

Traffic Impact Study

Proposed Coffee Shop with Drive-Through Window

399 Union Street (Route 135)
Ashland, MA

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INTRODUCTION

McMahon Associates has completed a review of the existing traffic operations and potential traffic impacts associated with the proposed coffee shop located at 399 Union Street (Route 135) in Ashland, MA. The purpose of this traffic impact study is to evaluate existing and projected traffic operations and safety conditions associated with the proposed development within the study area.

The assessment documented in this traffic impact study is based on a review of existing traffic volumes, recent crash data, and the anticipated traffic generating characteristics of the proposed project. The study examines existing and projected traffic operations (both with and without the proposed development) at key intersections in the vicinity of the project site. The study area was selected based on a review of the surrounding roadway network and estimated trip generating characteristics of the proposed project. This study provides an analysis of traffic operations during the weekday morning and weekday afternoon peak hours, when the combination of adjacent roadway volumes and project trips would be expected to be the greatest.

Project Description

The proposed coffee shop would be located at 399 Union Street (Route 135) in Ashland, MA, as shown in Figure 1. The site currently consists of a Walgreens Pharmacy with a drive-through window. Site access and egress is currently provided via three driveways, one full access driveway on Summer Street, referenced as the North Site Driveway, one full access driveway on Union Street (Route 135) that contains one entry and two exit lanes, referenced as the East Site Driveway, and one right-turn exit only driveway on Union Street (Route 135), referenced as the West Site Driveway. The site is bounded by Union Street (Route 135) to the south, Summer Street to the north and west, and residential properties to the east.

As shown in the proposed site plan received on July 11, 2022, the proposed project would include the demolition of the existing building and the construction of an approximately 2,575 square foot (sf) coffee shop with a drive-through window. A total of 41 parking spaces would be provided on-site, including four accessible spaces adjacent to the store entrance. Site access and egress would continue to be provided via the North Site Driveway, East Site Driveway, West Site Driveway; however, the East Site Driveway would be modified to include one entry and one exit lane.



Figure 1
Site Location
Proposed Coffee Shop
Ashland, Massachusetts

Study Methodology

This traffic impact study evaluates existing and projected traffic operations within the study area for the weekday morning and weekday afternoon peak hour traffic conditions, when the combination of the adjacent roadway volumes and estimated project trips would be greatest.

The study was conducted in three steps. The first step consisted of an inventory of existing traffic conditions within the project study area. As part of this inventory, manual turning movement counts were collected at key intersections during the weekday morning and afternoon peak periods. A field visit was also completed to document intersection and roadway geometries and available sight distances at the site driveways. Crash data for the study area intersections was obtained from the Massachusetts Department of Transportation (MassDOT) to establish if the study area has existing traffic safety deficiencies.

The second step of the study builds upon the data collected in the first step to establish the basis for evaluating potential transportation impacts associated with the projected future conditions. During this second step, the projected traffic demands associated with planned future developments that could influence traffic volumes at the study area intersections were assessed. Consistent with MassDOT traffic study guidelines, 2022 Existing traffic volumes were forecasted over a seven-year project horizon, to the future year 2029 to determine 2029 No Build (without project) conditions and 2029 Build (with project) conditions.

The third step of this study determined if measures are necessary to improve future traffic operations, minimize potential traffic impacts, and provide efficient access to the site with the proposed project in place.

Study Area Intersections

Based on a review of the anticipated traffic generating characteristics of the proposed project and a review of the adjacent roadways serving the project site, the following study area intersections were selected for analysis:

- West Union Street/Union Street (Route 135) at Summer Street
- Summer Street at Cherry Street
- Summer Street at North Site Driveway
- Union Street (Route 135) at West Site Driveway
- Union Street (Route 135) at Ashland Square Plaza Driveway
- Union Street (Route 135) at East Site Driveway

The traffic impact study presented in this report documents existing and future traffic conditions for the study area intersections noted above.

EXISTING CONDITIONS

An assessment of the potential traffic impacts associated with the proposed residential development requires an understanding of the existing traffic conditions within the project study area. The existing conditions assessment included in this study consists of an inventory of intersection and roadway geometries, an inventory of traffic control devices, the collection of peak period traffic volumes, and a review of recent crash data. The existing conditions in the vicinity of the project site are summarized below.

Roadway Network

A brief description of the principal roadways and public transportation providing access to the project site is presented below.

West Union Street/Union Street (Route 135)

West Union Street/Union Street (Route 135) is a signed east-west roadway that runs through the Town of Ashland and is classified as an urban principal arterial under the Town of Ashland jurisdiction. West Union Street (Route 135) transitions to Union Street (Route 135) at the signalized intersection with Summer Street, located just west of the project site. The roadway generally provides one 12-foot lane in each direction, with additional turning lanes at key intersections. Six-foot wide sidewalks are provided on both sides of Union Street (Route 135) in the vicinity of the Project site. There are no bicycle facilities provided on Union Street (Route 135). The posted speed limit is 30 mph in the westbound direction and 35 mph in the eastbound direction in the vicinity of the site. Land uses on Union Street (Route 135) consist of residential and commercial properties.

Summer Street

Summer Street generally runs in an east-west direction and is classified as an urban collector under the Town of Ashland jurisdiction. The roadway connects to West Union Street/Union Street (Route 135) in the west and Main Street in the east. Summer Street provides one travel lane in each direction, each measuring approximately 12-feet in width. Six-foot-wide sidewalks are provided on both sides of Summer Street in the vicinity of the Project site. No bicycle facilities are provided on Summer Street and the posted speed limit is 25 mph. Land uses on Summer Street consist of KidSpot Playground, Stone Park and residential and commercial properties.

Cherry Street

Cherry Street runs in a north-south direction and is classified as an urban minor arterial under the Town of Ashland jurisdiction. The roadway connects to Summer Street in the south and Pleasant Street in the north. Cherry Street provides one travel lane in each direction, measuring 10-feet in the northbound direction and 12-feet in the southbound direction to the intersection with Summer Street. A 5-foot sidewalk is provided on the west side of Cherry Street from Summer Street northerly to approximately 200 feet before the intersection with Park Road. No bicycle facilities are provided on Cherry Road and the

posted speed limit is 25 mph. Land uses on Cherry Street consist primarily of residential properties.

Signalized Intersections

West Union Street (Route 135)/Union Street (Route 135) at Summer Street

The signalized intersection of West Union Street/Union Street (Route 135) at Summer Street is a "T"-type intersection. The eastbound West Union Street (Route 135) approach consists of an exclusive left-turn lane and a through lane. The westbound Union Street (Route 135) approach consists of a shared through/right-turn lane, and the southbound Summer Street approach consists of an exclusive left-turn lane and an exclusive right-turn lane.

The intersection is controlled by an actuated, uncoordinated traffic signal with three phases for vehicular traffic. The traffic signal has a lead phase for eastbound left-turns that runs concurrent with the southbound right-turn movements, a phase for eastbound and westbound through traffic, and a phase for southbound traffic. Pedestrian traffic is accommodated by a push-button activated exclusive pedestrian phase that control the crosswalks located on all three approaches.

Unsignalized Intersections

Summer Street at Cherry Street

Summer Street at Cherry Street is an unsignalized Y-shaped intersection, with Summer Street forming the east and south legs, and Cherry Street as the north leg. The northbound Summer Street approach consists of a shared right-turn/through lane. The westbound Summer Street approach consists of a shared left-turn/right-turn lane. The southbound Cherry Street approach consists of a shared through/left-turn lane. The southbound Cherry Street approach and westbound Summer Street approach operate under STOP control.

Summer Street at North Site Driveway

Summer Street at the North Site Driveway is an unsignalized T-intersection, with Summer Street operating freely and the North Site Driveway operating under STOP control.

Union Street (Route 135) at West Site Driveway

Union Street (Route 135) at the West Site Driveway is an unsignalized T-intersection, with Union Street (Route 135) operating freely and the West Site Driveway operating under STOP control.

Union Street (Route 135) at Ashland Square Plaza Driveway

Union Street (Route 135) at Ashland Square Plaza Driveway is an unsignalized T-intersection, with Union Street (Route 135) operating freely and Ashland Square Plaza

Driveway operating under STOP control. The westbound Union Street (Route 135) approach consists of an exclusive left-turn lane for access to Ashland Square Plaza.

Union Street (Route 135) at East Site Driveway

Union Street (Route 135) at East Site Driveway is an unsignalized T-intersection, with Union Street (Route 135) operating freely and the East Site Driveway operating under STOP control.

Public Transportation

Public transportation is provided in Ashland by the Massachusetts Bay Regional Transit Authority (MBTA) commuter rail service and the MetroWest Regional Transit Authority (MWRTA) bus service.

The MBTA Framingham/Worcester Commuter Rail Line provides direct service to South Station in Boston. This line services Ashland Station at the corner of High Street and Pleasant Street, approximately one mile northwest of the site.

MWRTA Route 5 provides service to Ashland between the Blandin Hub in Framingham and the Price Chopper in Ashland. The closest bus stop to the site is at the Main Street/Homer Street intersection approximately 0.3 miles northeast of the site.

