

OLD COLONY METROPOLITAN PLANNING ORGANIZATION

# Traffic Study of Roadways in Pembroke and Duxbury

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Analysis of Potential Heavy Commercial Vehicle  
Exclusions Zones Proposed by Town of Pembroke

April 2016

**Prepared by:**  
Old Colony Planning Council  
70 School Street  
Brockton, MA. 02301

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The views and opinions of the Old Colony Planning Council expressed herein do not necessarily state or reflect those of the U.S. Department of Transportation.

This Planning Level Traffic Study was prepared by the following members of the Old Colony Planning Council staff under the direction of Pat Ciaramella, Executive Director, and the supervision of Charles Kilmer, Assistant Director / Transportation Program Manager.

## **Project Role**

**Project Manager**

## **Staff Members**

**Bill McNulty, Senior Transportation Planner**

***wmcnulty@ocpcrpa.org***

**Contributing Staff**

Shawn Bailey, Assistant Transportation Planner

*sbailey@ocpcrpa.org*

Kyle Mowatt, Transportation Planner

*kmowatt@ocpcrpa.org*

Andrew Vidal, Communication/GIS/IT Specialist

*avidal@ocpcrpa.org*

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**Appendix A:** Traffic Data (Traffic Volume, Traffic Speed, and Vehicle Classification Data)

**Appendix B:** 2012 Massachusetts Amendments to Manual on Uniform Traffic Control Devices  
(procedural information on Heavy Commercial Vehicle Exclusion Zones in Massachusetts)

## **Study Purpose and Scope**

This planning level traffic study was completed at the request of the Town of Pembroke, through the Old Colony Metropolitan Planning Organization's Local Highway Planning Technical Assistance Program, to assess existing conditions on Valley Street, Birch Street, Elm Street, Spring Street, and Pleasant Street in Pembroke, along with Birch Street, Franklin Street, and Keene Street in Duxbury. This data collection and analysis was completed to provide an assessment of existing conditions, as the Town considers requesting the establishment of Heavy Commercial Vehicle Exclusion (HCVE) zones on these roadways.

