CHAPTER 11 FREIGHT MOVEMENT

Freight movement plays a major role in the economic vitality and quality of life in the Northern Middlesex region. The region is traversed by I-495, a major truck route in the northeastern United States. Railroad lines also cross the region carrying commodities throughout the northeast. A freight system that promotes the efficient movement of goods, safety and security, economic competitiveness, and environmental sustainability is of great importance. The continued globalization of our economy and an increasing reliance on international trade highlights the need for a safe, reliable, and secure freight transportation system.

The FAST act established the National Highway Freight Network (NHFN) to better direct resources and policies toward improved performance of highway portions of the US freight transportation system. The NHFN includes a subsystem of roadways including:

- **Primary Highway Freight System (PHFS)** – a network of highways identified as the most critical highway portions of the US freight transportation system. In the Northern Middlesex Region, I-495 and I-93 are labeled as PHFS corridors.
- **Other Interstate portions not on the PHFS** – highways that consist of the remaining portion of Interstate roads not included in the PHFA, but important to continuity and access for freight movement. The Lowell Connector is designated in this category.
- **Critical Rural Freight Corridors (CRFC)** – Roads not in urbanized areas that proved access and connection to the PHFS. The NMMPO has designated a portion of Route 113 in Pepperell as a CRFC.
- **Critical Urban Freight Corridors (CUFC)** – Roads within an urbanized area that provide access and connection the PHFS system. East Street in Tewksbury is an example of a CUFC.

Discussion of determination of CRFC and CUFC roads in the Northern Middlesex region is included later in this chapter.

Freight traffic, by most any measure, is growing faster than passenger travel. In addition, freight is highly intermodal and cannot be addressed in modal pieces as it often crosses over modal boundaries. The commodities, modes, and origins and destinations of freight movement in the region are expected to change little. Highway-based modes are expected to continue to dominate other modes. Trucks carry nearly 90 percent of freight in the State (measured in tons). In October 2018, The NMMPO adopted State performance measures and targets for Level of Truck Time Reliability, as described below:

- **Level of Truck Travel Time Reliability (TTTR)**: the consistency or dependability in truck travel times, as measured from day-to-day and/or across different times of the day. TTTR is based on the amount of time it takes trucks to drive the length of a road segment and is an index of...
50th/95th percentile travel times. The TTTR index is reported as a weighted average of the largest period for each segment.

Monitoring progress toward achievement of these targets will be a priority to address freight needs and growth in the region and the Commonwealth.

Monitored conditions for 2017, show a regional TTTR index at 2.48, a number higher than the statewide index of 1.85. While the target for the statewide index for 2020 and 2022 is to remain at the 1.85 level, the region’s long-term goal is to decrease the regional index by 20%, to 1.98 by 2040. Projects aimed at improving overall TTTR include: replacement of the Rourke Bridge in Lowell; Route 38 improvements along Route 38 in Tewksbury; Rehabilitation of Route 3A in Billerica; and signalizing the I-495 ramps at Route 110 in Chelmsford. The widening of mainline I-495 is a long-term project without an identified funding source presently. The project is included in the RTP as a regionally significant for illustrative purposes.

The Commonwealth of Massachusetts is a major freight destination nationally. With five maritime ports (Fall River, New Bedford, Boston, Salem, and Gloucester), Massachusetts exported $151 billion dollars of goods and imported $177 billion dollars of goods in 2017 according to FHWA statistics.¹ The regional highways in Eastern Massachusetts, including those in the Greater Lowell Region, such as I-93, I-95, and I-495, are classified by the FHWA Office of Freight Management and Operations as Primary Highway Freight System corridors carrying over 8,500 trucks daily.

The following challenges to freight transportation will need to be addressed over the next twenty years:

- Poor highway performance;
- Inadequate access to freight handling facilities;
- Transportation network constraints; and
- The need for higher security.

Freight mobility is restricted by limitations on the region’s infrastructure for accommodating modern freight transportation operations. Freight movements over both rail and highway systems are restricted in locations where inadequate dimensional envelopes prevent the passage of modern rail cars or truck trailers, e.g. double stacking of rail containers. As a result, logistical companies are required to reroute freight shipments, thereby increasing costs and community impacts. These transportation deficiencies can

¹ [https://faf.ornl.gov/fafweb/Extraction0.aspx](https://faf.ornl.gov/fafweb/Extraction0.aspx)
also result in higher prices for goods and services, which can affect business location decisions, reduce the profitability of existing companies, and otherwise hamper the region’s economic vitality.

**NATIONAL MULTIMODAL FREIGHT POLICY**

The FAST Act includes several provisions to improve the condition and performance of the national freight network and to support investment in freight-related surface transportation projects. Specifically, the FAST Act:

- Establishes a National Multimodal Freight Policy that includes national goals to guide decision-making.
- Requires the Development of a National Freight Strategic Plan to implement the goals of the new National Multimodal Freight Policy. The National Freight Strategic Plan will address the conditions and performance of the multimodal freight system, identify strategies and best practices to improve intermodal connectivity and performance of the national freight system, and mitigate the impacts of freight movements on communities.
- Creates a new discretionary freight-focused grant program that will invest $4.5 billion over 5 years. This new program allows States, Metropolitan Planning Organizations (MPOs), local governments, tribal governments, special purpose districts and public authorities (including port authorities), and other parties, to apply for funding to complete projects that improve safety and hold the greatest promise to eliminate freight bottlenecks and improve critical freight movements.
- Establishes a National Highway Freight Program. The Act provides $6.3 billion in formula funds over five years for States to invest in freight projects on the National Highway Freight Network. Up to 10 percent of these funds may be used for intermodal projects.
- Includes new authorities and requirements to improve project delivery and facilitate innovative finance. The FAST Act includes provisions intended to reduce the time it takes to break ground on new freight transportation projects, including by promoting best contracting practices and innovating financing and funding opportunities, and by reducing uncertainty and delays with respect to environmental reviews and permitting.
- Collects performance measures for leading U.S. maritime ports. The FAST Act requires the Bureau of Transportation Statistics (BTS) to collect and annually report performance measures for the nation’s top twenty-five (25) ports, as measured by three methods (total tonnage, containers, and dry bulk tonnage).

