RESEARCH

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RESEARCH IMPLEMENTATION AND LEADERSHIP ENGAGEMENT:
2012 UDOT RESEARCH PEER EXCHANGE, OCT 29th–31st, 2012

Prepared For:

Utah Department of Transportation
Research Division

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16. Abstract

This report discusses the proceedings and recommendations of the 2012 UDOT Research Peer Exchange. The 2012 UDOT Research Peer Exchange took place in October of 2012. Representatives from eight different state DOTs, as well as representatives from four federal agencies, gave presentations on the implementation of research in his or her organization. Participants also attended the UDOT Annual Conference where they presented a condensed version of their state or agency's implementation of research and were able to see the inner workings of the Utah Department of Transportation. On day three, participants provided feedback for UDOT on how they could improve their research program. Participants then discussed leadership, how it fostered research implementation, and vice versa. Top suggestions for involving leadership were gathered from each participant at the end of the exchange. The participants were asked to focus on four areas: Implementation, Innovation, How Leadership Affects Research, and How Research Affects Leadership.

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ACRONYMS

AASHTO.....American Association of State Highway and Traffic Officials
ACS.....Adaptive Control Software
AMS.....Asset Management System
CMCG.....Construction Machine Control Guidance
CUTC.....Council of University Transportation Centers
DOT.....Department of Transportation
FAA.....Federal Aviation Administration
FHWA.....Federal Highway Administration
GIS.....Geographic Information Systems
GPS.....Global Positioning System
IDOT.....Iowa Department of Transportation
IT.....Information Technology
ITD.....Idaho Transportation Department
LSF.....Living Snow Fences
LTAP.....Local Technical Assistance Program
LTPP.....Long Term Pavement Performance
MAP-21.....Moving Ahead for Progress in the 21st Century
MDT.....Montana Department of Transportation
MnDOT.....Minnesota Department of Transportation
MUTCD.....Manual on Uniform Traffic Control Devices
NHTSA .....National Highway Traffic Safety Administration
NTSB.....National Transportation Safety Board
ODOT.....Oklahoma Department of Transportation
OMS.....Operations Management System
PMS.....Pavement Management System
RAC.....Research Advisory Council
RAP.....Reclaimed Asphalt Pavement
RD&T^2.....Research, Development, and Technology Transfer
RITA.....Research and Innovative Technology Administration
RRC.....Research Review Committee
SDDOT.....South Dakota Department of Transportation
SHRP 2.....Strategic Highway Research Program 2
SPR .....State Planning & Research
TRB.....Transportation Research Board
TRID.....Transportation Research International Documentation
UAV.....Unmanned Aerial Vehicle
UDOT.....Utah Department of Transportation

USDOT.....United States Department of Transportation
USU.....Utah State University
UTC.....University Transportation Center
UTC.....Utah Transportation Center
WyDOT.....Wyoming Department of Transportation

EXECUTIVE SUMMARY

This report discusses the proceedings and recommendations of the 2012 UDOT Research Peer Exchange. The 2012 UDOT Research Peer Exchange took place from October 29th to November 1st, 2012. Representatives from eight different state DOTs, as well as representatives from four federal agencies, gave presentations on the implementation of research in his or her organization. Participants also attended the UDOT Annual Conference where they presented a condensed version of their state or agency's implementation of research and were able to see the inner workings of the Utah Department of Transportation. On day three, participants provided feedback for UDOT on how they could improve their research program. Participants then discussed leadership, how it fostered research implementation, and vice versa. Top suggestions for involving leadership were gathered from each participant at the end of the exchange. The participants were asked to focus on four areas: Implementation, Innovation, How Leadership Affects Research, and How Research Affects Leadership.

Implementation can be occur in a variety of ways, from complete or partial implementation down to the suggestion that none of the research be adopted if it is not found to be useful to the DOT. Participants agreed that research projects need a champion for implementation to be successful and that person is vital to the projects implementation. Communication and support within the DOT was found to be the most important factor for innovation. Some of the best innovation comes from the work site and if there is not communication with workers some of the best ideas can be overlooked. In addition, some of the riskiest ideas can be overlooked if management does not have the support necessary to take those risks. For implementation to occur an informed champion must be given talking points to keep the research at the forefront of the decision-makers agenda.

Research affects leadership because it is necessary to have leaders who understand the research program and are capable of analyzing the program to identify and address shortcomings. The researcher is also in a position to offer objective suggestions that will improve a research program and make it easier for research to be conducted. In addition, leaders need their researchers to provide talking points, so that the research agenda may be easily explained to

individuals who do not necessarily have a research background or may otherwise not understand the research at hand. In most DOTs, leadership is the greatest influence of research. In order to achieve the desired goals, leaders must provide a clear and concise picture of their vision. They must also be open and accommodating to their researchers and enable them to conduct cutting edge research. Participants repeatedly stressed that communication of expectations, progress, and delivery was vital to the success of a research program. Throughout the process, management needs to stay apprised of the status of the research.

1.0 INTRODUCTION

Pursuant to 23 Code of Federal Regulations 420.209 (a)(7), as a condition for approval of FHWA planning and research funds for research activities, a State is required to conduct peer exchanges every five years as required by FHWA's Office of Research Development & Technology Transfer ($RD\&T^2$). The objective of the peer exchange program is to give State transportation agencies a means to improve the quality and effectiveness of their research management processes. A peer exchange is a practical and effective tool to foster excellence in research, development, and technology transfer program management by providing an opportunity for panelists to share best practices and management innovations with each other. Outside managers are invited to meet with the host agency to discuss and review its $RD\&T^2$ management process or provide ideas in a specific focus area. Information on the host agency's policies and procedures is shared with panel members prior to the meeting. During the peer exchange, panel members may meet with managers, staff, stakeholders, and customers to gain further insight into the host agency's program. The information gathered from the exchange is documented in a written report and presented to agency management.

1.1 Peer Exchange Panel Members

The 2012 Research exchange was composed of ten panel members. There were seven DOT's represented from five different FHWA regions (Regions 5, 6, 7, 8, and 10) and four federal agencies/programs were represented (SHRP 2, FHWA, TRB, and USDOT). Brief biographies of the participants are provided below.

Ron Curb (Oklahoma Department of Transportation)

Mr. Ron F. Curb has worked for the Oklahoma Department of Transportation for over 29 years. He has transportation experience in bridge design, traffic engineering and transportation planning & research. He has managed the Engineering Services Branch's Research and Traffic Data Analysis sections since 2006. In Oklahoma, he is a licensed Professional Engineer and Certified Public Manager.

Jerry DiMaggio (SHRP2)

Mr. Jerry DiMaggio is currently the Implementation Coordinator of the SHRP 2 program for TRB in Washington DC. He retired from FHWA in 2008 where he served as a Principal Bridge Engineer and National Program Manager for Foundation and Geotechnical Engineering. Jerry has worked on approximately 1000 projects in all 50 states, Central and South America and several Middle Eastern countries.

Stephen Maher (Transportation Research Board)

Mr. Maher is responsible for the leadership and management of design engineering technical standing committee and task force activities; development and conduct of the design engineering portion of the TRB Annual Meeting and other national and international conferences and workshops; worldwide response to design engineering inquiries; design related journal publications, electronic circulars and webinars; and a portion of the TRB Annual Field Visit/Research Correlation Services Program with state department of transportation and other sponsor agencies, universities and institutes.

Timothy McDowell (Wyoming Department of Transportation)

Mr. McDowell has been the administer the development and production of the Statewide Transportation Improvement Program for the State of Wyoming. He is responsible for administering the Research and Development program for WYDOT. He has been employed with the Wyoming Department of Transportation for 34 years with experience in construction and maintenance prior to present position.

John Moulden (Federal Highway Administration)

Mr. Moulden trained as a research psychologist with degrees from Johns Hopkins Univ. and Penn State Univ. Prior to FHWA, he was President of the National Commission Against Drunk Driving; Special Assistant to Chairman of the National Transportation Safety Board (NTSB), President, Transportation Safety Associates (consulting co.); and research psychologist at NHTSA (USDOT).

Linda Narigon (Iowa Department of Transportation)

Ms. Narigon is a Licensed Professional Engineer in Iowa and serves as Iowa DOT's SPR Part II Administrator and Research Implementation Engineer. Linda is a member of TRB's Hydrology, Hydraulics, and Water Quality Committee and a majority of her career has been in Water Resources and Floodplain Modeling. Linda joined Iowa DOT's Research Office in 2011.

Daris Ormesher (South Dakota Department of Transportation)

Mr. Ormesher has worked in the Office of Research for the South Dakota Department of Transportation since 1989. Prior to that he worked as a Geotechnical Engineer for Woodward Clyde in Omaha, Nebraska. He has a bachelors degree in Geological Engineering. His area of expertise is geotechnical engineering but has worked on a variety of projects covering topics from pavement materials to organizational health.

Ned Parrish (Idaho Department of Transportation)

Mr. Parrish has worked as the Research Program Manager at Idaho Department of Transportation since 2007. His responsibilities include management of ITD's Research Program, coordination of efforts to identify department research needs and priorities, and development and monitoring of research contracts. Mr. Parrish also serves as the Department's representative on local, state, and national research committees.

Nicole Peterson (Minnesota Department of Transportation)

Ms. Peterson has been with the Minnesota Department of Transportation for 14 years. She has worked primarily in their Metro District in traffic, design and project management. She joined Research Services in their Central Office a year ago as the Research Management Engineer.

Sue Sillick (Montana Department of Transportation)

Ms. Sillick has been with the Montana Department of Transportation for over 18 years and is currently the Research Programs Manager at the Montana Department of Transportation. Her responsibilities include managing the research, development, and technology transfer programs of MDT. Prior to this position, Sue was a project manager in the research programs.

Kevin Womack (RITA)

Dr. Womack has been the Associate Administrator for Research, Development, and Technology, previously he was a Professor of Civil Engineering and Director of the Utah Transportation Center at Utah State University. Dr. Womack received his Bachelor of Science degree (1980) and Ph.D. degree (1989, civil engineering) from Oregon State University, with a Masters degree in civil engineering from the University of Pennsylvania (1985). He was elected a Fellow in the American Society of Civil Engineers in April of 2010. Dr. Womack is a registered professional engineer in the State of Oregon.

1.2 Other Peer Exchange Participants

Kevin Heaslip (Utah State University)

Dr. Heaslip is an Assistant Professor at Utah State University and the Associate Director of the Utah Transportation Center (UTC). His research areas include resiliency, alternative fuel sources, safety and automation. Dr. Heaslip served as a facilitator to the 2012 Research Peer Exchange.

Cameron Kergaye (Utah Department of Transportation)

Dr. Kergaye has been with UDOT for over twenty years and has worked in many different disciplines including design, construction and materials. He has also worked on I-15 reconstruction and in engineering services and project management. He began his position of Director of Research in the fall of 2010.

Kevin Nichol (Utah Department of Transportation)

Mr. Nichol is a Research Project Manager for UDOT. His previous experience has included planning, local government engineering, and stormwater management. He is also an advisory member of the UDOT Standards Committee.

Becky Winstead (Utah State University)

Ms. Winstead is the Utah State University TIMELab coordinator and Staff Assistant for Utah LTAP. Ms. Winstead served as a facilitator for the 2012 Research Peer Exchange.

Table 1- 2012 UDOT Peer Exchange Attendees

2012 UDOT Peer Exchange Attendees		
Name	**Affiliation**	**Title**
Ron Curb	Oklahoma Department of Transportation	Engineering Manager II - Research
Jerry DiMaggio	SHRP2 Program/TRB	SHRP2 Implementation Engineer
Kevin Heaslip*	Utah State University	Assistant Professor
Cameron Kergaye	Utah Department of Transportation	Research Manager
Stephen Maher	Transportation Research Board	Senior Program Officer
Tim McDowell	Wyoming Department of Transportation	State Programming Engineer
John Moulden	Federal Highway Administration	National Partnership Program Manager
Linda Narigon	Iowa Department of Transportation	Research Implementation Engineer
Kevin Nichol	Utah Department of Transportation	Research Project Manager
Daris Ormesher	South Dakota Department of Transportation	Research Engineer
Ned Parrish	Idaho Transportation Department	Research Program Manager
Nicole Peterson	Minnesota Department of Transportation	Research Management Engineer
Sue Sillick	Montana Department of Transportation	Research Programs Manager
Becky Winstead*	Utah State University	Staff Assistant 3
Kevin Womack	USDOT/RITA	Associate Administrator for Research & Development

* indicates facilitator

2.0 FOCUS

Representatives from the states of Oklahoma, Wyoming, Iowa, South Dakota, Idaho, Minnesota, Montana, and Utah were present along with federal representatives from the Strategic Highway Research Program 2 (SHRP 2), the Transportation Research Board (TRB), the Federal Highway Administration (FHWA), and the Research and Innovation Technology Administration (RITA) from the United States Department of Transportation. The focus of the exchange was "Research Implementation and Leadership Engagement."

On day one of the exchange, each participant gave a 20-minute presentation on how research was implemented in his or her organization and the role that leadership played in that implementation. On day two, participants attended the Utah Department of Transportation Annual Conference where they presented shortened versions of their presentations to transportation professionals from around the state of Utah. Participants were also invited to look around the conference so that they would have a greater understanding of how UDOT functions and become familiar with the research that is being done in Utah. On day three, participants engaged in a wrap up of the exchange. They addressed the following questions:

- "How does research support your leadership?"
- "How does your leadership support research?"
- "What are your top suggestions for involving your leadership?"

3.0 PROCESS

The Utah Department of Transportation (UDOT) held a Research Peer Exchange on October 29-31, 2012 in Salt Lake City, Utah. To prepare for the exchange, the team received a package of information including the following:

- Travel information
- A tentative meeting agenda (Appendix A)
- A contact list of participants (Appendix B)

3.1 Presentations

As part of the exchange, participants were asked to give twenty minute presentations about their programs innovations and implementations. Following each presentation was a brief discussion of the research program. This allowed participants the ability to highlight innovations and implementations that have been successful within their respective organizations. This gave the panel members different perspectives on how to be successful in their research programs.

3.2 UDOT Annual Conference

On day 2, the participants were given the opportunity to present an abridged version of their presentations at the UDOT Annual Conference. This gave transportation professionals from different areas the ability to see what is being done nationwide in the area of transportation research. For the panel members, it gave them the ability to receive feedback from all levels of personnel that may be impacted by implementation of their research. This was a unique forum for communication between the research team and the field worker.

3.3 Deliverables & Debriefing

Day 3 allowed wrapped up the exchange by regrouping the panel to offer an observations and suggestions for the UDOT research team. They were asked a series of questions by the facilitators that provoked conversation about what was learned at the exchange and how the Peer Exchange process aided in furthering research innovation & implementation.

4.0 FINDINGS

4.1 Best Practices Observed From Presentations

The presentations of all participants in the 2012 UDOT Research Peer Exchange are summarized in the following section. They are listed alphabetically by the presenter's last name. The complete presentations are in Appendix C.

4.1.1 "*Integration of Implementable Research in Oklahoma*" Ron Curb (Oklahoma DOT)

An overview of the implementation options in Oklahoma was presented followed by a discussion of focus topics for the implementation of research.

Implementation Options

- There are instances where change is not justified
- Feedback can be considered implementation
- New engineering guidelines were created
- Technology transfer can be considered implementation

The Long Term Pavement Performance (LTPP)

- Used in the development of useful software tools, manuals and guidance documents.
- Been in operation for over 25 years, millions of measurements on pavement

Implementable Research

- New product evaluation program
- Transportation pooled fund studies
- University Research - Collaboration with eight different universities
- AASHTO technology implementation group

Integration Focus Topics

- Road Pavement Profilometry (Timeline integration)

- Purchased equipment for profilometry and calibrated the equipment
- Followed FHWA incentive program and shared results
- Hosted a Webinar on the topic 10/23/12
- In the process of establishing a certification procedure

- Pavement Design (Collaborative)
  - Pavement design guide in need of updating/ overhaul
  - Built test track in 2000 and continue to test experimental pavement cycling

- Scour Stop (Independent)
  - A transition mat to replace hard armor
  - Placed in ditches and river banks to slow or stop erosion

- Quick New Product Implementation
  - MIT Scan T2 (Measures thickness without coring)
  - Pipe Underdrain Inspection Service (On Demand, DVD recording)

- Continuous Implementation
  - Herbicide research & roadside vegetation management

4.1.2 "*Implementing SHRP 2 Products: Secrets to Success*" Jerry DiMaggio (SHRP2)

SHRP2 is a special-purpose research program that follows a non-traditional approach to meet customer-oriented goals. Currently, 27 states participate in the program, which engages in 100+ research projects, produces 65+ useable products, and are partners for prioritizing implementation. SHRP2 focuses on four areas: safety, renewal, reliability, and capacity. An overview of their three year plan was provided and is summarized below.

Development of a Three-Year Plan

- Includes safety, product development, product implementation, marketing, IT support, and program management.
- Find target audience & barriers to implementation
- User support, training, marketing of the program
- Conducting implementation workshops & strategy sessions
- Implementation of an evaluation process

4.1.3 "*TIMELab Research: Assessment of Sign Retroreflectivity Compliance for Development of a Management Plan*" Kevin Heaslip (USU)

The Transportation Infrastructure Management and Engineering Laboratory (TIMELab) specializes in transportation operations, intelligent transportation systems, transportation maintenance & asset management, alternative fuels, and automation & electrification. The lab is part of the Utah Transportation Center which is a member of the Mountain Plains Consortium Regional UTC and has received $4.9M in funding since 2008. An overview of research on retroreflectivity was provided.

Retroreflectivity (MUTCD Minimum Standard)

- Collected data on sign type, sheeting type, orientation, etc.
- Utah has 91% compliance, Type I sheeting needs replacing (98% failure)
- Blanket replacement needed, inventory should be in OMS
- QR code for new and replacement installations that will provide sign information
- Nighttime visual inspection is effective (Engineering interns)
- USU is in the process of developing a mobile app to collect and archive sign data

4.1.4 "*Assisting State DOTs Deploy Research*" Stephen Maher (TRB)

Return on research investments only occur when research is put into practice. Researchers must direct how the product can best be put into practice but other agencies. However, the cost of implementation can be an additional $10M to implement

research, in addition to $10-14M previously funded to conduct the research. Practice ready papers are selected for the TRB Annual Meeting and are indexed in TRID, by March of each year. All papers on the Annual Meeting Compendium of Papers are indexed in TRID as well. A discussion on deployment and implementation strategies followed.

Deployment

- Practitioners need to be brought on board early in research
- Cost of deployment of a research can be as much as 10x the cost of research
- Marketing & Communications are imperative
- "Research Pays Off" in TRB circulations highlights research implementation
- Database of practice ready papers on TRB site that is easily searchable
- "You don't have to do research to implement research"

Different Forms of Implementation

- Tech assistance
- Standards, specs, guides, and manuals
- Follow on research
- Training and education

4.1.5 *"WyDOT Research Center"* Tim McDowell (Wyoming DOT)

An overview of WyDOT Research was presented focusing on the business aspect of research. Research should be profitable and should consider uncertainties including: politics, price volatility, legalities, environmental factors, and right of way issues. These include:

- Reduction in design time
- Utilization of revenue projections in the "pipeline"
- Utilization of critical project draining approach
- Reduction in holding costs
- Effective utilization state funds

Evaluating the Department of Transportation Research Programs (A Study Conducted by the University of Wyoming)

- Objective: Evaluate methodology & make recommendations
- Push for outcome based research
- Evaluation done in 2007 resulted in 10 performance measures
    - Group projects by strategic intent and project category
    - 8 out of 10 performance measures were utilized
        1. Number of needs statements submitted
        2. Outcomes of the research projects
        3. Number of research reports completed each year
        4. Percentage of administrative costs to project funding
        5. Funds requested vs. funds available
        6. Percentage of projects completed on time and on budget
        7. Cost benefit analysis for projects and the research program
        8. Additional evaluations & analysis

WyDOT Research Program

- Funds $1M in research annually
- Research Advisory Council (RAC) meets four times per year
- Mission Statement: *"To enhance the economic well-being and quality of life in Wyoming by working with public and private partners to produce a safe and efficient transportation system"*
- 82% of funding is contracted research, 16% pooled fun studies, and 2% in-house
- Safety projects have the greatest funding (wildlife is it's own category)
- 9/15 contracted research projects were solicited by WyDOT
- There are three outcome categories (knowledge, product & standards)
- Completion rate of 63/65 in 3 years. (All pooled studies went over time)
- They have decreased administrative costs from 18.6% to under 10%
- There is a post research performance evaluation to be completed
- Improving online access to research reports a priority

WyDOT Conclusions:

- Overall, quite effective and proactive
- 80% of projects from 2005-2010 were being implemented
- 100% of pooled fund and in-house projects were funded
- 85% of contracted research was funded
- 100% of contracted and pooled research projects were completed within budget (88% within timeline)
- Research projects averaged a 96% on performance evaluations in phase 1
- Research projects averaged a 83% on performance evaluations in phase 2
- For pooled fund projects, the RAC should receive a formal presentation before voting on budget/ time extensions
- Performance evaluations should be implemented within WyDOT's research program

4.1.6 "*Every Day Counts Technology Initiative*" John Moulden (FHWA)

The need for the Every Day Counts Technology Initiative this emphasized by an implementation time of 12 years for all 50 states to implement SuperPave technology. The mission of the initiative is *"To identify and deploy readily available innovation and operational changes that will make a difference and to identify policy or operational changes required to advance system innovation in the longer term"*. To accomplish this, there should be a continuous collaboration with all stakeholders. All accelerated deployment innovations were selected in collaboration with stakeholders.

Selection Criteria:

- Market ready and meets the needs of the user
- Compliments strategic goals
- High success potential and ability for widespread application
- Adequate deployment and technical support
- Can work with other technologies
- Measurable outcomes and opportunities to enhance further deployment efforts

- Meets legal/ regulatory requirements
- Resource and support partners available
- There are 8 stakeholder technical panel members

Warm Mix Asphalt

- Allows a reduction in asphalt mixture production and placement temperatures
    - Better compaction
    - Less worker fatigue
    - Less fossil fuel consumption and reduction in CO_2
    - Longer paving season
    - Longer hauling distances
- Production temperatures reduced by 30-70°F

Precast Bridge Elements

- Prefabricated bridge elements and systems manufactured on-site or off-site, under controlled conditions, and brought to the job location ready to install
    - Minimizes traffic & community impact
    - Improves construction zone safety
    - Improves bridge designs constructability
    - Increases quality & lowers life-cycle costs

Geosynthetic Reinforced Soil

- Fast, cost-effective bridge support method using alternating layers of compacted fill and sheets of geotextile reinforcement to provide bridge support.
    - Eliminates approach slab or construction joint at the bridge-to-road interface
    - Reduced construction time (complete in 10 days)
    - 25-60 % less cost depending on standard of construction
    - Less dependent on weather conditions
    - Flexible design (easily modified for unforeseen site conditions)
    - Easier to maintain because of fewer parts
    - Built with common equipment and materials

Safety Edge

- Sloped pavement edge at a 30° angle
    - Allows drivers more controlled re-entry back onto the roadway after tire drop off
    - Reduces crashes due to edge drop-off and uncontrolled recovery
    - Minimal cost (less than 1% on 2-lane highway)
    - Consolidated edge and reduction in edge raveling
    - Increases durability

Adaptive Traffic Control Technology

- ACS measures traffic flow and adjusts signal timing to promote smooth flow of traffic along arterial streets
    - ACS improves travel time reliability
    - Reduces congestion and creates a smooth traffic flow
    - Increases long-term viability of traffic signal operations
    - Widely deployable using existing control equipment

Round-Two Initiatives:

- Reduce project delivery time and construction time
- Innovative contracting
- Safety
- Environment
- Mobility

New website will go live at TRB Annual Meeting January 2013

4.1.7 "*Transportation Research Innovation & Implementation: Promising Research*" Linda Narigon (Iowa DOT)

Iowa focused their research and innovation presentation on the safety of teen drivers in the State of Iowa. By having the youngest national driving age, Iowa has placed a great deal of

importance on keeping teens safe behind the wheel. Because of this, their research has gained national recognition and been implemented by American Family Insurance - Teen Safe Driver Program.

Iowa's Main Focus Areas

- Safety, Winter maintenance, Structures, and Concrete pavements
- In addition, human factors and intelligent construction are growing areas

Iowa's Graduated Drivers License

- Emerged from research in the 1990's (implemented in 1999) and evaluated several times since
- More than a 50% decrease in moving convictions involving 16-year-old drivers from its implementation through 2004.
- 36% of 14-year-old drivers involved in crashes were alone despite restrictions
- Use of video in teen driving – age vs. experience
    - 50% of participants received no feedback
    - 50% received a video of their driving that was watched with their parents
    - "Unsafe events" triggered recording of a 20 second clip (Sudden breaking, acceleration or swerving) -8 seconds before and 4 seconds after trigger event
    - Parents received a weekly report card that described data in a narrative form
    - Crashes increase 10-fold when the teen begins driving alone and then decreases at a moderate rate over several years
    - More young passengers lead to more crashes
    - Most serious crashes occur before midnight
    - User acceptance is critical for success
- Three groups monitored (90 participants total)
    - 14.5-15.5 year olds
    - 16 year olds who never held a school license
    - 16 year olds who have had a school license for at least 4 months
- Timeline
    - 4 weeks of no feedback (Baseline pre-intervention)

    - 16 weeks of feedback
    - 4 weeks of no feedback (Baseline post-intervention)
- Conclusions
    - Dramatic change in driver behavior was noted with the feedback
    - Age made no significant difference in the number of events
    - A distraction was present for 23% of events

Go-Team Project

- Evaluation of the context and detail of fatal teen crashes
- The "Go-Team" was assembled with experts in driver behavior, Iowa crash data, traffic engineering, and logistics
- Purpose of the Go-Team was to examine crashes as quickly as possible and gather as much information as possible to examine causation.
- Collision had to involve at least one driver under the age of 19
- 88 Fatal crashes
- Resulted in legislative changes that yielded a significant decrease in fatalities

4.1.8 "*Successful UDOT Research Projects*" Kevin Nichol (Utah DOT)

UDOT gave an overview of projects that have been successful for UDOT's research program. The purpose was to give participants the ability to see Utah's research accomplishments.

UAV Technology

- Goal: Improve high-resolution imagery along highway corridors
- Hand launched/ autonomous
- Low cost, but requires FAA approval

Native Fish Passage

- Goal: Improve upstream passage through culverts of non-salmonid native fishes in an economical fashion

- In lab testing discovered that small fish do best with a natural substrate that scales to size of fish and field tests corroborated lab results

Construction Machine Control Guidance

- Goal: Develop procedures to use CMC
- Developed guidelines
- Refined implementation
- Recommend inspector training
- Outlined survey control needs

Wildlife Crossing Structures

- Goals: Identify ideal culverts for wildlife
- Found ideal size and shape to encourage use of culverts

Benefits of Research

- 46 deliverables
- $4.81M spent, estimated $80.8M cost benefit (17:1)
- Highest cost benefit was on large projects & safety

4.1.9 *"SDDOT Research Implementation Process"* Daris Ormesher (South Dakota DOT)

The focus of the South Dakota presentation was an overview of the research process from inception to implementation. It showed the checks and balances practiced by South Dakota and how the different roles influenced research innovation and implementation.

