TRANSPORTATION POOLED FUND PROGRAM
QUARTERLY PROGRESS REPORT

Date: __12/31/2015

Lead Agency (FHWA or State DOT): __Vermont Agency of Transportation_____

INSTRUCTIONS:
Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.

Transportation Pooled Fund Program Project # *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* TPF-5(222)	**Transportation Pooled Fund Program - Report Period:** ☐Quarter 1 (January 1 – March 31) ☐Quarter 2 (April 1 – June 30) ☐Quarter 3 (July 1 – September 30) ☑Quarter 4 (October 1 – December 31)

Project Title: New England Transportation Consortium (VI)

Name of Project Manager(s):	**Phone Number:**	**E-Mail**
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Lead Agency Project ID:	**Other Project ID (i.e., contract #):**	**Project Start Date:**
CA0306	NETC 06-4	9/16/13
	NETC 07-1	7/1/13
	NETC 09-2	9/1/13
	NETC 09-3	9/1/13
	NETC 10-3	9/16/13
	NETC 13-1	9/1/14
	NETC 13-2	6/1/14
	NETC 13-3	12/1/14
	NETC 14-1	3/1/15
	NETC 14-2	2/1/15
Original Project End Date:	**Current Project End Date:**	**Number of Extensions:**
NETC 06-4 9/15/15	9/15/15, NCE to 9/15/16	1
NETC 07-1 3/31/16	3/31/16	0
NETC 09-2 2/28/16	2/28/16	0
NETC 09-3 8/31/15	8/31/15, NCE to 12/31/15	1 (NCE approved 6/23/15)
NETC 10-3 9/15/15	9/15/15	1 (for NETC)
NETC 13-1 8/31/16	4/2/16, NCE to 8/31/16	1 (for NETC)
NETC 13-2 5/31/16	4/2/16, NCE to 5/31/16	1 (for NETC)
NETC 13-3 11/30/15	3/31/16	1
NETC 14-1 4/2/16	4/2/16, NCE to 8/31/16	1 (for NETC)
NETC 14-2 4/2/16	4/2/16, NCE to 5/31/16	1 (for NETC)

Project schedule status:

☑ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Overall Project Statistics:

Total Project Budget	Total Cost to Date for Project	Percentage of Work Completed to Date
NETC 06-4 $242,909	$54,565.81	30%
NETC 07-1 $198,154	$128,300.40	90%
NETC 09-2 $80,000	$78,811.11	70%
NETC 09-3 $165,000	$113,593.68	81%
NETC 10-3 $150,158	$57,338.40	40%
NETC 13-1 $174,923	$75,211.98	60%
NETC 13-2 $249,785	$5,069.65	20%
NETC 13-3 $100,000	$24,164.12	55%
NETC 14-1 $100,000	$8,540.34	10%
NETC 14-2 $205,554	$54,653.88	40%

Quarterly Project Statistics:

Total Project Expenses and Percentage This Quarter	Total Amount of Funds Expended This Quarter	Total Percentage of Time Used to Date
NETC 06-4 $0 0%	$0	100% (based on 24 months)
NETC 07-1 $12,246.07 6.2%	$12,246.07	91% (based on 33 months)
NETC 09-2 $0 15%	$0	97% (based on 30 months)
NETC 09-3 $3,425.30 2%	$3,425.30	99% (based on 28 months)
NETC 10-3 $10,156.76 0%	$10,156.76	115% (based on 24 months)
NETC 13-1 $0 0%	$0	66% (based on 24 months)
NETC 13-2 $5,069.65 2%	$5,069.65	75% (based on 24 months)
NETC 13-3 $2,821.44 2.8%	$2,821.44	75% (based on 12 months)
NETC 14-1 $2,050.13 2%	$2,050.13	55.4% (based on 18 months)
NETC 14-2 $40,741.78 20%	$40,741.78	45% (based on 24 months)

Project Description:

