OLD COLONY 2022 FREIGHT PLANNING AND ACTION PLAN

October 2022

Old Colony Planning Council
Prepared under MassDOT Contract 114676 2022

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The preparation of this report has been financed in part through grant[s] from the Federal Highway Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code.

This report was funded in part through grant[s] from the Federal Highway Administration [and Federal Transit Administration], U.S. Department of Transportation. The views and opinions of the Old Colony Planning Council expressed herein do not necessarily state or reflect those of the U. S. Department of Transportation.

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Old Colony Planning Council
Title VI/ Nondiscrimination Coordinator
Mary Waldron
70 School Street
Brockton, MA 02301
508-583-1833 Extension 202
mwaldron@ocpcrpa.org

Title VI Specialist
MassDOT, Office of Diversity and Civil Rights
10 Park Plaza
Boston, MA 02116
857-368-8580
TTY: 857-368-0603
MASSDOT.CivilRights@state.ma.us

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English: If this information is needed in another language, please contact Mary Waldron at 508-583-1833 Extension 202.

Portuguese: Se esta informação é necessária em outro idioma, entre em contato com Mary Waldron em 508-583-1833 Ramal 202.

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Chinese Simplified: (mainland & Singapore): 如果这个信息是需要用另一种语言，请联系帕特Waldron在508-583-1833分机202。

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French: Si cette information est nécessaire dans une autre langue, s'il vous plaît communiquer avec Mary Waldron au 508-583-1833 extension 202.

Italian: Se questa informazione è necessaria in un'altra lingua, si prega di contattare Mary Waldron al 508-583-1833 Extension 202.

Khmer: ប្រសិនបើព័ត៌មាននេះត្រូវបានត្រូវការនៅក្នុងភាសាមួយផ្សេងទៀតសូមទាក់ទងជ័រ Waldron នៅផ្នែកបន្ថែម 508-583-1833 202 ។

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This report was prepared by the following members of the Old Colony Planning Council staff under the direction of Mary Waldron, Executive Director, and the supervision of Charles Kilmer, Assistant Director/Transportation Program Manager.

Report Preparation and Analysis

Ray Guarino, Principal Transportation Planner

rguarino@ocpcrpa.org

Shawn Bailey, Senior Transportation Planner

sbailey@ocpcrpa.org

Mapping and Graphics

Andrew Vidal, GIS Manager/Communications and IT Specialist

avidal@ocpcrpa.org

Contents

List of Figures

List of Tables

I. Introduction

A. Study Purpose

The principal objectives of the Old Colony 2022 Freight Planning and Action Plan include identifying and planning for long-term freight needs in the Old Colony Region, (therefore integrating freight planning into the overall planning process), developing specific long-range transportation projects and identifying potential funding sources for those projects, and identifying solutions to accommodate future levels of freight on the OCPC regional transportation system while maintaining the mobility and safety of the traveling public. This plan follows previous OCPC studies, including the 2014 Regional Freight and Goods Movement Study and the 2014 National Highway System (NHS) Intermodal Connectors Study. In addition, it builds upon the findings and recommendations from the Massachusetts Freight Plan released in 2018.

The OCPC 2014 Regional Freight and Goods Movement Study Trucking concluded that trucking remains the primary mode of transportation for the movement of goods in the region. Therefore, improvements key to freight movements in the region included:

- Better signal coordination is needed at intersections in key state numbered corridors.
- Improvements to turning radii at intersections is needed at those locations where truck movement in impeded (especially in Brockton Downtown).
- An East-West Truck Route through Brockton is needed (of major concern are the railroad underpasses, and tight turns throughout Brockton, especially downtown).
- Interchanges on I-495 should be improved to provide for longer acceleration and deceleration lanes and to reduce weaving.
- The upgrade of limited access highways in the region, especially Route 24 to interstate standards, including the redesign and reconstruction of interchanges, will contribute to the reduction of the potential for rollover incidents involving trucks.

B. Federal Authorization

Federal transportation authorization and funding legislation, including Moving Ahead for Progress in the 21st Century Act (MAP-21) passed in 2012 and the Fixing America's Surface Transportation Act (FAST Act) passed in 2015, require the tracking of freight performance. Some of the challenges in tracking freight performance include data consistency, accessing multi-modal data, data quality and quantity, developing and maintaining reliable freight transportation models, and understanding the roles of state agencies and MPOs in freight planning and funding. In addition, the proprietary nature of information regarding freight movement among private companies in a competitive environment represents an obstacle in surveying private freight providers.

The Infrastructure Investment and Jobs Act (IIJA) (also known as the "Bipartisan Infrastructure Law"), was signed into law in November of 2021. The bill includes funding to improve freight rail safety and efficiency by modernizing and expanding passenger rail. The bill included additional Amtrak funding to eliminate the rail maintenance backlog and modernize the Northeast Corridor. The funding includes federal-state partnership grants for Northeast Corridor modernization, and partnership grants for intercity rail service, including highspeed rail. Massachusetts is also eligible to compete for rail improvement and safety grants including grade crossing safety improvements. These improvements provide for greater freight efficiency and safety for both rail and truck.

a. National Freight Goals and Performance Measures

The federal highway authorization bill of 2012, MAP-21, established a national goal for freight movement and economic activity: "To improve the nation's freight network, strengthen the ability of rural communities to access national and international trade markets, and support regional economic development." The FAST Act of 2015 requires each state to develop a state freight plan (covering a five-year forecast period) in order to receive funding under the National Highway Freight Program. The FAST Act also included provisions to improve the condition and performance of the national freight network. Performance measures supporting freight movement include the categories of safety, infrastructure, and system performance. These performance measures were adopted by the MassDOT and the Old Colony MPO:

- 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
  - Percent of Interstate pavements in good/poor condition.
  - Percent of non-Interstate NHS pavements in good/poor condition.
  - Percent of NHS bridge deck area in good/poor condition.
- System performance
  - Truck Travel Time Reliability Index (TTTRI) : This measure is calculated by dividing the 95th percentile truck travel time on a road segment by the 50th percentile travel time.

Table 1 describes Massachusetts statewide targets adopted for federally required performance measures and the actual performance for travel time reliability on the Interstate Highway System, travel time reliability on the non-Interstate NHS, and TTTRI on the Interstate Highway system. In addition, the Old Colony MPO approved and endorsed the MassDOT System Performance Measure (PM3) 2020 and 2022 Targets in September 2018. Figure 1 shows the map area for the TTTRI on Massachusetts Highways for the year 2021 based on data available from INRIX/RITIS. The Old Colony Region contains a small portion of interstate mileage (approximately 2.526 miles of I-495 in Bridgewater). Non-Interstate NHS mileage in the Old Colony Region is 354.04 miles. Figures 2, 3, and 4 show the TTTRI for the portion of interstate (I-495) in the Old Colony Region for 2017, 2019, and 2021 (based on INRIX/RITIS) with a map of the interstate mileage attached. Figures 5, 6, and 7 (no maps attached) show the percent of person-miles on the non-Interstate NHS that are reliable in the Old Colony Region for 2017, 2019, and 2021. Figure 8 shows the percent of person-miles on the Interstate Highway System with the Old Colony Region (approximately 1.2 miles of I-495) that are reliable for 2017, 2019, and 2021, which was 100 percent for all three of the reporting years.

Table 1 - Massachusetts Statewide Performance Measures and Targets*

Adopted Performance Measure	2017 (Baseline Value)	2018 Actual	2019 Actual	2019 Target	2020 Actual	2021 Four Year Target	2021 Actual
Percent of person-miles on the Interstate Highway System that are reliable	70%	69%	69.1%	68%	__	68%	__
Percent of person-miles on the non-Interstate NHS that are reliable	__	__	82.4%	__	__	80%	__
Truck Travel Time Reliability Index for the Interstate Highway System	1.84	1.89	1.86	1.85	__	1.85	__

(Source: FHWA State Highway Reliability Report for Massachusetts)

According to the NCHRP Research Report 925, Estimating the Value of Truck Travel Time Reliability, unreliability in travel time can be caused by demand factors that affect vehicle volumes or supply factors affecting a system's ability to process traffic. These factors include:

- Demand factors: Special events, and fluctuations in demand.
- Incidents: Crashes, weather, work zones, malfunctioning of traffic control devices, failure in infrastructure, and other incidents that impede capacity and/or disrupt traffic operations.