Existing Traffic Volumes

Traffic Data Collection

To assess peak hour traffic conditions, manual turning movement counts were conducted at the study area intersections during the weekday morning and weekday afternoon peak periods.

Turning movement counts were conducted on Wednesday, June 1, 2022, from 6:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. The results of the turning movement counts are tabulated by 15-minute periods and are provided in Appendix A of this report. The four highest consecutive 15-minute intervals during each of these count periods constitute the peak hours that are the basis of the traffic analysis provided in this report. Based on a review of the peak period traffic data, the weekday morning peak hour at the study area intersections was identified as 7:30 AM to 8:30 AM and the weekday afternoon peak hour was identified as 4:45 PM to 5:45 PM.

Traffic Volume Adjustments

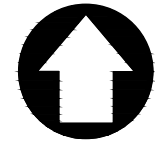
To account for seasonal variation in traffic volumes, the MassDOT 2019 Weekday Seasonal Adjustment Factors were reviewed. Based on the data, traffic volumes collected during the month of June along urban principal arterial, urban minor arterial roadways, and urban collector roadways are higher than the average month. To present a conservative analysis, the June volumes were not adjusted downwards to reflect an average month.

The resulting peak hourly traffic flows for the 2022 Existing conditions are depicted in Figure 2 for the weekday morning peak hour and Figure 3 for the weekday afternoon peak hour.

Pedestrian Activity

As noted during conversations with the Town of Ashland, students from the Ashland Middle School, located approximately 0.5 miles west of the site, often travel northeast on West Union Street (Route 135) to destinations such as Dunkin' (41 West Union Street), Murphy's East & Treats (16 West Union Street), and Honey Dew Donuts (14 West Union Street). In order to better understand student travel paths in the area, pedestrian and bicycle activity was observed during the field visit on Wednesday, June 15, 2022 from 2:25 PM to 3:00 PM shortly after the Ashland Middle School students were dismissed. Students were observed to cross Memorial Drive at the signalized crosswalk at the intersection with West Union Street (Route 135). Some students were observed visiting the Dunkin' located on the northwest corner of the signalized intersection, while others continued walking/biking along the sidewalk on the northwest side of West Union Street (Route 135). Students were observed crossing West Union Street (Route 135) at the unsignalized midblock crosswalk just west of Presidents Way. A police officer was located at the unsignalized crosswalk between 2:30 PM and 2:40 PM to direct traffic and allow for the students to cross West Union Street (Route 135). Students were also observed continuing east and crossing at the study area intersections of West Union Street/Union Street (Route 135) at Summer Street and Cherry Street at Summer Street, adjacent to the proposed coffee shop site. After crossing, students went to the KidSpot Playground, Stone Park, continued walking northeast-bound on Summer Street, or continued walking eastbound on Union Street (Route 135).

It is anticipated that students and other pedestrians accessing the proposed coffee shop from the west would utilize the signalized crosswalk at the intersection of West Union Street/Union Street (Route 135) at Summer Street which includes an exclusive pedestrian phase when activated.



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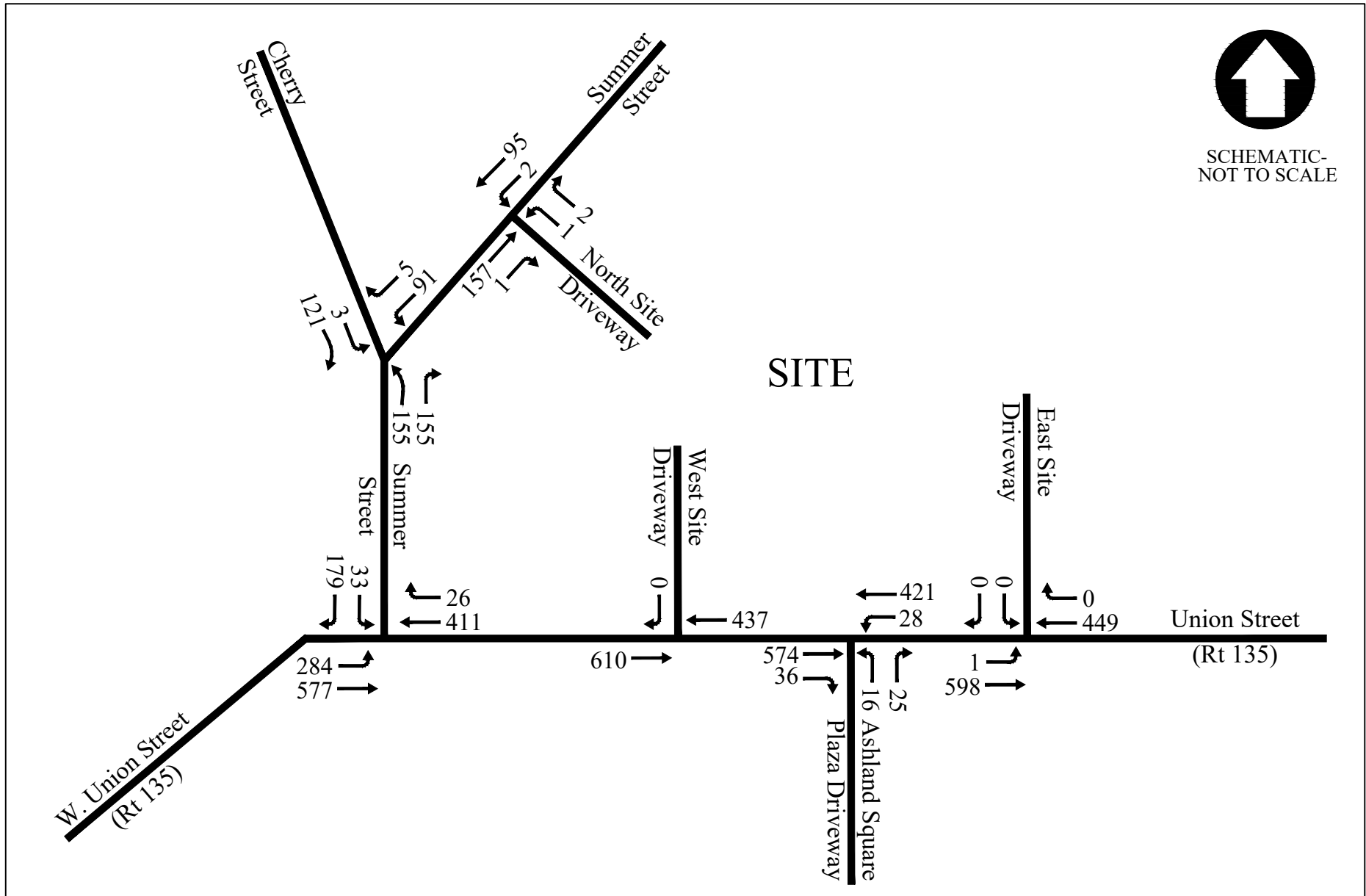


Figure 2
2022 Existing Weekday Morning
Peak Hour Traffic Volumes
Proposed Coffee Shop
Ashland, MA

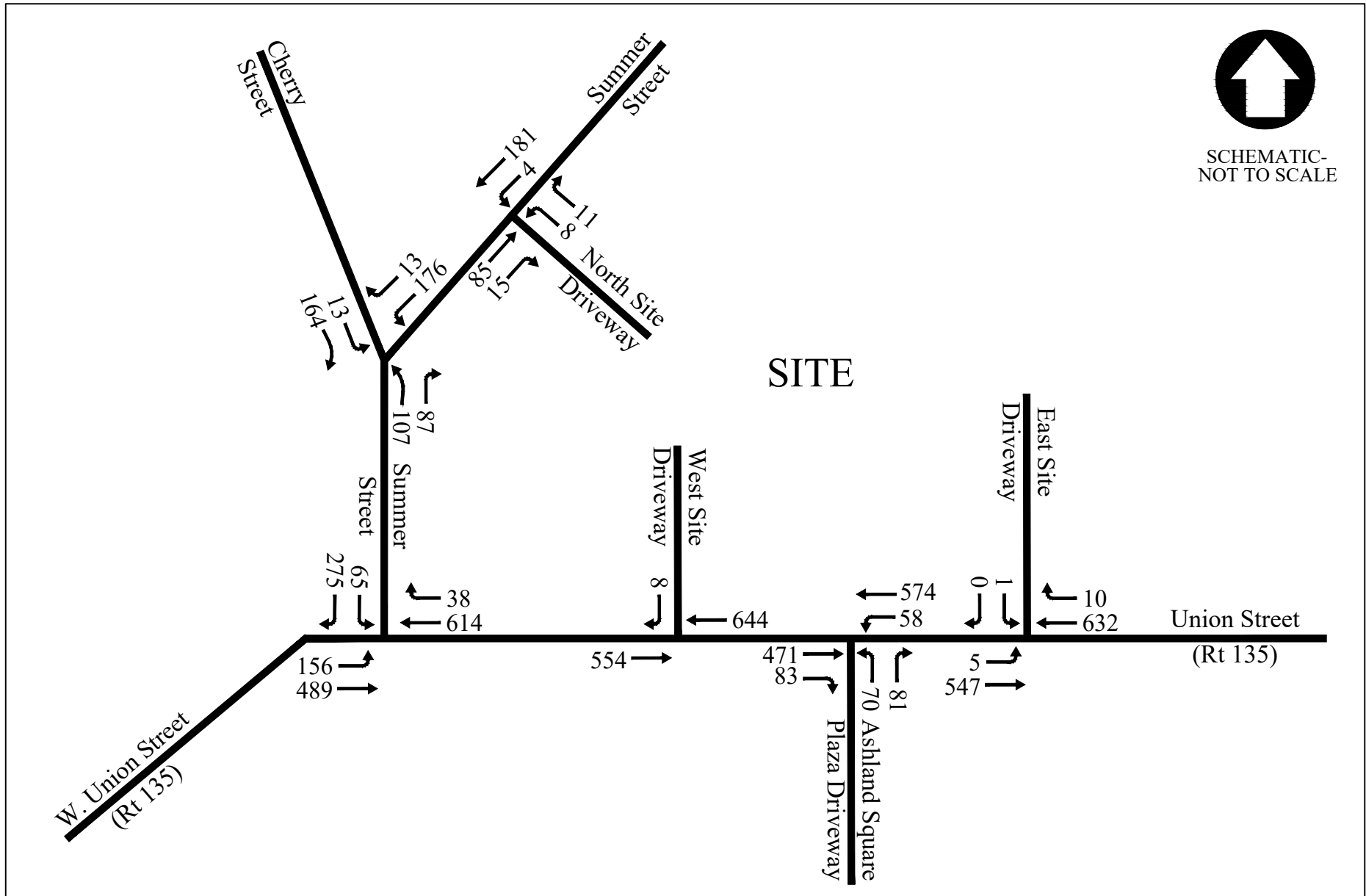
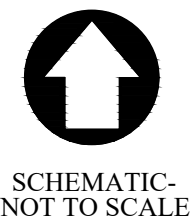


