

Traffic Engineering Study for Special Speed Regulations

Saugus, MA

Prepared for: **Town of Saugus**
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I have reviewed this document as it relates to the proposed design and have determined the design to be safe for public health and welfare in conformity with accepted engineering standards.

DRAFT

Elizabeth M. Oltman, PE

July 8, 2019

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I. INTRODUCTION

PURPOSE OF STUDY

TEC, Inc. has been retained by the Town of Saugus to provide professional engineering services to review and evaluate the existing speed limits on six specific streets within the Town of Saugus as well as the overall speed limits throughout the Town. The identified specific streets for evaluation include Water Street (Route 129), Central Street, Main Street, Hamilton Street, Essex Street (east of Route 1), and Lincoln Avenue. This report details the evaluation of the existing speed zones historically established by regulation with the Massachusetts Department of Transportation (MassDOT) and assessing where speed limits should and can be revised. This study is intended to be a collaboration between TEC, the Town of Saugus Police and Fire Departments, and the Town of Saugus Department of Public Works.

DEFINITIONS

There are three types of speed signage that may be found on the streets and highways of Massachusetts. Two are as defined by Massachusetts General Law (MGL Chapter 90, Sections 17 and 18) and one is governed by standard engineering design practice.

Regulatory Speed Limit

Regulatory speed limits are created by completing a thorough traffic engineering study, approval of a Special Speed Regulation by the roadway owner, the Registry of Motor Vehicles and MassDOT, and installing appropriate speed limit signs placed to clearly define the speed zones. These regulatory speed limits conform to MGL Chapter 90, Sections 18 and 18B. These signs are black lettering on a white background and are enforceable by the Saugus Police Department.



Statutory Speed Limit

Statutory speed limits exist in the absence of Special Speed Regulations. They are the background speed limit on roadways without posted speed limits and require that "drivers operate vehicles at a rate of speed that is not greater than reasonable and proper with regard to the use of the road and safety of the public" (MGL Chapter 90, Section 17, 17A and 17C). For example, undivided highways outside of a Thickly Settled residential or Business District have a statutory speed limit of 40 miles per hour (MPH) throughout Massachusetts. Special Speed Regulations will always supersede the statutory speed limit, except within School Zones. Statutory speed limits are not generally posted, except when a municipality has adopted a municipality-wide speed limit under MGL Chapter 90, Section 17C. In this case, the statutory speed limit must be posted on all roadways entering the municipality. These speed limits are enforceable by the Saugus Police Department.



Advisory Speed Signage

The necessity of advisory speed signage is determined based on an engineering study and engineering judgement for the geometry of a roadway in accordance with the standards found within the Manual on Uniform Traffic Control Devices (MUTCD). These signs are located in areas where a lower operating speed than the posted regulatory or statutory speed is recommended to ensure safe navigation of a roadway. These warning signs are typically seen on horizontal curves or ramps and are black lettering on a yellow background. These speed limits are not enforceable by the Saugus Police Department.



Thickly Settled or Business District

MGL Chapter 90 Section 1 defines a Thickly Settled or Business District as:

"the territory contiguous to any way which is built up with structures devoted to business, or the territory contiguous to any way where dwelling houses are situated at such distances as will average less than two hundred feet between them for a distance of a quarter of a mile or over."

II. EXISTING CONDITIONS

STUDY AREA

The Town of Saugus has identified several roadways in the Town where speed has become a concern for both Town officials and the general public. The following roadway corridors are included in the speed zoning study area:

1. Water Street
2. Central Street
3. Main Street
4. Hamilton Street
5. Essex Street (east of Route 1)
6. Lincoln Avenue

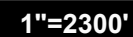
The Study area roadways, along with important landmarks throughout the Town, are shown graphically in Figure 1.

ROADWAY GEOMETRY

A field inventory of existing traffic conditions along the study area roadways was conducted by TEC staff in March 2019. The field investigation consisted of an inventory of existing roadway geometrics, operating characteristics, and safety characteristics. The following is a description of the existing roadway inventory.

Water Street (Route 129)

Water Street is a two-lane east-west principal arterial roadway maintained by the Town of Saugus within the Town Limits. The roadway provides regional connections between Wakefield to the west and Walnut Street in Saugus to the east. The roadway also provides Saugus residents access to Interstate 95 to the north through Montrose Avenue just over the Town line in Wakefield. Water Street varies in width along the corridor, ranging from ±26-feet wide to ±57-feet wide, with ancillary turn lanes provided at the signalized intersections. Directional flow is separated by a painted double-yellow centerline. Land uses along Water Street are shared amongst residential, commercial, office, and recreational.



Saugus Speed Study - Saugus, Massachusetts

Technical Memorandum

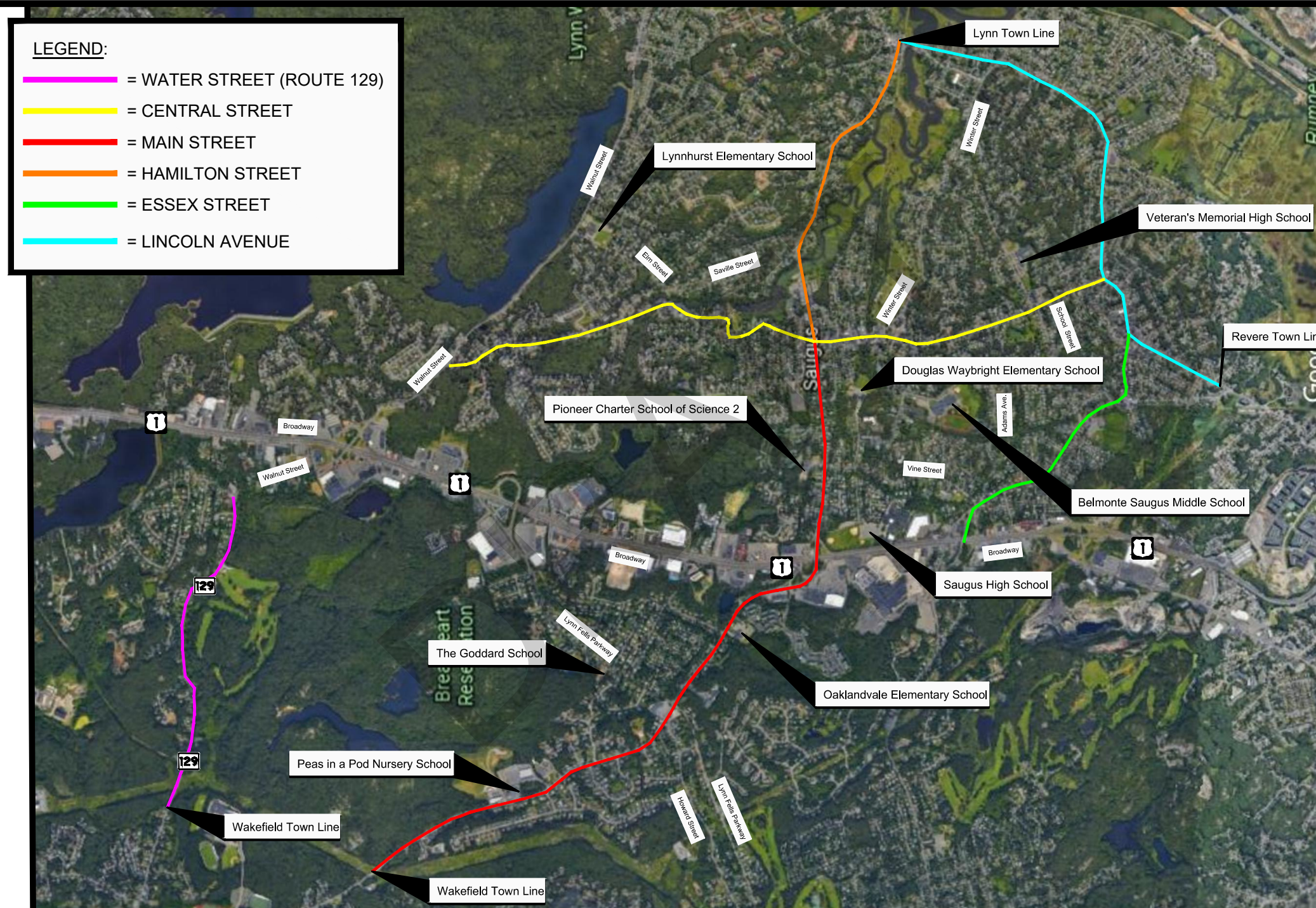


Figure 1
Project Location Map
Speed Study Roadways
and Town Landmarks

Central Street

Central Street is a two-lane, north-south urban major collector roadway maintained by the Town of Saugus. Locally, the roadway provides connections between Walnut Street to the north and Lincoln Avenue to the south along with providing access to the Saugus Town Center. Central Street varies in width along the corridor, ranging between ± 26 -feet wide and ± 78 -feet wide, with ancillary turn lanes provided at the signalized intersections. Directional flow is separated by a painted double-yellow centerline. Land uses along Central Street are shared amongst residential, commercial, educational, office, recreational, and religious uses.

Main Street

Main Street is an urban principal arterial roadway with a general east-west orientation. Main Street is maintained by the Town of Saugus along its length, with the exception of its interchange with Route 1, which is under MassDOT jurisdiction. The roadway provides regional connections between the Town of Wakefield to the west and Saugus Town Center to the east. Locally, the roadway provides connections between shopping centers at Route 1 and Lynn Fells Parkway to the west and Saugus Town Center to the east. Main Street varies in width along the corridor, ranging between ± 31 -feet wide and ± 76 -feet wide, with ancillary turn lanes provided at the signalized intersections. Directional flow is separated by a painted double-yellow centerline. Land uses along Main Street are shared amongst residential, commercial, educational, and recreational uses.

Hamilton Street

Hamilton Street is a two-lane east-west urban minor arterial roadway maintained by the Town of Saugus. The roadway provides local connections between Saugus Town Center to the west and Lincoln Avenue to the east. Hamilton Street varies in width along the corridor, ranging from ± 24 -feet wide to ± 40 -feet wide. Directional flow is separated by a painted double-yellow centerline. Land uses along Hamilton Street are shared amongst residential, commercial, and recreational uses.

Essex Street (east of Route 1)

Essex Street is a two-lane, south-north urban minor arterial roadway maintained by the Town of Saugus to the east of its interchange with Route 1. Essex Street to the west of Route 1 is under MassDOT jurisdiction. The roadway provides regional connections between the City of Melrose to the west and Lincoln Avenue in Saugus to the east. Locally, the roadway provides Saugus residents with access to Square One Mall at Route 1 to the west. Essex Street varies in width along the corridor, ranging between ± 36 -feet wide and ± 53 -feet wide. Directional flow is separated by a painted double-yellow centerline. Land uses along Main Street are shared amongst residential, commercial, and recreational uses.

Lincoln Avenue

Lincoln Avenue is a two-lane urban minor arterial roadway with a general north-south orientation maintained by the Town of Saugus. The roadway provides regional connections between Revere to the south and Lynn to the north. The roadway also provides connections locally by providing

access to businesses at the intersection of Essex Street and Lincoln Avenue rotary. Lincoln Avenue varies in width along the corridor, ranging between ±29-feet wide and ±50-feet wide. Directional flow is separated by a painted double-yellow centerline. Land uses along Lincoln Avenue are shared amongst residential, commercial, office, recreational, and religious uses.

EXISTING SPEED REGULATIONS

To provide a reference for new speed regulations, TEC obtained the existing speed zoning regulations on file with the MassDOT Traffic and Safety Engineering Section for the study area corridors. Table 1 provides a summary of the existing speed regulations for each speed study corridor. Graphical depictions of the regulations are provided on from Figures 2 through 7. Essex Street is absent from Table 1 as it is not currently governed by a MassDOT speed regulation. Therefore, Essex Street to the east of Route 1 is currently regulated and enforced by MGL Chapter 90, Section 17, or 30 MPH for a Thickly Settled or Business District.

Main Street in the vicinity of its interchanges with Route 1 is under MassDOT jurisdiction and is therefore not subject to regulation by the Town. A separate speed limit analysis may be requested by the Town in this location. Therefore, this area was not considered for speed regulation within this report.

Speed zoning regulations are also recorded with MassDOT for the following roadways outside of the study area: Elm Street, Winter Street, Saville Street, Walnut Street, Forest Street, Fairmont Avenue, Hurd Avenue, Appleton Street, Wamasit Avenue, Spring Street and Chestnut Street. These speed regulations are to be maintained as existing.

