



Mountain-Plains Consortium



2014 Year in Review

Acknowledgements

The faculty, staff and students involved in the Mountain-Plains Consortium thank the USDOT, particularly the Research and Innovative Technology Administration for its continued support of the University Transportation Centers Program. This program has allowed us to address critical transportation infrastructure issues in the Upper Great Plains and Intermountain West through research and outreach programs. At the same time the support has allowed us to launch innovative education programs that are producing the next generation of transportation professionals. We also express our gratitude to the departments of transportation in the Mountain-Plains states of Colorado, North Dakota, South Dakota, Wyoming, and Utah. Much of our work would be impossible without their support and partnership.



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Director's Message

Thank you for your interest in the work of the Mountain-Plains Consortium. The diversity of resources and expertise at our eight collaborating universities is resulting in a growing body of work that ranges from keeping the region's transportation infrastructure in good repair to innovative approaches to improving safety in light of a booming energy industry, especially in the Bakken.

The wide open spaces, harsh weather and sparsely populated regions that characterize our region present unique transportation challenges, but the region is the source of key agricultural commodities and energy resources for the nation. The region is also crossed by a critical web of transportation links that are critical to national and international movement of freight. Consequently, you'll see in this report, an emphasis on economic competitiveness both for the businesses, industries and agricultural producers of our region, but for the entire nation.

As you review this report, please pay particular attention to sections highlighting student and faculty activities. The faculty members of our collaborating universities are regularly recognized by their peers for their excellent work and creativity. Likewise, our students excel as well, reflecting the quality of our educational programs. Also note the training events we've provided for those working in the transportation industry. Our workforce development programs are helping transportation agencies assure that their professionals work safely and use the most up-to-date technology, techniques, and materials in their work.

This annual report provides a brief overview of the latest accomplishments of the Mountain-Plains Consortium. The work undertaken by MPC collaborators and students since the MPC was established in 1988 continues to enhance transportation in our region and across the nation. We are proud to continue that tradition.

If you have any questions about our organization, our students or our work, please contact us.

Best Regards.

Denver Tolliver

MPC at a Glance

The Consortium

The Mountain-Plains Consortium is one of 12 regional university transportation centers within 10 regions sponsored by the U.S. Department of Transportation. MPC is a national resource and focal point for the support of research and training concerning the transportation infrastructure and the movement of passengers and freight. The program aims to attract the nation's best talent to the study of transportation and to develop new strategies and concepts to effectively address transportation issues. The consortium is a center of excellence for rural and intermodal transportation.

Members

Colorado State University is a land grant institution and a Carnegie Research University (Very High Research Activity) ranked No. 58 among public universities in the US by U.S. News and World Report. CSU has an on-campus enrollment of more than 27,000 students, and offers 72 undergraduate and 100 graduate degree programs. Primary transportation graduate education and outreach activities occur in the College of Engineering with related activities in other colleges such as Business, Health and Human Sciences. Transportation-related graduate courses are available in civil engineering, mechanical engineering, business, remote sensing, and construction management.

North Dakota State University is a student-focused, land grant, research university ranked by the Carnegie Commission on Higher Education (Very High Research Activity) among the top 108 public and private universities in the country. NDSU has an annual enrollment of more than 14,700 students. The MPC is administered by the Upper Great Plains Transportation Institute, which also administers several other related transportation research centers at NDSU. Educational programs coordinated by the UGPTI include a PhD degree program in transportation and logistics and master's degree program in managerial logistics and transportation and urban systems. A certificate program is also offered in transportation and urban systems and transportation options are available for master's level students in civil engineering and agricultural and applied economics.

South Dakota State University is a land grant institution with an annual enrollment of more than 12,500 students. MPC-supporting programs include the Geographic Information Science Center of Excellence, which is a joint collaboration between SDSU and the U. S. Geological Survey's National Center for Earth Resources Observation and Sciences. SDSU houses the South Dakota Local Transportation Assistance Program—one of five technology transfer and outreach programs provided by the Engineering Resource Center. Moreover, the Civil and Environmental Engineering Department houses state-of-the-art laboratory facilities.

The **University of Colorado Denver** joins the strengths of a comprehensive campus in Denver with the health and medical programs at the Anschutz Medical Campus in Aurora to serve more than 17,000 students. UCD offers more than 130 degree programs through 13 schools and colleges. UCD's transportation emphasis is multidisciplinary, spanning departments in engineering, planning, public affairs, liberal arts and sciences, and health-related professions. The Transportation Research Center (TRC) addresses local, state, national, and international issues with funding from federal, state, local, and private sources. UCD is also home to the Active Communities Transportation (ACT) group that researches the integration of alternative transportation in healthier urban communities. Students and faculty investigate new methods and technologies for analyzing the performance and safety of transportation operations and designs, and also provide services to state and local agencies through seminars, committees, and special projects.

University of Denver, an independent university, has an enrollment of 11,500 students. The university offers more than 100 undergraduate programs of study and more than 120 graduate and professional programs. The Intermodal Transportation Institute offers a master's degree in intermodal transportation, one of the few of its kind in the world. Approximately 25 students enroll in the program each year. The programs are supported by the Daniels College of Business with faculty in finance, marketing and logistics. In addition, the Korbel School of International Studies faculty, with expertise in international transportation and transportation security policy, are also involved in the program. Faculty and staff from urban planning and the GIS Laboratory contribute to courses and research efforts. Finally, the Center for Ethical Decision Making contributes to the training and education of leaders in the field of intermodal transportation management.

