

Transportation Impact Assessment

Proposed Residential Community
279 and 281 Old Oaken Bucket Road
Scituate, Massachusetts

Prepared for:

Lovendale LLC
Duxbury, Massachusetts

December 2021

Prepared by:

 **Vanasse &
Associates inc**
Transportation Engineers & Planners

35 New England Business Center Drive
Suite 140
Andover, MA 01810

Dear Reviewer:

This letter shall certify that this *Transportation Impact Assessment* has been prepared under my direct supervision and responsible charge. I am a Registered Professional Engineer (P.E.) in the Commonwealth of Massachusetts (Massachusetts P.E. No. 38871, Civil) and hold Certification as a Professional Traffic Operations Engineer (PTOE) from the Transportation Professional Certification Board, Inc. (TPCB), an independent affiliate of the Institute of Transportation Engineers (ITE) (PTOE Certificate No. 993). I am also a Fellow of the Institute of Transportation Engineers (FITE).

Sincerely,

VANASSE & ASSOCIATES, INC.

Jeffrey S. Dirk, P.E., PTOE, FITE
Managing Partner

CONTENTS

EXECUTIVE SUMMARY	1
INTRODUCTION.....	4
Project Description.....	4
Study Methodology	5
EXISTING CONDITIONS	6
Roadway.....	6
Intersections.....	7
Traffic Volumes.....	7
Traffic-Volume Adjustments.....	7
Pedestrian and Bicycle Facilities.....	8
Public Transportation.....	9
Spot Speed Measurements.....	9
Motor Vehicle Crash Data.....	10
FUTURE CONDITIONS	12
Future Traffic Growth.....	12
Project-Generated Traffic.....	14
Trip Distribution and Assignment.....	15
Future Traffic Volumes - Build Condition.....	15
TRAFFIC OPERATIONS ANALYSIS	17
Methodology	17
Analysis Results	19

CONTENTS (Continued)

SIGHT DISTANCE EVALUATION.....21

CONCLUSIONS AND RECOMMENDATIONS.....23

 Conclusions23

 Recommendations24

FIGURES

No.	Title
1	Site Location Map
2	Existing Intersection Lane Use, Travel Lane Width, and Pedestrian Facilities
3	2021 Existing Weekday Peak-Hour Traffic Volumes
4	2028 No-Build Weekday Peak-Hour Traffic Volumes
5	Trip-Distribution Map
6	Project-Generated Weekday Peak-Hour Traffic Volumes
7	2028 Build Weekday Peak-Hour Traffic Volumes

TABLES

No.	Title
1	Study Area Intersection Description
2	2021 Existing Traffic Volumes
3	Vehicle Travel Speed Measurements
4	Motor Vehicle Crash Data Summary
5	Trip-Generation Summary
6	Peak-Hour Traffic-Volume Increases
7	Level-of-Service Criteria for Unsignalized Intersections
8	Unsignalized Intersection Level-of-Service and Vehicle Queue Summary
9	Sight Distance Measurements

EXECUTIVE SUMMARY

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential community to be known as The Cottages at Old Oaken Bucket and located at 279-281 Old Oaken Bucket Road in Scituate, Massachusetts (hereafter referred to as the Project). This assessment was prepared in consultation with the Town of Scituate and the Massachusetts Department of Transportation (MassDOT), and was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports.

Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the Institute of Transportation Engineers (ITE),¹ the Project is expected to generate approximately 240 vehicle trips on an average weekday (two-way, 24-hour volume), with 15 vehicle trips expected during the weekday morning peak-hour and 20 vehicle trips expected during the weekday evening peak-hour;
2. The Project will not result in a significant impact (increase) on motorist delays or vehicle queuing over anticipated future conditions without the Project (No-Build condition), with Project-related impacts defined as an increase in average motorist delay of up to 1.9 seconds with no (0) increase in vehicle queuing predicted to occur;
3. Project-related impacts to the Scituate Rotary were defined as an increase of 6 to 7 vehicles during the weekday peak hours, or approximately one (1) additional vehicle every 9 to 10 minutes, a level of impact that would not be perceivable over existing conditions;
4. Independent of the Project, the Old Oaken Bucket Road approach to Cornet Stetson Road (Route 123) is predicted to operate at capacity (defined as level-of-service (LOS) "E") during both the weekday morning and evening peak hours under No-Build conditions;
5. All movements exiting the Project site driveway to Old Oaken Bucket Road are predicted to operate at LOS A during the peak hours with negligible vehicle queuing;

¹*Trip Generation*, 11th Edition; Institute of Transportation Engineers; Washington, DC; 2021.

6. Independent of the Project, both the Old Oaken Bucket Road/Maple Street/Winter Street and the Route 123/Old Oaken Bucket Road intersections were found to have a motor vehicle crash rate that is above the MassDOT average crash rates for similar intersections. As such, specific recommendations have been provided to advance safety related improvements at these intersections; and
7. Lines of sight at the Project site driveway intersection with Old Oaken Bucket Road were found to exceed or could be made to exceed the recommended minimum sight distance to function in a safe manner based on the appropriate approach speed.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any deficiencies identified at off-site locations evaluated in conjunction with this study. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the east parcel of the Project site will be provided by way of a full-access driveway that will intersect the south side of Old Oaken Bucket Road at the approximate location of the existing driveway that serves 279 Old Oaken Bucket Road. The following recommendations are offered with respect to the design and operation of the Project site access and internal circulation:

- The Project site driveway and internal circulating roads should be 24 feet in width and designed to accommodate the turning and maneuvering requirements of the largest anticipated responding emergency vehicle.
- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.
- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices (MUTCD)*.²
- Pedestrian walkways are proposed within the Project site that will extend to Old Oaken Bucket Road and will include marked crosswalks with Americans with Disabilities Act (ADA) compliant wheelchair ramps at all pedestrian crossings.
- Driveways to the residential units should be a minimum of 21 feet long measured between the garage door and the far edge of the sidewalk (edge closest to the residence) where a sidewalk is provided, and 23 feet measured between the garage door and the edge of the traveled-way in locations without a sidewalk.

²*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

- Signs and landscaping to be installed as a part of the Project within the intersection sight triangle areas of the Project site driveway should be designed and maintained so as not to restrict lines of sight.
- Snow accumulation (windrows) within sight triangle areas of the Project site driveway should be promptly removed where such accumulations would impede sight lines.
- Existing trees and vegetation located along the south side of Old Oaken Bucket Road within the intersection triangle areas of the Project site driveway should be selectively trimmed or removed and maintained, and the existing embankment to the east of the Project site driveway along the south side of Old Oaken Bucket Road should be regraded in order to provide the required line of sight.

Off-Site

Old Oaken Bucket Road/Maple Street/Winter Street and Route 123/Old Oaken Bucket Road

Independent of the Project, the Old Oaken Bucket Road/Maple Street/Winter Street and Route 123/Old Oaken Bucket Road intersections were identified to have motor vehicle crash histories that warrant further review and advancement of specific improvements to enhance safety. In an effort to advance safety-related improvements at these intersections, the Project proponent will: i) facilitate the completion of a Road Safety Audit (RSA) at the intersections in order identify improvement strategies, and ii) design and construct the short-term improvements that are suggested as a part of the RSA subject to receipt of all necessary rights, permits, and approvals.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing transportation system.

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential community to be known as The Cottages at Old Oaken Bucket and located at 279-281 Old Oaken Bucket Road in Scituate, Massachusetts (hereafter referred to as the Project). This study evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project, along Old Oaken Bucket Road and at the following specific intersections: Old Oaken Bucket Road at Maple Street and Winter Street and Corner Stetson Road (Route 123) at Old Oaken Bucket Road. In addition, a qualitative assessment of Project-related impacts to the Scituate Rotary (Chief Justice Cushing Highway (Route 3A) at Route 123, New Driftway and County Road) was also undertaken.

PROJECT DESCRIPTION

The Project will entail the construction of a 34-unit residential community to be known as The Cottages at Old Oaken Bucket and located at 279-281 Old Oaken Bucket Road in Scituate, Massachusetts. As proposed, the residential units will include six (6) detached single-family cottages and 14 duplex cottages (28 units total). The Project site encompasses approximately 11.3± acres of land that is generally bounded by Old Oaken Bucket Road, residential properties to the north; residential properties and areas of open wooded space to the east and west; and areas of open and wooded space to the south. Figure 1 depicts the Project site location in relation to the existing roadway network. The Project site currently contains two (2) single-family homes and associated appurtenances located at 279 and 281 Old Oaken Bucket Road, respectively. The single-family home located at 281 Old Oaken Bucket Road may be renovated to serve as a duplex cottage, or, alternatively, both structures and their associated appurtenances will be removed.