**MASSACHUSETTS FREIGHT PLAN**

In September 2018, MassDOT adopted a comprehensive multi-modal freight evaluation, known as the *Massachusetts Freight Plan*. An important aspect of this Plan was to create a unifying vision, and establish a set of goals and objectives that could be linked to performance measures and evaluation criteria.
goals for the Massachusetts freight system, developed in the context of other MassDOT initiatives and its overall strategic plan, are outlined as follows:

- Promote the preservation and improvement of the freight system infrastructure in all modes;
- Facilitate appropriate freight system capacity and redundancy, enhance operational efficiency, and achieve a balanced mix of capacity and connections across all modes;
- Facilitate freight transportation system improvements, policies, and investment strategies that will enhance economic development opportunities and manage consumer costs; and
- Ensure that the freight system preserves the environment and contributes to the quality of life in Massachusetts.

To fulfill these goals, the Plan focused on providing transportation infrastructure and services in Massachusetts that: (1) facilitate the movement of goods to consumers efficiently and cost effectively; and (2) support economic prosperity for Massachusetts businesses and a strong quality of life for Massachusetts residents. The recommended investments and policies of the Plan were developed using a cost-benefit analysis with the following evaluation criteria:

- Congestion reduction and improved transportation system operations;
- Operational costs;
- Last mile connection to intermodal, seaport, and airport facilities;
- Economic development and land use benefits (e.g., jobs and supporting smart growth);
- Environmental considerations, including emissions;
- Local support and consistency with transportation plans;
- Safety and security;
- Partnership and linkage to regional initiatives; and
- Availability of funding from federal, local, and private sources.

As part of development of the State Freight Plan, MassDOT collaborated with the Commonwealth’s MPOs, including the NMMPO, to identify important freight corridors in urban and rural areas for inclusion in the National Highway Freight Network (NHFN).

**CRITICAL FREIGHT CORRIDORS**

The NMMPO adopted four corridors within the Greater Lowell Region for designation as Critical Freight Corridors, as part of the NHFN. Three of the corridors were designated as Critical Urban Freight Corridors (CUFCs) including:

- East Street between Whittemore Street and the Andover Town Line (0.76 miles) in Tewksbury.
- Brick Kiln Road and Route 129 from the UPS Center Entrance to U.S. Route 3 interchange (0.8 miles) in Chelmsford
• Industrial Avenue between Route 110 (Chelmsford Street) and Industrial Avenue East (1.38 miles) in Lowell

Route 113 (Townsend Street) From Bancroft Street to Prides Crossing (0.79 miles) was designated as a Critical Rural Freight Corridor (CRFC). With these designations, projects along these corridors are eligible for National Highway Freight Program (NHFP) funding through the TIP. NMCOG will continue to work with MassDOT and the FHWA to refine and expand on freight corridors in the region.

MASSACHUSETTS STATE RAIL PLAN

The 2018 Massachusetts State Rail outlines the Commonwealth’s long-term plan for the statewide rail system, and provides information on the existing rail system, the role of rail in the overall transportation system, system financing, and short-and long-term priorities and investment strategies. The plan is intended to:

• Set forth Commonwealth policy involving freight and passenger rail transportation;
• Establish policies, priorities and strategies to enhance rail services in the Commonwealth that provide benefits to the public;
• Serve as the basis for Federal and State rail investments within Massachusetts;
• Establish the means and mechanisms to coordinate with adjoining States, private parties and the Federal government in projects of regional and national significance, including corridor planning and investment strategies; and
• Meet the planning requirement established by the Federal Railroad Administration (FRA).

RAIL CORRIDORS

Greater Lowell was at one time a major center for freight rail operations. While the total number of active freight railroads diminished with the closure of factories and mills, there still is a sizeable freight rail operation in the region. Pan American (Pan-AM) Railways is the region’s main freight rail operator and its main line runs through Lowell. Pan Am Railways (PAR) is a privately held Class II/regional rail carrier with operations in five New England states and New York. Its operational headquarters are located in North Billerica. Pan Am has connections to the New England Central Railroad in Montague and Northfield, and the Providence and Worcester Railroad in Gardner and Worcester. Pan Am exchanges traffic with CSX Corporation in Worcester. PAR also connects with Pan Am Southern (PAS) in Ayer. It should be noted that CSX does not service Ayer directly; CSX trains from Worcester may be operated by PAS/Springfield Terminal Railroad (ST) crews traveling to Ayer. Norfolk Southern, via the Patriot Corridor, interchanges with PAR/PAS in Ayer. PAR also interchanges with CSX in Worcester.

The PAR/PAS owns approximately 216 miles of active railroad right-of-way in Massachusetts but operates on over 373 miles in the state (some via trackage rights). Rail ownership and operations of PAR are carried...
out by its subsidiaries, the Boston and Maine Corporation (B&M), which is the property owner, and ST, which operates the railroad and in joint ownership with Norfolk Southern (NS) and Pan Am Southern. The PAR operates via haulage or trackage rights on MBTA-owned tracks and rights-of-way in Lowell and Tyngsborough. Trackage rights allow one railroad to use another railroad’s track via a contract that pays the host railroad a fee for the use. Haulage rights are basically the same, but the host railroad supplies the train crew.

There are three principal freight rail corridors operating in the Northern Middlesex region. The freight main line which runs from Boston northwestward through the region into the Devens area has approximately six trains that operate daily, each carrying between 60 and 75 rail cars. The PAR/PAS Freight Main Line is the railroad’s most important line within the Commonwealth. It runs 475 miles from northern Maine to eastern New York. The freight main line between New Hampshire and Boston is owned by the MBTA. The New Hampshire main line, which branches off from the freight main line in Lowell and runs through Concord, New Hampshire, has approximately four trains traveling in both directions daily, and trains run in both directions from the western portion of the state through Tewksbury and into New Hampshire. Actual figures for tonnage being moved are not available as the rail company is a private entity and considers the data proprietary.

