**ANNUAL REPORT For**

**Calendar Year 2013**

**NEW ENGLAND TRANSPORTATION CONSORTIUM**

**NETCR94** **February 2014**

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.

**NEW ENGLAND TRANSPORTATION CONSORTIUM**

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Eric Jackson, Assistant Research Professor, University of Connecticut

**LEAD STATE**

William Ahearn, Materials & Research Engineer
Vermont Agency of Transportation

**COORDINATOR**

Amanda Hanaway-Corrente
University of Vermont

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# 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.

# 2013 HIGHLIGHTS

1. **THE FOLLOWING NETC-FUNDED TRANSPORTATION RESEARCH PROJECTS, VALUED AT $970,160 WERE ACTIVE AT NEW ENGLAND STATE UNIVERSITIES IN 2013:**

    a. **University of Massachusetts Dartmouth: $438,909**
    - Dr. Walaa Mogawer:
        - "NETC Research Challenge – 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"
        - "Preventative Maintenance and Timing of Applications"
        - "Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology"

    b. **University of New Hampshire: $266,239**
    - Dr. Jo-Sias Daniel:
        - "New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design"
        - "In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations"

    c. **University of Rhode Island: $20,012**
    - Dr. Sze Yang:
        - "Measurement of Adhesion Properties between Topcoat Paint and Metalized/Galvanized Steel with 'Surface-Energy' Measurement Equipment"

    d. **University of Connecticut: $80,000**
    - Dr. Julia Kuzovkina:
        - "Effective Establishment of Native Grasses on Roadsides"

    e. **University of Maine: $165,000**
    - Dr. Roberto Lopez-Anido:
        - "Advanced Composite Materials: Prototype Development and Demonstration"

## 2. TECHNOLOGY TRANSFER:

**a. Requests for Information and Technical Assistance:** The NETC Coordinator's office responded to the following requests:

- Jeff Finitz of Diversified Technology Consultants: Jeff called the NETC Coordinator looking for some research that may have been done on a new precast concrete beam known as the PCI NEXT D Beam. More specifically, any research that was done on the longitudinal closure pour that is required with this beam section. The research would have been done between 2009 and current. He was provided with the final report for NETC 99-1.

- Chuck A. Plaxico at RoadSafe LLC: RoadSafe LLC in Canton, Maine was working on a project that involved modifications to the NETC 4-Bar steel bridge rail system, which was tested at Southwest Research Institute (SwRI) by Kimball and Mayer in 1999 [NTIS No. PB99-137507] [Report No. NETCR14]. RoadSafe requested approval from NETC to obtain copies of the test videos, accelerometer and rate gyro data from SwRI for use in validating a finite element model of the system. After clarifying with FHWA, the NETC agreed to the request asking only that NETC be given credit where appropriate.

- Traffic Safety Analyst for the Vermont State Police contacted the NETC Coordinator requesting assistance with reaching out to people who do similar work throughout New England, whether they are with DOT Traffic Sections or the State Police, with respect to conducting statistical analysis of crash data and violation information to facilitate short and long range planning and evaluation of enforcement activities. The NETC Coordinator was able to provide contacts for all the other NETC member states.

- Matt Irvine from CCA Civil requested Crash Testing Data on NETC Bridge Rail Systems. The NETC Coordinator forwarded a link to the final report for NETC 99-1: NCHRP Report 350 Testing and Evaluation of NETC Bridge Rail Transitions; NETCR14: Full-scale Crash Evaluation of the NETC 4-Bar Sidewalk-mounted Steel Bridge Railing; and NETCR10: Crash Testing and Evaluation of the NETC 2-Bar Curb-mounted Bridge Rail

- Neil Hamilton, Product Development Engineer, at Watson Bowman Acme requested a copy of the original NETC 02-6 "Sealing Small Movement Bridge Expansion Joints" Research Problem Statement.

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

- Transportation Research Board 93rd Annual Meeting**:** The NETC Coordinator attended a RAC Region 1 Dinner Meeting as well as presentations related to subjects that are currently being researched through the NETC. (January 2013)

- Annual New England Materials & Research Engineer's Meeting. The NETC Coordinator attended this meeting to keep updated on current research in New England. The NETC also provided sponsorship for the event. (May 2013)

- NETC Retreat. A retreat was organized to discuss issues and process improvements associated with the NETC Policies and Procedures. (June 2013)

- 89th Annual Meeting of the North Eastern States Materials Engineers' Association. The NETC Coordinator attended this meeting to keep updated on current research in New England. The NETC also provided sponsorship for the event. (October 2013)

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

- Research Project Reports: Findings from the following research projects were distributed to: New England's State Transportation Agencies and State Universities, The American Association of State Highway and Transportation Officials' Region 1 Research and Advisory Committee, The National Technical Information Service, and the US Department of Transportation's National Transportation Library:

    - *NETC 06-1: "New England Transportation Consortium Research Study 06-1: New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs"*

- Technical Papers and Presentations: There were no technical papers or presentations in 2013.

