CHAPTER 13 ENVIRONMENTAL SUSTAINABILITY AND LIVABILITY

Transportation vehicles and the construction of infrastructure impact the environment in the Northern Middlesex Region through the production of greenhouse gas emissions, stormwater runoff, and habitat fragmentation. Vehicles that run on fossil fuels contribute to air pollution and climate change, while runoff from roadways can pollute surrounding water resources including rivers, streams and drinking water supplies. In addition, transportation infrastructure consumes land and resources, generates noise and creates visual impacts. The NMMPO’s goal is to minimize and mitigate the impacts of the transportation system on the environment, including air quality, water quality, wildlife habitat, and climate change. The NMMPO also works to create livable and sustainable communities. To achieve this goal, the following objectives have been developed:

- Objective 1: Promote transportation alternatives and techniques that reduce air pollution and greenhouse gases;
- Objective 2: Promote the protection of critical environmental resources;
- Objective 3: Protect critical transportation infrastructure from the effects of climate change and flooding; and
- Objective 4: Promote livability by strategically utilizing transportation facilities to increase access to good jobs, affordable housing, quality schools, and safer streets and roads.

This Chapter discusses how the NMMPO will address its environmental goals and objectives through the transportation planning process.

PERFORMANCE MANAGEMENT APPROACH TO ENVIRONMENTAL SUSTAINABILITY

In order to achieving its environmental goals, the NMMPO has adopted and reported on Congestion Mitigation and Air Quality (CMAQ) performance measures and targets set by MassDOT. Given that Lowell is in a maintenance area for carbon monoxide, the NMMPO is required to develop a CMAQ Performance Plan, in conjunction with the MassDOT biennial baseline period performance report for the overall 4-year performance period. Elements included within this performance plan meet the requirements of 23 CFR 490.107(c) and 23 USC 149(l). These regulations state that MPOs in non-
attainment or maintenance areas for ozone, carbon monoxide (CO), or particulate matter National Ambient Air Quality Standards (NAAQS), must set targets for on-road mobile source emissions and develop a CMAQ Performance Plan.

As of April 22, 2002, the City of Lowell was designated as being in attainment for CO with an EPA approved limited maintenance plan. In October 2017, FHWA released a report on an applicability determination for CMAQ traffic congestion and on-road mobile source emissions measures\(^1\) where it required the NMMPO to develop a CMAQ Performance Plan. Contents of this plan include the following key components:\(^2\):

- A baseline level of condition at the beginning of the performance period for CMAQ measures including Total On-Road Source Emission, Peak Hour Excessive Delay, and Non-Single Occupancy Vehicle Travel;
- MPO-established two- and four-year targets for the applicable CMAQ performance measures;
- A description of projects scheduled for CMAQ funding that will contribute to achieving the established targets; and
- An assessment of progress showing how listed projects contribute toward achieving set targets within the mid- and full-period performance reports.

**PERFORMANCE BASELINE CONDITIONS AND NMMPO TARGET SETTING**

**SYSTEM PERFORMANCE MEASURES**

The FHWA Final Rule on system performance measures\(^3\) applies to urbanized areas that contain National Highway System (NHS) mileage and have a population over 200,000, as well as to non-attainment and maintenance areas for air pollution. MPOs and State DOTs must coordinate on a single unified target for both peak hour excessive delay (PHED) per capita and non-single occupancy vehicle (non-SOV) travel across the urbanized area. For the emissions measure, MassDOT is reporting on the combined total emissions reductions for all projects in maintenance and nonattainment areas, while MPOs must adopt a target only for the nonattainment or maintenance areas within their planning boundaries.

---


\(^2\) 23 CFR Part 490.107(c)(3)

\(^3\) 23 CFR 490.703
CMAQ TRAFFIC CONGESTION MEASURES

PEAK HOUR EXCESSIVE DELAY (PHED) MEASURE

In order to set a target for the Boston UZA, MassDOT, with consultant support, calculated the PHED using the National Performance Measurement Research Dataset (NPMRDS). It is critical to note that the computation methodology for all NPMRDS speed data changed for 2017 with version 2.0 when the FHWA contract changed vendors, resulting in significant shifts in the metrics for that year due to changes in the calculation of path speeds compared to spot speeds on arterials.

PHED per capita for the UZA was calculated as:

\[
PHED_{UZA} = \frac{\sum_{segments} PHED_{Segment}}{Population_{UZA}}
\]

UZAs are defined by the US Census Bureau as collections of census blocks. Annual estimates of population are provided by the American Community Survey (ACS) on five-year rolling averages for years up to 2016, on the block group level. While the Census Bureau provides ACS population estimates for UZAs, the lack of NPMRDS data for Rhode Island means that the population must be limited to Massachusetts and New Hampshire to ensure consistency in the computations. The PHED per capita for 2017 is estimated in the Table 13.1:

### Table 13.1: Boston UZA Baseline Conditions for Peak Hour Excessive Delay per Capita

<table>
<thead>
<tr>
<th>2017</th>
<th>Total PHED</th>
<th>UZA (Annual Hours)</th>
<th>ACS Population (2012-2016 Five-Year Estimates)</th>
<th>PHED per Capita (Annual Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>80,053,183</td>
<td>4,371,476</td>
<td></td>
<td>18.3</td>
</tr>
</tbody>
</table>

Since only one year of data from the NPMRDS version 2.0 was available at the time of measure development, and since federal guidance advised that MassDOT use only PHED 2017 data to develop targets, the 2020 and 2022 targets for PHED reflect the 2017 PHED figure shown in Table 13.2. The targets reflect the goal for no increase in PHED, but as more data becomes available, these targets may be refined for future reporting periods.

### Table 13.2: Boston UZA PHED: Baseline Condition and 2- and 4- Year Targets

<table>
<thead>
<tr>
<th>Baseline Condition (Annual Hours/Capita)</th>
<th>2020 Target (Annual Hours/Capita)</th>
<th>2022 Target (Annual Hours/Capita)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.3</td>
<td>18.3</td>
<td>18.3</td>
</tr>
</tbody>
</table>
NON-SINGLE OCCUPANCY VEHICLE (NON-SOV) TRAVEL

The metric for non-SOV travel is based on the percentage of individuals within the Boston UZA commuting to work using a mode other than a single occupancy vehicle (e.g. carpool, van, public transit, walking, bicycling, or telecommuting).

Following federal guidance, MassDOT used 5-year estimates from the American Community Survey (ACS 2012-2016) for data within the Census table entitled, “Means of Transportation to Work” (also known as Journey to Work). In this table, the Census reports the percentage of individuals within the urbanized area who drive alone to work. To develop the baseline condition MassDOT used the 2016 data point for the percentage of individuals who drive to work alone (66.44%), which was the most recent data point available, and took the inverse (33.6%).

To develop the 2- and 4-year non-SOV travel targets, MassDOT, with assistance from CTPS, used Journey to Work Census data between 2012 and 2016 to establish a trend line, which was projected out to determine the 2020 and 2022 figures, which were used as targets, as shown in Table 13.3 and Figure 13.1.

Table 13.3: Non-SOV Travel: Boston UZA Baseline Condition and 2- and 4-Year Targets

<table>
<thead>
<tr>
<th>Baseline Condition</th>
<th>2020 Target</th>
<th>2022 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>33.6%</td>
<td>34.5%</td>
<td>35.1%</td>
</tr>
</tbody>
</table>

Figure 13.1: Percentage of Non-SOV Travel in Boston UZA with 2- and 4-Year Targets
ON-ROAD MOBILE SOURCE EMISSIONS REDUCTION MEASURE

The emissions reduction measure requires states and MPOs to measure and establish targets for the total emissions reduction of on-road mobile source emissions. The measure applies to states and MPOs whose geographic boundaries include any part of a nonattainment or maintenance area for ozone, carbon monoxide, or particulate matter. States and MPOs must establish separate targets for each of these applicable criteria pollutants and precursors.

