

# Draft Massachusetts Freight Plan

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of Transportation

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## Online Edition

An online edition of this document with a condensed narrative and interactive maps is available at:

<http://www.massdot.state.ma.us/planning/Main/StatewidePlans/FreightPlan.aspx>

## Letter from the Secretary and CEO



On behalf of the Massachusetts Department of Transportation (MassDOT), I am pleased to present this Massachusetts Freight Plan. This document lays out a vision for a multimodal freight system that is safe, secure, resilient, efficient, reliable, and sustainable, and one that catalyzes economic development while supporting the continued competitiveness of the Commonwealth. The strategies identified in this plan have been developed through a risk-aware, scenario-based process and are believed to be appropriate responses to whatever the future holds. This document is a companion piece to the *Massachusetts State Rail Plan*, which discusses that mode in more detail.

Upholding MassDOT's priority of customer service, the Massachusetts Freight Plan was developed through collaboration with a Freight Advisory Committee of industry members and municipal and regional leaders. MassDOT consulted with a wide range of subject matter experts from State and Federal agencies and sought public feedback at four workshops in different regions of the Commonwealth. We are confident that the strategies proposed herein serve the people of Massachusetts whenever they interact with our transportation system.

This document satisfies Massachusetts's obligation under the Fixing America's Surface Transportation (FAST) Act to "develop a freight plan that provides a comprehensive plan for the immediate and long-range planning activities of the State with respect to freight." MassDOT has collaborated with the Commonwealth's Metropolitan Planning Organizations (MPOs) to identify critical urban and rural freight corridors for inclusion on the National Highway Freight Network alongside Primary Freight Routes and the Interstate Highway System. Further, this Freight Plan identifies freight investments for fiscal years 2018 through 2022.

The Commonwealth already is investing in the freight system. MassDOT completed its last Freight Plan in 2010. Of the projects prioritized by that effort, MassDOT and its partners have completed improvements to Worcester's Franklin Street Terminal and the Department has instituted the recommended Industrial Rail Access Program (IRAP). Boston Harbor dredging and improvements

to freight rail lines are ongoing. Massport is expanding Conley Terminal and MassDOT is improving the I-495/I-90 interchange to improve the flow of cargo along a “freight spine” that connects Conley Terminal to the Interstate Highway System through local haul roads and to the national freight system through terminals in Worcester and other locations.

The strategies in this plan will build on those investments. Many of the 2010 Freight Plan's policy initiatives, including preservation of sites for industrial and logistics development and construction of improved truck parking, are carried forward in this effort.

Among the strategies proposed in the 2017 Massachusetts Freight Plan are: improving the Commonwealth's stock of truck parking and servicing areas; resolving key bottlenecks on highways; maintaining freight access; leveraging connected vehicle technology; protecting freight facilities from climate change impacts; integrating supply chain data; and encouraging use of underutilized ports and airports as cargo gateways. The Freight Plan recognizes that enhancements to the freight system can come as improvements to infrastructure, operational innovations, or as policy revisions.

MassDOT would love to hear from you about this plan! The public can provide feedback at <http://sgiz.mobi/s3/Massachusetts-Freight-Plan-Feedback>.

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## The Freight Advisory Committee

**Thomas Tinlin | MassDOT (Chair)**

**Ed Anthes-Washburn | Port of New Bedford**

**Chris Atwood | Unistress Corp.**

**Joe Barr | City of Cambridge**

**Pierre Bernier | Maritime International**

**Matthew Burwell | Legal Sea Foods**

**Joe Carter | SBA Global**

**Tom Cosgrove | NFI Industries**

**George Fournier | Cumberland Farms**

**Charles Hunter | Genesee & Wyoming Railroad**

**Colleen Kissane | Connecticut DOT**

**Mark Marasco | Maple Leaf Distribution Services**

**Gary Roux | Massachusetts Association of  
Regional Planning Agencies**

**Lisa Wieland | Massport**

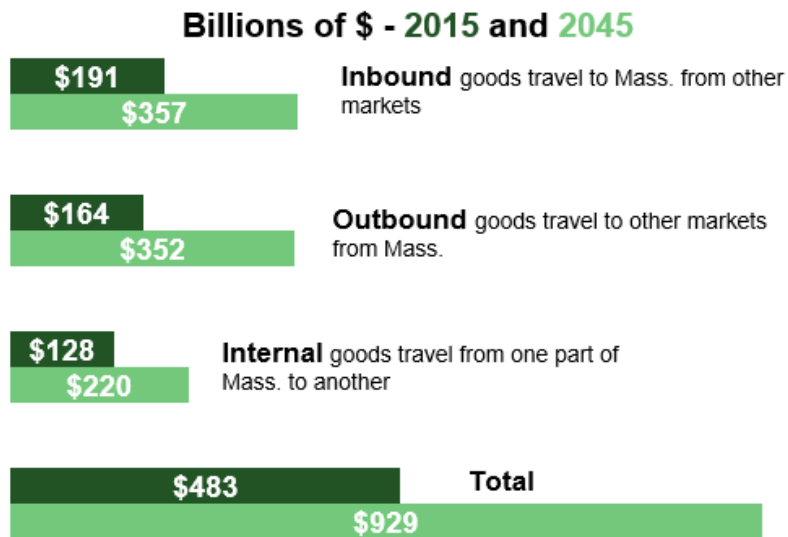
**Brandon Wilcox | FHWA**

**Kevin Young | Global Partners**

## 1.0 Vision and Purpose

The freight system brings produce from Central America to Central Massachusetts before it spoils and carries millions of products from Amazon Prime to your door in two days. It also serves a critical function in supporting the Commonwealth's economic development. Massachusetts's freight system transported goods valued at nearly \$500 billion in 2015 and expected to approach \$1 trillion in 2045.

Figure 1.1 Value of Goods in Massachusetts



Source: FHWA Freight Analysis Framework Version 4

This freight plan follows a “scenario-based analysis” model. In some traditional planning models, strategies are developed to

adapt to a single projected future. This future may be the product of extending current trends or making educated guesses coming developments and innovations. By contrast, this plan recognizes that many plausible futures exist. It identifies drivers of change in the world and the range of ways in which they could progress, and combines these into multiple plausible futures. Desirable strategies are those which allow the Commonwealth to thrive across the widest range of outcomes.

### 1.1 Vision and Guiding Principles

Our vision and guiding principles account for the key points of attention for the Massachusetts Department of Transportation (MassDOT), the Commonwealth of Massachusetts, and the Federal Government, among other contributors. In pursuing these goals, Massachusetts will pursue an innovative and efficient freight system that will support a thriving economy in the years and decades to come.

#### Those who maintain and operate the Massachusetts Freight System will:

- Be safe, secure, and resilient.
- Improve the condition of key freight assets.
- Improve the economic competitiveness of Massachusetts.

- Provide efficient and reliable mobility within Massachusetts and to/from neighboring states.
- Support healthy and sustainable communities.

#### Our guiding principles in implementing this vision are:

- Consider the experience of *all* customers.
- Provide reliable, efficient service within budget constraints.
- Take advantage of innovations and technology.
- Support a well-trained workforce with good-paying jobs.
- Be responsive to trends as they unfold.

## 1.2 Requirements and Policy Goals

The freight system impacts the ability of many communities, government bodies, and private sector organizations to achieve their policy goals. Actors and stakeholders are illustrated in Figure 1.2 (next page).

### *Federal Requirements and Policy Goals*

The Massachusetts Freight Plan satisfies 49 USC 70202, which states that “Each State that receives funding... shall develop a freight plan that provides a comprehensive plan for the immediate and long-range planning activities and investments of the State with respect to freight.”

The United States Congress established requirements for this and all other State freight plans through the “**Fixing America’s**

**Surface Transportation” (FAST) Act** in October 2015 (49 USC 70202):

- Identify significant freight system trends, needs, and issues.
- Describe policies, strategies, and performance measures that will guide freight-related transportation investment.
- List facilities on the National Multimodal Freight Network, including critical urban and rural freight corridors.
- Describe how MassDOT will meet national multimodal freight policy goals and the National Highway Freight Program goals.
- Consider innovative technologies, including Intelligent Transportation Systems (ITS).
- Describe preventive measures taken to preserve the condition of roadways projected for significant deterioration due to heavy vehicle usage.
- Inventory major freight bottlenecks and list strategies to resolve them.
- Consider the delay caused by freight movements, with mitigation strategies.
- List priority projects and describe how funds made available will be invested and matched.
- Document consultation with a Freight Advisory Committee.

Figure 1.2 Stakeholders in the Massachusetts Freight Plan

The COMMONWEALTH  
of MASSACHUSETTS

**Other State Agencies**

The COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT

The FEDERAL GOVERNMENT

**Other Federal Agencies**



Congress also set out policy goals (49 USC 70101) for the National Multimodal Freight Network (“the Network”):

- Identify infrastructure improvements, policies, and operational innovations that:
  - Strengthen the contribution of the Network to the economic competitiveness of the United States;
  - Reduce congestion and eliminate bottlenecks; and
  - Increase productivity, particularly for domestic industries and business that create high-value jobs.
- Improve the safety, security, efficiency, and resiliency of multimodal freight transportation;
- Achieve and maintain a state-of-good-repair on the Network;
- Improve the economic efficiency and productivity of the Network;
- Improve the reliability of freight transportation;
- Improve the short and long-distance movement of goods that:
  - Travel across rural areas between population centers;
  - Travel between rural areas and population centers; and
  - Travel from the nation’s ports, airports, and gateways to the Network.

- Improve the flexibility of States to support multi-State corridor planning and the creation of multi-State organizations to increase the ability of States to address multimodal freight connectivity; and
- Reduce the adverse environmental impacts of freight movements on the Network.

### Massachusetts Requirements and Policy Goals

#### ECONOMIC DEVELOPMENT

*Opportunities for All*, the Baker-Polito Administration’s economic development plan, laid out seven priority policy areas. This plan will interact with all of them.

- **Transportation access.** The freight system touches every region, including both urbanized and rural area in Massachusetts. This plan discusses how to serve the entire Commonwealth using both public and private infrastructure.
- **Housing policies that support economic growth.** A significant degree of freight activity is required to support mixed-use and residential districts. This plan discusses how the Commonwealth and its communities can better plan for these needs and serve residents.
- **Balanced regulatory and business cost environment.** The freight system is impacted by both Federal and State regulation on topics such as driver rest and vehicle emissions. This plan discusses both the societal imperatives

that drive these regulations and opportunities for collaborative refinements to serve the common good.

- **Supporting key industries and clusters.** Logistics and distribution is itself a key industry cluster, but it also is critical to maintaining the Commonwealth's strength in industries as disparate as fishing and biopharmaceuticals. This plan discusses key industry clusters, their needs, and how the freight system can evolve to support them better.
- **Workforce development and talent retention.** Truck driving is currently in a talent recruiting and retention crisis. This plan discusses this crisis and the opportunities for the Commonwealth to better support its logistics professionals.
- **Fostering a culture of innovation and entrepreneurship.** Easy access to supply chains and markets enables the innovation economy to exist in Massachusetts. This plan discusses opportunities to expand upon that support and identifies innovations and technologies that can be applied to the freight system itself to improve safety, efficiency, and reliability.
- **Preparing communities for success.** The freight system exists in close proximity to Massachusetts communities, some of which see adverse impacts (such as noise and fumes). It is therefore critical to communicate with and listen to community leaders and residents about their concerns. This plan discusses the necessity that State agencies and communities educate themselves and each other about needs, challenges, and opportunities associated with freight.

## TRANSPORTATION

MassDOT has set five overarching performance goals. As with the economic development strategic goals, each of these can be applied to the freight system, though budget and capital performance is somewhat more loosely related.

The performance goals are listed below in blue. For each goal, we have described how the freight system can impact MassDOT's ability to achieve it.

- **Customer Experience.** The freight system should work for *all* its customers: shippers, carriers, consumers, workforce, and communities.
- **System Condition.** The condition of the freight system should be improved to ensure an efficient and reliable supply chain.
- **Budget and Capital Performance.** Capital budgets should be set in part using freight performance metrics, to ensure that the benefits of projects for freight uses are properly considered in decision-making.
- **Safety.** Freight movement should be safe for operators, motorists and passengers, bicyclists, and pedestrians, in urban, suburban, and rural areas.
- **Healthy and Sustainable Transportation.** The freight system should not adversely impact the health and livability of the communities it touches, and it should contribute to the achievement **a 25% statewide reduction in GHG**

**emissions from utilities, industry, transportation, and other sources by 2020** (Global Warming Solutions Act of 2008).

### 1.3 Outreach Process

The Commonwealth's prior freight plan, completed in 2010, focused on freight data and analysis. This plan will focus on customer service. MassDOT conducted customer outreach through the following efforts:

- The 17-member **Freight Advisory Committee** met on four occasions to comment on all of the elements of this plan, chaired by the MassDOT Highway Administrator and facilitated by the project team. Membership included the public sector (ports and municipalities), industry, and representation from neighboring states.
- **Public Workshops** following each FAC meeting to allow residents an opportunity to freely comment on our research, analysis, vision, goals, and strategies.
- **Interviews** with industry representatives from key sectors and clusters, some of which were arranged through chambers of commerce and regional coalitions. These interviews focused on building a model of the company or institution's supply chain and documenting any challenges or needs at the forefront of the participants' minds.
- **Working groups** of subject matter experts to guide the development of strategies. There were four groups drawing

from a pool of 40 experts. Membership varied by subject area: Policy and Regulation (State and Federal public sector stakeholders), Capital Planning (MassDOT multimodal planning staff), The Economy (regional chambers of commerce and business coalitions), and Infrastructure and Technology (MassDOT engineering and design staff).

### 1.4 Organization of This Document

This freight plan is organized as follows:

- **Chapter 1** describes the vision and purpose of the Freight Plan.
- **Chapter 2** describes the Massachusetts Freight Network, identifying key assets and facilities across the Commonwealth and their function.
- **Chapter 3** places the plan in context by discussing the Commonwealth's current economy, drivers of change in the world, and plausible futures.
- **Chapter 4** describes the strategies that Massachusetts may pursue to respond to the widest range of possible futures.
- **Chapter 5** describes how Massachusetts can implement these strategies, including actors and funding sources.

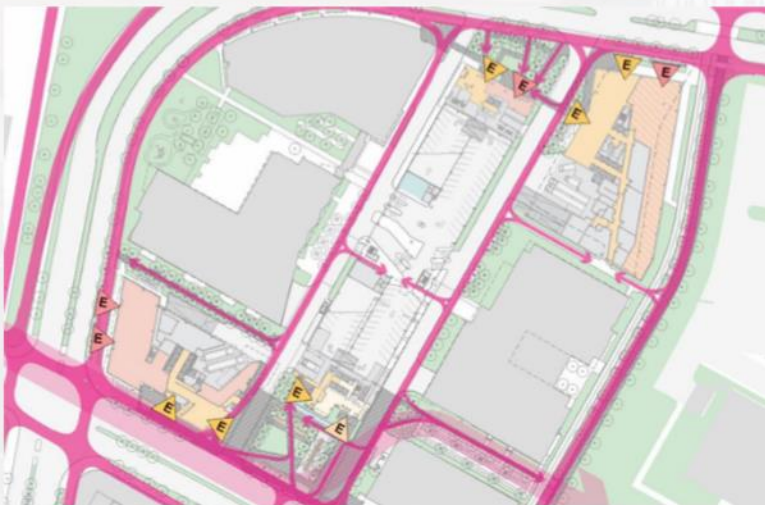
"Freight Focus" sections between the chapters shed additional light on key overarching issues.



## Freight Focus *on Urban Supply Chains*

The last decade has seen a renewed interest in urban living among many demographic groups. Central cities have become de-industrialized and lifestyle preferences have changed. Massachusetts's urban cores house dense concentrations of offices and labs, hospitals and universities, and the retail and restaurants that support these uses.

This economic engine must be fed with supplies. Stores must feed a growing demand from a limited footprint, and are converting back rooms into floor space. This in turn requires frequent deliveries by smaller vehicles and smart decision-making on what to stock.



Site Circulation and Loading at MXD - Image credit: Boston Properties



Massachusetts residents have increased their reliance on e-commerce and home deliveries for purchases from produce to furniture. As large online retailers promise very rapid delivery (now same-day in some cases), the number of small, dedicated home-delivery vehicles rises.

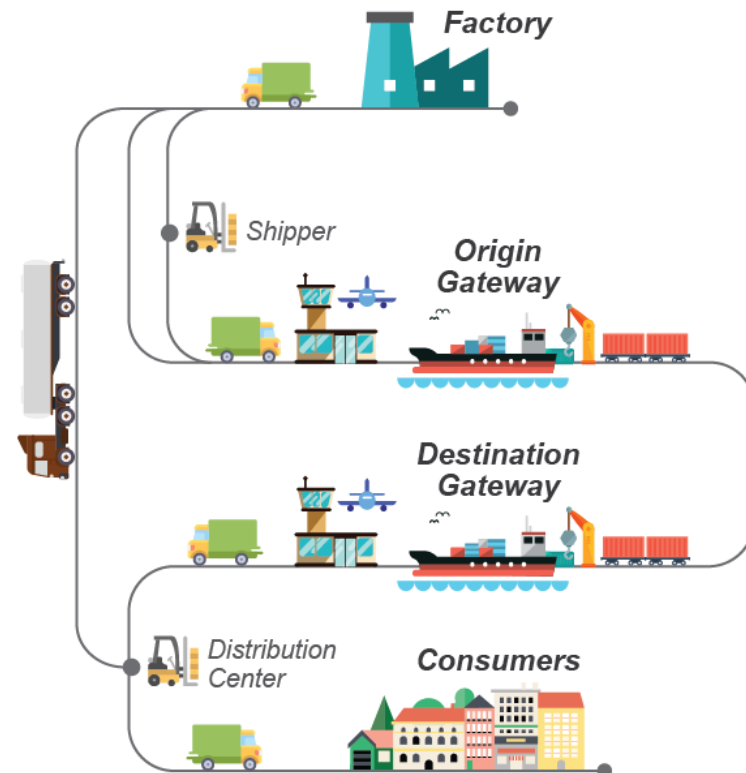
A dense urban fabric must accommodate cars and trucks; vans and bikes; loading docks and aesthetics. In addition to issues of safety and logistics, a tight network of targeted deliveries requires that urban areas host distribution centers, which require high-capacity connections to highways and ideally to railways, seaports, and airports. As these are traffic-intensive, light industrial facilities, cities may need to proactively plan more of the supply chain than they're accustomed to in coming years.

## 2.0 The Massachusetts Freight Network

Massachusetts consumes more goods than it produces, reflecting an industry mix that tilts toward institutions, offices, and other net consumers of freight. As a result, this section places emphasis on goods flowing into the Commonwealth (as opposed to those produced here). Figure 2.1 shows an example supply chain that moves products from the manufacturer to the consumer.

- **Gateways** include rail terminals (e.g., Worcester and Ayer), seaports (Boston and New Bedford) and airports (Boston). These facilities receive and dispatch long-haul, large-volume freight between Massachusetts, the nation, and the world.
- **Corridors** include highways and rail lines that serve both long and short-haul freight traffic.
- **Distribution and En-Route** facilities include warehouses and distribution centers, transload facilities where uniformly-packed cargo can move rapidly from trains to trucks and vice versa, truck service facilities along Massachusetts highways, and railyards. These facilities are concentrated along the I-495 belt and in the Worcester area.
- **First and Last Mile** is an industry term for the small trucks, vans, bicycles, and people that move cargo from distribution centers to consumers in the urban and suburban core and from manufacturers to gateways.

Figure 2.1 Example Supply Chain



### 2.1 Gateways

A gateway is any location where long-haul modes (such as trucks, trains, ships, or airplanes) arrive and depart and transfer their loads to trucks for processing within the Commonwealth.

Air and sea gateways typically host U.S. Customs and Border Protection (CBP) facilities, the operational capacity of which is not necessarily within the control of the facility’s operator.

In addition, it is important in this scenario-based plan to consider the impact of globalized supply chains and mode choice on gateway traffic. Specifically, if manufacturing returns in force to the United States, some goods that the Commonwealth is used to receiving by ship (cars, for example) may begin to arrive by truck and by train. Massachusetts must remain flexible and plan for this possibility.

The actors who control gateways include public and private organizations throughout the Commonwealth. Massachusetts’s large rail yards are controlled by private operators, while Massport operates Logan International Airport and the Port of Boston and other seaports are managed by cities and towns.

### Rail Freight Terminals

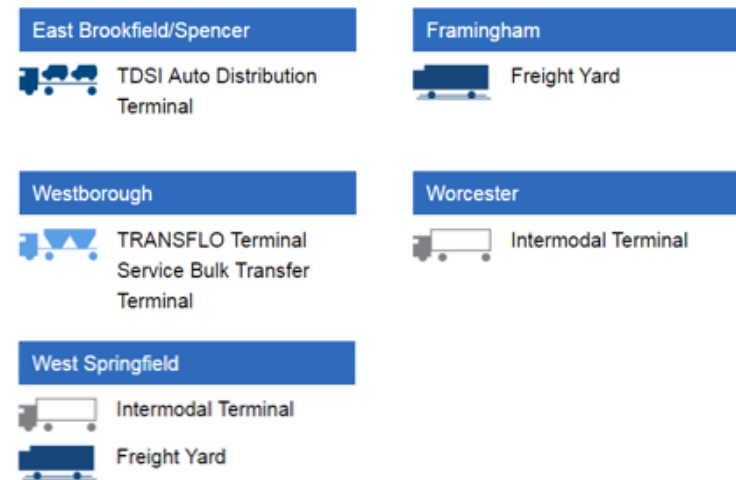
Massachusetts provides a key link for freight rail traffic entering and exiting the entire New England region, including rail arriving at West Coast ports and moving through Chicago. The majority of freight rail into southern New England comes through Massachusetts via the CSX and Pan Am Southern gateways over the Hudson River, as does a significant portion of the traffic destined for the three northern New England states.

MassDOT and the Massachusetts Bay Transportation Authority (MBTA) have acquired most major rail corridors within I-495, and have begun commuter rail service on many of them. Industry

interviews indicated that goods arriving to Boston by rail most often are trucked from rail terminals in Central Massachusetts to distribution centers on the I-495 belt.

**CSX** is the largest Class I (annual revenue exceeds approx. \$450M) railroad in Massachusetts. It operates the Boston Line west of Worcester, as well as the facilities in Figure 2.2.

Figure 2.2 CSX Facilities in Massachusetts



Source: CSX

**Pan Am Railways (PAR)** is the primary railroad network serving Boston from the north. PAR’s major terminals are located in Ayer and West Deerfield. PAR and Norfolk Southern (NS) form Pan Am Southern (PAS), which jointly owns the Patriot Corridor between Albany, NY and Ayer, MA.

Other freight rail carriers operating in Massachusetts include the **Genesee and Wyoming (G&W)**, which owns the New England Central (NECR) and Providence and Worcester (P&W) railroads.