Research Roles

- Research review board
    - Secretary of Transportation, SDDOT Region and Division Directors, Federal Highway Administration Representative, County Representatives, and the South Dakota Board of Regents

- Roles within the Process
    - Office of Research (manage & perform research)
    - Technical Panels (monitor & evaluate research)
    - Universities & Consultants (suggest & perform research)

Research Process

- Conception, Definition, Execution, Implementation, Tracking, and Evaluation

Everything is reported back to the research review board during the research process

Implementation Process

- Plan approval
- Research summary, objectives & outcomes and products defined
- Target audience is identified
- Implementation approach is outlined
- Implementation roles & responsibilities are defined
- A schedule is set
- Resources are listed with an estimated cost and the source of funding
- The tasks are monitored by their progress & percent completion
- Impact areas are evaluated

4.1.10 "*Study of ITD's Maintenance and Pavement Management Needs*" Ned Parrish (Idaho Transportation Dept.)

Idaho's research program recently funded a review if IDT's Maintenance and Pavement Management systems. The process of evaluating the old system, reporting the findings and implementing the new system was documented in this presentation.

- Project was funded in 2007 with a budget of $75,000
- Interviewed 40+ staff about management practices
- Researched best practices from other states

- Maintenance management is top priority.
    - Should be accessible to all staff
    - Linkage to PMS, AMS & GIS
    - Easy of use a priority
    - Maintenance management costs: $2.7M one time cost and $300,000 annual maintenance

<u>Current Pavement Management System</u>

- Meets some needs but system lacks tools and accessibility
- District 6 pilot projects helps, but not for statewide use
- Pavement management costs: $950,000 one time cost, $50,000 annual license
- Research addressed the lack of maintenance management system decommissioned in 2005
- Limits of current pavement management system
- Research had high level champions and was supported by staff
- Competitive bid process made for high quality contractors for research and development
- Research provided the information needed to overhaul the current system
    - Limitations of current system
    - Best practices from other states
    - Agency needs
    - Cost estimate
- Documentation of audit recommendations
    - Research results were presented to the Idaho Transportation Board
    - DMV fees increased to cover the cost
    - Executive order to implement the system
    - Implementation took about two years, completed under budget
    - Personnel structure was integral to the success of the project
    - Communication with users in each district to understand user needs
    - “Super user” assigned to each district
    - Continuing research for improvement of systems

4.1.11 "*Stewards of Transformative Change: How Minnesota Facilitates Progressive Research and Implements Innovative Ideas*" Nicole Peterson (Minnesota DOT)

The focus area of this presentation was successful research and implementation of Minnesota's research program. This not only focused on specific projects that were completely successful, but also projects that encountered difficulties along the way and how they were overcome.

MnDOT Overview

- State highway maintenance
- Operations, design and construction
- Multimodal system support and development
- Financial aid for local roads
- Funding $10.8M per year
    - 30% State research program
    - 27% Local roads research board
    - 29% FHWA
    - 3% Cooperative program for transportation research & studies
    - 10% Other

Largest amount is spent on administration followed by materials & construction then traffic & safety

Research Management

- Identify and track needs, Develop & fund projects, Execution, and Implementation

Evaluating the Cost & Benefits of Living Snow Fences (LSF)

- Average of 8 fatalities/ year because of hazardous road conditions
- 40% of hazardous locations contracted would save $1.3M/year
- MnDOT pays farmers to leave a standing row of corn as a snow fence
- LSF improves road conditions and lowers maintenance costs

- MnDOT experienced difficulties contracting farmers
- MnDOT determined that the payment was not sufficient
- MnDOT contracted for a LSF calculator that located the most problematic sites and optimized the payments
- Solutions for the LSF project
    - Payment- more flexibility in payment and a better valuation of the land, maintenance, and inconvenience of the LSF
    - Prioritization- Target high incidence landowners with a bonus incentive
    - Promotion- Educational materials to farmers, door to door visits, incentives and training
- Next actions
    - Modifications based on recommendations
    - Snowplows equipped with GPS to show where LSF are needed
    - Research best plant species for LSF

<u>Impacts of Playground Warning Signs on Vehicle Speed</u>

- Residents request the signs for local playgrounds
- Agencies want to install minimum number of signs
- The objective was to evaluate the efficacy of the signs on vehicle speed
- Findings of the Playground warning sign research
    - Signs did not affect average vehicle speed
    - Vehicle speed correlated to playground traffic & activity
- Resulted in a handbook outlining preferred sign placement for engineers
- Gave government officials the knowledge to address citizen requests

<u>Standard Sumps and the SAFL Baffle as Economical Solutions for Stormwater Treatment</u>

- Goals:
    - Minimize the sediment and effects of storm water run-off and comply with state and federal environmental regulations
    - Evaluation of current sumps and sumps with a SAFL baffle to increase sediment retaining efficacy

- What was learned:
    - The baffle was effective in increasing sediment capture and minimizing washout
    - Shallow sumps still had a high washout rate, but increasing the diameter can mitigate it
- Resulted in 50+ SAFL Baffle installations.
- Average equipped sump reduced sediment removal to ¼ its previous cost
- Licensed the SAFL Baffle to Upstream Technologies
- Barr Engineering has developed software for sizing manholes and SAFL Baffles
- Shows the benefits of collaborations for optimizing commercialization

4.1.12 "*Implementation of Research Results at MDT*" Sue Sillick (Montana DOT)

Management involvement and support, an enthusiastic champion, personnel involvement, coordination and collaboration, implementation consideration, product development, and the tools and funding required for implementation are the things necessary for any project to be successfully implemented within a research program. The projects overviewed in this presentation had all of these characteristics.

Overview of MDT Research

- Federal funding of $2.3M in 2013
- $1.2M in earmarked funding & $786,000 in pooled funding studies
- Research is directed by MDT executive management
- Focuses on the customer and funds applied and implementable research
- Continuous process & program improvement

Research Projects Program

- Solves problems, objective reporting, improves efficacy and efficiency
- Research review committee (RRC)
    - Determines priority
    - Approves funding
    - Reviews progress and implementation recommendations

- Technical panel
    - One assigned to each research project
    - Oversees the project from inception to implementation
    - Determines research needs & products necessary for implementation
    - Develops scope
    - Determines research venue
    - Reviews projects & makes implementation recommendations
- Implementation
    - Always deliberated throughout the project
    - Management involvement
    - Need a champion
    - Always consider implementation in every stage of the project
    - Eliminate barriers
    - Provide the tools and funding necessary for implementation

<u>Montana Rest Area Design</u>

- Usage evaluated (water & effluent flow, pedestrian & vehicle traffic)
- 10 Guidelines developed
- Overhauled 6 rest areas to make them more efficient
- Designed one new rest area using guidelines
- Reasons for success
    - Management involvement
    - Coordination and collaboration
    - Implementation considered from the beginning
    - Developed products for implementation
    - Tools and funding provided for implementation

<u>Portable Concrete Barriers</u>

- Problem identified by construction crews, chief engineer requested the research
- Combined inventory with research for improvements

Ride Specification Review

- Compare MDT with state of the practice
- Developed the test method, manual, ride specifications, implementation activities, and a final report
- Changed ride specifications and pay adjustments
- Trained personnel

Temporary Erosion and Sediment Control

- State of the practice, user survey and organizational structure review
- Completed two manuals, fact sheets and detail drawings
- Implemented a training program
- Generated two reports
- Conducted a two year implementation review
    - Added staff and a rate schedule committee
    - Revised the construction manual
    - Continued use of training

Experimental Projects Program

- In house research
- Annual meeting
    - Discusses design, construction, maintenance
    - Communicates information on experimental projects
    - Gives feedback
- Performance measures
    - Number of topic statements, Number of projects, Expenditures by subject area
    - On time, budget, scope
    - Cost sharing and partnerships
    - Overhead costs
    - Exit surveys
    - Number of publications
    - Implementation

4.1.13 Kevin Womack (RITA)

Dr. Womack focused his discussion on the need for research to be marketed and communicated effectively. Without effective communication of the research payoffs there is a concern that the agencies in control of funding will make budget cuts that will negatively impact research innovation and implementation. Documentation of research benefits is imperative to its survival.

U.S. Department of Transportation
Research and Innovative Technology Administration

- RITA coordinates modes.
- Questions are brought to RITA in regards to research.
    - "What's the value on research?"
    - "What's the return on investment?"
    - Gave typical answers "Hard to gauge"
    - Need to be concerned that this question keeps getting asked
- Research is a first cut in budgets (MAP21 is helpful)
- Had staff put together a briefing book for Washington of 150 success stories
- Implementation and value of research at RAC meeting
- Without implementation, value cannot be calculated
- Research HUB (Database of all federally funded research projects, outcomes & implementation)
- SHRP2 has an implementation component to the program.
- Researcher should work with DOT to implement the research and document it's benefits.
- Have higher expectations of researchers to help to implement.
- If not implemented, have an explanation (no funding etc.)
- Funding is at risk if there is no measurable value
- UTC's are filling out forms for DOT (Implementation forms)

4.2 Impressions of UDOT and Evaluation of the Exchange

4.2.1 Question: "*What are your suggestions for UDOT's research, annual conference or anything other aspects?*"

The main suggestion by participants for the UDOT annual conference was to label conference sessions in such a way that attendees are interested in the product (highlight research topics not research itself). A good way to market research to the people that need to see it is to make sure that the conference is putting forward their research in a way that allows people to see the value. Having a research member involved in the planning will allow them to give a venue to show these advantages as opposed to being a footnote at the conference.

Additionally there were suggestions for the UDOT website. The website should be broadened so that it is easily understood that UDOT is not the only entity conducting research. Highlighting the contracted agencies carrying out the research will allow a greater understanding of how research is conducted for UDOT. Additionally, new research innovations should be highlighted on the front page of the website so that the payoff of the research investment is seen immediately.

Other suggestions included that innovation needs to be trained. It is often thought that it will happen automatically and that is not a realistic way of thinking. There are ways to encourage innovative behaviors. One such way is to have an award offered yearly for innovative thinking and leadership. This is not something that has to be limited to UDOT employees, but should extend to private companies and universities.

Having the correct people involved can make a large difference. If you have people involved that are a part of the selection process, it can help to prioritize your research. Also, utilizing various committees such as RAC or AASHTO will allow you to promote your projects to people who have an interest in the area.

Another aspect to be considered is what kind of need there is for the research. Targeting a national audience lends itself to a greater likelihood of funding. If you focus on regional needs, you significantly narrow your audience.

It has been suggested that the term marketing is not appropriate for what researcher need to do to champion their work. Jerry DiMaggio (SHRP 2) suggested that "Outreach and Communication" might be a better route to take. This allows researchers to change their tone from one of boasting, to more of an informative perspective. This can be done in a newsletter or on the website. The newsletter should be targeted to audiences that would be interested so that there is not an overload of information. Targeting will allow the information to reach the people necessary and make it more likely that the research will get a champion.

To gain recognition, there were several suggestions for UDOT. One was to brand their research. One way to do this is to make sure that all presentations are given in the same format. Also, plan to have someone to market and obtain "visuals" of research being done. Having various photo or video shoots throughout the project will ensure that people are able to see and grasp the work that is being done.

The last suggestion for UDOT was that they have greater communication between their engineers and learn how to communicate what is being done as well as communicate what needs to be done. It is imperative to be able to relate the needs of the engineers and workers to the consumer. That will also include the ability to equip management with several talking points that they can easily remember and use in unexpected circumstances. It is helpful to be able to successfully champion a project when you run into someone in an unexpected place.

There was also praise from the 2012 Exchange participants in regards to UDOT's research program.

- "UDOT does have a culture of innovation and sees itself as a leader in moving transportation forward" –Ned Parrish (ITD)
- "UDOT has a reputation for innovation nationally." –Jerry DiMaggio (SHRP 2)

- "This is purely a function of who is leading UDOT right now" – Kevin Womack (RITA) (In regards to John Njord and Carlos Braceras)

4.2.2 Question: "*How does research support your leadership?"*

The overwhelming theme when participants were presented with this question was communication. There were examples of visiting the regions to understand their needs and even talking to the workers on site, offering them an environment where they would feel comfortable giving voice to their ideas. There was also the implementation of a research review board. Many DOT's met with their boards on a quarterly, monthly or as needed basis. Ormesher (SD DOT) referred to the Research Review Board as "Problem-Solvers". They are called in whenever a problem in encountered, whether it is project related, personnel, or even upper management related.

Another form of communication that was offered was the publication of a newsletter. This is something that conveys what is being done in research. It was recommended to do targeted circulation so that the subscribers don't begin to ignore the emails. Maher mentioned that in Virginia, they go as far as to have the governor issue a press release about the research being conducted.

Awards were also given in two different states honoring research innovation, giving recognition and inspiring people to come to the research division with innovative ideas. These were given annually and to entities not necessarily within the DOT. In Wyoming, their LTAP has the "Show Me" award, presented to anyone who finds a better way of doing something.

Another underlying current, was to offer assistance whenever possible. Reducing red tape to allow a project to move forward is essential. Also making sure that you say yes as often as possible. With this it may need to be altered to a "Yes. But..." but offering a yes is appreciated by the people you work with. It allows them to see you as someone who is enabling their success instead of putting up barriers.

4.2.3 Question: "*What would be the one thing from senior leadership that you would like to see?*"

Senior leadership can provide strategic direction to the DOT research department in order to match research goals with the goals of the greater organization. Nearly every DOT representative in the room echoed this sentiment. Also, they need support to take chances in their research. There was the feeling of an inability to take risks and therefore "play it safe", leading to less innovation.

It was also mentioned that there seemed to be a lack of regional champions. Because of this, there are regional needs that are not being addressed by the DOT. Perhaps the staff presenting an urgency of the research needed and its payoff upon completion could also help.

4.2.4 Question: "*How does research support your leadership*?"

When it comes to research supporting leadership, research funding is a large contributor. DiMaggio (SHRP 2) pointed out that UDOT has not participated in the SHRP 2 implementation program. Parrish mentioned that he has been struggling with getting information about the SHRP 2 program. At this time, Sillick (MDT) mentioned that in her attempts to get research funding from SHRP 2, she has been denied because of the geographical size of Montana. Narigon mentioned the turnover of RAC members and thought this might be a reason for the problems with information dissemination. Concluding remarks showed that there need to be more efforts in linking leadership of the DOT to the research programs.

4.2.5 Question: "*What type of relationships do you have with your UTC's?"*

This discussion came about in regards to research funding. In addition to SHRP 2, the UTC program is a good opportunity for research funding for state DOTs. There seems to be a good working relationship between the DOT's and their respective UTC's. As the program has developed after the most recent round of awards, the disagreements have been able to be worked out and they are working well for the DOT's. The one complaint across the board in working

with a UTC has been the writing of final reports. The way the university system is set up, there is no credit given to a university researcher for a report at the end of a research study. As a result of this, the reports being turned in are subpar and often need to be rewritten. The University system is unlikely to change its requirements, and so the task falls to the DOT to get an acceptable report. McDowell (WyDOT) suggested that the report should be written into the budget from the beginning. Narigon (IDOT) stated that they put a technical writer into the budget of every project to teach technical writing skills. She also suggested that perhaps a few states could pool funds to hire on a fulltime technical writer.

Writing seems to be the largest problem when working with universities. There is no incentive from the university who is ultimately responsible for the researchers employment. It seems that many university researchers are delegating writing to graduate students who have English as a second language. Native English speakers, however, seem to write just as poorly. It is a problem that will need to be continually addressed.

4.2.6 Question: "*What are your top suggestions for involving your leadership*"

The most recommended topic seemed again to fall on communication. Communication was broken down into subcategories such as researcher engagement, getting to know all new management in a timely fashion, and monthly meetings between researchers, project managers, and the review boards. It was suggested that serving on a national board (NCHRP, FHWA) would help with the communication between the DOT and funding agencies.

Documentation is also vital to the success of leadership. Being able to have a successful report that others can emulate can be very beneficial. Maher (TRB) also suggested the publishing of an annual accountability report that will show the benefits of the research being conducted. This stresses the importance of being able to market what your successes in research are and how they have benefitted the consumer.

APPENDIX A: MEETING AGENDA

udot.utah.gov

Research Implementation & Leadership Engagement
2012 UDOT Research Peer Exchange

Sunday, Oct. 28
(Arrival to Salt Lake City/Little America Hotel)

6:00 - 9:00 PM	Group Dinner at Stoneground Restaurant *(Optional)* ~249 East 400 South, 2nd Floor

Monday, Oct. 29
(Little America Hotel - Uintah Room)

7:00 - 8:00 AM	Breakfast Provided in the Uintah Conference Room
8:00 - 8:30 AM	Welcome & Introductions - Cameron Kergaye
8:30 - 9:00 AM	Overview of the Peer Exchange - Cameron Kergaye
9:00 - 10:00 AM	Presentations - 30 Minutes/Participant ~ Examples of DOT research that have led to implementation
10:00 - 10:15 AM	Break
10:15 - 11:45 PM	Presentations - 30 Minutes/Participant
11:45 - 1:00 PM	Lunch at the Grand America Hotel
1:00 - 3:00 PM	Presentations - 30 Minutes/Participant ~ Examples of DOT research that have led to implementation
3:00 - 3:15 PM	Break
3:15 - 5:00 PM	Discuss Criteria for Selecting Implementable Research ~ What are the indicators of implementable research? ~ How do you measure implementation or adoption? ~ How is implementation encouraged or proscribed?
6:00 - 9:00 PM	Dinner at Rodizio Grill ~Trolley Square, 600 South 700 East, 2nd Floor

Tuesday, Oct. 30

(UDOT Annual Conference, South Towne Expo Center, Sandy, UT)

7:00 - 7:30 AM	Shuttle to Conference Center
7:30 - 8:00 AM	Breakfast Provided at the Conference Center
8:00 - 12:00 PM	Peer Exchange Presentations - 10 Minutes/Participant ~8:00 - 9:30 Moulden, Maher & DiMaggio (35) ~10:00 - 10:50 Sillick, Parrish, Narigon, & Curb (44) ~11:00 - 11:50 Ormesher, McDowell, Taylor, & Nichol (53)
12:00 - 1:00 PM	Lunch Provided at the Conference
1:00 - 5:00 PM	Breakout Sessions (See Information Provided) ~Participants may attend up to three sessions.
5:30 - 7:30 PM	Dinner Banquet at Conference
7:30 - 8:00 PM	Shuttle Returns to Hotel

Wednesday, Oct. 31

(Little America Hotel – Uintah Room)

7:30 - 8:30 AM	Breakfast Provided in the Uintah Conference Room
8:30 - 9:00 AM	Discussion & Impressions of the UDOT Annual Conference
9:00 - 10:30 AM	Engaging Your Leadership in Research ~How does research support your leadership? ~How does your leadership support research? ~Top suggestions for involving your leadership.
10:30 - 10:45 AM	Break
10:45 - 12:00 PM	Lessons Learned from the Peer Exchange
12:00 - 12:30 PM	Summary Remarks
12:30 - 1:30 PM	Boxed Lunch Provided
1:30 - 4:30 PM	Tour of UDOT's CFI, DDI & TOC *(Optional)*
7:00 - 10:00 PM	Utah Jazz vs. Dallas Mavericks Basketball Game *(Optional)*

APPENDIX B: CONTACT LIST OF PARTICIPANTS

2012 UDOT Research Peer Exchange Attendees		
Name	**Affiliation**	**Email**
Ron Curb	Oklahoma DOT	Rcurb@odot.org
Jerry DiMaggio	SHRP2 Program/TRB	JDiMaggio@nas.edu
Kevin Heaslip	Utah State University	Kevin.Heaslip@usu.edu
Cameron Kergaye	Utah DOT	CKergaye@utah.gov
Stephen Maher	Transportation Research Board	Smaher@nas.edu
Tim McDowell	Wyoming DOT	Tim.McDowell@wyo.gov
John Moulden	Federal Highway Administration	John.Moulden@dot.gov
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Becky Winstead	Utah State University	Rebecca.Winstead@usu.edu
Kevin Womack	USDOT/RITA	Kevin.Womack@dot.gov

APPENDIX C: PRESENTATIONS

UTAH DEPARTMENT OF TRANSPORTATION
RESEARCH PEER EXCHANGE ~ OCT. 29-31, 2012

INTEGRATION OF IMPLEMENTABLE RESEARCH IN OKLAHOMA

Ron F. Curb, P.E., CPM
Engineering Manager
Engineering Services Branch
Planning & Research Division
Oklahoma Department of Transportation

IMPLEMENTATION

- Implementation should be the primary consideration throughout all stages and from all sources of transportation research and development.

OVERVIEW

- OPTIONS FOR IMPLEMENTATION
- BACKGROUND OF LTPP DATA
- SOURCES OF IMPLEMENTABLE RESEARCH
- INTEGRATION FOCUS TOPICS
- IMPLEMENTATION EXAMPLES
- SUMMARY

OPTIONS FOR IMPLEMENTATION

- no justification for change
- feedback for continuing research
- data for collaborative research
- new or revised test method
- equipment calibration procedure and subsequent QMS
- parameter testing for QA/QC
- construction control directive
- engineering design directive or guidance
- new / revised specification / standard drawing
- special provision / construction plan note
- technology transfer for equipment / material / software
- procedures training per organizational level

LTPP DATA

- Long Term Pavement Performance Program
- began operations in 1987 under the 5-year SHRP administered by the NRC of the NAS
- ProVal software
- Datasets aid in MEPDG inputs
- FWD Maintenance Manual
- *Long-Term Pavement Performance Manual for Profile Measurements and Processing* (FHWA-HRT-08-056) document, published in 2008.

http://www.fhwa.dot.gov/publications/publicroads/10septoct/03.cfm

SOURCES OF IMPLEMENTABLE RESEARCH

- Evaluation of New Technologies
- Transportation Pooled Fund Studies
- University Transportation Research Contracts
- Products from AASHTO's Technology Implementation Group

Evaluation of New Technologies

- Profilographs and Inertial Profilers
- Scour-Stop Product
- MIT Scan T2 Equipment
- Pipe Under-drain Inspection Equipment

Transportation Pooled Fund Studies

- Inertial Profiler Baseline
- Characteristics of Drainage Layers for MEPDG
- NCAT Asphalt Pavement Test Track

National Center for Asphalt Technology
NCAT
at Auburn University

University Transportation Research Contracts

- Local Calibration Data MEPDG ~ Flexible & Rigid Pavements
- ODOT FFY 2012 SP&R Item Number 2235 "Distress Modeling for DARWin-ME"
- University of Oklahoma on the I-35 instrumentation research project.
- NCAT Instrumentation on I-35
- Herbicide Research Program & Roadside Vegetation Management

Products From AASHTO's Technology Implementation Group

- AASHTOWare FOR MEPDG
- DARWin ME
- Initial JCP models from LTPP Data

INTEGRATION FOCUS TOPICS

- Road Pavement Profilometry (TIMELINE)
- Pavement Design (COLLABORATIVE)
- Erosion Mitigation (INDEPENDENT)

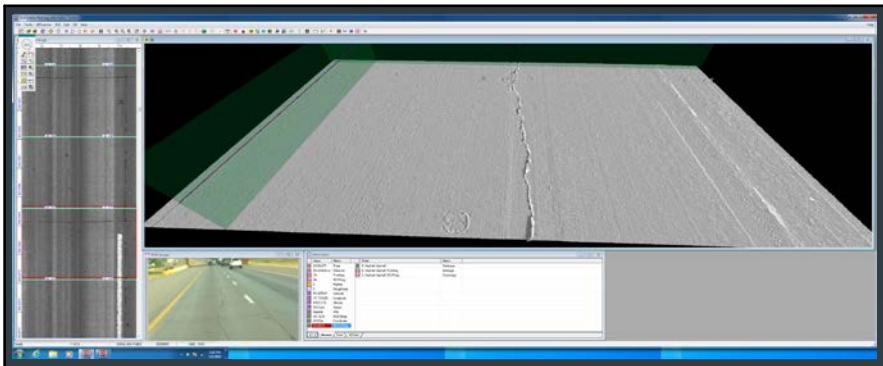
Road Pavement Profilometry (TIMELINE INTEGRATION)

- Early history of road smoothness testing and equipment
- Local profilograph and profiler cart purchase
- Local Validation of Profilograph & Profiler Equipment Calibration and Specification Compliance
- Equipment transferred to field office
- Quality Improvement Task Force Recommendation of Zero Blanking Band
- Incentive/disincentive process recommended by FHWA
- Pavement And Bridge Deck Smoothness Special Provision
- Shared the results with the industry

continued>

Road Pavement Profilometry (TIMELINE INTEGRATION)

- > continued
- Current participation in TPF-5(063) *Improving the Quality of Pavement Profiler Measurement*
- A webinar meeting was held on Tuesday October 23rd to finish the review of the AASHTO standards on what is needed for high speed inertial profilers and review the ProVAL future enhancements for prioritization.
- May establish a certification procedure and QA/QC guidelines for road smoothness
- Possible future longitudinal profiling capabilities using PaveVision3D technology



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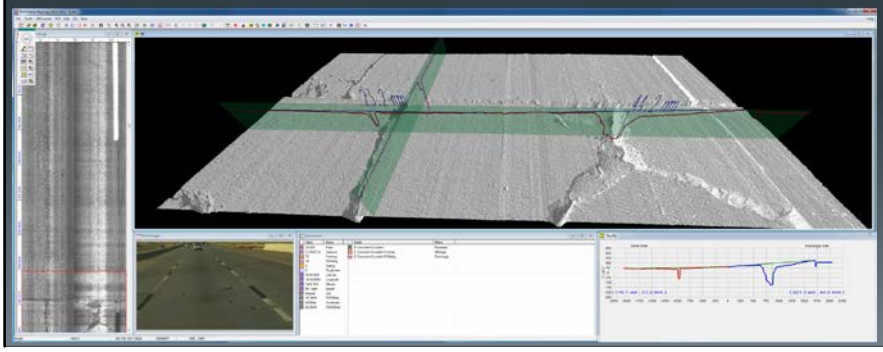


PCC

Pavement Design (COLLABORATIVE)

- Need for improved pavement design guide: new or rehabilitated, HMA or PCC
- LTPP data
- The 1993 AASHTO Guide for the Design of Pavement Structures
- AASHTO Joint Task Force on Pavements sponsored NCHRP 1-37A which resulted in a mechanistic-empirical pavement design guide and accompanying software.
- DARWinME software

continued>

Pavement Design (COLLABORATIVE)

- TPF-5(229) *Characteristics of Drainage Layer Properties for MEPDG*
- 2000, 2003, 2006, 2009 NCAT Pavement Test Track cycles, 10,000,000 ESALs per cycle
- TPF-5(267) *Accelerated Performance Testing on the 2012 NCAT Pavement Test Track (beginning)*