Figure 3
 2022 Existing Weekday Afternoon
 Peak Hour Traffic Volumes
 Proposed Coffee Shop
 Ashland, MA



Crash Summary

Crash data was obtained from MassDOT for the most recent five-year period available to understand the existing safety operations of the study area intersections. This included a review of crash data from 2015 through 2019. A summary of the crash data is presented in Appendix B.

The MassDOT Crash Rate Worksheet calculations were used to determine whether the crash frequencies at the study area intersections were unusually high given the travel demands at each location. The MassDOT Crash Rate Worksheet calculates a crash rate expressed in crashes per million entering vehicles (MEV). The calculated rate is then compared to the average rate for signalized and unsignalized intersections statewide and within MassDOT District 3. For signalized intersections, the statewide average crash rate is 0.78 crashes per MEV and the MassDOT District 3 crash rate is 0.89 crashes per MEV. For unsignalized intersections, the statewide average crash rate is 0.57 crashes per MEV and the MassDOT District 3 crash rate is 0.61 crashes per MEV.

The signalized intersection of West Union Street/Union Street (Route 135) at Summer Street is reported to have experienced a total of four crashes during the five-year period analyzed, resulting in a crash rate of 0.13 crashes per MEV, which is lower than the statewide and District 3 crash rates for signalized intersections. Of the four reported crashes at the intersection, two crashes were angle collisions, one crash was a rear-end collision, and one crash was a sideswipe collision. All four of the reported crashes resulted in property damage only.

The unsignalized intersection of Summer Street at Cherry Street is reported to have experienced three crashes during the five-year period analyzed, resulting in a crash rate of 0.28 crashes per MEV, which is below the statewide and District 3 crash rates for unsignalized intersections. Of the three reported crashes at the intersection, one crash was an angle collision and two crashes were single vehicle collisions. All three of the reported crashes resulted in property damage only.

The unsignalized intersection of Union Street (Route 135) at Ashland Square Plaza Driveway is reported to have experienced a total of five crashes during the five-year period analyzed, resulting in a crash rate of 0.22 crashes per MEV, which is below the statewide and District 3 crash rates for unsignalized intersections. Of the five reported crashes at the intersection, two crashes were angle collisions, one crash was a rear-end collision, one crash was a sideswipe collision, and one crash involved a pedestrian. One of the reported crashes resulted in personal injury and the remaining four crashes resulted in property damage only.

The unsignalized intersection of Union Street (Route 135) at the East Site Driveway is reported to have experienced a total of four crashes during the five-year period analyzed, resulting in a crash rate of 0.19 crashes per MEV, which is below the statewide and District 3

crash rates for unsignalized intersections. Of the four reported crashes at the intersection, three crashes were rear-end collisions and one crash was a single vehicle collision. One of the reported crashes resulted in personal injury and the remaining three crashes resulted in property damage only.

No crashes were reported at the unsignalized intersections of Summer Street at the North Site Driveway and Union Street (Route 135) at the West Site Driveway during the five-year period analyzed.

FUTURE CONDITIONS

To establish future traffic demands on the study area roadways and intersections, the 2022 Existing traffic volumes were projected to the future-year 2029. Traffic volumes on the study area roadways in 2029 are considered to include existing traffic, as well as new traffic resulting from general growth in the study area and from other planned development projects, independent of the proposed project. The potential background traffic growth, unrelated to the proposed project, was considered in the development of the 2029 No Build (without project) peak hour traffic volumes. The estimated traffic increases associated with the proposed project were then added to the 2029 No Build volumes to reflect the 2029 Build (with project) traffic conditions. A more detailed description of the development of the 2029 No Build and 2029 Build traffic volume networks is presented below.

Future Roadway Improvements

Planned roadway improvement projects can impact travel patterns and future traffic operations. Based on conversations with the Town of Ashland, two roadway projects are currently underway in the general vicinity of the project site. The first project is the Downtown Streetscape Improvements project which proposes to improve pedestrian accommodations along the Main Street and Front Street corridors. This project includes curb replacement and modification, the installation of accessible sidewalks, drainage improvements, and traffic signal upgrades at multiple intersections along Main Street. The project also includes pavement mill and overlay and new pavement markings along Summer Street, including at the intersection with Cherry Street, and extending just before the intersection with West Union Street/Union Street (Route 135).

The second project includes roadway improvements as part of the construction of the new public safety building, proposed to be located at 1 East Union Street. As part of this project, a traffic signal is proposed to be installed at the intersection of the public safety building driveway at East Union Street, approximately one mile east of the signalized intersection of West Union Street/Union Street (Route 135) at Summer Street. Along with the traffic signal installation, five other traffic signals along Union Street (Route 135) would be improved with the installation of an adaptive traffic signal system and updated coordination. The five intersections included as part of the improvement are West Union Street (Route 135) at Memorial Drive/Voyagers Lane, West Union Street/Union Street (Route 135) at Summer Street, Union Street (Route 135) at Main Street, Union Street (Route 135) at Homer Avenue/Chestnut Street, and Union Street (Route 135) at Fountain Street. The signal plans for the coordination are currently in the design phase and are not available; therefore, the signal timings and phasing were not updated in the No Build and Build analyses. Operations at the intersection of West Union Street/Union Street (Route 135) are anticipated to improve as a result of the traffic signal coordination.

Background Traffic Growth

Traffic growth is generally a function of changes in motor vehicle use and expected land development within the area. To establish the rate at which traffic on the study area roadways can be anticipated to grow during the seven-year forecast period (2022 to 2029), both planned area developments and historic traffic growth were reviewed.

Site-Specific Growth

Based on discussions with the Town of Ashland Planning Department, two other developments were identified which would be anticipated to impact traffic volumes within the study area. The first is a 180-unit age restricted rental community proposed at 0 Memorial Drive, approximately 0.8 miles northwest of the site. Proposed traffic volumes from the Traffic Memorandum prepared for the development by MDM Transportation Consultants, Inc., and dated March 11, 2021, were distributed onto the study area based on existing travel patterns at the study area intersections. The resulting distributed trips were included in the 2029 No Build volumes for the proposed Project.

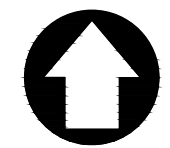
The second project is a mixed-use development at 81 West Union Street (Route 135). The development would consist of the construction of approximately 5,000 sf of office space, approximately 5,000 sf of retail space, and contractor-yard buildings with 33 employees. Proposed traffic volumes from the Traffic Assessment Memorandum prepared for the development by Transportation Engineering, Planning and Policy, and dated May 23, 2019, were distributed onto the study area based on existing travel patterns at the study area intersections. The resulting distributed trips were included in the 2029 No Build volumes for the proposed Project.

Historic Traffic Growth

To project the existing 2022 traffic volumes into the future year 2029, the Metropolitan Area Planning Council (MAPC) was contacted to establish the appropriate growth rate for the study area. MAPC determined a growth rate of less than 1.0 percent per year within the study area for the analysis of future conditions. To present a conservative analysis, a growth rate of 1.0 percent, compounded annually, was utilized to capture traffic growth associated with general changes in population, other smaller developments, and developments that may not be known at this time.

2029 No Build Traffic Volumes

The 2022 Existing peak hour traffic volumes were grown by 1.0 percent per year (compounded annually) over the seven-year study horizon (2022 to 2029). Traffic associated with the background development projects were then added to establish the 2029 No Build weekday morning and afternoon peak hour traffic volumes, which are illustrated in Figure 4 and Figure 5, respectively. Details of the 2029 No Build traffic volumes are documented in the traffic projection model presented in Appendix C.



