

ANNUAL REPORT for

Calendar Year 2016

NEW ENGLAND TRANSPORTATION CONSORTIUM

NETCR106

April 2018

This report was sponsored by the New England Transportation Consortium, a cooperative effort of the Departments of Transportation and the Land Grant Universities of the six New England States, and the U.S. Department of Transportation's Federal Highway Administration.

The contents of this report reflect the views of the author(s) who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Departments of Transportation or the Land Grant Universities of the six New England States, or the U.S. Department of Transportation's Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

NEW ENGLAND TRANSPORTATION CONSORTIUM

POLICY COMMITTEE

David B. Bernhardt, Commissioner, Maine Department of Transportation
Christopher D. Clement, Sr., Commissioner, New Hampshire Department of Transportation
Michael P. Lewis, Director of Transportation, Rhode Island Department of Transportation
Richard A. Davey, Secretary of Transportation and Chief Executive Officer, Massachusetts
Department of Transportation
James P. Redeker, Commissioner, Connecticut Department of Transportation
Sue Minter, Secretary of Transportation, Vermont Agency of Transportation
Matthew Hake, Division Administrator, FHWA, Vermont Division

ADVISORY COMMITTEE TRANSPORTATION AGENCIES

Joe Segale, Vermont Agency of Transportation
Michael Connors, Connecticut Department of Transportation
Colin Franco, Associate Chief Engineer, Rhode Island Department of Transportation
Dale Peabody, Director of Transportation Research, Maine Department of Transportation
Curtis Bradley, Massachusetts Department of Transportation
Ann Scholz, New Hampshire Department of Transportation
Christopher Jolly, Planning & Programming Engineer, FHWA, Vermont Division

UNIVERSITIES

Eric Hernandez, University of Vermont
Michael Knodler Jr., University of Massachusetts, Amherst
Jo Daniel, University of New Hampshire
Deborah Rosen, Associate Dean for Curricular Affairs and Assessment, University of Rhode Island
Per E. Garder, University of Maine
Eric Jackson, Assistant Research Professor, University of Connecticut

LEAD STATE

William Ahearn, Materials & Research Engineer
Vermont Agency of Transportation

COORDINATOR

Julie Dowds
University of Vermont

TABLE OF CONTENTS

INTRODUCTION	6
2016 HIGHLIGHTS	8
PROGRESS OF ACTIVE PROJECTS	10

<u>Project</u>	<u>Title</u>	
<u>Number</u>		
06-4	Preventative Maintenance and Timing of Applications.....	10
07-1	In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations.....	11
09-2	Effective Establishment of Native Grasses on Roadsides.....	12
09-3	Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain System.....	13
10-3	Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology	14
13-1	Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections	16
13-2	HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures.....	18
13-3	Improved Regionalization of Quality Assurance (QA) Functions.....	20
14-1	Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians.....	22
14-2	Investigation of Northern Long-Eared Bat Roosting Sites on Bridges	24
14-4	Optimizing Future Work Zones in New England for Safety & Mobility.....	27
15-1	Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats).....	30

15-3	Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England.....	31
FINANCIAL STATUS		32
Financial Status of Active Projects		32
Fund Balance		33
REPORTS, PAPERS AND PRESENTATIONS		36
Policies and Procedures		36
Annual Reports		36
Reports, Papers, and Presentations (1988-1994)		36
Reports, Papers, and Presentations (1995-2016)		39

INTRODUCTION

The New England Transportation Consortium (NETC) is a cooperative effort of the transportation agencies of the six New England States, the six New England state land grant universities, and the Federal Highway Administration (FHWA). Through the Consortium, the states pool professional, academic, and financial resources for transportation research leading to the development of improved methods for dealing with common problems associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation, and maintenance of the region's transportation system. The Consortium's activities are currently being managed by the University of Vermont Transportation Research Center (UVM TRC), with the Vermont Agency of Transportation (VAOT) acting as the Lead Agency.

The program is intended to supplement, not to replace, ongoing state and federal research activities and other national programs such as the National Cooperative Highway Research Program (NCHRP). To this end, a Memorandum of Understanding (MOU), establishing NETC has been consummated by the six New England state transportation agencies.

The following goals were established for NETC in order to focus the resolve of participating state transportation agencies and universities:

- Implementation of a three-pronged program for the New England region consisting of research and development; technology transfer; and education and training.
- Development of improved methods for dealing with common transportation problems.
- Providing an important source of trained professionals for employment in the Region.

NETC membership now extends to the following agencies: Connecticut Department of Transportation (ConnDOT); Massachusetts Department of Transportation; Maine Department of Transportation; New Hampshire Department of Transportation (NHDOT); Rhode Island Department of Transportation (RIDOT); Vermont Agency of Transportation (VAOT); and, FHWA.

Each of the member state transportation agencies has designated a state university to participate with the state transportation agency in developing and conducting the transportation research program. The following universities have been designated as member universities: University of Connecticut, University of Maine, University of Massachusetts System, University of New Hampshire System, University of Rhode Island, and University of Vermont.

NETC was first established, and work began, in 1986 and, over the years, has undergone a transformative process wherein the management and administrative processes have been under the governance of various governmental and non-governmental organizations. With each change in leadership, the experiential and institutional lessons that have been learned were incorporated into the administration of the program. And so, at the current time, the collective experience of over two decades is now addressed and incorporated in the administration of the NETC program.

In 1984, the Massachusetts Institute of Technology (MIT), the state transportation agencies of five New England states (Maine, Massachusetts, New Hampshire, Rhode Island and Vermont), the American Association of State Highway and Transportation Officials (AASHTO) and FHWA initiated the first transportation pooled fund (TPF) study, administered by RIDOT, to determine the feasibility of establishing a regional consortium. In 1985, the same group of organizations initiated

a second TPF study, again administered by RIDOT, to develop a work program. From 1986 to 1995, various research projects were funded through the NETC program in five funding blocks called “Rounds.”

RIDOT was the Lead Agency for the first two pooled fund studies. For the five Rounds, state funds were transferred to AASHTO, the Lead Agency (i.e., Administrative Agency), through FHWA, and a single contract was effected between AASHTO and MIT, the Coordinator. MIT would then enter into a contract with the selected university for a particular research project.

In 1994, ConnDOT stated its intention to participate in NETC and offered to act as Lead Agency. During Federal Fiscal Year (FFY) 1994, FHWA assumed the Lead Agency designation to facilitate the transition process. MIT and AASHTO exited NETC, effective FFY1994. ConnDOT entered NETC, effective FFY1995, and was the Lead Agency until the Vermont Agency of Transportation assumed the responsibility in March 2010.

2016 HIGHLIGHTS

1. THE FOLLOWING NETC-FUNDED TRANSPORTATION RESEARCH PROJECTS, VALUED AT \$2,187,850, WERE ACTIVE AT NEW ENGLAND STATE UNIVERSITIES IN 2016:

a. University of Massachusetts: \$1,329,726

- Walaa Mogawer (Dartmouth):
 - “Preventative Maintenance and Timing of Applications” (242908.82)
 - “Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology” (150158)
 - “HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures” (249,785)
- Sergio F. Breña (Amherst): “Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections” (191320)
- Chris Ahmadjian (Amherst): “Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians” (100,000)
- Scott Civjan (Amherst): “Investigation of Northern Long-Eared Bat Roosting Sites on Bridges” (205554)
- Yuanchang Xie (Lowell): “Optimizing Future Work Zones in New England for Safety and Mobility” (200,000)

b. University of New Hampshire: \$613,124

- Jo-Sias Daniel: “In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations” (198154)
- Eshan Dave:
 - “Improved Regionalization of Quality Assurance (QA) Functions” (100,000)
 - “Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England” (150,000)
- Jeffrey Foster: “Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats)” (164,970)

c. University of Connecticut: \$80,000

- Julia Kuzovkina: “Effective Establishment of Native Grasses on Roadsides” (\$80,000)

d. University of Maine: \$165,000

- Roberto A. Lopez-Anido: “Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain System” (165000)

2. TECHNOLOGY TRANSFER:

a. Requests for Information and Technical Assistance: The NETC Coordinator's office responded to the following requests: There were no requests received during 2016.

b. Conference Attendance and Exhibiting: The NETC Coordinator's office attended the following conferences and events:

- Annual New England Materials & Research Engineer's 27th Annual Meeting: The NETC Coordinator attended this meeting, as per the Advisory Committee's recommendation, to keep updated on current research in New England. The NETC also provided sponsorship for the event. (June 2016)

c. NETC Research Project Reports, Technical Papers and Presentations:

1. NETC 07-1: "In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations," Daniel, J.S.; Mallick, Rajib B.; Kestler, Maureen A.; Miller, Heather J, November 2016, NETCR96.
2. NETC 09-2: "Effective Establishment of Native Grasses on Roadsides," Kuzovkina, Julia; Schulthess, Cristina P.; Ricard, Robert; Dryer, Glenn, June 2016, NETCR97.
3. NETC 09-3: "Advanced Composite Materials in New England's Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain System." Lopez-Anido, Roberto A. and Goslin, Keenan, August 2016, NETCR98.

d. Technical Papers and Presentations:

- NETC 09-2: DOT Manual: Effective Establishment of Native Grasses on Roadsides in New England
- NETC 09-2: DOT Workshop and Field Day: Effective Establishment of Native Grasses and Forbs on Roadsides
- NETC 14-2: Presentation at Northeastern Transportation and Wildlife Conference, September 2016.

Abstract submitted/accepted for presentation at North American Society for Bat Research Annual Meeting, San Antonio, TX, October 2016.

Presented at the North American Society for Bat Research (NASBR) conference at San Antonio TX.

Presented (remotely) at Maine Bat Working Group Annual Meeting.

PROGRESS OF ACTIVE PROJECTS

PROJECT NUMBER: 06-4

PROJECT TITLE: “Preventative Maintenance and Timing of Applications”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dr. Walaa Mogawer, P.E., University of Massachusetts Dartmouth

STATUS: Open

AGREEMENT TERM: 9/16/2013 – 9/15/2016

ANTICIPATED COMPLETION: 9/15/2016

PROJECT OBJECTIVES: The purpose of this project is to research existing best practices for pavement preventative maintenance strategies and adapt them to the unique variety of road conditions in New England (different traffic volumes, pavement materials, and northern climates). Additionally this research will attempt to outline pavement maintenance techniques and the inter-relationship with the timing of their application in New England. To meet the purpose of this project, the following objectives have been established:

1. Identify the components of a Pavement Preventive Maintenance (PPM) program.
2. Evaluate the state-of-the-practice relative to agencies (both US and worldwide) that have demonstrated successful implementation of a pavement preservation program. Identify both single treatment and multi-treatment strategies.
3. Use current and past projects as appropriate to evaluate techniques that have been successfully used to effectively extend the life of the pavement.
4. Identify and quantify the factors that influenced the successful implementation of a preservation technique, including time of treatment application in the existing pavement life cycle.
5. Validate the treatment parameters and methodologies using available tests for surface treatments as well as those for conventional flexible pavements (Hot Mix Asphalt mixtures) that might be modified to test these treatments.
6. Determine the approximate cost for pavement preservation technique identified.
7. Develop an implementation pavement preservation manual for distribution to the state and local transportation agencies within the New England states.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

A draft Final Report was submitted to the Technical Committee for review and comments.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

None.

PROJECT NUMBER: 07-1

PROJECT TITLE: “In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Jo Sias Daniel, Ph.D., P.E.,
Department of Civil Engineering, University of New Hampshire

STATUS: Closed

AGREEMENT TERM: 7/1/2013 – 3/31/2016

ANTICIPATED COMPLETION: 3/31/2016

PROJECT OBJECTIVES: The main objective of this research is to determine the in-place properties of pavement cross-sections containing recycled materials common to the New England region, and to relate changes in those properties to variations in temperature and moisture. The study will focus primarily on obtaining field data from base layers (as opposed to asphalt surface layers) that have been constructed with different types of unbound or bound recycled layers such as full depth reclamation (with or without stabilizing additives), plant mix recycled asphalt pavement (PMRAP), or foamed asphalt. The research team will work with the NETC advisory board members to identify appropriate field sites where the pavement design is clearly documented and where pavement performance can be linked to factors such as traffic loadings, moisture regimes and freeze-thaw effects. Laboratory testing will also be included to complement the analysis of in-place test data and instrumentation monitoring.

The importance of testing reclaimed layers with Falling Weight Deflectometer, evaluating the response at the different times of the year, and utilizing good practices during mix design and construction have been emphasized by multiple researchers. In order to accomplish this research, five tasks have been established and are broken into two Phases.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

The Final Report was completed November 2016.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

“In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations,”
Daniel, J.S.; Mallick, Rajib B.; Kestler, Maureen A.; Miller, Heather J.

PROJECT NUMBER: 09-2

PROJECT TITLE: “Effective Establishment of Native Grasses on Roadsides in New England”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Julia Kuzovkina, Department of Plant Science and Landscape Architecture, University of Connecticut, Storrs, CT

STATUS: Closed

AGREEMENT TERM: 9/1/2013 – 2/28/2016

ANTICIPATED COMPLETION: 2/28/2016

PROJECT OBJECTIVES: To build a comprehensive knowledgebase for a gradual transition toward sustainable native roadside vegetation cover which will support transportation goals for safety and infrastructure reinforcement while providing economic, ecological and aesthetic advantages. The direct deliverables to the New England Departments of Transportation include the Manual with guidelines for the effective establishment of native grasses on roadsides in New England and a model for an accelerated adoption and commercialization of this novel ecological restoration approach.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

- Preparation of the Manual was completed. A draft version of the Manual was submitted to the three members of the Technical Committee for their feedback.
- The final version of the Manual, consisting of 283 pages, was submitted to the Technical Committee on June 7, 2016.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

“Effective Establishment of Native Grasses on Roadsides,” Kuzovkina, Julia; Schulthess, Cristina P.; Ricard, Robert; Dryer, Glenn.

PROJECT NUMBER: 09-3

PROJECT TITLE: “Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication and Installation of ACM Bridge Drain System”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dr. Roberto Lopez-Anido P.E.
University of Maine’s Advanced Structures and Composites Center

STATUS: Closed

AGREEMENT TERM: 9/1/2013 – 12/31/2015

ANTICIPATED COMPLETION: 12/31/2015

PROJECT OBJECTIVES:

1. Design and fabricate a standard FRP drain that can be produced economically for use throughout New England bridges; and
2. Install the fabricated drain system in two to three representative bridge applications in New England to provide information on its performance, ease of construction, and cost.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

- The Final Report was finalized and submitted August 2016.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

“Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain System.” Lopez-Anido, Roberto A. and Goslin, Keenan.