06-4 Preventative Maintenance and Timing of Applications
07-1 In-Place Response Mechanisms of Recycled Layers Due to Temperature and Moisture Variations
09-2 Effective Establishment of Native Grasses on Roadsides
09-3 Advanced Composite Materials: Prototype Development and Demonstration
10-3 Low Temperature and Moisture Susceptibility of RAP Mixtures with Warm Mix Technology
13-1 Development of High-Early Strength Concrete for Accelerated Bridge Construction Closure Pour Connections
13-2 HMA Mixtures Containing Recycled Asphalt Shingles (RAS): Low Temperature and Fatigue Performance of Plant-Produced Mixtures
13-3 Improved Regionalization of Quality Assurance (QA) Functions
14-1 Measuring the Effectiveness of Competency Models for Job-Specific Professional Development of Engineers & Engineering Technicians
14-2 Investigation of Northern Long Eared Bat Roosting Sites on Bridges

Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):

NETC 06-4, No progress reported this quarter.

NETC 07-1, In this quarter the Falling Weight Deflectometer (FWD) deflection data and the environmental data (moisture and temperature) were utilized to back calculate the moduli of the different layers under different (frozen and unfrozen conditions). First, the environmental data were analyzed to obtain frozen/unfrozen profiles for each day/time on which the section was tested. If part of the same layer was frozen and the remaining was unfrozen, then those two parts were

considered as two different layers. Next, the deflections were normalized to a load of 9,000 lb. Finally, using seed moduli that are appropriate for frozen or unfrozen conditions of the different layers, and the load-normalized deflections, the layer moduli were back calculated. The BAKFAA software from the Federal Highway Administration (FAA) was utilized for back calculation. BAKFAA utilizes FAA layered elastic analysis program LEAF and a downhill multidimensional simplex minimization method for back calculation, and minimizes the sum of squares of the differences between the measured and calculated deflections.

NETC 09-2, Maintenance of the demonstration sites along Rt. 6:
Campanelli planted cover crops to prevent weed competition on hillsides along Route 6 demonstration sites following the removal of invasive species by CT DOT.
After attending the Pollinator Partnership Conference from October 20th to 22nd, Campanelli participated on the Forage, Nutrition and Roadsides Task Force. He headed the Roadside Task Force's creation of a website that acts as a clearinghouse for information for state DOTs for the establishment of roadside pollinator habitats. He also participated in the creation of two yearly awards that acknowledge innovative programs for increasing pollinator habitats by state DOTs and public-private partnerships.
Campanelli participated on December 2nd at New England Grows, giving a Sprint Session lecture on the establishment of native grasses and forbs and answering questions about his work at the Ask Extension booth.
November-December: preparation of the Manual

NETC 09-3, No progress reported this quarter.

NETC 10-3,
The survey for Task 2 was distributed to the technical committee for comments. Comments were received and incorporated. The PI obtained a list of regional contacts consisting of both agency and industry members for distribution of the survey.
The participating contactor (Aggregate Industries Wrentham, MA) produced the mixtures for this study on 11-13-15. The following 12.5mm SSC (100 gyration) mixtures were produced using the contractors drum plant and a PG64-28 binder:
- 12.5mm with 15% RAP (typical mixture) + 0.5% SonneWarmix (Liquid) WMA
- 12.5mm with 27.8% RAP (1.5% binder replaced) + 0.5% SonneWarmix (Liquid) WMA
- 12.5mm with 46.3% RAP (2.5% binder replaced) + 0.5% SonneWarmix (Liquid) WMA

Please note that SonneWarmix was the only WMA technology utilized by the contractor at the time of production.
A loader bucket of each mixture was dropped in a safe location and mixture samples were appropriately collected.
Temperature measurements were taken in the pile of each mixture.
The moisture contents of the aggregate and RAP stockpiles were measured by the contractor prior to production. The results are shown at the bottom of the attached table. It should be noted that these moisture contents were generally higher than those noted for the dry run trial performed in September 2015. A total rainfall of approximately 0.4 inches was noted in the three days prior to production at a weather station near the plant. The RAP stockpiles at the plant were covered and only a slight increase in moisture content from 1.4% to 1.6% was noted since the dry run trial in September 2015.
The moisture content of each mixture was tested immediately at the contractor's facility after sampling. Moisture content of each mixture was determined in accordance with AASHTO T329. The results are shown in the attached table. The total moisture content in the mixture was below 0.16% for all the mixtures.
Laboratory verification and testing of the plant produced mixtures commenced.

