Maine DOT Research Peer Exchange

JUNE 2017

Prepared by Dale Peabody
MAINE DOT | TRANSPORTATION RESEARCH DIVISION

Maine DOT Research Peer Exchange

June 13 – 15, 2017

Team Members:

Ann Scholz – New Hampshire DOT

Brad Overturf – Connecticut DOT

Stephanie Dock – District of Columbia DOT

Megan Swanson – Illinois DOT

Emily Parkany – Vermont Agency of Transportation

Dale Peabody – Maine DOT

On June 13 -15, 2017 the Maine Department of Transportation hosted a research peer exchange to promote the research program within the department, provide a mechanism for sharing research management ideas amongst the team members, identify opportunities for improving our research programs and meet the FHWA requirements for use of SP&R funds for research activities.

Some areas of focus were selected by the host state:

1. General overview of each state's programs to include involvement with STIC's, EDC, SHRP2 initiatives.
2. Successful practices for engaging young professionals in the research activities.
3. Development of a research partnership in the area of spatial technologies primarily with the Virtual Environment and Multimodal Interaction (VEMI) Lab at the University of Maine.

The agenda included:

Tuesday June 13th (Day 1)

8:00 – Noon – Peer Exchange Focus Area #1: General overview of team members' research programs (from research needs through implementation) and how they interact with STIC's, EDC & SHRP2 initiatives. Each member will give brief presentation of research in their state, followed by discussions, observations, opportunities, take home items.

1:00 – 5:00 – Peer Exchange Focus Area #2: Involving Young Professionals in Research

One hour interview sessions with MaineDOT internal Research Advisory Committee members, research project champions (supervisor level), and young professionals. Followed by discussions, observations, opportunities, take home items.

Wednesday June 14th (Day 2)

8:00 – 5:00 – Travel to University of Maine to tour the Virtual Environment and Multimodal Interaction (VEMI) Lab and Advanced Structures and Composites Center

https://umaine.edu/vemi/

https://composites.umaine.edu/

Focus Area #3: Developing Partnerships in Spatial Technologies – We will meet with the VEMI lab directors and others at the university interested in forming partnerships on this topic. Followed by discussions, observations, opportunities, take home items.

The morning of Thursday June 15th was used to prepare and present findings to MaineDOT research champions, sponsors, partners and customers.

This report summarizes the strengths and opportunities that the host state and peer exchange team members discussed as a result of our information sharing, brainstorming and interviews.

<u>Peer Exchange Focus Area #1</u>: General overview of team members' research programs (from research needs through implementation) and how they interact with STIC's, EDC & SHRP2 initiatives. Each member will give brief presentation of research in their state, followed by discussions, observations, opportunities, take home items.

<u>MaineDOT Research Strengths/Observations</u>

The research office reports directly to the Chief Engineer. This has been the case for about 6 years and provides a positive link to the front office and promotes involvement of research staff and funding on high priority projects and initiatives. There is good support, high level accountability, provides research office some leverage (for example this helps with NCHRP problem statement reviews and ranking, getting volunteers for panels), focus on moving research results and innovations into practice, etc.

Problem Solving program is included in the research SP&R program. This is used for ad-hoc, off-cycle research requests and may be used by research or other department staff to conduct relatively quick research. Examples include service life analysis of pavement treatments using pavement management data, guard rail end treatment field inspections and performance, field performance of culvert pipe and highway & bridge barrier safety analysis. The research office should continue to leverage this problem solving program.

Research plays a role in department efforts: Barrier Report, Keeping Our Bridges Safe, Roads Report, Traffic Mobility, etc. The research office is called upon to serve and contribute to critical department efforts with the emphasis of ensuring recommendations are based on a data driven risk assessment.

Research office has built solid, trusting relationships with department staff and partners. They have a broad network and know who to talk to about most issues.

The Research office just completed a re-write of the SP&R Research Manual.

Research has played an active role in the SHRP2 Implementation Assistance Program. MaineDOT has received 8 I.A.P. awards and the research office is involved with most of these from both a project manager and technical perspective.

On a national level, MaineDOT is very active in AASHTO and NCHRP efforts.

