



MINUTES

Clear Roads 2010 Technical Advisory Committee Winter Meeting:

Pooled Fund Project #TPF-5(218) - Test and Evaluation of Materials, Equipment and Methods for Winter Highway Maintenance

Tuesday- Thursday, February 1-3, 2011
Virginia Tech Transportation Institute

Attendees:

David Wieder, Colorado DOT	Caleb Dobbins, New Hampshire DOT	Kyle Stollings, West Virginia DOT
Annette Dunn, Iowa DOT	Mike Lashmet, New York DOT	Mike Sproul, Wisconsin DOT
Tim Peters, Illinois DOT	Larry Gangl, North Dakota DOT	Cliff Spoonemore, Wyoming DOT
Paul Brown, Massachusetts DOT	Charles Goodhart, Pennsylvania DOT	Rudy Persaud, FHWA – D.C.
Tim Croze, Michigan DOT	Lynn Bernhard, Utah DOT	John Scharffbillig, APWA
Tom Peters, Minnesota DOT	Allen Williams, Virginia DOT	Jason Norville, Aurora
Tim Jackson, Missouri DOT	Monty Mills, Washington DOT	Colleen Bos, CTC & Assoc.

Materials Distributed:

- Agenda
- Clear Roads Budget Overview
- Clear Roads Operating Procedures
- Implementation Tracking Spreadsheet
- 2011 Research Proposals
- 2011 Ranking Sheet
- Aurora Knowledge Base Procedures (Draft)
- True Costs of Snow and Ice Control Scope of Work
- Mapping Severe Weather Zones Scope of Work
- Deicing Video Script
- Missouri State Report PowerPoint
- New York State Report PowerPoint
- Colorado State Report PowerPoint
- North Dakota State Report PowerPoint
- Pennsylvania State Report PowerPoint
- Wyoming State Report

February 1, 2011

Introductions and Meeting Objectives

Chairperson Paul Brown kicked off the day with introductions of all attendees and a review of objectives:

- To get updated on current Clear Roads research and;
- To select new projects for funding and RFP development.

Introductions included some first-time attendees:

- Several first-time guests joined the Clear Roads members for the winter meeting: John Scharfbillig from the City of Minneapolis representing the APWA, Jason Norville from the Pennsylvania DOT representing Aurora, and W. Kyle Stollings from West Virginia DOT.

Research Project Presentation and Discussion

Each member state in attendance that had proposed a project to be considered for funding in 2011 described the goal and scope of their proposed project.

The discussion regarding each project is included in a table at the end of this document.

Implementation Projects Update

Colleen reviewed the status of all the projects closed in 2011.

- Most projects that required follow up have had an appropriate project proposed for funding in 2011.
- Mike Sproul noted that he plans to propose a project in 2012 to build on the information learned from the Safe Winter Driving Message project on target demographics and develop another public service announcement.
- The group wanted to make sure that the Evaluation Process discussed at the Summer 2010 meeting is carried out for each of the projects that closed in 2010.

>>Action Items

- *CTC & Associates*: Follow up with Allen Williams on implementing the evaluation process.

Clear Roads Budget

Colleen Bos provided an overview of the Clear Roads budget, including amounts committed and obligated, amounts contracted, and estimated planned expenses. Clear Roads has approximately \$646,572 to spend on research this year, although we are still awaiting the transfer of the remaining balance from Wisconsin DOT for TPF-5(092).

APWA Update

John Scharfbillig presented an update on APWA activities:

- The APWA is holding the 2011 APWA North American Snow and Pacific Northwest Snowfighters Conference in Spokane, Washington in April.
- This year's conference will introduce a certificate program for supervisors directed at how to be a good snow and ice manager.
- The APWA is focusing on sustainability and livability and how to assess and improve those measures.
- John chairs the Fleet Committee, which is looking at alternative fuels and standards.
- There are new federal CDL rules and regulations being developed that may impact snowplow drivers in terms of physical cards and hours of work.

Smart Road/ VTTI Tour

Virginia Tech Transportation Institute and the Virginia DOT hosted the Clear Roads TAC for a tour of the Smart Road facility.

February 2, 2011

Colorado State Report

David Wieder shared an overview of his agency's activity for the last year. Here are a few highlights:

- Conducting a Salt Brine pilot in the southwest part of the state with the goal of meeting CDOT/PNS specifications and reusing wash water.
- Continuing expansion of MDSS.

- Increasing Quality Assurance testing of deicer products.
- Implementing a tow plow.
- Evaluating JOMA blades.

