

Updated Traffic Impact Study

Cumberland Farms Development

2880 Acushnet Avenue, New Bedford, MA



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April 2019

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INTRODUCTION

McMahon Associates has completed a review of the existing traffic operations and potential traffic impacts associated with the proposed Cumberland Farms and car wash development project in New Bedford, MA. The purpose of this traffic impact study is to evaluate existing and projected traffic operations and safety conditions associated with the proposed development project 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, the expected trip generating characteristics of the proposed project, and input from the City peer review consultant. This study provides a detailed analysis of traffic operations during the weekday morning and weekday afternoon peak hours, when the adjacent roadway volumes are greatest.

Based on the analysis presented in this study, the project-related traffic estimated to be generated by the proposed development are shown to have a minimal effect on the area roadways and intersections. The following report documents these findings.

Project Description

The proposed Cumberland Farms and car wash development would be located at 2880 Acushnet Avenue in New Bedford, MA, as shown in Figure 1. The site is currently occupied by three residential buildings with two driveways which provide access Acushnet Avenue (Route 18) and undeveloped land. The site is bounded by commercial land uses to the north and south, undeveloped land to the east, and Acushnet Avenue to the west.

The proposed project would include a 4,384 square foot Cumberland Farms convenience market, five gasoline pumps (10 fueling positions) and a 2,640 square foot car wash. Access to the proposed site would be provided via two full-access driveways located on Acushnet Avenue. The North Site Driveway would be included in the signalized intersection with Acushnet Avenue and Ashley Boulevard (Route 18), which would be reconfigured as part of this project. The South Site Driveway would be unsignalized and located approximately 100 feet south of the signalized intersection on Acushnet Avenue.



Figure 1
Site Location Map
Cumberland Farms Development
New Bedford, Massachusetts

Study Methodology

This traffic impact study evaluates existing and projected traffic operations within the project study area during the weekday morning and weekday afternoon peak hour traffic conditions when the adjacent roadway volumes are 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 weekday afternoon peak hours. A field visit was also completed to document intersection and roadway geometries and available sight distances at the proposed site driveways. Crash data for the study area intersections was obtained from the Massachusetts Department of Transportation (MassDOT) to determine if the study area has any 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 any planned future developments that could influence traffic volumes at the study area intersections were assessed. Consistent with MassDOT traffic study guidelines, the 2018 Existing traffic volumes were forecasted to the future year 2025 to determine 2025 No Build (without project) conditions and 2025 Build (with project) conditions.

The third step of this study determined if measures were necessary to improve existing or future traffic operations and safety, minimize potential traffic impacts, and provide safe and efficient access to the proposed project site.

Study Area Intersections

Based on a review of the anticipated traffic generating characteristics of the proposed convenience store with gas station and car wash and a review of the adjacent roadways serving the project site, the following study area intersections were selected for detailed analysis:

- Acushnet Avenue (Route 18) at Phillips Road
- Acushnet Avenue (Route 18) at Bowles Street
- Acushnet Avenue (Route 18) at Belair Street
- Acushnet Avenue at Ashley Boulevard (Route 18)
- Acushnet Avenue (Route 18) at North Site Driveway
- Acushnet Avenue at South Site Driveway

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

EXISTING CONDITIONS

An accurate assessment of the potential traffic impacts associated with the proposed Cumberland Farms development requires a comprehensive 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, summarized below.

Roadway Network and Intersections

The project site benefits from excellent access via the local and regional roadway system. A brief description of the principal roadways providing access to the project site is presented below.

Acushnet Avenue (Route 18)

Acushnet Avenue generally travels in a north to southeast direction (designated as north to south for the purposes of this report) through the City of New Bedford within the vicinity of the site. The roadway is classified as an urban minor arterial under the City of New Bedford jurisdiction. Acushnet Avenue becomes Route 18 north of its intersection with Ashley Boulevard (Route 18). Acushnet Avenue generally provides two lanes of travel in each direction. At its signalized intersection with Ashley Boulevard (Route 18), Acushnet Avenue provides two exclusive right-turn lanes in the northbound direction to continue onto Acushnet Avenue and provides an exclusive left-turn lane and an exclusive through lane on the southbound approach. Sidewalks are provided on both sides of Acushnet Avenue measuring approximately 5.5 feet in width at the intersection. The posted speed limit along Acushnet Avenue is 30 miles per hour within the study area.

Ashley Boulevard (Route 18)

Ashley Boulevard (Route 18) generally travels in a north to south direction through the City of New Bedford. The roadway is classified as an urban principal arterial under the City of New Bedford jurisdiction. Ashley Boulevard (Route 18) generally provides two lanes of travel in each direction. Sidewalks are provided on both sides of Ashley Boulevard (Route 18) measuring between 5 feet and 7 feet in width. Bike lanes are not currently provided on Ashley Boulevard (Route 18). Ashley Boulevard (Route 18) generally provides access to commercial and residential land uses within the vicinity of the project site.

Phillips Road

Phillips Road generally travels in an east to west direction through the City of New Bedford. Phillips Road is classified as a local roadway east of Acushnet Avenue (Route 18) and an urban collector to the west. The roadway is under the City of New Bedford jurisdiction. Phillips Road generally provides one lane of travel in each direction. Sidewalks are provided on the northern side of Phillips Road east of Acushnet Avenue (Route 18) and on each side of

the roadway to the west. Bike lanes are not currently provided on Phillips Road (Route 18). The roadway primarily provides access to residential land uses.

Belair Street

Belair Street generally travels in an east to west direction through the City of New Bedford. Belair Street is classified as a local roadway under the City of New Bedford jurisdiction. Belair Street generally provides one lane of travel in each direction with on-street parking allowed on each side of the roadway. Sidewalks and bike lanes are not provided on Belair Street. The roadway primarily provides access to residential land uses.

Bowles Street

Bowles Street generally travels in an east to west direction through the City of New Bedford. Bowles Street is classified as a local roadway under the City of New Bedford jurisdiction. Bowles Street generally provides one lane of travel in each direction with on-street parking allowed on each side of the roadway. Sidewalks are provided on each side of the roadway and bike lanes are not provided. The roadway primarily provides access to residential land uses.

Multi-Modal Accommodations

Sidewalks are provided on both sides of Acushnet Avenue and Ashley Boulevard (Route 18) within the vicinity of the study area varying between 5 feet and 7 feet in width. The intersection of Acushnet Avenue at Ashley Boulevard (Route 18) currently provides crosswalks on the northwestbound and northbound approaches with pedestrian signal equipment. The intersection of Acushnet Avenue (Route 18) at Phillips Road also provides crosswalks on each of the approaches with a dedicated pedestrian phase. Bike lanes are not currently provided on Acushnet Avenue or Ashley Boulevard (Route 18).

The Southeastern Regional Transit Authority (SRTA) Routes NB4 Bus (Ashley Boulevard) and NB21 Bus (North End Shuttle) provide service along Acushnet Avenue and Ashley Boulevard, with a stop provided at Acushnet Avenue and Victoria Street. The NB4 Bus provides service between the SRTA Terminal and Industrial Park approximately every 30 minutes. Service is provided outbound between approximately 6:00 AM and 8:30 PM during the weekdays and between approximately 7:30 AM and 5:40 PM on Saturdays. Service is provided inbound between approximately 6:30 AM and 9:00 PM on weekdays and between approximately 8:00 AM and 6:00 PM on Saturdays. The NB21 Bus provides a service on a loop from the Fieldstone Marketplace approximately every 40 minutes. Service is provided Monday through Saturday between approximately 9:00 AM and 5:00 PM.

Existing Traffic Volumes

Existing Peak Hour Traffic Volumes

To assess peak hour traffic conditions, manual turning movement counts were conducted at the intersection of Acushnet Avenue at Ashley Boulevard (Route 18) and Acushnet Avenue (Route 18) at Belair Street on Tuesday, April 10, 2018 from 7:00 AM to 9:00 AM and from 2:00

PM to 6:00 PM and at the intersections of Acushnet Avenue (Route 18) at Bowles Street and Acushnet Avenue (Route 18) at Phillips Road on January 17, 2019 from 7:00 AM to 9:00 AM and 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 occurs between 7:15 AM and 8:15 AM and the weekday afternoon peak hour occurs from 4:45 PM to 5:45 PM.

Automatic traffic recorder (ATR) data was collected along Acushnet Avenue, north of Belair Street and north of Victoria Street for a 24-hour period on Tuesday, April 10, 2018 which has been included in Appendix A. The ATR collected traffic volume, vehicle speed and vehicle classification data. The speed data collected as part of this ATR has been utilized as part of the sight distance analysis documented subsequently in this report. A summary of the ATR data is provided in Table 1 below.

Table 1: Acushnet Avenue Automatic Traffic Recorder Data

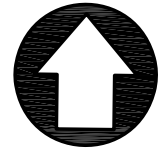
<u>Location</u>	<u>Direction</u>	<u>ADT⁽¹⁾</u>	<u>85th Percentile Speed</u>
North of Belair Street	NB	8,640	30
	SB	<u>8,520</u>	<u>38</u>
	Overall	17,160	n/a
North of Victoria Street	NB	5,770	35
	SB	<u>5,040</u>	<u>34</u>
	Overall	10,810	n/a

(1) Average daily traffic volume in vehicles per day.