Table 1 – Existing Speed Regulations

Corridor	Mile Post*	Direction	Distance	Speed Regulation
Water Street ¹	0.00 to 0.64	Eastbound	0.64 miles	35 MPH
	0.64 to 1.13	Eastbound	0.49 miles	30 MPH
	0.00 to 0.49	Westbound	0.49 miles	30 MPH
	0.49 to 1.13	Westbound	0.64 miles	35 MPH
Central Street ²	0.00 to 0.26	Northbound	0.26 miles	30 MPH
	0.26 to 0.56	Northbound	0.30 miles	35 MPH
	0.56 to 0.76	Northbound	0.20 miles	30 MPH
	0.76 to 1.20	Northbound	0.44 miles	25 MPH
	1.20 to 1.53	Northbound	0.33 miles	20 MPH
	1.53 to 1.76	Northbound	0.23 miles	25 MPH
	1.76 to 2.19	Northbound	0.43 miles	35 MPH
	2.19 to 2.48	Northbound	0.29 miles	30 MPH
	0.00 to 0.27	Southbound	0.27 miles	30 MPH
	0.27 to 0.70	Southbound	0.43 miles	35 MPH
	0.70 to 0.93	Southbound	0.23 miles	25 MPH
	0.93 to 1.26	Southbound	0.33 miles	20 MPH
	1.26 to 1.70	Southbound	0.44 miles	25 MPH
	1.70 to 1.90	Southbound	0.20 miles	30 MPH
	1.90 to 2.20	Southbound	0.30 miles	35 MPH
	2.20 to 2.46	Southbound	0.26 miles	30 MPH
Main Street ³	0.00 to 0.42	Eastbound	0.42 miles	45 MPH
	0.42 to 0.99	Eastbound	0.57 miles	35 MPH
	0.99 to 1.36	Eastbound	0.37 miles	30 MPH
	State Highway	Eastbound	+/- 0.56 miles	30 MPH
	1.36 to 1.90	Eastbound	0.54 miles	30 MPH
	1.90 to 1.98	Eastbound	0.08 miles	20 MPH
	0.00 to 0.62	Westbound	0.62 miles	30 MPH
	State Highway	Westbound	+/- 0.56 miles	30 MPH
	0.62 to 0.99	Westbound	0.37 miles	30 MPH
	0.99 to 1.56	Westbound	0.57 miles	35 MPH
	1.56 to 1.98	Westbound	0.42 miles	45 MPH
Hamilton Street ⁴	0.00 to 0.63	Westbound	0.63 miles	35 MPH
	0.63 to 1.09	Westbound	0.46 miles	30 MPH
	0.00 to 0.46	Eastbound	0.46 miles	30 MPH
	0.46 to 1.09	Eastbound	0.63 miles	35 MPH

* Mile Post 0.00 indicates the Town Line and / or the end of the roadway for each respective corridor

¹ Special Speed Regulation No. 4024; Saugus – Main Street, Water Street, Hamilton Street, Elm Street, Lincoln Avenue, Water Street; March 24, 1978

² Special Speed Regulation No. 407; Saugus – Central; May 10, 1968

³ Special Speed Regulation No. 4024; Saugus – Main Street, Water Street, Hamilton Street, Elm Street, Lincoln Avenue, Water Street; March 24, 1978

⁴ Special Speed Regulation No. 4024-A; Saugus – Hamilton Street; April 26, 1979

Table 1 – Existing Speed Regulations (Continued)

Corridor	Mile Post*	Direction	Distance	Speed Regulation
Lincoln Avenue ⁵	0.00 to 0.29	Northbound	0.29 miles	30 MPH
	0.29 to 0.62	Northbound	0.33 miles	20 MPH
	0.62 to 1.91	Northbound	1.29 miles	30 MPH
	0.00 to 1.29	Southbound	1.29 miles	30 MPH
	1.29 to 1.62	Southbound	0.33 miles	20 MPH
	1.62 to 1.91	Southbound	0.29 miles	30 MPH

* Mile Post 0.00 indicates the Town Line and / or the end of the roadway for each respective corridor

A review of Table 1 and the Figures 2 through 7 show that several roadways within the Town, specifically Central Street and Main Street, have many regulations that change over short roadway distances. This can be confusing for drivers and difficult to enforce by the Police Department. Further, MassDOT recommends that speed zones be greater than one-half mile outside of specific special zoning for schools. Establishing speed zones in accordance with standard engineering practices will aid in driver expectancy, increase the likelihood of vehicles traveling a consistent safe speed and assist in the ability to enforce the regulations. The existing MassDOT speed regulations are provided in Appendix A

⁵ Special Speed Regulation No. 4024; Saugus – Main Street, Water Street, Hamilton Street, Elm Street, Lincoln Avenue, Water Street; March 24, 1978

1"=600'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations

WATER STREET (ROUTE 129)

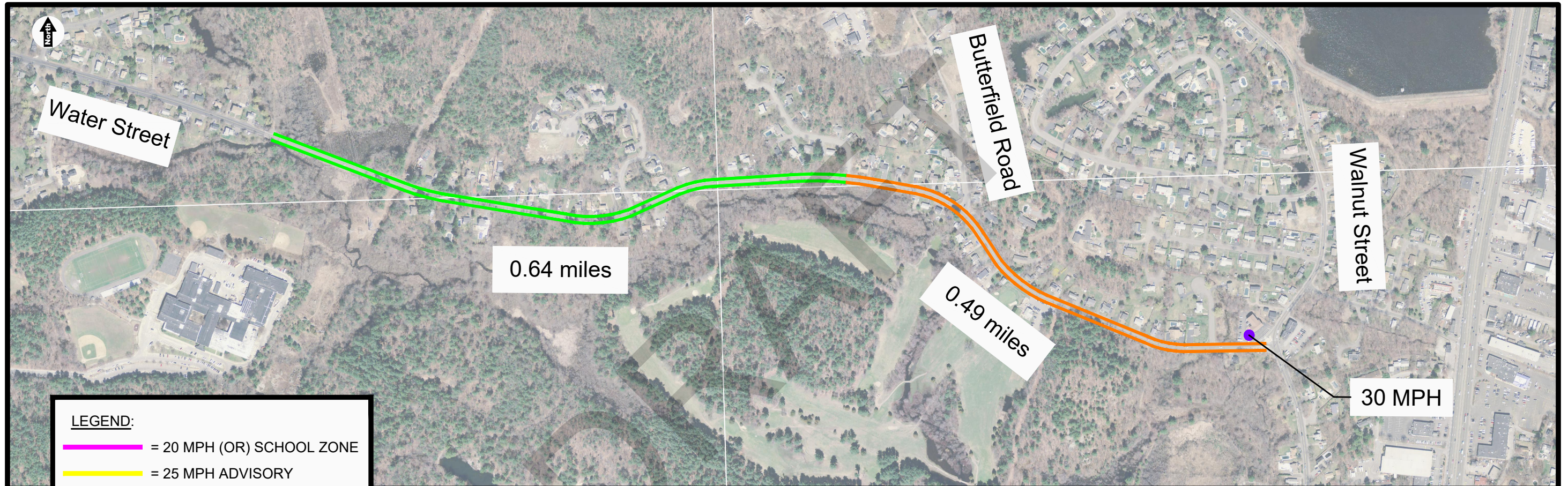


Figure 2

Existing Speed Regulations
Water Street (Route 129)

1"=1000'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Street, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations

CENTRAL STREET



Figure 3

Existing Speed Regulations
Central Street

1"=1000'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations

MAIN STREET

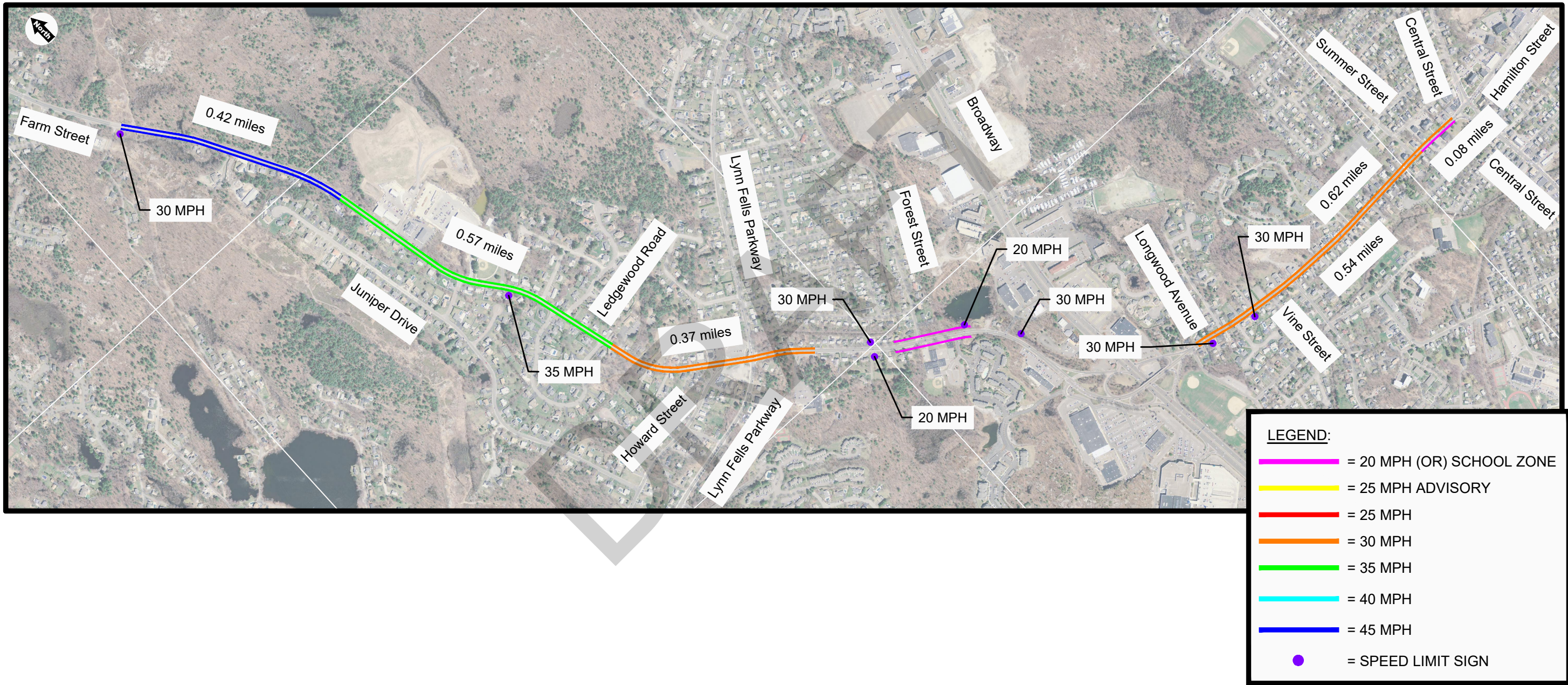


Figure 4

Existing Speed Regulations
Main Street

1"=600'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations

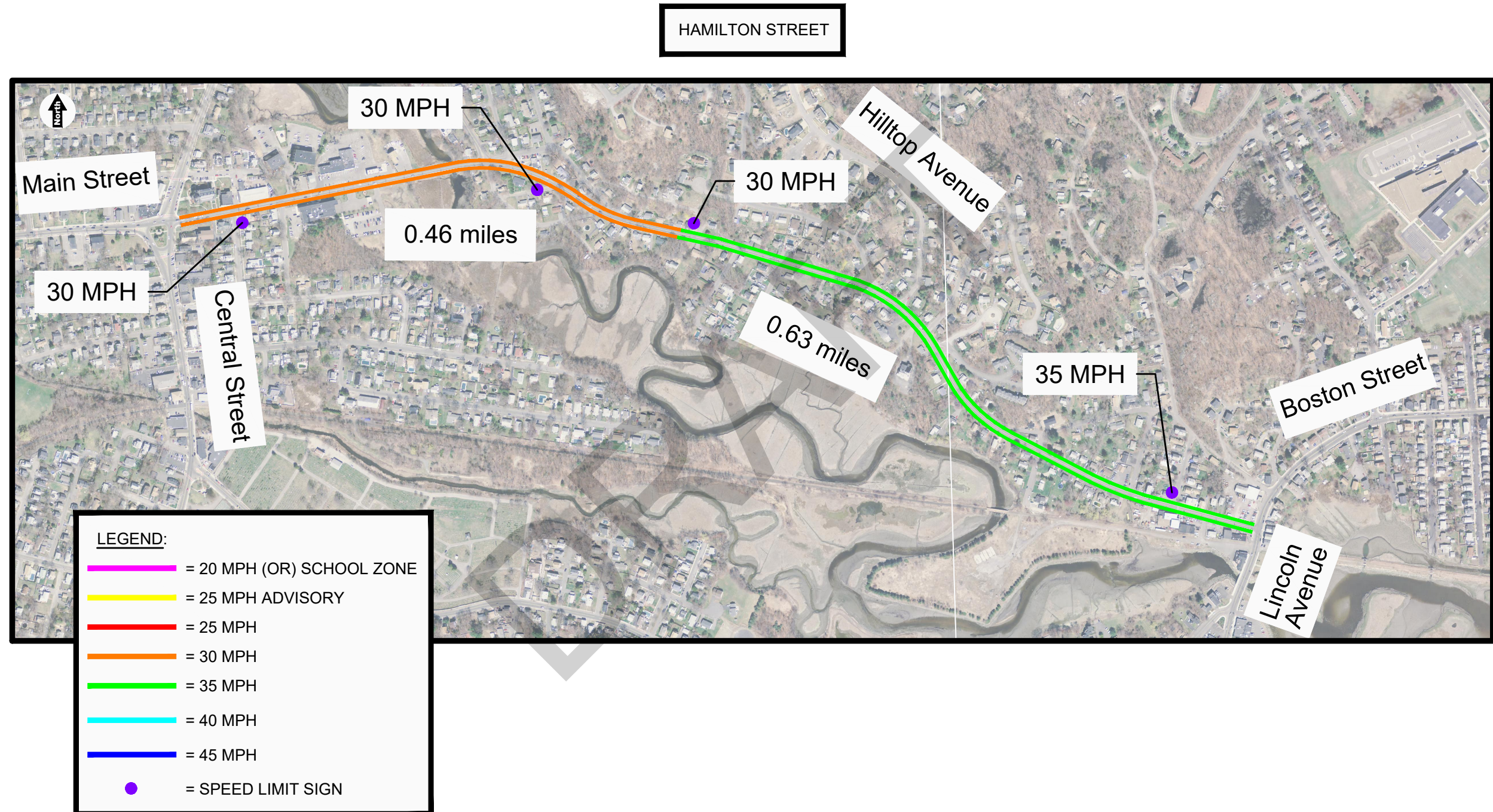


Figure 5

Existing Speed Regulations
Hamilton Street

1"=600'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations

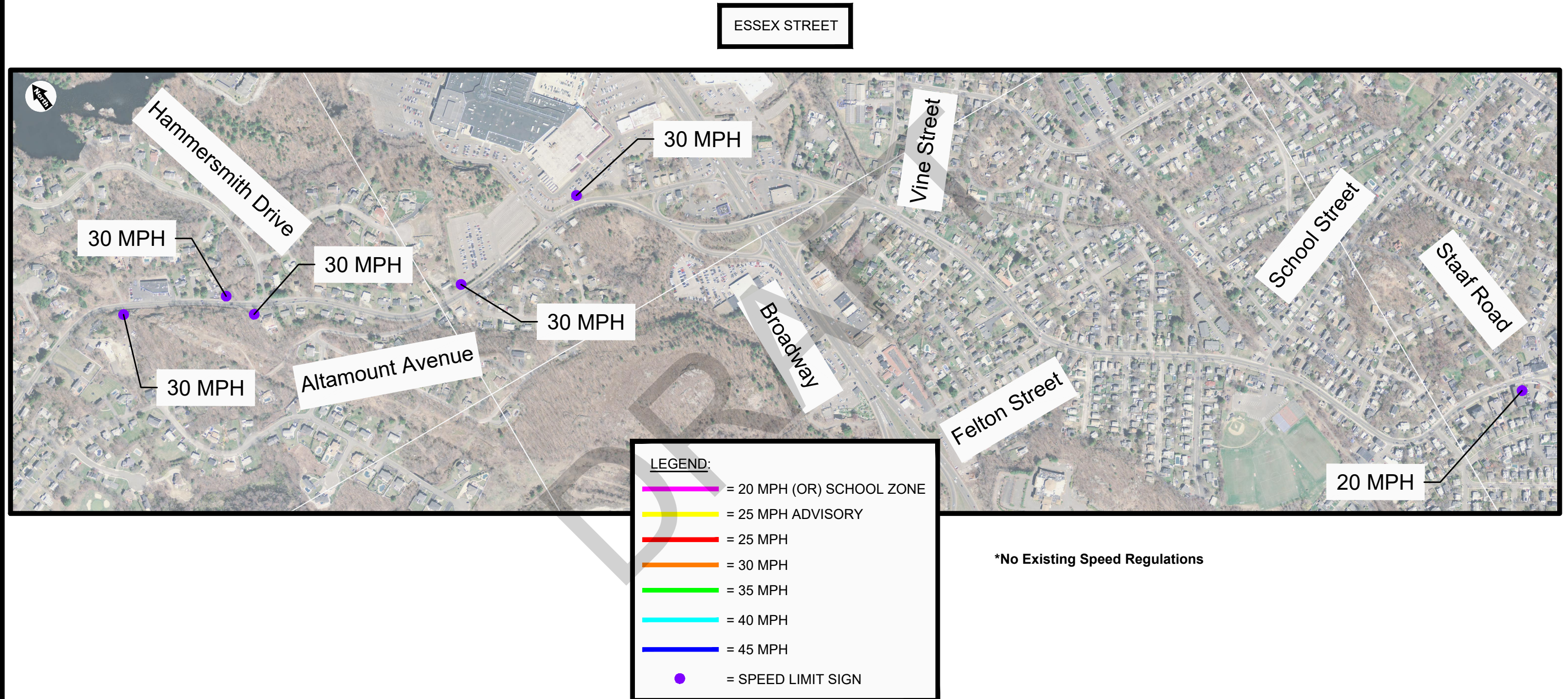
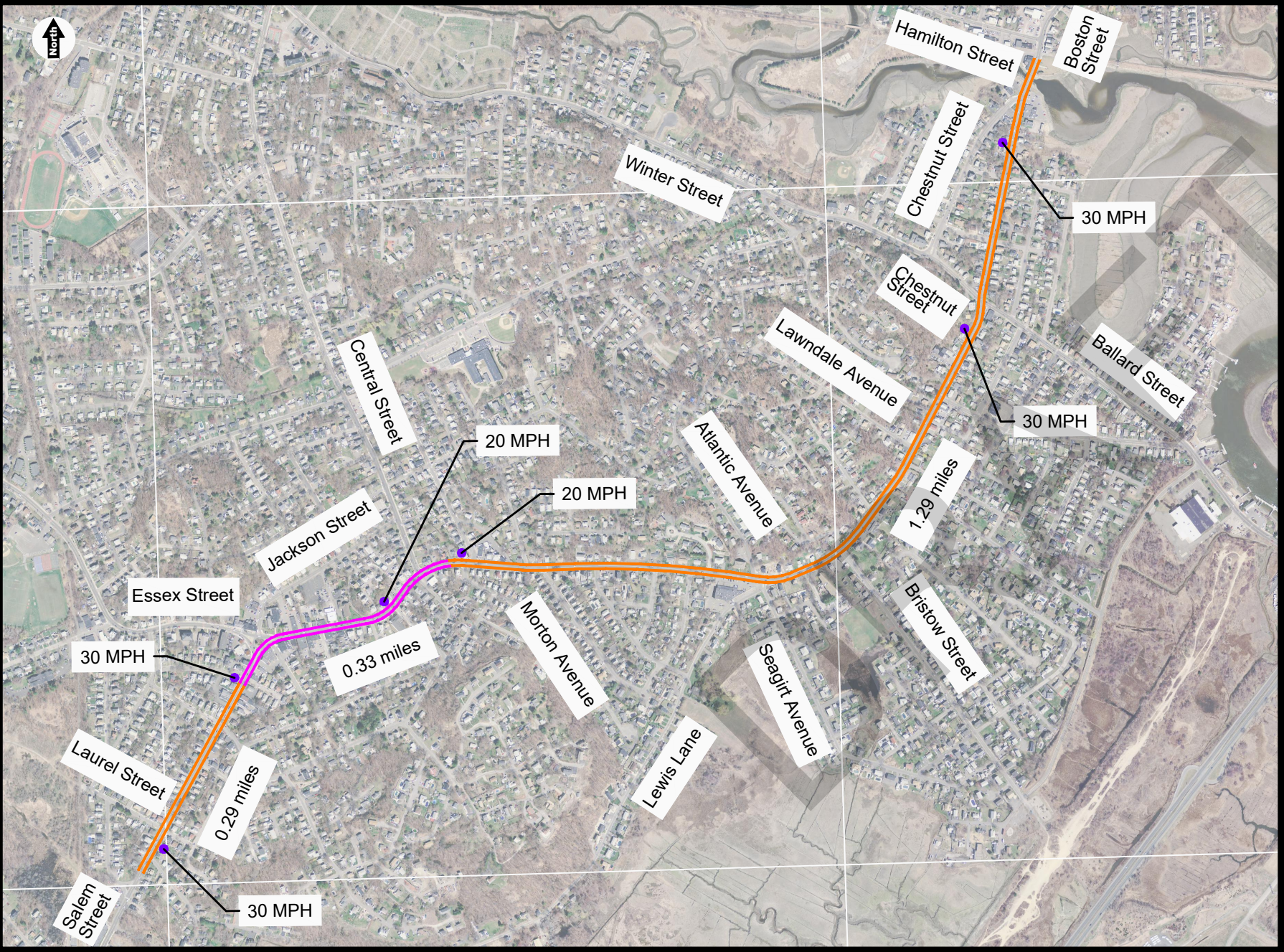


Figure 6

Existing Speed Regulations
Essex Street

1"=1000'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations



LINCOLN AVENUE

LEGEND:

- = 20 MPH (OR) SCHOOL ZONE
- = 25 MPH ADVISORY
- = 25 MPH
- = 30 MPH
- = 35 MPH
- = 40 MPH
- = 45 MPH
- = SPEED LIMIT SIGN

Figure 7

Existing Speed Regulations
Lincoln Avenue

III. DATA COLLECTION

The MassDOT publication *Procedures for Speed Zoning on State Highways and Municipal Roads* (herein referred to as "MassDOT Procedures for Speed Zoning"), as revised in February 2017, defines the process by which regulatory and statutory speed zones may be requested or changed by a municipality in Massachusetts. These procedures are based upon guidelines found within the Federal Highway Administration's publication, *Manual of Uniform Traffic Control Devices (MUTCD)*, which is the overarching national standard.

To post a legally-enforceable regulatory speed limit, a comprehensive engineering study must be conducted within each proposed speed zone to establish a safe, reasonable, self-enforcing speed limit. This has been established by MGL Chapter 90, Section 18 and as outlined in the MassDOT Procedures for Speed Zoning. Generally, new speeds are established based on a safe speed range centered on an analysis of the current speed distribution of free-flowing traffic along the existing roadway.

One of the most important steps for defining the current speed distribution of free-flowing traffic is measuring the prevailing speeds of motorists on a particular section of a roadway under ideal conditions. The speed at or below which 85 percent of motorists travel is the primary value used for establishing speed control. This is commonly referred to as the 85th percentile speed. This method is based on numerous studies which indicate that the majority of motorists are prudent and capable of selecting safe speeds. The 85th percentile speed is the national standard for establishing safe speed limits. In Massachusetts, numerical limits are based on ideal conditions. More specifically, the posted speed limits represent the maximum safe speed under ideal driving conditions.

The measures for determining the 85th percentile speeds upon the study area roadways include travel trial runs and radar speed collection. Additional studies as required by the MassDOT Procedures for Speed Zoning include a crash data analysis and field observations of existing geometric conditions. These analyses were undertaken by TEC on behalf of the Town of Saugus for the six study area roadways to determine the continued applicability of the existing speed regulations and the zones where change is recommended.

PRELIMINARY SPEED ZONES

TEC established preliminary speed zones to define the areas under consideration for a change in the posted speed regulations. Areas which currently have an existing speed regulation of 25 MPH or less were not considered for a change in speed regulations.

The preliminary speed zones were segmented based on physical roadway characteristics, housing density, and adjacent land uses. MassDOT recommends that speed zones be a minimum of one-half mile in length along each roadway; however still dependent on sight distances and uniformity of traffic conditions. As a more urban setting with current regulations defining shorter roadway sections, TEC identified the existing speed zones for study as within the current regulation areas of the corridors.

A breakdown of these speed zones by corridor is described below:

Water Street (Route 129) – 1.13 miles

- Between Saugus Town Line and Richardson Circle – 0.64 miles
- Between Richardson Circle and Walnut Street – 0.49 miles

Central Street – 2.46 miles

- Between Walnut Street and Pearl Road – 0.27 miles
- Pearl Road and Saville Street – 0.43 miles
- Between Saville Street and Vermont Avenue – 1.00 miles (25/20 MPH Regulations)
- Between Vermont Avenue and Adams Avenue – 0.20 miles
- Between Adams Avenue and School Street – 0.30 miles
- Between School Street and Lincoln Avenue – 0.26 miles

Main Street – 1.98 miles under Town jurisdiction

- Between Harmon Road and Town of Saugus Public Works – 0.42 miles
- Between Town of Saugus Public Works and Heritage Lane – 0.57 miles
- Between Heritage Lane and Saugus Family YMCA – 0.37 miles
- Between Saugus Family YMCA and Pierce Memorial Drive – 0.56 miles (under MassDOT Jurisdiction)
- Between Pearce Memorial Drive and Central Street – 0.54 miles

Hamilton Street – 1.09 miles

- Between Central Street and Riverview Avenue – 0.46 miles
- Between Riverview Avenue and Lincoln Avenue – 0.63 miles

Essex Street (east of Route 1) – 1.10 miles

- Between Vine Street and Norman Road – 0.3 miles
- Between Norman Road and Lincoln Avenue – 0.6 miles

Lincoln Avenue – 1.91 miles

- Between Park Street and Myrtle Street – 0.29 miles
- Between Myrtle Street and Endicott Street – 0.33 miles (20 MPH Regulation)

- Between Endicott Street and Overlea Avenue – 0.64 miles
- Between Overlea Avenue and Hamilton Street – 0.65 miles

All existing speed limit signage was reviewed prior to any data collection efforts. Where the posted speed limit did not comply with the current MassDOT speed regulation, that signage was removed by the Saugus Public Works Department.

CORRIDOR TRIAL RUNS

TEC conducted multiple speed trial runs along each of the study area corridors. In accordance with the MassDOT Procedures for Speed Zoning, three different drivers conducted three runs in each direction of each roadway. For each trial run, the driver operated at the safe maximum comfortable speed while a passenger seated directly behind the driver recorded speedometer and odometer readings approximately every one-tenth of a mile. The data from the trial runs was aggregated to develop a speed curve representing the average safe maximum comfortable speed along each point of the study area corridors. A compilation of the trial run speed data is provided in Appendix B and is depicted on the Speed Control Summary sheets provided in Figures 8 through 13.

SPEED DATA COLLECTION

Spot speed checks were conducted at singular locations within each preliminary speed zone identified as a speed zone with potential for a speed limit regulation change. The general 'rule of thumb' is to establish spot speed checks at intervals at or around every 0.25 miles along each roadway. As a more urban setting with current regulations defining shorter roadway sections, TEC identified the speed check locations within the existing speed zones and in approximately 0.5-mile sections of longer roadways with one or no existing speed zones.

The spot speeds were collected for both directions of travel on weekdays during off-peak hours under ideal conditions. For each spot collection, data was gathered for 105 vehicles over a maximum two-hour period in accordance with the MassDOT Procedures for Speed Zoning. Spot speed data was only gathered for vehicles in which the driver was choosing his or her own speed. For vehicles in closely-spaced platoons, only the lead vehicle's speed was recorded. Precision Data Industries, LLC collected the data from unmarked vehicles using a radar gun following proper training on radar gun usage.

