

# **Aurora Program - Ongoing Project Status**

October 23, 2013

## **FY 2007 through FY2009**

- 2007-05: Multiple-Use ITS Data Collection Practices (\$15,000) = 45% complete
- 2009-01: Summary and Comparison of Agency Experience w/ Sensors (\$5,000) = 85% complete

## **FY 2010**

- 2010-02: Mobile Weather Data Collection Guidelines (\$5,000) = 100% complete
- 2010-03: Results-Based Winter Road Maintenance Standards (\$155,000) = 85% complete
- 2010-04: RWIS Sensor Density and Location (\$100,000) = 50% complete

## **FY 2011**

- 2011-02: RWIS Training Tool (\$265,000) = 15% complete
- 2011-04: Study of MDSS Costs (\$5,000) = 100% complete
- 2011-05: Funding Sources Identification (\$5,000) = 10% complete

## **FY 2012**

- 2012-01: Validate the Accuracy of Pavement Condition Predictions (\$100,000) = 5% complete
- 2012-03: Cameras and Operational Impact of Remote ... Monitoring (\$25,000) = 25% complete
- 2012-04: Communicating and Publicizing Information (\$30,000) = 5% complete
- 2012-05: Seasonal Weight Restrictions Demonstration (\$250,000) = 5% complete

## **FY 2013**

- 2013-01: 2013 National Winter Maintenance Peer Exchange (\$35,000) = 85% complete
- 2013-02: Transition of Clarus to MADIS (\$5,000) = 10% complete
- 2013-03: Improving Estimation ... for Performance Measurement (\$130,000) = 5% complete
- 2013-04: Quantifying Salt Concentration on Pavement (\$150,000) = 5% complete
- 2013-05: Knowledge Base Content Management and Marketing (\$10,000) = 10% complete
- 2013-06: Make the Aurora Winter Severity Index Available to All (\$30,000) = 50% complete



# Research Quarterly Progress Report

Form 541001.pdf (9/08)

For Quarter Ending

QPR Project Number (RTXXX)	Other Project Numbers (addendum, IHRB etc.)	Project Title
RT		

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Co-Principal Investigator Name(s)	Email Address

Principal Investigator Organization Name/Address

DOT Office	DOT Contact Name	Email Address

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## **Project Status Report**

October 19, 2013

**Project:** 2007-05: Multiple-Use ITS Data Collection Practices

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**Champion:** Jack Stickel, Alaska Department of Transportation and Public Facilities

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**Objective:** The ultimate objective of this project is to use RWIS-equipped sites for different types of data collection, such as air-quality and traffic; and to use existing traffic and ITS infrastructure as a platform for RWIS equipment. The addition of multiple intelligent transportation system (ITS) applications at established RWIS sites has the potential to maximize available funding, reduce maintenance and operational risks, and produce more robust data sets per segment.

**Status:**

- The effort being conducted by Iowa State University will support the overall objective of this project by documenting existing practices where agencies have bundled data collection sensors at RWIS collection sites.
- A project team conference call was held on March 19, 2013 to discuss the initial state-of-practice electronic survey of agency practices. A project mini-meeting was also held on April 2, 2013.
- Results will likely be documented as part of the Knowledge Base.
- The survey was sent to snow-ice and ITS contacts in mid-June.
- Survey results were reviewed on a project call, held on August 14.
- the initial list of agencies to follow-up with; including New York, Iowa, Ontario, North Dakota, Pennsylvania, Minnesota, Sweden, Alberta, Colorado, Utah, Ontario, and a few local agencies.

**Approximate % Complete:** 45 %

**Barriers/Issues:** None

**Recommendations:**  X  continue as planned  
    continue with modifications  
    discontinue

**Additional Comments:**

- This project was funded for \$35,000 in FY 2007. This amount was reduced to \$15,000 at the September 2010 board meeting.
- Project Team: Jack Stickel (champion), Tina Greenfield, Joe Doherty, Curt Pape, Dawn Gustafson



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## **Project Status Report**

October 19, 2013

**Project:** 2009-01: Summary and Comparison of Agency Experience with Sensors

**Champion:** Dawn Gustafson, Michigan Department of Transportation

**Background:** This project was originally established to summarize and compare the Lufft R2S. Before this project began, several states had obtained and installed sensors. Ultimately, the team decided to proceed with this project as a summary of what sensors Aurora members have installed and their experiences with them. Clear Roads has a working document similar to this.

**Objective:** The objective of this project is to develop a matrix that will summarize different agencies' experiences with sensors used in road weather information data collection.

### **Status:**

- A final detailed scope was developed and approved by the board in October 2012. Tasks are:
  1. InTrans to resend matrix to Aurora members with note added: survey results will only be used as an internal document for Aurora members. Please complete and return by December 30, 2012. (start 10-10-2012 / end 1-30-2013)
  2. InTrans will compile the responses from Aurora members and distribute the results before the spring 2013 meeting. (start 2-10-2013 / end 4-30-2013)
- A comparison matrix was developed and sent to the team for review and modified from comments received. A tab was added to the bottom of the spreadsheet for sensor types.
- The spreadsheet will be resent to all Aurora members for their input, with a planned closing date for this project of December 31, 2013.
- Joe Doherty is currently updating the spreadsheet with NYSDOT history/experiences.
- The spreadsheet will also include information on the life expectancy of ITS devices, such as RWIS RPU's and sensors, that would help agencies anticipate the mean time between failures and help agencies plan for funding, maintenance, procurement, and replacement.