PROJECT NUMBER: 10-3

PROJECT TITLE: “Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Professor Walaa S. Mogawer, PE, F.ASCE, Highway Sustainability Research Center (HSRC), University of Massachusetts

STATUS: Open

AGREEMENT TERM: 9/16/2013 – 5/31/2017

ANTICIPATED COMPLETION: 5/31/2017

PROJECT OBJECTIVES: The research project will evaluate the moisture susceptibility and low temperature cracking properties of RAP mixtures produced with WMA technologies. Plant mixtures produced with varying RAP contents and warm mix technologies will be sampled. Laboratory testing will include an evaluation of mixtures susceptibility to moisture damage using one or more of the following tests: (1) AASHTO T324 “Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)”, (2) AASHTO T-283 “Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage”, and (3) ratio of wet to dry dynamic modulus measured at 20°C. The test(s) selection will be based on the literature review conducted under Task 1. Also, the low temperature cracking susceptibility will be evaluated using the following two tests: (1) AASHTO TP10-93 “Standard Test Method for Thermal Stress Restrained Specimen Tensile Strength (TSRST)” and (2) AASHTO T322 “Standard Method of Test for Determining the Creep Compliance and Strength of Hot Mix Asphalt (HMA) Using the Indirect Tensile Test Device.” Additional testing will include evaluating the effect of the different WMA technologies on the workability of the mixtures and evaluating the degree of blending between the RAP binder and the virgin binder using a procedure developed by Bonaquist.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

- The survey results distributed for Task 2 were compiled. Responses were analyzed and respective tables and charts of the results were made.
- Laboratory verification and testing of the plant produced mixtures from the first contractor (Aggregate Industries Wrentham, MA) continued. The following 12.5mm SSC (100 gyration) mixtures were produced using the contractors drum plant and a PG64-28 binder:
 - 12.5mm with 15% RAP (typical mixture) + 0.5% SonneWarmix (Liquid) WMA
 - 12.5mm with 27.8% RAP (1.5% binder replaced) + 0.5% SonneWarmix (Liquid) WMA
 - 12.5mm with 46.3% RAP (2.5% binder replaced) + 0.5% SonneWarmix (Liquid) WMA
- The following tests were completed on each mixture using multiple replicates:
 - Binder content verification using the ignition oven.
 - JMF verification by wet wash sieve analysis
 - Volumetric verification (density, VMA, VFA, etc.)
 - Moisture susceptibility testing using the Hamburg wheel tracking device (HWTD) in accordance with AASHTO T324 at 45°C
 - Low temperature cracking using the disk-shaped compact tension (DCT) test at -18°C
 - Constructed performance space diagram (HWTD vs. DCT) for each mixture
 - Moisture susceptibility (TSR) in accordance with AASHTO T283
 - Low temperature cracking using the thermal stress restrained specimen test (TSRST)

- Mixture dynamic modulus and subsequent construction of mixture master curve
- Dynamic modulus (E^*) ratio evaluation of moisture susceptibility
- Mixture workability in the asphalt workability device.
- Summary sheets of results were constructed and data was analyzed.
- Another contractor has committed to producing mixtures for this study in the early summer of 2016.
- A second contractor (Palmer Paving, Springfield MA) began producing mixtures for this study in June 2106. More mixtures will be produced as the contractor schedule allows.
- UMass Dartmouth received the following plant produced mixtures from the second contractor this month:
 - SSC 12.5mm 75 Gyration WMA with 29% RAP (1.5% Binder Replacement)
 - SSC 12.5mm 75 Gyration WMA with 39% RAP (2.0% Binder Replacement)
 - The contractor is using Evotherm as the WMA additive.
- UMass Dartmouth began verification and performance testing of these mixtures.
- Due to delays in producing the mixtures, UMass Dartmouth requested a no-cost extension until 12/31/17 so that the remainder of mixtures can be produced, tested and analyzed. No response to this request has been received and the project ends this quarter June 30th, 2016.
- UMass Dartmouth conducted additional meetings with the two contractors, (Palmer Paving - MA, & Tilcon - CT) who committed to produce mixtures for this study to determine when the mixtures will be produced. Each responded they will be produced in the fall of 2014.
- In September 2014, UMass Dartmouth formally requested a no additional cost time extension for this project of twelve month (new end date 9/15/2016). The basis of the request is that the contractors have not produced or provided the mixtures required for this study. Therefore, an extension is needed as the testing will require sixteen months for completion (as listed in the proposal). UMass Dartmouth is waiting for a response on this time extension request.
- On October 14th, 2016; UMass Dartmouth received a no-cost extension for the project until 5/31/17. This agreement for this project expired on 6/30/16. The extension time was so that the remainder of mixtures can be produced, tested and analyzed.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

A Transportation Research Board (TRB) paper was submitted in August of 2016 related to this research work for this project. The paper was accepted for presentation at the Transportation Research Board 96th Annual Meeting in Washington DC on January 10th, 2017. The paper entitled “Understanding Influence of Moisture on Performance of Plant-Produced High Reclaimed Asphalt Pavement Content Mixtures Incorporating Warm-Mix Asphalt Technologies” will be presented in TRB session 636 “Reclaimed Asphalt Pavement and Recycled Asphalt Shingles in Asphalt Mixtures.”

PROJECT NUMBER: 13-1

PROJECT TITLE: “Development of High Early-Strength Concrete for Accelerated Bridge Construction Closure Pour Connections”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Sergio F. Brena – University of Massachusetts Amherst

STATUS: Open

AGREEMENT TERM: 9/1/2014 – 1/14/2017

ANTICIPATED COMPLETION: 1/14/2017

PROJECT OBJECTIVES: To develop and validate concrete mixtures capable of developing high early strength without detrimentally affecting their long-term durability. The mixtures are for use in projects using accelerated bridge construction methods.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

1. Performed literature review as necessary to obtain research reports and technical papers to assist in further development of mix design trial batches.
2. Remixed multiple trial batches numerous times to understand the variability of properties of the trial batch mix designs
3. The set time test (AASHTO T197 / ASTM C403) was performed on each trial batch.
4. The slump test (AASHTO T119 / ASTM C143) or the spread test (ASTM C1611) was performed on each trial batch depending on the workability of the concrete mixture.
5. The air content test, pressure method (AASHTO T152 / ASTM C231), was performed on concrete mixtures developed through trial batches.
6. Running ring shrinkage tests to understand behavior of mix designs; will modify based on results
7. A mix design typically used for precast/prestressed bulb-tee girders was mixed to compare concrete properties
8. The compressive strength was tested for each trial batch at 12 hours and 24 hours (ASTM C39)
9. Progression of the design of the bar pullout test (ASTM A944) setup
10. The volume of paste to volume of voids ratio was adjusted to improve the consistency of trial batches
11. A pilot study was performed to understand the effects of high range water reducer addition rates
12. Aggregate sizes were blended at specified ratios to reduce the gap grading of the coarse and fine aggregates
13. The curing temperature was increased, and the compressive strength was measured to quantify the effects
14. The shrinkage test (AASHTO PP 34-99) was performed on selected concrete mixtures developed through trial batches. These tests are conducted on batches reaching target strength gain and workability.
15. Design of the setup for the bar pullout test (ASTM A944) is still progressing, and fabrication
16. Completed the literature review and summarized findings.
17. Created a mixture design specification based on the development procedure used in this research project

18. No further development was required of the mixture design. The two selected concrete mixtures were used for final testing.
19. Completed the shrinkage testing (AASHTO PP 34-99). A minimum of three tests were performed on each of the final selected concrete mixtures.
20. Completed the design and fabrication for the bar pullout test setup, including strength analysis of members within the setup (ASTM A944)
21. Design and fabrication of steel reinforcement used within each bar pullout test concrete specimen completed
22. Completed fabrication of formwork used for the bar pullout test concrete specimens for No.4 and No.6 test bars, including tying of steel reinforcement within each specimen
23. Performed bar pullout test on two selected concrete mixtures developed through trial batches on No. 4 and No. 6 epoxy coated test bars
24. Gradation of aggregates used for the selected mixes was modified as required to conduct alkali-silica reactivity test (ASTM C1567) using fine aggregates and a crushed coarse aggregates
25. Mixed the sodium hydroxide solution required for the alkali-silica reactivity testing
26. Performed alkali-silica reactivity aggregate tests on two mortar mix designs compatible with the selected concrete mixtures, one using coarse aggregates and the other using fine aggregates

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

None thus far.

PROJECT NUMBER: 13-2

PROJECT TITLE: “HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Professor Walaa S. Mogawer, PE, F.ASCE, Highway Sustainability Research Center (HSRC), University of Massachusetts

STATUS: Open

AGREEMENT TERM: 6/1/2014 – 12/1/2017

ANTICIPATED COMPLETION: 12/1/2017

PROJECT OBJECTIVES: The goal of this research is to evaluate plant-produced HMA mixtures that contain RAS to identify the critical material properties and plant operations needed to produce RAS mixtures with fatigue and low temperature cracking properties equivalent (or better than) typical mixtures that are produced. Research objectives:

1. Determine the current state-of-practice for recycled shingle usage in paving mixtures.
2. Locate regional asphalt mixture producers in New England with capabilities and willingness to produce mixtures incorporating RAS for this study. From this list of producers, select producers so that both batch and drum plant are utilized for production.
3. Assist the selected producers in evaluating the properties of the RAS and RAP to be used in production.
4. Construct a matrix of mixtures that will be produced. An all-virgin material control mixture, 5% RAS mixture and a 5% RAS + RAP mixture will be designed.
5. Assist the selected producers in developing laboratory mixture designs utilizing RAS that meet the required volumetric criteria.
6. Produce the mixtures using a batch plant and drum plant. Produce mixtures assuming 100% blending of the RAS and virgin binder and at the calculated actual RAS binder contribution.
7. Sample the mixture at the plant and verify volumetric properties. Mixtures not meeting the volumetric properties should be produced again with alteration to the production parameters (use higher temperatures, longer silo storage or increased mixing times).
8. Construct a matrix for evaluating the performance of the mixtures with emphasis of low temperature and fatigue cracking. The matrix should contain a component to evaluate the effect of aging on the degree of blending between aged and virgin binders.
9. Identify critical material properties and plant operations that yield RAS mixtures with performance properties equivalent to typical all-virgin material mixtures.
10. Develop a guideline for the use of RAS in virgin and RAP mixtures.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

1. The approved survey for Task 3 was distributed to a list of regional contacts consisting of both agency and industry members for solicitation of responses. Responses were tabulated.
2. Four 12.5mm mixtures were previously developed with similar gradations (Task 6) in the laboratory. The mixtures were:
 - Control mixture using all virgin materials
 - Control mixture incorporating 15% RAP (Typical)
 - Control mixture incorporating 5% RAS (Using the MSW RAS Source)
 - Control mixture incorporating 5% RAS and 15% RAP (Using the MSW RAS Source)
3. For each of these mixtures, the following testing was completed on replicate specimens this quarter:

- Mixture dynamic modulus and subsequent construction of mixture master curve
 - Fatigue testing using the flexural beam fatigue in accordance with AASHTO T321
 - Moisture susceptibility testing using the Hamburg wheel tracking device (HWTB) in accordance with AASHTO T324
 - Low temperature cracking using the disk-shaped compact tension (DCT) test at -18°C
 - Low temperature cracking using the thermal stress restrained specimen test (TSRST)
 - Fatigue cracking using the Semi Circular Bend (SCB) Illinois Flexibility Index Test (IFIT) test at 25°C
4. UMass Dartmouth met with the contractor to discuss production of the mixtures. A meeting with the plant operations manager will be held in April to discuss these items further.
 5. Due to time delays in finding a contractor willing to produce mixtures for this study, UMass Dartmouth requested a no-cost time extension for this project in January 2016 until December 2017. To date no response has been received for this request. The project ended this quarter on 5/31/16.
 6. UMass Dartmouth met with the contractor plant operations manager to discuss production of the mixtures in April 29th, 2016. The contractor stated they would attempt to produce the mixtures in early summer 2016, schedule permitting.
 7. UMass Dartmouth finished reducing and compiling the survey results obtained for Task 2.
 8. UMass Dartmouth has consistently contacted and met with the contractor during the last quarter to discuss production of the mixtures for this study. The contractor stated they would attempt to produce the mixtures as soon their schedule permits but no mixtures were delivered to date.
 9. On October 14th, 2016; UMass Dartmouth received a no-cost extension for the project until 12/01/17. This agreement for this project expired on 5/31/16. The extension time was so that the mixtures can be produced, tested and analyzed.
 10. In September, since no plant produced mixtures had been received, UMass Dartmouth obtained Post Consumer Asphalt Shingles (PCAS) to begin development of the mixtures designs with this new source of RAS. Previous mixture work had been completed with Manufactures Shingle Waste (MSW).
 11. The PCAS source material was tested to determine its properties (binder content, gradation, etc.).
 12. Mixture design using 5% PCAS and 15% RAP + 5% PCAS were developed using the same source of aggregates as the previous MSW RAS testing.
 13. Performance testing of the two mixtures developed with PCAS commenced. Specifically dynamic modulus testing, flexural beam fatigue, Thermal Stress Restrained Specimen Test (TSRST), Illinois Flexibility Index Test (IFIT), and Disk Shaped Compact Tension Test (DC (T)) were undertaken.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

A Transportation Research Board (TRB) paper was submitted in August of 2016 related to this research work for this project. The paper was accepted for presentation at the Transportation Research Board 96th Annual Meeting in Washington DC on January 10th, 2017. The paper entitled “Performance Characterization of Asphalt Mixtures Incorporating Recycled Asphalt Shingles: Mechanical Approach to Asphalt Binder Degree of Blending” will be presented in TRB session 636 “Reclaimed Asphalt Pavement and Recycled Asphalt Shingles in Asphalt Mixtures.”

PROJECT NUMBER: 13-3

PROJECT TITLE: “Improved Regionalization of Quality Assurance (QA) Functions”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Eshan Dave, University of New Hampshire

STATUS: Open

AGREEMENT TERM: 12/1/2014 – 4/2/2017

ANTICIPATED COMPLETION: 4/30/2017

PROJECT OBJECTIVES:

1. Review of current QA process used by New England DOTs for precast and prestressed concrete elements (PCE/PSE).
2. Review of QA specifications for PCE/PSE.
3. On the basis of the review and through working with the technical review committee of the project, develop common acceptance standards for PCE/PSE to be used by NETC constituents.
4. Develop a cost-sharing mechanism to accompany the common acceptance standards.
5. Identify agencies and contractors to conduct pilot implementation of the common acceptance standards.
6. Develop a list of additional materials and services for which common acceptance standards might be beneficial and feasible.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

In the first quarter of 2016, a major research effort was on Task-2 of the project that deals with developing first version of the regionalized QA process for precast and prestressed elements used in highway construction. The regionalized QA process is being developed for elements in three primary categories: non-structural precast elements (examples: catch basins, drop inlets, guard barriers), structural pre-cast elements (examples: precast bearing piles, MSE wall, precast gravity walls) and prestressed elements. The specifications are being developed in form of series of tables (spreadsheets) for plant inspection and certifications, and agency inspection and testing.

Researchers had a web conference meeting with the project technical advisory committee on March 3rd 2016. During this meeting researchers presented the findings of the review of QA processes from various New England agencies (Task-1 findings) and also made a proposal for the regionalized QA processes (Task-2 preliminary proposal). During the meeting the agency representatives provided feedback on a number of items for modifying the draft report from Task-1. A revised report has been prepared and is currently under editorial review.

There was limited progress during the second quarter for 2016. During majority of this quarter the project amendment process was underway for obtaining a no-cost extension. Two main activities that occurred during this quarter include: Revision of the task repots on basis of the meeting from March 3rd and continued development of spreadsheets that provides recommendations for various sampling and testing activities undertaken by producers and sampling and testing activities undertaken by agencies.

The project amendment was under administrative processing that required researchers to stop work on the study until amendment contract was executed. During this, primary research effort was spent on developing two spreadsheets that provide recommendations for QA practices to be adopted by state agencies for precast and prestressed concrete elements.

A detailed report to accompany these recommendations is currently being prepared and is expected to be delivered to Technical Committee by end of October.

The research team finalized two spreadsheets with recommendations for (1) plant certification; (2) sampling and testing as part of QA inspection. These spreadsheets are instrumental in adoption of common acceptance standards for precast and prestressed concrete elements for all six New England DOTs. The spreadsheets were emailed to the project technical committee in early November and a conference call between researchers and the technical committee was held on November 18th 2016. During the conference call researchers presented their recommendations and the technical committee provided their feedback. On basis of the technical committee feedback researchers revised the recommendations.

During the conference call there was discussion of setting up a Share Point site by Vermont Agency of Transportation (VAOT). The Share Point site will be used to share QA data between the states. Since the call, VAOT has obtained necessary approvals for setting of the Share Point data sharing site. MassDOT and ConnDOT staff has already obtained necessary login information to access this site. Once other states also obtain the login information from VAOT, another conference call will be organized to go over the Share Point site as well as to further discuss pilot projects during 2017 construction season where sharing of QA resources will be tried by different states.