NETC 13-1,
Task 1: Literature Search
Performed literature review as necessary to obtain research reports and technical papers to assist in further development of mix design trial batches.
Task 3: Develop Mix Design
Adjusted the w/cm ratio and adjusted the fly ash class and quantity to determine the final trial batch mixture before moving on to additional testing.
Added accelerating admixture in an attempt to increase compressive strengths of trial batches as needed. Inconsistent compressive strength results were found with the use of accelerating admixtures; therefore, test results using accelerating admixtures cannot be deemed accurate in small scale batches used for this project.
A combination of maximum coarse aggregate sizes used to smooth the aggregate gradation curve in order to reduce concerns related to segregation of trial batches.
Task 4: Test Mixture
The set time test (AASHTO T197 / ASTM C403) was performed on each trial batch.
The slump test (AASHTO T119 / ASTM C143) or the spread test (ASTM C1611) was

performed on each trial batch depending on the workability of the concrete mixture.
The shrinkage test (AASHTO PP 34-99) was successfully performed on a concrete mixture developed through trial batches.

NETC 13-2,
1. A kickoff meeting with project update was held on Friday October 16th, 2015 via online meeting software. A brief presentation of the project on a task-by-task basis was conducted. The current progress to date and problems encountered was also discussed. The representative from Massachusetts asked why a 12.5mm mixture was selected over a 9.5mm mixture as a 9.5mm mixture typically has a larger binder content which would assist in the use of more RAS. The project PI responded that this mixture was selected by the contractor assisting producing the mixtures for this study with RAS. No other questions were presented. The PI will schedule another update meeting for winter 2015/2016. The PI also emailed a copy of the presentation to the committee at the conclusion of the meeting.
2. The survey for Task 3 was distributed to the technical committee for comments. Comments were received and incorporated. The PI obtained a list of regional contacts consisting of both agency and industry members for distribution of the survey.
3. Testing continued on the virgin aggregates, RAS, and RAP stockpile materials related to the 12.5mm mixture identified by the contractor assisting producing the mixtures for this study (Task 5). The contractor only utilizes one source of RAS which is manufacturers shingle waste (MSW).
4. Based on the testing of stockpile materials, four 12.5mm mixtures were developed with similar gradations (Task 6). The mixtures were:
- Control mixture using all virgin materials
- Control mixture incorporating 15% RAP (Typical)
- Control mixture incorporating 5% RAS (Using the MSW RAS Source)
- Control mixture incorporating 5% RAS and 15% RAP (Using the MSW RAS Source)

Note for the second and a fourth mixture that 15% RAP contents were used as it is the amount typically utilized by the contractor for this 12.5mm mixture.
5. Volumetric verification of each of the developed mixtures was completed using the same PG64-28 binder that the contractor intends to use during production. Verifications were completed assuming 100% contribution of RAS and/or RAP binders.

NETC 13-3, The past quarter activities for the researchers started with completion of the DOT QA personnel interviews as well as visits to PCE/PSE fabricators in New England. The data collected through literature review, review of specifications and QA manuals, interview of New England agency engineers and QA inspectors, and interview of PCE/PSE fabricators was compiled and analyzed. The analysis focused on evaluating the similarities and differences between the current agency practices.

