2026 State Planning and Research Program II

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Research

A. Program Administration

Task Lead: Hao Yin

Task Purpose:

To provide oversight and administration of the research program, conduct internal and external outreach activities, and manage associated contracts. The Research Section's work includes conducting research problem statement (RPS) solicitations; organizing RPS evaluation and selection; procuring and administering research contracts; and tracking project performance and implementation efforts and impacts.

Accomplishments in prior year:

- Engaged in scoping and contracting coordination efforts between research project principal investigators (PI) and project champions (PC).
- Procured and/or administered all SPRII-funded research agreements (and/or contracts) with research entities.
- Performed project development and management for all SPRII-funded research projects.
- Coordinated the review and prioritization of statements for new FFY25 projects.
- Coordinated initial scope discussion and PI identification approach with agency technical leads for the FFY25 research projects.
- Produced FFY24 Research & Tech Transfer Annual Report.
- Produced four MassDOT Research Quarterly Newsletters.
- Updated MassDOT research website with new contents regularly.
- Conducted web-based project completion survey with project champions, principal investigators and project managers for thirteen projects completed in 2024 to collect feedback and information on how the research process can be improved and research results have been/are to be utilized and implemented.
- Prepared quarterly reports on the status of research and training programs.

Proposed activities for next year:

- Continue oversight of research contracts and agreements.
- Continue research project management.

- Update 2016 MassDOT Research Manual.
- Prepare quarterly reports on the status of research and training programs.
- Update MassDOT Research Section website regularly.
- Produce FFY25 Research & Tech Transfer Annual Report.
- Produce MassDOT Research Quarterly Newsletters.
- Continue tracking research project performance, implementation and impacts.

Anticipated products:

Anticipated products:

- Executed ISAs and contracts.
- 2025 MassDOT Research Manual.
- Quarterly reports.
- Regular updating of the Research & Technology Transfer website.
- FFY25 Research & Tech Transfer Annual Report.
- Research Quarterly Newsletters.

Estimated task completion: 09-30-2026

Estimated task budget: $201,440.36

Estimated staff salaries and benefits: $101,440.36

MassDOT staff members	% Time to task
Michael Flanary	**20%**
Patrick McMahon	**20%**
Nicholas Zavolas	**20%**
Anil Gurcan	**20%**
Austin Sanders	**20%**
Hao Yin	**10%**

Consultant costs: $0.00

Other costs: $100,000.00

B. Research

Task Lead: Hao Yin

Task Purpose:

On-going Projects

To perform the research contained within this task, MassDOT contracts with universities, research institutes and/or private companies. There may be occasions when a project actual duration doesn't align with the anticipated duration due to challenges arising during research investigation and beyond the project team's control. Under such circumstances, additional time may be granted pending FHWA's approval, and the project shall remain within the original category for fiscal tracking purpose. In addition, MassDOT research personnel will provide the following services:

Update Transportation Research International Documentation (TRID), National Transportation Library and other national transportation research record repositories

Perform literature searches and reviews

Maintain and expand MassDOT research network

Schedule and host MassDOT transportation research and innovation webinar series

Subtasks:

Cracks of Low-P Rapid Set Concrete in Deck Repairs: Analysis, Prevention, and Alternatives

The overall objective of this project is to analyze the correlations between cracks in Low-P rapid set concrete and factors including concrete mix design, construction practices, curing conditions, and the service environment/weather conditions of bridge decks. This analysis aims to deepen the understanding of cracking mechanisms and to develop strategies for preventing crack formation in this special concrete. The outcomes will guide the treatment of deck repair materials for MassDOT projects, ultimately enhancing the durability and longevity of repaired bridge decks. Anticipated outcomes include: 1. A comprehensive literature review. 2. Detailed data collected via laboratory tests per selected AASHTO and ASTM test methods. 3. A thorough understanding of the causes and mechanisms behind

crack formation in young Low-P rapid set concrete. 4. Recommendation for preventing cracks in bridge decks repaired with Low-P concrete. 5. Development of high-performance alternative materials for bridge deck repair.

Environmental Scan of Community Transit Needs Among Older Adults in Massachusetts

This project aims to support MassDOT in advancing its community transit programs by systematically identifying and addressing the needs of older adults. Through detailed analysis and stakeholder engagement, the project will provide actionable recommendations for improving transit options and enhancing the quality of life for Massachusetts's aging population. Outputs and deliverables include:

A report documenting existing transportation needs of older adults in MA. This will illustrate nuanced differences in transportation needs for different populations of older people and people with disabilities.