Access to the east parcel of the Project site will be provided by way of a full-access driveway that will intersect the south side of Old Oaken Bucket Road at the approximate location of the existing driveway that serves 279 Old Oaken Bucket Road.



Figure 1

Site Location Map

Off-street parking will be provided in individual garages and driveways that will accommodate a minimum of two (2) vehicles per unit, which is consistent with the parking requirements for single-family and two-family homes as specified in Section 760.6, *Parking Requirements*, of the Town of Scituate Zoning Bylaws.³

STUDY METHODOLOGY

This study was prepared in consultation with the Town of Scituate and Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics; pedestrian and bicycle facilities; public transportation services; observations of traffic flow; and collection of daily and peak-period traffic counts.

In the second stage of the study, future traffic conditions were projected and analyzed. Specific travel demand forecasts for the Project were assessed along with future traffic demands due to expected traffic growth independent of the Project. A seven-year time horizon was selected for analyses consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. The traffic analysis conducted in stage two identifies existing or projected future roadway capacity, traffic safety, and site access issues.

The third stage of the study presents and evaluates measures to address traffic and safety issues, if any, identified in stage two of the study.

³The Zoning bylaw requires that 2.0 parking spaces be provided for a single-family home and that 4.0 parking spaces be provided for a two-family home.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in August, November and December 2021. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area that was assessed for the Project consisted of Old Oaken Bucket Road and the following specific intersections: Old Oaken Bucket Road at Maple Street and Winter Street and Cornet Stetson Road (Route 123) at Old Oaken Bucket Road. In addition, a review of the motor vehicle crash history and a qualitative analysis of potential impacts resulting from the Project was completed at the Scituate Rotary (Chief Justice Cushing Highway (Route 3A) at Route 123, New Driftway and County Road).

The following describes the study area roadway and intersections.

ROADWAY

Old Oaken Bucket Road

- Two-lane urban collector roadway that is under Town jurisdiction;
- Traverses the study area in a general east-west direction;
- Provides two 12-foot wide travel lanes that are separated by a double-yellow centerline with no marked shoulders provided;
- The posted speed limit is 30 miles per hour (mph) in the vicinity of the Project site;
- Sidewalks are not provided within the study area;
- Illumination is provided intermittently by way of streetlights mounted on wooden poles; and
- Land use within the study area consists of the Project site, residential and agricultural properties, and areas of open and wooded space.

INTERSECTIONS

Table 1 and Figure 2 summarize lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in August 2021.

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type^a	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Old Oaken Bucket Rd./ Maple St./ Winter St.	S (All-Way)	One general-purpose travel lane on all approaches	No	No	No
Rte. 123/ Old Oaken Bucket Rd.	S	One general-purpose travel lane on all approaches	Yes; 2 feet on Route 123	Yes; sidewalks along the north side of Route 123 east of Old Oaken Bucket Rd.; crosswalks provided across Old Oaken Bucket Rd.	Yes; Shared traveled-way ^b on Route 123 east of Old Oaken Bucket Rd.

^aS = STOP-sign control.

^bCombined shoulder and travel lane width equal to or exceed 14 feet.

TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, manual turning movement counts (TMCs), and vehicle classification counts were completed in November 2021. The ATR counts were conducted on November 3rd through 4th, 2021 (Wednesday through Thursday, inclusive) on Old Oaken Bucket Road in the vicinity of the Project site in order to record weekday traffic conditions over an extended period, with weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak-period manual TMCs performed at the study area intersections on November 3rd, 2021 (Wednesday). These time periods were selected for analysis purposes as they are representative of the peak-traffic-volume hours for both the Project and the adjacent roadway network.

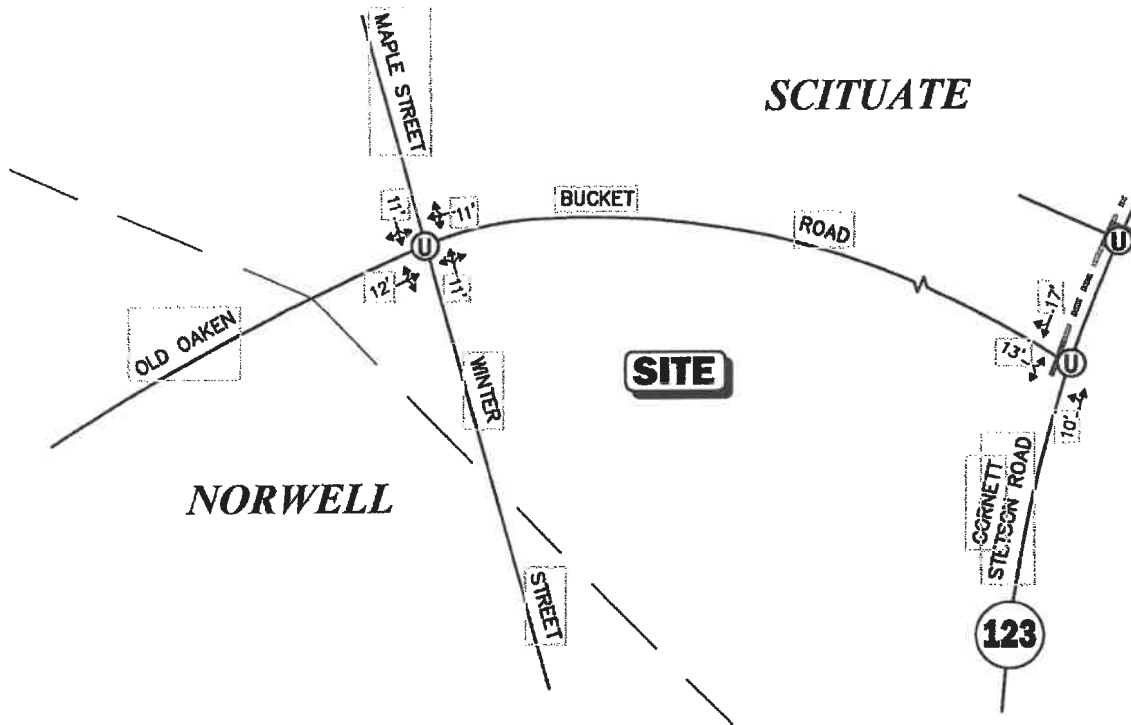
Traffic-Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, traffic-volume data from MassDOT Continuous Count Station No. 7318 located on Southeast Expressway (Route 3) in Hingham were reviewed.⁴ Based on a review of this data, it was determined that traffic volumes during the month of November are approximately 2.9 percent below average-month conditions. As such, the November traffic volumes were adjusted upward

⁴MassDOT Traffic Volumes for the Commonwealth of Massachusetts; 2021.

Legend:

- ⓪ Unsignalized Intersection
- Sidewalk
- Crosswalk
- XX' Lane Use and Travel Lane Width



Not To Scale



Figure 2
Existing Intersection Lane Use, Travel Lane Width, and Pedestrian Facilities

by 2.9 percent in order to be representative of average-month conditions. Adjustments to the traffic-volume data in order to account for the impacts associated with restrictions imposed as a result of the COVID-19 pandemic were not required as the mandatory restrictions were lifted and replaced with voluntary measures on May 28th, 2021, prior to the date of the collection of the traffic-volume data that forms the basis of this assessment.

The 2021 Existing traffic volumes are summarized in Table 2, with the weekday morning and evening peak-hour traffic volumes graphically depicted on Figure 3. Note that the peak-hour traffic volumes presented in Table 2 were obtained from aforementioned figures.

**Table 2
2021 EXISTING TRAFFIC VOLUMES**

Location/Peak Hour	AWT ^a	VPH ^b	K Factor ^c	Directional Distribution ^d
<i>Old Oaken Bucket Road, west of Maple Street:</i>	4,025	--	--	--
Weekday Morning (8:00 – 9:00 AM)	--	340	8.5	65.6% WB
Weekday Evening (4:00 – 5:00 PM)	--	406	10.1	55.9% EB

^aAverage weekday traffic in vehicles per day.

^bVehicles per hour.

^cPercent of daily traffic occurring during the peak hour.

^dPercent traveling in peak direction.

WB = westbound, EB = eastbound.