A highlight of findings from review of QA processes for PCE/PSE of the New England DOTs are as follows:
Large number of PCE/PSE fabricators supply elements to multiple New England states
For PSE, producer qualification requirements are comparable between different New England states. For PCE there are some differences, some states allow PCI plant certification also for PCE whereas, others prefer NPCA certification.
There is a full spectrum of QA inspector types in New England in terms of agency employee versus consultant QA inspector usage. On basis of the current consultant inspection contracts, the range of cost per hour per inspector is found to be from $50 to $100. The lower range does not include travel reimbursement which is paid separately.
The pre-pour inspection processes amongst the states were found to be comparable.
The plastic testing was similar amongst the states as they all require the necessary tests to ensure the quality of the mix. However, the frequencies of these tests were found to vary significantly amongst the state agencies. It was found that the frequency of testing ranged from testing per sub-lot (typically defined as one element) to a consistency based sampling frequency.
The majority of the states require inspectors to be present for the destressing of prestressed elements.
The requirements between states are not similar in the number of compressive strength cylinders that were required to be cast and tested. Also, all states conduct 28 day strength testing, but some require additional testing, such as 56 day strength measurements by Massachusetts. Furthermore, only two states currently have requirements in place to determine durability of concrete in terms of permeability through rapid chloride ion permeation (Maine) or surface resistivity testing (New Hampshire).
The post-pour inspection processes were found to be also very similar amongst the states.
All agencies allow accelerated curing of precast elements. Majority of agencies do not specify controls associated with curing conditions, internal temperature etc. (Maine being only exception).
A few currently utilized practices as well as some that are currently under implementation at various DOTs could really aid in implementation of the unified QA process between New England DOTs. For example, use of RFID (Radio Frequency Identity) tag with cloud based data-storage system that is being evaluated by MassDOT could serve as a vehicle for

management of information and the use of “Shift Planning” system used by VTrans can make it streamlined to keep database of eligible inspection personnel in the region, their availability as well as tracking of their work hours.

NETC 14-1, Work on Task 1 has continued.
The planned schedule has been revised:
Task 1 completion by March 2016.
Tasks 2 and 3 – Determine Gaps and Develop a CM Framework – completion by July 2016.
Task 4 – Pilot Program – completion by October 2016.
Task 5 – Final Report – completion by December 2016.

Task 1 involves researching existing competency models and matrices. A number of articles and references have been found; however, specific models for DOT’s have been more difficult to identify than anticipated. Work on Task 1 will continue.
Task 2 involves determining gaps in existing competency models. Work on creating standard employment classifications for both technicians and civil engineers within a DOT has started. The competency model developed will then be based on those standard classifications. Research on existing grades within DOT’s is underway. A proposal on standard grades is scheduled for our next technical committee meeting, which is anticipated for February.

NETC 14-2
Borescope camera received
• GIS software used to integrate maps with National Bridge Inventory to determine routes for visual screening and instrumentation
• Initial screening of data
• Evaluation of all calls from summer 2015 with SonoBat software
• Hand sorted SonoBat results for 2 dataloggers to determine if hourly readings provided additional insight
• Meeting with Technical Committee 10/20/2015 (follow up by phone with those that could not attend in person due to PI dropping the video line)
• Provided update on project activities and preliminary findings
• Updates by Technical Committee on their activities summer 2015
• Due to minimal information on bats in bridges from phone surveys, no formal survey will be sent (Task 3)
• Due to publication of FHWA/FRA report: Range-Wide Biological Assessment for Transportation Projects for Indiana Bat and Northern Long-Eared Bat (2015) Task 4 NETC_14-2_1st_qtly_prog_rpt_2016 will be modified to evaluate this and other existing surveys with recommendations on regional issues and proposed modifications (Task 4.1)
• Bridges for summer 2016 will be modified to include at least one CT bridge and one coastal bridge
• Requested funds to present at TRB 2016
• Distributed deliverables for Tasks 1 and 2 for comment
• Used borescope camera in late Fall to evaluate its use in the field
• Received information from Technical Committee regarding 5 bridges with recently confirmed or suspected bat roosting in New England (from summer/fall 2015)
• Attended Northern Long Eared-Bat Transportation Agencies/FWS Meeting at Parker River National Wildlife Refuge
• Revised TRB paper based on reviewer comments (accepted for Lectern presentation)

Anticipated work next quarter:

NETC 06-4, No work projected at this time.

NETC 07-1, The research team will complete the back calculation of modulus values from the FWD testing and compare with estimated values from FWD deflection measurements in the upcoming quarter. The research team will also submit a draft of the final report to the technical committee.

NETC 09-2, Manual writing. Continue to provide maintenance of the demonstration plots.

NETC 09-3, No work projected at this time.

NETC 10-3, UMass Dartmouth will continue testing the plant produce mixtures..

NETC 13-1, Task 1: Literature Search
Continue literature search as required.