Figure 1 - Map of Massachusetts 2021 Truck Travel Time Reliability Index

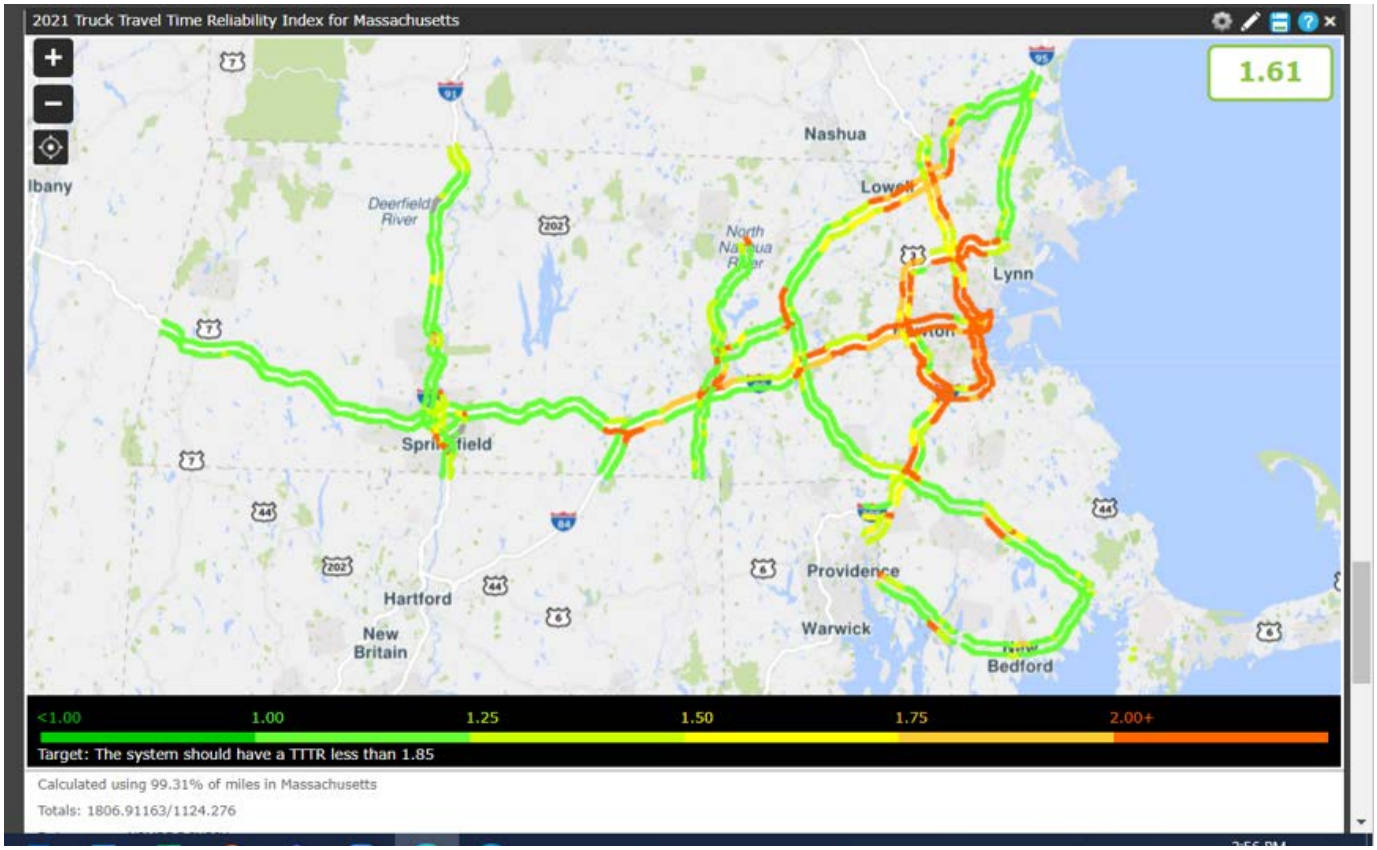


Figure 2 - Old Colony MPO 2017 Truck Travel Time Reliability Index Interstate

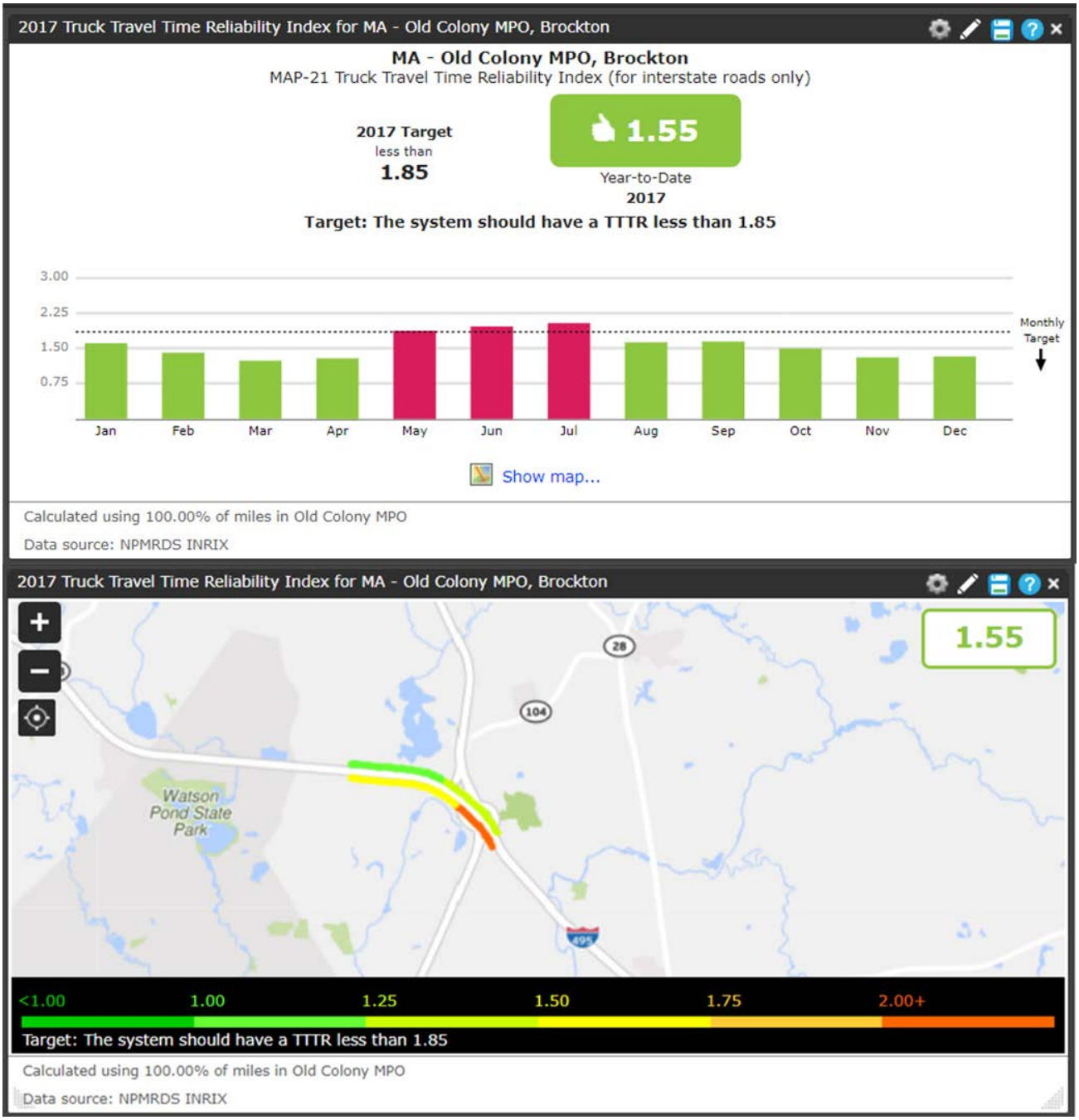


Figure 3 - Old Colony MPO 2019 Truck Travel Time Reliability Index Interstate

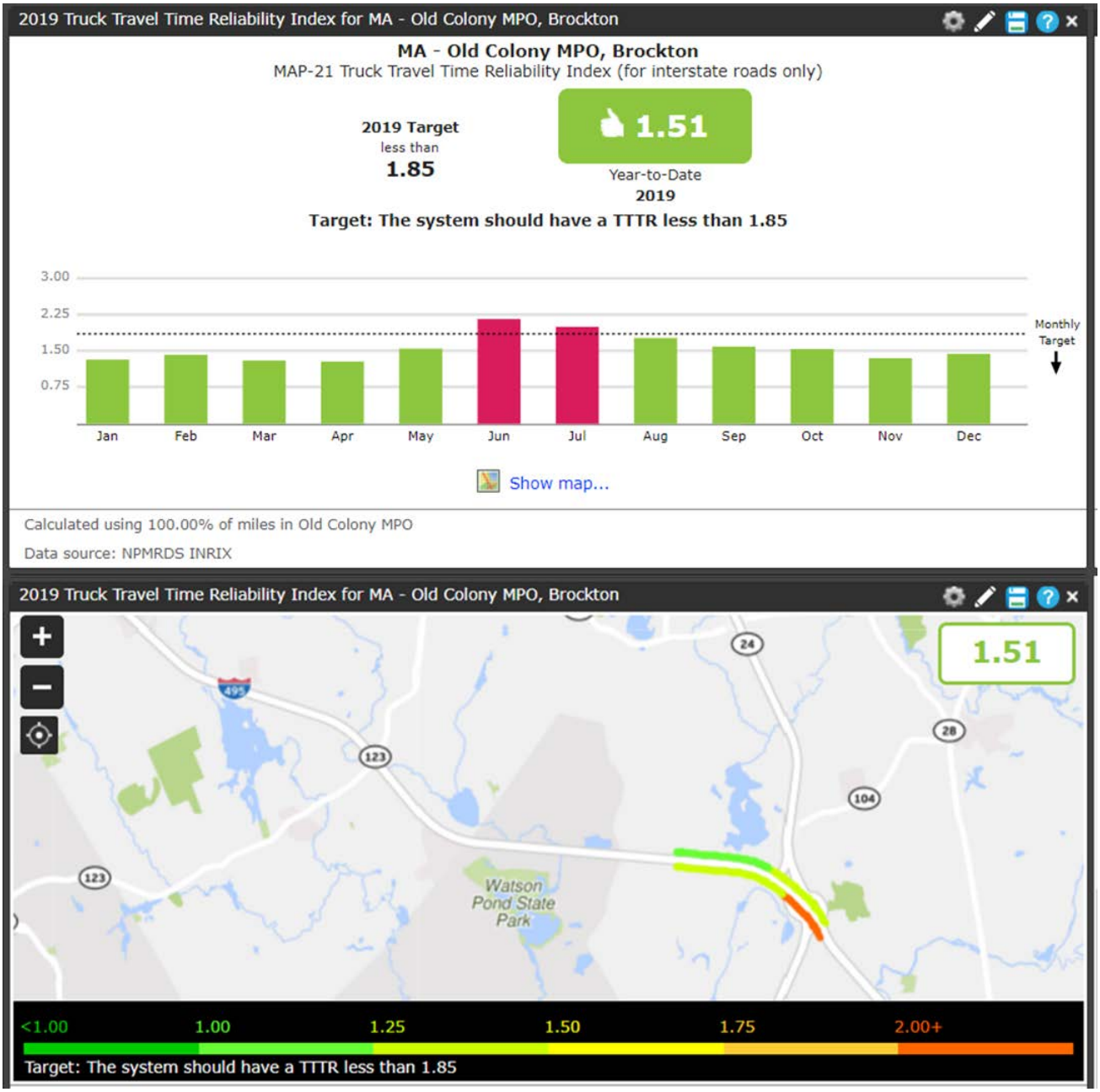


Figure 4 - Old Colony MPO 2021 Truck Travel Time Reliability Index Interstate

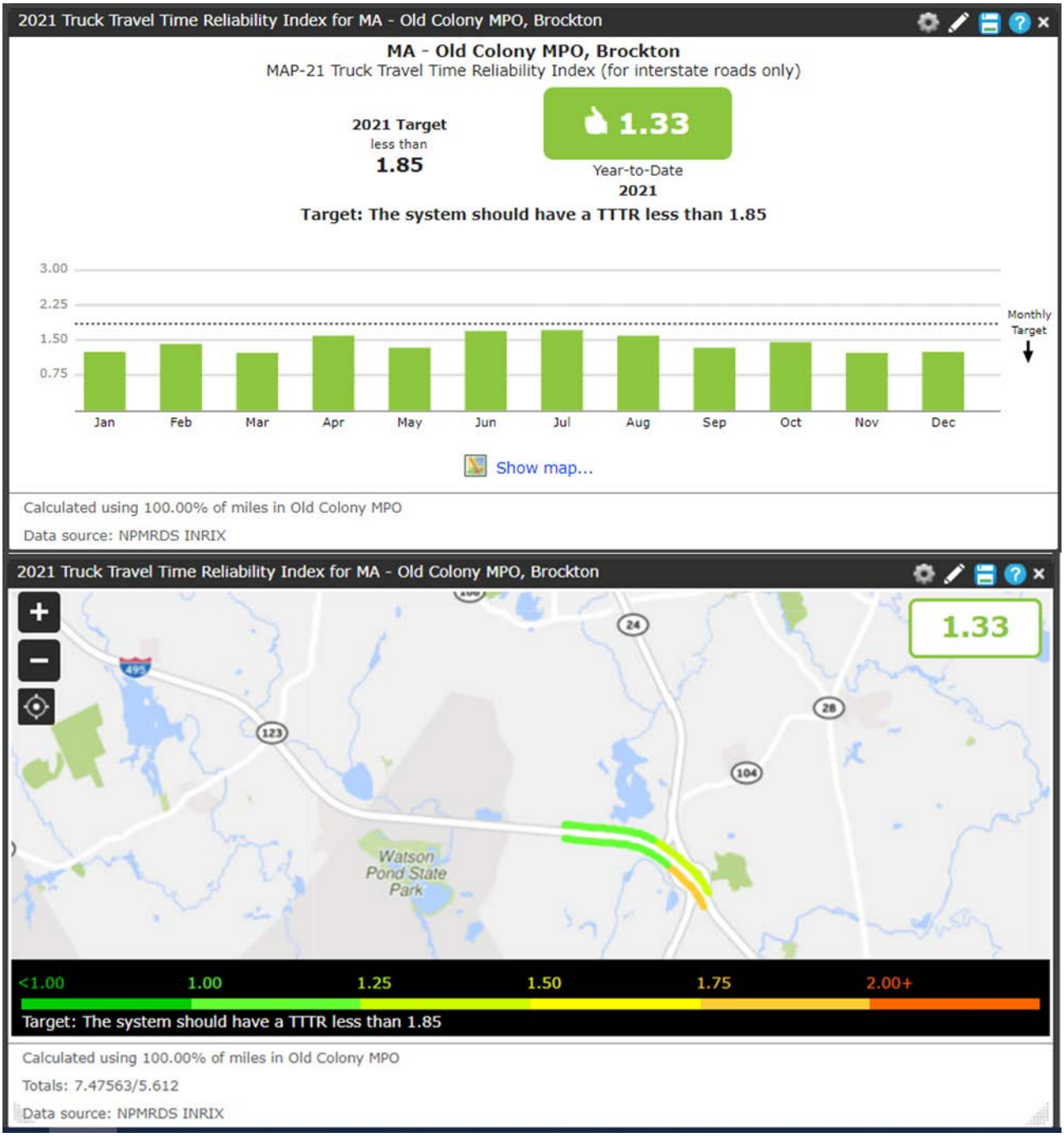


Figure 5 - Old Colony MPO 2017 Non-interstate NHS Travel Time Reliability Index

Figure 6 - Old Colony MPO 2019 Non-interstate NHS Travel Time Reliability Index

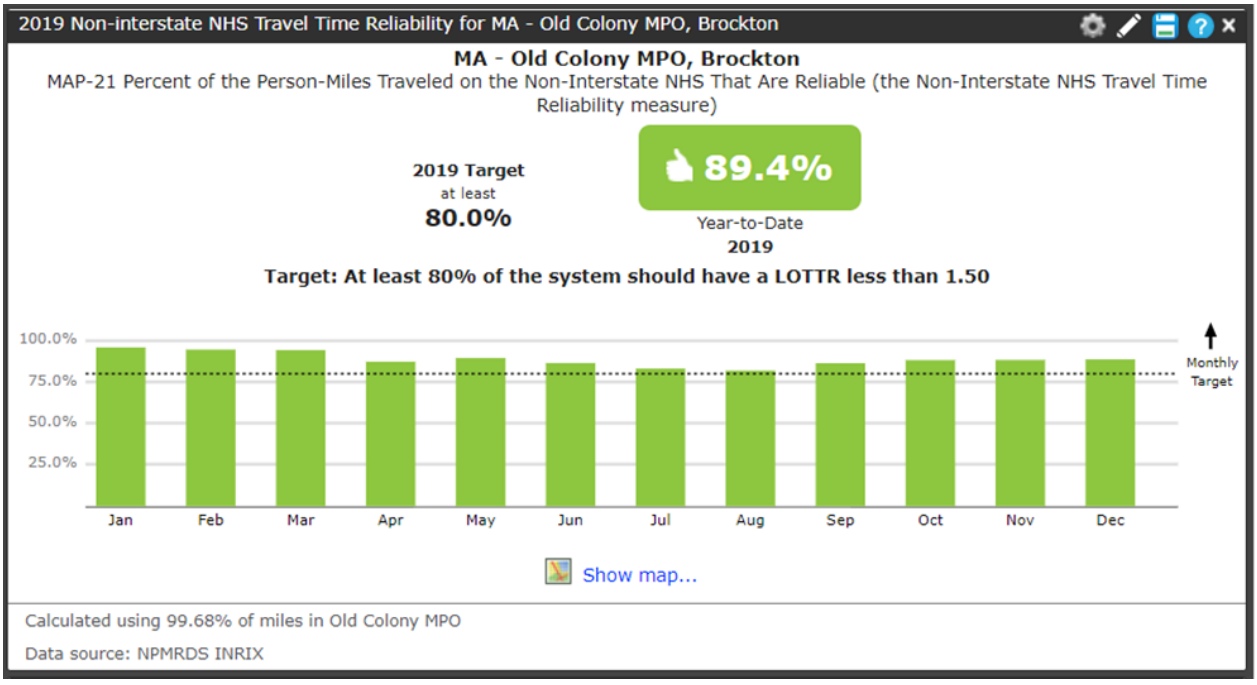
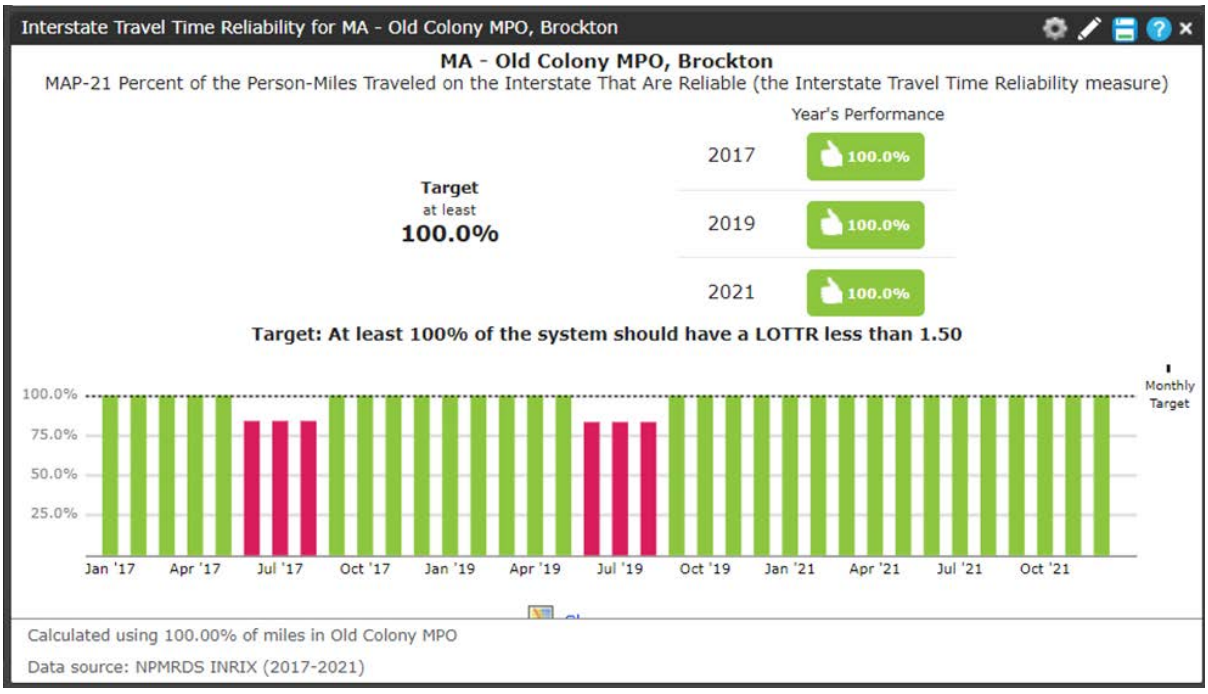


Figure 7 - Old Colony MPO 2021 Non-interstate NHS Travel Time Reliability Index

Figure 8 - Old Colony MPO Interstate Travel Time Reliability Index



National Highway Freight Program Funds

Eligible use of the National Highway Freight Program funds must include activities that contribute to efficient movement of freight identified in a state freight investment plan as part of a state's overall freight plan. These can include:

- Development phase activities, including planning, feasibility analysis, revenue forecasting, environmental review, preliminary engineering and design work, and other preconstruction activities.
- Construction, reconstruction, rehabilitation, acquisition of real property (including land relating to the project and improvements to land), construction contingencies, acquisition of equipment, and operational improvements directly relating to improving system performance.
- Intelligent transportation systems and other technology to improve the flow of freight, including intelligent freight transportation systems.
- Efforts to reduce the environmental impacts of freight movement.
- Environmental and community mitigation for freight movement.
- Railway-highway grade separation.
- Geometric improvements to interchanges and ramps.
- Truck-only lanes.
- Climbing and runaway truck lanes.
- Adding or widening of shoulders.
- Truck parking facilities eligible for funding under section 1401 (Jason's Law) of MAP21.
- Real-time traffic, truck parking, roadway condition, and multimodal transportation information systems.
- Electronic screening and credentialing systems for vehicles, including weigh-in-motion truck inspection technologies.
- Traffic signal optimization, including synchronized and adaptive signals.
- Work zone management and information systems.
- Highway ramp metering.
- Electronic cargo and border security technologies that improve truck freight movement.
- Intelligent transportation systems that would increase truck freight efficiencies inside the boundaries of intermodal facilities.
- Additional road capacity to address highway freight bottlenecks.
- Physical separation of passenger vehicles from commercial motor freight.
- Enhancement of the resiliency of critical highway infrastructure, including highway infrastructure that supports national energy security, to improve the flow of freight.
- A highway or bridge project, other than a project described above, to improve the flow of freight on the National Highway Freight Network.
- Any other surface transportation project to improve the flow of freight into and out of an eligible intermodal freight facility.
- Diesel retrofit or alternative fuel projects under the Congestion Mitigation and Air Quality Improvement program (CMAQ) for class 8 vehicles.
- Conducting analyses and data collection related to the NHFP, developing and updating freight performance targets, and reporting compliance of freight performance targets.

b. The National Highway Freight Network

The National Highway Freight Network (NHFN) was established by the FAST Act. The NHFN network consists of those highway corridors of the U.S. freight transportation system critical to the current and future movement of freight, including all modes and connections in the national freight system (as determined by measurable and objective national data).

The FAST Act required that the NHFN consist of the following road network components:

- The Primary Highway Freight System (PHFS)
- Critical Rural Freight Corridors
- Critical Urban Freight Corridors
- Those portions of the Interstate System that are not part of the PHFS (Old Colony Region has a minimal amount of Interstate mileage (approximately 1.2 centerline miles) limited to I-495 in Bridgewater)

The FAST Act designated the PHFS and requires FHWA to redesignate it every five years. It also provides for designation of Critical Rural Freight Corridors and Critical Urban Freight Corridors. The Federal Highway Administrator determines the percentage of the national total of PHFS mileage that is located within each individual State. Figure 9 shows the National Highway Freight Network in Massachusetts and the Primary Highway Freight System. As shown in Figure 9, none of the PHFN is located within the Old Colony Region, although a small portion of I-495, outside of the PHFN is located in Bridgewater within the Old Colony Region. In Massachusetts, the major freight highway corridors within the NHFN include I-84, I-90, I-91, I-93, I-95, I-290, and I-495. Figure 10 shows the major freight corridors in the US by connecting gaps less than 440 miles (the distance a truck can travel in 8 hours at 55 miles per hour) between highway segments. The corridors in Figure 10 include 26,000 miles of highways plus 1,500 miles of bulk cargo rail and waterway routes measured along the nearest parallel highway. Interstate highways make up 95 percent of the total mileage.

Figure 9 - Massachusetts National Highway Freight Network

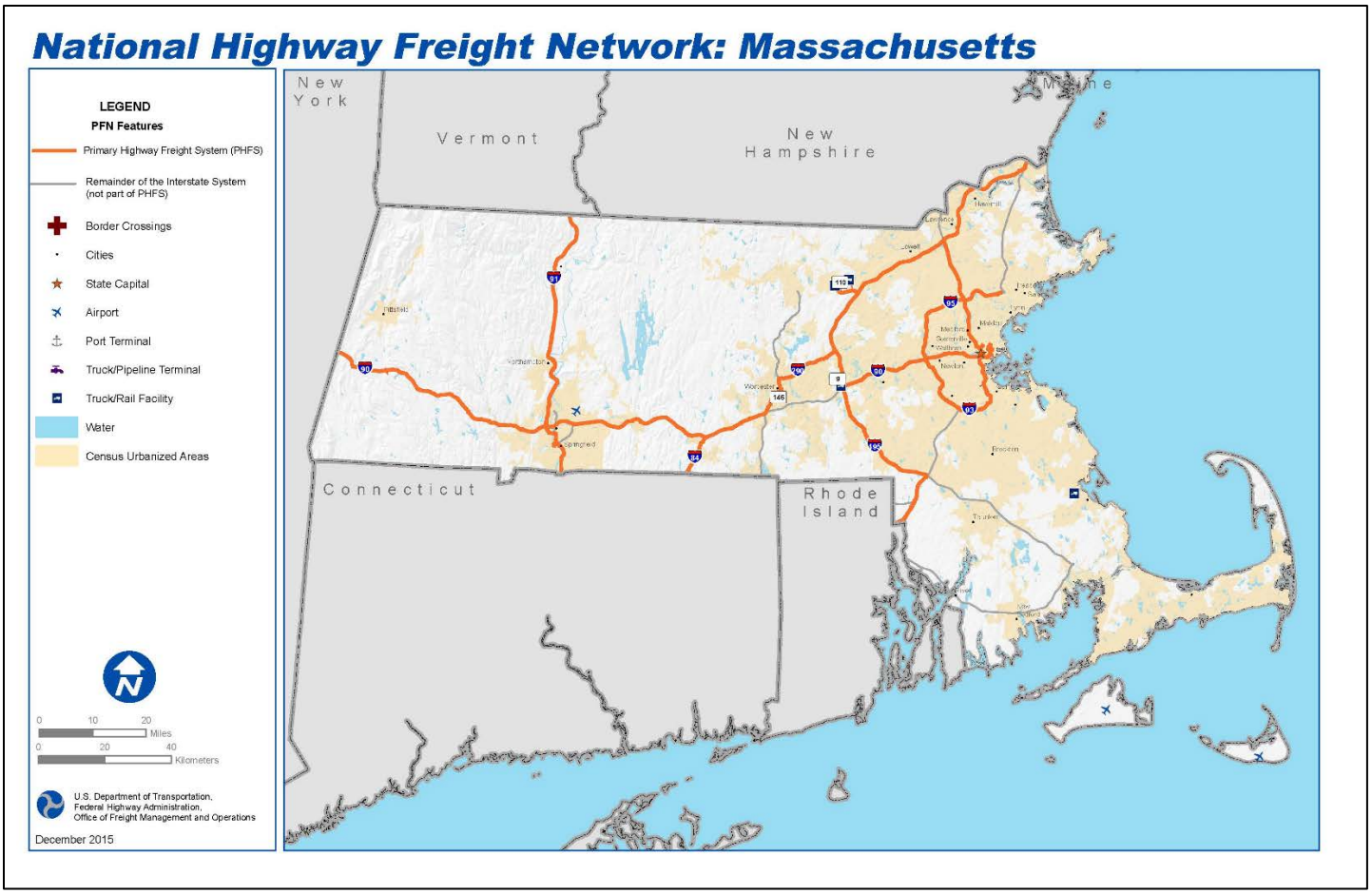
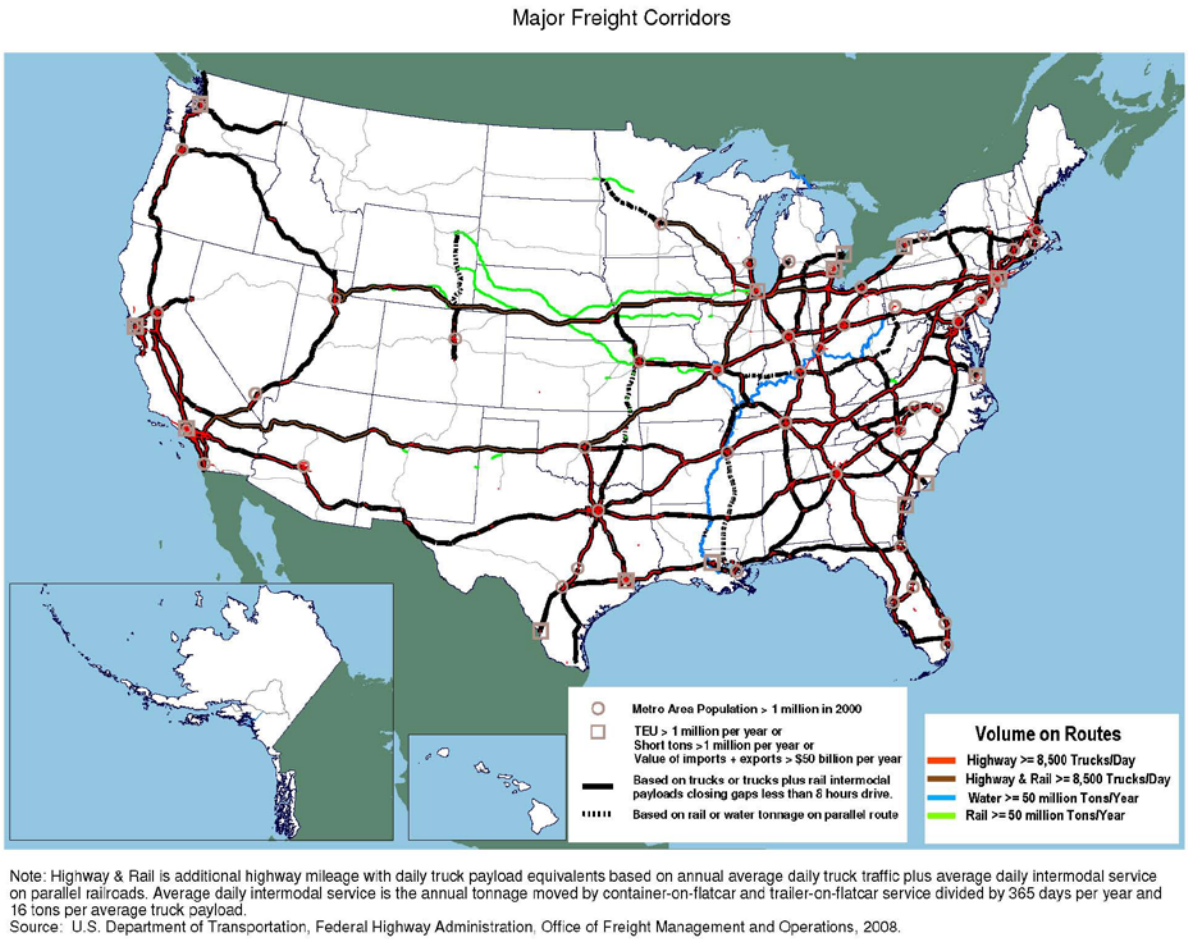


Figure 10 - Major U.S. Freight Corridors



Note: Highway & Rail is additional highway mileage with daily truck payload equivalents based on annual average daily truck traffic plus average daily intermodal service on parallel railroads. Average daily intermodal service is the annual tonnage moved by container-on-flatcar and trailer-on-flatcar service divided by 365 days per year and 16 tons per average truck payload.
Source: U.S. Department of Transportation, Federal Highway Administration, Office of Freight Management and Operations, 2008.

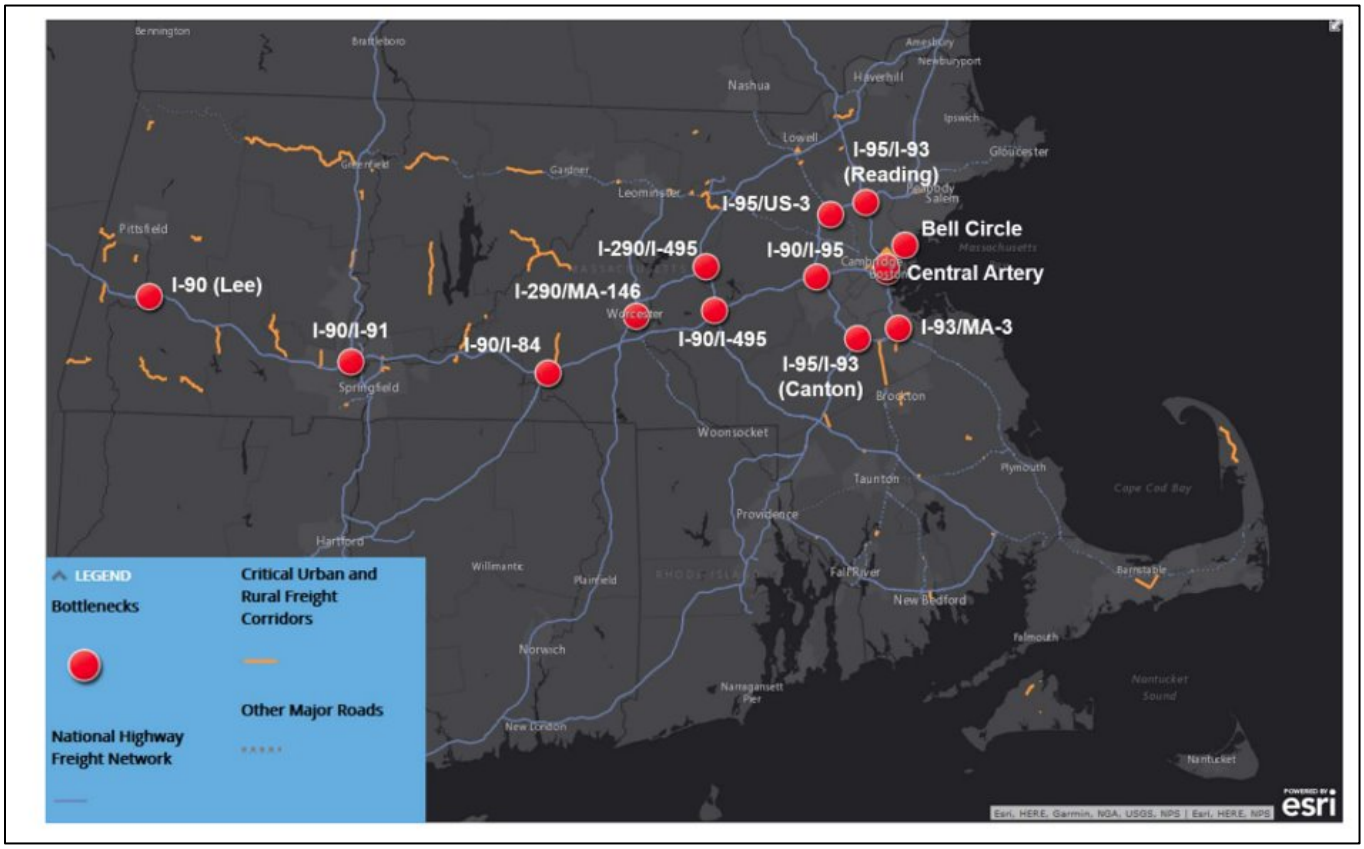
II. State Freight Plan

The Massachusetts Freight Plan was completed in 2018 in compliance with the FAST Act. The purpose of the plan was to develop and document the vision and goals of the Commonwealth in achieving a safe, secure, resilient freight system as well as achieving economic competitiveness, efficient and reliable mobility, and healthy and sustainable communities. The FAST Act requires the development of a comprehensive plan for immediate and long-range planning activities for freight investments within each state.