REGIONAL FREIGHT PLANNING ACTIVITIES

The Northern Middlesex MPO supports the national freight policy and MassDOT’s statewide freight goals for improving infrastructure and promoting the efficient movement of goods along the transportation networks. The UPWP for the Northern Middlesex region contains a freight-planning task, which was established to enhance the regional freight system, both within the region and with outside connections to other freight movement networks. Regional freight planning is an ongoing process of system evaluation, supported by data collection activities such as traffic counting and pavement management programs. This system evaluation is used in the development of the RTP and in the identification of projects in the regional TIP.

Many of the infrastructure improvement projects recommended in this plan benefit the freight network and efficient goods movement. Examples of improvement projects along arterials affecting goods movement in the region include:

- **The Rourke Bridge Replacement project:** will serve to improve congestion on a major arterial connecting US Route 3 and the North side of the Merrimack River in Lowell.
- **Intersection Improvements at Andover Road (Route 133) and River Road in Tewksbury:** will improve overall traffic flow for freight movements between Lowell, I-93 and I-495 to the east.
- **Resurfacing of Route 38:** will improve pavement conditions and address access management, serving to reduce congestion along the main arterial in Tewksbury.
• **Route 113 Improvements in Dunstable**: will improve pavement conditions and realign skewed intersections to enhance traffic flow.

• **Rehabilitation of Route 3A**: will serve to improve traffic flow between Route 129, Route 3A and River Street in Billerica Center.

• **Traffic Signal Installation at I-495 and Route 110 in Chelmsford**: will improve overall safety and reduce congestion along Route 110 and at the interchange intersections.

• **Rehabilitation of Boston Road**: will improve roadway travel conditions between I-495, Route 110 and Westford Town Center.

### REGIONAL FREIGHT NETWORK

In Massachusetts, 225 million tons of goods are moved on an annual basis, with truck movements representing almost 90% of all freight movements in and out the state.\(^2\) Whether freight arrives in Massachusetts or leaves the state by rail, ship or air, trucks typically provide the final link between freight terminals, manufacturers or distributors. Table 11.1 provides an overview of how goods are moved through the Commonwealth.

#### Table 11.1: Freight Movement by Mode throughout Massachusetts

<table>
<thead>
<tr>
<th>Freight Mode</th>
<th>Within Massachusetts</th>
<th>Outbound from Massachusetts</th>
<th>Inbound to Massachusetts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tons</td>
<td>%</td>
<td>Tons</td>
</tr>
<tr>
<td>Truck</td>
<td>118,681,122</td>
<td>99.0%</td>
<td>34,728,531</td>
</tr>
<tr>
<td>Rail</td>
<td>596,424</td>
<td>0.5%</td>
<td>1,483,652</td>
</tr>
<tr>
<td>Water</td>
<td>86,072</td>
<td>0.1%</td>
<td>3,233,252</td>
</tr>
<tr>
<td>Air</td>
<td>0</td>
<td>0.0%</td>
<td>136,166</td>
</tr>
<tr>
<td>Multiple Modes and Mail</td>
<td>185,534</td>
<td>0.2%</td>
<td>1,171,672</td>
</tr>
<tr>
<td>Pipeline</td>
<td>203,169</td>
<td>0.2%</td>
<td>1,604,489</td>
</tr>
<tr>
<td>Other</td>
<td>77,759</td>
<td>0.1%</td>
<td>2,228</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>119,830,079</td>
<td>100%</td>
<td>42,359,989</td>
</tr>
</tbody>
</table>

Source: FHWA Freight Analysis Framework Version 4.4

Nearly all in-state freight is transported by trucks and large percentages of freight shipped in and out of the state (72% and 82% respectively) are transported by trucks. Truck mobility tends to be most important during the early morning and midday hours, between the commute peak periods. The spreading of peak period congestion and delays due to traffic incidents also affects trucking operations. Table 11.2 details the top ten truck movements by commodity within Massachusetts in 2017.

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\(^2\) FHWA Freight Analysis Framework, 2017 Dataset.
### Table 11.2: Top Commodities moved by Trucks within Massachusetts Destinations

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Truck Tons</th>
<th>% Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravel</td>
<td>25,784,283</td>
<td>21.7%</td>
</tr>
<tr>
<td>Gasoline</td>
<td>24,316,546</td>
<td>20.5%</td>
</tr>
<tr>
<td>Nonmetal min. prods.</td>
<td>12,745,296</td>
<td>10.7%</td>
</tr>
<tr>
<td>Waste/scrap</td>
<td>12,517,086</td>
<td>10.5%</td>
</tr>
<tr>
<td>Fuel oils</td>
<td>8,273,627</td>
<td>7.0%</td>
</tr>
<tr>
<td>Natural sands</td>
<td>6,924,748</td>
<td>5.8%</td>
</tr>
<tr>
<td>Coal-n.e.c.</td>
<td>5,120,659</td>
<td>4.3%</td>
</tr>
<tr>
<td>Mixed freight</td>
<td>3,845,792</td>
<td>3.2%</td>
</tr>
<tr>
<td>Wood prods.</td>
<td>3,571,055</td>
<td>3.0%</td>
</tr>
<tr>
<td>Other foodstuffs</td>
<td>2,335,261</td>
<td>2.0%</td>
</tr>
<tr>
<td><strong>Total Tons</strong></td>
<td>118,681,122</td>
<td>88.8%</td>
</tr>
</tbody>
</table>

Source: FHWA Freight Analysis Framework. 2017

In the Northern Middlesex region, I-495 and US Route 3 carry the highest percentage of truck traffic. I-495 is a limited access highway that serves as an outer circumferential ring around the Boston area and allows trucks to access New Hampshire and Maine without traveling through the congested city of Boston. US Route 3 provides north-south truck access from I-95 in Burlington to major cities in New Hampshire, including Nashua, Manchester, and Concord.

