A		NONE		0	0.2	0.2		0%	
PM	Southbound	A	A		NONE		9.5	9.4	-0.1		-1%	
PM	Westbound	A	A		NONE		0	0	0		0%	

Table 35: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Queuing (Phase 1)

Intersection 5: Hagers Hollow Dr. & Wesleyan Church Entrance (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Thru	N/A	5	0	-5
AM	Southbound	Thru	N/A	21	21	0
AM	Westbound	Thru/Right	N/A	0	0	0
PM	Eastbound	Left/Thru	N/A	0	30	30
PM	Southbound	Thru	N/A	25	0	-25
PM	Westbound	Thru/Right	N/A	0	10	10

The Engineer recommends no mitigation at this intersection during Phase 1.

INTERSECTION 5-PHASE 2

Table 36 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 37 shows that of Hagers Hollow Dr. & Wesleyan Church operates at a LOS A or B in the background case. This intersection remains the same in the buildout case.

Table 38 shows the queuing for each analyzed case, period, and approach.

Table 36: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Traffic Volumes (Phase 2)

Intersection 5: Hagers Hollow Dr. & Wesleyan Church Entrance (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Church Access	Eastbound	Left	0	0	0	0
AM	Church Access	Eastbound	Right	0	0	0	0
AM	Church Access	Eastbound	Through	23	160	0	160
AM	Church Access	Eastbound	U-Turn	0	0	0	0
AM	Church Access	Northbound	Left	0	0	0	0
AM	Church Access	Northbound	Right	0	0	0	0
AM	Church Access	Northbound	Through	0	0	0	0
AM	Church Access	Northbound	U-Turn	0	0	0	0
AM	Church Access	Southbound	Left	11	12	0	12
AM	Church Access	Southbound	Right	0	0	0	0
AM	Church Access	Southbound	Through	0	0	0	0
AM	Church Access	Southbound	U-Turn	0	0	0	0
AM	Church Access	Westbound	Left	0	0	0	0
AM	Church Access	Westbound	Right	15	16	0	16
AM	Church Access	Westbound	Through	24	26	0	26
AM	Church Access	Westbound	U-Turn	0	0	0	0
PM	Church Access	Eastbound	Left	0	0	0	0
PM	Church Access	Eastbound	Right	0	0	0	0
PM	Church Access	Eastbound	Through	32	128	0	128
PM	Church Access	Eastbound	U-Turn	0	0	0	0
PM	Church Access	Northbound	Left	0	0	0	0
PM	Church Access	Northbound	Right	0	0	0	0
PM	Church Access	Northbound	Through	0	0	0	0
PM	Church Access	Northbound	U-Turn	0	0	0	0
PM	Church Access	Southbound	Left	13	14	0	14
PM	Church Access	Southbound	Right	0	0	0	0
PM	Church Access	Southbound	Through	0	0	0	0
PM	Church Access	Southbound	U-Turn	0	0	0	0
PM	Church Access	Westbound	Left	0	0	0	0
PM	Church Access	Westbound	Right	11	12	0	12
PM	Church Access	Westbound	Through	28	30	0	30
PM	Church Access	Westbound	U-Turn	0	0	0	0

Table 37: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Comparison Table (Phase 2)

Intersection 5: Hagers Hollow Dr. & Wesleyan Church Access (Phase 2)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	A	A		NONE		0.2	0.2	0		0%	
AM	Southbound	A	A		NONE		9.8	9.5	-0.3		-3%	
AM	Westbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	A	A		NONE		0.2	0.2	0		0%	
PM	Southbound	B	B		NONE		9.4	9.1	-0.3		-3%	
PM	Westbound	A	A		NONE		0	0	0		0%	

Table 38: Intersection 5 Hagers Hollow Dr. & Wesleyan Church Queuing (Phase 2)

Intersection 5: Hagers Hollow Dr. & Wesleyan Church Entrance (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Thru	N/A	5	0	-5
AM	Southbound	Thru	N/A	21	21	0
AM	Westbound	Thru/Right	N/A	0	0	0
PM	Eastbound	Left/Thru	N/A	5	0	-5
PM	Southbound	Thru	N/A	3	26	23
PM	Westbound	Thru/Right	N/A	21	0	-21

The Engineer recommends no mitigation at this intersection during Phase 2.