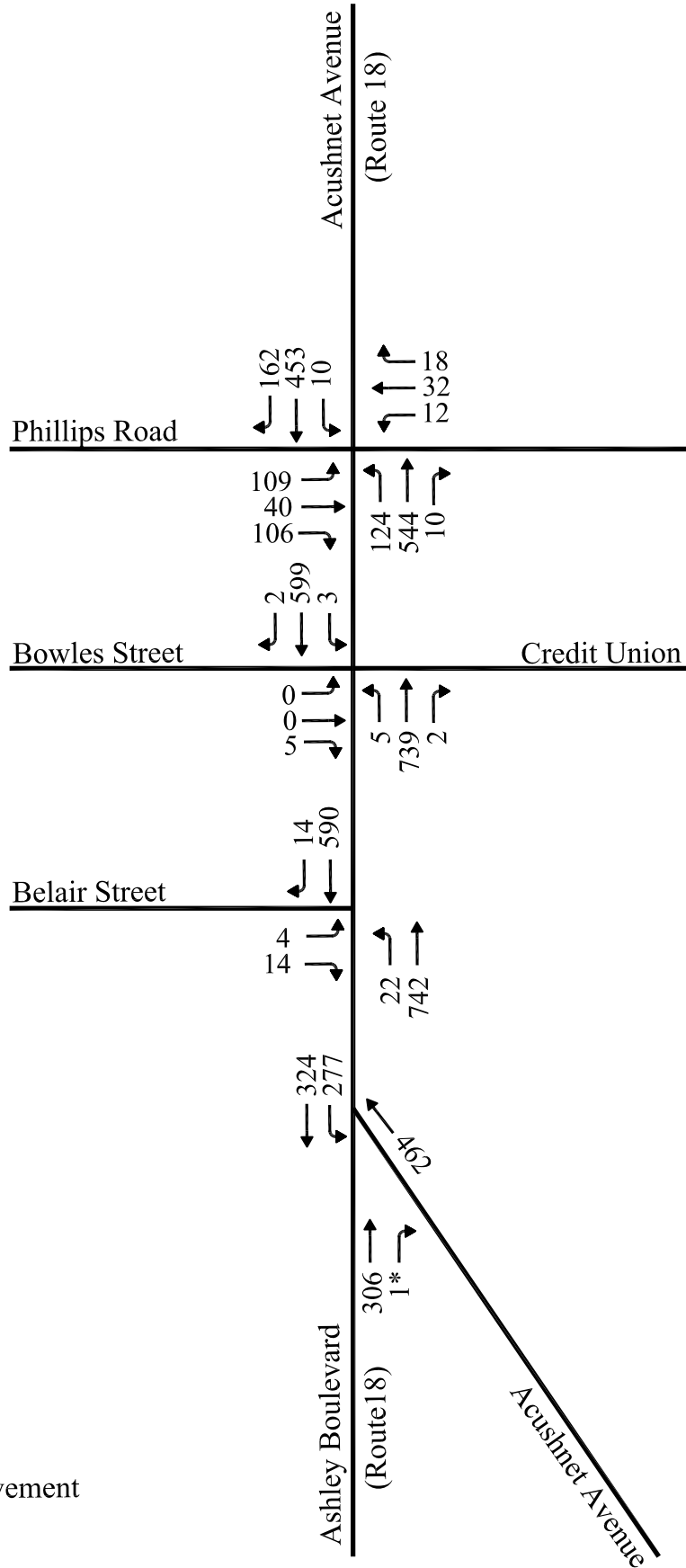
Based on the ATR data, the average daily traffic volume on Acushnet Avenue north of the signalized intersection is approximately 17,160 vehicles and south of the intersection on Acushnet Avenue the average daily traffic volume is approximately 10,810 vehicles.

Seasonal Variation

In order to account for seasonal variation in traffic volumes, continuous count data from a nearby count station on Interstate 195 in Dartmouth, MA was reviewed. Based on the seasonal adjustment trends of the data, traffic counts collected during the month of April are shown to be representative of an average month. Therefore, the existing peak hour traffic volumes were not adjusted. The traffic counts taken during the month of January were balanced with the April counts to be representative of an average month. The seasonal adjustment data from the continuous count station is provided in Appendix B of this report. The resulting peak hourly traffic flows for the 2018 Existing condition are depicted in Figure 2 for the weekday morning peak hour and Figure 3 for the weekday afternoon peak hour.



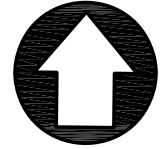
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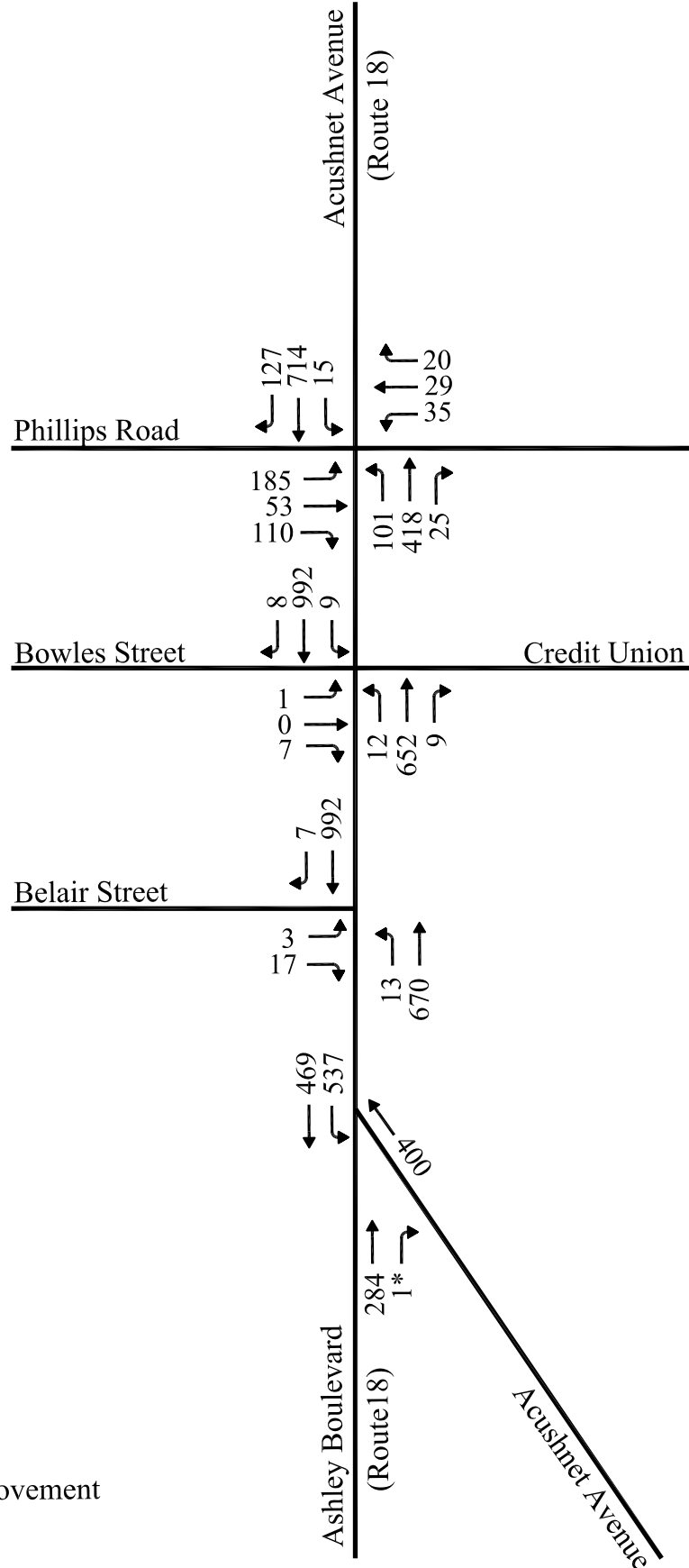
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Figure 2
2018 Existing Weekday Morning
Peak Hour Traffic Volumes
Cumberland Farms
New Bedford, Massachusetts