Research Project Selection

Colleen shared the combined rankings submitted by TAC members. The TAC discussed the outcome and approved eight projects for funding:

1. **Cost-benefit Analysis Toolkit Phase 2**
Subcommittee: Paul Brown*, Mike Lashmet, Annette Dunn, Lynn Bernhard
Funding: \$100,000
2. **Pacific Northwest Snowfighters**
Subcommittee: Monty Mills*, Tom Peters, Lynn Bernhard, David Wieder
Funding: \$25,000
3. **Determining the Toxicity of Deicing Materials**
Subcommittee: David Wieder*, Paul Brown, Ron Wright (need to confirm)
Funding: \$75,000
4. **Environmental Factors Causing Fatigue in Snowplow Operators**
Subcommittee: Allen Williams*, Cliff Spoonemore, Dr. Gerardo Flintsch, Tim Peters
Funding: \$125,000
5. **Maintenance of Aurora's Knowledge Base for Winter Operations Research**
Subcommittee: Paul Brown*, Tim Croze, Monty Mills
Funding: \$9,000
6. **Snow Removal at Extreme Temperatures – Phase 1**
Subcommittee: Mike Sproul*, Larry Gangl, Lynn Bernhard, Tim Croze, David Wieder (tentative)
Funding: \$50,000
7. **Improved Snowplow Design and Material Used In Construction on Both Front and Underbody Plows** Subcommittee: Jim Dowd* (Iowa DOT), Annette Dunn, Randy Gray (Maine DOT), Caleb Dobbins, Mike Mattison (tentative)
Funding: \$150,000
8. **Development of a Totally Automated Spreading System – Phase 1**
Subcommittee: Jim Smith* (Pennsylvania DOT), Charlie Goodhart, Cliff Spoonemore, Paul Brown, Gabe Guevara (FHWA), Mark DeVries (APWA)
Funding: \$75,000

*indicates the Project Champion

>>Action Items

- *CTC & Associates:* Follow up with project champions and subcommittees to scope all selected projects and/or address any other next steps.
- *Paul Brown:* Serve as project champion for the Cost-benefit Analysis Toolkit Phase 2 and Aurora Knowledge Base projects
- *Monty Mills:* Serve as project champion for the Pacific Northwest Snowfighters efforts.
- *David Wieder:* Serve as project champion for the Determining the Toxicity of Deicing Materials project.
- *Allen Williams:* Serve as project champion for the Environmental Factors Causing Fatigue in Snowplow Operators
- *Mike Sproul:* Serve as project champion for the Snow Removal at Extreme Temperature – Phase 1 project.
- *Jim Dowd:* Serve as project champion for the Improved Snowplow Design project.
- *Jim Smith:* Serve as project champion for the Development of a Totally Automated Spreading System – Phase 1.

Scoping Projects

The group spent some time discussing the scope and tasks that would be involved in the projects selected for funding that will need to go through an RFP process. The initial thoughts on scoping are captured below for each project.

Cost-benefit Analysis Toolkit

- Task 1: Provide fixes to the Phase 1 system, such as ensuring it works on all browsers; saves drafts so users can come back to them; supports easier manipulation of the output from the system.
- Task 2: Survey Clear Roads members to determine the next ten most important items and work with TAC to determine final list for Phase 2 development.
- Task 3: Gather data on the ten items identified for development in Task 2.
- Task 4: Continue development of the Cost-benefit Toolkit based on Tasks 2 and 3.

Additional items suggested for consideration in Phase 2 development by the TAC include:

1. Comparing flexible blades to traditional blades
2. Pre-treating prior to the storm
3. Pre-wetting at the spreader
4. Slurries
5. Plow guards
6. Spreader calibration
7. Tow plows
8. Open vs. closed loop spreader controls
9. Laser guides
10. Aggregate types – different weights/sizes
11. Remote cameras for monitoring remote sites locations
12. Hired truck vs. state truck
13. Tailgate vs. hopper spreaders

Determining the Toxicity of Deicing Materials

- Task 1: Survey of deicing chemicals in use, including components like the inhibitors, urea, etc. and also include combinations of materials working with the TAC to determine which combinations need to be tested.
- Task 2: Perform a literature search on the toxicity of the chemicals identified in Task 1.
- Task 3: Conduct laboratory tests on the toxicity of chemicals identified in Task 1.
- Task 4: Create a report on chemical toxicity along with a brief guide that summarizes findings.

