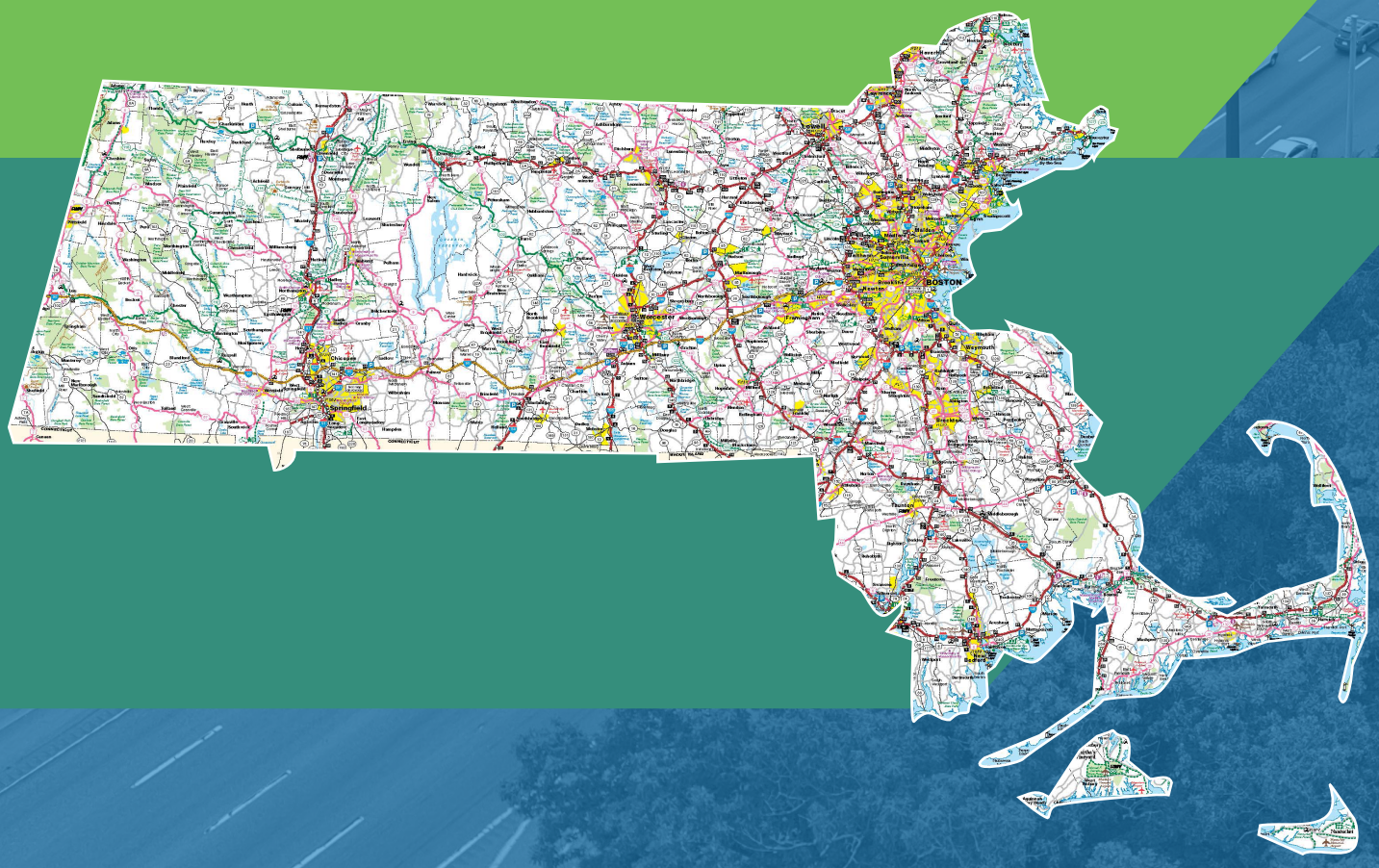
Massachusetts Department of Transportation



Asset Management & Performance Update 2023

The Honorable Michael J. Rodrigues
Chair
Senate Committee on Ways and Means
24 Beacon St, Room 212
Boston, MA 02133

The Honorable Aaron Michlewitz
Chair
House Committee on Ways and Means
24 Beacon St, Room 243
Boston, MA, 02133

The Honorable Brendan P. Crighton
Senate Chair
Joint Committee on Transportation
24 Beacon Street, Room 109-C
Boston, MA 02133

The Honorable William M. Straus
House Chair
Joint Committee on Transportation State
24 Beacon St, Room 134
Boston, MA 02133

Members of the General Court:

Enclosed please find an annual summary report on MassDOT Highway Division transportation asset management.

In 2023, MassDOT published its first update to the state Federal Transportation Asset Management Plan (TAMP) which focuses on National Highway System (NHS) bridges and pavements. State of good repair remains the foundation for the Highway Division investment strategy, and the TAMP informs our existing State Transportation Improvement (STIP) and Capital Investment Planning (CIP) processes. In future iterations of the TAMP, we will extend this framework to additional assets within our portfolio including ancillary structures, pavement markings, and multimodal infrastructure, consistent with our goal to fully represent the needs of Massachusetts roadways, and ensure we have the management processes in place for success.

State of good repair has been the primary focus of asset management, but MassDOT is also considering infrastructure modernization alongside the repair of legacy assets. Roadway assets are integral to safety, mobility, and resiliency goals, and we are approaching roadway modernization with the same analytical approach employed for state of good repair. The goal is to identify programmatic investment levels to support substantive outcomes in these areas. The strategy behind this effort is included in the following pages.

Thank you for the opportunity to update you on our important work and we look forward to ongoing collaboration in the coming year.

Respectfully Submitted,

Jonathan Gulliver
Highway Administrator, MassDOT

Looking Forward

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

The following are key take-aways from each chapter:

PAVEMENT

- For all state-maintained roads (interstates and non-interstates combined), the percentage of "poor" pavement has been **less than 8% (or about 700 lane miles) since 2018**.
- As anticipated last year, condition improvements are leveling off on non-interstate pavement as more complex and expensive projects incorporating complete street elements reach construction.
- MassDOT will continue its focus on maintaining good pavement conditions on all state-owned roadways through the interstate and non-interstate programs. Pavement funding will be reevaluated during the STIP Process to address the gaps in the interstate system and to continue moving towards meeting long term state of good repair.
- The MassDOT Pavement Management Section will continue its research on environmentally friendly modifications to pavement design. The results of this research will be applied in 2024 as MassDOT continues its work on projects that **utilize pavement with higher amounts of recycled asphalt (25-30% RAP binder replacement)** reducing the project carbon footprint.

BRIDGE INVENTORY

- With over **10% structurally deficient bridges,** Massachusetts is out of compliance with federal minimum bridge condition targets, and the consequential penalty has reduced flexibility in the use of federal funds
- The Bipartisan Infrastructure Law (BIL) Bridge Formula Program and the Massachusetts Next Generation Bridge Financing Program (NGB) has introduced approximately **$2.8 B of additional bridge funding.** This is much needed resource to address the aging bridge infrastructure.
- For 2024, MassDOT received an additional **$50M through the State Education and Transportation Fund (ETF).** This will help address the mounting preservation needs to reduce the amount of bridge deck area in poor conditions.

MOBILITY

- In 2023, MassDOT completed **3.5 miles of sidewalks, 1.75 miles of bicycle lanes, and improved 13 crosswalks.** MassDOT also constructed **20 miles of new shared use paths** in 14 cities and towns.
- MassDOT will complete an **inventory of sidewalks and their condition on state owned roads, approximately 1,300 miles.** The inventory will help the state understand the needs more clearly for planning, maintenance, and construction of pedestrian facilities.
- A NextGen Bicycle and Pedestrian Vision Map is being completed to identify where facilities are needed for people to have a safe, comfortable, and convenient option to walk and bike for short, everyday trips across Massachusetts.

SAFETY

- MassDOT spent $10.5 M in 2023 **replacing 227 overhead guide signs, 155 ground-mounted mainline guide signs, 77 ground-mounted secondary road guide signs, and 920 regulatory, warning, and route marker signs** on new and existing structures in three segments of the I-95 corridor.
- The Safety and Intersections Capital Program Working Group has been assembled to meet monthly and includes a cross-functional team of delegates from the HQ Traffic & Safety teams, the Office of Transportation Planning (OTP), District Safety Engineers, Asset Management, GIS experts, and Highway Design.

- Commissioned Road Safety Audits at all the **Top 200 intersections** that exist on roadways under its jurisdiction to guide project initiation based on a data-driven approach to address the highest safety needs.

RESILIENCY

- MassDOT has been at the forefront of resiliency planning through federal funding sources for resiliency-focused projects (PROTECT → Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation) and planning for EV charging through the Federally mandated National Electric Vehicle Infrastructure (NEVI) program.
- An internal working group will be established to gather asset and environmental stressor data to develop a risk-based matrix for identifying asset vulnerability in 2024.
- A PROTECT Grant Application for Climate Adaptation Vulnerability Assessment (CAVA) has been submitted to identify transportation assets (such as low-lying roadways, tunnels, undersized culverts) that are at risk of riverine and coastal flooding over the coming decades.

ANCILLARY STRUCTURES

- MassDOT committed to completing initial inspections of the remaining ancillary structures in 2023.
- Routine inspection of the inventory will begin in 2024. Inspection frequency will be risk-based, with all overhead structures inspected on a four-year schedule.

MUNICIPAL SUPPORT

- MassDOT has been supporting the Municipal Pavement Program, a multi-year initiative authorized by the 2021 Transportation Bond Bill. Similarly, the Municipal Small Bridge program provides funding to municipalities for the replacement, preservation, and rehabilitation of eligible bridges since 2016.
- Municipally owned state numbered routes have **3 times more poor pavement miles** than the MassDOT owned non-interstate system.
- The Municipal Pavement Program has overall awarded approximately **$72M for 70 segments covering over 286 lane miles.** The Program is currently working on FY 2024 projects which includes **17 segments in 15 communities covering 87 lane miles**
- The Municipal Small Bridge Program has awarded **174 grants since 2016 totaling $64.9M.** The latest FY 2024 round awarded 30 Phase 1 grants and six Phase 2 grants totaling **$10.35M.**

TUNNELS

- Massachusetts is **third nationally** in both count and total length of tunnels, and **second in total lane miles** traveling through the tunnels.
- MassDOT is focused on significant completion of the Sumner Rehabilitation project in 2024.
- In 2025 MassDOT plans to advertise a project to rehabilitate the Central Artery North Area (CANA) Tunnel under City Square in Charlestown.