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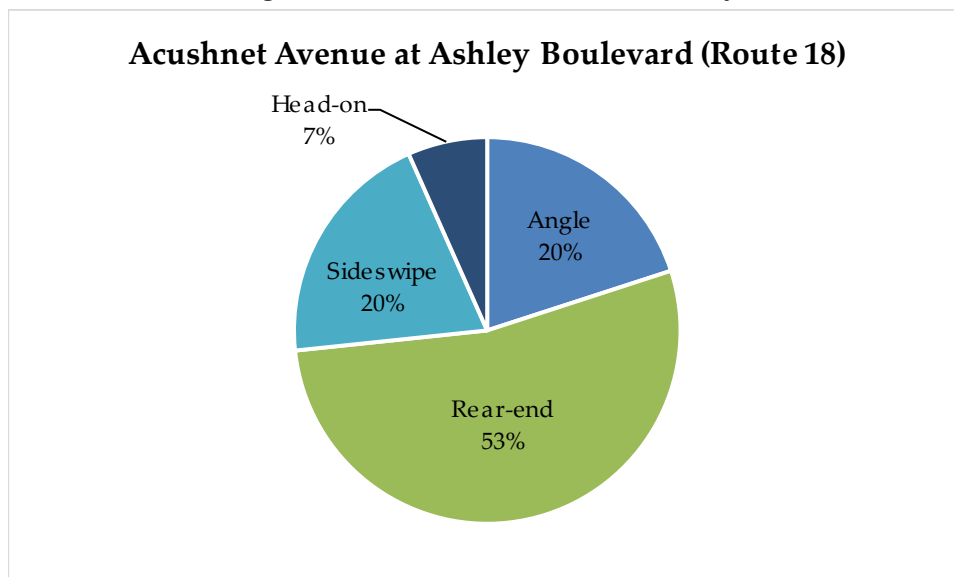
Figure 3
2018 Existing Weekday Afternoon
Peak Hour Traffic Volumes
Cumberland Farms
New Bedford, Massachusetts

Crash Summary

Crash data for the study area intersection was obtained from MassDOT for the most recent five-year period available. This data includes complete yearly crash summaries for 2012, 2013, 2014, 2015, and 2016. A summary of the crash data is presented in Appendix C.

The MassDOT Crash Rate Worksheet was 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. The calculated rate was then compared to the average rate for signalized and unsignalized intersections statewide and within MassDOT District 5. For signalized intersections, the statewide average crash rate is 0.77 crashes per million entering vehicles and the MassDOT District 5 crash rate is 0.76 crashes per million entering vehicles. For unsignalized intersections, the statewide and MassDOT District 5 average crash rate is 0.57 crashes per million entering vehicles. A summary of crash types at the intersection of Acushnet Avenue at Ashley Boulevard (Route 18) is depicted in Figure 4.

Figure 4: Intersection Crash Summary



The intersection of Acushnet Avenue at Ashley Boulevard (Route 18) is shown to have experienced 15 crashes over the five-year period between 2012 and 2016. The resulting crash rate of 0.38 crashes per million entering vehicles is well below both the statewide and District 5 averages for signalized intersections. Of the reported crashes at this intersection, three were angle crashes, eight were rear-end collisions, three were sideswipes, and one was head-on. Of the 15 reported crashes, ten resulted in property damage only and five resulted in personal injury. No fatal crashes were reported at this intersection through the MassDOT data.

The intersection of Acushnet Avenue (Route 18) at Belair Street is shown to have experienced 22 crashes over the five-year period (2012-2016). The resulting crash rate is shown to be 0.56 crashes per million entering vehicles which is below the statewide and District 5 averages for unsignalized intersections. It should be noted that the intersection is listed as a 2013-2015 Highway Safety Improvement Program (HSIP) Cluster. Crash Clusters identified as HSIP represent the top five percent of each region based on factors such as crash incidences and severity. Of the reported crashes at this intersection, 17 were angled crashes, one was a rear-end, two were head-on collisions, and two were single vehicle crashes. Of the 22 reported crashes, 13 resulted in property damage only, six in personal injury and three were unknown/other.

The intersection of Acushnet Avenue (Route 18) at Bowles Street is shown to have experienced 15 crashes over the five-year period from 2012 to 2016. The resulting crash rate is shown to be 0.38 crashes per million entering vehicles which is below both the statewide and District 5 averages for unsignalized intersections. The intersection is also listed as a 2013-2015 HSIP Cluster and is clustered with the intersection of Acushnet Avenue at Belair Street. Of the reported crashes at this intersection, 13 were angled crashes and two were rear-end collisions. Of the 15 crashes, nine resulted in property damage only and six resulted in personal injury.

The intersection of Acushnet Avenue (Route 18) at Phillips Road is shown to have experienced 55 crashes from 2012 to 2016. The resulting crash rate is shown to be 1.29 crashes per million entering vehicles which is above the statewide and District 5 averages. Of the reported crashes, 30 were angled collisions, 15 were rear-end crashes, four were sideswipes, four were head-on, one was a single vehicle crash, and one was unknown. Of the 55 crashes, 38 resulted in property damage, 14 in personal injury and three were other/unknown.

Additional Field Review

Observations were conducted to understand the critical gap acceptance behavior of vehicles at unsignalized intersections within the study area. Observations were performed during the weekday afternoon peak hour on Tuesday, May 15, 2018 at the intersection of Acushnet Avenue at Belair Street. The purpose of the supplemental review was to determine the minimum gap drivers are willing to accept when making a left or right turn onto Acushnet Avenue. When a vehicle exited Belair Street, the accepted gap was recorded in half second intervals.

A review of the critical gap acceptance data determined that the gap acceptance time provided in the HCM (6.9 seconds for a right-turn and 7.5 seconds for a left-turn onto a four-lane roadway) is overly conservative compared to what drivers are accepting along Acushnet Avenue. Gaps as short as 3.0 to 3.5 seconds were shown to be accepted by both left and right turning vehicles. Based on a review of the field measured accepted gaps, the critical gap acceptance within the capacity analysis for this project was adjusted to 6.5 seconds for a turning movement exiting a stop-controlled roadway within the study area.

FUTURE CONDITIONS

To determine future traffic demands on the study area roadways and intersections, the 2018 Existing traffic volumes were projected to the future-year 2025, by which time the proposed project would be expected to be built and occupied. Traffic volumes on the study area roadways in 2025 are assumed to include all 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 convenience store with gas station and car wash. The potential background traffic growth, unrelated to the proposed project, was considered in the development of the 2025 No Build (without project) peak hour traffic volumes. The estimated traffic increases associated with the proposed project were then added to the 2025 No Build volumes to reflect the 2025 Build (with project) traffic conditions. A more detailed description of the development of the 2025 No Build and 2025 Build traffic volume networks is presented below.

Future Roadway Improvements

Planned roadway improvement projects can impact travel patterns and future traffic operations. MassDOT project information was consulted to develop and understanding of future area roadway improvement projects. According to MassDOT project information, there are no planned roadway improvements within the vicinity of the project site that are expected to significantly alter traffic flow or operations within the study area.

Background Traffic Growth

Traffic growth is generally a function of changes in motor vehicle use and expected land development within the area. In order to predict the rate at which traffic on the study area roadways can be expected to grow during the seven-year forecast period (2018 to 2025), both planned area developments and historic traffic growth were reviewed.

Site-Specific Growth

One site-specific development was identified for inclusion in the background growth of this study based on its proximity to the project site and trip generation characteristics. The development is proposed to include 15-single family homes to be located off of Philips Road, north of the Cumberland Farms project site. New trip volumes associated with the development were identified based on the traffic impact study completed by Vanasse & Associates, Inc. (VAI) in August 2017. The traffic volumes associated with the residential development are provided in Appendix D and are documented in the traffic projection model located in Appendix E.

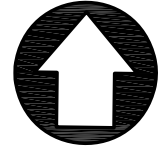
Historic Traffic Growth

The Southern Regional Planning and Economic Development District (SRPEDD) was contacted to determine an annual growth rate for the study area. SRPEDD recommended an annual growth rate of one percent. The one percent growth rate, compounded annually, was utilized to capture traffic growth associated with general changes in population, other

