

TRAFFIC IMPACT STUDY

FOR THE

HERRING BROOK MEADOW RESIDENTIAL DEVELOPMENT

CHIEF JUSTICE CUSHING HIGHWAY
(ROUTE 3A)
SCITUATE, MASSACHUSETTS

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INTRODUCTION

McMahon Associates has reviewed the potential traffic impacts associated with the proposed Herring Brook Meadow residential development located on Chief Justice Cushing Highway (Route 3A) in Scituate, Massachusetts, shown in Figure 1. As part of the proposed development, the proponent intends to raze the existing residential structures located on 126 and 132 Chief Justice Cushing Highway (Route 3A). The proposed site will combine the two land lots into one, and will result in the construction of 60 new residential garden-style condominium units. The proposed site will be accessed via a single, full-access, unsignalized site driveway on Chief Justice Cushing Highway (Route 3A).

The purpose of this study is to assess the traffic operational and safety conditions in the vicinity of, and on, the proposed site. This study will also identify potential measures to improve any traffic-related deficiencies in the study area. This study provides a detailed analysis of traffic operations during the typical weekday morning and weekday afternoon commuter peak periods, when potential traffic impacts associated with the proposed residential development would be greatest.

Our review indicates that the proposed Herring Brook Meadow residential development will have little, if any, traffic impact on the study area roadways and intersections.



FIGURE 1
Site Location Map
Herring Brook Meadow
SCITUATE, MASSACHUSETTS

EXISTING TRAFFIC CONDITIONS

The study area roadways include Chief Justice Cushing Highway (Route 3A) and the proposed site driveway. The intersection examined as part of this study is the unsignalized intersection of Chief Justice Cushing Highway (Route 3A) and the proposed full access driveway.

Roadway Characteristics

Chief Justice Cushing Highway (Route 3A) is a state operated, two-lane roadway that generally runs in a northwest-southeast direction through the Town of Scituate. Chief Justice Cushing Highway (Route 3A), in the vicinity of the site, has a posted speed limit of 50 miles per hour in both directions and provides direct access to mainly residential land uses in the study area.

Accident Summary

Accident data on Chief Justice Cushing Highway (Route 3A), in the vicinity of the site driveway, was obtained from the Massachusetts Highway Department (MHD) for the most recent three-year period available. The accident data is a compilation of accident reports submitted to the Registry of Motor Vehicles (RMV) from local, state, university, and public transit police departments as well as from local citizens. The RMV in return gives the accident data to the MHD. For the purpose of this study, complete yearly accident summaries for the years 2003, 2004, and 2005 were examined. Based on the available data, there were no reported accidents in the vicinity of the proposed site driveway on Chief Justice Cushing Highway (Route 3A).

Additionally, McMahon reviewed the accident data for the intersection of Martha's Lane and Chief Justice Cushing Highway (Route 3A) to present a comparison of average crash rates for an intersection near the proposed development that serves residential land uses on Chief Justice Cushing Highway. Based on the MHD data, there were a total of two reported accidents at the intersection of Martha's Lane and Chief Justice Cushing Highway (Route 3A) during the three-year period studied, 2003-2005. The resultant three-year average crash rate is 0.201 accidents per million entering vehicles, which is well below both the statewide and District 5 unsignalized intersection averages of 0.66 and 0.59, respectively.

Existing Traffic Volumes

To assess average daily traffic conditions and peak hour traffic conditions on Chief Justice Cushing Highway (Route 3A), a 24-hour Automatic Traffic Recorder (ATR) count was conducted on Chief Justice Cushing Highway (Route 3A) in the vicinity of the proposed site driveway from Wednesday, September 6, 2006 through Thursday, September 7, 2006.

The results of the ATR counts are tabulated by 15-minute periods in Appendix A. The four highest consecutive 15-minute intervals within the weekday morning (7:00 AM to 9:00AM)

and weekday afternoon (4:00 PM to 6:00 PM) commuter peak periods constitute the peak hours that are the basis of this traffic analysis.

A review of the ATR data indicates that during the weekday morning peak hour approximately 395 vehicles travel in the southeasterly direction on Chief Justice Cushing Highway (Route 3A) and approximately 663 vehicles travel in the northwesterly direction. The weekday afternoon peak hour volumes indicate that Chief Justice Cushing Highway (Route 3A) services approximately 608 vehicles in the southeasterly direction and approximately 481 vehicles in the northwesterly direction. The average daily traffic volume on Chief Justice Cushing Highway (Route 3A) in the vicinity of the proposed development is approximately 12,860 vehicles (total in both directions).