A series of evaluative questions for future community transit grantees such that target populations are being served and metrics collected to communicate impact of the investments by the MassDOT Community Transit grant program.

A slide deck summarizing findings and recommended priority areas for future grantees will be developed.

Evaluation and Mitigation Methods for the Prevention of Cement Concrete Deterioration due to Pyrrhotite Phase II

The project will investigate the effectiveness of concrete mix design mitigation methods on the evolution of deterioration of cement concrete containing pyrrhotite reactive minerals. The study will be performed by using the developed electro-chemical acceleration testing method complemented by visual observations, quantitative crack-length development, non-destructive evaluation test methods and microstructural analysis. Additionally, the effectiveness of other potential mitigation methods on the deterioration rate of affected concrete mixtures will be investigated.

Advanced Technologies and Data Analytics for Safe, Smart, and Efficient Transportation (ASSET)

The project will recalibrate the SPFs in Chapter 16.6.4 of the HSM2, along with the associated parameters, for the twelve types of urban intersections in Massachusetts using the most recent data. Develop and refine methodologies that can effectively and reliably extract sidewalk data from aerial imagery. Leverage artificial intelligence (AI) to automate the counting of pedestrians, active transit modes (such as bicycles and e-scooters), and site trips generated by new developments. By using real-time AI models that process video and sensor data, this task also aims to develop algorithms to estimate multimodal trip projections associated with multiple ITE land use codes or Massachusetts-specific land use codes, considering the existing or planned infrastructure design, congestion management, and mobility strategies.

Salt Spreader Field Implementation

Clearing roadways during winter seasons, it is critical to deliver the materials efficiently and effectively so that the impacts of winter storms are minimized while the utilization of the materials is maximized to reduce potential environmental impacts. The objective of this study is twofold: 1) to develop an improved RSC algorithm by incorporating additional critical road condition categories (e.g., black ice and packed snow) and employing a more complex deep learning architecture; 2) to develop a new SRP model by incorporating the real-time mobile RWIS information from the instrumented truck, the regional stationary RWIS information, and the climate and weather forecasting information. The algorithm and model developed will be validated on multiple snowplowing trucks.

Speed Management Research

This scope of work will synthesize existing speed management research and guidance to resources to aid MassDOT and municipalities with the application and implementation of speed management countermeasures.

MassDOT Speed Regulation Editing Support

Throughout this effort, speed regulations gaps along the conflated Traffic Messaging Channel (TMC) segment network will be checked out from a web map, reviewed and edited in a roads and highways event editor Application while cross-referencing the speed regulation statute documents associated with the roadways described.

MCRP

One of the four components of UMTC ISA #109600

3D Printed Lattice-Based Structures for Next Generation Bridge Bearings and Bridge Isolation Bearings

Bridge bearings are installed between the bridge substructure and the superstructure to transfer loads and allow controlled translations to reduce stresses in the structure. In deteriorated and aging bridges, the old bearing system commonly needs to be replaced, and these replacements are currently very costly. Recent progress in 3D printing applications through a recent Phase I MassDOT research project examined a new promising, customizable design for typical bridge bearings and isolation bearings. The current project will develop a prototype bearing system using concepts from architected lattice materials and aspire to manufacture and test the 3D printing bearing systems.

The objectives of the proposed research include computational and experimental work to develop a new architected material bridge bearing product and test it for vertical, transverse, and other load conditions. In addition, the proposed research will aim to develop recommendations regarding the technoeconomic decision-making process (including cost models) informing how to apply the new prototype and identify the technical capabilities to achieve a cost-effective solution that can be implemented in the field.

Accomplishments in prior year:

1. Completed “Measuring Fare Payment Compliance on MBTA Buses and Light Rails” project.

2. Completed “Post-Fire Damage Inspection of Concrete Structures Phase III Field Verification Phase” project.

3. Completed “Developing a Visualization, Sharing and Processing Platform for Large-Scale Highway Asset Point Cloud Data” Project.

4. Completed "Method for Pavement Marking Inventory and Retroreflectivity Condition Assessment Using Mobile Lidar" project.