Environmental Factors Causing Fatigue in Snowplow Operators

- Task 1: Conduct a literature search and survey to identify elements of trucks and factors that cause driver fatigue. Consider all types of factors including sleep deprivation, winter conditions, cold temperatures, traffic, scheduling/shifts and equipment (perhaps conducting two or more separate surveys for these categories). It may also be beneficial to look at accident rates for snowplow drivers and analyze whether the factors identified have an impact.
- Task 2: Conduct humanistic studies to identify which are the greatest factors causing fatigue and assessing long-term health of the drivers.
- Task 3: identify ways to mitigate these factors.
- Task 4: Develop recommendations on cost-effective ways to mitigate the factors that contribute to driver fatigue.

Snow Removal at Extreme Temperatures

- Task 1: Conduct a literature search on snow removal at extreme temperatures that focuses on high-volume interstates and identifying the cost and benefits of various strategies.
- Task 2: Conduct a survey of states to find out how they handle snow removal at extreme temperatures for high-volume interstates.
- Task 3: Identify and evaluate cost-effective deicing agents or strategies for snow removal at extreme temperatures.
- Task 4: Recommend two or three cost-effective strategies or materials for snow removal at extreme temperatures on high-volume interstates. If the possible strategies are too high in cost and policy solutions (such as requiring chains on trucks or closing roads) are more appropriate, that should be included in the recommendations. Recommendations could also include suggestions about strategies or materials to avoid.

Improved Snowplow Design and Material Used In Construction on Both Front and Underbody Plows

The group agreed that Jim Dowd from Iowa DOT would scope this project, but that it would likely include:

- A comprehensive literature search looking at both the US and abroad for creative approaches to snow plow design.
- It would also be similar to the multiple blade plow project in researching design elements to incorporate into a plow truck and then getting vendors to produce the designs for DOT testing.

Totally Automated Spreading System

- Task 1: Conduct a broad literature search looking at international efforts in places such as the UK, Japan and Italy where they have already done work with automation to reduce fatigue, avoid hazards and provide for automatic dispensing of materials.
- Task 2: Conduct surveys on the functional requirements and inputs for an automated spreader system. Surveys should reach beyond the snow and ice community to include industries such as agriculture that may have developed related technology already.
- Task 3: Provide recommendations on how to develop the smart logic that would formulate the outputs needed or indicating whether automated spreading systems are viable.

Pennsylvania State Report

Charlie Goodhart shared an overview of his agency's recent activities and initiatives. Here are a few highlights:

- PennDOT has been on a mission to continuously improve, focusing on management, technology communications and planning/preparations. This focus resulted from the February 14, 2007 storm that halted interstate traffic.
- In terms of management, they are more involved in national programs, mapping of winter crash clusters and focusing on how to mitigate dangerous crash sites.
- Their technology efforts have included RWIS, AVL, an MDSS pilot, salt brine research, developing an optimized dump truck for 2011 and conducting a tow plow pilot.
- They have increased public communication using 511, Twitter, and pre-storm and in-storm press releases. They also conduct pre-winter storm Webex's, have developed a winter services guide, and ensured that managers have BlackBerry smart phones, which will also be deployed to supervisors.
- Their planning/preparations have focused on winter AAR, utilizing Accuweather, updating standard operating guidelines, conducting tabletop exercises, developing a winter services strategic plan, creating an anti-icing decision tree.

Center for Sustainable Transportation Infrastructure

Dr. Gerardo F. Flintsch, the Director of the Center for Sustainable Transportation Infrastructure at VTTI presented to the Clear Roads TAC on the Center's research focus on sustainability. This Center is organized in two groups: Infrastructure Management and Sensing and Modeling and Simulation and focuses its research efforts in the areas of pavement design, analysis, rehabilitation and safety, infrastructure management, civil engineering materials, nondestructive testing and life-cycle cost analysis.

Future Meetings

The TAC discussed future meetings and the majority decided that it would be easier to get travel approval if the meetings were scheduled in Spring/Fall rather than on a Summer/Winter calendar. Due to the timing of the Winter Maintenance Peer Exchange in September, the calendar change will wait until spring 2012.

The future meeting dates and locations are:

- August 9, 10 and 11' 2011 in Minneapolis/St. Paul, Minnesota
- March 20, 21 and 22' 2012 in Salt Lake City, Utah

The group also agreed that summer and winter teleconferences or webinars would be valuable for reviewing the status of projects and resolving agenda items that don't require face-to-face discussion.

Vice Chair Selection

The Clear Roads TAC voted to have David Wieder of the Colorado DOT fill the role of Vice Chair. Cliff Spoonmore the current Vice Chair will take over the role of Chair of Clear Roads.