Seasonal Adjustment

According to MassHighway's 2003 Weekday Seasonal Factors, traffic volumes collected during the month of September are higher than traffic volumes for the average month. Therefore, no adjustments were made to the peak hour traffic volumes, as they would have been reduced to reflect average conditions.

FUTURE TRAFFIC CONDITIONS

Background Growth and Other Developments

Based on information provided by the Massachusetts Area Planning Council (MAPC), Scituate is not expected to experience an appreciable increase in general population growth over the next five years. However, to present a conservative analysis and to account for any additional developments in the vicinity of the project site, an annual growth rate of one-percent per year was used to forecast the future-year, 2011, base traffic volumes.

In addition to the general background traffic growth, planned development projects that could influence traffic volumes on the study area roadways were also considered. Specifically, the Massachusetts Bay Transportation Authority (MBTA) Greenbush commuter rail line is expected to increase traffic volumes on Chief Justice Cushing Highway (Route 3A) in front of the proposed Herring Brook Meadow residential development.

The Greenbush Station is to be located south of Old Driftwood approximately ¼ mile east of the intersection of Chief Justice Cushing Highway (Route 3A) and Route 123. Access to the Greenbush Station will be via two driveways intersecting Old Driftway. Vehicle trip estimates and trip distribution for the planned the Greenbush Station are contained in the *Transportation Improvements in the Greenbush Line Corridor Support Document: Analysis of Traffic Impacts* prepared by Sverdrup Civil, Inc. for the MBTA, dated January 2001. Based on the information contained in the previously referenced report, the Greenbush Station is expected to result in 112 vehicles northbound and 45 vehicle southbound on Chief Justice Cushing Highway (Route 3A) south of the intersection of Chief Justice Cushing Highway (Route 3A) and Route 123 during the weekday morning and weekday afternoon peak hours, respectively. Similarly, the Greenbush station is expected to result in 45 vehicles northbound and 112 vehicles southbound on Chief Justice Cushing Highway (Route 3A) south of the intersection of Chief Justice Cushing Highway (Route 3A) and Route 123 during the weekday afternoon peak hour. The vehicle trips associated with the Greenbush Station were added to the future-year, 2011, base year traffic conditions. The resulting future-year, 2011, without development traffic volumes are documented in the traffic projection model presented in Appendix B of this report. Figures from the Sverdrup report depicting the expected traffic generation from the Greenbush Station are provided in Appendix C.

Roadway Improvements

As part of the Greenbush Station project, the signalized intersection of Chief Justice Cushing Highway (Route 3A) and Route 123/Driftway is proposed to be converted into a roundabout. The proposed reconstruction of this intersection is not expected to have any impact the traffic patterns in front of the proposed Herring Brook Meadow site on Chief Justice Cushing Highway (Route 3A).

With Development Traffic Conditions

The overall traffic impact of the proposed residential development was established based upon an estimation of traffic to be generated by the project during the weekday morning and weekday afternoon peak hours. This traffic was then distributed to the study area roadways and added to the projected future-year, 2011, without development traffic volumes. The future-year, 2011, with development traffic volumes were then analyzed to determine the development’s impact on the operations of the study area roadways and intersections. The following sections describe this process in greater detail.

Trip Generation

Estimates of traffic volumes expected to be generated by the proposed development were prepared on the basis of trip generation data provided in the Institute of Transportation Engineers (ITE) research publication, *Trip Generation, 7th Edition*. This reference establishes vehicular trip generation rates based on actual counts of similar existing facilities throughout the United States. Land Use Code 230 (Residential Condominium/Townhouse) was used to forecast the trips generated by the proposed 60-unit residential development during the weekday morning and weekday afternoon peak hours. Table 1 presents the vehicular trip generation expected for the proposed development.