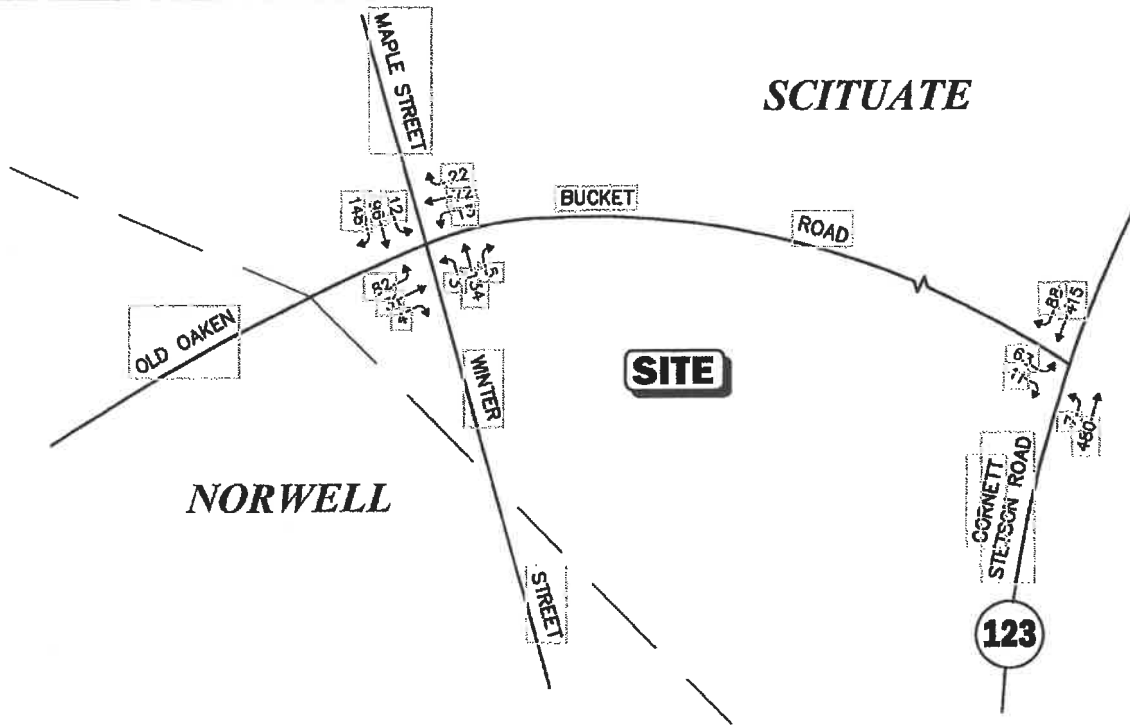
As can be seen in Table 2, Old Oaken Bucket Road in the vicinity of the Project site was found to accommodate approximately 4,025 vehicles on an average weekday (two-way, 24-hour volume), with approximately 340 vehicles per hour (vph) during the weekday morning peak hour and 406 vph during the weekday evening peak hour.

PEDESTRIAN AND BICYCLE FACILITIES

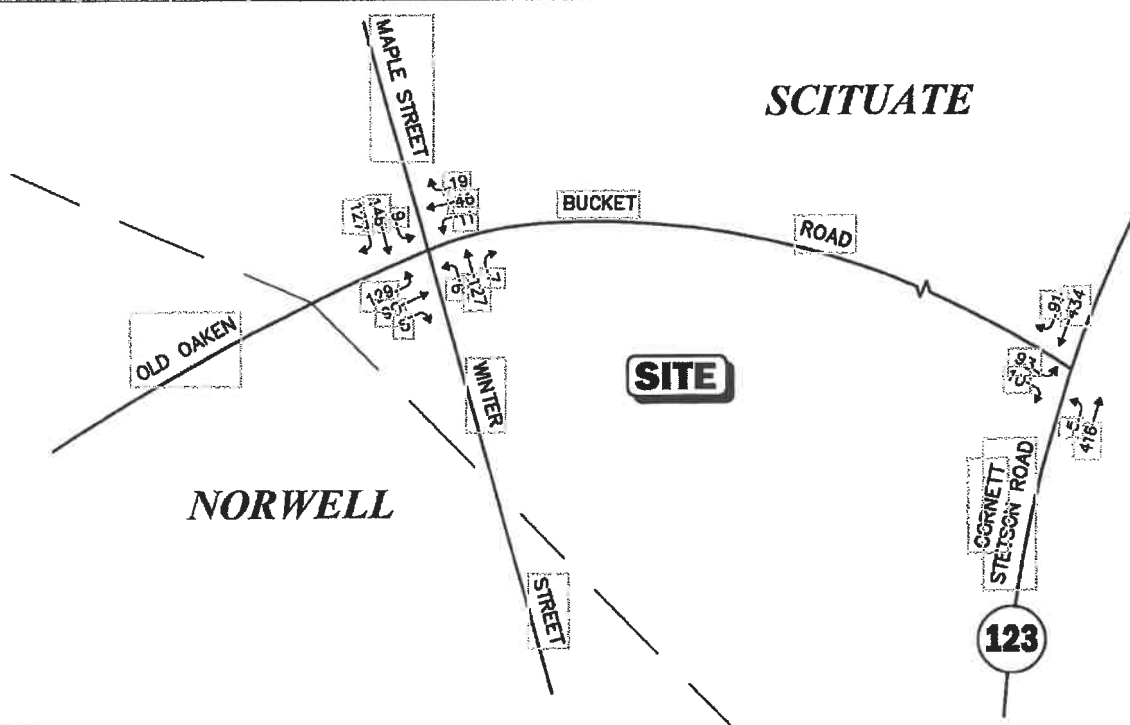
A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in August 2021. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadway and at the study intersections, as well as the location of existing and planned future bicycle facilities. As detailed on Figure 2, sidewalks are not provided along Old Oaken Bucket Road within the study area. A sidewalk is provided along the north side of Route 123 east of Old Oaken Bucket Road that includes a crosswalk across Old Oaken Bucket Road. Formal bicycle facilities are not currently provided within the study area and the study area roadways do not provide sufficient width (combined travel lane and shoulder) on a continuous basis to support bicycle travel in a shared traveled-way configuration.⁵

⁵A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared traveled-way condition.

WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



WEEKDAY EVENING PEAK HOUR (4:00 - 5:00 PM)



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale

Figure 3



2021 Existing Peak-Hour Traffic Volumes

PUBLIC TRANSPORTATION

Regularly scheduled public transportation services are provided to the Town of Scituate but are not currently available at the Project site. The Massachusetts Bay Transit Authority (MBTA) provides Commuter Rail service to South Station in Boston on the Greenbush Line from Greenbush Station in Scituate, which is located at 247 Old Driftway (an approximate 4-minute driving distance to the east of the Project site). In addition, the MBTA provides The RIDE paratransit services to eligible persons who cannot use fixed-route transit (bus, subway, trolley) due to a physical, cognitive, or mental disability in compliance with the Americans with Disabilities Act (ADA), and the Scituate Council on Aging (COA) provides transportation services to Scituate residents age 60+ and those who meet ADA requirements for medical appointments, COA events, shopping, and recreational activities.

The public transportation schedules and fare information are provided in the Appendix.

SPOT SPEED MEASUREMENTS

Vehicle travel speed measurements were performed on Old Oaken Road in the vicinity of the Project site on November 3rd through 4th, 2021 (Wednesday through Thursday, inclusive). Table 3 summarizes the vehicle travel speed measurements.

Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS

	Old Oaken Bucket Road	
	Eastbound	Westbound
Mean Travel Speed (mph)	34	35
85 th Percentile Speed (mph)	38	38
Posted Speed Limit (mph)	30	30

mph = miles per hour.

As can be seen in Table 3, the mean vehicle travel speed along Old Oaken Bucket Road in the vicinity of the Project site was found to be 34 mph in the eastbound direction and 35 mph westbound. The measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be 38 mph in both the east and westbound directions, which is 8 mph above the posted speed limit (30 mph). The 85th percentile speed is used as the basis of engineering design and in the evaluation of sight distances and is often used in establishing posted speed limits.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2014 through 2018, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, roadway and weather conditions, and day of occurrence, and presented in Table 4.

As can be seen in Table 4, the study area intersections were found to have experienced an average of 3.2 or fewer motor vehicle crashes per year over the five-year review period, the majority of which occurred on a weekday; during daylight under clear weather conditions; and involved angle-type collisions that resulted in property damage only. The Old Oaken Bucket Road/Maple Street/Winter Street and the Route 123 at Old Oaken Bucket Road intersections were found to have a motor vehicle crash rate that is above both the MassDOT statewide and District average crash rates for similar intersections for the MassDOT Highway Division District in which the intersections are located (District 5). As such, specific safety-related improvements have been identified for this intersection that will be undertaken as a part of the Project (discussed in the *Recommendations* section of this assessment).