The final report for the project was prepared during the previous quarter. The report is currently being revised to incorporate recommendations made by technical committee during the November conference call.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

A Share Point site has been setup by VAOT as first step in realizing the implementation of the research conducted through this study. As a next step, a series of pilot project will be conducted by various New England agencies to use the unified QA processes developed herein and to share inspection resources.

PROJECT NUMBER: 14-1

PROJECT TITLE: “Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers and Engineering Technicians”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Chris Ahmadjian, University of Massachusetts, Amherst

STATUS: Open

AGREEMENT TERM: 3/1/2015 – 4/3/2016

ANTICIPATED COMPLETION: 4/3/2016

PROJECT OBJECTIVES:

1. To identify and review existing Competency Models (CM) and matrices that can help in the development of a DOT specific competency model
2. To perform a gap analysis on the existing CM’s and matrices to create a DOT specific employee competency matrix
3. To create a CM framework for each of the NETC member states
4. To run a pilot program in one of the NETC member states
5. To determine the financial benefits (return on investment) of having a CM in place
6. To create an implementation plan and technology transfer strategy for the research results
7. To deliver a final report

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

1. Work on Task 1 is complete. Specific models for DOT’s were not found. We will continue to search for specific models as the research continues
2. The subcontractor Bob LePage has started work on the gap analysis between the standard employment classifications for both technicians and civil engineers and the standard classifications in industry. Bob will also look at strategic plans and see if gaps in needed competencies exists. He will also begin work on the pilot project in Maine.
3. Work was begun on a conceptual process that would create a CM model for each DOT.
4. Bob LePage continued work on the gap analysis.
5. Work was completed on a conceptual process that would create a CM model for each DOT.
6. The graduate student has completed her thesis work. That work forms the base information for this research project. The literature search and data are directly transferrable and her results and conclusions should transfer as key parts for a model under this research.
7. The PI has brought in two new researchers: Dr. Michael Knodler, Associate Professor at UMass will be providing direction and support for the project; Cole Fitzpatrick, Research Fellow here at UMass will be applying his expertise to move the project forward.
8. The research team met and decided on a revised strategy.
 - a. The first step is to get an extension until 12/31/17.
 - b. The next step is to give up on the subcontractor, who has not been responsive.
 - c. Cole Fitzpatrick will meet with members of the technical committee to brief them on progress.
 - d. The team will then pull already developed model parts into a comprehensive model.
 - e. The model will be tested in Maine.
 - f. The final report will be written.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

None thus far.

PROJECT NUMBER: 14-2

PROJECT TITLE: “Investigation of Northern Long-Eared Bat Roosting Sites on Bridges”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Dr. Scott Civjan, University of Massachusetts, Amherst

STATUS: Open

AGREEMENT TERM: 2/1/2015 – 4/2/2017

ANTICIPATED COMPLETION: 4/2/2017

PROJECT OBJECTIVES: The main objective of the proposed research project is to develop a screening tool and to demonstrate its accuracy in determining the presence of NLEB roosting in New England bridges. Additional information will be collected and disseminated related to preferred structural types for bat roosting, New England bat population distributions and evaluation of existing public data already collected by State Fish and Wildlife Departments and Transportation Agencies throughout New England.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

1. Further/more detailed evaluation/analysis of all calls from summer 2015 with SonoBat software
2. Evaluation of all calls from summer 2015 with EchoClass software
3. Initial comparison of call results using SonoBat vs EchoClass
4. Conducted rapid visual screenings in CT
5. Determined final 15 bridges to monitor summer 2016 including replacements and sent out for committee approval
6. Contacted regional personnel for updated Summer 2015 data related to NLEB and bridge use for bat roosts
7. Developed preliminary recommendations related to inspection surveys
8. Obtained approval for borescope use in all New England states and UMass Amherst campus
9. Got verbal commitment from two interns for summer 2016
10. Wrote initial draft of report detailing summer 2015 findings
11. Developed field routes for summer 2016
12. Continued discussions about the implications of the final 4(d) ruling
13. Initial discussions on new protocol survey
14. Presentation at TRB Annual Meeting
15. Presentation at MassDOT Innovation and Tech Transfer Exchange
16. Submitted abstract to Northeastern Transportation and Wildlife Conference
17. Finalized bridge selection for summer 2016 field work.
18. Research team bridge assessment survey form: Developed, distributed and revised based on feedback.
19. Completed detailed schedule for remaining summer field work and shared with TC.
20. Purchased materials required for summer 2016 field work.
21. Hired two undergraduate interns for summer 2016.
22. Completed 1st round (early season) monitoring for summer 2016 (15 bridges)
23. Completed bridge assessments of all 15 monitored bridges including the FHWA/FRA and the research team bridge assessment survey forms
24. Completed emergence studies at 7 bridges
25. Completed call analysis running collected call data through SonoBat and EchoClass for

- summer 2015 data.
26. Initiated call analysis running collected call data through SonoBat and EchoClass for first round of 2016 data.
 27. Initiated analysis using altered settings in SonoBat to determine influence of non-default settings.
 28. Initiated evaluation of call analysis results from summers 2015 and 2016.
 29. Meeting with TC on 06/30/16 by phone conference to discuss progress to date and summer 2016 activities.
 30. Determined best conferences for dissemination of research results and requested travel approval from NETC and TC.
 31. Concluded the field work component of the project
 32. Completed early, mid and late season 2016 field monitoring of bridges
 33. Completed rapid inspections of all 15 bridges during both 2016 summer monitoring
 34. Completed emergence studies at all bridges
 35. Documented all collected data
 36. Collected guano samples
 37. Completed call analysis running collected call data through SonoBat and EchoClass for summer 2016 data.
 38. Continued acoustic monitoring program comparison analyses
 39. Presentation at New England Transportation and Wildlife Conference at Lake Placid, NY
 40. Contacted guano testing labs for project samples
 41. Updating of final project report draft
 42. Guano samples sent to 2 labs for species identification.
 43. Hand vetting results of MYSE calls received from Sarah Boyden of MaineDOT.
 44. Continued evaluation of data.
 45. Began compiling inspection and data collection forms into report format.
 46. Obtained quotes from consultants for data analysis.
 47. Sent acoustic data to two consultants for further acoustic analysis with automated programs and select hand vetting.
 48. Continued work on Draft Final Report.
 49. Modified presentation of research and revised for conferences as appropriate.
 50. Presented at the North American Society for Bat Research (NASBR) conference at San Antonio TX.
 51. Presented (remotely) at Maine Bat Working Group Annual Meeting.
 52. Submitted abstract to the Northeastern Bat Working Group (NEBWG) conference.
 53. Submitted abstract to International Conference on Ecology and Transportation (ICOET) conference.
 54. Conference call to discuss planning of Transportation Research Board Workshop 114: Bats at the Crossroads: Regulatory Compliance for Program and Project Delivery and Approaches to Conserving Imperiled Species.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

- Presentation at Northeastern Transportation and Wildlife Conference, September 2016.
- Abstract submitted/accepted for presentation at North American Society for Bat Research Annual Meeting, San Antonio, TX, October 2016.
- Presented at the North American Society for Bat Research (NASBR) conference at San Antonio TX.
- Presented (remotely) at Maine Bat Working Group Annual Meeting.

- Submitted abstract to the Northeastern Bat Working Group (NEBWG) conference.
- Submitted abstract to International Conference on Ecology and Transportation (ICOET) conference.
- Paper accepted for TRB 2017 Annual Meeting in Washington D.C. Workshop 114: Bats at the Crossroads: Regulatory Compliance for Program and Project Delivery and Approaches to Conserving Imperiled Species.
- Extension granted to project end date to allow presentation at 2017 International Conference on Ecology and Transportation, Salt Lake City, UT, May 2017.

PROJECT NUMBER: 14-4

PROJECT TITLE: “Optimizing Future Work Zones in New England for Safety and Mobility”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Yuanchang Xie, University of Massachusetts, Lowell

STATUS: Open

AGREEMENT TERM: 7/6/2015 – 7/5/2017

ANTICIPATED COMPLETION: 7/5/2017

PROJECT OBJECTIVES:

Given the aging infrastructure and the anticipated growing number of work zones in New England, it is of utmost importance to optimize their layouts to improve safety and to mitigate their impact on mobility. This study aims to use the Transportation Research Board’s SHRP2 Naturalistic Driving Study (SNDS) data for investigating driver behavior in work zones under different traffic, lighting, and weather conditions. In addition, data from the smart work zones (SWZs) in Massachusetts (and other New England states if available) to validate the findings obtained from the analysis of the SNDS data is also proposed. Based on the analysis of the SNDS and SWZs data, improved work zone TTCPs will be developed. These TTCPs will be evaluated using an advanced driving simulator and a microscopic traffic simulation tool. The main objectives of this study include:

- Literature Review: A focused review on work zone safety will be conducted.
- SNDS Data Analysis: Critical factors that may potentially affect (either positively or negatively) driver behavior in work zones under various conditions will be reviewed and analyzed based on the SNDS data. These factors may include traffic signs, variable message signs, law enforcement, work zone layout, etc.
- Identify and Quantify Strategies: The identified factors will be further examined and tools will be developed to quantify these factors’ impacts on three key aspects of improving work zone safety: reducing speed, maintaining safe distances, and preventing driver distraction. In addition, the impacts of these factors on reducing near crash events will be studied. Investigating near crash events and driver behavior/maneuvers immediately prior to them will allow us to better understand how work zone crashes occur.
- Proposed Work Zone Control Plans: Based on the SNDS data analysis results and a review of work zone control strategies, new and improved work zone TTCPs will be developed.
- Validate the Results: Field data collected from smart work zones (SWZs) in Massachusetts (and other New England states if available) will be used to evaluate the performance of certain work zone TTCPs. If there is a match between the SWZs and the work zones in the SNDS data, the corresponding data sets will be compared both quantitatively and qualitatively. In addition, an advanced driving simulator and a microscopic traffic simulator will be used to evaluate the safety and mobility performance of various work zone layouts and controls. Extensive driving simulator studies will be conducted to evaluate how drivers respond to different work zone layouts and controls.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

Task 3 – Development of Methodology for Testing and Analyzing TTCPs

- The team has finished all the required paperwork/training and has obtained the roadway

information database and some shapefiles for the NDS.

- An agreement must be signed between Virginia Tech and UMass Lowell before the team can obtain the requested NDS data. Virginia Tech sent an agreement to UMass Lowell for signature in January 2016. However, UMass Lowell has a template for such an agreement and asked Virginia Tech to use the UMass Lowell template. Virginia Tech also has certain required languages to be included in the agreement. There have been many email exchanges between Virginia Tech and UMass Lowell. The agreement so far has not been finalized and signed yet. The team is still awaiting the NDS data for the candidate sites.
 - However, Virginia Tech raised additional questions on our data security plan. These new problems were finally solved on June 20, 2016. According to the email response from Virginia Tech, our Naturalistic Driving Study data request is now under review by the Transportation Research Board.
- The Naturalistic Driving Study (NDS) data at the end of August 2016 in two batches. The team are currently working on submitting our second data request to the Virginia Tech Transportation Institute (VTTI). For this data request, we will make sure that scenarios with lane closure and one lane open will be covered.

Smart Work Zone (SWZ) Data

- The team has acquired some data for a SWZ in Connecticut from ConnDOT.
- The team is also in the process of obtaining data from two additional SWZs in Massachusetts.
- The team has finished analyzing the data obtained from one SWZ in Massachusetts.

Safety Data

- The team has also acquired some work zone crash data from ConnDOT and the University of Connecticut (Connecticut Transportation Safety Research Center).
- Task 3 – Development of Methodology for Testing and Analyzing TTCPs

Other Data Sources

- The team is coordinating with MassDOT regarding this data collection effort using a drone.
- The team also explored the possibility of using the emerging VR technology for modeling driver behavior under different work zone scenarios. The driving simulator is much cheaper.

Task 4 – Development of New TTCPs

- The team has reviewed about 60 literatures on work zone temporary traffic control strategies. Most of them are on work zone speed and merge control.
- The team attempted to identify innovative traffic control strategies from the NDS data but were unsuccessful. We also checked the SWZ data. It seems that the two SWZs used the MassDOT Standard Traffic Control Plans for work zones. Currently, we are in the process of documenting the reviewed traffic control strategies and will present them at the upcoming project meeting.
- The team reviewed many strategies for speed and merge control for highway work zones.

Task 5 – Evaluation of New TTCPs

- For this task, the PI initially proposed to use either VISSIM or Aimsun to evaluate the proposed temporary traffic control strategies. We have now tentatively decided to use VISSIM, since an ongoing FHWA sponsored project is working on developing a new car-following model specifically for work zones. This FHWA project also plans to implement this work zone car-following model as a VISSIM extension. If this extension is successfully

implemented before May 2017, we will adopt in our TTCP evaluation.

- The team plans to finish developing the dynamic merge control strategy by the end of this year. The driving simulator and VISSIM evaluations of this strategy will be concluded before May 2017.

Task 5 – Evaluation of New TTCPs

The team has been working on two strategies to evaluate the proposed TTCPs: 1) virtual reality driving simulator (VRDS) and 2) VISSIM microscopic traffic simulation. The VRDS is mainly for evaluating speed control strategies (i.e., strategies 1~4). The team has coded all four strategies and prepared recruiting materials, and is ready to conduct the driving simulation study once the semester starts and students are back on campus.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

An abstract entitled “Modelling Highway Work Zone Traffic Safety and Driver Behaviours in the United States Using a Virtual Reality Driving Simulator” has been accepted by the 2017 Road Safety & Simulation Conference to be held in The Hague, Netherland in October 2017.

PROJECT NUMBER: 15-1

PROJECT TITLE: “Use of Forested Habitat Adjacent to Highways by Northern Long Ear Bats (and Other Bats)”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Jeffrey Foster, University of New Hampshire

STATUS: Open

AGREEMENT TERM: 12/1/2016 – 11/30/2018

ANTICIPATED COMPLETION: 11/30/2018

PROJECT OBJECTIVES: The project objectives would be to develop a matrix of disturbance features (sound frequencies and volumes, canopy width, etc.) and an assessment of a barrier effect that would affect foraging and roosting behavior of Northern Long-Eared Bat colonies and other potential listed species. There would be a screening tool and GIS model that would show zones of influence around highways that have noise and disturbance levels that would result in unlikely bat utilization in adjacent habitats. The screening tool could be GIS-linked. It would link with other geocoded information, and databases, and satellite imagery, that could be updated by future researchers if need be as more information is collected.

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

None thus far.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

None thus far.

PROJECT NUMBER: 15-3

PROJECT TITLE: “Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England”

PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S): Eshan Dave, University of New Hampshire

STATUS: Open

AGREEMENT TERM: 08/01/2016 – 07/31/2018

ANTICIPATED COMPLETION: 07/31/2018

PROJECT OBJECTIVES:

1. Evaluate good and poor performing asphalt mixtures in New England and determine mechanisms responsible for poor performing mixtures
2. Determine impacts of remedial measures (anti-stripping additives and hydrated lime) in reducing moisture susceptibility of poor performing mixtures
3. Assess impacts of moisture induced-damage on pavement performance and service life
4. Recommend an evaluation framework consisting of appropriate test procedure(s), specification, analysis procedure verified with field performance data that is reliable and suitable for moisture susceptibility testing of asphalt mixtures used in New England

PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2016:

The contract for this project between NETC and University of New Hampshire was set up during the reported quarter. The “notice to proceed” was sent to researchers on December 22nd 2016. Since only one working day was available in the reported quarter between the receipt of the notice to proceed and end of the quarter, insignificant progress has been accomplished. Researchers have started to collect published literature on the topic of moisture-induced damage in asphalt mixtures and have started to also collect standard specifications from various agencies to conduct a state of the practice review.

REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2016:

None thus far.