## **Previous Work**

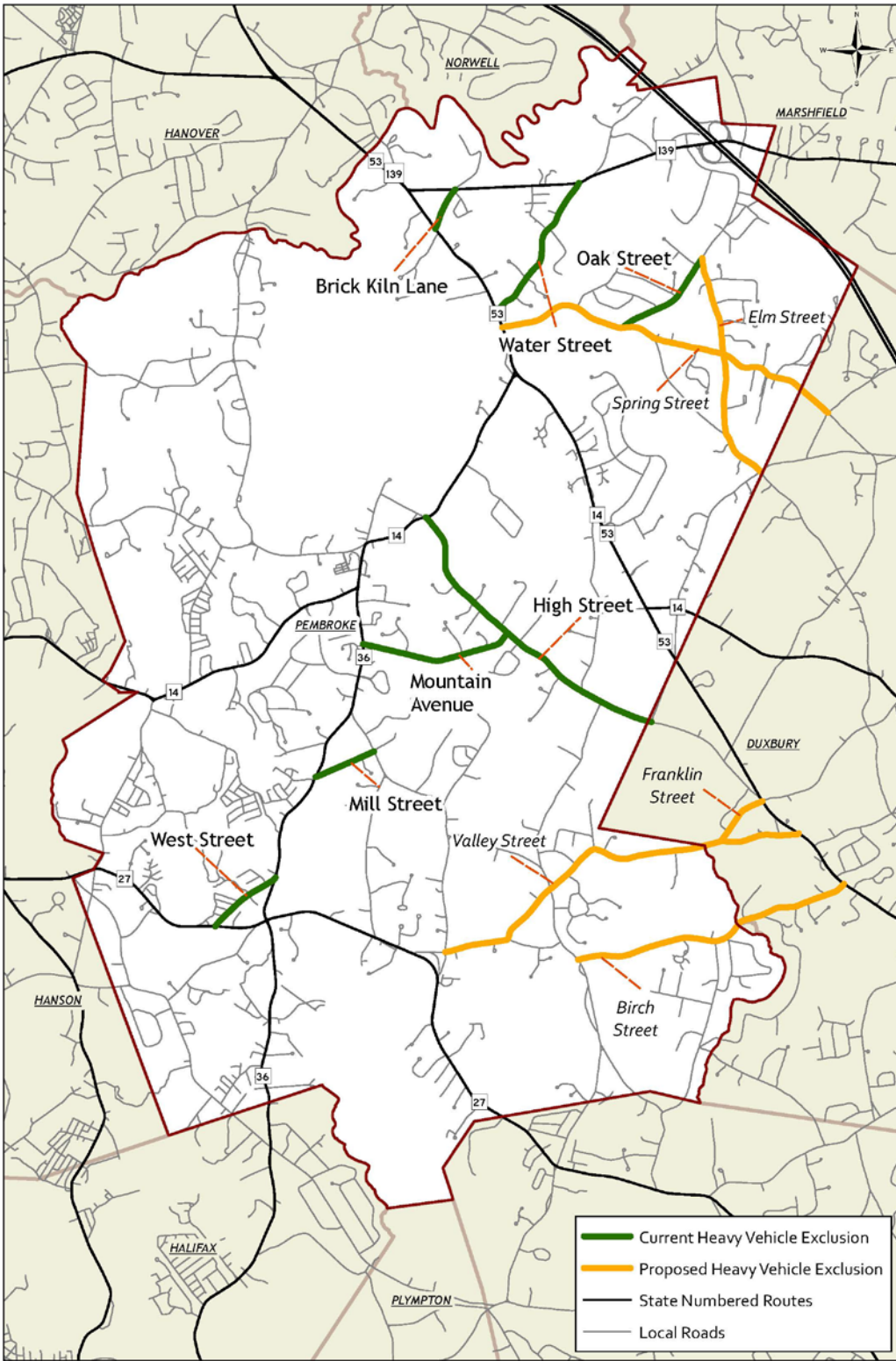
A traffic study for the consideration of Heavy Commercial Vehicle Exclusion (HCVE) zones on Valley Street and Birch Street was completed by Old Colony Planning Council in 2011. Similarly, OCPC completed a traffic study for the consideration of HCVE zones on Pleasant Street, Spring Street, and Elm Street in 2010.

## **Existing and Proposed Heavy Commercial Vehicle Exclusion Zones in Pembroke**

Figure 1 illustrates the locations of the proposed Heavy Commercial Vehicle Exclusion (HCVE) zones in relation to existing posted HCVE zones in the Town of Pembroke. The Town of Pembroke as established several HCVE zones throughout town, including West Street, Mill Street, Mountain Avenue, High Street, Oak Street, Water Street, and Brick Kiln Lane.

**Figure 1: Existing and Proposed HCVE Zones in Pembroke**

**Pembroke Heavy Commercial Vehicle Exclusion (HCVE) Zones**



## Study Sub Area: Valley Street, Franklin Street, and Birch Street

Valley Street, Franklin Street, and Birch Street are roadways in southeastern Pembroke and western Duxbury, creating connections between Route 53 in Duxbury and Route 27 in Pembroke. Valley Street in Pembroke and Franklin Street in Duxbury are functionally classified as an Urban Minor Arterial, while Birch Street is an unclassified local roadway. The roadways are characterized by primarily suburban residential development, with single family homes situated amongst a wooded area. The roadways are 2-lane roads with travel lanes varying between 10 and 12 feet wide, very limited to non-existent shoulders, and no sidewalks.

### Existing Conditions

Table 1 contains the results of the data collected in November 2015 on Franklin Street, Valley Street, and Birch Street in Pembroke and Duxbury. The collected data indicates high percentages of heavy vehicle traffic on Franklin Street and Valley Street through Pembroke and Duxbury, with smaller percentages on Birch Street. The data also indicates that the 85<sup>th</sup> percentile speed of traffic is above the 35 MPH and 30 MPH speed limits at all locations. Pavement is generally in fair condition along Franklin Street, Valley Street, and Birch Street, with some weathering and cracking observed.