### Seaports

The *Ports of Massachusetts Strategic Plan (2013)* identified five major seaports: Boston, Fall River, Gloucester, New Bedford, and Salem. Some freight destined for Massachusetts also lands at out-of-state seaports in Providence, New Haven, and most significantly New York/New Jersey. Essentially all freight from all seaports is transferred to trucks to continue its journey.

Within the “**Port of Boston**” are multiple sea terminals, most geared to a specific purpose. These terminals and their primary product include:

- **Massachusetts Port Authority (Massport)**
  - Conley Terminal (containers) | South Boston.
  - Boston Fish Pier (seafood processing) | South Boston.
  - Boston Autoport (motor vehicles) | Charlestown.
- **Private Terminals**
  - Chelsea Creek (fuel, jet fuel, bulk cargo) | Chelsea.
  - Mystic River (bulk cargo, fuel) | Everett.

**The overriding factor in the success of the Port of Boston is its cost-competitiveness against New York/New Jersey.**

While it will typically be cheaper for a load bound for

Massachusetts to be delivered to New York, the cost of unloading and transporting that load to its final destination is lower from Boston. The degree to which it is lower – the balance between shipping and drayage costs – can make a very significant difference in demand. To manage this risk MassDOT and Massport have set a high priority on maintaining high-efficiency road connections from the Port of Boston to nearby highways.

The **Port of New Bedford** primarily handles fish and produce, but has attempted to find new markets, including as a hub for the offshore wind industry. The **Ports of Fall River** and **Salem** primarily handle fuel. The **Port of Gloucester** primarily handles fish.

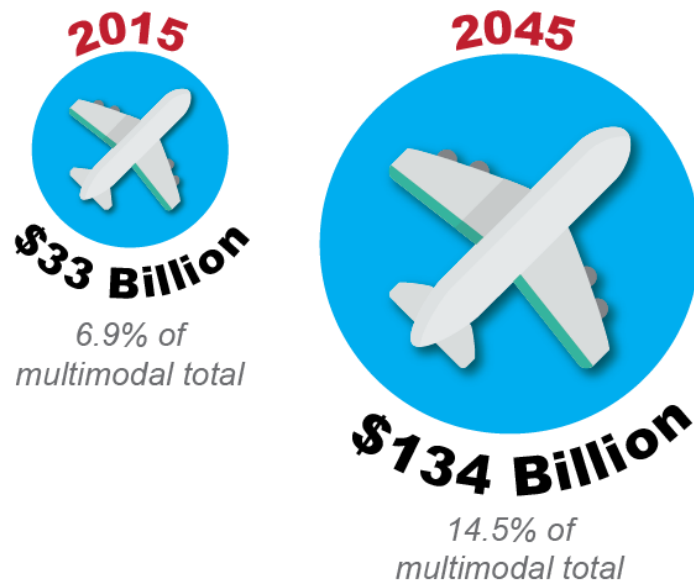
### Airports

The Federal Aviation Administration reports that only one airport in Massachusetts – Logan International Airport in Boston – had meaningful air cargo traffic in 2016 (the most recent year of reporting). Massport reports that Logan handled approximately 600 million pounds (300,000 tons) of cargo that year, ranked 20<sup>th</sup> in the United States.

Air cargo is very expensive to move but air travel is the fastest and often the most flexible mode. As a result, air cargo tends to be very valuable by weight. This is especially true in Massachusetts, which has a concentration of industries that produce high-value, perishable goods (e.g., fish and biopharmaceuticals).

FHWA collaborates with the Bureau of Transportation Statistics to produce a comprehensive picture of multimodal freight movement called the Freight Analysis Framework (FAF). FAF data has shown that air cargo accounts for 0.2% of Massachusetts freight movements by weight, but nearly 7% by value. Furthermore, as shown in Figure 2.3, FAF projects air's share of Massachusetts freight value to more than double by 2045.

Figure 2.3 Air Freight Commodity Value: 2015 vs. 2045



Source: FHWA Freight Analysis Framework Version 4

Logan Airport cargo is approximately evenly split between integrated logistics shippers (“all-cargo” carriers such as Federal

Express and United Parcel Service), and passenger airlines that carry cargo in the luggage hold (known as “belly freight”). Massport reports that FedEx carried 38% of Logan’s 2015 freight volume, UPS carried 12%, and passenger airlines carried 43% (*Boston-Logan International Environmental Data Report, 2015*)

Figure 2.4 shows air cargo areas at Logan Airport.

Figure 2.4 Logan Airport Service Areas



FIGURE 3-2 Logan Airport Service Areas

2015 Environmental Data Report

Service Areas

Source: Massport *Boston-Logan International Environmental Data Report*

The Terminal E Modernization project will increase Logan Airport's capacity for international belly freight, but may decrease capacity for dedicated cargo flights. **Massport continues to pursue opportunities to make air cargo processing at Logan more efficient to get the most value out of limited space.**

In addition to its responsibilities at Logan, Massport continues to explore opportunities to increase Worcester Regional Airport's attractiveness as a gateway for additional air freight.

## 2.2 Corridors

Freight corridors serve both inbound/outbound and internal goods movement. Where they meet and interchange with each other, among other geometric changes, bottlenecks can occur.

### Highways

Massachusetts highways include five major Interstate corridors: Interstates 84, 90, 91, 93, and 95; as well as seven auxiliary routes: Interstates 190, 290, 291, 391, 295, 395, and 495. Major non-Interstate corridors include US-3, US-6, MA-2, MA-3, MA-24, MA-128, and MA-146.

Major trucking routes tend to either serve Boston directly or circumnavigate the metropolitan area using I-495. The primary through route in Massachusetts enters the Commonwealth on I-84 from Connecticut and New York City, proceeds past Worcester on I-90, continues north on I-495, and exits using I-93 to New Hampshire and I-95 to Maine. An additional through

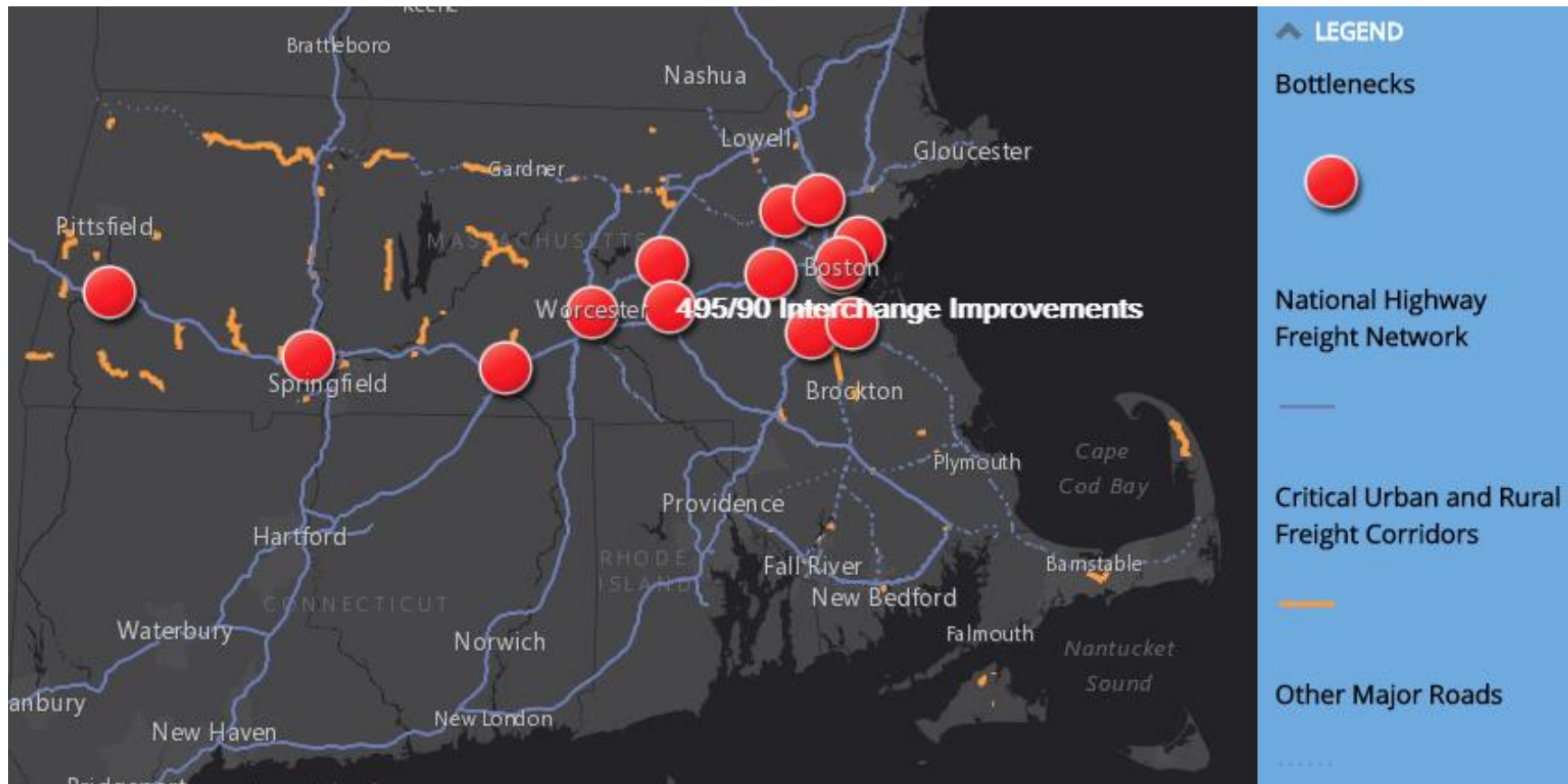
route from Chicago and the Midwest enters Massachusetts via I-90 from New York. The I-495/I-90 interchange is a particularly important bottleneck along a major trucking route and MassDOT is actively seeking remedies for it.

Freight traffic, of course, is subject to the same congestion delays as all other road traffic. For that reason, it is important to look at truck traffic in the context of the national bottleneck listings developed by the American Transportation Research Institute (ATRI) and the American Highway Users Association (AHUA). The definition of a "bottleneck" is slightly different for each organization – ATRI lists interchanges and AHUA lists segments of highway, ATRI uses trade data while AHUA uses traffic data – but the findings are comparable.

In addition to the I-495/I-90 interchange for which MassDOT is exploring various remedies, there are two other bottlenecks from ATRI – **The Braintree Split (I-93 and MA-3) and I-95/I-93 in Reading** – as well as two from AHUA – **I-90 from I-93 to South Boston and Tip O'Neill Tunnel (I-93).**

Figure 2.5 shows the location of the ATRI and AHUA listed sites, as well as the I-495/I-90 interchange and bottlenecks, as well as additional bottlenecks identified by the *2010 Massachusetts Freight Plan* based on their volume-to-capacity ratio. The map also includes the National Highway Freight Network (purple line), Critical Urban and Rural Freight Corridors, and other major highways (dotted line) for context.

Figure 2.5 The Massachusetts Highway System



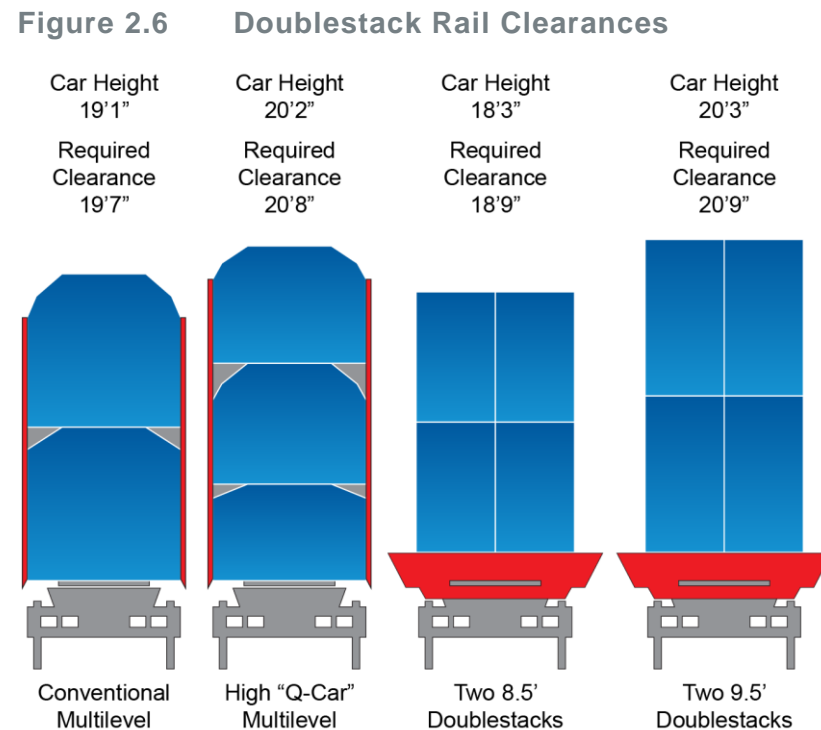
### Rail Lines

One defining characteristic of a rail line is the load that it is permitted to carry in terms of weight and in terms of speed. The current U.S. standard is that a rail line be rated for rail cars weighing up to 286,000 pounds, known as the **“286K” standard**. Higher than that is the “315K” rating, while lower is the “263K” rating. Weight ratings are based primarily on bridge and culvert strength and condition, as well as track weight. A substandard rating prevents the use of a potentially economically productive line by national carriers, but the rail industry has concluded that the benefits of 286K are significantly higher than 315K when weighed against the costs of upgrading.

Figure 2.7 (next page) shows Massachusetts rail lines by weight rating. Only the CSX/MBTA Boston Line is rated at 315K. MassDOT’s Housatonic and Ware River Lines and the PAR Main Line are rated at 286K. The remainder of the Massachusetts freight rail network is currently rated at 263K.

In addition, rail lines are rated for height based on the clearance of bridges. Accommodating intermodal freight to its full potential requires that bridges over a line be high enough to accommodate **doublestacking** (as shown in Figure 2.6). Currently, only the Boston Line is so rated.

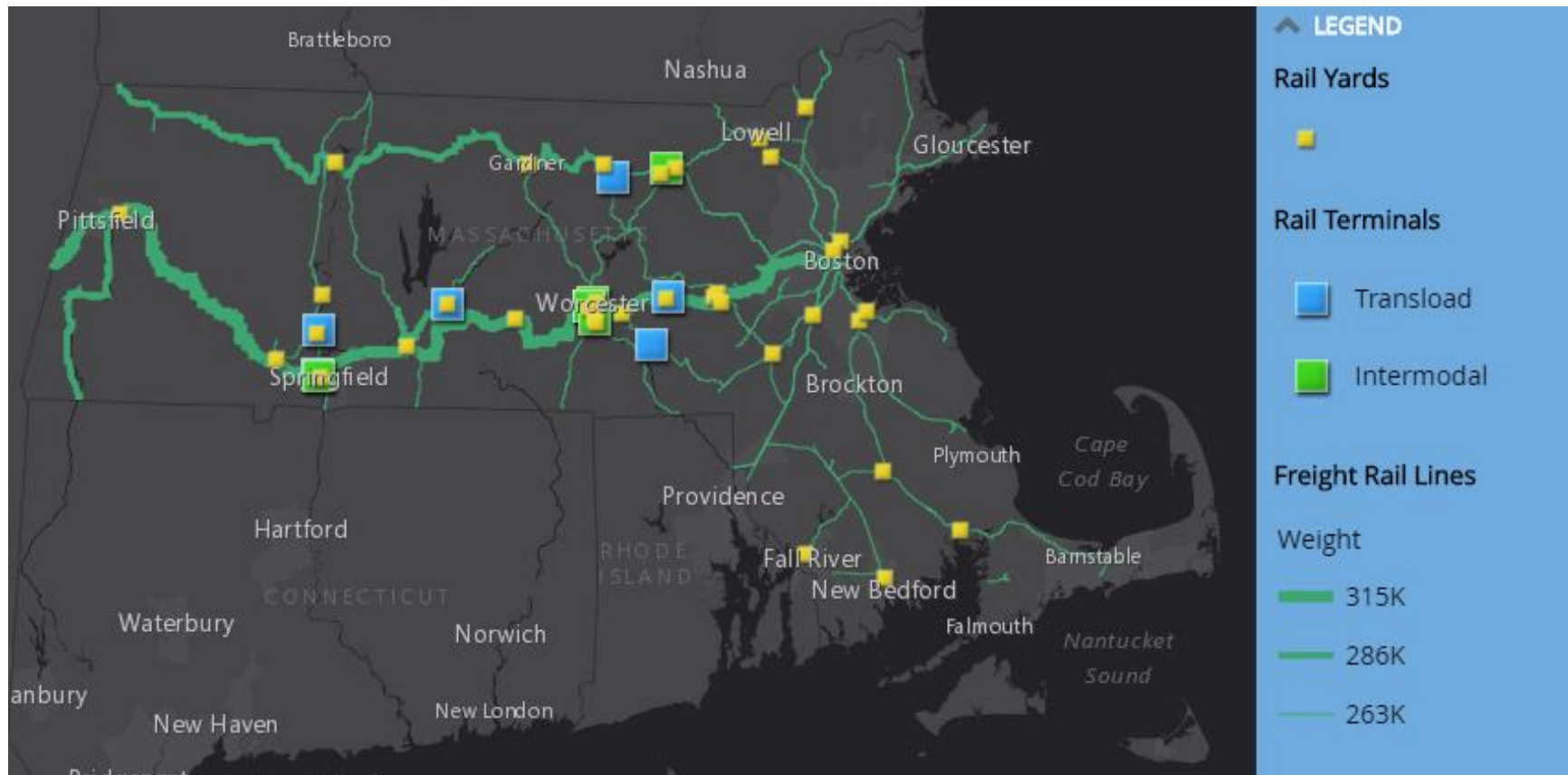
Finally, rail lines are rated for speed, based on track condition and inspection frequency, at the discretion of the owner and with the approval and oversight of the Federal Railroad Administration (FRA).



Source: [Adapted from Dean Wise, 2009](#)



Figure 2.7 The Massachusetts Freight Rail Network



## 2.3 En-Route and Distribution

Truck parking areas, distribution centers, and transload facilities facilitate a healthy long-haul transportation industry.

### *Distribution Centers*

Distribution centers receive large shipments of goods, often from wholesalers and suppliers, store those goods until delivery, and package them in loads for shipment to stores and for home delivery. Because of their function, they require high-capacity highway access and are often located near major interchanges. In Massachusetts, distribution centers often locate on the “Distribution Belt” along I-495 and US-44. Significant food distribution occurs in the Newmarket area of Boston.

Industry interviews indicated that mode shift for Massachusetts freight from road to rail and sea is complicated by the fact that many distribution centers lack direct rail or water access. Also, as urbanization and the growth of home-delivery necessitate more small-vehicle deliveries in urban areas, pressure may grow for distribution centers to move closer to the city even as development pushes them out, presenting a challenge for local authorities concerned about traffic volume.

### *Truck Parking and Service*

Truck parking and service facilities (e.g., “truck stops”) serve several critical functions:

- **Rest Requirements** – Under the guidelines of the Federal Motor Carrier Safety Administration (FMCSA), a truck driver

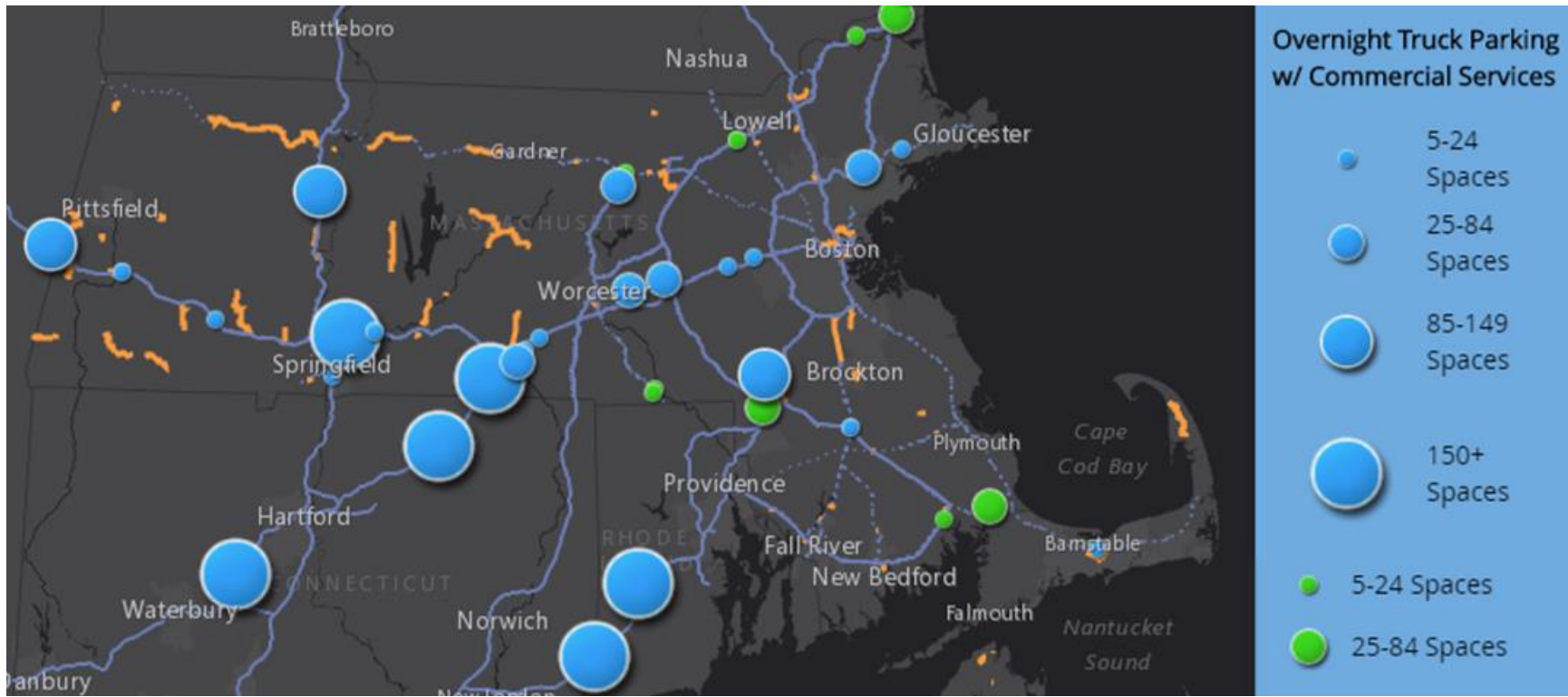
is limited to 11 hours of driving, followed by 10 hours of rest. When the time limit approaches, drivers must find a legal place to pull over, and it is not legal to do that on highway shoulders. Trucks can park at MassDOT-owned service areas and private truck stops, as well as in some private parking lots.

- **Repairs** – Like any motor vehicle, trucks suffer flat tires and they break down. Truck stops sometimes provide repair and maintenance facilities, and all provide an opportunity for a driver to perform repairs on their own.
- **Food and Fuel** – Both drivers and trucks must refuel during long trips. While a truck may be able to use any diesel pump at a local service station, truck stops offer many diesel pumps in purpose-built facilities.