FINANCIAL STATUS

1. FINANCIAL STATUS OF ACTIVE PROJECTS:

NO.	PROJECT TITLE	APPROVED BUDGET	INVOICES APPROVED FOR PAYMENT	PROJECT BALANCE
05-5	Measurement of Adhesion Properties Between Topcoat Paint and Metallized/Galvanized Steel with Surface Energy Measurement Equipment	\$125,000.00	\$124,895.54	FINAL
06-4	Preventative Maintenance and Timing of Applications	\$242,909.00	\$214,777.87	\$28,131.13
07-1	In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations	\$198,154.00	\$177,767.98	\$20,386.02
09-2	Effective Establishment of Native Grasses on Roadsides	\$80,000.00	\$80,000.00	\$0.00
09-3	Advanced Composite Materials: Prototype Development and Demonstration	\$165,000.00	\$136,268.49	\$28,731.51
10-3	Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology	\$150,158.00	\$65,317.38	\$84,840.62
13-1	Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections	\$174,923.00	\$147,921.23	\$27,001.77
13-2	HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures	\$249,785.00	\$55,042.07	\$194,742.93

2. FUND BALANCE:

NETC FUND BALANCE As of January 8, 2017							
ITEM	OBLIGATION FOR PROJECTS	TRAVEL OBLIGATIONS AND EXPENDITURES	BUDGET	EXPENDED	INVOICE	CUMMULATIVE BALANCE	NOTES
Unexpended Balance of NETC funds from AASHTO as of 6/5/95 (Per AASHTO memo 12/4/95)						132,777.07	
Member Obligations 1994 = 6 X \$75,000	450,000.00					450,000.00	
Coord./Admin. of NETC: Calendar Year 1995 Bdg. = \$73042				58,761.32	FINAL	391,238.68	
- Construction Costs of New England Bridges-Phase II				39,500.00	FINAL/CLOSED	351,738.68	
- Tire Chips as Lightweight Backfill-Phase II: Full-Scale Testing (Supplemental Funding)				16,000.00	FINAL/CLOSED	335,738.68	
- Bridge Rail Crash Test - Phase II: Sidewalk-Mounted Rail				134,127.00	FINAL/CLOSED	201,611.68	
- New England Vehicle Classification and Truck Weight Program				6,752.57	FINAL/CLOSED	194,859.11	
94-1: Structural Analysis of New England Subbase Materials and Structures				110,057.38	FINAL/CLOSED	84,801.73	
94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques				224,901.80	FINAL/CLOSED	-140,100.07	
94-3: Procedures for The Evaluation of Sheet Membrane Waterproofing				67,002.00	FINAL/CLOSED	-207,102.07	Note: Project adminis
94-4: Durability of Concrete Crack Repair Systems				72,036.04	FINAL/TERM.	-279,138.11	
Member Obligations 1995 = 7 X \$75,000	525,000.00					245,861.89	
95-1: Use of Tire Chips/Soil Mixtures to Limit Pavement Damage of Paved Roads				75,000.00	FINAL/CLOSED	170,861.89	
95-2: Suitability of Non-Hydric Soils for Wetland Mitigation				39,867.70	FINAL/CLOSED	130,994.19	
95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement				120,812.12	FINAL/CLOSED	10,182.07	
95-5: Buried Joints in Short Span Bridges				61,705.61	FINAL/TERM.	-51,523.54	
95-6: Guidelines for Ride Quality Acceptance of Pavements				106,124.00	FINAL/CLOSED	-157,647.54	
Member Obligations 1996 = 6 X \$75,000	450,000.00					292,352.46	
Coord./Admin. of NETC: Calendar Year 1996; Bdg. = \$75,000				69,123.85	FINAL	223,228.61	
96-1: SUPERPAVE Implementation				60,139.25	FINAL/CLOSED	163,089.36	
96-2: Optimizing GPS Use in Transportation Projects				27,008.81	FINAL/TERM.	136,080.55	
96-3: Effectiveness of Fiber Reinforced Composites as Protective Coverings for Bridge Elements, etc.				135,000.00	FINAL/CLOSED	1,080.55	
Member Allocations 1997 = 6 X \$75,000	450,000.00					451,080.55	
Coord./Admin. of NETC: Calendar Year 1997; Bdg. = \$82,494				77,244.35	FINAL	373,836.20	
97-1: A Portable Method for Determining Chloride Concentration on Roadway Pavements				96,669.50	FINAL/CLOSED	277,166.70	Phase I Phase II
97-2: Performance Evaluation & Economic Analysis of Durability Enhancing Admixtures, etc.				90,667.79	FINAL/CLOSED	186,498.91	
97-3: Determining Properties, Standards & Performance of Wood Waste Compost, etc.				108,318.73	FINAL/CLOSED	78,180.18	
Alloc. to ConnDOT for Constr. Costs of Test Site (Approved 1/21/99 Ballot)				27,779.64	FINAL/CLOSED	50,400.54	Phase I
97-4: Early Distress of Open-Graded Friction Course				16,074.30	FINAL/CLOSED	34,326.24	Phase II
				10,700.00		23,626.24	
				57,495.71	FINAL/CLOSED	-33,869.47	
Member Obligations 1998 = 6 X \$75,000	450,000.00					416,130.53	
Coord./Admin. of NETC: Calendar Year 1998; Bdg. = \$73,021				80,422.65	FINAL	335,707.88	
- Travel Tech. Comm. (Aug. 98 tel. poll) for 1998 = \$5,000				0.00		335,707.88	
- T2 (per 12/2/97 Adv. Committee Mtg.) for 1998 = \$10,000				9,551.06	FINAL	326,156.82	
- Refund Check (No. 15-663337), for CY '98 Management of NETC, from UConn OSP; Ref. 7/19/00 letter to J. Sime	336.00					326,492.82	Refund Check (No. 15-
Member Obligations 1999 = 6 X \$75,000	450,000.00					776,492.82	
Coord./Admin. of NETC: Calendar Year 1999: Bdg. = \$98,066				79,101.20	FINAL	697,391.62	
99-1: Bridge Rail Transitions				240,000.00	FINAL/CLOSED	457,391.62	
99-2: Evaluation of Asphaltic Expansion Joints				62,234.76	FINAL/CLOSED	395,156.86	
99-3: Bridge Scour Monitoring Systems				78,523.32	FINAL/CLOSED	316,633.54	
99-4: Quantifying Roadside Rest Area Usage				44,857.00	FINAL/CLOSED	271,776.54	
99-6: The Effects of Concrete Removal Operations on Adjacent Concrete that Is to Remain				96,008.36	FINAL/CLOSED	175,768.18	
Member Obligations 2000 = 6 X \$100,000	600,000.00					775,768.18	
Coord./Admin. of NETC: Calendar Year 2000: Bdg. = \$102,588				91,899.37	FINAL	683,868.81	
00-1: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England - A Synthesis				31,251.92	FINAL/CLOSED	652,616.89	
00-2: Evaluation of Permeability of Superpave Mixes				95,499.16	FINAL/CLOSED	557,117.73	
00-3: Composite Reinforced Timber Guard Rail - Phase I: Design, Fabrication and Testing				81,989.38	FINAL/CLOSED	475,128.35	
00-4: Falling Weight Deflectometer Study				100,000.00	FINAL/CLOSED	375,128.35	
00-5: Guard Rail Testing - Modified eccentric Loading Terminal at NCHRP 350 TL2				61,287.00	FINAL/CLOSED	313,841.35	
00-6: Implementation of Visualization Technologies to Create Simplified Presentations Within Highway agencies				74,914.49	FINAL/CLOSED	238,926.86	
00-7: A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn't				45,369.45	FINAL/CLOSED	193,557.41	
00-8: Performance and Effectiveness of A Thin Pavement Section Using Geogrids and Drainage geocomposites in				150,000.00	FINAL/CLOSED	43,557.41	
Member Obligations 2001 = 6 X \$100,000	600,000.00					643,557.41	
Coord./Admin. of NETC: Calendar Year 2001: Bdg. = \$106,248				104,385.35	FINAL	539,172.06	
01-1: Advanced Composite Materials for New England's Transportation Infrastructure				47,559.27	FINAL/CLOSED	491,612.79	
01-1: Advanced Composite Materials for New England's Transportation Infrastructure - Technology Transfer Phase				25,286.18	FINAL/CLOSED	466,326.61	
01-2: Development of A Testing Protocol for Quality Control/Quality Assurance of Hot Mix Asphalt				80,000.00	FINAL/CLOSED	386,326.61	
01-3: Design of Superpave HMA for Low Volume Roads				120,324.15	FINAL/CLOSED	266,002.46	
01-6: Field Evaluation of A New Compaction Device				49,944.50	FINAL/CLOSED	216,057.96	
Member Obligations 2002 = 6 X \$100,000	600,000.00					816,057.96	
NY DOT Obligation = \$56,551.38	56,551.38					872,609.34	
Coord./Admin. Of NETC: Calendar Year 2002				109,207.12	FINAL	763,402.22	
02-1: Relating Hot Mix Asphalt Pavement Density to Performance				103,260.73	FINAL/CLOSED	660,141.49	
02-2: Formulate Approach for 511 Implementation in New England Phase 1				48,158.19	FINAL/CLOSED	611,983.30	
02-2: Formulate Approach for 511 Implementation in New England Phase 2				32,813.16	FINAL/CLOSED	579,170.14	
02-3: Establish Subgrade Support Values (Mr) for Typical Soils in New England				79,936.86	FINAL/CLOSED	499,233.28	
02-5: Determination of Moisture Content of De-Icing Salt at Point of Delivery				19,679.99	FINAL ² /CLOSED	479,553.29	
02-6: Sealing of Expansion Joints - Phase 1				74,982.81	FINAL/CLOSED	404,570.48	
02-7: Calibrating Traffic Simulation Models to Inclement Weather Conditions with Applications to Arterial				74,037.57	FINAL/CLOSED	330,532.91	
02-8: Intelligent Transportation Systems Applications to Ski Resorts in New England				54,724.71	FINAL/CLOSED	275,808.20	

Member Obligations 2003 = 6 X \$100,000	600,000.00				875,808.20	
NY DOT Obligation = \$50,000	50,000.00				925,808.20	
Coord./Admin. Of NETC Calendar Year 2003 = \$124,258				118,855.19	FINAL	806,953.01
03-1: Ability Of Wood Fiber Materials To Attenuate Heavy Metals Associated with Highway Runoff				70,690.16	FINAL/CLOSED	736,262.85
03-2: Field Studies of Concrete Containing Salts of An Alkenyl-Substituted Succinic Acid				133,385.33	FINAL/CLOSED	602,877.52
03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England				20,682.70	FINAL/CLOSED	582,194.82
03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England - Phase 2				13,135.80	FINAL/CLOSED	569,059.02
03-4: Measuring Pollutant Removal Efficiencies of Storm Water Treatment Units				80,000.00	FINAL/CLOSED	489,059.02
03-5: Evaluation of Field Permeameter As A Longitudinal Joint Quality Control Indicator				77,318.43	FINAL/CLOSED	411,740.59
03-6: Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop Guidelines for the Use of Polymer				54,085.45	FINAL/CLOSED	357,655.14
03-6 (FHWA) : Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop Guidelines for the Use of				44,479.52	FINAL/CLOSED	313,175.62
03-7 (Alt.): Basalt Fiber Reinforced Polymer Composites				64,092.29	FINAL/CLOSED	249,083.33
Member Obligations 2004 = 6 X \$100,000	600,000.00					849,083.33
NY DOT Obligation = \$50,000	50,000.00					899,083.33
Coord./Admin. Of NETC Calendar Year 2004 = \$126,559				113,012.87	FINAL	786,070.46
04-1: Recycling Asphalt Pavements Containing Modified Binders - Phase I				27,166.58	FINAL/CLOSED	758,903.88
04-1: Recycling Asphalt Pavements Containing Modified Binders - Phase II				82,750.99	FINAL/CLOSED	676,152.89
04-2: Driver-Eye-Movement-Based Investigation for Improving Work Zone Safety				70,387.66	FINAL/CLOSED	605,765.23
04-3: Estimating the Magnitude of Peak Flows For Steep Gradient Streams in New England. Cont'd as 04-3 (FHWA)				98,025.49	FINAL/CLOSED	507,739.74
04-3 (FHWA) : Estimating the Magnitude of Peak Flows For Steep Gradient Streams in New England				21,950.37	FINAL/CLOSED	485,789.37
04-4: Determining the Effective PG Grade of Binder in RAP Mixes				130,876.00	FINAL/CLOSED	354,913.37
04-5: Network-Based Highway Crash Prediction Using Geographic Information Systems				129,020.04	FINAL/CLOSED	225,893.33
Member Obligations 2005 = 6 x \$100,000	600,000.00					825,893.33
NY DOT Obligation = \$50,000	50,000.00					875,893.33
Coord./Admin. Of NETC Calendar Year 2005 = \$130,528				128,934.25	FINAL	746,959.08
05-1: Develop Base Resistance Load-Displacement Curves for The Design of Drilled Shaft Rock Sockets. Cont'd as				52,155.25	FINAL/CLOSED	694,803.83
05-1 (FHWA) : Develop Base Resistance Load-Displacement Curves for The Design of Drilled Shaft Rock Sockets				46,820.24	FINAL/CLOSED	647,983.59
05-5: Measurement of Work of Adhesion Between Paint and Metalized/Galvanized Steel Cont'd as 05-5 (FHWA)				104,987.55	FINAL/CLOSED	542,996.04
05-5 (FHWA) : Measurement of Work of Adhesion Between Paint and Metalized/Galvanized Steel				19,907.99	FINAL/CLOSED	523,088.05
05-6: Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message Comprehension Cont'd as				46,712.74	FINAL/CLOSED	476,375.31
05-6 (FHWA) : Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message Comprehension				13,222.32	FINAL/CLOSED	463,152.99
05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways Phase I				92,000.36	FINAL/CLOSED	371,152.63
05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways Phase II				7,431.26	FINAL/CLOSED	363,721.37
05-8: Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for Analysis of Traffic Impacts of				94,964.22	FINAL/CLOSED	268,757.15
05-8 (FHWA) : Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for Analysis of Traffic				5,035.00	FINAL/CLOSED	263,722.15
Member Obligations 2006 = 5 x \$100,000 (no ME DOT allocation)	500,000.00	10,000.00				763,722.15
Note: Maine 2006 Obligation as of 11/06/06 per Peabody 11/30/06 email	100,000.00					863,722.15
Coord./Admin. Of NETC Calendar Year 2006 = \$131,814				100,718.92	FINAL	763,003.23
06-1: New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide With Level 2 & 3				82,209.78	FINAL/CLOSED	680,793.45
06-1 (FHWA) : New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide With				68,085.00	FINAL/CLOSED	612,708.45
06-3 Establish Default Dynamic Modulus Values for New England				109,787.00	FINAL/CLOSED	502,921.45
06-5 Winter Severity Indices for New England				73,639.62	FINAL/CLOSED	429,281.83
Member Obligations 2007 = 600,000	600,000.00	5,000.00				1,029,281.83
Coord./Admin. Of NETC Calendar Year 2007 = \$136,061				122,644.79	FINAL	906,637.04
Member Obligations 2008 = 600,000	600,000.00	10,000.00				1,506,637.04
NY DOT Obligation (50,000)	50,000.00					1,556,637.04
Coord./Admin. Of NETC Calendar Year 2008 = \$134,998				131,509.90	FINAL	1,425,127.14
02-6 Phase II Sealing of Small Mvmt Bridge Expan Joints - Field Inst. & Mntrng				74,558.62	FINAL/CLOSED	1,350,568.52
Member Obligations 2009 = 600,000	600,000.00					1,950,568.52
Coord./Admin. Of NETC Calendar Year 2009 (Approved) = 139,309				131,157.45	FINAL	1,819,411.07
Member Obligations 2010 = 600,000	600,000.00	15,000.00				2,419,411.07
Coord./Admin. Of NETC Calendar Year 2010 (Approved) = 134,809				127,097.21	FINAL	2,292,313.86
Member Obligations 2011 = 600,000	600,000.00	10,000.00				2,892,313.86
Coord./Admin. Of NETC Calendar Year 2011 (Approved) = 133,793				133,793.00	FINAL	2,758,520.86
Reconciliation of previous Pooled Fund Accounts	-354,400.71					2,404,120.15
Member Obligations 2012 = 100,000	100,000.00	5,000.00				2,504,120.15
Coord./Admin. Of NETC Calendar Year 2012 (Approved) = 179,344.49				179,344.49	FINAL	2,324,775.66
06-4 Preventative Maintenance and Timing of Applications			251,534.00			2,073,241.66
07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations				199,046.37	FINAL	1,874,195.29
09-2 Effective Establishment of Native Grasses on Roadsides				87,436.11	FINAL	1,786,759.18
09-3 Advanced Composite Materials: Prototype Development and Demonstration				158,320.39	FINAL	1,628,438.79
10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology			158,783.00			1,469,655.79
Member Obligations 2013 = 0	0.00					1,469,655.79
Coord./Admin. Of NETC Calendar Year 2013 (Approved) = 179,344.49				179,344.49	FINAL	1,290,311.30
13-1: Development of High Early Strength Connections for Accelerated Bridge Construction			183,548.00			1,106,763.30
13-2: HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of			258,410.00			848,353.30
13-3: Improved Regionalization of QA Functions			108,625.00			739,728.30
Member Obligations 2014 = 500,000	500,000.00	10,000.00				1,239,728.30
Coord./Admin. Of NETC Calendar Year 2014 (Approved) = 179,344.49				179,344.49	FINAL	1,060,383.81
14-1: Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of			108,625.00			951,758.81
14-2: Investigation of Northern Long-Eared Bat Roosting Sites on Bridges			214,179.00			737,579.81
14-4: Optimizing future work zones in New England for safety			208,625.00			528,954.81
Member Obligations 2015 = 600,000	600,000.00	5,000.00				1,128,954.81
Coord./Admin. Of NETC Calendar Year 2015 (Approved) = 179,344.49			179,344.49			949,610.32
15-1: Use of Forested Habitat Adjacent to Highways by Northern Long ear Bats			173,625.00			775,985.32
15-2: Using the New SHRP2 Naturalistic Driving Study Safety Databases to Examine Safety Concerns for Teens and			158,625.00			617,360.32
15-3: Moisture Susceptibility Testing for Hot Mix Asphalt Pavements in New England			158,625.00			458,735.32
15-4: Optimizing Quality Assurance (QA) Process for Asphalt Pavement Construction in the Northeast			158,625.00			300,110.32
Member Obligations 2016 = 0	0.00	0.00				300,110.32
Coord./Admin. Of NETC Calendar Year 2016 (Approved) = 0			0.00			300,110.32