Pavement

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

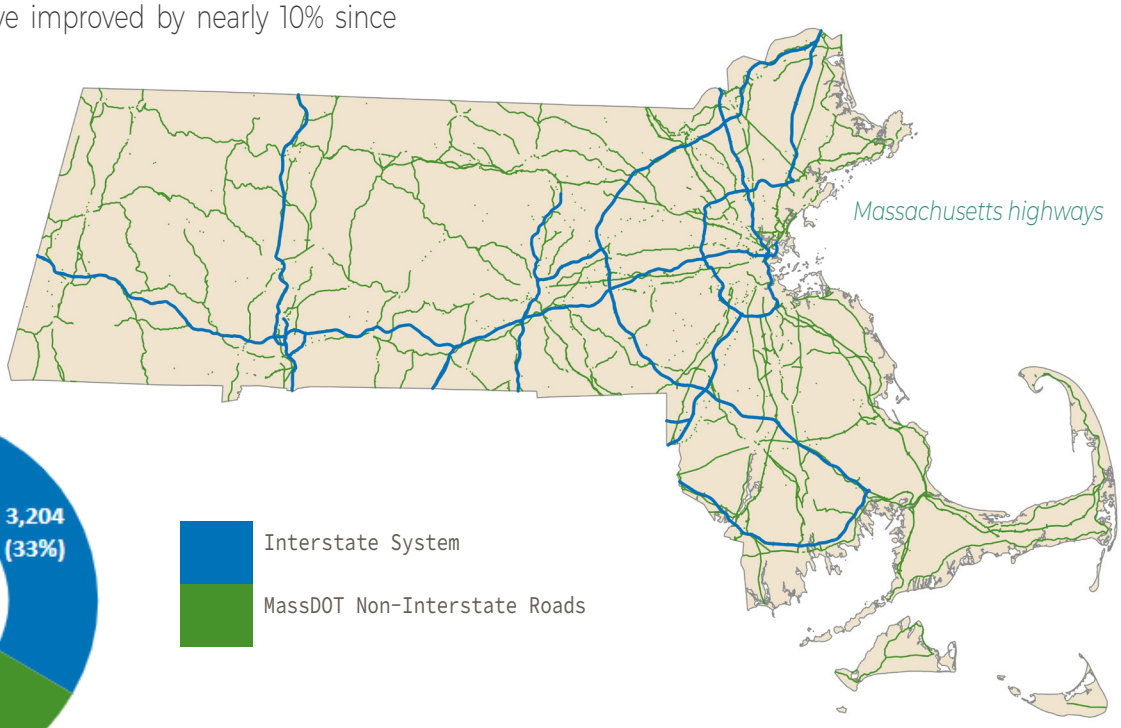
Pavement is a significant Commonwealth asset. MassDOT owns just 13% of the Commonwealth's roads by lane mile yet more than half of annual state vehicle miles traveled are on department-owned facilities. The MassDOT road network includes the interstate system, freeways, and other major roadways which together provide local, regional, and national connectivity. The character of MassDOT-owned roads can vary from limited access highways with heavy commercial traffic, to urban downtowns and rural villages. A well-maintained pavement surface is necessary for all uses, and MassDOT seeks to efficiently manage the entire network to optimum conditions.

CURRENT STATE (2023)

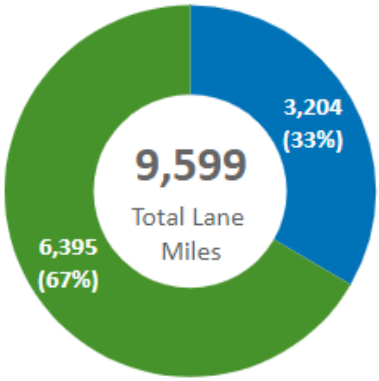
The non-interstate network has been a priority in recent years as the department worked to address worsening conditions and stave off forecasted downward trends. Through a combined federal and state investment, non-interstate conditions have improved by nearly 10% since 2016.

As anticipated last year, condition improvements are leveling off as more complex and expensive projects incorporating complete street elements reach construction.

Roadway ownership involves investments beyond pavement, and nearly all MassDOT pavement projects address state of repair for safety systems (guardrail, barrier), bridges, drainage, and existing bicycle and pedestrian infrastructure. For more comprehensive roadway improvements, moving forward MassDOT will look to prioritize these investments through modernization programs of the Capital Investment Plan (CIP). More information on these strategies is provided in the Mobility, Safety, and Resiliency sections of this report. MassDOT intends to apply the framework of asset management to better quantify modernization needs and make progress toward agency priorities.



Massachusetts highways



Interstate System

MassDOT Non-Interstate Roads

EXAMPLE PROJECT

Lowell- Dracut- Methuen Resurfacing and Related Work on Route 110

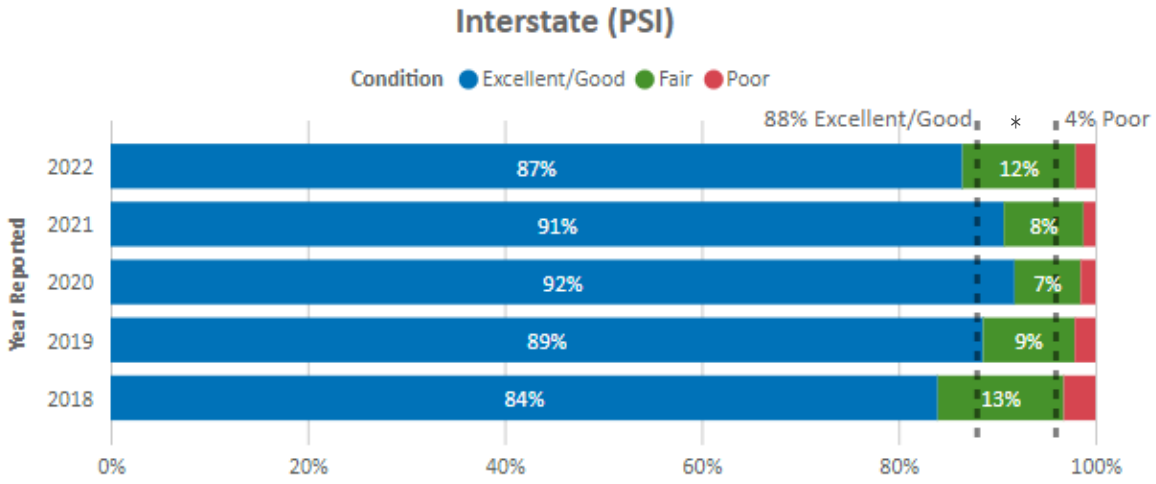
Status: Design

6 miles of non-interstate resurfacing and construction of separated bike facilities.

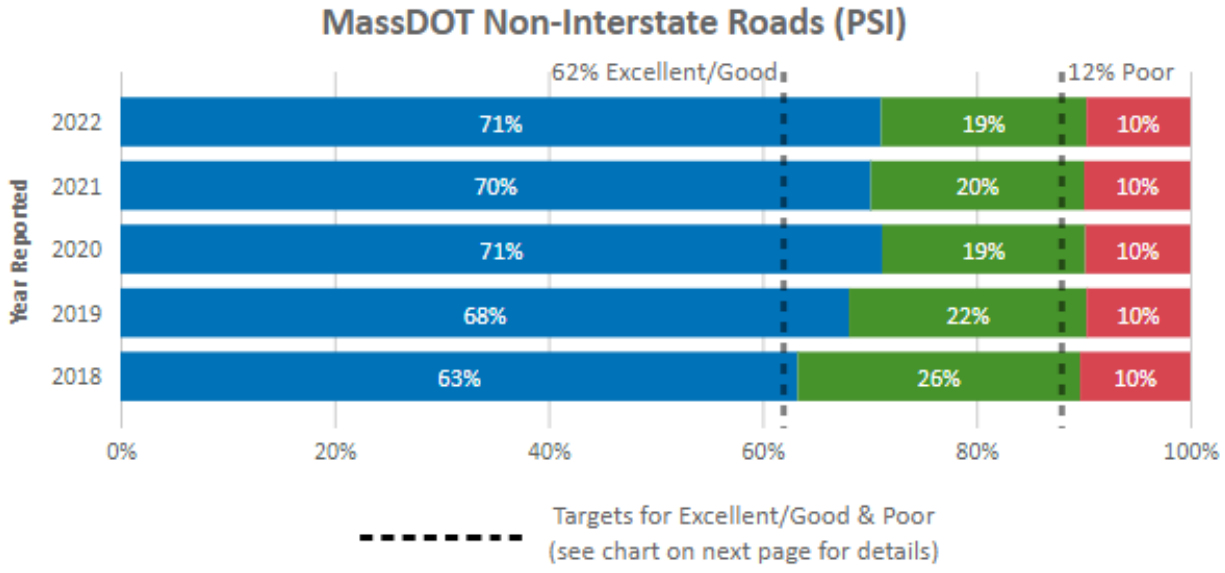
With marginal condition improvements over the past 5 years, interstate pavement has seen a slight decline. Poor pavement quality increased to 2% of the lane miles but was still within the target of less than 4%. Excellent and Good pavement quality decreased to 86.5% of the lane miles, which was slightly lower than the target of 88% and the 2021 condition ratings. However, with several large projects slated for completion by the end of 2023 that include 66.8 lane miles of I-495, MassDOT anticipates these pavement conditions to improve towards the target of 88% Excellent and Good. MassDOT has been able to minimize negative impacts on the interstate using lower-cost preservation treatments.

*The pavement serviceability index (PSI) is the condition rating scale used by MassDOT. Each graph below represents 100% of the lane mile network for interstates and non-interstate roads separately. **

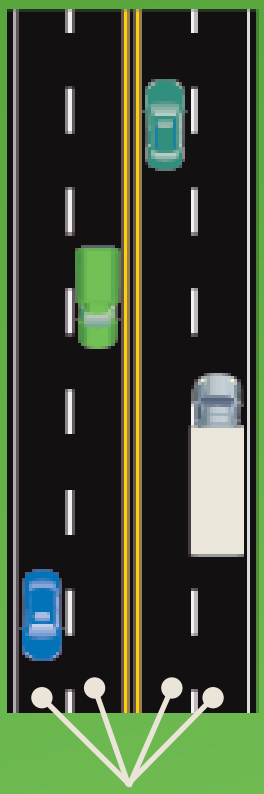
** The 2022 PSI ratings were collected in 2022, then processed and reported in 2023. The 2023 PSI ratings will be available in 2024.*



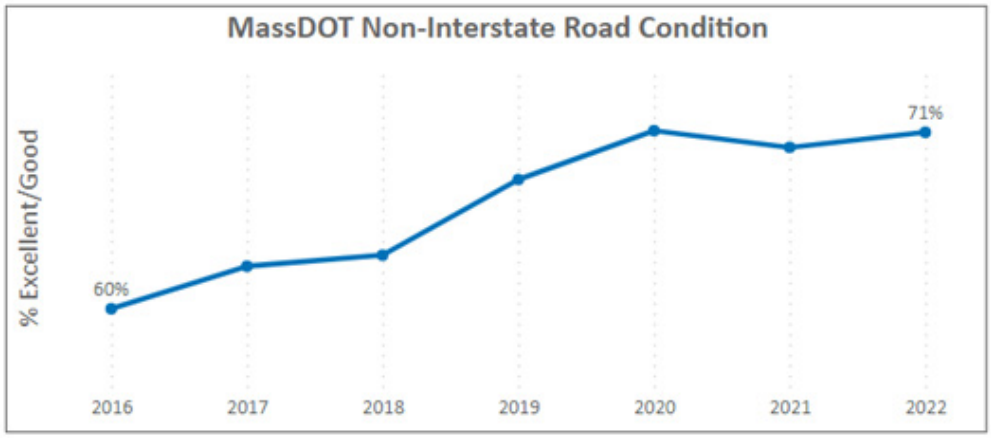
*Note: Fair condition pavement is growing on the Interstate



Most drivers consider roadways by length and distance traveled, regardless of the number of lanes. These are called centerline miles. However, pavement is typically managed in terms of lane miles, which is equivalent to the centerline miles multiplied by the number of lanes on the roadway, e.g., a 1-mile stretch of road with 2 lanes in each direction is equal to 4 lane miles.



