



research for winter highway maintenance

## MINUTES

### Clear Roads 2014 Technical Advisory Committee Spring Meeting:

Pooled Fund Project #TPF-5(218)

**Tuesday- Thursday, March 25-27, 2014**

**Westin Portland Harborview - Portland, Maine**

#### Attendees:

David Frame, California DOT	Justun Juelfs, Montana DOT	Wayne Gammell, Vermont DOT
David Wieder, Colorado DOT	Tom Renninger, Nebraska DOT	Allen Williams, Virginia DOT
Ron Wright, Idaho TD	Mike Lashmet, New York DOT	Kyle Stollings, West Virginia DOT
Tina Greenfield, Iowa DOT	Caleb Dobbins, New Hampshire DOT	Mike Sproul, Wisconsin DOT
Peter Carttar, Kansas DOT	Brad Darr, North Dakota DOT	Cliff Spoonemore, Wyoming DOT
Brian Burne, Maine DOT	Scott Lucas, Ohio DOT	John Scharffbillig, APWA
Sam Salfity, Massachusetts DOT	Patti Caswell, Oregon DOT	Colleen Bos, CTC & Assoc.
Justin Droste, Michigan DOT	Daryl St. Clair, Pennsylvania DOT	Kim Linsenmayer, CTC & Assoc.
Tom Peters, Minnesota DOT	Joe Baker, Rhode Island, DOT	Jeffrey Hickman, VTTI
Tim Chojnacki, Missouri DOT	Lynn Bernhard, Utah DOT	Matthew Camden, VTTI

#### Materials Distributed

Clear Roads Budget Overview  
2014 Research Proposals  
Implementation Status Report

### Tuesday, March 25, 2014

#### Welcome

Brian Burne and Dale Doughty from the Maine DOT welcomed the Clear Roads Technical Advisory Committee (TAC) to Portland, Maine. Dale, the Director of Maintenance and Operations noted the harsh winter across most of the US and the big impact it has had on state maintenance budgets. In a year like this with its special challenges, Clear Roads research and information sharing is especially valuable to its member states.

#### Introductions and Meeting Objectives

Chairperson David Wieder kicked off the day with introductions of all the attendees and a review of objectives:

- To select new projects for funding and RFP development, and;
- To update each other on the status of research and partnership projects.

Dave welcomed Tom Renninger (Nebraska DOT), Sam Salfity (Massachusetts DOT) and Peter Carttar (Kansas DOT) who were all attending for the first time.

## **Status of Implementation and Technology Transfer Efforts**

Colleen reviewed the status of implementation efforts.

- Progress has been made for most completed projects, although there are a few recently closed projects that should be considered for implementation and technology transfer activities.
- Colleen will convene the implementation subcommittee members Scott Lucas, Lynn Bernhard, Tim Peters and Tom Peters to discuss additional implementation and technology transfer activities.

### **>>Action Items**

- CTC & Associates: Set up a teleconference to review implementation and technology transfer efforts with the subcommittee.

## **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 \$647,051 to spend on research this year.

## **Discussion and Ranking of Research Proposals**

Each Clear Roads member who had proposed a project to be considered for funding in the 2014 cycle described the goal and scope of their proposed project. The entire group discussed the merits of each proposed project and then submitted individual rankings to determine funding selections. See the table starting on page 10 of this document for the details of the discussions that took place.

The TAC voted unanimously to approve nine projects for funding using \$635,000 of the available funds. The following projects and subcommittees were approved:

### **Synthesis on GPS/AVL Equipment Used for Winter Maintenance**

Subcommittee: Patti Caswell (Champion), Cliff Spoonemore, Tim Peters, Tom Renninger, Scott Lucas

Funding: \$60,000

### **Quantifying the Impact that New Capital Projects Will Have on Roadway Snow and Ice Control (RSIC) Operations**

Subcommittee: Wayne Gammell (Champion), David Wieder, Joseph Baker, Brad Darr, Larry Gangl\* (ND DOT), Caleb Dobbins, Ken Berg\* (Utah DOT)

Funding: \$150,000

### **Winter Severity Mapping Enhancement**

Subcommittee: Cliff Spoonemore (Champion), David Wieder, Tina Greenfield, Brian Burne

Funding: \$10,000

### **Developing a Training Video and Manual for Best Practices and Techniques in Clearing Different Interchange Configurations and Other Geometric Layouts**

Subcommittee: Justin Droste (Champion), Kyle Stollings, Mike Sproul, Sam Salfity, David Wieder

Funding: \$100,000

### **Plug and Play Phase II**

Subcommittee: Allen Williams (Champion), Monty Mills, Paul Brown\*, John Scharffbillig\* (City of Minneapolis), Craig Bargfrede, Scott Lucas, David Wieder

Funding: \$100,000

### **Snow Removal Performance Metrics – Phase I: Synthesis**

Subcommittee: Allen Williams (Champion), Mike Lashmet, Peter Carttar\*, Tim Chojnacki, Brian Burne, Craig Bargfrede, Lee Smithson\*  
Funding: \$75,000

### **Use Of Equipment Lighting During Snowplow Operations**

Subcommittee: David Frame (Champion), Lynn Bernhard, Ed Hardiman (Caltrans)\*, Tim Chojnacki, Mike Sproul, Matt Spina (RI DOT)\*, Roy Smith (CDOT)\*  
Funding: \$40,000

### **Development of a Winter Driver's Education Program**

Subcommittee: Craig Bargfrede (Champion), Kyle Stollings, Carrie Bly\* (WV DOT), Patti Caswell, Joseph Baker, Allen Williams  
Funding: \$25,000 (assumes that we are partnering with NHTSA or another agency)

### **Snowplow Route Optimization**

Subcommittee: Clay Adams (Champion), Brad Darr (Champion), Peter Carttar\* (KDOT), Daryl St. Clair, Larry Gangl\* (ND DOT), Mike Lashmet, Justun Juelfs  
Funding: \$75,000

\*Denotes that a subcommittee member is a non-voting member.