5. Completed “Measuring Accessibility to Improve Public Health Phase II" project.

6. Completed "Recycled Ground-Glass Pozzolan (RGGP) for Use in Cement Concrete" project.

7. Completed “Field Study to Determine Salt Usage Efficiency on Two Pavement Types” project.

8. Completed “Effects of Asphalt Binder Source in Asphalt Mixture Performance" project.

9. Completed “Evaluating Driver Education Modules on Safety" project.

Proposed activities for next year:

1. Complete "3D-Printed Lattice-based Structures for Next Gen Bridge Bearings" project.

2. Continue “Advanced Technologies and Data Analytics for Safe, Smart, and Efficient Transportation (ASSET)” project.

3. Complete “Environmental Scan of Community Transit Needs in Older Adults in MA” Project.

4. Continue "Cracks of Low-P Rapid Set Concrete in Deck Repairs: Analysis, Prevention, and Alternatives" project.

5. Complete "Evaluation and Mitigation Methods for the Prevention of Cement Concrete Deterioration due to Pyrrhotite" project.

6. Continue “Speed Management Research" project.

7. Continue "Development of a Salt Spreader Controller Program Using Machine-Sensed Roadway Weather Parameters and Climate Data" project.

8. Continue "MassDOT Speed Regulation Editing Support" project.

9. Following discussions with Highway and district offices, we will initiate targeted research and pilot efforts in the following areas:

- Statewide Testing & Validation of Valmont Dampers
    - Objective: Evaluate performance and reliability of Valmont dampers for traffic signal and sign structures under various environmental and operational conditions.

    - Scope: Conduct field testing across multiple regions to assess vibration reduction, durability, and maintenance benefits.
    - Outcome Goal: Develop statewide implementation guidance.
- Drone-in-a-Box (DiB) Feasibility & Impact Study – Cape Cod
    - Objective: Assess the practicality, cost-effectiveness, and operational benefits of automated drone stations for: traffic congestion monitoring and mitigation, emergency response support, environmental monitoring (e.g., coastal erosion, wildlife tracking)
    - Scope: Pilot deployment on Cape Cod, with integration into existing traffic and emergency management systems.
    - Outcome Goal: Recommend policies, operational procedures, and scaling strategies for statewide adoption if successful.
- Sustainable Concrete Research
    - Objective: Investigate low-carbon and long-life concrete mixes and techniques suitable for Massachusetts climate and infrastructure demands.
    - Scope: Material testing, life-cycle cost analysis, and pilot pours in active projects.
    - Outcome Goal: Identify specifications and best practices for sustainable concrete in state projects.
- Field Demonstration – Bridge Repair Using 3D Cold Spray Technology
    - Objective: Test 3D cold spray additive manufacturing for structural steel repair in bridges, focusing on corrosion damage remediation.
    - Scope: Select candidate bridge, coordinate with vendors and inspectors, evaluate repair performance over time.
    - Outcome Goal: Determine technical viability, cost implications, and safety considerations for field application.

Anticipated products:

- Interim deliverables and final reports for all on-going research projects.

Estimated task completion: 09-30-2026

Estimated task budget: $2,312,640.80

Estimated staff salaries and benefits: $263,613.34

Consultant costs: $1,153,653.86

Other costs: $895,373.60

Subtask Financial Table

Subtask / contract #	Total cost:	Pre-FFY 2026:	FFY 2026:	Post-FFY 2026:	Consultant/Contractor Name:	Contract End Date:
Cracks of Low-P Rapid Set Concrete in Deck Repairs: Analysis, Prevention, and Alternatives / 128752	$300,000.00	$100,000.00	$100,000.00	$100,000.00	UMass Lowell	09-30-2027
Environmental Scan of Community Transit Needs Among Older Adults in Massachusetts / 129061	$149,999.00	$79,377.83	$70,621.17	$0.00	UMass Boston	06-30-2026
Evaluation and Mitigation Methods for the Prevention of Cement Concrete Deterioration due to Pyrrhotite Phase II / 129275	$204,889.00	$0.00	$204,889.00	$0.00	UConn	12-31-2027
Advanced Technologies and Data Analytics for Safe, Smart, and Efficient Transportation (ASSET) / 129892	$604,334.00	$0.00	$399,557.00	$204,777.00	UMass Lowell	12-31-2026

Salt Spreader Field Implementation / 128970	$234,921.00	$43,171.00	$70,000.00	$121,750.00	UMass Amherst	12-31-2027
Speed Management Research / 129014	$153,026.00	$8,000.00	$96,586.69	$48,439.30	Kittelson&Associates	09-30-2027
MassDOT Speed Regulation Editing Support / 129140	$92,405.00	$90,405.00	$20,000.00	$0.00	UMass Amherst	03-31-2026
MCRP / 109600	$5,381,241.00	$5,231,241.00	$150,000.00	$0.00	UMTC	12-31-2025
3D Printed Lattice-Based Structures for Next Generation Bridge Bearings and Bridge Isolation Bearings / 121135	$270,042.00	$228,042.00	$42,000.00	$0.00	UMass Amherst	09-30-2026

C. Technology Transfer

Task Lead: Hao Yin

Task Purpose:

This task consists of the following programs and activities:

Local Technical Assistance Program (LTAP) serves as a conduit for information transfer on technologies, best practices, and methodologies for operating, maintaining, and managing municipal departments of public works and highway departments throughout the Commonwealth.