4 lane Miles



When timed correctly, preservation treatments can arrest deterioration and extend service life, forestalling more costly interventions. This strategy has been effective in the short term, but increased investment is needed to rehabilitate corridors where preservation has been used to extend service life. MassDOT will evaluate Interstate Pavement program size within the 2025-2029 STIP planning cycle.

For all state-maintained roads (interstates and non-interstates combined), the percentage of "poor" pavement has been less than 8% (or about 700 lane miles) since 2018.

MassDOT is focused on pavement durability, assessing high-performance asphalt pavement overlays for enhanced crack resistance, and on pavement sustainability. Sustainability is the ability to function indefinitely without a decline in quality. While this concept is applicable to the project selection process, it is increasingly applicable to environmental and social concerns. MassDOT is deploying projects that increase recycling, thereby reducing its reliance on virgin materials. Through its ongoing research on the properties of recycled pavement materials, it was concluded that recycling could be increased provided additional quality control processes were implemented. This award-winning research study has resulted in four pilot projects that nearly double the prior recycling efforts. MassDOT's utilization of newer rehabilitation methods has increased the usage of environmentally friendly technologies.

To enhance the sustainability of its pavements, MassDOT completed a multi-year assessment to benchmark the performance of asphalt pavements state-wide. These benchmarks are used to set minimum performance standards which will be applied to all paving materials in future years. Massachusetts was the first state in the country to require warm mix asphalt technology in all asphalt pavements under its specifications. It remains one of few states which require the utilization of admixtures to lower production temperatures. By lowering production temperatures, greenhouse gas (GHG) emissions are reduced at asphalt plants across the state. This benefits the neighborhoods near the asphalt production plants, the haul routes, and all workers involved in the placement of the materials.

To Put it In Perspective...

For pavement, MassDOT has 3,200+ lane miles of interstate and 6,300+ miles of MassDOT-maintained roads. If a typical pavement lasts 14 years, then MassDOT should be rehabbing 1/14th (7.2%) of its lane mileage annually to "keep the system status quo." This is almost 700 lane miles annually. Preservation and rehabilitation actions differ in how the pavement is improved. These are affected by available funding and priority decisions out of routine condition assessment. This variability in condition and improvement options shows why it is important to emphasize the idea of the "right treatment to the right road at the right time" (pavement preservation).

EXAMPLE PROJECT

Milford- Hopkinton- Westborough- Southborough- Marlboro- Hudson- Berlin- Pavement Preservation and Related Work On I-495

Status: Complete

12 miles of Interstate preservation using ultra-thin bonded overlay.

Research continues to advance recycling and preservation, including preservation treatments to assess the viability of photocatalytic pavement treatments to sequester carbon in roadway surfaces. This approach is being assessed to determine whether it can be implemented within MassDOT's ongoing preservation programs.

LOOKING FORWARD (2024)

MassDOT will continue its focus on maintaining good pavement conditions on all state-owned roadways through the interstate and non-interstate programs. As a result of conditions on the interstate dipping slightly below the target in 2023, while non-interstate pavement met or exceeded targets, funding will be reevaluated during the STIP Process to address the gaps in the interstate system and to continue moving towards meeting long term state of good repair.

The MassDOT Pavement Management Section will continue its research on environmentally friendly modifications to pavement design. The results of this research will be applied in 2024 as MassDOT continues its work on the Gardner-Westminster Pavement Preservation project among other projects that utilize pavement with higher amounts of recycled asphalt (25-30% RAP binder replacement) reducing the project carbon footprint.

MassDOT will continue to implement the municipal pavement program in 2024 as described in the Municipal Support section of this report.

Great Barrington Route 71 Complete

Bridge Inventory

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

The standards used for National Bridge Inventory (NBI) define a bridge as a structure or culvert that carries vehicular traffic and has a span length of over 20 feet. Massachusetts has over 42 million square feet of bridge area, the majority of which are owned by MassDOT, and one of the oldest bridge inventories in the nation, with many bridges near or at the end of useful life, and the fourth largest percentage of poor bridges in the nation. The age of the infrastructure, along with environmental conditions and historical investment strategies, have all contributed to the current state.

CURRENT STATE (2023)

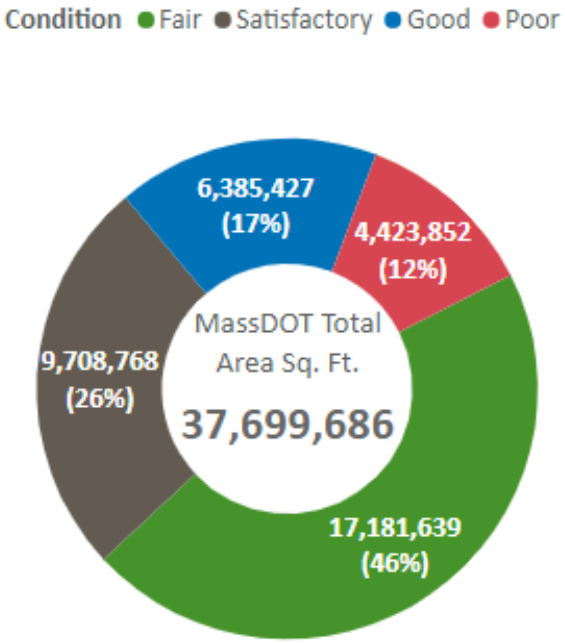
With over 10% structurally deficient bridges, Massachusetts is out of compliance with federal minimum bridge condition targets, and the consequential penalty has reduced flexibility in the use of federal funds. In turn, funds that could be invested in system modernization must instead be applied to the bridge repair backlog.

In addition to impacting funding autonomy, the bridge backlog presents a resource liability for the state. Poor condition bridges require more frequent inspection and reactive repairs. In cases where deterioration has reduced the rated capacity of a bridge, postings and restrictions are used to limit the size and weight of vehicles to a safe level. In extreme cases, bridges are closed to traffic completely. Owning 90% of the bridge area (37.6 million square feet), MassDOT devotes significant resources to bridge inspections, ratings, and maintenance repairs to ensure every MassDOT bridge is safe. As the state looks to modernize the system to increase safety, resiliency, and freight throughput, reduction of the bridge backlog should be viewed as a strategic necessity.

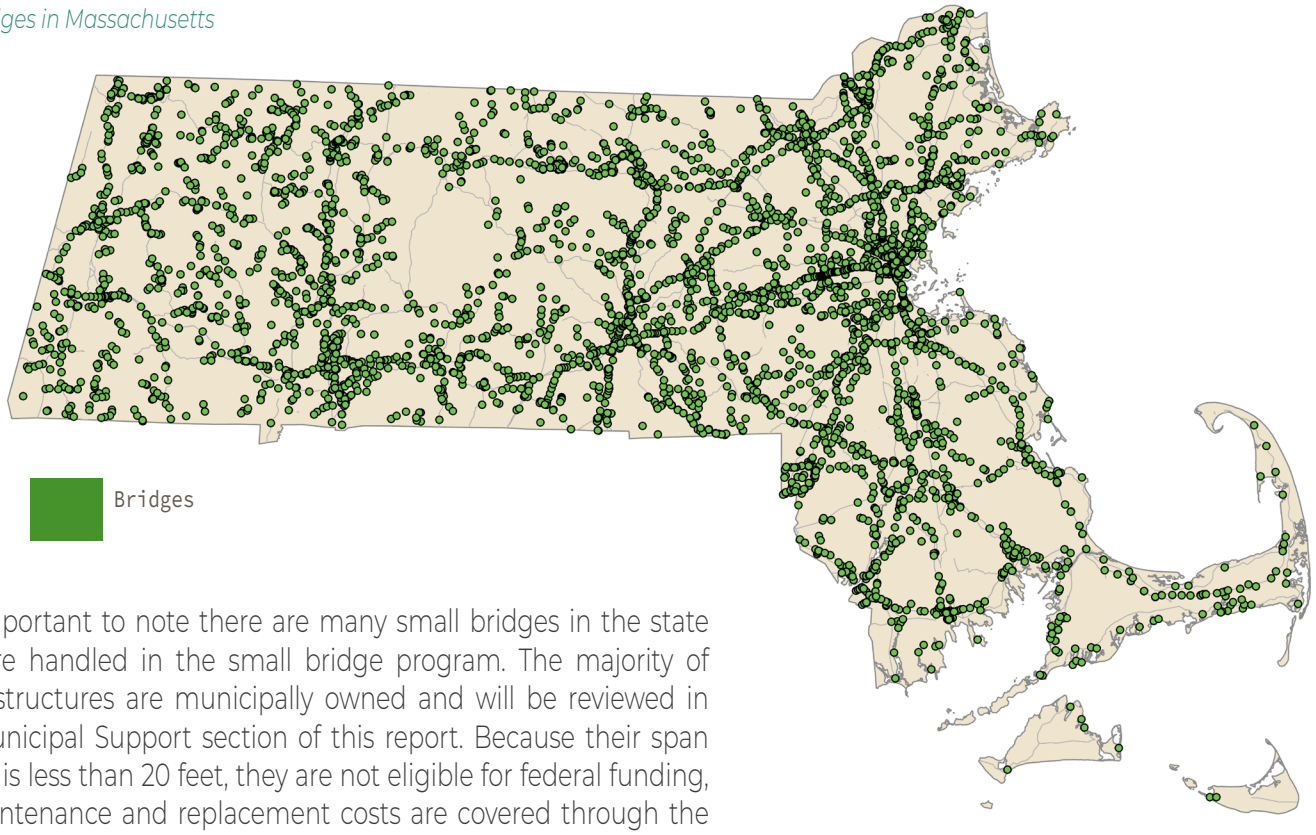
Significant maintenance is required for continued operation of structures in disrepair. Replacement is the right investment for most poor bridges, but for structures in fair or better condition, lower cost preservation work can extend service well into the future, and slow further growth of the poor backlog. Strategically, MassDOT has committed to preservation as a cornerstone of the state infrastructure investment portfolio. Bridge preservation typically consists of cleaning, painting, concrete and steel repairs, paving, and replacement of expansion joints. The preservation strategy has evolved over the past few years to change from a focus on various localized repairs to a more developed program, targeting fair condition bridges through site specific contracts. This allows for more targeted preservation to the overall bridge structure that complements the efforts of the localized repairs. An increased project volume, in terms of number and size, has raised the proportion of bridges receiving overall preservation treatments, allowing for true extension of life.

The average year built of Massachusetts bridges is **1960**

compared to the national average of **1976**



NBI Bridges in Massachusetts



It is important to note there are many small bridges in the state that are handled in the small bridge program. The majority of these structures are municipally owned and will be reviewed in the Municipal Support section of this report. Because their span length is less than 20 feet, they are not eligible for federal funding, so maintenance and replacement costs are covered through the 2021 Transportation Bond Bill.

LOOKING FORWARD (2024)

Progress has begun. The Bipartisan Infrastructure Law (BIL) Bridge Formula Program and the Massachusetts Next Generation Bridge Financing Program (NGB) has introduced approximately $2.8 B of additional bridge funding. This investment is of a similar scale to the 2008 Accelerated Bridge Program ($3 B), though buying power has been reduced by 15 years of inflation. MassDOT has committed most of the funds to projects planned to begin in the next five years. For 2024, MassDOT received an additional $50M through the State Education and Transportation Fund (ETF). This funding is being used to support a two-part strategy of replacements of poor bridges while simultaneously preserving structures in better condition.