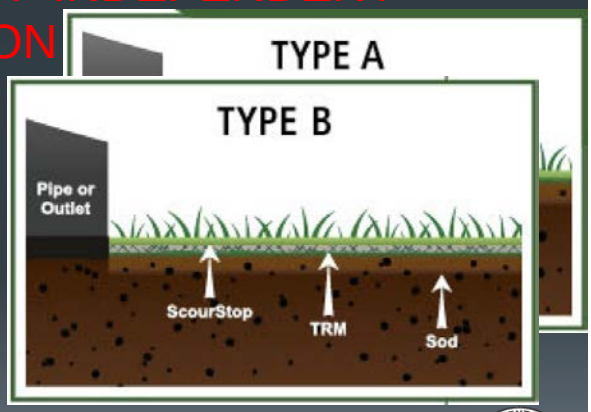
continued>

Pavement Design (COLLABORATIVE)

- ODOT SPR Item 2200 *Instrumented Pavement Construction on I-35, Purcell, Oklahoma*
- ODOT SPR Item 2208 *Development and Implementation of MEPDG for Rigid Pavements*
- ODOT SPR Item 2209 *Development of a Flexible Pavement Database for Local Calibration of MEPDG*
- ODOT SPR Item 2235 *Distress Modeling for DARWin ME, Phase 1*

EXAMPLE OF INDEPENDENT INTEGRATION

- Scour Stop product



http://www.scourstop.com/files/Install%2520Guide%2520Screen%25202.pdf

SCOUR-STOP

- ½" Polymer (Recycled)
- 4,000 pounds Tensile Strength
- Deep Anchoring

SCOUR-STOP

- IMPLEMENTATION:
  SERVING AS WASHITA RIVER BANK PROTECTION

SH74, 12 MILES SOUTH OF PURCELL , UPSTREAM FROM BR

EXAMPLE OF QUICK NEW PRODUCT IMPLEMENTATION

- MIT Scan T2 Equipment

NDT THICKNESS MEASUREMENTS FOR PORTLAND CONCRETE PAVEMENTS

- MIT SCAN T2 Equipment
- Sole Source Distributor
- Target Pricing, Selection and Calibration
- Construction Projects (AC, PCC, No CRCP)
- Significant Reduction in the Number of Corings Required

MIT-SCAN-T2

Measuring Device to Accurately and Non-Destructively Determine the Thickness of Asphalt Concrete or Concrete Pavements During Construction

NDT THICKNESS MEASUREMENTS FOR PORTLAND CONCRETE PAVEMENTS

- IMPLEMENTATION:
- ODOT COMMITTEE IN PROCESS OF DETERMINING EQUIPMENT QUANTITY NEEDED STATEWIDE AND FREQUENCY OF CORINGS FOR QA/QC & DEVELOPING SPECIFICATIONS FOR NON-DESTRUCTIVE THICKNESS MEASUREMENT OF AC & PCC PAVEMENT

PIPE UNDERDRAIN INSPECTION SERVICE

- Special Service Equipment
- On Demand
- Size Limitation = 18" minimum diameter
- 1000' long power/fiber optic cable
- DVD recording

Rover, camera & spool

Remote control & recording equipment

Specially Designed Trailer

PIPE UNDERDRAIN INSPECTION SERVICE

- IMPLEMENTATION:
  ESTABLISHED A STATEWIDE SERVICE TO INVESTIGATE PIPE UNDERDRAINS

EXAMPLE OF A NEVER ENDING IMPLEMENTATION

- Herbicide Research Program & Roadside Vegetation Management

Research Vegetation Management (RVM) Training & Consultation / Herbicide Research program

- Pesticide Applicator Certification
- Equipment Calibration Workshops
- Approved Herbicide & Adjuvant List (AHAL)

- Refinement of RVM Practices
- New & Generic Herbicide Formulations
- Tank Mix Compatibilites (Adjuvants/Herbicides)

- IMPLEMENTATION:

RESULTS INCORPORATED ANNUALLY INTO NEW VEGETATION SPECIFICATIONS

SUMMARY OF INTEGRATIONS

- (TIMELINE) National Inertial Profiler Developments with Local Validation of Profilograph & Profiler Equipment Calibration and Specification Compliance
- (COLLABORATIVE) MEPDG Software with National & Local Data Inputs for Pavement Design

SUMMARY OF IMPLEMENTATIONS

- (QUICK) Nondestructive Testing Equipment for Measurement of Pavement Thickness
- (SERVICE) Established Service to Inspect Underdrain Pipes
- (NEVER ENDING) Herbicide Research & Roadside Vegetation Management

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THANK YOU !

SHRP2 SOLUTIONS

STRATEGIC HIGHWAY RESEARCH PROGRAM

Implementing SHRP 2 Products: "**Secrets to Success**"

Utah Dot Peer Exchange: October, 2012

Jerry A. DiMaggio, SHRP 2 Implementation Coordinator

American Association of State Highway and Transportation Officials

AASHTO

The Voice of Transportation

U.S. Department of Transportation

Federal Highway Administration

TRB

Agenda

- A Brief history of SHRP 2
- Summary of the Success Secrets
- Implementation Continuum
- Definition of Success
- Know the Audience and Stakeholders: Assumptions
- Joint AASHTO/FHWA 3-Year Plan
- Budget and Next Steps
- Summary

2

A Brief History of SHRP 2

- Role of special-purpose research programs: focused, large-scale program of limited duration
- Success stories of first SHRP: Superpave, winter maintenance, high performance steel and concrete
- SHRP 2 proposed 2001; NCHRP with matching funds from FHWA develop detailed research plans
- SAFETEA-LU authorized the program
- $218 million, 9 years, ends 3/31/15

SHRP2 STRATEGIC HIGHWAY RESEARCH PROGRAM

TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES

SHRP 2 Origin & Philosophy

- Needs identified by State DOT and industry leaders—driven by customer-oriented goals:
  - Make highways safer: revolutionary change
  - Fix highways: address epidemic of aging infrastructure
  - Reduce congestion: increase physical and operational capacity
- Success requires non-traditional approach:
  - Multiple disciplines
  - Collaboration with non-DOT stakeholders
  - Portfolio from new knowledge to practical tools to allow existing innovations to be more widely used

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Four Focus Areas

- **Safety:** fielding the largest-ever naturalistic driving study to reduce crashes and save lives through understanding driver behavior
- **Renewal:** making rapid, innovative construction possible for "ordinary" projects
- **Reliability:** Providing management and technical tools to reduce congestion through operations
- **Capacity:** Systematizing collaborative decision making to achieve better, faster project decisions

SHRP2 STRATEGIC HIGHWAY RESEARCH PROGRAM

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Status of Research Program: The Numbers

- 106 contracts to date, 37 complete, 10-12 new contracts by end of 2012
- Nearly all of the $218 million is committed
- More than 500 expert committee members
- More than 300 research contractors
- 49 reports published or in production/review
- 30+ web tools, databases, software apps
- 24+ pilots conducted with state DOTs

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27 STATES PARTICIPATE IN 74 SHRP 2 ACTIVITIES

[SPRING 2012]

Development requires close collaboration with users and stakeholders to ensure that innovations work in real-world situations.

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Summary of the Implementation Secrets

- What's missing in our traditional technology deployment approaches? Develop and follow detailed Strategic and Tactical Plans!
- Implementation Continuum: Define products and additional developmental activities. Many products are new processes/procedures
- Define Success: have realistic expectations, locate champions and lead users, don't understand estimate IT complexities
- Know the Audience and Stakeholders: Assumptions
- Joint AASHTO/FHWA 3-Year Plan
- Budget and Next Steps
- Summary

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Research Development Implementa2on

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Research (2007 - 2013)
- 100+ research projects
- Administered by TRB

Development (Now through 2015)
- Conversion of research results into 65± products that are usable by implementing agencies
- Pilot testing and refinement of products

Implementation (2012 - forward)
- Partner agencies prioritize products for implementation
- State DOTs and other agencies integrate products into current transportation practices

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Development Activities

- **TRB is underway with development activities to convert research results into usable products through:**
- **Activities include development of:**
  - Guidebooks
  - Training programs
  - Model specifications and/or standards
  - Web tools
  - Webinars and workshops
  - Pilot tests of products (new technologies, IT and processes)

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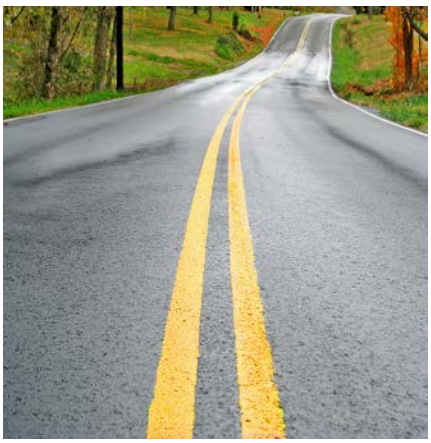
Define What Is Implementation?



1. Implementation is the **routine use** of a SHRP2 product
2. Carried out by **State DOTs** and other implementing agencies
3. Focus on **high-priority products** for national adoption, with lesser efforts on other products

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standard

provide continuing support

Cost-effective

13

14

Development of 3-Year Plan

- **A 3-year plan was jointly agreed to by AASHTO and FHWA based on the following considerations:**
  - **AASHTO and FHWA priorities**
  - **Year each priority product is ready**
  - **Logical bundling of products**
  - **6-7 products per year**
  - **Fiscally constrained to $81 million**
  - **Planning level cost estimates**
  - **Set asides for additional and cross cutting items**

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Set Asides Included in Plan

- **Safety Implementation**
- **Additional Product Development/Future Priorities**
- **Other Product Implementation**
- Marketing &Communications
- **IT Support**
- FHWA, AASHTO, TRB Program Management

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Product Level Implementation Plans

- Implementation goals and objectives
- Target audiences
- Barriers to implementation
- Implementation strategies and tactics
- Change management issues
- Roles and responsibilities for FHWA, AASHTO and others
- Governance structure (e.g. advisory committee)
- Hosting of web tools; IT requirements
- Updating of content
- User support
- Training
- Marketing/communications
- Budget
- Evaluation

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Next Steps

- Implementation Advisory Committee makes recommendation to FHWA and AASHTO
- Strategic implementation plans developed for bundles of products:
  - TCAPP
  - Reliability technical tools
  - Long life pavements
- Implementation plan workshops and strategy sessions to develop product-level implementation plans and to deploy products
- Implement a demonstration project program
- Develop and execute an evaluation process for the implementation program (near term/ long term)

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Next Steps

- **FHWA to develop contracts and identify roles of:**
  - Headquarters program offices,
  - Resource centers and
  - Divisions
- **AASHTO to identify resources for implementation and roles of:**
  - AASHTO committees,
  - Technology Implementation Group
  - AASHTO staff
- **TRB to develop plan for remaining development and support activities**
- **FHWA, AASHTO and TRB to jointly develop:**
  - IT Plan
  - Marketing and Communications Plan
  - Evaluation Plan

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Deployment

- **Routine use of products by lead states and other agencies**
- **Interest generated among other states and implementing agencies in use of products**
- **Adoption of standards, specifications, manuals by AASHTO**
- **Evaluation of impact on practice and benefits and value of use of SHRP2 products**

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SHRP2 SOLUTIONS

STRATEGIC HIGHWAY RESEARCH PROGRAM

THANK YOU!

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TIMELab Research: Assessment of Sign Retroreflectivity Compliance for Development of a Management Plan

UDOT Research Peer Exchange

Kevin Heaslip, Ph.D, P.E.

October 30, 2012

udot.utah.gov timelab UtahState University

timelab TIMELab at USU

- Transportation Infrastructure Management and Engineering Laboratory http://timelab.usu.edu
- Member of the Mountain Plains Consortium Regional UTC
- A collaboration of UDOT and USU
- Specializes in:
  - Transportation Operations
  - Intelligent Transportation Systems
  - Transportation Maintenance and Asset Management
  - Alternative Fuels for Transportation
  - Transportation Automation & Electrification

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Funding Profile

- $4.9 Million in funding since 2008
- Funding Sources
  - UDOT
  - WSDOT
  - USDOT/FHWA
  - AASHTO
  - Department of Energy
  - Forest Service

- Research and Workforce Development Mission

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3

Retroreflecivity and Nighttime Visibility

- MUTCD minimum retroreflectivity standard

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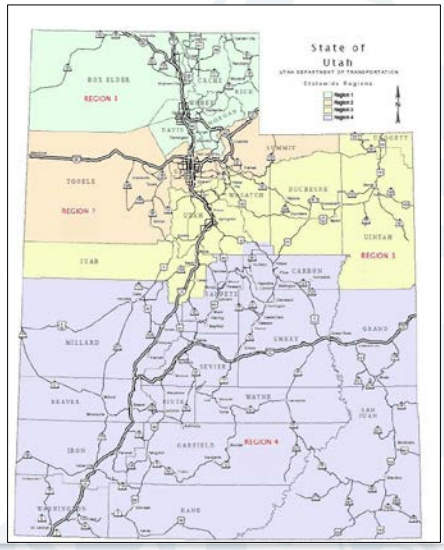
UDOT Operations and Site Selection

- Four Administrative Regions
- Regions Subdivided into Maintenance Stations
- Sampling Determined by Sign Densities



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Sign Attributes

- Data Collected Included
- Sign Type (MUTCD)
- Sheeting Type
- Retroreflectivity Measurements
- Orientation
- Mounting
- Offsets
- Installation Data

6

CLASSIFYING DAMAGE

A. Bending Damage B. Peeling Damage

C. Vandalism

D. Cracking Damage E. Other Damage Types

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Signs Surveyed

	Red				White					Yellow					Green					Other	
Region	III	III HIP	IX	XI	I	III	III HIP	IX	XI	I	III	III HIP	IX	XI	I	III	III HIP	IX	XI		Total
One	29	2	4	3	53	143	21	25	1	18	102	3	30	4	4	129	5	18	1	29	624
Two	24	13	15	0	0	10	36	28	11	1	21	6	12	5	0	21	8	14	12	12	249
Three	7	4	1	3	20	73	3	4	10	11	50	4	10	14	4	46	21	13	7	4	309
Four	88	12	4	13	13	99	18	20	9	7	79	35	27	8	7	58	4	18	15	0	534
Total	148	31	24	19	86	325	78	77	31	37	252	48	79	31	15	254	38	63	35	45	1,716

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Compliance Overview

91 % Overall Compliance

	Sheeting Type				
Color	I	III	III HIP	IX	XI
Red	0	6	0	0	0
White	46	0	0	0	0
Yellow	33	20	0	0	0
Green	9	3	2	5	0
Rejected	69%	3%	1%	3%	0%

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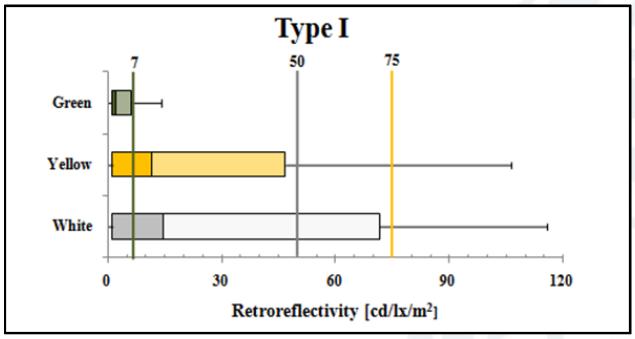
Type I Sheeting



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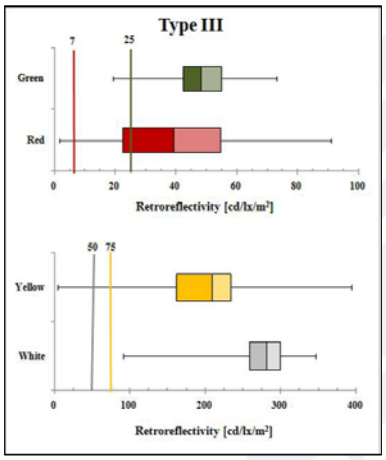
Type III Sheeting



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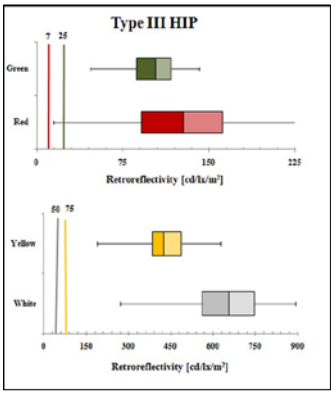
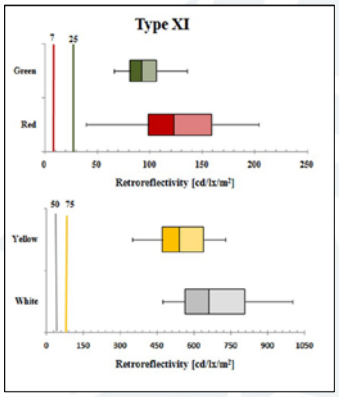
Type III HIP & Type XI





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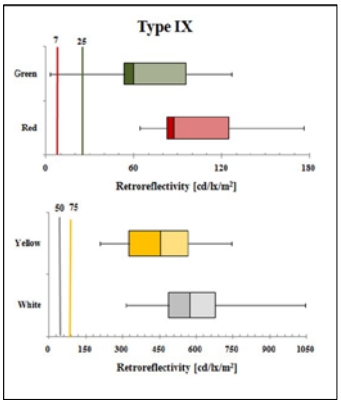
Type IX



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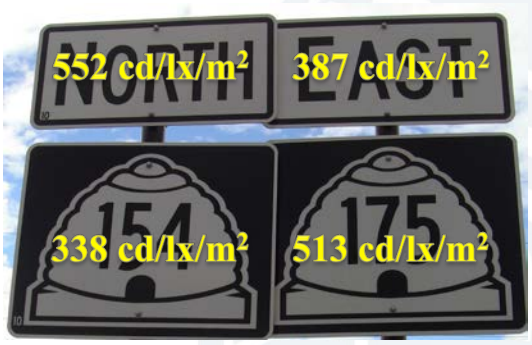
Rotational Sensitivity



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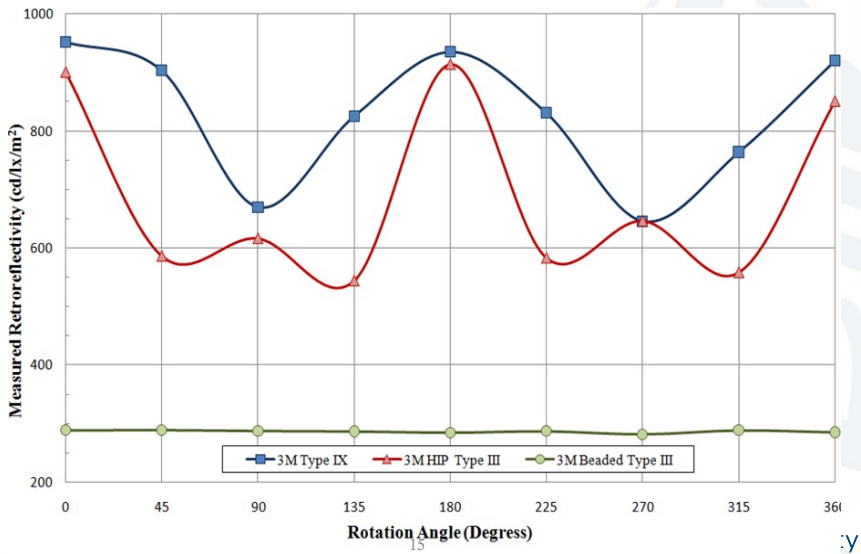
Rotational Sensitivity



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Damaged Sign Challenges

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Plan Implementation

- Update traffic sign installation requirements.
- Establishment of a in-service traffic sign inventory.
- Integrate traffic sign inventory into OMS.
- Implement traffic sign management methods.
  - Blanket Replacement
  - Visual Nighttime Inspection

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Sign Installation Requirements

Installation Data is imperative to efficient traffic sign management

- Only 8% of sample population had installation stickers.
- Two recommendations
  - New Installations
    - ASTM Type and date of manufacture stamped into back of sign
  - Replacements
    - Portable Dot Peen Machine

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In-service Sign Inventory

Can be accomplished by mobile or manual inspector collection.

Sign attributes that should be collected:

- MUTCD Number
- Sheeting Color
- Sheeting Type
- Sheeting Area
  - Offset
- Mount Height
- Orientation
- Retroreflectivity Values
- GPS Location
- Photograph
- Installation Date

Blanket Replacement

ASTM Type I sheeting exhibited a high rate of failure.

Type I sheeting with cracking damage had a 98% failure rate.

Visual Nighttime Inspection

- Myth - Nighttime visual inspection requires that the agency follows the consistent parameters that were used in the development of the minimum retroreflectivity levels.
- Studies have shown that inspectors aging from 18-24 have accuracy in detecting failed signs.
- Hiring engineering interns would avoid overtime hours for maintenance crews.

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Mobile Data Collection App

Each time an asset is addressed, information such as location, size, photograph, retroreflectivity, and etc will be input into the graphical user interface (GUI) of the application by maintenance personnel.

This information is then transferred wirelessly to UDOT controlled servers, minimizing the potential for data loss or corruption.

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Technology Development

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Implementation Conclusions

Opportunities

- Champion Enthusiasm
- TAC Involvement
- Maintenance Budgetary Challenges
- Influencing Policy
- Technology Dissemination

Challenges

- Champion Enthusiasm
- Staff Turnover
- Research Budgetary Challenges

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Questions?

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Presentation Outline

- Introductory Comments
- Research Pays Off Series
- Practical Papers Database
- Electronic Circulars
- Annual Meeting Sessions and Workshops: 2013 Theme and 2012 Examples
- Cooperative Research Program (e.g., NCHRP)
- Strategic Highway Research Program 2
- Virginia DOT Implementation Initiative

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Introductory Comments

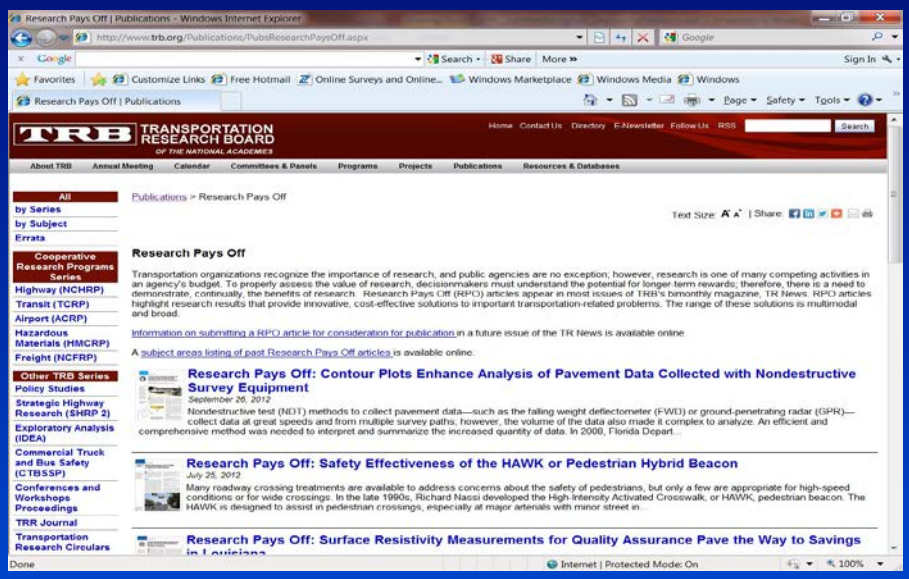
- August 29, 2012 Webinar: https://connectdot.connectsolutions.com/p65xotvzhto/
- The return on investment in research only occurs when it is put into practice
- The sooner this happen and the greater the frequency of use, the higher the return

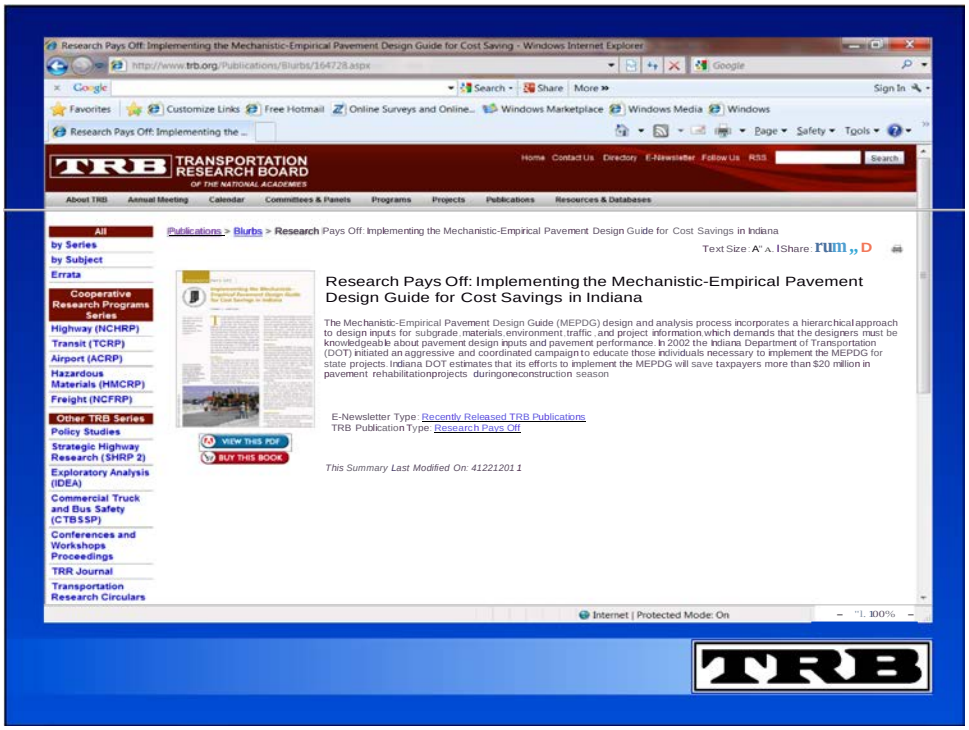
Introductory Comments

- Research should address needs
- It is essential to recognize the need and direct the research to produce products that can be put into practice
- Researchers should begin to think about deployment and involve practitioners at an early stage in most research

Research Deployment is not Easy!