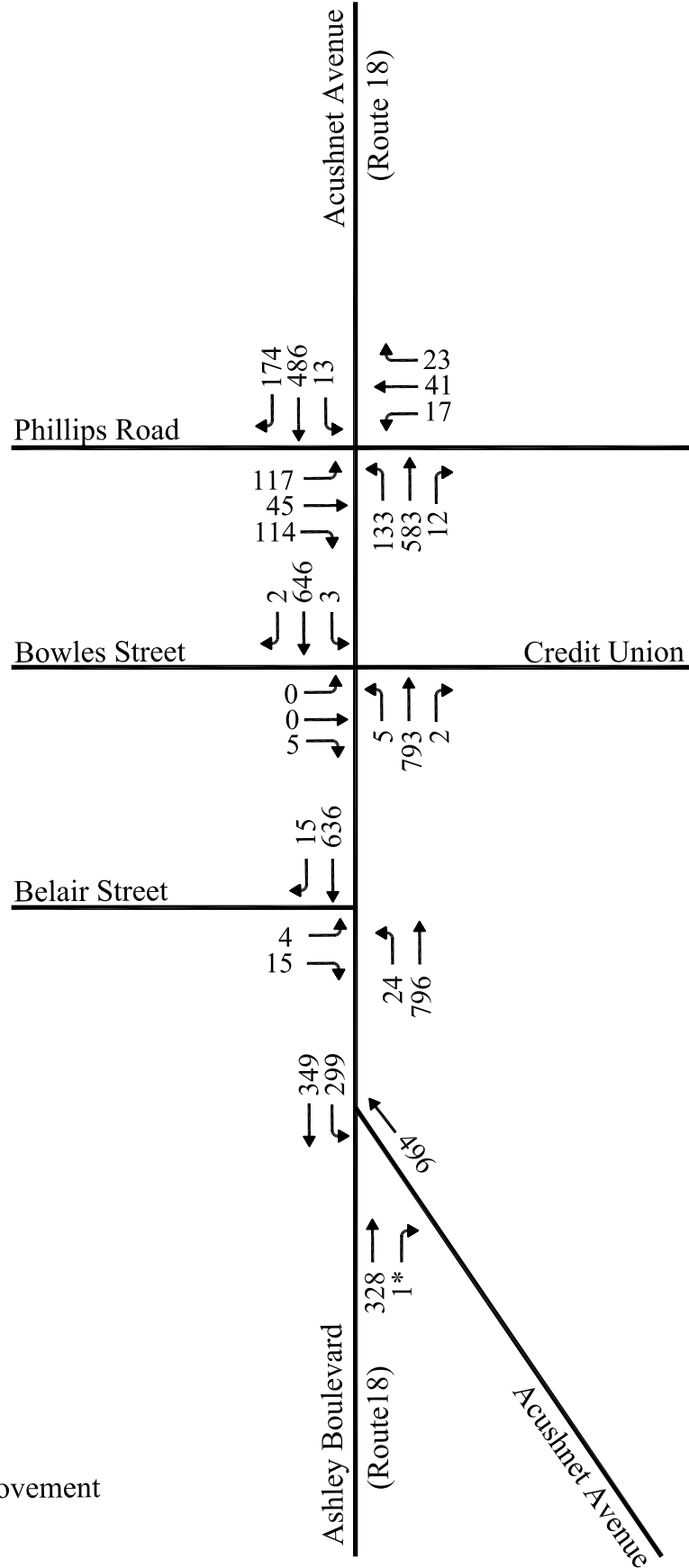
smaller developments and developments that may not be known at this time to forecast increases in traffic volumes on the study area roadways and intersections.

2025 No Build Traffic Volumes

The 2018 Existing peak hour traffic volumes were grown by one percent per year (compounded annually) over the seven-year study horizon (2018 to 2025) to establish the 2025 base traffic volumes. Trips expected to be generated by the additional developments were then added to the 2025 base future volumes utilizing the methodologies described above. The resulting 2025 No Build weekday morning and weekday afternoon peak hour traffic volumes are illustrated in Figure 5 and Figure 6, and are documented in the traffic projection model presented in Appendix E of this report.



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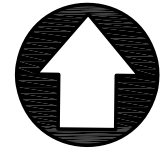


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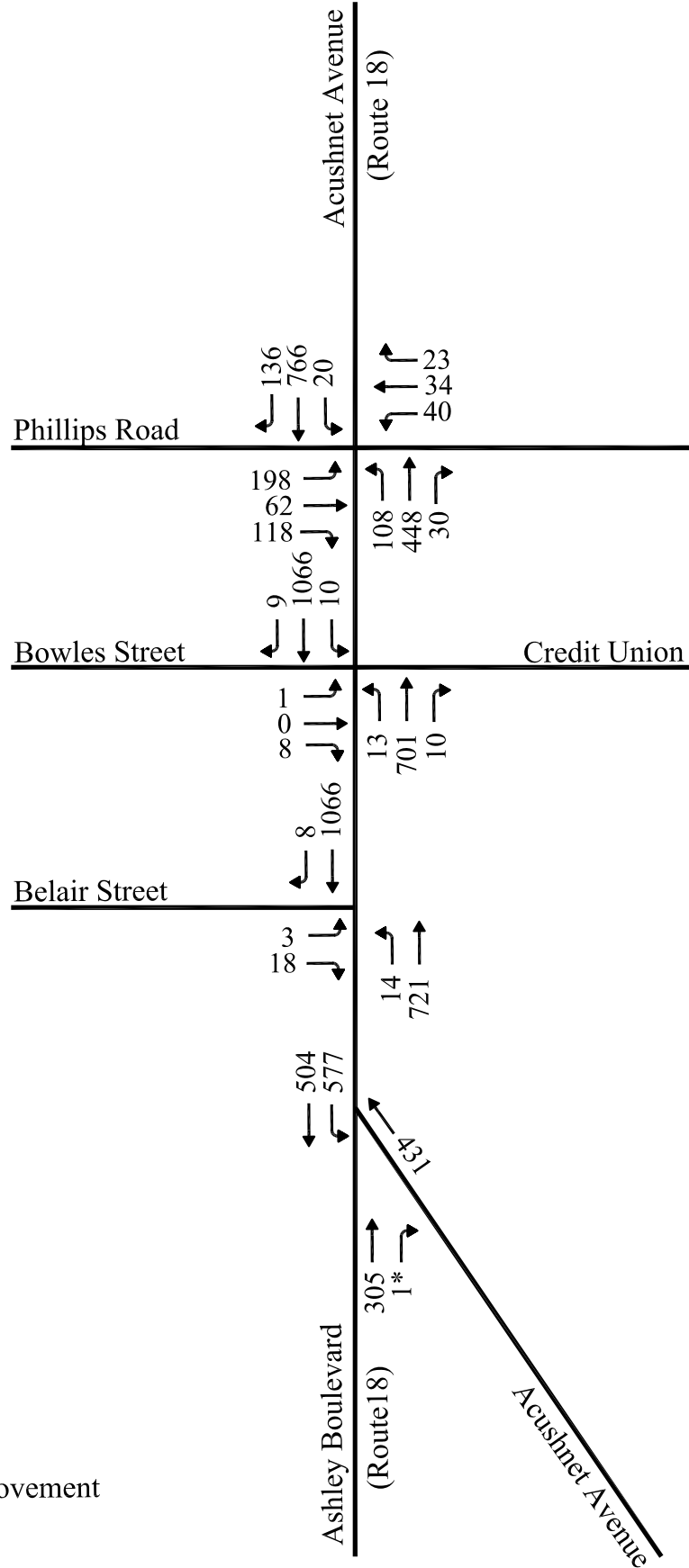
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Figure 5
2025 No Build Weekday Morning
Peak Hour Traffic Volumes
Cumberland Farms
New Bedford, Massachusetts



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Figure 6
2025 No Build Weekday Afternoon
Peak Hour Traffic Volumes
Cumberland Farms
New Bedford, Massachusetts

Site-Generated Traffic

In order to estimate the number of vehicle trip associated with the proposed Cumberland Farms development, trip generation data was collected at similar locations. The counts included the existing Cumberland Farms on Shawmut Avenue in New Bedford, MA and the Tarkiln Hill Car Wash on Tarkiln Hill Road in New Bedford, MA. Counts were conducted at the two locations on Tuesday, January 15, 2019 from 7:00 AM to 9:00 AM for the weekday morning peak period and Thursday, January 10, 2019 from 4:00 PM to 6:00 PM for the weekday afternoon peak period. The existing counts are provided in Appendix F. A trip generation rate equating the number of entering and exiting vehicles to the size of each development was then calculated in order to determine the expected trip generating characteristics of the proposed project.

Not all (driveway) trips to convenience markets with gasoline pumps are “new” trips. In fact, a significant portion of the total trips attracted to such retail uses are “pass-by” trips. For pass-by trips, the Institute of Transportation Engineers’ (ITE) publication, *Trip Generation Manual, 10th Edition*, was referenced. ITE is a national research organization of transportation professionals, and *Trip Generation Manual, 10th Edition* provides traffic generation information for various land uses compiled from studies conducted by members nationwide. Land use category (LUC) 853 “Convenience Market with Gasoline Pumps” was utilized to forecast the expected pass-by trips associated with the project. Based on this land use, approximately 63 percent of the total weekday morning trips and 66 percent of the total weekday afternoon trips attracted to this type of retail use are attributed to pass-by trips. The vehicle trips expected to be generated by the proposed convenience market and gasoline station portion of the development are separated into pass-by vehicle trips and new vehicle trips. Those trips were then added to the vehicle trip generation developed using the existing car wash, as shown in Table 2.

Table 2: Summary of New and Pass-by Trips

<u>Description</u>	<u>Weekday AM</u>			<u>Weekday PM</u>		
	<u>In</u>	<u>Out</u>	<u>Total</u>	<u>In</u>	<u>Out</u>	<u>Total</u>
Total Convenience/Gas Trips ⁽¹⁾	175	176	351	140	141	281
- Pass-By Trips ⁽²⁾	<u>111</u>	<u>111</u>	<u>222</u>	<u>93</u>	<u>93</u>	<u>186</u>
- New Convenience/Gas Trips	64	65	129	47	48	95
Car Wash Trips ⁽³⁾	<u>3</u>	<u>3</u>	<u>6</u>	<u>4</u>	<u>4</u>	<u>8</u>
Total New Trips⁽⁴⁾	67	68	135	51	52	103

(1) Based on counts conducted at the Cumberland Farms on Shawmut Avenue on Tuesday, January 15, 2019 for the weekday morning peak period and Thursday, January 10, 2019 for the weekday afternoon peak period.