After compiling the spot speed data, an 85th percentile speed was calculated for each spot speed location in accordance with MassDOT standards. The speed associated with the 85th percentile numbered vehicle (rounded to the nearest whole number) was then recorded as the 85th percentile speed. In addition to the 85th percentile speed, the following information was also tabulated: 95th percentile speed, 50th percentile speed, mode (the speed at which the greatest number of vehicles are traveling), and the pace (the 10 MPH speed range containing the greatest number of vehicles). The Speed Distribution sheets containing these values are provided in Appendix C and the resulting summary data for each location is depicted on the Speed Control Summary sheets provided in Figures 8 through 13.

CRASH HISTORY

Crash reports for the study area corridors was compiled and analyzed for the most recent consecutive five-year period (January 2014 through March 2019) on file with the Town of Saugus Police Department. This data was reviewed to determine if any crash trends exist along the study area corridors; specifically pertaining to speed related crashes. A summary of the vehicle crash data for each corridor is provided in Table 2.

Table 2 – Corridor Crash History Summary

Parameter		Water Street	Central Street	Main Street	Hamilton Street	Essex Street	Lincoln Avenue
Crash Year	2014	3	8	17	1	12	16
	2015	1	7	17	3	6	20
	2016	8	21	59	12	26	58
	2017	6	16	52	8	15	63
	2018	2	22	64	7	16	55
	2019	<u>1</u>	<u>6</u>	<u>10</u>	<u>1</u>	<u>2</u>	<u>14</u>
	TOTAL	21	80	219	32	77	226
Average Annual*		4.00	14.80	42.0	6.20	15.00	42.40
Directly Speed Related		1	6	9	2	7	10
Manner of Collision	Angled	4	34	52	9	23	54
	Rear-end	3	14	106	8	20	68
	Sideswipe	2	13	21	5	16	53
	Single Vehicle	11	13	29	8	9	32
	Head-On	1	3	6	1	5	8
	Ped / Bike	0	2	3	1	3	10
	Not Reported	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>1</u>	<u>1</u>
	TOTAL	21	80	219	32	77	226
Weather Conditions	Clear	11	55	142	24	59	155
	Cloudy	2	11	32	4	5	33
	Rain	6	9	31	1	4	23
	Snow	2	5	9	2	9	7
	Other / Unknown	<u>0</u>	<u>0</u>	<u>5</u>	<u>1</u>	<u>0</u>	<u>8</u>
	TOTAL	21	80	219	32	77	226
Day of Week	Monday-Friday	15	62	162	22	55	151
	Saturday-Sunday	<u>6</u>	<u>18</u>	<u>57</u>	<u>10</u>	<u>22</u>	<u>75</u>
	TOTAL	21	80	219	32	77	226
Time of Day	6:00AM-9:00AM	4	8	29	3	7	39
	9:00AM-12:00PM	2	14	30	4	8	36
	12:00PM-3:00PM	4	19	49	9	15	45
	3:00PM-6:00PM	5	11	25	8	13	25
	6:00PM-9:00PM	2	14	57	3	18	44
	9:00PM-6:00AM	<u>4</u>	<u>14</u>	<u>29</u>	<u>5</u>	<u>16</u>	<u>37</u>
	TOTAL	21	80	219	32	77	226

- 2019 Data not included in Average Annual calculation due to only having data for part of the year.

Crash Data Summary

The Water Street (Route 129) corridor experienced a total of 21 crashes with 1 crash directly related to speed within the five-year period (2014-2019). Of the reported collisions along this corridor, 14 percent were rear-end crashes, 19 percent were angled crashes, 52 percent were single vehicle crashes, 2 percent were sideswipe crashes, 1 percent were head-on crashes, and 0 percent was pedestrian/bicyclist crashes. 47 percent of the crashes occurred on wet or snow-covered pavement.

The Central Street corridor experienced a total of 80 crashes with 6 crashes directly related to speed within the five-year period (2014-2019). Of the reported collisions along this corridor, 18 percent were rear-end crashes, 43 percent were angled crashes, 13 percent were single vehicle crashes, 16 percent were sideswipe crashes, 3 percent were head-on crashes, and the remaining 3 percent and 1 percent were pedestrian/bicyclist crashes and other/not reported crashes respectively. 21 percent of the crashes occurred on wet or snow-covered pavement.

The Main Street corridor experienced a total of 219 crashes with 9 crashes directly related to speed within the five-year period (2014-2019). Of the reported collisions along this corridor, which includes the Route 1 / Main Street interchange, 48 percent were rear-end crashes, 24 percent were angled crashes, 13 percent were single vehicle crashes, 10 percent were sideswipe crashes, 3 percent were head-on crashes, and the remaining 1 percent was pedestrian/bicyclist crashes. 6 percent of the crashes occurred on wet or snow-covered pavement.

The Hamilton Street corridor experienced a total of 32 crashes with 2 crashes directly related to speed within the five-year period (2014-2019). Of the reported collisions along this corridor, 25 percent were rear-end crashes, 28 percent were angled crashes, 25 percent were single vehicle crashes, 16 percent were sideswipe crashes, 3 percent were head-on crashes, and the remaining 3 percent was pedestrian/bicyclist crashes. 15 percent of the crashes occurred on wet or snow-covered pavement.

The Essex Street (east of Route 1) corridor experienced a total of 77 crashes with 7 crashes directly related to speed within the five-year period (2014-2019). Of the reported collisions along this corridor, 26 percent were rear-end crashes, 30 percent were angled crashes, 12 percent were single vehicle crashes, 21 percent were sideswipe crashes, 6 percent were head-on crashes, and the remaining 4 percent and 1 percent were pedestrian/bicyclist crashes and other/not reported crashed respectively. 22 percent of the crashes occurred on wet or snow-covered pavement.

The Lincoln Avenue corridor experienced a total of 226 crashes with 10 crashes directly related to speed within the five-year period (2014-2019). Of the reported collisions along this corridor, 30 percent were rear-end crashes, 24 percent were angled crashes, 14 percent were single vehicle crashes, 23 percent were sideswipe crashes, 4 percent were head-on crashes, and the remaining 4 percent was pedestrian/bicyclist crashes. 25 percent of the crashes occurred on wet or snow-covered pavement.

Of the total 655 crashes along the six roadway corridors, approximately 5 percent (35 of 655) of the crashes were directly speed related crashes based on the narrative provided in the crash reports. Many of the rear-end and "following too closely" crashes could be attributed to driver frustration as a result of the driver not being able to travel at their desired speed due to a slow-

traveling vehicle in front of them. This could be indicative of the posted speed limit not accurately representing the 85th percentile speed along the roadway corridor. It is important to note that although speed may not be documented as the direct factor for the crashes, many crashes may be tied to vehicle speed. For example, an angled crash where a vehicle on the side-street misjudges a gap in traffic due to a vehicle on the mainline roadway driving with excessive speed. A compilation of the crash data spreadsheets and crash location figures for the six roadway corridors is provided in Appendix D.

MAPPING OF CONDITIONS

Upon completion of all data collection, a Speed Control Summary Sheet was prepared for each of the study area roadways. The summaries include the existing geometric conditions, including elevations, side streets, traffic signals and roundabouts. Existing speed limit and curve warning signage are noted along with the current speed limit regulations. The median speed from the trial runs are noted. The 50th percentile, 85th percentile, and mode speeds are listed for each direction at the identified observation stations.



1"=1500'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

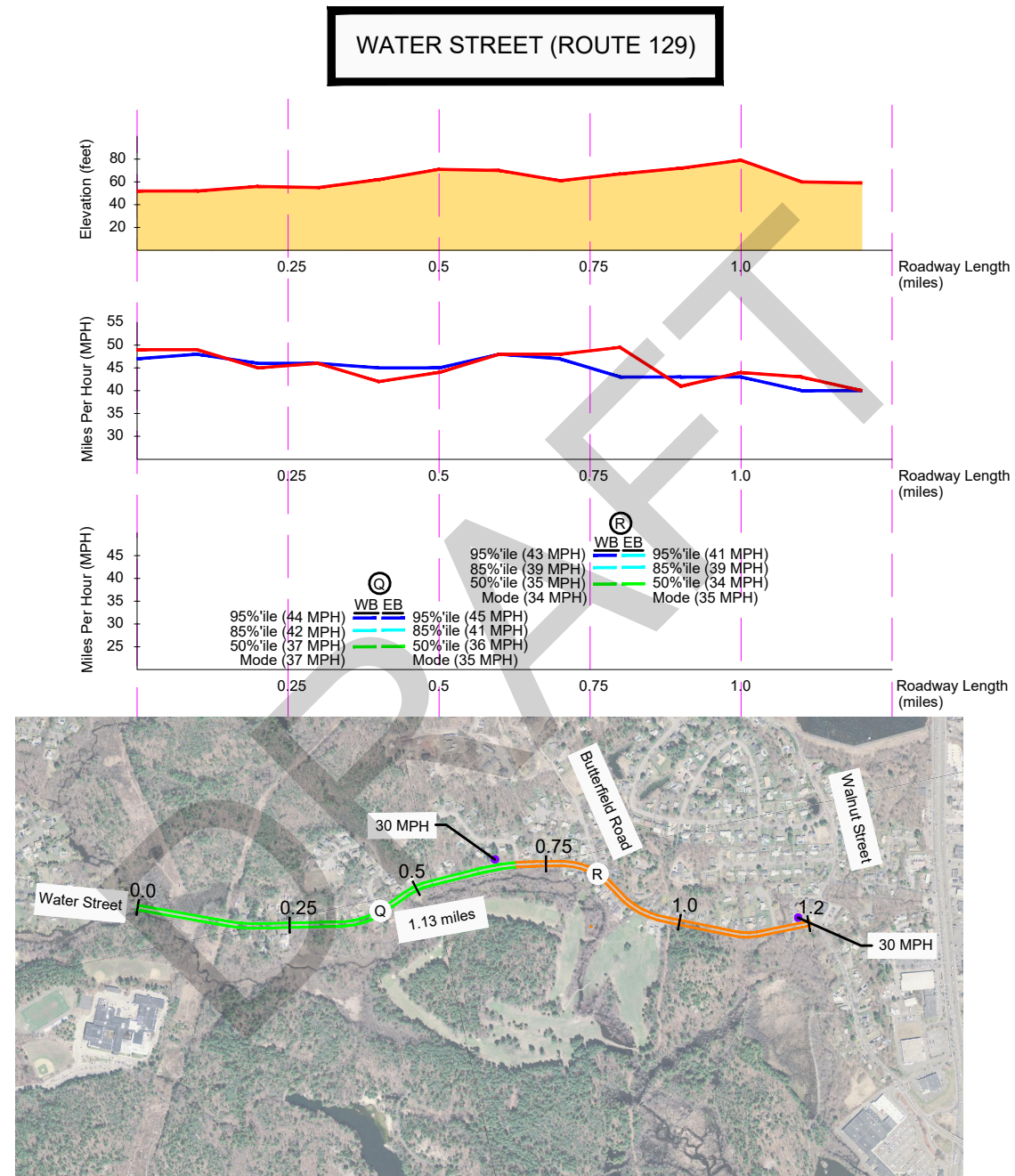


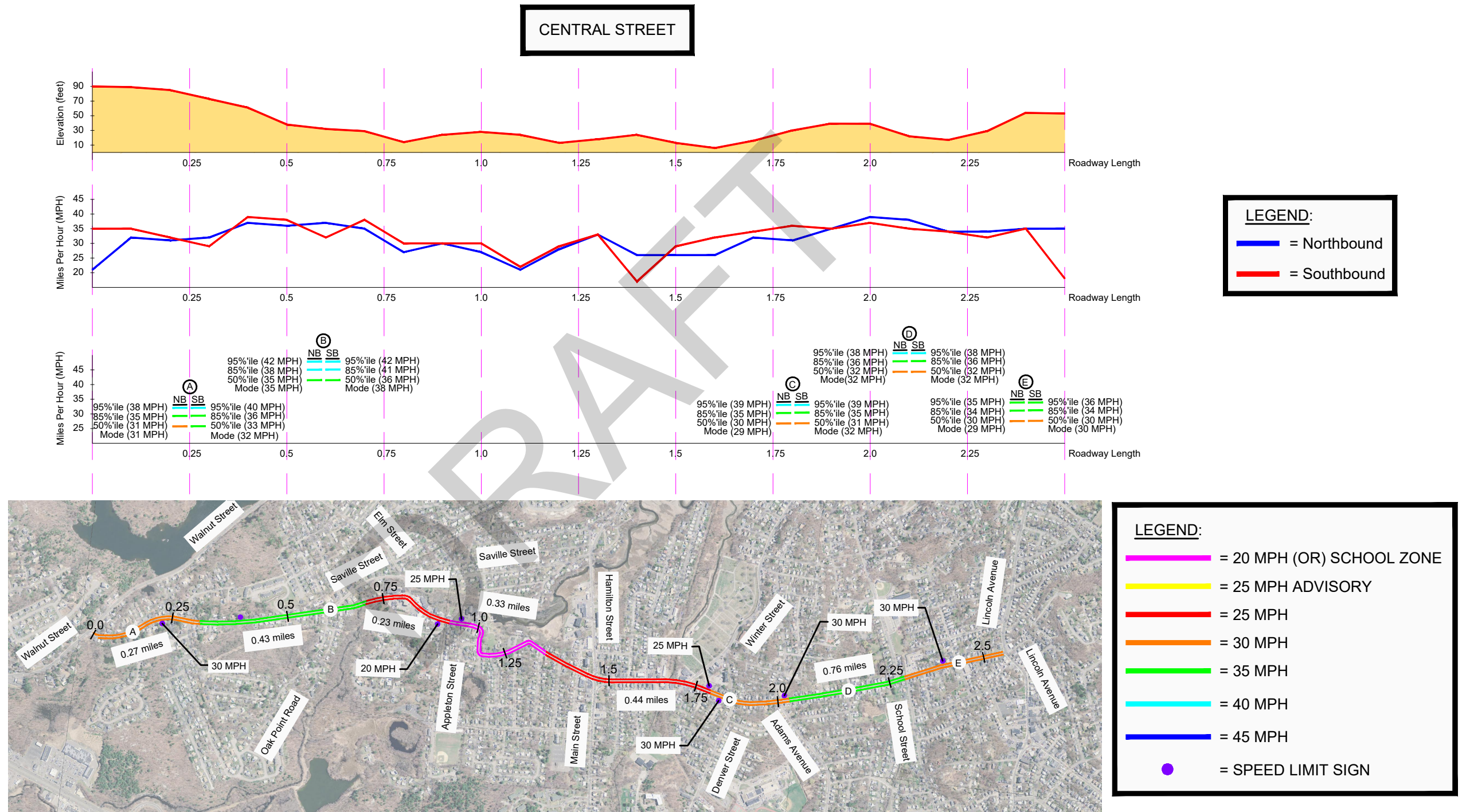
Figure 8

Speed Control Summary
Water Street (Route 129)