Intersection 6: Old Post Rd. & Access 1 (Entrance Only) (Phase 1)

Figure 25: Intersection 6 Old Post Rd. & Access 1

Figure 25 shows the intersection of Old Post Rd. & Access 1.

Table 39 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 40 shows that Old Post Rd. & Access 1 operates at a LOS A in the background case. This intersection remains the same during the build out case.

Table 41 shows the queuing for each analyzed case, period, and approach.

Figure 26 shows the turn lane warrant analysis for this proposed access point.

Table 39: Intersection 6 Old Post Rd. & Access 1 Traffic Volumes (Phase 1)

Intersection 6: Old Post Road & Access 1-Entrance Only (Phase 1)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Access 1	Eastbound	Left	0	0	0	0
AM	Access 1	Eastbound	Right	0	0	0	0
AM	Access 1	Eastbound	Through	23	24	0	24
AM	Access 1	Eastbound	U-Turn	0	0	0	0
AM	Access 1	Northbound	Left	0	0	0	0
AM	Access 1	Northbound	Right	0	0	0	0
AM	Access 1	Northbound	Through	0	0	0	0
AM	Access 1	Northbound	U-Turn	0	0	0	0
AM	Access 1	Southbound	Left	0	0	0	0
AM	Access 1	Southbound	Right	0	0	0	0
AM	Access 1	Southbound	Through	0	0	0	0
AM	Access 1	Southbound	U-Turn	0	0	0	0
AM	Access 1	Westbound	Left	0	0	0	0
AM	Access 1	Westbound	Right	39	41	78	119
AM	Access 1	Westbound	Through	3	3	0	3
AM	Access 1	Westbound	U-Turn	0	0	0	0
PM	Access 1	Eastbound	Left	0	0	0	0
PM	Access 1	Eastbound	Right	0	0	0	0
PM	Access 1	Eastbound	Through	8	8	0	8
PM	Access 1	Eastbound	U-Turn	0	0	0	0
PM	Access 1	Northbound	Left	0	0	0	0
PM	Access 1	Northbound	Right	0	0	0	0
PM	Access 1	Northbound	Through	0	0	0	0
PM	Access 1	Northbound	U-Turn	0	0	0	0
PM	Access 1	Southbound	Left	0	0	0	0
PM	Access 1	Southbound	Right	0	0	0	0
PM	Access 1	Southbound	Through	0	0	0	0
PM	Access 1	Southbound	U-Turn	0	0	0	0
PM	Access 1	Westbound	Left	0	0	0	0
PM	Access 1	Westbound	Right	20	21	28	49
PM	Access 1	Westbound	Through	12	12	0	12
PM	Access 1	Westbound	U-Turn	0	0	0	0

Table 40 Intersection 6 Old Post Rd. & Access 1 Comparison Table (Phase 1)

Intersection 6: Old Post Rd. & DCA East Drive Access (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	A	A		NONE		0.2	0.2	0		0%	
AM	Westbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	A	A		NONE		0.2	0.2	0		0%	
PM	Westbound	A	A		NONE		0	0	0		0%	

Table 41 Intersection 6 Old Post Rd. & Access 1 Queuing (Phase 1)

Intersection 6: Old Post Rd. & Access 1 (Entrance Only) (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Thru	N/A	0	10	10
AM	Southbound	Left/Right	N/A	3	0	-3
AM	Westbound	Thru/Right	N/A	0	0	0
PM	Eastbound	Left/Thru	N/A	4	5	1
PM	Southbound	Left/Right	N/A	0	0	0
PM	Westbound	Thru/Right	N/A	0	0	0