**Massachusetts suffers from a critical lack of truck parking and service facilities.** Figure 2.8 (next page) shows the location of these facilities relative to major highways and the “distribution belt” that follows I-495, I-290, and US-44 along the periphery of the Boston Area. Truck stops cluster in Springfield and near the intersection of I-90 and I-84, but no parking facility public or private exists on I-495 north of I-90. This stretch of highway sees the highest truck volume in the Commonwealth.

When truck drivers run out of time and no parking is available, they face a conflict between Federal rest requirements and state safety regulations regarding truck parking.

Figure 2.8 Truck Parking and Servicing Facilities in Massachusetts and Neighboring States



Source: Reproduced from *Rest Locations for Long-Distance Truck Drivers in Massachusetts*, Boston MPO, 2016

## 2.4 First and Last Mile

The “first mile” of a shipment is from the factory, farm, or mine to a distribution center, railyard, or port. The “last mile” is from the distribution center to the store, home, or business. These shipments are often made by small trucks and vans, often making frequent stops and subject to mixed-traffic conditions outside the control of the carrier.

First and last mile shipments present particular opportunities for disruption by new technology. Smartphones and GPS systems provide real-time traffic and routing information, but can actually decrease efficiency when they direct drivers to roads not designed for use by trucks. Bicycles, drones, and robots all represent potential modal replacements for short-distance trucking in urban and suburban areas.

The first and last mile also includes loading zones and docks at the destination. Some urban communities have begun to set guidelines for how loading areas should be planned and managed. MassDOT supports communities in developing Complete Streets plans that include welcoming sidewalks, greenery, parklets, bicycle lanes, transit lanes, and street parking. These beneficial uses compete with loading zones for the same space, and properly accommodating trucks is important to ensure the safety of pedestrians and cyclists. As demand for small-vehicle deliveries continues to increase, communities may wish to develop or draw upon a toolbox for managing loading in neighborhoods and village centers.

## 2.5 The Network

This plan lays out a strategy for the freight projects the Commonwealth should pursue in the future. Once the plan is formally adopted, MassDOT will begin soliciting project ideas and running them through the project development process. It anticipates that the first of these new projects will begin to materialize in the outer years of the CIP.

In the early years of the CIP, MassDOT is using the NHFP funds to support projects along the NHFN that will improve truck travel time reliability or the condition of core freight assets. MassDOT also intends to flex eligible funds to rail projects that align with the plan's vision, starting in FY2019.

A list of the freight projects selected for the 2018-2022 CIP is provided in Table 2.1.

Table 2.1: Proposed Projects to use National Highway Freight Program Funds

| CIP/STIP program       | Project description                                                                                                                | Total federal participating project cost | Funding source        | 2018        | 2019        | 2020 | 2021 | 2022 |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------|-------------|-------------|------|------|------|
| Roadway Reconstruction | NORTHAMPTON- IMPROVEMENTS ON I-91 INTERCHANGE 19 AT ROUTE 9 AND DAMON ROAD                                                         | \$7,438,489                              | Freight funding       | \$5,950,791 |             |      |      |      |
|                        |                                                                                                                                    |                                          | Other federal funding | \$0         |             |      |      |      |
|                        |                                                                                                                                    |                                          | Non-federal match     | \$1,487,698 |             |      |      |      |
| Roadway Reconstruction | PALMER- RECONSTRUCTION OF ROUTE 32, FROM 765 FT. SOUTH OF STIMSON STREET TO 1/2 MILES SOUTH OF RIVER STREET (PHASE I) (1.63 MILES) | \$6,134,080                              | Freight funding       |             | \$2,856,243 |      |      |      |
|                        |                                                                                                                                    |                                          | Other federal funding |             | \$2,563,776 |      |      |      |
|                        |                                                                                                                                    |                                          | Non-federal match     |             | \$714,061   |      |      |      |
| Roadway Reconstruction | WORCESTER- SIGNAL & INTERSECTION IMPROVEMENTS ON ROUTE SR 122A (PROVIDENCE STREET) AT MILLBURY STREET & MCKEON ROAD                | \$594,000                                | Freight funding       |             | \$475,200   |      |      |      |
|                        |                                                                                                                                    |                                          | Other federal funding |             | \$0         |      |      |      |
|                        |                                                                                                                                    |                                          | Non-federal match     |             | \$118,800   |      |      |      |
| Roadway Reconstruction | MANSFIELD- INTERSECTION & SIGNAL IMPROVEMENTS AT SR 140 (COMMERCIAL STREET) & SR 106 (CHAUNCEY STREET)                             | \$594,000                                | Freight funding       |             | \$475,200   |      |      |      |
|                        |                                                                                                                                    |                                          | Other federal funding |             | \$0         |      |      |      |
|                        |                                                                                                                                    |                                          | Non-federal match     |             | \$118,800   |      |      |      |
| Roadway Reconstruction | BARNSTABLE- INTERSECTION IMPROVEMENTS AT IYANOUGH ROAD (ROUTE 28) AND YARMOUTH ROAD                                                | \$9,573,048                              | Freight funding       |             | \$7,658,438 |      |      |      |
|                        |                                                                                                                                    |                                          | Other federal funding |             | \$0         |      |      |      |
|                        |                                                                                                                                    |                                          | Non-federal match     |             | \$1,914,610 |      |      |      |

| CIP/STIP program                   | Project description                                                          | Total federal participating project cost | Funding source        | 2018 | 2019        | 2020         | 2021         | 2022         |
|------------------------------------|------------------------------------------------------------------------------|------------------------------------------|-----------------------|------|-------------|--------------|--------------|--------------|
| Intelligent Transportation Systems | STATEWIDE- EXPANSION OF HIGHWAY OPERATIONS CENTER INCIDENT DETECTION SYSTEMS | \$1,442,307                              | Freight funding       |      | \$1,153,846 |              |              |              |
|                                    |                                                                              |                                          | Other federal funding |      | \$0         |              |              |              |
|                                    |                                                                              |                                          | Non-federal match     |      | \$288,461   |              |              |              |
| Intersection Improvements          | WELLFLEET- INTERSECTION IMPROVEMENTS & RELATED WORK AT ROUTE 6 & MAIN STREET | \$2,000,400                              | Freight funding       |      |             | \$1,600,320  |              |              |
|                                    |                                                                              |                                          | Other federal funding |      |             | \$0          |              |              |
|                                    |                                                                              |                                          | Non-federal match     |      |             | \$400,080    |              |              |
| Roadway Reconstruction             | HOPKINTON- WESTBOROUGH- RECONSTRUCTION OF I-90/I-495 INTERCHANGE             | \$144,000,000                            | Freight funding       |      |             | \$800,000    | \$20,212,849 | \$20,212,849 |
|                                    |                                                                              |                                          | Other federal funding |      |             | \$0          | \$9,787,151  | \$9,787,151  |
|                                    |                                                                              |                                          | Non-federal match     |      |             | \$200,000    | \$25,612,483 | \$25,612,483 |
| Highway CIP Programs               | To be identified and implemented by the Highway Division                     | \$30,673,765                             | Freight funding       |      | \$6,726,483 | \$17,812,529 |              |              |
|                                    |                                                                              |                                          | Other federal funding |      | \$0         | \$0          |              |              |
|                                    |                                                                              |                                          | Non-federal match     |      | \$1,681,621 | \$4,453,132  |              |              |
| Rail CIP Programs                  | To be identified and implemented by the Rail & Transit Division              | \$10,948,627                             | Freight funding       |      | \$2,021,285 | \$2,245,872  | \$2,245,872  | \$2,245,872  |
|                                    |                                                                              |                                          | Other federal funding |      | \$0         | \$0          | \$0          | \$0          |
|                                    |                                                                              |                                          | Non-federal match     |      | \$505,321   | \$561,468    | \$561,468    | \$561,468    |

## Freight Focus *on The Trucking Workforce*

The overwhelming majority of freight in Massachusetts travels by truck. It is a significant challenge, then, that the American Transportation Research Institute estimated a nationwide shortage of 25,000 drivers in 2015, with projections that the shortage could increase to 175,000 by 2025 (*Critical Issues in the Trucking Industry, 2016*).

This critical shortage has many causes. American young people are increasingly attending college while truck driving attracts those without a degree. Commercial Driver's Licenses (CDLs) are not available until age 21, at which point potential recruits may have begun other careers. Massachusetts has formed a CDL Task Force to consider these and other issues and ensure the health of the trucking work force in the Commonwealth.



*Autonomous vehicles are a tremendous opportunity, and at the same time, there's this big time workforce issue. We need to be thinking far enough ahead on that one so that we don't wind up creating a tremendous amount of economic hardship along the way.*

*Governor Charles D. Baker*

Complicating the issue, however, is uncertainty about the future of the trucking profession. Automated trucking is already in testing in the United States and elsewhere, with Walmart, Mercedes Benz, Uber, Tesla, and others looking into medium-term applications. Automated trucking has significant safety and logistics benefits (rest requirements would become obsolete, for instance).

This opportunity, however, comes with an obligation to prepare and train drivers so that they remain prosperous whatever the future holds. Government, labor, and industry must be partners in order to fulfill it.

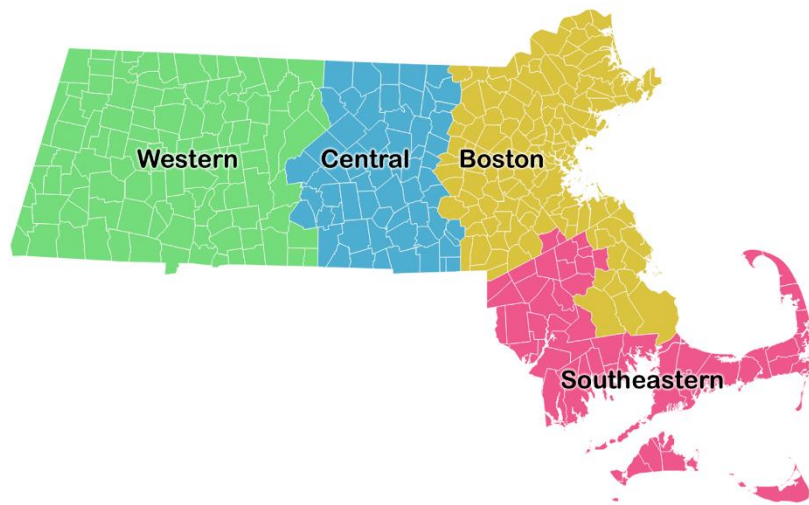
5 DD 01/12/2016 Rev 02/22/2016

## 3.0 Planning Context

This chapter will place the vision, strategies, and implementation planning in the remainder of the report in the context of the Commonwealth's dynamic economy and demography. It will begin by discussing existing economic conditions and the industry clusters that thrive in Massachusetts. It will then identify and briefly discuss major drivers of global change and identify plausible futures based on those drivers.

Throughout, it will use the economic regions identified in Figure 3.1. These four regions are derived from 16 workforce development areas developed and used by the Massachusetts Executive Office of Labor and Workforce Development to keep consistent with official employment data.

**Figure 3.1** Massachusetts Economic Regions



### 3.1 Existing Conditions

While developing this plan, MassDOT reviewed population, employment, gross domestic product, commodities, and industry cluster data. It also interviewed more than 25 companies and facilitated cross-agency public sector discussion groups to develop an understanding of supply chains and the real-world implications of Massachusetts policies and regulations.

A detailed look at these topics can be found in *Technical Memorandum 1: Background Review* and *Technical Memorandum 2: Existing Conditions and Trends*. This section will summarize findings concerning the Commonwealth's economy, industry, and policy and regulation.

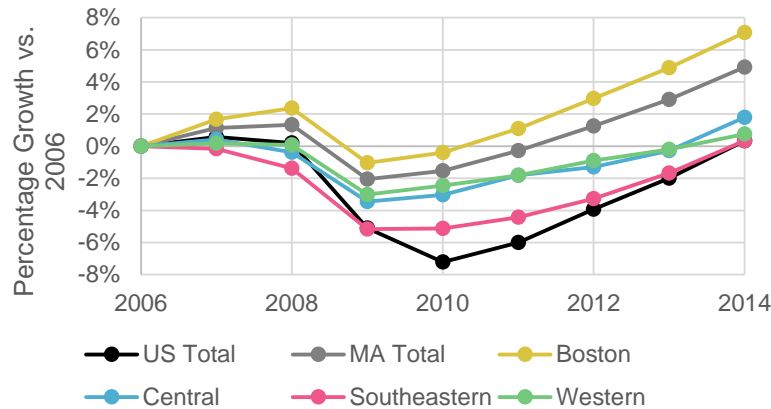
#### *Economy*

The economy of Massachusetts is strong and growing:

- **Population** has grown in Massachusetts over the past decade more slowly than the national average. It is growing faster in the Boston and Central regions than in others. It is growing faster than neighboring states (except for New Hampshire).
- **Employment** has grown in Massachusetts over the past decade faster than the national average. Boston is growing faster than elsewhere in the state.



**Figure 3.2 Employment Growth of Massachusetts and Regions**



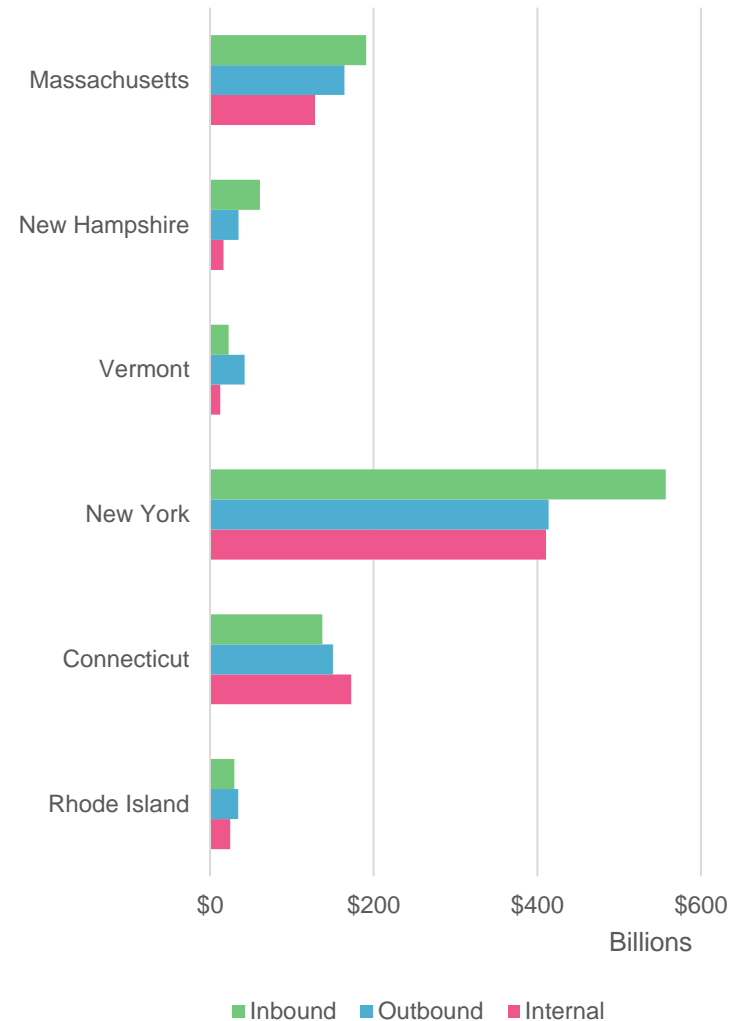
Source: US Census Bureau, Donahue Institute (UMass)

- **Gross Domestic Product (GDP)** in the state is larger than any New England state. It continues to grow at the fastest pace of any New England economy.

The FAF analyzes commodities flows between regions, by industry, by commodity, and by mode. It found that both in the present and in the future, more cargo tonnage in Massachusetts is internal than inbound or outbound, and more value is inbound than in the other categories.

Massachusetts imports more goods than it exports, making it similar to New Hampshire and New York but dissimilar from Vermont and Connecticut, as shown in Figure 3.3.

**Figure 3.3 Commodity Value (2015) for Massachusetts and Bordering States**



Source: FHWA Freight Analysis Framework Version 4

Industry

The U.S. Cluster Mapping Project (US Department of Commerce Economic Development Administration (EDA), Harvard Business School) conducts an employment-based analysis of industries that catalyze and support each other and therefore benefit from close proximity. It has identified 51 such clusters.

Figure 3.4 shows the industries in which Massachusetts is ranked in the top 10 in employment among states.

Figure 3.4 Cluster Rankings for Massachusetts among US States (2014 employment)



| Industry                                          | In US, MA is     |
|---------------------------------------------------|------------------|
| Education and Knowledge Creation                  | 4 <sup>th</sup>  |
| Information Technology and Analytical Instruments | 4 <sup>th</sup>  |
| Fishing and Fishing Products                      | 4 <sup>th</sup>  |
| Jewelry and Precious Metals                       | 6 <sup>th</sup>  |
| Biopharmaceuticals                                | 7 <sup>th</sup>  |
| Performing Arts                                   | 7 <sup>th</sup>  |
| Recreational and Small Electric Goods             | 7 <sup>th</sup>  |
| Financial Services                                | 8 <sup>th</sup>  |
| Marketing, Design, and Publishing                 | 8 <sup>th</sup>  |
| Communications Equipment and Services             | 9 <sup>th</sup>  |
| Medical Devices                                   | 9 <sup>th</sup>  |
| Video Production and Distribution                 | 9 <sup>th</sup>  |
| Footwear                                          | 10 <sup>th</sup> |
| Apparel                                           | 10 <sup>th</sup> |

Source: US Cluster Mapping Project

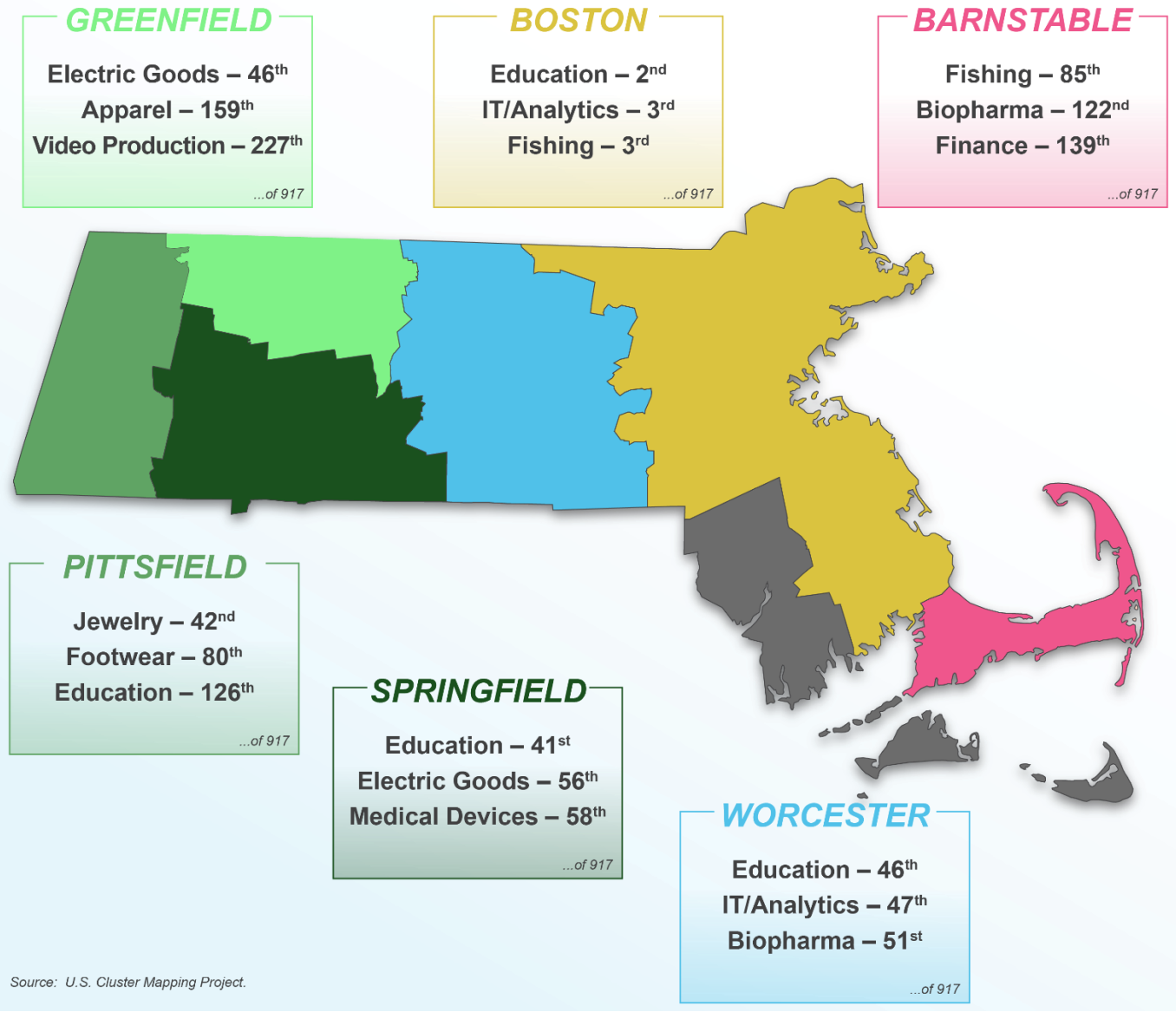
Figure 3.5 (next page) contains the same information for the Commonwealth’s Metropolitan Statistical Areas (MSAs), as they rank among MSAs nationwide in employment. The figure shows

the top 3 industry clusters for each. Note that a ranking of 100 would place an MSA in the top 11% of all clusters in the nation.

The interviews conducted to support this plan generated a critical set of industry-specific insights, concerns, and needs.

- **Institutions** are seeing more e-commerce, buy lots of food and beverage, produce lots of waste, and have their own construction seasons. In urban areas, truckers have issues with urban geometries and congestion when delivering materials and foods. Logistics for universities are seasonal.
- **Biopharmaceuticals** are typically manufactured out-of-state with the research and development performed in-state by an expensive, highly-skilled workforce. These companies tend to make small shipments of drugs on an ad hoc basis, targeted for clinical trials. They do take multiple daily shipments of lab equipment.
- **Fuel** for eastern and central Massachusetts arrives by pipeline into Braintree or into ports in Chelsea and Providence and for western Massachusetts it is trucked from the Port of New Haven and the Buckeye pipeline in the Springfield Area (several locations). The fuel supply chain is vulnerable to disruption from flooding.
- **Food** is delivered from regional distribution centers and is also becoming more locally-sourced. Increasing urban populations and land prices may lead retailers to increase turnover in urban locations, perhaps requiring more frequent deliveries with smaller vehicles.