**Approximate % Complete:** 85 %

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

### **Additional Comments:**

- The board agreed to reduce project funding to \$5,000.
- This project has also absorbed the goals of Project 2010-05.
- Project Team: Dawn Gustafson (champion), Curt Pape, Jack Stickel, Joe Doherty, Tina Greenfield, Jason Norville



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## **Project Status Report**

October 21, 2013

**Project:** 2010-02: Mobile Weather Data Collection Guidelines

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**Champion:** Curt Pape, Minnesota Department of Transportation

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### **Status:**

- After a lengthy discussion in Toronto, the board agreed to let Curt Pape write a short position paper explaining Aurora's position on mobile sensing of weather parameters.
- The team also agreed that following up to see what happens in Michigan in the winter of 2012-2013 would be a good idea.
- A mini-meeting was held on April 2, 2013 in Virginia.
- The project team has drafted a short white paper detailing Aurora's position on mobile atmospheric data from snow plows. Data addressed included air temperature, precipitation, visibility, wind speed, humidity, and road surface temperature.
- The board agreed to provide further comments on the paper and have Chris Albrecht and InTrans staff edit it as necessary.
- Comments from Mike Adams and Tina Greenfield have been incorporated into the draft document, and a revised version was sent out by Chris Albrecht.
- This project was accepted as complete by the board on October 17, 2013.

**Approximate % Complete:** 100 %

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

### **Additional Comments:**

- Funding amount for this project was reduced from \$25,000 to \$5,000.
- Project Team: Curt Pape (champion), Max Perchanok, Mike Adams, Tina Greenfield, Joe Doherty, Gabe Guevera, Li Fu, Sheldon Drobot



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## **Project Status Report**

October 18, 2013

**Project:** 2010-03: Results-Based Winter Road Maintenance Standards

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**Champion:** Max Perchanok, Ontario Ministry of Transportation

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### **Status:**

- Project is nearing completion, on schedule.
- Safety analysis and modelling: 100%.
- Mobility analysis and modelling: 100%.
- Performance measures and service standards: 60%
  - Speed as a performance measure: complete
  - Friction as a performance measure: 70%
  - Performance standards: 70% (Literature review complete, benefit/cost analysis tool in progress to complete by July 31)
  - GIS system prepared to analyze system-wide impacts to changes in winter maintenance performance standards.
- Road Surface Condition Monitoring, Technology, Tools 80%
  - Vaisala non-invasive sensor; complete
  - Friction trailer; complete
  - Automated video interpretation (MSc)
  - Benefit/cost of hot water sanding; complete

**Approximate % Complete:** 85 %

**Barriers / Issues:** The partnership agreement for this project ends on September 20, 2013. Since some work is behind schedule an extension or addendum is needed.

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

### **Additional Comments:**

- Project Team: Max Perchanok (Champion), Dawn Gustafson, Joe Doherty, Sheldon Drobot, Neal Hawkins, Chris Albrecht
- MTO funding schedule ends March 31 2012.
- Aurora funding continues to December 2013.
- Earlier status reports incorrectly listed a Cost model as a deliverable for this project however, the research group is developing a cost model using other resources that will support the work done in this project.



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## **Project Status Report**

October 17, 2013

**Project:** 2010-04: RWIS Sensor Network Density and Location

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**Champion:** Max Perchanok, Ontario Ministry of Transportation

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### **Status:**

- A 2 year contract was signed on September 28, 2012
- Work completed:
  - Literature review
  - Web-based survey on practices used to site RWIS stations.
  - Preliminary model development, data collection, exploratory analysis and a case study for Ontario
  - The current model uses a case study approach rather than theoretical, to identify and rank weather and traffic factors influencing winter conditions, and uses them to estimate the importance of situating an RWIS in alternate locations.
  - Approximately 20 data sets of road surface friction and video data sets were obtained in Ontario during winter 2013-14. Data are now being reduced to a form that can be used for analysis and modelling of local road-weather variations that would impact network spacing.
  - Additional data sets were obtained from Iowa and Minnesota
- Next steps
  - Another case study will be undertaken using Minnesota data focussing on different location criteria from those used in Ontario
  - Investigate factor weightings in the model
  - Develop framework for optimum RWIS siting
  - Generalize the model based on the additional case studies from different areas.
  - Develop a benefits model to predict how benefits from RWIS vary with spacing under different geographic conditions.
  - Present interim results at fall 2013 board meeting.