(2) Based on ITE LUC 853 63% of AM and 66% of PM peak hour trips are attributed to “pass-by” trips.

(3) Based on counts conducted at the Tarkiln Hill Car Wash on Tarkiln Hill Road on Tuesday, January 15, 2019 for the weekday morning peak period and Thursday, January 10, 2019 for the weekday afternoon peak period.

(4) Summation of new project trips from convenience market/gasoline station, and car wash components of the project.

Since pass-by traffic is already on the adjacent roadways, this portion of the total development traffic is reflected in the existing traffic volumes and does not represent additional traffic on the roadway network. Therefore, the total proposed development traffic volume is reduced by the pass-by trips to estimate the new traffic generated by the proposed development. As shown in Table 2, the peak hour trip generation of the proposed Cumberland Farms is estimated to result in an increase of approximately 135 new vehicle trips (67 entering vehicles and 68 exiting vehicles) during the weekday morning peak hour and an increase of approximately 103 new vehicle trips (51 entering vehicles and 52 exiting vehicles) during the weekday afternoon peak hour.

The total new proposed development traffic volumes shown in Table 2 did not account for pass-by volumes associated with the proposed car wash component or internal capture between the convenience store/gas station uses and the car wash use. Since pass-by trips and internal capture trips associated with the car wash would reduce the overall traffic volume to and from the project site, the trip generation and associated analysis presented in this report are considered to be conservative.

Project Site Distribution and Assignment

The additional traffic projected to be generated by the proposed development was distributed onto the study area roadways and intersections based on the existing travel patterns of the adjacent roadways. Vehicle trips accessing the project site were assigned to the site driveways based on location of proposed parking spaces and ease of access to Acushnet Avenue and Ashley Boulevard. The resulting arrival and departure patterns are presented in Figure 7 and are documented in the traffic projection model found in Appendix E.

The project-related traffic was assigned to the surrounding roadway network based on the project trip distribution patterns presented in Figure 7. The resulting distributed new project trips are shown in Figure 8 and Figure 9 for the weekday morning and weekday afternoon peak hours, respectively.

2025 Build Traffic Volumes

To establish the 2025 Build peak hour traffic volumes, the distributed new project trips and diverted pass-by trips were then added to the 2025 No Build peak hour traffic volumes to reflect the 2025 Build peak hour traffic volumes. The resulting 2025 Build weekday morning and weekday afternoon peak hour traffic volumes are presented in Figure 10 and Figure 11, respectively, and are documented in the traffic projection model presented in Appendix E of this report.

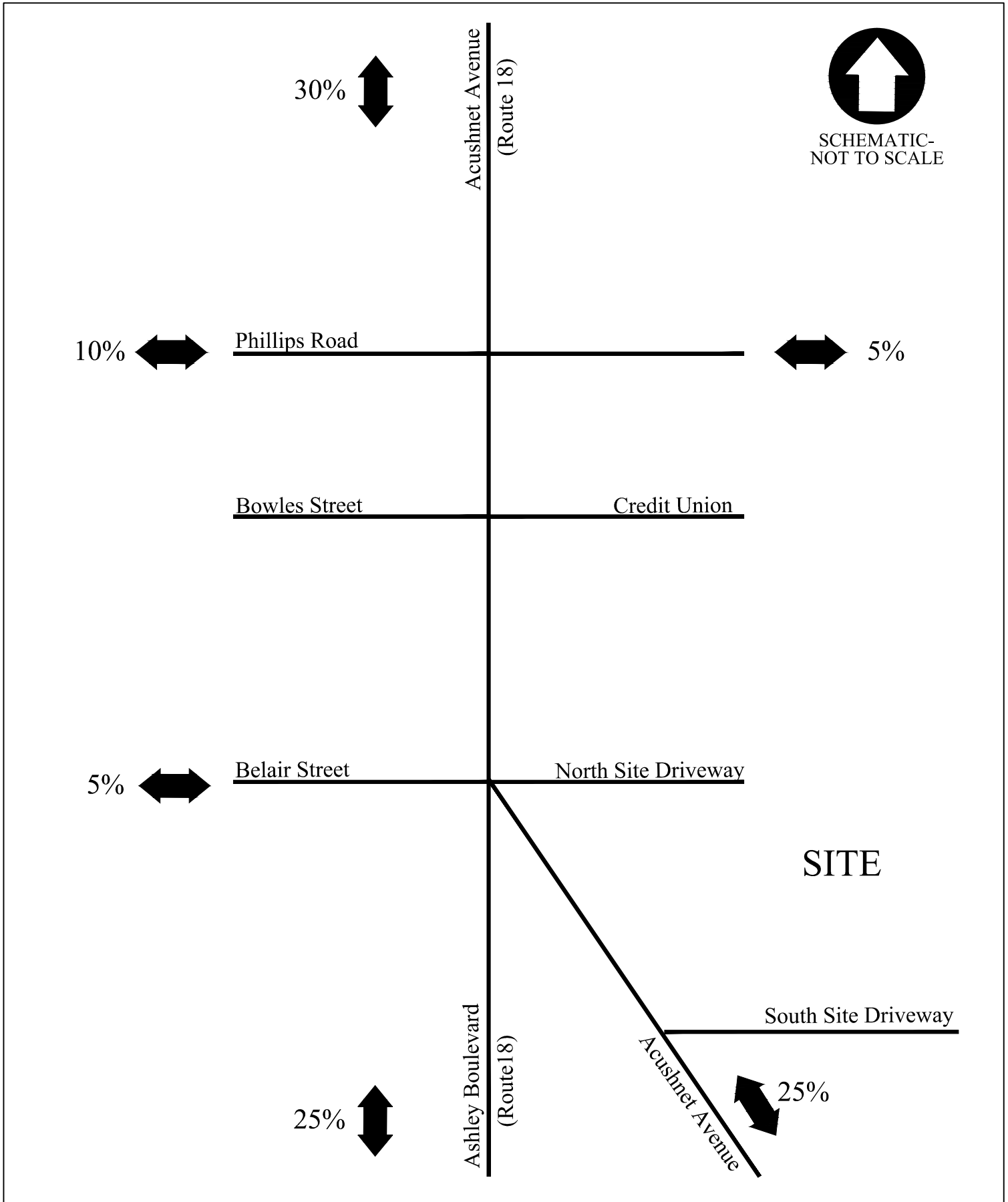
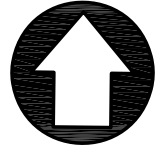
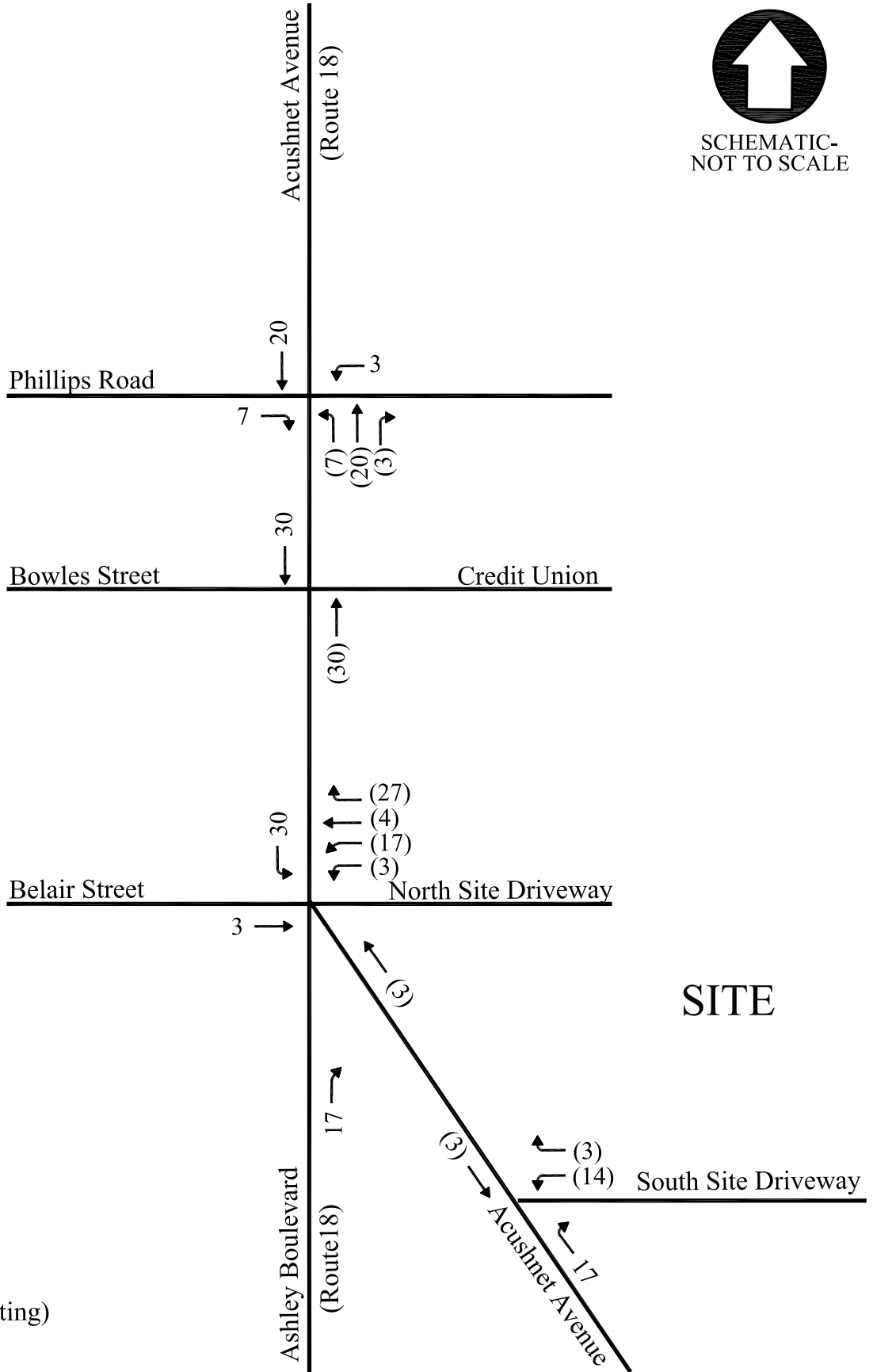