## HEAVY VEHICLE MONITORING PROGRAM

Vehicle classification counts are the basis for understanding freight movements on area roadways. Determining how many heavy vehicles travel on a roadway is key to identifying freight corridors in the region. NMCOG has collected vehicle classification data since 2005. Prior to 2005, MassDOT maintained the classification database, providing information to the MPOs as needed. MassDOT and NMCOG staff use the Federal Highway Vehicle Classification Scheme F Report to determine truck percentages at specific locations. Map 11.1 provides an overview of truck volumes on monitored roadways throughout the Northern Middlesex Region.

Ledge Road in Chelmsford carries the most trucks with 50.9 percent of its total traffic comprised of heavy vehicles. This roadway is functionally classified as a local, mostly residential road, but provides the only access to LeMasureir Granite Quarry, located at the end of the road. Thus, high percentages of heavy vehicles traverse the road during the day. The Town of Chelmsford requested that NMCOG monitor the roadway for increases in heavy vehicular traffic. Commercial Drive in Dracut also carries high percentages (30.9%), mainly due to several freight companies as well as a school bus company located along this road. The region’s interstate highway, I-495, experiences heavy vehicle traffic between 11% in Chelmsford and 17.9% in Tewksbury. U.S. Route 3, designated as a limited access principal arterial in the Northern Middlesex Region, actually has relatively low truck volumes, with trucks representing approximately 4-6 percent of the average daily traffic along the highway.
Map 11.1: Regional Truck Traffic Percentages by Traffic Count Location
2009-2018
Map 11.2: Lowell Truck Traffic Percentages by Traffic Count Location
2009-2018

Truck Traffic Percentage 2009-2018
20% - 50% 4% - 9%
6% - 10% 2% - 3%
4% - 5% 0% - 1%
2% - 3% 1%
0.0% - 1.0%

Roads by Functional Class
Interstate
Principal Arterial
Rural/Minor Arterial/Urban Principal Arterial
Rural/Major Collector/Urban Minor Arterial
Rural/Minor Collector/Urban Collector
Local Roadway
MassDOT Urbanized Area (2010)
Town Boundary
Water


Truck traffic count locations are determined by MassDOT Highway. Data presented on this map is not sufficient for either boundary determination or regulatory interpretation.

Produced 5/12/2018 by RACOG.

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CHAPTER 11 FREIGHT MOVEMENT
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WEIGHT RESTRICTED BRIDGES

Many older bridges were designed for loads that no longer meet modern freight demands. As a result, weight restrictions have been placed on the use of these bridges to prevent premature structure failure or excessive damage. Weight restrictions, insufficient vertical clearance, and reduced speed limits on bridges often negatively affect the movement of freight and goods through the region. Beyond the economic impacts, freight drivers must find alternate routes, which extends travel time, uses more fuel, and harms the environment.

Currently, eighteen bridges in the Northern Middlesex region are posted as weight restricted, which represents approximately 8% of all bridges. As shown in Table 11.3 below, eleven of the weight-restricted bridges are located in the City of Lowell, including the canal bridges that are currently under construction. Additionally, twenty-two (22) bridges (11%) in the Northern Middlesex region have posted vertical clearances.

Table 11.3: Weight Restricted Bridges in the Northern Middlesex Region, 2017

<table>
<thead>
<tr>
<th>Community</th>
<th>Bridge</th>
<th>Under Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Billerica</td>
<td>Boston Rd. (Rte.3A)</td>
<td>Shawsheen River</td>
</tr>
<tr>
<td>Billerica</td>
<td>Faulkner St.</td>
<td>Concord River</td>
</tr>
<tr>
<td>Billerica</td>
<td>Route 129 (Salem Road)</td>
<td>Shawsheen River</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>Meadowbrook Rd.</td>
<td>Canal</td>
</tr>
<tr>
<td>Chelmsford</td>
<td>Westford St</td>
<td>I-495</td>
</tr>
<tr>
<td>Dracut</td>
<td>Parker Ave</td>
<td>Beaver Brook</td>
</tr>
<tr>
<td>Lowell</td>
<td>Appleton St</td>
<td>Thorndike St.</td>
</tr>
<tr>
<td>Lowell</td>
<td>Beaver St</td>
<td>Beaver Book</td>
</tr>
<tr>
<td>Lowell</td>
<td>Father Morrissette Blvd</td>
<td>Western Canal</td>
</tr>
<tr>
<td>Lowell</td>
<td>French St</td>
<td>Merrimack Canal</td>
</tr>
<tr>
<td>Lowell</td>
<td>Lincoln St</td>
<td>Meadow Brook</td>
</tr>
<tr>
<td>Lowell</td>
<td>Market St</td>
<td>Merrimack Canal</td>
</tr>
<tr>
<td>Lowell</td>
<td>Market St</td>
<td>Western Canal</td>
</tr>
<tr>
<td>Lowell</td>
<td>Middlesex Rd</td>
<td>Thorndike St</td>
</tr>
<tr>
<td>Lowell</td>
<td>Pawtucket St</td>
<td>Pawtucket Canal</td>
</tr>
<tr>
<td>Lowell</td>
<td>VFW Highway</td>
<td>Beaver Brook</td>
</tr>
<tr>
<td>Lowell</td>
<td>Wood St. Extension (Rourke Bridge)</td>
<td>Merrimack River and Boston &amp; Maine Railroad</td>
</tr>
<tr>
<td>Tewksbury</td>
<td>North St</td>
<td>I-495</td>
</tr>
</tbody>
</table>

Source: MassDOT

Certain vehicles, such as LRTA and UMass Lowell buses, fire trucks and commercial vehicles, are prohibited from using these spans and must find alternative routes, which can be difficult at times.
FREIGHT RAIL