The Scituate Rotary was reported to have experience a total of 19 crashes over the five-year review period, or an average of 3.8 crashes per year, the majority of which occurred on a weekday; during daylight under clear weather conditions; and involved rear-end type collisions that resulted in property damage only. A Road Safety Audit (RSA) is being performed for the Scituate Rotary by the proponent of the Greenbush mixed-use development that is planned within a portion of the MBTA Greenbush Station parking lot that is situated east of Old Driftway and north of New Driftway. The RSA will serve to identify safety enhancements for the rotary as countermeasures to address motor vehicle crash patterns. The RSA is expected to be complete in early 2022.

A review of the MassDOT statewide High Crash Location List indicated that there are no locations within the Town of Scituate that are included on MassDOT's Highway Safety Improvement Program (HSIP) listing as high crash locations. In addition, no fatal motor vehicle crashes were reported to have occurred at the study area intersections over the five-year review period.

The detailed MassDOT Crash Rate Worksheets are provided in the Appendix.

**Table 4
MOTOR VEHICLE CRASH DATA SUMMARY^a**

	Old Oaken Bucket Road/ Maple Street/ Winter Street	Route 123/ Old Oaken Bucket Road	Old Oaken Bucket Road/ Project Driveway	Scituate Rotary ^f
Traffic Control Type: ^b	U	U	U	U
<i>Year:</i>				
2014	2	2	0	7
2015	3	2	0	2
2016	1	3	0	3
2017	4	3	1	4
<u>2018</u>	<u>6</u>	<u>5</u>	<u>0</u>	<u>3</u>
Total	16	15	1	19
Average Rate ^c	3.20	3.00	0.20	3.80
MassDOT Crash Rate: ^d	0.57/0.57	0.57/0.57	0.57/0.57	--
Significant? ^e	Yes	Yes	No	--
<i>Type:</i>				
Angle	11	6	0	1
Rear-End	0	4	0	8
Head-On	0	0	0	1
Sideswipe	3	3	0	2
Fixed Object	1	2	1	6
Pedestrian/Bicycle	0	0	0	1
<u>Unknown/Other</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	16	15	1	19
<i>Conditions:</i>				
Clear	9	7	0	12
Cloudy	5	1	0	4
Rain	1	2	0	2
Fog/Smog/Smoke	0	2	0	0
<u>Snow/Ice</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>1</u>
Total	16	15	1	19
<i>Lighting:</i>				
Daylight	13	10	1	13
Dawn/Dusk	1	2	0	1
Dark (Road Lit)	1	2	0	5
<u>Dark (Road Unlit)</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>
Total	16	15	1	19
<i>Day of Week:</i>				
Monday through Friday	11	11	1	16
Saturday	2	3	0	1
<u>Sunday</u>	<u>3</u>	<u>1</u>	<u>0</u>	<u>2</u>
Total	16	15	1	19
<i>Severity:</i>				
Property Damage Only	11	13	1	14
Personal Injury	4	2	0	3
Fatality	0	0	0	0
<u>Unknown</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>2</u>
Total	16	15	1	19

^aSource: MassDOT Safety Management/Traffic Operations Unit records, 2014 through 2018.

^bTraffic Control Type: U = unsignalized; TS = traffic signal.

^cCrash rate per million vehicles entering the intersection.

^dDistrictwide/Statewide crash rate.

^eThe intersection crash rate is significant if it is found to exceed the MassDOT crash rate for the MassDOT Highway Division District in which the Project is located (District 5).

^fExpanded study area intersection.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2028, which reflects a seven-year planning horizon consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. Independent of the Project, traffic volumes on the roadway network in the year 2028 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2028 No-Build traffic volumes to reflect 2028 Build traffic-volume conditions with the Project.

FUTURE TRAFFIC GROWTH

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, potential population growth and development external to the study area would not be accounted for in the resulting traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

The Town of Scituate was consulted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. Based on this discussion, the following projects were identified for review in conjunction with this assessment:

- ***Greenbush Mixed-Use Development, New Driftway, Scituate, Massachusetts.*** This project will entail the construction of 78 multifamily residential units and approximately 10,593 square feet (sf) of retail space that will include a 2,010± sf coffee shop, 2,012± sf of commercial space and 6,571± sf of retail space to be situated within an underutilized

parking lot that serves the MBTA Greenbush Commuter Rail Station. Traffic volumes associated with this project within the study area were obtained from the traffic study prepared for the project and were incorporated into the future condition traffic volumes.⁶

- ***Proposed Mixed-Use Development, 48-52 New Driftway, Scituate, Massachusetts.*** This project entails the construction of a mixed-use commercial development that includes a four pump, eight vehicle fueling position fueling facility, a 4,000± sf convenience store, and 1,500± sf of retail/restaurant space. Based on a review of the traffic study that was prepared for the project,⁷ traffic volumes associated with this project within the study area of this assessment are expected to be relatively minor and would be reflected in the general background growth rate (discussion follows).
- ***Proposed Residential Development, 7 New Driftway, Scituate, Massachusetts.*** This proposed project entails the construction of a four-story, 21-unit multifamily residential building located at 7 New Driftway. Based on a review of the Traffic Assessment that was prepared for the project,⁸ the multifamily development will result in an overall reduction in traffic when compared to the former medical office building that operated within the site.

No other developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

Traffic-volume data compiled by MassDOT from permanent count stations located in the region were reviewed in order to determine general traffic growth trends in the area. This data indicates that traffic volumes have fluctuated over the past several years (2015 to 2019), ranging from a decrease of 0.5 percent to an increase of 2.0 percent, with the average growth rate found to be approximately 0.7 percent. In order to provide a prudent planning condition for the Project, a slightly higher 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

MassDOT and the Town of Scituate were consulted in order to determine if there were any planned future roadway improvement projects expected to be complete by 2028 within the study area. Based on these discussions, no roadway improvement projects aside from routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

The 2028 No-Build condition peak-hour traffic volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2021 Existing peak-hour traffic volumes and then adding the peak-hour traffic volumes associated with the identified

⁶*Traffic Impact and Access Study, Proposed Mixed-Use Development, Scituate, Massachusetts; VHB; January 2019.*

⁷*Traffic Impact and Access Study, Proposed Mixed-Use Development, Scituate, Massachusetts; VHB; July 2020.*

⁸*Traffic Assessment, Proposed Multifamily Residential Development, Scituate, Massachusetts; Gillon Associates; October 2021.*

specific development project by others. The resulting 2028 No-Build weekday morning and evening peak-hour traffic volumes are shown on Figure 4.

PROJECT-GENERATED TRAFFIC

Design year (2028 Build) traffic volumes for the study area roadways were determined by estimating Project-generated traffic volumes and assigning those volumes on the study roadways. The following sections describe the methodology used to develop the anticipated traffic characteristics of the Project.

As proposed, the Project will entail the construction of a 34-unit residential community that will consist of six (6) detached single-family cottages and 14 duplex cottages (28 units total). In order to develop the traffic characteristics of the Project, trip-generation statistics published by the ITE⁹ for similar land uses as those proposed were used. ITE Land Use Codes (LUCs) 210, *Single-Family Detached Housing*, and 215, *Single-Family Attached Housing*, were used to develop the traffic characteristics of the Project, the results of which are summarized in Table 5.