<u>MaineDOT Opportunities</u>

MaineDOT has an Engineering Council consisting of higher level engineers and chaired by the chief engineer. Among the Council's roles are "establishing engineering research agenda" and "adoption of engineering standards, policies and instructions". The Research Director is a

member and should leverage this group to help formulate the research program and implement research results.

The MaineDOT Research Advisory Committee suggests more interaction, especially off-cycle, to review research progress, stay informed, share results, develop new ideas and keep research program essential to the department's strategic plan. Since most research projects have progress meetings and a final meeting with a Principal Investigator presentation, RAC members should be invited to attend.

The Research Director currently attends the State Transportation Innovation Committee (STIC) meetings but is not a voting member. Research may want to investigate a more active role with the STIC to help mature this initiative into a more valuable department asset.

The Research Director should consider involving Research staff in more research management duties on the formal SP&R projects.

Research should consider improving its technology transfer/marketing activities such as using website, newsletters, bulletins, showcase and posters. Some excellent examples were presented by peer exchange team members. A good start would be preparing a bulletin to showcase the AASHTO High Value Research award on bridge rivet testing and analysis. There may be opportunity to involve/leverage the University of Maine media office.

Research should consider improving research project solicitation notifications using emails, posters, etc.

Peer Exchange Focus Area #2: Involving Young Professionals in Research

MaineDOT Research Strengths/Observations

Department Assistant Engineers meet twice a year as part of an employee development initiative to better engage these young professionals. These meetings typically include some training and education components and a visit to an active or recently completed project.

Some of the A.E.'s have conducted research and/or are involved with research and innovation initiatives. Examples include preparing a guidance document for culvert rehabilitation, inspection of guardrail end treatments and pavement roller intelligent compaction pilot projects.

Some of the A.E.'s interviewed expressed a desire to have easier and quicker access to department knowledge and experiences. It often takes a while to find the right person to talk to since the networks and relationships haven't been formed. This delves into a more strategic knowledge management approach.

It was also noted that while there is a venue to engage the assistant engineers there appears to be a lack of opportunities for other non-engineer young professionals.

During interviews one of the summer interns explained the desire to have problem solving and critical thinking as part of their work and to be engaged with agency groups or communities of practice. The opportunity to interact and learn from others is important to employee development and job satisfaction.

MaineDOT Opportunities

Build off the Assistant Engineering Days to promote research and innovation within the department.

Leverage the Problem Solving Program to facilitate projects led by younger professionals where interaction with subject matter experts is required. Match department research needs with interests. For example M&O is very interested in having a resource to evaluate snow and ice control technologies.

Consider including Research Program overview in employee orientation (all new employees).

The Research Director can be a resource and mentor for newer employees (who do they need to talk too). Utilize existing network.

Consider involvement of younger staff on technical panels for state, regional and national research projects.

Highlight the role of department staff in research projects. This can be done in technology transfer documents.

There appears to be an interest in knowledge management and knowledge transfer to provide improved communications and a more strategic approach to educating and developing networks. Investigate the possibility of a technical transfer project to educate staff using FHWA T2 funds.

Focus Area #3: Developing Partnerships in Spatial Technologies

MaineDOT Research Strengths/Observations

Research has had a strong working relationship with the University of Maine Civil and Environmental Engineering Department for many years. This was the foundation for a partnership with the Advanced Engineering Wood Composites Center now called the Advanced Structures and Composites Center.

https://composites.umaine.edu/

A Transportation in Composites Initiative was started that includes DOT, the Composites Center and the Maine composites industry leading to millions of dollars in research funding that has resulted in practical composite solutions for our transportation infrastructure.

The Virtual Environment and Multimodal Interaction (VEMI) Lab provides a resource for the DOT to potentially provide solutions to challenging issues using human behavior and interaction science in a virtual environment. The VEMI Lab is especially interested in driver safety and behavior in autonomous vehicles.

https://umaine.edu/vemi/

MaineDOT Opportunities

Resources for the Research program, through the Composite Center and VEMI, should continue to develop and enhance the research results. Use your resources through AASHTO RAC to promote their capabilities and/or determine if pooled fund studies could generate funds for research topics discussed on tour.