- Successful deployment can exceed the work to develop the innovation
- It is essential to have a plan to put the innovation into practice
- It takes a team to be successful
  - Technical Experts, Champions
  - Marketing and Communications Specialists
  - Practitioners

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The Mechanistic-Empirical Pavement Design Guide (MEPDG) design and analysis process incorporates a hierarchical approach to design inputs for subgrade, materials, environment, traffic, and project information, which demands that the designers must be knowledgeable about pavement design inputs and pavement performance. In 2002 the Indiana Department of Transportation (DOT) initiated an aggressive and coordinated campaign to educate those individuals necessary to implement the MEPDG for state projects. Indiana DOT estimates that its efforts to implement the MEPDG will save taxpayers more than $20 million in pavement rehabilitation projects during one construction season
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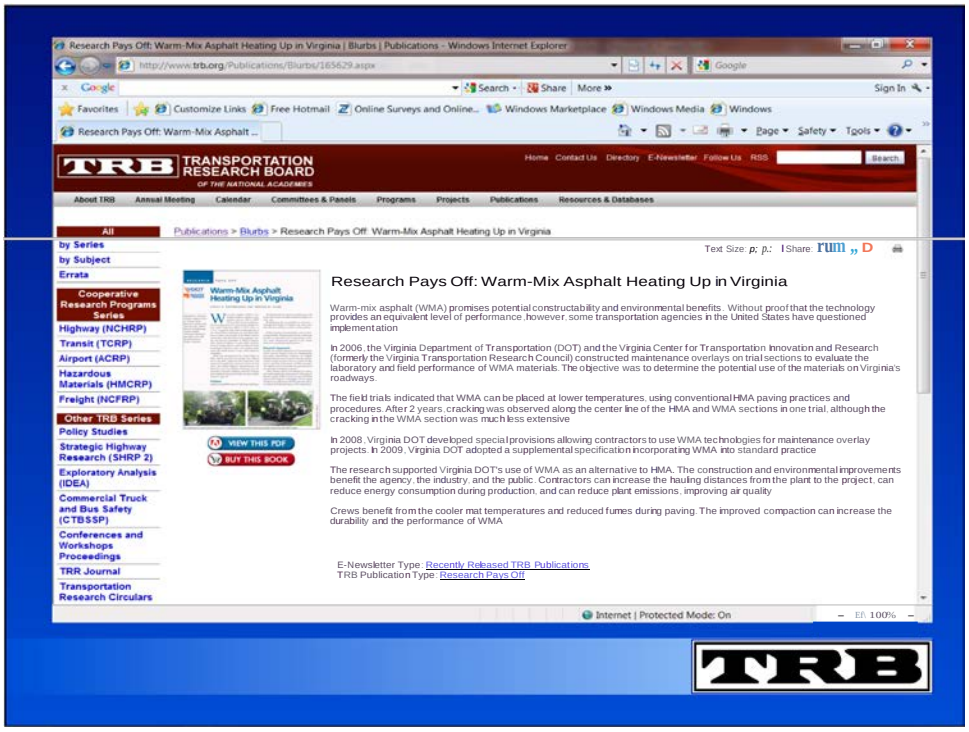
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Research Pays Off: Warm-Mix Asphalt Heating Up in Virginia
Warm-mix asphalt (WMA) promises potential constructability and environmental benefits. Without proof that the technology provides an equivalent level of performance, however, some transportation agencies in the United States have questioned implementation
In 2006, the Virginia Department of Transportation (DOT) and the Virginia Center for Transportation Innovation and Research (formerly the Virginia Transportation Research Council) constructed maintenance overlays on trial sections to evaluate the laboratory and field performance of WMA materials. The objective was to determine the potential use of the materials on Virginia's roadways.
The field trials indicated that WMA can be placed at lower temperatures, using conventional HMA paving practices and procedures. After 2 years, cracking was observed along the center line of the HMA and WMA sections in one trial, although the cracking in the WMA section was much less extensive
In 2008, Virginia DOT developed special provisions allowing contractors to use WMA technologies for maintenance overlay projects. In 2009, Virginia DOT adopted a supplemental specification incorporating WMA into standard practice
The research supported Virginia DOT's use of WMA as an alternative to HMA. The construction and environmental improvements benefit the agency, the industry, and the public. Contractors can increase the hauling distances from the plant to the project, can reduce energy consumption during production, and can reduce plant emissions, improving air quality
Crews benefit from the cooler mat temperatures and reduced fumes during paving. The improved compaction can increase the durability and the performance of WMA
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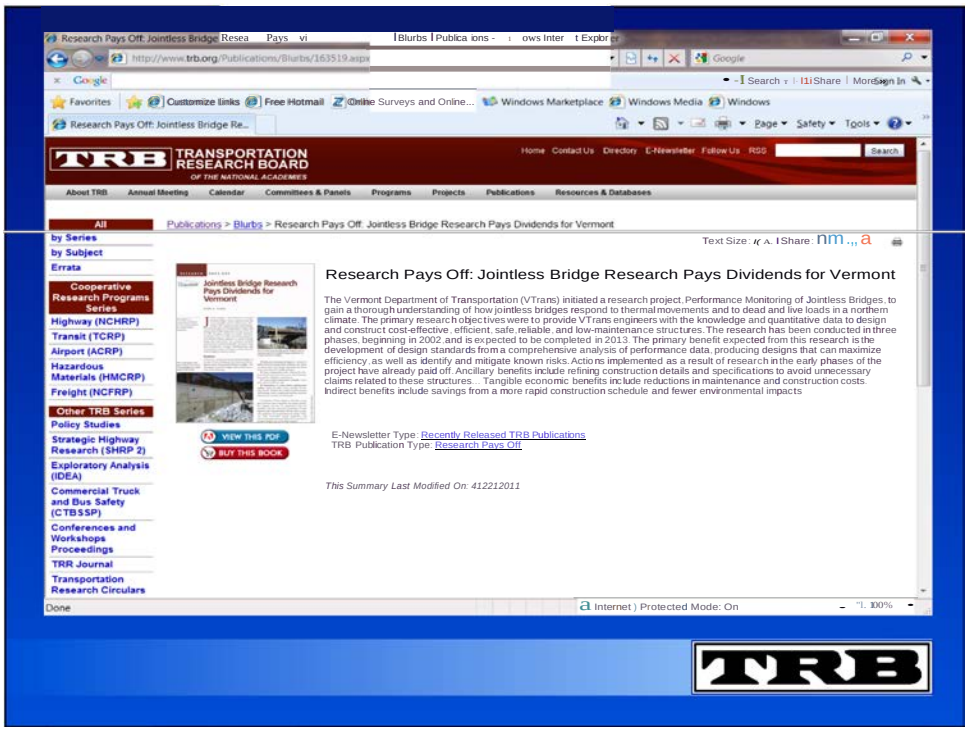
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Research Pays Off: Jointless Bridge Research Pays Dividends for Vermont
The Vermont Department of Transportation (VTrans) initiated a research project, Performance Monitoring of Jointless Bridges, to gain a thorough understanding of how jointless bridges respond to thermal movements and to dead and live loads in a northern climate. The primary research objectives were to provide VTrans engineers with the knowledge and quantitative data to design and construct cost-effective, efficient, safe, reliable, and low-maintenance structures. The research has been conducted in three phases, beginning in 2002, and is expected to be completed in 2013. The primary benefit expected from this research is the development of design standards from a comprehensive analysis of performance data, producing designs that can maximize efficiency, as well as identify and mitigate known risks. Actions implemented as a result of research in the early phases of the project have already paid off. Ancillary benefits include refining construction details and specifications to avoid unnecessary claims related to these structures. Tangible economic benefits include reductions in maintenance and construction costs. Indirect benefits include savings from a more rapid construction schedule and fewer environmental impacts
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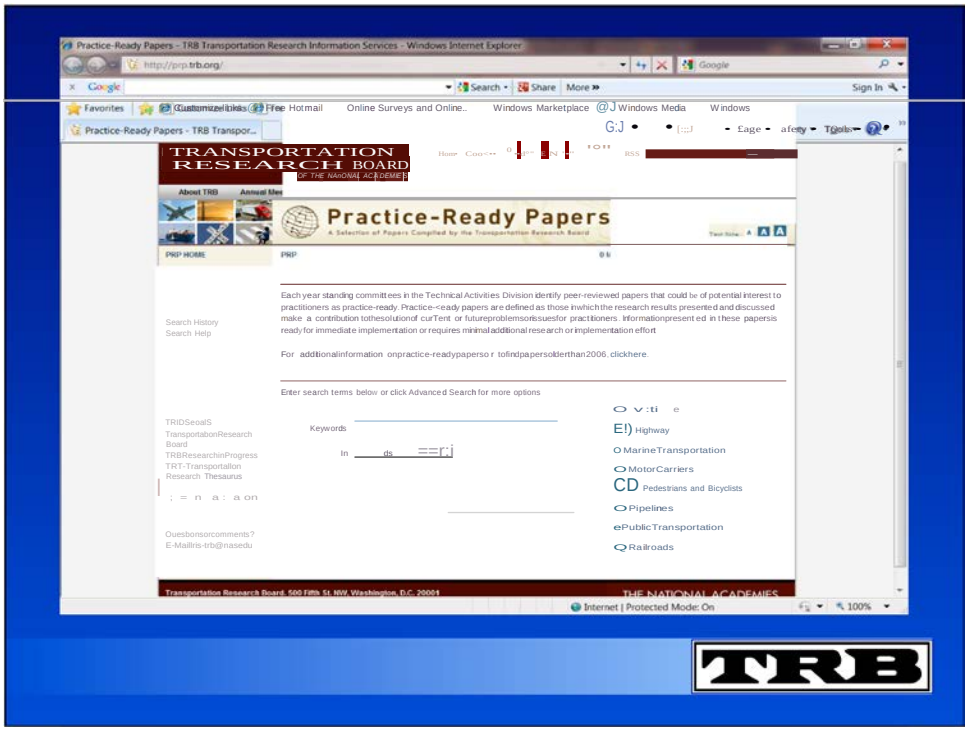
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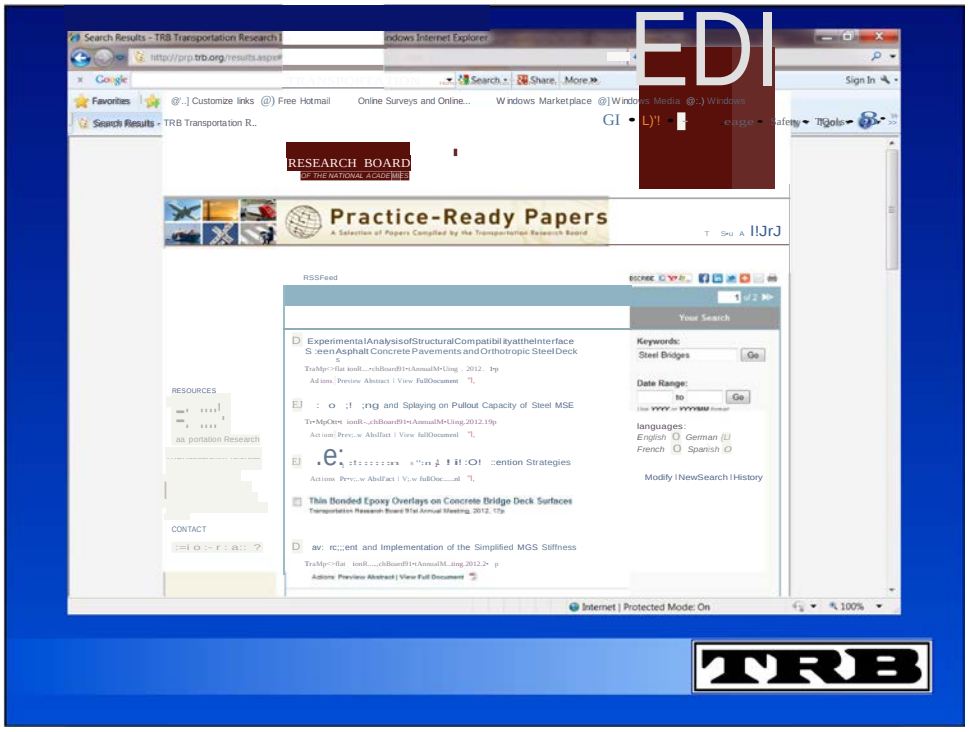
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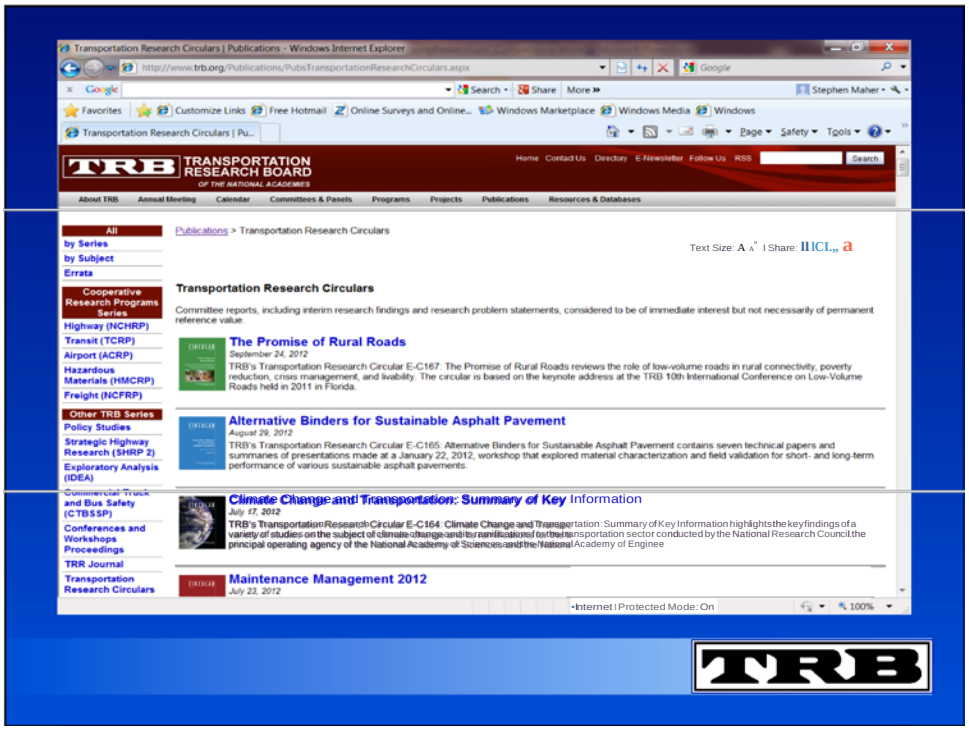
Transportation Research Circulars | Publications - Windows Internet Explorer
http://www.trb.org/Publications/PubsTransportationResearchCirculars.aspx
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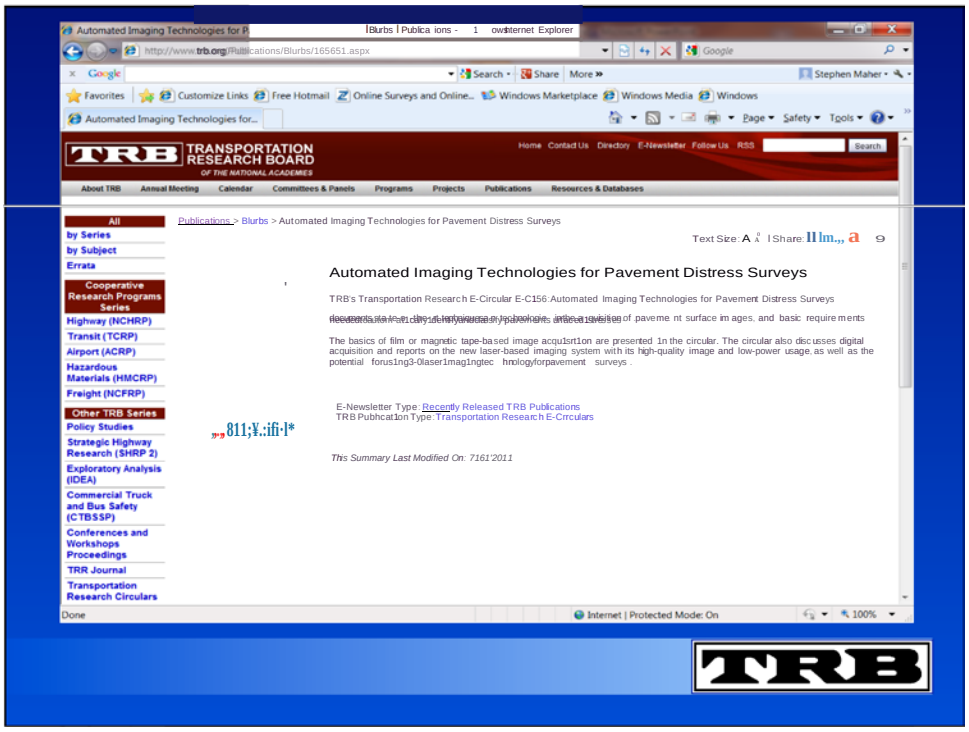
Publications > Transportation Research Circulars
Transportation Research Circulars
Committee reports, including interim research findings and research problem statements, considered to be of immediate interest but not necessarily of permanent reference value.
The Promise of Rural Roads
September 24, 2012
TRB's Transportation Research Circular E-C167: The Promise of Rural Roads reviews the role of low-volume roads in rural connectivity, poverty reduction, crisis management, and livability. The circular is based on the keynote address at the TRB 10th International Conference on Low-Volume Roads held in 2011 in Florida.
Alternative Binders for Sustainable Asphalt Pavement
August 29, 2012
TRB's Transportation Research Circular E-C165: Alternative Binders for Sustainable Asphalt Pavement contains seven technical papers and summaries of presentations made at a January 22, 2012, workshop that explored material characterization and field validation for short- and long-term performance of various sustainable asphalt pavements.
Climate Change and Transportation: Summary of Key Information
July 17, 2012
Maintenance Management 2012
July 23, 2012


Automated Imaging Technologies for Pavement Distress Surveys - Blurbs | Publications - 1 owsInternet Explorer
http://www.trb.org/Publications/Blurbs/165651.aspx
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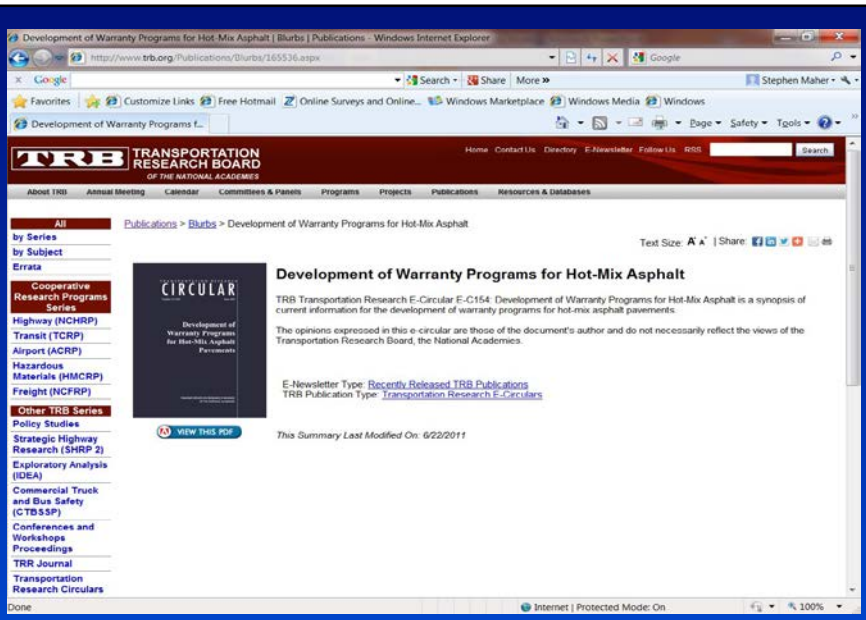
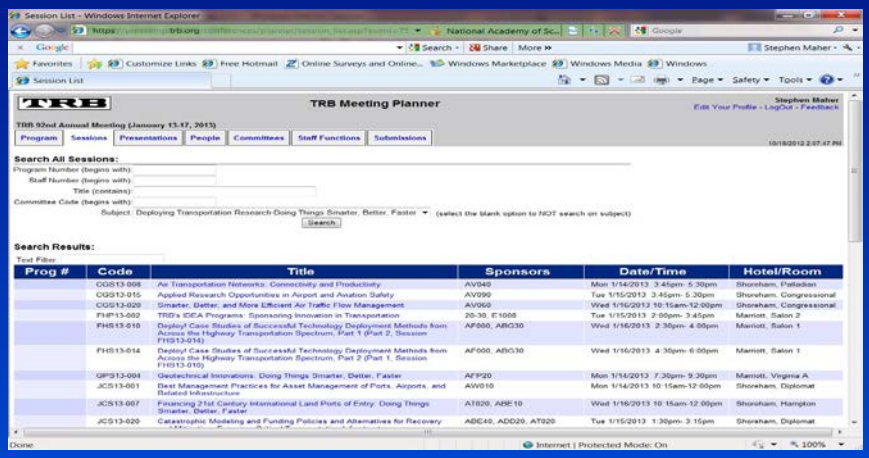
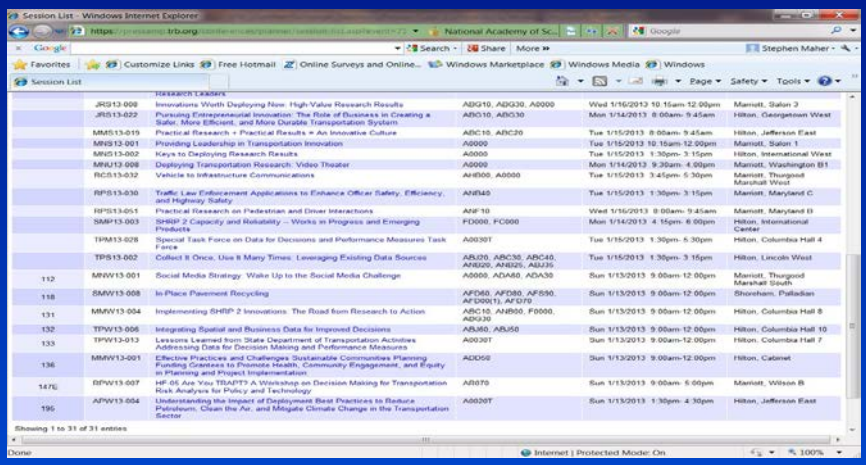
Publications > Blurbs > Automated Imaging Technologies for Pavement Distress Surveys
Automated Imaging Technologies for Pavement Distress Surveys
TRB's Transportation Research E-Circular E-C156: Automated Imaging Technologies for Pavement Distress Surveys
The basics of film or magnetic tape-based image acqu1srt1on are presented 1n the circular. The circular also discusses digital acquisition and reports on the new laser-based imaging system with its high-quality image and low-power usage, as well as the potential forus1ng3-0laser1mag1ngtec hnologyforpavement surveys .
E-Newsletter Type: Recently Released TRB Publications
TRB Pubhcat1on Type: Transportation Research E-Crrculars
This Summary Last Modified On: 7161'2011



Deploying Transportation Research – Doing Things Smarter, Better, Faster



Deploying Transportation Research – Doing Things Smarter, Better, Faster



Deploying Transportation Research – Doing Things Smarter, Better, Faster

- Deploy! Case Studies of Successful Technology Deployment Methods from Across the Highway Transportation Spectrum, Part 1 & 2
- Be Prepared; Work Smarter: Strategic Program Elements for Effective Research Leaders
- Innovations Worth Deploying Now: High-Value Research Results
- Practical Research + Practical Results = An Innovative Culture

Deploying Transportation Research – Doing Things Smarter, Better, Faster

- Keys to Deploying Research Results
- Deploying Transportation Research: Video Theater
- Implementing SHRP 2 Innovations: The Road from Research to Action
- Understanding the Impact of Deployment Best Practices to Reduce Petroleum, Clean the Air, and Mitigate Climate Change in the Transportation Sector

2012 TRB Annual Meeting – "Implementation"

- Evaluation of Mechanistic-Empirical Pavement Design Guide for Implementation
- Best Practices and Lessons Learned Through Private Industry Partnerships with Public Agencies and Academia to Implement Research Results
- Positive Train Control: Implementation Challenges and Possible Solutions
- Implementation of NCHRP Project Results by State Departments of Transportation: AASHTO Research Advisory Committee Initiative

2012 TRB Annual Meeting – "Implementation"

- State of Play: Implementation Efforts for Vehicle-Miles-Traveled Fee
- Implementation of the AASHTO Highway Safety Manual – What is Underway?
- DARWin-ME : Initial Experience of Software Users
- FAA's Airport Geographic Information System Program: Implementation Plan and Data Submission

Facilitating Implementation Impacting Practice

NCHRP Impacts State Departments of Transportation at all Levels Across all Functions

Management/Administration-Safety
Pavements-Bridges-Design-Construction
Materials-Maintenance-ROW-Planning
Environment -Traffic-Operations-Geotechnical
Hydrology/Hydraulics-Legal-Human Resources

Applied Research Products

- Recommended AASHTO Guides, Policies, Specifications
- Guides for practitioners
- Software products
- New or improved models/tools
- New or improved operations and services
- New or improved testing/evaluation techniques
- Fact finding (white papers)

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Panels: Available Tools

- Include in original scope
- Request a continuation project/funds
- Use NCHRP 20-44 funds for the unexpected
- Apply various techniques, for example:
  - Workshops, webinars, demonstrations
  - Training material, pilot courses, PPT summaries
  - Interaction with AASHTO committees or programs; assistance in balloting

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AASHTO Products Examples

- ❖❖LRFD Bridge Design Specifications
- ❖❖M-E Pavement Design Guide
- ❖❖Highway Safety Manual
- ❖❖Asset Management Guides (2)
- ❖❖Manual for Assessing Safety Hardware (MASH)
- ❖❖Roadside Design Guide (Chapters)
- ❖❖Bike and Pedestrian Guides (In development)
- ❖❖Green Book (Geometric design updates)

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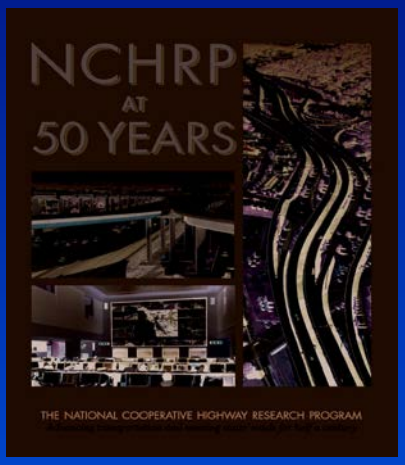
Impacts



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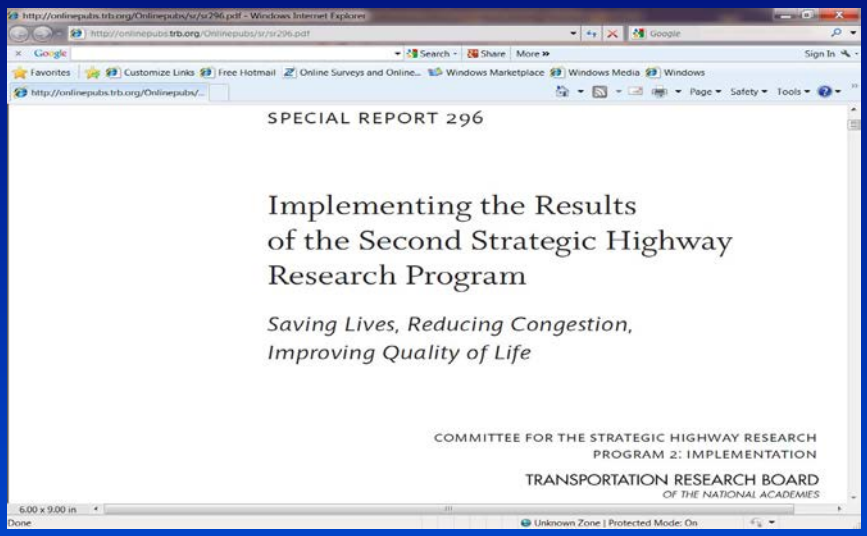
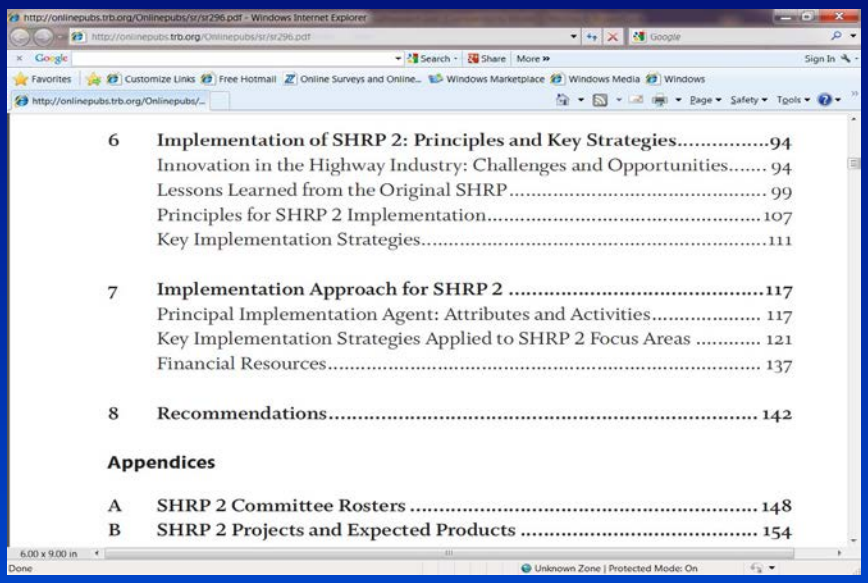
Additional Activity (Proposed)

- Prepare theme summaries (state of knowledge-guidance)
- Review final implementation plans for possible funding
- Better assist those who provide advice and training based on NCHRP results
- Support state DOTs thru RAC to facilitate NCHRP implementation





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"An off-the-record estimate from a major U.S. firm set the cost of the implementation phase of new product development at approximately 10 times the cost of research."