Aurora Update

Jason Norville provided an update on new Aurora projects, including:

- Survey of DOTs to identify funding sources for RWIS
- Study of MDSS costs
- Cost-benefit and instruction for migrating to an open-source RWIS
- Funding for the 2011 Winter Maintenance Peer Exchange
- RWIS CBT expansion and conversion to the Web-based model
- RWIS sensor density grid
- Results-based winter maintenance standards
- RWIS data and data collection for mobile units

Peer Exchange 2011

Allen reviewed the agenda for the 2011 Winter Maintenance Peer Exchange.

Annette also reviewed some logistical questions regarding air travel, such as:

- Who is making arrangements? The TAC agreed that each research consortium could make flight arrangements for its own members, so Mn/DOT will make them for Clear Roads.
- How to structure the vendor session? It was suggested vendors could be solicited to attend and then the planning committee could develop questions appropriate to the categories of vendors who are coming.
- How to present Clear Roads research? Colleen will develop a PowerPoint presentation for Cliff to present the latest updates on Clear Roads research. The goal will be to keep the presentation brief and try to have a panel for a question and answer session afterwards.

New York State Report

Mike Lashmet shared an overview of his agency's activity for the last year. Here are a few highlights:

- Started using variable-message signs to warn drivers to be cautious around plows.
- Reduced staff from previous years.
- Reduced their use of sand while holding salt usage steady.
- Experienced a 1% reduction in salt cost on average statewide.
- Embraced cost-saving measures such as spot-check calibrations, a no idling policy for trucks, and increasing use of anti-icing liquids like salt brine.
- Created a business case and RFP for MDSS.

February 3, 2011

Missouri State Report

Tim Jackson shared an overview of his agency's activity for the last year. Here are a few highlights:

- Decreasing their number of maintenance buildings.
- Planning to decrease their number of trucks.
- Invested in RWIS.
- Developed a traveler information map that incorporates cameras and dynamic message boards.
- Changed their level of service from clear to mostly clear to help save money.
- Standardized their continuous operation routes.
- Restricting salt purchases, because they have a lot more storage than their average usage.
- Controlling overtime hours.
- Reducing their workforce by 400 employees over 3 years.

Winter Maintenance Operations Knowledge Base

The TAC reviewed the draft procedures for populating the Winter Maintenance Operations Knowledge Base with research. The group discussed criteria for research to be posted in the Knowledge Base as well as the procedures and agreed on the following:

- Peer-reviewed research articles should be posted.
- All other research will be reviewed to assess the integrity of the research as independent and legitimate, not on whether the TAC agrees with the results.
- Comment fields will allow individual users to discuss or raise issues with results that they may question.
- The site needs a button or link to send questions or report faulty research to the Administrator.
- The TAC will hold conference calls quarterly or as needed to review research submitted.
- The TAC voted to approve five committees for reviewing research in materials, equipment, training, technology and methods.
- A leader was selected for each committee and all the other TAC members will need to sign up for a committee, so that there are four members in each committee. Volunteers will be taken until all four slots are filled for each committee on a first come basis. After that TAC members will be assigned to fill in where they are needed.
- The TAC suggested that there is existing research that could be posted immediately, such as from Wilf Nixon, WTI, TRB and a search of TRIS. Then Clear Roads should reach out via the Snow and Ice Listserv and by contacting each state to solicit research papers in a searchable PDF format.
- The TAC would also like to promote the Knowledge Base at the Winter Maintenance Peer Exchange.

The five committees and their leaders are:

1. Materials – Monty Mills
2. Equipment – Tim Peters
3. Training/Technology Transfer – Tim Croze
4. Technology – Brian Burne
5. Methods/Processes – Lynn Bernhard

>>Action Items

- *CTC & Associates*: Revise Knowledge Base procedures based on the TAC's input.
- *CTC & Associates*: Send an email out to the rest of the TAC to get volunteers for the committees.
- *CTC & Associates*: Identify research from Wilf Nixon, WTI, TRB and a search of TRIS and begin posting research to the Winter Operations Knowledge Base.
- *CTC & Associates*: Check with Lee Smithson on plans to promote the Winter Maintenance Knowledge Base at the Peer Exchange.

Deicing Video

Tom and Paul provided an update on the progress of this project:

- Filming for the video will take place this month at Mn/DOT. Tom has coordinated the location, equipment and staffing with the MLT Group.
- Everything seems to be proceeding well and we should have a video by next summer.

Plug and Play Specifications Meeting Update

Paul Brown reviewed the progress made towards interoperability for plug and play technology at the meeting with vendors that took place on Monday, January 31, 2011.