Some possible research ideas with the VEMI lab and Composites Center include:

Safety impacts due to human behavior and interaction in autonomous/connected vehicles. What happens when an autonomous vehicle suddenly requires the driver to take control? This would likely be a national study effort via NCHRP or pooled fund.

Safety studies using the SHRP2 Naturalistic Driver Safety database. There is already a New England Transportation Consortium study using the NDS for elderly driver behavior at signalized intersections being performed by another state university. The VEMI Lab could partner with the University of Maine Civil and Environmental staff on similar studies and augment the database analysis with virtual evaluations to further examine potential safety countermeasures.

Wrong Way Drivers along the Interstate. MaineDOT is deploying safety countermeasures to mitigate wrong way driving. These countermeasures could be tested first in a virtual environment prior to deployment at some of our interstate ramps.

Dynamic Message Sign messages. One school of thought is to leave message signs blank except when needed for critical events such as notifying motorists of an incident ahead. The theory is that motorists will get complacent when message signs are used for non-critical events and reminders such as “Santa knows when you’re speeding”. This could be addressed with an initial literature search and perhaps validated in a virtual environment.

Another potential area for research is improving work zone safety and worker visibility.

TAKE HOME ITEMS

Stephanie Dock – DC DOT

Here is my list of takeaways from the peer exchange. This was a great exchange!

- Explore the IDOT TAG idea - annual research needs meetings led by bureau chiefs
  - In meantime, set up focus group meetings with divisions
- Consider a mechanism for people to identify needs but not necessarily solutions- IDOT and VTrans have forms that would help set this up
- Get IDOT forms on implementation planning and close out; IL/NH forms on peer exchanges
- Technical editor at university paid by DOT, send reports 3 months before project end
- Outreach:
  - actually set up the "research corner" in the DDOT employee newsletter
  - work with Communications to make regular contributions to the DDOT Blog
- Consider setting up a compendium of projects - others are doing on a map
- Explore which projects do not need a final report - presentation, TRB paper, spec...
- Suggest Tia (HR director) look at NH new employee rotation program
- Consider a "problem solving" line item like Maine does to provide staff time for internal research
- Add project call (form link) to my signature
- Look at leveraging other recurring staff meetings to keep research on the radar throughout the year
- T2 funds for Division Office?
- Talk to IT group about possible partnership with VEMI Lab on field x-ray viewer for showing the 3D underground utility data that we collect/prepare as part of the SHRP2 R01A project.

Emily Parkany – Vtrans

The Vermont Actions are very similar to the Highlights.

Illinois has Pooled Fund form and Implementation Worksheet

IL uses Quick Step function in Outlook for --send out surveys --send out reports

I'm interested in Barbara Harder's 7 Keys to a Robust Work Program

Liked that Joyce said "NCHRP panels are an awesome opportunity to have a voice as a state"

NH has two month poster campaign: "Got an idea for research"?

NH puts QRs on website

Great tech transfer examples on NH Research Awareness slide

NH has their Research Manual on RPPM (new federal requirements compliant)

Guidebook to funding opportunities--Sue Sillick (RPPM?)

Great that Maine Problem Solving fund can be used with one-page form and brief report afterwards (give a junior eng 40 hours to pursue their idea)

CT project list had links to rip.trb.org links (project pages)

CT has a Research project: specification for porous pavement for locals

CT Research Bulletin newsletter uses Adobe Spark and has profiles of students and their university projects

(NH uses Microsoft Publisher)

Need to ask Ann for NH example of "memo to file" for how NH closed research programs

Vermont Actions

Need to ask Ann for NH example of "memo to file" for how NH closed research programs

Ask CT for a Research project: specification for porous pavement for locals

Need to emulate: CT project list had links to rip.trb.org links (project pages)

Need to consult: Barbara Harder's 7 Keys to a Robust Work Program

NH has two month poster campaign: "Got an idea for research"?

NH puts QRs on website

Great tech transfer examples on NH Research Awareness slide

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Ann Scholz – NH DOT

District DOT wrote a Research Strategic Plan in 2013 that should be requested as an example.