- Strategic packaging and branding;
- Technical assistance;
- Standards, specifications, guidebooks, and manuals;
- Follow-on research, testing, and evaluation;
- Lead users and demonstration projects;
- Training and education; and
- Long-term stewardship.

Virginia DOT Implementation Initiative

- 2010: Independent Audit of the Virginia Transportation Research Council Completed
- Audit Recommended more Emphasis on Implementation and Use of Research Results
- Changed name to "Virginia Center for Transportation Innovation and Research"
- Approximately $10M Budgeted (additional, annually) for Research Implementation
- Represents 40 Percent of FY 2013 Budget

Virginia DOT Implementation Initiative

- Money Used to Cover Construction Delta Costs for Research Implementation
- Proposals for Funds Received from Research Director and Associate Directors
- Research Personnel work with Districts to Implement Research Results into Projects
- 2011: Recycled and Quieter Pavements Projects; 2012: Road Kill Composting Program
- Contact: James W. White, Implementation Coordinator, James.White@vdot.virginia.gov

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"Research is to see what everybody else has seen, and to think what nobody else has thought."
--Albert Szent-Gyorgyi, Hungarian biochemist
QUESTIONS?
Thank You!

- People Spend So Much Time Just Wondering.....

- We Will Show You What Wonder Is!!!!

- **WYDOT Research Center began focusing on performance measures in 2007.**
- **Focused on Wyoming Centric first, Rural Regional second.**
- **Applied Research with return---on---investment.**
- **What we do best!!**

Performance---Based Management
"Maximizing Value and Cost Savings"

Performance Benefits & Savings

Programming — *Minimized risks in the Project Pipeline*

Project Optimization — *Optimized components, scoping, timing, designs, mix, locations, groupings*

Program Trade---Offs — *Best cost and benefit trade---offs between programs ----- performance target---seEng, optimized budgets*

Program Optimization — *Recommended assets, treatments, project timing, maintenance operations*

Asset Management Efforts

Larry Redd, P.E., larryredd@earthlink.net

Uncertainties Can Ruin Your Asset Management Plans

Best Laid Plans
- ***Optimized project selection***
- ***Intended performance benefits***
- ***Assumed revenue by year***

STIP—
"Project Pipeline"

Unplanned Outcomes
- ***Actual Revenue?***
- ***Missed deliveries***
- ***Holding Costs***
- ***Obsolete projects***
- ***"Hurry-up" projects***
- ***Low performance***

Project Programming

2017+ 2017 2016 2015 2014 2013 2012

Project Deliveries

Larry Redd, P.E.
970---219---4732
larryredd@earthlink.net

Larry Redd LLC

Pipeline Uncertainties
- ***Scope growth and project cost***
- ***Labor and Materials price volatility***
- ***Environmental or ROW issues***
- ***Unplanned political priorities***
- ***Construction cost inflation***
- ***Uncertain or variable revenue***

Simulation Cartoon

3Rs and 4Rs in Design

3Rs and 4Rs "On---the---Shelf"

3R4Rs Paved

3R4R Project Loading Rate

3R4R Design Completion Rate

3R4R Paving Rate

1Rs and 2Rs in Design

1Rs and 2Rs "On---the---Shelf"

1R2Rs Paved

1R2R Project Loading Rate

1R2R Design Completion Rate

1R2R Paving Rate

Larry Redd, P.E., larryredd@earthlink.net

Non---Optimum Pipeline Costs

Costs

<u>Costs of "Being Lean"--</u>
-Loss of Stimulus Funds, Block Grants, Special Legislative Funds
-"Hurry-up" design costs
-Non-optimum advanced const.

"Optimum" Range

Holding Costs –
-"PE 10 yr Limit List" $Millions at risk, and $Billions in projects may not get done
-Lost permit costs
-ROW and EA costs
-Development costs
-Obsolete projects
-Redesign costs

Amount in Inventory ("On-the-Shelf")

Larry Redd LLC, Proprietary and Confidential

Uncertainty Factors

- Scope growth
- Political priorities
- Material price volatility
- Labor costs
- Other construction cost escalation
- Legal issues
- Environmental or regulatory issues
- Right---of---way issues

Sensitivity of Losses to Key Parameters

Parameter	Initial Value	Sensitivity Value	Reduction in Losses
Design Time for 3R4Rs	5 yrs	3 yrs	Up to 22% or more
Pipeline (Shelf) Draining Logic	Proportional based on intended Mix	"Keep the Critical Projects Moving"	Up to 16 % or more
Holding Cost factor (per year)	5% for 3R4Rs and 2% for 1R2Rs	2.5% for 3R4Rs and 1% for 1R2Rs	20 to 30%
Hurry Up Inefficiency	40% inefficiency	20% inefficiency	25% or more
Use of Projected Revenue	No Projections used	Projected two years out	Up to 30 % or much more
"Smoothness" of Funding	"Bumpy" or "Blocky" funding	Smoothed or flattened funding	Ideally this would eliminate losses

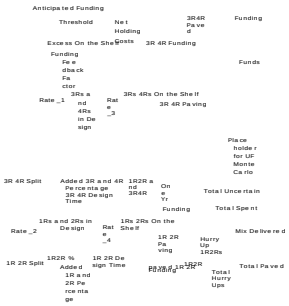
Larry Redd, P.E., larryredd@earthlink.net

Next Steps ------ Strategy Development

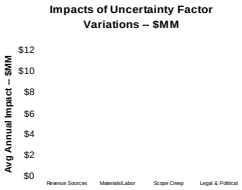
- Pipeline loading – project volume & mix based on projected revenue, etc.
- Pipeline Mgmt – e.g. Critical Project concept
- Holding costs – i.e. costs of delays

- Hurry---Up project costs
- Reduce project pipeline times/delays
  - Uncertainties ------ scope growth, etc.
  - Critical path of design

Quantify Benefits vs. "What If" Scenarios



Select & Plan Process Improvement Efforts



Overlap Of Processes at WYDOT

District Engineers

Design

Mat's Lab

Project Delivery

--- TAM and Planning Processes
--- Roles, Responsibilities
--- Expectations
--- Interactions & Handoffs
--- WYDOT BSC and PMI

ROW

Key Opportunities

- Reduce design cycle times
- Utilize revenue projections in loading the pipeline
- Utilize the "Shelby" draining approach
- Reduce Holding Costs
- Reduce Hurry Up Costs
- Smooth out "blocky funding" if possible (state funds?)
- Continue research on other uncertainty factors (scope growth, price volatility, inflation, political, legal, regulatory, etc.)

Evaluating Department of Transportation's Research Programs: A Methodology and Case Study

University Of Wyoming
College of Engineering and Applied Sciences
April 16, 2016

Study Objectives

- **Develop an Evaluation Methodology**
- **Demonstrate the methodology using the WYDOT Research Program as a case study**
- **From the WYDOT case study, make conclusions and recommendations**
- **Recommendations for implementing the developed methodology for any other DOT research program**

Transportation Funding – SP&R

- **SAFETEA---LU, 2005---2012**
  - Started pushing for outcome---based research
  - Utilize performance measurements for evaluating research
- **MAP21, 2012**
  - Emphasizes performance based research
  - Major reductions in Earmarks
  - Performance Management mandate

SP&R Funding

Background

- **Evaluating Research Programs**
  - Process Management
  - Program Quality
  - Program Value

- **Performance Measurements**
  - Assessment of data and techniques that reflect which performance measures work
  - needs and expectations are met

Background – Phase I

- **Evaluation of WYDOT's Research Center and Research Program**
  - Performed in 2007
  - Resulted in specific recommendations
  - Developed 10 Performance Measurements

First Level Analysis

- Project Groupings
  - Strategic Intent
  - Infrastructure Upgrade, Preservation of Infrastructure, Public Affairs, Safety, Shared Knowledge, etc.
- Project Category
  - In---House Research, Contracted Research, and Pooled Fund Studies

Performance Measurements

- **8 of the 10 Developed Performance Measurements are Used for the Stage I Methodology**
  - Number of Projects and Amount of Funding per Project by Strategic Intent
  - Number of Proposals Responding to Research Program Solicitations

PM's for Stage I Continued

- Number of Needs Statements Submitted by the Agency's Programs
- Outcomes of the Research Projects
- Number of Research Reports Completed Each Year
- Percentage of Administrative Costs to Overall Program Funding

PM's for Stage I Continued

– Funds Requested by the Research Community versus Funds Available

– Percentage of Projects Completed On---time and Within Budget

Stage II Methodology

– Addresses the Remaining 2 Performance Measurements using Performance Evaluations
  - Cost---benefit analysis for Individual Projects
  - Cost---benefit analysis for the Research Program

– Additional Evaluations and Analysis

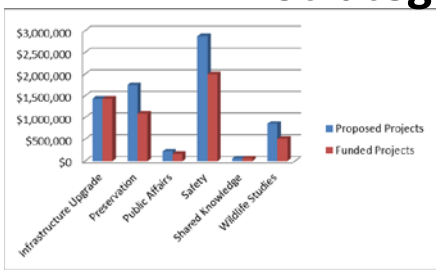
WYDOT Research Program

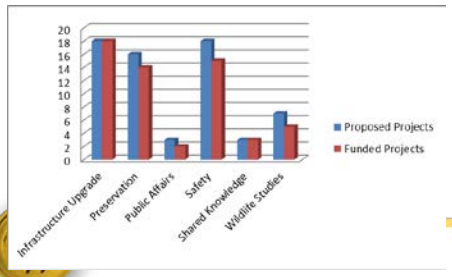
- Funds over $1 million in research annually
- Research Advisory Committee (RAC)
  - Meets 4 times a year to approve and fund research projects
- WYDOT Mission
  - "To enhance the economic well---being and quality of life in Wyoming by working with public and private partners to produce a safe and efficient transportation system"

Breakdown by Project Category

- **3 Types of Projects**
  - Contract Research
  - Pooled Fund Studies
  - In---house Research

Number of Projects and Funding by Strategic Intent





- **Projects relating to Safety have more funding**
- **Wildlife Studies was created due to the significant amount of projects related to Wildlife**

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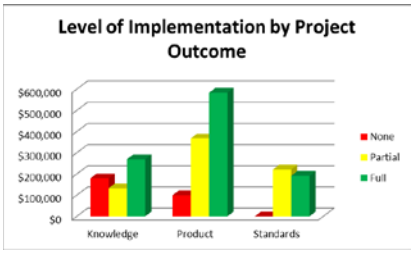
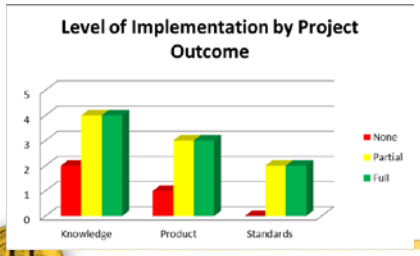
Number of Proposals Responding to Research Program Solicitations

- **9 out of 15 Contracted Research Projects were solicited by WYDOT**
  - In---house Research Projects and Pooled Fund Studies were not considered for this PM

Outcomes of the Research Projects





- **3 Project Outcome Categories**
  - Knowledge
  - Product
  - Standards

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Number of Research Reports Completed Each Year

- **Out of the 65 projects from the First Level Analysis**
  - All Contracted Research Projects but 2 were completed within 3 years
  - 2 Contracted Research Projects went over their proposed timeline
  - All pooled Fund Studies went over their initial proposed timeline

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Pooled Fund Extension Form

Request for Additional Funding for Pooled Fund Studies

Project Name:

Project
Number: Lead
State:
WYDOT Liaison:
Number of Participating States:

Project History	
Start Date	
Initial Estimated Completion Date	
Initial Funding	
Additional Funding Already Received	
Additional Needs	
Additional Funding Requested	
Additional Time Requested	
New Estimated Completion Date	

Benefits and Implementation for WYDOT

What products /knowledge /policies /etc. have resulted from this project?

How have these results been implemented throughout WYDOT?

If these results have not been implemented, what boundaries are being faced?

What are the expected outcomes if additional funding and time are approved?

Is a plan for implementation throughout WYDOT being developed or is developed?

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Percentage of Administrative Costs to Overall Program Funding

	2005	2006	2007	2008	2009	2010	2011	Averages
Administrative Costs	$16,360	$69,433	$103,993	$81,877	$118,183	$118,642	$118,642	$89,590
Overall Research Budget	$923,795	$1,061,660	$559,716	$628,172	$1,212,314	$1,375,280	$1,359,808	$1,017,249
Percent Admin. Costs	1.8%	6.5%	18.6%	13.0%	9.7%	8.6%	8.7%	9.57%

- 2005---2006 A different accounting system was used within WYDOT
- 2009---2011 shows the expected administrative costs, under 10%

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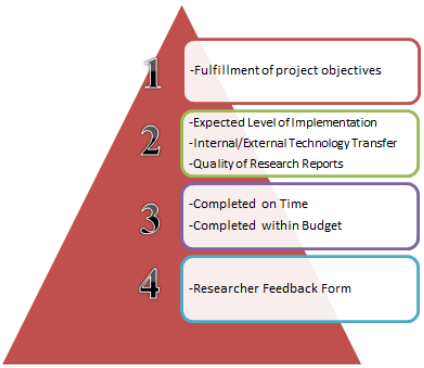
Performance Evaluations

- **Phase 1 Performance Criteria Ranking**



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Performance Evaluations

- **Phase 2 Performance Criteria Ranking**

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Phase 1 Performance Evaluation Form

Project Performance
Evaluation - Phase 1

Project I.D.: _____

Date: _____ WYDOT Program: _____

Principal Investigator: _____ WYDOT Sponsor: _____

* This form is to be completed immediately at the end of a research project, select one corresponding box for each question.

1) **Were all of the proposed objectives of the research project fulfilled?**

- ☐ All objectives were fulfilled
- ☐ Some objectives were fulfilled
- ☐ No objectives were fulfilled

2) **Expected future level of implementation within WYDOT.**

- ☐ Full implementation
- ☐ Partial implementation
- ☐ No implementation
- ☐ Results do not recommend implementation

3) **External technology transfer.**

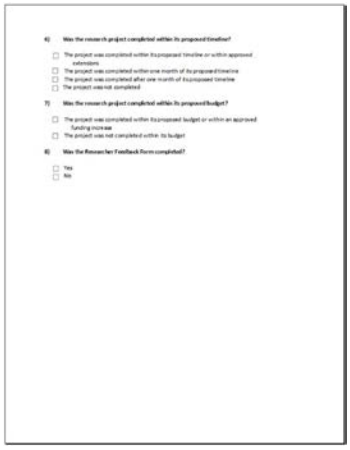
- ☐ Any National, Regional, or Local presentations, publications, etc.
- ☐ No external technology transfer

4) **Internal technology transfer.**

- ☐ Presentations created and used by the Research Center or relevant departments within WYDOT
- ☐ No internal technology transfer

5) **Was a research report created?**

- ☐ A professional and concise research report was created, meeting WYDOT's expectations.
- ☐ No research report was created or an inadequate research report was submitted



6) **Was the research project completed within its proposed timeline?**

- ☐ The project was completed within its proposed timeline or within approved extensions
- ☐ The project was completed within one month of its proposed timeline
- ☐ The project was completed after one month of its proposed timeline
- ☐ The project was not completed

7) **Was the research project completed within its proposed budget?**

- ☐ The project was completed within its proposed budget or within an approved funding increase
- ☐ The project was not completed within its budget

8) **Was the Researcher Feedback Form completed?**

- ☐ Yes
- ☐ No

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Phase 2 Performance Evaluation Form

Project Performacne
Evaluation - Phase 2

Project I.D.: _____

Date: _____ WYDOT Program: _____

Principal Investigator: _____ WYDOT Sponsor: _____

* This form is to be completed 2 years after a research project has been completed, select one corresponding box for each question or fill in applicable questions.

1) **Have the results of this research project contributed to WYDOT's Mission?**

- ☐ Yes
- ☐ No

1a) **If yes, briefly describe which aspects of WYDOT's Mission have been advanced or affected by the results of the research project:**

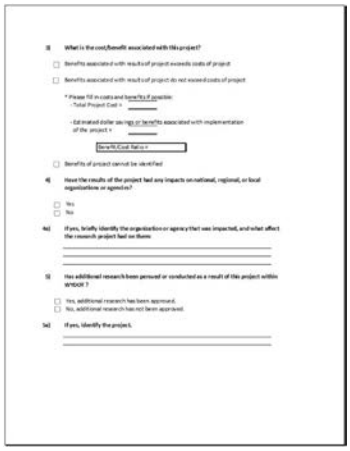
_____

2) **Have the results of this research project been implemented within WYDOT?**

- ☐ Full implementation
- ☐ Partial implementation
- ☐ No implementation

2a) **If level of implementation has changed from the phase 1 evaluation, please explain:**

_____



3) **What is the cost/benefit associated with this project?**

- ☐ Benefits associated with result of project exceeds costs of project
- ☐ Benefits associated with result of project do not exceed costs of project

* Please fill in costs and benefits if possible:
- Total Project Cost = _____
- Estimated dollar savings or benefits associated with implementation of the project = _____

Benefit/Cost Ratio =

- ☐ Benefits of project cannot be identified

4) **Have the results of the project had any impacts on national, regional, or local organizations or agencies?**

- ☐ Yes
- ☐ No

4a) **If yes, briefly identify the organization or agency that was impacted, and what affect the research project had on them:**

_____

5) **Has additional research been pursued or conducted as a result of this project within WYDOT ?**

- ☐ Yes, additional research has been approved.
- ☐ No, additional research has not been approved.

5a) **If yes, identify the project.**

_____

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Benefits from the Performance Evaluations

- **Phase 1**
  - Identifies the successful and unsuccessful research projects
  - Help WYDOT identify which types of research projects are not successful
- **Phase 2**
  - Generates final score of a research project
  - Compiling all projects completed will allow for an overall score of the Research Program

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Budgetary Categories

- **3 main budget categories were created**
  - Direct Costs
    - Total Personnel Costs, Fringe Benefits, Research Travel, Report Generation, Equipment, Others
  - Technology transfer
    - Conferences/ Report Presentation, Miscellaneous Travel
  - Indirect Costs
    - Project Administration, Overhead

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WYDOT Research Project Budget Analysis Form

	Projected Project Costs	Percentage of Overall Project Budget	Indicator	Lower Range	Upper Range
Direct Costs	**$63,206**	83%		81%	96%
Total Personnel Costs	$34,108	45%		44%	72%
Principal Investigator	$15,208	20%		12%	46%
Other Personnel	$18,900	25%		23%	44%
Frigne Benefits	$6,083	8%		5%	12%
Research Travel		0%	*	2%	10%
Report Generation		0%	*	2%	11%
Equipment	$16,800	22%		3%	30%
Others	$6,215	8%		2%	9%
Technology Transfer	**$2,000**	3%		1%	5%
Conferences	$1,000	1%		1%	3%
Miscellanous Travel	$1,000	1%		1%	11%
Indirect Costs	**$11,138**	15%		12%	17%
Project Administration	$2,250	3%		1%	8%
Overhead	$8,888	12%		12%	17%
Total Project Cost	**$76,344**				

UNIVERSITY OF WYOMING

WYDOT Research Program Website Analysis

- **Compared the WYDOT Research Program Website to other DOT Research Websites for content and overall structure**
  - Comparisons were made between the following DOTs:
    - Colorado
    - Idaho
    - Montana
    - South Dakota
    - Utah
    - Minnesota

UNIVERSITY OF WYOMING

Improving Access to Past Research Reports

- Currently WYDOT has a few Research Reports on their website
- Allow research reports to be accessed from search engines
- Colorado DOT's Research Report OrganizaMon

Creating a Mission Statement

Social Networking

WYDOT Case Study Conclusions

- **The WYDOT Research Center is an effective and productive program**
- **Sponsors a variety of projects that fulfill WYDOT's Mission**
- **Flexible and proactive when addressing current research needs**

WYDOT Case Study Conclusions

- Over 80% of projects approved and completed from 2005---2010 had some level of implementation
- 60 percent of research projects were initiated by WYDOT employees
- 8 WYDOT Programs and 2 WYDOT Districts sponsored research projects between 2005 and 2010

WYDOT Case Study Conclusions

- Less than 10 percent of the overall research budget is used for administrative costs
- 100% of proposed pooled fund studies, 100% of the proposed in---house research projects, and 85% of proposed contracted research projects were approved and funded by the RAC were funded during the analysis period

WYDOT Case Study Conclusions

- 100% of contracted and in---house research projects are completed within budget and 88% are completed within their proposed timeline
- The performance evaluations completed on the research projects yielded high overall performance scores

WYDOT Case Study Conclusions

- The research projects averaged a score of 96 % for the phase 1 performance evaluation
- The research projects averaged a score of 83 % for the phase 2 performance evaluation
- Pooled fund studies are effective research options for WYDOT but they should be more closely evaluated

WYDOT Case Study Recommendations

- **WYDOT should continue funding research projects that advance the overall goals of their mission statement**
- **The RAC should receive formal presentations about pooled fund studies before voting on budgetary and timeline extensions**
- **The performance evaluations should be implemented within the WYDOT Research Program**

WYDOT Case Study Recommendations

- **The developed standardized budget should be used to evaluate proposed research project's budgets**
- **WYDOT Research Program should revamp its website for greater technology transfer opportunities**

UDOT Research Peer Exchange

John Moulden

Office of Research Development & Technology

U.S. Department of Transportation
Federal Highway Administration

U.S. Department of Transportation
Federal Highway Administration

EVERY DAY COUNTS TECHNOLOGY INITIATIVE

WHY?

- How long does it take to deploy innovation in the transportation industry?
  - Change a business practice
  - Replace a design system
  - Replace a construction process…

2 YEARS?

5 YEARS?

10 YEARS?

20+ YEARS?

EVERY DAY COUNTS MISSION

- To identify and deploy readily available innovation and operational changes that will make a difference.
- To identify policy or operational changes required to advance system innovation in the longer term.

TECHNOLOGIES & INNOVATIONS

- Continuous collaboration with stakeholders
  - develop innovations and technologies;
  - solve problems;
  - bring innovation to market.
- Many sources for ideas (Federal R&D, other countries, states, universities, entrepreneurs, etc.).

A COLLABORATIVE TECHNOLOGY SELECTION PROCESS

- EDC Innovations & technologies selected collaboratively with FHWA and key stakeholders input.
- Technologies scored by an objective panel
- R&T Leadership team selected 5 technology innovations for accelerated deployment. (EDC-I)

EDC TECHNOLOGY SELECTION CRITERIA

- Market ready
- Meets user needs
- Complements National/DOT/FHWA strategic goals
- Has "high payoff" & success potential
- Shows potential for widespread application and use
- Has adequate deployment & technical support resources available
- Can be packaged with other technologies to multiply benefits
- Has measurable outcomes
- Meets legal & regulatory requirements
- Resource & Support partners available
- Provides opportunities to enhance future deployment efforts

STAKEHOLDER TECHNICAL PANEL MEMBERS

- AASHTO Dave Huft (SD), Keith Platte (AASHTO)
- NACE Tony Giancola
- ARTBA John Kulka (HRI, Inc.), Rich Juliano
- AGC Donald Weaver (Weaver-Bailey Construction) , Brian Deery (AGC)

EDC-I TECHNOLOGY SELECTION MATRIX

EVERY DAY COUNTS (EDC) – TECHNOLOGY SELECTION MATRIX (DRAFT !!!!)											
CRITERIA	*1. Does It Meet Customer Needs?*	*2. Market Ready?*	*3.Roadmap & Outcome Plans Ready?*	*4. Meets National Needs & Agency Goals?*	*5. High Payoff/ Success Potential?*	*6. Result in Wide-spread Application & Use?*	*7. Adequate Deployment, implementation & Technical Support Available?*	*8. Can Be Packaged with Other Technology?*	*9. Outcomes Measurable?*	*10. Resource & Support Partners Available?*	*11. Meets all Legal / Regulatory / Political Requirements?*
TECHNOLOGY											
1. "Green" PavingTechnologies: Increased use of recycled materials - concrete & asphalt	?	?		?	?	?					
2. Accelerated Bridge Construction: Increased use of Pre-cast Bridge Elements (PFBES); Geosynthetic Bridge Abutments; Augered Cast-in-Place (ACIP) & Continuous Flight Auger (CFA) Foundations;EPS Geofoam	?	?		?	?	?		?			
3. Bridge Inspection Technology (BINS): Expanded training on innovative NDE technologies & methodology	?	?		?	?	?					
4. ACS Lite: Expanded use adaptive traffic signal control technology	?	?		?	?	?		?			