- There is tension between the stakeholders, but developing specifications from the snow and ice community seems like a viable path to overcoming the barriers to plug and play technology.
- The meeting on Monday established several groups to work on the various parts that need to come together to develop a specification. The groups are as follows:
 - Group 1 – Developing minimum requirements for controller outputs (GPS/AVL) - Annette Dunn, Monty Mills, Dave Adams (Penn DOT), John Scharbillig, Paul Brown
 - Group 2 – Truck component (CAN buss) - Tim Peters, Erle Potter, John Scharbillig
 - Group 3 – MDSS component – David Wieder, Mike Lashmet
 - Group 4 – Database/ data captured – Paul Brown, Allen Williams, Tim Croze
- The TAC also discussed what they view as minimum data requirements for controller outputs.

- Thompson Engineering's interim report to Clear Roads from the Interface Specifications project outlines the survey results regarding minimum requirements and should provide a good starting place for Group 1.

>>Action Items

- *CTC & Associates*: Send notes from the meeting to the TAC, the meeting attendees and other interested stakeholders.
- *Annette Dunn*: Lead Group 1 to develop minimum requirements for controller outputs.
- *Tim Peters*: Lead Group 2 to work on the truck component of the requirements.
- *David Wieder*: Lead Group 3 on the MDSS requirements.
- *Paul Brown* Lead Group 4 on determining how to manage the data captured and also serve as the overall Project Champion for this effort.

Understanding the True Costs of Snow and Ice Control Operations

Paul Brown provided an update on this project. The project was divided into two contracts and RFPs have been scoped for each one and will be posted shortly by Mn/DOT.

Report Distribution

The TAC discussed the distribution of Clear Roads research and agreed that they would like to have the broadest possible distribution, including:

- Snow and Ice Listserv
- TRB newsletter
- APWA
- AASHTO
- National Association of County Engineers
- LTAP Clearinghouse

>>Action Items

- *CTC & Associates*: Develop a thorough distribution list for the TAC to review.

Clear Roads Brochure

The TAC reviewed the need for a formal, printed brochure for Clear Roads and agreed on the following:

- They do not need a formal brochure, because it does tend to get outdated quickly.
- The two-page Clear Roads Overview should be maintained up-to-date on the Web site at all times.
- The Overview should include some additional information on the history and mission of Clear Roads.
- The TAC would like to send out the overview to engineers at all states that are not members of Clear Roads, including those who sit on the AASHTO subcommittee on Maintenance as well as snow and ice-specific contacts. The mailing should also include any available information on the return on investment that states get from Clear Roads.
- The TAC would like to start sending follow up letters to the managers of guests who are invited to attend Clear Roads meetings.
- Charlie Goodhart volunteered to make calls to individual managers as needed.
- The TAC would also like to consider doing a one-hour Webinar periodically to share the results of Clear Roads research and provide professional development hours to winter maintenance engineers.

>>Action Items

- *CTC & Associates*: Work with the Chair and Vice Chair to develop a plan for reaching out to the right contacts at non-member states to share information about Clear Roads and to consider a plan for doing a one-hour Webinar on Clear Roads research.

Meeting Attendance Policy

The TAC discussed the established policy on one Clear Roads member getting funding to attend meetings of other organizations, such as Aurora, APWA, PNS. In most cases the person from the state nearest the meeting location attends on behalf of Clear Roads.

- The only exceptions have been if a particular member is requested to attend by the host organization or if there is a Clear Roads project related to the meeting and the project champion needs to attend. For example, the University of Waterloo Road Salt Conference is coming up and Mike Sproul is going to try

to get approval to attend, because it matches up with his project on Snow Removal at Extreme Temperatures.

- The TAC reinforced that they like the policy of sending the attendee who is located nearest to the meeting, because it allows more opportunity for the whole TAC to speak on behalf of Clear Roads.
- The group also noted that they feel there is substantial benefit in continuing to ensure that Clear Roads coordinates with other winter maintenance research consortia on projects.