Preservation will continue to be a major area of emphasis and key to achieving a sustainable inventory. Currently, 12% of bridge area is in poor condition, and an additional 1% (420,000 square feet) becomes poor each year. At current cost of construction, full replacement of poor condition structures approaches $10B, with $1B added each year. MassDOT is applying all ETF funds to preservation to reduce the annual growth rate. Preservation is 80% less costly than replacement, giving the best return on investment for the ETF.

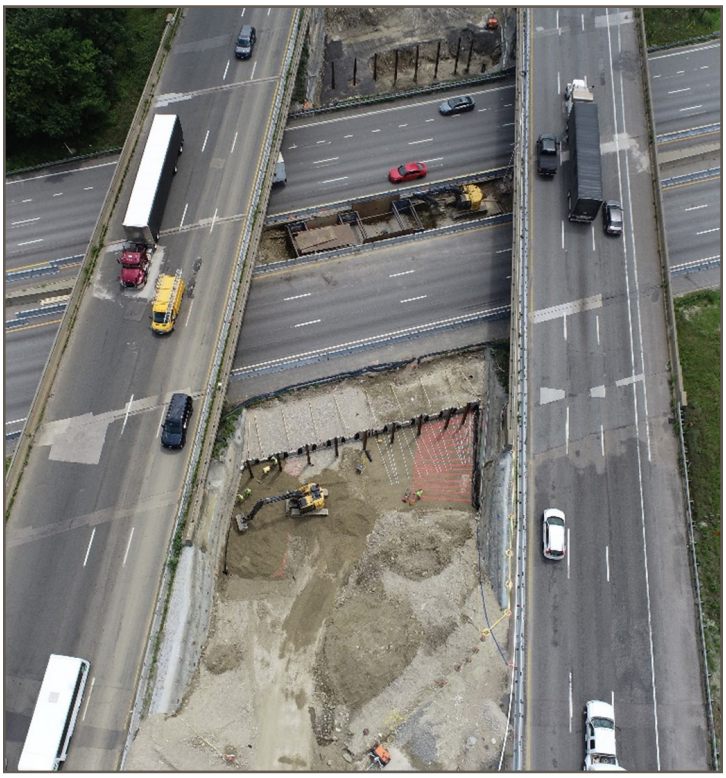
EXAMPLE PROJECT

Williamstown-Systematic Bridge Maintenance, W-37-013, Route 7 (Moody Bridge) over Hoosic River & Pan-Am RR

Status: Construction Complete

Weekend closure of Route 7 to allow for hydrodemolition of the bridge wearing surface, deck repairs, and a new rapid set concrete overlay. This project's success has demonstrated a path forward for other concrete overlay projects planned across the state.

The DOT is currently focused on delivering projects funded through BIL, NGB & ETF. MassDOT leadership has put great effort into internal streamlining and partnering with industry to ensure available funds are delivered efficiently and effectively. BIL & NGB funds are expected to be fully committed by 2028. Without follow-on federal and/or state funding, it is unlikely that the percentage of structurally deficient bridges in the inventory will significantly improve over the long term to achieve a sustainable bridge condition and allow for system modernization.



EXAMPLE PROJECT

Chicopee-Holyoke Bridge Preservation Along I-391

Status: Construction Underway, 50% Complete

Corridor bridge preservation project utilizing new details for ultra high performance concrete (UHPC) joint headers to improve long term joint performance and keep bridges in a state of good repair.

EXAMPLE PROJECT

District 5 Off-System Bridge Bundle, D-14-008, L-01-011, , L-01-015, M-03-018, P-13-031, P-13-035, W-06-038

Status: Final Design / Early Construction

Bundle of deck replacements to address off-system bridges that would fall into the poor category in the upcoming inspection cycles due to deck deterioration. Project was procured in a first-of-its-kind for MassDOT Highway as a design build low bid project that allowed for rapid turnaround.

% Good Condition *Desired trend = UP ↑*					% Poor Condition *Desired trend = DOWN ↓*				
2022 TARGET	**2023 ACHIEVED**	2024 TARGET	2026 TARGET	SoGR	2022 TARGET	**2023 ACHIEVED**	2024 TARGET	2026 TARGET	SoGR
16%	**16% (good)**	16%	16%	18%	12%	**12% (poor)**	12%	12%	8%

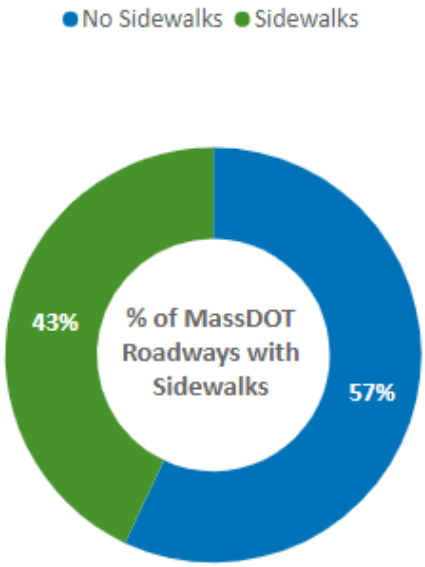
MassDOT has achieved the targets for bridge conditions.
The DOT anticipates it will achieve the 2024 targets with the appropriate funding.

Mobility

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

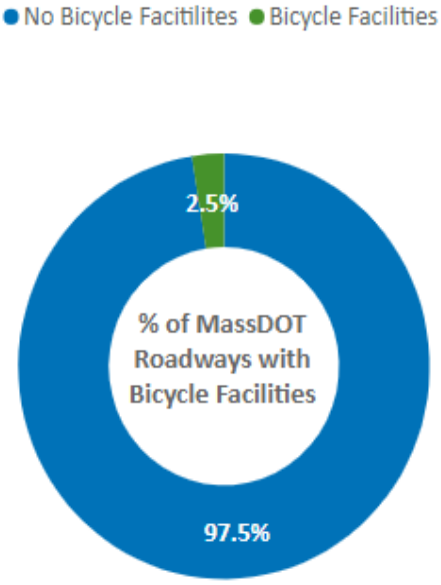
A primary focus of the asset management process has been on state of good repair of vehicle pavement condition and bridge structures. MassDOT has fully adopted performance-based capital planning around key performance indicators of pavement and bridge asset condition. The maintenance of transportation infrastructure in good working order is a baseline expectation and priority for the agency, and imperative to the mobility, economic, and quality of life patterns which exist today and can be expected in the near term.

However, in addition to SoGR, MassDOT must also prioritize adaptation of infrastructure to contemporary needs. This includes taking steps to adopt a more holistic approach to asset management, which integrates mobility, accessibility, safety, and resiliency priorities alongside condition goals. This section focuses on mobility. Safety and resiliency are included in their own sections of this report.



CURRENT STATE (2023)

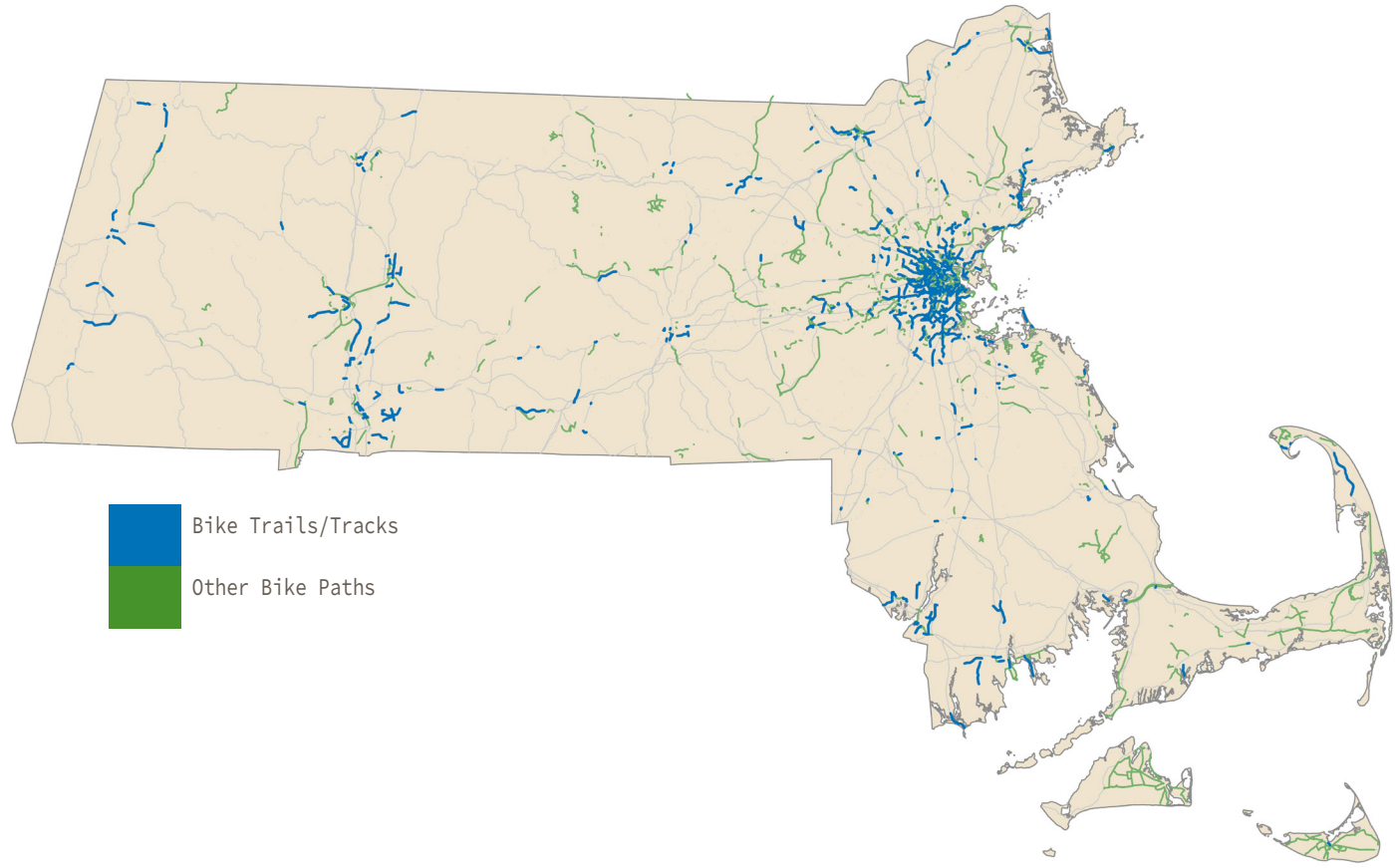
Mobility investments are primarily found within the Bicycle and Pedestrian, ADA retrofit, and Roadway Reconstruction programs of the MassDOT CIP. They involve modernizing roadway assets to accommodate all modes of transportation, including making improvements to expand the pedestrian and bicycle networks and better accommodate transit services.



The goal is to make walking and biking safe, comfortable, and convenient mobility options, specifically for everyday short trips, given that most trips in Massachusetts are short (less than 3 miles, equivalent to a 16-minute bicycle ride) and non-commuting. Roadway assets play a significant role in doing so. The 2019 Statewide Bicycle Plan and 2019 Statewide Pedestrian Plan identified the need for pedestrian and bicycle-specific projects on MassDOT-owned roadways and bridges to address critical gaps in connectivity and accessibility. Since then, MassDOT has been working to close these gaps.