1"=1500'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Street, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations





1"=1500'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

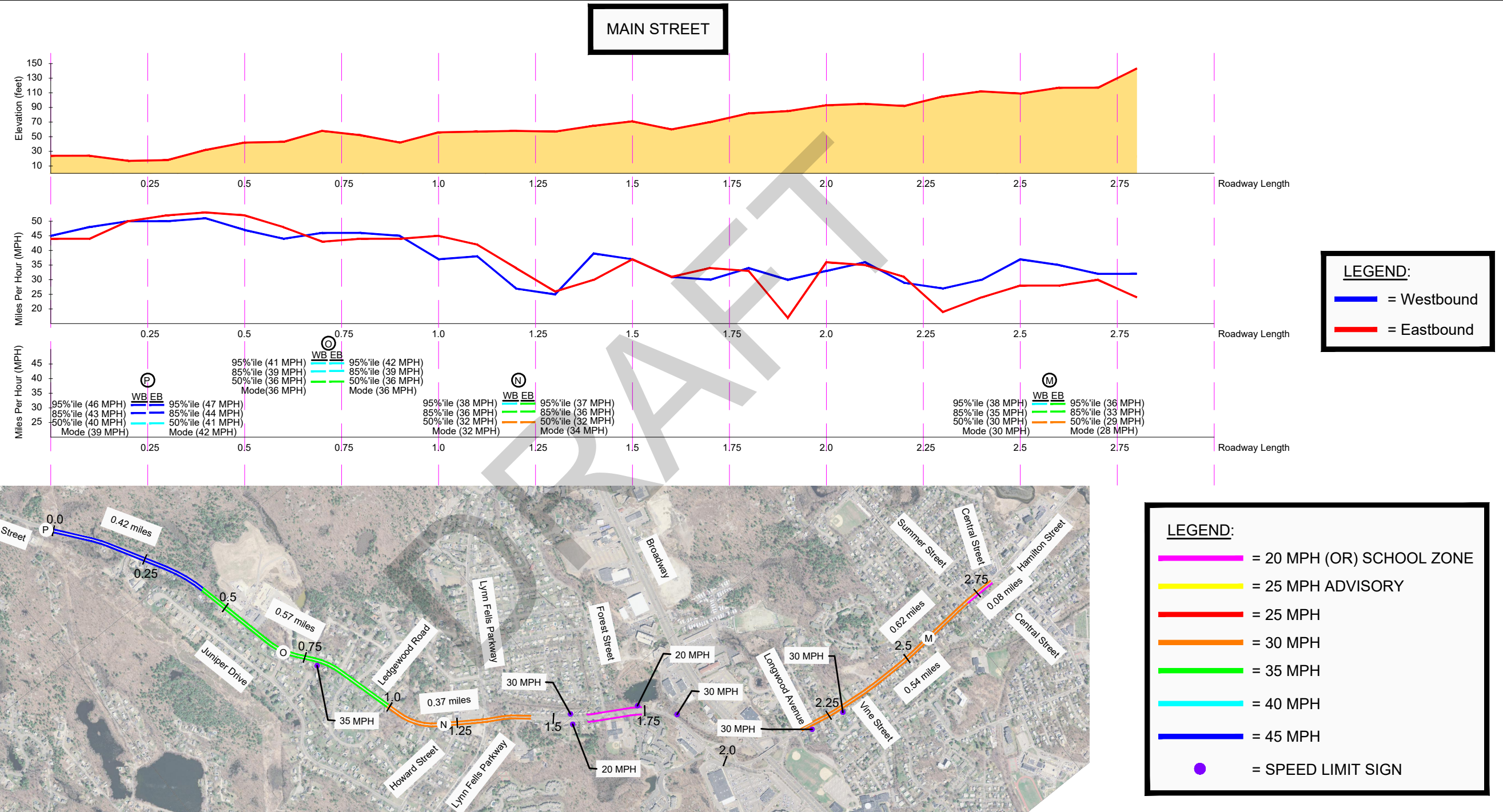


Figure 10
Speed Control Summary
Main Street



1"=1500'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

HAMILTON STREET

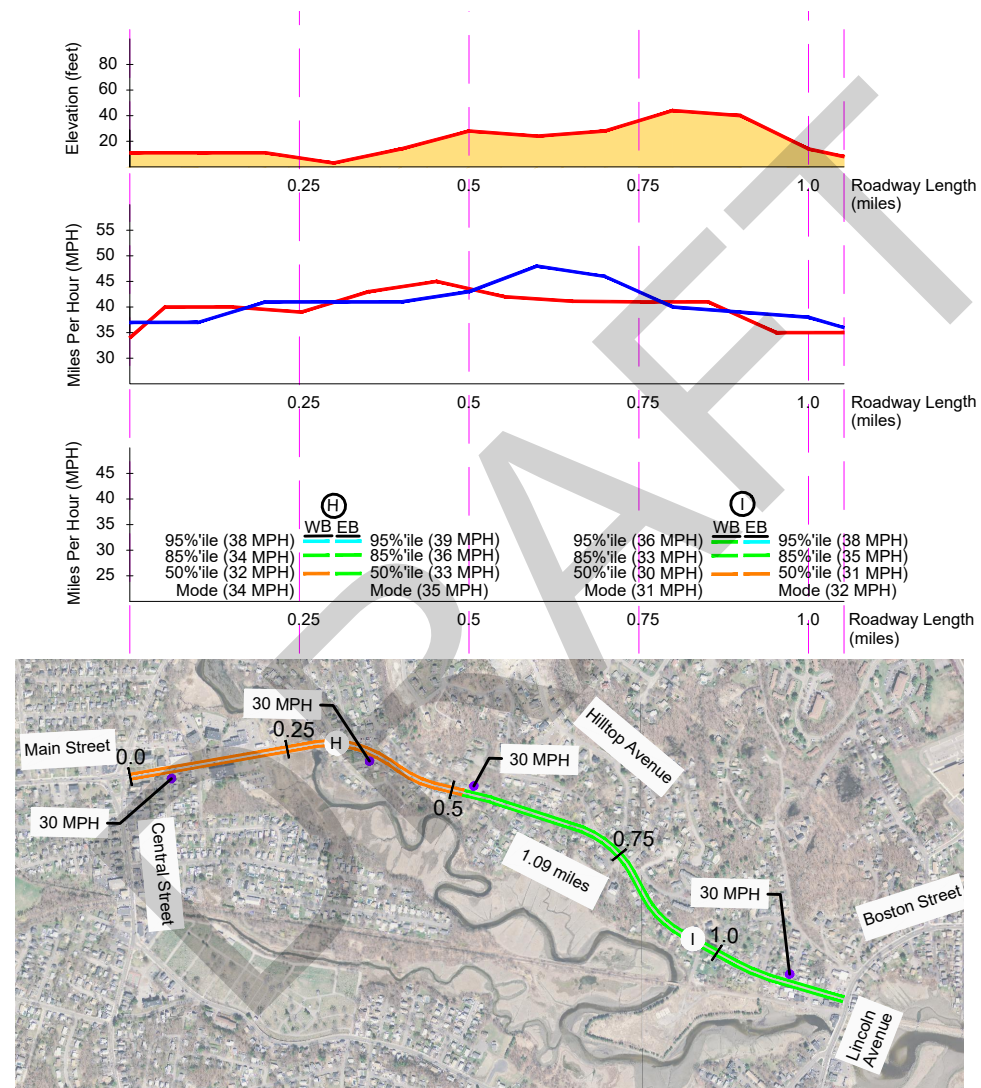


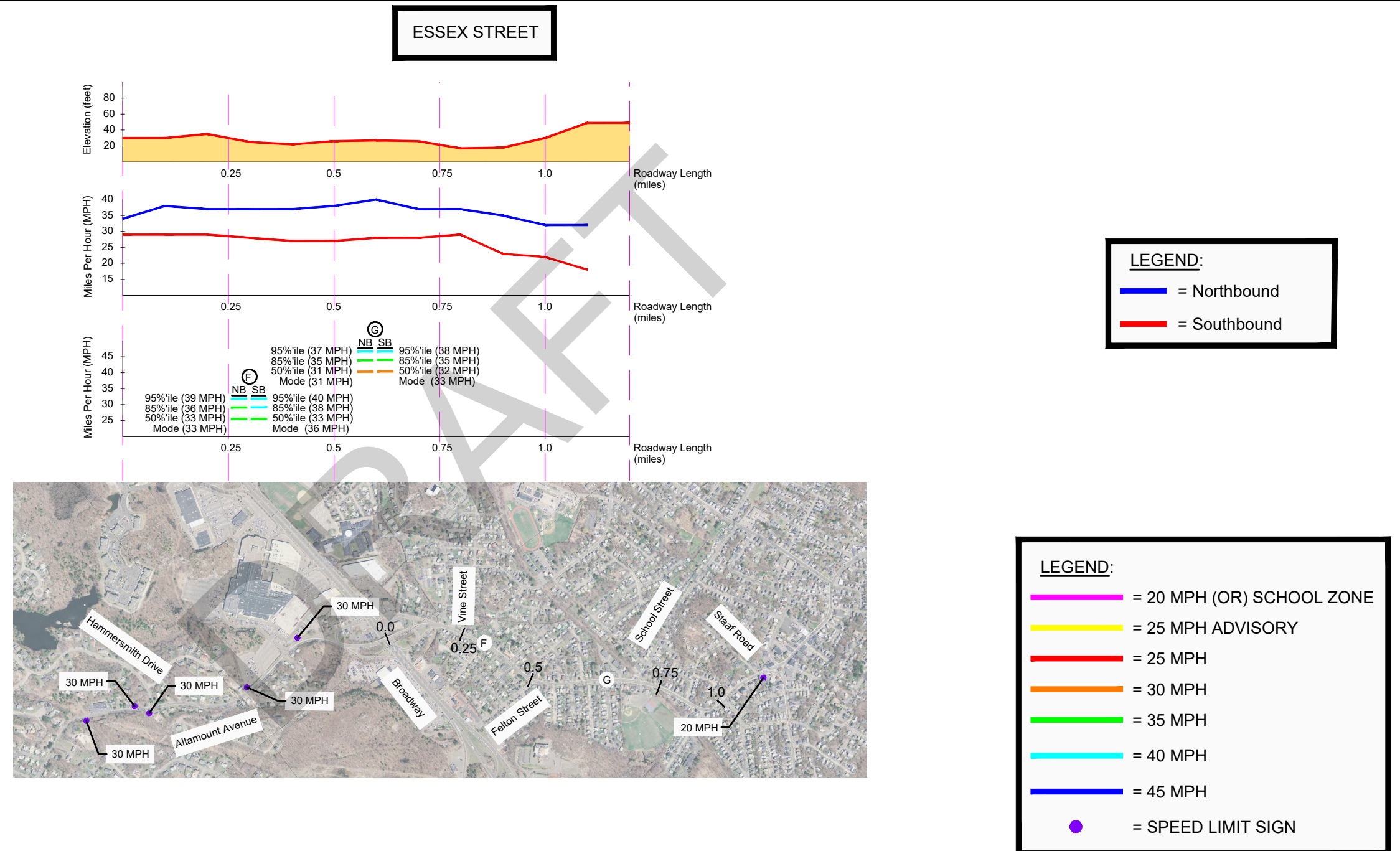
Figure 11

Speed Control Summary
Hamilton Street



1"=1500'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations





1"=1500'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

Saugus Speed Study - Saugus, Massachusetts
Technical Memorandum

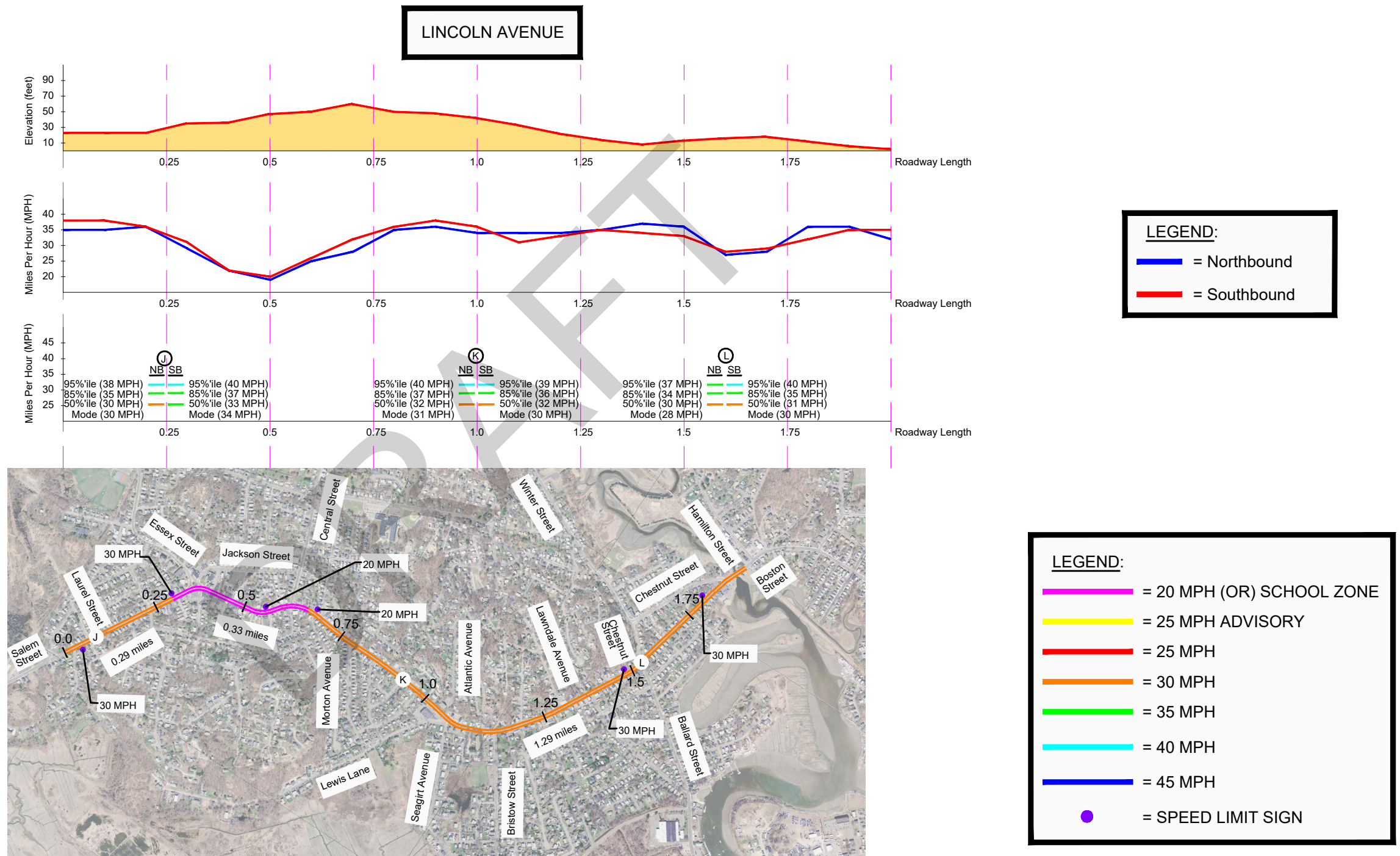


Figure 13

Speed Control Summary
Lincoln Avenue

IV. ANALYSIS OF SPEED DATA

SAFE SPEED RANGE

After compiling the speed data, TEC calculated a safe speed range for each spot speed location. The ranges were based on the following criteria: the low end is equal to seven (7) MPH below the 85th percentile speed; the high end is equal to the 95th percentile speed. Any newly proposed speed limit is within this range, depending on the frequency of crashes and geometric roadway conditions. Table 3 contains a summary of the recorded spot speed data and the resulting safe speed range for each spot speed location.

Table 3 – Safe Speed Range

<u>Corridor</u>	<u>Location</u>	<u>Safe Speed Range</u>		
		<u>Low End</u>	<u>85th Percentile</u>	<u>High End</u>
Water Street (Route 129) EB	at Homeland Circle	34 MPH	41 MPH	45 MPH
	at Butterfield Road	32 MPH	39 MPH	41 MPH
Water Street (Route 129) WB	at Homeland Circle	35 MPH	42 MPH	44 MPH
	at Butterfield Road	32 MPH	39 MPH	43 MPH
Central Street NB	at Sanders Drive	28 MPH	35 MPH	38 MPH
	at Lily Park	31 MPH	38 MPH	42 MPH
	at Denver Street	28 MPH	35 MPH	39 MPH
	at Knowles Avenue	29 MPH	36 MPH	38 MPH
	at Castle Street	27 MPH	34 MPH	35 MPH
Central Street SB	at Sanders Drive	29 MPH	36 MPH	40 MPH
	at Lily Park	34 MPH	41 MPH	42 MPH
	at Denver Street	28 MPH	35 MPH	39 MPH
	at Knowles Avenue	29 MPH	36 MPH	38 MPH
	at Castle Street	27 MPH	34 MPH	36 MPH

Table 3 – Safe Speed Range (Continued)

Corridor	Location	Safe Speed Range		
		Low End	85th Percentile	High End
Main Street WB	at Newhall Avenue	28 MPH	35 MPH	38 MPH
	at Howard Street	29 MPH	36 MPH	38 MPH
	at Hickory Lane	32 MPH	39 MPH	41 MPH
	east of Harmon Road	36 MPH	43 MPH	46 MPH
Main Street EB	at Newhall Avenue	26 MPH	33 MPH	36 MPH
	at Howard Street	29 MPH	36 MPH	37 MPH
	at Hickory Lane	32 MPH	39 MPH	42 MPH
	east of Harmon Road	37 MPH	44 MPH	47 MPH
Hamilton Street EB	at Pace Road	28 MPH	35 MPH	38 MPH
	at Riverbank Road	29 MPH	36 MPH	39 MPH
Hamilton Street WB	at Pace Road	26 MPH	33 MPH	36 MPH
	at Riverbank Road	27 MPH	34 MPH	38 MPH
Essex Street (east of Route 1) NB	at Pleasant Avenue	29 MPH	36 MPH	39 MPH
	at Anawan Street	28 MPH	35 MPH	37 MPH
Essex Street (east of Route 1) SB	at Pleasant Avenue	31 MPH	38 MPH	40 MPH
	at Anawan Street	28 MPH	35 MPH	38 MPH
Lincoln Avenue NB	at Laurel Street	28 MPH	35 MPH	38 MPH
	at Nason Road	30 MPH	37 MPH	40 MPH
	at Chestnut Street	27 MPH	34 MPH	37 MPH
Lincoln Avenue SB	at Laurel Street	30 MPH	37 MPH	40 MPH
	at Nason Road	29 MPH	36 MPH	39 MPH
	at Chestnut Street	28 MPH	35 MPH	40 MPH

Establishing a Regulatory Speed Limit

In accordance with the MassDOT Procedures for Speed Zoning, the 85th percentile speed is the basis for establishing speed zoning. This method assumes that most motorists will select a safe speed that they are comfortable driving on a particular roadway. Should the number of crashes along a section of roadway be unusual, the 85th percentile speed may be lowered up to 7 miles per hour. Only Lincoln Avenue and Main Street exhibit a high crash rate per year, with a large percentage of those crashes being rear-end crashes. Therefore, for the purposes of this report, the 85th percentile speed was used as the basis for recommending a proposed change in speed limit within one of the identified speed zones along the study area roadways.

Statutory Speed Alternative

The Town of Saugus has the option of adopting MGL Chapter 90, Section 17C on either a town-wide basis or street-by-street basis. MassDOT recommends the former as the messaging is consistent and less likely to create confusion.

"Thickly Settled or Business Districts, as defined in MGL c. 90 Section 1 have a default statutory speed limit of 30 MPH unless the municipality has adopted MGL chapter 90 section 17C, wherein the statutory speed limit in these areas is reduced to 25 MPH. However if a Special Speed Regulation has been enacted on this section of roadway, the regulatory speed will govern."