The Massachusetts plan identified five major interstate corridors as major trucking routes for freight traffic, including I-84, I-90, I-91, I-93, and I-95. It included seven interstate routes characterized as auxiliary routes, which include I-190, I-290, I-291, I-391, I-295, I-395, and I-495. Major non-interstate corridors identified as major trucking routes in the Massachusetts plan includes US-3, US-6, MA-2, MA-3 (within the Old Colony Region), MA-24 (within the Old Colony Region), MA-128, and MA-146.
The Massachusetts plan stated that major trucking routes in Massachusetts serve Boston directly or circumnavigate the Boston metropolitan area using I-495. The plan describes the primary truck route

through Massachusetts entering on I-84 from Connecticut and New York City, proceeding past Worcester on I-90, continuing north on I-495, and exiting using I-93 to New Hampshire and I-95 to Maine. Additionally, the route from Chicago and the Midwest enters Massachusetts via I-90 from New York. The I-495/I-90 interchange is considered an important bottleneck along the major trucking route, requiring solutions for remediation. Access to the major truck route network in the Old Colony Region is via Route 24 to I-495 in Bridgewater or Route 24 north to I-93 (Route 128) and in Plymouth, Route 3 north to I-93 or west on Route 44 to I-495. Figure 11 shows the bottlenecks in the Massachusetts freight network cited in the Massachusetts Freight Plan. Figure 11 also shows the Critical Urban Freight Corridors along Route 24 and in Brockton downtown.

Figure 11 - Bottlenecks and Critical Urban & Rural Freight Corridors in Massachusetts



The recommended strategies in the Massachusetts Freight Plan were developed based on MassDOT priorities. These priorities include considering the experience of all customers, providing reliable, efficient service within budget constraints, taking advantage of innovations and technology, and supporting a well-trained workforce with good-paying jobs, as well as being responsive to trends as they unfold. The recommendations also considered the needs and priorities of Massport, MPOs, Massachusetts state agencies, and municipalities. The priorities were identified through stakeholder interviews and through the meetings of the Freight Advisory Committee (FAC). The best practices from FHWA, other states, municipalities, and academia were also considered. Immediate strategies include:

Infrastructure:

1. Improve the condition of freight network assets.
2. Build or expand truck stops on primary truck routes.

3. Upgrade rail lines to the 286K standard.
4. Revolve key bottlenecks on highways.
5. Maintain uncongested freight access to airports, seaports, and rail terminals in mixed-use urban settings.
6. Modernize container terminal facilities.

Policies and people:
1. Develop a workforce strategy for freight professions.
2. Support policies to reduce CO2 emissions from all freight vehicles.
3. Harmonize oversize/overweight permitting across New England.
4. Coordinate with freight planning in neighboring states.

III. Freight Profile

A. Existing Freight Network

a. Freight Movement in Massachusetts

The primary mode for moving freight in Massachusetts is by truck. Trucking is the primary mode utilized for the movement of goods to, from, and through the Old Colony Region. This is based upon analysis of the movement of freight by mode in Massachusetts developed in the Freight Analysis Framework. The Freight Analysis Framework (FAF) is a model developed for the U.S. Department of Transportation to provide a comprehensive picture of freight movement and activity. The FAF estimates commodity flow and freight transportation activity among states, regions, and international gateways. It includes estimates of tonnage and value of goods shipped by type of commodity and mode of transportation.

The FAF reports on freight tonnage and value of commodities on the freight network within and through the states. It does not include freight movement on a local level, or within a regional planning region such as the Old Colony Region, nevertheless, the FAF can give an insight into the character of freight movement for the Old Colony Region. Within the FAF freight model, the Old Colony Region is part of a larger Massachusetts Eastern zone (Boston Area). Figure 12 shows this FAF zone and the Old Colony Region within the zone. Table 2 shows the top 20 freight commodities in thousands of tons in Eastern Massachusetts (year 2020). Table 3 shows the top 10 freight commodities in Eastern Massachusetts based on value (year 2020).[1]

[1] FAF5 data for 2020 is a forecast and may differ from the regional annual data that will be provided in a future version of FAF due to the COVID-19 pandemic

Table 2 - Top 20 Eastern Massachusetts Freight Commodities by Thousands of Tons Shipped

	Commodity	Thousands of tons shipped (all commodities imports, exports, and within)
1	Coal	40,684.9
2	Gasoline	35,528.2
3	Gravel	27,449.8
4	Nonmetal min. prods.	22,714.1
5	Fuel oils	16,506.0
6	Waste/scrap	14,411.9
7	Mixed freight	13,306.8
8	Other foodstuffs	12,390.3
9	Wood prods.	5,712.6
10	Natural sands	5,698.4
11	Basic chemicals	5,082.1
12	Plastics/rubber	4,889.6
13	Other ag prods.	4,590.4
14	Newsprint/paper	4,358.3
15	Nonmetallic minerals	3,279.8
16	Base metals	2,871.1
17	Alcoholic beverages	2,592.8
18	Milled grain prods.	2,576.9
19	Meat/seafood	2,385.1
20	Misc. mfg. prods.	2,118.9

Table 3 - Top 10 Eastern Massachusetts Freight Commodities by Value

	Commodity	Value of commodities in millions of US dollars (all commodities imports, exports, and within)
1	Pharmaceuticals	53,294.70
2	Mixed freight	52,794.50
3	Electronics	51,043.60
4	Precision instruments	36,957.70
5	Misc. mfg. prods.	34,061.10
6	Machinery	26,383.90
7	Textiles/leather	25,798.30
8	Gasoline	22,147.00
9	Plastics/rubber	20,670.30
10	Other foodstuffs	18,599.10

Figure 12 - Map of Freight Analysis Area Framework Zones

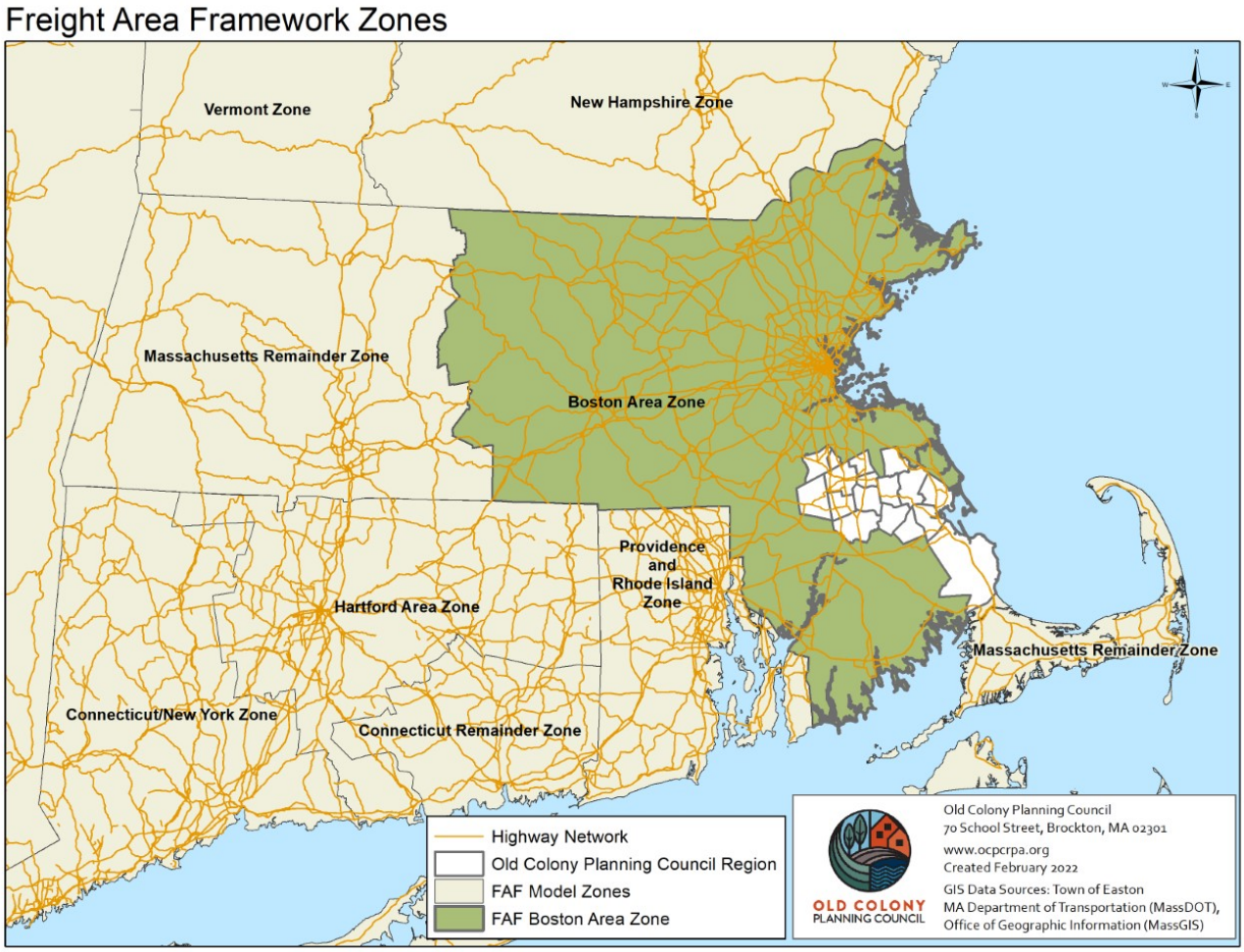


Table 4 shows the movement of freight to, from, and through Massachusetts as a whole by mode in thousands of tons for the year 2020. Table 4 shows that 83 percent of all goods imported, exported, and shipped within Massachusetts are shipped by truck, 11.40 are shipped by pipeline, 2.82 by multiple modes and mail, 2.20 percent by rail, 0.09 percent by water, and 0.06 percent by air.

Table 4 - Freight Mode by Thousands of Tons Shipped

Mode	Thousands of tons shipped (all commodities imports, exports, and within)	Percent of total
Air (include truck-air)	142	0.06%
Multiple modes & mail	7,054.00	2.82%
Pipeline	28,548.5	11.40%
Rail	5,503.00	2.20%
Truck	208,781.4	83.41%
Water	56.4	0.09%
Other and unknown	231.4	0.09%

b. Rail

Rail freight volumes in Massachusetts are significantly smaller than truck freight volumes. Table 4 shows that 2.2 percent of freight is moved by rail in Massachusetts. Much of the freight rail activity is in the western half of the state where CSX is able to run double stack trains. Figure 13, from the Massachusetts State Rail Plan, shows the rail freight network and rail terminals in Massachusetts.

A 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. There are two other ratings including the higher "315K" rating, and the "263K" rating, lower than the "286K". Weight ratings are based primarily on bridge and culvert strength and condition, as well as track weight. If a line has a substandard rating, this prevents the use of a potentially economically productive line by national carriers; however, the rail industry has concluded that the benefits of 286K are significantly higher than 315K when weighed against the costs of upgrading. Figure 13 shows Massachusetts rail lines by the 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.

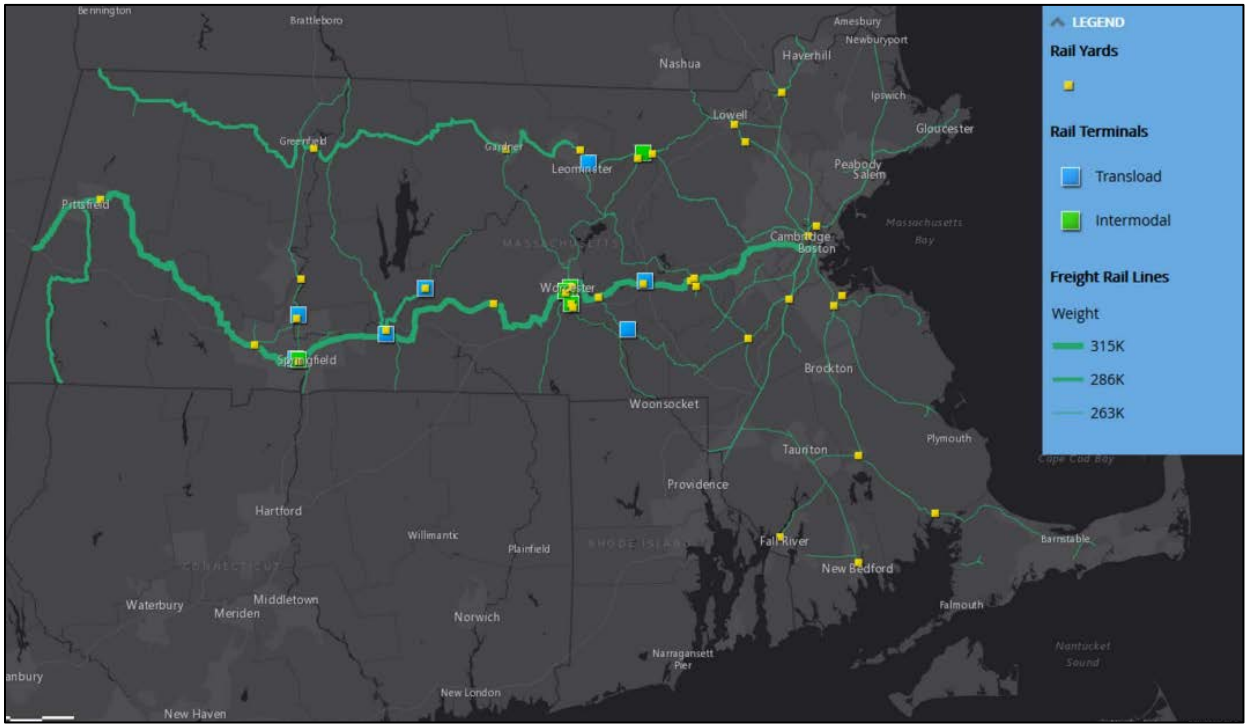
Since the restoration of the Old Colony Commuter Rail lines in the Old Colony Region, freight transportation has benefited from the upgrades in facilities that were necessary for passenger rail reintroduction, as both passenger rail and freight trains share the rail lines. In addition, many of the grade crossings along the line were upgraded as safety was enhanced, which included pedestrian walkways and secured fencing to discourage people from crossing the line at unsafe crossings.