**Table 5
TRIP-GENERATION SUMMARY**

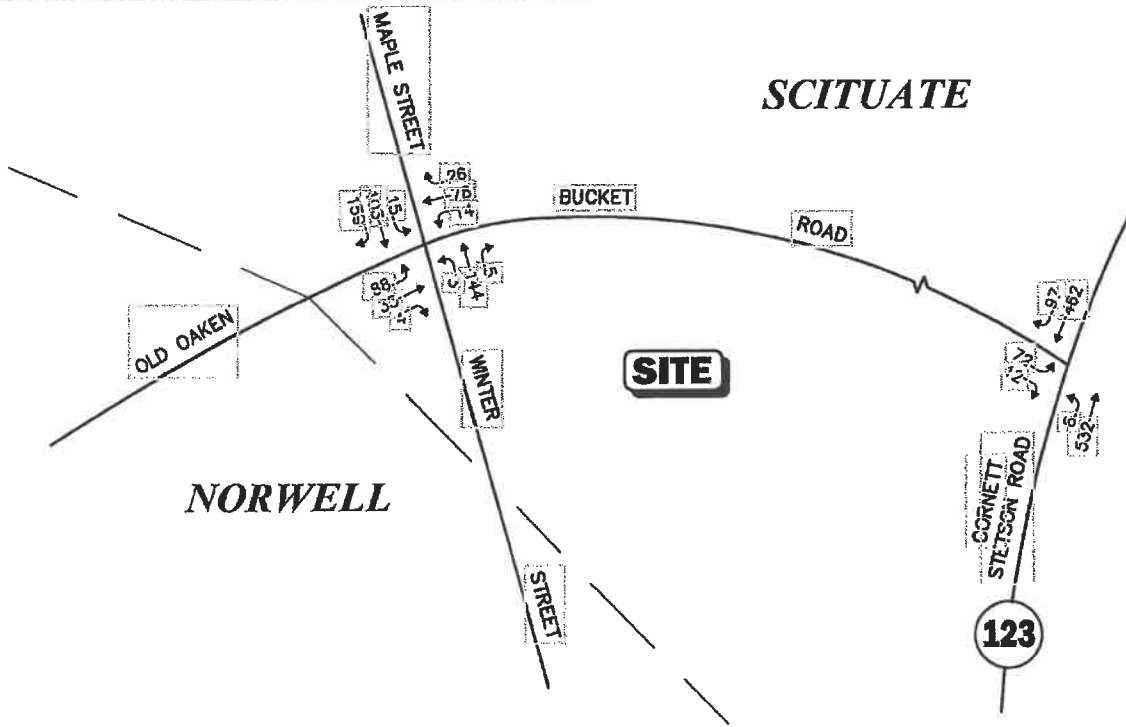
Time Period/Direction	(A) Single-Family Detached Housing (6 Dwellings) ^a	(B) Single-Family Attached Housing (28 Dwellings) ^b	(C = A+B) Total Trips
<i>Average Weekday Daily:</i>			
Entering	38	82	120
Exiting	38	82	120
Total	76	164	240
<i>Weekday Morning Peak Hour:</i>			
Entering	2	3	5
Exiting	4	6	10
Total	6	9	15
<i>Weekday Evening Peak Hour:</i>			
Entering	4	7	11
Exiting	3	6	9
Total	7	13	20

^aBased on ITE LUC 210, *Single-Family Detached Housing*.

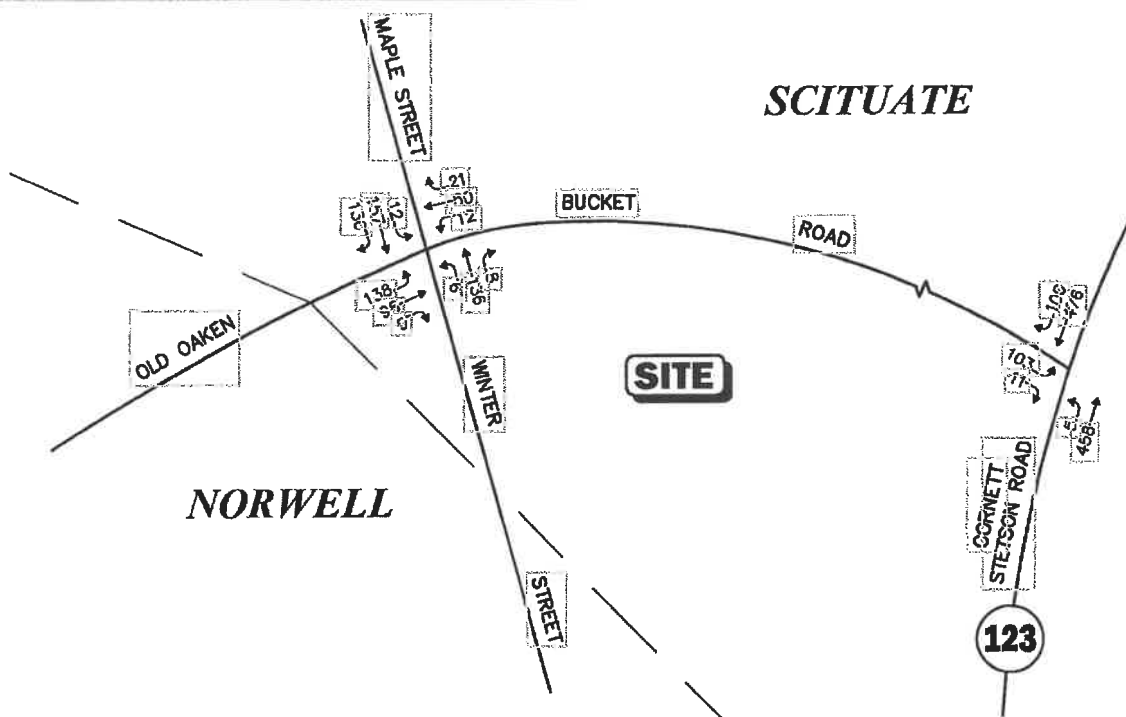
^bBased on ITE LUC 215, *Single-Family Attached Housing*.

⁹Ibid 1.

WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



WEEKDAY EVENING PEAK HOUR (4:00 - 5:00 PM)



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale



Figure 4
2028 No-Build
Peak-Hour Traffic Volumes

Project-Generated Traffic Volume Summary

As can be seen in Table 5, the Project is expected to generate approximately 240 vehicle trips on an average weekday (two-way, 24-hour volume, or 120 vehicles entering and 120 exiting), with 15 vehicle trips (5 vehicles entering and 10 exiting) expected during the weekday morning peak-hour and 20 vehicle trips (11 vehicles entering and 9 exiting) expected during the weekday evening peak-hour.

TRIP DISTRIBUTION AND ASSIGNMENT

The directional distribution of generated trips to and from the Project site was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Scituate and then refined based on existing traffic patterns within the study area. This methodology is consistent with the residential nature of the Project. The general trip distribution for the Project is graphically depicted on Figure 5. The additional traffic expected to be generated by the Project was assigned on the study area roadway network as shown in Figure 6.

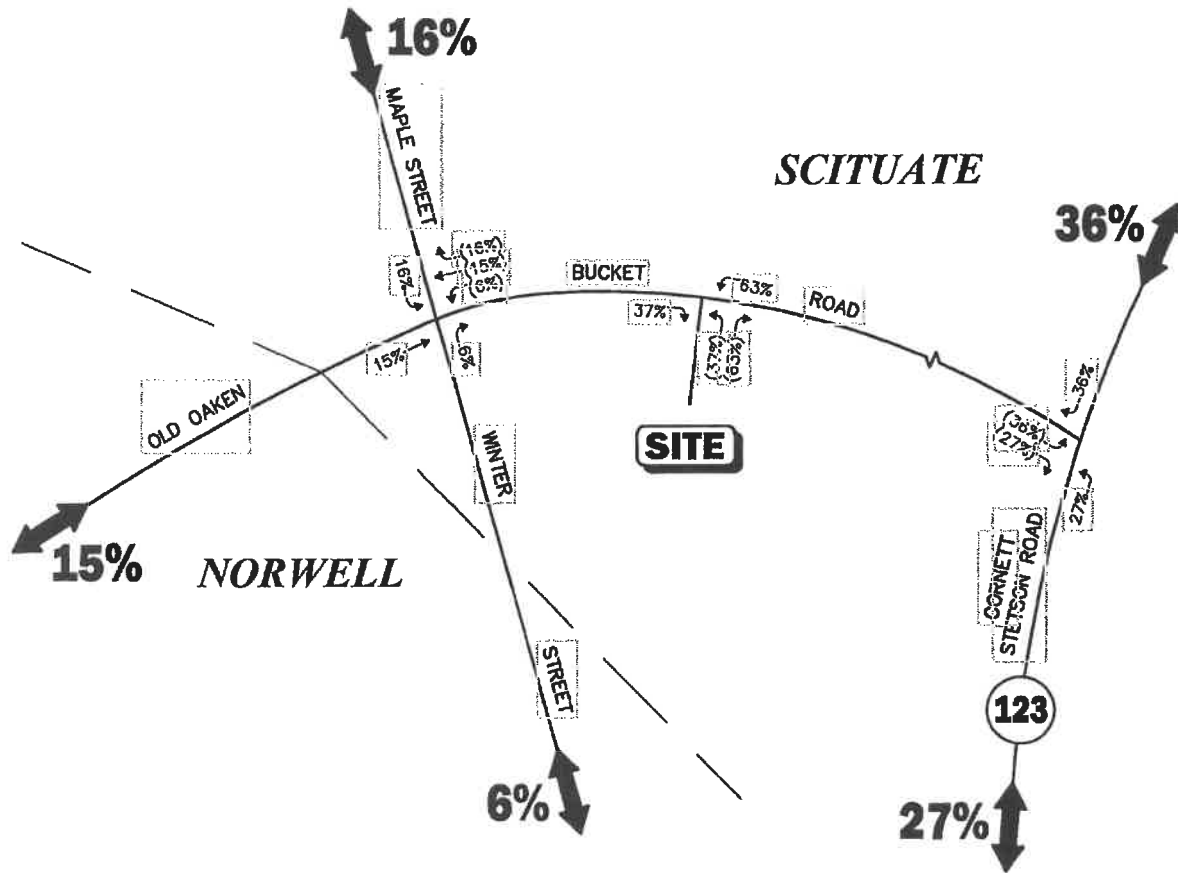
FUTURE TRAFFIC VOLUMES - BUILD CONDITION

The 2028 Build condition traffic volumes consist of the 2028 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The 2028 Build weekday morning and evening peak-hour traffic volumes are graphically depicted on Figure 7.