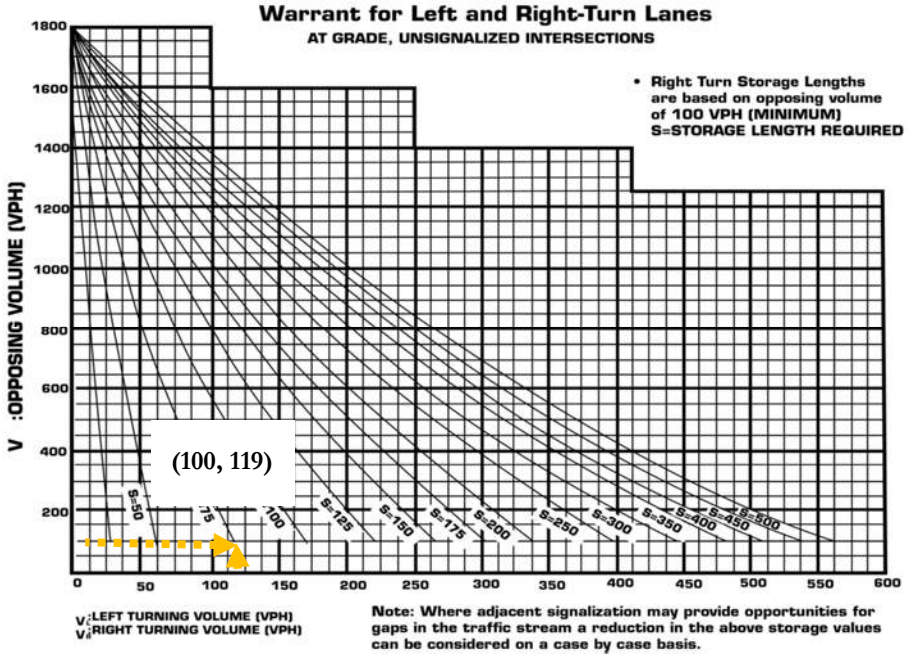


Figure 26: Westbound Right Turn Lane Warrant

This intersection operates at LOS A. While a 75-foot turn lane is warranted, the Engineer recommends no mitigation at this time.

INTERSECTION 6-PHASE 2

Table 42 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 43 shows that Old Post Rd. & Access 1 operates at a LOS A in the background case. This intersection remains the same in the buildout case.

Table 44 shows the queuing for each analyzed case, period, and approach.

Figure 27 shows the turn lane warrant analysis for this proposed access point.

Table 42: Intersection 6 Old Post Road & Access 1 Traffic Volumes (Phase 2)

Intersection 6: Old Post Road & Access 1-Entrance Only (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Access 1	Eastbound	Left	0	0	0	0
AM	Access 1	Eastbound	Right	0	0	0	0
AM	Access 1	Eastbound	Through	23	25	0	25
AM	Access 1	Eastbound	U-Turn	0	0	0	0
AM	Access 1	Northbound	Left	0	0	0	0
AM	Access 1	Northbound	Right	0	0	0	0
AM	Access 1	Northbound	Through	0	0	0	0
AM	Access 1	Northbound	U-Turn	0	0	0	0
AM	Access 1	Southbound	Left	0	0	0	0
AM	Access 1	Southbound	Right	0	0	0	0
AM	Access 1	Southbound	Through	0	0	0	0
AM	Access 1	Southbound	U-Turn	0	0	0	0
AM	Access 1	Westbound	Left	0	0	0	0
AM	Access 1	Westbound	Right	39	42	135	177
AM	Access 1	Westbound	Through	3	3	0	3
AM	Access 1	Westbound	U-Turn	0	0	0	0
PM	Access 1	Eastbound	Left	0	0	0	0
PM	Access 1	Eastbound	Right	0	0	0	0
PM	Access 1	Eastbound	Through	8	9	0	9
PM	Access 1	Eastbound	U-Turn	0	0	0	0
PM	Access 1	Northbound	Left	0	0	0	0
PM	Access 1	Northbound	Right	0	0	0	0
PM	Access 1	Northbound	Through	0	0	0	0
PM	Access 1	Northbound	U-Turn	0	0	0	0
PM	Access 1	Southbound	Left	0	0	0	0
PM	Access 1	Southbound	Right	0	0	0	0
PM	Access 1	Southbound	Through	0	0	0	0
PM	Access 1	Southbound	U-Turn	0	0	0	0
PM	Access 1	Westbound	Left	0	0	0	0
PM	Access 1	Westbound	Right	20	22	55	77
PM	Access 1	Westbound	Through	12	13	0	13
PM	Access 1	Westbound	U-Turn	0	0	0	0

Table 43: Intersection 6 Old Post Road & Access 1 Comparison Table (Phase 2)