### **>>Action Items**

- CTC & Associates: Follow up with members of the subcommittees to continue scoping projects and work with MnDOT to get RFPs posted.
- CTC & Associates: Talk to John Scharffbillig at the APWA regarding issues with 2010 and newer International trucks discussed in relationship to the project on Diesel Particulate (DPF) Filter Reliability Enhancement in High Elevations and Cold Weather Conditions proposal.
- Allen Williams: Talk to Erle Potter at the AASHTO Fleet Group regarding issues with 2010 and newer International trucks discussed in relationship to the project on Diesel Particulate (DPF) Filter Reliability Enhancement in High Elevations and Cold Weather Conditions.
- David Wieder: Talk to Erle Potter about the need for an addendum to the Green Book to address maintenance issues.

### **Preliminary Scoping of New Research Projects**

The TAC spent time discussing each of the projects selected for 2014 funding and outlined a high-level scope for the project including deliverables. The group agreed that each subcommittee would be responsible for finalizing the specific tasks and deliverables in greater detail. See the table at the end of the document for notes from these discussions.

### **FHWA Presentation**

Gabe Guevara presented an update on the Road Weather Management Program (RWMP).

- RWMP has been focused on the Connected Vehicle Project, which is getting support from the Secretary of the USDOT. They are also developing FHWA V21 Guidance to outline what states need to do to be prepared for the Connected Vehicle project.
- Other projects and initiatives include:
  - Weather Responsive Traffic Management
  - Performance Measures
  - Updating NTCIP 1204
- Integrated Mobile Observations (IMO) 2.0 is coming to an end, so they will start to focus on IMO 3.0.

- Gabe attended the PIARC meeting and had key takeaways for both Equipment and Operations:
  - They have snow-plow trucks with integrated lift mechanisms.
  - International agencies using remotely operated snow-blower (multi-function).
  - Spreaders with more automated capabilities are on the market.
  - Pavement condition forecast remains a big challenge for all agencies.
  - There is a Denmark study to quantify the mechanical action of tires (traffic volume) on snow and ice fighting process.
  - Germany is considering going all-liquid.
- FHWA is also working on Salt Management Best Practices in response to the difficult winter and salt shortages that occurred nationally.

## **Wednesday, March 26, 2014**

### **Implementation Project Update: Plug and Play Initiative**

To give DOTs more flexibility and reduce the costs of integrating new components, Clear Roads is working with the vendor community to develop a standard protocol that will allow plug-and-play connectivity for sensors and other electronic devices used on winter maintenance vehicles.

- Clear Roads has drafted a specification for a standard communications protocol, and in February invited all interested stakeholders in the winter maintenance community and related vendor organizations to provide comments and feedback.
- Clear Roads received comments from Delcan and FHWA.
- Once we have addressed those comments, we will be going out for public comment a second time.
- We need every member to help in getting additional comments from their AVL and Controller vendors.

### **>>Action Items**

- CTC & Associates: Colleen will remind all TAC members to send the name and contact information of their AVL vendor, so we can make sure they have the opportunity to review the Plug and Play Protocol.

### **Research Update: Progress on Current Research Projects**

A champion for each of the Clear Roads projects in progress provided an update on the status those projects:

- Best Practices for the Prevention of Corrosion to DOT Equipment: A User's Manual (Justin Droste)
  - The goal is to follow up on the Washington State DOT's research on corrosion by developing a User's Manual of best practices that is written in layman's terms.
  - WTI was selected and the project kicked off January. They are starting with a literature search.
  - Deliverables should be available by December 2014.
- Snow and Ice Control Environmental Best Management Practices Manual (Brian Burne)
  - The goal is to help states make good decisions about product use in terms of environmental impacts, by developing a summary of the pros and cons of different products and how they compare.
  - WTI was selected and the project kicked off January. They are starting with a literature search.
  - The deliverables will include a comprehensive manual building on all the available research and should be available by December 2014.

- Snowplow Operator and Supervisor Training (Mike Sproul)
  - The goal of this project is to develop a training program that all Clear Roads member states can use.
  - We initially tried working with APWA, but that didn't work out due to costs and train-the-trainer issues.
  - Mike had one of his staff filter and sort the existing training materials into the categories of interest. There is a lot of material, but there are some gaps that we'll need to fill.
  - This will be a set of modules for classroom training that is intended to be complementary with the Computer-based Training (CBT).
  - There is an RFP out to get materials developed for each topic based on the existing materials. Deliverables will include presentations, instructor and student booklets as well as sample tests and quizzes.
  - There was some discussion regarding whether or not the CBT could be set up as a centralized resource accessible to Clear Roads member states and other local agencies via the Clear Roads website. David Wieder agreed to bring this up at the AASHTO Safety and Reliability Technical Working Group meeting.
  - The TAC also discussed whether they would charge for access to the training developed through this project. There is no plan to charge for access to the training materials. However, if an organization wants to use the training materials for profit, then charges may apply.
  
- Developing Test Bed Software to Qualify Plug and Play Technology (David Wieder)
  - The goal of this project is to develop the software needed to test compatibility with the Plug and Play protocol developed via the Plug and Play Initiative.
  - The plan is to post this RFP in April. Eric Cowger (Location Technologies) is working on the scope for the RFP.
  - Clear Roads may ask member states who work Eric to check in with him for an update on progress.
  