Research Project Presentation and Discussion Notes

Title	Proposed by	Summary	Presentation and Discussion Notes
Investigating Effective Avalanche Control and Mitigation Methods	Colorado DOT	Many DOT's and other entities (such as ski areas) must routinely trigger avalanches in order to protect the safety of the general public. The goal of this project is to obtain specific scientific information as to the effectiveness, costs, and environmental impacts for each method, so each agency has the information needed to choose the correct method for their program.	<p>Background</p> <ul style="list-style-type: none"> • CDOT gets pressure from ski areas to control avalanches without impacting the roadway. • There is some danger searching out duds resulting from the current method and also some environmental concerns. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • Avalanche control is important for Colorado, though it does not affect every snow and ice state. • There is a suggestion that this could be addressed through a synthesis report.
Material Selection for Corrosion Testing of Deicing Chemicals	Colorado DOT	The goal of this project is to determine the current metals used in automobile and truck manufacturing and which of these should be used to evaluate the corrosiveness of deicing chemicals (both liquid and solid).	<p>Background</p> <ul style="list-style-type: none"> • PNS has good methods for testing corrosion, but the metals they are testing may be outdated. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • Bridge components and structures could be included in the research as well. • This might fit into the current AUTC corrosion testing project with WTI. • The TAC agreed to send this project to WTI to see if they can include it in Phase II of the corrosion testing project. If not, it should be proposed again next year.
Determining the Toxicity of De-icing Materials	Colorado DOT	This project would determine the toxicity of each deicer chemical in use throughout the snowbelt states and rank the chemicals according to toxicity. This would help states to balance their selection of deicers with consideration for the impact on the environment.	<p>Background</p> <ul style="list-style-type: none"> • There are a lot of new chemicals in use and their level of toxicity is unknown especially to the aquatic environment. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • Minnesota is doing laboratory toxicity testing of all the materials that they use, though it may not be as comprehensive as this project is proposing. • There will be region-specific concerns that need to be addressed by each state, but understanding toxicity levels will help them to make those decisions.
Field Tests of Liquid Routes	Indiana DOT	The goal of this project is to perform field-testing to confirm effectiveness of liquid only treatments and validate the results of the previous Clear Roads project on liquid routes.	<p>Background</p> <ul style="list-style-type: none"> • This would be Phase II of the project that was previously funded by Clear Roads and would conduct field-testing to validate Phase I.

Research Project Presentation and Discussion Notes

Improved Snowplow Design and Material Used In Construction on Both Front and Underbody Plows	Iowa DOT	This project will review past research done in plow designs and materials and investigate potential new materials and designs that may be better suited for a more pro-active approach to snow removal. Both front plow and under body designs will be considered.	<p>Background</p> <ul style="list-style-type: none"> • This project would continue the study of materials and designs begun with the multiple blade plow project. • The vendors are not driving this, but they were willing to respond once it was funded. • The suggested direction is to consider using a heavier steel mold board design and to look at the underbody more. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • The response to the plow in the field as been very positive. The squeegee blade was especially popular.
Electronic Plow Route Hazard Marking	Maine DOT	Plow routes involve numerous hazards. The goal is to develop a few methods to effectively, inexpensively, and electronically log plow routes hazards so that they are flagged for all operators.	<p>Background</p> <ul style="list-style-type: none"> • The idea is to provide guidance on hazards like the start and end of guardrails or where bridge decks are located. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • There are some low-tech solutions with markings along the route, but it would be better to have it downloaded into AVL for all maintenance crews. • There could be challenges to make sure warnings clearly indicate the direction and location of the hazard.
The Effect of Plow Characteristics on Uneven Blade Wear	Maine DOT	The goal of this project is to quantify how plow shape can affect blade wear and identify ways to provide more consistent wear.	<p>Background</p> <ul style="list-style-type: none"> • This project would look specifically at how plow shape impacts blade wear. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • The group agreed that this project could be folded into the project looking at improving snowplow design presented by Iowa.
Expanded CBT Modules (Spreader Controls)	Maine DOT	This proposal is to recommend additional modules for the existing Computer-based Training (CBT) to cover the operation of standardized spreader controls. The training would be targeted at operators, calibrators, and supervisors.	<p>Background</p> <ul style="list-style-type: none"> • This is a straightforward proposal to expand the CBT for spreader controls. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • There was some discussion about whether it would be possible to keep this updated with all the changes in technology.
Quantifying the Relationship between Road Condition and Snow and Ice Control Chemical Usage	Maine DOT	Pavement condition is usually assessed by states through an analysis of rutting, cracking and IRI (roughness/ride). This proposal is to create a factor that could be applied to the various aspects of the pavement condition to address the impact	<p>Background</p> <ul style="list-style-type: none"> • This is really looking at how much deicer it takes to melt snow under certain circumstances. If roads are smoother, it's easier to plow. • The goal would be to quantify the correlation between the IRI and chemical usage, and thus quantify the cost in chemicals