Figure 7
Directions of Arrival and Departure
Cumberland Farms
New Bedford, Massachusetts



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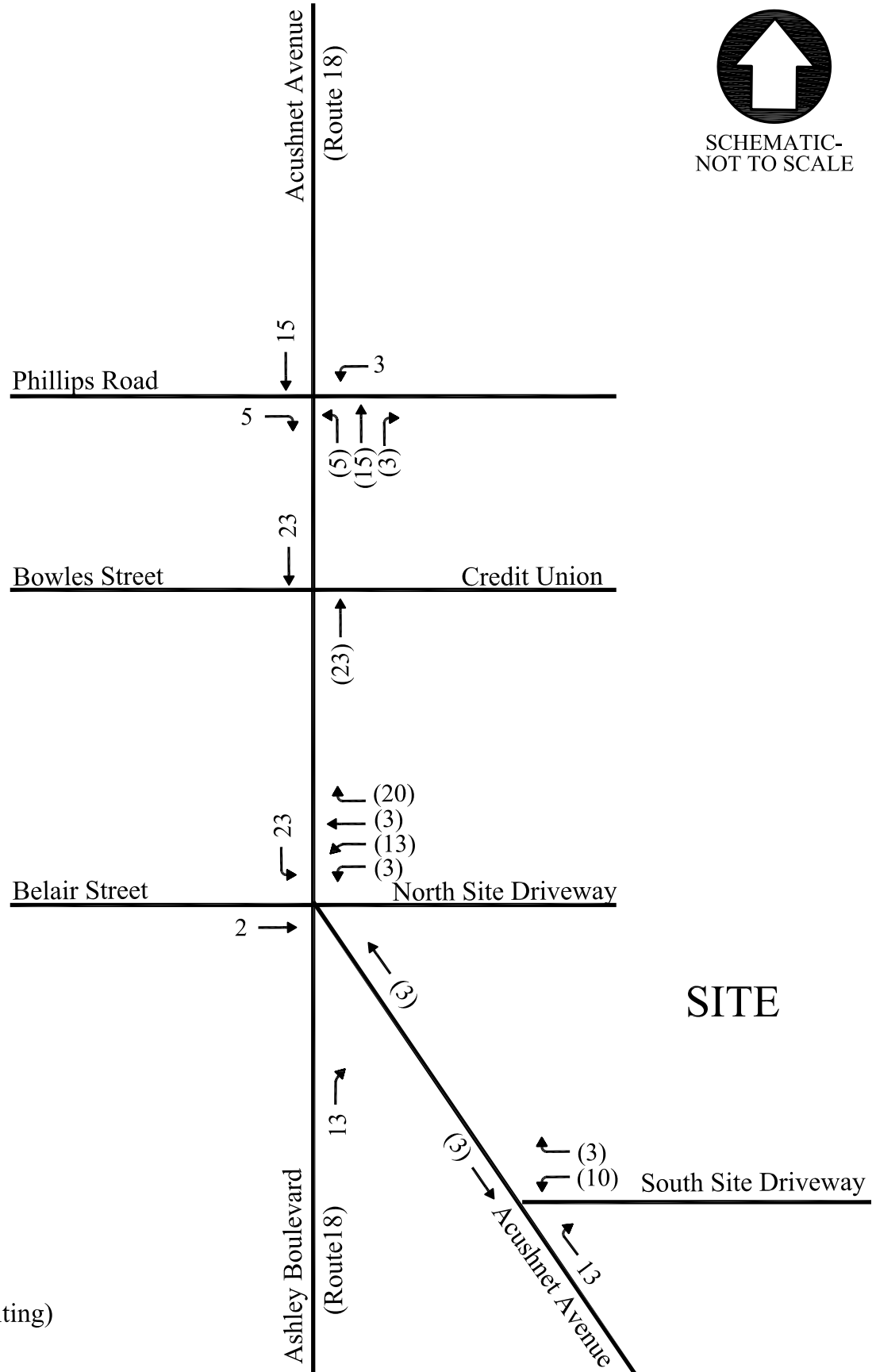


Legend
Entering (Exiting)

Figure 8
Weekday Morning Peak Hour
New Project Trips
Cumberland Farms
New Bedford, Massachusetts



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NOT TO SCALE

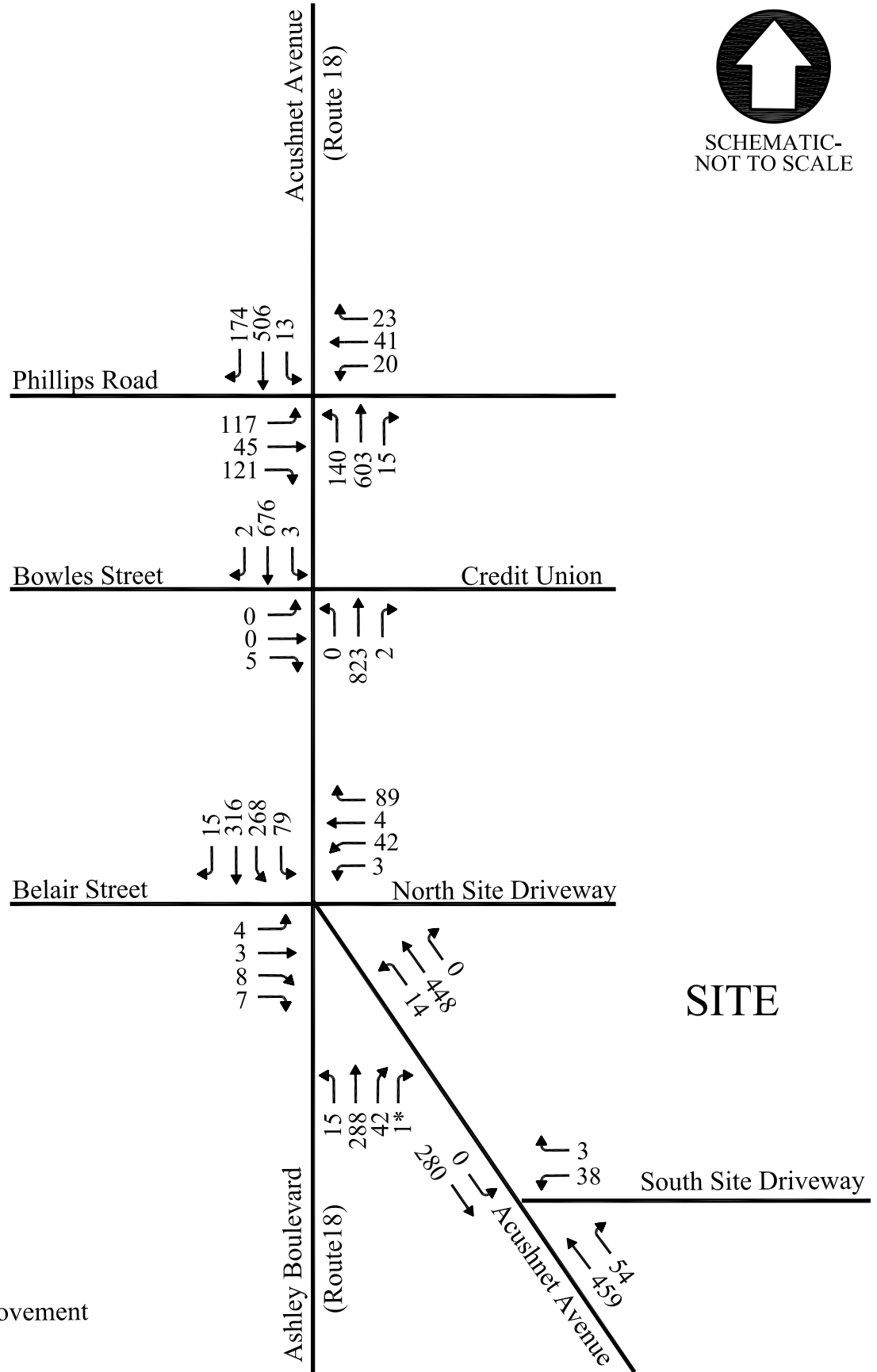


Legend
Entering (Exiting)