- Cost Benefit Analysis of Various Winter Maintenance Strategies (Ron Wright)
  - The goal of this project is to look at three strategies for snow and ice control and to compare them by assessing LOS, economic impacts, corrosion, safety and some environmental issues.
  - There's a lot of cost-benefit information out there, but with a narrow focus. This project is meant to bring those all together into a more comprehensive package.
  - WTI was selected and they are starting with a literature search.
  - The project should be concluded by November 2014.
  
- Understanding the Effectiveness of Non-Chloride Liquid Agricultural By-Products and Solid Complex Chloride (Ron Wright)
  - The goal is to look at agricultural by-products and solid complex chloride to better understand how they work.
  - WTI was selected to do the research and the subcommittee kicked off the project in January.
  - The subcommittee will pick up to 10 products for testing.
  - The deliverables are expected in September 2015.
  
- Establishing Effective Salt and Anti-icing Application Rates (David Wieder)
  - The goal of this project was to update TE-28. This has been of high interest at all of the Peer Exchanges.
  - Blackburn & Associates is doing the research and need some help with phase diagrams and other information for some of the products. The TAC is asked to respond to David Wieder's email on that subject ASAP.
  - The deliverables are expected in October 2014.

- Understanding the Chemical and Mechanical Performance of Snow and Ice Control Agents on Porous or Permeable Pavements (Mike Lashmet)
  - The objective is to look at different types of porous and permeable pavements and see how chemicals perform on them. Certain types of pavements seemed to be requiring more material to control the snow and ice.
  - WTI conducted interviews with 10 different states and some international sources as well.
  - They have collected pavements from several states and they are doing lab testing at University of Massachusetts Dartmouth to better understand how the pavements perform. They'll also be conducting testing at their own lab with their trafficking device.
  - The deliverables are expected in September 2014.
- Comparison of Materials Distribution Systems (Justin Droste)
  - The goal of this project is to develop a photographic catalog of material distribution systems.
  - Thompson Engineering has been conducting this project. They have the photos they need now and final deliverables are anticipated by no later than June 2014.
- Developing a Totally Automated Spreader System (Cliff Spoonemore)
  - The focus of this project was to understand what technology was available for automated spreading systems and to look at how best to achieve different levels of automation.
  - Thompson Engineering was selected to do the research and the project is nearly complete.
  - Ultimately they found that some level of automation is available, but not as much as there is for the agricultural industry, for example, which moves at slower speeds than snowplow trucks.
  - TAC comments on the Final Report and Guides are due back on March 31, 2014.
- Pacific Northwest Snowfighters (PNS) (Ron Wright)
  - Clear Roads funded the work of PNS to support the lab testing for the Qualified Product List (QPL) list and update the PNS website.
  - There is about \$13,600 remaining with a number of new products that need to be tested.
  - There are about 20 chemicals in some state of completion with QPL testing.
  - PNS has enough funding to continue through 2015, but PNS funding should be proposed again in 2015.

**>>Action Items**

- *David Weider*: Talk to the AASHTO Safety and Reliability Technical Working Group about having the CBT available for centralized access via a website such as Clear Roads.
- *TAC*: Send phase diagrams and other requested information to David Wieder or Colleen Bos per the email sent out in March requesting assistance for Blackburn & Associates with the Anti-icing and Deicing Guidelines project.

**Cooperative Purchasing Contract**

Lynn Bernhard presented regarding progress on collective purchasing contracts.

- Lynn contacted the Western States Contracting Alliance to see if it was possible to develop a joint specification for all kinds of blades and bits.
- A number of states submitted their specifications.
- Vermont agreed to be the “home state” in terms of running the bid.
- Any state can buy off of the contract if they will agree to the terms and conditions.
- It's very flexible with multiple vendors for blades and no obligation to buy through the contract.
- This should be available in May 2014.

## **Research Update: Environmental Factors Causing Fatigue in Snowplow Operators**

Dr. Jeffrey Hickman presented the results of this project, which researched cost-effective, realistic recommendations for reducing fatigue in snowplow operators. The project included a literature review, a survey, the collection of naturalistic data and the resulting analysis. Some highlights from the findings are:

- Four drivers participated in the study, which is not enough to be statistically valid, but is enough to help determine how to conduct this type of research on a larger scale.
- Fatigue is a factor in 15 to 30% of crashes with more crashes happening during a circadian low.
- Time on task also led to higher crash rates.
- One driver was responsible for a majority of the crashes and that person was a night driver with poor sleep patterns 24 hours prior to each safety critical event.

Some recommendations that came out of the study:

- Encourage use of breaks/naps
- Encourage winter maintenance operator fatigue reporting
- Increased vehicle maintenance
- Investigate winter emergency shift start/end times (including shift length)
- Offer shift options
- Involve winter maintenance operators in the decision-making process
- Increase personal interactions with winter maintenance operators.

Additional resources are available at:

- Federal Motor Carrier Safety Administration – [fmcsa.gov](http://fmcsa.gov)
- North American Fatigue Management Program - [nafmp.com](http://nafmp.com)

## **Thursday, March 27, 2014**

### **APWA Report**

John Scharffbillig provided an update on APWA and their winter maintenance program.

- Mark DeVries is retiring and is stepping down from his leadership role with the Snow and Ice Committee. Ben Dow will be his replacement.
- APWA membership is rising with lots of cities, states and counties rejoining who had left APWA during the economic downturn.
- The APWA is planning future meetings and attempting to partner with related entities so they can broaden their audience.
- They are also working on expanding the program for the APWA snow and ice training.
- Their snow and ice conference will be held in Cincinnati on May 4-7, 2014.