Railroad carriers are designated as Class I, II, or III, in the US according to annual revenue criteria originally set by the Surface Transportation Board in 1992. The thresholds, last adjusted for inflation in 2019 are: Class I: A carrier earning revenue greater than $504,803,294, Class II: A carrier earning revenue between $40,387,772 and $504,803,294, and Class III: A carrier earning revenue less than $40,387,772. Class II Railroads are also referred to as a "regional railroads," and Class III Railroads are also known as a "short line railroads."

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. CSX is the largest Class I railroad in Massachusetts. It operates the Boston Line west of Worcester. Pan Am Railways (PAR) is the primary railroad network serving Boston from the north. PAR's major terminals are located in Ayer and East 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. Pan Am was recently sold to CSX, which has been approved by the Surface Transportation Board.

The current rail freight network within the Old Colony Region includes CSX Transportation, which operates on the Middleborough/Lakeville line and the Providence/Stoughton line. CSX has operating rights along these lines, but the Massachusetts Bay Transportation Authority owns the right of way.

Figure 13 - Rail Freight Network in Massachusetts



Precision Railroading or Precision Scheduled Railroading (PSR) is a relatively new concept in freight railroad operations pioneered by E. Hunter Harrison. It shifts the focus from older practices, such as unit trains, hub and spoke operations, and individual car switching at hump yards, to emphasize point-to-point freight car movements on regular scheduled and simplified routing networks. The goal of PSR is to achieve a lower operating ratio. The railroading industry uses operating ratio as its most widely used measure of operational efficiency. The operating ratio represents how much a company needs to spend to make a dollar so for an operating ratio of 60, the company would make 40 cents for every 60 cents spent.

Under PSR, freight trains operate on fixed schedules, much like passenger trains, instead of being dispatched whenever enough loaded cars are available. In the past, container trains and general merchandise trains operated separately; under PSR they are combined as needed. Under PSR, inventories of freight cars and locomotives are reduced as well as the number of workers. This results in improvements in railroad operating ratios and improves financial operations. CSX implemented PSR techniques in its operations in Massachusetts as most Class I railroads are adopting PSR throughout the country.

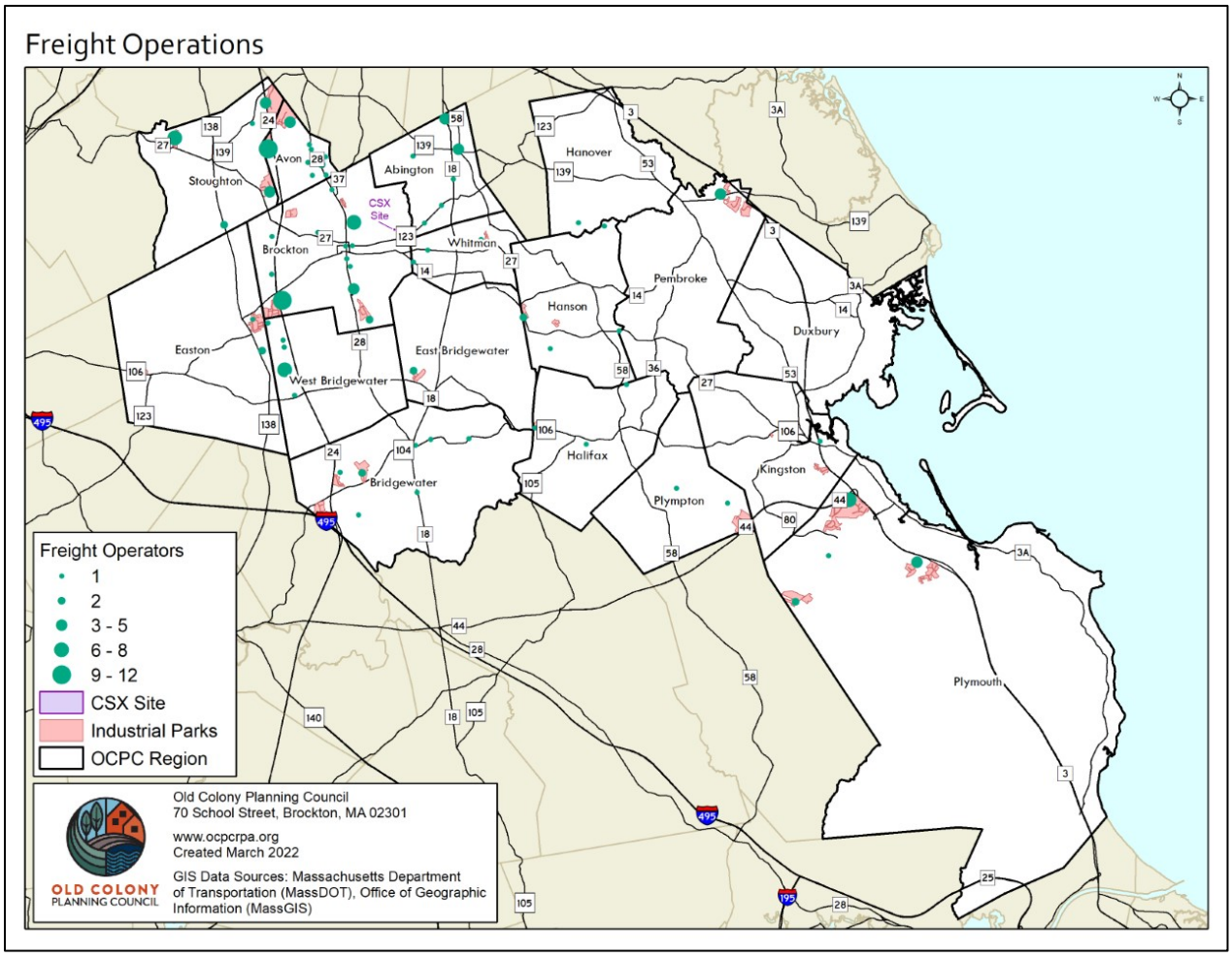
c. Freight Providers in the Old Colony Region

Freight providers and their locations within the Old Colony Region are based on a number of sources including commercial business listings, public directory listings, and industrial park listings was compiled for this study. The Old Colony Comprehensive Economic Development Strategy (CEDS) Report was utilized to supplement information on industrial parks and known providers. Figure 14 shows the locations of freight operators and distribution centers in the Old Colony Region as well as industrial parks. Figure 14 also shows the location of the CSX site on Montello Street (Route 28) in Brockton. The CSX site on Montello Street is the former Brockton freight yard, which is currently vacant. This facility had acted as a secondary freight rail facility, and it once served regional markets in southeastern Massachusetts. CSX still uses the Middleboro/Lakeville line that passes through Brockton to ship freight despite that this facility is no longer in use. The freight trains share the line with passenger rail. There has been a number of discussions for re-use of the former Brockton freight yard, including a study by the Donahue Institute. Regarding the use of this site for trucking and shipping, there are a number of physical constraints for trucks in the road network surrounding the site, including low bridges as well as turning radii constrictions at Brockton downtown intersections.

Figure 14 shows that most of the locations for freight operations in the region are clustered along important highway corridors including Route 24 in Avon, Stoughton, Brockton, West Bridgewater, and Bridgewater. Route 18 in Abington, Whitman, and East Bridgewater serves as a truck freight corridor in the region parallel to Route 28 and Route 24. In addition to these routes providing north south travel, Route 27, Route 123, Route 106, and Route 104 provide east west truck freight access through the region. Brockton downtown represents a bottleneck for both Route 27 and Route 123 as trucks navigate low bridges as well as restrictive turning radii through the downtown.

In the eastern section of the Old Colony Region, Route 3 is a major freight corridor with clusters of providers and industrial parks in Kingston, Plympton, and Plymouth. Other important truck freight routes in this part of the region include Route 3A, which parallels Route 3 along the coast, and Route 44 for east west travel.

Figure 14 - Freight Operators and Distribution Centers in the OCPC Region



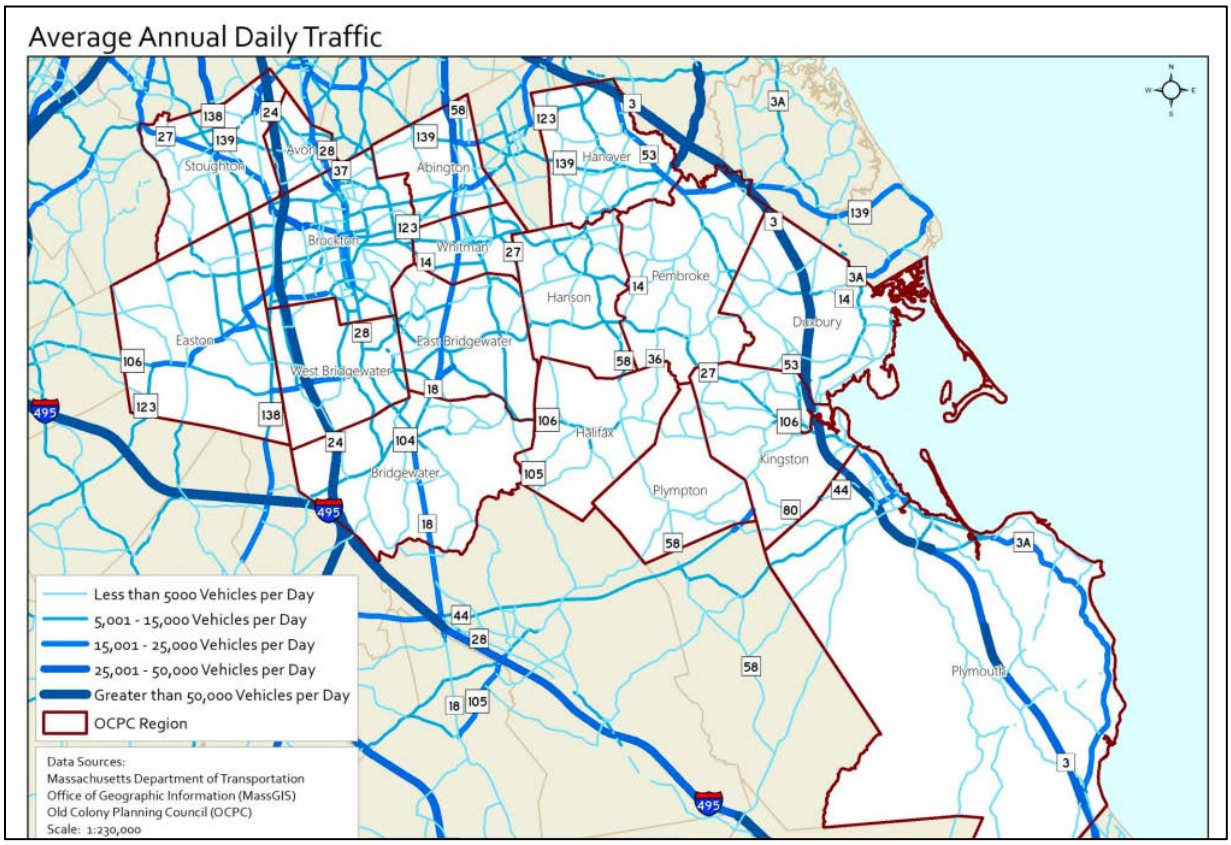
d. Highway Network and System Constraints Bottlenecks and Congestion

OCPC compiles historic traffic count volumes for the highway network that have been taken by OCPC staff as well as other sources, including MassDOT. OCPC produces the *Old Colony Traffic Volumes Report*, which lists the locations and traffic counts it compiles. This report includes calculations of average growth factors (Section VI, Traffic Growth Rate) for the region's state numbered routes. Traffic volumes have remained static or increased slowly over the short term (the past five to ten years), according to the report. There has been some decrease in volumes over the short-term at some specific locations and regional traffic growth can vary from route to route, with modest increases in areas that have experienced growth in retail and commercial development. Some areas that experience developmental growth can experience spikes in traffic. The trend for growth over a longer period (15 years) based on counts compiled in the OCPC Traffic Volumes Report has been at 0.84 percent per year. This is rounded up to a one percent growth in traffic per year.

Traffic growth within a highway corridor can be attributed to the influences of land development along the highway or in proximity. As businesses continue to locate along arterials, the function of these corridors shifts from mobility to access for land use, which increases vehicle trip generation. These vehicle trips, many of them passenger vehicle trips, exacerbate congestion and bottlenecks, which in turn impeded truck and freight movement on the highway network. Fluctuations and changes in the

overall economy also influence job growth and retail and commercial activity. Volatility in the price of gasoline can also bring about a decrease in auto use and number of trips and cause a switch to transit use. Figure 15 illustrates the traffic volumes on the regional highway network in the Old Colony Region. The highway corridors in the Old Colony Region with the highest traffic volumes are also those key highway corridors where freight operators are located. Route 24 and Route 3 have the highest daily vehicle volumes in the region. Route 24 traverses through Brockton, Avon, and West Bridgewater and Route 3 traverses Plymouth, Kingston, Duxbury, and Pembroke. These two routes are key truck freight corridors, and they both have the highest daily volumes (greater than 50,000 vehicles per day). Route 27 in Brockton, Route 139 in Stoughton (in the vicinity of Route 24), Route 28 in Brockton, Route 106 in West Bridgewater, and Route 18 in Abington all have heavy daily vehicle volumes (25,000 to 50,000 vehicles per day). These highways are also key truck freight corridors. Figure 14 (Freight Operation Locations in the Old Colony Region) shows that these highways have clusters of freight and trucking providers located within their corridors. Other state numbered routes in the region that are key to freight movement, which have 15,000 to 25,000 vehicles per day, include: Route 28, Route 27, and Route 138 in Stoughton; Route 123 and Route 106 in Easton; Route 123 in Brockton; Route 18 in Bridgewater, East Bridgewater, and Whitman; Route 25 (I-495) in Plymouth; Route 44, Samoset Street (Old Route 44), in Kingston; Route 3A in Plymouth; and Route 139 in Pembroke.

Figure 15 - Average Annual Daily Traffic in the OCPC Region*



*Source: Old Colony Traffic Volumes Report 2021

A Congestion Management Process (CMP) was developed for the Old Colony Region to reduce congestion, improve mobility, and improve access to essential services. The Old Colony CMP includes federal-aid classified roadways in the regional road network within the seventeen OCPC communities.

The Old Colony CMP is designed to identify key facilities that demonstrate congestion, excessive delays, and circulation problems. Congestion on a transportation facility can be defined as the level of performance that is deemed unacceptable due to traffic interference. The purpose of the Congestion Management Process (CMP) is to identify congested locations, determine the causes of congestion, develop strategies to mitigate congestion, evaluate mitigation strategies, and propose alternative strategies that best address the causes and impacts of congestion. The CMP also helps track and evaluate the impact of previously implemented congestion management strategies.