MassDOT Training Services (MTS) assist MassDOT in developing and implementing an annual plan to provide essential and high-quality technical training to MassDOT employees with a focus on the Highway Division.

MassDOT convenes two transportation technology transfer conferences each year: a one-day Moving Together Conference in the fall and a two-day Transportation Innovation Conference in the spring.

Construction Management Certificate Program is a 4-year partnership agreement with the Wentworth Institute of Technology (WIT) to train MassDOT staff.

Subtasks:

LTAP

Baystate Roads is the longstanding program name for Massachusetts LTAP, and it serves as a conduit for information transfer on technologies, best practices, and methodologies for operating, maintaining, and managing municipal departments of public works and highway departments throughout the Commonwealth. The program also serves as an efficient communications network, by which MassDOT transfers policy information, engineering directives, program funding, and other updates to the 351 municipalities in Massachusetts. Please see Appendix C.1 for FFY26 LTAP Training Plan.

MTS

MassDOT Training Services (MTS) assist MassDOT in developing and implementing an annual plan to provide essential and high-quality technical training to MassDOT employees with a focus on the Highway Division. Through this component, MassDOT coordinates, directs, and oversees the UMTC training team as it provides training classes requested by MassDOT's Highway Division to its staff throughout the state. Please see Appendix C.2 for FFY26 MTS Training Plan.

Conferences

MassDOT convenes two transportation technology transfer conferences each year: a one-day Moving Together Conference in the fall and a two-day Transportation Innovation Conference in the spring.

Through the comprehensive MassDOT-UMass Amherst Interdepartmental Service Agreement (ISA #109600), UMTC provides services to MassDOT including conference program planning, coordinating with speakers and moderators, managing event registration and exhibitors, contracting with venue and event support services, managing conference logistics, and delivering the conferences.

Construction Management Certificate Program

Continue implementing the new 4-year partnership agreement with the Wentworth Institute of Technology (WIT). Deliver the Construction Management Certification Program to 30 participants representing all Highway districts. The annual expense is set at $65,000, which covers the delivery of the 7-week curriculum.

Accomplishments in prior year:

• Delivered LTAP training classes per FFY25 Plan
• Delivered MTS training classes per FFY25 plan
• Delivered both MassDOT 24 Moving Together and 25 Innovation conferences

Proposed activities for next year:

• Execute FFY26 LTAP training plan
• Execute FFY26 MTS training plan
• Plan and host both MassDOT 25 Moving Together and 26 Innovation conferences

Anticipated products:

Estimated task completion: 09-30-2026

Estimated task budget: $3,018,116.83

Estimated staff salaries and benefits: $18,115.83

Consultant costs:$2,965,000.00.

Other costs:$35,000.00

MassDOT Staff Assignments

MassDOT staff members	% Time to task
Anil Gurcan	5%
Austin Sanders	5%
Hao Yin	10%

Subtask Financial Table

Subtask / contract #	Total cost:	Pre-FFY 2026:	FFY 2026:	Post-FFY 2026:	Consultant/Contractor Name:	Contract End Date:
LTAP / 109600	$7,420,807.00	$6,285,807.00	$1,135,000.00	$0.00	UMTC	12-31-2025
MTS / 109600	$8,106,771.00	$6,706,771.00	$1,400,000.00	$0.00	UMTC	12-31-2025
Conferences / 109600	$2,553,823.00	$2,153,823.00	$400,000.00	$0.00	UMTC	12-31-2025
Construction Management Certificate Program / 129272	$252,000.00	$63,000.00	$65,000.00	$125,000.00	WIT	09-30-2028

D. Regional and National Collaboration

Task Lead: Hao Yin

Task Purpose:

To coordinate MassDOT's participation in national and regional transportation research activities, including the research committees, research statement submission and reviews, project panels, technical working groups, and task forces; to disseminate MassDOT's research efforts, products, program management and delivery approaches both nationally and regionally; and to distribute research results and activities of the Transportation Research Board (TRB), American Association of State Highway and Transportation Officials (AASHTO) and other state DOTs within MassDOT.