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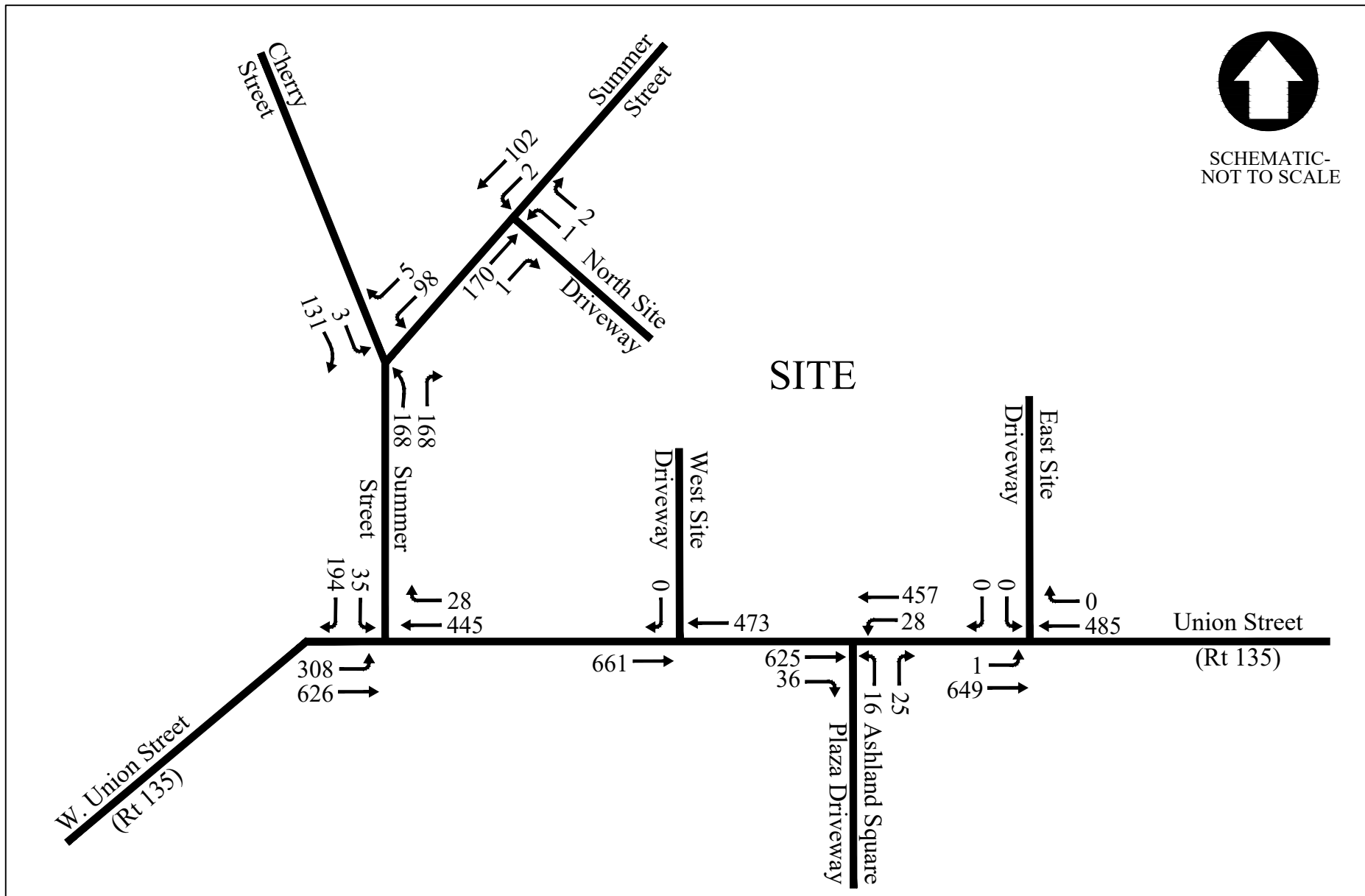


Figure 4
2029 No Build Weekday Morning
Peak Hour Traffic Volumes
Proposed Coffee Shop
Ashland, MA

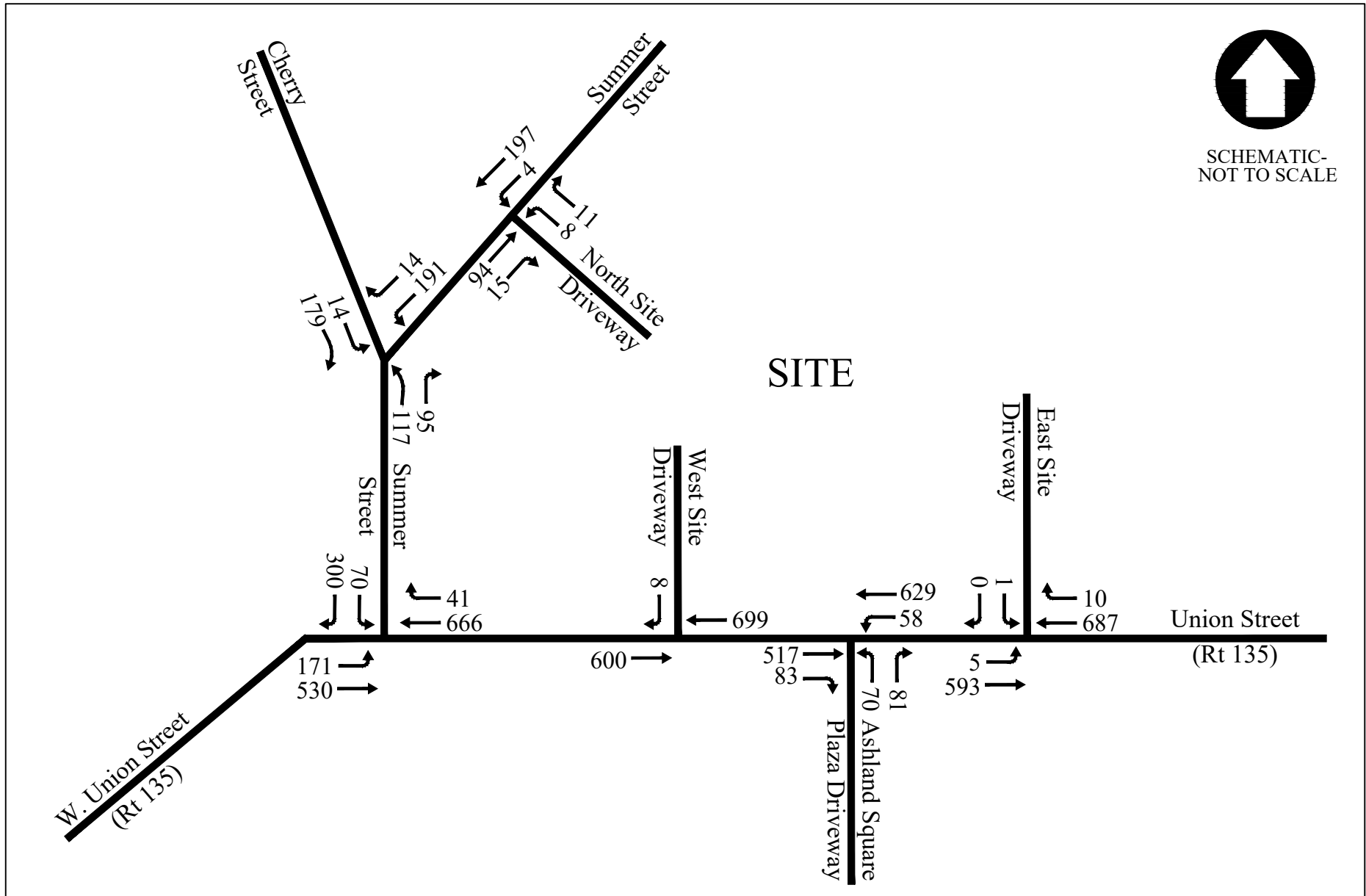
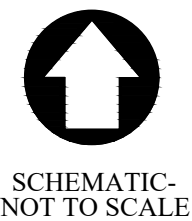


Figure 5
2029 No Build Weekday Afternoon
Peak Hour Traffic Volumes
Proposed Coffee Shop
Ashland, MA



Site-Generated Traffic

To estimate the number of vehicle trips associated with the proposed coffee shop, the Institute of Transportation Engineers’ (ITE) publication, *Trip Generation Manual, 11th Edition*, was referenced. ITE is a national research organization of transportation professionals, and the *Trip Generation Manual, 11th Edition* provides traffic generation information for various land uses compiled from studies conducted by members nationwide. Vehicle trip estimates for the proposed coffee shop were developed based on data presented in this publication for Land Use Code 937 – Coffee/Donut Shop with Drive-Through Window. This reference establishes vehicle trip rates (in this case expressed in trips per square foot) based on actual traffic counts conducted at similar types of existing land uses.

Table 1 shows a comparison of the counted vehicles accessing the existing site which are considered associated with the pharmacy with drive-through, and the proposed trip generation for the proposed coffee shop.