**Table 1: Existing 2015 Conditions – Valley Street and Birch Street**

	Average Weekday Volume	Average Speed	85th Percentile Speed	Posted Speed Limit	% heavy Vehicles
<b>Franklin Street, North of Valley Street, Duxbury</b>	1,391	30 MPH	40 MPH	35 MPH	12.50%
<b>Valley Street, east of Franklin Street, Duxbury</b>	895	36 MPH	44 MPH	35 MPH	13.90%
<b>Valley Street, at Duxbury Town Line (west of Franklin Street), Pembroke</b>	2,155	34 MPH	42 MPH	35 MPH	10.70%
<b>Valley Street, west of Forest Street, Pembroke</b>	1,726	33 MPH	43 MPH	30 MPH	16.50%
<b>Birch Street, west of Summer Street (Route 53), Duxbury</b>	2,885	28 MPH	39 MPH	35 MPH	4.80%
<b>Birch Street, east of Pelham Street, Pembroke</b>	1,496	35 MPH	43 MPH	35 MPH	6.60%

## Proposed Heavy Commercial Vehicle Exclusion (HCVE) Zones and Preferred Alternate Route

The proposed Heavy Commercial Vehicle Exclusion (HCVE) zones would be posted for the entire length of Valley Street and Franklin Street in the towns of Pembroke and Duxbury

- **Valley Street:** Entire length of roadway from Plain Street in Pembroke to Route 53 in Duxbury
- **Franklin Street:** Between Valley Street in Duxbury and Route 53 in Duxbury
- **Birch Street:** Entire length of roadway from Pelham Street in Pembroke to Route 53 in Duxbury