Figure 9
Weekday Afternoon Peak Hour
New Project Trips
Cumberland Farms
New Bedford, Massachusetts



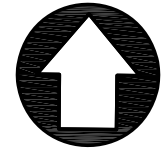
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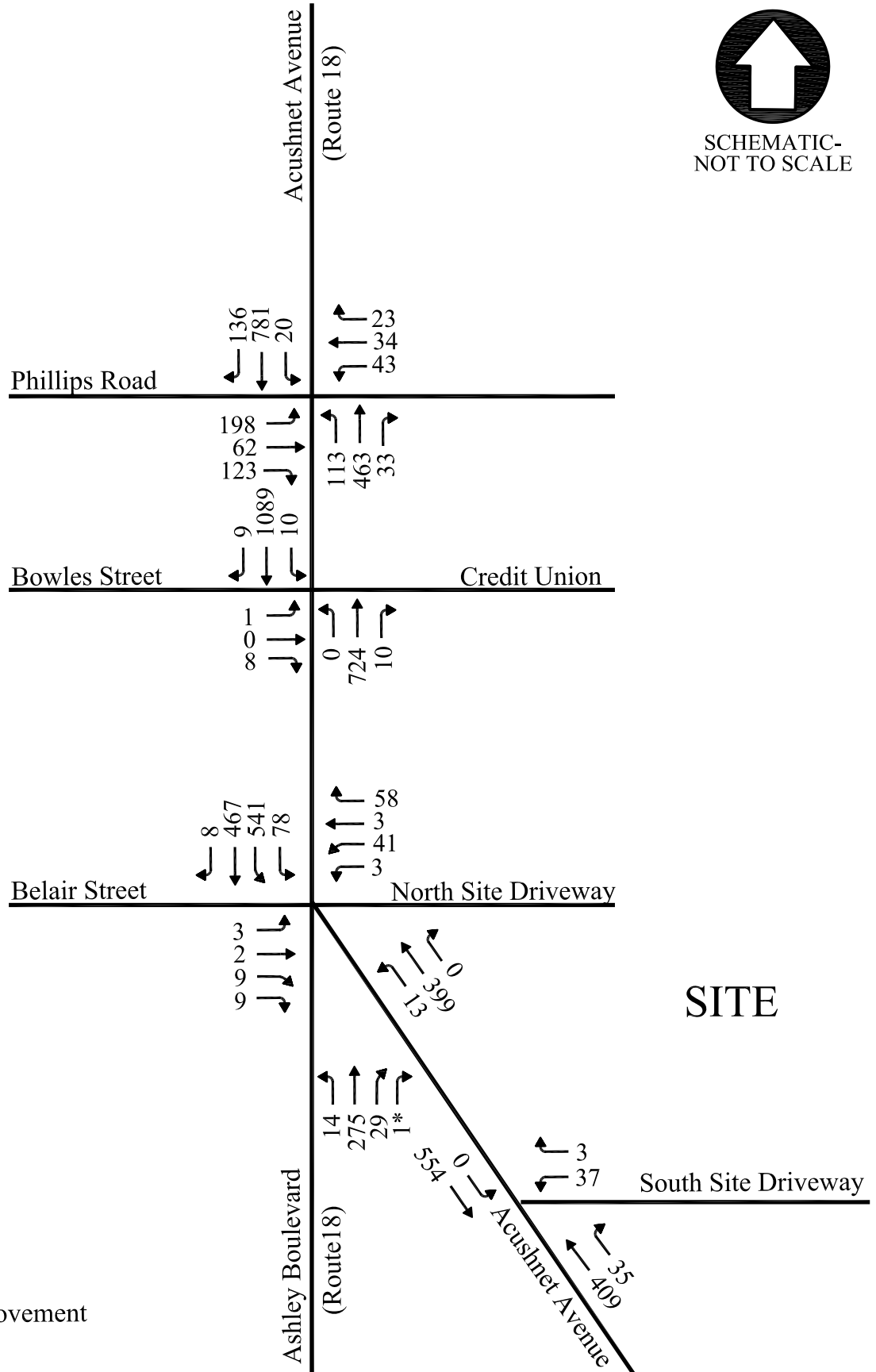
Legend

X* Illegal Movement

Figure 10
2025 Build Weekday Morning
Peak Hour Traffic Volumes
Cumberland Farms
New Bedford, Massachusetts



SCHEMATIC-
NOT TO SCALE



Legend

X* Illegal Movement

Figure 11
2025 Build Weekday Afternoon
Peak Hour Traffic Volumes
Cumberland Farms
New Bedford, Massachusetts

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 analyses were conducted using the Synchro capacity analysis software at the study area intersections under the 2018 Existing, 2025 No Build and 2025 Build peak hour traffic conditions. The analysis is based on Synchro capacity analysis methodologies and procedures contained in the *Highway Capacity Manual, 6th Edition* (HCM), which is summarized in Appendix G. A discussion of the evaluation criteria and a summary of the results of the capacity analyses 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 movements and greater than 80 seconds for movements at signalized intersections. A more detailed description of the LOS criteria is provided in Appendix G.

Capacity Analysis Results

Intersection capacity analyses were conducted using Synchro capacity analysis software for the study area intersections to evaluate the 2018 Existing, 2025 No Build and 2025 Build traffic conditions. As mentioned previously, the peak hour traffic volumes utilized as part of this analysis are provided in the traffic projection model, attached in Appendix E of this report.

The Synchro capacity analysis results for the 2018 Existing, 2025 No Build and 2025 Build traffic conditions are presented in Appendix H, Appendix I, and Appendix J, respectively. The overall results of the intersection capacity analysis for the signalized study area intersections is presented in Table 3 below. Table 4 summarizes the level-of-service results for the critical movements at the unsignalized intersections during the weekday morning and weekday afternoon peak hours. A more detailed summary of the capacity analysis for the study area intersections is provided in Appendix K. The results of the specific capacity analysis at the study area intersections is discussed below.

Proposed Project Mitigation

As mitigation for the project, the Cumberland Farms North Site Driveway and Belair Street are proposed to be placed under traffic signal control and the intersection of Acushnet Avenue and Ashley Boulevard (Route 18) would be reconfigured. The intersection improvements proposed as part of this project would improve safety at the intersections of Acushnet Avenue and Ashley Boulevard (Route 18) and Acushnet Avenue and Belair Street while also allowing movements to and from the proposed site to operate in a safe and efficient manner. As part of the intersection improvements, pedestrian accommodations would also be upgraded.

In addition to the geometric and signal equipment improvements proposed at the intersection of Acushnet Avenue and Ashley Boulevard (Route 18), traffic signal timing changes would also be implemented at the adjacent signalized intersection of Acushnet Avenue (Route 18) and Phillips Road. The two signalized intersections would be coordinated in order to manage the flow of traffic along Acushnet Avenue and better manage vehicle queuing.

The capacity analysis conducted as part of this report reflects the proposed intersection improvements at Acushnet Avenue and Ashley Boulevard (Route 18) and Acushnet Avenue and Phillips Road.

Table 3: Signalized Peak Hour Intersection Capacity Analysis Results

Intersection	2018 Existing			2025 No Build			2025 Build			
	LOS ⁽¹⁾	Delay ⁽²⁾	V/C ⁽³⁾	LOS	Delay	V/C	LOS	Delay	V/C	
Acushnet Avenue at Ashley Boulevard (Route 18)	AM	B	12.4	0.56	B	12.9	0.59	n/a	n/a	n/a
Acushnet Avenue at Ashley Boulevard (Route 18)/ Belair Street/North Site Driveway	AM	n/a	n/a	n/a	n/a	n/a	n/a	C	29.1	0.95
	PM	n/a	n/a	n/a	n/a	n/a	n/a	C	27.8	0.95
Acushnet Avenue (Route 18) at Phillips Road	AM	C	25.5	0.85	C	27.1	0.87	C	28.0	0.88
	PM	C	32.6	0.89	C	35.0	0.92	C	30.8	0.93

(1) Level-of-Service

(2) Average vehicle delay, in seconds

(3) Volume to capacity ratio

Acushnet Avenue at Ashley Boulevard (Route 18)

Based on a review of the capacity analysis, the signalized intersection of Acushnet Avenue at Ashley Boulevard (Route 18) is shown to currently operate at overall LOS B during the weekday morning and weekday afternoon peak hours. Under the 2025 No Build conditions, the intersection is projected to continue to operate at overall LOS B during the weekday morning and weekday afternoon peak hours. Under the proposed condition, the intersection would be reconfigured to include the North Site Driveway and Belair Street. 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. With the proposed project in place, the intersection is projected to continue to operate under capacity during the weekday morning and weekday afternoon peak hours.