Table 1: Trip Comparison

Description	Size	Weekday AM			Weekday PM		
		In	Out	Total	In	Out	Total
Proposed Coffee Shop ⁽¹⁾	2,575 sf	113	109	222	50	50	100
Existing Pharmacy Trips ⁽²⁾	9,754 sf	4	3	7	34	28	62
Difference		109	106	215	16	22	38

(1) ITE Land Use Code 937 (Coffee/Donut Shop with Drive-Through Window), based on 2,575 s.f.

(2) Based on traffic count data from June 1, 2022.

As shown in Table 1, when compared to the existing land use, the proposed coffee shop is shown to result in an additional 215 vehicle trips (109 entering vehicles and 106 exiting vehicles) during the weekday morning peak hour and an additional 38 vehicle trips (16 entering vehicles and 22 exiting vehicles) during the weekday afternoon peak hour. To present a conservative analysis, the existing pharmacy trips were not subtracted from the existing site when considering the addition of the proposed coffee shop trips.

Not all of the vehicle trips to coffee shops are considered “new” vehicles trips. In fact, a significant portion of the total trips attached to such land uses are “pass-by” trips. Since pass-by traffic is already on the adjacent roadways, this portion of the total development traffic is reflected in the existing, base traffic volumes and does not represent additional traffic on the roadway network. Therefore, the total proposed traffic volume is reduced by the pass-by volumes to estimate the new traffic generated by the proposed development, i.e., that traffic which would be added to the study area roadways and intersections. Table 2 presents a summary of the estimated vehicle trips associated with the proposed coffee shop.

Table 2: Proposed Project Trips

Description	Size	Weekday AM			Weekday PM		
		In	Out	Total	In	Out	Total
Proposed Coffee Shop ⁽¹⁾	2,575 sf	113	109	222	50	50	100
<i>Pass-by Trips</i> ⁽²⁾		56	56	112	28	28	56
New Trips		57	53	110	22	22	44

(1) ITE Land Use Code 937 (Coffee/Donut Shop with Drive-Through Window), based on 2,575 s.f.

(2) ITE pass-by data was not available for LUC 937. Based on similar LUC 934 (Fast-food restaurant with drive-through window), 50% of weekday AM and 55% of weekday PM peak hour trips are attributed to pass-by trips.

As shown in Table 2, the proposed coffee shop is estimated to result in approximately 110 new vehicle trips (57 entering vehicles and 53 exiting vehicles) during the weekday morning peak hour and approximately 44 new vehicle trips (22 entering vehicles and 22 exiting vehicles) during the weekday afternoon peak hour.

Project Trip Distribution and Assignment

The additional traffic estimated to be generated by the proposed coffee shop was distributed onto the study area roadways and intersections using existing travel patterns and logical travel routes. The resulting arrival and departure patterns are presented in Figure 6 and are documented in the traffic projection model found in Appendix C.

The project-related traffic was then assigned to the surrounding roadway network based on the project trip distribution patterns presented in Figure 6. The resulting distributed new project trips are shown in Figure 7 and Figure 8 for the weekday morning and weekday afternoon peak hours, respectively.

2029 Build Traffic Volumes

To establish the 2029 Build peak hour traffic volumes, the distributed new project trips were added to the 2029 No Build peak hour traffic volumes to reflect the 2029 Build peak hour traffic volumes. The resulting 2029 Build weekday morning and afternoon peak hour traffic volumes are presented in Figure 9 and Figure 10, respectively, and are documented in the traffic projection model presented in Appendix C.

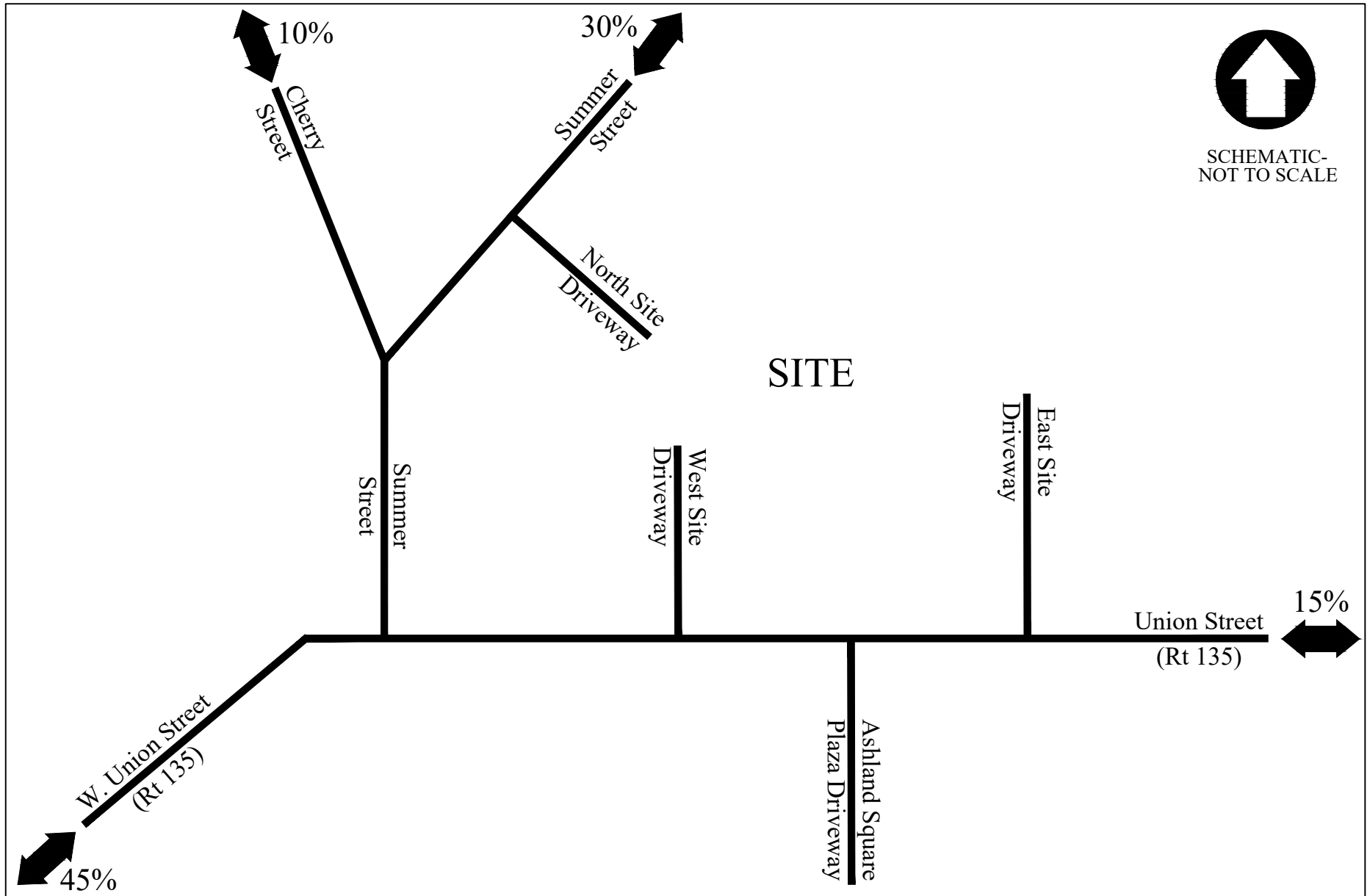
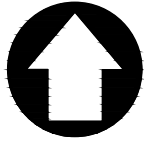


Figure 6
Directions of Arrival and Departure
Peak Hour Traffic Volumes
Proposed Coffee Shop
Ashland, MA