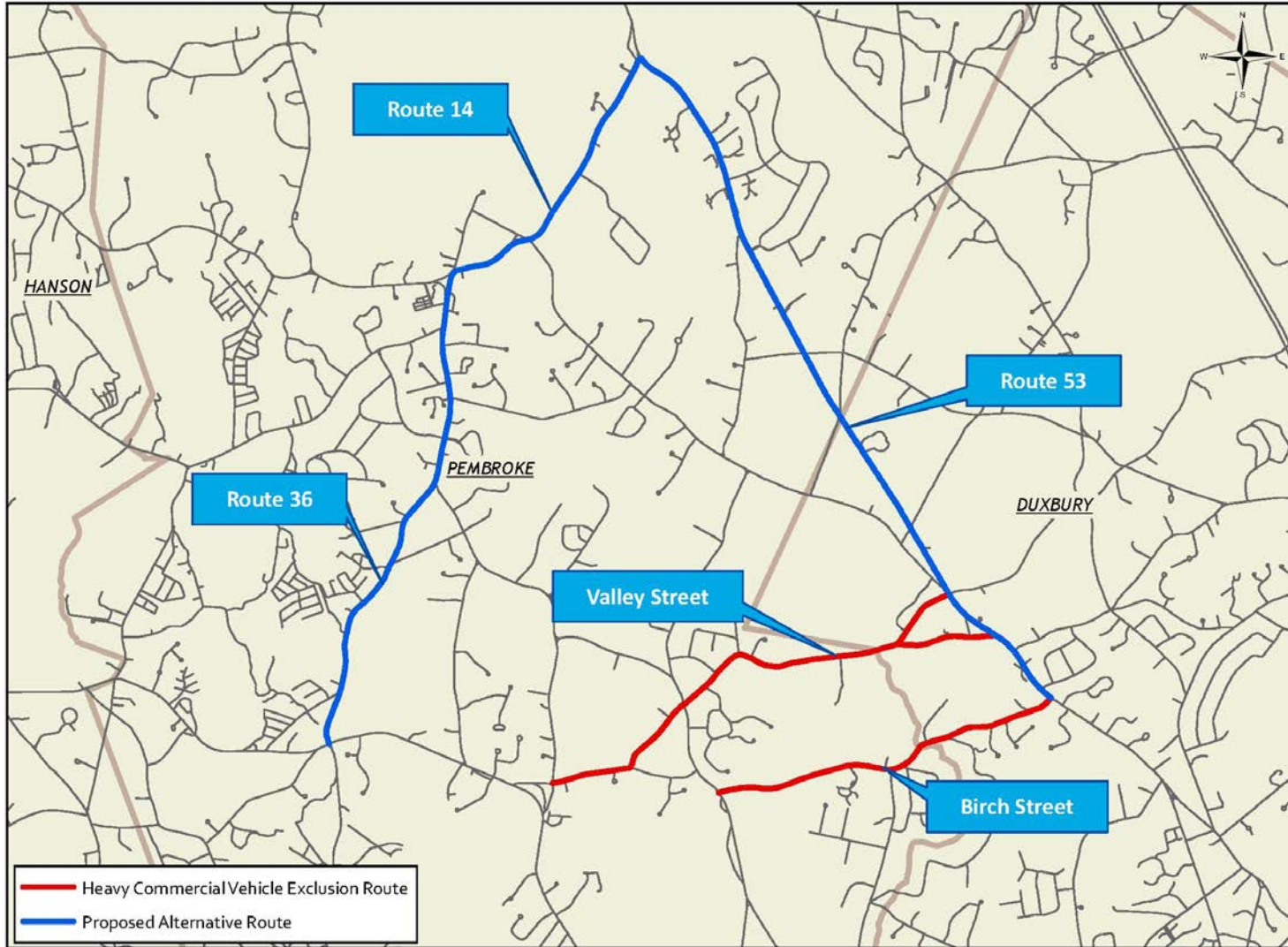
The existing percentage of heavy vehicle traffic at all locations along Valley Street and Franklin Street are above 5 percent, the minimum threshold for consideration of a heavy commercial vehicle exclusion zone as stated in the Massachusetts Amendments to the Manual on Uniform Traffic Control Devices. The percentage of heavy vehicles on Birch Street is above 5 percent for a portion of the roadway (as recorded east of Pelham Street in Pembroke).

The preferred alternate route for heavy vehicles is to bypass traveling through this residential area by using the state numbered highway network of Route 53, Route 14, Route 36, and Route 27.

Please see map in Figure 2 for proposed HCVE zones and preferred alternate route for heavy vehicles.

**Figure 2: Map of Proposed HCVE Zones on Valley Street and Birch Street, and Preferred Alternate Route**

Proposed Heavy Commercial Vehicle Exclusion (HCVE) Zones - Pembroke and Duxbury





## Growth and Change in Heavy Vehicle Percentages

Table 2 shows the growth in overall traffic volume and percentages of heavy vehicle traffic on Valley Street and Birch Street in Pembroke. The data indicates that there has been a substantial increase in traffic volume and truck traffic on Valley Street since 2011. Posted Heavy Commercial Vehicle Exclusion zones on High Street in Pembroke and Duxbury and on Mountain Avenue and Mill Street in Pembroke have likely contributed to heavy vehicle operators using Valley Street as an alternative around these existing exclusions.

There has been some growth in traffic volume on Birch Street as well. However, this increase is more modest than what has occurred on Valley Street, and consistent with the average annual growth rate for the region.