Acushnet Avenue (Route 18) at Phillips Road

The signalized intersection of Acushnet Avenue (Route 18) and Phillips Road is shown to operate at overall LOS C during both the weekday morning and weekday afternoon peak hours under Existing conditions. The intersection is shown to continue operate at overall LOS C during both peak hours through the 2025 Build conditions. The proposed project is not expected to have a noticeable impact on the operations of the intersection, and the mitigation proposed as part of the project is expected to better manage vehicle progression along Acushnet Avenue.

Table 4: Unsignalized Peak Hour Intersection Capacity Analysis Results

Intersection	Movement	2018 Existing			2025 No Build			2025 Build			
		LOS ⁽¹⁾	Delay ⁽²⁾	V/C ⁽³⁾	LOS	Delay	V/C	LOS	Delay	V/C	
Acushnet Avenue (Route 18) at Bowles Street	EB LR	AM	B	10.6	0.01	B	10.9	0.01	B	11.0	0.01
		PM	C	16.5	0.04	C	17.5	0.04	C	17.4	0.04
Acushnet Avenue (Route 18) at Belair Street	EB LR	AM	C	16.4	0.08	C	17.6	0.09	n/a	n/a	n/a
		PM	C	17.0	0.11	C	18.4	0.12	n/a	n/a	n/a
Acushnet Avenue at South Site Driveway	WB LR	AM	n/a	n/a	n/a	n/a	n/a	n/a	C	16.8	0.13
		PM	n/a	n/a	n/a	n/a	n/a	n/a	C	21.8	0.17

(1) Level-of-Service

(2) Average vehicle delay, in seconds

(3) Volume to capacity ratio

Acushnet Avenue (Route 18) at Bowles Street

Under the 2018 Existing condition, the critical eastbound exiting movement from Bowles Street is shown to currently operate at LOS B during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour and is projected to continue to operate similarly under the 2025 No Build condition with minimal increase in delay. With the proposed project in place, the critical eastbound exiting movement is projected to continue to operate at LOS B during the weekday morning peak hour and at LOS C during the weekday afternoon peak hour and operate well under capacity.

Acushnet Avenue (Route 18) at Belair Street

Under the 2018 Existing condition, the critical eastbound exiting movement from Belair Street is shown to currently operate at LOS C during the weekday morning and weekday afternoon peak hours. Under the 2025 No Build condition, the critical movement is projected to continue to operate at LOS C and well under capacity. The proposed project would place the Belair Street approach to the intersection of Acushnet Avenue under signal control.

Acushnet Avenue at South Site Driveway

Under the 2025 Build condition, the westbound movement exiting the South Site Driveway onto Acushnet Avenue is projected to operate at LOS C during the weekday morning and weekday afternoon peak hours. The South Site Driveway is projected to operate well under capacity during the weekday morning and weekday afternoon peak hours. The proposed site driveway is projected to have little impact on Acushnet Avenue operations.

Site Access and Circulation

Access to the proposed Cumberland Farms development is proposed to be provided via two full-access driveways on Acushnet Avenue. The North Site Driveway would be located at the signalized intersection of Acushnet Avenue at Ashley Boulevard (Route 18) which would be reconfigured as part of the project. The South Site Driveway would be unsignalized and

located south of the signalized intersection on Acushnet Avenue. Each of the site driveways has been located to provide sufficient sight distance for vehicles entering and exiting the site.

The Cumberland Farms convenience store with gasoline station and car wash development has been designed to provide safe and efficient movement throughout the site. Fuel tanker trucks are expected to enter the site via the North Site Driveway to access the underground storage tankers and exit via the South Site Driveway. The project site driveways are shown to operate with minimal vehicle queues and are not anticipated to impact site operations or the operations on the adjacent roadways.

Sight Distance

A field review of the available sight distance was conducted at the location of the two proposed full-access site driveways on Acushnet Avenue. Vehicle speeds collected through the ATR counts indicate that the 85th percentile speed on Acushnet Avenue (Route 18) located north of Belair Street is approximately 30 miles per hour for vehicles traveling in the northbound direction and approximately 38 miles per hour for vehicles traveling southbound. Therefore, a speed of 40 miles per hour was utilized in the sight distance review for the North Site Driveway. Vehicle speeds collected through the ATR counts indicate that the 85th percentile speed on Acushnet Avenue located south of the signalized intersection is approximately 35 miles per hour for vehicles traveling in the northbound direction and approximately 34 miles per hour for vehicles traveling southbound. Therefore, a speed of 35 miles per hour was utilized in the sight distance review for the South Site Driveway.

The American Association of State Highway and Transportation Officials (AASHTO) publication, *A Policy on Geometric Design, 2011 Edition*, defines minimum and desirable 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 at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient time to anticipate and avoid collisions."

Table 5 summarizes the AASHTO sight distance standards for a speed of 40 miles per hour at the North Site Driveway and 35 miles per hour at the South Site Driveway, and the available sight distance at the proposed site driveways.

Table 5: Sight Distance Requirements

Vehicle Location	Direction	SSD	ISD	Available Sight	Meets SSD/ISD
		Required (ft) ⁽¹⁾	Recommended (ft) ⁽²⁾	Distance Measured (ft)	
North Site Driveway	Looking Left (South)	305	415	>500 ⁽³⁾	Yes
	Looking Right (North)	305	470	>500	Yes
South Site Driveway	Looking Left (South)	250	365	>500	Yes
	Looking Right (North)	250	415	>500 ⁽³⁾	Yes

(1) AASHTO stopping sight distance (see AASHTO Table 3-1) for operating speeds of 40 miles per hour for the North Site Driveway and 35 miles per hour for the South Site Driveway.

(2) AASHTO intersection sight distance (see AASHTO Table 9-6 for Case B1, Left Turn from Stop and Table 9-8 for Case B2, Right Turn from Stop).

(3) Sight lines limited by existing vegetation on the site. With proposed clearing >500' of sight lines would be available if vegetation removed.

As shown in Table 5, the available sight distance for a vehicle exiting the proposed North Site Driveway looking to the left (south) and to the right (north) onto Acushnet Avenue (Route 18) is greater than 500 feet, which exceeds the SSD and ISD requirements for 40 miles per hour. The available sight distance looking left (south) and right (north) from the proposed South Site Driveway is greater than 500 feet, which exceeds the SSD and ISD requirements for 35 miles per hour. As part of the proposed project, existing vegetation in front of the site would be removed eliminating any existing obstructions to sight distance and providing for safe operations.

CONCLUSION

The proposed Cumberland Farms development includes the construction of a 4,384 square foot convenience store with five gasoline pumps (10 fueling positions) and a 2,640 square foot car wash located at 2880 Acushnet Avenue in New Bedford, MA. Access to the site is to be provided via two full-access driveways on Acushnet Avenue. The North Site Driveway would be included in the signalized reconfigured intersection of Acushnet Avenue at Ashley Boulevard (Route 18) and the South Site Driveway would be unsignalized and located south of the signalized intersection on Acushnet Avenue.

Based on the analysis presented in this assessment, the Cumberland Farms project is estimated to generate approximately 135 new vehicle trips (67 entering vehicles and 68 exiting vehicles) during the weekday morning peak hour and approximately 103 new vehicle trips (51 entering vehicles and 52 exiting vehicles) during the weekday afternoon peak hour. Pass-by trips and internal capture trips associated with the car wash were not accounted for as part of this study. Therefore, the trip generation and associated capacity analysis presented in this report is considered to be conservative.

As part of the project, the signalized intersection of Acushnet Avenue at Ashley Boulevard (Route 18) would be reconfigured to place Belair Street and the North Site Driveway under traffic signal control. The proposed improvements to the signalized intersection would improve the safety at the intersection and allow the North Site Driveway to operate in a safe and efficient manner. Pedestrian improvements within the vicinity of the intersection would also be included.

The capacity analysis indicates that the proposed project would not have a significant impact on the operations of the study area intersections and roadways. Under the 2025 Build condition, the intersection of Acushnet Avenue at Ashley Boulevard (Route 18) would include the Belair Street approach and the North Site Driveway. The intersection is projected to operate at overall LOS C during the weekday morning and weekday afternoon peak hours and under capacity. The addition of Belair Street to the intersection would reduce the number of curb cuts on the intersection approaches and improve safety for vehicles turning in and out of Belair Street and traveling through the intersection. The exiting movement at the South Site Driveway is projected to operate at LOS C during the weekday morning and weekday afternoon peak hours. Operations along Acushnet Avenue (Route 18) and Ashley Boulevard (Route 18) are not shown to be significantly impacted by the project. The South Site Driveway has been designed to provide sufficient sight distance from the adjacent signal and is shown to provide sufficient sight distance to allow vehicles to enter and exit the site safely.

Based on a review of the analysis contained within this traffic impact study, the proposed Cumberland Farms development is expected to improve the overall safety of the study area and is not shown to have an appreciable impact on the traffic operations of the study area roadways and intersections.