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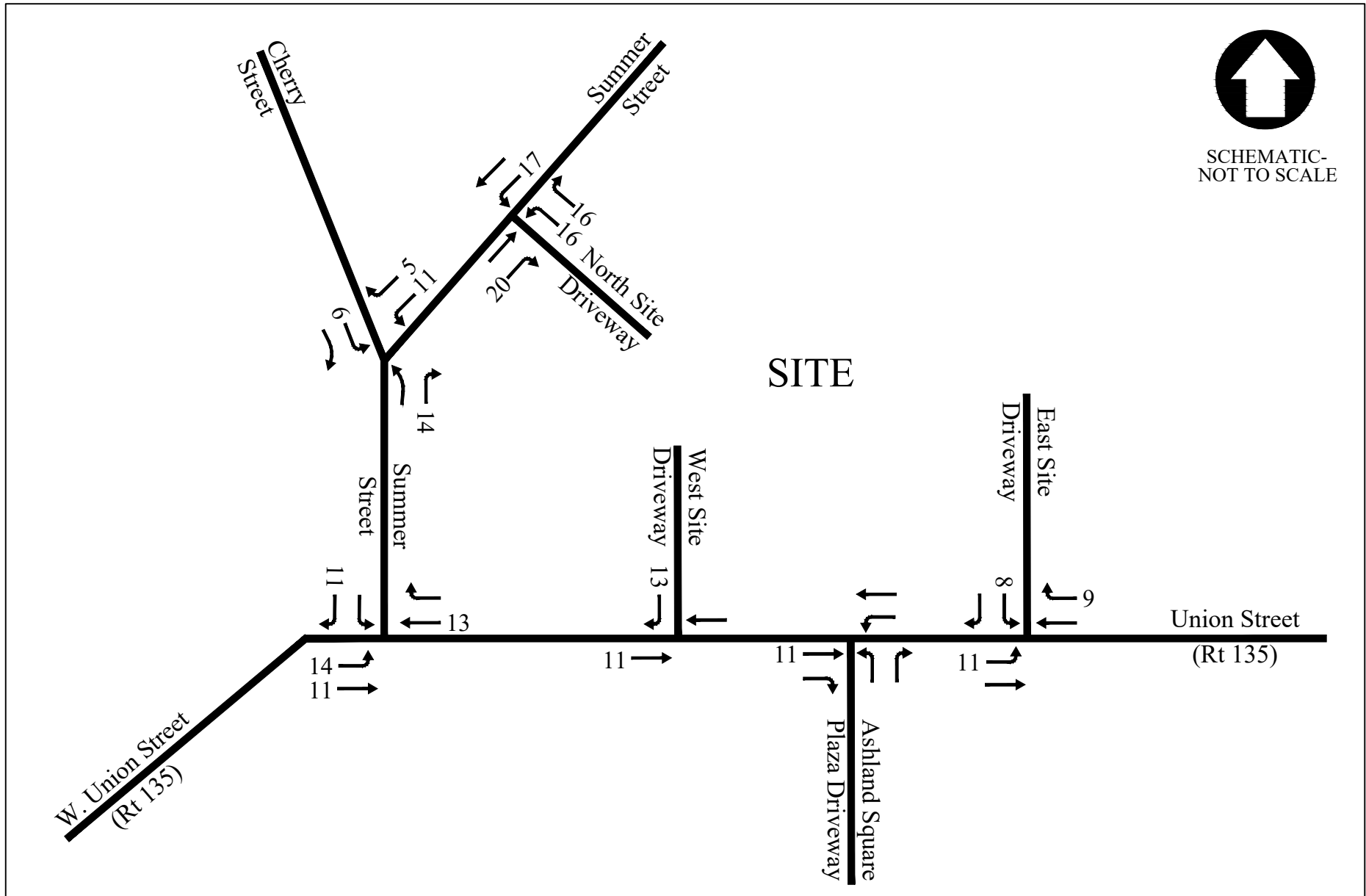
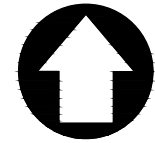


Figure 7
Weekday Morning Peak Hour
Net New Project Trips
Proposed Coffee Shop
Ashland, MA



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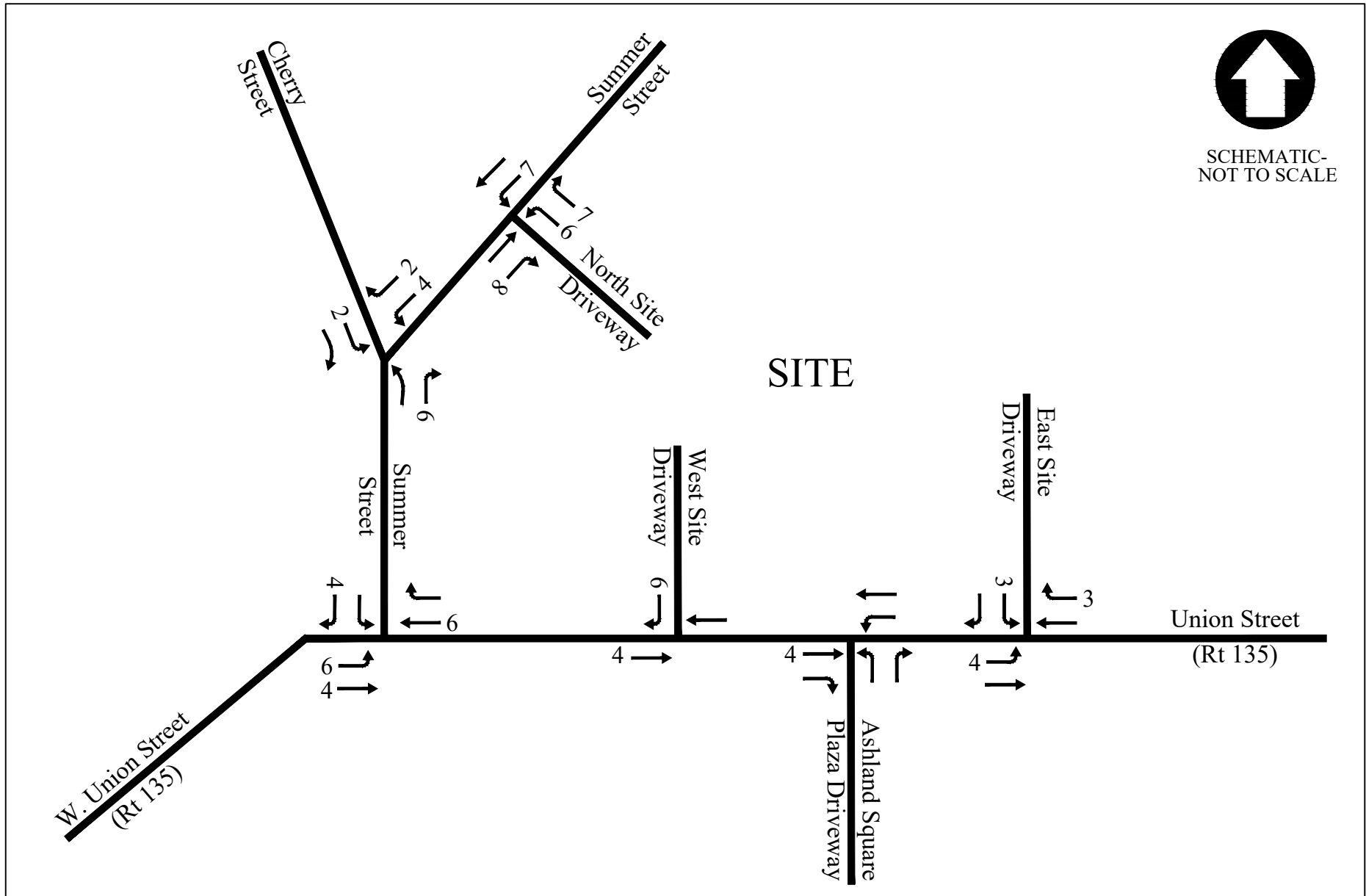
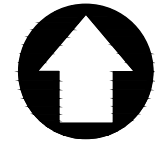


Figure 8
Weekday Afternoon Peak Hour
Net New Project Trips
Proposed Coffee Shop
Ashland, MA



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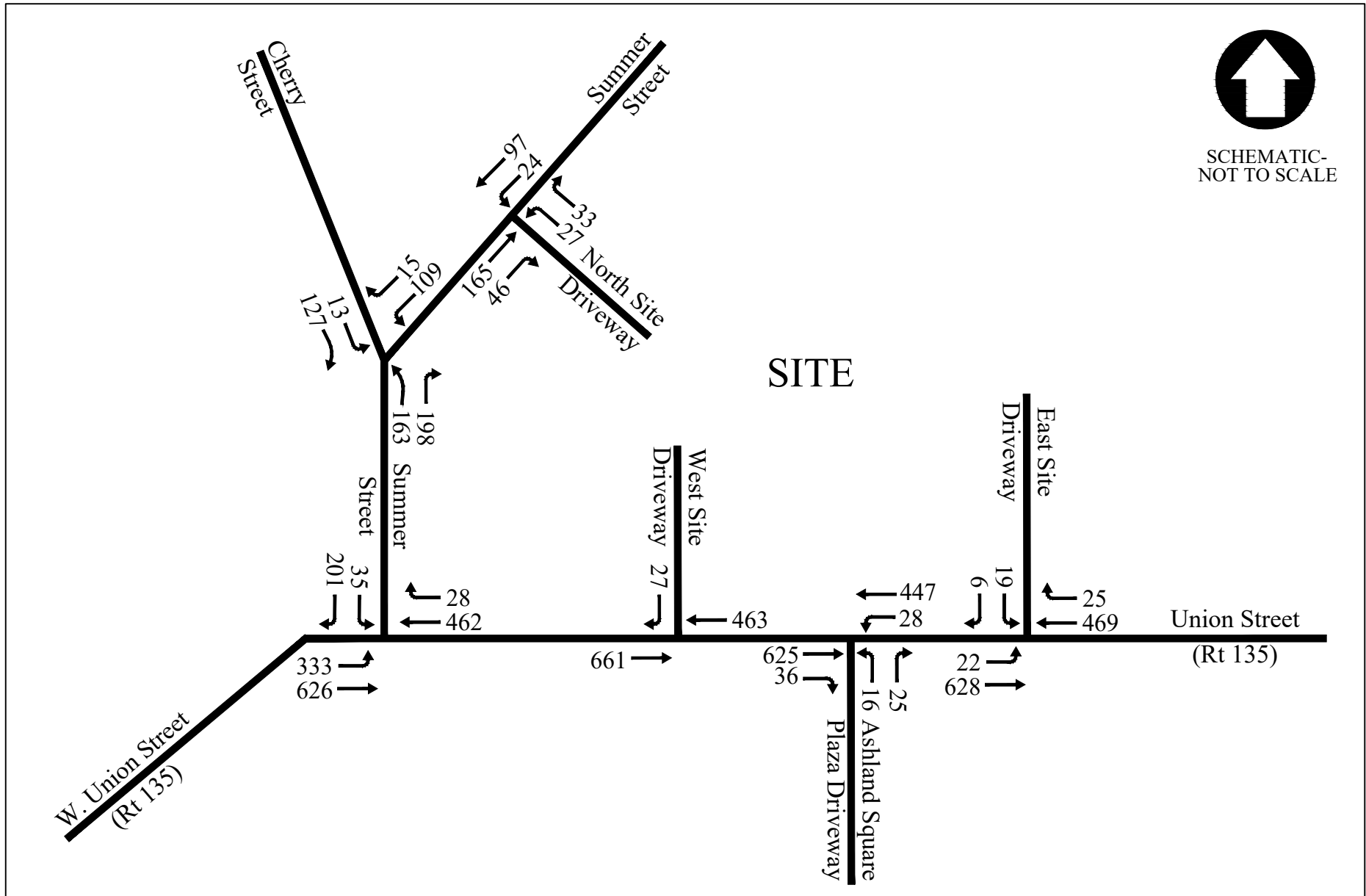
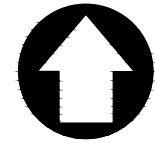