## 3. OTHER:

**a. NETC Retreat:** On June 26- 27, 2013, the Advisory Committee met to discuss issues and process improvements for the NETC. The following items were discussed, resulting in 26 Action Items that are all either completed or in progress:

- The NETC Goals, Mission, and Vision
- Conferences and Events that NETC should attend
- Technical Committee Procedures
- RFP Solicitations
- University Representatives
- Research Problem Statements
- NETC Process Timeline
- Verifying Milestones within Research Projects
- Literature Searches
- Improving Technical Transfer And Implementation (TT/I) Projects
- Engaging Policy Committee

**b. Project Under FHWA Agreement:** The FHWA CT-DIV office will continue to assist with the following study officially started by the previous NETC lead state agency (ConnDOT) that is not yet finished but for contractual reasons could not be given a time extension by the state of Connecticut: NETC 05-5. The funding to complete this study is presently reserved in TPF-5(201).

**c. New Committee Members:** The following is a list of people who have taken over for the previous committee member from their institution:

<u>Universities</u>
Deborah Rosen, Associate Dean for Curricular Affairs and Assessment (URI)

# PROGRESS OF ACTIVE PROJECTS

**PROJECT NUMBER:** 03-6

**PROJECT TITLE:** 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

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Walaa S. Mogawer, PI, UMass Dartmouth; Jo Sias Daniel, Co-PI, University of New Hampshire

**STATUS:** Closed

**AGREEMENT TERM:** 10/1/2009 – 9/30/2011

**ANTICIPATED COMPLETION:** September 1, 2012

**PROJECT OBJECTIVES:**

- Define and compare thin lift overlay maintenance mixes and surface treatments currently used in the New England States.
- Evaluate the thin lift overlay maintenance mixes and surface treatments currently used in the New England States and compare to those currently used worldwide.
- Determine the current New England DOT procedures for picking rehabilitation methodologies.
- Perform and evaluate non-destructive testing to better determine the optimum time to apply surface treatments or thin lift overlay mixes to the existing pavements in order to properly prioritize rehabilitation projects.
- Evaluate the benefits and drawbacks of using PMA thin lift mixes versus surface treatments with lab testing.
- Evaluate the cost comparisons between PMA thin lift mixes and surface treatments.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2013:**

- NETC Advisory Committee voted to officially close this project on April 23, 2013

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:**

- None

**PROJECT NUMBER:** 05-5

**PROJECT TITLE:** Measurement of Adhesion Properties Between Topcoat Paint and Metallized/Galvanized Steel with Surface Energy Measurement Equipment

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Sze C. Yang, PI, and K. Wayne Lee, Co-PI, University of Rhode Island

**STATUS:** Continuing

**AGREEMENT TERM:** 4/22/2010 – 8/22/2011

**ANTICIPATED COMPLETION:** 9/23/2013

**PROJECT OBJECTIVES:**

1. Compare the adhesion properties of NEPCOAT-approved topcoat paint over metallizing to topcoat paint over galvanizing using specialized "surface-energy" measuring lab methods. As a control the adhesion properties of topcoat paint over zinc primer painted steel substrates will also be measured.
2. Investigate various factors affecting the adhesion of topcoat paint over galvanizing.
3. Report and recommend practices which produce the best adhesion of NEPCOAT-approved topcoat paints over metalized and particularly galvanized steel surfaces.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2013:**

- Final draft of final report completed and approved by the Technical Committee and NETC Coordinator.
- For the purposes of closing out the previous pooled fund account TPF-5(201), NETC 05-5 was considered administratively closed in October 2013 when the final report was approved for printing. However, the final step of printing and distributing the final report will carry through to early 2014.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:**

"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.

**PROJECT NUMBER:** 06-1

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

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):** Jo Sias Daniel, PI, University of New Hampshire; Ghassan R. Chehab, Co-PI, Pennsylvania State University

**STATUS:** Continuing

**AGREEMENT TERM:** 10/1/2009 - 9/30/2011

**ANTICIPATED COMPLETION:** 5/22/2013

**PROJECT OBJECTIVES:**

- Determine the design and data collection methods, material tests, and testing equipment currently in use by each state.
- Identify the Level 2 and Level 3 design guide inputs for which regional or local values are required.
- Provide state specific recommendations on implementation of the MEPDG including changes in data collection & measurement, equipment needs, training, and anticipated benefits.
- Provide specific recommendations for regional and local calibration of the MEPDG by identifying appropriate field test & monitoring sites, data to be collected, and perform local calibrations if appropriate field data is available.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2013:**

- Final Report Completed, Approved, and Distributed.
- The Advisory Committee voted to officially close the project on 5/22/2013

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:**

"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.