NETC Fund Balance Notes:

1. Member FFY allocations are obligated between October 1 and December 31
2. A credit of \$6,599.70 for NETC's overpayment to UConn for CY 2004 NETC Management was applied, by UConn, to the 'Indirect Cost' for project 02-5. Therefore although the total expenditures of the project were \$26,279.69 the amount paid by NETC was \$19,679.99.

3. Per minutes of NETC Adv. Comm. Mtg. 5/12/08: "It was agreed that since the encumbered amount for NETC 05-7 was incorrectly shown in the Fund Balance Report (April 30, 2008) as \$70,000 and the correct amount is \$100,000, the amount of funding to be allocated for the third ranked problem statement for the FFY 09 research program (NETC 09-3) would be set at the amount of the revised unencumbered fund balance remaining (at that time) after the allocation of funds for NETC 09-1 and NETC 09-2, i.e., \$48,847." (Note no longer relevant. TAC revised budget. AHC 6/25/2013)
4. Work on project suspended pending resolution of authorization of payment for costs incurred prior to execution of project agreement. VAOT to submit request to FHWA for approval of costs incurred prior to execution of the project agreement in accordance with 23CFR Section 1.9.
5. During the Process to Close out SPR-3(089) and TPF-5(201), it became clear that there was a discrepancy between the NETC Coordinator's Fund Balance Tracking Sheet and what was actually left over in the accounts. The reconciliation is approximately \$-450,000. This leads me to believe that an annual contribution from the 1990s might have been canceled, but it is not reflected in the tracking sheet. Unfortunately, SPR-3(009) has been closed for a long time, so the detailed account information cannot be obtained.
6. Contributions for FY 2012 and FY 2013 were canceled in an Advisory Committee ballot dated 1/10/14. Connecticut had already made their contribution. Therefore, they will not need to make a contribution for FY 2014.
7. Contributions for FY 2016 have been waived.

REPORTS, PAPERS AND PRESENTATIONS

1. POLICIES AND PROCEDURES:

- “Policies and Procedures, New England Transportation Consortium,” July 1995.
- “Policies and Procedures, New England Transportation Consortium,” April 2002.
- “Policies and Procedures, New England Transportation Consortium,” May 2008.
- “Policies and Procedures, New England Transportation Consortium,” March 2015.
- “Policies and Procedures, New England Transportation Consortium,” Nov. 2016.

2. ANNUAL REPORTS:

- “Annual Report For Calendar Year 1995,” March 1996, NETCR3
- “Annual Report For Calendar Year 1996,” January 1997, NETCR4
- “Annual Report For Calendar Year 1997,” January 1998, NETCR9
- “Annual Report For Calendar Year 1998,” January 1999, NETCR10
- “Annual Report For Calendar Year 1999,” January 2000, NETCR21
- “Annual Report For Calendar Year 2000,” August 2001, NETCR27
- “Annual Report For Calendar Year 2001,” December 2002, NETCR40
- “Annual Report For Calendar Year 2002,” November 2003, NETCR41
- “Annual Report For Calendar Year 2003,” September 2005, NETCR55
- “Annual Report For Calendar Year 2004,” December 2005, NETCR59
- “Annual Report For Calendar Year 2005,” August 2006, NETCR61
- “Annual Report For Calendar Year 2006,” April 2007, NETCR68
- “Annual Report For Calendar Year 2007,” February 2008, NETCR70
- “Annual Report For Calendar Year 2008,” April 2009, NETCR75
- “Annual Report For Calendar Year 2009,” March 2010, NETCR79
- “Annual Report For Calendar Year 2010,” April 2011, NETCR84
- “Annual Report For Calendar Year 2011,” December 2011, NETCR90
- “Annual Report For Calendar Year 2012,” February 2013, NETCR92
- “Annual Report For Calendar Year 2013,” February 2014, NETCR94
- “Annual Report For Calendar Year 2014,” February 2015, NETCR95
- “Annual Report For Calendar Year 2015,” January 2018, NETCR102
- “Annual Report For Calendar Year 2016,” April 2018, NETCR106

3. REPORTS, PAPERS, AND PRESENTATIONS 1988-1995:

- “The Development of a Common Regional System for Issuing Permits for Oversize and Overweight Trucks Engaged in Interstate Travel,” Humphrey, T.F., May 1986.
- “Agreement to Implement a Common Set of Procedures for Issuing Permits for Nondivisible Oversize and Overweight Trucks Engaged in Interstate Travel,” The New England Transportation Consortium, October 1988.
- “The New England Transportation Consortium, Round One Activities,” Humphrey, T.F., and Maser, K.R., MIT, December 1988.

“New Technology for Bridge Deck Assessment - Phase I Final Report,” Vols. I and II, Maser, Kenneth R., MIT Center for Transportation Studies, October 1989.

“Handbook for Use by the Trucking Industry to Implement The NETC Common Truck Permit Procedures for Certain Nondivisible Oversize/Overweight Vehicles Traveling on State Highways,” MIT Center for Transportation Studies, January 1989.

“Bridge Rail Design and Crash Worthiness - Final Report,” Elgaaly, M., Dagher, H., and Kulendran, S., University of Maine, May 1989.

“New England Transportation Consortium, Operational Procedures,” Humphrey, T.F., November 1991.

“Wetlands: Problem & Issues,” Shuldiner, P.W., University of Massachusetts, August 1990.

“Development of a Uniform Truck Management System,” Vols. I and II, Lee, K.W., and McEwen, E.E., University of Rhode Island. July 1990.

“A Study of STAA Truck Safety in New England - Phases I & II,” MIT, November 1991.

“New Technology for Bridge Deck Assessment - Phase II Final Report,” MIT, May 1990.

“Rail Service in New England,” Martland, C.P. Little, and Alvaro, A.E., MIT Center for Transportation Studies, April 1992.

“CMA Degradation and Trace Metals in Roadside Soil,” Ostendorf, D.W., Palaia, T.A., and Zutell, C.A., University of Massachusetts, March 1993.

“Tire Chips as Lightweight Backfill for Retaining Walls - Phase I,” Humphrey, D., Sandford, T.C., Cribbs, M.M., Gharegrat, H.G., and Manion, W.P., University of Maine, August 1992.

“Cooperative Regional Transportation Research Programs Underway in New England,” Humphrey, T.F., and Sussman, J.M., International Congress on Technology and Technology Exchange, June 1989.

“Uniformity Efforts in Oversize/Overweight Permits,” Humphrey, T.F., NCHRP Synthesis, No. 143, Transportation Research Board, 1988.

“Implementation of a Uniform Truck Permit System by the New England Transportation Consortium,” Humphrey, T.F., AASHTO 1987 Annual Meeting Proceedings, pp. 84-90, 1987.

“Advantages of Oversize/Overweight Truck Permit Uniformity,” AASHTO 1990

Annual Meeting Proceedings, pp. 83-85, 1990.

“Crash Worthiness of Bridge Rails,” Dagher, H., Elgaaly, M., and Kulendran, S., Proceedings, Fourth Rail Bridge Centenary Conference, Heriot-Watt University, Edinburgh, Scotland, August 1990.

“Principles of Radar and Thermography for Bridge Deck Assessment,” Maser, R., and Roddis, W.M.K., ASCE Journal of Transportation Engineering, Vol. 116, No. 5, Sept. /Oct. 1990.

“Regional Rail Planning In New England,” Martland, C.P. Little, and Alvaro, A.E., MIT, August 1993. (Accepted for publication 1994)

“CMA Degradation in Roadside Soil: Acetate Microcosms,” Ostendorf, D.W., Pollock, S.J., De Cheke, M.E., and Palaia, T.A., Transportation Research Record, No. 1366, pp. 41-43, 1992.

“Aerobic Degradation of CMA in Roadside Soils: Field Simulations from Soil Microcosms,” Ostendorf, D.W., Pollock, S.J., De Cheke, M.E., and Palaia, T.A., Journal of Environmental Quality, Vol. 22, pp. 229-304, 1993.

“Shear Strength and Compressibility of Tire Chips for Use as Retaining Wall Backfill,” Humphrey, D.N., Sandford, T.C., Cribbs, M.M., and Manion, W.P., Transportation Research Record No. 1422, pp. 29-35, Transportation Research Board, National Research Council Washington, D.C., 1993.

“Tire Chips as Lightweight Subgrade Fill and Retaining Wall Backfill,” Humphrey, D.N., and Sandford, T.C., Proceedings of the Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities, pp. 5-87 to 5-99, Federal Highway Administration, Washington, D.C., 1993.

4. REPORTS, PAPERS AND PRESENTATIONS 1995-2016:

Project No.	Title
-------------	-------

N/A	Construction Costs of New England Bridges
-----	--

Reports:

“Construction Costs of New England Bridges,” Alexander, J.A., Dagher, H. and James, S., November 1996, NETCR1.

Papers and Presentations:

“Construction Costs of New England Bridges,” Alexander, J., Dagher, H. and James, S. Presented at the Annual Maine Transportation Conference, December 7, 1995.

N/A	Tire Chips as Lightweight Backfill for Retaining Walls, Phase II: Full-Scale Testing
-----	---

Reports:

“Tire Chips As Lightweight Backfill for Retaining Walls - Phase II,” Tweedie, Jeffrey J., Humphrey, Dana N., and Sandford, T.C., March 11, 1998, NETCR8.

Papers and Presentations:

“Tire Shreds as Lightweight Retaining Wall Backfill-Active Conditions,” Humphrey, D. Submitted for publication in the ASCE Journal of Geotechnical and Geoenvironmental Engineering.

“Civil Engineering Uses for Tire Chips,” Humphrey D.N. A six-hour short course presented to the Nebraska Department of Environmental Quality, the Maine Dept. of Transportation, the Texas Engineering Extension Service, the Manitoba Tire Stewardship Board, the Alberta Tire Recycling Management Board, and the Arkansas Department of Pollution Control and Ecology.

“Tire Chips as Lightweight Subgrade and Retaining Wall Backfill,” by Humphrey, D.N. and Sandford, T.C. Symposium on Recovery and Effective Reuse of Discarded Materials and By-Products for Construction of Highway Facilities, FHWA, Denver, Colorado, October 19-22, 1993.

“Use of Tire Chips as Subgrade Insulation and as Lightweight Fill for Highway Construction,” Humphrey, D.N. Presented at the 18th Annual Meeting of the Asphalt Recycling and Reclaiming Association, Pompano Beach, Florida, February 23-26, 1994.

“Use of Tire Chips in Highway Construction,” Humphrey, D.N. Presented to the New England Environmental Expo, Boston, Massachusetts, May 9, 1995.

N/A

Tire Chips as Lightweight Backfill for Retaining Walls, Phase II: Full-Scale Testing (cont'd):

Papers and Presentations (cont'd):

“Use of Tire Chips in Highway Construction,” Humphrey, D.N. Presented to the AASHTO Region 1 RAC Meeting, Portland, Maine, May 23, 1995.

“Tire Chips for Highway Construction,” Humphrey, D.N. Presented to the Northeast Recycling Council in Sturbridge, Massachusetts on December 8, 1995.

“Tire Chips: A New Road Building Geomaterial,” Humphrey, D. Presented at the Conference on Waste and Recycled Materials in the Transportation Infrastructure, held in conjunction with the 75th Annual Meeting of the Transportation Research Board, January 7, 1996.

“Use of Tire Chips in Civil Engineering.” Presented at the 76th Annual Meeting of the Rubber Association of Canada, March 7, 1996.

“Civil Engineering Uses for Scrap Tires,” Humphrey, D. Presented at Scrap Tire '96 held in Chicago, Illinois on August 16, 1996.

“Full Scale Field Trials of Tire Chips as Lightweight Retaining Wall Backfill-At Rest Conditions,” Tweedie, J.J., Humphrey, D.N., and Sandford, T.C., Transportation Research Board No. 1619, Transportation Research Board, Washington, D.C., p. 64-71, 1998.

“Tire Shreds as Retaining Wall Backfill, Active Conditions,” Tweedie, J.J., Humphrey, D.N., and Sandford, T.C, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, Vol. 124, No. 11, Nov., pp.1061-1070, 1998.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented in each of the six New England States, 1998.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented to the RI DOT, April 1999.

N/A

New England Vehicle Classification And Truck Weight Program, Phase I

Reports:

“New England Vehicle Classification and Truck Weight Program, Technical Report No. 1: Toward the Development of a Vehicle Classification Program for New England,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

N/A

New England Vehicle Classification And Truck Weight Program, Phase I (cont'd):

Reports (cont'd):

“New England Vehicle Classification and Truck Weight Program, Technical Report No. 2: Toward the Development of a Truck Weight Program for New England,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

“New England Vehicle Classification and Truck Weight Program, Technical Report No. 3: Supplemental Analysis of Truck Weight Data Collection at SHRP Continuous Count Stations,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T., and Shuldiner, P., April 1996.

“New England Vehicle Classification and Truck Weight Program, Phase I,” Collura, J., Chan, D., Evans, E., Kelly, S., Hosmer, T. and Shuldiner, P., April 1996, NETCR2.

Papers and Presentations:

“An Analysis of Vehicle Class and Truck Weight Patterns in New England,” Collura, J. and Orloski, F. Presented at the 1994 National Traffic Data Acquisition Conference, Rocky Hill, Connecticut, September 18-22, 1994.

“New England Vehicle Classification and Truck Weight Program,” Collura, J. and Orloski, F. Presented to the Transportation Research Board's Highway Traffic Monitoring Committee, Annual Meeting of the Transportation Research Board, Washington, D.C., January 1995.