Figure 9
2029 Build Weekday Morning
Peak Hour Traffic Volumes
Proposed Coffee Shop
Ashland, MA



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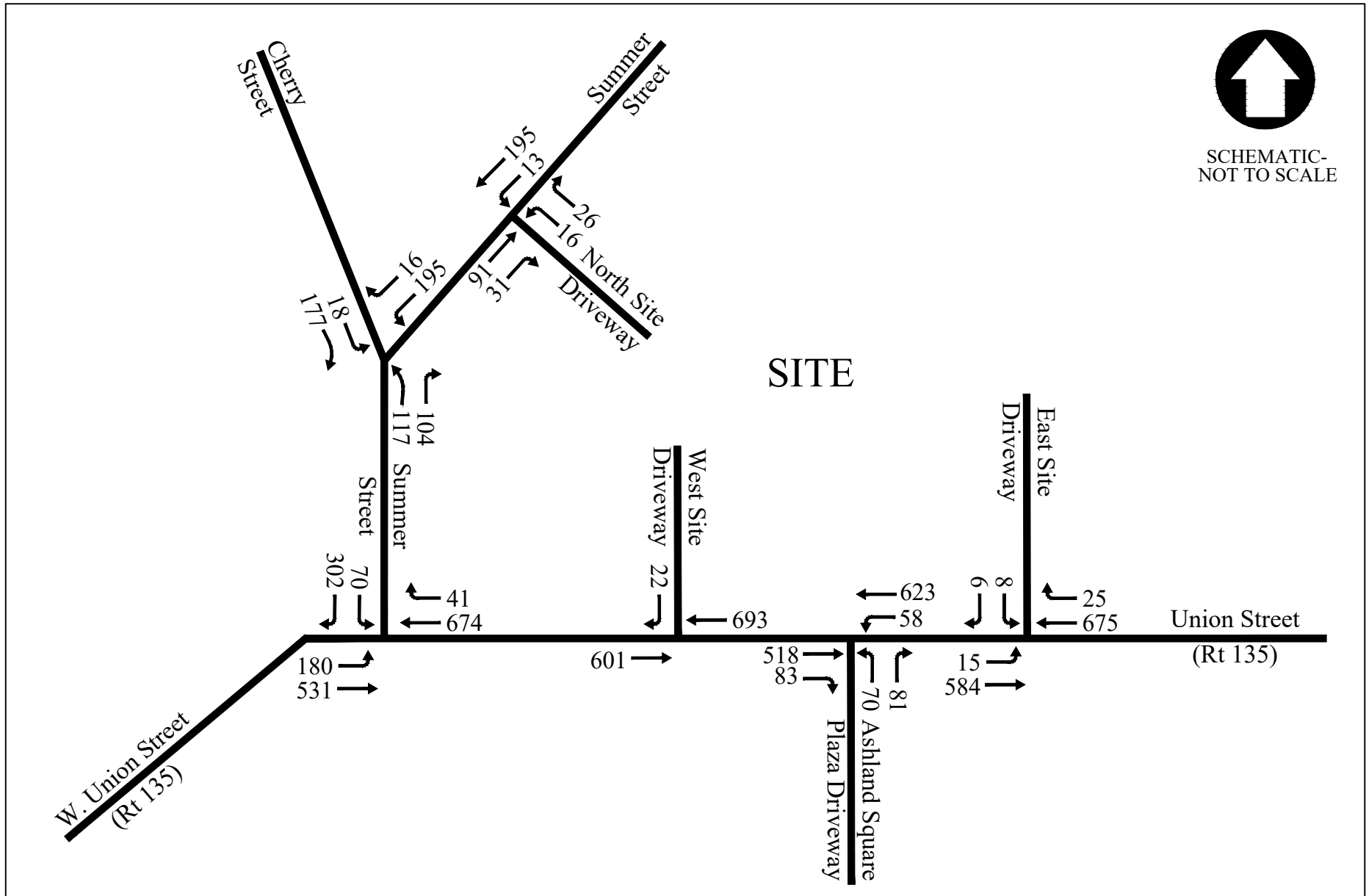


Figure 10
2029 Build Weekday Afternoon
Peak Hour Traffic Volumes
Proposed Coffee Shop
Ashland, MA

TRAFFIC OPERATIONS ANALYSIS

In previous sections of this report, the quantity of traffic at the study area intersections has been discussed. This section describes the overall quality of the traffic flow at the study area intersections during the weekday morning and weekday afternoon peak hours. As a basis for this assessment, intersection capacity analysis was conducted using Synchro and Highway Capacity Software (HCS) intersection capacity analysis software at the study area intersections under the 2022 Existing, 2029 No Build and 2029 Build peak hour traffic conditions. The unsignalized intersection of Summer Street at Cherry Street was analyzed using HCS due to the geometry of the intersection which is not supported by Synchro. The remaining study area intersections were analyzed in Synchro. Both software are based on procedures contained in the *Highway Capacity Manual, 6th Edition* (HCM), which is summarized in Appendix D. A discussion of the evaluation criteria and a summary of the results of the capacity analysis are presented below.

Level-of-Service Criteria

Average total vehicle delay is reported as level-of-service (LOS) on a scale of A to F. LOS A represents delays of 10 seconds or less and LOS F represents delays in excess of 50 seconds for unsignalized intersections and greater than 80 seconds for signalized intersections. A more detailed description of the LOS criteria is provided in Appendix D.

Capacity Analysis Results

Intersection capacity analysis was conducted using Synchro and HCS capacity analysis software for the study area intersections to evaluate the 2022 Existing, 2029 No Build and 2029 Build traffic conditions during the weekday morning and weekday afternoon peak hours. As mentioned previously, the peak hour traffic volumes utilized as part of this analysis are provided in the traffic projection model, attached in Appendix C.

The Synchro and HCS capacity analysis worksheets for the 2022 Existing, 2029 No Build and 2029 Build traffic conditions are presented in Appendix E, Appendix F, and Appendix G, respectively. The overall results of the signalized intersection capacity analyses are presented in Table 3 below, and the results for the stop-controlled approaches to the unsignalized study area intersections are presented in Table 4. A more detailed summary of the capacity analysis for each study area intersection is provided in Appendix H. The results of the specific capacity analysis at the study area intersections are discussed below.

Table 3: Overall Signalized Intersection Capacity Analysis Results

Intersection	Period	2022 Existing			2029 No Build			2029 Build		
		LOS ¹	Delay ²	ICU ³	LOS	Delay	ICU	LOS	Delay	ICU
West Union/Union St. (Rte 135) at Summer Street	AM	B	19.8	0.57	C	20.9	0.60	C	21.9	0.62
	PM	B	18.1	0.61	B	19.5	0.65	C	20.0	0.65

1 Level-of-Service

2 Average vehicle delay in seconds

3 Intersection capacity utilization ratio

As shown in Table 3, the signalized intersection of West Union Street/Union Street (Route 135) at Summer Street is shown to currently operate at overall LOS B during the weekday morning and weekday afternoon peak hours. Under 2029 No Build condition, the intersection is shown to operate at overall LOS C during the weekday morning peak hour and at overall LOS B during the weekday afternoon peak hour. Under 2029 Build conditions, with the proposed project in place, the intersection is projected to operate at overall LOS C during the weekday morning and weekday afternoon peak hours. The proposed signal improvements associated with the new public safety building are not known at this time and are not reflected in the future capacity analysis results. However, these improvements, which include coordination and the installation of an adaptive traffic signal system are anticipated to improve the intersection operations.