Intersection 6: Old Post Rd. & DCA East Drive Access (Phase 2)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Eastbound	A	A		NONE		1	1.1	0.1		10%	
AM	Westbound	A	A		NONE		0	0	0		0%	
PM	Eastbound	A	A		NONE		2.2	2.3	0.1		5%	
PM	Westbound	A	A		NONE		0	0	0		0%	

Table 44: Intersection 6 Old Post Road & Access 1 Queuing (Phase 2)

Intersection 6: Old Post Rd. & Access 1 (Entrance Only) (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Eastbound	Left/Thru	N/A	5	15	10
AM	Southbound	Left/Right	N/A	0	0	0
AM	Westbound	Thru/Right	N/A	0	0	0
PM	Eastbound	Left/Thru	N/A	0	0	0
PM	Southbound	Left/Right	N/A	0	0	0
PM	Westbound	Thru/Right	N/A	0	0	0

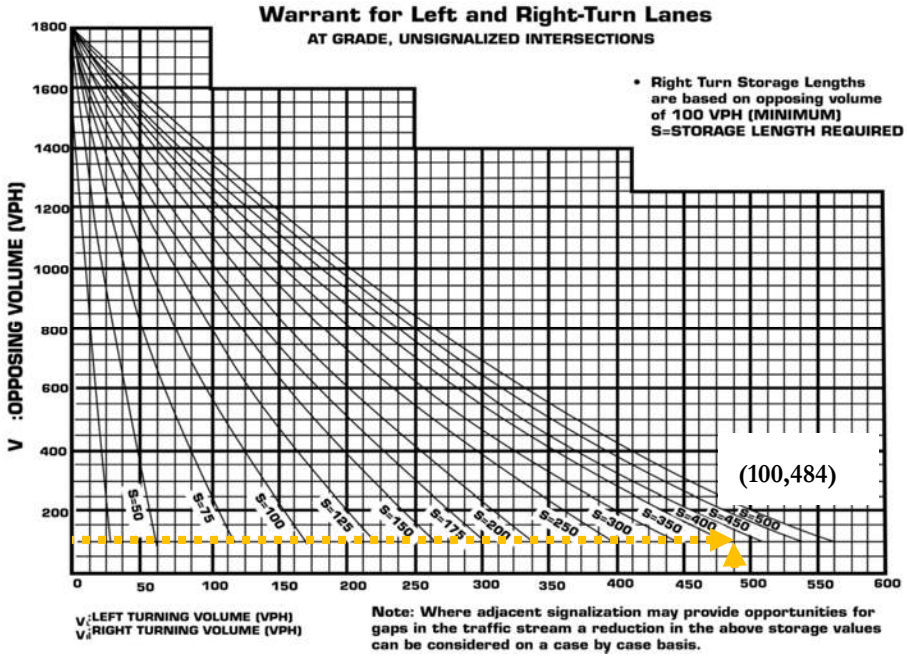


Figure 27: Westbound Right Turn Lane Warrant

This intersection operates at LOS A. While a 100-foot turn lane is warranted, the Engineer recommends no mitigation at this time.

INTERSECTION 7: CHARTER LANE AND NEW ACCESS 2 (EXIT ONLY) (PHASE 1)

Figure 28: Charter Lane and New Access 2 (Exit Only) shows the intersection of Charter Lane and Access 2.

Table 45 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 46 shows that Charter Lane and Access 2 operates at a LOS A in the background case. This intersection remains the same during the build out case.

Table 47 shows the queuing for each analyzed case, period, and approach.

Figure 28: Charter Lane and New Access 2 (Exit Only)

Table 45: Intersection 7 Charter Ln & New Access 2 Traffic Volumes (Phase 1)