Historically, truck competition and burdensome economic regulations led to a decline in railroad service and, in the case of many northeastern railroads, bankruptcy. However, with the passage of the Staggers Act in 1980, which substantially deregulated the industry, the railroads have made a comeback, hauling 40% more traffic than they did during World War II on over 44% less track. According to the Association of American Railroads (AAR), there were 562 railroads of all sizes in the United States operating over 172,101 miles of track in 2008. Fourteen freight railroads operate in Massachusetts, the largest of which are CSX Transportation, Pan Am Railways, Providence and Worcester Railroad, and New England Central Railroad. These companies provide the major rail connections to the national system along the following corridors:

- The southern east-west route along the CSX Boston line, which connects to the CSX national system in Selkirk, NY, is the most heavily used freight rail corridor in Massachusetts.
- The northern east-west route, operated by Pan Am, connects to the Norfolk Southern Class 1 rail network in Mechanicville, New York, through a major rail yard in Ayer and with connections to New Hampshire and Maine.
- The most heavily used north-south route owned by NECR and P&W connects to the Canadian National rail network through Connecticut and Vermont.
- Short-line railroads such as the Housatonic, Pioneer Valley, Mass Central, and Mass Coastal provide key linkages to rail customers from longer-distance rail corridors.

MassDOT has responsibility for the care and custody of a portfolio of railroad properties, including one hundred (100) miles of active rail, thirty-five (35) miles of inactive right-of-way and eighty (80) acres of railroad property. Massachusetts acquired these properties in the 1980s to preserve rail service and freight lines that otherwise would have been abandoned. Currently, MassDOT has license and operating agreements in place with two railroads for two separate lines. Both of these lines lie outside of the region.

Rail is typically used to ship heavier bulk commodities and other goods over long distances. The delivery of such goods is generally not time-sensitive. Increasingly, many rail companies are able to provide on-time delivery, and these companies are expanding into the intermodal container and perishable goods markets. Goods moved by rail account for 6.5% of all freight movements in Massachusetts, according to the Massachusetts Freight Plan.

Pan Am Railways (PAR) directly serves the Northern Middlesex Region. In general, the region serves as the major connection for freight movement by rail between New Hampshire and Massachusetts, and both raw and completed materials pass through to their final destinations. Table 11.4 and Map 11.3 detail the active rail lines in the Northern Middlesex region.
Table 11.4: Rail Lines in Northern Middlesex Region

<table>
<thead>
<tr>
<th>Rail Line</th>
<th>Location</th>
<th>Distance (miles)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Active Rail Lines Owned by Pan Am</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Former Lowell Secondary Track (out of service)</td>
<td>Lowell CBD to Industrial Avenue</td>
<td>3.8</td>
</tr>
<tr>
<td>Former Tewksbury Branch</td>
<td>Wamesit to Tewksbury Center</td>
<td>1.9</td>
</tr>
<tr>
<td>Billerica Branch (out of service)</td>
<td>Billerica Center to North Billerica</td>
<td>2.4</td>
</tr>
<tr>
<td>Stony Brook Freight Main Line</td>
<td>Willows (Ayer) to North Chelmsford</td>
<td>13.2</td>
</tr>
<tr>
<td>NH Route Branch</td>
<td>North Chelmsford to Lowell</td>
<td>3.2</td>
</tr>
<tr>
<td>Lowell Branch</td>
<td>Bleachery to Lowell Junction</td>
<td>7.9</td>
</tr>
<tr>
<td>NH Route Branch</td>
<td>Bleachery to Lowell</td>
<td>0.7</td>
</tr>
<tr>
<td>Northern Main Line</td>
<td>North Chelmsford to NH line</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Source: MassDOT State Rail Plan

Existing freight railroad yards in the region are shown in Table 11.5 below. Currently there are no distribution or intermodal freight facilities that serve more than one user. There are many companies throughout the area that use rail for distribution; however, each facility serves only one company. There are few large (over 100 acres) sites available for freight activity inside the I-495 corridor.

Table 11.5: Existing Freight Yards and Facilities

<table>
<thead>
<tr>
<th>City/ Town</th>
<th>Name of Facility</th>
<th>General Function</th>
<th>Other Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lowell</td>
<td>Turnout Yard</td>
<td>Merchandise Freight</td>
<td>Several tracks near Gallagher Transportation Center used for block swapping and local freight.</td>
</tr>
<tr>
<td>North Billerica</td>
<td>Shop Yard</td>
<td>Merchandise Freight</td>
<td>A number of consignees use various tracks in the old yard where the former B&amp;M shops are located.</td>
</tr>
</tbody>
</table>

Source: MassDOT Rail Plan
Page intentionally left blank.
Beyond the region, Ayer has proven to be an excellent location for intermodal transportation and distribution. The implementation of the Patriot Corridor, a joint venture between Norfolk Southern (NS) and Pan Am, will provide infrastructure upgrades such as intermodal facilities in Ayer and Mechanicville, NY. The upgrades significantly improve rail connections with the NS system and the rest of the United States. These improvements will increase competition with CSX and its Boston-Worcester-Selkirk, NY main line. This arrangement also created the Pan Am Southern Railroad, which is operated by Springfield Terminal Railroad (ST), a fully owned subsidiary of Pan Am. This new transportation system and facility benefits freight rail service throughout Massachusetts and helps this region compete with the major facilities in New York, Philadelphia, and Baltimore.

**MARITIME AND PORT FACILITIES**

The major Massachusetts ports of Boston, Salem, Gloucester, New Bedford and Fall River ship and receive a variety of commodities both domestically and internationally. Goods moved by water account for 4.9 percent of all freight movements in Massachusetts, with the majority of goods consisting of petroleum and coal products. The ports of Boston and Portsmouth, New Hampshire are the major maritime facilities closest to the Northern Middlesex region. The ports are accessible to all Atlantic Ocean sea routes. The principal inland market areas associated with these ports are the mid-Atlantic, northeastern and mid-western states.