**Approximate % Complete:** 50 %

**Barriers/Issues:** Limitation on availability of weather and traffic data reduces scope somewhat.

**Recommendations:**  X  continue as planned  
     continue with modifications  
     discontinue

### **Additional Comments:**

- This project was funded for \$100,000 in FY 2010
- MTO funding of \$55,000 for field data collection is proposed as an MTO in-kind contribution.
- Project Team: Max Perchanok (champion), Jack Stickel, Curt Pape, Dawn Gustafson, Mike Adams, Jason Norville, Tina Greenfield, Sheldon Drobot, Travis Lutman



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## **Project Status Report**

October 4, 2013

**Project:** 2011-02: RWIS Training Tool

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**Champion:** Tina Greenfield, Iowa Department of Transportation

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**Background:** It is often the case across states and even within states that winter maintenance supervisors or foremen do not have a consistent understanding of RWIS and weather information in real-world decision making. Training may be administered but it is difficult to determine how much is retained, whether understanding was reached, and which parts of the training were successfully integrated into decision making practice. Therefore it is difficult to assess supervisor/foremen competency and it is difficult to tailor training to their needs. This is especially a problem when hiring new staff or hiring contractors because there are few tools to evaluate their ability to perform as required. This project involves the creation of a supervisor evaluation tool which can measure a supervisor's ability to incorporate RWIS and risk management into their decision making process.

**Status:**

- This project is estimated to last 3 years.
- The project is now under contract with Iteris/Meridian.
- A project kickoff conference call was held on April 26, 2013.
- Good progress to date.

**Approximate % Complete:** 15 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- This project was funded for \$265,000.
- Project Team: Tina Greenfield (champion), Max Perchanok, Mike Kisse, Jack Stickel, Mike Adams



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## **Project Status Report**

October 18, 2013

**Project:** 2011-04: Study of MDSS Costs

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**Champion:** Mike Adams, Wisconsin Department of Transportation

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**Background:** This project concept was presented as a concern at the 2009 Peer Exchange and ranked at #9 among those ideas. The objective of this effort is to determine the upfront costs vs. long-term benefits for implementing MDSS systems. Also, determine necessary equipment, how to best equip the trucks, and quantify secondary benefits of equipping the fleet for MDSS. Initially this project will require a survey of the states.

**Status:**

- This project will be conducted internally by Wisconsin DOT and InTrans. No outside contract work will be performed.
- Chris Albrecht distributed the survey link to the Aurora board.
- The board agreed that analysis of the survey should be completed by May 31, 2013.
- Board agreed to re-scope the project to only discuss Wisconsin DOT's cost information.
- The report is complete and being reviewed by Aurora members.
- This project was accepted as complete by the board on October 17, 2013.

**Approximate % Complete:** 100 %

**Recommendations:**  X  continue as planned  
    continue with modifications  
    discontinue

**Additional Comments:**

- This project was funded for \$5,000 in FY 2011.
- Project Team: Mike Adams (champion), Mike Kisse, Jason Norville, Sheldon Drobot



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## **Project Status Report**

September 9, 2013

**Project:** 2011-05: Funding Sources Identification

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**Champion:** Jack Stickel, Alaska Department of Transportation and Public Facilities

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**Background:** Road weather management programs and Road Weather Information Systems (RWIS) can tap into various federal funding sources. This includes standard funding allocations and grant allocations. These sources are not well known to all agencies.

**Objective:** This project will compile potential funding sources and approaches that state department of transportation agencies can tap to fund the road weather management program. This would include funding partnerships, grants, standard allocations, and shared cost opportunities.

### **Status:**

- This project will involve surveying the Aurora member agencies on the funding sources they use, how to tap into them, and the processes they use to secure the funding
- This may be done internally by board members or through ISU.
- The new surface transportation program authorization “Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21) was signed in July 2012. The funding authorization is for federal fiscal year (FFY) 2013-2014. There have been several webinars covering funding eligibility since the authorization bill was signed, including ITS America:
- A new scope was developed and approved by the board in October 2012. Tasks are:
  - Establish a Funding Source section in the Aurora Knowledge Base.
  - Review MAP-21 and reference the applicable funding avenues for RWIS technologies.
  - Provide links to applicable webinars on MAP-21 that cover ITS, RWIS, traveler information funding.
  - Establish an Aurora website notification process where members can add short term funding opportunities and have this information distributed automatically to Aurora members.
- Jack will send information on MAP-21 funding to the team by April 15.
- Chris Albrecht is working with Jack and InTrans staff to set up the knowledge base page.

**Approximate % Complete:** 10 %

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

### **Additional Comments:**

- This project was funded for \$5,000 in FY 2011.
- Project Team: Jack Stickel (champion), Joe Doherty, Jason Norville, Lee Smithson



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## **Project Status Report**

October 20, 2013

**Project:** 2012-01: Validate the Accuracy of Pavement Condition Predictions from Various Sources

**Champion:** Max Perchanok, Ontario Ministry of Transportation

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**Background:** MDSS of various types have been implemented in several agencies. They combine RWIS forecasts with rules of practice, real-time plow and salt records, and other information to predict the current and future snow/ice status of the pavement during storms. Successful operations require accurate predictions. There is a need to close the loop on the "open loop" status of pavement forecasting.