Intersection 7: Charter Ln. & New Access 2 - Exit Only (Phase 1)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Access 2	Eastbound	Left	0	0	0	0
AM	Access 2	Eastbound	Right	0	0	0	0
AM	Access 2	Eastbound	Through	3	3	0	3
AM	Access 2	Eastbound	U-Turn	0	0	0	0
AM	Access 2	Northbound	Left	3	3	0	3
AM	Access 2	Northbound	Right	96	100	59	159
AM	Access 2	Northbound	Through	0	0	0	0
AM	Access 2	Northbound	U-Turn	0	0	0	0
AM	Access 2	Southbound	Left	0	0	0	0
AM	Access 2	Southbound	Right	0	0	0	0
AM	Access 2	Southbound	Through	0	0	0	0
AM	Access 2	Southbound	U-Turn	0	0	0	0
AM	Access 2	Westbound	Left	1	1	38	39
AM	Access 2	Westbound	Right	0	0	0	0
AM	Access 2	Westbound	Through	78	81	0	81
AM	Access 2	Westbound	U-Turn	0	0	0	0
PM	Access 2	Eastbound	Left	0	0	0	0
PM	Access 2	Eastbound	Right	0	0	0	0
PM	Access 2	Eastbound	Through	11	11	0	11
PM	Access 2	Eastbound	U-Turn	0	0	0	0
PM	Access 2	Northbound	Left	0	0	0	0
PM	Access 2	Northbound	Right	67	70	101	171
PM	Access 2	Northbound	Through	0	0	0	0
PM	Access 2	Northbound	U-Turn	0	0	0	0
PM	Access 2	Southbound	Left	0	0	0	0
PM	Access 2	Southbound	Right	0	0	0	0
PM	Access 2	Southbound	Through	0	0	0	0
PM	Access 2	Southbound	U-Turn	0	0	0	0
PM	Access 2	Westbound	Left	0	0	14	14
PM	Access 2	Westbound	Right	0	0	0	0
PM	Access 2	Westbound	Through	33	34	0	34
PM	Access 2	Westbound	U-Turn	0	0	0	0

Table 46: Intersection 7 Charter Ln. & New Access 2 Comparison Table (Phase 1)

Intersection 7: Charter Ln. & DCA Exit Only Access (Phase 1)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Northbound	A	A		NONE		9.2	9.1	-0.1		-1%	
PM	Northbound	A	A		NONE		8.7	9.1	0.4		5%	

Table 47: Intersection 7 Charter Ln. & New Access 2 Queuing (Phase 1)

Intersection 7: Charter Ln. & New Access 2 (Exit Only) (Phase 1)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Northbound	Left/Right	N/A	71	80	9
PM	Northbound	Left/Right	N/A	66	82	16

The Engineer recommends no mitigation at this access point.

INTERSECTION 7-PHASE 2

Table 48 shows the traffic volumes for each analyzed case, period, and approach. It also shows how the components of the total volumes come together.

Table 49 shows that Charter Lane and Access 2 operate at a LOS A in the background case. This intersection drops to a B in the build-out case.

Table 50: Intersection 7 Charter Ln. & Access 2 - Exit Only Queuing (Phase 2 shows the queuing for each analyzed case, period, and approach.

Table 48: Intersection 7 Charter Ln. & Access 2 – Exit Only Traffic Volumes (Phase 2)

Intersection 7: Charter Ln. & New Access 2 - Exit Only (Phase 2)							
Period	Minor Road Name	Approach Dir (N/S/E/W)	L/T/R/U	Base Vol.	Background Vol.	Trip Gen.	Future Vol.
AM	Access 2	Eastbound	Left	0	0	0	0
AM	Access 2	Eastbound	Right	0	0	0	0
AM	Access 2	Eastbound	Through	3	3	0	3
AM	Access 2	Eastbound	U-Turn	0	0	0	0
AM	Access 2	Northbound	Left	3	3	0	3
AM	Access 2	Northbound	Right	96	104	120	224
AM	Access 2	Northbound	Through	0	0	0	0
AM	Access 2	Northbound	U-Turn	0	0	0	0
AM	Access 2	Southbound	Left	0	0	0	0
AM	Access 2	Southbound	Right	0	0	0	0
AM	Access 2	Southbound	Through	0	0	0	0
AM	Access 2	Southbound	U-Turn	0	0	0	0
AM	Access 2	Westbound	Left	1	1	67	68
AM	Access 2	Westbound	Right	0	0	0	0
AM	Access 2	Westbound	Through	78	84	0	84
AM	Access 2	Westbound	U-Turn	0	0	0	0
PM	Access 2	Eastbound	Left	0	0	0	0
PM	Access 2	Eastbound	Right	0	0	0	0
PM	Access 2	Eastbound	Through	11	12	0	12
PM	Access 2	Eastbound	U-Turn	0	0	0	0
PM	Access 2	Northbound	Left	0	0	0	0
PM	Access 2	Northbound	Right	67	73	172	245
PM	Access 2	Northbound	Through	0	0	0	0
PM	Access 2	Northbound	U-Turn	0	0	0	0
PM	Access 2	Southbound	Left	0	0	0	0
PM	Access 2	Southbound	Right	0	0	0	0
PM	Access 2	Southbound	Through	0	0	0	0
PM	Access 2	Southbound	U-Turn	0	0	0	0
PM	Access 2	Westbound	Left	0	0	27	27
PM	Access 2	Westbound	Right	0	0	0	0
PM	Access 2	Westbound	Through	33	36	0	36
PM	Access 2	Westbound	U-Turn	0	0	0	0