To complement larger roadway projects, MassDOT has continued to deploy quick-build projects to realize asset improvements across multiple locations. Improvements include new or reconstructed sidewalks, new or reconstructed curb ramps, crosswalk enhancements with pedestrian crossing aids, pavement markings, signage upgrades, and bicycle lanes. In 2023, MassDOT completed 3.5 miles of sidewalks, 1.75 miles of bicycle lanes, and improved 13 crosswalks. MassDOT also constructed 20 miles of new shared use paths in 14 cities and towns.

Statewide Bicycle Activity



EXAMPLE PROJECT

Mattapoisett Rail Trail Extension

Status: Complete

A $6.6 million extension of the Mattapoisett Rail Trail was completed, connecting Fairhaven and Mattapoisett with a 5-mile shared use path.

LOOKING FORWARD (2024)

In 2024 MassDOT will complete an inventory of sidewalks and their condition on state owned roads using light detection and ranging (LIDAR). The inventory will help the state understand the needs more clearly for planning, maintenance, and construction of pedestrian facilities. The assessment will cover the MassDOT-managed sidewalk network in the Commonwealth, covering approximately 1300 miles, and will also provide lessons for how the process could be applied to all pedestrian facilities.

Additionally, MassDOT is developing a NextGen Bicycle and Pedestrian Vision Map to identify where facilities are needed for people to have a safe, comfortable, and convenient option to walk and bike for short, everyday trips across Massachusetts. The results will be an asset map identifying existing facilities and their quality, where additional facilities are needed, and priority locations for new projects.

Safety

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

Adapting the asset management infrastructure to meet contemporary safety needs has become one of MassDOT's priorities. There are several initiatives in place to address these safety needs. This section highlights some of them.

CURRENT STATE (2023)

One of the initiatives of Safety's Strategic Highway Safety Plan (2022) is speed management, which is currently being integrated into the project development process. Its focus is on setting target speeds to guide design rather than designing for the maximum operating speed by default. A new section of the Project Development Design Guide to be released this year will educate designers on the iterative process of setting design speeds that is critical to designing safe, self-regulating roads.

While MassDOT has many projects that address all needs of a roadway, certain scenarios call for a targeted project that focuses on safety alone to streamline safety improvements. As policy is built to allow for execution of asset management projects, considerations are being made of where a safety need is urgent and must be addressed with a limited scope and streamlined process.

To complement these efforts, a Safety and Intersections Capital Program Working Group has been assembled to meet monthly, and includes a cross-functional team of delegates from the HQ Traffic & Safety teams, the Office of Transportation Planning (OTP), District Safety Engineers, Asset Management, GIS experts, and Highway Design. The meetings allow for ongoing collaboration between the corners of the organization that all work on safety in their own ways, to ensure that the Capital Program is programming and delivering projects that meet our goals for zero fatal and injury crashes, and capitalizing on all resources that exist in the Commonwealth.

LOOKING FORWARD (2024)

MassDOT is performing outreach to communities that have been identified, using crash and risk data, as the Top 5% Communities with Vulnerable Road User Safety Needs. Additionally, MassDOT updated the Top 200 crash clusters in 2023 and has commissioned Road Safety Audits at all the Top 200 intersections that exist on roadways under its jurisdiction to guide project initiation based on a data-driven approach to address the highest safety needs.

One of Safety's ongoing initiatives is the interstate and freeway sign replacement program. MassDOT spent $10.5 M in 2023 replacing 227 overhead guide signs, 155 ground-mounted mainline guide signs, 77 ground-mounted secondary road guide signs, and 920 regulatory, warning, and route marker signs on new and existing structures in three segments of the I-95 corridor within Massachusetts.

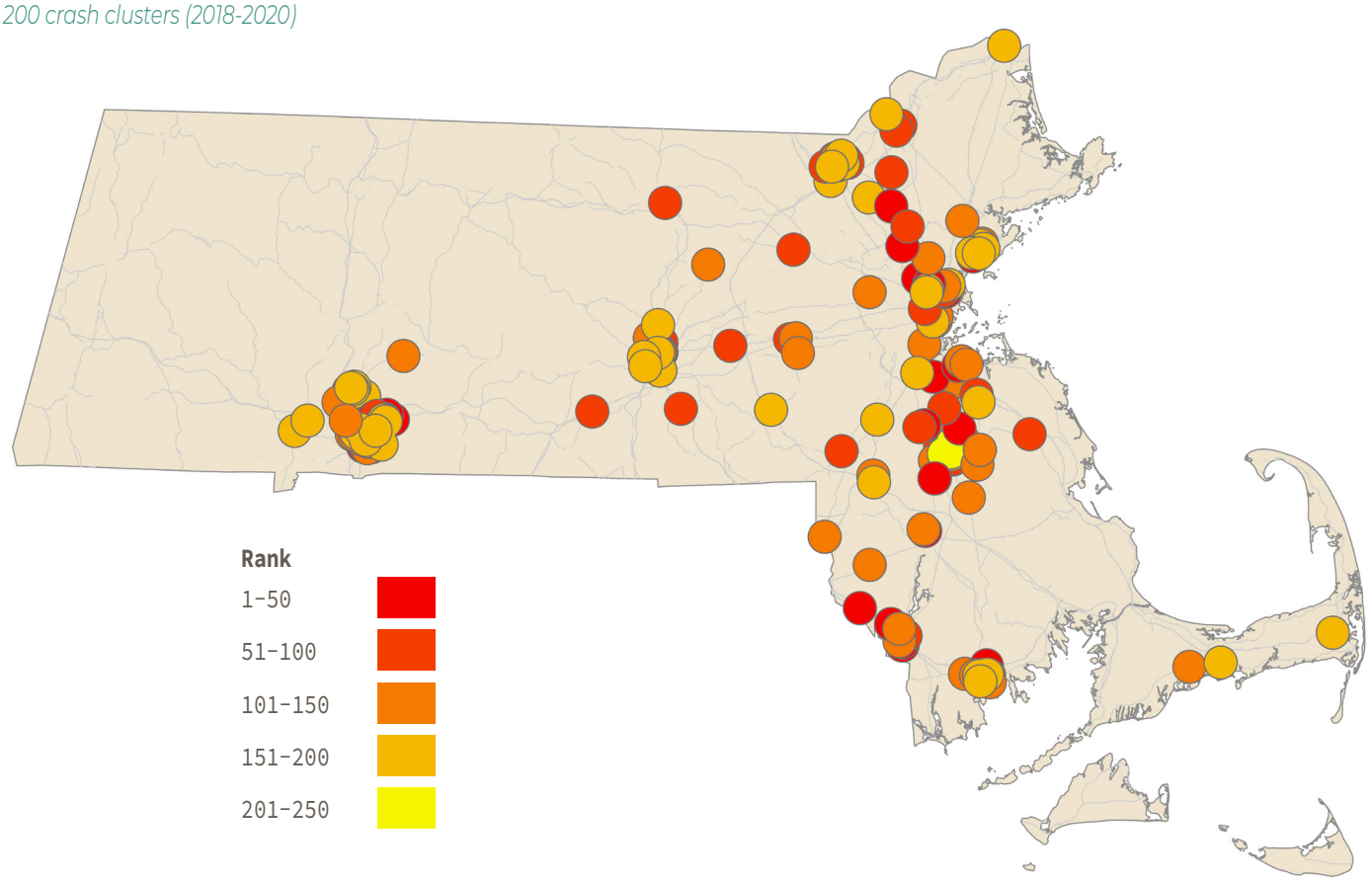
EXAMPLE PROJECT

Rt 108 at Rt 110, Haverhill – Intersection Reconstruction

Status: Completed September 2023

Increased safety for all modes of transportation, improved intersection operations, and provided bicycle and enhanced pedestrian accommodations while reconstructing the roadway and improving the geometry of the intersection of Route 108 (Newton Road) and Route 110 (Kenoza Avenue and Amesbury Road).

Top 200 crash clusters (2018-2020)



EXAMPLE PROJECT

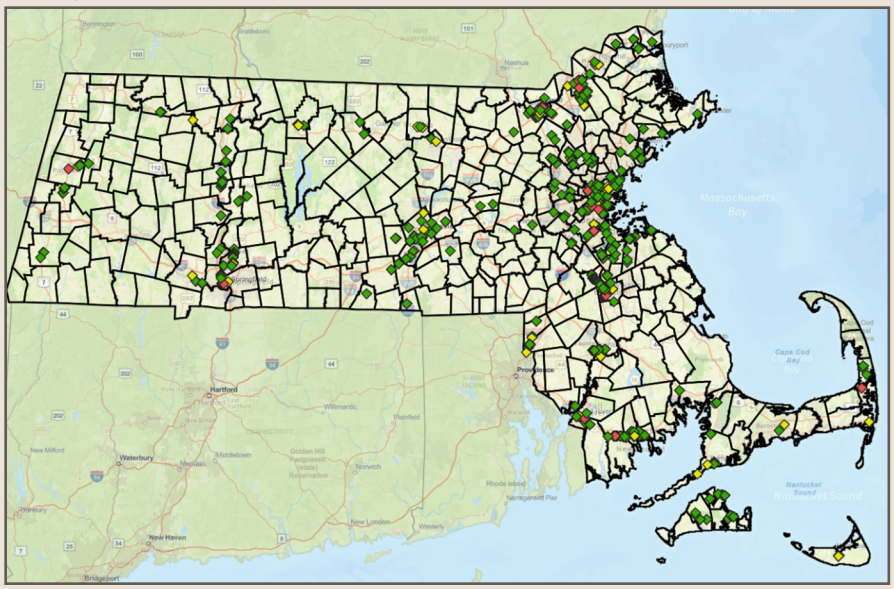
Vulnerable Road User Systemic Safety Near Bus Stops

Status: In Design

Multi-year program in response to the VRU Assessment* that will evaluate and construct quick-build safety improvements at up to 200 bus stops across the state that have been identified as primary risk for pedestrians and high potential for walking.

