



Montana Department of Transportation
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Memorandum

To: RRC Members
Steve Albert/WTI
Mike Bousliman, Administrator/Information Services Division
Jeffery M. Ebert, P.E./District Administrator-Butte
Larry Flynn, Administrator/Administration Division
Dwane Kailey, Administrator/Highways and Engineering Division
Bob Seliskar/FHWA
Jon Swartz, Administrator/Maintenance Division
Mike Tooley/Director
Duane Williams, Administrator/Motor Carrier Services Division
Pat Wise/Deputy Director
Lynn Zanto, Administrator/Rail, Transit, and Planning Division

From: Susan C. Sillick, Manager
Research Programs

Date: March 8, 2018

Subject: January 24, 2018 RRC Meeting Notes

RRC Members Present: Mike Bousliman, Sue Sillick, Jon Swartz, Mike Tooley, Duane Williams, Pat Wise, and Lynn Zanto.

Others Present: Audrey Allums, Jeff Jackson, Lenci Kappes, Darin Reynolds, Lesly Tribelhorn, and Matt Ulberg/LTAP

1. **Budget Report:** Attached

Lynn asked about the estimate for overspending state budget authority. Sue stated that since Research rolls up into Engineering's budget authority, she has been allowed to overspend as long as there is federal funding available. She also stated that she's never been given enough budget authority to cover the federal appropriation.

2. **[Research Projects - current listing](#)**

No discussion.

3. **Reports:** Available on Research [website](#)

- a. Evaluation of Effectiveness and Cost Benefits of Woolen Roadside Reclamation Products (13-008) – Final, Implementation, Project Summary, and Performance Measures Reports
- b. Feasibility of Non-Proprietary Ultra-High Performance Concrete (UHPC) for Use in Highway Bridges in Montana (14-002) – Final, and Project Summary Reports, and Final Presentation
- c. Guidelines for Stabilizing Problematic Soils Using Calcium-Based Stabilizers (15-008) – Task 1 Report
- d. Highway Project Cost Estimating and Management (14-022) – Final Report, Final Presentation, and Highway Project Costs Data Template
- e. Investigation of Prefabricated Steel Truss/Bridge Deck Systems (12-010) – Lenci Kappes
- f. Statewide Rockfall Hazard Rating Process Update - Final, Implementation, and Project Summary Reports
- g. Top-Down Construction Cost Estimating Model Using an Artificial Neural Network (14-017) – Final and Project Summary Reports

No Discussion.

4. **Proposed Research Projects (attached)**

- a. Large-Scale Laboratory Testing of Geosynthetics in Roadway Applications (18-007)

Darin Reynolds attended this meeting on behalf of the project technical panel to request this proposal be funded.

The goal of this project is to characterize the performance of geosynthetic-reinforced test sections when compared to an unreinforced section to assess the benefits in terms of a reduction in base course thickness, an extension of pavement life, or the strengthening of the individual pavement layers. This project also includes a cost/benefit analysis.

The objective will be achieved through the construction of a single test track containing three test sections, a detailed analysis and synthesis of the results, and the evaluation of an analytical design tool. The test track was moved from MT to SC; the testing will occur in SC. The pavement sections will be built similar to conditions in the Great Falls and Glendive Districts. The control section will be built similar to a typical low-volume road. The second section will be built with a non-woven geotextile and the third section will be built with a stronger geotextile. Test sections will be instrumented and will be trafficked to an estimated 20 years over a one-year period. At the end of the project, we expect to have a design methodology with a quantifiable benefit.

Steve Perkins/MSU will be the principal investigator for this project, which will also be staffed by Eli Cuelho, who now works in the private sector. This project is scheduled to take 2 years to complete, with a cost of \$379,656.

Matt Ulberg added that he was already approached to facilitate getting the word out to local agencies.

Duane asked about the cost of the geotextiles. The non-woven geotextile costs about \$1.25//yd² and the heavier geotextile runs about \$5/ yd².darin added that we already

know that we obtain increased design life, but this project will take it to the next level, determining if we can reduce the base course as well. It was mentioned that the City of Missoula used a geogrid to reduce the base course by 10-12 in.; it is performing well.

Duane also stated other states will be interested in our results. He doesn't know of any studies using non-woven geosynthetics. This is big if we can use it to decrease the base course or just use it to extend pavement life.

Jon made a motion to fund this project. Duane seconded the motion. All RRC members present voted in favor of the motion.