The volume to capacity ratio (V/C), which is based on the relationship between a facility's theoretical capacity to the actual volumes utilizing the system, is an important performance measure utilized in the congestion management process. The capacity of a road or facility can be thought of as its ability to process traffic, measured in both the physical space available and in time, or the speed in which vehicles can travel (how quickly, measured in time, the vehicle traverses the facility). Therefore, the higher the volume to capacity (V/C) ratio, the more congestion exists. A V/C ratio of 0.80 or above is used as a threshold for screening congested facilities.

Table 5, which is based on the Old Colony Congestion Management Process (CMP) 2019 Year-End Report, lists the state numbered routes in the Old Colony Region considered congested based on a volume to capacity (V/C) ratio equal to or greater than 0.80. Table 6 lists other arterials or major collectors without state route designation that have a V/C ratio of 0.80 or higher.

Table 5 - State Numbered Locations with a V/C Ratio of 0.80 or Higher

Route	Community	Street	Location	ADT	V/C Ratio
18	Abington	Bedford Street (Route 18)	S of Randolph Street (Route 139)	28,390	1.00
24	Avon	AmVets Memorial Highway (Route 24)	S of Harrison Boulevard	125,982	1.18
24	Bridgewater	AmVets Memorial Highway (Route 24)	N of Interstate 495	98,865	1.00
24	Brockton	AmVets Memorial Highway (Route 24)	At West Bridgewater Town Line	105,251	1.00
24	Brockton	AmVets Memorial Highway (Route 24)	N of Belmont Street (Route 123)	114,015	1.07
24	Stoughton	AmVets Memorial Highway (Route 24)	S of Lindelof Avenue (Route 139)	118,224	1.11
24	West Bridgewater	AmVets Memorial Highway (Route 24)	At Bridgewater Town Line	104,099	1.00
28	Brockton	Main Street (Route 28)	N of Brookside Avenue	30,282	1.00
53/139	Pembroke	Columbia Road (Route 53/139)	At Hanover Town Line	30,000	1.00
106	West Bridgewater	West Center Street (Route 106)	Between Route 24 Ramps	15,006	1.00
106	West Bridgewater	West Center Street (Route 106)	E of AmVets Memorial Highway (Route 24)	28,776	1.00
106	West Bridgewater	West Center Street (Route 106)	E of West Street	29,325	1.00
106	West Bridgewater	West Center Street (Route 106)	W of Howard Street	31,766	1.00
106	West Bridgewater	West Center Street (Route 106)	W of Lincoln Street	30,436	0.86
106	West Bridgewater	West Center Street (Route 106)	W of North Elm Street	30,702	0.86
123	Brockton	Belmont Street (Route 123)	W of High School Service Drive	29,096	0.82
138	Stoughton	Washington Street (Route 138)	S of Wyman Street	36,269	1.02
139	Pembroke	Church Street (Route 139)	E of Water Street	28,288	1.00

Table 6 - Local Locations with a V/C Ratio of 0.80 or Higher

Community	Street	Location	ADT	V/C
Avon	Harrison Boulevard	E of AmVets Memorial Highway (Route 24)	31,141	1.00
Avon	Harrison Boulevard	W of AmVets Memorial Highway (Route 24)	32,387	1.00
Plymouth	Samoset Street	W of Algonquin Terrace	30,417	0.86
Plymouth	Samoset Street	W of Pilgrim Highway (Route 3)	36,054	1.01

Rest Locations for Long-Distance Truck Drivers

MAP-21, which became effective on July 6, 2012, included a section (1401) known as "Jason's Law". This section required that the states address the commercial motor vehicle parking shortage at public and private facilities along the National Highway System (NHS).[2] The specific requirements include:

- Evaluate the capability of each State to provide adequate parking and rest facilities for commercial motor vehicles engaged in interstate transportation.
- Assess the volume of commercial motor vehicle traffic in each State.
- Develop a system of metrics to measure the adequacy of commercial motor vehicle parking facilities in each State.

Recent Studies completed for the FHWA that analyze truck parking adequacy and safety, have documented potential truck traffic growth on the Nation's highway system, along with severe truck parking shortages in some regions, a lack of adequate information for truck drivers about parking capacity at existing facilities, and other challenges associated with routing and delivery requirements and accommodating rest periods required of truckers such as electric hook-ups and showers. Anecdotal evidence from the trucking industry backs the study findings. Figure 16 shows the availability of truck parking in Massachusetts according to the Massachusetts Freight Plan.

FHWA studies on truck parking cited challenges in determining and identifying the need for truck parking and the locating of truck parking:

- There is often a disconnect between perceived need and actual need for truck parking. Parking on a shoulder or ramp does not always correlate to a truck parking shortage.
- There is a significant cost to construct new private facilities, and there must be an adequate return on the investment to offset initial land acquisition and capital costs as well as recurring costs such as operations and maintenance. Permitting for new and expanded facilities can be expensive and time consuming.
- Shippers have no mechanism to monetize their investment of additional parking facilities on site, particularly when it comes to addressing the costs of security, additional liability insurance, and maintenance of paved parking areas. The burden of providing truck parking facilities more than often falls on the truck stop industry and on public highway authorities.
- Discussions of truck parking adequacy rarely include considerations of driver amenities, such as showers, fuel, food, and electrical hook-ups.

Evaluations of the availability of truck rest stops for long distance truck drivers show that the states with the most severe challenges in providing availability include states along the east coast corridor: New Jersey, Pennsylvania, New York, Virginia, Maryland, South Carolina, Connecticut, Massachusetts, as well as those outside the corridor including Tennessee, Kentucky, Illinois, Iowa, Minnesota, Wisconsin, California, Washington, and Oregon. The states of New Hampshire, Massachusetts, Vermont, and Rhode Island have the fewest spaces at private truck stops with showers available.

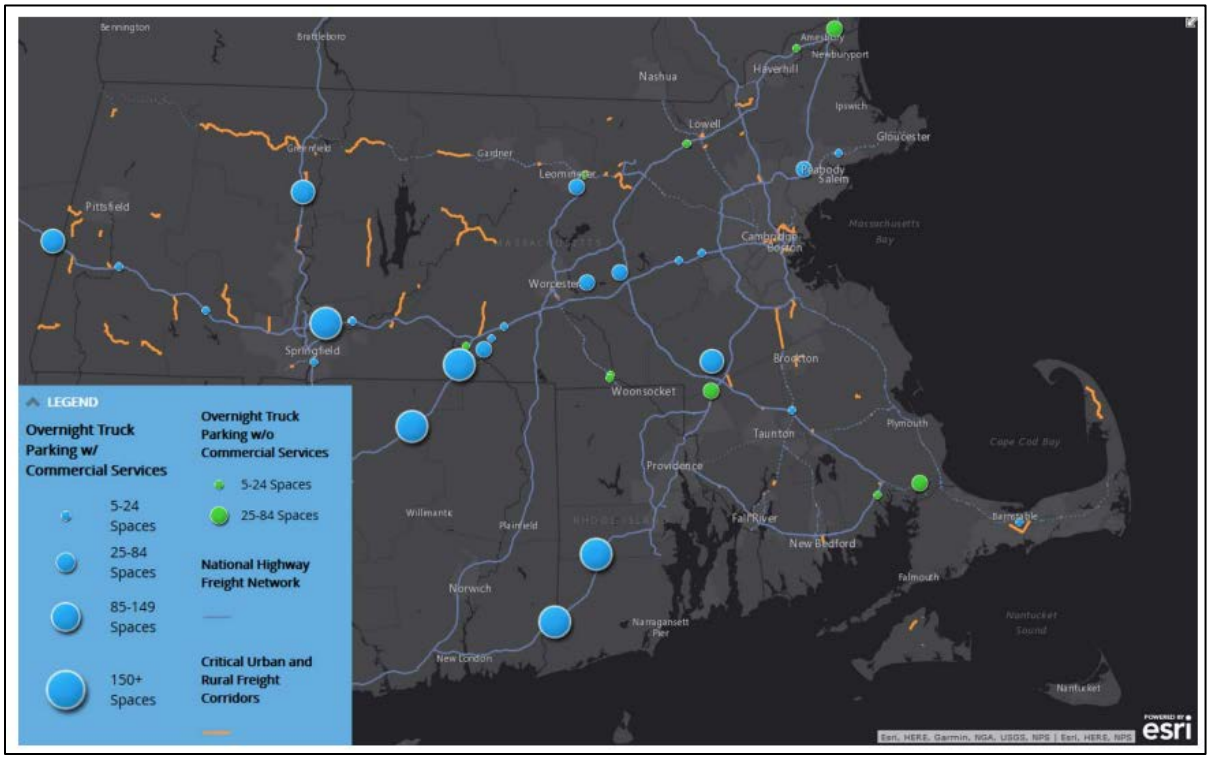
According to the Massachusetts Freight Plan, truck stops serve critical functions. Under the guidelines of the Federal Motor Carrier Safety Administration (FMCSA), a truck driver is limited to 11 hours of driving followed by 10 hours of rest. Drivers are required to find a legal place to pull over when the time

[2] Jason's Law was named in honor of Jason Rivenburg who was robbed and killed in March 2009 when he had to seek accommodations for his rig at an abandoned gasoline station where he stopped because truck rest stops in the area were unavailable.

limit approaches. It is illegal to pull over and rest on highway shoulders. Trucks can park at MassDOT-owned service areas and private truck stops, as well as in some private parking lots. Some truck stops also provide repair and maintenance facilities as well as an opportunity for owners and drivers to do their own maintenance. Truck stops also provide food and fuel for long trips.

Figure 16 shows that most of the overnight trucking locations are along the major interstate routes in Massachusetts including I-90, I-95, I-495, I-190, I-84, and I-91. The Old Colony Region has two locations at the junction of I-495 and Route 24 in Bridgewater, one on the northbound and one on the southbound side of Route 24. Each of these locations in Bridgewater have parking striped for ten tractor trailers to park although trucks also park along the edge of the lot when the spaces are full, resulting in approximately 20 tractor trailers parking overnight at each of these locations almost every night. Both of these locations offer fuel, food, and a rest room, but lack a shower and electric hook-up availability.

Figure 16 - Overnight Trucking Locations in Southern New England



Truckers often find overnight accommodations allowed at other locations in the Old Colony Region. According to a website specializing in trucker travel information, the following areas are available to truckers for overnight accommodation in the Old Colony Region with varying amenities:

- Route 24 NB Service Plaza – Between Exits 22 (Route 104) and 24 (Interstate 495) in Bridgewater (Truck Parking, Overnight Parking, Fuel, Restrooms, Food, Convenience Store, ATM).
- Route 24 SB Service Plaza – Between Exits 22 (Route 104) and 24 (Interstate 495) in Bridgewater (Truck Parking, Overnight Parking, Fuel, Restrooms, Food, Convenience Store, ATM).
- Dunkin Donuts, 600 Page Street, Avon (Truck Parking, Food, Restrooms), near Route 24, Route 139, and Route 28.

- Wal-Mart, 700 Oak Street, Brockton (Truck Parking, Food, Restrooms), near Route 24, Route 28, and Route 27.
- Alltown Fresh, 22 Long Pond Road, Plymouth (Truck Parking, Overnight Parking, Fuel, Food, ATM), near Route 3.
- Route 3 Service Plaza – Exit 13 (Long Pond Road), Plymouth (Truck Parking, Overnight Parking, Restrooms, Food, ATM)
- Walmart – 300 Colony Place, Plymouth (Truck Parking, Overnight Parking, Restrooms, Food/Drinks), near Route 3 and Route 44.

In addition to rest stops, The Massachusetts Department of Transportation (MassDOT) provides the web page Mass511.com to the traveling public. This page is a free traveler information service providing key resources for commercial vehicle operators. It provides live traffic reports, commuter service information, and personalizes trips in Massachusetts for traveling needs. The 511 website provides information about: Traffic including freeway travel times and freeway speeds along specific routes. It will also notify the user of road construction, traffic alerts or accidents ahead. The website includes incidents, accidents, road closures, construction, lane closures, real-time live traffic cameras, weather alerts and forecasts, travel times and traffic speeds. all viewed on an interactive live traffic map. Users sign up and create an account to personalize routes and notifications.

Other mapping and navigation apps are also available via smart phone or internet, providing truckers with information on the closest truck stop, available parking, weigh stations, fuel stops, trip planning and truck-safe routing. These apps also provide truckers advice on safe navigation based on truck dimensions as well as truck restricted routes and tolling. Some of these trucker apps like Mass511 provide drivers with real time traffic and weather conditions, enhancing safety and drive time. State governments have also been improving technology with weigh in motion and enhanced inspection technology to decrease delay times for truck inspections.

Other improvements that enhance delivery time in the supply chain include the focus on the “first mile” and “last mile” of shipment, which involves frequent shipments made by trucks and vans smaller than tractor-trailers, which make distribution shipments from factory, farm, or mine to distribution center, or from distribution center to the store, home, or business. Smartphones and GPS systems providing real-time traffic and routing information can actually impede efficiency if they direct drivers to roads not designed for use by trucks, as these shipments are often made on local and connector roads a well as arterial. The first and last mile shipment also includes issues around parking at loading zones and docks at the destination. Guidance on best practices in the management of loading zones is sometimes required for communities for properly accommodating trucks while ensuring the safety of passenger cars, pedestrians, and cyclists around the zone.

e. Truck Crashes in the Old Colony Region

Crashes in the Old Colony Region involving heavy vehicles for the four-year study period including 2018, 2019, 2020, and 2021 were compiled utilizing the Massachusetts Department of Transportation (MassDOT) Crash Data Portal. MassDOT obtains and compiles crash data from the RMV's collection of state and local police crash reports, which is made available to the public for analysis purposes. Figure 17 shows the crashes in the Old Colony Region based on the crash data compiled for the analysis period (2018 to 2021).