**As required by a Federal Mandate, MassDOT performed a Vulnerable Road User (VRU) Assessment to analyze data and find trends that are causing pedestrian and cyclist fatal and injury crashes across the state.*

Primary Risk Bus Stops Map



Resiliency

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

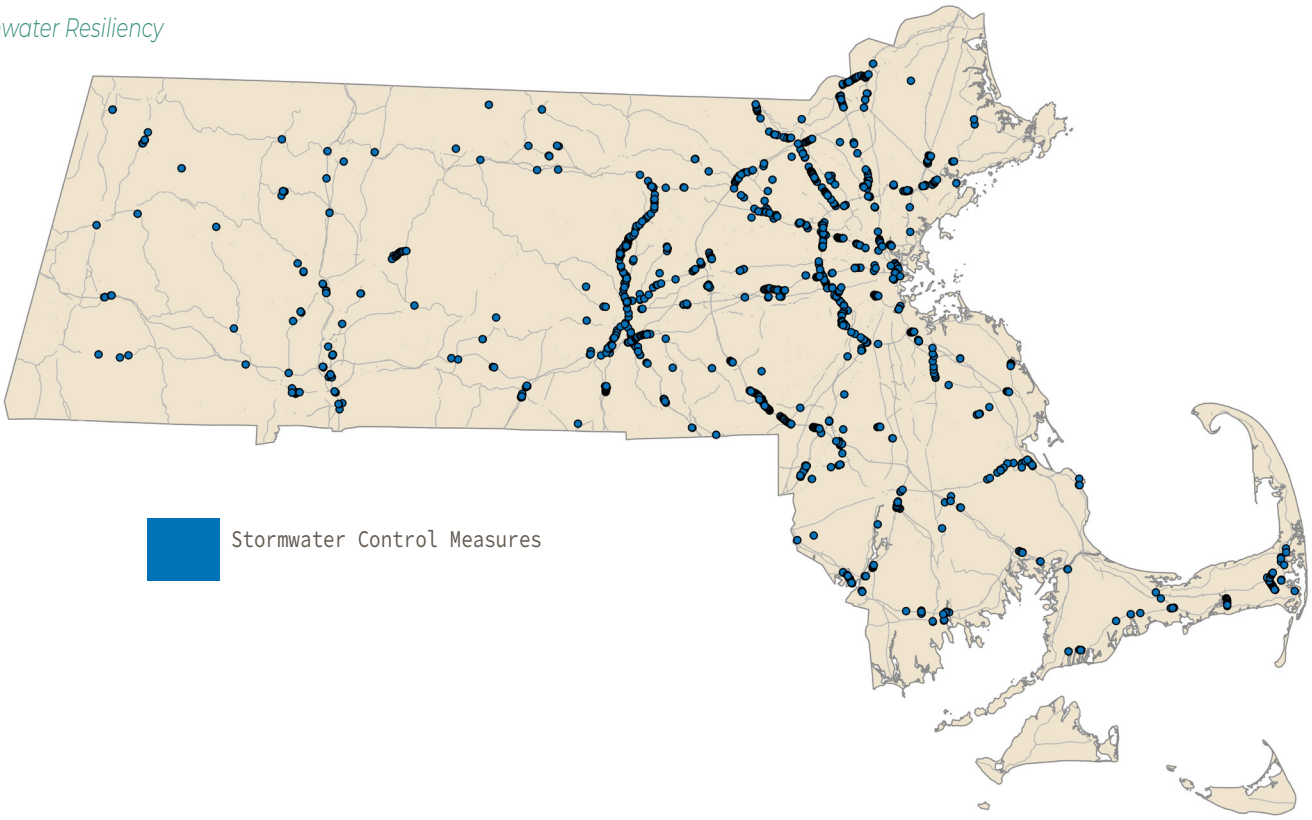
This section highlights the commonwealth's vulnerable transportation assets and the tactics, both projects and policy, to make the infrastructure more resilient to climate change , extreme weather events and disasters.

CURRENT STATE (2023)

MassDOT began strategic planning for resiliency in 2019, through formation of a Resiliency Task Force with the Massachusetts Department of Environmental Protection, the Division of Ecological Restoration, and the Division of Fisheries and Wildlife (the latter two from the Massachusetts Department of Fish and Game), charged with developing a mission and vision for a resiliency program. The Bipartisan Infrastructure Law has created a federal funding source for resiliency-focused projects (PROTECT → Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation) and MassDOT is well positioned to program these funds and harden infrastructure across the state.

The Natural Resource Defense Council ranked Massachusetts #2 of all states doing the most to improve equity and climate outcomes from the transportation sector.

Stormwater Resiliency



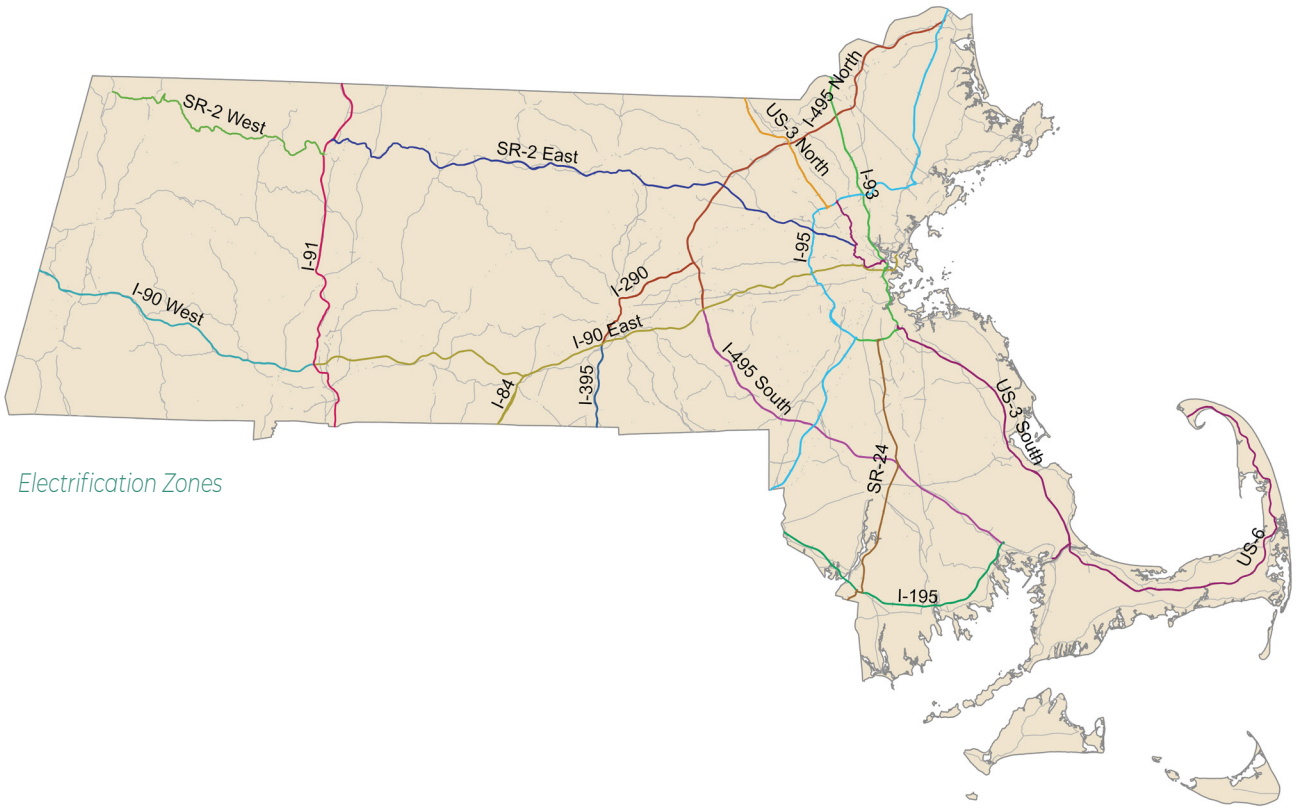
To begin the program, MassDOT needed to understand the inventory and location of the assets with which it was charged to make more resilient. In 2021, MassDOT initiated an effort to start mapping out the drainage system to better understand the agency's stormwater conveyance system. Since then, there have been 524 miles within 11 municipalities that mapped out pipes, stormwater control measures, and interconnections. Similarly, MassDOT has been gathering and updating data for other assets - such as culverts, embankments, low-lying roadways - and has been addressing known issues like slope erosion, ineffective drainage systems, and undersized culverts.

Another example of MassDOT's efforts towards resiliency is its focus on electric vehicles (EVs). EVs have the potential to serve as a resilience resource during severe weather events and disasters. MassDOT has been at the forefront of planning for EV charging through the Federally mandated National Electric Vehicle Infrastructure (NEVI) program. Focusing on charging station infrastructure and adoption of this technology requires planning on multiple levels. MassDOT will follow a two-stage approach to deployment of NEVI direct current fast charging (DCFC) infrastructure on EV Alternative Fuel Corridors:

1. NEVI formula funds will first be used to eliminate 50-mile gaps on the EV alternative fuel corridor (AFC) network in Massachusetts to ensure a complete network.

2. Additional NEVI funds will then be used to focus on zones within the AFC network where there is the most unserved demand, with higher priority given to zones with high percentages of environmental justice (EJ) communities.

The stage of investing to meet demand is based on the concept of electrification zones, continuous subsets of the alternative fuel corridor network defined by similar long-distance trip charging demand characteristics. The map of these zones is shown below. MassDOT also analyzed each zone and ranked these according to the ratio of EJ block group populations with the intent of integrating equity into the way it will prioritize addressing under-served demand for long-distance trip making, filling coverage gaps that currently exist, and meeting growth demand across the commonwealth.



Electrification Zones

LOOKING FORWARD (2024)

MassDOT is continuing to develop its resiliency program. An internal working group will be established to gather asset and environmental stressor data to develop a risk-based matrix for identifying asset vulnerability. This will assist in determining state of good repair and planning asset-based improvements to combat climate change. MassDOT Office of Transportation Planning has submitted a PROTECT Grant Application for Climate Adaptation Vulnerability Assessment (CAVA) to continue efforts in identifying transportation assets (such as low-lying roadways, tunnels, undersized culverts) that are at risk of riverine and coastal flooding over the coming decades. Additionally, the Program Management team is engaging District Maintenance to help identify more known issues and potentially address them through the project scoping process.

Regarding electric vehicles, conservative estimates of capital and operating costs suggest that the five years of NEVI program funding should be capable of funding approximately 92 ports. This is anticipated to enable MassDOT to build a NEVI-compliant DCFC network with no gaps greater than 50 miles along all existing EV AFCs, as well as part or all of the additional build to meet projected 2025 demand. However, demand projections suggest that meeting 2030 demand will be well beyond the reach of MassDOT's NEVI formula funds. This means additional investment would be needed from the private sector to meet this demand.

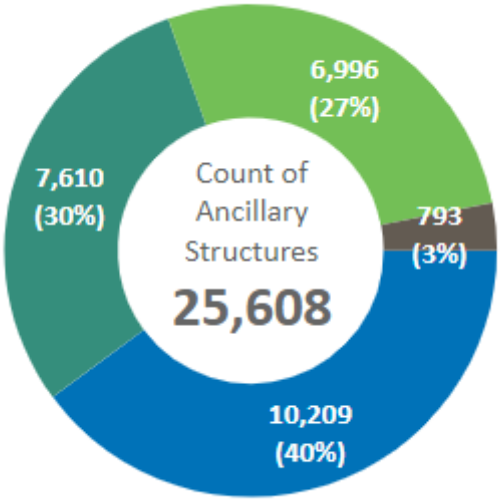
12 culvert and three roadway embankment projects have been initiated and scoped out for design.

New Culvert Installation

Ancillary Structures

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

The modern roadway employs multiple systems which provide safety, way-finding, and traffic advisories for users. These systems include signage, lighting, traffic signals, closed circuit cameras, and changeable message signs. These assets also typically include significant structural supports to locate them safely within the roadway envelope. As roadway design has evolved, the number and size of these types of structures has grown. MassDOT manages these structural assets through the MassDOT Ancillary Structure Program.