Figure 3.5 Cluster Ranking for Massachusetts Metropolitan Areas



### Policy and Regulation

A complete summary of policies and regulations on the freight system can be found in *Technical Memorandum 1: Background Review*. The interview and public sector workshop process generated some suggestions for how MassDOT could improve on its policy and regulatory stance:

- Some users experienced challenges in Massachusetts when transferring, acquiring, and renewing commercial drivers' licenses for truckers.
- Trucks with wide or heavy loads require special permits to move those loads on MassDOT roads. Some users reported challenges with this oversize/overweight (OS/OW) permitting, including institutional issues with operating on the Massachusetts Turnpike (duplicate escorts and permits), repeated need for structural bridge analysis, and barriers to transferring permits among states.
- Fuel trucks are required to take a long diversion around the City of Boston due to restrictions on through routes.
- Many system users said that MassDOT must preserve truck access to South Boston, Chelsea, and Everett on dedicated roadways. It has been suggested that existing dedicated haul roads be opened to general traffic to relieve congestion in these developing neighborhoods.

### 3.2 Drivers of Global Change

The world is changing quickly, and Massachusetts must be flexible and resilient in responding those changes. *NCHRP Report 750 Foresight Series* relies upon expert opinion to develop an idea of what the future holds:

- **What unique factors must be considered?** Massachusetts has developed an important cluster of innovative industries largely because of its supply of workers with postsecondary and advanced degrees. The Commonwealth has economic centers and transportation facilities located at low elevations and adjacent to the ocean, placing them at risk from sea level rise and storm flooding.
- **What are the drivers of global change?** A driver is a catalyst and influencer of world events across demographic, economic, and political realms.
- **What are the possible outcomes for each driver?** For each driver, this plan considers multiple potential trends. It does not include “good” or “bad” alternatives, but rather plausible ones for which Massachusetts should be prepared.
- **What are the plausible futures that should be considered?** The multiple trends for each driver can be combined into plausible futures in which they interact.

Some sources that informed our understanding of drivers and trends are shown in Figure 3.11. The trends are illustrated in Figures 3.6 through 3.10.

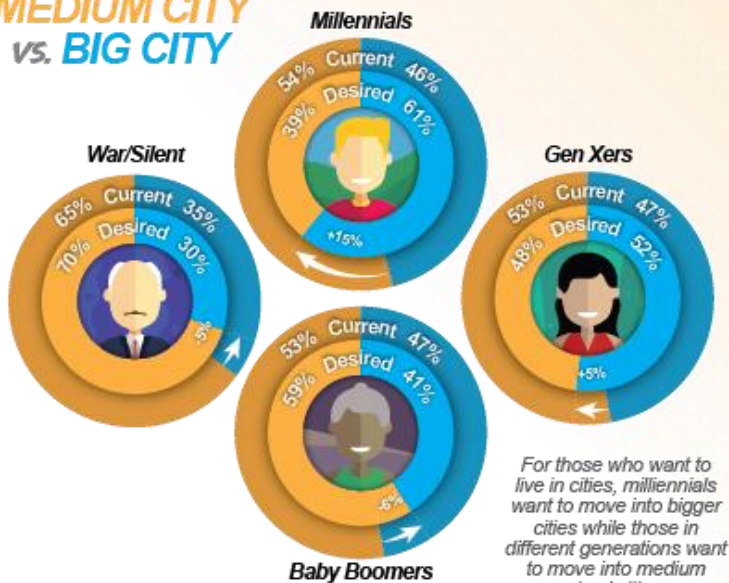
Figure 3.6 Drivers of the Future: Urbanization



Sources: Anthony Wirth and Marc Rasmussen: "US Urbanization Trends: Investment Implications for Commercial Real Estate." CBRE Global Investors, 1/2015.

Mitchell, M Roschelle , Kathleen B. Carey, et al, "Emerging trends in Real Estate 2016." Urban Land Institute and PWC, 2016.

**MEDIUM CITY vs. BIG CITY**



**The RANGE of FUTURES**

...compared to current trends

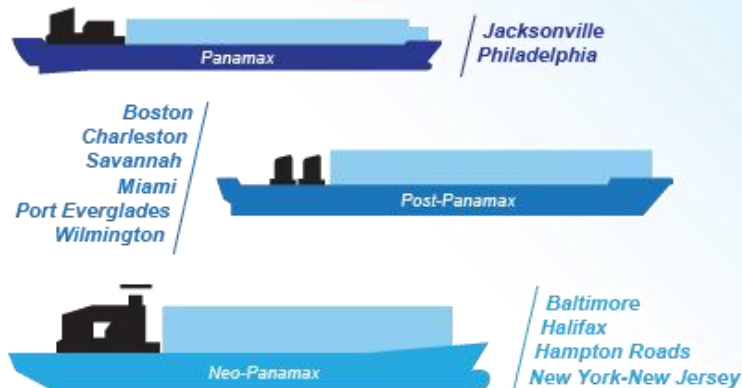


Figure 3.7 Drivers of the Future: Globalization



### STANDARD LARGE CONTAINER SHIPS accommodated at EAST COAST PORTS

Boston will be able to handle neo-panamax ships once the Conley Terminal upgrades and the Boston Harbor Deep Draft Navigation Improvement Project have been completed.



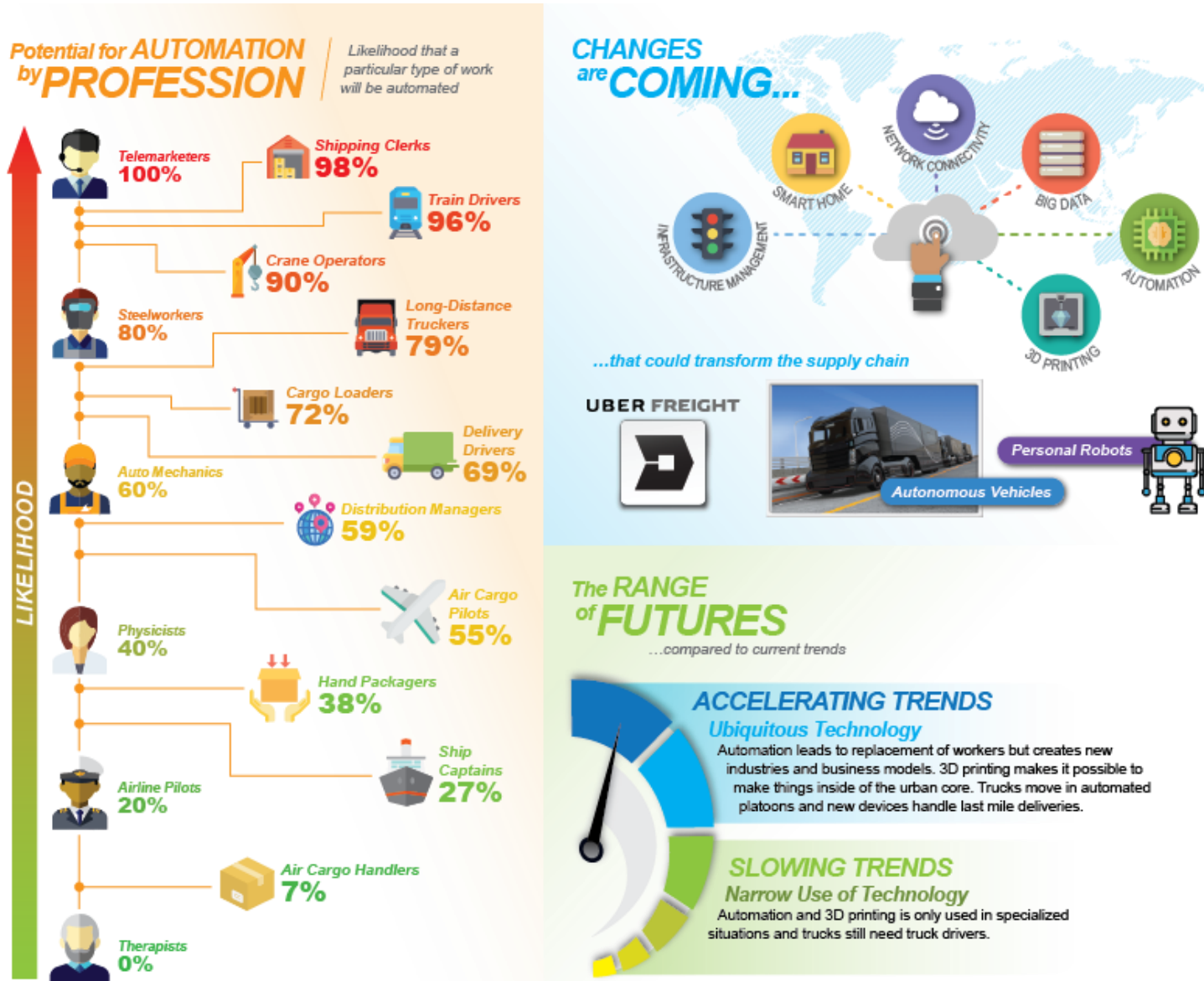
Source: Dr. Jean-Paul Rodrigue, Hofstra University.

### The RANGE of FUTURES

...compared to current trends



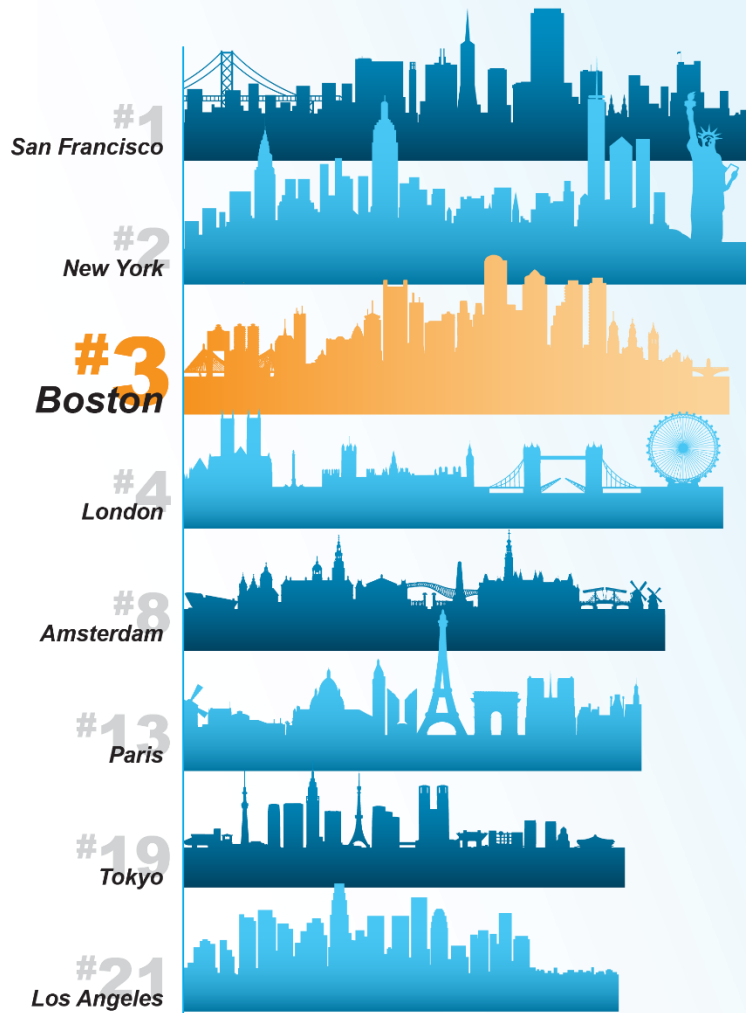
Figure 3.8 Drivers of the Future: Technology



Source: "The Future of Employment: How susceptible are jobs to automation."  
Michael Osborne and Carl Frey, Oxford University.

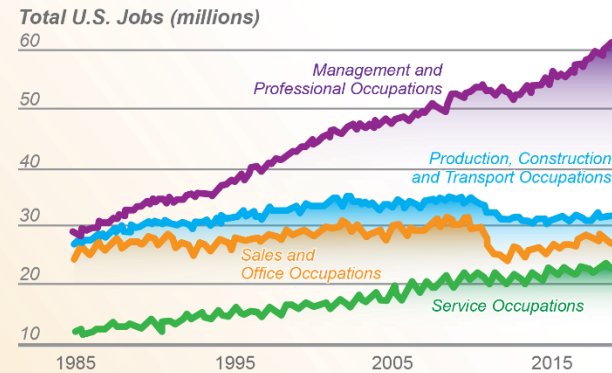
Figure 3.9 Drivers of the Future: Knowledge

**Global Cities OUTLOOK** | A global city ranking based on equal parts: Personal Well Being / Economics / Innovation / Governance



Source: "Global Cities Outlook", AT Kearney. <https://www.atkearney.com/global-cities>

**The NATURE of WORK** | Knowledge and Service Jobs are Growing



Source: Federal Reserve Bank

**The RANGE of FUTURES** ...compared to current trends

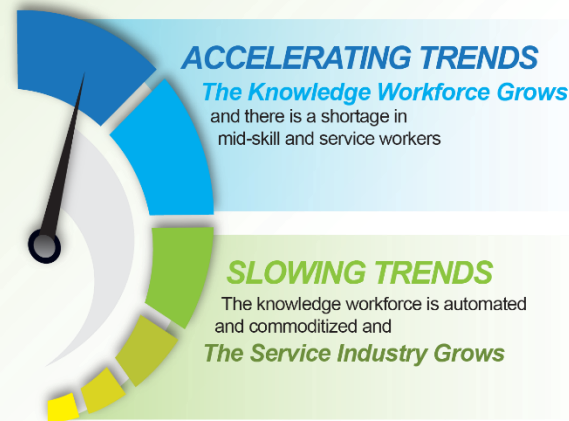
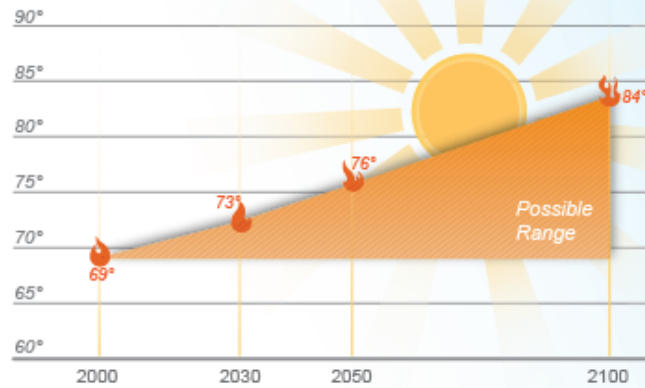




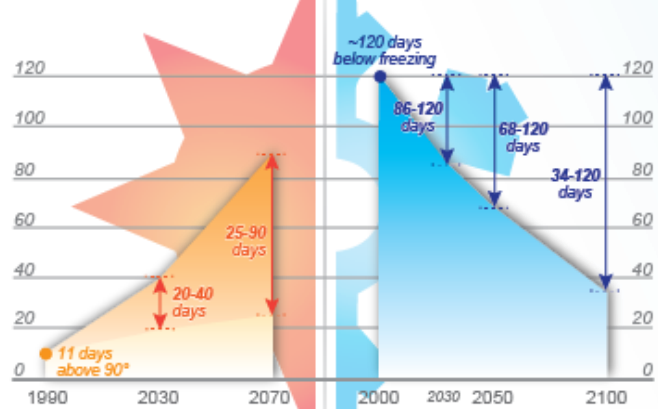
Figure 3.10 Drivers of the Future: Climate

**CLIMATE CHANGE**  
will have an **IMPACT...**

Average summer temperature will increase

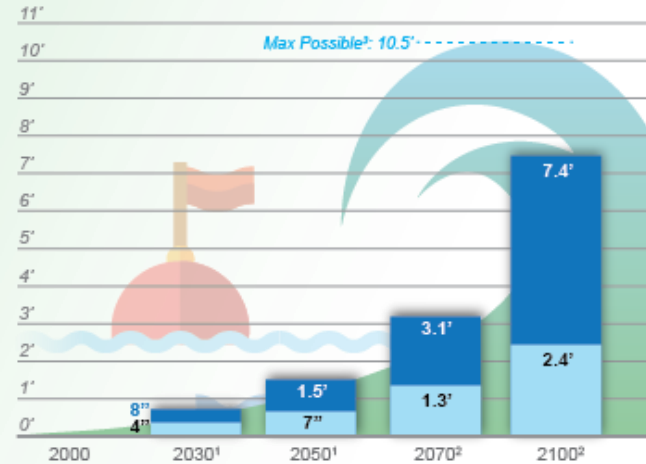


Very Hot Days will increase...  
Range of days above 90°



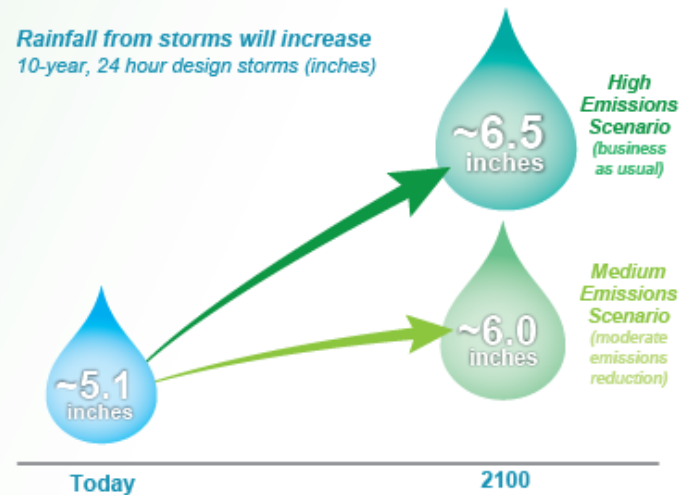
Sea levels in Boston will continue to increase

Relative Sea Level Rise (above 2000)



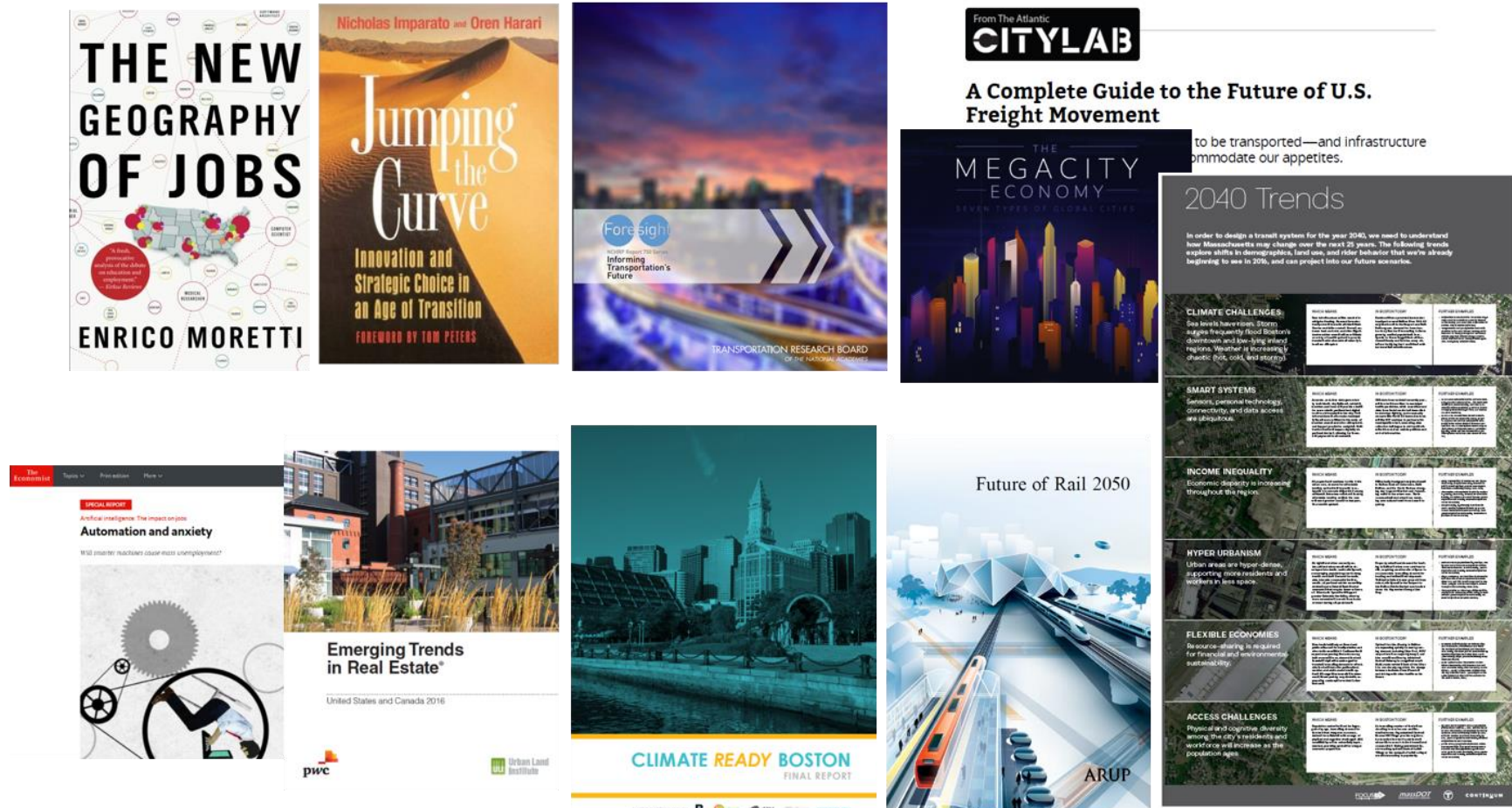
<sup>1</sup> Likely under all emission scenarios.  
<sup>2</sup> Likely under moderate to high emission scenarios.  
<sup>3</sup> Low probability under high emission scenario.  
 Data source: BRAG Report, 2010

Rainfall from storms will increase  
10-year, 24 hour design storms (inches)



Source: Climate Ready Boston

Figure 3.11 A Selection of the Sources Used to Develop Drivers of Future Change



### 3.3 Plausible Futures

The Massachusetts Freight Plan prioritized its recommended strategies using a qualitative Robust Decision-Making (RDM) process. The principle behind RDM is that the future has many plausible shapes. To account for this uncertainty, one should pursue “robust” strategies and actions – those that work in the widest range of possible futures.

This contrasts with traditional planning, in which trends are either assumed to be constant or are generated through educated guesswork. The peril of planning based on a single forecast is that, if the “most likely” future fails to occur, investments may be less effective, ineffective, or even counter-productive. There is also an opportunity cost – investing in the wrong solutions implies that not enough was invested in the right ones.

RDM defines success not as predicting the future accurately, but as pursuing a strategy that is productive and appropriate even if events do not proceed as expected and that adapts as trends become clear.

The plausible futures developed for this plan do not represent “good” or “bad”, “success” or “crisis”. They are what happens if the drivers described in this chapter follow recent trends, accelerate, or see current trends plateau and reverse. All of these futures assume that **climate change continues, so Massachusetts will need to pursue adaptation strategies regardless of what occurs with the other drivers.**

These futures were selected to represent a range of possibilities.



#### *Commonwealth Quo*

*Commonwealth Quo* is a future in which urbanization accelerates and the status quo remains in other drivers. Massachusetts city centers grow rapidly in population and employment, while suburbs and exurbs plateau or grow more slowly. Increasing real estate prices continue to drive a development boom but limit the ability of new labor to move to Massachusetts. The same forces place strong pressure on light industrial and distribution to move out of urban cores.