"Sensitivity of RAP Binder Grade on Performance Predictions in the MEPDG," Daniel, J. S., Cehab, 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.

**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 – 9/15/2015

**ANTICIPATED COMPLETION:** 9/15/2015

**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, 2013:** UMass Dartmouth is organizing the kickoff meeting for the week of January 20th, 2014. Also, UMass is developing an internet survey to properly determine the critical factors that relate to the selection and timing of a particular pavement preservation treatment.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:** None thus far.

**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:** Open

**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. Based on their conclusions, the following testing and analysis plan is proposed for the study. In order to accomplish this research, five tasks have been established and are broken into two Phases.

**PROGRESS/ACCOMPLISHMENTS THROUGH DECEMBER 31, 2013:** The research team was given approval to start work on this project on August 13, 2013. Since the starting date, the research team has developed the Task 1 survey with input from the Technical Committee (TC) and has sent it out to the appropriate state representatives for completion. The research team has also been gathering information on various instrumentation and data acquisition options for the pavement instrumentation. The research team received the results of the Task 1 survey, collated the results, and held the initial meeting with the TC via webmeeting on November 6, 2013. Based on the currently available sites, the research team has developed a plan for testing two existing sites in NH (Kancamangus and Warren Flats) during the 2014 spring thaw.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:** None thus far.

**PROJECT NUMBER:** 09-2

**PROJECT TITLE:** "Effective Establishment of Native Grasses on Roadsides"

**PRINCIPAL INVESTIGATOR(S) & UNIVERSITY(S):**

- Julia Kuzovkina, Cristian Schulthess, Robert Ricard, Department of Plant Science and Landscape Architecture, University of Connecticut, Storrs, CT
- Glenn Dryer, Director, Connecticut College Arboretum, New London, CT

**STATUS:** Open

**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, 2013:**

- Kuzovkina met with the CT DOT transportation landscape designers Susan Fiedler to discuss the selection of native grasses for a new site in Connecticut.
- First meeting of the project PIs at the Connecticut College Arboretum, New London, CT Visited a few native grass planting at the Connecticut College Arboretum, to evaluate native grasses plantings and to discuss plant selection.
- Preliminary specifications of native grass plantings were sent to Susan Fiedler
- 1st meeting with the Project Technical Committee. The initial plan for the field testing, survey instrument and manual content were discussed.
- Development of the survey instrument was initiated
- 1st meeting with a stakeholder. The best approaches to the manual compilation and potential mixt res for the demonstration plots were discussed.
- 2st meeting with the stakeholders. The discussion of the plant selection for roadside planting followed by a field trip to observe the native grasses research plots of the Colonial Seed LLC in Windsor, CT.
- Meeting with the CT DOT transportation landscape designers and Susan Fiedler to identify the location for the demonstration plots along Rt.6. Three sites were identified as suitable for spring establishment of the demonstration plots.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:** None thus far.

**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:** Open

**AGREEMENT TERM:** 9/1/2013 – 8/31/2015

**ANTICIPATED COMPLETION:** 8/31/2015

**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, 2013:**

- Vendors have been screened and selected for participation.
- Drain designs from participating DOTs were collected for review and comparison.
- Material properties are under review and being evaluated for inclusion to the specifications
- Specifications are being re-written to comply to the FHWA specification format, completion date for end of January 2014.
- Questionnaire drafted and circulated to DOTs regarding problem areas and best practices as viewed by design and field maintenance departments.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:** None thus far.

**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 – 9/15/2015

**ANTICIPATED COMPLETION:** 9/15/2015

**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 20ºC. 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, 2013:** UMass Dartmouth contacted several producers of asphalt mixtures about their availability and willingness to participate in the study. Two producers, Palmer from Massachusetts and Tilcon from Connecticut agreed to provide the UMass Highway Sustainability Research Center with the following mixtures:

1. Control mixture produced with only virgin materials.
2. The same control mixture incorporating reclaimed asphalt pavement (RAP) at different binder replacement contents. These binder replacement contents will be higher than typically specified in the New England States.
3. The mixtures will incorporate RAP at different moisture contents.
4. Three different WMA will also be used to produce the above mixtures.

**REPORTS/PAPERS PUBLISHED, PRESENTATIONS MADE RELATING TO THIS PROJECT FROM THE START OF THE PROJECT THROUGH DECEMBER 31, 2013:** None thus far.