Review the implementation plan created by Illinois DOT and incorporates it into the project work plan and TAG discussion's throughout the research time period.

If appropriate for topic, consider videos as a deliverable or seek a resource to provide this service.

Start a dialogue with our Front Office on where Research belongs; especially since the Program is not responsible for STIC, EDC, AID grants, AASHTO committee, etc.

Send an email blast to the Department's RAC upon receipt of all research project quarterly reports.

Include the affiliated Bureau Administrator (cc'd) for TAG meetings and personally invite them to final presentations by the Research.

Upon approval, promote availability for Department staff to be in charge of their own research project.

Request a seat on the LTAP Advisory Board.

Include the link in email signature for submitting simple research ideas (VTrans) during solicitation of ideas.

Megan Swanson – Illinois DOT

Reach out to Ann Scholz about funding available from FHWA for Technology Transfer. This is handled through the FHWA Division Office.

Ask for a copy of the NH "Research Post" from Ann Scholz.

DDOT hires interns to fill f/t positions – there is not a clear path, but they are working an creating a more seamless process.

Get information from Stephanie about the DDOT Wiki. Maine also has a wiki, and Missouri has something similar

Talk to Stephanie or Ann about creating a list of membership responsibilities for the AASHTO chairs. One of them already does this.

Reach out to Dale Peabody to get information on VEMI. Is there a way that IDOT could utilize their skill set? Is there something like this at UIC? Get a contact name for UIC Electronic Visualization lab from Stephanie Dock.

CT gets a print out of all staff who have taken TC3 classes and creates a spreadsheet of how much those classes would cost individually (in TC3 and potentially NHI). This can show the CBA for TC3 participation.

Reach out to Brad Overturf on information about the CT Career Trainee Program.

Get information from Emily Parkany on their research symposium day on September 28. Ask for copy of this slide.

Maine's "Young Engineers Days" are a great idea. Is there a way that I could incorporate a similar idea into our ELDS project recommendations?

Send information on how to create Quick Steps to the group.

Talk about what we learned as "challenges" (cons) and "wins" (pros).

Consider requiring a poster for each project along with the reports

Does IDOT have some kind of Summer Transportation Institute? This is an FHWA program and is usually handled by the Civil Rights Office.

During project selection cycle, ask each TRP chair to include one new person who is not currently involved in research on each committee. This may be a way to help deepen our bench.

Look into Grid Smart intersection technology. Brad Overturf thinks that it worked well.

Appendix A – Brainstorming ideas for research

Composites lab:

- Could they make a composite ADA-compliant ramp for installation following overlays. This is a major cost currently
- For bridge maintenance crews: specialized joint for joining old and new elements when repairing a bridge (e.g. a steel and a concrete member)
- Composite beach for coastal erosion - armoring that blends in (like hard and green armoring done now)
- Saltwater tank: corrosion on coastal infrastructure testing – e.g. drainage pipes

VEMI lab:

- Finding alternative ways to bridge gaps in comfortable bicycle network – how do we let drivers know that they need to share the space when there isn't space for a 6 foot lane/shoulder
- Sign reflectivity – better testing, what are the means of evaluating that? MUTCD guidance doesn't seem that clear
- Rumble strips - determining when and where to install them (communities sometimes object to universal placement)
- Wrong way driving - are there better ways to address that? Which treatments work best
- Extension to DC: reversible lane operations when we cannot put overhead signage up
- Ensuring that all system users are included – we talk about mobility impaired, but we don't talk as much about vision and hearing impaired
- X-ray model for underground infrastructure – link to the 3D utility database work (R01).
- DC would have a good use for utility cuts
- Age-friendly efforts to help seniors transition to other modes of travel when driving is no longer an option
- Seniors and AVs – are there extra considerations we should be thinking about in our AV planning?
- Blind and other special needs traveling populations as well – DC is very interested in what AVs could mean for paratransit, for example
- Bicycle + vehicle simulator

- Pedestrian safety – VR – what cross walk treatments work best

Funding opportunities – VEMI lab has heard DOT needs. They can use this information in proposals.