Globalization plateaus and potentially begins to recede, as manufacturing moves gradually back to the United States. This reduces demand for international sea shipping, which is already suffering from oversupply.

New freight-related technology fills important but niche markets. 3D printing is used to manufacture some products at the point-of-sale and even in private homes. Automated driving and artificial intelligence have a presence in urban areas for short-distance deliveries (rolling drones on the sidewalk, ridesharing) and need to be accommodated by piloted vehicles, pedestrians, and bicycles.

Massachusetts’s advantages as a “knowledge capital” continue to build, with its colleges and universities educating the best and brightest of many nations, creating an inward flow of expertise and strengthening the innovation economy.



### *Innovation Acceleration*

*Innovation Acceleration* is a “spiky world” future in which technology, globalization, and the knowledge economy drive an economic boom in well-equipped cities but provide limited benefits for others. Boston, with an innovation cluster, colleges, and universities sees a boom, but the Commonwealth’s suburbs, exurbs, and “gateway cities” struggle unless they are college towns (e.g., Lowell and Worcester).

Through a combination of globalization and automation, most manufacturing jobs in the United States are eliminated. Shipments will arrive via ship, airplane, and potentially airship, stressing the urban road networks and neighborhoods that surround these facilities in Boston, New Bedford, and elsewhere.

Automation largely displaces the trucking workforce and its members require government support to educate themselves in professions and industries created by new technology. Automated trucks travel in platoons and require MassDOT to invest heavily in intelligent transportation and support systems on freight corridors – but they obviate the need for truck stops and truck parking.

Consumer goods are largely 3D printed at “micro-manufacture” shops in urban areas. These business still require large shipments of raw materials, so communities are smart to invest in rail and highway access.



### *Picket Fences*

*Picket Fences* is a future in which urbanization and globalization plateau, while technology and knowledge continue to develop as they have in recent years. The migration to suburban and exurban areas from city centers is driven by concerns about schools, commute times to still-thriving office parks on Route 128 and I-495, desire for open space, and cost.

A spread-out population drives e-commerce and automated vehicle implementation (since it is easier to automate in a standardized, predictable environment). Electric cars are the dominant mode of transportation. Congestion pricing becomes necessary as demand increases. Telepresence becomes more practical.

Large distribution centers are necessary in rural and exurban communities. Communities are challenged to prepare for impacts in policy, zoning, bylaws, and infrastructure.

Globalization goes into retreat, with significant manufacturing returning to the United States. Large numbers of products that used to arrive by ship from China and Southeast Asia arrive by train or short sea ship from domestic factories. Heavy traffic challenges neighborhoods around intermodal rail and limited capacity at those facilities drives goods to trucking and adds large vehicles to congested highways over long distances.

### 3.4 Massachusetts and the Future

It is important to differentiate the Commonwealth's unique concerns from those of the nation as a whole, or from individual families. Because Massachusetts has an economy focused on urban offices, knowledge, and supporting services, growth in these sectors presents different opportunities than their plateauing or decline. That this is true at the State level does not imply that urbanization is "good" and de-densification is "bad", merely that Massachusetts is better positioned to benefit from the former than from the latter.

With this in mind, strategies in this freight plan should address not only the three plausible futures described above but others as well. The three discussed stand in for an infinite range of possible outcomes. The key is to develop *robust* strategies that are strong investments of time and money regardless of what is coming, so that the Commonwealth continues to thrive.

## Freight Focus on The Seafood Supply Chain

The seafood industry has undergone a transformation in recent years. Where once fish were offloaded, processed, and shipped out at a single dockside location, the processing of fish from many disparate ports can now occur at centralized locations.

Massachusetts hosts fish processing hubs in Boston and New Bedford. Fish are landed at both locations, but they are also trucked there from other New England ports and flown in from the US West Coast and Iceland, among other sources. Once processed, 75% of fish processed in Boston is exported from the US.



Seafood is extremely valuable by its weight and highly perishable. While some can be transported by refrigerated container via ship, rail, and truck, much of it travels to and from Boston's Logan International Airport in the luggage hold of passenger airliners, a practice referred to as "belly freight." Because fish is high-value, it has made direct flights from Boston to Tokyo, Beijing, and Reykjavik desirable for airlines.

Fish, of course, have company on these flights. Direct international flights improve the competitiveness of key Massachusetts industries and institutions. A healthy fish processing industry on the South Boston Waterfront and in New Bedford has significant benefits for all residents and for the Commonwealth at large.

## 4.0 Recommended Strategies

FHWA defines three categories of strategies for state freight plans: infrastructure improvements, operational innovations, and policies. This plan expands the final category to “policies and people” to emphasize the human element of the freight system: to recognize the importance of the workforce and the community and to align with MassDOT’s focus on customer service.

Strategies were taken from several sources:

- MassDOT priorities, as documented in Section 1.2.
- Priorities for Massport, MPOs, Commonwealth agencies, and municipalities, as established by those organizations.
- Industry priorities and suggestions, gathered through 25 interviews and the Freight Advisory Committee (FAC).
- Best practices from FHWA, other states, municipalities, and academia.

To categorize the strategies, FAC members took part in a survey on whether the strategies would be appropriate for each of the plausible futures. Based on these results and the established priorities of FHWA, MassDOT, Massport, the Commonwealth of Massachusetts, strategies were grouped into five categories. MassDOT provided final review of the categories.

This section lists the strategies in each of the following prioritization categories separately:

- **Immediate Strategies** address a current or near-term need. They are worthwhile ideas today, no matter what the future holds. *For example, improving the condition of freight system assets.*
- **Robust Strategies** address issues that are expected to arise in the future but should be appropriate no matter what the future holds. *For example, mitigating climate change impacts on infrastructure.*
- **Hedging Strategies** might not be needed, but if they are needed we’ll need to have started implementing them now. *For example, building right-sized distribution centers inside of Route 128.*
- **Shaping Strategies** allow Massachusetts agencies to influence – and hopefully direct – trends for the future. *For example, increasing the use of underutilized gateways.*
- **Deferred Strategies** might be necessary, but it is safe to wait and see what happens. *For example, installing standardized package drops at homes.*

This process allows for Massachusetts to accommodate the risk that the future does not reflect the status quo, a continuation of current trends, or any other speculation – however educated – made by planners in 2017.

## Immediate Strategies

### Infrastructure

- Improve the condition of freight network assets
- Build or expand truck stops on primary truck routes
- Upgrade rail lines to the 286K standard
- Resolve key bottlenecks on highways
- Maintain uncongested freight access to airports, seaports, and rail terminals in mixed-use urban settings
- Modernize container terminal facilities

### Policies and People

- Develop a workforce strategy for freight professions
- Support policies to reduce CO<sub>2</sub> emissions from all freight vehicles
- Harmonize oversize/overweight permitting across New England
- Coordinate with freight planning in neighboring states



## Robust Strategies

### Infrastructure

- Protect freight facilities from climate change impacts

### Operations

- Develop Intelligent Transportation Systems (ITS) and Active Transportation and Demand Management (ATDM)

## Deferred Strategies

### Infrastructure

- Build standardized small package drops

# Hedging and Shaping Strategies

## Infrastructure

- Build right-sized distribution centers inside of Route 128
- Electrify truck stops
- Identify and preserve existing rural and industrial sites for warehousing and distribution development
- Develop delivery areas in urban districts and town centers
- Encourage increased use of underutilized gateway infrastructure (ports and airports)

## Operations

- Improve the efficiency of air cargo processing at Logan Airport and in the surrounding area
- Better integrate supply chain information to reduce administrative and regulatory delays
- Review State regulations and practices that impact security clearance and chain-of-custody for imports and exports
- Leverage connected vehicle technology to maximize en-route efficiency
- Encourage side guards on trucks to protect cyclists

## Policies and People

- 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
- Encourage private industry to adopt short-sea shipping

## 4.1 Immediate Strategies

### Infrastructure Improvements

#### Improve the condition of freight network assets

MassDOT currently tracks the condition of its highway pavement, bridges, tunnels, and signage through inspections and FHWA reporting. Further, MassDOT has significant records of the condition of rail track, right-of-way and bridges. From this data, MassDOT reported in 2016 that 444 of its roughly 5,200 highway bridges (9%), 2% of its lane-miles of Interstate pavement, and 13% of its non-Interstate pavement are in “poor” condition. It considers truck traffic when developing investments.

Continued investment to improve the state-of-good repair of these assets – to inspect them, inventory them, and ensure that a minimal number of them are in “poor” condition – aligns with MassDOT’s first investment priority. While MassDOT places its first priority on reliability when making capital investments, it is always possible to do more and to do better.

Pursuing this strategy may involve:

- Creation of a feedback mechanism for industry to report infrastructure issues that significantly impact their business (bridge weight limits, for example).
- For MassDOT-owned assets, inclusion of a priority boost into project selection tools for assets and projects located on the National Multimodal Freight Network.

- For locally owned assets, inclusion of a priority boost into Chapter 90 and Municipal Bridge Program selection processes for assets and projects located on the National Multimodal Freight Network.
- Completion of inventory and asset management program for all MassDOT-owned freight rail lines.
- Consideration of heavy truck traffic as part of the asset condition project selection process.

#### Build or expand truck stops on primary truck routes

The lack of adequate rest and service facilities for trucks along major corridors threatens both the efficiency and the safety of the freight system. Because truck stops are typically privately operated, public-private partnerships between these operators and multiple levels of government may be necessary to develop new facilities.

The Boston MPO’s 2016 memorandum on this subject – *Rest Locations for Long-Distance Truck Drivers in Massachusetts* – provides detailed background and recommendations, including narrative of what driving and resting in the Commonwealth is like from a driver’s perspective.

Pursuing this strategy may involve:

- Collaboration between State, local, regional, and multistate authorities to locate appropriate properties on primary truck routes.

- Collaboration between State, local, regional, and multistate authorities to manage zoning, permitting, taxation, traffic, and other logistical and quality-of-life issues.
- Public-private partnerships between State and local authorities and private truck stop operators to defray the risk of opening facilities.
- Development of smartphone apps and variable message signboards to allow drivers to view available spaces, reserve spaces, and receive directions.

### Upgrade rail lines to the 286K standard

Freight rail traffic in Massachusetts would be significantly more efficient if key lines were upgraded to the national 286K weight standard. In the long-term the owners and customers of those key lines would also benefit from further increases to the 315K weight standard.

Pursuing this strategy may involve:

- Massachusetts agencies collaboratively prioritizing rail lines for 286K upgrades and developing a medium-term (10-year) plan for completion of the work.
- Investments by MassDOT on its own lines and those owned by others (through grants, public-private partnerships, or other means) to replace deficient bridges and culverts and to improve track and right-of-way where necessary to achieve a 286K rating.

### Resolve key bottlenecks on highways

Chapter 2 discusses key highway bottlenecks as required by FHWA, as well as by the Commonwealth's stated priorities. MassDOT has studied a project to address capacity and efficiency issues at I-95/I-93 in Reading. The other three major bottlenecks are constrained by dense urban development and significant recent investment (the I-90 and I-93 tunnels were built in the past two decades). MassDOT is working to invest in the I-495/I-90 bottleneck, which falls along the path of the east-west freight spine.

Pursuing this strategy may involve:

- Management and operations improvements, including striping and intelligent transportation systems (ITS). MassDOT has experimented with restriping congested freeway interchanges to reduce weaving and conflicts and to streamline traffic flow.
- Low-cost modernization of interchanges, including geometry improvements and ramp realignments.
- Higher-cost modernization and reconstruction projects.

### Maintain uncongested freight access to airports, seaports, and rail terminals in mixed-use urban settings

The major port gateways to Massachusetts are all located in dense and developing urban neighborhoods in East Boston, South Boston, Chelsea, Everett, and New Bedford. Their location inherently leads to conflicts between the needs of truck traffic and the needs of motorists, but the challenge has become

especially acute in the South Boston Seaport/Innovation District, which has become a booming mixed-use development area, driven in part by Massport's own development of its waterfront property.

Increasing congestion has become one of the principal obstacles to the Seaport District reaching its enormous potential as an economic driver. Consequently, the Commonwealth, MassDOT, and the City of Boston have recently begun to consider various changes to the traffic system in the area, and Massport has opened a new first/last-mile freight connection (the Thomas J. Butler Haul Road) to improve the connection between the Port and the Interstate System.

The ability to move freight through the area in a timely manner is critical to the continued success of port operations. Conley Terminal currently has efficient access to the Interstate highway system and along the freight spine between Boston, Worcester and points west. In order to ensure the continued health of its dominant port, Massachusetts must preserve existing truck routes and enhance truck connections to ensure that trucks can continue to access the terminal efficiently.

Pursuing this strategy may involve:

- Educating officials, the business community, and the public of the benefits of port access for trucks.
- Limiting or monitoring general use of existing access and haul roads in South Boston and East Boston.

- Collaborate with MassDOT, the City of Boston, and the Massachusetts Convention Center Authority (MCCA) to improve connections between South Boston and the Interstate Highway System by building the Cypher-E Freight Corridor to serve Conley Terminal and other maritime and industrial businesses in the Port of Boston.
- Accounting for the needs of trucks when designing the infrastructure and operations (signal timing, etc.) on streets adjacent to major port facilities in Boston, Chelsea, Everett, and New Bedford.

#### Modernize container terminal facilities

As part of the strategy to revitalize the Port of Boston, Massport and the Commonwealth are investing to deepen Boston Harbor and to modernize Conley Terminal to better serve the large container ships that are already calling the Port of Boston, and the even bigger ships expected in the future. With the help of a \$42 million FASTLANE Grant, projects are underway to repair, rehabilitate and deepen existing berths, construct new in and out gate facilities, enhance terminal technology, and expand the storage area for refrigerated containers. In addition, Massport is planning to build a new 50-foot berth and procure larger cranes.

Pursuing this strategy may involve:

- Pursuing additional funding sources, including Federal grants and possible private sector investment.

## Policies and People

### Develop a workforce strategy for freight professions

The aging/retirement of skilled technical labor across all freight modes and professions (rail, marine, air cargo, logistics and supply chain management, etc.) and a lack of recruitment among young people has been identified consistently as a crisis facing supply chains across the United States – ATRI's annual industry survey named it as one of the top 10 challenges facing trucking in 2016. Its causes include:

- A Federal requirement that a person be 21 to receive a commercial driver's license (CDL), without the opportunity for provisional licensure. This effectively renders trucking off-limits as a profession to young people who chose not to attend college, the demographic that will likely produce the most truck drivers.
- A lack of access to training courses and career advising for young people considering freight professions. None of Massachusetts's 27 vocational/technical high schools currently offer a program in transportation or logistics.
- An increasing expectation that young people will obtain a college degree – logistics professions are seen as blue collar and not preferable for college-educated people.

There is potential that some freight work could be automated in the future. Even so, there are real opportunities for growth of a freight workforce that focuses on skills that are less likely to be automated, such as loading/unloading and vehicle maintenance.

Pursuing this strategy may involve:

- Engaging with current transportation and logistics professionals (potentially through labor organizations) to understand what made their professions attractive to them, what support and training they had or wish they had, and what recommendations they would make for encouraging younger people to enter their fields.
- Developing exposure and training programs for freight professions, potentially with vocational/technical high schools, but also potentially through financial and logistical partnerships with airports, seaports, labor organizations, and industry.
- Exploring ways in which MassDOT (through the RMV) could make the process of obtaining or transferring a CDL quicker and more reliable.
- Exploring ways in which MassDOT (through the RMV) could institute graduated commercial licensure for people under 21 without violating Federal policy.

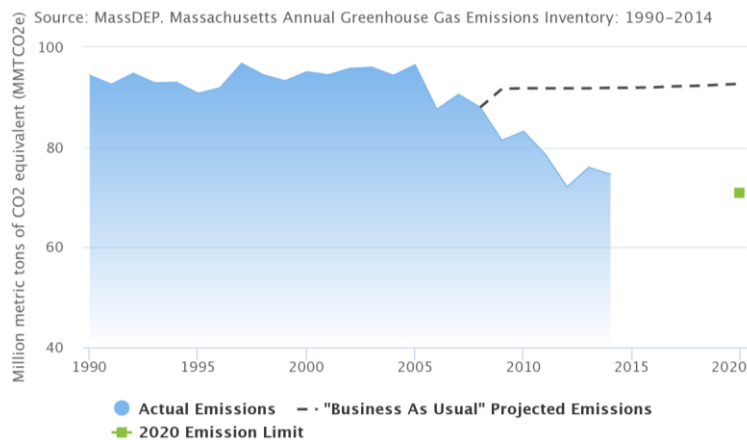
### Support policies to reduce CO<sub>2</sub> emissions from all freight vehicles

The Massachusetts Executive Office of Energy and Environmental Affairs provides a greenhouse gas (GHG) emission reduction dashboard at:

<http://www.mass.gov/eea/air-water-climate-change/climate-change/massachusetts-global-warming-solutions-act/mock-up/#ghg-emissions-reductions>

The 2008 Massachusetts Global Warming Solutions Act (GWSA) created a framework for reducing heat-trapping emissions to levels that scientists believe give us a reasonable chance of avoiding the worst effects of global warming. It requires reductions in GHG emissions from each sector of the economy that sum to a total reduction of 25% below the 1990 baseline emission level in 2020 and at least an 80% reduction in 2050. As of 2013, Massachusetts was making progress toward these goals, as shown in Figure 4.1.

**Figure 4.1 Massachusetts GHG Emissions**



Current Federal standards for medium and heavy-duty vehicles were established by DOT and the EPA in August, 2016. They are available from the EPA at:

<https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-greenhouse-gas-emissions-commercial-trucks>

Pursuing this strategy may involve:

- Continuing to track emissions in general and from transportation in Massachusetts against stated goals.
- Considering additional measures to reduce GHG emissions should Federal policy not be projected to achieve the Commonwealth’s objectives.

### Harmonize oversize/overweight permitting across New England

MassDOT is improving its permitting system, but permits for a single journey must be obtained separately from each state a load will pass through, through a separate process. Data systems at these agencies cannot forward and share information, and procedures and forms are not standardized and interoperable. Standards and requirements may also vary among the states. All of these factors limit the efficiency of shipments that cross state lines.

Pursuing this strategy may involve:

- Utilize and build upon the USDOT Commercial Vehicle Information Systems and Networks (CVISN) program.
- Drawing upon professional relationships and existing regional consortia to research ways in which oversize/overweight permitting can be harmonized in neighboring states.

### Coordinate with freight planning in neighboring states

All states are required to complete a freight plan under the FAST Act. The goals and objectives contained in these plans will likely

be consistent, and may present opportunities for information sharing, cooperative investment, and coordination of policies, to the benefit of the freight system as a whole.

Pursuing this strategy may involve:

- Reviewing freight plans for other New England and northeastern states and identifying opportunities for cooperation in reaching common goals.
- Identification of key multi-state freight corridors for cooperative study and collaborative support.
- Continue New England Regional Freight (NERF) meetings.
- Notification of potential cross-state impacts of freight-related projects (a freight village located on a border, for example, or a project at a port that sees demand from multiple states).



## 4.2 Robust Strategies

### *Infrastructure Improvements*

#### **Protect freight facilities from climate change impacts**

Impacts of these changes on the Massachusetts freight system could include:

- Tidal and storm flooding of coastal transportation facilities, including port facilities that supply Massachusetts with fuel and the New England Produce Center. Logan Airport and key Boston roads are also at risk.
- Storm-related flooding on inland river valleys, threatening to scour bridges and culverts that carry roadways and railways and to undermine the right-of-way.
- Changes to the profile of fuel and power needs in Massachusetts, as the winter and summer both become warmer.

Pursuing this strategy may involve:

- Completing climate resiliency plans for MassDOT, Massport and for other major public asset owners. MassDOT's reports are in-progress, while Massport's resiliency work is ongoing and the MBTA's report is complete. Cities and towns have begun to conduct climate change vulnerability studies as well.

- Coordinating with industry to develop climate change resiliency plans for key Massachusetts supply chains (fuel, for example).
- Continuing to support and publicize climate research to identify potential impacts on Massachusetts.

### *Operational Innovations*

#### **Develop Intelligent Transportation Systems and Active Transportation and Demand Management**

USDOT in 2015 identified the following program categories in the *ITS Strategic Plan 2015-2019*:

- Connected vehicles.
- Automation.
- Emerging capabilities.
- Enterprise data.
- Interoperability.
- Accelerating deployment.

These programs are intended to enable safer vehicles and roadways, enhance mobility, limit environmental impacts, promote innovation, and support transportation system information sharing. In freight, ITS systems can be used to intelligently route trucks and guide drivers through urban areas

into parking spaces, to automate freight vehicles, and to share information among public and private organizations.

Pursuing this strategy may involve:

- Collaborating with regional and local officials, the business community, and the public to identify potential ITS strategies for implementation over a 5-10 year timespan. This could include direct community outreach at neighborhood and industry gatherings.
- Evaluating the ITS proposals that come out of the outreach process for consistency with statewide goals and developing feasibility analyses for the preferred options.
- Identifying preferred routes for long-haul automated trucking and developing feasibility analyses for operational improvements on these routes.

### 4.3 Hedging and Shaping Strategies

#### *Infrastructure Improvements*

##### **Build right-sized distribution centers inside of Route 128**

Amazon's strategy of guaranteeing delivery in two days, one day, or even on the same day is driving change in e-commerce. For some customers, it is no longer acceptable to take over a week to bring products from a warehouse, through a regional distribution center, and to the customer.

In order to make a significant business of very-short-term deliveries, however, goods will often be stored and processed within an urban area. As an example, Amazon has such a facility on Beacham St. in Chelsea, a Critical Urban Freight Corridor adjacent to port facilities and lined with light industrial uses. Such industrial areas are becoming less and less common, however, as urban development and population growth continues.

E-commerce is not the only business model that will benefit from urban distribution facilities. Increasing rent and land value in urban areas is making retail stores ever smaller in relation to their demand, leading to a model without a stockroom, in which all stock is on the floor. Restaurants have also begun to replace brick-and mortar retail stores in town centers.

These changes must be supported with frequent small deliveries, which will strain the supply chain if they are traveling to and from distribution centers in rural areas.

Pursuing this strategy may involve:

- Educating officials, the business community, and the public of the benefits of distribution centers in urban areas.
- Engaging with industry and with local officials to collaboratively target areas with strong road and rail connections for distribution use.

Explore whether State agencies can provide support to local governments in building distribution centers in urban areas

### Electrify truck stops

Idling at truck stops can be a source of both emissions and noise pollution in surrounding neighborhoods. Plugging in trucks when they would otherwise be idling can prevent these impacts. Government may need to become involved both due to the upfront cost of electrification, and also because the trucking industry may not reimburse drivers for electricity used while idling as they do for diesel fuel.