MGL Chapter 90, Section 1 defines a Thickly Settled or Business District as "the territory contiguous to any way which is built up with structures devoted to business, or the territory contiguous to any way where dwelling houses are situated at such distances as will average less than two hundred feet between them for a distance of a quarter of a mile or over." The Town of Saugus has many such areas, indicating that adoption of MGL Chapter 90, Section 17C may be a viable option for adoption by the Town for those roadways outside of the study area that do not have established speed regulations on file with MassDOT.

MassDOT strongly recommends maintaining existing regulatory speeds that are established and on file, as these speed limits have been determined through the performance of an engineering study and are fully able to be enforced by the Town of Saugus Police Department.

Should the option of adopting a town-wide statutory speed limit be enacted, consistent signage is required to be erected on the major roadways entering the Town.

V. CONCLUSIONS AND RECOMMENDATIONS

RECOMMENDATIONS

The primary result of the analyses performed within this report is to determine the 85th percentile speed of vehicles traveling along each study area roadway. This information is then directly used to determine the speed limit that would be established under MassDOT regulations by rounding the 85th percentile speed to the closest multiple of 5 MPH.

The recommendations, as described below, refer to speed zone intervals between known roadway demarcations to provide an easily conveyed location of the zone. The roadway intervals directly correlate to the approximate length of the existing speed zones where applicable. The proposed speed limits were consolidated into designated speed zones made up of spot speed locations which exhibited similar safe speed ranges. Table 4 contains TEC's recommended speed regulations along each speed study corridor. Graphical depictions of these recommended speed regulations are provided in Figures 14 through 19.

Note that MassDOT recommends that speed zones are proposed to the nearest tenth of a mile. The mile posts and distances listed in Table 4 are generally based on the existing speed zones as defined by MassDOT prior to the study and follow general characteristics of the roadway profile and geometry. The Town of Saugus should alter the proposed mile posts and distances as necessary in the field to be generally consistent with the lengths as recommended and approved by MassDOT; but so that speed limit signs do not conflict with driveways, intersecting roadways, trees, or sight lines.

Table 4 – Recommended Speed Regulations

Corridor	Location (Speed Zone)	Mile Post*	Direction	Distance	85th Percentile Speed	Recommended Speed Regulation
Water Street	Saugus Town Line to Richardson Circle	0.00 to 0.64	Eastbound	0.64 miles	40 MPH	Maintain Existing 35 MPH Speed Regulation
	Richardson Circle to Walnut Street	0.64 to 1.13	Eastbound	0.49 miles	40 MPH	Maintain Existing 30 MPH Speed Regulation
	Walnut Street to Richardson Circle	0.00 to 0.49	Westbound	0.49 miles	40 MPH	Maintain Existing 30 MPH Speed Regulation
	Richardson Circle to Saugus Town Line	0.49 to 1.13	Westbound	0.64 miles	40 MPH	Maintain Existing 35 MPH Speed Regulation
Central Street	Lincoln Avenue to School Street	0.00 to 0.26	Northbound	0.26 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	School Street to Adams Avenue	0.26 to 0.56	Northbound	0.30 miles	35 MPH	Existing 35 MPH Proposed 30 MPH
	Adams Avenue to Vermont Avenue	0.56 to 0.76	Northbound	0.20 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Vermont Avenue to Saville Street	0.76 to 1.20	Northbound	0.44 miles		Maintain Existing 25 MPH Speed Regulation
		1.20 to 1.53	Northbound	0.33 miles		Maintain Existing 20 MPH Speed Regulation
		1.53 to 1.76	Northbound	0.23 miles		Maintain Existing 25 MPH Speed Regulation
	Saville Street to Pearl Road	1.76 to 2.19	Northbound	0.43 miles	40 MPH	Existing 35 MPH Proposed 30 MPH
	Pearl Road to Walnut Street	2.19 to 2.48	Northbound	0.29 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Walnut Street to Pearl Road	0.00 to 0.27	Southbound	0.27 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Pearl Road to Saville Street	0.27 to 0.70	Southbound	0.43 miles	40 MPH	Existing 35 MPH Proposed 30 MPH
	Saville Street to Vermont Avenue	0.70 to 0.93	Southbound	0.23 miles		Maintain Existing 25 MPH Speed Regulation
		0.93 to 1.26	Southbound	0.33 miles		Maintain Existing 20 MPH Speed Regulation
		1.26 to 1.70	Southbound	0.44 miles		Maintain Existing 25 MPH Speed Regulation
	Vermont Avenue to Adams Avenue	1.70 to 1.90	Southbound	0.20 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Adams Avenue to School Street	1.90 to 2.20	Southbound	0.30 miles	35 MPH	Existing 35 MPH Proposed 30 MPH
	School Street to Lincoln Avenue	2.20 to 2.46	Southbound	0.26 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation

Table 4 – Recommended Speed Regulations (Continued)