# FINANCIAL STATUS

## 1. FINANCIAL STATUS OF ACTIVE PROJECTS:

Table 1: Financial Status of Projects Active During 2013 (As of December 31, 2013):

| NO. | PROJECT TITLE | APPROVED BUDGET | INVOICES APPROVED FOR PAYMENT | PROJECT BALANCE |
|---|---|---|---|---|
| 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 | $45,842.00 | $44,479.52 | FINAL |
| 05-5 | Measurement of Adhesion Properties Between Topcoat Paint and Metallized/Galvanized Steel with Surface Energy Measurement Equipment | $20,012.00 | $19,907.99 | FINAL |
| 06-1 | New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design Guide with Level 2 & 3 Inputs | $68,085.00 | $68,085.00 | FINAL |
| 06-4 | Preventative Maintenance and Timing of Applications | $242,909.00 | $0 | $242,909.00 |
| 07-1 | In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations | $198,154.00 | $3,380.03 | $194,773.97 |
| 09-2 | Effective Establishment of Native Grasses on Roadsides | $80,000.00 | $1,083.20 | $78,916.80 |
| 09-3 | Advanced Composite Materials: Prototype Development and Demonstration | $165,000.00 | $13,765.00 | $151,235.00 |
| 10-3 | Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology | $150,158.00 | $0 | $150,158.00 |