Pursuing this strategy may involve:

- Researching electricity rates at different times of day to develop a cost profile for plugged-in idling (at night, the unit cost may become zero or negative).
- Reaching out to current and prospective truck stop operators to identify a small pilot study of electrification.
- Collaborating with pilot study operators to develop a business plan for electrification that is not burdensome to operators or to their customers.
- Implementing public-private partnerships to install electrification equipment and track its usage.
- Advertising the presence of electrification equipment and providing initial incentives for its use.
- Interfacing with trucking companies to encourage reimbursement of electricity costs.

### Identify and preserve existing rural and industrial sites for warehousing and distribution development

Warehousing and distribution are considered “light industrial” use. In urban environments where light industrial is often not considered the “highest and best use” for land, and in which the traffic, noise, and emissions associated with these facilities may not be desirable for neighbors, it can be difficult to secure and preserve appropriate sites.

However, the increasingly on-demand nature of retail (e-commerce and home delivery) is creating ever-more need for distribution facilities in close proximity to growing population centers. Furthermore, distribution centers are typically located near freeway interchanges without rail access, limiting the attractiveness of mode-shifting bulk deliveries to rail.

Pursuing this strategy may involve:

- Collaborating with industry to develop a map of areas they would like to locate warehousing and distribution, based upon access to highways and rail.
- Sharing data and expertise with interested local governments to develop a plan for maintaining selected sites for light industrial use, and for ensuring that benefits are maximized and negative impacts minimized for the community.
- Identify State-level funding sources, beyond IRAP, to assist industry and communities with preserving light industrial

sites and improving their connectivity (by improving highway connectivity, for example).

### Develop delivery areas in urban districts and town centers

Streets in urban areas are becoming busier and more shopping is taking place in town centers. Unlike suburban shopping centers, these neighborhood hubs do not have dedicated loading docks and delivery facilities. Consequently, trucks double-park and unload in public parking, travel lanes, bike lanes, and bus stops.

This arrangement both impedes the efficient flow of consumer supply chains and creates congestion and obstacles for all road users. Simply banning trucks from cities is not realistic, as they are required for commerce to take place in these areas.

Pursuing this strategy may involve:

- Educating officials, the business community, and the public of the benefits of loading and unloading access for trucks.
- Collaborating with local officials to document and assess the magnitude of the problems caused by informal loading in business centers and neighborhoods.
- Analyzing potential interventions, including shared loading spaces and routes in town centers, geometry improvements in areas where loading and unloading will be encouraged, or metered parking for trucks.

### Encourage increased use of underutilized gateway infrastructure (ports and airports)

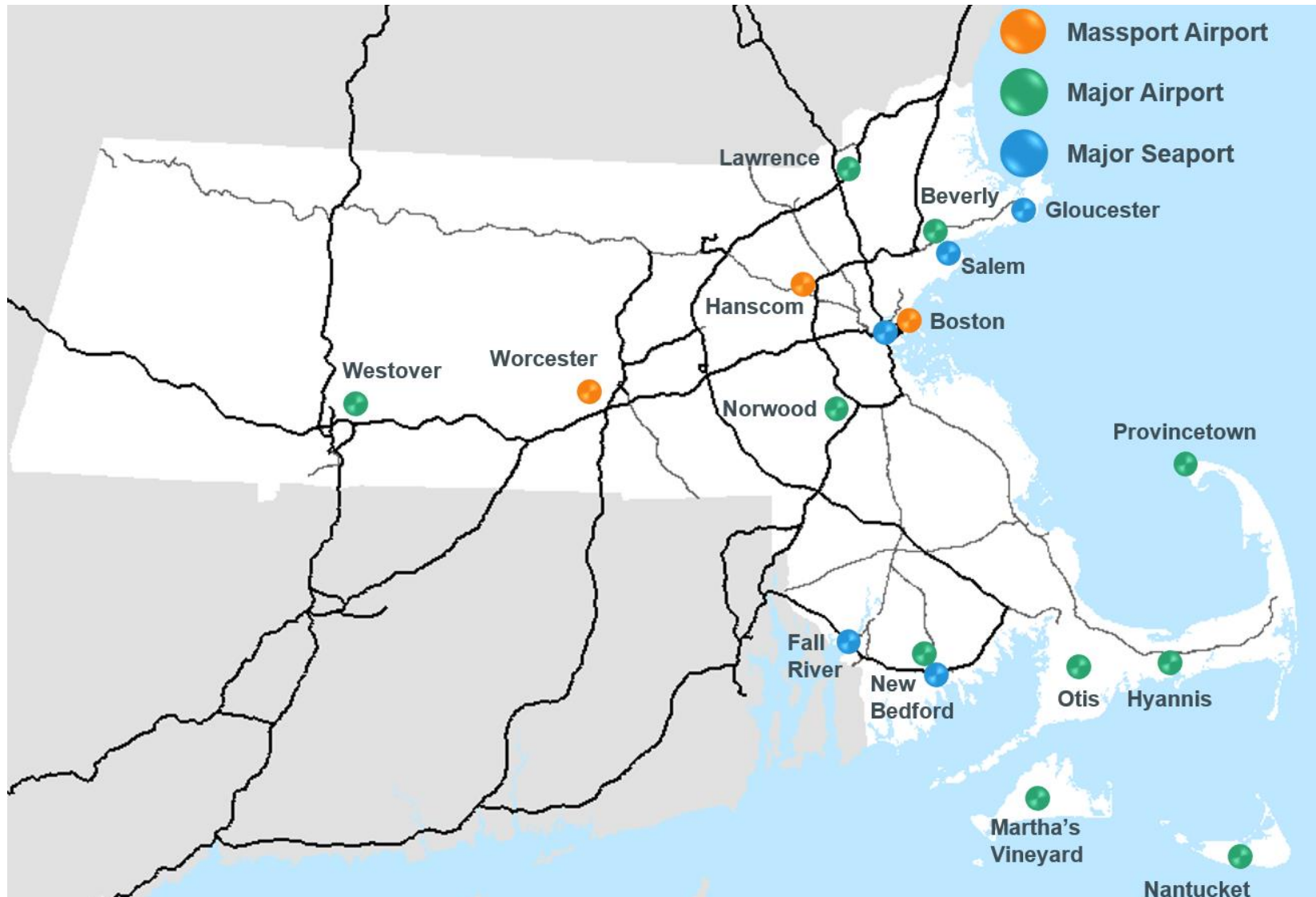
Currently, air cargo in Massachusetts is processed only through Logan Airport in Boston. Minor out-of-state operations exist at airports in Providence, Hartford, Manchester, and Portland, Maine. Multi-industry commercial seaport operations exist only at Boston and New Bedford.

Massachusetts has other gateway infrastructure that might be utilized better given proper incentives. Not only do the Ports of Boston and New Bedford have excess capacity and opportunities for growth, but the Commonwealth has identified additional major ports at Gloucester, Salem, and Fall River that currently see limited service. Major seaports in Massachusetts are marked in Figure 4.2 (next page).

A greater challenge exists for air freight. Logan Airport is reducing cargo capacity even as demand continues to increase. While one solution is to build “bypass” facilities on the landside to process and sterilize goods, another option is to identify cargo reliever airports and encourage their use. Major airports identified by the *National Plan of Integrated Airport Systems* (NPIAS) in Massachusetts are marked in Figure 4.2 (next page).

Every one of these gateway facilities faces challenges if they should pursue additional utilization. The Port of Salem (and to a lesser extent Gloucester) and Worcester Regional Airport do not have strong freeway connections and are located in urban centers. Westover Metropolitan Airport (and Air National Guard Base) is relatively isolated, with strong highway and ...

Figure 4.2 Major Airports and Seaports in Massachusetts



...rail access and significant development potential. On the other hand, its Western Massachusetts location works against it in capturing the Boston area air cargo business, which strongly values flexible, on-demand service and short delivery and pick-up windows.

This plan makes no recommendations about air or seaport facilities not owned by Massport. However, regional facility owners and supervisors in Massachusetts should be aware of both the constraints and opportunities presented by these facilities.

Pursuing this strategy will involve:

- Completing planned structural and technological improvements to berths 10, 11, and 12 at Conley Terminal.

Pursuing this strategy may also involve:

- Engaging with industry to map demand for sea and air cargo service against access routes and existing facilities.
- Engaging with facility owners, Federal authorities, and local government to explore potential service expansions.
- Identifying incentives or infrastructure improvements that would be necessary for service expansions at appropriate facilities with willing owners and communities.

## Operational Innovations

### Improve the efficiency of air cargo processing at Logan Airport and in the surrounding area

Air cargo that is processed at Logan Airport begins its journey through a freight forwarder. Essentially a warehouse, these companies are located near the airport in Chelsea, Everett, East Boston, and on the North Shore. Forwarders would be on-airport in many other cities, but cannot be accommodated within Logan's space constraints. Forwarders bring cargo to a facility in one of Logan's two cargo areas – north and south – where it is processed through security and transferred to an aircraft.

Logan Airport has seen its square footage for cargo processing reduced by 50% in recent years to make space for passenger facilities. Further, the Terminal E Modernization could impact the North Cargo Area. If significant air cargo capacity is to be maintained at Logan, the operation must become more efficient to maximize the capacity of existing infrastructure.

Pursuing this issue may involve:

- Researching available priority management systems for carriers and forwarders. These could provide an appointment management system and account for perishable goods and customs restrictions and be provided to carriers and forwarders in a smartphone app.
- Considering sites near Logan Airport that could accommodate a truck parking facility to eliminate truck storage at on-airport loading doors.

- Conducting a feasibility analysis for an off-airport “bypass” facility, where goods could be received and processed before being moved to the airport in closely-managed sterile trucks.

### **Better integrate supply chain information to reduce administrative and regulatory delays**

Supply chain information includes customs clearances, waybills, oversize/overweight permits, hazmat permits, and other permissions provided by the Commonwealth. In Massachusetts, these permits can involve multiple agencies and can be route-specific (the Massachusetts Turnpike is permitted separately from other roadways). Even when the paper trail is nominally simple, data systems may not speak to each other in a common vernacular that allows for efficient management of the system.

Pursuing this strategy may involve:

- Collaborating with regional and local officials, the business community, and the public to identify potential ITS strategies for implementation over a 5-10 year timespan. This could include direct community outreach at neighborhood and industry gatherings.

### **Review State regulations and practices that impact security clearance and chain-of-custody for imports and exports**

Massachusetts imports a significant number of perishable goods. Customs clearance delays can result in significant loss of goods if they are left sitting at an airport, seaport, or rail yard

for a significant period of time. Even for non-perishable goods, efficient customs and effective chain-of-custody tracking is affects bottom lines and can alleviate security risks.

One idea that is gaining traction is “blockchain,” a cloud based ledger that, according to the World Economic Forum, “cannot be duplicated, manipulated, or faked.” It allows for a plain and immutable record of every transfer of custody in a supply chain. While applications to date have mostly been in banking and international finance, the US Department of Homeland Security has experimented with the technology to secure cameras and other sensors at points of entry, and IBM has suggested its use in customs declarations to improve efficiency, reduce paperwork, and ensure trust.

Pursuing this strategy may involve:

- Engaging Massport, Federal customs officials assigned to Massachusetts, and other key international facility stakeholders to explore ways to improve the efficiency of security clearance, including automation of processes, additional staffing, etc.
- Following up on blockchain technology for supply chain management and consider whether its use could be facilitated or encouraged at the State level.

### Leverage connected vehicle technology to maximize en-route efficiency

Connected vehicle technology can be applied in multiple ways to improve en-route efficiency of freight vehicles. Among them:

- Trucks can communicate with each other and with non-freight vehicles about their location and intentions, with significant safety benefits (a car in a truck's blind spot could trigger a warning in the cab or even prevent the truck from turning into it, for example).
- Trucks can be grouped into "convoys", with automated vehicles following a human-controlled lead vehicle.
- Trucks can share information, as truckers already do, concerning traffic congestion, crashes or other incidents, weather, etc. That information could either be conveyed to the driver or applied automatically (to turn on the headlights and wipers of trailing vehicles, for example).
- Trucks can report travel times along certain routes, creating the opportunity for truck-specific routing programs that account for roadway-geometry and the location of loading and delivery points.

Pursuing this strategy may involve:

- Engaging the trucking industry, the business community, officials, and the public to develop a list of potential implementations of connected vehicle technology.
- Keeping tabs on developments and research in the private sector and in academia and ensuring that information on potential technologies is shared between the Commonwealth and its industries.
- Exploring ways in which action at the State level can facilitate or encourage connected-vehicle technologies in freight.

### Encourage side guards on trucks to protect cyclists

The USDOT Volpe Center in Cambridge has developed a resource page on truck side guards that is available at:

<https://www.volpe.dot.gov/our-work/truck-side-guards-resource-page>

During a crash with high ground clearance, vulnerable road users can fall into the exposed space between the front and rear wheels of a truck and suffer fatal crushing injuries (see Figure 4.3, next page). Side guards physically cover that space, shielding vulnerable road users from being swept underneath the truck's rear wheels. This technology can be retrofitted onto existing trucks or incorporated into new vehicle fleets.

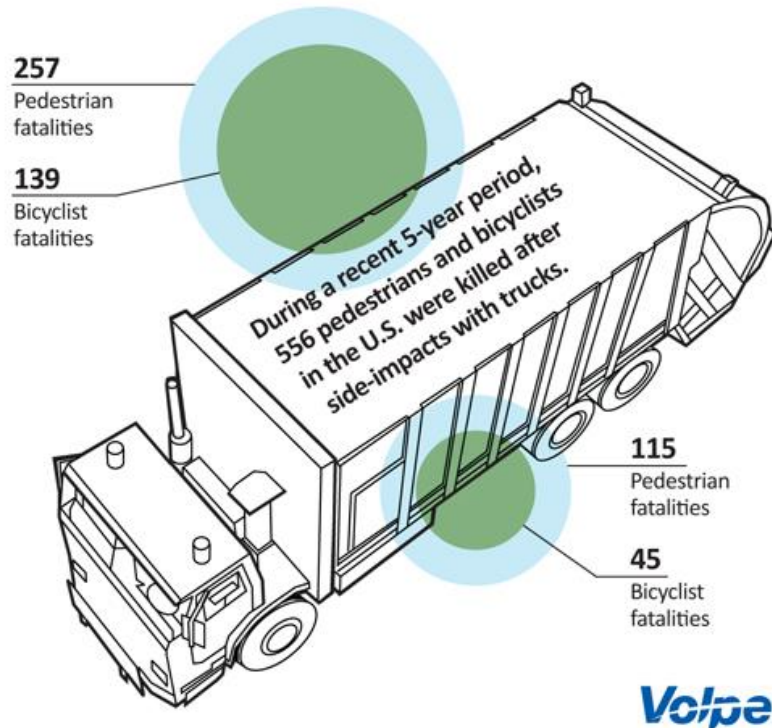
Side guards that skirt the entire side of the truck to ground level can also provide aerodynamic benefits to fuel economy: 4 to 7% according to the EPA, equating to a **\$5,000 annual fuel cost savings for a long haul truck trailer.**

Boston and Cambridge have adopted side guards for municipal fleets in partnership with Volpe.



Figure 4.3 Benefits of Side Guards

Nearly **half of bicyclists** and more than **one-quarter of pedestrians** killed by a large truck first impact the side of a truck.



Source: USDOT Volpe Center

Pursuing this strategy may involve:

- Educating officials, the business community, and the public of the benefits of truck side guards.

- Developing a feasibility analysis of truck side guards for MassDOT’s own fleet and those owned by other agencies, both for new purchases and retrofitted on existing vehicles.
- Developing a feasibility analysis of encouraging truck side guards on newly-purchased large trucks and trailers registered in Massachusetts.

### Policies and People

**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**

The National Cooperative Highway and Freight Research Programs (NCHRP and NCFRP) have studied issues that arise in synthesizing freight and smart growth. The research notes that increasing freight traffic, decreasing popular familiarity with the supply chain, growth in US population (and urbanization), and downward cost pressure have contributed to a need for good neighbor policies between freight uses and host communities. The report further notes the following as key community goals/concerns regarding freight:

- **Communication** – Communities are frequently called first when a problem occurs, are first-responders to emergencies, and deal with local neighborhoods when they try to build transportation projects.
- **Traffic flow and congestion** – Trucks must share road space with vehicles that behave very differently than they do

and require different roadway geometry and infrastructure. Trains obstruct traffic when they occupy grade crossings. Air passenger flow consumes capacity from cargo.

- **Safety** – Major safety concerns arise at grade crossings, and also along rail and highway corridors.
- **Economic development** – This includes the desire to relocate freight facilities and operations to redevelop property for other uses.
- **Environmental and quality-of-life concerns** – This includes emissions, noise, and vibrations.

Pursuing this strategy may involve:

- *At the local level*, engaging with communities to collaboratively address loading and delivery needs in comprehensive plans, land use decisions, complete streets plans, parking studies, and zoning requirements. A fair amount of this task is research and education – familiarizing both State agencies and local governments about best practices for efficient roadways and properties.
- *At the regional level*, engaging with regional leaders and MPOs to identify the best sites for freight uses both on the periphery of urban centers and closer in, then developing region-level assessments of the feasibility of these sites and how their use for freight can be encouraged or assured.

### Encourage private industry to adopt short-sea shipping

“Short sea shipping” is domestic marine freight movement from international gateway ports to regional and local ports along a coastline, lake, or river. While popular in Europe, the idea has never caught hold in the United States. Short sea shipping has the potential to alleviate congestion, reduce GHG emissions, and bring new business to regional ports such as New Bedford.

The US Maritime Administration’s Maritime Highway Program (MARAD) has a vision of “full integration of reliable, regularly scheduled, competitive, and sustainable Marine Highway services into the surface transportation system that are a routine choice for shippers.

Pursuing this strategy may involve:

- Staying aware of the development of Marine Highways and ready to respond to opportunities for Massachusetts shippers, consumers, and ports.

## 4.4 Deferred Strategies

### *Infrastructure Improvements*

#### **Build standardized small package drops**

Amazon has already rolled out a standardized, centralized package drop facility: the Amazon Locker. Amazon Lockers are located in leased space at private businesses – schools, post offices, convenience stores, gas stations, etc. A customer can select a location for package delivery and is sent a code to open the locked, weatherproof box when their shipment arrives. As an additional service, Amazon Lockers can be used as drop-off locations for merchandise returns. DHL offers “Packstation” as a comparable service.

In urban and suburban environments, mailboxes represent a semi-standard drop-off point for envelopes. No equivalent exists for packages, however. In the age of e-commerce, the number of packages arriving at homes daily continues to increase.

Pursuing this strategy may involve:

- Building relationships among State and local officials and the business community to share information on trends in home delivery of small packages and the development of automated delivery methods.
- Watching the development of delivery vehicles and architectural trends to identify gathering trends.

## 5.0 Implementation

This freight plan is built around identifying strategies that work in the widest range of plausible futures. Chapter 4 discusses the content of each. The next step is turning the strategies into projects with locations, budgets, and schedules. This plan is not intended to perform this step – it is left to proponents and planners in future years.

Figure 5.1 (next page) illustrates MassDOT's project development process. This chapter seeks to answer four questions about these strategies:

- **Who** proposes individual projects?
- **Where** does funding come from?
- **How** is value to freight reflected in project scoring?
- **Who** manages projects and resulting assets?

Example projects are assessed in detail in Section 5.4. The remainder are addressed in Table 5.1.

### 5.1 Who Proposes Projects?

#### *Commonwealth of Massachusetts*

##### **MassDOT**

MassDOT owns major roads in all regions of Massachusetts, including all Interstates and divided highways. Through its Rail

and Transit Division, MassDOT owns many freight rail lines. Through the MBTA, MassDOT owns all major rail corridors in the immediate Boston Area.

MassDOT also serves as a conduit for Federal and State Aid funding. It receives and applies for Federal Aid for highways, railways, and airports that is passed on to municipalities and private owners.

MassDOT can influence the decisions of municipalities through guidance attached to municipal aid programs (such as the complete streets programs). Its regulatory and permitting functions allow it to influence industry.

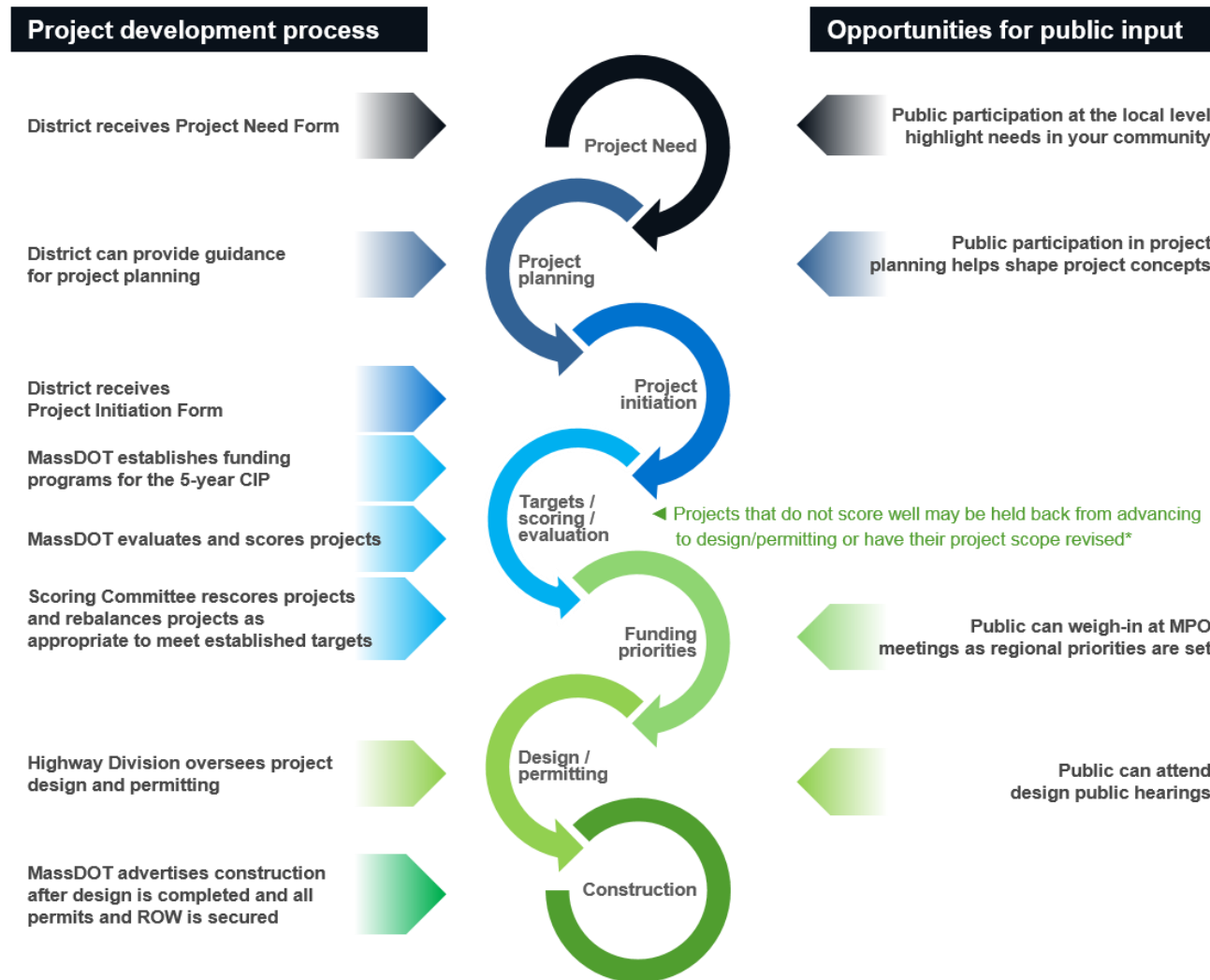
##### **Massport**

Massport owns the major air and sea ports in Massachusetts:

- Logan International Airport in Boston.
- Worcester Regional Airport.
- Hanscom Field in Bedford.
- Conley Terminal and Boston Autoport in Boston.