Table 1
Vehicular Trip Generation
Herring Brook Meadow
Scituate, Massachusetts

<u>Description</u>	<u>Size</u>	<u>Weekday AM</u> <u>Peak Hour</u>			<u>Weekday PM</u> <u>Peak Hour</u>		
		<u>In</u>	<u>Out</u>	<u>Total</u>	<u>In</u>	<u>Out</u>	<u>Total</u>
<i>Proposed</i>							
Residential Condo/Townhouse ⁽¹⁾	60 units	6	28	34	27	13	40

¹ ITE Land Use Code 230 (Residential Condominium/Townhouse), based on the number of proposed units.

As shown in Table 1, the peak-hour trip generation of the proposed development is expected to result in approximately 34 vehicle trips (6 entering and 28 exiting) during the weekday morning peak hour and approximately 40 vehicle trips (27 entering and 13 exiting) during the weekday afternoon peak hour.

Trip Distribution and Assignment

To determine the expected trip distribution for the proposed residential development, the U.S. Census Bureau Journey-to-Work data for the Town of Scituate was reviewed. Distribution percentages for the site generated traffic were determined from this data. The resultant directions of arrival and departure for the proposed development are shown in Figure 2.



SCHEMATIC-
NOT TO SCALE

90%

Chief Justice Cushing Highway (Route 3A)

SITE

Site Driveway

10%

FIGURE 2
Directions of Arrival and Departure
Herring Brook Meadow
SCITUATE, MASSACHUSETTS



The percentages for directions of arrival and departure, illustrated in Figure 2, were applied to the peak hour trip generation provided in Table 2, to estimate the traffic volumes added to the adjacent roadways and intersections.

The distributed site-generated traffic was added to the future-year, 2011, without development traffic volumes. The resultant future-year, 2011, with development weekday morning and weekday afternoon peak hour traffic volumes are depicted in Figure 3 and Figure 4, respectively. The proposed development is expected to increase the traffic volumes on Chief Justice Cushing Highway (Route 3A), in front of the proposed development, by less than 3.5 percent during the weekday morning peak hour and three-percent during the weekday afternoon peak hour. Furthermore, the proposed development is expected to increase the average daily traffic volumes by approximately three-percent.

Future-Year, 2011, Capacity Analysis With Development

Based on the methodologies described in the *2000 Highway Capacity Manual*, which are provided in Appendix D, a detailed capacity/level-of-service (LOS) analyses was completed for the 2011 with development weekday morning and weekday afternoon peak hour traffic volumes at the study area intersection. The analysis results are depicted graphically in Figure 5, and the capacity/level-of-service analysis worksheets are provided in Appendix E and are summarized in Appendix F.

As shown in Figure 5, the westbound shared left/right-turn movement exiting the proposed site drive to Chief Justice Cushing Highway (Route 3A) is expected to operate at an acceptable LOS C and well under capacity during the weekday morning and weekday afternoon peak hours. All other movements at this intersection are shown to operate at LOS A during both peak hours.

Herring Brook Meadow is expected to result in approximately 30 additional vehicles during the weekday morning peak hour and approximately 36 additional vehicles during the weekday afternoon peak hour to the intersection of Chief Justice Cushing Highway (Route 3A) and Route 123/Driftway. Analysis and LOS summary tables included as part of the previously identified *Transportation Improvements in the Greenbush Line Corridor Support Document: Analysis of Traffic Impacts* report show that the all movements are shown to operate at LOS C or better during both peak hours at the proposed roundabout at the Route 3A and Route 123/Driftway. This minimal increase in traffic due to this project is expected to have little impact on the operations of the intersection.

Internal Site Circulation

The internal site plan for the proposed development is shown to generally provide adequate site access and circulation. Based on a review of the internal operations, emergency vehicles and residential vehicles can adequately maneuver throughout the site. Additionally, it is recommended that in order to maintain adequate stopping sight distance at internal