Subtasks:

Peer Exchange

AASHTO TSP

Pooled Fund Studies

In FFY26, MassDOT intends to the following Transportation Pooled Fund studies.

5(422) National Cooperative Highway Research Program

5(455) National Accessibility Evaluation Phase II Access Across America

5(464) Hydrologic and Hydraulic Software Enhancements (SMS, WMS, Hydraulic Toolbox, and HY-8)

5(465) Consortium of Asphalt Pavement Research and Implementation

5(479) Clear Roads Winter Highway Operations Phase III Pooled Fund

5(481) In-Service Performance Evaluation (ISPE) of Roadway Safety Features

5(482) Development and Evaluation of Roadside Safety Systems for Motorcyclists

5(501) Roadside Safety

5(511) TRB Core Support Services

5(516) Highway Safety Manual 2nd Edition (HSM2) Implementation

5(544) 5(437) Technology Transfer Concrete Consortium

5(549) Northeast Transportation Research Consortium (NTRC)

5(556) Uncrewed Aircraft Systems (UAS) Standardization

Accomplishments in prior year:

- Delivery of MassDOT Research Peer Exchange.
- Coordinated with MassDOT Highway Divisions and Planning Office to establish participation in transportation pooled fund (TPF) projects funded through SPR II.
- Participated in and contributed to AASHTO RAC activities.
- Coordinated the TRB National Cooperative Highway Research Program (NCHRP) problem statement review process.
- Disseminated TRB research reports, technical webinars and NCHRP project panel member solicitations to appropriate MassDOT staff.
- Participated in and contributed to New England Transportation Consortium (NETC) program management and technical activities.
- Participated in and contributed to AASHTO's RAC Regional 1 activities including preparation activities for the RAC 2024 winter meeting.
- Applied for AASHTO RAC Committee High Value Research Projects Award and received Sweet-16 Award.
- Updated MassDOT research projects in the TRB Research-In-Progress database.
- Disseminated MassDOT research reports through the TRB E-Newsletter.

Proposed activities for next year:

- Coordinate within MassDOT to establish participation in pooled fund programs, and support AASHTO RAC activities, NCHRP research statement reviews, NCHRP technical panel participation, and TRB representative's visit.
- Participate in other State DOT’s Research Peer Exchanges when appropriate.

Anticipated products:

- Distribution of research products and information from TRB, TPF and other state DOTs.
- Communication of MassDOT research reports through TRB E-Newsletter.

- Participation in AASHTO RAC activities.
- Review and implement appropriate findings of the MassDOT Research Peer Exchange Report
- Identification of MassDOT's position on problem statements for the annual NCHRP project cycle.

Estimated task completion: 09-30-2026

Estimated task budget: $796,145.42

Estimated staff salaries and benefits: $155,864.79

Consultant Costs: $140,272.00

Other costs: $500,000.00

MassDOT Staff Assignments

MassDOT staff members	% Time to task
Nicholas Zavolas	50.0
Patrick McMahon	40.0
Hao Yin	30.0
Michael Flanary	10.0
Anil Gurcan	10.0
Austin Sanders	10.0

Subtask Financial Table

Subtask / contract #	Total cost:	Pre-FFY 2026:	FFY 2026:	Post-FFY 2026:	Consultant/Contractor Name:	Contract End Date:
Peer Exchange/126725	$140,727.00	$0.00	$205,000.00	$0.00	VOLPE	12-31-2025
Transportation Pooled Fund Studies (100% Federal)/ TBD**	*$419,647.00*	--	*$419,647.00*	--		

**Note: TPF costs are 100% federal and are not counted in the SPR totals. They are included here for informational purposes.

Other cost notes: AASHTO subscription, training, and travel

SPR II Financial Table

Totals

	Staff cost	Consultant cost	Other cost	Total cost
SPR I A	$5,156,650.50	$2,028,863.00	$3,986,753.90	$11,172,267.40
SPR I B	$4,758,332.82	$1,262,000.00	$1,485,068.70	$7,505,401.52
SPR I (A+B) total	$9,914,983.32	$3,290,863.00	$5,471,822.60	$18,677,668.92
SPR II	$539,034.32	$4,258,925.86	$1,530,373.60	$6,328,333.78
SPR I & II total	**$10,454,017.64**	**$7,549,788.86**	**$7,002,196.20**	**$25,006,002.70**

The SPR will be monitored throughout the year to determine if an amendment to the STIP is necessary to ensure adequate funding. The SPR II is 25.3% of the overall program, meeting the 25% minimum threshold.