Table 49: Intersection 7 Charter Ln. & Access 2 - Exit Only Comparison Table (Phase 2)

Intersection 7: Charter Ln. & DCA Exit Only Access (Phase 2)												
Background vs. Build-Out												
Period	Approach	LOS					Delay in Seconds				Percent Change	
		Background	Build-Out	Mitigated	Build-out Change	Mitigated Change	Background	Build-Out	Change	Mitigated	Build-Out	Mitigated
AM	Northbound	A	B		DROP		9.3	16.1	6.8		73%	
PM	Northbound	A	B		DROP		9.4	16.5	7.1		76%	

Table 50: Intersection 7 Charter Ln. & Access 2 - Exit Only Queuing (Phase 2)

Intersection 7: Charter Ln. & New Access 2 (Exit Only) (Phase 2)						
Period	Approach	Lane	Storage (ft)	Background Queue (ft)	Build-out Queue (ft)	Difference (ft)
AM	Northbound	Left/Right	N/A	76	84	8
PM	Northbound	Left/Right	N/A	55	87	32

This intersection is entirely on Denver Christian Academy campus. The level of service drop does not affect the public roadway. The Engineer recommends no mitigation at this intersection.

COMPARISON OF ON-SITE QUEUING

The NCDOT requires that schools contain vehicle queues on campus. As shown in Table 51 there is sufficient storage available to accommodate both the Pre-K, Kindergarten, Middle School, and High School vehicles on campus at the same time. The site circulation plan (included in Appendix A) shows the queue demand for all grades totaling a length of 489 feet for Phase 1, and 864 feet for Phase 2. The total available queue is 1,100 feet. There is adequate onsite queuing based on the MSTA spreadsheet calculations, see Appendix E.

Table 51: Denver Academy Queue Demand

Analysis Case	Pre-K and K Queue Demand (ft)	1-12th Queue Demand (ft)	Total Queue Demand (ft)	Total Available Queue (ft)
Phase 1	311	178	489	1,100
Phase 2	510	354	864	1,100

MITIGATION

This section discusses the proposed mitigations at each intersection and access point. If no mitigations are proposed that too is noted. Figure 29 shows the recommended lane diagram once this project is complete.

INTERSECTION 1: NC 16 BUSINESS & WESLEYAN CHURCH SOUTH ENTRANCE

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

INTERSECTION 2: NC 16 BUSINESS & HAGERS HOLLOW DR.

The Villages of Denver developer is obligated to construct a signal at this intersection. The additional traffic from the development was modeled in the base and build out conditions.

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

INTERSECTION 3: NC 16 BUSINESS & CHARTER LN.

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

INTERSECTION 4: NC 16 BUSINESS & OLD POST ROAD

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

INTERSECTION 5: WESLEYAN CHURCH SOUTH ENTRANCE & HAGERS HOLLOW DR

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

INTERSECTION 6: OLD POST ROAD & ACCESS 1

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

INTERSECTION 7: CHARTER LANE AND NEW ACCESS 2 (EXIT ONLY)

Phase 1: The Engineer recommends no mitigation at this intersection.

Phase 2: The Engineer recommends no mitigation at this intersection.