## 2. FUND BALANCE:

**NETC FUND BALANCE**
**As of December 31, 2013**

| 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 | | | | | 582,777.07 | |
| **Coord./Admin. of NETC: Calendar Year 1995 Bdgt. = $73042** | | | | 58,761.32 | FINAL | 524,015.75 | |
| - Construction Costs of New England Bridges-Phase II | | | | 39,500.00 | FINAL/CLOSED | 484,515.75 | |
| - Tire Chips as Lightweight Backfill-Phase II: Full-Scale Testing (Supplemental Funding) | | | | 16,000.00 | FINAL/CLOSED | 468,515.75 | |
| - Bridge Rail Crash Test - Phase II: Sidewalk-Mounted Rail | | | | 134,127.00 | FINAL/CLOSED | 334,388.75 | |
| - New England Vehicle Classification and Truck Weight Program | | | | 6,752.57 | FINAL/CLOSED | 327,636.18 | |
| 94-1: Structural Analysis of New England Subbase Materials and Structures | | | | 110,057.38 | FINAL/CLOSED | 217,578.80 | |
| 94-2: Nondestructive Testing of Reinforced Concrete Bridges Using Radar Imaging | | | | 224,901.80 | FINAL/CLOSED | -7,323.00 | |
| 94-3: Procedures for The Evaluation of Sheet Membrane Waterproofing | | | | 67,002.00 | FINAL/CLOSED | -74,325.00 | Note: Project administ |
| 94-4: Durability of Concrete Crack Repair Systems | | | | 72,036.04 | FINAL/TERM. | -146,361.04 | |
| **Member Obligations 1995 = 7 X $75,000** | 525,000.00 | | | | | 378,638.96 | |
| 95-1: Use of Tire Chips/Soil Mixtures to Limit Pavement Damage of Paved Roads | | | | 75,000.00 | FINAL/CLOSED | 303,638.96 | |
| 95-2: Suitability of Non-Hydric Soils for Wetland Mitigation | | | | 39,867.70 | FINAL/CLOSED | 263,771.26 | |
| 95-3: Implementation and Evaluation of Traffic Marking Recesses for Application of | | | | 120,812.12 | FINAL/CLOSED | 142,959.14 | |
| 95-5: Buried Joints in Short Span Bridges | | | | 61,705.61 | FINAL/TERM. | 81,253.53 | |
| 95-6: Guidelines for Ride Quality Acceptance of Pavements | | | | 106,124.00 | FINAL/CLOSED | -24,870.47 | |
| **Member Obligations 1996 = 6 X $75,000** | 450,000.00 | | | | | 425,129.53 | |
| **Coord./Admin.of NETC: Calendar Year 1996; Bdgt. = $75,000** | | | | 69,123.85 | FINAL | 356,005.68 | |
| 96-1: SUPERPAVE Implementation | | | | 60,139.25 | FINAL/CLOSED | 295,866.43 | |
| 96-2: Optimizing GPS Use in Transportation Projects | | | | 27,008.81 | FINAL/TERM. | 268,857.62 | |
| 96-3: Effectiveness of Fiber Reinforced Composites as Protective Coverings for Bridge | | | | 135,000.00 | FINAL/CLOSED | 133,857.62 | |
| **Member Allocations 1997 = 6 X $75,000** | 450,000.00 | | | | | 583,857.62 | |
| **Coord./Admin. of NETC: Calendar Year 1997; Bdgt. = $82,494** | | | | 77,244.35 | FINAL | 506,613.27 | |
| 97-1: A Portable Method for Determining Chloride Concentration on | | | | 96,669.50 | FINAL/CLOSED | 409,943.77 | Phase I |
| Roadway Pavements | | | | 90,667.79 | FINAL/CLOSED | 319,275.98 | Phase II |
| 97-2: Performance Evaluation & Economic Analysis of Durability Enhancing Admixtures, | | | | 108,318.73 | FINAL/CLOSED | 210,957.25 | |
| 97-3: Determining Properties, Standards & Performance | | | | 27,779.64 | FINAL/CLOSED | 183,177.61 | Phase I |
| of Wood Waste Compost, etc.: | | | | 16,074.30 | FINAL/CLOSED | 167,103.31 | Phase II |
| Alloc. to ConnDOT for Constr. Costs of Test Site (Approved 1/21/99 Ballot) | | | | 10,700.00 | | 156,403.31 | |
| 97-4: Early Distress of Open-Graded Friction Course | | | | 57,495.71 | FINAL/CLOSED | 98,907.60 | |
| **Member Obligations 1998 = 6 X $75,000** | 450,000.00 | | | | | 548,907.60 | |
| **Coord./Admin. of NETC: Calendar Year 1998; Bdgt = $73,021** | | | | 80,422.65 | FINAL | 468,484.95 | |
| - Travel Tech. Comm. ( Aug. 98 tel. poll) for 1998 = $5,000 | | | | 0.00 | | 468,484.95 | |
| - T2 (per 12/2/97 Adv. Committee Mtg.) for 1998 = $10,000 | | | | 9,551.06 | FINAL | 458,933.89 | |
| - Refund Check (No. 15-663337), for CY '98 Management of NETC, from UConn OSP; Ref. | 336.00 | | | | | 459,269.89 | Refund Check (No. 15- |
| **Member Obligations 1999 = 6 X $75,000** | 450,000.00 | | | | | 909,269.89 | |
| **Coord./Admin. of NETC: Calendar Year 1999: Bdgt = $98,066** | | | | 79,101.20 | FINAL | 830,168.69 | |
| 99-1: Bridge Rail Transitions | | | | 240,000.00 | FINAL/CLOSED | 590,168.69 | |
| 99-2: Evaluation of Asphaltic Expansion Joints | | | | 62,234.76 | FINAL/CLOSED | 527,933.93 | |
| 99-3: Bridge Scour Monitoring Systems | | | | 78,523.32 | FINAL/CLOSED | 449,410.61 | |
| 99-4: Quantifying Roadside Rest Area Usage | | | | 44,857.00 | FINAL/CLOSED | 404,553.61 | |
| 99-6: The Effects of Concrete Removal Operations on Adjacent Concrete that Is to Remain | | | | 96,008.36 | FINAL/CLOSED | 308,545.25 | |
| **Member Obligations 2000 = 6 X $100,000** | 600,000.00 | | | | | 908,545.25 | |
| **Coord./Admin. of NETC: Calendar Year 2000: Bdgt = $102,588** | | | | 91,899.37 | FINAL | 816,645.88 | |
| 00-1: Ground-Based Imaging and Data Acquisition Systems for Roadway Inventories in | | | | 31,251.92 | FINAL/CLOSED | 785,393.96 | |
| 00-2: Evaluation of Permeability of Superpave Mixes | | | | 95,499.16 | FINAL/CLOSED | 689,894.80 | |
| 00-3: Composite Reinforced Timber Guard Rail - Phase I: Design, Fabrication and Testing | | | | 81,989.38 | FINAL/CLOSED | 607,905.42 | |
| 00-4: Falling Weight Deflectometer Study | | | | 100,000.00 | FINAL/CLOSED | 507,905.42 | |
| 00-5: Guard Rail Testing - Modified eccentric Loading Terminal at NCHRP 350 TL2 | | | | 61,287.00 | FINAL/CLOSED | 446,618.42 | |
| 00-6: Implementation of Visualization Technologies to Create Simplified Presentations | | | | 74,914.49 | FINAL/CLOSED | 371,703.93 | |
| 00-7: A Complete Review of Incident Detection Algorithms and Their Deployment: What | | | | 45,369.45 | FINAL/CLOSED | 326,334.48 | |
| 00-8: Performance and Effectiveness of A Thin Pavement Section Using Geogrids and | | | | 150,000.00 | FINAL/CLOSED | 176,334.48 | |
| **Member Obligations 2001 = 6 X $100,000** | 600,000.00 | | | | | 776,334.48 | |
| **Coord./Admin. of NETC: Calendar Year 2001:Bdgt = $106,248** | | | | 104,385.35 | FINAL | 671,949.13 | |
| 01-1: Advanced Composite Materials for New England's Transportation Infrastructure | | | | 47,559.27 | FINAL/CLOSED | 624,389.86 | |
| 01-1: Advanced Composite Materials for New England's Transportation Infrastructure - | | | | 25,286.18 | FINAL/CLOSED | 599,103.68 | |
| 01-2: Development of A Testing Protocol for Quality Control/Quality Assurance of Hot Mix | | | | 80,000.00 | FINAL/CLOSED | 519,103.68 | |
| 01-3: Design of Superpave HMA for Low Volume Roads | | | | 120,324.15 | FINAL/CLOSED | 398,779.53 | |
| 01-6: Field Evaluation of A New Compaction Device | | | | 49,944.50 | FINAL/CLOSED | 348,835.03 | |
| **Member Obligations 2002 = 6 X $100,000** | 600,000.00 | | | | | 948,835.03 | |
| **NY DOT Obligation = $56,551.38** | 56,551.38 | | | | | 1,005,386.41 | |
| **Coord./Admin. Of NETC: Calendar Year 2002** | | | | 109,207.12 | FINAL | 896,179.29 | |
| 02-1: Relating Hot Mix Asphalt Pavement Density to Performance | | | | 103,260.73 | FINAL/CLOSED | 792,918.56 | |
| 02-2: Formulate Approach for 511 Implementation in New England Phase 1 | | | | 48,158.19 | FINAL/CLOSED | 744,760.37 | |
| 02-2: Formulate Approach for 511 Implementation in New England Phase 2 | | | | 32,813.16 | FINAL/CLOSED | 711,947.21 | |
| 02-3: Establish Subgrade Support Values (Mr) for Typical Soils in New England | | | | 79,936.86 | FINAL/CLOSED | 632,010.35 | |
| 02-5: Determination of Moisture Content of De-Icing Salt at Point of Delivery | | | | 19,679.99 | FINAL[2] /CLOSED | 612,330.36 | |
| 02-6 : Sealing of Expansion Joints - Phase 1 | | | | 74,982.81 | FINAL/CLOSED | 537,347.55 | |
| 02-7: Calibrating Traffic Simulation Models to Inclement Weather Conditions with | | | | 74,037.57 | FINAL/CLOSED | 463,309.98 | |
| 02-8: Intelligent Transportation Systems Applications to Ski Resorts in New England | | | | 54,724.71 | FINAL/CLOSED | 408,585.27 | |