**Objective:** This project would validate the accuracy of the pavement condition predictions and provide confidence in the MDSS recommendations.

**Status:**

- The project team identified a large number of clarifications required in the RFP and is now working on draft #4.
- The current scope:
  - Requires special, iterative forecasts including both the recommended treatments and the actual treatments (extra cost to be paid by the highway agency with possible help from Aurora).
  - To be undertaken at 1 patrol route in Wisconsin and 1 in Minnesota, where the Pooled Fund MDSS is currently running.
  - Investigating whether Vaisala and Federal MDSS can be included for comparison (Costs be paid by the highway agency with possible assistance from Aurora)..
  - RFP will list the sties and all data to be provided by the highway agencies.
  - RFP will focus on the desired outcome. Bidders will be evaluated on their proposed methodology.

**Approximate % Complete:** 5 %

**Barriers/Issues:** Complex logistics involving multiple MDSS providers and multiple highway agencies. Delay in finalizing RFP may postpone the project by a year, since all aspect must be in place by late fall to collect winter data.

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- This project was funded for \$100,000 in FY 2012.
- Project Team: Max Perchanok (champion), Dawn Gustafson, Tim Peters, Curt Pape, Mike Adams, Tina Greenfield, Gabe Guevera



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# Aurora Project 2012-03: Cameras and Operational Impact of Remote Road Condition Monitoring

## MINUTES

JULY 23, 2013

14:00-14:40 MST

LOCATION: VARIOUS LOCATIONS

TYPE OF MEETING	TAC Meeting via Video Conference
ATTENDEES	Jeff Williams (Utah DOT), Travis Lutman (North Dakota DOT), Jimmy White (Virginia DOT), Ron Hall (Kansas DOT), Gene Martin (Virginia DOT), Ryan Porter (Live View Tech.), Call-in-user 3?, Dr. Mitsuru Saito (BYU), Seishi Yamagata (BYU)

### 1. Welcome

### 2. Review of Tasks

- Literature search is completed.
- Interviews with maintenance station supervisors began in early July, and are ongoing. Three shed managers who received the cameras for the first time had been visited by this TAC data. Three more shed managers who received the cameras for the first time will be interviewed shortly.
- A questionnaire for those who received cameras in the 2011/2012 winter will be prepared.
- There is an ongoing investigation of snow-related costs on labor, material, and equipment that were provided by Lynn.

### 3. Results of Interviews

- Report on the summary of three interviews done so far by Seishi.
  - Suggestion from Ryan: There were 22 difference sheds that received new cameras last year. It would be good to look at sheds that received a camera for the first time. Ryan will provide BYU researchers a list of those shed managers who received for the first time in the 2011/2012 winter.

### 4. Next 3-month work

- Interviews of station supervisors and analysis on expenditure will be continued.

### 5. Next Meeting Date

- Next meeting will be sometime in early October, after the next quarterly report. The agenda sent out to the TAC members for this meeting had an error, saying the next TAC would be held early September.

# Aurora Project 2012-03: Cameras and Operational Impact of Remote Road Condition Monitoring

## MINUTES

AUGUST 21, 2013

LOCATION: 6 MAINTENANCE STATIONS

Summary of interviews of maintenance station supervisors who received a camera for 2012/2013 winter

1. How long have you been station supervisor here?
  - 25 – 26 years (Station Supervisor 1)
  - 10 years (Station Supervisor 2)
  - 4 years (Station Supervisor 3)
  - 14 years (Station Supervisor 4)
  - 5 years (Station Supervisor 5)
  - 14 years (Station Supervisor 6)
2. When did you start using the camera?
  - Around November and December in 2012 (Station supervisors 1, 2, 3, 4, and 5)
3. During winter conditions, how often do you access the camera?
  - Depending on weather, sometimes multiple times a day (Station supervisors 1, 2, 3, 5, and 6)
  - Average of about every 3 hours (Station Supervisor 4)
4. Has the snow removal crew dispatch protocol changed after the installation of the camera?
  - Yes. With the camera being available, the roadway condition there can be easily checked. Fewer dispatches were sent out if the conditions could be checked on the camera. (Station supervisors 1, 2, 3, and 6)
  - Not totally, but it has reduced some trips sent out the area. (Station supervisors 4 and 5)
5. Do you use cameras installed within the boundaries of other maintenance stations other than the camera in own station boundary?
  - Yes, all the time. (Station supervisors 1, 2, 3, 4, and 6)
  - No. (Station supervisor 5)
6. Besides you, is there anybody else that has access to the cameras?
  - Yes, others on the crew access them quite frequently too. (Station supervisors 1, 2, 3 and 4)
  - Yes, but others haven't taken advantage of them as much. (Station supervisors 5 and 6)
7. On a scale of 1 to 5 (1=not effective at all, 2=less effective, 3=no change, 4=more effective than before, 5=definitely more effective) how effective would you say the camera is to maintenance operations?
  - 5 (Station supervisor 1 and 2)
  - Somewhere between 4 and 5 (Station supervisor 3)
  - 4 (Station supervisor 4 and 6)
  - 3 (Station supervisor 5)
8. Other comments