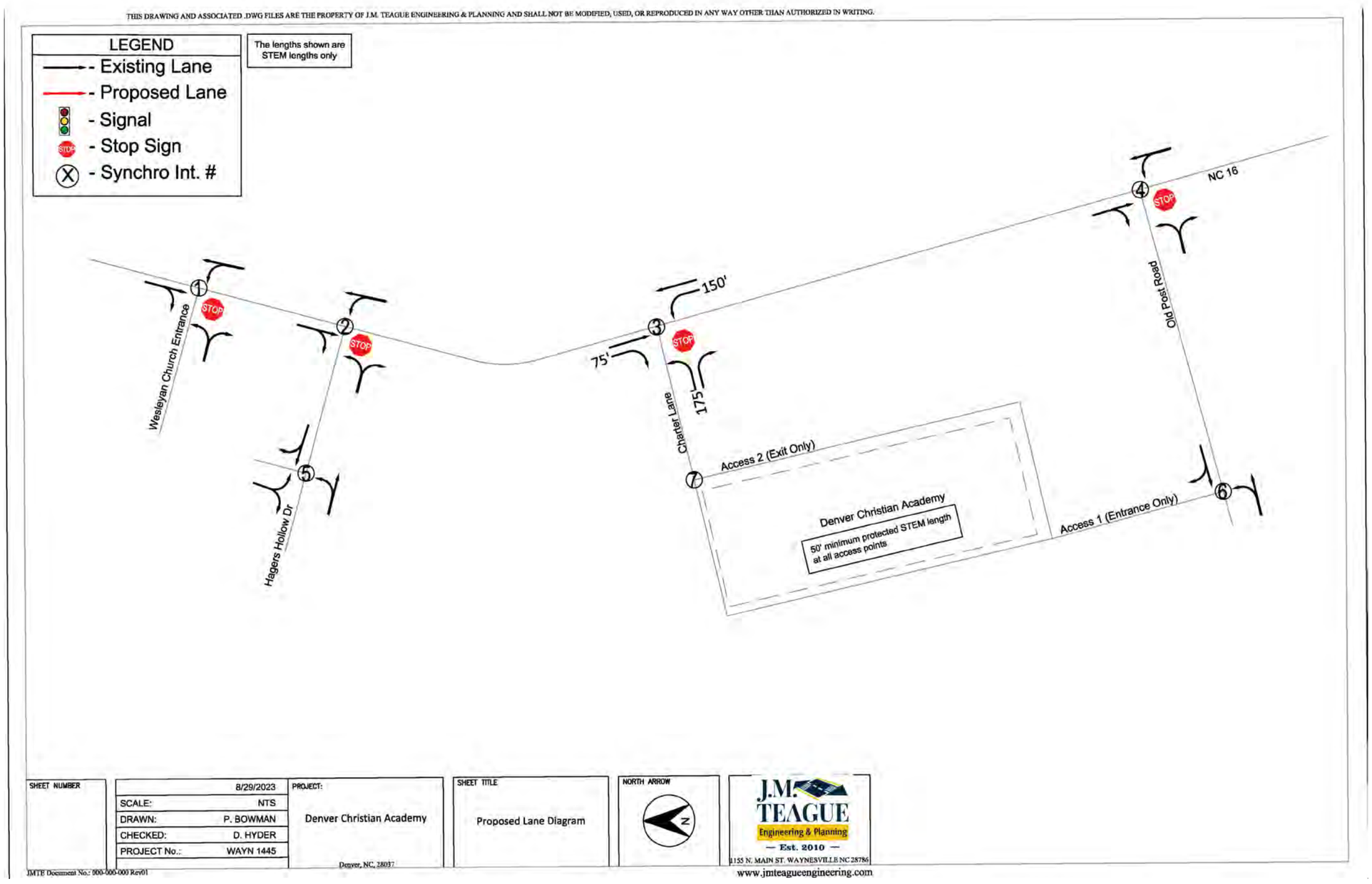


Figure 29: Proposed Lane Diagram (2027)

EFFECT OF THE PROJECT ON ALTERNATE MODES

The project is not expected to affect alternative transportation modes in the area.

CONCLUSION

The additional 277 students and 50 staff positions at Denver Christian Academy are expected to produce 497 AM Peak and 397 PM Peak trips. In accordance with the Lincoln County Unified Development Ordinance this TIA was performed because the expansion is proposed to generate more than 100 trips in the peak hour, which exceeds the threshold.

All Denver Christian Academy-related queuing can be accommodated on campus. No improvements are needed on NC 16 Business. The Engineer recommends no offsite improvements.