Appendix B – Powerpoints

Maine Research Peer Exchange
June 13-15, 2017

"If You Always Do What You've Always Done, You Always Get What You've Always Gotten"
– Henry Ford

Research at MaineDOT

Who we are: Transportation Research Division Director, Senior Technician, Assistant Engineer

Report to: Chief Engineer

Major responsibilities: Delivery of the SP&R research program, product evaluation and approval/ Qualified Products List, experimental construction evaluations, SHRP2 coordination, ad-hoc requests

Research Advisory Committee: Consists of managers from major Bureaus and Offices, meet every odd number year to select new SP&R projects for two year program, may meet off-cycle

Formation of SP&R research program: general solicitation to DOT for research problem statements (summer 2017). Includes email request for research, getting "research" on agendas, occasionally hold research focus meetings
* Approximately $900,000 per year, less than ½ goes to new SP&R projects

Research at Maine DOT

Formation of SP&R research program (cont.): RAC meeting in Fall 2017, Research Problem Statements presented by champions and researchers, RAC prioritizes and approves projects and budget, final approval by Chief Engineer

Transportation Pooled Funds: Projects are considered after above prioritization completed

AASHTO Technical Service Programs: Solicit TSP contacts for value and interest in participating

Research Project Management: RPS=>Technical Advisory Committee=>Proposal/SOW=>Agreement/Contract=>Project kickoff=>periodic updates from PI=>Focus on deliverables and implementation

Technology Transfer: D plus, once a year research summary two pager, HVR submittals

Partnerships: examples include UMaine ABSI, Composites Initiative, UMaine Civil and Environmental Engineering, WPI, USGS, others (VEMI?)

Ad-hoc requests

Become go-to unit for special requests & projects:

Adds value to the department

Builds trust and relationships with Bureaus/Offices

Find a niche and become the experts or “reliable resource”

Examples:
Concrete ASR & shrinkage cracking
Guardrail end treatments
Culverts & pipes
Bridge joints & deck membranes

SP&R - Research Program
Dale Peabody

Description	PSN	PIN	FY16	FY17	FY18	NOTES
Research Admin		2134.16	$ 120,000			Staff
2134.xx		2134.17		$ 120,000		
		2134.18			$ 120,000	
Product Evaluation		7519.16	$ 80,000			Staff
7519.xx		7519.17		$ 80,000		
		7519.18			$ 80,000	
Experimental Construction		7115.14	$ 40,000			Staff +
7115.xx		7115.15		$ 40,000		
		7115.16			$ 40,000	
Problem Solving		8958.16	$ 60,000			Staff +
8958.xx		8958.17		$ 60,000		
		8958.18			$ 60,000	
Coastal Risk			$ 80,000			Transfer from 20228
Roadside Vegetation, Invasive species			$ 59,000	$ 50,000		Transfer from 20228
Roadside Vegetation, Wild Seeds			$ 12,000			Transfer from 20228
Bridge Testing			$ -	$ 42,000		Transfer from 20228 Will use $58k from WIN 17666
Research Pooled Funds		20223.16	$ 404,000			100% Federal, no state match
20223.xx		20223.17		$ 404,000		
		20223.18			$ 404,000	
Research Initiatives		20228.16				This is holding PIN for new projects
20228.xx		20228.17				
		20228.18			$ 175,000	
AASHTO Tech Service Program		TBD	$ 101,000			
		TBD		$ 101,000		
		TBD			$ 101,000	
		TOTAL	**$ 956,000**	**$ 897,000**	**$ 980,000**	

NOTES Reduced Staff WIN's by $15,000 per year
Added $55,000 per year for AASHTO TSP

Pooled Funds	NCHRP	$ 186,500	$ 186,500	$ 186,500
	NETC	$ 100,000	$ 100,000	$ 100,000
	TRB Core Services	$ 75,000	$ 75,000	$ 75,000
	Clear Roads	$ 25,000	$ 25,000	$ 25,000
	IC - VETA	$ 17,500	$ 17,500	$ 17,500
	TOTAL	$ 404,000	$ 404,000	$ 404,000