Figure 17 - Heavy Vehicle Crashes in the OCPC Region

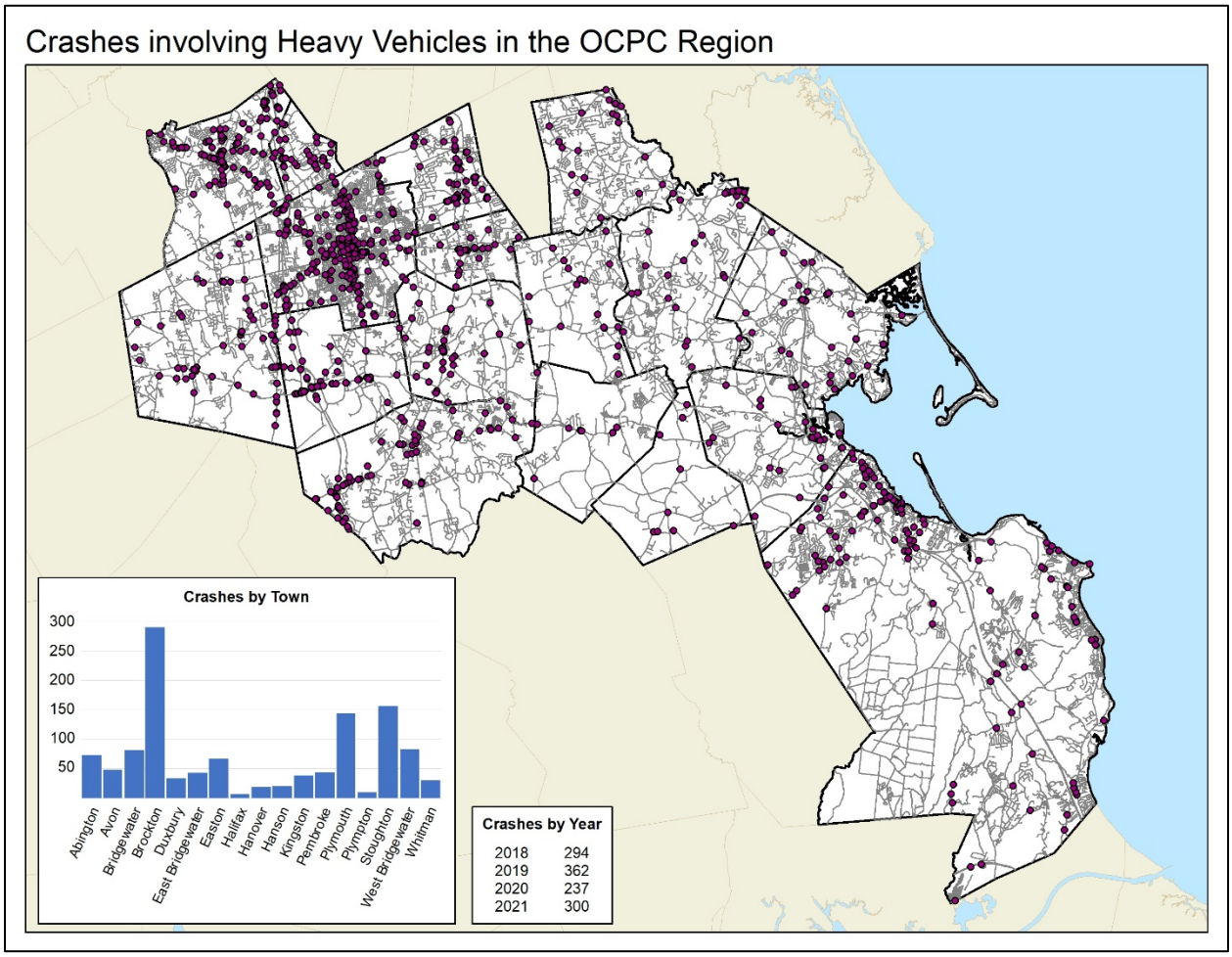


Figure 17 shows that Brockton had the most truck crashes with 290, followed by Stoughton with 156 and Plymouth with 144. Halifax had the least with seven and Plympton had ten truck crashes within the study time period. The region experienced most truck crashes in 2019 with 362 and the year 2021 was second with 300 truck crashes. The region experienced one fatality as a result of truck crashes within the four-year period. This occurred in 2021 at the intersection of North Main Street and Huntington Street in Brockton. A pedestrian was struck and killed by a tractor trailer as the truck was making a left turn from North Main Street to Huntington Street. The crash occurred after sunset. There was a total of 1,193 truck crashes in the region within the three-year period, 136 of these crashes resulted in personal injury, with one fatality.

Figure 17 shows that many of the crashes are clustered along major state route corridors. These clusters are located in Brockton, Stoughton, Easton, Abington, Avon, East Bridgewater, Bridgewater, and West Bridgewater within the Route 24 corridor. Along the Route 3 corridor, the truck crashes are clustered in Plymouth and Kingston. The truck crashes are clustered along Route 24 and the Route 24 interchanges in Brockton, Avon, West Bridgewater, and Bridgewater, Route 123 in Brockton and Easton, the Route 28 corridor in Brockton and Avon, Route 27 in Brockton and Stoughton, the Route 138 corridor in Easton and Stoughton, the Route 106 corridor in Easton and West Bridgewater, and the

Route 18 corridor in Bridgewater, East Bridgewater, Whitman, and Abington. In Plymouth and Kingston, the truck crash clusters are located along Route 3 and its interchanges and along the Route 3A corridor. Table 7 shows the truck crashes that occurred involving single vehicles, such as tractor trailers, hitting an object, a fixed object such as a utility pole or parked car. Table 7 also shows the truck crashes hitting bridges and overheads, pedestrians, and bicycles.

Brockton and Plymouth had the most trucks hitting fixed objects along the side of the road (mostly occurring when trucks are maneuvering turning movements) with Brockton at 38 and Plymouth at 32. Stoughton had 29 crashes involving trucks hitting objects along the side of the road. There was a total of 201 (17 percent) truck crashes that were the result of this type of crash. Brockton and Kingston had the most truck crashes with bridges. In Brockton, the bridge over Court Street was hit nine times in the four-year period. In Kingston, the Landing Road Bridge was hit five times in the four-year period. There were seven truck crashes with pedestrians (including the fatal pedestrian crash in Brockton), and there were two truck crashes with bicycles within the four-year study period.

Table 7 - Truck Crashes in the OCPC Region by Type of Crash

Community	Single Vehicle Truck Crash hit fixed object (parked car, sign post, etc.)	Truck Crash with Bridge or Overhead	Truck Crash with Pedestrian	Truck Crash with Bicycle
Abington	10	4	0	0
Avon	5	0	0	0
Bridgewater	14	0	0	1
Brockton	38	11	5	0
Duxbury	10	1	0	0
East Bridgewater	6	0	0	0
Easton	12	0	0	0
Halifax	2	0	0	0
Hanover	4	0	0	0
Hanson	6	0	0	0
Kingston	6	6	0	0
Pembroke	2	1	0	0
Plymouth	32	1	2	1
Plympton	2	0	0	0
Stoughton	29	1	0	0
West Bridgewater	14	1	0	0
Whitman	9	1	0	0
Total	201	27	7	2

f. Physical Truck Constrains in the Old Colony Region

Physical constraints and impediments to trucks exist within the roadway network in the Old Colony Region at various locations. Some of these impediments stand out as they slow down traffic, create bottlenecks, and raise safety concerns. These locations present freight operators with chronic constraints and impact delivery time for customers. Table 8 lists truck constraint locations in the Old Colony Region.

Table 8 Truck Constraints in the Old Colony Region

Community	Location	Physical Constraint	Project
Avon	Harrison Boulevard/Pond Street intersection	Congestion and queuing on Pond Street to Harrison, back-ups to Bodwell. Weaving and lane changes on Harrison Boulevard from Route 24 ramps to Pond Street. Vehicles turning left on this approach back-up on Harrison Boulevard impeding through traffic and creating hazardous conditions.	MassDOT Project Number 608086 (under construction)
Avon	Route 28/East Spring Street/West Spring Street intersection	Turning radii constraints for trucks turning in and out of east Spring Street to and from Route 28. The project is under design and expected to be programmed in FFY 2026 of the FFY 2023-2027 TIP.	Road Safety Audit Completed Project Number 611979.
Bridgewater	Bridgewater Center	Turning radii limited for trucks turning into Bridgewater Center from Plymouth Street and from North Main Street. In addition, the angled parking limits sight visibility of pedestrians in the Town Center.	Pre-PRC*
Bridgewater	Pleasant Street (Route 104) at Scotland Boulevard	Limited turning radii for trucks entering and exiting Scotland Boulevard to and from Pleasant Street (Route 104) resulting in trucks hitting utility poles at the side of the road.	
Brockton	-Elliot Street -Route 27 Court Street -Route 123 Centre Street -School Street -Crescent Street	Limited height distances for trucks beneath the railroad viaduct in Brockton downtown. Court Street had the highest number of truck crashes.	
Brockton	-Route 27 Court Street at Route 28 Montello Street -Route 123 Centre Street at Route 28 Court Street -Main Street at Pleasant Street and Court Street -Route 123 Belmont Street at Main Street -Legion Parkway at Warren Avenue -Route 123 Belmont Street at Warren Avenue	Limited turning radii along at various intersection locations in Brockton downtown. Tractor trailers often end up jumping the curb on to the sidewalk when making turning movements at these intersections.	
Kingston	Landing Road	MBTA overpass	
Stoughton	-Central Street at Tosca Drive and Canton Street (Route 27)	Limited turning radii for trucks in and out of Tosca Drive. The Intersection is skewed and misaligned. Funded in FFY 2023 for construction.	MassDOT Project Number 608279
Stoughton	Island Street at Central Street (route 27)	Limited turning radii for trucks in and out of Island Street.	
Whitman	Route 18 at Route 14	Right turn radii constricted resulting in trucks hitting utility poles at the side of the road. Reconstructed began in winter 2019 and is now complete.	Project Complete

**Pre-PRC = Not yet accepted by the MassDOT Project Review Committee*

Table 8 includes key truck routes in Brockton Downtown that pass under the railroad viaduct. This rail line carries MBTA passenger rail as well as CSX freight. The roads beneath the rail include Elliot Street, Court Street (Route 27), Centre Street (Route 123), School Street, and Crescent Street (Route 27). The viaducts were built in the late 1800s and over the years, as trucks became larger, the height of the viaducts became an issue for moving freight beneath the rail line. The viaduct bridges in Brockton are all included in MassDOT's Historic Stone Arch Bridges List (as well as the Lincoln Street/Railroad Street pedestrian underpass). MassDOT has two criteria for inclusion on the list: 1. The bridge must be listed in MassDOT's computerized statewide bridge database and, therefore, must possess a MassDOT's Bridge Department Number (BDEPT), and 2. MassDOT must possess evidence that the bridge has been individually listed in, or has been found eligible for individual listing in, the National Register of Historic Places.

The height of the viaducts (at their highest point) is different at each location. The viaduct over Elliot Street is 13 feet 6 inches at its highest point over the road and 11 feet at the edge of the road; the Centre Street (Route 123) viaduct is 14.0 feet high at the center and 11 feet 6 inches at the edge of the road; the viaduct on Court Street is 13 feet 6 inches high at the center of the street; the School Street viaduct is 12 feet 6 inches high at the center of the road and 10 feet at the edge of the road; and the Crescent Street viaduct is 15 feet 6 inches high from the center of the road and 12 feet at the edge of the road. These heights are insufficient for many of today's heavy vehicles. These low height restrictions hinder east to west truck traffic in Brockton.

In addition to the low railroad viaduct, truck traffic turning between these major east west routes in Downtown Brockton to north south routes such as Main Street or Montello Street (or vice-versa) are hindered by tight turning radii. Trucks often encroach on other lanes or end up on sidewalks making these turns at intersections along Montello Street (Route 28) and Main Street in Brockton Downtown.

Height limitations on Centre Street (Route 27) Brockton – 14.0 feet at the center, 11 feet 6 inches at the edge of the road

Truck Exclusions

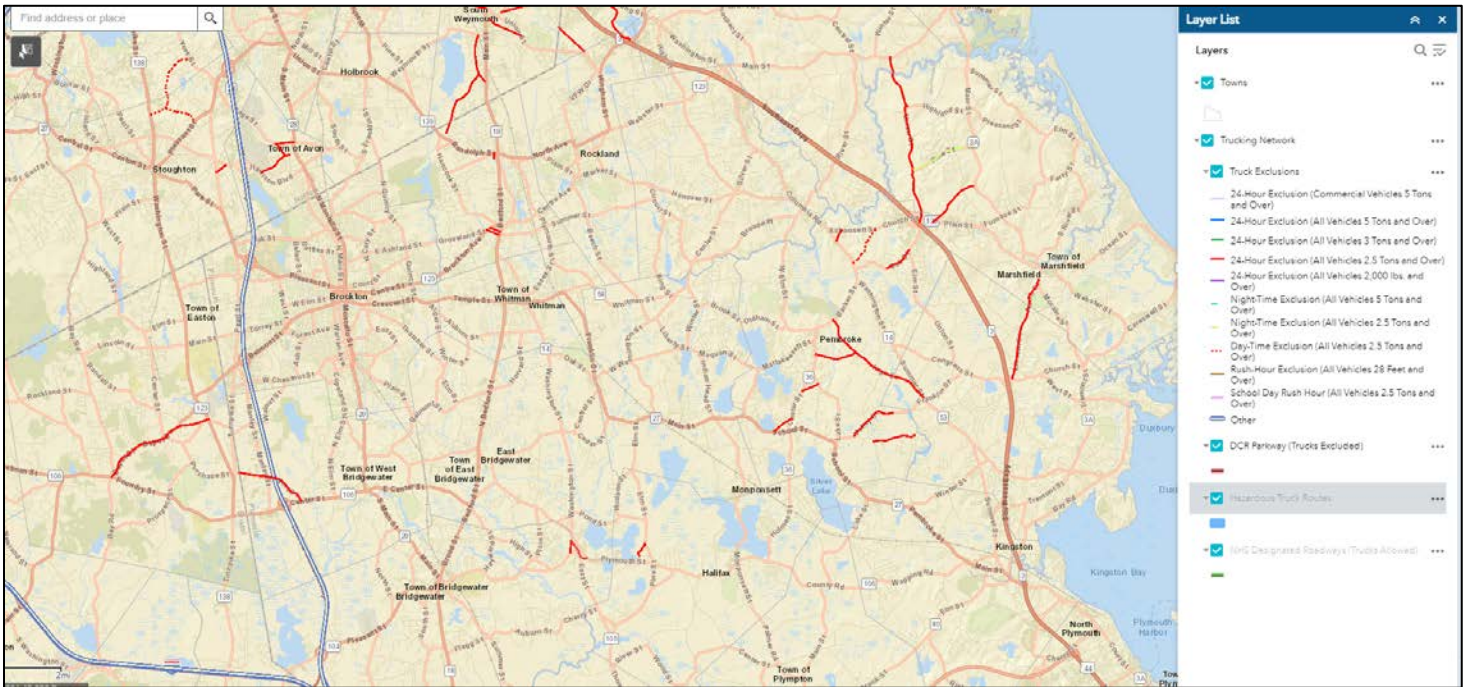
Some roads in the region in residential areas exclude trucks. The MassDOT authorizes truck exclusions in Massachusetts as formally requested by municipalities. The criteria for heavy vehicle exclusion includes that a truck exclusion from a municipal way may be authorized if a suitable alternate route is available. If the alternate route does not lie wholly within one community, the exclusion must have the written support of both communities.

Table 9 lists the truck route restrictions in the Region, based on MassDOT data. The impact of trucks on neighborhoods is an important issue regarding the movement of goods in the region. MassDOT maintains sole jurisdiction over the granting of these exclusions, and grants the exclusions based upon specific criteria. Figure 18 shows the truck exclusions in the Old Colony Region based on MassDOT ARC GIS layers.