### **Future Meetings**

Colleen and David reviewed plans for future meetings.

- The TAC confirmed September 9-11, 2014 for the Fall meeting in Kansas City.
- They also agreed that the Spring meeting would take place in either California or Idaho and Colleen will search for some cost effective options with adequate facilities in those states.

### **>>Action Items**

- CTC & Associates: Work with Dave Frame and Ron Wright to identify cost effective meeting options in California and Idaho.

## 2015 Peer Exchange

The TAC discussed plans for the next Winter Maintenance Peer Exchange:

- They established a subcommittee: Allen Williams, Lynn Bernhard, Tom Renninger, Patti Caswell, and Monty Mills.
- Colleen will help connect this subcommittee with other planners from Aurora and AASHTO.
- Dave Wieder will talk to Steve Lund regarding who can take the lead for SICOP/ AASHTO, since it sounds like it will not be Lee Smithson as it has been in previous years.

### >>Action Items

- CTC & Associates: Coordinate with Aurora and AASHTO to get members of the planning subcommittee connected with planners from the other organizations.
- David Weider: Talk to Steve Lund to find out who will be taking the lead on planning for SICOP/ AASHTO.

## PNS/APWA

Jay Wells (Washington DOT) called in to provide an update on planning for a joint meeting of PNS and APWA in Loveland, Colorado on September 24-25, 2014.

- They are in the early stages of planning but are looking at what types of speakers PNS can provide.
- PNS will also provide some funding to APWA, because they feel this is a good way to get their research out to a broader audience.
- This will be in addition to the regular PNS meeting in May or June.
- Clear Roads may work with PNS to identify some speakers to present on the results of recent research as well.

## Open Discussion

David Wieder opened up the floor for general discussion topics. Key topics discussed were:

- Whether to have a booth at the AASHTO SCOM meeting. The group agreed that individual members will do the best job representing Clear Roads and a booth is not needed.
- Iowa is looking for help with several issues including:
  - Measuring TowPlow performance
  - Tracking salt capacity and usage in sheds
  - Developing a public road condition reporting system
- New York State is interested in hearing from each state about whether they are renewing with salt vendors. At the same price? With a set increase? Or are you rebidding?
- The group discussed whether to invite a couple of guests states to the upcoming meetings and agreed to invite Kentucky and Indiana to the Fall meeting and Alaska and Nevada to the Spring meeting.

## State Reports

### PennDOT State Report

Daryl St. Clair shared an overview of his agency's activity for the last year. Highlights included:

- 2013-14 was the most expensive winter in PennDOT history and required the most salt they've ever used, resulting in salt shortages.
- PennDOT had previously made a huge investment in TowPlows, which seem to increase LOS but their agency did not see cost savings. As a result, they will be selling off the TowPlows that they have.
- They are looking at implementing AVL for 2,491 vehicles and are looking at other states for best practices and lessons learned.
- PennDOT is working on a Snow Map Planning application for route optimization, which they designed in-house.
- They are putting their MDSS implementation on hold.



- PennDOT is working on a marketing campaign to let the traveling public know that they are reducing levels of service.
- They are developing a Weather Severity Index.
- They are also working on a brine research project. They are assessing different mixes and their effectiveness.
- They have developed a best-in-class National Incident Management System and are building a new State Traffic Management Center (STMC).
- PennDOT is taking out their RWIS sites and will be reinvesting in RWIS based on a new study to determine the best locations for the stations.

## North Dakota DOT State Report

Brad Darr shared an overview of his agency's activity for the last year. Highlights included:

- NDDOT has implemented 13 TowPlows, and they did a report on TowPlows with their research department. They also use them as brine trailers when they aren't being used for plowing.
- They continue to struggle to keep operators on staff, because they can't match the way that drivers are paid by oil companies. They have implemented some bonuses and vouchers in an effort to remain competitive.
- They are adding capacity to a lot of their roadways also to address the needs of the oil industry.
- NDDOT is attempting to reuse some of the salt brine that results from fracking.
- They are trending towards using less sand, although some of their districts still use it at high rates.
- They are building new salt sheds using their own labor. The sheds cost \$35,000 for materials, plus the cost of the labor.
- NDDOT is working on some innovations:
  - MDSS
  - Cameras
  - Reduction in motor graders
  - Installation of permanent DMS (Digital Message Signs), which help with road closures and getting trucks off the roads at places where there is truck parking
  - Implementing AVL in 100 units
  - Traveler Information Map available online
- NDDOT participates in the MDSS, Aurora and Clear Roads pooled funds.
- They are responding to a lot of impacts from the oil industry in terms of damage, spills and other issues.

## California State Report

David Frame shared an overview of his agency's activities. Highlights included:

- Due to climate and terrain Caltrans is unique in having bunkhouses for winter employees in two of their mountainous districts.
- They require chains in some mountainous areas and employ a 24-hour staffed chain patrol that is supported by California Highway Patrol.
- They are also using changeable message signs and highway advisory radio to communicate with the traveling public.
- Avalanche control is a significant focus. They are using Gazex Avalanche Control Systems as well as LoCAT systems. They are also employing Jet Roofs in high wind areas on ridgelines.
- They have implemented a brine-making system.
- They have experimented with the Heads Up Display that Alaska has used, but a key problem is that it doesn't register people on its radar.
- Caltrans just ordered a TowPlow and they have been involved in a successful study with the Epoke spreader.