**NETC FUND BALANCE**
**As of December 31, 2013**

| ITEM | OBLIGATION FOR PROJECTS | TRAVEL OBLIGATIONS AND EXPENDITURES | BUDGET | EXPENDED | INVOICE | CUMMULATIVE BALANCE | NOTES |
|---|---|---|---|---|---|---|---|
| **Member Obligations 2003 = 6 X $100,000** | 600,000.00 | | | | | 1,008,585.27 | |
| **NY DOT Obligation = $50,000** | 50,000.00 | | | | | 1,058,585.27 | |
| **Coord./Admin. Of NETC Calendar Year 2003 = $124,258** | | | | 118,855.19 | FINAL | 939,730.08 | |
| 03-1: Ability of Wood Fiber Materials to Attenuate Heavy Metals Associated with Highway | | | | 70,690.16 | FINAL/CLOSED | 869,039.92 | |
| 03-2: Field Studies of Concrete Containing Salts of An Alkenyl-Substituted Succinic Acid | | | | 133,385.33 | FINAL/CLOSED | 735,654.59 | |
| 03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England | | | | 20,682.70 | FINAL/CLOSED | 714,971.89 | |
| 03-3: Feasibility Study and Design of An Erosion Control Laboratory in New England - | | | | 13,135.80 | FINAL/CLOSED | 701,836.09 | |
| 03-4: Measuring Pollutant Removal Efficiencies of Storm Water Treatment Units | | | | 80,000.00 | FINAL/CLOSED | 621,836.09 | |
| 03-5: Evaluation of Field Permeameter As A Longitudinal Joint Quality Control Indicator | | | | 77,318.43 | FINAL/CLOSED | 544,517.66 | |
| 03-6: Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop Guidelines | | | | 54,085.45 | FINAL/CLOSED | 490,432.21 | Cont'd as 03-6 (FHWA) |
| 03-6 (FHWA) : Fix It First: Utilizing the Seismic Property Analyzer & MMLS to Develop | | | | 44,479.52 | FINAL/CLOSED | 445,952.69 | FHWA Led Project. Fir |
| 03-7 (Alt.): Basalt Fiber Reinforced Polymer Composites | | | | 64,092.29 | FINAL/CLOSED | 381,860.40 | |
| **Member Obligations 2004 = 6 X $100,000** | 600,000.00 | | | | | 981,860.40 | |
| **NY DOT Obligation = $50,000** | 50,000.00 | | | | | 1,031,860.40 | |
| **Coord./Admin. Of NETC Calendar Year 2004 = $126,559** | | | | 113,012.87 | FINAL | 918,847.53 | |
| 04-1: Recycling Asphalt Pavements Containing Modified Binders - Phase I | | | | 27,166.58 | FINAL/CLOSED | 891,680.95 | |
| 04-1: Recycling Asphalt Pavements Containing Modified Binders - Phase II | | | | 82,750.99 | FINAL/CLOSED | 808,929.96 | |
| 04-2: Driver-Eye-Movement-Based Investigation for Improving Work Zone Safety | | | | 70,387.66 | FINAL/CLOSED | 738,542.30 | |
| 04-3: Estimating the Magnitude of Peak Flows For Steep Gradient Streams in New | | | | 98,025.49 | FINAL/CLOSED | 640,516.81 | Cont'd as 04-3 (FHWA) |
| 04-3 (FHWA) : Estimating the Magnitude of Peak Flows For Steep Gradient Streams in | | | | 21,950.37 | FINAL/CLOSED | 618,566.44 | FHWA Led Project. Bu |
| 04-4: Determining the Effective PG Grade of Binder in RAP Mixes | | | | 130,876.00 | FINAL/CLOSED | 487,690.44 | |
| 04-5: Network-Based Highway Crash Prediction Using Geographic Information Systems | | | | 129,020.04 | FINAL/CLOSED | 358,670.40 | |
| **Member Obligations 2005 = 6 x $100,000** | 600,000.00 | | | | | 958,670.40 | |
| **NY DOT Obligation = $50,000** | 50,000.00 | | | | | 1,008,670.40 | |
| **Coord./Admin. Of NETC Calendar Year 2005 = $130,528** | | | | 128,934.25 | FINAL | 879,736.15 | |
| 05-1: Develop Base Resistance Load-Displacement Curves for The Design of Drilled Shaft | | | | 52,155.25 | FINAL/CLOSED | 827,580.90 | Cont'd as 05-1 (FHWA) |
| 05-1 (FHWA) : Develop Base Resistance Load-Displacement Curves for The Design of | | | | 46,820.24 | FINAL/CLOSED | 780,760.66 | FHWA Led Project. Buc |
| 05-5: Measurement of Work of Adhesion Between Paint and Metalized/Galvanized Steel | | | | 104,987.55 | | 675,773.11 | Cont'd as 05-5 (FHWA) |
| 05-5 (FHWA) : Measurement of Work of Adhesion Between Paint and | | | | 19,907.99 | | 655,865.12 | FHWA Led Project. Bu |
| 05-6: Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' Message | | | | 46,712.74 | FINAL/CLOSED | 609,152.38 | Cont'd as 05-6 (FHWA) |
| 05-6 (FHWA) : Employing Graphic-Aided Dynamic Message Signs to Assist Elder Drivers' | | | | 13,222.32 | FINAL/CLOSED | 595,930.06 | FHWA Led Project. Buc |
| 05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways | | | | 92,000.36 | FINAL/CLOSED | 503,929.70 | |