The marine terminals in Boston include both publicly and privately owned and operated facilities. The Massachusetts Port Authority (MassPort) is responsible for the overall management, safety, operation, and marketing of these facilities. The principal types of cargo handled by Massachusetts ports include:

- Petroleum and other fuels;
- Dry bulk cargo, such as waste, cement, scrap metal, gypsum, salt and stone;
- Containerized cargo including machinery, frozen fish and electronics;
- Non-fuel liquids, such as vegetable oils and chemicals; and
- General cargo including automobiles, fresh fruit, waste paper, iron and steel.

Conley Terminal, located in South Boston, serves three of the world’s top ten container lines and handles nearly 1.5 million metric tons of cargo each year.

**NATURAL GAS PIPELINES**

The U.S. natural gas pipeline network is a highly integrated transmission and distribution grid that can transport natural gas to and from nearly any location in the continental U.S. There is currently one major interstate pipeline located in the region.

The Maritimes & Northeast Pipeline delivers natural gas from the Sable Offshore Energy Project to markets in Atlantic Canada and the Northeast United States. The Maritimes pipeline system consists of a
670-mile underground pipeline running from Goldboro, Nova Scotia, through Nova Scotia and New Brunswick, to the Canadian-U.S. border near Baileyville, Maine. The pipeline continues through Maine and New Hampshire into Massachusetts, where it connects with the existing North American pipeline grid in Dracut. With the completion of the Maritimes Phase III project, the pipeline now extends from Methuen to Beverly, interconnecting with the Algonquin Gas Transmission Company system. Maritimes is owned by Spectra Energy Partners, ExxonMobil Corporation and Emera, Inc.

AIR FREIGHT FACILITIES

Air freight is a small but growing mode of transport in Massachusetts, often used for carrying high-value and time-sensitive cargo. Given that the state and the region are centers of high-tech manufacturing in such sectors as biotechnology, nanotechnology, pharmaceuticals, defense and information technology, air freight is critical to future economic prosperity. Air freight is projected to grow more quickly than other modes of goods transport.

All major air freight activities in Massachusetts are handled at Boston’s Logan Airport. In 2018, Logan Airport moved 704,200,557 tons of cargo (including mail), making it the one of the busiest airports in the U.S in terms of cargo.³ While there are no major airports in the Northern Middlesex region, both Logan Airport and Boston-Manchester Regional Airport are within an hour drive. These airports, along with a general aviation airport at Hanscom Field in Bedford, MA, provide air freight connections for the region. Manchester, New Hampshire and Boston are served by major air freight carriers, including FedEx and UPS.

There is one small private airport in the Northern Middlesex region located in Pepperell. It is owned by the Pepperell Airport Trust and prior permission is required for landing.

CURRENT FREIGHT MOVEMENTS

Goods in Massachusetts are typically delivered by truck, rail, air or ship. Massachusetts is a destination for freight given its large consumer markets, relatively high per capita income, and the dominant role of service and high-tech industries. A well performing freight system is essential for the state’s industries, particularly given the importance of receiving bulk products by rail or sea, and shipment of high-value goods to domestic and international markets.

Freight is typically measured by weight in tons; however, the value of freight is also a major consideration. In Massachusetts, as in the nation overall, the value of freight tends to increase more quickly than its weight. Both the value and the weight increase over time as the economy grows. Freight

³ MassPort
can also be measured in ton-miles, which is the weight multiplied by the miles traveled. When this measure increases more quickly than weight, it indicates that more goods are being shipped further away and that markets are expanding.

A major freight planning challenge at the regional level is the collection of new and robust localized data specific to the region. More specifically, some of the limitations related to local freight data collection include:

- Difficulty in obtaining proprietary data from private sources;
- Privately-maintained data sets are costly and require extensive analysis;
- Publicly available data often lacks industry detail due to privacy concerns;
- Inaccurate or nonexistent local-level commodity flow data;
- Inconsistency of data across different modes of transportation;
- Limitations in local applicability of national data, which typically results in less than robust data; and
- Discontinuation of certain current data collection processes that could provide critical data at various geographic levels.

As a result of the above limitations, NMMPO staff analyzed commodity flow data for Massachusetts available through FHWA’s Freight Analysis Framework. This data tabulation tool integrates data from a variety of sources to create a comprehensive picture of freight movement among states by all modes of transportation. Total flows include those between domestic origins and destinations and includes both domestic and foreign shipments.

Appendix O presents information on Massachusetts freight shipments by weight and mode for 2012 and 2017, and provides projections through 2040. It also provides information by value and mode for the same years. This data indicates that trucks move the vast majority of the weight and value of freight within, from and to Massachusetts. High rates of growth in freight movement indicate continued need for transportation investments. In the future, the majority of commercial goods are likely to move by truck, while some will move by rail. Attention to rail capacity and investment in major highways will be needed to support continued economic growth. High growth in freight shipped abroad is expected, suggesting an increasing importance for establishing intermodal facilities.

Appendix also details the top commodity groups shipped to, from and within Massachusetts for all modes in 2012, 2017, and projected to 2040, by weight and value. Gravel was the top commodity shipped by weight within the state, gasoline from the state, and coal to the state in 2017. Gasoline was the top commodity shipped within Massachusetts by value, at $25 billion dollars in 2017. Electronics was the top valued commodity shipped from Massachusetts in 2017, at approximately $21 billion. Mixed freight was the top valued commodity shipped to the state in 2017, at approximately $24 billion. Projecting to 2040, the growth in the consumer market, the volume of through traffic, and the
specialized shipping needs of high value-added goods could lead to increased goods movement in Massachusetts.

FREIGHT MOVEMENT CHALLENGES AND OPPORTUNITIES

Regional freight mobility is driven by broad national and international trends. These include federal deregulation of the carrier industries and related international trade trends. New technologies are being used for container shipping. Business and manufacturing efficiencies now rely on outsourcing such that final assembly of products depends upon precise and reliable delivery schedules.