Massachusetts contains four nonattainment areas for carbon monoxide: Waltham, Lowell, Springfield, and Worcester. With the Lowell designation in place, the Northern Middlesex MPO has developed baseline conditions and regional targets for the CO emission reduction measure.

To establish the Northern Middlesex MPO’s baseline conditions, a review was conducted for obligated CMAQ funded projects in Federal Fiscal Years 2014-2017. In this review, one project was identified in the City of Lowell: intersection improvements at VFW Highway/Bridge Street and Lakeview Avenue. Table 13.4 summarizes the baseline condition for the emissions measure.

Table 13.4: Northern Middlesex MPO Baseline Condition for On-Road Mobile Source Emissions Performance Measure

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Baseline Data Set</th>
<th>Baseline Condition (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO Emissions Reduction (kg/day) from CMAQ funded projects in Northern Middlesex MPO</td>
<td>FFY 2014-2017 Obligated TIP projects using CMAQ funding</td>
<td>11.76</td>
</tr>
</tbody>
</table>

In this initial reporting period, the Northern Middlesex MPO is required to set two- (FFY 2018-2019) and four-year (FFY 2018-2021) targets aimed at reducing CO emissions in Lowell. In setting these targets, TIP programmed projects using CMAQ funds in Lowell were identified. While staff identified the Pawtucket Falls Overlook project (FFY 2020) as a potential emissions reducing CMAQ project in Lowell, quantitative numbers have not been made available as of this baseline reporting period. Results of quantitative emissions analysis of the project will be included in the mid-period report. There are no CMAQ funded projects programmed in Lowell in the 2-year target range. Thus, the 2- and 4-year targets have been set at zero kg/day. Table 13.5 lists the reduction targets set for the NMMPO.
Table 13.5: Northern Middlesex MPO CO Emissions 2 and 4 year Targets for On-Road Mobile Source Emissions Performance Measure

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Baseline Data Set</th>
<th>Baseline Condition (kg/day)</th>
<th>2-Year Target (kg/day) (FFY 2018-2019)</th>
<th>4-Year Target (kg/day) (FFY 2018-2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO Emissions Reduction (kg/day) from CMAQ funded projects in Northern Middlesex MPO</td>
<td>FFY 2014-2017 Obligated TIP projects using CMAQ funding</td>
<td>11.76</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Within the nonattainment/maintenance areas of the State, known emissions reductions from projects that are anticipated to receive CMAQ funding over the next five federal fiscal years were compiled to develop statewide targets. The statewide targets for CO and ozone precursors are compilations of all emissions reductions from each maintenance or nonattainment area as shown in Table 13.6.

Table 13.6: Massachusetts Statewide Baseline Conditions, 2 and 4 Year Targets for On-Road Mobile Emission Measures

<table>
<thead>
<tr>
<th>Performance Measure</th>
<th>Baseline Data Set</th>
<th>Baseline Condition (kg/day)</th>
<th>2-Year Target (kg/day) (FFY 2018-2019)</th>
<th>4-Year Target (kg/day) (FFY 2018-2021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO Emissions Reduction (kg/day)</td>
<td>FFY 2014-2017 Obligated STIP projects using CMAQ funding</td>
<td>24.452</td>
<td>1,596.514</td>
<td>1,596.514</td>
</tr>
<tr>
<td>NOx Emissions Reduction (kg/day)</td>
<td></td>
<td>0.742</td>
<td>0.500</td>
<td>1.600</td>
</tr>
<tr>
<td>VOC Emissions Reduction (kg/day)</td>
<td></td>
<td>1.667</td>
<td>0.600</td>
<td>0.900</td>
</tr>
</tbody>
</table>

**EVALUATION AND REPORTING OF STATEWIDE GREENHOUSE GAS REDUCTIONS IN TRANSPORTATION**

This section documents recent progress made by MassDOT and the MPOs in working to help achieve greenhouse gas (GHG) reduction goals as outlined in state regulations applicable to Massachusetts. This “progress report” estimates future carbon dioxide (CO₂) emissions from the transportation sector as part of meeting the GHG reduction goals established through the Commonwealth’s Global Warming Solutions Act (GWSA).
GWSA TRANSPORTATION STATUS: FUTURE CARBON DIOXIDE EMISSIONS REDUCTIONS

The Global Warming Solutions Act of 2008 requires statewide reductions in greenhouse gas (CO2) emissions of 25 percent below 1990 levels by the year 2020, and 80 percent below 1990 levels by 2050.

The Commonwealth’s thirteen metropolitan planning organizations (MPOs) are involved in helping to achieve greenhouse gas reductions mandated under the GWSA. The MPOs work closely with the Massachusetts Department of Transportation (MassDOT) and other involved agencies to develop common transportation goals, policies, and projects that would help to reduce GHG emission levels statewide, and meet the specific requirements of the GWSA regulation – Global Warming Solutions Act Requirements for the Transportation Sector and the Massachusetts Department of Transportation (310 CMR 60.05). The purpose of this regulation is to assist the Commonwealth in achieving their adopted GHG emission reduction goals by:

- Requiring each MPO to evaluate and report the aggregate GHG emissions and impacts of both its Regional Transportation Plan (RTP) and Transportation Improvement Program (TIP).
- Requiring each MPO, in consultation with MassDOT, to develop and utilize procedures to prioritize and select projects in its RTP and TIP based on factors that include GHG emissions and impacts.

Meeting the requirements of this regulation is being achieved through the transportation goals and policies contained in the 2020 RTPs, the major projects planned in the RTPs, and the mix of new transportation projects that are programmed and implemented through the TIPs.

The GHG evaluation and reporting processes enable the MPOs and MassDOT to identify the anticipated GHG impacts of the planned and programmed projects, and also to use GHG impacts as a criterion in prioritizing transportation projects. This approach is consistent with the greenhouse gas reduction policies of promoting healthy transportation modes through prioritizing and programming an appropriate balance of roadway, transit, bicycle and pedestrian investments; as well as supporting smart growth development patterns through the creation of a balanced multi-modal transportation system. All of the MPOs and MassDOT are working toward reducing greenhouse gases with “sustainable” transportation plans, actions, and strategies that include (but are not limited to):

- Reducing emissions from construction and operations
- Using more fuel-efficient fleets
- Implementing and expanding travel demand management programs
- Encouraging eco-driving
- Providing mitigation for development projects
- Improving pedestrian, bicycle, and public transit infrastructure and operations (healthy transportation)
• Investing in higher density, mixed use, and transit-oriented developments (smart growth)

REGIONAL GHG EVALUATION AND REPORTING IN RTPS

MassDOT coordinated with MPOs and regional planning agency (RPA) staffs on the implementation of GHG evaluation and reporting in development of each MPO’s 2012 and 2016 RTPs. This collaboration has continued for the MPOs’ 2020 RTPs and 2020-24 TIPs. Working together, MassDOT and the MPOs have attained the following milestones:

• Modeling and long-range statewide projections for GHG emissions resulting from the transportation sector, as a supplement to the 2020 RTPs. Using the newly updated statewide travel demand model, GHG emissions have been projected for 2020 no-build (base) and build (action) conditions, and for 2040 no-build (base) and build (action) conditions (see the chart in this section for the results of this modeling).