A summary of peak-hour projected traffic-volume changes outside of the study area that is the subject of this assessment is shown in Table 6. These changes are a result of the construction of the Project.

Legend:

- XX Entering Trips
- (XX) Exiting Trips



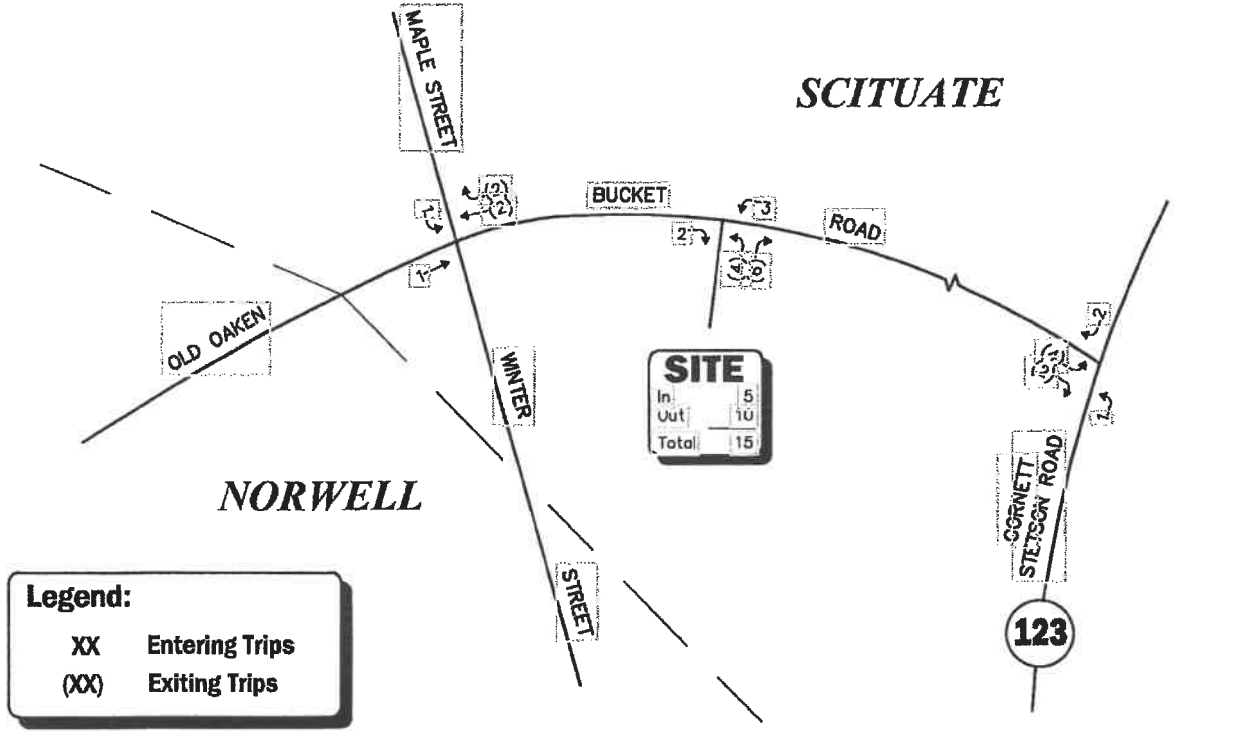
Not To Scale

Figure 5

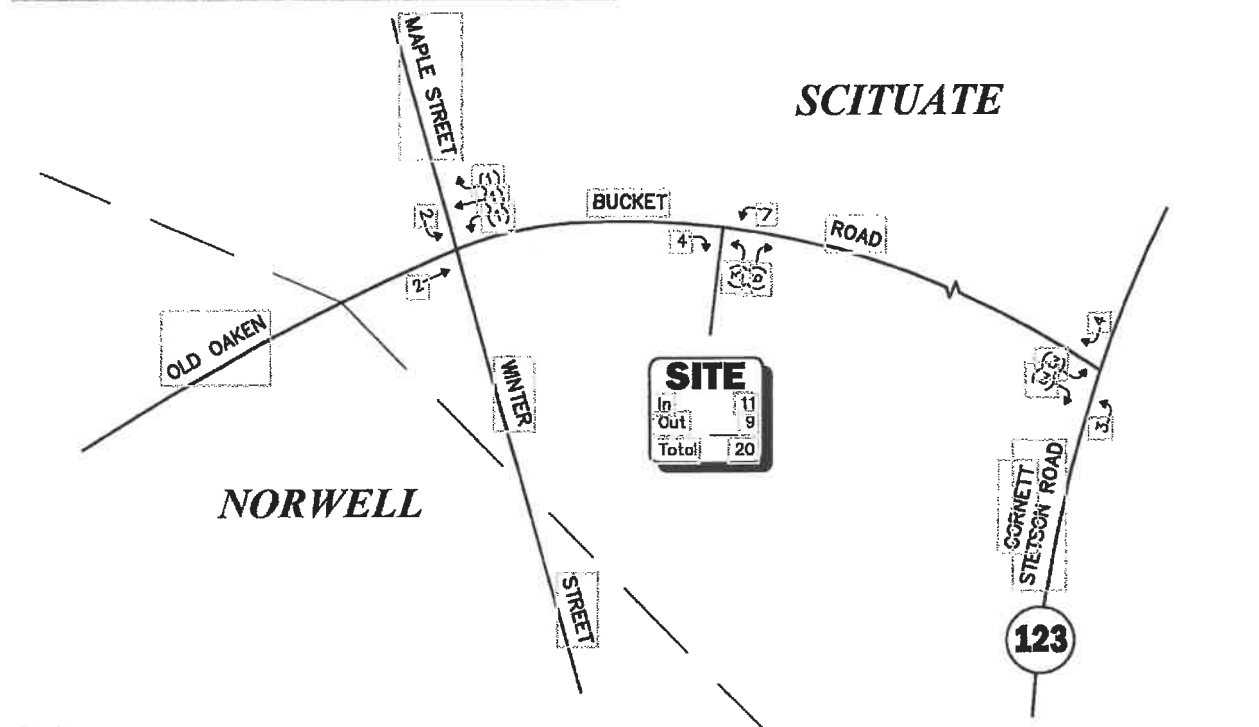
Trip Distribution Map



WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



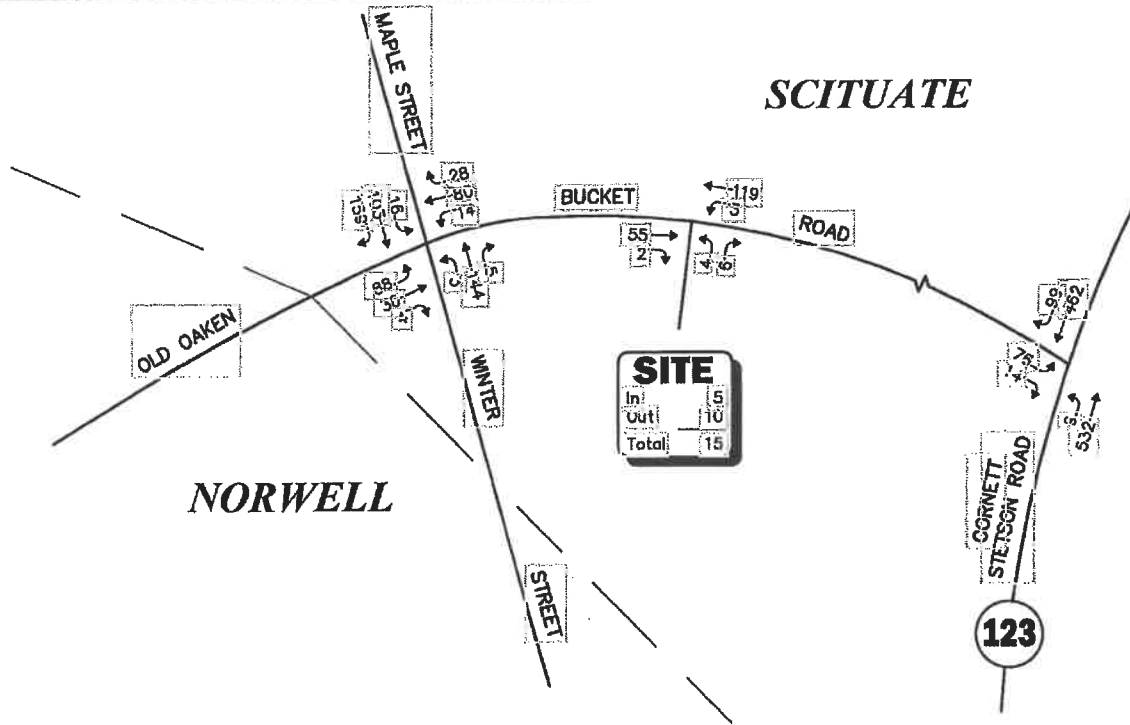
WEEKDAY EVENING PEAK HOUR (4:00 - 5:00 PM)