Sue will set up a project and execute a contract.

b. Agricultural Loads on MT Bridges – Dwane Kailey

Dwane was unable to attend, so, Lesly presented instead. This project is being run through Consultant Design and will not be funded with SPR funds. It was brought before the RRC as it has a large research component and the RRC is the governing board for all research conducted by MDT, regardless of funding source. Lesly explained the purpose of this project is to gather and analyze information regarding the actual loads placed on Montana's bridges from agricultural vehicles throughout the state. This project will include the identification of what proportion of agricultural vehicles are using the farm exemption, and to what extent they are approaching the 20% overage limit.

Duane stated he is not sure how the data will be obtained and suggested caution in spending a large amount of funds to obtain this data. He stated some data could be obtained from the scales and delivery locations. Duane added that it is time-dependent and that the local MCS officers can provide valuable insight. Duane would like someone from MCS involved in scoping the project.

Mike B. asked about permitting. Duane responded agricultural vehicles do not need permitting.

Mike T. added that the agricultural community is vocal; education about the project and communication with local entities such as the Farm Bureau, county officials, etc. may be beneficial before data collection starts.

Matt Ulberg suggested we can obtain data from grain elevators. Mike indicated we couldn't get all the data needed from this source.

We should ensure there is not duplication of data collection efforts. Recommended resources include: MCS records, county resources, and grain elevator records. The RRC would like more information on the proposed data collection methodology.

The RRC would like to review the top proposal for comment and approval, and a report out. **Note:** After the RRC meeting, it was discovered the project hadn't yet been scoped. A vetted scope will be developed after the consulting firm is under contract for the project.

5. Implementation/Performance Measures/Technology Transfer

- a. Feasibility of Non-Proprietary Ultra-High Performance Concrete (UHPC) for Use in Highway Bridges in Montana (14-002) – Lenci Kappes

Lenci Kappes was present to represent the project panel and the Bridge Bureau in reporting the results of this project. He stated UHPC is a super-material, but available proprietary mixes also come with a high cost. The purpose of this Phase 1 project was to determine if a non-proprietary mix design could be developed, using readily available materials at a significant cost reduction. Trial batches were made and advanced statistics (response surface methodology) were applied to isolate the best performing mixes. The surface response methodology is a systematic method to isolate the best mixes through an understanding of the material sensitivities. These mixes had excellent mechanical and durability properties, with a cost under \$1,000/yd³. Lenci added that several observations were made in this Phase 1 project, such as the impact of concrete batch size and the type and size of concrete mixer on the results. Once these mixes are fine-tuned and the factors impacting the performance of these mixes are understood (through a Phase 2 project), these mixes can be used in accelerated bridge construction and other applications.

- b. Highway Project Cost Estimating and Management (14-022) – Lesly Tribelhorn

Lesly Tribelhorn was present to represent the technical panel and the Highways Bureau in reporting the results of this project. First, Lesly noted that the title is incorrect. The correct title is Advanced Methodology to Determine Highway Construction Cost Index. The Highway Construction Cost Index (HCCI) is an indicator of cost fluctuation in current market condition and, therefore, the purchasing power of the Department. It allows agencies to make early financial decisions based on the changing amount of financial resources and changing market conditions. It also helps determine the return on investment value of a new project. Lesly indicated the MT market is not the typical market and our trends are a little bit behind.

Prior to this project, we used a single composite HCCI, which takes a couple of months to generate and has limitations. Specifically, the effects of item quantities, project size, project type and spatial distribution of the project are neglected, and it is in many cases difficult to estimate cost changes and differences for a wide range of construction projects. Through this project, a MT-specific Multi-Dimensional HCCI system was developed using a newly developed concept, dynamic item basket. In addition, a unit price visualization tool was also developed. This tool is powerful and can generate interactive maps that show the distribution of unit prices of bid items across the state. It can serve as a quick tool to determine the unit price of a bid item in a certain location. The benefits gained by this tool include such items as the following:

- ★ It is fast.
- ★ It shows heat maps by item category, year, and quantity
- ★ It shows trends in real time
- ★ It will improve engineer's estimating
- ★ It can compare inflation.

There is interest in this nationally. The one issue is we need more GIS licenses so that we can use this tool to its fullest extent.

c. Investigation of Prefabricated Steel Truss/Bridge Deck Systems (12-010) – Lenci Kappes

Lenci Kappes was present to represent the project panel and the Bridge Bureau in reporting the results of this project, through which a prototype of a welded steel truss constructed with an integral concrete deck, as suggested by Allied Steel, was investigated. The initial proposed design resulted in fatigue concerns. A new configuration was then evaluated. This configuration satisfied the strength and fatigue requirements for an infinite-life design. For one design, as compared to a plate girder bridge recently built in MT, the weight of the steel of the bolted and welded trusses, assuming conventional and accelerated construction were 15% and 28% less, resulting in lighter structures and an approximate cost reduction of 10% and 26%, respectively. As the length of the structure increases, so does the cost savings.