WHAT ARE THE INNOVATIONS? EDC-I

- Warm Mix Asphalt

- Precast Bridge Elements

- Geosynthetic Reinforced Soil
- Safety Edge

- Adaptive Traffic Control Technology

TECHNOLOGY & INNOVATION

Warm Mix Asphalt

Allows a reduction in asphalt mixture production & placement temperatures

Benefits:

- *Provides better compaction*
- *Reduce worker fatigue*
- *Reduces fossil fuel consumption*
- *Reduces CO_2e & other emissions*
- *Longer paving season*
- *Allows for longer hauling distances*
- *Benefits with High RAP*

WARM MIX ASPHALT

- Various technologies are used, which allows the plant mix to be produced and compacted at lower temperatures…

Typical production temperature reduction 30 to 75ºF

WMA Technologies:

- Foaming Processes
- Wax-like Additives
- Chemical Additives
- Hybrids

TECHNOLOGY & INNOVATION

Prefabricated Bridge Elements & Systems

Prefabricated bridge elements and systems manufactured on-site or off-site, under controlled conditions, and brought to the job location ready to install

Benefits:

- Minimizes traffic & community impact
- Improves construction zone safety
- Improves bridge designs constructability
- Increases quality & lowers life-cycle costs

TECHNOLOGY & INNOVATION

Geosynthetic Reinforced Soil

Fast, cost-effective bridge support method using alternating layers of compacted fill and sheets of geotextile reinforcement to provide bridge support.

Benefits:

- Eliminates approach slab or construction joint at the bridge-to-road interface
- Reduced construction time (complete in10 days)
- 25 - 60 % less cost depending on standard of construction
- Less dependent on weather conditions
- Flexible design – easily modified for unforeseen site conditions
- Easier to maintain because of fewer parts
- Built with common equipment and materials

TECHNOLOGY & INNOVATION

Safety Edge

Sloped pavement edge at a 30º angle which allows drivers a more controlled re-entry back onto the roadway after tire drop-off, if shoulder re-creates a drop-off

Benefits:

- Reduces crashes due to edge drop-off and uncontrolled recovery Minimal
- cost (less than 1% on 2-lane highway)
- Consolidated edge reduces edge raveling, increases durability

TECHNOLOGY & INNOVATION

Adaptive Traffic Control Technology

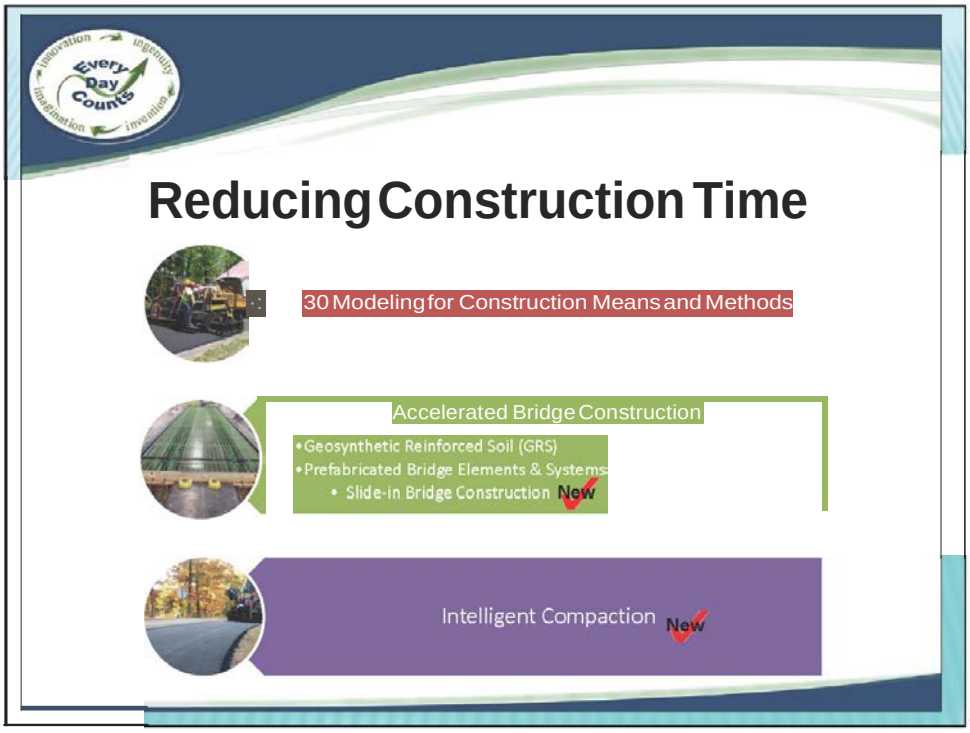
ACS measures traffic flow and adjusts signal timing to promote smooth flow of traffic along arterial streets

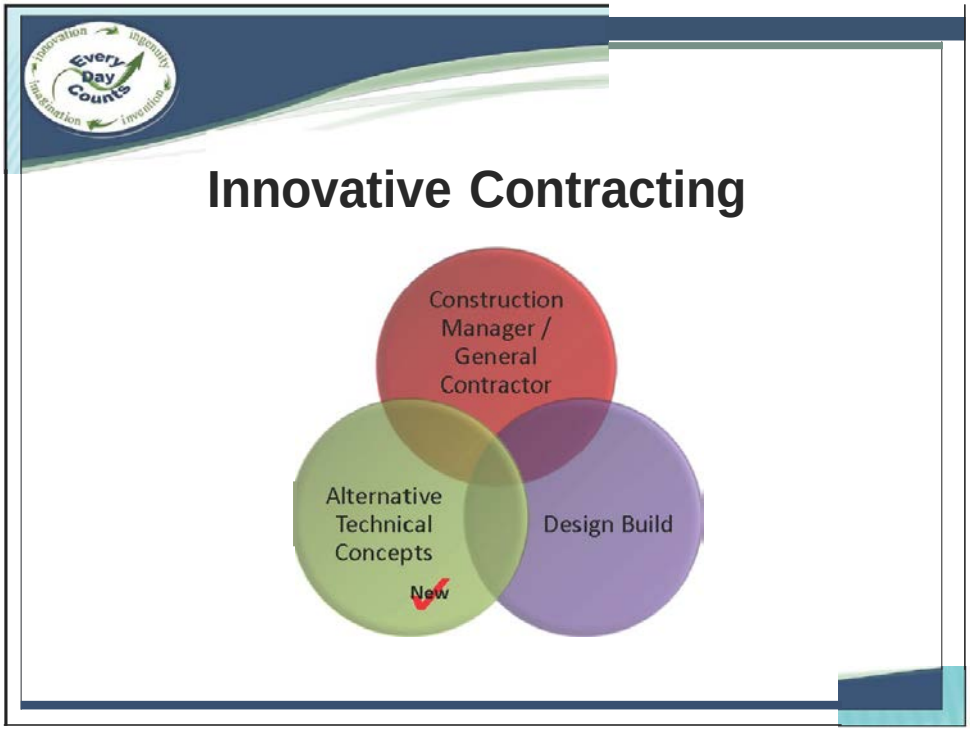
Benefits:

- *ACS improves travel time reliability, reduces congestion, smoothes traffic flow*
- *Increases long-term viability of traffic signal operations*
- *Widely deployable & uses existing control equipment*

Round III Initiatives Categories
Reducing Project Delivery Time
Reducing Construction Time
Innovative Contracting
Safety
Environment
Mobility

Reducing Project Delivery Time
Programmatic Agreements
New
Locally Administered Projects
• Certification / Qualification Program for LPAs
• Innovative Procurement for Engineering Services
• Innovative Partnering
New
Geospatial Data Collaboration


Reducing Construction Time
30 Modeling for Construction Means and Methods
Accelerated Bridge Construction
•Geosynthetic Reinforced Soil (GRS)
•Prefabricated Bridge Elements & Systems
• Slide-in Bridge Construction New
Intelligent Compaction New


Innovative Contracting
Construction Manager / General Contractor
Alternative Technical Concepts
New
Design Build

Spring 2013 Delivery

21st **Century Solutions**

- Five new initiatives
- Focused on Safety, Environment & Mobility
- Virtual Summits

  v'Delivery in February & March

  v'Digital technology to participant's desktops
- EDC Exchange for Local & Tribal Agencies

State Transportation Innovation Councils (STICs)

STICs will have an important deployment role

- ✓Boost implementation success
- ✓Provides a state partnership in innovation
- ✓Offers opportunities for national collaboration

FHWA preparing a number of strategies to support efforts in the States

MEASURING IMPLEMENTATION

- Process Measures
- Outcome Measures
- Impact Measures

Safety Edge$_{SM}$

Goal 1: By December 2011, 40 State DOTs will have used the Safety Edge$_{SM}$ on projects

Goal 2: By December 2011, 15 State DOTs and all Federal Lands Divisions have adopted Safety Edge$_{SM}$ specificaUons.

Goal 3: By December 2012, 40 State DOTs will have adopted as a standard for paving projects

Deployed
Ac0vely Deploying
Not Selected

Alaska
Hawai
i
Puerto Rico
Virgin Islands
DC
WF
L
CFL
EFL

GeosyntheUc Reinforced Soil

Goal 1: By June 2012, 20 states have adopted the GRS IBS specificaUons and special provisions within their standard bridge documents.

Goal 2: By December 2012, a total of 30 NHS bridges in 20 states have been designed and/or constructed using GRS

Goal 3: By December 2012, 75 Off – NHS bridges have been designed and/ or constructed using GRS

Deployed
Ac0vely Deploying
Not Selected

Alaska
Hawaii
Puerto Rico
Virgin Islands
DC
WFL
CFL
EFL

Pre---fabricated Bridge Elements & Systems

Goal 1: By December 2012, to accelerate bridge construcUon, 100 cumulaUve bridges have been designed and/or constructed rapidly using PBES.

Goal 2: By December 2012, 25 percent of single--- or mulU---span replacement bridges authorized using Federal---aid have at least one major prefabricated bridge element that shortens onsite construcUon Ume relaUve to convenUonal construcUon.

Superstructure Substructure Both

PBES Use in Implemen0ng States

Deployed
Ac0vely Deploying
Not Selected

Alaska
Hawaii
Puerto Rico
Virgin Islands
DC
WFL
CFL
EFL

AdapUve Signal Control Technology

Goal 1: By December 2012, ASCT tools will be used by 40 agencies to guide programming and /or implementaUon of adapUve signal control.

Deployed
Ac0vely Deploying
Not Selected

Alaska
Hawai
i
Puerto Rico
Virgin Islands
DC
WF
L
CFL
EFL

Warm Mix Asphalt

Goal 1: By December 2011, 40 State DOTs and all Federal Lands Divisions will have a specificaUon &/or contractual language that allows WMA on Federal---aid or Federal Lands projects.

Goal 2: By December 2012, at least 30 State DOTs will have achieved set targets for WMA usage.

Deployed

Ac0vely Deploying

Not Selected

Alaska

Hawaii

Puerto Rico

Virgin Islands

DC

WFL

CFL

EFL

InnovaUon Deployment Planning

- **Tier I: EDC**
  - EDC compeUUve program for accelerated implementaUon of innovaUons that are truly ready to become the---state---of---pracUce.
- **Tier II: Corporate Technology Deployment**
  - CompeUUve process for the selecUon of non---selected or near---market ready innovaUons for pilot, showcase, and/or demonstraUon that will feed future Tier I selecUons. Candidates will come from non---selected Tier I innovaUons and a solicitaUon of FHWA program offices.
- **Tier III: Core Program Area Technology Deployment**
  - Program office determines priority innovaUons for further development, showcase, demonstraUon and/or deployment. May feed Tier I or Tier II. Funds to be distributed proporUonately to the major program areas.

Thank You!

US. Oepar1maT
c:JltJ ISPCl1afta
Federal Highway
M1••hallwl

Iowa's BIG 4 and Growing Areas

The Big 4

- Safety
- Winter Maintenance
- Structures
- Concrete Pavements

Growing areas

- Human Factors
- Intelligent Construction

Iowa Department of Transportation

Iowa's Graduated Drivers License

- Research in the 1990's led to recommendations for Iowa's driver licensing of teens.
- This resulted in Iowa's Graduated Driver Licensing (GDL).
- Changes included time limits and hours of instruction required to obtain an intermediate license.
- The change took effect in 1999.
- Several studies have followed this change to evaluate its significance.

Iowa Department of Transportation

"Graduated Driver License, Iowa's Experience Since the Law's Inception"

The late Scott R. Falb, Iowa DOT Office of Driver Services, Nov. 2005

Year GDL took effect. Not all novice drivers were part of the GDL this year.

DOT Crash Reporting Form Changed

Iowa's Graduated Drivers License

2007 Study by the Center for Transportation Research (now InTrans) at Iowa State University

"Evaluation of Iowa's Graduated Driver's Licensing Program"
(CTRE Project 04-181)

Evaluated Characteristics of Young Driver Crashes including:

- **Time of Day**
- **Risk Taking Behavior (speeding, drinking, etc.)**
- **Passengers**
- **Seat Belt Use**

Iowa Department of Transportation

Iowa's Graduated Drivers License

2007 Study by CTRE

The impact of the school permit, which allows teenage drivers to drive alone to school, school events, or work, was also examined. The percentage of school license holders per licensed driver was relatively constant for 14-year-olds and 16-year-olds from the before to after period, but increased for 15-year-olds.

The percentage of 15-year-old school license holders in December 1997 was 22.7%, compared to 30.0% in December 2003.

Iowa Department of Transportation

Iowa's Graduated Drivers License

2007 Study by CTRE

A large number of 14-year-olds involved in crashes still drove alone (36%), despite GDL restrictions.

The relative nighttime involvement decreased sharply for 14-year-olds after implementation of GDL for the nighttime period from midnight to 6 AM, indicating that GDL driving time restrictions may have been successful in reducing the nighttime accident risk…however, increased for the 10 PM to midnight time period.

Iowa Department of Transportation

Use of Video in Teen Driving - Age vs. Experience

Funded through:

- TPF-5(207). IA (lead), KS, MO.
- NHTSA
- CDC

Work conducted at the University of Iowa Policy Center, http://ppc.uiowa.edu/

Use of Video in Teen Driving - Age vs. Experience

Research includes

- Evaluation of driving characteristics
- Evaluating impacts of feedback (from researcher to driver and parents)

Iowa Department of Transportation

Use of Video in Teen Driving - Age vs. Experience

- This research examined the use of event-triggered video feedback to reduce unsafe driving by teens in urban and rural settings.
- "Unsafe events" triggered the video system to begin recording a 20-second video and audio clip.
- Triggered events included situations where a driver exceeded a lateral or longitudinal physical limit, such as when abrupt accelerations, braking or erratic steering occurred.
- Parents received a weekly report card of their teen's driving data that described each event in narrative form.

Teen crashes

- Number 1 cause of death and injury among our 14-19 year-olds
  - Young drivers and passengers
  - Occupants of other vehicles
  - Non-motorists – pedestrians, bicyclists

Crash causes

1. Inexperience in vehicle control skills
2. Poor ability to anticipate & identify hazards
3. Sensitivity to peer influence and willingness to take risks
4. Impulsive
5. Poor understanding of driving abilities relative to demands

   -Texting and cell phone conversations compound

Iowa Department of Transportation

Compelling teen driving research

- Crash risk increases about 10-fold when teens begin driving unsupervised and decreases at a moderate rate over first several *years*
- More young passengers →→ more crashes
- Most severe crashes occur before midnight
- Enhanced Graduated Driver Licensing (GDL) showing positive results
  - More supervised driving
  - Passenger restrictions
  - Nighttime driving limitations

Event-triggered video as an intervention tool

- Purpose is to extend parent mentoring, not monitoring
  - Goal is to enhance learning for long term
- Video provides the driver and parent the context of safety-relevant events.
- Looking for teachable moments…
  - The good, the bad, and the "you almost died".
- User acceptance is critical for success

14

Event-triggered video recorders

- Two cameras
- 3-axis accelerometer
- Video/audio buffer
- GPS location and speed
- Triggers and saves video clips when g-force exceeds threshold (~ .5 g)
- Records 8 sec before/4 sec after trigger
- Cellular download

Current evaluation: age and experience

- Three different groups of participants
  - School license holders (14.5 – 15.5 years old)
  - Inexperienced intermediate license (16 years old) – never held a school license
  - Experienced intermediate license (16 years old) – had a school license for at least 4 months
- Half the participants in each group assigned to control condition
- Total study: 90 participants

Iowa Department of Transportation

Timeline

- ETVR installed prior to independent driving under applicable license
- First 4 weeks were no-feedback baseline for all (pre-intervention)
- 16 weeks of feedback
  - Flashing light on ETVR (immediate feedback)
  - Weekly report and CD of video (delayed feedback)
- Four weeks of baseline (post-intervention)

Iowa Department of Transportation

March 2012 analysis

- Data completed for 79/90 participants
- 240,257 miles
- Primary dependent measure is number of safety-relevant events per 1000 miles
  - Event frequency
- Negative binomial regression
  - Log of mileage as offset variable
  - Repeated measures

Iowa Department of Transportation

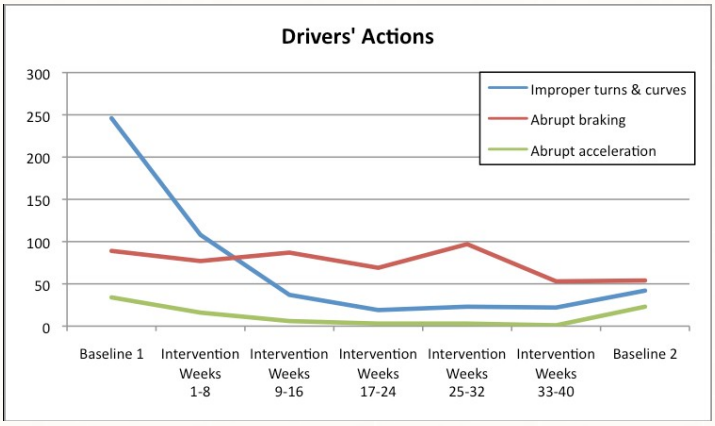
Subjects as of March 10, 2012

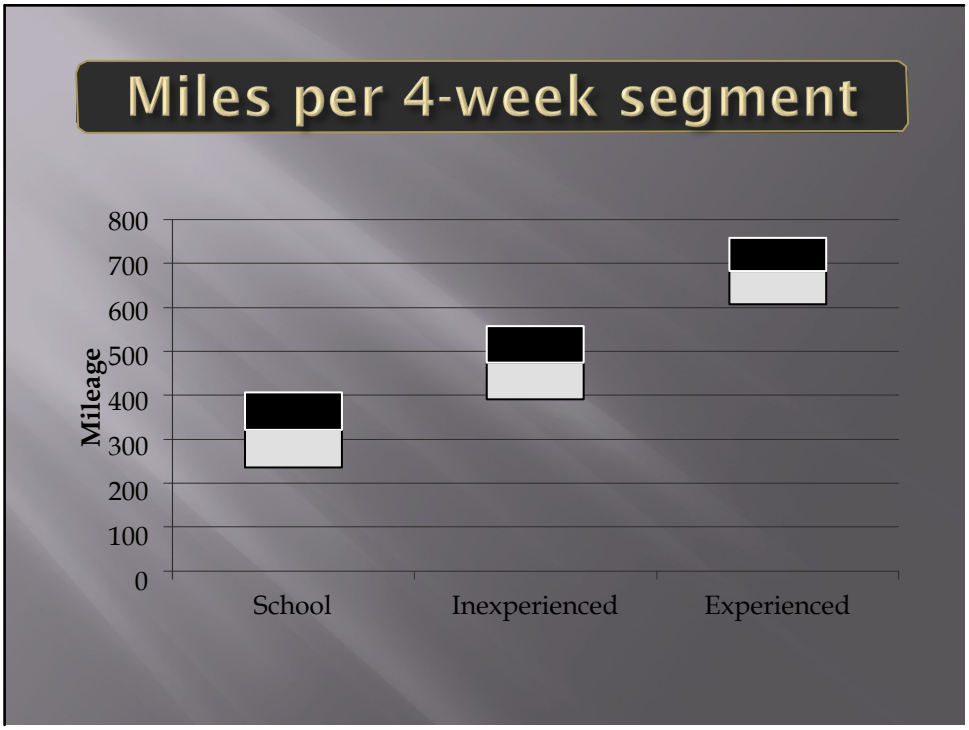
	Completed (n=79)		In Process (n=11)		Total
	Intervention	Control	Intervention	Control	
School Group (School License)	12	11	4	5	32
Inexperienced Intermediate Group (Intermediate License without prior School License)	13	13	1	1	28
Experienced Intermediate Group (School License before Intermediate License)	15	15	0	0	30
Total	40	39	5	6	90

Data collection complete Summer 2012

Use of Video in Teen Driving - Age vs. Experience

Preliminary results





Effectiveness of intervention March 2012

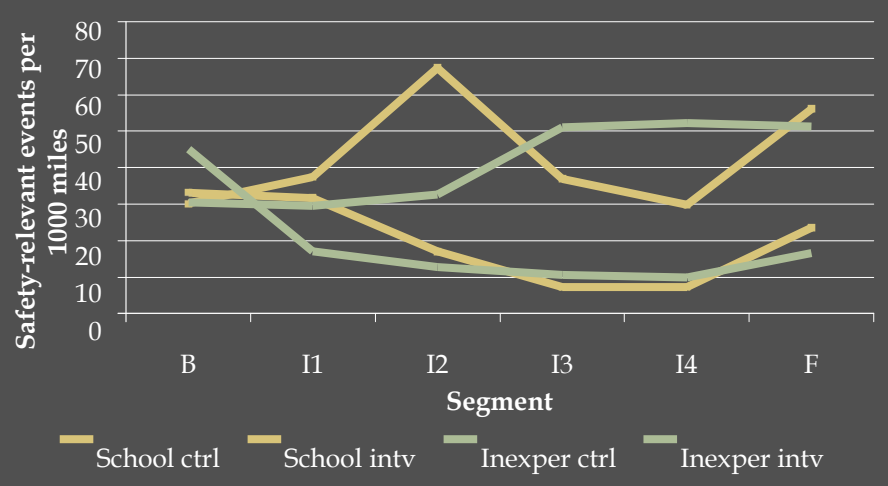
License group	Intervention condition	Event rate	Lower 95% CL	Upper 95% CL	X^2 value for diff	$P > X^2$
School	Control	40.8	23.8	70.1	4.85	0.0275
School	Intervention	12.9	5.4	30.8		
Inexperienced	Control	40.0	18.7	85.8	5.93	0.0149
Inexperienced	Intervention	12.3	6.9	21.7		
Experienced	20.6	20.6	12.8	33.1	12.15	0.0005
Experienced	Intervention	6.0	3.6	10.0		

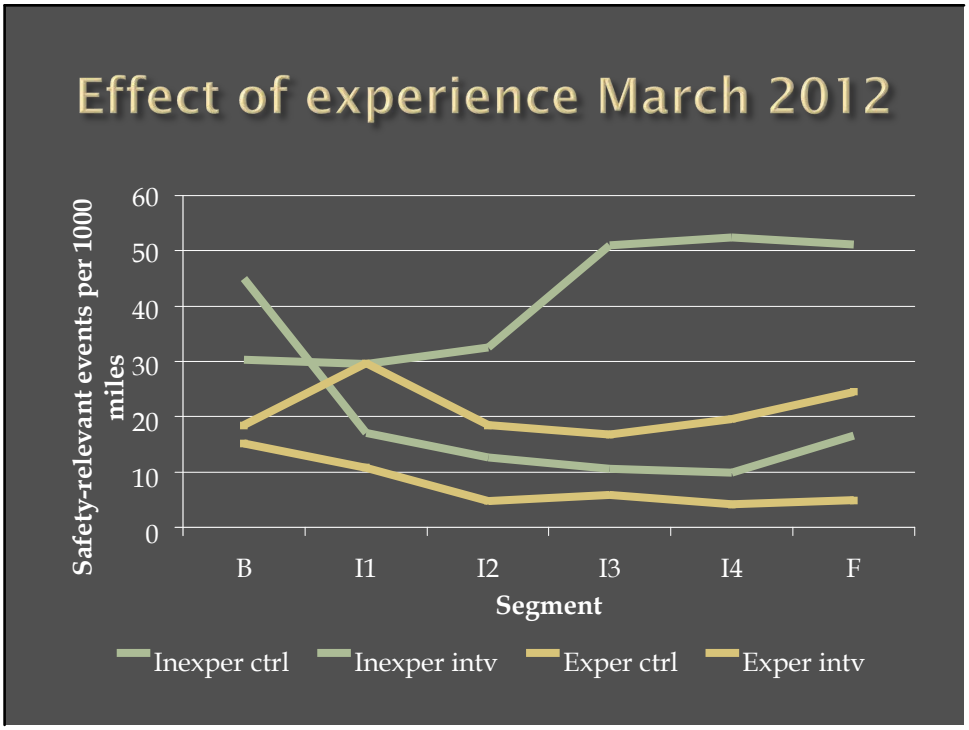
After the intervention March 2012

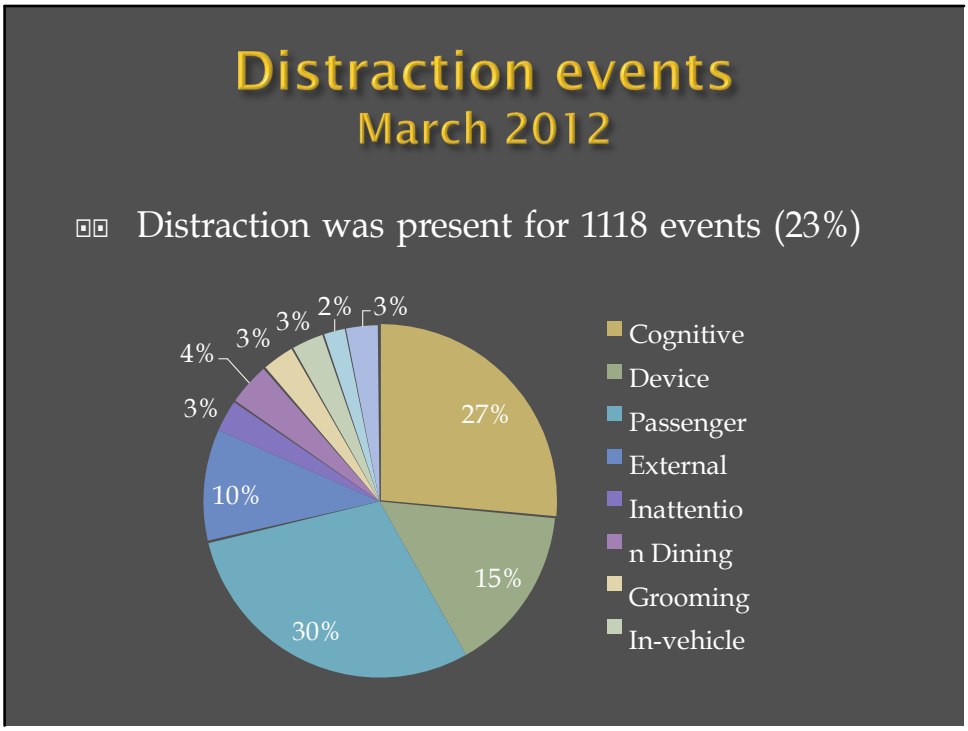
- School license group saw an increase of about 11 events/1000 miles after intervention ended ($X^2 = 5.13$, $p = 0.0235$)
- No increase after the intervention ended for both inexperienced and experienced 16-year-olds in the feedback condition.