N/A

Bridge Rail Crash Test, Phase II: Sidewalk-Mounted Rail

Reports:

“NETC 2-Bar Curb-Mounted Bridge Rail Design - Plans and Specifications.” Revised January 1997.

“NETC 4-Bar Sidewalk-Mounted Bridge Rail Design - Plans and Specifications.” January 1997.

“Crash Testing and Evaluation of the NETC 2-Bar Curb-Mounted Bridge Rail,” Mak, K.K., and Menges, W.L., February 1998, NETCR10.

“Full-Scale Crash Evaluation of the NETC 4-Bar Sidewalk Steel Bridge Railing,” Kimball, C.E., and Mayer, J.B., March 1999, NETCR14. Papers and Presentations: None

Structural Analysis of New England Subbase Materials And StructuresReports:

“Structural Analysis of New England Subbase Materials and Structures,” Lee, K.W., Huston, M.T., Davis, J., Vajjhalla, S., June 30, 2001, NETCR26.

Papers and Presentations:

“Structural Analysis of New England Subbase Materials and Structures,” Davis, J. Presented at the Rhode Island Transportation and Civil Engineering Forum, Kingston, Rhode Island, October 23, 1996.

“Structural Analysis of New England Subbase Materials and Structures.” Presented at the Northeast Graduate Student Symposium on Applied Mechanics, University of Rhode Island, April 26, 1997.

“Structural Analysis of New England Subbase Materials and Structures.” Presented at the Rhode Island Transportation and Civil Engineering Forum, University of Rhode Island, October 15, 1997.

“Structural Analysis of New England Subbase Materials and Structures,” Davis, J., Huston, M., and Lee, K.W. Presented at the 1998 Annual Transportation Research Board Meeting.

“Structural Properties of New England Subbase Materials of Flexible Pavements.” Presented at the 5th International Conference on the Bearing Capacity of Roads and Airfields, July 8, 1998.

“Structural Properties of New England Subbase Materials of Flexible Pavements.” Presented at the 5th International Conference on the Bearing Capacity of Roads and Airfields on July 8, 1998.

“Characterization of Subbase Materials of Flexible Pavements with and Without Reclaimed Asphalt Pavement,” Lee, K.W., Davis, J., and Vajjhalla, S. Presented at the 1999 World Congress for Korean Scientists and Engineers, July 7, 1999.

“Characterization of Subbase Materials of Flexible Pavements with and Without Reclaimed Asphalt Pavement,” Lee, K.W., Davis, J. and Vajjhalla, S. Presented at the 12th Rhode Island Transportation Forum, University of Rhode Island, October 15, 1999.

Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques

Reports:

“Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques,” Huston, D., Fuhr, P., Maser, K. and Weedon, W., July 1, 2002, NETCR 19.

Papers and Presentations:

“Bridge Deck Structural Monitoring Techniques,” Huston, D. Presented at the New England State Materials Engineer Association Conference, Burlington, Vermont, October 9, 1996.

“Bridge Deck Evaluation with Ground Penetrating Radar,” Huston, D., Maser, K., Weedon, W., Fuhr, P.L., and Adam, C., Structural Health Monitoring, Chang F., Editor, Technomic Publishing, pp. 91-109, Proceedings of the International Workshop on Structural Health Monitoring, Stanford, California, September 1997.

“Ground Penetrating Radar for Nondestructive Evaluation of Concrete Bridge Decks,” Adam, C., M.S. Thesis, Department of Mechanical Engineering University of Vermont, September 1997.

“Bridge Deck Evaluation with Ground Penetrating Radar,” Huston, D., Master, K., Hu, J.Q., Weedon, W., and Adam, C., Proceedings of the GPR '98 7th International Conference on Ground-Penetrating Radar, The University of Kansas, Lawrence, KS, May 27-30, 1998.

“Bridge Deck Evaluation with Ground Penetrating Radar,” Huston, D., Hu, J.Q., Pelczarski, N, and Esser, B., Proceedings Second International Conference on Structural Health Monitoring, Stanford University, September 1999.

“GIMA Antenna Design for Ground Penetrating Radar in Concrete NDE Application,” Hu J.Q., Huston, D. and Fuhr, P. SPIE paper 3670-63, SPIE Conference On Sensory Phenomena and Measurement Instrumentation for Smart Structures and Materials, Newport Beach, CA, March 1999.

“Ground Penetrating Radar for Concrete Bridge Health Monitoring Applications,” Huston, D, Hu, J.Q., Maser, K., Weedon, W., and Adam, C. SPIE 3587-23, Proceedings SPIE NDE Techniques for Aging Infrastructure and Manufacturing, Newport Beach, CA, March 1999.

“Electromagnetic Interrogation of Structures,” Huston, D. Fourth Army Research Office on Smart Structures, State College, PA, August 1999.

94-2

Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging Techniques (cont'd):

Papers and Presentations (cont'd):

“GIMA Ground Penetrating Radar System For Infrastructure Health Monitoring,” Huston, D.R., Hu, J.Q, Maser, K., Weedon, W., and Adam, C. Journal of Applied Geophysics 43, 2000, pp. 39-146.

“Good Impedance Match Antenna (GIMA) Design and Its Applications for Ground Penetrating Radar In Concrete Structures NDE Applications,” Hu, J. M.S. Thesis, Department of Mechanical Engineering, University of Vermont, March, 2000.

“Damage Assessment in Roadways with Ground Penetrating Radar,” Huston, D., Pelczarski, N., Esser, B., Maser, K., and Weedon, W. SPIE Conference on Nondestructive Evaluation and Health Monitoring of Aging Infrastructure, 3995A-55, Newport Beach CA, March 2000.

“Damage Detection in Roadways with Ground Penetrating Radar,” Huston, D.R., Pelczarski, N., Esser, B., and Master, K. GPR 2000, 8th International Conference on Ground Penetrating Radar," Gold Coast, Australia, May 2000.

“Wireless Inspection of Structures Aided by Robots,” Huston D.R., Pelczarski N., Esser B., Gaida G., Arms S. and Townsend C. SPIE Symposium on NDE for Health Monitoring and Diagnostics, 4337-24, Newport Beach CA, March 2001.

“Inspection of Bridge Columns and Retaining Walls with Electromagnetic Waves,” Huston D.R., Pelczarski N., and Key C. SPIE Symposium on Smart Systems for Bridges, Structures, and Highways, 4330-09, Newport Beach, CA, March 2001.

“Wireless Electromagnetic Interrogation of Structures,” Huston D., Pelczarski N., Fuhr P., Arms S., and Esser B. (Tentatively accepted) Smart Materials and Structures, April 2001.

“Adaptive Sensors and Sensor Networks for Structural Health Monitoring,” Huston D. SPIE 4512-24, Symposium on Complex Adaptive Structures, Hutchinson Island, FL, June 2001.

94-3

Procedures for the Evaluation of Sheet Membrane Waterproofing:

Reports:

“Procedures for the Evaluation Sheet Membrane Waterproofing,” Korhonen, C.J., Buska, J.S., Cortez, Edel R., and Greatorex, Alan R., August 1999, NETCR13.

Papers and Presentations: None

94-4

Durability of Concrete Crack Repair Systems:

Reports: None

Papers and Presentations:

“Durability of Concrete Crack Repair, Projects,” Robinson, J. Presented at the University of Rhode Island Graduate Seminar Series, Kingston, RI, November 19, 1997.

“Durability of Concrete Crack Repair System,” Tsiatas, G. and Robinson, J. Presentation to representatives of the Chemical Grouting Division of Kajima Corporation (Japan), University of Rhode Island, College of Engineering, October 26, 1999.

95-1

Use of Tire Chip/Soil Mixtures to Limit Frost Heave and Pavement Damage of Paved Road

Reports:

“Use of Tire Chip/Soil Mixtures to Limit Frost Heave and Pavement Damage of Paved Roads,” Brian, K.L., and Humphrey, D. N., June 2000, NETCR12.

Papers and Presentations:

“Laboratory and Field Measurement of the Thermal Conductivity of Tire Chips for Use as Subgrade Insulation,” Humphrey, D., Chen, L.H. and Eaton, R. A paper submitted to the Transportation Research Board for presentation at the session on “Properties of Unconventional Aggregates” at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented in each of the six New England States, 1998.

“Highway Applications of Tire Shreds,” Humphrey, D. A 7-hour short course presented to the RI DOT, April 1999.

“Field Trial of Tire Shreds as Insulation for Paved Roads,” Humphrey, D., Chen, L.H., Lawrence, B. A paper presented at the 10th International Conference on Cold Regions Engineering: Putting Research into Practice, held in Hanover, NH, August 16-19, 1999.

95-2

Suitability of Non-Hydric Soils for Wetland Mitigation

Reports:

“Suitability of Non-Hydric Soils for Wetland Mitigation,” Brannaka, L.K. and Evans, C.V., February 28, 1997, NETCR5.

Papers and Presentations: None

95-3 Implementation and Evaluation of Traffic Marking Recesses for Application of Thermo-Plastic Markings on Modified Open Graded Mixes

Reports:

“Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Friction Course,” Lee, K.W., Cardi, S.A., and Corrigan, S., July 2000, NETCR23.

Papers and Presentations:

“Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open Graded Mixes,” Lee, K.W. Presented at the Rhode Island Transportation and Civil Engineering Forum, Kingston, Rhode Island, October 23, 1996.

“Implementation and Evaluation of Traffic Marking Recesses for Application of Thermoplastic Pavement Markings on Modified Open-Graded Mixes,” Lee, K.W. Presented at the Rhode Island Transportation and Civil Engineering Forum, University of Rhode Island, October 15, 1997.

95-5 Buried Joints In Short Span Bridges

Reports: None

Papers and Presentations:

“State of the Art Study of Bridge Joint Systems in New England,” Tsiatas, and Chandrasekaran, S. Submitted for presentation at the Annual Meeting of the Transportation Research Board, Washington, D.C., January 1997.

95-6 Guidelines for Ride Quality Acceptance of Pavements

Reports:

“Guidelines for Ride Quality Acceptance of Pavements,” Collura, J., El-Korchi, T., Black K., Chase, M. and Li, J., April 1997, NETCR 6.

Papers and Presentations: None

96-1 Implementation of Superpave

Reports:

“Superpave Implementation,” Mahoney, James, Stephens, Jack E., September 1999, NETCR18.

Effectiveness of Fiber Reinforced Composite as Structural and Protective Coverings for Bridge Elements Exposed To Deicing Salt ChloridesReports:

“Effectiveness of High Strength Composites as Structural and Protective Coatings for Structural Elements,” Balaguru, P., and Lee, K.W., May 2001, NETCR28.

Papers and Presentations:

“Inorganic Matrices for Composites,” NSF Workshop on Composites, Hanover, NH, March 15, 1998.

“Behavior of Geopolymer Reinforced with Various Types of Fabrics,” SAMPE 1998, Anaheim, CA, May 1998.

“Use of Ferrocement Theory for Analysis of High Strength Composites,” Ferrocement VI, Ann Arbor, MI, June 1998.

“Advances in Composites,” National University of Singapore, July 19, 1998.

“Effectiveness of Fiber Reinforced Composites as Structural and Protective Covering Bridge Elements Exposed to Deicing-Salt Chlorides,” Visiting Scholar Lecture, Transportation Forum, University of Rhode Island, October 15, 1999.

“Advanced High Strength Fiber Composites,” U.S.-Germany Workshop, Maiz, Germany, May 16-19, 1999.

“Recent Advances in Fiber Composites,” Seminar Series, University Cataleuna, Spain, June 28, 1999.

“Inorganic Coatings for Transportation Infrastructures,” Geopolymer Conference, St. Quentin, France, July 2, 1999.

“State-of-the-Art: Fiber Reinforced Concrete,” NSF Faculty Workshop, Northwestern University, Evanston, IL, July 21, 1999.

“Recent Advances in High Strength Composites and Applications for Repair and Rehabilitation,” 6th International Conference on Structural Failure, Durability, and Retrofitting, Singapore, September 15, 2000.

96-3 Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides (cont'd):

Papers and Presentations (cont'd):

"Durability of Carbon Composites Made With Inorganic Matrix," Garon, R., and Balaguru, P., "SAMPE", November 2000, pp. 34-43.

"Inorganic Matrix - High Strength Fiber Composites," University of Missouri, Rolla, July 27, 2000.

"Comparison of Inorganic and Organic Matrices for Strengthening of Reinforced Concrete Beams," Kurtz, S., and Balaguru, P., Journal of Structural Engineering ASCE, V 127, January 2001, pp. 35-42.

"Durability of High Strength Composite Repairs under Scaling Conditions," Garon, R., and Balaguru, P., Proceedings of Third International Conference on Concrete Under Severe Conditions, Vancouver, Canada, June 2001.

97-1 A Portable Method to Determine Chloride Concentration on Roadway Pavements

Reports:

"A Portable Method to Determine Chloride Concentration on Roadway Pavements," Garrick, N., Nikolaidis, N., P. and Luo, J, September 2002, NETCR17.

Papers and Presentations: None

97-2 Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) In Structural Concrete for the Northeast U.S.A

Reports:

"Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete for the Northeast U.S.A.," Civjan, S.A., LaFave, J.M., Lovett, D., Sund, D.J., Trybulski, J., February 2003, NETCR 36.

Papers and Presentations:

"Performance Evaluation of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete," Sund, D., Report in Partial Fulfillment of Master of Science in Civil Engineering Degree, Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, September, 1999.

97-2 Performance Evaluation and Economic Analysis of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) In Structural Concrete for the Northeast U.S.A (cont'd):

Papers and Presentations:

“On the Use of Combinations of Durability Enhancing Admixtures (Mineral and Chemical) in Structural Concrete,” Lafave, J.M., Lovett, D., and Civjan, S.A., ACI Fall Convention, Toronto, Ontario, Canada, October 15-21, 2000.

“Performance Evaluation of Combinations of Durability Enhancing Admixtures in Concrete - Review and Experimental Program,” Report in Partial Fulfillment of Master of Science in Civil Engineering Degree, Lovette, D., Department of Civil and Environmental Engineering, University of Massachusetts, Amherst, February, 2001.

97-3 Determining Properties, Standards and Performance of Wood Material as an Erosion Control Mulch and as a Filter Berm

Reports:

“Performance Specifications for Wood Waste Materials as an Erosion Control Mulch and as a Filter Berm,” Demars, K.R., Long, R.P., Ives, J.R. April 2000, NETCR20.

Papers and Presentations:

“Compost Applications for Erosion Control: New and Improved Methods,” K. Demars. Presented at the Conference on ‘Putting Compost in the Specs: Practical Applications for Erosion Control’, Wrentham Development Center, Wrentham, MA, October 8, 2002.

97-4 Early Distress of Open-Graded Friction Course (OGFC)

Reports:

“Early Distress in Open-Graded Friction Course,” Stephens, J.E., Mahoney, J., Dougan, C.E., July 1999, NETCR16.

Papers and Presentations: None

99-1 Bridge Rail Transitions – Development and Crash Testing

Reports:

“NCHRP Report 350 Testing and Evaluation of NETC Bridge Rail Transitions,” Dean C. Alberson, C. Eugene Buth, Wanda L. Menges, and Rebecca R. Haug, Texas Transportation Institute, Texas A&M University, January 2006, NETCR 53.

Note:

Design documents for the NETC 2-Bar Curb-Mounted and 4-Bar Sidewalk-Mounted Bridge Rail Transitions are available from the NETC Coordinator.

- 99-1 Bridge Rail Transitions – Development and Crash Testing (cont’d):**
Papers and Presentations:
“NETC Bridge Rail Transitions,” by Dean C. Alberson and Wanda L. Menges, Concord, New Hampshire, December 13, 2005.

“Summary of NCHRP Report 350,” by Dean C. Alberson, Concord, New Hampshire, December 13, 2005.
- 99-2 Evaluation of Asphaltic Expansion Joints**
Reports:
“Evaluation of Asphaltic Expansion Joints,” Mogawer, W.S., November 2004, NETCR 50.