In addition, Massport is a significant landowner in the South Boston Waterfront neighborhood and is in the process of selling and leasing properties for dense mixed-use development. This places it in the dual position of both being challenged by and benefiting from the densification of the neighborhood surrounding the port.

Figure 5.1 MassDOT Project Development Process



\* The targets/scoring/evaluation step was one of the recommendations of the [Project Selection Advisory Council](#) which was created by the General Court to assist MassDOT in creating uniform project selection criteria for transportation investments.

Massport is a public authority, but not a Massachusetts government agency. It sustains itself from internal revenues, and does not use tax dollars. It is governed by a seven-member board that includes the Secretary of Transportation as an ex-officio member, but MassDOT does not have any other formal link to Massport.

### Other State Agencies

State organizations with an interest in the health and impacts of the freight system include:

- **The Massachusetts Development Finance Agency (MassDevelopment)** is the Commonwealth's public lender and developer. It coordinates public support for and benefits from private development on the South Boston Waterfront, and has been identified as the future operator of state piers in Gloucester, New Bedford, and Fall River (distinct entities from the port authorities in these locations).
- The **Executive Office of Energy and Environmental Affairs (EEA)**, which includes the Department of Environmental Protection (DEP). EEA is responsible for setting and meeting emissions reduction targets, regulating energy and utilities, and protecting environments that may be threatened by freight activity.
- **The Executive Office of Labor and Workforce Development (LWD)** collects workforce and employment data and provides career services support.

- **The Massachusetts General Court** membership is elected locally and therefore is a key conduit to bring the concerns of their constituents to agencies.
- **The Massachusetts Workforce Development Board** advises the Governor on building a strong workforce development system aligned with State education policies and economic development goals.

### Federal Government

The Federal Government's role in the freight system includes both laws passed by Congress and rules and policies enacted by agencies in the Executive Branch. Some of these agencies are described below.

#### FHWA

The Federal Highway Administration (FHWA) funds and regulates State DOTs, municipalities, and private industry in the management and maintenance of roads. FHWA rules govern performance measurement and condition management for pavement, bridges, signage, and sign structures.

FHWA distributes funding under several programs, including Interstate Maintenance, the Highway Bridge Program, the National Highway Performance Program, and – beginning in FFY2016 – the National Highway Freight Program.

## FMCSA

The Federal Motor Carrier Safety Administration (FMCSA) regulates the registration and licensure of trucking companies, drivers, and vehicles. Its official strategy includes:

- Developing and enforcing data driven regulations that balance safety with efficiency.
- Harnessing safety information systems to focus on higher-risk carriers in enforcing safety regulations.
- Targeting educational messages to carriers, commercial drivers, and the public.
- Partnering with stakeholders including Federal, State, and local enforcement agencies, the motor carrier industry, safety groups, and organized labor on efforts to reduce bus and truck-related crashes.

Important FMCSA rules include mandatory rest and licensure requirements for drivers, though the licensure process itself is facilitated by the states.

## FRA

The Federal Railroad Administration (FRA) regulates private and public rail operations, including both passenger and freight. It oversees inspection of rail lines and writes and enforces safety regulations. It also provides Federal Aid grants to railroad owners through State DOTs.

## MARAD

The Maritime Administration (MARAD) runs programs to promote use of waterborne transportation and to maintain the viability of the US merchant marine. It manages the Marine Highway Program and provides assistance to US-flag domestic shippers.

## EPA

The Environmental Protection Agency (EPA) regulates emissions from freight industries and reviews potential infrastructure projects for environmental impacts. In addition, the EPA's regional office receives feedback from the public about emissions and noise from freight facilities.

## Other Federal Agencies

Federal agencies with an interest in the health and impacts of the freight system include:

- **The Federal Aviation Administration (FAA)**, which provides grants for airport infrastructure through the Airport Improvement Program (AIP).
- The **Department of Homeland Security (DHS)** which includes the agencies that inspect and clear international freight at customs (TSA, CBP) as well as the US Coast Guard.
- The **US Department of Commerce**, which (with others) governs the US position on international trade and the **Economic Development Agency (EDA)**.

- The independent, Congressionally-mandated **Surface Transportation Board (STB)**, which regulates rail service and collects and disseminates data on rail traffic.
- The **Department of Labor**, which governs the relationship between workforce and management.

### *Municipalities*

Massachusetts cities and towns own many key freight facilities, including:

- Roads and bridges, including some that are on the National Highway System (NHS) and the National Multimodal Freight Network (NMFN).
- All significant airports not owned by Massport.
- All major public seaport facilities not owned by Massport, including the Port of New Bedford and the Raymond L. Flynn Marine Park in Boston.

Cities also are key collaborators with MassDOT and Massport, as they are typically the first to hear feedback from the public, even concerning facilities they do not own.

### *Freight Industries*

The freight system is inherently a public-private partnership. Private carriers and forwarders make use of infrastructure funded by the public sector through Federal and State Aid. In many cases, industry must partner with MassDOT, Massport,

and others to apply for funding or to maintain infrastructure. In addition, industry owns and funds its own assets.

### **Motor Carriers**

Motor carriers can be either for-hire (“trucking companies”) or private corporations that operate their own fleets (retail chains or Amazon, for example). They handle the administrative side of the trucking industry, and as such are primarily concerned with conditions that impact the business environment, including health of infrastructure, permitting for OS/OW and hazmat, operations restrictions (time and weight), and licensure issues for their workforce. Motor carriers own a fleet of vehicles, and often own home facilities for maintenance.

The legislative interests of motor carriers in Massachusetts are represented by the Massachusetts Motor Transportation Association (MMTA).

### **Rail Carriers**

Three classes of railroad companies service the United States:

- **Class I** railroads are defined by the STB as “having annual carrier operating revenues of \$250 million or more in 1991 dollars”. Only one Class I railroad (CSX Transportation) serves or owns trackage in Massachusetts.
- **Class II** railroads haul regional freight. Class II railroads in Massachusetts include Pan Am (PAR and PAS) and Genesee and Wyoming (G&W), which owns the New



England Central (NECR) and Providence and Worcester (P&W) railroads.

- **Class III** railroads connect the Class I and Class II railroads to customers over short distances.

The primary function of rail carriers is to operate locomotives that pull trains made up of cars from multiple owners. Rail carriers also own most freight rail trackage in Massachusetts west of Worcester, although MassDOT and the MBTA have been steadily purchasing lines over time. The Boston Line west of Worcester, the P&W, the PAR, and the NECR remain in private hands.

Rail carriers conduct Federally-mandated inspections of any lines they own, and can receive Federal grants for improvements in partnership with MassDOT.

### Sea Carriers

Sea carriers own, charter, and operate oceangoing ships (Massachusetts does not host any river shipping on inland waterways). No major container shipping companies are US-based, nor are their ships. Fuel companies use chartered barges and other vessels to deliver gasoline and fuel oil to private terminals in the Port of Boston (Chelsea Creek).

### Air Carriers

Air carriers own, charter, and operate aircraft. They include integrated logistics carriers that operate air fleets (UPS, FedEx, DHL, and Amazon), cargo airlines, and passenger airlines that

carry belly freight. While no air carrier directly owns a facility in Massachusetts, they are key stakeholders in any infrastructure improvement at Logan International Airport.

### Freight Forwarders and the Shipping Community

Freight forwarders receive cargo from shippers (or pick it up), hold it at warehouses if needed, bring it to airports, seaports, or rail terminals, and do the same in reverse for incoming shipments. They use primarily public infrastructure at seaports and airports (loading doors and docks) and operate their own off-site facilities for processing and distribution. All of these stakeholders are key partners in any efficiency or operational improvements planned at the port facilities.

### Distributors

Distributors receive shipments from producers and send them out to homes and retail outlets. Their primary function is regional storage in warehouses and distribution centers, but many of them also operate private truck fleets. They are often but not always sector-specific (milk and dairy, consumer goods).

### Regional Bodies

Regional bodies include metropolitan planning organizations (MPOs), economic development councils (EDCs), and chambers of commerce.

MPOs develop transportation improvement plans (TIPs) to identify targets for Federal Aid investment in their regional transportation networks. MPOs also identified each region's

section of the National Multimodal Freight Network. EDCs and chambers are often more aware than other public organizations of challenges facing local industry.

### *The Workforce*

The freight workforce includes truck drivers, railroad drivers, logistics managers, dock workers, mechanics, seafood processors, and fishermen, among many others. In general, the workforce is unionized. Its primary concern is making a living and ensuring financial security for its members and their families.

On a daily basis, the workforce is affected by traffic congestion, deferred maintenance of infrastructure, efficient or inefficient administrative functions, regulations, fuel prices and availability, and many other performance indicators of the freight system.

### *The Business Community*

The business community includes consumers, producers, buyers, and sellers of goods. Its legislative interests are represented by local and regional chambers of commerce and business coalitions.

### *The Public*

The public has many, sometimes competing expectations for the freight system:

- Goods will arrive to nearby stores or to their homes quickly and reliably at all times and from all destinations.
- Trucks will operate safely and comfortably in mixed traffic and will not add noticeably to traffic congestion.
- Moving and idling trucks and trains will not produce noise or air pollution that impacts quality-of-life.
- Industrial uses and distribution will not be an aesthetic detriment in urban and waterfront neighborhoods.

The public expresses feedback through direct contact with government agencies, the freight industry, and retail businesses, as well as through State legislators.

The Commonwealth also seeks out public comment actively. Massachusetts law requires it for all major planning and infrastructure efforts, including this Freight Plan.

## 5.2 Where Does Funding Come From?

All of the strategies listed in Chapter 4 will require some degree of funding to be implemented. This section briefly describes the major funding sources available for use on the freight system and permissible applications for each. A diagram relating revenue sources to modes is provided in 5.2 (p.68).

### *Agency Revenue and Bonds*

MassDOT and Massport both generate their own revenue and issue their own bonds for capital improvements. Municipalities also collect tax and fee revenue that maintains roads and bridges, as well as revenue from seaports and airports that they own and operate.

### MassDOT Bonds and Revenue

MassDOT programmed approximately \$2.2 billion in FY16:

- **Bond Cap, Taxes and Fees** – MassDOT primarily funds its capital budget through General Obligation Debt (a.k.a. “GO Bonds” or “Bond Cap”). The Bond Cap can be used to fund projects on most MassDOT-owned elements of the freight system. The debt service is paid through revenue from gasoline and diesel excise tax (\$0.24 per gallon), motor vehicle license, registration, and title fees, and the motor vehicle sales tax.
- **Tolls** – Toll revenue in Massachusetts is eligible for use only on the facilities where it is collected.

### Massport Revenue

Massport generated approximately \$700 million in FY16.

- **Aviation** – Aviation revenues include rentals (of gates and hangars), parking, landing fees, concessions (including rental car fees), and shuttle bus fares. Aviation accounted for 86% of Massport’s total operating revenues in FY2016.
- **Maritime** – Maritime revenues include container loading and unloading fees, tariffs, facility rentals (including for seafood processors at Fish Pier), parking, and the Cruiseport. Maritime accounted for 11% of Massport’s total operating revenues in FY2016.

- **Real Estate** – Real estate revenues include leases and rentals as well as fees. Real estate accounted for 3% of Massport’s total operating revenues in FY2016.

As Massport is a self-sustaining authority, all Massport revenue must be used at Massport facilities.

### Municipal Revenue

Municipalities apply several types of revenue to public works, including property taxes, fines and fees, and revenue from rental of municipal properties. The specific sources and amounts vary by municipality. While major air freight facilities are located at Massport-owned airports, municipally-owned facilities may serve niche demand. Municipalities that own ports and airports generate funding for use at those facilities.

### Federal Aid

Federal Aid is allocated to MassDOT from several Federal agencies, each corresponding roughly to a MassDOT Division.

### FHWA

The Highway Division receives reimbursement on freight system projects from FHWA through several programs, including:

- The **National Highway Freight Program (NHFP)** can be applied to infrastructure and operations enhancement projects on the National Highway Freight Network (NHFN). Massachusetts’s allotment from the NHFP is approximately \$20M per year, on average.

- The **Railway-Highway Crossings Program (Section 130)** provides funds for the elimination of hazards at grade crossings.
- The **National Highway Performance Program (NHPP)** provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a State's asset management plan for the NHS.
- The **Surface Transportation Block Grant Program (STBG)** provides flexible funding to best address State and local transportation needs. It can be applied on most highway and rail facilities.
- **Congestion Mitigation/Air Quality (CMAQ)** is applicable on projects that will help Massachusetts meet the requirements of the Clean Air Act.
- **Off-System Bridge** funding is used for bridges that see less traffic, in order to expand high-quality system access.
- The **Highway Safety Improvement Program (HSIP)** is eligible for use on safety improvements.

## FAA

The FAA provides funds to airport sponsors (cities, towns, counties, port authorities, states, etc.) through its **Airport Improvement Program (AIP)**. In Massachusetts, Massport uses very little AIP funding due to its independent revenue streams, so AIP funds are typically applied to infrastructure projects at municipal airports. MassDOT must provide matching funds for between 5% and 25% of project costs, depending on the size of the airport.

## State Aid to Municipalities

### Chapter 90

MassDOT provides municipal aid for roadway projects through the Chapter 90 Program. Chapter 90 projects are 100% reimbursable, meaning that municipalities are not required to contribute to them, though municipalities may contribute significantly to the general upkeep of their roadway network. Permissible uses include resurfacing and related work, bridges, right-of-way acquisition, shoulders, side road approaches, landscaping, drainage, sidewalk, traffic control and service facilities, and lighting.

Municipalities are allocated \$200 million of annual Chapter 90 funds based a composite of three factors:

- Road miles – 58.33%;
- Population – 20.83%; and
- Employment – 20.83%.

After the total apportionment for a city or town is calculated, municipalities apply for reimbursements on a project-by-project basis.

### **Municipal Bridge Program**

MassDOT manages and funds rehabilitation and replacement of municipally-owned bridges, and as of 2016 has allocated \$50 million in general obligation bonds for municipal structures over the next five years.

### **Complete Streets Program**

MassDOT provides funding to cities and towns for the completion of “Complete Streets” plans, which could include provisions for freight loading areas in business districts.

### **Public-Private Partnerships**

Public-private partnerships (PPPs) are common in many areas of the freight system, as key assets (rail lines and port facilities, for example) are owned privately. These owners can apply on their own for MassDOT grants through sources such as the Industrial Rail Access Program (IRAP) that is used for new industrial sidings and opening or reopening branch lines. Railroads can also lobby MassDOT for project specific funding (for 286K upgrading, for example).

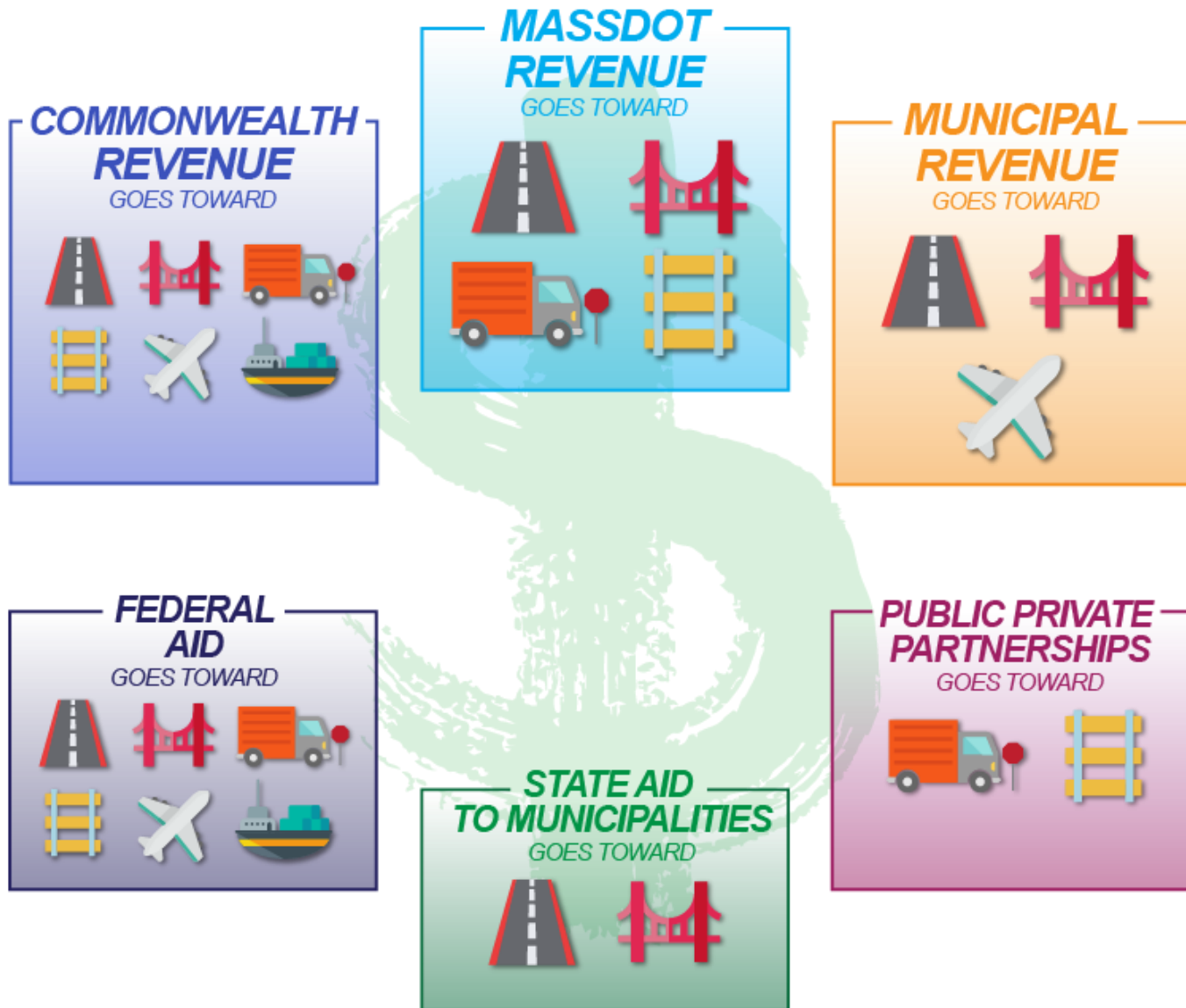
Many additional PPP opportunities exist. The second part of the Truck Parking Case Study (see p.77) addresses one particular opportunity for mutually-beneficial collaboration between motor carriers, truck stop owners, and MassDOT.

### **Other Sources**

A significant additional source of funding for the freight system is the mitigation paid by Volkswagen AG in a settlement with the EPA in 2016. \$2.7 billion in mitigation funds will be distributed to 50 states, Puerto Rico, the District of Columbia, and native tribes, and can be used for any projects intended to reduce emission of NO<sub>x</sub> from heavy duty diesel sources near population centers. **Eligible actions include Truck Stop and Rail Yard Electrification and support for replacing old, inefficient diesel trucks and switching locomotives.** Massachusetts has been allocated \$69 million in mitigation funds, and the Department of Environmental Protection (DEP) [is currently soliciting public comment](#) on how best to spend the Commonwealth’s share, estimated to be over \$75 million.

Figure 5.2 (next page) summarizes the sources and uses of freight funding.

Figure 5.2 Sources and Uses of Freight Funding



### 5.3 How is Freight Prioritized?

In order to make targeted investments in the freight system, MassDOT must incorporate benefits for freight into its capital planning process. This section describes how that might be done.

MassDOT assigns programs to one of three capital priorities: reliability, modernization, and expansion. Reliability receives the majority of capital funding. Reliability projects are selected using asset management systems associated with each program. Projects proposed for the modernization and expansion priorities are evaluated by the Divisions using the Project Selection Advisory Council (PSAC) criteria. The PSAC recommended different weights when scoring different types of projects.

Freight needs may be prioritized by creating a new criterion or by incorporating the benefits to freight into existing criteria. In the latter case, all of the criteria may be applicable to freight projects:

- **System Preservation** – Projects that improve the condition of freight infrastructure might be scored higher under this criterion.
- **Mobility** – Projects that reduce congestion for system users or enable increased/improved movement of people and goods might be scored higher under this criterion.

- **Cost Effectiveness** – Projects that promote preventive maintenance and other strategies to reduce the life-cycle cost of freight system assets might be scored higher under this criterion.
- **Economic Impact** – Projects that support the freight workforce or improve the supply chain provide significant economic development benefits to the Commonwealth and might be scored higher under this criterion. MassDOT currently is studying ways to better incorporate freight into the economic impact criteria.
- **Safety** – Projects that make infrastructure safer to use or that reduce collisions between freight vehicles and other system users might be scored higher under this criterion.
- **Social Equity and Fairness** – Projects that support the freight workforce or promote investment in rural areas, gateway cities, and low-income urban neighborhoods might be scored higher under this criterion.
- **Environmental and Health Effects** – Projects that reduce greenhouse gas and other pollutant emissions might be scored higher under this criterion.
- **Policy Support** – All projects that advance the strategies in this plan support MassDOT policy and might be scored higher under this criterion.

In addition to these criteria, the existence of a dedicated Federal funding stream (or other established funding source) increases the priority of projects in the PSAC process.

## 5.4 Putting it All Together

This section details the proponents, funding, prioritization criteria, and management strategies that can be used to implement five selected strategies:

- **Build or expand truck stops on primary truck routes;**
- **Upgrade rail lines to the 286K standard;**
- **Resolve key bottlenecks on highways;**
- **Maintain uncongested freight access to airports, seaports, and rail terminals in mixed-use urban settings;** and
- **Develop Intelligent Transportation Systems and Active Transportation Demand Management.**

Brief summaries of the implementation for all of the strategies in the Freight Plan are provided in Table 5.1.



*Implementing an Immediate Strategy* | **BUILD TRUCK STOPS AND PARKING**

The problem of insufficient truck parking is not limited to Massachusetts. Many if not all states face it. Nonetheless, *it is a critical immediate priority that new truck stops and parking areas be constructed, in particular along the northern arc of I-495.*

In addition to increasing parking capacity, there are other measures that states can take to improve the efficiency of their existing parking stock:

- Electrify truck parking areas so that vehicles need not idle. This will reduce emissions and noise pollution.
- Improve driver information systems, providing parking availability in advance and allowing for reservations.