Research Project Presentation and Discussion Notes

		of snow and ice material usage.	to treat good roads versus bad roads.
Cost-benefit Analysis Toolkit: Phase II	Massachusetts DOT	The Cost-benefit Analysis Toolkit Phase I created a workable tool that can be used by Clear Roads states to calculate the cost/benefits and justify expenditures for specific new practices, equipment and operations used in winter maintenance activities. Phase II will provide more flexible report outputs and easier printing for the end user. It will accommodate additional types of browsers and allow users to have multiple "new scenarios" that can be saved. It will also expand to include more the maintenance tools, materials and procedures.	<p>Background</p> <ul style="list-style-type: none"> This Phase would fix some of the issues that are not very user-friendly and also develop the next ten priorities for cost-benefit analysis. <p>Questions and Discussion</p> <ul style="list-style-type: none"> The tool is extremely valuable but it's a little clumsy to use and this would fix those issues while expanding its content.
Maintenance of Aurora's Knowledge Base for Winter Operations Research	Michigan DOT	The funding for this project would allow Clear Roads to support Aurora's wiki-style Knowledge Base website to include information on research for winter operations not just road weather information.	<p>Background</p> <ul style="list-style-type: none"> This project would provide some funding to partner with Aurora on their "wiki-style" Web site that aggregates winter maintenance and RWIS research. This would provide initial funding and would need to be renewed periodically.
Evaluation of Alternative Chemicals Field Tested in Minnesota	Minnesota DOT	The objective of this proposal is to develop a guide based on the existing evaluations of alternative chemicals done by Mn/DOT maintenance staff that can be used by all other DOTs and local agencies.	<p>Background</p> <ul style="list-style-type: none"> This small project would not include formalized testing, but would collect the evaluations of chemicals by maintenance staff by district. Mn/DOT already conducts testing at an independent lab before they go out for field testing. This would be a survey of what's discovered from the field.
High Friction Epoxy Aggregate Surface Treatment	Minnesota DOT	Textured seal coats for pavements have the potential to prevent dangerous road and bridge icing while minimizing the damaging effects of deicing chemicals. This project would identify and evaluate additional high friction surface products not already studied that could provide good performance on Minnesota bridges.	<p>Background</p> <ul style="list-style-type: none"> Mn/DOT would like to find one bridge where multiple products, plus a control section could be laid down and tested under the same circumstances side by side to look at the cost-effectiveness of them. <p>Questions and Discussion</p> <ul style="list-style-type: none"> VTTI did some testing and found that measuring effectiveness was the real challenge. It seems like a lot of states are using this. It might be a good candidate for a synthesis report to see how that's going. For example, Colorado has had trouble with it peeling up at higher elevations.

Research Project Presentation and Discussion Notes

Development and Implementation of a Totally Automated Spreading System	Pennsylvania DOT	The goal of this project is to develop a totally automated material dispensing system in order to ensure maximum benefit from the materials while minimizing environmental impacts. The system would be capable of applying the right amount of materials in the right locations at the right time, using a “smart logic” system capable of formulating output based upon multiple inputs and algorithmically calculated variables.	<p>Background</p> <ul style="list-style-type: none"> The idea came up at the 2009 Peer Exchange to develop a totally automated spreading system. <p>Questions and Discussion</p> <ul style="list-style-type: none"> The UK already has a great deal of automation.. The group discussed if this should be part of the larger plug and play project. PennDOT uses a lot of temps and has a third of their staff without experience each winter, so this would be very useful for them. There is some concern about whether you are taking away too much of the human element, but the idea is that there is a lot of responsibility on drivers and this would just help lighten their load.
Environmental Factors Causing Fatigue in Equipment Operators during Winter Operations	Virginia DOT	During winter events, equipment operators work long, stressful hours and fatigue can be a major problem resulting in higher accident rates, lower productivity and increased health issues. This project would look at the environmental stimuli with the greatest influence on operator fatigue and recommend cost effective, realistic mitigation solutions.	<p>Background</p> <ul style="list-style-type: none"> This project would study the factors related to fatigue, which has been done for other types of equipment operators but not for winter maintenance. <p>Questions and Discussions</p> <ul style="list-style-type: none"> The group discussed whether rest period policies could be included in this proposal. The challenge is to take better care of the drivers, because a variety of new initiatives related to health may make it harder to maintain CDLs.
Pacific Northwest Snowfighters (PNS)	Washington DOT	With the impending conclusion of the Inhibitor Longevity and Deicer Performance research project sponsored by PNS, the organization will soon cease to have a Pooled Fund Project assigned to it and will begin to function solely as an unaffiliated association of Northwest states and provinces. Without a steady and reliable source of funding to continue the core mission, PNS could lose the ability to keep the specifications and the Qualified Product List (QPL) viable as a standard for other states and provinces to rely upon. This project would provide continued funding of PNS under the auspices of Clear Roads.	<p>Background</p> <ul style="list-style-type: none"> PNS formed in the mid-nineties as a pooled fund and did product testing and developed specifications for chemical testing. As the current inhibitor longevity project comes to an end, the organization will no longer be a pooled fund but an unaffiliated association of Northwest states. This project would ensure that the work that PNS does on product testing could continue under the auspices of Clear Roads. <p>Questions and Discussion</p> <ul style="list-style-type: none"> PNS would be funded as a Clear Roads project with a subcommittee and have the members of PNS form that subcommittee. Any PNS members who are not members of Clear Roads would not have a vote in any Clear Roads funding decisions.