Table 4: Critical Stop Controlled Movements Capacity Analysis Results

Intersection	Period	Movement	2022 Existing				2029 No Build			2029 Build		
			LOS ¹	Delay ²	V/C ³	LOS	Delay	V/C	LOS	Delay	V/C	
Summer Street at Cherry Street	AM	WB	LR	C	16.1	0.24	C	17.6	0.28	C	19.0	0.34
	PM	WB	LR	C	16.2	0.39	C	18.3	0.45	C	18.9	0.47
Summer Street at North Site Driveway	AM	NB	LR	A	9.6	0.01	A	9.7	0.01	B	10.8	0.11
	PM	NB	LR	A	9.6	0.03	A	9.7	0.03	B	10	0.07
Union Street (Route 135) at West Site Driveway	AM	SB	R	A	0.0	0.00	A	0.0	0.00	B	11.9	0.05
	PM	SB	R	B	13.2	0.02	B	13.9	0.02	B	14.2	0.07
Union Street (Route 135) at Ashland Square Plaza Driveway	AM	NB	LR	C	18.5	0.16	C	20.4	0.18	C	20.3	0.18
	PM	NB	LR	E	36.5	0.62	E	47.2	0.70	E	46.8	0.69
Union Street (Route 135) at East Site Driveway	AM	SB	LR	A	0.0	0.00	A	0.0	0.00	C	24.5	0.13
	PM	SB	LR	C	24.8	0.01	D	28.1	0.01	C	23.8	0.08

1 Level-of-Service

2 Average vehicle delay in seconds

3 Volume to capacity ratio

As shown in Table 4, at the intersection of Summer Street at Cherry Street, the critical stop controlled westbound Summer Street approach is shown to currently operate at LOS C during the weekday morning and weekday afternoon peak hours. Under 2029 No-Build and

2029 Build conditions, the westbound approach is projected to continue to operate at LOS C during the weekday morning and weekday afternoon peak hours.

At the intersection of Summer Street at the North Site Driveway, the stop controlled northbound North Site Driveway approach is shown to currently operate at LOS A during the weekday morning and weekday afternoon peak hours. Under 2029 No-Build conditions, the northbound approach is projected to continue to operate at LOS A during the weekday morning and weekday afternoon peak hours. Under 2029 Build conditions, the northbound approach is projected to operate at LOS B during the weekday morning and weekday afternoon peak hours.

At the intersection of Union Street (Route 135) at the West Site Driveway, the stop controlled southbound West Site Driveway approach is shown to currently operate at LOS A during the weekday morning peak hour and at LOS B during the weekday afternoon peak hour. Under 2029 No-Build conditions, the southbound approach is projected to continue to operate at LOS A during the weekday morning peak hour and at LOS B during the weekday afternoon peak hours. Under 2029 Build conditions, the southbound approach is projected to operate at LOS B during the weekday morning and weekday afternoon peak hours.

At the intersection of Union Street (Route 135) at the Ashland Square Plaza Driveway, the stop controlled northbound Ashland Square Plaza Driveway approach is shown to currently operate at LOS C during the weekday morning peak hour and under capacity during the weekday afternoon peak hour. Under 2029 No-Build and 2029 Build conditions, the northbound approach is projected to continue to operate at LOS C during the weekday morning peak hour and under capacity during the weekday afternoon peak hour.

At the intersection of Union Street (Route 135) at the East Site Driveway, the stop controlled southbound East Site Driveway approach is shown to currently operate at LOS A during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour. Under 2029 No-Build conditions, the southbound approach is projected to operate at LOS A during the weekday morning peak hour and at LOS D during the weekday afternoon peak hour. Under 2029 Build conditions, the southbound approach is projected to operate at LOS C during the weekday morning and weekday afternoon peak hours.

Site Access and Circulation

Access to the site would continue to be provided via the three driveways. These include a full access driveway on Summer Street (North Site Driveway), a full access driveway on Union Street (Route 135) (East Site Driveway), and a right-turn exit only driveway on Union Street (Route 135) (West Site Driveway). A total of 41 parking spaces would be provided on-site, including four accessible spaces adjacent to the store entrance.

Vehicles using the drive-through would circulate the proposed building in a counter-clockwise direction and exit adjacent to the North Site Driveway. Based on the Site Plan and the plan titled "Salvatore Capital Proposed Queuing Plan, dated June 1, 2022", there is room for one vehicle at the pickup window and an 11-vehicle queue to the pick-up window, which exceeds the requirements of Section 5.1.4.5 of the Bylaw. Additionally, there is room for at least one vehicle after the pick-up window. A bypass lane is provided around the building to permit vehicles to enter from both the North Site Driveway and the East Site Driveway and exit out of any of the three driveways and circulate around the queue. Vehicles entering the site from the East Site Driveway would follow signage around the building to join the back of the queue.

The proposed coffee shop has been designed to provide safe and efficient movements internal to the site. Internal site circulation is not anticipated to impact the external site access and egress. The permitted movements at each of the three site driveways were considered in conjunction with anticipated patterns of customer entering and exiting vehicles, and consideration of emergency vehicle access.

Sight Distance

A field review of the available sight distance was conducted at the site driveways on Summer Street and Union Street (Route 135). The American Association of State Highway and Transportation Officials (AASHTO) publication, *A Policy on Geometric Design, 2018 Edition*, defines minimum and recommended sight distances at intersections.

The minimum sight distance is based on the required stopping sight distance (SSD) for vehicles traveling along the main road. According to AASHTO, "If the available sight distance for an entering or crossing vehicle is equal to the appropriate stopping sight distance for the major road, then drivers have sufficient time to anticipate and avoid collisions". Table 55 summarizes the AASHTO sight distance evaluation for the three site driveways.

Based on feedback from the Town of Ashland, the existing vegetation located west and east of the East Site Driveway prohibited the required SSD for vehicles approaching the driveway westbound along Union Street (Route 135) and eastbound along West Union Street (Route 135). As a result of this feedback, the Project proponent removed the existing vegetation such that sight lines are clear of the vegetation obstruction.

As shown in Table 5 below, the available sight distance exceeds the required AASHTO SSD for the posted speed limit. It is recommended that this vegetation be maintained, and all sight triangles be kept clear. Any plantings in the vicinity of the sight triangles should remain below 2.5-feet in height.

Table 5: Sight Distance Evaluation

Site Driveway Location	Looking	Speed	SSD ¹	Sight	Meets SSD?
		Limit (mph)	Required	Distance Measured	
Summer Street at	Left (West)	25	155	450	Yes
North Site Driveway	Right (East)	25	155	500+	Yes
Union Street (Route 135) at	Left (East)	30	200	400	Yes
West Site Driveway	Right (West)	35	250	500+	Yes
Union Street (Route 135) at	Left (East)	30	200	200	Yes
East Site Driveway	Right (West)	35	250	275	Yes

¹ Stopping sight distance (see AASHTO equations 3-2 and 3-3) for the posted speed limits.

CONCLUSION

The proposed project would include the demolition of the existing pharmacy building and the construction of an approximately 2,575 sf coffee shop with a drive-through window. A total of 41 parking spaces would be provided on-site, including four accessible spaces at the store front. Access to the site would continue to be provided via three driveways: the existing full access driveway on Summer Street (North Site Driveway), the existing full access driveway on Union Street (East Site Driveway), and the existing right-turn exit only driveway Union Street (West Site Driveway). Vehicles using the drive-through would circulate the proposed building in a counter-clockwise direction and exit adjacent to the North Site Driveway. A bypass lane is provided around the building to permit vehicles to enter from both the North Site Driveway and the East Site Driveway, exit out of any of the three driveways, and circulate around the queue. Internal site circulation is not anticipated to impact the external site access and egress.

All study area intersections were determined to have a crash rate lower than the statewide and District 3 crash rates indicating there is no existing safety issues within the study area.

Students from Ashland Middle School were observed crossing at the study area intersections of West Union Street/Union Street (Route 135) at Summer Street and Cherry Street at Summer Street, adjacent to the proposed coffee shop site. It is anticipated that students and other pedestrians accessing the proposed coffee shop from the west would utilize the signalized crosswalk at the intersection of West Union Street/Union Street (Route 135) at Summer Street which includes an exclusive pedestrian phase when activated.

Based on trip generation data published by ITE, the proposed coffee shop is estimated to result in approximately 110 new vehicle trips (57 entering vehicles and 53 exiting vehicles) during the weekday morning peak hour and approximately 44 new vehicle trips (22 entering vehicles and 22 exiting vehicles) during the weekday afternoon peak hour.

The capacity analysis indicates that the proposed coffee shop is anticipated to have a limited impact on the operations of the roadway network adjacent to the site. The signalized intersection of West Union Street (Route 135)/Union Street at Summer Street is projected to operate at overall LOS C or better during both peak hours under 2029 Build conditions and the critical movements at the three unsignalized site driveways are projected to operate at LOS C or better during both peak hours under 2029 Build conditions. The proposed signal improvements associated with the new public safety building are anticipated to improve the intersection operations.

Using AASHTO methodology, the available sight distance exceeds the required AASHTO SSD for the posted speed limit for the three site driveways. It is recommended that all sight triangles be kept clear and proposed plantings in the vicinity of the sight triangles remain below 2.5-feet in height.

Based on the evaluation documented within this traffic impact study, the proposed coffee shop is not shown to have a significant impact on the overall traffic operations and safety of the study area roadways and intersections.