	Category	Examples
	ITS (Intelligent Transportation Systems	Message Boards, Traffic Cameras
	Lighting	Light Poles, High Mast Lighting
	Signals	Ground Mounted, Mast Arms, Span Wire
	Signs	Ground Mounted, Overhead Signs

message boards

traffic cameras

light poles

high mast lighting

ground-mounted signals

mast arms

span wire

ground-mounted signs

overhead signs

CURRENT STATE (2023)

MassDOT committed to completing initial inspections of the remaining ancillary structures in 2023, and consultant engineering firms stepped up to perform over 5,700 inspections to meet this goal. The inventory of all ancillary structures consists of just over 25,600 structures, nearly 5 times the size of the state bridge inventory. Each inspection consisted of hands-on assessments of all structural components and, where needed, employed non-destructive testing to determine the condition of underlying materials. Inspections were conducted by trained personnel and typically required lane closures to ensure the safety of inspectors and roadway users. Inspection findings are recorded in the Highway Division Bridge Management System and include pictures and recommendations.

LOOKING FORWARD (2024)

Routine inspection of the inventory will begin in 2024. Inspection frequency will be risk-based, with all overhead structures inspected on a four-year schedule. Initial inspection for new structures will now be conducted at the time of installation to ensure the inventory remains complete and inspections are accurately timed with asset age.

The findings from the initial inspection are being used to inform maintenance and capital needs. MassDOT program managers have analyzed inspection results to identify priority structure types and corridors for replacement. It is expected that initial investments will be programmed in the upcoming 2025-2029 planning cycle.

MassDOT is building headquarters and regional-based teams to manage the ancillary program and is seeking to fill initial positions by early 2024.

Municipal Support

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

MassDOT has been supporting the Municipal Pavement Program, a multi-year initiative authorized by the 2021 Transportation Bond Bill. The program provides MassDOT with funding to support municipalities and improve locally owned road conditions, with an emphasis on state numbered routes, and those on the National Highway System. Similarly, the Municipal Small Bridge program provides funding to municipalities for the replacement, preservation, and rehabilitation of eligible bridges. The program was first created through the 2016 Transportation Bond Bill and reauthorized in the 2021 Transportation Bond Bill (same as the municipal pavement program). This section will discuss the current condition and effort for the municipal program achievement in 2023 and look forward to 2024.

It would take
20 years
to address the current municipal backlog through the program.

MUNICIPAL PAVEMENT + MUNICIPAL SMALL BRIDGE = DOT MUNICIPAL PROGRAM

Municipally-owned state numbered routes have
3X
more poor pavement miles than the MassDOT-owned non-interstate system.

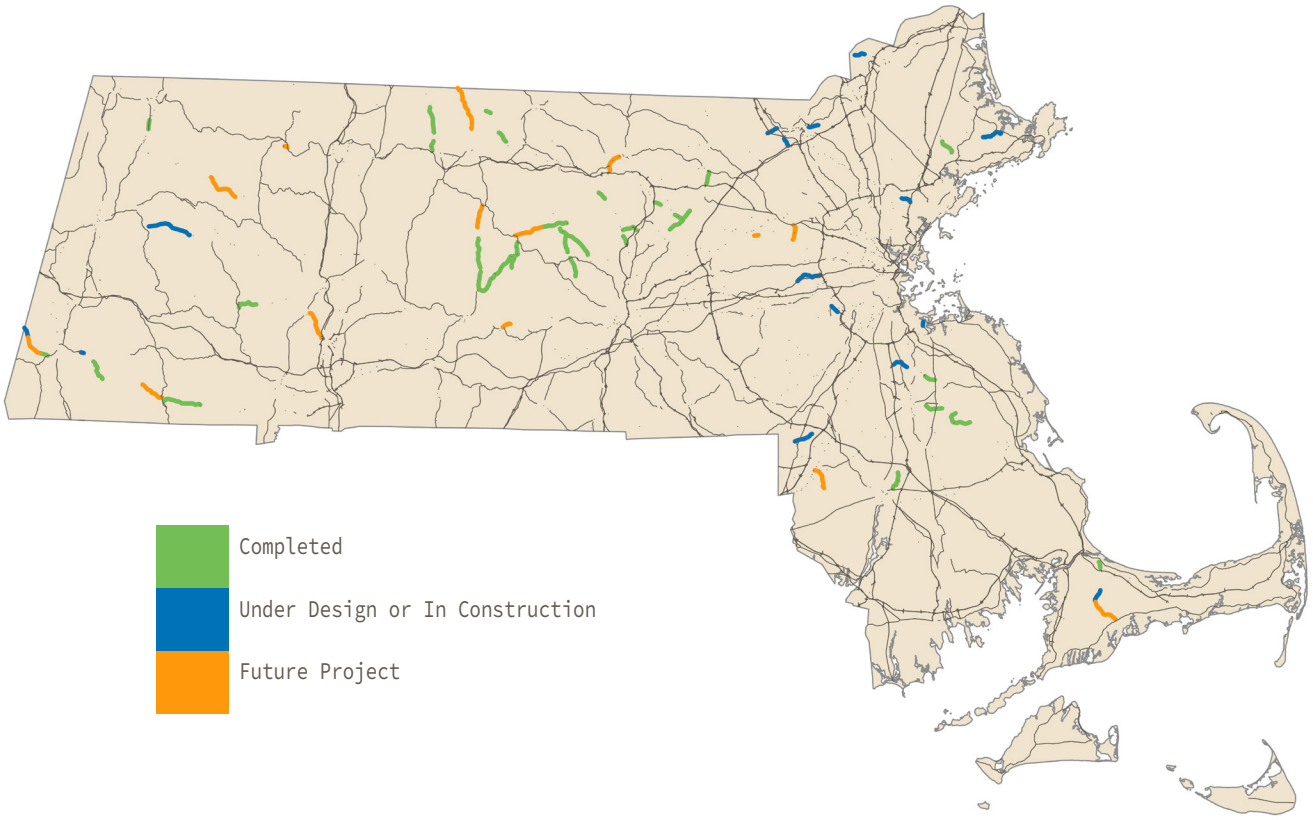
CURRENT STATE (2023)

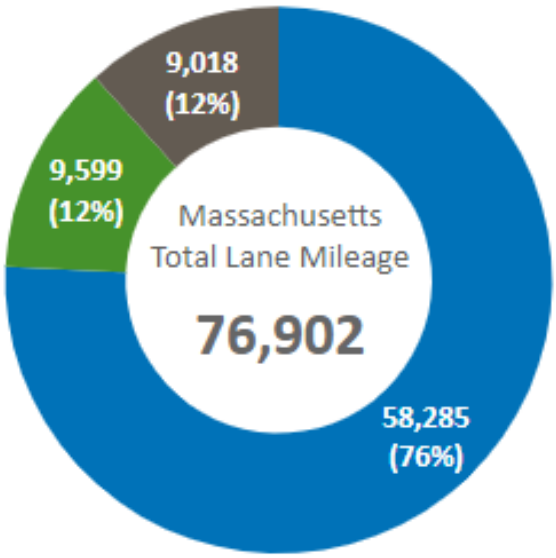
The Municipal Pavement Program

The Municipal Pavement Program seeks to improve the condition of municipally owned state numbered routes, with an emphasis on National Highway System (NHS) roadways, and to find opportunities to improve safety and accessibility for all modes. The program launched in FY 2022 and is currently authorized for $140M from the 2021 Transportation Bond Bill over five years with the Capital Investment Plan providing $25M for Fiscal Year 2024. The Municipal Pavement Program is not a competitive grant program. Projects are selected by MassDOT each fiscal year based on pavement condition data, the proportion of state numbered routes in poor condition in a municipality, and geographic equity. After municipalities have been awarded, MassDOT then works closely with selected communities to develop a scope of work for each roadway segment. All work is conducted by MassDOT contractors in coordination with the municipality.

Now in its third year of the program, the Municipal Pavement Program has overall awarded approximately $72M for 70 segments covering over 286 lane miles. Typical projects have included pavement rehabilitation, resurfacing, preservation, and other unique treatments based on what is right for the pavement at the time of improvement.

Munipave State Route Status





EXAMPLE PROJECT

Sterling Route 62 & Route 140

Status: Completed July 2023

Involved great collaboration with the town's Department of Public Works (DPW) and showed the benefit of recycling existing pavements through stabilized reclamation (on Route 62) and Cold-In-Place recycling (on Route 140). In preparation for the recycling projects, the town's DPW spent days clearing the roadsides of decades worth of built-up debris and making sure the drainage swales were functioning properly.

The Municipal Small Bridge Program

To be eligible for the program, bridges must be on a public way and must have a recorded span of between 10 and 20 feet. Currently, these bridges are not eligible for federal aid under existing bridge programs. The Municipal Small Bridge Program currently offers one application round per fiscal year for both Phase 1 (Design) and Phase 2 (Construction) grants. For Phase 1 (Design) grants, applicants can be awarded a $100,000 grant or the choice to work with a MassDOT on-boarded consultant to complete the bridge design. For Phase 2, once a successful Chapter 85 review has been obtained, the program awards construction grants of up to $500,000 to complete the necessary work on the bridge. Selection for the Municipal Small Bridge Program is based on need and merit.

The Municipal Small Bridge Program has awarded 174 grants since 2016 totaling $64.9M. Currently, 54 of these bridges are in kick-off or design, 45 are under construction, and 75 of the projects are complete.

LOOKING FORWARD (2024)

The Municipal Pavement Program is currently working on FY 2024 projects which includes 17 segments in 15 communities covering 87 lane miles. Both the Municipal Pavement team and district-wide staff are working individually with each municipality to develop scopes and schedule the work. All work for FY 2024 is due to be completed by June 2024. The team is currently planning for FY 2025 and is working on a list of proposed segments. The awarded segments should be announced in spring/summer of 2024.

The Municipal Small Bridge Program has awarded 30 Phase 1 grants and six Phase 2 grants in the latest FY 2024 round. The total award amount is $10.35M. To break down the awarded municipalities, 17 of these awards are for municipalities new to the program, 26 are for rural communities, and 19 are for Environmental Justice Communities. MassDOT is currently monitoring the design process of prior grant awardees and plans to have a 2nd FY 2024 round in the winter of 2024.

EXAMPLE PROJECT

Royalston Route 32

Status: Completed October 2023

Treated the existing surface course pavement with Hot-In-Place recycling and overlaid with a 1.25" polymer modified hot mix asphalt (HMA) for a 6.4 mile stretch of roadway from the Athol town line to the NH state line, previously reconstructed by MassDOT around 2010 and in fair to good condition.