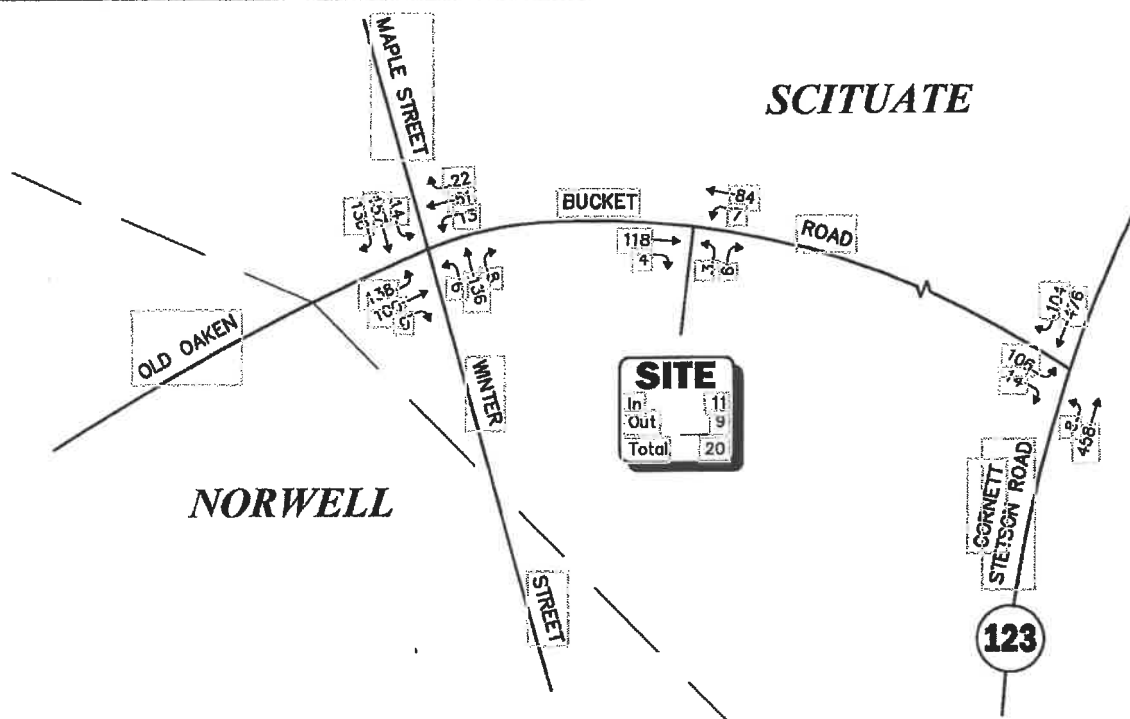
*Volumes generated by Parcel 2.
Not To Scale

Figure 6

WEEKDAY MORNING PEAK HOUR (8:00 - 9:00 AM)



WEEKDAY EVENING PEAK HOUR (4:00 - 5:00 PM)



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
 Not To Scale

Figure 7

Table 6
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	2021 Existing	2028 No-Build	2028 Build	Traffic-Volume Increase Over No-Build	Percent Increase Over No-Build
<i>Maple Street, north of Old Oaken Bucket Road:</i>					
Weekday Morning	494	535	538	3	0.6
Weekday Evening	557	600	603	3	0.5
<i>Winter Street, south of Old Oaken Bucket Road:</i>					
Weekday Morning	255	273	273	0	0.0
Weekday Evening	305	328	329	1	0.3
<i>Old Oaken Bucket Road, west of Maple Street:</i>					
Weekday Morning	340	367	370	3	0.8
Weekday Evening	406	437	440	3	0.7
<i>Route 123, south of Old Oaken Bucket Road:</i>					
Weekday Morning	913	1,014	1,017	3	0.3
Weekday Evening	865	950	956	6	0.6
<i>Route 123, north of Old Oaken Bucket Road:</i>					
Weekday Morning	1,046	1,163	1,169	6	0.5
Weekday Evening	1,034	1,137	1,144	7	0.6

As shown in Table 6, Project-related traffic-volume increases outside of the study area relative to 2028 No-Build conditions are anticipated to range from 0.0 to 0.8 percent during the peak periods, with vehicle increases shown to range from 0 to 7 vehicles. *When distributed over the peak-hour, the predicted traffic volume increases would not result in a significant impact (increase) on motorist delays or vehicle queuing outside of the immediate study area that is the subject of this assessment.*

With specific regard to impacts at the Scituate Rotary, the Project is expected to add 6 to 7 vehicles to the rotary during the weekday peak hours, or approximately one (1) additional vehicle every 9 to 10 minutes, a level of impact that would not be perceivable over existing conditions.

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build, and Build traffic-volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.¹⁰ The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

¹⁰The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual*.¹¹ Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2010 *Highway Capacity Manual*. Table 7 summarizes the relationship between level of service and average control delay for two-way stop controlled and all-way stop controlled intersections.

Table 7
LEVEL-OF-SERVICE CRITERIA FOR
UNSIGNALIZED INTERSECTIONS^a

Level-Of-Service by Volume-to-Capacity Ratio		Average Control Delay (Seconds Per Vehicle)
$v/c \leq 1.0$	$v/c > 1.0$	
A	F	≥ 10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	> 50.0

^aSource: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 19-2.

¹¹*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro® intersection capacity analysis software which is based upon the methodology and procedures presented in the 2010 *Highway Capacity Manual*. The Synchro® vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of 6 seconds or more at an intersection. For signalized intersections, Synchro® reports both the average (50th percentile) the 95th percentile vehicle queue. For unsignalized intersections, Synchro® reports the 95th percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95th percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately 3 minutes out of 60 minutes during the peak one hour of the day (during the remaining 57 minutes, the vehicle queue length will be less than the 95th percentile queue length).

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2021 Existing, 2028 No-Build, and 2028 Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized on Table 8; with the detailed analysis results presented in the Appendix.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area. For context, we note that an LOS of "D" or better is generally defined as "acceptable" operating conditions. Project-related impacts at the study area intersections are shown on Table 8 and are defined as follows:

Old Oaken Bucket Road/Maple Street/Winter Street

No change in level-of-service or vehicle queuing is predicted to occur for any movement over No-Build conditions, with all movements continuing to operate at LOS B or better and Project-related impacts defined as an increase in average motorist delay of less than 1.0 seconds.

Route 123/Old Oaken Bucket Road

No change in level-of-service or vehicle queuing is predicted to occur for any movement over No-Build conditions, with Project-related impacts defined as an increase in average motorist delay of up to 1.9 seconds. Independent of the Project, it was noted that the Old Oaken Bucket Road approach is predicted to operate at its design capacity (i.e., LOS "E") during both the weekday morning and evening peak hours under No-Build conditions, with residual vehicle queues of up to four (4) vehicles.

Old Oaken Bucket Road/Project Site Driveway

All movements at the Project site driveway intersection with Old Oaken Bucket Road were shown to operate at LOS A during the peak hours with negligible vehicle queuing.