• All of the MPOs have addressed GHG emission reduction projections in their RTPs (including the statewide estimates in the chart that follows), along with a discussion of climate change and a statement of MPO support for reducing GHG emissions from transportation as a regional goal.

MassDOT’s statewide estimates of CO₂ emissions resulting from the collective list of all recommended projects in all of the Massachusetts RTPs combined are presented in the table 13.7 below. Emissions estimates incorporate the latest planning assumptions including updated socio-economic projections consistent with the 2020 RTPs:

Table 13.7: Massachusetts Statewide Aggregate CO2 Estimated Emissions Impacts from Transportation

<table>
<thead>
<tr>
<th>Year</th>
<th>CO₂ Action Emissions (tons/ summer day)</th>
<th>CO₂ Base Emissions (tons/ summer day)</th>
<th>Difference (Action – Base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>86,035.60</td>
<td>86,035.60</td>
<td>n/a</td>
</tr>
<tr>
<td>2020</td>
<td>75,675.60</td>
<td>75,865.90</td>
<td>-190.3</td>
</tr>
<tr>
<td>2040</td>
<td>54,484.20</td>
<td>54,702.20</td>
<td>-218</td>
</tr>
</tbody>
</table>

This analysis includes only those larger, regionally significant projects that are included in the statewide travel demand model. Many other types of projects that cannot be accounted for in the model (such as bicycle and pedestrian facilities, shuttle services, intersection improvements, etc.), are covered in each MPO region’s RTP with either “qualitative” assessments of likely CO₂ change, or actual quantitative estimates listed for each project.
As shown above, collectively, all the projects in the RTPs in the 2020 Action scenario provide a statewide reduction of over 190 tons of CO₂ per day compared to the base case. The 2040 Action scenario estimates a reduction of 218 tons per day of CO₂ emissions compared to the base case.

These results demonstrate that the transportation sector is expected to continue making positive progress in contributing to the achievement of GHG reduction targets consistent with the requirements of the GWSA. MassDOT and the MPOs will continue to advocate for steps needed to accomplish the Commonwealth’s long-term goals for greenhouse gas reductions.

**NORTHERN MIDDLESEX REGION CMAQ FUNDED PROJECTS**

This section presents regional projects designed to decrease greenhouse gas emissions and assist in achieving targets outlined for reducing peak hour excessive delay and single occupancy vehicle travel. Table 13.8 provides a summary of projects included in the recommendations of the Plan that have identified CMAQ funding sources. The Pawtucket Falls Overlook project quantitative analysis, which will directly work toward the achievement of CO emissions reduction targets, has not been made available for the baseline reporting period. This analysis will be included in the mid period CMAQ performance report in FFY 2021.

**Table 13.8: Summary of CMAQ Funded Projects in Northern Middlesex MPO**

<table>
<thead>
<tr>
<th>Project</th>
<th>Description of Project</th>
<th>Year Anticipated for CMAQ Obligation</th>
<th>VOC Benefit (kg/day)</th>
<th>NOx Benefit (kg/day)</th>
<th>CO Benefit (kg/day)</th>
<th>PHED Reduction</th>
<th>NON SOV Travel Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pawtucket Falls Overlook Construction, Lowell</td>
<td>New/Improved sidewalk and multipurpose trail</td>
<td>2020</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>No</td>
<td>Yes – Increased use of Non-SOV through expansion of Bike/Ped Facilities</td>
</tr>
<tr>
<td>Main Street Improvements, Dunstable</td>
<td>New sidewalk and shoulders as part of improvement project</td>
<td>2021</td>
<td>0.1</td>
<td>0.0</td>
<td>1.3</td>
<td>Yes – Reduced PHED on NHS Roadway</td>
<td>Yes – Increased use of Non-SOV through expansion of sidewalk facilities</td>
</tr>
</tbody>
</table>
Table 13.8: Summary of CMAQ Funded Projects in Northern Middlesex MPO

<table>
<thead>
<tr>
<th>Project</th>
<th>Description of Project</th>
<th>Year Anticipated for CMAQ Obligation</th>
<th>VOC Benefit (kg/day)</th>
<th>NOx Benefit (kg/day)</th>
<th>CO Benefit (kg/day)</th>
<th>PHED Reduction</th>
<th>NON SOV Travel Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yankee Doodle Bike Path Construction, Billerica</td>
<td>New Multipurpose trail</td>
<td>2023</td>
<td>13.3</td>
<td>36.0</td>
<td>930.2</td>
<td>No</td>
<td>Yes – Increased use of Non-SOV with new bike path.</td>
</tr>
</tbody>
</table>

ENVIRONMENTAL CONSULTATION

In compliance with FAST requirements, the NMMPO conducted an environmental consultation session, to identify resources that will need to be considered as the projects advance through the project development and permitting processes, and where possible, to discuss possible strategies to avoid, minimize and mitigate such impacts. In addition to the Conservation Commissions and Historical Commissions in each community, over forty stakeholder groups were invited to the consultation session including the following:

**Land Trusts and Open Space Stewards**

- Chelmsford Land and Conservation Trust
- Dracut Land Trust
- Dunstable Rural Land Trust
- Lowell Parks and Conservation Trust
- Nashoba Conservation Trust
- Westford Conservation Trust
- Westford Land Preservation Foundation, Inc.
- Sudbury Valley Trustees
- Chelmsford Open Space Stewards

**Federal Stakeholders**

- EPA NE Headquarters (Region 1)
- US National Park Service
- US Fish and Wildlife Service New England Field Office

**Non-Profits**

- Merrimack River Watershed Council
- Nashua River Watershed Association
- Chelmsford Historical Society
As part of the consultation process, project recommendations were analyzed to determine their potential impact to aquatic and terrestrial habitats. Project locations were mapped and a 100-foot buffer was applied around each limit of work to estimate the project impact area (See Map 13.1 on page 13-12). Each project was then examined to see if its boundaries intersected with the following environmental resource areas: wetlands, the wetlands 100-ft buffer, the Rivers Protection Act 200-ft Riverfront Area, vernal pools, and the Natural Heritage and Endangered Species Program (NHESP) Priority Habitats for State-Listed Rare Species. Through this process, thirteen recommended financially constrained projects emerged as having a high impact on environmental resources, as they intersect with at least one of the four resource areas. These include projects listed in Table 13.8 and are shown on climate change risk analysis.

Project recommendations were reviewed to see if they would be at risk from climate change and flooding. Each project was mapped to see if it fell within 100 feet of FEMA’s 1% annual chance floodplain (Table 13.9). Nine project recommendations (financially constrained) are located within 100 feet of the floodplain (Map 13.2 on page 13-14). Adaptation and mitigation strategies will be needed to ensure these projects will not be affected by future flooding.