Tunnels

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

According to the Federal Highway Administration, Massachusetts tunnels rank:

2nd in total lane miles with 209,315 feet (or approximately 40 miles)

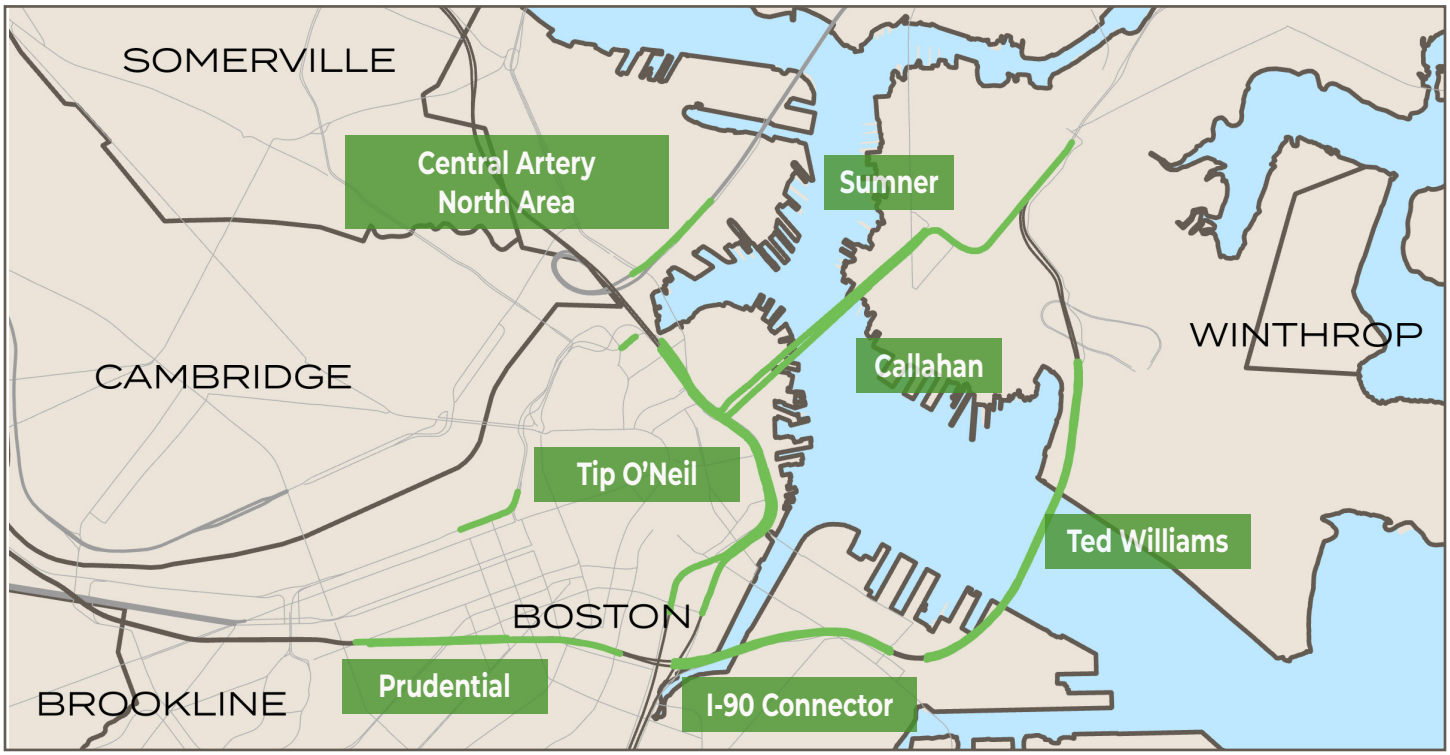
3rd in total length with 86,688 feet (or approximately 16 miles)

3rd in total count among US tunnels

Tunnels are the most technologically complex examples of transportation infrastructure, resembling buildings with full mechanical, electrical, and life safety systems. Massachusetts has the third-largest tunnel inventory in the US, primarily contained within the Metropolitan Highway System network (MHS) and located within the city of Boston. The Massachusetts Tunnel inventory was constructed over a period of 75 years, most notably through the "Big Dig" project, reflecting and changing the Boston region in the process.

Due to the size and complexity of the tunnel system, inspection crews are active most nights of a typical week to evaluate the condition of structural, civil, mechanical, electrical, fire/life safety/security, and material protective systems. The entire network is fully inspected on a rolling two-year schedule. All overhead elements are inspected annually, with additional inspections performed in response to damage, fire, deterioration, and as condition dictates. In addition to the extensive inspections performed by MassDOT forces, every three years the department commissions a third-party assessment of the entire MHS. The next Triennial Inspection report will be completed by October 2024.

MassDOT Major Tunnels



Concurrent with the inspection work, MassDOT crews perform routine and preventative maintenance of the system during the night hours to lessen impact to roadway users. Work consists of remedial action of inspection findings, servicing of electrical and mechanical equipment, and cleaning of tunnels walls and roadway surfaces.

CURRENT STATE (2023)

MassDOT is currently managing a major project to rehabilitate the oldest tunnel in the MHS (Sumner Tunnel, 1934). This project includes several phases of construction, including weekend closures and longer full tunnel closures. The first long-term tunnel closure of eight weeks, from July through September of 2023, was successfully completed and included installation of new pre-cast tunnel arch panels. Weekend closures continued through the fall and winter with another anticipated full tunnel closure in Summer 2024.

Although the closure was disruptive to abutters and roadway users, extensive stakeholder engagement was conducted well in advance of the project to identify optimum staging and alternative transportation options. MassDOT partnered with the MBTA to provide free Blue Line rail service, and project staff worked with affected communities to ensure project operations were conducted with the least possible impact.

LOOKING FORWARD (2024)

MassDOT is focused on significant completion of the Sumner Rehabilitation project in 2024. Concurrently, work continues to replace tunnel lighting across the MHS. In 2025, MassDOT plans to advertise a project to rehabilitate the Central Artery North Area (CANA) Tunnel under City Square in Charlestown. The CANA Tunnel opened in 1994 as a precursor to the larger Central Artery/ Third Harbor Tunnel project.

EXAMPLE PROJECT

Central Artery North Area (CANA) Tunnel Rehabilitation Project

Status: Design

Anticipated to begin after restoration of the Sumner, this project will upgrade civil, mechanical, and electrical systems to the 28-year-old CANA tunnel.

Sumner Tunnel Before

Sumner Tunnel Construction

Sumner Tunnel After

Project Spotlight

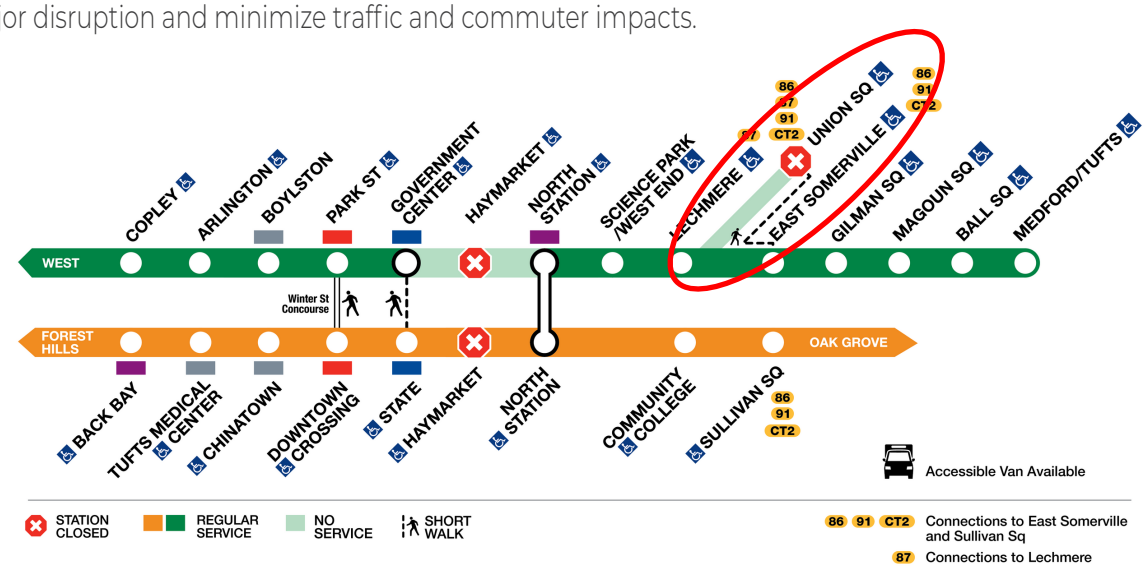
massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

The Squires Bridge in Somerville carries Route 28/McGrath Highway over the Union Branch of the Green Line, the Fitchburg Commuter Rail Line, and Somerville Avenue Extension. On average, the bridge carries approximately 40,000 motor vehicles per day, roughly the equivalent of travel volumes through the Sumner Tunnel in Boston. Earlier this year, MassDOT bridge inspectors identified deterioration in several steel bridge beams, necessitating near term repairs to support safe operation of the structure. The repairs were performed in an around-the-clock effort this fall.

The repair work required closure of the Union Branch of the Green Line, impacting 1,550 customers boarding at Union Square each weekday. MassDOT worked with its contractors and the MBTA to limit the closure to 25 days (from an earlier estimate of 42 days) and lessen impacts to system users. The mitigation plan included:

- Multiple travel alternatives / routes coordinated by MassDOT prior to the shutdown.
- Accessibility vans available between Union Square and Lechmere Station on an on-call basis.
- Multiple shuttle buses between East Somerville Station and Union Square on a 10/15-minute headway to the Union Square "Fluff Festival."
- MBTA service alerts active throughout the project along with in-station signage and public outreach.
- Daily progress reporting provided to key stakeholders.

Like the Orange Line Shutdown in 2022, this was another demonstration of MassDOT and MBTA working together to manage a major disruption and minimize traffic and commuter impacts.



Glossary

massDOT ASSET MANAGEMENT & PERFORMANCE UPDATE 2023

AFC | Alternative Fuel Corridor

ADA | Americans with Disabilities Act of 1990

BIL | Bipartisan Infrastructure Law

CANA | Central Artery North Area tunnel in Boston

CAVA | Climate Adaptation Vulnerability Assessment

Centerline Miles | Miles of roadway not accounting for direction or lanes. Measured according to the center of the roadway.

CIP | Capital Investment Plan. Usually, a five-year plan that is updated annually, but programs state and federal funds to pay for long-term improvements.

DCFC | Direct Current Fast Charging

DOT | Department of Transportation

ETF | State Education and Transportation Fund

EJ | Environmental Justice Communities

EV | Electric Vehicles

FHWA | The U.S. Department of Transportation Federal Highway Administration

GHG | Green House Gas

GIS | Geographic Information Systems

HMA | Hot Mix Asphalt

Lane Miles | Centerline miles multiplied by the number of lanes. Example: 10 miles of 4-lane interstate would be 40 lane miles.

MassDOT Roads | This includes interstates as well as major freeways and arterial roads maintained by MassDOT.

MBTA | Massachusetts Bay Transportation Authority

MHS | Metropolitan Highway System. Legislatively defined to include the tolled highway system that consists of the Boston Extension, the Callahan Tunnel, the Central Artery, the Central Artery North Area of the Massachusetts Turnpike, the Sumner Tunnel, and the Ted Williams Tunnel, as defined in M.G.L. c. 6C, § 1.

NBI | National Bridge Inventory. Any bridge with a span of more than 20 feet.

NEVI | National Electric Vehicle Infrastructure

NGB | Next Generation Bridge Financing Program

NHS | National Highway System. Interstates and other roadways that are important to the nation's economy, defense, and mobility.

Off-System Bridge | Highway bridge located on a public road, other than a bridge on a Federal-aid highway.

OTP | MassDOT Office of Transportation Planning

PROTECT | Promoting Resilient Operations for Transformative, Efficient, and Cost-Saving Transportation

PSI | Pavement Serviceability Index. A scale from 0 to 100 that rates the pavement condition

RAP | Reclaimed Asphalt Pavement

SoGR | State of Good Repair

STIP | State Transportation Improvement Program. A combined effort between MassDOT and many state agencies that work together to design and build highways and transit projects. Updated annually.

TAMP | Transportation Asset Management Plan

UHPC | Ultra High Performance Concrete

VRU | Vulnerable Road User

MASSDOT MISSION

Our mission is to deliver excellent customer service to people traveling in the Commonwealth by providing transportation infrastructure which is safe, reliable, robust, and resilient. We work to provide a transportation system which can strengthen the state's economy and improve the quality of life for all.