As the Massachusetts and regional economies become more service-based, freight is increasingly concentrated on high-value, low weight products that are shipped in smaller packages and require faster delivery. Despite a drop in the share of jobs within the manufacturing sector, manufacturing output has increased over the past decade. Much of this growth has been in high-value, low weight products such as electronic instruments and medical devices. This fast growth in value of smaller shipments is supported by just-in-time inventory systems, which reduce inventory carrying costs and overall logistics costs.

Freight concerns largely involve mobility and access issues. Mobility issues focus on efficient and reliable traffic conditions on the region’s highways and major arterials, as well as grade crossings on freight railroad lines. Access issues deal with roadway geometrics, intermodal interchanges, bridge clearances, and the need to provide efficient connections to major freight facilities.

According to FHWA, several key challenges face the freight transportation industry including:

1. Congestion and expanding capacity;
2. Improving systems operations;
3. Planning and financing freight projects;
4. Safety and environmental effects of freight transport;
5. National security; and
6. Building professional capacity in the freight sector.

The transportation network capacity has not increased at a rate equivalent to the growth in travel and commerce. When demand exceeds supply, the resulting congestion can have a highly negative effect on freight transportation speed and dependability. This can be devastating for businesses that increasingly rely on tightly integrated operations, limited inventory, and just-in-time manufacturing and retailing.

Existing barriers to and potential opportunities for the efficient movement of goods by highway and rail in the Northern Middlesex region and throughout Massachusetts, as outlined in the Massachusetts Freight Plan, include the following:
AGING INFRASTRUCTURE

The age of infrastructure within Massachusetts and the region has resulted in a need for significant improvements to accommodate existing freight movements and to support the heavier loads that are becoming standard in the freight industry. The Association of American Railroads (AAR) estimates that $148 billion is needed nationally for freight rail investment. Support for funding such freight infrastructure projects remains challenging.

BRIDGE DEFICIENCIES

Bridges are a critical link in the highway network. In the Northern Middlesex region, there are (thirteen) 13 bridges listed as structurally deficient. Bridge weight limits, overweight route restrictions, municipally imposed truck exclusions, and hazardous material restrictions can result in longer truck routes or the use of less appropriate streets. The MassDOT Accelerated Bridge program has reduced the number of structurally deficient bridges statewide, but in the Northern Middlesex region, the number of structurally deficient bridges has remained constant since the 2016 RTP.

LOW VERTICAL CLEARANCE

Many rail corridors do not meet sufficient vertical clearance (20'8") to support second-generation double-stack intermodal container traffic. Containers are now the dominant form of moving finished goods internationally via container ship. There are currently no double stack container routes within Massachusetts. If clearances were to improve, it would make rail more competitive in Massachusetts by increasing efficiency and capacity per trip. According to the Massachusetts Freight Plan, full double-stack vertical clearance on the Pan Am Southern line was identified to have produced a high return on investment.

WEIGHT

Over the years, freight railroads have shifted their weight-on-rail from the traditional standard of 263,000 pounds to a heavier gross weight of 286,000 pounds for individual rail cars. The shift increases competitiveness by allowing for more efficient and cost effective transportation of heavy bulk goods.

Only three railroads in the state have been approved for 286,000 lbs. The entire CSX Boston Line is rated to carry cars weighing up to 315,000 lbs. (although secondary tracks are generally rated at 263,000 lbs). The entire Housatonic Railroad and limited sections of the Providence and Worcester line are rated to carry 286,000 lb. cars.

All other railroad lines in the state, including those in the Northern Middlesex region, are currently rated at 263,000 lbs. However, the creation of PAS (as part of the Patriot Corridor project) is anticipated to
increase the allowed weight on this rail line from 263,000 lbs to 286,000 lbs from Mechanicville, New York to Ayer, Massachusetts.

### RAILROAD GRADE CROSSINGS AND FREIGHT SAFETY

Railroad grade crossings present a safety problem throughout Massachusetts. Unsafe or inadequate crossings can increase the risk of train and vehicle collisions resulting in potential loss of life, equipment, goods and time. Prior studies have shown that about half of the accidents occur at crossings that are equipped with active warning device, bells, gates and lights (AAR). From 2014 to September 2017, there have been a total of 43 incidents at highway-rail crossings in Massachusetts, of which 8 were fatal.4

On a national level, FHWA is actively working to address issues related to grade crossing accidents. As of December 2018, the United States had 211,256 at-grade rail crossings. Of the public crossings, 130,822 have gates, 52,208 have other activated crossing such as signals or bells, and 18,270 have passive warnings such as signage. In 2018, there were 2,211 incidents at public highway-rail crossings in the United States resulting in 265 deaths, and 834 injuries5.

In Massachusetts, the Department of Public Utilities (DPU) has responsibility and regulatory authority for grade crossing safety. Federal funds are available under Section 130 of federal surface transportation law to assist in eliminating or mitigating hazards at public highway-railroad grade crossings. The MassDOT Highway Division administers these funds and works with the railroads and communities to identify and construct priority projects. The MassDOT Grade Crossing Program focuses on improving safety at existing highway-railroad grade crossings primarily through the installation of warning devices. Such devices include: standard signs and pavement markings; installation or replacement of active warning devices (flashers and gates); upgrading active warning devices, including track circuitry improvements and interconnections with highway traffic signals; crossing illumination; crossing surface improvements; and general site improvements.

Maintenance and repair of highway-railroad grade crossing warning device equipment are the responsibility of the railroad owner. The FRA has established minimum inspection requirements for railroad maintenance of the warning systems, and each operating railroad is responsible for inspecting crossing system signals and equipment.

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5 Source: Federal Railroad Administration, Office of Safety Analysis
TRAFFIC CONGESTION, DELAY, AND BOTTLENECKS

The trucking industry is hindered by the same traffic congestion that affects automobile traffic. Congestion, delays, and “bottlenecks” that occur along roadways and at intersections adversely impact travel time and air quality. It also affects the cost and efficiency of truck transport and, subsequently, the reliability required for just-in-time delivery. Congestion is occurring at a time when the need for reliable truck travel is likely to increase significantly.