An implementation meeting was held with MDT staff, FHWA, MSU researchers, steel fabricators, design consultants, and construction contractors. Everyone was excited about trying this new design. The next step is to build a structure, with evaluation as an experimental feature and/or a research project.

Lynn stated that about 10 years ago, MDT made a concerted effort to get rid of our steel structures. Lenci responded that there can be a fight between concrete and steel. He stated the Swan River bridge was originally designed as a concrete bridge, but due to environmental aspects, public consideration, and scour potential, it was more economical to use steel. Also, in the past fatigue had always been an issue in steel bridges, but we also have to deal with spalling in concrete. They both have their strengths and weaknesses. Lynn asked if cost and expected life drive the decision on which material to use. Lenci responded that they do, as well as solving specific issues.

Duane asked if the new steel truss girder design typically required deeper superstructures than an equivalent plate girder. Lenci responded that the depth observation is indeed a concern and, therefore, the proposed new design would require the right site conditions to allow for the deeper superstructure requirements

d. Statewide Rockfall Hazard Rating Process Update – Jeff Jackson

Jeff Jackson was present to represent the technical panel and the Materials Bureau in reporting the results of this project. In 2005, the Rockfall Hazard Rating System was developed. While this system was used, it was difficult to use. With this project, the Rock Slope Asset Management Program (RAMP) was developed due to a combination of changed sites, a need for additional tools to aid in project selection, and a desire to incorporate principles of Transportation Asset Management (TAM) in managing rock slopes. The goal of this project was to assess changes in rock slopes since 2003 and gather data that would allow MDT to develop an updated rock slope hazard assessment program with TAM-compatibility as an added benefit. The scope included identifying rock slope condition and risk factors, determining critical sites, incorporating benefit/cost analysis, and forecasting future asset condition, based on various budget

scenarios. This new tool was developed in ArcGIS. Jeff demonstrated the features of this new tool.

Conceptual mitigation costs were developed, not only for a newly constructed slope (condition state 1) that meets modern design criteria, but also to the next higher condition state in the rating system. Maintenance costs were included as well. It was estimated that it will cost MDT about \$35 M/year if we continue to address worst-first to maintain current conditions. However, if MDT acts proactively to prevent excessive slope deterioration, it will cost about \$28 M annually to maintain current conditions. Further, this research showed MDT can recoup every dollar spent on preserving rock slopes and also realize a benefit of an additional \$1.14 for every dollar spent.

Jeff added that this project was presented at the recent TRB Annual Meeting and it was well received.

Mike T. asked if this tool pulls from the Maintenance Management System. Jon responded that it does not. Jeff stated that we need to keep up with the data entry. He added that the system will improve as more data is entered.

- e. Top-Down Construction Cost Estimating Model Using an Artificial Neural Network (14-017) – Lesly Tribelhorn

Lesly Tribelhorn was present to represent the technical panel and the Highways Bureau in reporting the results of this project. The purpose of this project was to improve the quality of early construction cost estimates by using data mining and acquisition to develop data-driven estimating models using artificial neural networks and multiple regression techniques. These tools were combined with a top-down estimating approach to achieve improved cost estimating certainty in early planning stages before quantities are available.

Lesly stated the results of this project increased the confidence in cost estimating for some projects. However, the artificial neural network is a black box. Also, we weren't able to use this tool in Excel without an add-on. Currently, we don't know if we have access to this add-on. For future use, we need to begin capturing data, set it up in the new PPMS when it becomes available, and provide training. It will be a few years before we have enough data to use this tool.

Lynn asked if this tool can provide total cost. Lesly stated it can. The pieces are all there. We just need to put all the pieces together. Lesly added that it can be used to break down PE, construction costs, etc. Lynn also asked if we are still using the previously developed HEAT tool. Lesly responded we are; however, we are limping along until we get this new tool in place. She added that we are using HEAT for risk analysis and contingency planning.

Duane asked if this new tool will change contingency factors. Lesly stated, yes, it will.

f. Traffic Safety Pooled Fund Update – Audrey Allums

Audrey was present to discuss this pooled fund, initiated by Mike T. This pooled fund began in FFY 2015, 10/1/14. We are currently in the 4th of five years. There are 14 partners: CA, CT, IA, ID, IL, IN, LA, MT, NHDOT, NV, TX, UT, VT, WA. These states have contributed about \$1.2 M; MT's contribution was \$80,000.