### Table 13.9: RTP Financially Constrained Recommended Projects with a High Anticipated Impact to Aquatic and Terrestrial Resources

<table>
<thead>
<tr>
<th>Community</th>
<th>Project Description</th>
<th>Within 100 feet of a Floodplain</th>
<th>Within 100 feet of Wetland</th>
<th>Within 100 feet of Wetlands 100 ft Buffer</th>
<th>Within 100 feet of Rivers Protection Act Buffer Zone</th>
<th>Within 100 feet of Vernal Pool</th>
<th>Within 100 feet of NHESP Priority Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billerica</td>
<td>Intersection Improvements to Boston Rd/ Glad Valley Dr/ Lexington Rd</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Billerica</td>
<td>Middlesex Canal Enhancement</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Billerica</td>
<td>Rehabilitation on Boston Road (Route 3A) from Floyd St to Billerica Town Center</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Table 13.9: RTP Financially Constrained Recommended Projects with a High Anticipated Impact to Aquatic and Terrestrial Resources

<table>
<thead>
<tr>
<th>Community</th>
<th>Project Description</th>
<th>Within 100 feet of a Floodplain</th>
<th>Within 100 feet of Wetland</th>
<th>Within 100 feet of the Wetlands 100 ft Buffer</th>
<th>Within 100 feet of Rivers Protection Act Buffer Zone</th>
<th>Within 100 feet of Vernal Pool</th>
<th>Within 100 feet of NHESP Priority Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billerica</td>
<td>Yankee Doodle Bike Path, Design and Construction</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>Intersection Improvements at Boston Road and Concord Road</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Dracut</td>
<td>Improvements on Nashua Rd</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Dunstable</td>
<td>Route 113 Improvements on Main Street (Route 113) from Pleasant Street to 750 Ft East of Westford Street</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Lowell</td>
<td>Pedestrian Walkway and Bicycle Connection at Pawtucket Falls Overlook, from Vandenberg Esplanade to School Street</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Lowell</td>
<td>Reconstruction and related Work on VFW Highway</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>Resurfacing and Sidewalk Reconstruction on Route 38 beginning at Colonial Drive North of the Intersection of Old Boston Road Approximately 1.5 miles</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>Route 38 Improvements</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Table 13.9: RTP Financially Constrained Recommended Projects with a High Anticipated Impact to Aquatic and Terrestrial Resources

<table>
<thead>
<tr>
<th>Community</th>
<th>Project Description</th>
<th>Within 100 feet of a Floodplain</th>
<th>Within 100 feet of Wetland</th>
<th>Within 100 feet of Wetlands 100 ft Buffer</th>
<th>Within 100 feet of Rivers Protection Act Buffer Zone</th>
<th>Within 100 feet of Vernal Pool</th>
<th>Within 100 feet of NHESP Priority Habitat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westford</td>
<td>Bridge Rehabilitation, Beaver Brook Road over Beaver Brook</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Westford</td>
<td>Bridge Replacement, W26-002, Stony Brook Road over the Stony Brook</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

HISTORIC RESOURCES RISK ANALYSIS

Projects were mapped to determine whether they are located within 100 feet of a local historic district, National Register Historic District, or a Massachusetts Historical Commission Historical Site (Map 13.3 on page 13-16). Twenty-two sites intersected with all three of the historic resource areas, indicating they are likely to impact a historic resource area (Table 13.10).
Table 13.10: RTP Project Recommendations with a High Anticipated Impact to Historical Resources

<table>
<thead>
<tr>
<th>Community</th>
<th>Project Description</th>
<th>Within 100 feet of Local Historic District</th>
<th>Within 100 feet of National Register Historic District or Property</th>
<th>Within 100 feet of Mass. Historical Commission Historic Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billerica</td>
<td>Intersection Improvements to Boston Rd/ Glad Valley Dr/ Lexington Rd</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Billerica</td>
<td>Rehabilitation on Boston Road (Route 3A) from Floyd St to Billerica Town Center</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Billerica</td>
<td>Yankee Doodle Bike Path Construction (Phase 1)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Billerica</td>
<td>Middlesex Canal Enhancement</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>Improvements on Chelmsford Street (Route 110)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Lowell</td>
<td>Church Street 2 Way Conversion</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lowell</td>
<td>Connector Reconstruction from Thorndike Street to Gorham Street</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Lowell</td>
<td>Pedestrian Walkway &amp; Bicycle Connection at Pawtucket Falls Overlook, from Vandenberg Esplanade to School Street</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Lowell</td>
<td>Reconstruction and related Work on VFW Highway</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>Route 38 Intersection Improvements</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Westford</td>
<td>Bridge Replacement, W26-002, Stony Brook Road over the Stony Brook</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Map 13.1: Regional Transportation Plan Projects and Environmentally Regulated Areas
This Page intentionally left blank.
Map 13.2: Regional Transportation Plan Projects and FEMA 1% Annual Chance Flood Zones
PROMOTE TRANSPORTATION ALTERNATIVES AND TECHNIQUES THAT REDUCE AIR POLLUTION AND GREEN HOUSE GASES

The earth's climate is predicted to change over time, in part because human activities are altering the chemical composition of the atmosphere through the buildup of greenhouse gases - primarily carbon dioxide, methane, and nitrous oxide. Within the United States, transportation is the largest source of greenhouse gas (GHG) emissions after electricity generation. Transportation contributes over 40% of Massachusetts' greenhouse gas emissions, and is the largest source of air pollution of any sector of the state's economy. Extreme heat may cause heat stress in materials like asphalt and increase the frequency of repairs and replacements. Peaks in power demand during hotter summer days could cause outages that affect electrified public transit. Flooding caused by heavier downpours may damage roads and stormwater infrastructure like undersized culverts. More nuisance ponding on roads may slow commutes and commerce. Rapid freeze thaw cycles may cause damage to road surfaces.

The Massachusetts’ Global Warming Solutions Act of 2008 (GWSA) established a statewide goal to reduce greenhouse gas emissions to a level 25% below the 1990 level by the year 2020, and 80% below the 1990 level by the year 2050. In 2010, the State released the Massachusetts Clean Energy and Climate Plan. The Plan outlined how the State intends to achieve the reductions in GHG emissions. Transportation was identified as one of four areas where GHG reductions can be accomplished. The Clean Energy and Climate Plan includes an analysis of GHG emissions reductions based on the implementation of policy recommendations and established targets for reduction in the transportation sector. The analysis indicates that with the implementation of the transportation related policies, the transportation sector emission reductions could account for 7.6% of the 25% goal by 2020. The Plan recommends implementation of the following transportation policies to achieve this goal:

- Federal and California vehicle efficiency and GHG emissions standards;
- Federal emissions and fuel efficiency standards for Medium and Heavy Duty vehicles;
- Federal renewable fuel standards and regional low carbon fuel standard;
- Clean car consumer incentives;
- Pay As You Drive (PAYD) auto insurance;
- Sustainable Development Principles; and
• Smart growth policy package.

In 2015, the Commonwealth released the 2020 Clean Energy and Climate Plan for 2020, which showed that passenger vehicles are the dominant source of emissions from the transportation sector, with significant contributions also coming from diesel trucks and aviation. Emissions from fuel combustion are determined by the efficiency and usage of vehicles (as measured in “vehicle miles traveled,” or “VMT”), and characteristics of fuels. Between 2015 and 2020, significant improvements in vehicle efficiency will occur as the stringency of vehicle GHG standards increases. Analysis showed reductions in the range of 3–4 MMTCO2e from fuel use in vehicles in Massachusetts between 2013 and 2020, driven by increases in vehicle efficiency. Other policies will have positive impacts by supporting the use of alternative transportation modes (such as transit and walking) and fuel switching (to electricity and possibly advanced low carbon biofuels). However, recognizing the historic increase in VMT from 1990 to 2013 of 22%, it remains possible that an increase in VMT will offset some or all of these benefits.

The Commonwealth has set an ambitious zero emission vehicle (ZEV) target, and offers a variety of policies and programs encouraging the purchase and use of efficient vehicles. The Commonwealth signed a memorandum with seven states to coordinate ZEV adoption efforts, and with these states is implementing a “Multi-State ZEV Action Plan” that includes 11 key actions. Massachusetts has initiated several programs funded from state and federal sources to provide charging infrastructure, incentives and education. Examples include a program offering rebates to consumers to purchase more fuel-efficient models, a clean vehicle grant program for medium and heavy-duty alternative fuel vehicles, and funding to communities and institutions of higher education to purchase plug-in electric vehicles and install charging stations.