**Table 2: Current and Historical Traffic Volumes and Heavy Vehicle Traffic on Valley Street and Birch Street**

Location	2011		2015		2011 - 2015		
	Average Weekday Volume	% Heavy Vehicles	Average Weekday Volume	% Heavy Vehicles	% Change Volume	Annual Growth Rate	Change in HV%
Valley Street, at Duxbury Town Line (west of Franklin Street), Pembroke	1,921	7.30%	2,155	10.70%	12.2%	2.9%	3.4%
Valley Street, west of Forest Street, Pembroke	1,513	6.20%	1,726	16.50%	14.1%	3.3%	10.3%
Birch Street, east of Pelham Street, Pembroke	1,461	8.40%	1,496	6.60%	2.4%	0.6%	-1.8%

## Study Sub Area: Pleasant Street, Elm Street, Spring Street, and Keene Street

Pleasant Street, Elm Street, Spring Street, and Keene Street are roadways in northeastern Pembroke and northern Duxbury, serving primarily residential areas of Pembroke, Duxbury, and Marshfield and also serving as a network of connections between the state numbered route network of Route 53, Route 139, and Route 14. Pleasant Street and Elm Street are functionally classified as an Urban Collectors, while Spring Street and Keene Street are unclassified local roadways. Spring Street becomes Keene Street in Duxbury. The roadways are characterized by primarily suburban residential development, with single family homes situated amongst a wooded area. The roadways are 2-lane roads with travel lanes varying between 10 and 12 feet wide, very limited to non-existent shoulders, and no sidewalks.

## Existing Conditions

Table 3 contains the results of the data collected in November 2015 on Pleasant Street, Spring Street, Keene Street, and Elm Street in Pembroke and Duxbury. The collected data indicates high percentages of heavy vehicle traffic on Elm Street and portions of Pleasant Street in Pembroke. The data also indicates that the 85<sup>th</sup> percentile speed of traffic is above the 35 MPH and 25 MPH speed limits at all locations. Pavement is generally in fair to poor condition along these roadways, with areas of significant deterioration present in spots, particularly on Spring Street and Elm Street.

**Table 3: Existing 2015 Conditions – Pleasant Street, Spring Street / Keene Street, and Elm Street**

	Average Weekday Volume	Average Speed	85th Percentile Speed	Posted Speed Limit	% heavy Vehicles
<b>Pleasant Street, east of Washington Street (Route 53), Pembroke</b>	5,985	30 MPH	39 MPH	35 MPH	5.90%
<b>Pleasant Street, south of Spring Street, Pembroke</b>	528	33 MPH	43 MPH	35 MPH	14.60%
<b>Spring Street, west of Elm Street, Pembroke</b>	934	22 MPH	36 MPH	25 MPH	6.70%
<b>Keene Street, west of North Street, Duxbury</b>	1,117	27 MPH	39 MPH	35 MPH	3.90%
<b>Elm Street, north of Hillcrest Drive, Pembroke</b>	2,721	30 MPH	40 MPH	35 MPH	10.10%
<b>Elm Street, south of Spring Street, Pembroke</b>	1,526	30 MPH	40 MPH	35 MPH	8.70%
<b>Elm Street, north of Taylor Street, Pembroke</b>	1,719	29 MPH	39 MPH	35 MPH	10.80%

## Proposed Heavy Commercial Vehicle Exclusion (HCVE) Zones and Preferred Alternate Route

The proposed Heavy Commercial Vehicle Exclusion (HCVE) zones would be posted for the following roadways:

- **Pleasant Street:** Entire length of roadway from Route 53 in Pembroke to Elm Street in Pembroke
- **Elm Street:** Entire length of roadway from Elm Street in Pembroke to Taylor Street in Pembroke
- **Spring Street:** Entire length of roadway from Pleasant Street in Pembroke to Duxbury Town Line

- **Keene Street** – Section of roadway from Pembroke Town Line to North Street in Duxbury