Corridor	Location (Speed Zone)	Mile Post*	Direction	Distance	85 th Percentile Speed	Recommended Speed Regulation
Main Street	Harmon Road to DPW	0.00 to 0.42	Eastbound	0.42 miles	45 MPH	Maintain Existing 45 MPH Speed Regulation
	DPW to Heritage Lane	0.42 to 0.99	Eastbound	0.57 miles	40 MPH	Maintain Existing 35 MPH Speed Regulation
	Heritage Lane to Forest Street	0.99 to 1.36	Eastbound	0.37 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Forest Street to Pierce Memorial Drive	State Highway	Eastbound	+/- 0.56 miles		30 MPH
	Pierce Memorial Drive to Central Street	1.36 to 1.90	Eastbound	0.54 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
		1.90 to 1.98	Eastbound	0.08 miles		Maintain Existing 20 MPH Speed Regulation
	Central Street to Pierce Memorial Drive	0.00 to 0.62	Westbound	0.62 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Pierce Memorial Drive to Forest Street	State Highway	Westbound	+/- 0.56 miles		30 MPH
	Forest Street to Heritage Lane	0.62 to 0.99	Westbound	0.37 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Heritage Lane to DPW	0.99 to 1.56	Westbound	0.57 miles	40 MPH	Maintain Existing 35 MPH Speed Regulation
	DPW to Harmon Road	1.56 to 1.98	Westbound	0.42 miles	45 MPH	Maintain Existing 45 MPH Speed Regulation
Hamilton Street	Lincoln Avenue to Riverview Avenue	0.00 to 0.63	Westbound	0.63 miles	35 MPH	Maintain Existing 35 MPH Speed Regulation
	Riverview Avenue to Central Street	0.63 to 1.09	Westbound	0.46 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Central Street to Riverview Avenue	0.00 to 0.46	Eastbound	0.46 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Riverview Avenue to Lincoln Avenue	0.46 to 1.09	Eastbound	0.63 miles	35 MPH	Maintain Existing 35 MPH Speed Regulation
Essex Street (East of Route 1)	Vine Street to Lincoln Avenue	0.00 to 1.10	Southbound	1.10 miles	35 MPH	Maintain 30 MPH Statutory Speed
	Lincoln Avenue to Vine Street	0.49 to 1.10	Northbound	1.10 miles	35 MPH	Maintain 30 MPH Statutory Speed
Lincoln Avenue	Park Street to Myrtle Street	0.00 to 0.29	Northbound	0.29 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Myrtle Street to Endicott Street	0.29 to 0.62	Northbound	0.33 miles		Maintain Existing 20 MPH Speed Regulation
	Endicott Street to Hamilton Street	0.62 to 1.91	Northbound	1.29 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Hamilton Street to Endicott Street	0.00 to 1.29	Southbound	1.29 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation
	Endicott Street to Myrtle Street	1.29 to 1.62	Southbound	0.33 miles		Maintain Existing 20 MPH Speed Regulation
	Myrtle Street to Park Street	1.62 to 1.91	Southbound	0.29 miles	35 MPH	Maintain Existing 30 MPH Speed Regulation

* Mile Post 0.00 indicates the Town Line and / or the end of the roadway for each respective corridor

Water Street (Route 129)

The Water Street speed data as noted in Table 3 and as shown in Figure 9 shows an 85th percentile speed of 39 MPH to 41 MPH in the eastbound direction and 39 MPH to 42 MPH in the westbound direction. The trial runs generally range from 35 MPH to 45 MPH through the corridor. The Water Street corridor experienced a total of 21 crashes with 1 crash directly related to speed within the five-year period (2014-2019).

Water Street is a commuter corridor which connects Wakefield with Route 1 through Saugus. Although a heavy commuter corridor, the corridor also provides access to residential homes and recreation areas along its length. Based on the number of residences with direct access to Water Street and other side-friction elements throughout the corridor, it is TEC's engineering judgement to recommend maintaining the existing 30 MPH speed limit to the east of Richardson Circle and 35 MPH to the west of Richardson Circle. Between Richardson Circle and the Town Line, the existing 35 MPH speed limit is within the calculated safe speed range. Although the existing 30 MPH zone between Richardson Circle and Walnut Street is lower than the safe speed range, TEC notes that the close spacing of residences conforms with the Thickly Settled criteria, specifically between Butterfield Road and Walnut Street, and therefore merits the lower speed limit, which matches the MGL Chapter 90, Section 17 general statutory speed limit of 30 MPH for Thickly Settled areas, which would be applicable in this speed zone.

Central Street

Central Street currently has eight speed regulations over its 2.5-mile length, ranging from 20 MPH to 35 MPH. The Central Street speed data as noted in Table 3 and as shown in Figure 10 shows an 85th percentile speed of 34 to 36 MPH in the northbound and southbound directions throughout the corridor, except for between Pearl Road and Saville Street, where the 85th percentile speed was 38 MPH northbound and 41 MPH southbound. The trial runs generally range from 20 MPH to 40 MPH through the corridor. The Central Street corridor experienced a total of 80 crashes with 6 crashes directly related to speed within the five-year period.

Central Street is a collector roadway traveling the length of Saugus. A heavily traveled corridor, Central Street provides access to residential areas and the Town Center along its length and can be classified as Thickly Settled in the residential districts and as a Business District within the Town Center. Based on the number of residences with direct access to Central Street and other side-friction elements throughout the corridor, it is TEC's engineering judgement to recommend a consistent 30 MPH speed limit along the length of Central Street, with the exception of maintaining the existing 25 MPH and 20 MPH speed zones surrounding the Town Center (between Saville Street and Vermont Avenue). The 30 MPH proposed speed zone is within the 7 miles per hour low range of the 85th percentile speed as collected, matches the applicable MGL Chapter 90, Section 17 general statutory speed limit for Thickly Settled/Business District areas, and is less of a change in speed between the residential area speed zones and the business area 25/20 MPH speed zones. The 30 MPH speed limit is consistent with other primary roadways entering the Town Center through residential areas. The proposed speed limits standardize the speed limits along the majority of the roadway length, reducing the number of speed regulations to five.

Main Street

The Main Street speed data as noted in Table 3 and as shown in Figure 10 shows an 85th percentile speed ranging from 33 MPH east of Route 1 to 44 MPH near the Town Line. The trial runs range from 30 MPH toward the Town Center to 45 MPH to the Town Line. The Main Street corridor experienced a total of 219 crashes with 9 crashes directly related to speed within the five-year period. This would correspond to approximately 109 crashes per mile of roadway over that period; however, a majority of the crashes are focused in the vicinity of the Main Street / Route 1 interchange.

Main Street is a heavily used commuter corridor which provides direct access to Route 1. Although a heavy commuter corridor, the corridor also provides flow for significant non-commuter traffic with a concentration of retail land uses to the west of Route 1, residential areas to the east of Route 1 and direct access to the Oaklandvale Elementary School. The 85th percentile speeds are within 6 MPH of the existing speed regulations along the roadway. Therefore, it is TEC's engineering judgement to maintain the existing speed zoning along this roadway. Due to the commuter nature of the roadway and the commercial land uses, a change in speed limit is unlikely to change driver behavior along the roadway. Maintaining the existing conditions retains consistency for drivers through the corridor. The speed zones are of a length, between 0.4 miles and 0.57 miles, which can be enforced by the Saugus Police Department.

Hamilton Street

The Hamilton Street speed data as noted in Table 3 and as shown in Figure 11 shows an 85th percentile speed of 35 to 36 MPH in the eastbound direction and 33 MPH to 34 MPH in the westbound direction. The trial runs generally range from 35 MPH to 45 MPH through the corridor. The Hamilton Street corridor experienced a total of 32 crashes with 2 crashes directly related to speed within the five-year period.

The 85th percentile speeds observed are within 6 MPH of the current speed zones along Hamilton Street, with a posted 35 MPH speed limit between Riverview Avenue and Lincoln Avenue and 30 MPH posted between Riverview Avenue and Central Avenue. Therefore, it is TEC's engineering judgement to maintain the existing speed zoning along this roadway. With the 85th percentile speed being close to the existing posted speed limit, it is unlikely that a change in speed limit will change driver behavior along the roadway. Maintaining the existing conditions retains uniformity for drivers through the corridor and the 30 MPH speed limit immediately to the east of Central Street is consistent with other primary roadways entering the Town Center through Thickly Settled residential areas. The speed zones are of a length, between 0.46 miles and 0.63 miles, which can be more enforced by the Saugus Police Department.

Essex Street (east of Route 1)

The Essex Street speed data as noted in Table 3 and as shown in Figure 12 shows an 85th percentile speed of 35 MPH to 36 MPH in the northbound direction and 35 MPH to 38 MPH in the southbound direction. The trial runs generally range from 30 MPH to 40 MPH through the corridor. The Essex Street corridor experienced a total of 76 crashes with 6 crashes directly related to speed within the five-year period.

Essex Street is currently governed by the MGL Chapter 90, Section 17 general statutory speed limit of 30 MPH for a Thickly Settled residential area or Business District. It is TEC's engineering judgement to maintain the existing speed zoning along this roadway. With the 85th percentile speed being close to the existing statutory speed limit, it is unlikely that a posting either a 30 MPH or 35 MPH speed limit will change driver behavior along the roadway. Maintaining the existing conditions retains uniformity for drivers through the corridor, as the MassDOT jurisdiction section of roadway to the west of Route 1 is posted with a 30 MPH speed limit. The 30 MPH statutory speed limit is consistent with other primary roadways entering the Town Center through Thickly Settled residential areas.

Lincoln Avenue

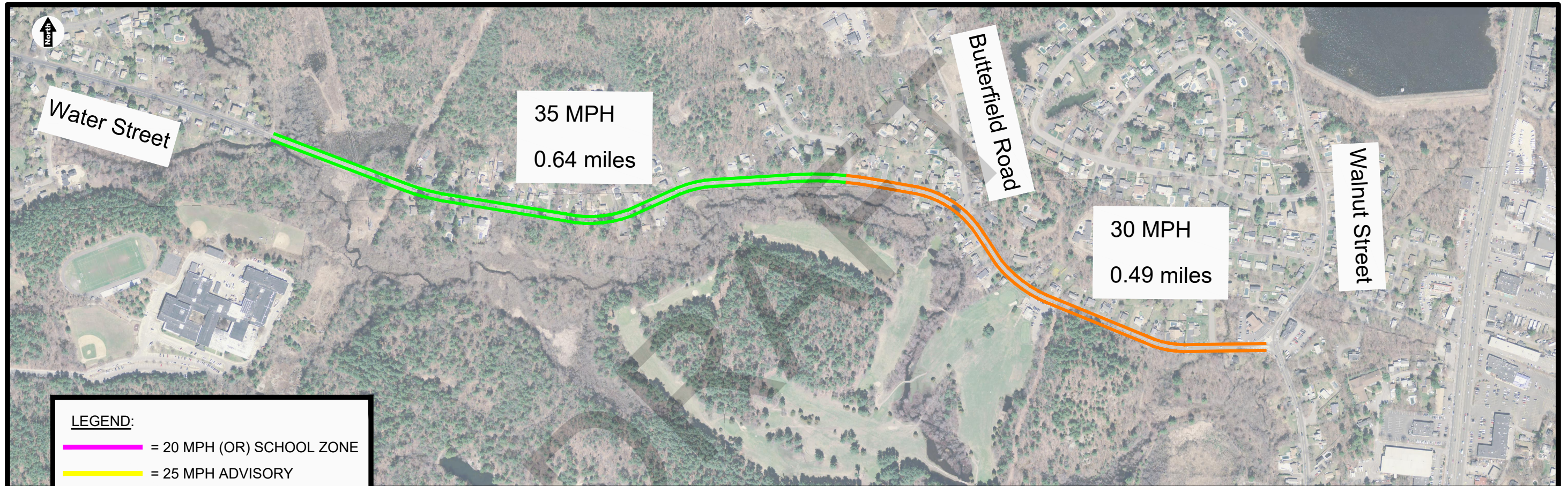
The Lincoln Avenue speed data as noted in Table 3 and as shown in Figure 13 shows an 85th percentile speed of 34 MPH to 37 MPH in the northbound direction and 35 MPH to 37 MPH in the southbound direction. The trial runs generally range from 35 MPH to 45 MPH through the corridor. The Lincoln Avenue corridor experienced a total of 226 crashes with 10 crashes directly related to speed within the five-year period. This would correspond to approximately 113 crashes per mile of roadway over that period. In addition to the high level of speed related crashes, this is a significant number of crashes that are intersection related due to the number of intersections and other side-friction elements along the corridor.

Although a heavy commuter corridor, Lincoln Avenue also provides flow for significant non-commuter traffic with a concentration commercial land uses as well as a route to the Town Center. Based on the number of crashes and other side-friction elements throughout the corridor, it is TEC's engineering judgement to recommend a maintaining the consistent speed zone throughout the corridor of 30 MPH, within the 7 miles per hour low range of the 85th percentile speed as collected. Although on the lower end of the safe speed range, TEC notes that the rate of crashes related to speed through this corridor merits a lower speed at the next 'multiple of 5' interval. TEC also recommends that the existing 20 MPH speed zone between Myrtle Street and Endicott Street be maintained. Maintaining the existing conditions retains uniformity for drivers through the corridor and the 30 MPH speed limit is consistent with other primary roadways entering the Town Center with access to Thickly Settled residential and Business District areas.