## **Rhode Island State Report**

Joseph Baker shared an overview of his agency's activity for the last year. Highlights included:

- RI DOT implemented a Maintenance Management System.
- The 2013-14 season was much more severe than is typical and they had to stretch their salt supply.
- They have worked on developing some robust social media coverage to communicate with the public.
- They started to focus on calibration and realized they had been using salt very heavily. They did an ROI study on the closed loop controllers and realized they could pay for them out of the salt budget, because they could save so much on materials by implementing them. RI DOT is also trying to get closed loop spreaders installed on their vendor trucks.
- RI DOT previously had no fleet replacement plan and was paying a lot of money on fleet maintenance. They now have a plan to get to the point in the next 10 years where their fleet has trucks that are a maximum of 10 years old.
- They are constructing a lot of new salt sheds and going back to fix old ones as well.

## **New York State Report**

Mike Lashmet shared an overview of his agency's activity for the last year. Highlights included:

- The severe winter resulted in much heavier salt usage than projected and resulted in a salt emergency.
- Long Island and many municipalities were hit hard by winter storm events, and the governor ordered NYSDOT to help these areas find salt. They were able to find salt, but had to spend a lot on transportation costs.
- They were pleased at the level of coordination with their salt vendors, despite the challenges.
- They conducted a TowPlow pilot. They operators picked up on it quickly. They had to adjust the horsepower on the truck that pulled it and they also had some issues with bounce as the salt depleted. It was overall a successful pilot.

## **Oregon State Report**

Patti Caswell shared an overview of her agency's activity for the last year. Highlights included:

- ODOT has been stressing the pre-wetting of sand to reduce bounce and scatter.
- They use liquid Magnesium Chloride, not salt (NaCl), although they are doing a pilot with salt.
- ODOT's salt pilot is to evaluate salt as a supplemental tool in areas where there might be extended pack.
- They are using poly tanks to store deicer. With yearly tank inspections, they expect 10+years out of the tanks.
- They have implemented a number of Best Management Practices:
  - ODOT has established an LOS for sanding and use of deicing products.
  - They adhere to the PNS QPL.
  - ODOT has a QA/QC program to test deicers.
  - They are maintaining better application records.
  - ODOT conducts routine inspections of application equipment and tanks.
  - They keep all chemical storage away from water.
  - They have an annual training program.
  - ODOT ensures that all new and experimental chemicals are carefully coordinated between the regions and the central office.
- They are just beginning an AVL pilot.

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
No	Diesel Particulate (DPF) Filter Reliability Enhancement in High Elevations and Cold Weather Conditions	TBD	18 months	<p><b>Background</b>                      Caltrans is having trouble with air quality, so they are using Diesel Particulate Filters (DPFs) to diminish the problem. However, DPFs tend to quickly plug and fail in cold weather and high elevations, especially with trucks that are idling for extended periods of time.</p> <p><b>Goal</b>                      The goal is to determine if the use of standalone engine heaters and cab heaters (alone or together) will significantly reduce the occurrence of DPF failures. The project would also assess whether these solutions were cost-effective.</p> <p><b>Questions and Discussion</b>                      Have the Western States Highway Equipment Managers Association or AASHTO looked at this? It seems like the kind of issue they would be in the best position to address.</p> <p>Are these the 2010 and newer International brand? Other agencies are having similar problems and it seems like International should develop an after-market fix. Virginia is using a fuel additive to address the problem.</p> <p>Allen Williams will also talk to Erle Potter at the AASHTO Fleet Group. CTC will also contact John Scharffbillig to get his input.</p>	David Frame, California DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Use Of Equipment Lighting During Snowplow Operations	\$40,000	12 months	<p><b>Background</b>                      The California Department of Transportation is installing LED warning lights on its fleet of new vehicles including snowplow trucks. Equipment operators in the snow areas are reporting warning lights being too bright, especially for plow truck drivers following behind during train-type snow removal operations. Additionally, snowplow operators are experiencing bounce back off the plow from headlights on their own vehicles.</p> <p><b>Goal</b>                      This project would develop a summary of best practices in use today by state DOTs for the use of headlights, work lights, and LED warning light technology in snowplow operations.</p> <p><b>Questions and Discussion</b>                      VTTI just completed a lighting study and VDOT has changed their lights in response to the findings.</p> <p>The National Fire Institute also just completed a conspicuity study.</p> <p>Many states report trying to find more ways to make trucks more visible, while also looking for the best visibility for the driver.</p> <p>The study should focus on best practices nationally and not try to address laws of each state regarding the use of different colored lights.</p>	David Frame, California DOT