Iowa Department of Transportation

No effect of age




Effect of experience March 2012
Safety-relevant events per 1000 miles
60
50
40
30
20
10
0
B
I1
I2
I3
I4
F
Segment
Inexper ctrl
Inexper intv
Exper ctrl
Exper intv


Distraction events
March 2012
Distraction was present for 1118 events (23%)
27%
15%
30%
10%
3%
4%
3%
3%
2%
3%
Cognitive
Device
Passenger
External
Inattentio
n Dining
Grooming
In-vehicle

Summary through March 2012

- Results for 78 drivers suggest:
  - Feedback significantly decreases event frequency relative to control for all driver groups
  - School permit drivers saw a rebound in event rates after intervention ended
  - Effect of experience
    - Inexperienced drivers tend to have more events in the initial baseline period
    - In the control condition, event rates are higher for inexperienced drivers after about 3 months of driving
    - In the feedback condition, inexperienced drivers tend to have more events

Summary

Data collection was completed on August 31, 2012 and all systems have been removed.

As of June 30, 2012	Completed (n=90)		In—Process (n=0)		Total
	Feedback	Control	Feedback	Control	
School Group (School License)	16	16	0	0	32
Inexperienced Intermediate Group (Intermediate License)	14	14	0	0	28
Experienced Intermediate Group (School License before Intermediate License)	15	15	0	0	30
Total	45	45	0	0	90

Work being completed:

Data coding of final events,
Quality assurance of data,
Data analysis,
Report writing

Iowa Department of Transportation

- 40 to 50 teenage fatali.es each year in Iowa from vehicular crashes.
- While all states keep and analyze crash records, the amount of detail from each state varies. Specific crash---related factors may not reveal themselves in the overall state---based crash sta.s.cs.

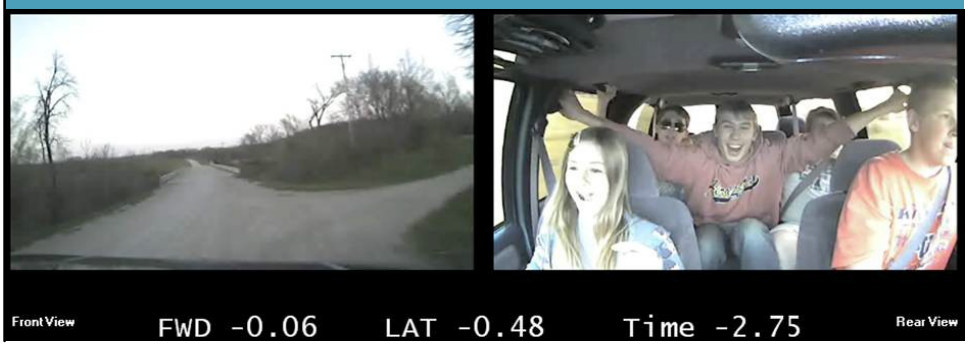
Go Team project

Research includes

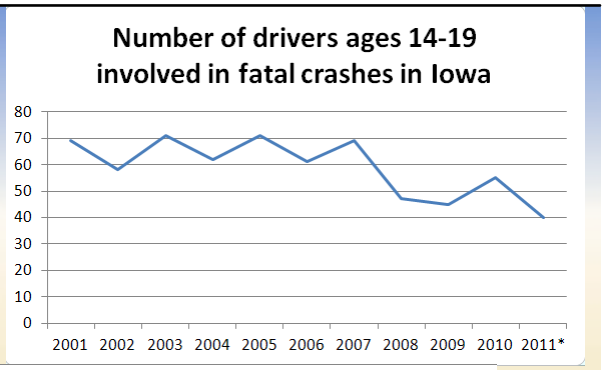
- Short case studies were developed for each fatal teen crash in Iowa.
- At the core of the investigations was the "Go-Team."
- This team consisted of experts in driver behavior and performance, Iowa crash data, traffic engineering, and logistics.
- The purpose of the Go-Team was simple and effective: begin the investigation of a crash with as much data as possibly available within a short timeframe, assembled from a team of experts proficient in examining the complex nature of a car crash.

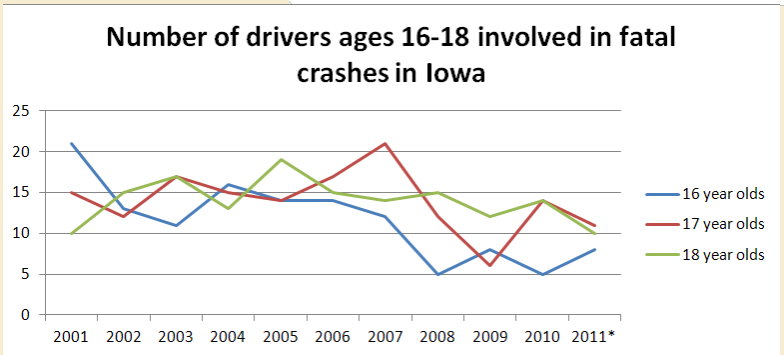
Go Team project

- Driver of at least one of the vehicles involved under the age of 19 (did not include chain-reaction crashes).
- 88 Fatal crashes evaluated. Four of these included more than one teen driver. 29 full ejections and 8 partial ejections.

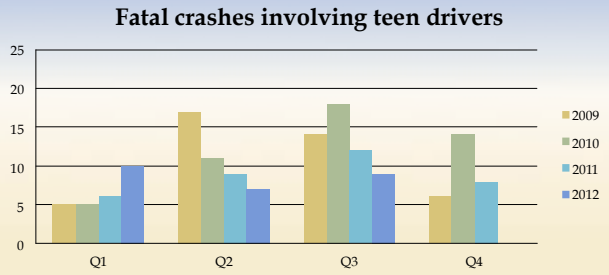


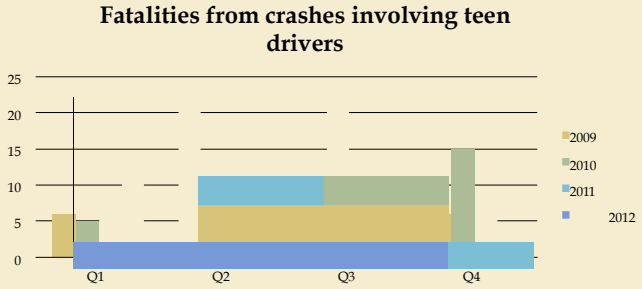
Go Team project





Go Team project





Thank You Utah DOT

ABC Implementa.on

- Iowa DOT new Policy
- Technical Transfer/Training/Workshop
- First Slide-In project scheduled for next spring.

Iowa Department of Transportation

Working
Together….
SOLUTIONS
AHEAD

Successful UDOT Research Projects

2012 UDOT Research Peer Exchange
2012 UDOT Annual Conference

Kevin P. Nichol, PE, MPA

Successful Projects

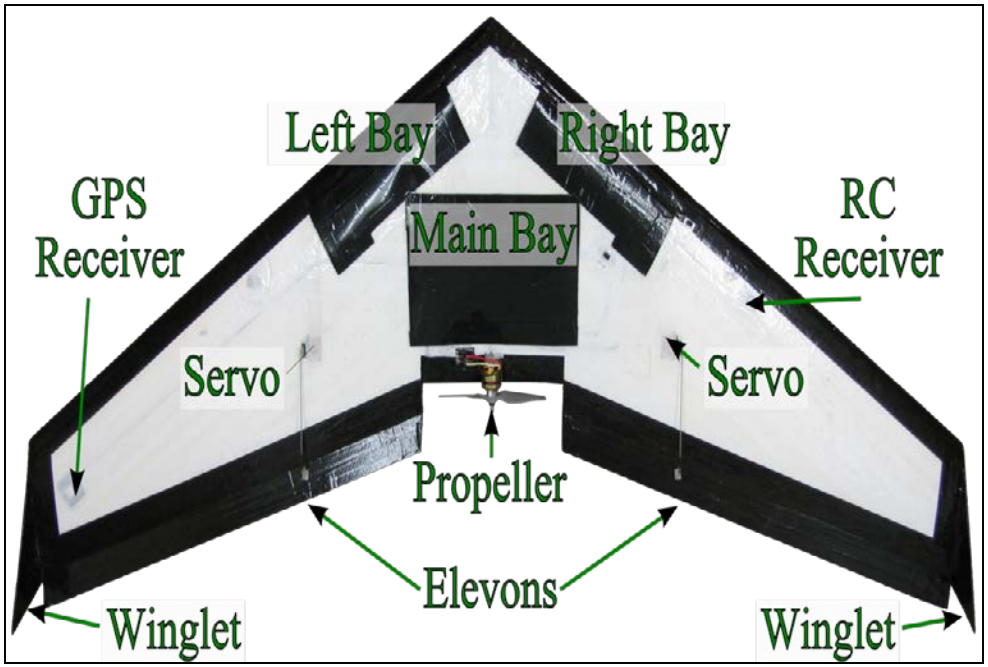
* Evaluation of UAV Technology
* Culvert Elements for Native Utah Fish Passage
* Construction Machine Control Guidance
* Wildlife Crossing Structures
* Measuring Benefits of Research
* Accelerated Bridge Construction

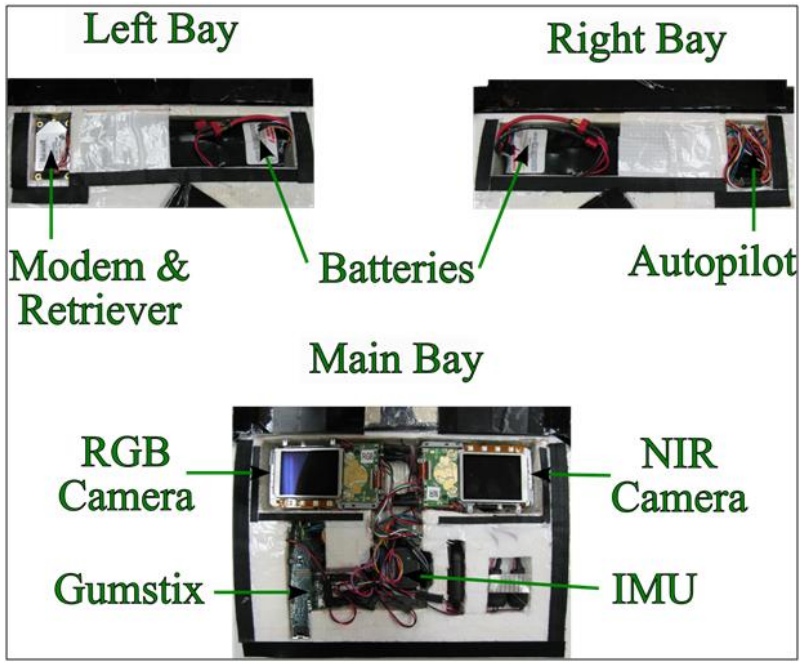
UAV Technology

Goal: Improve high-resolution imagery along highway corridors

* Monitor wetlands and invasive plant species
* Track construction projects
* Locate structures for inventories

UAV Technology





UAV Technology

Native Fish Passage

Leatherside Chub – image Casper Star Tribune

Speckled Dace – image Oregon State

Goal: Improve upstream passage through culverts of non-salmonid native fishes in an economical fashion

Native Fish Passage – Phase I

Control

Substrate

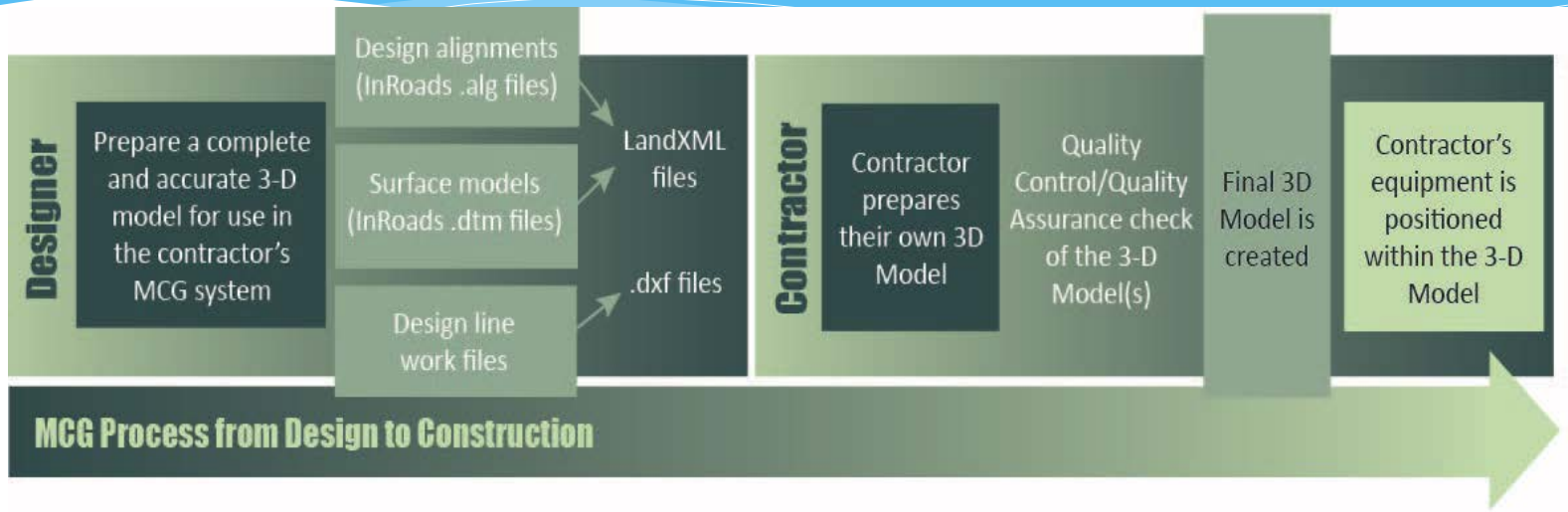
Cylinders

Native Fish Passage – Phase I

Native Fish Passage – Phase II

Construction Machine Control Guidance

Construction Machine Control Guidance



Developed guidance for design and construction

Refined an implementation process

Recommended project inspector training

Outlined survey control needs for design

Wildlife Crossing Structures

Goals:

* Identify preferred culvert and bridge designs for passing mule deer, elk, and wildlife
* Maintain wildlife connectivity and avoid vehicle collisions

Wildlife Crossing Structures

Wildlife Crossing Structures

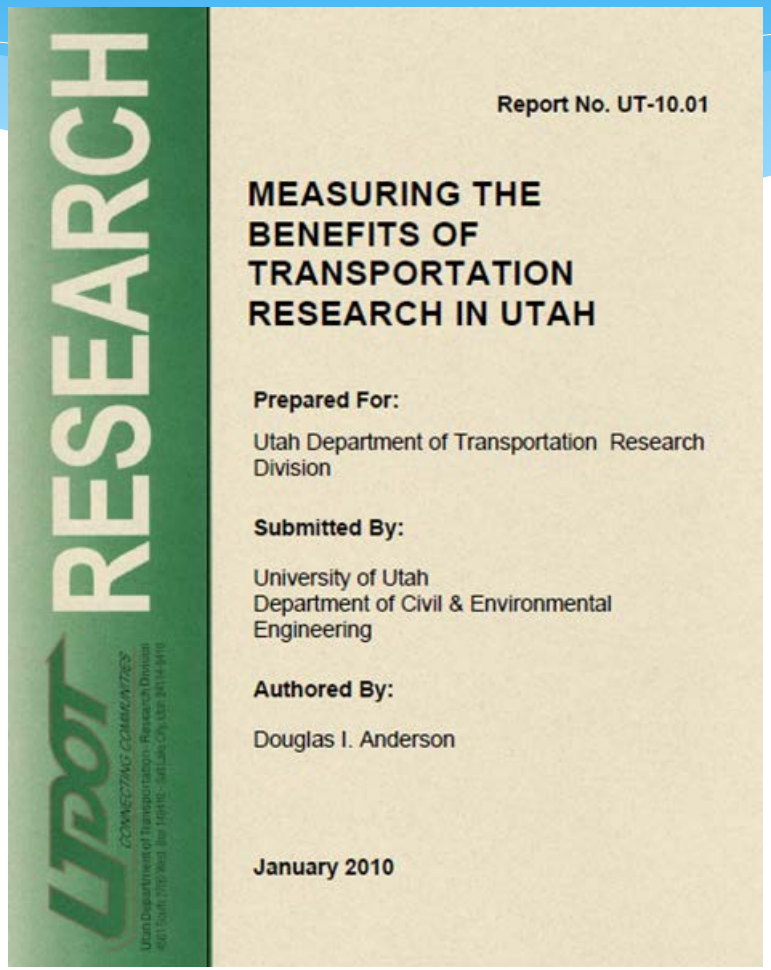
Benefits of Research

Estimated benefits of research at UDOT:

* Estimated B/C ratio
* Feedback on process/direction

Reviewed research projects from 2006 to 2008:

* Evaluated and classified 41 projects
* Interviewed key champions to quantify implementation
* Compiled and calculated B/C ratio
* Determined greatest payback per classification


RESEARCH

UDOT

Report No. UT-10.01

MEASURING THE BENEFITS OF TRANSPORTATION RESEARCH IN UTAH

Prepared For:

Utah Department of Transportation Research Division

Submitted By:

University of Utah
Department of Civil & Environmental Engineering

Authored By:

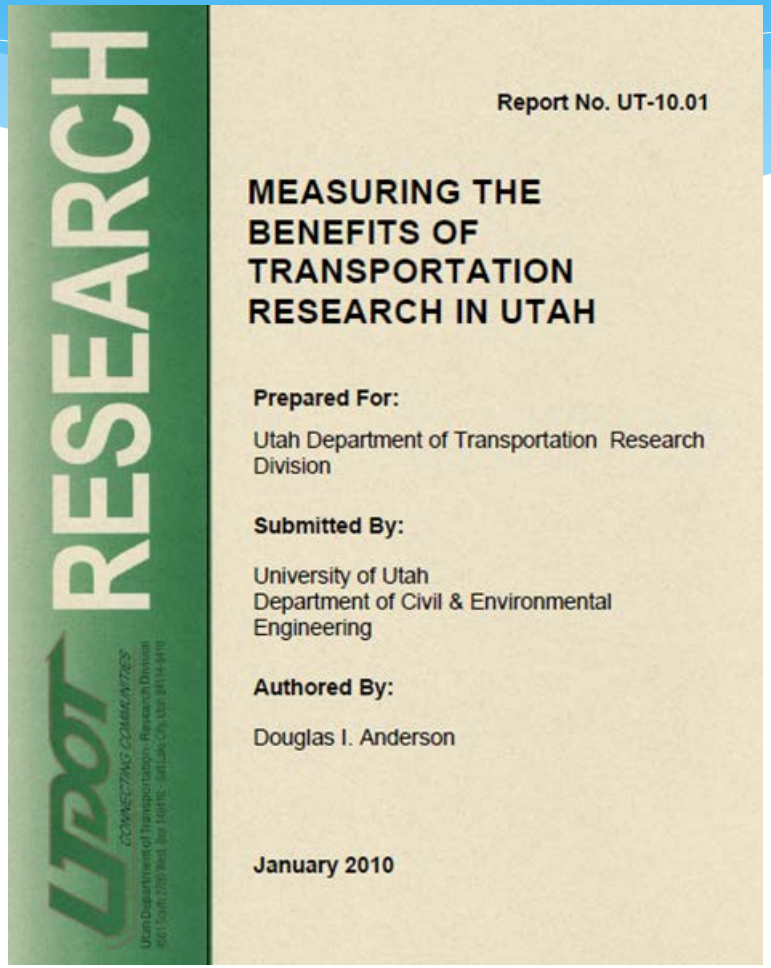
Douglas I. Anderson

January 2010

Benefits of Research

46 deliverables benefit-cost (17:1)

* 46 deliverables were produced
* $4.81 million cost of projects
* $80.8 million of estimated benefit
* Highest benefits achieved by studies on big ticket items:
  * Highways, bridges, traffic control, and right-of-way
  * Safety studies also show significant returns
* Portion of Research Division resources dedicated to implementation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January 2010

Accelerated Bridge Construction

http://www.youtube.com/watch?feature=player_detailpage&v=gInuHGcjf24

Connecting South Dakota and the Nation

SDDOT Research Implementation Process

Daris Ormesher
South Dakota DOT

1

SDDOT Implementation Process

- Research Process
- Implementation Process
- Implementation Example

2

Research Review Board

- Secretary of Transportation
- Division Directors
  - Planning and Engineering
  - Operations
  - Finance
- SDDOT Region
- Federal Highway
- County
- South Dakota Board of Regents

3

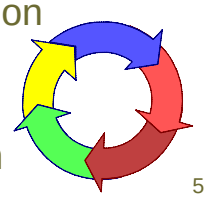
SDDOT Research Roles

- **Research Review Board:** set priorities, approve funding, decide implementation
- **Office of Research:** manage and perform research; chair technical panels; administer research program; maintain research library; coordinate LTAP; coordinate with other state and national research programs
- **Technical Panels:** define,monitor and evaluate research; recommend implementation
- **Universities & Consultants:** suggest & perform research

4

Research Process Phases

- Conception: Identify improvement opportunity
- Definition: Confirm need, define scope
- Execution: Perform research
- Implementation: Put research into practice
- Tracking: Monitor implementation progress
- Evaluation: Estimate value of research projects & program



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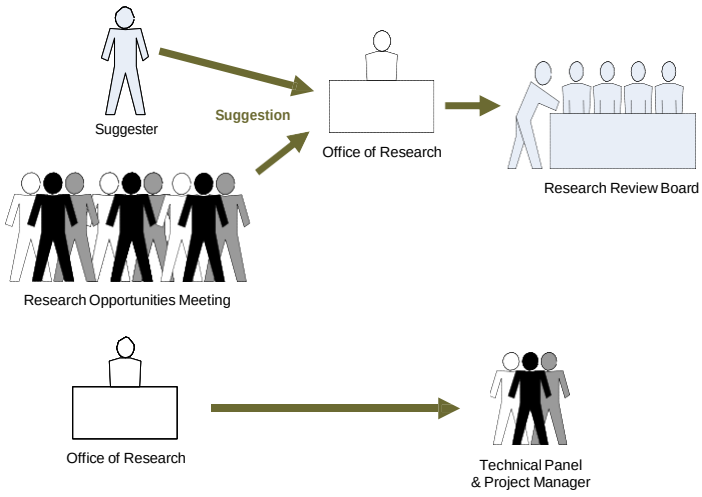
Research Conception



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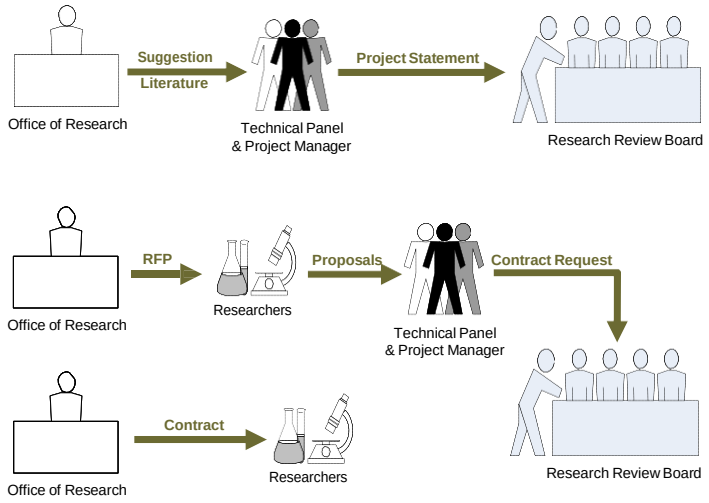
Research Definition



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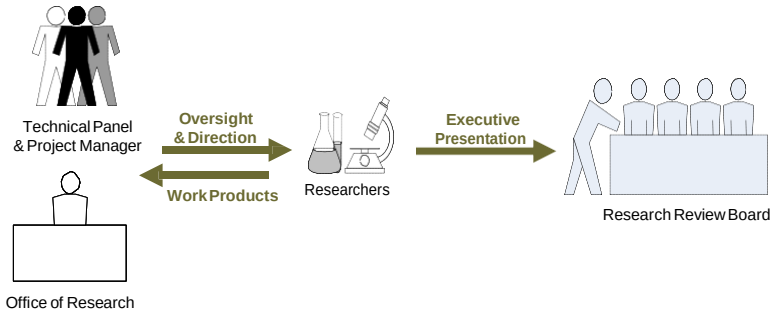
Research Execution



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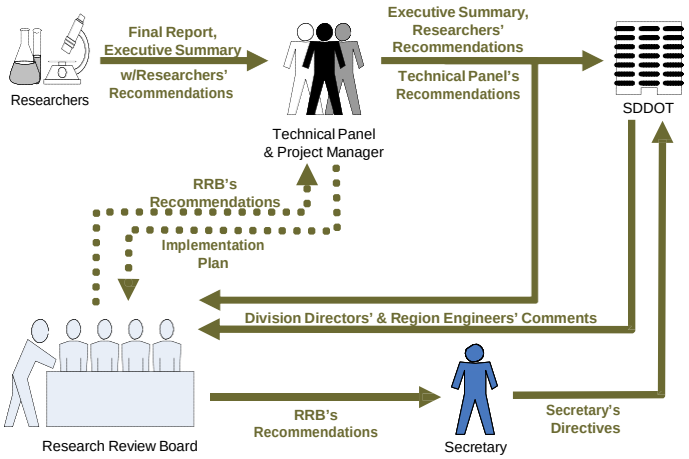
SDDOT Research Process

David Hu4, Research Program Manager

Implementation



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Tracking & Evaluation

Implementation Actions

Secretary's Directives, Implementation Plan

SDDOT

Office of Research

Implementation Report

Implementation Valuation

Research Review Board

10

Projects Implemented

- Well Defined Projects
- Upper Management Support
- Materials Related
- DOT Only Projects

11

SD2008-08 Implementation Plan

Review and Refinement of SDDOT'sLRFD Deep Foundation Design Method

Study SD2008-08

Implementation Plan

SD2008-08 Implementation Plan

- Version History
- Implementation Plan Approval

1 Version History

Version #	By	Revision Date	Approved By	Approval Date	Reason
1.0	SD2008-08 Technical Panel	07/06/2011	SDDOT Research Review Board		Original Version

Title: Bridge Design Engineer Manager

Signature: Date: 07/06/2011
Print Name: Jim Jurgens
Title: Director, Division of Planning & Engineering

Signature: Date: 07/06/2011
Print Name: Dave Bergquist
Title: Secretary, Department of Transportation

SD2008-08 Implementation Plan

- Research Summary
  - Research Summary
  - Research Objectives and Outcomes
    - Assess FHWA LRFD Specifications
    - Recommend Refinements
  - Research Products
    - Executive Summary
    - Final Report
    - Load Test Database
    - Implementation Plan

Implementation Plan

n Target Audience

SDDOT Founda>ons Sec>on	The Founda>ons Sec>on will have to establish a load tes>ng plan, incorporate load tes>ng provisions in construc>on plan sets, and revise procedures for deep founda>on design.
SDDOT Bridge Design Program	Bridge Design will need to incorporate revised resistance factors into substructure design procedures to reflect revised procedures for deep founda>on design.
SDDOT Local Transporta>on	Local Transporta>on Programs must be informed of modifica>ons to construc>ons plans, pile driving, and load tes>ng procedures, review relevant construc>on