The NMMPO is actively working to carry out the greenhouse gas emissions reduction goals by prioritizing projects that achieve an appropriate balance of mode choice, and by supporting smart growth development and resiliency principles.

AIR QUALITY CONFORMITY DETERMINATION

The 1990 Clean Air Act Amendments (CAA) require metropolitan planning organizations within nonattainment and maintenance areas to perform air quality conformity determinations prior to the approval of Long-Range Transportation Plans (LRTPs) and Transportation Improvement Programs (TIPs), and at such other times as required by regulation. Clean Air Act (CAA) section 176(c) (42 U.S.C. 7506(c)) requires that federally funded or approved highway and transit activities are consistent with (“conform to”) the purpose of the State Implementation Plan (SIP). Conformity to the purpose of the SIP means that Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding and approvals are given to highway and transit activities that will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or any interim milestones (42 U.S.C. 7506(c)(1)). EPA’s transportation conformity rules establish the criteria and procedures for determining whether metropolitan transportation plans, transportation improvement
programs (TIPs), and federally supported highway and transit projects conform to the SIP (40 CFR Parts 51.390 and 93).

A nonattainment area is one that the U.S. Environmental Protection Agency (EPA) has designated as not meeting certain air quality standards. A maintenance area is a nonattainment area that now meets the standards and has been re-designated as maintaining the standard. A conformity determination is a demonstration that plans, programs, and projects are consistent with the State Implementation Plan (SIP) for attaining the air quality standards. The CAAA requirement to perform a conformity determination ensures that federal approval and funding go to transportation activities that are consistent with air quality goals.

### LEGISLATIVE AND REGULATORY BACKGROUND

The entire Commonwealth of Massachusetts was previously classified as nonattainment for ozone, and was divided into two nonattainment areas. The Eastern Massachusetts ozone nonattainment area included Barnstable, Bristol, Dukes, Essex, Middlesex, Nantucket, Norfolk, Plymouth, Suffolk, and Worcester counties. Berkshire, Franklin, Hampden, and Hampshire counties comprised the Western Massachusetts ozone nonattainment area. With these classifications, the 1990 Clean Air Act Amendments (CAAA) required the Commonwealth to reduce its emissions of volatile organic compounds (VOCs) and nitrogen oxides (NOx), the two major precursors to ozone formation to achieve attainment of the ozone standard.

The 1970 Clean Air Act defined a one-hour national ambient air quality standard (NAAQS) for ground-level ozone. The 1990 CAAA further classified degrees of nonattainment of the one-hour standard based on the severity of the monitored levels of the pollutant. The entire commonwealth of Massachusetts was classified as being in serious nonattainment for the one-hour ozone standard, with a required attainment date of 1999. The attainment date was later extended, first to 2003 and a second time to 2007.

In 1997, the EPA proposed a new, eight-hour ozone standard that replaced the one-hour standard, effective June 15, 2005. Scientific information had shown that ozone could affect human health at lower levels, and over longer exposure times than one hour. The new standard was challenged in court, and after a lengthy legal battle, the courts upheld it. It was finalized in June 2004. The eight-hour standard is 0.08 parts per million, averaged over eight hours and not to be exceeded more than once per year. Nonattainment areas were again further classified based on the severity of the eight-hour values. Massachusetts as a whole was classified as being in moderate nonattainment for the eight-hour standard, and was separated into two nonattainment areas—Eastern Massachusetts and Western Massachusetts.

In March 2008, EPA published revisions to the eight-hour ozone NAAQS establishing a level of 0.075 ppm, (March 27, 2008; 73 FR 16483). In 2009, EPA announced it would reconsider this standard because it fell outside of the range recommended by the Clean Air Scientific Advisory Committee.
However, EPA did not take final action on the reconsideration so the standard would remain at 0.075 ppm.

After reviewing data from Massachusetts monitoring stations, EPA sent a letter on December 16, 2011 proposing that only Dukes County would be designated as nonattainment for the new proposed 0.075 ozone standard. Massachusetts concurred with these findings.

On May 21, 2012, (77 FR 30088), the final rule was published in the Federal Register, defining the 2008 NAAQS at 0.075 ppm, the standard that was promulgated in March 2008. A second rule published on May 21, 2012 (77 FR 30160), revoked the 1997 ozone NAAQS to occur one year after the July 20, 2012 effective date of the 2008 NAAQS.

Also on May 21, 2012, the air quality designations areas for the 2008 NAAQS were published in the Federal Register. In this Federal Register, the only area in Massachusetts that was designated as nonattainment is Dukes County. All other Massachusetts counties were designated as attainment/unclassified for the 2008 standard. On March 6, 2015, (80 FR 12264, effective April 6, 2015) EPA published the Final Rulemaking, “Implementation of the 2008 National Ambient Air Quality Standards (NAAQS) for Ozone: State Implementation Plan Requirements; Final Rule.” This rulemaking confirmed the removal of transportation conformity to the 1997 Ozone NAAQS.

However, on February 16, 2018, the United States Court of Appeals for the District of Columbia Circuit in South Coast Air Quality Mgmt. District v. EPA (“South Coast II,” 882 F.3d 1138) held that transportation conformity determinations must be made in areas that were either nonattainment or maintenance for the 1997 ozone NAAQS and attainment for the 2008 ozone NAAQS when the 1997 ozone NAAQS was revoked. These conformity determinations are required in these areas after February 16, 2019. On November 29, 2018, EPA issued Transportation Conformity Guidance for the South Coast II Court Decision (EPA-420-B-18-050, November 2018) that addresses how transportation conformity determinations can be made in areas. According to the guidance, both Eastern and Western Massachusetts, along with several other areas across the country, are now defined as “orphan nonattainment areas” – areas that were designated as nonattainment for the 1997 ozone NAAQS at the time of its revocation (80 FR 12264, March 6, 2015) and were designated attainment for the 2008 ozone NAAQS in EPA’s original designations rule for this NAAQS (77 FR 30160, May 21, 2012). After February 16, 2019, as a result of the court ruling and the subsequent federal guidance, transportation conformity for the 1997 NAAQS – intended as an “anti-backsliding” measure – now applies to both of Massachusetts’ orphan areas. Therefore, this conformity determination is being made for the 1997 ozone NAAQS on the Northern Middlesex FFY 2020-2024 Transportation Improvement Program and 2020-2040 Regional Transportation Plan.

The transportation conformity regulation at 40 CFR 93.109 sets forth the criteria and procedures for determining conformity. The conformity criteria for TIPs and RTPs include: latest planning assumptions (93.110), latest emissions model (93.111), consultation (93.112), transportation control measures (93.113(b) and (c), and emissions budget and/or interim emissions (93.118 and/or 93.119).
For the 1997 ozone NAAQS areas, transportation conformity for TIPs and RTPs for the 1997 ozone NAAQS can be demonstrated without a regional emissions analysis, per 40 CFR 93.109(c). This provision states that the regional emissions analysis requirement applies one year after the effective date of EPA’s nonattainment designation for a NAAQS and until the effective date of revocation of such NAAQS for an area. The 1997 ozone NAAQS revocation was effective on April 6, 2015, and the South Coast II court upheld the revocation. As no regional emission analysis is required for this conformity determination, there is no requirement to use the latest emissions model, or budget or interim emissions tests.