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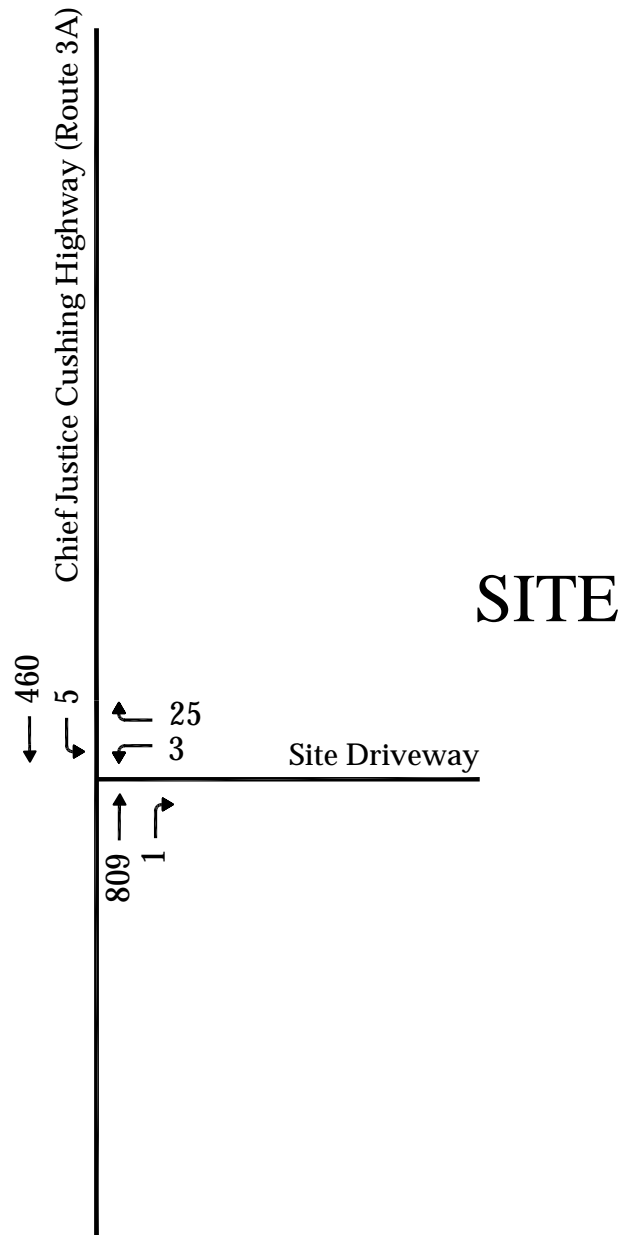
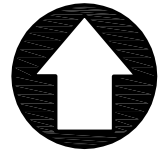


FIGURE 3
2011 With Development Weekday Morning
Peak Hour Traffic Volumes

Herring Brook Meadow
SCITUATE, MASSACHUSETTS





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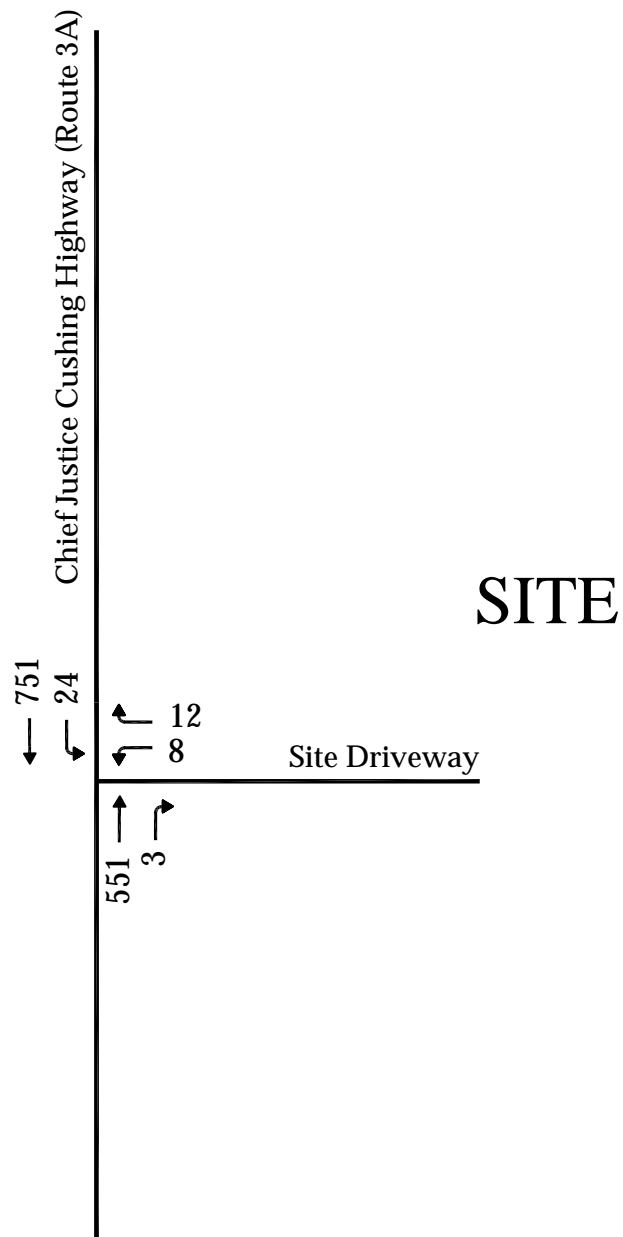