Table 9 - Truck Restrictions in the Region

Community	Truck Restriction Street	Exemption From	Exemption To	Exemption Type	Time Restrictions
Abington	Temple Street	Randolph Street (Route 139)	Bates Street	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Abington	Thicket Street	Old Randolph Road	Weymouth Town Line	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Abington	Vernon Street	Washington Street	Brockton Avenue	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Abington	Niles Street	Washington Street	Brockton Avenue	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Avon	West High Street	Page Street	North Main Street (Route 28)	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Avon	Page Street	West High Street	Pond Street	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Avon	Pond Street	West Main Street	Harrison Blvd.	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Bridgewater	Roberts Road	Pond Street (Route 104)	East Bridgewater Town Line	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
East Bridgewater	Old Plymouth Street	Plymouth Street (Route 106)	Bridgewater Town Line	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Duxbury	Lincoln Street	Church Street	Marshfield Town Line	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Duxbury	High Street	Summer Street (Route 53)	Pembroke Town Line	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Easton	Depot Street	Foundry Street (Route 106)	Washington Street (Route 138	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Halifax	Furnace Street	Old Plymouth Street	Elm Street	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Pembroke	Brick Kiln Lane	Schooset Street (Route 139)	Hamilton Drive	All vehicles 2 1/2 tons and over	Day Time
Pembroke	Brick Kiln Lane	Hamilton Drive	Washington Street (Route 53)	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Pembroke	Mill Street	Route 36 (Center Street)	Hobomock Street	All vehicles 2 1/2 tons and over	24 Hours, 7 days
Pembroke	Oak Street	Elm Street	Pleasant Street	All vehicles 2 1/2 tons and over	24 Hours, 7 Days
Pembroke	Water Street	Washington Street (Route53)	Schooset Street (Route139)	All vehicles 2 1/2 tons and over	Day Time
Pembroke	West Street	Route 27 (School Street)	Route 36 (Center Street)	All vehicles 2 1/2 tons and over	24 hrs., 7 days
Pembroke	Valley Street	Plain Street	½ mile east of Duxbury Town Line	All vehicles 2 1/2 tons and over	24 hrs., 7 days
Pembroke	Birch Street	Pelham Street	Harvard Street	All vehicles 2 1/2 tons and over	24 hrs., 7 days
Pembroke	Mountain Avenue	Center Street (Route 36)	High Street	All vehicles 2 1/2 tons and over	24 hrs., 7 days
Pembroke	High Street	Barker Street (Route 14)	Summer Street (Route 53)	All vehicles 2 1/2 tons and over	24 hrs., 7 days
Stoughton	Chapman Road	Central Street	Turnpike Street	All vehicles 2 1/2 tons and over	24 hrs., 7 days
Stoughton	Pine Street	Pleasant Street	York Street	All vehicles 2 1/2 tons and over	Day Time
Stoughton	York Street	Washington Street (Route 138)	Canton Town Line	All vehicles 2 1/2 tons and over	Day Time
West Bridgewater	West Street	West Center Street	Easton Town line	All vehicles 2 1/2 tons and over	24 Hours, 7 Days

Figure 18 – Truck Exclusions in the OCPC Region



g. Future Increases in Freight to 2050

Table 10 shows all freight movement in Massachusetts in thousands of tons shipped for the year 2050 based on the Freight Analysis Framework. Table 10 shows the movement of freight to, from, and through Massachusetts by mode in thousands of tons for 2050. Table 10 shows that 89.21 percent of all goods imported, exported, and shipped within Massachusetts are expected to be shipped by truck, 3.75 by pipeline, 3.84 by multiple modes and mail, 2.98 percent by rail, 0.01 percent by water, and 0.08 percent by air. Shipments by truck are expected to increase in 2050 over 2020 by 5.8 percent

Table 10 - Estimated Massachusetts 2050 Freight Operations by Mode and Tonnage

Mode	Tons	Percent
Air (include truck-air)	290.6	0.08%
Multiple modes & mail	13,399.8	3.84%
Pipeline	13,100.4	3.75%
Rail	10,399.1	2.98%
Truck	311,352.0	89.21%
Water	27.8	0.01%
Other and unknown	456.4	0.13%

IV. Potential Improvements

The primary trucking routes in the Old Colony Region include Route 24, Route 3, and I-495 as trucking remains the primary mode of transportation for the movement of goods in the region and is expected to continue to play this major role into the future. Trucking facilities, warehousing, and industrial parks cluster in the Route 24 corridor and along ancillary highways that serve Route 24. The state numbered route system in the Old Colony Region is vital as trucking facilities and industrial parks are clustered along these routes with easy access to the regional highway network and the national highway network. These include Route 106, Route 104, Route 138, Route 139, Route 27, Route 28, Route 123, and Route 27. State routes important to the Route 3 corridor include Route 3A, Route 27, and Route 139. Freight shipments by truck are expected to grow in the region, therefore constraints in the highway network including limited intersection turning radii, limited bridge heights, and bottleneck congestion will have a negative impact on freight movement in the region. The lack of interstate standards on Route 24, which creates weaving problems and conflicts due to lack of acceleration and deceleration lanes, will continue to have a negative impact on freight movement in the region.

The FHWA offers a series of Transportation Systems Management and Operations improvements as well as Freight Planning Management techniques as potential improvement in the movement of goods in the transportation system. These include:

- Freight Traveler Information Systems
- Truck Parking Information Management Systems
- Weigh-in Motion Systems and Smart Roadside Monitoring
- Arterial Progression Management and Access Management
- Curb Loading Zone Management
- Electronic Credentialing for Drivers and Vehicles
- Off-Peak Deliveries and Demand Management

General improvements to accommodate future freight movement in the Old Colony Region include:

- Intersections - signal timing adjustments and improved signal coordination is needed in key corridors.
- Intersection – limited turning radii at intersections impede truck movement, intersections should be reconfigured for wide truck turns and movements at specific intersections.
- Roadway pavement surface needs to be in a state of good repair (including road/pavement markings and lane markings).
- Traffic flow issues, congestion and bottlenecks, on many of the state numbered routes heavily utilized by trucks should be addressed including Routes 24, 106, 123, Bridgewater Center, and East Bridgewater Center.
- An East-West Truck Route through Brockton is needed (of major concern are the railroad underpasses, and tight turns throughout Brockton, especially downtown)
- Interchanges on I-495 should be improved to provide for longer acceleration and deceleration lanes and to reduce weaving.
- Coordination should be encouraged between the MBTA and the railroad freight operators in the Old Colony Region to increase the Level of Freight/Goods Movement by Rail to help reduce truck traffic congestion.
- The upgrade of Route 24 to interstate standards, including the redesign and reconstruction of interchanges along Route 24, will contribute to the reduction of the potential for rollover incidents involving trucks.
- Encourage side guards on trucks to protect cyclists.

Truck Side Guards/Truck Lateral Protective Device

The USDOT Volpe Center in Cambridge has developed a resource page on truck side guards, also called the truck lateral protective device, to help protect bicyclists from turning tractor trailers. Bicyclists can fall into the exposed space between the front and rear wheels of a truck due to high ground clearance especially when the truck is making a turning movement and suffer fatal crushing injuries. Side guards block this space on a truck and shield bicyclists or pedestrians from being caught underneath the truck's rear wheels. These shields can be retrofitted onto existing trucks or put on new vehicles. According to the USDOT, large trucks comprise four percent of registered vehicles, large trucks are involved in 10 percent of pedestrian and bicyclist fatalities. In 2018, these non-motorist fatalities rose to 541, the highest since 1990. The side guards skirt the entire side of the truck to ground level and can also provide aerodynamic benefits to fuel economy: 4 to 7%. Figures 19 and 20 show the truck lateral protective device.

Figure 19 - Diagram of Truck with Pedestrian & Bicycle Statistics

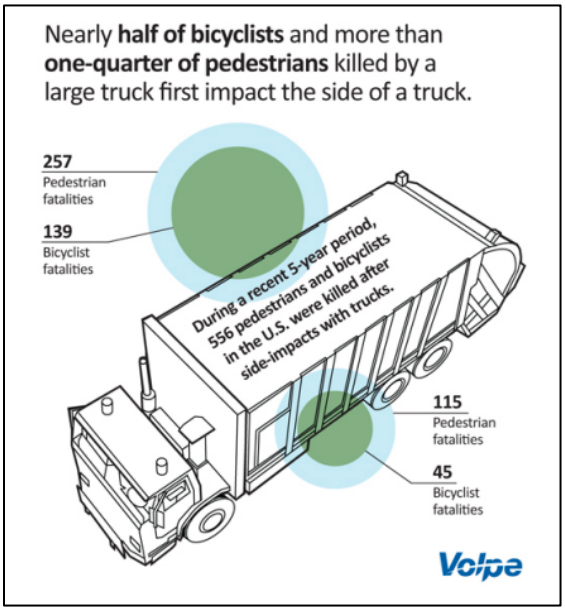


Figure 20 - Truck Lateral Protective Device

V. Funding for Improvements

The MassDOT publication, Project Development and Design Guide, explains the project development process in Massachusetts and design standards for transportation projects. MassDOT initiates new projects through a formal 3-step process using the Massachusetts Project Intake Tool (MaPIT). A GeoDOT account to log into MaPIT is needed to initiate new projects. The implementation of projects includes taking transportation improvements from the concept stage through to design and construction. Funding is an essential element in ensuring the implementation of recommended improvements.

- Step one – The proponent identifies the project need.
- Step two – Using MaPIT, project proponent works with a MassDOT District Office (District 5) or other MassDOT Section to define project scope, costs, timeline, impacts and responsibilities.
- Step Three – The District Office or other MassDOT Section submits project to the Project Review Committee for approval.

The MassDOT project development process includes the following:

- Problem/Need/Opportunity Identification
- Planning (A project planning report is completed)
- Project Initiation
  ✓ Identification of Appropriate Funding

✓ Definition of Appropriate Next Steps
✓ Project Review Committee Action

- Environmental Design and Right of Way (ROW) Process (Includes Plans, Specifications, and Estimates, P, S, & E)
  ✓ Environmental Studies and Permits
  ✓ Right-of-Way Plans
  ✓ Permits
- Programming (Old Colony TIP and State Transportation Improvement Program, STIP)
  ✓ Programming of Funds
- Procurement (Construction bids and contractor selection)
- Construction
- Project Assessment

On sections of roadway owned and maintained by the municipality, the community typically initiates a project (utilizing MaPIT) and provides for project planning and design. Similarly, for state owned facilities, the MassDOT initiates projects and provides planning and design on its section of roads.
A number of funding options are available for project construction as are outlined further. Note that some funding programs, such as the Congestion Mitigation and Air Quality (CMAQ) Program, are for specific types of projects that meet specific criteria, while other programs such as Chapter 90 can be utilized on a much broader range of projects. Federal aid eligible regional transportation needs have outpaced available funding in the Transportation Improvement Program (TIP) for the past several years. All projects on the TIP go through a comprehensive evaluation process to determine priority for funding; therefore, the programming of the TIP is a competitive process. In general, the process to fund a project through the TIP may take up to five years. Due to this limitation of TIP funding, communities are encouraged to seek alternate funding avenues for their high priority projects. Examples of such options include using Chapter 90 funds, developer mitigation, or public/private partnerships with local stakeholders. Funding Programs.

- Capital Improvement Program (CIP) and Local Funding: This program has historically been utilized to help provide the design and engineering of highway projects.
- Exactions (Developer Mitigation Agreements): Communities have increasingly turned to exactions as a means to meet new infrastructure and public service needs. Cities and towns use developer exactions as a strategy to offset the burdens of new development on the community. Exactions contribute to regional equity by ensuring that a new development pays a fair share of the public costs that they generate. Exactions consist of a developer's payment of funds to offset the cost of necessary construction, design, or maintenance of public infrastructure directly connected to the new development. Developers commit to an agreement for funding or constructing off-site improvements in exchange for the approvals to proceed with a development project.
- Bridge Replacement and Rehabilitation Program: This program provides funds for rehabilitation and replacement of any bridge on a public road. Bridges on the federal aid system or off the federal aid system are eligible for these funds.
- Chapter 90: This program provides State funding for highway construction, preservation, and improvement projects that create or extend the life of capital facilities. The level of funding is determined by a formula that is based upon public way mileage, population and level of employment in each community. The Chapter 90 Program is a reimbursement program, as the community must initially pay the cost of a particular project.

- Community Development Block Grant (CDBG) Program: This program provides for the development or expansion of economic opportunities and the provision of decent housing and public facilities. Eligible use of funds includes community development (construction or reconstruction of streets, water and sewer facilities, neighborhood centers, recreation facilities, and other public works).
- Congestion Mitigation and Air Quality Improvement Program (CMAQ): This directs funds toward transportation projects in Clean Air Act non-attainment areas for ozone and carbon monoxide. The Old Colony Region is located in the Boston non-attainment area for ozone.
- Highway Safety Improvement Program (HSIP): This program is a core Federal-aid program with the objective of achieving a significant reduction in traffic fatalities and injuries.
- National Highway Performance Program (NHPP): This program 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 the State's asset management plan.
- Non-Federal Aid (NFA): This program provides state funds for projects that due to federal fiscal constraints would not be able to receive federal funding. Projects under this category are listed for informational purposes only.
- Surface Transportation Block Grant Program (STBG): This is a block grant type program that may be used for any roads (including NHS) that are not functionally classified as local or rural minor collectors. These roads are collectively referred to as federal-aid eligible roads.
- Transportation Alternative Program (TAP): The TAP program provides Federal-aid funding for programs and projects defined as transportation alternatives, including on and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation; recreational trail program projects; safe routes to school projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways.
- Transportation Bond Bill (TBB): This authorizes and directs the MassDOT to expend monies for transportation projects such as reconstruction, resurfacing, rehabilitation or improvements of highways, bridges, and parking facilities. From this, the State will issue either general obligation or special obligation bonds.
- Federal appropriations: These allocate federal funding for federal aid eligible projects.
- Massachusetts Complete Streets Program: This program provides $12.5 million dollars for two years beginning in 2016 to municipalities to implement Complete Streets projects. Municipalities must adopt Complete Streets policies, develop a priority plan, and send staff for training for eligibility.
- MassWorks Infrastructure Program: In September of 2010, the MassWorks Infrastructure Program was instituted to provide a one-stop shop for municipalities and other eligible public entities seeking public infrastructure funding to support economic development and job creation in Massachusetts. The Program is an administrative consolidation of six former grant programs:

    - Public Works Economic Development Grant (PWED)
    - Community Development Action Grant (CDAG)
    - Growth Districts Initiative (GDI) Grant Program
    - Massachusetts Opportunity Relocation and Expansion Program (MORE)

- Small Town Rural Assistance Program (STRAP)
- Transit Oriented Development (TOD) Program

The MassWorks Infrastructure Program is administered by the Executive Office of Housing and Economic Development, in cooperation with the Department of Transportation and Executive Office for Administration & Finance.