Therefore, transportation conformity for the 1997 ozone NAAQS for the Northern Middlesex FFY 2020-2024 Transportation Improvement Program and 2020-2040 Regional Transportation Plan can be demonstrated by showing that remaining requirements in Table 1 in 40 CFR 93.109 have been met. These requirements, which are laid out in Section 2.4 of EPA’s guidance and addressed below, include:

- Latest planning assumptions (93.110)
- Consultation (93.112)
- Transportation Control Measures (93.113)
- Fiscal Constraint (93.108)

**LATEST PLANNING ASSUMPTIONS:**

The use of latest planning assumptions in 40 CFR 93.110 of the conformity rule generally apply to regional emissions analysis. In the 1997 ozone NAAQS areas, the use of latest planning assumptions requirement applies to assumptions about transportation control measures (TCMs) in an approved SIP (See following section on Timely Implementation of TCMs).

**CONSULTATION:**

The consultation requirements in 40 CFR 93.112 were addressed both for interagency consultation and public consultation. Interagency consultation was conducted with FHWA, FTA, US EPA Region 1, MassDEP, and the other Massachusetts MPOs, with the most recent conformity consultation meeting held on March 6, 2019 (this most recent meeting focused on understanding the latest conformity-related court rulings and resulting federal guidance). This ongoing consultation is conducted in accordance with the following:

- Massachusetts’ Air Pollution Control Regulations 310 CMR 60.03 “Conformity to the State Implementation Plan of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 USC or the Federal Transit Act”
- The Commonwealth of Massachusetts Memorandum of Understanding by and between Massachusetts Department of Environmental Protection, Massachusetts Executive Office of Transportation and Construction, Massachusetts Metropolitan Planning Organizations

CHAPTER 13 ENVIRONMENTAL SUSTAINABILITY AND LIVABILITY 13-25 | PAGE
Public consultation was conducted consistent with planning rule requirements in 23 CFR 450 in accordance with the region’s public participation plan (www.nm cog.org/public-participation).

Title 23 CFR Section 450.324 and 310 CMR 60.03(6)(h) requires that the development of the RTP, and related certification documents provide an adequate opportunity for public review and comment. Section 450.316(b) also establishes the outline for MPO public participation programs. The Northern Middlesex MPO’s Public Participation Plan was formally adopted in 2016. The Public Participation Plan ensures that the public will have access to the RTP and all supporting documentation, provides for public notification of the availability of the RTP and the public’s right to review the document and comment thereon, and provides a 21-day public review and comment period prior to the adoption of the RTP and related certification documents.

**TIMELY IMPLEMENTATION OF TRANSPORTATION CONTROL MEASURES:**

Transportation Control Measures (TCMs) have been required in the SIP in revisions submitted to EPA in 1979 and 1982. All SIP TCMs have been accomplished through construction or through implementation of ongoing programs. All of the projects have been included in the Region’s Transportation Plan (present or past) as recommended projects or projects requiring further study.

DEP submitted to EPA its strategy of programs to show Reasonable Further Progress of a 15% reduction of VOCs in 1996 and the further 9% reduction of NOx toward attainment of the National Ambient Air Quality Standards (NAAQS) for ozone in 1999. Within that strategy there are no specific TCM projects. The strategy does call for traffic flow improvements to reduce congestion and, therefore, improve air quality. Other transportation-related projects that have been included in the SIP control strategy are listed below:

- Enhanced Inspection and Maintenance Program
- California Low Emission Vehicle Program
- Reformulated Gasoline for On- and Off-Road Vehicles
- Stage II Vapor Recovery at Gasoline Refueling Stations
- Tier I Federal Vehicle Standards

**Fiscal Constraint:**

Transportation conformity requirements in 40 CFR 93.108 state that TIPs and transportation plans and must be fiscally constrained consistent with DOT’s metropolitan planning regulations at 23 CFR part 450.

As of April 22, 2002, the city of Lowell was re-designated as being in attainment for carbon monoxide (CO) with an EPA-approved limited maintenance plan. In areas with approved limited maintenance plans, federal actions requiring conformity determinations under the transportation conformity rule are considered to satisfy the "budget test" (as budgets are treated as not constraining in these areas for the...
length of the initial maintenance period). Any future required "project level" conformity determinations for projects located within this community will continue to use a "hot-spot" analysis to assure that any new transportation projects in this CO attainment area do not cause or contribute to carbon monoxide non-attainment.

PROMOTE THE PROTECTION OF CRITICAL ENVIRONMENTAL RESOURCES

Many roads are located along rivers, through wetlands, or in valleys to avoid steep grades and minimize construction costs. In recent years, habitat loss and water quality pollution has created the need for transportation agencies to address potential impacts to aquatic and terrestrial resources. Transportation related problems stem from a variety of culprits including stormwater runoff from roads, snow and ice removal and the creation of new roads and infrastructure, which can disrupt habitats and can cause connectivity issues. The NMMPO describes below the methods it will use to protect these sensitive resources in planning and designing transportation improvements.

AQUATIC RESOURCES

Stormwater runoff, including runoff from highways, carries compounds that can contribute to the degradation of water quality in receiving water bodies. For example, solids, nutrients, heavy metals, oil and grease may be found in stormwater runoff associated with highway construction, operation and maintenance activities. The Federal Phase II Stormwater Rule published by EPA in December 1999 required operators of municipal separate storm sewer systems ("MS4s") to develop and implement six minimum stormwater management measures:

- Public education and outreach;
- Public participation and involvement;
- Illicit discharge detection and elimination;
- Construction site runoff control;
- Post-construction runoff control; and
- Stormwater pollution prevention/municipal good housekeeping.

Successful implementation of these six measures requires a detailed knowledge of the location, function, and condition of urbanized areas’ municipal storm drainage infrastructure – storm drains, manholes, catch basins, and outfall pipes – as well as of the receiving waters.
Proper policies and procedures for roadway project design, including deep sump catch basins, and best management practices, such as roadway sweeping and the regular cleaning of catch basins, must be followed to prevent the contamination of water resources. MassDOT Highway Division has incorporated new stormwater standards into its specifications for construction projects in order to meet the requirements of recent regulatory changes, and to implement best management practices for attenuating pollution from highway traffic. The state has also developed a priority list of sites for remediation of existing problem locations. Best management practices (BMPs) must be utilized in controlling the quantity and quality of stormwater. BMPs are continually evolving based on the latest technologies and innovations. Structural BMPs include:

- Storage controls such as detention and retention basins;
- Infiltration practices such as infiltration basins and trenches, and porous pavements;
- Vegetative controls such as grassed swales and vegetative filter strips; and
- Wetland replication.

Structural BMPs operate by physically trapping run-off until contaminants settle out or are filtered through the underlying soils. The basic mechanisms for contaminant removal are gravity settling, infiltration of soluble nutrients through soils or filters, or biological and chemical processes. Non-structural BMPs are source control practices such as street sweeping, land use planning, vegetated buffer areas, and fertilizer application controls. Non-structural BMPs may reduce the need for costly structural controls.

### STORMWATER MANAGEMENT

On May 10, 2018, the U.S. Environmental Protection Agency ("EPA") issued a new Municipal Stormwater Sewer System ("MS4") general permit for small MS4s. The permit replaces the MS4 permit that was issued in 2003. The new permits includes the following six “minimum control measures”:

- Public Education and Outreach;
- Public Participation;
- Illicit Discharge Detection and Elimination;
- Management of Construction Site Runoff;
- Management of Post-Construction Site Runoff; and
- Good Housekeeping in Municipal Operation.

In general, the new permit is substantially more robust, detailed, and prescriptive than the 2003 permit. For example, permittees will be required to demonstrate the effectiveness of their public education and outreach efforts and promptly modify their methods as needed. More extensive measures must be taken by MS4s that discharge to impaired waters, both those with an EPA-approved Total Maximum Daily Load ("TMDL") and those without an approved TMDL. In addition, the new permit requires inspection and sampling under both dry and wet weather conditions, including monitoring and
sampling of stormwater outfalls. All of the communities in the Northern Middlesex region are subject to the permit.