- It is really useful to access the camera from home or from the phone. There have been many instances where unnecessary trips were reduced by being able to view the camera from home. (Station supervisors 1, 2, 3)
- Having the camera has helped with less anticipation and anxiety in snow removal. (Station supervisors 1, 2, 3)
- Would be useful if more cameras were installed (Station supervisors 1, 2, 3, 4, 6)
- The night time vision is fair due to infrared (Station supervisor 1, 2)
- The camera is difficult to view at night even with infrared, and sometimes the lens gets dirty or fogged up (Station supervisor 3)
- The camera has poor nighttime vision (Station supervisors 4,5, and 6)
- The cameras were up and running and available when needed (Station supervisors 1, 2, 4)
- One of the newer cameras on MP 27.5 on US-40 hardly ever worked (Station supervisor 3)
- The camera is very slow due to poor cellular reception, and it is frustrating to try to operate (Station supervisor 5)
- Something that would be nice to have is the ability to take still pictures on the cameras for liability issues. (Station Supervisor 6)
- It would be a great advantage if there was a way for the public to view the camera. People call in all the time to ask about road conditions. (Station supervisor 5)
- Roughly about 40-50 man hours plus equipment cost was saved this past winter. (Station supervisor 4)
- There was probably roughly 15-20% less unnecessary trips out to the location. (Station supervisor 6)
- The camera did help a little bit and reduced trips out there by maybe 25% (rough estimate) but it didn't totally reduce trips out there. (Station supervisor 5)

# Aurora Project 2012-03: Cameras and Operational Impact of Remote Road Condition Monitoring

## SURVEY RESULTS

8 MAINTENANCE STATIONS

Summary of questionnaire responses of maintenance stations with a camera installed in 2011/2012
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1. When did you become station supervisor at your current station?
  - February 2012 (Station Supervisor 1)
  - July 2006 (Station Supervisor 3)
  - October 2008 (Station Supervisor 4)
  - September 2009 (Station Supervisor 5)
  - January 2007 (Station Supervisor 6)
  - September 2009 (Station Supervisor 7)
  - April 2000 (Station supervisor 8)
2. Were you the station supervisor in the winter of 2011/2012 when the first camera was installed in your boundary?
  - Yes (All station supervisors)
3. When did you begin using the camera?
  - February 2012 (Station supervisor 1)
  - October 2010 (Station supervisor 3)
  - October 2011 (Station supervisors 4, 8)
  - November or December 2011 (Station supervisor 5)
  - As soon as it was up and running (Station supervisors 6, 7)
4. During winter conditions, how often do you access the cameras?
  - Multiple times a day (All station supervisors)
5. Have protocols of snow removal changed in your opinion after the installation of the camera?
  - Yes (Station supervisors 1, 4, )
  - Maybe (Station supervisors 2, 3, 5, 6, 7, 8)
6. How have the protocols of snow removal changed?
  - I would check the camera first to make sure we needed to be there. Then someone would be sent to each required route. (Station supervisor 1)
  - I do not have to drive 30 miles to check road conditions. (Station supervisor 3)
  - It helped in quicker response times by watching storms earlier and being aware that a storm is coming. (Station supervisor 4)
  - I have areas that I cannot see with camera so I have to send numerous trucks either way, but it does give me an idea when the snow starts to stick so it may improve response if that occurs during my work hours. (Station supervisor 5)
  - I can check the condition of the road by accessing the camera instead of making a trip out on the road. (Station supervisor 6)
  - I have the ability to look at our summit. However, we have about 30 miles of canyon that I cannot see unless I send someone out to look. So, for early storms that are only forecasted to snow around 8000 ft., the camera is a great tool, but later in the winter not so much. (Station supervisor 7)

- I can see if I need to send someone all the way out to the far end of our road section. (Station supervisor 8)
7. Have the number of dispatches you send out (to check road conditions) decreased after the installation of the camera?
    - Yes (All station supervisors)
  8. How much reduction have you seen in the number of dispatches sent out?
    - 10 - 20% (Station supervisor 1)
    - 25% (Station supervisor 2)
    - 35% (Station supervisor 3)
    - 15 – 20% (Station supervisor 4)
    - 1 to 5 dispatches per season (Station supervisor 5)
    - 50% (Station supervisor 6)
    - 10% (Station supervisor 7)
    - 75% (Station supervisor 8)
  9. Do you use cameras in other station boundaries?
    - Yes (Station supervisors 1, 2, 3, 4, 5, 7)
    - No (Station supervisors 6, 8)
  10. Is the camera effective at night? (Does it have fair night vision?)
    - Yes (Station supervisors 2, 3, 5, 7, 8)
    - No (Station supervisors 1, 4, 6)
  11. Why is it not effective at night?
    - There is no light or not sure how to use it if there is. The internet connection is slow at this location so reloading pictures takes a long time. (Station supervisor 1)
    - If there is no traffic it is hard to see roadway. (Station supervisor 4)
    - It is hard to see the road surface at night. (Station supervisor 6)
  12. Is it an advantage to be able to access the camera from home?
    - Yes (All station supervisors)
  13. If funds become available, where would you want more cameras to be installed?
    - SR 92/North County Blvd.
    - US-89/Geneva Road
    - North County Blvd./1 block south of Lone Peak High School
    - SR-146/Cedar Hills city building
    - End of SR-144
    - SR-191 MP 145
    - SR-313 MP 8
    - SR-128 MP 14.5
    - I-15 MP 122
    - I-15 MP 123.3
    - I-15 MP 126
    - I-15 MP 141
    - I-70 MP 4.5
    - I-70 MP 72
    - I-70 MP 64
    - I-70 MP 50
    - I-70 MP 206
    - I-70 MP 182