| 05-7: Warrants for Exclusive Left Turn Lanes at Unsignalized Intersections and Driveways | | | | 7,431.26 | FINAL/CLOSED | 496,498.44 | |
| 05-8: Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for Analysis | | | | 94,964.22 | FINAL/CLOSED | 401,534.22 | Cont'd as 05-8 (FHWA) |
| 05-8 (FHWA) : Evaluation of Alternative Traffic Simulation Models, Including CA4PRS for | | | | 5,035.00 | FINAL/CLOSED | 396,499.22 | FHWA Led Project |
| **Member Obligations 2006 = 5 x $100,000 (no ME DOT allocation)** | 500,000.00 | 10,000.00 | | | | 896,499.22 | |
| ***Note: Maine 2006 Obligation as of 11/06/06 per Peabody 11/30/06 email*** | 100,000.00 | | | | | 996,499.22 | |
| **Coord./Admin. Of NETC Calendar Year 2006 = 131,814** | | | | 100,718.92 | FINAL | 895,780.30 | |
| 06-1: New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement Design | | | | 82,209.78 | FINAL/CLOSED | 813,570.52 | |
| 06-1 (FHWA) : New England Verification of NCHRP 1-37A Mechanistic-Empirical Pavement | | | | 68,085.00 | FINAL/CLOSED | 745,485.52 | FHWA Led Project |
| 06-3 Establish Default Dynamic Modulus Values for New England | | | | 109,787.00 | FINAL/CLOSED | 635,698.52 | |
| 06-5 Winter Severity Indices for New England | | | | 73,639.62 | FINAL/CLOSED | 562,058.90 | Note: Project terminat |
| **Member Obligations 2007 = 600,000** | 600,000.00 | 5,000.00 | | | | 1,162,058.90 | |
| **Coord./Admin. Of NETC Calendar Year 2007 = 136,061** | | | | 122,644.79 | FINAL | 1,039,414.11 | |
| **Member Obligations 2008 = 600,000** | 600,000.00 | 10,000.00 | | | | 1,639,414.11 | |
| **NY DOT Obligation** (50,000) | 50,000.00 | | | | | 1,689,414.11 | |
| **Coord./Admin. Of NETC Calendar Year 2008 = 134,998** | | | | 131,509.90 | FINAL | 1,557,904.21 | |
| 02-6 Phase II Sealing of Small Mvmnt Bridge Expan Joints - Field Inst. & Mntrng | | | | 74,558.62 | FINAL/CLOSED | 1,483,345.59 | |
| **Member Obligations 2009 = 600,000** | 600,000.00 | 10,000.00 | | | | 2,083,345.59 | |
| **NYSDOT Obligation** | 50,000.00 | | | | | 2,133,345.59 | |
| **Coord./Admin. Of NETC Calendar Year 2009** (Approved) = 139,309 | | | | 131,157.45 | FINAL | 2,002,188.14 | |
| **Member Obligations 2010 = 600,000** | 600,000.00 | 10,000.00 | | | | 2,602,188.14 | |
| **NYSDOT Obligation** | 50,000.00 | | | | | 2,652,188.14 | |
| **Coord./Admin. Of NETC Calendar Year 2010** (Approved) = 134,809 | | | | 127,097.21 | FINAL | 2,525,090.93 | |
| **Member Obligations 2011 = 600,000** | 600,000.00 | 10,000.00 | | | | 3,125,090.93 | |
| **Coord./Admin. Of NETC Calendar Year 2011** (Approved) = 133,793 | | | | 133,793.00 | FINAL | 2,991,297.93 | |
| **Reconciliation of previous Pooled Fund Accounts** | -454,400.71 | | | | | 2,536,897.22 | See Note 5 |
| **Member Obligations 2012 = 100,000** | 100,000.00 | | | | | 2,636,897.22 | See Note 6 |
| **Coord./Admin. Of NETC Calendar Year 2012** (Approved) = 179,344.49 | | | | 179,344.49 | | 2,457,552.73 | |
| 06-4 Preventative Maintenance and Timing of Applications | | | 242,908.82 | | | 2,214,643.91 | |
| 07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture | | | 198,154.00 | | | 2,016,489.91 | |
| 09-2 Effective Establishment of Native Grasses on Roadsides | | | 80,000.00 | | | 1,936,489.91 | |
| 09-3 Advanced Composite Materials: Prototype Development and Demonstration | | | 165,000.00 | | | 1,771,489.91 | See Note 3 |
| 10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix | | | 150,157.70 | | | 1,621,332.21 | |
| **Member Obligations 2013 = 0** | 0.00 | | | | | 1,621,332.21 | See Note 6 |
| **Coord./Admin. Of NETC Calendar Year 2013** (Approved) = 179,344.49 | | | | 179,344.49 | | 1,441,987.72 | |
| 13-1: Development of High Early Strength Connections for Accelerated Bridge | | | 175,000.00 | | | 1,266,987.72 | |
| 13-2: HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and | | | 250,000.00 | | | 1,016,987.72 | |
| 13-3: Improved Regionalization of QA Functions | | | 200,000.00 | | | 816,987.72 | |
| **Travel Expenditures to date** | | -27,257.95 | | | | | |
| **Totals =** | 9,977,486.67 | 27,742.05 | 1,461,220.52 | 7,832,055.50 | | | |