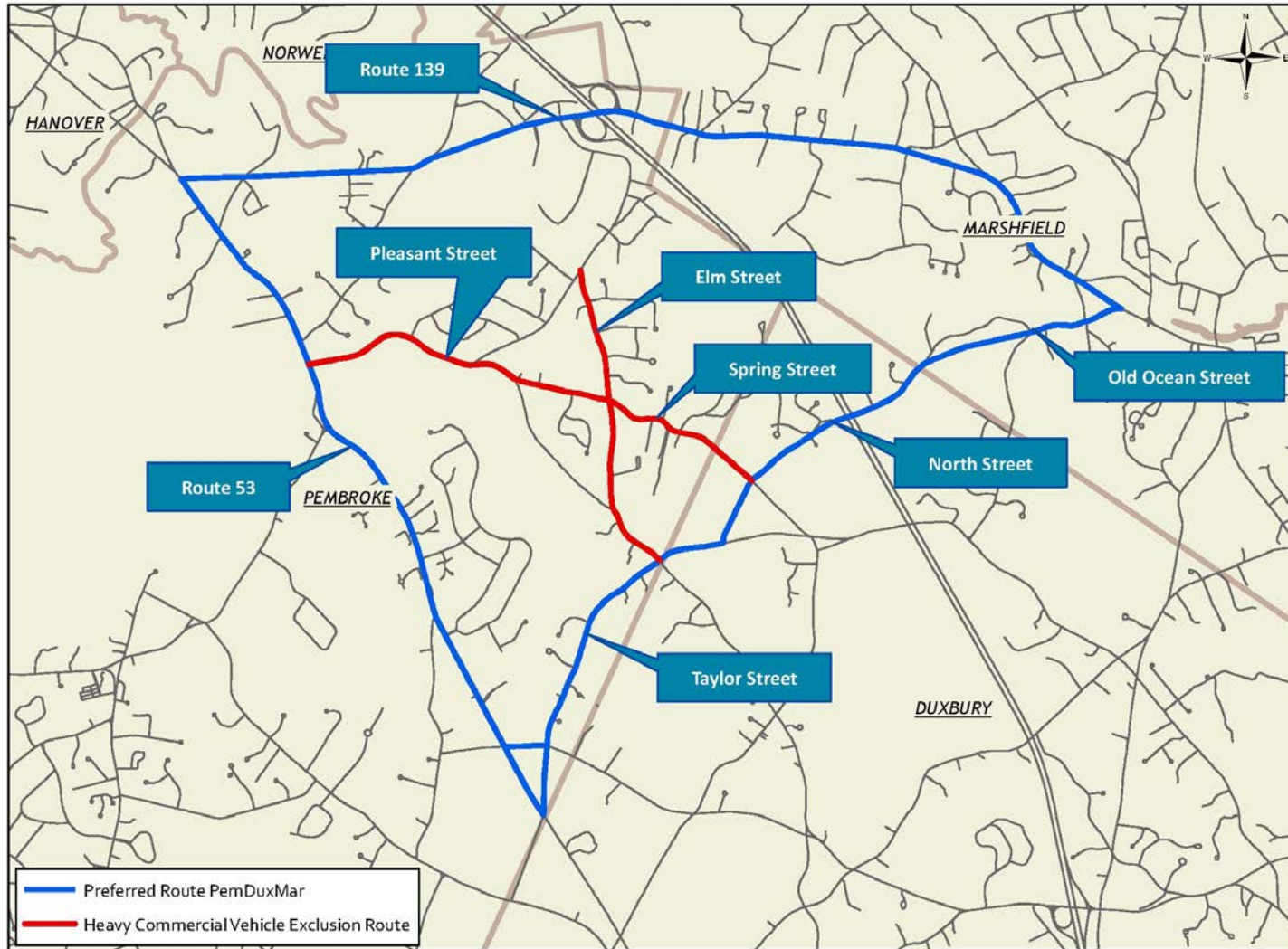
The existing percentage of heavy vehicle traffic at all locations along Pleasant Street, Spring Street, and Elm Street are above 5 percent, the minimum threshold for consideration of a HCVE zone as stated in the Massachusetts Amendments to the Manual on Uniform Traffic Control Devices. The percentage of heavy vehicles on Keene Street is below 5 percent; however the proposed Spring Street HCVE zone must extend onto this portion of Keene Street in Duxbury as there is it feeds direction into Spring Street.

The preferred alternate route for heavy vehicles is to bypass traveling through these residential areas as much as possible by using the state numbered highway network of Route 53 and Route 139. However, it is likely that streets serving residential areas such as Taylor Street, North Street, and Old Ocean Street would become alternate routes for truck traffic given the geographic extent of the HCVE zones.