## 2014 Clear Roads Project Proposals – Results of TAC Discussion

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
No	Synthesis of Best Practices on Multi-Purpose Trucks for Snow and Ice Control	\$50,000	12 months	<p><b>Background</b> The purpose of this project is to research how agencies are using multipurpose snow and ice trucks. The project would document ways that trucks can be configured so they can be repurposed either by adding/removing accessories or having multiple uses.</p> <p><b>Goal</b> This project would document different dual-purpose trucks used by state DOTs. The resulting synthesis would include pictures, discuss costs and identify the manufacturers and body companies that develop these trucks.</p> <p><b>Questions and Discussion</b> States would like to use things as multi-seasonally as possible. For example, brine trucks that get used for bridge washing.</p> <p>It's important to make sure that the secondary functions are really effective. In some cases, it might be more efficient to have two separate vehicles.</p> <p>This might be considered a fleet issue, but it's really broader than that.</p>	Tim Peters, Illinois DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Development of a Winter Driver's Education Program	\$25,000	6 months	<p><b>Background</b> There are very limited (almost non-existent) winter driving training materials for Driver's Education classes.</p> <p><b>Goal</b> The goal of this project is to develop comprehensive winter driving training materials for use by Driver's Education courses. It would include winter driving tips, operating a motor vehicle around snowplows and winter safety tips.</p> <p><b>Questions and Discussion</b> The group favored the idea of putting together a training video that would include winter preparedness, how to operate a car in winter, some information on simple vehicle care and maintenance, as well as specific guidance on how to operate safely around plows.</p> <p>Simulator scenarios and other non-traditional options might also be a good idea.</p> <p>Are there partners like NHTSA or AAA that we can work with? Clear Roads would definitely like to partner on this project. We will need additional expertise to help ensure broad distribution.</p>	Tina Greenfield, Iowa DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Snowplow Route Optimization	TBD	12 months	<p><b>Background</b>                      Many agencies are looking for a better way to determine where and how many plow trucks should be deployed for a given area or if there is a specific way to set up routes for maximum efficiency.</p> <p><b>Goal</b>                      To determine a routing formula that provides guidance on how to best deploy snow-fighting resources in the most optimized possible way</p> <p><b>Questions and Discussion</b>                      There are commercial tools available that calculate efficient routing. However, weather conditions and LOS add more complexity for winter maintenance routing.</p> <p>Kansas DOT would also like to look at shop placement, in case they are able to build something new in the future.</p> <p>Vermont has recently completed an optimization study and shared that with the group.</p> <p>This proposal will be combined with North Dakota's related project and the deliverables should be a matrix of available tools with an analysis of their strengths and weaknesses.</p>	Clay Adams & Peter Carttar, Kansas DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Developing a Training Video and Manual for Best Practices and Techniques in Clearing Different Interchange Configurations and Other Geometric Layouts	\$100,000	6 months	<p><b>Background</b> There are currently many types of existing and new interchange configurations (Diamond, Cloverleaf, SPUI, Roundabout, Michigan Left, Diverging Diamond, etc) that provide challenges for winter maintenance operations. All states would benefit from training materials, including a video to instruct operators and managers on best practices.</p> <p><b>Goal</b> This proposal is to develop a training video and materials to instruct new snowplow operators on the best practices for clearing different interchange configurations (Diamond, Cloverleaf, SPUI, Roundabout, Michigan Left, Diverging Diamond, etc).</p> <p><b>Questions and Discussion</b> This could be useful for designers as well as drivers.</p> <p>The resulting materials could eventually be added to the current CBT.</p> <p>It may be possible to add this into the existing Training project, but MnDOT Contracts would need to be consulted on how that could work.</p>	Justin Droste, Michigan DOT & David Wieder Colorado DOT
No	Determining the Best Method for Pre-treating Salt	\$125,000	12 months	<p><b>Background</b> There are currently many methods to mix or pre-treat dry rock salt (including but not limited to stockpile injecting, onboard pre-wet, prewetting each truck load with spraybar, etc). However, it's not clear which method is most effective in delivering the best pre-treated product to the roadway.</p> <p><b>Goal</b> This project would identify and evaluate the range of different methods for mixing or pre-treating dry rock salt (including but not limited to stockpile injecting, onboard pre-wet, pre-wetting each truck load with spray bar, etc) to determine which method is most effective at delivering the best pre-treated product to the roadway.</p> <p><b>Questions and Discussion</b> This project should look at pros and cons rather than “best” methods, which will help avoid issues with assessing the product rather than the method itself. Benefits and costs of different methods should also be included.</p>	Justin Droste, Michigan DOT