FIGURE 4
2011 With Development Weekday Afternoon
Peak Hour Traffic Volumes

Herring Brook Meadow
SCITUATE, MASSACHUSETTS



LEGEND

Weekday Morning
(Weekday Afternoon)



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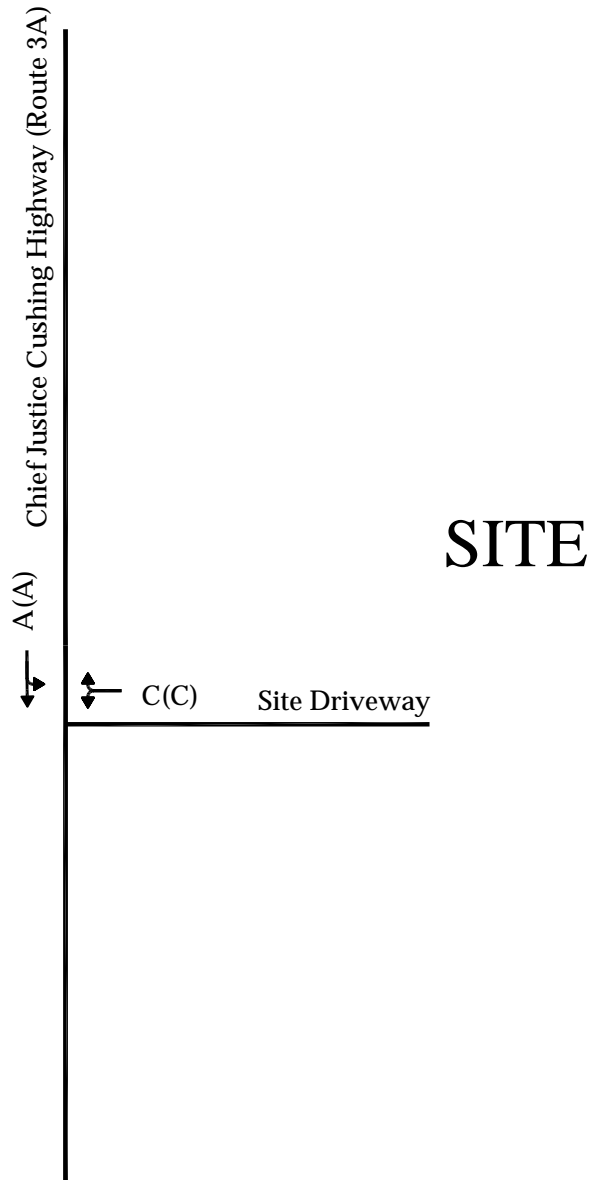


FIGURE 5
2011 With Development
Levels-of-Service

Herring Brook Meadow
SCITUATE, MASSACHUSETTS



driveways the vegetation along the development's internal roadway edge should be generally kept to a height of 3.5 feet or less to avoid the obstruction of sight lines.

Parking

Based on data contained in the *ITE Parking Generation Handbook*, the peak parking demand for Herring Brook Meadow was calculated using ITE Land Used Code 230 (Residential Condominiums/Townhouses). The average peak hour parking demand for ITE Land Use Code 230 is 1.46 parking spaces per unit, resulting in a peak hour parking demand of 88 spaces. The latest site plan for Herring Brook Meadow proposes 120 parking spaces, which is in excess of 32 parking spaces based on ITE data.

According to the Town of Scituate Zoning By-Laws, two off-street parking spaces must be provided for each residential unit, resulting in a required 120 parking spaces for the proposed Herring Brook Meadow residential development. The latest site plan for Herring Brook Meadow proposes 120 parking spaces, which meets the town's zoning by-laws.

The Herring Brook Meadow development provides adequate parking to meet both the Town and ITE requirements.