Papers and Presentations: None
- 99-3 Development of Priority Based Statewide Scour Monitoring Systems In New England**
Reports:
“Development of Priority Based Statewide Scour Monitoring Systems in New England,” Ho, C.T., Di Stasi, J.M., August 2, 2001, NETCR24.

Papers and Presentations:
“Real-Time Bridge Scour Assessment and Warning,” Di Stasi, J.M. and Ho, C.L., Proceedings of International Symposium: Technical Committee No. 33 on Scour of Foundations. Melbourne, Australia, pp. 337-352.
- 99-4 Quantifying Roadside Rest Area Usage**
Reports:
“Quantifying Roadside Rest Area Usage,” Garder, P. and Bosonetto, N., November 27, 2002, NETCR 38.

Papers and Presentations:
Results from the rest-area research were included in a presentation by the PI: “The Efficacy and Use of Continuous Shoulder Rumble Strips: Engineering a Solution,” presented at the November 20-21, 2002 National Summit to Prevent Drowsy Driving, National Academy of Sciences, Washington, DC, November 21, 2002 (taped by C-SPAN. Summit also covered by CNN Live Today, CNN Live on Location, CBS Early Show, National Public Radio’s Market Place, and national radio network coverage by ABC, CBS, and AP as well as two stories by nationally syndicated health columnist Jane Brody of The New York Times).

99-6 Analytical and Experimental Investigation of the Effects of Concrete Removal Operations on Adjacent Concrete That Is To Remain

Reports:

“Analytical and Experimental Investigation of the Effects of Concrete Removal Operations on Adjacent Concrete That is to Remain,” Masih, R., Wang, T. and Forbes, A., January 15, 2002, NETCR 29.

Papers and Presentations:

“Enhancing the Students' Learning Process Through Interaction Project Between Academia and Industry.” Presented and published in the Abstract of ASEE 2000 at the University of Massachusetts, Lowell, April 2000.

“The Effect of Powerful Demolition Equipment on the Remaining Part of the Concrete Bridge,” Masih, R. Presented and published in the proceedings of the Second International Conference on Computational Methods for Smart Structures and Material. Madrid, June 2000.

“Effect of Demolition on Remaining Part of Concrete Bridge, Numerical Analysis Vs. Experimental Results.” Presented and published in the proceedings of Internationales Kolloquium uber die Anwedungen der Informatik in Architektur und Bauwesen, Germany, June 2000

“The Effect of Bridge Rehabilitation on the Remaining Structural Parts.” Presented and published in the proceedings of the ASCE conference at Stanford University, August 2000.

00-1 Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in New England - A Synthesis of Practice

Reports:

“Ground-Based Image and Data Acquisition Systems for Roadway Inventories in New England – A Synthesis of Highway Practice,” Hancock, K. and Degray, J., August 2002, NETCR 30.

Papers and Presentations: None

00-2 Evaluation of Permeability of Superpave Mixes

Reports:

“Evaluation of Permeability of Superpave Mixes,” Mogawer, W., Mallick, R., Teto, M. and Crockford, C., July 3, 2002, NETCR34.

Papers and Presentations:

“An Alternative Approach to Determination of Bulk Specific Gravity and Permeability of Hot Mix Asphalt (HMA),” Bhattacharjee, S., Mallick, R. and Mogawer, W. Submitted to International Journal of Pavement Engineering.

A Presentation, by W. Mogawer, to the Northeast Asphalt User Producer Group Meeting, October 18, 2001, Albany, New York.

- 00-3 Design, Fabrication and Preliminary Testing of a Composite Reinforced Timber Guardrail**
Reports:
“Design, Fabrication and Preliminary Testing of a Composite Reinforced Timber Guardrail,” Davids, W., Botting, J., March 31, 2004, NETCR 39.

Papers and Presentations: None
- 00-4 Portable Falling Weight Deflectometer Study**
Reports:
“Portable Falling Weight Deflectometer Study,” Steinert, B., Humphrey, D., Kestler, M., March 11, 2005, NETCR52.

Papers and Presentations: None
- 00-5 Guardrail Testing Modified Eccentric Loader Terminal (MELT) at NCHRP 350 TL-2**
Reports:
“Guardrail Testing Modified Eccentric Loader Terminal (MELT) at NCHRP 350 TL-2,” Alberson, D., Menges, W. and Haug, R., July 2002, NETCR35.

Papers and Presentations:
Dean Alberson, Texas Transportation Institute, Principal Investigator presented the results of the crash tests conducted on the MELT guardrail terminal to the Association of General Contractors/American Road Transportation Builders Association/American Association of State Highway Transportation Officials Task Force 13 meeting in Seattle, Washington, April 2002.
- 00-6 Effective Visualization Techniques for the Public Presentation of Transportation**
Reports:
“Effective Visualization Techniques for the Public Presentation of Transportation Projects,” Garrick, N.W., Minutti, P., Westa, M., Luo, J., Bishop, M., July 2005, NETCR 48.

Papers and Presentations:
“Effective Visualization Techniques for the Public Presentation of Transportation Projects,” Luo, J., MS Thesis, University of Connecticut, August 2002.

- 00-7 A Complete Review of Incident Detection Algorithms and Their Deployment: What Works and What Doesn't**
Reports:
 "A Complete Review of Incident Detection Algorithms & Their Deployment: What Works and What Doesn't," Parkany, E., Xie C., February 7, 2005, NETCR 37.
- Papers and Presentations:
 "Use of Driver-Based Data for Incident Detection," Parkany, Emily, Submitted to the 7th International Conference on Applications of Advanced Technologies in Transportation Engineering (AATT), Boston, August 2002.
- 00-8 Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region**
Reports:
 "Performance and Effectiveness of a Thin Pavement Section Using Geogrids and Drainage Geocomposites in a Cold Region," Helstrom, C.L., Humphrey, D.N., and Labbe, J.M., August 2007, NETCR60.
- Papers and Presentations:
 "Geogrid Reinforced Pavement Structure in a Cold Region," Helstrom, C.L., Humphrey, D.N., and Hayden, S.A., Proceedings of the 13th International Conference on Cold Regions Engineering, ASCE, Orono, Maine, 12 pp., 2006.
- 01-1 Advanced Composite Materials for New England's Transportation Infrastructure: A Study for Implementation and Synthesis of Technology and Practice**
Reports:
 "Advanced Composite Materials for New England's Transportation Infrastructure: A Study for Implementation and Synthesis of Technology and Practice," Breña, S.F., Civjan, S.A., and Goodchild, M., May 2006, NETCR62.
- Papers and Presentations: None
- 01-1 Advanced Composite Materials in New England's Transportation Infrastructure - Technology Transfer Phase 1: Selection of Prototype**
T2 Phase I Reports:
 "Advanced Composite Materials in New England's Transportation Infrastructure – Technology Transfer Phase 1: Selection of Prototype," Breña, F., and Civjan, S.A., November 1, 2009, NETCR77.
- Papers and Presentations: None

- 01-2 Development of a Testing Protocol for QC/QA of Hot Mix Asphalt**
Reports:
“Development of a Testing Protocol for QC/QA of Hot Mix Asphalt (HMA),” Mogawer, W.S., Mallick, R., February 5, 2004, NETCR 43.
- Papers and Presentations:
“An Evaluation of Use of Rapid Triaxial Test In Quality Control of Hot Mix Asphalt (HMA),” Mogawer, W. S., Presented at the 82nd Annual Meeting of the Transportation Research Board, January 12-16, 2003, Washington DC.
- 01-3 Design of Superpave HMA for Low Volume Roads**
Reports:
“Design of Superpave HMA for Low Volume Roads,” Mogawer, W.S., Mallick, R., December 31, 2004, NETCR 51.
- Papers and Presentations:
“Development of Mix Design Criteria for Low Traffic Volume Hot Mix Asphalt Roads,” Nanagiri, Y.V., Mallick, R., Mogawer, W.S. Proceedings of the Annual Meeting of the Canadian Technical Asphalt Association, November 2003.
- 01-6 Field Evaluation of a New Compaction Monitoring Device**
Reports:
“Field Evaluations of A New Compaction Monitoring Device,” Miller, H.J., June 26, 2003, NETCR 42.
- Papers and Presentations: None
- 02-1 Relating Hot Mix Asphalt Pavement Density to Performance**
Reports:
“Relating Hot Mix Asphalt Pavement Density to Performance,” Mogawer, W.S., Daniel, J.S., and Austerman, A.J., April 1, 2010, NETCR76.
- Papers and Presentations:
“Evaluation of the Effects of HMA Density on Mixture Fatigue and Rutting Performance,” Mogawer, W.S., Northeast Asphalt User/Producer Group (NEAUPG) Annual Meeting, South Portland, Maine, October 8, 2009.
- “Evaluation of the Effects of Hot Mix Asphalt Density on Mixture Fatigue Performance, Rutting Performance and MEPDG Distress Predictions,” Mogawer, W.S., Austerman, A.J., Daniel, J.S., Fujie, Z., and Bennert, T., International Journal of Pavement Engineering, 2011.

- 02-2 Formulate Approach for 511 Implementation in New England**
Reports:
“Formulate Approach for 511 Implementation in New England,” Shuldiner, P., Loane, G., and Knapick, R., October 2005, NETCR44.

Papers and Presentations: None
- 02-3 Establish Subgrade Support Values for Typical Soils in New England**
Reports:
“Establish Subgrade Support Values for Typical Subs in New England,” Malla, R. B., and Joshi, S., April 2006, NETCR57.

Papers and Presentations:
“Resilient Modulus Prediction Models for Some New England Subgrade Soils,” Malla, R. and Joshi, S., Electronic Proceedings of the 2005 Joint ASCE/ASME/SES Conference on Mechanics and Materials (McMat 2005), Baton Rouge, LA, June 1-3, 2005.

“Resilient Modulus of Subgrade Soils A-1-b, A-3, and A-7-6 using LTPP Data: Prediction Models with Experimental Verification,” Joshi, Shraddha, and Malla, R., Proceedings, ASCE GeoCongress 2006, (Atlanta, GA, Feb. 26-March 01, 2006), ASCE, Reston, VA; Feb. 2006, 6p (CD ROM).
- 02-5 Determination of Moisture Content of Deicing Salt at Point of Delivery**
Reports:
“Determination of Moisture Content of Deicing Salt at Point of Delivery,” Long, R.P., Demars, K.R., and Balunaini, U., March 2004, NETCR 45.

Papers and Presentations: None

Sealing of Small Movement Bridge Expansion JointsReports:

“Sealing of Small Movement Bridge Expansion Joints,” Malla, R.B., Shaw, M.T., Shrestha, M.R. and Boob, S., June 2006, NETCR58.

Papers and Presentations:

“Silicone Foam Sealant for Bridge Expansion Joints,” Malla R. B., Shaw M. T., Shrestha M. R., Boob S., McMat 2005 Mechanics and Materials Conference Baton Rouge, Louisiana, June 1-3, 2005.

“Experimental Evaluation of Mechanical characteristics of Silicone Foam Sealant for Bridge Expansion Joints,” Malla R. B., Shaw M. T., Shrestha M. R., Boob S., 2005 Society for Experimental Mechanics Annual Conference Portland, Oregon, June 7-9, 2005.

“Development and Experimental Evaluation of Silicone Foam Sealant For Small Bridge Expansion Joints,” Matu Shrestha, M.S. Thesis, Dept. of Civil & Environmental Engineering, University of Connecticut, Storrs, CT, September 2005.

“Laboratory Evaluation of Weathering and Freeze-Thaw Effects on Silicone Foam Bridge Joint Sealant,” Shrestha, M.R., Malla, R.B., Boob, S. and Shaw, M.T., Paper #369, Proceedings, SEM 2006 Annual Conference and Exposition (St. Louis, MO, June 04-07, 2006), SEM, Bethel, CT, June 2006, 8p (CD ROM).

“Development and Laboratory Analysis of Silicone Foam Sealant for Bridge Expansion Joints,” Malla, R., Shaw, M., Shrestha, M., and Brijmohan, S., Journal of Bridge Engineering, ASCE, Reston, VA, July 2006.

02-6 Phase 2 Sealing of Small Movement Bridge Expansion Joints - Phase II: Field Demonstration and Monitoring

Reports:

"Sealing of Small Movement Bridge Expansion Joints - Phase 2: Field Demonstration and Monitoring," Malla, R.B., Shaw, M., Swanson, B., and Gionet, T., July 31, 2011, NETCR86.

Papers and Presentations:

"Laboratory Evaluation of a Silicone Foam Sealant for Field Application of Bridge Expansion Joints," Malla, R.B., Swanson, B., and Shaw M.T., Proceedings of the 2010 SEM Annual Conference & Exposition, SEM, Bethel, CT, 12 pages, June 2010.

"Development and Installation of Foam Sealant for Small Movement Bridge Expansion Joints," Malla, R.B., Swanson, B., and Shaw M.T., Poster presentation to the Proceedings, 27th Annual International Bridge Conference, Pittsburgh, PA, June 6-9, 2010.

"Laboratory Evaluation, Field Application, and Monitoring of a Silicone Foam Sealant Bonded to Various Bridge Expansion Joint Headers," Swanson, B.J., (2011), M.S. Thesis, Department of Civil and Environmental Engineering, University of Connecticut, Storrs, CT, 128 pages.

"Laboratory Evaluation of a Silicone Foam Sealant Bonded to Various Header Materials used in Bridge Expansion Joints," Malla, R.B., Swanson, B.J., and Shaw, M.T., "Construction and Building Materials – An International Journal, (published on-line <http://dx.doi.org/10.1016/j.conbuildmat.2011.04.050> ; May 26, 2011).

"Laboratory Testing Field Installation, and Monitoring of a Silicone Foam Sealant for Bridge Expansion Joints," Swanson, B.J., Malla, R.B., and Shaw, M.T., J. Bridge Engineering, ASCE, Reston, VA. (In Review).

02-7 Validating Traffic Simulation Models to Inclement Weather Travel Conditions with Applications to Arterial Coordinated Signal Systems
Reports:

“Validating Traffic Simulation Models to Inclement Weather Travel Conditions with Applications to Arterial Coordinated Signal Systems,” Sadek, A., El-Dessouki, W., November 2004, NETCR 47.

Papers and Presentations:

“Inclement Weather and Traffic Flow at Signalized Intersections: A Case Study from Northern New England,” Agbolosu-Amison, S.J., Sadek, A.W., and El-Dessouki, W., (2003). Tentatively accepted for publication in the Journal of the Transportation Research Board.

“Impact of Inclement Weather on Traffic Signal Operations in New England,” Agbolosu-Amison, S.J., Sadek, A.W., (2003). Presented to the Vermont Chapter of the Institute of Transportation Engineers, Montpelier, Vermont.

“Inclement Weather and Traffic Flow at Signalized Intersections: A Case Study from Northern New England,” Agbolosu-Amison, S.J., Sadek, A.W., and El-Dessouki, W., (2003). Presented at the 83rd Annual Transportation Research Board Meeting, Washington, D.C.

02-8 Intelligent Transportation Systems Applications to Ski Resorts in New England

Reports:

“Intelligent Transportation Systems Applications to Ski Resorts in New England,” Sadek, A., March 2004, NETCR 46.

Papers and Presentations:

“Addressing Ski Resort Transportation Problems with Intelligent Transportation Systems Applications,” Knapick, R.J., and Sadek, A.W., (2003). Abstract submitted to the Institute of Transportation Engineers District One Meeting, Burlington, VT.

03-1 Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff

Reports:

“Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway Runoff”, MacKay, A.A., July 16, 2008, NETCR65.

Papers and Presentations: None

03-2 Field Studies of Concrete Containing Salts of an Alkenyl-Substituted Succinic Acid

Reports:

“Field Studies of Concrete Containing Salts of an Alkenyl-Substituted Succinic Acid,” Civjan, Scott A., and Crellin, Benjamin, June 30, 2008, NETCR73.