NMCOG provides Stormwater Management technical assistance to its communities through the Northern Middlesex Stormwater Collaborative (NMSC) and the stormwater management task outlined in the NMMPO’s Unified Planning Work Program (UPWP). NMCOG designs and conducts local and regional workshops to train municipal personnel (public works and highway departments, conservation commissions, health boards, and municipal engineers) on the state and federal stormwater requirements. Past training topics have included stormwater infrastructure inventorying and mapping, illicit discharge detection and elimination, municipal operations best management practices, and stormwater management program (SWMP) financing options, and public education and outreach.

Relevant stormwater management documents and associated public outreach materials that are customizable for each community have also been provided as part of the public education process. The stormwater management activities in every community are critical to reducing the volume and pollutant loads of uncontrolled stormwater that enters local drainage systems, waterways, and groundwater. Building on previous infrastructure mapping work, NMCOG continues to collect and review drainage plans, maps, and reports, and consults with knowledgeable local DPW and highway department personnel in order to map the locations of local stormwater infrastructure for communities. The emphasis has been on inventorying and mapping drainpipe locations as well as catch basins and the catchment areas of outfall pipes.

SNOW AND ICE REMOVAL
MassDOT Highway Division conducts ongoing research and development aimed at reducing or eliminating the effects of snow and ice control on water quality. A number of steps have been taken to limit the use of sodium chloride on state highways, including mixing salt with sand, improving the calibration of spreaders, and establishing zones where no salt or limited salt is used in order to protect groundwater aquifers. A weather forecasting and in-pavement monitoring system has also been implemented to improve the targeted application of de-icing materials.

MassDOT has a Clean Wells Initiative to remedy situations where residential water supplies have been compromised due to salt runoff from state highways. The program is focused on replacing those wells that have been contaminated. Experience has shown that the number of salt complaints is dynamic from year-to-year and depends on such factors as winter severity, adherence to Standard Operating
Procedures, and public awareness of salt remediation programs. An additional goal of the Clean Wells Initiative is to provide continued funding to allow the construction of up to 20 replacement wells per year. Other program elements include:

- Assessment of the state’s Salt Management Program relative to salt storage sheds;
- Training of employees to increase awareness of salt sensitive areas and emphasize proper procedures and practices;
- Continued use of designated reduced salt zones, where appropriate;
- Use of wetting agents to reduce the amount of salt applied;
- Exploration of other feasible and cost-effective de-icing agents to reduce dependence on sodium chloride; and
- Use of weather data and GIS information to improve operations.

MassDOT coordinates the investigation and remediation of public water supplies with the appropriate regional office of the Massachusetts Department of Environmental Protection (DEP). For Non-Community Water Systems, MassDOT will evaluate a salt contamination complaint that is from a water supplier that documents full compliance with 310 CMR 22 for at least one year. This compliance must be confirmed by the appropriate DEP regional office before MassDOT can institute remedial action. Prior to implementation of any remedial action, MassDOT requires an opportunity to review the monthly data provided by the water supplier. Due to the size of a public water supply system, the investigation of these matters is considerably more complex than a private well, and may result in the designation of a reduced salt area or modifications to highway drainage, if it is determined that MassDOT significantly contributed to the sodium and chloride concentrations in the public water supply.

MassDOT works closely with the property owner when assessing a private well for potential salt contamination. The DEP recommended guideline for sodium concentrations in drinking water supplies is 20 milligrams per liter (mg/l), and the secondary maximum contaminant level (MCL) for chloride is 250 mg/l. These recommended contaminant levels are referenced in DEP’s Private Well Guidelines. The guideline for sodium is intended to be protective of individuals on a 1,000 milligram per day (mg/d) sodium-restricted diet, while the chloride MCL is an aesthetic value solely for taste. Investigations are performed in accordance with Standard Operating Procedures (SOP) pertaining to Salt Contamination Complaints.
In addition to MassDOT’s progressive approach for the investigation and remediation of water supplies potentially contaminated by road salt due to winter maintenance operations, MassDOT takes a proactive approach in ensuring that environmental stewardship is a priority when dealing with matters of this nature. To that end, MassDOT has implemented a series of initiatives aimed at promoting the effective and efficient use of deicing chemicals.

- **Snow and Ice Material Usage Committee:** In conjunction with MassDOT Operations personnel, the Environmental Services Section has formed a committee to review, evaluate, and potentially revise the Reduced Salt Policy, on an annual basis. The Committee is also responsible for the review and revision of current deicing chemical application policies, Best Management Practices (BMPs) and assessment of potential alternative deicing chemicals.

- **Unionized and Privatized Forces Training:** This program initiative provides additional training to unionized and privatized forces for the proper management and application of deicing chemicals. MassDOT and privatized personnel are trained on an annual basis on different aspects of snow and ice control.

- **Salt Storage and Housekeeping BMPs:** There is an existing SOP for the management of sand and deicing chemicals at MassDOT facilities, ENV-01-08-1-000. However, a new SOP for the proper management of sand and deicing chemicals at MassDOT facilities after storm events or materials deliveries is under development. In conjunction with the materials management SOP, MassDOT will implement a salt storage and management program that will review the locations and condition of existing storage structures. Criteria for evaluating storage facilities are being developed in order to review each salt storage location and prioritize facilities for new construction or repair. Based on a shed's location and condition, MassDOT can prepare and implement the necessary facility upgrades (i.e., construction of a new gambrel style shed, drainage modifications or repairs, minor repairs to the existing structure, etc.).

- **Use of Alternative Deicing Chemicals:** MassDOT is currently using a corrosion inhibited magnesium chloride (MgCl₂) along roadway segments on a trial basis.

NMCOG will work with the municipalities in the region to encourage the proper snow and ice removal techniques, as discussed above, to ensure protection of our local streams, lakes and rivers.
TERRESTRIAL RESOURCES

While roadways connect communities, they can also alter and fragment natural habitat. The introduction of a roadway can cause wildlife-vehicle collisions, habitat loss, habitat fragmentation, and a decrease in habitat quality. In Massachusetts, reptiles and amphibians are more likely to be affected than other species, primarily because they depend on both wetland and upland habitat, which are frequently separated by roads. Studies have shown that female Blanding’s turtles may travel up to a mile in search of a suitable nest site, and are likely to cross at least one road to do so. To minimize or mitigate the potential impacts to important species, the NMMPO will advocate for a variety of techniques including the following:

- Wetland replication;
- Vegetated berms;
- Native plantings;
- Responsive mowing regimes;
- “Living fences”;
- Wildlife crossings; and
- Sloped curbing.

These techniques will encourage movement of reptiles and amphibians, and other wildlife and can be incorporated into transportation projects for both new and reconstructed roadways and transportation corridors.

PROTECT CRITICAL TRANSPORTATION INFRASTRUCTURE FROM THE AFFECTS OF CLIMATE CHANGE AND FLOODING

CLIMATE CHANGE ADAPTATION

There are many effects resulting from climate change, including rising sea level, flooding, and an increase in the occurrence of severe weather events. Warmer air can hold more moisture, so storms produce greater amounts of precipitation. Therefore, damage will be likely intensified in areas already prone to flooding. Climate change will have significant impacts on transportation, affecting the way transportation professionals plan, design, construct, operate, and maintain infrastructure. Decisions...
made today, particularly those related to the redesign and retrofitting of existing infrastructure, or the location and design of new transportation infrastructure, will affect how well the system can adapt to climate change in the future.