1"=600'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

WATER STREET (ROUTE 129)



* No Proposed Change to Existing Speed Limits

Figure 14

Proposed Speed Regulations
Water Street (Route 129)

1"=1000'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Street, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance Eindra (Elena) Aung, E.I.T.
SOURCE: Town of Saugus / MassDOT Speed Regulations

CENTRAL STREET

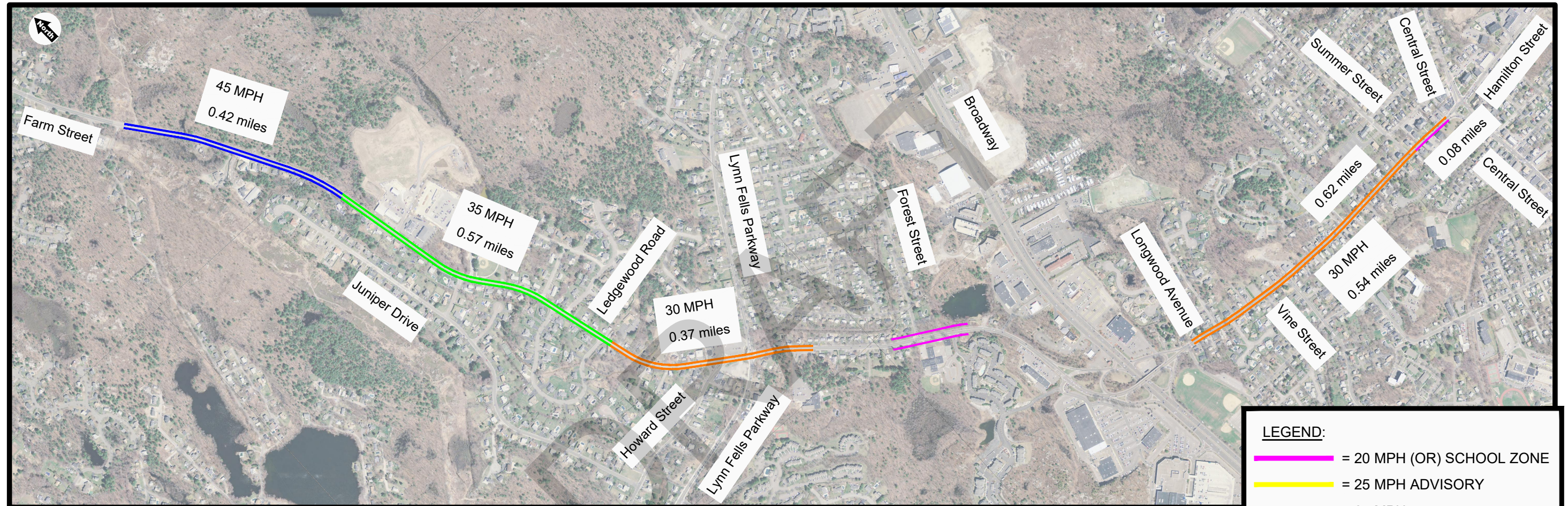


Figure 15
Proposed Speed Regulations
Central Street

1"=1000'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

MAIN STREET



* No Proposed Change to Existing Speed Limits

LEGEND:

- = 20 MPH (OR) SCHOOL ZONE
- = 25 MPH ADVISORY
- = 25 MPH
- = 30 MPH
- = 35 MPH
- = 40 MPH
- = 45 MPH
- = SPEED LIMIT SIGN

Figure 16

Proposed Speed Regulations
Main Street

1"=600'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

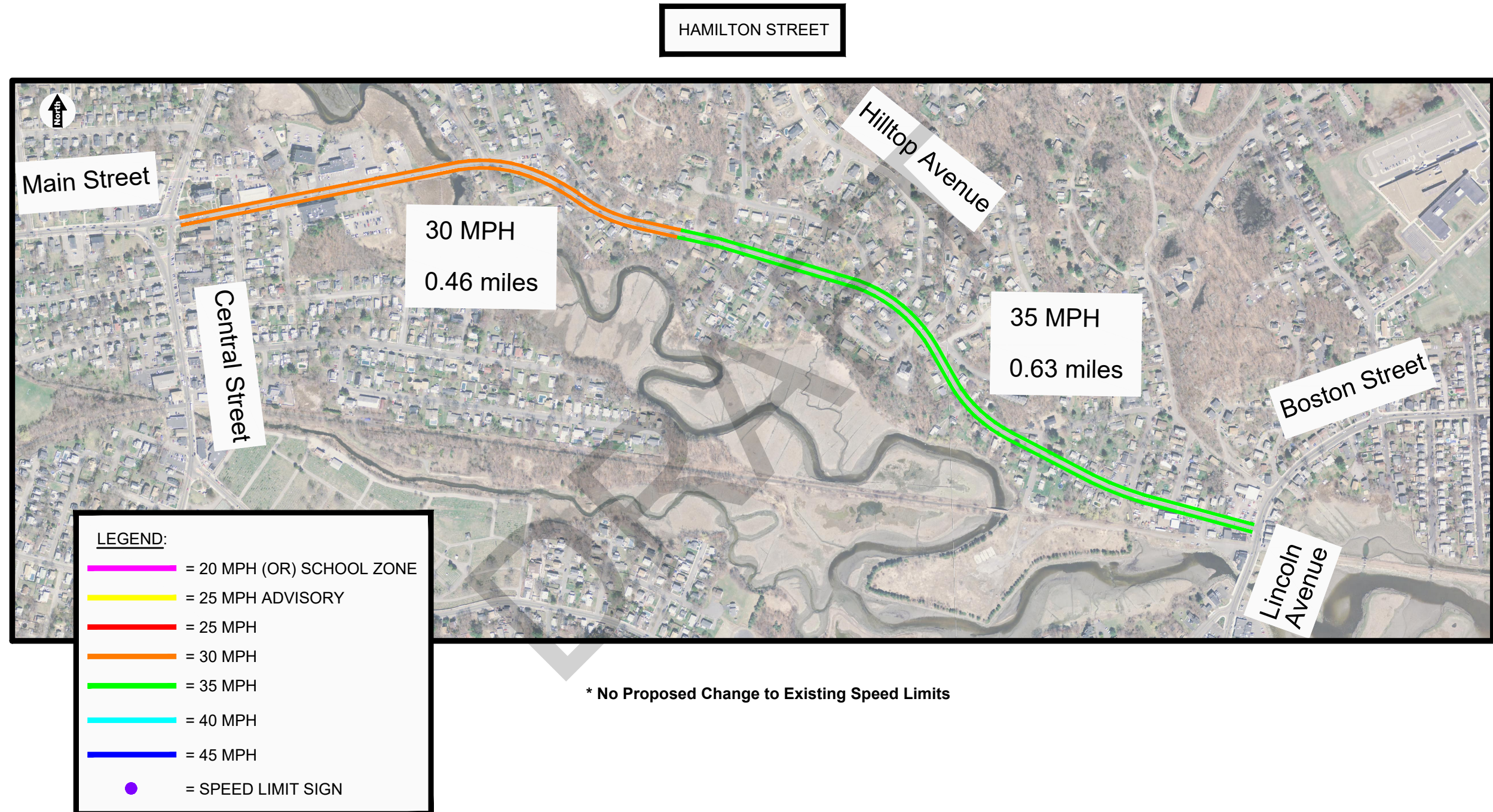


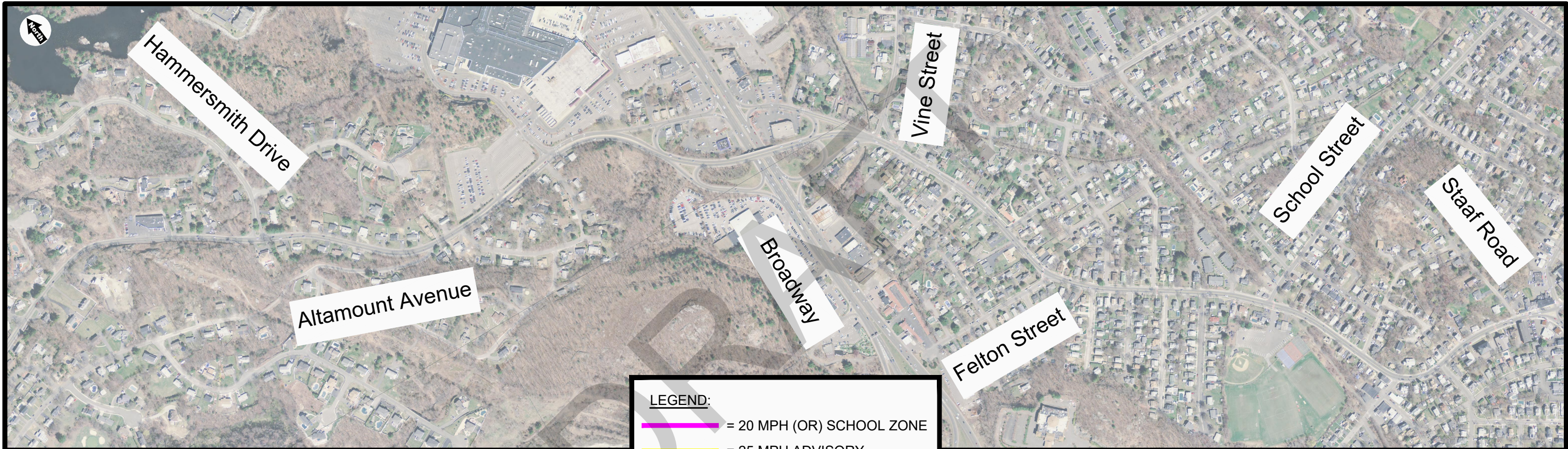
Figure 17

Proposed Speed Regulations
Hamilton Street

1"=600'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations

ESSEX STREET



LEGEND:

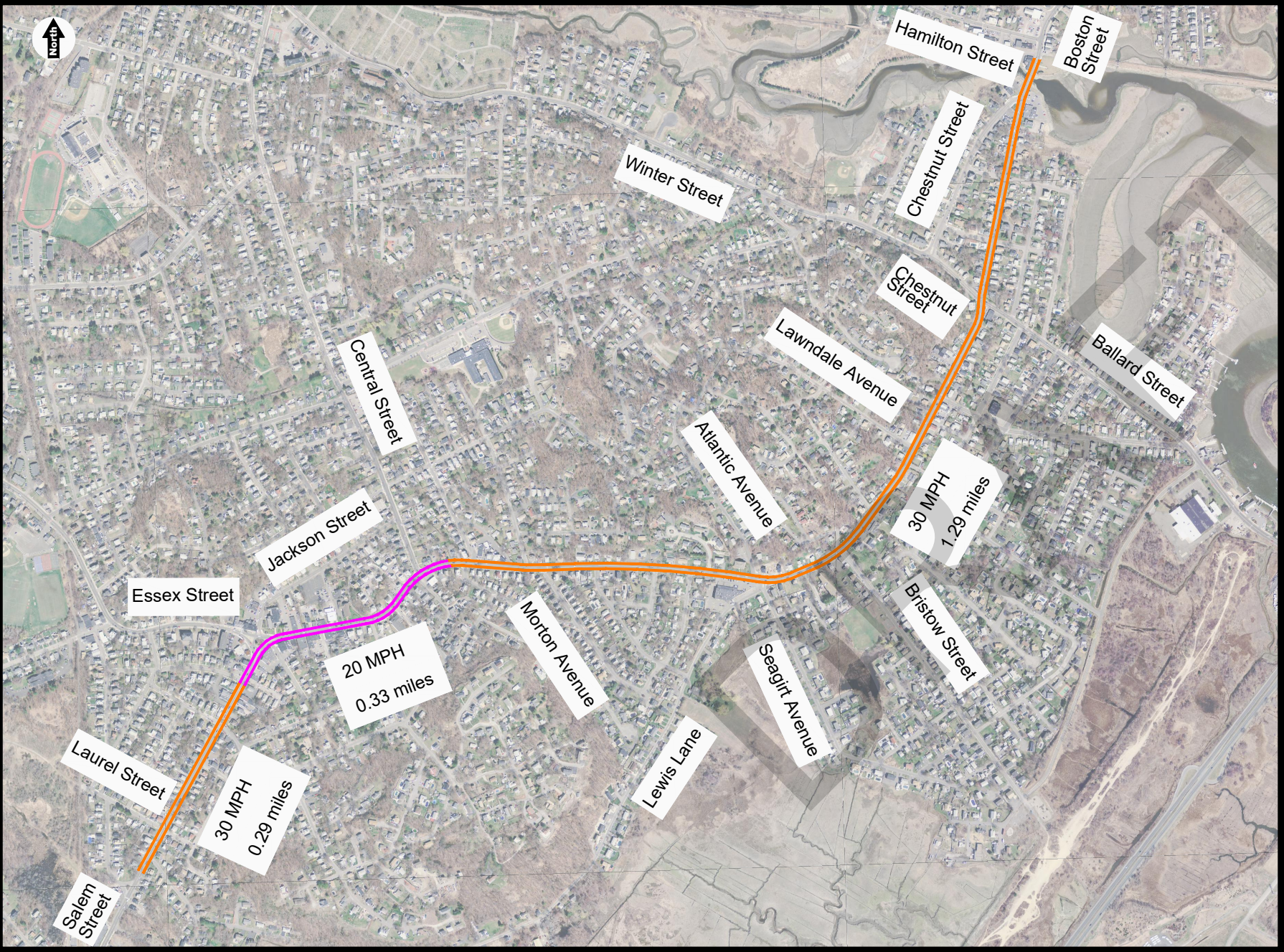
- = 20 MPH (OR) SCHOOL ZONE
- = 25 MPH ADVISORY
- = 25 MPH
- = 30 MPH
- = 35 MPH
- = 40 MPH
- = 45 MPH
- = SPEED LIMIT SIGN

* Maintain Existing 30 MPH Statutory Speed Limit

Figure 18
Proposed Speed Regulations
Essex Street

1"=1000'

PROJECT: Saugus Speed Study
LOCATION: Central Street, Essex Street, Hamilton Street, Lincoln Avenue, Main Street, and Water Street (Route 129)
CITY/STATE: Saugus, Massachusetts
PREPARED BY: TEC, Inc. / Kimberly Forance
SOURCE: Town of Saugus / MassDOT Speed Regulations



LINCOLN AVENUE

LEGEND:

- = 20 MPH (OR) SCHOOL ZONE
- = 25 MPH ADVISORY
- = 25 MPH
- = 30 MPH
- = 35 MPH
- = 40 MPH
- = 45 MPH
- = SPEED LIMIT SIGN

* No Proposed Change to Existing Speed Limits

Figure 19
Proposed Speed Regulations
Lincoln Avenue