14. On a scale of 1 to 5 (1=not effective at all, 2=less effective, 3=no change, 4=more effective than before, 5=definitely more effective) how effective would you say the camera is to maintenance operations?

- 5 (Station supervisors 1, 6, 8)
- 4 (Station supervisors 2, 3, 5, 7)
- 3 (Station supervisor 4)

15. Please note why you chose your certain rating on a scale of 1 to 5.

- It saves time, meaning personnel. With our area gaining new roads and lane miles each year, our employees are getting more work. If I can just look at the camera instead of sending an employee where they may not be needed, I can keep them where they are needed. (Station supervisor 1)
- There are cost savings. (Station supervisor 2)
- It cuts down chasing storms and I am able to get trucks where they need to be sooner. (Station supervisor 3)
- We don't use the cameras when doing routine maintenance activities. (Station supervisor 4)
- The cameras are a benefit to me in my snow plow operations and save me from checking roads manually by driving. (Station supervisor 5)
- I check the cameras to check on road conditions and weather. (Station supervisor 6)
- There are some benefits especially in the spring and fall. (Station supervisor 7)
- Being able to see the conditions from home before I call people out helps a lot. (Station supervisor 8)

16. Other comments

- I really like having cameras for my section and I use them quite a bit. (Station supervisor 1)
- The cameras are effective for accidents if we have problems with back up of traffic during a storm. (Station supervisor 4)
- You can't beat real-time information. (Station supervisor 8)

## **Project Status Report**

October 19, 2013

**Project:** 2012-03: Cameras and Operational Impact of Remote Road Condition Monitoring

**Champion:** Travis Lutman, North Dakota Department of Transportation

**Background:** This idea came out of the September 2011 peer exchange in Montana. Utah DOT and a private contractor have developed a low-cost live PTZ camera system to monitor road conditions at locations not covered by conventional traffic cameras or RWIS sites. The purpose of this is to identify if treatment is needed or not. The outcome is that the local manager can decide whether a truck needs to go out or not. The system has had impacts on how and when dispatch is done. It has also enhanced road condition observation in rural areas for the purposes of traffic management.

**Objective:** This project would identify efficiencies gained, impacts on road condition, costs, cost avoidance, and document the model for other agencies to follow.

**Status:**

- A contract is now in place with BYU, and they have begun work on this effort.
- A project team call was scheduled with BYU and the camera manufacturer for late April.
- The research team met with Chris Albrecht on June 5 to go over progress.

**Approximate % Complete:** 25 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- This project was funded for \$25,000 in FY 2012.
- Project Team: Travis Lutman (champion), Ron Hall, Mike Kisse, Curt Pape, Gene Martin



# Research Quarterly Progress Report

Form 541001.pdf (9/08)

For Quarter Ending

QPR Project Number (RTXXX)		Other Project Numbers (addendum, IHRB etc.)		Project Title		
RT						
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Co-Principal Investigator Name(s)				Email Address		
Principal Investigator Organization Name/Address						
DOT Office		DOT Contact Name		Email Address		
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## **Project Status Report**

October 19, 2013

**Project:** 2012-04: Communicating and Publicizing Road Weather and Operations Information

**Champion:** Joe Doherty, New York State Department of Transportation

**Background:** This idea also came out of the 2011 peer exchange. Road weather systems are designed to meet a broad array of stakeholder needs. Key stakeholders include winter weather maintenance operations, first responders, emergency managers, value-added forecast providers, commercial trucking operations, transit and the traveling public. Information delivery to this stakeholder base may include data feeds, tabular listings, graphical presentations, and weather data integrated with other data sources (real-time traffic data, for example). Having an understanding of the stakeholder's key operational weather thresholds and how stakeholders make decisions based on these thresholds can help transportation agencies tailor a road weather information system program to meet the stakeholder needs.

**Objective:** This research would likely compile the best practices on how road weather information is being transferred to stakeholders. It is also important to identify the best method(s) for notifying the public/media and operations staff of current RWIS data. It is not clear how much information is needed to inform the public and government officials of "current" operations during a storm. Research should look at how new operational processes and sensor output can be quickly adopted.

**Status:**

- A discussion has been had with SICOP as well.
- Chris Albrecht will work with Joe to develop a revised objective and research scope that would include a state-of-the-practice review on what states are doing to communicate road weather information
- A scope should be completed soon.
- The 2013 peer exchange identified a topic that may be combined with this RFP.