Image Credit: Boston Region MPO.

**ACTIONS**

*Collaborate among State, local, regional, and multi-state authorities to locate appropriate properties on primary truck routes.*

*Form public-private partnerships between State and local authorities and private truck stop operators to defray the risk of opening facilities.*

*Develop smartphone apps and variable message signboards to allow drivers to view available spaces, reserve spaces, and receive directions.*

**WHO PROPOSES?**

**MassDOT.**

**WHO PAYS?**

**Public Private Partnership between operator and MassDOT, with MA funds from NHFP and other sources for truck stop electrification (TSE).**

**WHAT BENEFIT?**

**Cost-effectiveness (PPP), Economic Impact, Safety, Environmental and Health (TSE), Policy Support (in the Freight Plan).**

**WHO MANAGES?**

**Private operator and municipality.**

*Implementing an Immediate Strategy* | **UPGRADE TO 286K STANDARD RAIL**

Freight railroads provide a cost effective, safe, and energy efficient option for Massachusetts' shippers and receivers. Massachusetts' freight railroads are an important link to the national freight rail network. But there are many rail lines in Massachusetts that can only carry cars loaded with 263,000 lbs. – even though the national norm is now 286,000 lbs. That means that many rail cars destined for Massachusetts receivers or coming from Massachusetts shippers cannot be fully loaded. Even rail cars just travelling through Massachusetts on lines that are only rated for 263,000 lbs. will be hampered. This weight restriction adds an element of inefficiency to every freight rail shipment that must use Massachusetts' 263,000 lb. lines and puts Massachusetts' companies at a competitive disadvantage.



**ACTIONS**

*Identify areas with rail service and clusters of shippers/receivers who could benefit from increased weight limits.*

*Work with private railroads to secure federal funding to increase weight limits on lines that are likely to provide significant benefits to shippers and receivers.*

**WHO PROPOSES?**

*Private railroads supported by MassDOT.*

**WHO PAYS?**

*Federal aid, private railroads, and MassDOT.*

**WHAT BENEFIT?**

*Economic Impact (job creation, productivity gains, and reduced operating costs), Mobility (reduced congestion), Safety, Environmental and Health Effects, and Policy Support.*

**WHO MANAGES?**

*Railroad owners and operators.*

*Implementing an Immediate Strategy* | **RESOLVE KEY BOTTLENECKS ON HIGHWAYS**

Freight mobility within the 495 MetroWest region has historically been plagued by bottlenecks at the interchanges with I-90 and Route 9, located less than a mile and a half apart. These bottlenecks happen as they intersect the freight spine flowing from Conley Terminal to Worcester and points west.

Traffic congestion at each of these interchanges regularly occurs during peak commute times and non-peak commute times. In fact, it is more likely that during the off-peak hours when interstate trucking volumes are generally higher that backups at the on and off-ramps to I-495 occur.

The corridor also presents challenges to the trucking industry due to the grades along the approaches to the ramp junctions. Steep inclines are difficult for heavy commercial vehicles to negotiate in slow or stop and go traffic, further adding to the vehicular delays and congestion observed. Conversely, sharp downgrades require the heavy trucks to begin to decelerate well in advance of a ramp junction thereby creating a safety concern with traffic changing lanes to bypass the slower moving truck.

Improvements to the I-495 at I-90 and Route 9 Interchanges are essential for the quality of life, safety, and continued economic growth in MetroWest, and serving to maintain Massachusetts viability in the national freight network.



**ACTIONS**

*Engage the trucking industry and general public to document the magnitude of the bottleneck congestion directly related to freight mobility between the adjacent I-495 and I-90 and I-495 at Route 9 interchanges.*

*Conduct an analysis to determine the economic impacts of reducing delay and lost productivity due to existing congestion at the junctions of I-495 at I-90 and Route 9.*

*Identify infrastructure improvements needed to improve safety and mobility at the I-495 freight bottlenecks, including the potential for truck climbing or auxiliary lanes to mitigate the closely spaced interchanges.*

**WHO PROPOSES?**

*Industry, the workforce, the business community and MassDOT.*

**WHO PAYS?**

*MassDOT, with funds from INFRA Grant.*

**WHAT BENEFIT?**

*Mobility, safety, economic impact, environmental and health effects (Air Quality) and policy support.*

**WHO MANAGES?**

*MassDOT.*

*Implementing an Immediate Strategy* / **MAINTAIN FREIGHT ACCESS**

In order to sustain the 7,000 direct jobs and \$4.6 billion of annual economic impact, it is critical to upgrade Conley Terminal and ensure efficient interstate highway access and last mile connections. Conley Terminal is at the beginning of the freight spine that connects to Worcester/CSX via I-90 and continues to points west via rail and roadway. It also is connected to new Thomas J. Butler Haul Road, a dedicated first/last mile freight facility. Recent investments to make the Port of Boston more competitive have resulted in all major global ocean carriers call at Conley Terminal and record breaking container volume. However, the shipping industry is moving to larger container vessels to achieve economies of scale. As a result, ports along the East Coast are investing in harbor deepening and landside infrastructure to serve these larger vessels. With the expansion of the Panama Canal, 8,500-9,000 TEU ships began calling the Port of Boston, a 40-60% increase in ship size. But Conley's current infrastructure cannot efficiently serve these larger vessels and volume growth without additional investment.



**ACTIONS**

*Design and build new deep-water berth and wharf and procure larger ship-to-shore cranes to serve neo-panamax container ships.*

*Collaborate with MassDOT, City of Boston and MCCA to improve connection to the interstate highway system by building the Cypher-E Freight Corridor to serve Conley Terminal and other maritime and industrial businesses in the Port of Boston.*

*Implement new Intelligent Transportation System at Conley Terminal to accelerate gate activity, minimize truck processing time and maximize productivity.*

**WHO PROPOSES?**

**Massport.**

**WHO PAYS?**

**Massport, Commonwealth, MassDOT; also seeking federal grant funding and potential private investment.**

**WHAT BENEFIT?**

**Economic Impact (job creation, productivity gains, and reduced operating costs), Mobility (reduced congestion), Safety, Environmental and Health Effects, and Policy Support.**

**WHO MANAGES?**

**Massport.**

*Implementing a Robust Strategy* | **LEVERAGE CONNECTED VEHICLE TECH**

Connected vehicle technology can be applied in multiple ways to improve en-route efficiency of freight vehicles. Among them:

- Trucks can communicate with each other and about their location and intentions.
- Trucks can be grouped into “convoys”, with automated vehicles following a human-controlled lead vehicle.
- Trucks can share information as truckers already do concerning traffic congestion, crashes or other incidents, weather, etc.
- Trucks can report travel times along certain routes, creating the opportunity for truck-specific routing programs that account for roadway-geometry and the location of loading and delivery points.

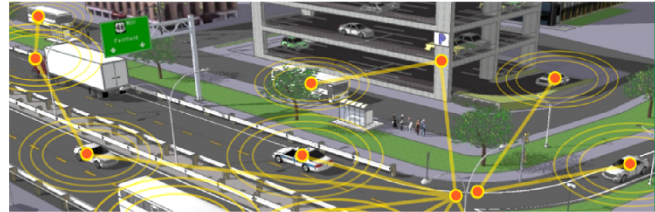


Image Credit: VOLPE Center.

**ACTIONS**

*Engage the trucking industry, the business community, officials, and the public to develop a list of potential implementations of connected vehicle technology.*

*Keep tabs on developments and research in the private sector and in academia and ensuring that information on potential technologies is shared between the Commonwealth and its industries.*

*Explore ways in which action at the State level can facilitate or encourage connected-vehicle technologies in freight, including the Automated Vehicles Working Group.*

**WHO PROPOSES?**

**Industry, The Workforce, and MassDOT.**

**WHO PAYS?**

**Generally Industry, though other vehicle fleet owners (like MassDOT) might participate.**

**WHAT BENEFIT?**

**Mobility, Safety, and Policy Support.**

**WHO MANAGES?**

**Industry, The Workforce, and MassDOT.**

Table 5.1: Implementation of Strategies

| Strategy                                                                                                  | Proponent                                                                                                                                       | Funding                                                                                                                                                      | PSAC Criteria                                                                                                                                                         | Management                                                                                              |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| <b>Immediate Strategies</b>                                                                               |                                                                                                                                                 |                                                                                                                                                              |                                                                                                                                                                       |                                                                                                         |
| Improve the condition of freight network assets                                                           | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Massport</li> <li>• MPOs</li> <li>• Municipalities</li> <li>• The Public</li> </ul> | <ul style="list-style-type: none"> <li>• Federal Aid</li> <li>• MassDOT</li> <li>• Massport</li> </ul>                                                       | <ul style="list-style-type: none"> <li>• System Preservation</li> <li>• Mobility</li> <li>• Cost Effectiveness</li> <li>• Safety</li> <li>• Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Massport</li> <li>• Asset owners</li> </ul> |
| Build or expand on truck stops on primary truck routes                                                    | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                                                                     | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Truck Stop Operator</li> </ul>                                                                   | <ul style="list-style-type: none"> <li>• Cost Effectiveness</li> <li>• Economic Impact</li> <li>• Safety</li> <li>• Policy Support</li> </ul>                         | <ul style="list-style-type: none"> <li>• Truck Stop Operator</li> <li>• Municipalities</li> </ul>       |
| Upgrade rail lines to the 286K standard                                                                   | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Railroads</li> </ul>                                                                | <ul style="list-style-type: none"> <li>• Federal Aid</li> <li>• MassDOT</li> <li>• Railroads</li> </ul>                                                      | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Safety</li> <li>• Mobility</li> <li>• Environment and Health</li> <li>• Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>• Railroad owners and operators</li> </ul>                       |
| Resolve key bottlenecks on highways                                                                       | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Industry</li> <li>• Labor</li> <li>• Business Community</li> </ul>                  | <ul style="list-style-type: none"> <li>• Federal Aid (INFRA)</li> <li>• MassDOT</li> </ul>                                                                   | <ul style="list-style-type: none"> <li>• Mobility</li> <li>• Economic Impact</li> <li>• Safety</li> <li>• Environment and Health</li> <li>• Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                             |
| Maintain uncongested freight access to airports, seaports, and rail terminals in mixed-use urban settings | <ul style="list-style-type: none"> <li>• Massport</li> </ul>                                                                                    | <ul style="list-style-type: none"> <li>• Federal Aid</li> <li>• MassDOT</li> <li>• Massport</li> <li>• Commonwealth</li> <li>• Private investment</li> </ul> | <ul style="list-style-type: none"> <li>• Mobility</li> <li>• Economic Impact</li> <li>• Safety</li> <li>• Environment and Health</li> <li>• Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>• Massport</li> </ul>                                            |

| Strategy                                                                       | Proponent                                                                                                                                                   | Funding                                                                                                                                  | PSAC Criteria                                                                                                                         | Management                                                                                                             |
|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Develop a workforce strategy for freight professions                           | <ul style="list-style-type: none"> <li>Vocational Schools</li> <li>Labor</li> <li>Industry</li> </ul>                                                       | <ul style="list-style-type: none"> <li>MassDOT</li> <li>Massport</li> <li>Vocational Schools</li> <li>Labor</li> <li>Industry</li> </ul> | <ul style="list-style-type: none"> <li>Economic Impact</li> <li>Social Equity</li> <li>Policy Support</li> </ul>                      | <ul style="list-style-type: none"> <li>MassDOT</li> <li>Vocational Schools</li> <li>Labor</li> <li>Industry</li> </ul> |
| Support policies to reduce CO <sub>2</sub> emissions from all freight vehicles | <ul style="list-style-type: none"> <li>MassDOT</li> <li>Commonwealth (DEP)</li> </ul>                                                                       | <ul style="list-style-type: none"> <li>Federal Aid</li> <li>Vehicle Owners (MassDOT, Municipalities, Industry)</li> </ul>                | <ul style="list-style-type: none"> <li>Environ. &amp; Health</li> <li>Policy Support</li> </ul>                                       | <ul style="list-style-type: none"> <li>Vehicle Owners</li> </ul>                                                       |
| Harmonize oversize/overweight permitting across New England                    | <ul style="list-style-type: none"> <li>MassDOT</li> </ul>                                                                                                   | <ul style="list-style-type: none"> <li>Federal Aid</li> <li>MassDOT</li> </ul>                                                           | <ul style="list-style-type: none"> <li>Economic Impact</li> <li>Policy Support</li> </ul>                                             | <ul style="list-style-type: none"> <li>MassDOT</li> </ul>                                                              |
| Coordinate with freight planning in neighboring states                         | <ul style="list-style-type: none"> <li>MassDOT</li> </ul>                                                                                                   | <ul style="list-style-type: none"> <li>Federal Aid</li> <li>MassDOT</li> </ul>                                                           | <ul style="list-style-type: none"> <li>Economic Impact</li> <li>Policy Support</li> </ul>                                             | <ul style="list-style-type: none"> <li>MassDOT</li> </ul>                                                              |
| <b>Robust Strategies</b>                                                       |                                                                                                                                                             |                                                                                                                                          |                                                                                                                                       |                                                                                                                        |
| Protect freight facilities from climate change impacts                         | <ul style="list-style-type: none"> <li>MassDOT</li> <li>Massport</li> <li>Commonwealth</li> <li>MPOs</li> <li>Municipalities</li> <li>The Public</li> </ul> | <ul style="list-style-type: none"> <li>Federal Aid</li> <li>MassDOT</li> <li>Massport</li> </ul>                                         | <ul style="list-style-type: none"> <li>Safety</li> <li>Policy Support</li> </ul>                                                      | <ul style="list-style-type: none"> <li>MassDOT</li> <li>Massport</li> <li>Municipalities</li> </ul>                    |
| Develop Intelligent Transportation Systems and Active Operations Management    | <ul style="list-style-type: none"> <li>MassDOT</li> </ul>                                                                                                   | <ul style="list-style-type: none"> <li>Federal Aid</li> <li>MassDOT</li> <li>Industry</li> </ul>                                         | <ul style="list-style-type: none"> <li>Cost Effectiveness</li> <li>Economic Impact</li> <li>Safety</li> <li>Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>MassDOT</li> <li>Industry</li> </ul>                                            |

| Strategy                                                                                               | Proponent                                                                                                                                               | Funding                                                                                                                                      | PSAC Criteria                                                                                                                     | Management                                                                                                                              |
|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hedging and Shaping Strategies</b>                                                                  |                                                                                                                                                         |                                                                                                                                              |                                                                                                                                   |                                                                                                                                         |
| Build right-sized distribution centers inside of Route 128                                             | <ul style="list-style-type: none"> <li>• EDCs</li> <li>• Industry</li> </ul>                                                                            | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Municipalities</li> <li>• Industry</li> </ul>                                    | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Policy Support</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Municipalities</li> <li>• Industry</li> </ul>                                                  |
| Electrify truck stops                                                                                  | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                                                                             | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Truck Stop Operator</li> </ul>                                                   | <ul style="list-style-type: none"> <li>• Cost Effectiveness</li> <li>• Environ. &amp; Health</li> <li>• Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Truck Stop Operator</li> </ul>                                              |
| Identify and preserve existing rural and industrial sites for warehousing and distribution development | <ul style="list-style-type: none"> <li>• EDCs</li> <li>• Municipalities</li> <li>• Industry</li> </ul>                                                  | <ul style="list-style-type: none"> <li>• MassDOT (staff time)</li> <li>• Municipalities (staff time)</li> <li>• EDCs (staff time)</li> </ul> | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Social Equity</li> <li>• Policy Support</li> </ul>            | <ul style="list-style-type: none"> <li>• EDCs</li> <li>• Municipalities</li> </ul>                                                      |
| Develop delivery areas in urban districts and town centers                                             | <ul style="list-style-type: none"> <li>• MPOs</li> <li>• EDCs</li> <li>• Municipalities</li> </ul>                                                      | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Municipalities</li> </ul>                                                        | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Safety</li> <li>• Policy Support</li> </ul>                   | <ul style="list-style-type: none"> <li>• Municipalities</li> </ul>                                                                      |
| Encourage increased use of underutilized gateway infrastructure (ports and airports)                   | <ul style="list-style-type: none"> <li>• Federal Government</li> <li>• MassDOT</li> <li>• Massport</li> <li>• Municipalities</li> <li>• EDCs</li> </ul> | <ul style="list-style-type: none"> <li>• Federal Aid</li> <li>• Municipalities</li> </ul>                                                    | <ul style="list-style-type: none"> <li>• Mobility</li> <li>• Economic Impact</li> <li>• Policy Support</li> </ul>                 | <ul style="list-style-type: none"> <li>• Massport</li> <li>• Municipalities</li> </ul>                                                  |
| Improve the efficiency of air cargo processing at Logan Airport and in the surrounding area            | <ul style="list-style-type: none"> <li>• Massport</li> <li>• Industry</li> </ul>                                                                        | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Massport</li> <li>• Industry</li> </ul>                                          | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Policy Support</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Massport</li> <li>• Industry</li> </ul>                                                        |
| Better integrate supply chain information to reduce administrative and regulatory delays               | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                                                                             | <ul style="list-style-type: none"> <li>• Federal Aid</li> <li>• MassDOT</li> <li>• Massport</li> </ul>                                       | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Safety</li> <li>• Policy Support</li> </ul>                   | <ul style="list-style-type: none"> <li>• Federal Government</li> <li>• MassDOT</li> <li>• Massport</li> <li>• Municipalities</li> </ul> |



| Strategy                                                                                                                                                                                         | Proponent                                                                                              | Funding                                                                                                                                      | PSAC Criteria                                                                                                          | Management                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Review State regulations and practices that impact security clearance and chain-of-custody for imports and exports                                                                               | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                            | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                                                                  | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Policy Support</li> </ul>                          | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                                                                  |
| Leverage connected vehicle technology to maximize en-route efficiency                                                                                                                            | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Industry</li> <li>• Labor</li> </ul>       | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Industry</li> </ul>                                                              | <ul style="list-style-type: none"> <li>• Mobility</li> <li>• Safety</li> <li>• Policy Support</li> </ul>               | <ul style="list-style-type: none"> <li>• MassDOT</li> <li>• Industry</li> <li>• Labor</li> </ul>                                             |
| Encourage side guards on trucks to protect cyclists                                                                                                                                              | <ul style="list-style-type: none"> <li>• MassDOT</li> </ul>                                            | <ul style="list-style-type: none"> <li>• Federal Aid</li> <li>• Vehicle Owners (MassDOT, Municipalities, Industry)</li> </ul>                | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Safety</li> <li>• Policy Support</li> </ul>        | <ul style="list-style-type: none"> <li>• MassDOT (regulation)</li> <li>• Industry (maintenance)</li> </ul>                                   |
| Provide collaborative guidance and support to MPOs and local governments in integrating freight, distribution, and loading into their planning, zoning, and land use decision-making and polices | <ul style="list-style-type: none"> <li>• EDCs</li> <li>• Municipalities</li> <li>• Industry</li> </ul> | <ul style="list-style-type: none"> <li>• MassDOT (staff time)</li> <li>• Municipalities (staff time)</li> <li>• EDCs (staff time)</li> </ul> | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Social Equity</li> <li>• Policy Support</li> </ul> | <ul style="list-style-type: none"> <li>• MassDOT (staff time)</li> <li>• Municipalities (staff time)</li> <li>• EDCs (staff time)</li> </ul> |
| Encourage private industry to adopt short-sea shipping                                                                                                                                           | <ul style="list-style-type: none"> <li>• Industry</li> </ul>                                           | <ul style="list-style-type: none"> <li>• Federal Aid</li> </ul>                                                                              | <ul style="list-style-type: none"> <li>• Mobility</li> <li>• Economic Impact</li> <li>• Policy Support</li> </ul>      | <ul style="list-style-type: none"> <li>• Industry</li> </ul>                                                                                 |
| <b>Deferred Strategies</b>                                                                                                                                                                       |                                                                                                        |                                                                                                                                              |                                                                                                                        |                                                                                                                                              |
| Build standardized small package drops                                                                                                                                                           | <ul style="list-style-type: none"> <li>• Municipalities</li> </ul>                                     | <ul style="list-style-type: none"> <li>• Municipalities (staff time)</li> <li>• Industry (developers)</li> </ul>                             | <ul style="list-style-type: none"> <li>• Economic Impact</li> <li>• Policy Support</li> </ul>                          | <ul style="list-style-type: none"> <li>• Municipalities</li> <li>• Industry</li> <li>• The Public</li> </ul>                                 |

## 5.5 Performance Measures

The final rules established performance measures to support MAP-21 and The FAST Act for the freight system in the categories of safety, infrastructure, and system performance. MassDOT is working to calculate the measures and meet the Federal deadlines for reporting.

Performance measures that relate to freight include:

- **Safety**
  - Number and rate of fatalities on all public roads.
  - Number and rate of serious injuries on all public roads.
  - Number of non-motorized fatalities and serious injuries on all public roads.
- **Infrastructure**
  - % of Interstate pavements in good/poor condition.
  - % of non-Interstate NHS pavements in g/p condition.
  - % of NHS bridges in good/poor condition.
- **System performance**
  - **Truck Travel Time Reliability (TTTR) index:** The ratio of travel total truck travel time need to ensure on-time arrival (80<sup>th</sup> percentile travel time) to the agency-determined congestion threshold travel time (60% of posted speed).

## 6.0 The Road Ahead

This Freight Plan identifies the strengths of the Massachusetts freight system as well as the challenges facing it. It proposes strategies for addressing these challenges that include maintaining the current system in a state-of-good-repair, building a sustainable and resilient system in the face of climate change, and embracing Intelligent Transportation Systems and new technologies.

These strategies will be pursued according to the vision and guiding principles stated in this plan:

### The Massachusetts Freight System will:

- Be safe, secure, and resilient;
- Maintain a state-of-good-repair for key freight assets;
- Contribute to the economic competitiveness of Massachusetts;
- Provide efficient and reliable mobility within Massachusetts and to/from neighboring states and nations; and
- Support healthy and sustainable communities.

### Our guiding principles in implementing this vision are:

- Consider the experience of *all* customers, including shippers, carriers, customers, workers, and neighbors;
- Provide reliable, efficient service within budget constraints;

- Take advantage of innovations and technology; and
- Support a well-trained workforce with good-paying jobs.

A key element to realizing this vision is collaboration and communication between public and private stakeholders. **Every person in Massachusetts is a freight system customer to a substantial degree. For this reason, all of their feedback is valuable.** The system should function for the benefit of shippers, carriers, customers, the workforce, and the public, while doing as little detriment to them as is possible.

In order to facilitate one element of this collaboration, **MassDOT will seek to maintain its relationships with the members of the Freight Advisory Committee**, including Massport, industry, municipalities, and Federal agencies. In the coming months of 2017, MassDOT will consider the proper format for the FAC's continued operation, but its contributions to this Freight Plan have been significant and critical.

MassDOT welcomes public participation in envisioning a vibrant future for the Massachusetts freight system as a contributor to a thriving economy. This plan is only a first step. Together, the people, industries, and agencies of the Commonwealth of Massachusetts can maintain and build an innovative freight system.