**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
No	Identifying Successful Practices for Staffing Winter Operations	\$100,000	12 months	<p><b>Background</b>                      Most winter agencies utilize permanent and temporary workers to perform winter maintenance, but there are questions regarding the appropriate ratio for winter staffing and the costs associated with each type of worker. These include training, accidents, benefits, unions, salaries, effect on summer programs, etc. Other issues include shift schedules, overtime, and continuous working hours that cause fatigue and safety concerns</p> <p><b>Goal</b>                      The goal of this project is to better understand costs associated with using full time and permanent workers in order to aid managers in developing staffing plans. The project would also identify maximum shift lengths to help agencies standardize practices statewide and nationally.</p> <p><b>Questions and Discussion</b>                      Part of this project would be to look at the costs of inexperienced drivers who require training, have accidents, etc. The deliverable could include a matrix assessing 4 or 5 different considerations in staffing.</p> <p>It could be hard to find cost data. There will be many variables for each state depending on their situation with contractors and unions.</p> <p>LOS drives a lot of this. Perhaps the question is “how do you justify what you request in terms of staffing?”</p> <p>Do you look at the cost of winter maintenance employees or just drivers?</p>	Justin Droste, Michigan DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
No	Assessing Snowplow Weight and Function	\$50,000	12 months	<p><b>Background</b>                      In an effort make snowplow trucks as versatile as possible, agencies have expanded the types of materials carried on and the number of various plow attachments on their snowplow trucks. These attachments add weight and it's possible to exceed the gross vehicle weight rating (GVWR) of a plow truck when it is loaded with snow and ice chemicals. To ensure trucks stay below the GVWR, operators need to be able to determine how much material they can load. More information is needed to determine if it is more advantageous to carry a full load of chemicals or to have the various attachments available.</p> <p><b>Goal</b>                      The purpose of this project would be to develop a simple tool to analyze the loaded weights of snowplow trucks "on paper," including all attachments and materials. The tool would support trade-off comparisons to help agencies make decisions about plow attachments and/or material carrying capacity.</p> <p><b>Questions and Discussion</b>                      This tool would need to consider standard truck configurations, axles, spacing, bed length, and different types of front plows.</p> <p>This could get pretty complex if different material weights are included. Clear Roads would need to keep up with that on an ongoing basis.</p>	Tim Chojnacki, Missouri DOT & David Wieder Colorado DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Section (Garage)/ Route Optimization	\$25-50,000 Change to <b>\$75000</b>	12 months	<p><b>Background</b> States look at garage locations to identify opportunities for greater efficiency. In conjunction with that, route optimization is also needed.</p> <p><b>Goal</b> This project would identify best practices for garage placement and route optimization, including the use of Commercial Off-The-Shelf (COTS) software.</p> <p><b>Questions and Discussion</b> Member states report using RouteSmart and Spacial Matters.</p> <p>The goal of this project and the Kansas project on route optimization are very similar. They will be combined and will include section/garage optimization.</p> <p>The project will deliver a synthesis of available tools and the pros and cons of each given different circumstances or priorities.</p>	Brad Darr, North Dakota DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Synthesis on GPS/AVL Equipment Used for Winter Maintenance	\$60,000	6 months	<p><b>Background</b>                      Many states are testing or using GPS/AVL systems to gather information on their winter maintenance programs. There are a variety of moving parts to consider including truck controllers, data collection devices, cell phone or Wi-Fi, plow sensors, and data schemas that allow synthesis of a lot of individual data collected. States want to learn from each other and need a better clearinghouse of information regarding which controller or system might work better for different situations or truck configurations.</p> <p><b>Goal</b>                      The goal of this project would be to develop a “consumer reports” type of digest analyzing the different GPS/AVL systems out there, including how well each one performs and systems requirements and constraints.</p> <p><b>Questions and Discussion</b>                      This was a highly rated research need at the 2013 Peer Exchange. The group would like a survey and synthesis of what agencies are doing that includes pros and cons of different approaches.</p> <p>The challenge will be that there are many varying needs between agencies.</p> <p>If Clear Roads funds this, it would need to be updated every couple of years to make sure it continued to be relevant.</p>	Patti Caswell, Oregon DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
No	Best Methods and Practices for Sleet and Ice Storm Management, Phase I	\$100,000	12 months	<p><b>Background</b> Sleet and freezing rain have devastating impacts on transportation systems. These events are forecast accurately, but still the affected areas seem to have major delays in restoring mobility after the event. Government agencies could use a compendium of scalable best practices.</p> <p><b>Goal</b> The purpose of this project would be to develop a best practices manual that includes specific recommendations for planning, preparing and executing a sleet and ice storm response.</p> <p><b>Questions and Discussion</b> Are there agencies doing this well that Clear Roads can learn from? Places like Chicago seem to handle it better than others.</p> <p>Power and other utility lines cause issues that agencies have little or no control over. Understanding how best to work with utilities might be a good aspect to address.</p>	Lynn Bernhard, Utah DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Quantifying the Impact that New Capital Projects will have on Roadway Snow and Ice Control (RSIC) Operations	\$150,000	18 months	<p><b>Background</b> New capital projects increase the time and money required to complete RSIC operations. Unfortunately this increased RSIC burden is rarely quantified and therefore is not considered during the early stages of the capital project development process.</p> <p><b>Goal</b> The goal of the project is to develop an automated method of quantifying the anticipated impact that new capital projects will have on total vehicle hours of travel for the winter maintenance fleet.</p> <p><b>Questions and Discussion</b> Ideally this would be a resource for design engineers, but at a minimum would support maintenance engineers as they make budget requests.</p> <p>At the Peer Exchange, many agencies discussed the need for an addendum to the Green Book to address maintenance issues. David Wieder will talk to Erle Potter about this.</p> <p>This project could have two parts: 1) Development of Methodology and 2) An Automated Calculation Tool.</p>	Wayne Gammell, Vermont DOT
Yes	Plug and Play Phase II	\$100,000	18 months	<p><b>Background</b> Clear Roads has drafted in-cabin protocols and in the process of developing the test-bed software for the protocols. The next step will be the format and standards for transmitting data from the vehicle.</p> <p><b>Goal</b> This project would build on the efforts of both the Plug and Play initiative and the Connected Vehicle project to define a standardized set of data (attributes and units of measure) available from winter operations equipment and would also identify the standards for the transmission of data from vehicle to point location.</p> <p><b>Questions and Discussion</b> Different protocols may be needed for different types of data.</p> <p>The goal is to get out ahead of the AVL industry and establish the standards that Clear Roads prefers.</p>	Allen Williams, Virginia DOT

**2014 Clear Roads Project Proposals – Results of TAC Discussion**

Funded?	Title	Est. Cost	Est. Duration	Project Summary	Proposed by
Yes	Snow Removal Performance Metrics	\$150,000	12 months	<p><b>Background</b> States all measure their snow removal success in some way or the other but few have a consistent measure and few know if their measure is an accurate description of the success of the program.</p> <p><b>Goal</b> The purpose of this project would be to determine the most successful and accurate performance measures for snow removal operations being utilized throughout the world. Deliverables would include an implementation guide for establishing a successful program within a transportation agency and a summary of the costs associated with implementation.</p> <p><b>Questions and Discussion</b> This project would start with a synthesis of state practices and that would need to be updated over time.</p> <p>There is an NCHRP report on performance metrics and Clear Roads could also look at the I-80 coalition as model for making some progress on standardizing these metrics.</p>	Allen Williams, Virginia DOT
Yes	Winter Severity Mapping Enhancement	\$5,000	3 months	<p><b>Background</b> The Weather Severity Mapping project generated some very good maps for the US. However, to focus on each individual state, some additional maps are needed that zoom in on each one.</p> <p><b>Goal</b> The goal of this project is to develop individual state maps (image files) from the national maps created through the Weather Severity Mapping project.</p> <p><b>Questions and Discussion</b> This could be a simple graphics project to make three state-size maps for each state representing the three weather indices.</p> <p>Would we want to update this annually? The data is probably not dynamic enough to justify annual updates, but it might be valuable to update periodically.</p>	Cliff Spoonmore, Wyoming DOT