**Approximate % Complete:** 5 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- This project was funded for \$30,000 in FY 2012.
- Project Team: Joe Doherty (champion), Jack Stickel, Jason Norville, Dawn Gustafson, Tim Peters



# Research Quarterly Progress Report

Form 541001.pdf (9/08)

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## **Project Status Report**

October 17, 2013

**Project:** 2012-05: Seasonal Weight Restrictions

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**Champion:** Max Perchanok, Ontario Ministry of Transportation

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**Objective:** The objective of this research is to validate the predicted thaw depths and restriction dates recommended using the *Clarus* EICM approach and alternative, degree-day based approaches to provide an understanding of reliability of different approaches in setting load restriction dates.

**Status:**

- Details of the draft RFP were discussed in length during the mini-meeting. The draft RFP is ready for advertisement with Iowa DOT.
- Chris Albrecht sent the RFP to Linda Narigon for final comments and direction on who it can be sent to.
- An RFP is now ready for posting by Iowa DOT and IHRB.

**Approximate % Complete:** 5 %

**Barriers/Issues:** The RFP calls for two phases; planning and implementation. Based on experience with previous RWIS-related projects, a planning phase is needed for literature review and to see which agencies have the appropriate infrastructure to provide case studies for the project. Posting of the RFP was delayed since March by a miscommunication with IHRB.

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- This project was funded for \$250,000 in FY 2012.
- Project Team: Max Perchanok (champion), Mike Adams, Jack Stickel, Dawn Gustafson, Travis Lutman, Mike Kisse
- TRB Winter Maintenance Committee submitted a proposal for an NCHRP synthesis on spring load restrictions. If funded it would provide useful input to Phase 1.
- TRB Winter Maintenance Committee will propose a workshop at the 2015 TRB meeting that would support this project.



# Research Quarterly Progress Report

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## **Project Status Report**

October 17, 2013

**Project:** 2013-01: 2013 National Winter Maintenance Peer Exchange

**Champion:** Jason Norville, Pennsylvania Department of Transportation

**Background:** Aurora has been actively researching a number of surface transportation weather projects while Clear Roads is researching materials, equipment and practices related to winter maintenance operations. Unfortunately the information/results sometimes does not reach end users in all states or at different agency levels. The winter maintenance community needs to be more aware of the research conducted by Aurora and Clear Roads and other research organizations and take a more active role in requesting research to meet winter operational needs.

**Objective:** The objective of this project is to conduct a national winter maintenance meeting to share research results from the peer exchanges held in 2007, 2009, and 2011, get updates from each snow-belt state, and discuss other issues related to winter snow removal operations. Each state would send a representative to the meeting that is most actively involved with the areas covered by Aurora, Clear Roads, PNS, SICOP and FHWA efforts.

**Status:**

- The event is almost complete.

**Approximate % Complete:** 85 %

**Recommendations:**  X  continue as planned  
    continue with modifications  
    discontinue

**Additional Comments:**

- This project was funded for \$35,000 in FY 2013.
- Project Team: Jason Norville (champion), Mike Adams, Dawn Gustafson, Tina Greenfield



# Research Quarterly Progress Report

Form 541001.pdf (9/08)

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## **Project Status Report**

September 9, 2013

**Project:** 2013-02: Transition of Clarus to MADIS

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**Champion:** Jack Stickel, Alaska Department of Transportation and Public Facilities

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**Background:** The Clarus System functionality (observations, quality checks, metadata, and spatial location) is transitioning to the MADIS System. Existing FHWA funding will carry the existing Clarus System into CY 2013/2. Aurora needs to materially participate in the transition to ensure the Clarus functionality is captured in the new MADIS system. There will be four phases in the transition:

- Each transportation agency's RWIS network will be added as a mesonet.
- A metadata interface to add and modify RWIS site information will be added.
- The Clarus quality checks for atmospheric and surface observations will be added.
- Subscription services similar to Clarus will be added.

The initial MADIS Surface Display web site has been established. No specific Aurora funding opportunities to assist in the transition have been identified as of yet. There potentially could be assistance requests or design review meetings.

**Objective:** The objective of this project is to participate in the transition of the Clarus System to the NOAA's ESRL Meteorological Assimilation Data Ingest System (MADIS) system.

**Status:**

- Just underway.
- The effort would include adding missing RWIS sites to the MADIS system, updating metadata, and participating in the MADIS Surface System web reviews.
- Research Approach:
  1. Add missing RWIS sites to the new MADIS system.
  2. Update RWIS metadata through Mixon Hill.
  3. Participate in MADIS Surface System web site reviews for a) how well it captures the Clarus System functionality, and b) how efficient the web site operates.

**Approximate % Complete:** 10 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- This project was funded for \$5,000 in FY 2013.
- Project Team: Jack Stickel (champion), Mike Adams, Ron Hall



# Research Quarterly Progress Report

Form 541001.pdf (9/08)

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## **Project Status Report**

October 17, 2013

**Project:** 2013-03: Improving Traffic Speed Estimations for Winter Maintenance Performance

**Champion:** Tina Greenfield, Iowa Department of Transportation

**Background:** The Iowa DOT is interested in developing a dynamic model capable of predicting in real time acceptable drops in traffic speed at major highway during major weather events with realistic uncertainty measures. The primary usage of such model is to evaluate the performance of highway winter maintenance operations and optimize resource allocation.