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			<p>Nor would they have travel paid for by Clear Roads.</p> <ul style="list-style-type: none"> • PNS meetings would continue to be funded via Washington State University and WS DOT would continue to maintain their Web site. • Ron Wright does most of the current testing analysis for the QPL list on Idaho DOT's time. • Analytical Labs would conduct the testing of materials and providing Ron the info he needs for the QPL. • If Clear Roads provides funding, they would want to have PNS give a report on their work efforts at each meeting. • The group discussed the level of funding and how many chemicals would get tested each year. • The group also reviewed whether vendors should be paying for their own testing and agreed that vendors already do this, but PNS provides an independent verification. • PNS would like to keep its "brand" in tact and also leverage the strength of the Clear Roads consortium in terms of the number of states it represents. • The TAC voted to partner with PNS to coordinate materials testing and standards for deicing chemicals separate from the funding decision. • Tom Peters and the members of PNS who are also Clear Roads members (Monty Mills, David Wieder and Lynn Bernhard) will work out the administrative details based on the funding outcome.
Snow Removal at Extreme Temperatures	Wisconsin DOT	Salt works well down to about 10 degrees. It works at lower temperatures as well but not cost effectively. The goal of this project is to develop two cost effective strategies for getting the roadway to a bare/dry condition in extreme temperatures.	<p>Background</p> <ul style="list-style-type: none"> • There do not seem to be consistent answers for how to handle snow removal in the extreme cold. • The goal is to get some consistency for how the interstate is cleared nationally in extreme temperatures. The research should focus on the high volume interstate not every type of roadway. <p>Questions and Discussion</p> <ul style="list-style-type: none"> • Surveys have not yielded any good information on this topic. • Training does not seem to be the issue either. There is a lack of best practices out there for high volume roads in extreme temperatures.

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<p>Guidelines to provide the Minimum Maintenance Decision Support System (MDSS) Data Elements</p>	<p>Wyoming DOT</p>	<p>MDSS has a wide variety of data elements related to weather, roadway and crew that can be entered in advance of running the program. To ensure a consistent result from a MDSS program, it is necessary for an established set of elements to be incorporated into the setup of the program. The purpose of this project is to establish the minimum data parameters required to operate MDSS.</p>	<p>Background</p> <ul style="list-style-type: none"> This project did not receive a lot of discussion, because there is a lawsuit settlement that puts the future of MDSS in jeopardy, so the group agreed to table this project.
<p>Right of Way Snow Fence: Evaluate Alternative Types of Short Structural Fence</p>	<p>Wyoming DOT</p>	<p>The objective of this project is to discover if there are alternative snow fence types (materials) or configurations (heights or porosities) that can store snow effectively starting at the Right of Way line.</p>	<p>Background</p> <ul style="list-style-type: none"> This project would try to identify the right level of porosity for snow fences. <p>Questions and Discussion</p> <ul style="list-style-type: none"> Iowa has some related research on Right of Way snow fences that may address this problem.
<p>Salinity Sensor: Determine if the Technology Can Be Developed and Evaluated</p>	<p>Wyoming DOT</p>	<p>The goal of this project is to determine if the technology is available to develop a reliable fixed RWIS salinity sensor and whether it can be adapted to a mobile platform. If it can be proven possible, the next step would be to encourage the vendor community to produce this product.</p>	<p>Background</p> <ul style="list-style-type: none"> This project idea came from the 2009 Peer Exchange where it was assigned to Clear Roads. Aurora would like to collaborate on this project. <p>Questions and Discussion</p> <ul style="list-style-type: none"> There are challenges integrating any sensor with the RWIS system due to the lack of open architecture.