To date the Center for Health and Safety Culture at the Western Transportation Institute has conducted the research; however, if there is research the Center is not fully qualified to conduct, we would issue an RFP, as stated in the governance document. Research completed to date includes Driving Under the Influence of Cannabis and Traffic Safety Citizenship. Currently, MDT has implementation activities ongoing for both of these projects. Projects in progress include: Law Enforcement Safety Culture and TraSaCu (an international technology transfer effort). We are pending proposals on three newly approved projects, including: Traffic Safety Culture Primer, Traffic Safety Citizenship Primer. There are three additional research ideas that we may be able to fund with funds committed for FFY 2019. We also submitted and received funding for a project to the Behavioral Traffic Safety Cooperative Research Program (BTSCRCP).

FFY 2019 is the last year of this pooled fund project. The Board members are discussing if they want to continue the program for another five years. FHWA wants pooled funds to be closed and a new project started for those lasting more than five years.

6. **LTAP Discussion** – Matt Ulberg

Matt Ulberg was present to give the RRC an update on LTAP. Matt started in April 2017. Matt discussed LTAP in general; there are eight initiatives in the current work plan, including continual needs assessments and working more with the Transportation Learning Network (TLN). He stated he's accomplished the first year's goal in his first nine months. Matt explained there are three annual funding sources for LTAP: 1) FHWA - \$150,000 (funding has remained stagnant for a number of years), 2) gas tax (legislated, increased in 2017 from \$100,000 to \$150,000), and MDT SPR (\$80,000). He stated the funding has not kept up with inflation and Montana has one of the lowest funded centers. LTAP is staffed with one office staff, one professional trainer, and him, the director.

He's reaching out more to Cities, MDT, and FHWA. For example, Matt provided the LTAP mailing list and helped to promote the rail conference. Also, between MDT and LTAP, the work zone traffic control committee is being reinstated, with LTAP's new professional trainer taking the lead. Matt noted Jon Axline will be the keynote speaker at this year's Montana Association of County Road Supervisors (MACRS) meeting. Matt would also like to reach out to Roy Peterson and his Bureau. Matt wants to attend as many RRC meetings as he can; this will facilitate him giving more LTAP updates to the RRC and sharing pertinent information with the cities and counties. He indicated the CSKT is concerned with the direction of the Tribal Technical Assistance Program from regional assistance to one national assistance entity. Given this LTAP is now working with the CSKT to support them as much as is practical.

Mike T. thanked Matt for his efforts and indicated he would like to see more local participation with the safety program.

Mike B. indicated the MDT-LTAP relationship has deteriorated over time and Matt's efforts to reach out are encouraged.

Finally, Matt discussed the composition of the LTAP Advisory Board. He indicated he will be making changes to this group. He wants people who will attend meetings, ask questions, provide input, advocate for LTAP on their circle of influence, and will be a resource to improve LTAP.

7. Department/Division Hot Topics - RRC Members Roundtable Discussion

None.

Copies: Craig Abernathy/Research Section
Audrey Allums/Grants Bureau
Kevin Christensen/Highways and Engineering Division
Tim Conway/Aeronautics Division
Ryan Dahlke, P.E./Consultant Design Bureau
Lisa Durbin/Construction Administration Bureau
Mike Dyr Dahl/Engineering Operations Bureau
Ed Ereth/Data and Statistics Bureau
Jake Goettle/Contract Plans Bureau
Paul Jagoda, P.E./Construction Engineering Services Bureau
Tom Martin, P.E./Environmental Services Bureau
Kraig McLeod/Multimodal Planning Bureau
Shane Mintz/District Administrator-Glendive
Jeff Olsen, P.E./Bridge Bureau
Roy Peterson, P.E./Traffic & Safety Bureau
Dustin Rouse, P.E./Highways and Engineering Division
Ed Toavs/District Administrator-Missoula
Lesly Tribelhorn, P.E./Highways Bureau
Jim Skinner/Planning and Policy Analysis Bureau
Rob Stapley/Right of Way Bureau
Jerry Stephens, P.E./WTI MSU
Stefan Streeter, P.E./District Administrator-Billings
Matt Strizich, P.E./Materials Bureau
Matt Ulberg, P.E./LTAP
Doug Wilmot/District Administrator-Great Falls
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