**Objective:** The objective of this project is to develop point level performance measurements based on an improved model which can produce real time prediction of traffic speed drops with uncertainty measures. This model will be tested and improved based on traffic, weather, and maintenance activity data from several different states/regions.

**Status:**

- Just underway.
- The preferred plan is to sole-source this effort to the Iowa State University Statistics Department.

**Approximate % Complete:** 5 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- Project Team: Tina Greenfield (champion), Max Perchanok, Jack Stickel, Ron Hall
- This project was funded for \$130,000 (\$30,000 for task 1, \$35,000 for task 2, \$35,000 for task 3, \$30,000 for task 4) in FY 2013.



# Research Quarterly Progress Report

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## **Project Status Report**

October 17, 2013

**Project:** 2013-04: Quantifying Salt Concentration on Pavement

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**Champion:** Max Perchanok, Ontario Ministry of Transportation

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**Background:** Peer exchanges have shown the need for a mobile and/or more accurate surface salinity sensor. An alternative is to develop a better way to predict the salt concentration on the pavement considering the records of application rate, time plowing, precipitation type and rate, surface temperature, traffic, pavement type, wind speed, etc. Road salt management is a key issue for many highway agencies that are required to provide safe roads during winter storms while protecting the natural environment from excessive exposure to its environmental effects. Critical methods to manage salt loadings are by applying the right amount of salt at the right place and the right time, and this requires accurate knowledge of how much salt is already on the road before re-applying during a storm.

**Objective:** To develop a better way to build upon and combine previously attempted approaches to measure or predict representative salt concentration on the pavement to a precision that can be used for tactical planning of salt application rates in advance of and during winter storms. It should consider past applications and timing, plowing, precipitation type and rate, surface temperature, traffic, pavement type, wind speed, etc. The pooled fund MDSS initiative should do a lot of this for its surface condition and treatment predictions, so this effort could just focus on just what MDSS may be lacking.

**Status:**

- A project description was prepared and discussed by the team in Virginia Beach.
- The RFP is being prepared.

**Approximate % Complete:** 5 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

- Project Team: Max Perchanok (champion), Tina Greenfield, Jason Norville, Tim Peters, Curt Pape, Lee Smithson
- This project was funded for \$150,000 in FY 2013.
- This project was given a high priority at the National Winter Maintenance Peer Exchange.



# Research Quarterly Progress Report

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## **Project Status Report**

October 17, 2013

Project: 2013-05: Knowledge Base Content Management and Marketing

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**Champion:** Tina Greenfield, Iowa Department of Transportation

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**Background:** This idea was suggested by Tina Greenfield as a way to help populate and maintain the knowledge base website with several of the smaller Aurora projects that do not fall under the management contract. Periodically, certain road weather topics arise that seem well suited to be added to the “wiki” site. If the information is easily available it can simply be posted by Aurora members or administration. Sometimes the topic requires a little bit of work before a good product can be posted, such as collecting opinions from a survey, literature reviews, and other minor analysis and arrangement. Other topics may require regular reviews and updates in order for the information to stay pertinent. For example, information on funding sources or calls for papers may change regularly.

**Objective:** To create a mechanism by which topics requiring extra work can be added to the Wiki.

**Status:**

- Chris Albrecht and Neal Hawkins are producing a scope and plan for this effort to be done through ISU.
- Funding from Project 2011-05 could be added to this effort.
- A meeting was held on September 18 to discuss transfer of all Knowledge Base materials to new site.

**Approximate % Complete:** 10 %

**Barriers/Issues:** None

**Recommendations:**  continue as planned  
 continue with modifications  
 discontinue

**Additional Comments:**

This project was funded for \$10,000 in FY 2013.

- Project Team: Tina Greenfield (champion), Jack Stickel, Jason Norville



# Research Quarterly Progress Report

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## **Project Status Report**

October 17, 2013

Project: 2013-06: Make the Aurora Winter Severity Index Available to All

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**Champion:** Tina Greenfield, Iowa Department of Transportation

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**Background:** This idea also came out of the September 2011 peer exchange in Montana. This effort would involve making the Aurora winter index available to anyone and extend the length of the record from the current period (2002-2008). Another component would be to develop technology transfer sessions at APWA or AASHTO.

**Objective:** This effort would involve making the Aurora winter index available to anyone and extend the length of the record from the current period (from now back to the 2008-2002 period as well).

**Status:**

- An extension with AccuWeather is now in place.

**Approximate % Complete:** 50 %

**Barriers/Issues:** None

**Recommendations:**  X  continue as planned  
       continue with modifications  
       discontinue

**Additional Comments:**

- Project Team: Tina Greenfield (champion), Mike Adams, Curt Pape, Jack Stickel, Jason Norville
- This project was funded for \$30,000 in FY 2013.