Please see map in Figure 3 for proposed HCVE zones and preferred alternate route for heavy vehicles.

Figure 3: Map of Proposed HCVE Zones on Pleasant Street, Spring Street, and Elm Street, and Preferred Alternate Route

Proposed Heavy Commercial Vehicle Exclusion (HCVE) Zones - Pembroke, Duxbury & Marshfield



## Growth and Change in Heavy Vehicle Percentages

Table 4 shows the growth in overall traffic volume and percentages of heavy vehicle traffic on Pleasant Street, Spring Street, and Elm Street in Pembroke. The data indicates that there the Heavy Commercial Vehicle Exclusion zone on Oak Street may have had a substantial effect on the Pleasant Street and Elm Street traffic patterns. The decrease in traffic on the section of Pleasant Street between Route 53 and Spring Street may be the result of the restriction on truck traffic on Oak Street, which feeds into this section of Pleasant Street from the east. Similarly, as operators of heavy vehicles traveling east on Pleasant Street realize that they cannot turn onto Oak Street, they may be continuing onto Pleasant Street and Elm Street, which has led to a substantial increase in traffic volumes on these roadways.

**Table 4: Current and Historical Traffic Volumes and Heavy Vehicle Traffic on Valley Street and Birch Street**

	2010		2015		2010 - 2015		
	Average Weekday Volume	% Heavy Vehicle	Average Weekday Volume	% Heavy Vehicles	% Change Volume	Annual Growth Rate	Change in HV%
Pleasant Street, east of Washington Street (Route 53), Pembroke	6,307	5.20%	5,985	5.90%	-5.1%	-1.0%	<b>0.70%</b>
Pleasant Street, south of Spring Street, Pembroke	450	1.80%	528	14.60%	17.3%	3.2%	<b>12.80%</b>
Spring Street, west of Elm Street, Pembroke	889	5.70%	934	6.70%	5.1%	1.0%	<b>1.00%</b>
Elm Street, south of Spring Street, Pembroke	1,407	6.10%	1,526	8.70%	8.5%	1.6%	<b>2.60%</b>
Elm Street, north of Taylor Street, Pembroke	1,670	5.60%	1,719	10.80%	2.9%	0.6%	<b>5.20%</b>

## Next Steps and Recommendations

The Town of Pembroke may pursue the establishment of Heavy Commercial Vehicle Exclusion zones on any combination of the roadways assessed in this traffic study, at their discretion. The Massachusetts Department of Transportation (MassDOT) is responsible for reviewing and approving requests for Heavy Commercial Vehicle Exclusion zones on all public roadways in the Commonwealth of Massachusetts.

The Town of Pembroke must work with the Town of Duxbury on the request(s) for Heavy Commercial Vehicle Exclusions zones on Franklin Street, Valley Street, Birch Street, and Spring/Keene Streets as these roadways partially lie within the Town of Duxbury. Furthermore, the Town of Duxbury should seek the written approval from the Town of Marshfield as the alternate route(s) for the proposed HCVE zones on Pleasant Street, Spring / Keene Street, and Elm Street enter the Town of Marshfield.

Working jointly with the Town of Duxbury and with the approval of the Town of Marshfield, the Town of Pembroke should work with District Five of the Massachusetts Department of Transportation (MassDOT) on its request(s) for Heavy Commercial Vehicle Exclusion zones on these roadways. The Town may use the data, maps, and findings from this Study as supporting material in its request(s).

The Town of Pembroke should be advised that the establishment of Heavy Commercial Vehicle Exclusion zones may have impacts on traffic on surrounding roadways, and potential effects should be considered during this process.

Finally, given the residential nature of the roadways studied in this traffic study along with the recorded traffic speeds, the Old Colony Planning Council recommends strict, regular enforcement of speed limits on these roadways. The use of speed trailers can be a very effective tool for regulating travel speeds.