**HIGH HAZARD DAMS**

Dam infrastructure will be particularly vulnerable to the effects of climate change. As part of NMCOG’s updated Hazard Mitigation Plan, ninety-seven areas of repetitive flooding were identified by the nine communities in the region, with all communities except Westford and Dunstable having at least one area, and Billerica having the most areas at fifty. Dam failure during a flood event can pose a serious threat to downstream properties by releasing a surge of water that was stored behind the dam prior to its failure. There are four high hazard dams in the region, defined as one where failure would result in potential catastrophic loss in both life and property (Table 13.11). These dams should be inspected every two years.

**Table 13.11: High Hazard Dams in the Northern Middlesex Region**

<table>
<thead>
<tr>
<th>Community</th>
<th>Dam Name</th>
<th>Impoundment Name</th>
<th>Downstream Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowell</td>
<td>Lowell Reservoir Dam</td>
<td>Lowell Reservoir</td>
<td>400</td>
</tr>
<tr>
<td>Pepperell</td>
<td>Turner Dam</td>
<td>Nissitissit River</td>
<td>0</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>Ames Pond</td>
<td>Ames Pond</td>
<td>5,000</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>Dike A</td>
<td>Ames Pond</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Source: NMCOG 2015 Regional Hazard Mitigation Plan

**ADAPTATION AND MITIGATION TECHNIQUES**

In an effort to reduce GHG emissions, the NMMPO has identified projects which could result in a reduction in GHG emission for those benchmark years. Table 13.12 lists projects in the Northern Middlesex Region RTP that have been analyzed and expect to contribute to a reduction in GHG emissions upon completion of construction.
Table 13.12: Project Recommendations expected to reduce GHG Emissions

<table>
<thead>
<tr>
<th>Community</th>
<th>Project Type/Project ID #</th>
<th>Project Description</th>
<th>Year of Expenditure Cost*</th>
<th>GHG Reduction (kg/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowell</td>
<td>607885</td>
<td>Lowell- Pedestrian Walkway &amp; Bicycle Connection At Pawtucket Falls Overlook, From Vandenberg Esplanade To School Street</td>
<td>$2,321,280</td>
<td>4,669</td>
</tr>
<tr>
<td>Billerica</td>
<td>608227</td>
<td>Billerica- Yankee Doodle Bike Path Construction (Phase I)</td>
<td>$11,221,761</td>
<td>147,642</td>
</tr>
<tr>
<td>Dunstable</td>
<td>608603</td>
<td>Dunstable-Improvements On Main Street (Route 113), From Pleasant Street To 750 Ft East Of Westford Street</td>
<td>$4,894,986</td>
<td>203.9</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>609038</td>
<td>Tewksbury - Andover Road (Route 133)/River Road Intersection Improvements</td>
<td>$3,518,633</td>
<td>979,262</td>
</tr>
</tbody>
</table>

Note: GHG analysis can only be completed for projects that have advanced to 25% design

In order to reduce GHG and mitigate the impacts of climate change, the NMMPO will work to advance projects that accomplish the following objectives:

- Reduce VMT and roadway congestion;
- Support smart growth development strategies and plans;
- Increase the use of alternative modes of transportation;
- Address adaptation of critical infrastructure based on estimated climate change impacts; and
- Reduce energy consumption and encourage use of zero emission and alternative fuel vehicles.

**PROMOTE LIVABILITY BY SUPPORTING TRANSPORTATION TECHNIQUES THAT IMPROVE QUALITY OF LIFE AND SUSTAINABILITY**

The concept of livability is used to describe a range of initiatives aimed at improving community quality of life while supporting broader sustainability goals. Livability encompasses multi-dimensional issues relative to community design, land use, environmental protection and enhancement, mobility and accessibility, public health, and economic well-being. Incorporating livability into transportation planning, programs, and projects is not a new concept. Communities, developers, advocacy groups, businesses, and neighborhood residents have been working for generations to make places more livable through transportation initiatives, with varying degrees of support from local, regional, State, and
Federal agencies. These initiatives have used a range of terms to describe an overlapping set of objectives and strategies—livability, sustainability, community impact assessment, scenario planning, land use and transportation, smart growth, walkable communities, new urbanism, healthy neighborhoods, active living, transit-oriented development (TOD), complete streets, context-sensitive solutions (CSS), and many others. While advocates for each approach or “brand name” might find differences, most transportation practitioners understand the key concept behind livability in transportation: transportation planning is a process that must consider broader community goals.

The U.S. Department of Transportation (DOT), the U.S. Department of Housing and Urban Development (HUD), and the U.S. Environmental Protection Agency (EPA) formed the Sustainable Communities Partnership to bring livability into the planning process. The tri-agency partnership developed the following Livability Principles to guide their efforts:

- **Provide more transportation choices.** Develop safe, reliable, and economical transportation choices to decrease household transportation costs, reduce our nation’s dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health.
- **Promote equitable, affordable housing.** Expand location-and energy-efficient housing choices for people of all ages, incomes, races, and ethnicities to increase mobility and lower the combined cost of housing and transportation.
- **Enhance economic competitiveness.** Improve economic competitiveness through reliable and timely access to employment centers, educational opportunities, services, and other basic needs by workers, as well as expanded business access to markets.
- **Support existing communities.** Target Federal funding toward existing communities—through strategies like transit oriented, mixed-use development, and land recycling—to increase community revitalization and the efficiency of public works investments and safeguard rural landscapes.
- **Coordinate and leverage Federal policies and investment.** Align Federal policies and funding to remove barriers to collaboration, leverage funding, and increase the accountability and effectiveness of all levels of government to plan for future growth, including making smart energy choices such as locally generated renewable energy.
- **Value communities and neighborhoods.** Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods—rural, urban, or suburban.
Livability is about tying the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safe streets. This includes addressing safety and capacity issues on roads through better planning and design, maximizing and expanding new technologies such as ITS and the use of quiet pavements, and using Travel Demand Management approaches to system planning and operations.

As changing demographics and evolving markets increase demand for compact, walkable neighborhoods with a range of housing choices, transportation planning, programming, management and operations can help ensure that walking, biking, and transit are safe, convenient, and realistic choices for more people, making transportation systems more accessible, efficient and equitable.

By increasing multimodal mobility and access in the existing system, the overall costs of moving people, goods, and services can be reduced, enhancing economic competitiveness. Transportation investments that support community livability can have multiple benefits. Compact, connected communities encourage regular walking, bicycling, and transit use, reducing the need for auto travel—while making trips shorter for those who choose to drive. Less driving helps reduce greenhouse gases (GHGs) and other pollution, lowering energy use and reducing dependence on foreign oil. Compact, connected development patterns require less land and pavement, reducing storm water runoff, groundwater pollution, and loss of wildlife habitat, fields, and forests. The daily exercise associated with more active transportation choices has been shown to improve human health, reduce obesity and health care costs, and encourage community social interactions.

The region’s existing travel patterns and reliance on the automobile have impacted the health of its residents, primarily due to the lack of physical activity. Livable communities are often associated with good sidewalk coverage and bicycling facilities. A long-term goal of the region’s transportation planning process is to provide residents with the ability to utilize healthy transportation choices in their day-to-day lives. Investing transportation resources in areas with existing activity and employment centers is one mechanism for working toward the achievement of this goal. Investments in bicycle and pedestrian facilities and in public transit will support healthy lifestyle choices and increase mobility. Livability is a relatively new emphasis area for the NMMPO. The Regional Transportation Plan outlines programs and projects that will help promote livability within the region’s communities.