Task 2: Develop Mixture Design Specification
Adjust existing concrete mix design specifications based on feedback from the NETC Project Technical Committee, trial batch results, and feedback from the PCI Bridge Tech Committee.
Task 3: Develop Mix Design
Adjust concrete mix design and perform select short-term tests on additional trial batches as required by results of further testing.
Task 4: Test Mixture
Continue design and begin fabrication of bar pullout test (ASTM A944) setup.
Perform air content test, pressure method (AASHTO T152 / ASTM C231), on concrete mixtures developed through trial batches.
Perform shrinkage bar test (ASTM C157) on concrete mixtures developed through trial batches and compare to results from shrinkage ring test (AASHTO PP 34-99).

NETC 13-2, Distribute survey to respondents (Task 3). Continue mixture design development by adding additional binders for mixtures that do not meet volumetric requirements as outlined in Task 6.

NETC 13-3,
- Meeting with project technical committee in late January – early February time frame
- Continued development of draft common acceptance standards
- Selection of agencies and manufacturers for pilot implementation of common acceptance standards

NETC 14-1, Complete Task 1
Create standard employment classifications for technicians and civil engineers and present those to the technical committee for review.
Hold a technical committee meeting in February.
Engage our subcontractor who will begin to determine gaps between existing CM's and standard classifications.

NETC 14-2
• Complete knowledge summary writeup incorporating Technical Committee comments
• Provide some evaluation of zero cross programs for species identification of summer 2015 data
• Prepare presentation for TRB 2016 Annual meeting (this will be the basis for the technology transfer workshop presentations noted in the proposal)
• Attend TRB 2016 Annual meeting
• Contact regional personnel for updated Summer 2015 data related to NLEB and bridge use for bat roosts
• Develop monitoring plan (new bridges) for Summer 2016 for distribution to Technical Committee
• Provide preliminary recommendations related to inspection surveys and time of year/temperature allowances for bridge work (including exclusion practices)
• Initiate UMass process to allow approval for use of borescope in research
• Initiate permitting process in states for use of borescope in research NETC_14-2_1st_qtly_prog_rpt_2016
• Determine undergraduate intern hires for summer 2016

Significant Results:

None as of this reporting period.

Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints set forth in the agreement, along with recommended solutions to those problems).

NETC 06-4, None during the current period.

NETC 07-1, There are a few freely available back calculation software programs. The team had originally planned on using EVERCALC. However, the software did not function with Windows 7. Subsequently, the team contacted TTI for their MODULUS software. The MODULUS software was obtained and installed; however, the software was found to be crashing after a few steps, repeatedly. The team then downloaded BAKFAA from the FAA website, and was successful in using it. The time needed to try the different software and become familiarized with new software resulted in delay of several months*20 in the back calculation work.

NETC 09-2, No problems were encountered during this reporting period.
NETC 09-3, None during the current period.

NETC 10-3, The research team has still been making arrangements with contractors to provide plant produced mixtures as stated in the scope of work. However, only one contactor has committed to produce the mixtures. The research team is still searching for additional contractors.
The research team requested a no-cost project extension in September 2014. To date there has been no response to this request and the original project deadline has expired..

NETC 13-1, No major problems encountered to date. The shrinkage ring tests were started in this reporting period and the specimens are taking longer to exhibit cracking than was anticipated. This has delayed the initiation of subsequent shrinkage ring tests, which may affect the project schedule slightly.

NETC 13-2,
1. The contractor assisting producing the mixtures for this study only utilizes one source of RAS which is manufacturers shingle waste (MSW). The contractor does not utilize post-consumer asphalt shingles (PCAS) or a blend of MSW and PCAS.
2. The project PI has continued efforts to find another contractor willing to produce mixtures for this study, preferably one that utilizes other RAS sources. To date, the PI has only been able to get commitment from one local contactor.

NETC 13-3, None during the current period.
NETC 14-1, Difficulties have unfortunately been at our end.
I have assigned a new project manager (Karen Dodge) to help with the project.
This Manager is known for keeping projects on schedule.
We are refocusing our efforts and will check in with the committee in February.

NETC 14-2, None during the current period.

Potential Implementation:
The 10 research projects listed above are still in progress. Implementations of the results of those projects are not anticipated in the near future.