**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.

# 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.

## 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

## 3. REPORTS, PAPERS, AND PRESENTATIONS 1988-1994:

"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.

**NETC REPORTS, PAPERS, AND PRESENTATIONS 1988-1994 (cont'd):**

"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.

**NETC REPORTS, PAPERS, AND PRESENTATIONS 1988-1994 (cont'd):**

"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 1995-2011:

**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

**94-1 Structural Analysis Of New England Subbase Materials And Structures**

Reports:

"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.

**94-2 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.

**96-3 Effectiveness Of Fiber Reinforced Composite As Structural And Protective Coverings For Bridge Elements Exposed To Deicing Salt Chlorides**

Reports:

"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 Concenteration 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 Architectur 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 T2 Phase I** **Advanced Composite Materials in New England's Transportation Infrastructure - Technology Transfer Phase 1: Selection of Prototype**

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, an 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

**02-6 Sealing of Small Movement Bridge Expansion Joints**

Reports:

"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**.**

**04-2** **Driver-Eye-Movement-Based Investigation for Improving Work-Zone Safety**

Reports:

"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 Metallized/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-Speredelozzi, 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-Speredelozzi, 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- Speredelozzi, 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: None

Papers and Presentations: None

**09-2** **Effective Establishment of Native Grasses on Roadsides**

Reports: None

Papers and Presentations: None

**09-3** **Advanced Composite Materials: Prototype Development and Demonstration**

Reports: None

Papers and Presentations: None

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

Reports: None

Papers and Presentations: None