Sight Distance

A field review of the available sight distance was conducted at the approximate location of the proposed site driveway on Chief Justice Cushing Highway (Route 3A), as shown in Figure 6. Chief Justice Cushing Highway (Route 3A) has a gentle vertical curve north of project site which crests near Martha’s Lane. The posted speed limit on Chief Justice Cushing Highway (Route 3A) is 50 miles per hour in both directions. The speed limit signs are posted north of the site in the vicinity of the intersection of Chief Justice Cushing Highway (Route 3A) and Route 123 as well as south of the site on Chief Justice Cushing Highway (Route 3A). It is recommended that additional speed limit signage be posted near the proposed site on both the northwesterly and southeasterly approaches to the site driveway on Chief Justice Cushing Highway (Route 3A) due to the additional vehicles.

The American Association of State Highway and Transportation Officials (AASHTO) publication, *A Policy on Geometric Design, 2004 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 and the desirable sight distance allows vehicles to enter the main street traffic flow without requiring the mainline traffic to slow to less than 70% of their speed and is referred to as intersection sight distance (ISD). 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.” The following table summarizes the sight distance standards for the various speeds.

Table 2
Sight Distance Requirements
Herring Brook Meadow
Scituate, Massachusetts

Design Speed (mph)	AASHTO Stopping Sight Distance (ft)¹	AASHTO Intersection Sight Distance (ft)²	Available Sight Distance (ft)
50	425	555/480	Site Driveway
55	495	610/530	800*/640
60	570	665/575	
65	645	720/625	

1 - AASHTO Stopping sight distance (see AASHTO Exhibit 3-1).

2 - AASHTO Intersection sight distance based on Case B1, left turn from stop or Case B2, right turn from stop. (Case B1/Case B2)

The sight distance looking northwest (right) from the proposed site drive at its intersection with Chief Justice Cushing Highway (Route 3A) is over 800 feet. The sight distance looking southeast (left) from the proposed primary site drive is approximately 640 feet and is constrained by a gentle vertical curve near Martha’s Lane. Photographs taken from the location where sight distance was measured looking towards Martha’s Lane are presented

below. The available sight distance for the vehicles exiting from the proposed site driveway exceeds the AASHTO ISD desirable standards for vehicle speeds in excess of 65 miles per hour and will allow vehicles to safely enter the Chief Justice Cushing Highway (Route 3A) traffic flow with minimal impact to approaching vehicles. The SSD requirements for vehicles traveling on Chief Justice Cushing Highway (Route 3A) are met for travel speeds in excess of 60 miles per hour.

Looking south from the location of the proposed site driveway





FIGURE 6
Sight Distance
Herring Brook Meadow
SCITUATE, MASSACHUSETTS

CONCLUSIONS

The Herring Brook Meadow residential development is proposed to be located on Chief Justice Cushing Highway (Route 3A) in Scituate, Massachusetts. As part of the development, the proponent intends to raze the existing residential structures located on 126 and 132 Chief Justice Cushing Highway (Route 3A). The proposed site will combine the two land lots into one which will result in the construction of 60 new residential garden-style condominium units. The site will be accessed via a single, full-access, unsignalized site driveway on Chief Justice Cushing Highway (Route 3A).

The project is expected to have a minimal impact on the traffic operations within the study area. The proposed development is expected to generate approximately 34 vehicle trips (6 entering and 28 exiting) during the weekday morning peak hour and approximately 40 vehicle trips (27 entering and 13 exiting) during the weekday afternoon peak hour. The development is expected to increase the traffic volumes on Chief Justice Cushing Highway (Route 3A), in front of the proposed development, by less than 3.5-percent during the weekday morning peak hour and less than three-percent during the weekday afternoon peak hour.

Capacity analysis indicates that the westbound shared left/right-turn movement exiting the proposed site drive to Chief Justice Cushing Highway (Route 3A) is expected to operate at level-of-service (LOS) C and well under capacity during the weekday morning and weekday afternoon peak hours. All other movements at this intersection are shown to operate at LOS A during both peak hours.

Based on the analysis results, the proposed Herring Brook Meadow residential development is expected to have a minimal impact on the operations of the study area intersections and roadways. Any delays experienced by vehicles exiting the project site will not effect operations along Chief Justice Cushing Highway (Route 3A).