According to the Massachusetts Freight Plan, traffic congestion continues to grow with over 93 million hours of person delay on Massachusetts highways. Trucks are rarely more than 15 percent of traffic volume on Massachusetts highways and are estimated to be less than 9 percent of all traffic on key Northern Middlesex area highways. Traffic bottlenecks with heavy truck and automobile volumes in the region include sections of I-495, Route 3, and the Lowell Connector.

Traffic congestion and delay will continue to increase as the region’s traffic volumes grow. Massachusetts moves a high volume of goods by truck and a relatively low volume by rail. Although geographic and market characteristics limit the potential for significant mode shifts, a more diverse multi-modal system would help relieve some roadway congestion problems. In addition, shifting some future freight growth from the highway to rail could produce environmental benefits and reduce energy consumption.

In order to improve freight operations, emphasis is now being placed on better management of public infrastructure and the use of intelligent transportation system (ITS) technologies. As a part of highway and trucking operations, ITS is used to monitor traffic conditions and provide information on traffic incidents. In the Northern Middlesex region, infrastructure such as variable message signs, closed circuit cameras, and real time travel time signs are being put into place on I-495, Route 3, the Lowell Connector and I-93. This is important as federal, state, and local policymakers, as well as the private sector, are making major capital investments to eliminate freight bottlenecks and ensure capacity for future growth.

TRAFFIC DESIGN

Traffic design issues often contribute to a less reliable freight network. For example, turning radii on narrow roads or encroachment of structures may be an issue for shippers and motor freight carriers. Common roadway design considerations for truck activities include intersection design, cross-section and geometric design, signalization, and grade separation.

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6 2017 NMCOG Traffic Volume Report
TRUCK IMPACTS ON ROADWAYS

The high truck volumes associated with freight transport significantly impact pavement and bridge conditions, require more energy per ton-mile traveled, and result in greater emissions as compared to freight shipped by rail. Improving and preserving conditions along existing freight routes would prevent wear and tear on roadways that are not designed to handle such loads, and would lessen community and environmental impact.

LACK OF TRUCK STOP FACILITIES

A lack of rest areas (or truck stops) can impact safety as a result of driver fatigue. It can also impact logistics due to overcrowding at existing truck stop facilities. Truck parking demand at some rest areas tends to exceed supply, which may also lead to trucks parking in unsafe, poorly lit areas. The Northern Middlesex region contains two rest areas along I-495 in Chelmsford (one SB and one NB) and there are no truck weigh stations within the region.

RAIL NETWORK DEMAND

While the rail network in Massachusetts represents only 25 percent of the entire rail network in New England, it carries more than 40 percent of all freight moving through New England. There are increasingly clear benefits to moving goods by rail versus alternative modes. Relatively high fuel prices tend to make freight rail more competitive with trucks as rail has “per ton mile” advantages of lower shipping costs, greater energy efficiency, and less air emissions. Diverting freight to rail will reduce trucks on roadways, which will relieve highway congestion, reduce the number of highway crashes, and lessen pavement damage.

RAIL ACCESS

Development pressures on land adjacent to rail have reduced the potential pool of rail-served businesses. Many existing businesses along rail lines need to build or upgrade the rail sidings that serve them. Additionally, new industrial sites often lack rail access. This infrastructure expense is generally far higher than most highway connections and thus limits opportunities to ship by rail.

SHARED USE RAIL NETWORKS

In Massachusetts, much of the freight rail system operates on corridors that also have commuter and/or intercity rail passenger service. While shared use rail operations allow for cost sharing benefits, they also create challenges with finances, liability, scheduling and dispatch, safety, and the need for suitable switching and signal equipment. Shared use operations often require investment to install double-tracking and passing sides for the most heavily traveled routes such as on the Northeast Corridor,
Northern Middlesex Regional Transportation Plan 2020

Worcester-Boston route and the Down-easter route. Privately owned freight rail providers generally finance rail improvements through current cash flow based on expectations of future demand. As passenger and freight rail needs exceed capacity, conflicts with shared corridors may become more apparent.

INTERMODAL CONNECTION

Principal intermodal shipments to the state and region are related to container/trailer movements via rail cars. The purpose of these types of shipments is to allow a container/trailer to move from origin to destination without opening the container/trailer for re-handling or repacking. Within Massachusetts, there is a need for improved “last mile” connections to other modes – rail, air, and maritime.

Even though there are no intermodal facilities located in the Northern Middlesex region, the rail-to-truck intermodal traffic generated in Worcester has increased heavy truck traffic along I-495 through the region.

LAND USE CONFLICTS

For freight system users and operators, access to transportation and freight facilities (e.g., warehouses, distribution centers, intermodal yards, and other facilities) is very important and will frequently dictate where and how they locate. Freight system users often locate where transportation corridors converge. Communities could work to guide warehouse and distribution center development to appropriate locations for sustainable freight movement by taking into account modal accessibility needs and adjacent land uses. Freight transportation activity often conflicts with other land uses. Implementing regulatory changes with sustained policy incentives to preserve and strategically locate freight activities has been challenging.

The Massachusetts Freight Plan recommends a policy to provide collaborative guidance and support to MPOs and local governments in integrating freight, distribution and loading into their planning and zoning and land use decision-making processes. Research notes that increasing freight traffic, decreasing popular familiarity with the supply chain, growth in the US population, and downward cost pressure have contributed to a need for good neighbor policies between freight users and local communities. Key components of this recommendation include strategies to address:

1. Communication;
2. Traffic flow and congestion;
3. Safety;
4. Economic Development; and
5. Environment and quality of life.
Most freight transportation issues are linked to passenger transportation. Many rail corridors are subject to complex ownership and operation agreements between private freight railroads and public passenger services by Amtrak or the MBTA. This shared usage of tracks presents the challenge of scheduling to avoid bottlenecks but also provides an opportunity for public-private partnerships to fund improvements.