## 2014 Clear Roads Funded Projects – Results of TAC Scoping Discussion

Project	Goals and Deliverables
Synthesis on GPS/AVL Equipment Used for Winter Maintenance	<ul style="list-style-type: none"> <li>• Synthesize existing survey results.</li> <li>• Survey all the states that have implemented GPS/AVL, including what data they collected, fleet size, how much they pay in data fees to have hosted, what company using, type of hardware and sensors, who's hosting it, specification used in procurement, communications method (megahertz, Wi-Fi), etc.</li> <li>• Find out if the agency displays information via a public website or how they display the information internally.</li> <li>• Analyze pros and cons of different systems based on lessons learned from states, information gathered.</li> <li>• Deliverable: synthesis report with above details.</li> </ul>
Quantifying the Impact that New Capital Projects will have on Roadway Snow and Ice Control (RSIC) Operations	<ul style="list-style-type: none"> <li>• The goal is an automated method of calculating impact of capital projects on total hours traveled for fleet vehicles.</li> <li>• Understand costs in equipment, people, materials.</li> <li>• Capture all design features that increase snow and ice maintenance.</li> <li>• The results could be used by designers coming up with any new features to consider expected maintenance costs for life of the feature when weighing design options.</li> <li>• Considering focusing on the top three things that have been problematic.</li> <li>• Challenge in scoping: how much to focus on encouraging Green Book changes versus just identifying costs.</li> <li>• Deliverable: An automated method to calculate costs.</li> <li>• David Wieder is following up with AASHTO on this as well.</li> </ul>
Winter Severity Mapping Enhancement	<ul style="list-style-type: none"> <li>• Find out which states want a map with just their own state highlighted.</li> <li>• Consider adding district boundaries or state highways.</li> <li>• States can also access the shape files to work with their GIS sections internally to develop what they want.</li> <li>• Iowa and Michigan are equipped to create individual maps and maybe they could help other states that are not?</li> <li>• If there are concerns about resolution, maybe the vendor can generate higher resolution versions.</li> </ul>
Developing a Training Video and Manual for Best Practices and Techniques in Clearing Different Interchange Configurations and Other Geometric Layouts	<ul style="list-style-type: none"> <li>• Identify what the specific interchanges, including a few specific plows and plowing approaches</li> <li>• Have researcher survey states and conduct a literature search for ideas.</li> <li>• The subcommittee will need to evaluate the approaches identified to determine which should be used in the video.</li> <li>• The video will include animations to demonstrate plowing techniques and also incorporate some live video.</li> <li>• It will be in a chapter format in the video, so you can select the information you want.</li> </ul>



## 2014 Clear Roads Funded Projects – Results of TAC Scoping Discussion

Plug and Play Phase II	<ul style="list-style-type: none"> <li>• Look at the material we already have assembled and what type of information we want to pull out of vehicle.</li> <li>• Make sure the types of data and attributes are correct.</li> <li>• Have researcher look at all info with connected vehicle regarding standards for data transmission to pick the most appropriate standards for our use.</li> <li>• Standardize data coming in and out and get a recommendation from researcher as to the proper data platform.</li> <li>• The focus is on both format and mechanism of data transfer.</li> <li>• Deliverable: report out</li> </ul>
Snow Removal Performance Metrics	<ul style="list-style-type: none"> <li>• Review data from previous surveys and research on performance metrics.</li> <li>• Conduct a survey to see what various states are doing with performance metrics and how well they are working.</li> <li>• Update this survey on a periodic basis.</li> <li>• Review results to see what approach is most useful for describing conditions.</li> <li>• Look at costs for capturing performance data.</li> <li>• How do we tie winter operations into MAP 21?</li> <li>• A phase 2 project might involve figuring out what works in terms of communication with the public (focus groups).</li> <li>• Deliverable: report and implementation guide</li> </ul>
Use Of Equipment Lighting During Snow Plow Operations	<ul style="list-style-type: none"> <li>• Figure out how to get value balancing both operator visibility and visibility to the public</li> <li>• Compile state experiences with lighting, including specifications, colors, mounting location, reflective tape, etc.</li> <li>• Some work exists that will need to be reviewed.</li> <li>• Don't focus on individual state laws. States can pick what might be best for their agency among the options compiled.</li> <li>• Survey plow operators on their own visibility and on visibility seeing other plows they follow.</li> <li>• Consider reviewing accident data on cause of accidents (if drivers said they had visibility problems).</li> <li>• Deliverable: A summary and best practices guide with recommendations for lighting and mounting</li> </ul>
Development of a Winter Driver's Education Program	<ul style="list-style-type: none"> <li>• Partner with NHTSA and maybe AAA.</li> <li>• We definitely need highway safety partners for this.</li> </ul>
Snow Plow Route Optimization Section (Garage)/ Route Optimization	<ul style="list-style-type: none"> <li>• Compile state practices and available off-the-shelf software.</li> <li>• Come up with whole range of plow configurations to be considered.</li> <li>• Consider material and spread rates, pavement type, and other nuances that affect operations.</li> <li>• See what all is considered in the existing commercial products.</li> <li>• Include information on the underlying framework needed to run each software package.</li> </ul>