**Table 8
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY**

Unsignalized Intersection/ Peak Hour/Movement	2021 Existing			2028 No-Build			2028 Build					
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Old Oaken Bucket Road/Maple Street/Winter Street												
<i>Weekday Morning:</i>												
Old Oaken Bucket Road EB LT/TH/RT	117	9.5	A	1	127	9.9	A	1	128	10.0	A	1
Old Oaken Bucket Road WB LT/TH/RT	107	9.3	A	1	118	9.7	A	1	122	9.8	A	1
Winter Street NB LT/TH/RT	142	9.4	A	1	152	9.9	A	1	152	9.9	A	1
Maple Street SB LT/TH/RT	256	10.5	B	2	277	11.2	B	2	278	11.4	B	2
<i>Weekday Evening:</i>												
Old Oaken Bucket Road EB LT/TH/RT	227	12.2	B	2	245	13.2	B	3	247	13.3	B	3
Old Oaken Bucket Road WB LT/TH/RT	76	9.9	A	1	83	10.4	B	1	86	10.5	B	1
Winter Street NB LT/TH/RT	140	10.7	B	1	150	11.3	B	1	150	11.4	B	1
Maple Street SB LT/TH/RT	282	12.1	B	3	305	13.3	B	3	307	13.5	B	3
Route 123/Olden Bucket Road												
<i>Weekday Morning:</i>												
Old Oaken Bucket Road EB LT/RT	74	26.6	D	2	84	36.4	E	3	90	38.3	E	3
Route 123 NB LT/TH	487	0.1	A	0	540	0.1	A	0	541	0.1	A	0
Route 123 SB TH/RT	503	0.0	A	0	559	0.0	A	0	561	0.0	A	0
<i>Weekday Evening:</i>												
Old Oaken Bucket Road EB LT/RT	103	30.9	D	3	114	42.8	E	4	120	44.0	E	4
Route 123 NB LT/TH	421	0.1	A	0	463	0.1	A	0	466	0.2	A	0
Route 123 SB TH/RT	525	0.0	A	0	576	0.0	A	0	580	0.0	A	0
Old Oaken Bucket Road/Project Driveway												
<i>Weekday Morning:</i>												
Old Oaken Bucket Road EB TH/RT	--	--	--	--	--	--	--	--	57	0.0	A	0
Old Oaken Bucket Road WB LT/TH	--	--	--	--	--	--	--	--	122	0.2	A	0
Project Driveway NB LT/RT	--	--	--	--	--	--	--	--	10	9.1	A	0
<i>Weekday Evening:</i>												
Old Oaken Bucket Road EB TH/RT	--	--	--	--	--	--	--	--	122	0.0	A	0
Old Oaken Bucket Road WB LT/TH	--	--	--	--	--	--	--	--	91	0.5	A	0
Project Driveway NB LT/RT	--	--	--	--	--	--	--	--	9	9.4	A	0

^aDemand in vehicles per hour.

^bAverage control delay per vehicle (in seconds).

^cLevel of service.

^dQueue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements

SIGHT DISTANCE EVALUATION

Sight distance measurements were performed at the Project site driveway intersection with Old Oaken Bucket Road in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)¹² requirements. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with oncoming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 9 presents the measured SSD and ISD at the subject intersection.

¹²*A Policy on Geometric Design of Highway and Streets*, 7th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2018.

**Table 9
SIGHT DISTANCE MEASUREMENTS^a**

Intersection/Sight Distance Measurement	Feet		
	Required Minimum (SSD)	Desirable (ISD) ^b	Measured
Old Oaken Bucket Road at the Project Site Driveway			
<i>Stopping Sight Distance:</i>			
Old Oaken Bucket Road approaching from the east	305	--	336
Old Oaken Bucket Road approaching from the west	305	--	362
<i>Intersection Sight Distance:</i>			
Looking to the east from the Project Driveway	305	445	216/500+ ^c
Looking to the west from the Project Driveway	305	385	321

^aRecommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 7th Edition; American Association of State Highway and Transportation Officials (AASHTO), 2018; and based on a 40 mph approach speed on Old Oaken Bucket Road.

^bValues shown are the intersection sight distance for a vehicle turning right or left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

^cAvailable sight distance with the selective trimming/removal of trees and vegetation located within the sight triangle area and the regrading of the embankment to the east of the Project site driveway along the south side of Old Oaken Bucket Road.

As can be seen in Table 9, with the selective trimming or removal of trees and vegetation located along within the sight triangle areas of the Project site driveway and the regrading of the existing embankment to the east of the Project site driveway along the south side of Old Oaken Bucket Road, the available lines of sight to and from the Project site driveway intersection with Old Oaken Bucket Road were found to exceed the recommended minimum sight distances to function in a safe (SSD) manner based on a 40 mph appropriate approach speed, which is consistent with the measured 85th percentile vehicle travel speed (38 mph) and 10 mph above the posted speed limit (30 mph).

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

VAI has completed a detailed assessment of the potential impacts on the transportation infrastructure associated with the proposed construction of a residential community to be known as The Cottages at Old Oaken Bucket and located at 279-281 Old Oaken Bucket Road in Scituate, Massachusetts. The following specific areas have been evaluated as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE,¹³ the Project is expected to generate approximately 240 vehicle trips on an average weekday (two-way, 24-hour volume), with 15 vehicle trips expected during the weekday morning peak-hour and 20 vehicle trips expected during the weekday evening peak-hour;
2. The Project will not result in a significant impact (increase) on motorist delays or vehicle queuing over anticipated future conditions without the Project (No-Build condition), with Project-related impacts defined as an increase in average motorist delay of up to 1.9 seconds with no (0) increase in vehicle queuing predicted to occur;
3. Project-related impacts to the Scituate Rotary were defined as an increase of 6 to 7 vehicles during the weekday peak hours, or approximately one (1) additional vehicle every 9 to 10 minutes, a level of impact that would not be perceivable over existing conditions;
4. Independent of the Project, the Old Oaken Bucket Road approach to Cornet Stetson Road (Route 123) is predicted to operate at capacity (defined as LOS "E") during both the weekday morning and evening peak hours under No-Build conditions;
5. All movements exiting the Project site driveway to Old Oaken Bucket Road are predicted to operate at LOS A during the peak hours with negligible vehicle queuing;

¹³Ibid 1.

6. Independent of the Project, both the Old Oaken Bucket Road/Maple Street/Winter Street and the Route 123/Old Oaken Bucket Road intersections were found to have a motor vehicle crash rate that is above the MassDOT average crash rates for similar intersections. As such, specific recommendations have been provided to advance safety related improvements at these intersections; and
7. Lines of sight at the Project site driveway intersection with Old Oaken Bucket Road were found to exceed or could be made to exceed the recommended minimum sight distance to function in a safe manner based on the appropriate approach speed.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site and address any deficiencies identified at off-site locations evaluated in conjunction with this study. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the east parcel of the Project site will be provided by way of a full-access driveway that will intersect the south side of Old Oaken Bucket Road at the approximate location of the existing driveway that serves 279 Old Oaken Bucket Road. The following recommendations are offered with respect to the design and operation of the Project site access and internal circulation:

- The Project site driveway and internal circulating roads should be 24 feet in width and designed to accommodate the turning and maneuvering requirements of the largest anticipated responding emergency vehicle.
- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.
- All signs and pavement markings to be installed within the Project site should conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).¹⁴
- Pedestrian walkways are proposed within the Project site that will extend to Old Oaken Bucket Road and will include marked crosswalks with Americans with Disabilities Act (ADA) compliant wheelchair ramps at all pedestrian crossings.
- Driveways to the residential units should be a minimum of 21 feet long measured between the garage door and the far edge of the sidewalk (edge closest to the residence) where a sidewalk is provided, and 23 feet measured between the garage door and the edge of the traveled-way in locations without a sidewalk.
- Signs and landscaping to be installed as a part of the Project within the intersection sight

¹⁴Ibid 2.

triangle areas of the Project site driveway should be designed and maintained so as not to restrict lines of sight.

- Snow accumulation (windrows) within sight triangle areas of the Project site driveway should be promptly removed where such accumulations would impede sight lines.
- Existing trees and vegetation located along the south side of Old Oaken Bucket Road within the intersection triangle areas of the Project site driveway should be selectively trimmed or removed and maintained, and the existing embankment to the east of the Project site driveway along the south side of Old Oaken Bucket Road should be regraded in order to provide the required line of sight.

Off-Site

Old Oaken Bucket Road/Maple Street/Winter Street and Route 123/Old Oaken Bucket Road

Independent of the Project, the Old Oaken Bucket Road/Maple Street/Winter Street and Route 123/Old Oaken Bucket Road intersections were identified to have motor vehicle crash histories that warrant further review and advancement of specific improvements to enhance safety. In an effort to advance safety-related improvements at these intersections, the Project proponent will: i) facilitate the completion of a Road Safety Audit (RSA) at the intersections in order identify improvement strategies, and ii) design and construct the short-term improvements that are suggested as a part of the RSA subject to receipt of all necessary rights, permits, and approvals.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing transportation system.