Ref #1	Ref #2	Research Project Title ***(SAMPLE)***
16	01	Martins Point Bridge - Modular Expansion Device Evaluation
16	02	Bridge-in-a-Backpack™ Task 3.1: Investigate Soil-Structure Interaction-Experimental Design
16	03	Bridge-in-a-Backpack™ Task 3.2: Investigate Soil-Structure Interaction-Modeling and Experimental Results of Steel Arches
16	04	Bridge-in-a-Backpack™ Task 3.3: Investigate Soil-Structure Interaction-Modeling and Experimental Results of Concrete Filled FRP Tube Arches
16	05	Use of FORTA FI fiber in 1½" Polymer Modified HMA Mill & Fill on Route 703 Eastbound and Westbound, South Portland
16	06	Bridge Testing and Diagnostics for Enhanced Load Rating
16	07	Incorporating Coastal Risk into Asset Management at MaineDOT
16	08	Roadside Vegetation Management of Invasive Plants to Benefit Biodiversity and MDOT Management Programs
16	09	Handbook on Maine Native Plants and Grasses for Roadside Habitat
16	10	Enhancement to the Intelligent Construction Data Management System (VETA) and Implementation
16	11	Bridge in a Backpack Task 4: Improved Arch Concrete Mix
16	12	Bridge in a Backpack Task 6: Guidelines for Maintenance & Inspection
16	13	"Bridge-in-a-BackpackTM - Task 5 Guidelines for Quality Assurance Task 5: Guidelines for Quality Assurance"
16	14	Advanced Bridge Safety Initiative: Phase 2 - Task 1 - Rivet Testing of Rivets Taken from Maine Truss Bridge
16	15	Advanced Bridge Safety Initiative: Phase 2 - Task 3 - Instrumentation During Live Load Testing and Load Rating of 5 Slab Bridges

STIC, EDC, SHRP2

STIC: Research is at the table but not voting member. Opportunity to increase involvement, take STIC to next level

EDC: Research is not active, except when involved with ad-hoc projects or initiatives. For example, Traffic Signal Performance Measures, CM/GC, Intelligent Compaction

SHRP2: Research coordinates for department. Eight IAP projects. Project-level involvement from Research varies from very little to project manager.

MaineDOT Strategic Plan
Research Actions

- **Coordinate Advanced Bridge Safety Initiative Research effort with UMaine.**
- **Coordinate MaineDOT's participation in the Maine Composites Initiative.**
- **Establish series of workshops to promote new technologies from SPR, SHRP 2, TIG, EDC, NCHRP, etc.**
- **Manage MaineDOT's Product Evaluation Program**
- **Provide opportunities for DOT staff and new engineers to participate in research and development.**

So what did I learn.....

MaineDOT Peer Exchange Summary

- What we did
- What we learned

Team members & What we did

Ann Scholz – New Hampshire DOT
Brad Overturf – Connecticut DOT
Stephanie Dock – District of Columbia DOT
Megan Swanson – Illinois DOT
Emily Parkany – Vermont Agency of Transportation
Dale Peabody – Maine DOT

Focus areas
Overall SP&R Research Programs – ½ day
Getting younger professionals involved w/research
UMaine visit – Composites Center and VEMI (Virtual Environment & Multimodal Interaction) Lab

What we learned (team observations and opportunities)

- Research office directly reports to Chief Engineer – provides excellent front office support, accountability, leverage
- Problem Solving projects – adhoc, off-cycle mini research projects
- Research office plays a role in critical department efforts: KOBS, Roads Report, Barrier Report
- Research has built solid relationships with staff and partners

Opportunities

- Research Director is a member of Engineering Council and should leverage this group to help formulate the research program and implement research results
- The MaineDOT Research Advisory Committee suggests more interaction, especially off-cycle, to review research progress, stay informed, share results, develop new ideas and keep research program essential to the department's strategic plan.
- Improve T2 activities
- Build off the Assistant Engineering Days to promote research and innovation within the department.

More opportunities….

Leverage the Problem Solving Program to facilitate projects led by younger professionals where interaction with subject matter experts is required (example: snow and ice control)
Strategic knowledge management approach for younger professionals
VEMI Lab – engage them in research to generate some early successes (example: wrong way Interstate driving)

It was all fun and games .....