Papers and Presentations:

“Hycrete – DSS An Innovative Admixture for Concrete: An Update on NETC 03-2,” Civjan, Scott A., and Crellin, Benjamin, 16th Annual NE Materials and Research Meeting Concord, NH. June 7, 2005.

“Hycrete Concretes: An Update on NETC 03-2,” Civjan, Scott A., and Crellin, Benjamin, Connecticut DOT, November 2, 2005.

“A New Admixture to Mitigate Corrosion Problems,” Civjan, S.A., and Crellin, B.J., Concrete International, Volume 28, No. 8, Pp. 78-82.

03-3 Feasibility Study of an Erosion Control Laboratory in New England

Reports:

“Feasibility Study of an Erosion Control Laboratory in New England,” Long, R.P., and Demars, K.R., December 2004, NETCR 49.

Papers and Presentations: None

03-3 Phase 2 Design Considerations for a Prototype Erosion Control Laboratory in New England

Reports:

“Design Considerations for a Prototype Erosion Control Testing Plot,” Long, R.P., and Demars, K.R., December 2005, NETCR 56.

Papers and Presentations: None

03-4 Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units

Reports:

“Measuring Pollutant Removal Efficiencies of Stormwater Treatment Units,” Zhang, X., September 27, 2005, NETCR54.

Papers and Presentations:

“Evaluation of Pathogenic Indicator Bacteria in Structural BMPs,” Zhang, X. and Lulla, M., to be published in the Journal of Environmental Science and Health, Volume A41 (November 2006).

“Distribution of Pathogenic Indicator Bacteria in Structural BMPs,” Zhang, X. and Lulla, M. to be published in the Journal of Environmental Science and Health, Volume A41 (August 2006).

03-5 Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator

Reports:

“Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator”, Daniel, J.S., Mallick, R.B., and Mogawer, W.S., April 20, 2007, NETCR64.

Papers and Presentations:

“Development of a Longitudinal Joint Permeameter as a QC/QA Tool for HMA Pavements,” Daniel, J.S., a Presentation to the Petersen Asphalt Research Conference, Cheyenne, WY, June 2005.

“Longitudinal Joint Permeameter: New Non-Destructive Pavement Joint Test,” Daniel, J.S., a Presentation to the North East Asphalt User/Producer Group Meeting, Burlington, VT, October 2005.

“Longitudinal Joint Permeameter: Non-Destructive Test for QC,” Daniel, J.S., a presentation to PennDOT Bituminous Technician Certification Program, March 14, 2006.

“Development and Evaluation of a Field Permeameter as a Longitudinal Joint Quality Indicator,” Mallick, R.B., and Daniel, J.S., International Journal of Pavement Engineering, Vol. 7, No. 1, March 2006. pp. 11-21.

03-6 Fix It First: Utilizing the Seismic Property Analyzer and MMLS to Develop Guidelines for the Use of Polymer Modified Thin Lift HMA vs. Surface Treatments

Reports:

“Fix It First: Utilizing the Seismic Property Analyzer and MMLS to Develop Guidelines for the Use of Polymer Modified Thin Lift HMA vs. Surface Treatments”, Mogawer, W.S. and Daniel, J.S., September 1, 2012, NETCR91.

Papers and Presentations: None

03-7

Basalt Fiber Reinforced Polymer Composites

Reports:

“Basalt Fiber Reinforced Polymer Composites,” Parnas, R., Shaw, M., and Liu, Q., August 2007, NETCR63.

Papers and Presentations:

“Preliminary Investigation of Basalt Fiber Composite Properties for Applications in Transportation,” Liu, Q., Shaw, M.T., Parnas, R.S., McDonnell, A., Transportation Research Board Annual Meeting, January 2005, Washington, D.C., Paper 05-1117, Session 487.

“Investigation of Basalt Fiber Composite Mechanical Properties for Applications in Transportation,” Q. Liu, M.T. Shaw, R.S. Parnas and A.M. McDonnell, Polymer Composites, 27(1), 41-48, 2006.

“Investigation of Basalt Fiber Composite Aging Behavior for Applications in Transportation,” Q. Liu, M. T. Shaw, R. S. Parnas, A.M. McDonnell, Polymer Composites.

“Basalt Fiber Reinforced Polymer Composites,” Q. Liu, R.S. Parnas, M.T. Shaw, A.M. McDonnell, SAMPE, Seattle, WA, November 2005.

“New Set-up for Permeability Measurement,” Q. Liu, R.S. Parnas, SAMPE, Seattle, WA, November 2005.

04-1 Phase2 Recycling Asphalt Pavements Containing Modified Binders - Phase 2

Reports:

“Recycling Asphalt Pavements Containing Modified Binders,” Mahoney, J., Zinke, S., DaDalt, J., Zofka, A., Bernier, A. and Yut, I., March 3, 2011, NETCR66.

Papers and Presentations:

“Laboratory Evaluation of HMA Containing RAP and PMB,” Zofka A., Bernier A., Mahoney J., and Zinke S., presented at NEAUPG Annual Meeting Poster Session, October 6-7, 2010, Saratoga, New York.

“Laboratory Evaluation of HMA Containing RAP and PMB,” Zofka A., Bernier A., Mahoney J., and Zinke S., presented at ASCE 1st T&DI Green Streets & Highways Conference Poster Session, November 14-17, 2010, Denver, Colorado.

Driver-Eye-Movement-Based Investigation for Improving Work-Zone SafetyReports:

“Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety,” Fisher, D.L., Knodler, M., and Muttart, J., January 28, 2009, NETCR71.

Papers and Presentations:

“Human Factors: Understanding & Evaluating Driver Response,” Muttart, J.W., Anne Arundel County Police Special Operations Building, Sponsored by the Maryland Association of Traffic Accident Investigators, Hanover, MD. March 20 - 23, 2006.

“Understanding and Quantifying Driver Response,” Muttart, J.W., Texas Association of Accident Reconstructionist Specials, Houston, TX, February 17 & 18, 2006.

“Using Event Data Recorder Information for Driver Response Research and Intelligent Transportation Systems in Rear End Collision,” Muttart, J.W., CDR Users Conference, Dallas, TX. February 13, 2006.

“Human Factors: Understanding & Evaluating Driver Response,” Muttart, J.W., Canadian Association of Traffic Accident Investigators & Reconstructionists, Fredericton, NB, Canada. July 10 - 13, 2006.

“Driving Simulator Evaluation of Situational Awareness during Hands- Free Communication,” Muttart, J.W., New England Institute of Transportation Engineers Technology Day, Amherst, MA. July 20, 2006.

“Accounting for Moderate Driver Distractions in Work Zones,” Muttart, J.W., Factors, Formulae, Forensic, Technology, & Training Conference, Houston, TX. September 17, 2006.

“Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue,” Muttart, J., Fisher, D. L., and Pollatsek, A., (January 2007), Presentation given at the 86th Transportation Research Board Annual Meeting, TRB, National Research Council, Washington, D.C.

“Driving Simulator Evaluation of Driver Performance during Hands-Free Cell Phone Operation in a Work Zone: Driving without a Clue”, Muttart, J., Fisher, D. L., Knodler, M. and Pollatsek, A., (2007), Transportation Research Record, 2018, pp 9-14.

04-3 Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England

Reports:

“Estimating the Magnitude of Peak Flows for Steep Gradient Streams in New England,” Jacobs, J., November 17, 2010, NETCR81.

Papers and Presentations:

2006 Maine Water Conference, Augusta, ME, March 22, 2006, Poster presentation.

04-4 Determining the Effective PG Grade of Binder in RAP Mixes

Reports:

“Determining the Effective PG Grade of Binder in RAP Mixes,” Daniel, J.S. and Mogawer, W.S., January 2010, NETCR78.

Papers and Presentations:

“The Impact of RAP on the Volumetric, Stiffness, Strength and Low Temperature Properties of HMA,” Krishna Swamy, A., Mitchell, L.F., Hall, S.J., and Daniel, J.S., Journal of Materials in Civil Engineering.

04-5 Network-Based Highway Crash Prediction Using Geographic Information Systems

Reports:

“Network-Based Highway Crash Prediction Using Geographic Information Systems,” Ivan, J.N., Gårder, P.E., Bindra, S., Jonsson, B.T., Shin, H., Deng, Z., June 2007, NETCR67.

Papers and Presentations:

“A Procedure for Allocating Zonal Attributes to a Link Network in a GIS Environment,” Jonsson, T., Deng, Z., Ivan, J.N., presented at 85th TRB Annual meeting, Jan. 2006, Paper No.: 06-2561.

“Using Land Use Data to Estimate Exposure for Improving Road Accident Prediction,” Jonsson, T., Ivan, J.N., Zhang, C., presented at 32nd Annual Traffic Records Forum, Palm Desert CA, Aug. 3, 2006.

05-1 Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets

Reports:

“Development of Supplemental Resistance Method for the Design of Drilled Shaft Rock Sockets,” Sandford, T.C., McCarthy, J., and Bussiere, J., March 31, 2011, NETCR83.

Papers and Presentations: None

05-5 Measurement of Adhesion Properties Between Topcoat Paint and Metalized/Galvanized Steel with Surface Energy Measurement Equipment

Reports:

“Measurement of Adhesion Properties Between Topcoat Paint and Metalized/Galvanized Steel with Surface Energy Measurement Equipment,” Yang, S.C., Lee, K.W., Lu, C., Mirville, M. and Pahram, A., September 23, 2013, NETCR93.

Papers and Presentations:

“Measurement of Adhesion Properties Between Topcoat Paint and Metalized / Galvanized Steel With Surface Energy Measurement Equipment,” Paper # CET-25, Yang, S.C., Lee, K.W., Lu, C., and Mirville, M., Presented at the US-Korea Conference on Science, Technology, and Entrepreneurship (UKC2010), Seattle, Washington, August 14, 2010.

05-6 Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers’ Message Comprehension

Reports:

“Employing Graphic-Aided DMS to Assist Elder Drivers’ Message Comprehension,” Wang, J.H. and Clark, A. Y., December 30, 2010, NETCR82.

Papers and Presentations:

“Improving Elder Drivers Comprehension of Dynamic Message through a Human Factors Study,” Clark, A., Wang, J.H., Maier-Sperdelozzi, V., and Collyer, C., Proceedings of the 12th International Conference on Industrial Engineering – Theory, Application, and Practice, p.747-753, 2007.

“Assisting Elder Drivers’ Comprehension of Dynamic Message Signs,” Clark, A.T., Wang, J.H., Maier-Sperdelozzi, V., and Collyer, C.E., Proceedings of the 87th Annual Meeting of Transportation Research Board, Paper No. 08-2276, p.1-16, CD-ROM, 2008.

“Age Effect on Driver Comprehension of Messages Displayed on Dynamic Message Signs,” Wang, J.H., Clark, A.Y., and Maier-Sperdelozzi, V., Proceedings of IIE Research Conference, Paper No. 307, p.1-6, CD-ROM, 2008.

05-7 Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways

Reports:

“Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways,” Ivan, J.N., Sadek, A.W., Hongmei, Z., and Surang, R., February 12, 2009, NETCR72.

05-7 Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways (cont'd):

Papers and Presentations:

“A Decision Support System for Predicting the likely Benefits of Left-turn Lane Installation,” Ranade, S., Sadek, A.W. and Ivan, J., 2007, TRB Annual meeting, Paper No. 07-0992; January 2007; Transportation Research Record, 2023:28-36, 2007. This paper received the Best Paper Award from the Committee on Operational Effects of Geometrics at the 2008 Annual Meeting.

“Safety Effects of Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways,” Zhou, H., Ivan, J. and Sadek, A., Transportation Research Board Annual Meeting; Paper No. 09-2000, Washington, DC, Jan. 2009.

05-8 Evaluation and Implementation of Traffic Simulation Models for Work Zones

Reports:

“Evaluation and Implementation of Traffic Simulation Models for Work Zones,” Collura, J., June 18, 2010, NETCR80.

Papers and Presentations:

“Using Simulation Models to Assess the Impacts of Highway Work Zone Strategies: Case Studies Along Interstate Highways in Massachusetts and Rhode Island,” Moriarty, K.D., Collura, J., Knodler Jr., M.A., Daiheng, N., and Heaslip, K., Paper presented at the TRB Annual Meeting in January 2008.

“Using Simulation Models to Assess the Impacts of Highway Work Zone Strategies,” Collura, J., Heaslip, K., Moriarty, K., Wu, F., Khanta, R., and Berthaume, A., Paper presented at the TRB Annual Meeting in January 2010.

06-1 New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs

Reports:

“New England Verification of National Cooperative Highway Research Program (NCHRP) 1-37A Mechanistic-Empirical Pavement Design Guide (MEPDG),” Daniel, J. S., Chehab, G. R., Ayyala, D., and Nogaj, I.M., November 2012, NETCR87.

Papers and Presentations:

“Sensitivity of MEPDG Level 2 and 3 Inputs using Statistical Analysis Techniques for New England States,” Ayyala, D., Chehab, G. R., and Daniel, J. S., accepted for publication in the Transportation Research Record 2010.

- 06-1 New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs (cont'd):**
Papers and Presentations:
“Sensitivity of RAP Binder Grade on Performance Predictions in the MEPDG,” Daniel, J. S., Chehab, G. R., and Ayyala, D., Journal of the Association of Asphalt Pavement Technologists, Vol. 78, 2009, pp. 352-376.

“Sensitivity of RAP Binder Grade on Performance Predictions in the MEPDG,” Presentation by Jo Sias Daniel to the Association of Asphalt Paving Technologists Annual Meeting, March 2009.
- 06-3 Establishing Default Dynamic Modulus Values for New England**
Reports:
“Establishing Default Dynamic Modulus Values for New England,” Jackson, E., Jingcheng, L., Zofka, A., Iliya, Y., and Mahoney, J., April 11, 2011, NETCR85.

Papers and Presentations: None
- 06-4 Preventative Maintenance and Timing of Applications**
Reports: None

Papers and Presentations: None
- 07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations**
Reports:
“In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations,” Daniel, J.S.; Mallick, Rajib B.; Kestler, Maureen A.; Miller, Heather J, November 2016, NETCR96.

Papers and Presentations: None
- 09-2 Effective Establishment of Native Grasses on Roadsides**
Reports:
“Effective Establishment of Native Grasses on Roadsides,” Kuzovkina, Julia; Schulthess, Cristina P.; Ricard, Robert; Dryer, Glenn, June 2016, NETCR97.

Papers and Presentations: None
- 09-3 Advanced Composite Materials: Prototype Development and Demonstration**
Reports:
“Advanced Composite Materials in New England’s Transportation Infrastructure: Design, Fabrication, and Installation of ACM Bridge Drain

System.” Lopez-Anido, Roberto A. and Goslin, Keenan, August 2016, NETCR98.

Papers and Presentations: None

10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology

Reports: None

Papers and Presentations: None

3-1 Development of High Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections

Reports: None

Papers and Presentations: None

13-2 HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures

Reports: None

Papers and Presentations: None

13-3 Improved Regionalization of Quality Assurance (QA) Functions

Reports: None

Papers and Presentations: None

14-1 Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians

Reports: None

Papers and Presentations: None

14-2 Investigation of Northern Long-Eared Bat Roosting Sites on Bridges

Reports: None

Papers and Presentations:

Presentation at Northeastern Transportation and Wildlife Conference, September 2016.

Abstract submitted/accepted for presentation at North American Society for Bat Research Annual Meeting, San Antonio, TX, October 2016.

Presented at the North American Society for Bat Research (NASBR) conference at San Antonio TX.

Presented (remotely) at Maine Bat Working Group Annual Meeting.

14-4 Optimizing Future Work Zones in New England for Safety and Mobility
Reports: None

Papers and Presentations: None

15-1 Optimizing Future Work Zones in New England for Safety and Mobility
Reports: None

Papers and Presentations: None

15-3 Optimizing Future Work Zones in New England for Safety and Mobility
Reports: None

Papers and Presentations: None