15

Implementation Approach

Implementa>on Recommenda>on (Approved by RRB 11/04/2010)	Task or Milestone Name	Task or Milestone Descrip>on
The Founda>on Sec>on and the Bridge Office should update current procedures for serviceability design		The Founda>on Sec>on will formally analyze

16

Implementation Roles and Responsibilities

Task or Milestone Name	Responsible Office(s)
Analyze serviceability limit state	Founda>ons Sec>on, Bridge Design
Analyze lateral pile performance	Founda>ons Sec>on, Bridge Design
Analyze pile grouping effects	Founda>ons Sec>on, Bridge Design
Use Grade 50 in Lateral Load	Bridge Design

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Implementation Roles and Responsibilities

Iden>fy supplemental funding sources	SD Division, Federal Highway Administra>on
Develop load test specifica>ons	Founda>ons Sec>on, Research Consultant
Select load test projects	Founda>ons Sec>on
Perform load tests	Construc>on Contractors, Research Consultant

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Implementation Schedule

Task or Milestone Name	CY2011				CY2012				CY2013				CY2014				CY2015				CY2016			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Analyze serviceability limit state																								
Analyze lateral pile performance																								
Analyze pile grouping effects																								
Use Grade 50 in Lateral Load Analysis																								
Use Grade 50 in Ver>cal Load Analysis																								
Employ undisturbed sampling																								
Establish research project																								
Iden>fy supplemental funding sources																								
Develop load test specifica>ons																								
Select load test projects																								
Perform load tests																								
Recalibrate resistance factors																								
Evaluate pile capacity formulas																								
Evaluate GRLWEAP driveability model																								
Refine GRLWEAP driveability model																								

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Needed Resources

Resource	Es>mated Cost	Source
Load tes>ng services by construc>on contractors; 3 projects per year average for 5 years, $150,000 per project	$2,250,000	Federally--par>cipa>ng construc>on funds for both state and federal projects;
		Special funding to support pile load tes>ng from FHWA

20

Needed Resources

SDDOT staff >me for engineering and research management	$175,000	Project funding; State Planning & Research funds from SDDOT Office of Research

21

Evaluation

Task or Milestone Name	Progress	% Complete
Analyze serviceability limit state	This ac>on is planned July, 2011.	0%
Analyze lateral pile performance	This ac>on is planned July, 2011.	0%
Analyze pile grouping effects	This ac>on is planned July, 2011.	0%
Use Grade 50 in Lateral Load Analysis	This ac>on is planned July, 2011.	0%

22

Evaluation (continued)

Establish research project	The SD2008---08 technical panel has developed a Research Project Statement en>tled *Technical Support for SDDOT's Pile Load Tes8ng Program* for presenta>on to SDDOT's Research	50%

23

Evaluation (continued)

Develop load test specifica>ons	The Founda>ons Sec>on is working with Dr. Allen Jones and Dr. Lance Roberts to develop an ini>al Special Provision for load tes>ng.	60%
	Three projects—SD 65 over the Grand River in Corson County,	

24

Evaluation (continued)

Perform load tests		0%
Recalibrate resistance factors		0%
Evaluate pile capacity formulas		0%
Evaluate GRLWEAP driveability model		0%
Refine GRLWEAP		

25

Criteria for Evaluation Effect on Practice

Impact Area	Poten>al Impact	Method of Measurement
Cost	Savings in pile length, number, and cost due to more efficient founda>on designs	Es>mated savings in pile cost compared to current designs.
Product & Service	Improved reliability in founda>ons	Subjec>ve evalua>on, as quan>ta>ve

26

Criteria for Evaluation Effect on Practice

Impact Area	Poten>al Impact	Method of Measurement
Safety	Enhanced public safety deriving from improved founda>on reliability	Subjec>ve evalua>on, as quan>ta>ve es>mates are not prac>cal
	Reduced material	Subjec>ve evalua>on,

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Key Terms

- ENR Formula
- Grade 50 Steel
- GRLWEAP
- LRFD
- Pile Load Test
- PDA

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Questions?

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  SD Department of Transportation
- 700 East Broadway Avenue
  Pierre, SD 57501-2586
  605.773.3358
- Daris.Ormesher@state.sd.us
-
-

29

Study of ITD's Maintenance and Pavement Management Needs

Ned Parrish, Research Program Manager
Idaho Transportation Department

Presentation Outline

- Provide overview of the project
- Describe key factors to project success
- Present overview of implementation efforts
- Discuss factors the led to implementation success
- Summarize actions following implementation
- Questions

Project Background

- Project requested by Chief Engineer and Transportation Planning Administrator
- ITD Research Advisory Council selected project for funding in the fall of 2007
- Broad-based steering committee established that included staff from:
  - Highways, Planning, and Administration
  - Each district
- Project budget = $75,000

Research Conducted

- Reviewed ITD systems and practices for needs, gaps, and enhancements
  - Maintenance management
  - Pavement management
  - Financial management (AMS)
  - Geographic information systems
- Interviewed 40+ headquarters and district staff
- Gathered information about management systems and best practices in other states

Maintenance Management Findings

- Acquiring an MMS system is a top priority
- System must provide:
  - Basic cost accounting and budgeting information
  - Ability to analyze productivity rates and assess level of service for performance measurement
  - Condition information and maintenance history for system assets/features
- System should be accessible to HQ and district staff and provide information at state, district, and shed levels
- Linkages needed to PMS, AMS, GIS, and other systems
- Ease of reporting and geographical display important

Estimated Costs for Maintenance Management System

Activity	Estimated Cost
Statewide software license and implementation	$1,500,000
Financial management system interface development	$500,000
Hardware (8 - 10 GPS units per district)	$300,000
User interface customization	$250,000
Training (train the trainer)	$150,000
Total One-time Costs	**$2,700,000**
Annual maintenance (~ 20% of license fee)	$300,000

Pavement Management Findings

- Current 20-year old system meets some department needs:
  - Assesses need based on annual pavement condition surveys for submittal to Legislature
  - Identifies deficient pavements using "worst-first" strategy
- System weaknesses:
  - Lacks analysis tools needed to examine preservation treatment strategies
  - System is centralized, requiring districts to request information from HQ
- District 6 pilot project has given the district some additional capabilities, but not intended to be a statewide system

Estimated Cost for New Basic Pavement Management System

Activity	Estimated Cost
Software	$700,000
Customization and training	$250,000
Total One-time Costs	**$950,000**
Annual licenses	$50,000

Success Factor: The Research Addressed Key Problem Area

- No Maintenance Management System
  - MMS was over 20 years old
  - Decommissioned since July 2005 following acquisition of new financial system
- Limited Pavement Management System
  - PMS was of similar age
  - Available only to technical experts at HQ
  - System would not connect to MMS or other related systems

Success Factor: Significant Support for the Study

- Project had high-level sponsors/champions
  - Chief Engineer
  - Planning Division Administrator
- Study supported by staff in HQ and districts
  - Interest in better tools for analyzing pavement management options
  - Desire for system to manage maintenance function
    - Scheduling work
    - Evaluating level of service
    - Budget planning

Success Factor: Contractor Quality

- Selected contractor for the project through competitive RFP process
- The contractor selected, AP Tech, had substantial expertise
  - Experience working with a number of state DOTs
  - Knowledgeable of best management practices
  - Familiar with available commercial-off-the-shelf systems
- Contractor prevented from bidding on system development/implementation to help ensure objectivity

Success Factor: The Research Provided the Needed Information

- Documented limitations/weaknesses of existing systems
- Described agency needs and clearly articulated systems benefits
- Summarized best practices from other states
- Provided estimates for costs of systems acquisition and ongoing operations
- Included information about ROI from similar systems in other states

Success Factor: Study Informed Audit Recommendations

- American Society of Civil Engineers (ASCE) Review
  - Recommended acquisition of a new maintenance management system
- Office of Performance Evaluations (OPE) Audit
  - Recommended change from "worst-first" to "preservation-first" focus
  - Found ITD lacks necessary management systems for cost-effective highway program
  - Recommended Legislature appropriate $6 million for new MMS and PMS systems, integrated with AMS and GIS

Report Impact

- Research results presented to ID Transportation Board
- Information from the study discussed in ID Legislature
  - Joint Legislative Oversight Committee
  - House and Senate Transportation Committee
- Legislation passed increasing DMV fees with a portion of the initial revenues dedicated to systems acquisition and implementation
- Governor issued executive order directing ITD to implement new systems

Implementation Overview

- Project team established (3/09)
- Used research report in developing RFP (8/09)
- Agile Assets selected and contract signed (12/09)
- System goes live (12/10)
- Staff training provided (Spring/11)

- Project completed under budget

Success Factor: Team Structure

- The research sponsors continued to champion the project in the implementation phase
- ITD designated business leaders for each system
- Project Manager with experience in IT system implementation
- Vendor technical experts provided on site support
- Roles and expectations were clearly articulated

Success Factor: User Involvement

- Project team interviewed customers in HQ and districts to better understand systems needs.
- Communications continued throughout the process
  - Weekly meetings of core team
  - Monthly project status reports widely distributed
- Super users identified for each system in each district
- Super users and regular users involved in system testing and refinement

Subsequent Developments

- Similar review done of ITD's aging LRS
  - Funding received for a new system
  - The system is currently under development
- ITD has continued to develop its asset management capabilities
  - Added equipment management and fleet management modules
  - Established Transportation Systems Section
- Currently developing tool similar to UDOT's UPLAN

Questions?

For additional information:

Ned Parrish
ned.parrish@itd.idaho.gov
(208) 334-8296

How Minnesota facilitates progressive research and implements innovative ideas

Utah DOT Peer Exchange and Research Conference
October 2012
By Nicole Peterson
MnDOT Research Management Engineer

Your Destination...Our Priority

Overview of MnDOT Program

MnDOT's Core Business:

State highway maintenance, operations, design and construction; multimodal system support and development; and financial aid for local roads

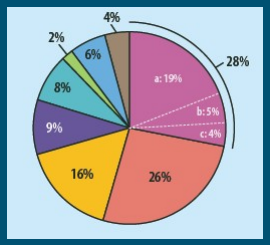
http://www.dot.state.mn.us/strategicplan/

FY2012 Research Funds by Funding Source

- FHWA State Planning and Research (29%) $3,190,840
- State Research Program (30%) $3,284,000
- Local Road Research Board (27%) $2,902,378
- Cooperative Program for Transportation Research and Studies (3%) $363,000
- Other (10%) $1,117,087
- Total 10,857,305

FY2012 Research Funds by Topic Area

- 28% Administrative
- 26% Materials & Construction
- 16% Traffic & Safety
- 9% Policy & Planning
- 8% Bridge & Structures
- 6% Maintenance Operations & Security
- 4% Multimodal
- 2% Environmental



MnDOT Research Management

- Identifying and Tracking Needs
  - Internal and external collaboration
  - Our database and other tools
- Developing and Funding Projects
  - MnDOT Transportation Research and Innovation Group (TRIG)
  - Local Road Research Board
  - Other funding programs
- Project Execution
  - Technical Advisory Panel and project management roles
- Implementation
  - Facilitating growth
  - Marketing and outreach efforts
  - Tracking next steps

Projects

Evaluating the Costs and Benefits of Living Snow Fences

http://www.dot.state.mn.us/research/documents/201203TS.pdf
http://www.dot.state.mn.us/research/TS/2012/201203.pdf

What Was the Need?

- Minnesota Division of Emergency Management estimated 142 fatalities caused by hazardous driving conditions associated with blowing & drifting snow between 1984 & 2002 (Average of 8 fatalities/year)
- By contracting 40 percent of sites with snow problems to the Living Snow Fences program, MnDOT could save $1.3 million per year. LSFs improve driver visibility and road surface conditions, and have the potential to reduce accidents, snow removal costs and removal equipment emissions.

MNDOT is paying farmers to leave standing corn as a snow fence in problem areas on state highways.

This Honeysuckle single row protects MN-Hwy 30.

Segments of roads with LSFs (right) have better driver visibility and road surface conditions than those without (left), leading to lower road maintenance costs and fewer accidents. LSFs can also benefit the atmosphere by storing carbon dioxide and reducing emissions from snow removal operations.

Evaluating the Costs and Benefits of Living Snow Fences

- Inducing landowners to participate in the LSF program has been difficult, and as of 2011 MnDOT had only used 12 percent of its LSF budget, obtaining contracts for just 2.3 percent of problem sites.
- The current level of payments offered to landowners may not be a sufficient incentive to establish and maintain LSFs, and research was needed to determine a payment structure that will increase adoption rates while remaining cost-effective.

Evaluating the Costs and Benefits of Living Snow Fences

What Was Our Goal?

The goal of this project was to develop a calculator for estimating optimal LSF program payments to landowners by identifying costs, benefits and obstacles to implementing the program.

MnDOT developed a calculator for estimating optimal LSF program payments to landowners by identifying costs, benefits and obstacles to implementing the program.
http://www.dot.state.mn.us/environment/livingsnowfence/cost-benefit.html

"Of about 3,800 possible LSF sites in Minnesota, not all have the same traffic, crash rates and snow problems. The tool developed in this project will allow personnel to prioritize LSF funding to target the most critical sites."
—Dan Gullickson
Living Snow Fence Program Coordinator
MnDOT Office of Environmental Stewardship

Evaluating the Costs and Benefits of Living Snow Fences

What Did We Learn?

Based on agency and landowner feedback, researchers recommend improving the LSF program in the following ways:

- Payments
- Prioritization
- Promotion

Evaluating the Costs and Benefits of Living Snow Fences

What's Next?

- Modifications to our LSF program based on recommendations
- Researchers suggest that once MnDOT snowplows are fully equipped with GPS, resulting data should be used to quantify sand and salt applications to determine where snow fences are needed most and what impact they are having.
- Further research is also needed on the effectiveness of various plant species for use as LSFs

Evaluating the Costs and Benefits of Living Snow Fences

In the context of a research program…

- Highlights the spectrum of implementation and the need to understanding obstacles to implementing

Impacts of Playground Warning Signs on Vehicle Speeds

http://www.dot.state.mn.us/research/documents/201206TS.pdf
http://www.dot.state.mn.us/research/TS/2012/201206.pdf

What Was the Need?

- Residents often request these warning signs from their local governments to make their neighborhood streets safer
- Agencies aim to install only the most necessary road signs

Impacts of Playground Warning Signs on Vehicle Speeds

What Was Our Goal?

This project's objective was to evaluate the impact of playground warning signs on vehicle speeds at three locations in Bloomington, Minnesota. Since the state and federal editions of the Manual on Uniform Traffic Control Devices currently leave the placement of these signs to engineering judgment, the study results would help local engineers determine whether the benefits of the signs justify the costs.

Impacts of Playground Warning Signs on Vehicle Speeds

What Did We Learn?

- Installing playground warning signs did not have a large effect on average vehicle speeds at any of the three sites
- However, researchers found that vehicle speeds were strongly related to levels of playground activity and parked cars
- The impact of playground warning signs on vehicle speeds appeared to be site-specific. Researchers noted that some of the variability in the vehicle speed impacts is likely due to the differences in site characteristics and suggested that it may also be affected by subjective differences in how the field personnel categorized on-street parking levels for the study.

Playground without nearby street parking.

Playground with nearby street parking.

Impacts of Playground Warning Signs on Vehicle Speeds

What's Next?

- Use this research
- Update the Best Practices for Sign Reduction on the Local System (http://www.dot.state.mn.us/stateaid/trafficsafety/MnDOT_Traffic_Sign_Maintenance_Management_Book_Low-Res_10_13_10_FINAL.pdf)

Impacts of Playground Warning Signs on Vehicle Speeds

In the context of a research program…

- Equipping practitioners at all levels of government with information to make better decisions in response to citizen requests.

Standard Sumps and the SAFL Baffle as Economical Solutions for Stormwater Treatment

http://www.dot.state.mn.us/research/TS/2012/201213TS.pdf
http://www.dot.state.mn.us/research/documents/201213.pdf

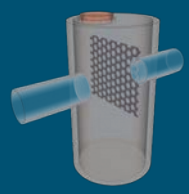
What Was the Need?

- Minimize the effects of stormwater runoff on regional surface waters and groundwater
- Effectively remove sediments using significantly cheaper standard sumps, which are cylindrical tanks that are already a common feature of stormwater infrastructure
- Comply with federal and state environmental regulations

Standard Sumps and the SAFL Baffle as Economical Solutions for Stormwater Treatment

What Was Our Goal?

The goal of this project was to evaluate the effectiveness of standard sumps for stormwater management, including sumps retrofitted with the SAFL Baffle, a device designed to increase the effectiveness of sumps for removing and retaining sediments from stormwater runoff.



Standard Sumps and the SAFL Baffle as Economical Solutions for Stormwater Treatment

What Did We Learn?

- Tests of the SAFL Baffle showed that it dissipated the energy of water entering the sump
- Improving sediment capture by 10 percent to 15 percent and decreasing washout by a factor of 16, to nearly zero at high flow rates
- Shallow sumps with baffles clogged by debris had significant washout, but this can be mitigated by increasing baffle hole diameters
- Washout was also high in sumps with outlet pipes angled at 90 degrees to inlet pipes, but could be decreased by installing the baffle at an angle of 90 to 120 degrees to the inlet pipe
- Additionally, researchers developed recommendations for using the SAFL Baffle in sumps receiving water from both inlet pipes and grates

Typical baffles are impermeable, leading to a circulation of water that washes sediment out of sumps. The SAFL Baffle developed by the St. Anthony Falls Laboratory is porous, distributing the jet flowing from the inlet pipe more evenly across the sump, reducing its maximum velocity and so virtually eliminating washout.

Standard Sumps and the SAFL Baffle as Economical Solutions for Stormwater Treatment

What's Next?

- Continue to share the results
- Upstream Technologies manufacturing the SAFL Baffle (www.RevolutionaryBaffle.com)
- Software has been developed by Barr Engineering for sizing sump manholes and SAFL Baffles, as well as many of the hydrodynamic separators (https://www.barr.com/WhatsNew/SHSAM/SHSAMapp.asp)

Standard Sumps and the SAFL Baffle as Economical Solutions for Stormwater Treatment

In the context of a research program…

- Demonstrates the need to work collaboratively through the development process to optimize the commercialization potential of products.

For More Information about MnDOT's Research Services

http://www.dot.state.mn.us/research/index.html

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Also, take a look at our MnDOT Library resources:
http://www.dot.state.mn.us/library/

IMPLEMENTATION OF RESEARCH RESULTS AT MDT

Sue Sillick
Montana Department of Transportation
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RESEARCH PROGRAMS

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Organizational Structure

MDT Organization

RESEARCH PROGRAMS

MDT Organization

RESEARCH PROGRAMS

Research Staff

Research Programs Manager
Sue Sillick

Research Projects Manager
Kris Christensen

Experimental Projects Manager
Craig Abernathy

Librarian
Katy Callon

Funding

SPR

- 2013 Federal Funding $1.8 M; $2.3 M Total (est.)
- Planning – Project by Project

Earmark Funding

- FHWA and other USDOT Administrations
- Amount Varies on an Annual Basis
- Currently ~ $1.2 M

Pooled---Fund Studies

- TPF---5(251); $636,000; MT $150,000

Guiding Principles

Target MDT Needs

- Department---Wide, Multi/Inter---Modal Focus
- Answer Questions/Solve Problems

Direction Set by MDT's Executive Management

Strong Focus on Customer

Focus on Applied, Implementable Research

Define "Research" and "Implementation" Broadly

Guiding Principles

Focus on Business Case, Implementation, and Technology Transfer

Involve Stakeholders (Internal and External) to Facilitate Implementation

Provide Necessary Resources

Continuous Process and Program Improvement

Research Programs

Research Projects
Experimental Projects
Technology Transfer

Research Projects Program

Purpose

Research projects provide solutions to MDT's problems and improve efficiency and effectiveness of operational activities.

Benefits

Solves Problems – Answers Questions

Objective Reporting of Results

Improves Operations Efficiency and Effectiveness

RESEARCH PROGRAMS

Research Projects Program

Research Review Committee (RRC)

- Director, Deputy Director, Division Administrators, District Rep, FHWA, WTI, Research Manager (12 members)
- Determines MDT's High Priority Research Needs and which Topics Forward to Technical Panels
- Approves Research Projects (SOW and Proposal/ Funding)
- Reviews Progress and Implementation Recommendations

Research Projects Program

Technical Panel

- Critical for Success
- One for each Research Project (Champion, RPM, Stakeholders, Implementers)
- Oversees Research Project from Idea through Implementation
- Determines Need for Research

Research Projects Program

Technical Panel

- Determines Products Necessary for Implementation
- Develops Scope
- Determines Appropriate Venue for Research
- Reviews Project Progress
- Makes Implementation Recommendations

Research Projects Program

Implementation

- Consider Implementation from the Beginning and Throughout Each Project
  - Research Topic Statement
  - Champion
  - Sponsor
  - Technical Panel
  - Research Project Statement
  - Scope of Work

Research Projects Program

Implementation

- Consider Implementation from the Beginning and Throughout Each Project
  - Proposal
  - Reports
  - Consultant Recommendations
  - Technical Panel
  - Recommendations RRC
  - Recommendations

Research Projects Program

Implementation Summary

- Management Involvement and Support
- Involve the Right People
- Excited Champions/Implementers
- Communication, Coordination, & Collaboration
- Consider Implementation from the Beginning and Throughout Each Project

Research Projects Program

Implementation Summary

- ID implementation Barriers; Reduce or Eliminate Barriers
- Develop Products Necessary for Implementation
- Provide the Tools and Funding to Accomplish Implementation

Research Projects Program

Implementation Challenges

- Follow---Up
- Formalize Process
- Need Additional
- Tools

Implementation Future

- UDOT Peer Exchange Lessons Learned
- RAC Survey
- Tool Development
- Develop Implementation Action Plan
- Present Plan to MDT and FHWA MT
- Division Implement the Action Plan

Research Projects Program

- Implementation Examples
  - Montana Rest Area Design
    - Design Document Applicability to MT Rest Areas Questioned
    - Usage Evaluated
      - Water Usage
      - Effluent Flow
      - Pedestrian Traffic
      - Vehicle Traffic Counts and Classification
      - Vehicle Dwell Times for Commercial and Passenger Vehicles
    - 10 Design Guidelines Developed

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MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
  - Montana Rest Area Design
    - Dena Mora Rest Area
      - Required Rehabilitation of Wastewater System
      - 50,000 gallons reduced to 10,000
      - $1.5 M Estimate Reduced to $0.8 M
      - Improved Environmental Stewardship
      - Reduced Overall Lifecycle Costs
      - 5 Other Sites
    - 1 New Rest Area (2013) Designed with New Guidelines
    - Improved MT DEQ Review Time
    - Monitoring Equipment Part of the Construction Bid

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MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

Implementation Examples

- Montana Rest Area Design
  - Management Involvement and Support
  - Excited Champion/Implementers
  - Involve the Right People
  - Coordination & Collaboration
  - Occurred
  - Implementation Considered from the Beginning
  - Products Necessary for Implementation Developed
  - Tools and Funding Provided to Accomplish Implementation

RESEARCH PROGRAMS

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
  - Portable Concrete Barrier
    - Problem Identified by Construction
    - Chief Engineer Notified; Requested Research Support
    - Two---Pronged Approach
      - Synthesis Research Project
      - Condition Inventory, Analysis, & Prioritization to District Administrators

RESEARCH PROGRAMS

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
  - Portable Concrete Barrier
    - Management Involvement and Support
    - Excited Champion/Implementers
    - Involve the Right People
    - Communication, Coordination, & Collaboration Occurred
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Research Projects Program

- Implementation Examples
  - Ride Specification Review
    - Compare MDT Practice with the State of the Practice
    - Developed
      - Test Method for Surface Smoothness and Profile
      - QC/QA Manual for MDT Profiling
      - Profiler Operations Manual
      - Ride Specification for Flexible Pavements
      - Detailed Implementation Activities and
      - Timeframe Final Report
      - Project Summary Report

RESEARCH PROGRAMS

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
  - Ride Specification Review
    - Added Two Ride Specification
    - Classifications Changed Pay Adjustment
    - Factors Proactive contractor Education
    - Field Profiling Personnel Training

RESEARCH PROGRAMS

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
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      Tools and Funding Provided to Accomplish Implementation

MONTANA MDT DEPARTMENT OF TRANSPORTATION

RESEARCH PROGRAMS

Research Projects Program

- Implementation Examples
  - Temporary Erosion and Sediment Control Measures
    - Research included:
      - State of the
      - Practice User
      - Survey
      - Organizational Structure Review

RESEARCH PROGRAMS

MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
  - Temporary Erosion and Sediment Control Measures
    - Products included:
      - Reference Manual
      - Field Manual
      - BMPs -- Fact Sheets & Detail Drawings
      - Training Program
      - Users Survey Report
      - Organization Structure Survey Report

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MONTANA MDT DEPARTMENT OF TRANSPORTATION

Research Projects Program

- Implementation Examples
  - Temporary Erosion and Sediment Control Measures
    - Conducted a Two---Year Implementation Review
    - Added E&SC Staff in HQ & Each District
    - Established an E&SC BMP Rate Schedule Committee
    - Revised Construction Manual to Include BMPs
    - MDT and Contractor Staff Using Field and Reference Manuals
    - Continued Use of Training

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Research Projects Program

- Implementation Examples
  - Temporary Erosion and Sediment Control Measures
    - Management Involvement and Support
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Experimental Projects Program

- Purpose
  - Experimental projects allow the testing of new materials and methods in association with a construction or maintenance project.
- Benefits
  - Objective Reporting of Results
  - Allows the Specification of Proprietary Products w/o a PIF
  - FHWA Participation if Premature Failure Occurs
  - Can use 100% Federal Funds

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Experimental Projects Program

- Conducted in---house, by Experimental Projects Manager
  - Facilitates Experimental Design
  - Writes Work Plan
  - Obtains FHWA Approval of Work Plan
  - Participate in all Project Meetings
  - Evaluates Performance
  - Writes Reports to Document Results

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Experimental Projects Program

- Annual meeting
  - Includes Design, Construction, Maintenance, District (Field Research Coordinators)
  - Communicate Information on Current Experimental Projects
    - Project status
    - Performance
    - Available reports
    - Construction and/or performance issues
    - Implementation
  - Feedback loop

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Research Projects Program

- Performance Measures
  - Number of Topic Statements and Disposition
  - Number of Projects and Project Status
  - Expenditures by Subject Area and Type of Project
  - On Time, Budget, and Scope
  - Cost Sharing/Partnering – Leveraging Funds
  - Overhead Costs

RESEARCH PROGRAMS

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Research Projects Program

- Performance Measures
  - Technical Panel Exit Survey
  - Project Reporting
  - Number of Publications Resulting from Project
  - Implementation
  - $ saved
  - NCHRP 20---63 Tool

RESEARCH PROGRAMS

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