The **University of Utah** located in Salt Lake City, has an annual enrollment of 32,077 students. The department of Civil and Environmental Engineering has well-equipped laboratories specializing in transportation, structural, geotechnical, hydraulic, environmental, and materials engineering. The Utah Traffic Laboratory is connected by fiber optic cable to the Utah DOT Traffic Operations Center. The lab has a state-of-the-art multimedia video conferencing studio with delivery, recording, and hosting capabilities for teaching, training, and research collaboration. The lab boasts the first North American installation of VISUM Online, which is an intelligent platform for traffic management.

Utah State University is a land grant university located in Logan, with an enrollment of more than 27,500. Utah State University offers 168 undergraduate degree programs and 143 graduate degree programs. There are eight colleges in the university with the College of Engineering being the fourth largest. Within the college, the Department of Civil & Environmental Engineering houses the Utah Transportation Center, the Utah Water Research Laboratory, Structural Materials and Structural Health Laboratory and, the Transportation Infrastructure Management & Engineering Laboratory. The transportation program at Utah State University provides learning and research opportunities for students in public transportation, traffic, safety, and planning. In addition, Utah State University operates the Utah Local Technical Assistance Program.

The **University of Wyoming** has an annual enrollment of approximately 13,800 students. The Department of Civil and Architectural Engineering provides a core of basic engineering courses for its undergraduates and allows them to specialize in any one or a combination of the following technical areas: structures, water resources, environmental engineering, geotechnical engineering, and transportation. The transportation program at the University of Wyoming provides learning opportunities for students in paving materials, traffic, safety, and planning. In addition, the WYDOT Material Certification Program and the Wyoming Local Technical Assistance Program are hosted at the University of Wyoming.

History

The Mountain-Plains Consortium was established in 1988 as part of the University Transportation Centers Program. MPC was selected as the center for federal Region 8 in the initial competition held by USDOT. MPC won subsequent re-competitions under ISTEA, TEA-21, and SAFETELU legislation. From 1988 through 2014, MPC produced a library of nearly 300 research reports while attracting new faculty to the field of transportation. MPC universities continued to teach most of their pre-existing transportation courses and exceeded the targeted maintenance of effort funding levels specified by USDOT. During this period, MPC funds were used to leverage funding from agencies such as state and local transportation departments, USDA, FTA, FRA, and the American Association of Railroads.

Management Structure

As MPC center director, Dr. Denver Tolliver is involved in planning and administrative activities at all levels and sites. Although Dr. Tolliver is an employee of the lead university, he represents all MPC institutions.

Designated program directors at each MPC university perform local oversight and management of activities. These directors are Dr. Rebecca Atadero, Colorado State University; Dr. Kimberly Vachal, North Dakota State University; Dr. Nadim Wehbe, South Dakota State University; Dr. Wesley Marshal, University of Colorado Denver; Dr. Patrick Sherry, University of Denver; Dr. Richard Porter, University of Utah; Dr. Paul Barr, Utah State University; and Dr. Khaled Ksaibati, University of Wyoming.

Dr. Tolliver visits each campus annually to meet with principal investigators and program managers to gauge progress toward program goals and objectives. The MPC center director also holds video conferences as needed to evaluate progress and ensure that milestones are being met. The MPC center director also communicates with directors of the other centers in Region 8 on a regular basis.

Transportation Learning Network (TLN)

The Transportation Learning Network uses technology to help people work together on transportation issues in the region. Each partner provides transportation programming, training, and technology transfer to the network. Efforts include technical training, peer sessions, graduate-level classes, professional management and leadership courses and seminars. The eight MPC universities are partners in the network, which also includes four state transportation departments in Region 8: Montana, North Dakota, South Dakota, and Wyoming. The system carries interactive audio and video to conference rooms and classrooms at the respective sites as well as webinars directly to desktops. TLN enhances and improves the cost-effectiveness of the MPC by reducing travel costs and maximizing use of scarce faculty and administrative time.

TLN Board and Programming Committee

The state transportation departments in the region provide substantial input to the MPC center director and executive committee regarding educational and research needs. Much of this interaction results from a close working relationship between the MPC executive committee and the TLN board of directors. The MPC center director holds a position on the TLN executive board. The TLN program director attends the MPC board meeting to discuss and promote research presentations to the TLN audience. The TLN programming committee, which meets monthly, brings together representatives from the four state transportation departments and the MPC universities to plan a regional education and training program.

In addition, an advisory committee helps MPC directors identify key research needs within the region and develop a research program that addresses those needs. The committee plays a key role in setting the Mountain-Plains Consortium's research agenda.

Education & Workforce Development

Education Program

Collectively, the MPC universities offer one of the most diverse and comprehensive multimodal multidisciplinary graduate education programs in the nation. Forty-two undergraduate and 83 graduate courses were offered in 2014. The impact of the educational program will increase in future years, as the MPC universities expand the number of courses offered through their existing exchange program, in which students from any MPC university can take courses from other universities. These courses must be placed online for the collaborative exchange to work most effectively. Considerable progress has been made in converting classroom courses to online courses and increasing the reach of the program. The Master of Transportation and Urban Systems degree is offered fully online at NDSU as is the Master of Managerial Logistics.

Twenty-three undergraduate and 121 graduate students are working on MPC research projects under the tutelage of faculty researchers. These graduate students represent the researchers and technical analysts of tomorrow. Without the MPC program and the stipend funds that it provides, these students may not be specializing in transportation; but, instead would be seeking career opportunities in other fields. The MPC research program allows

faculty to mentor graduate students while allowing the students to work on projects for federal and state transportation agencies—thereby, gaining valuable practical experience.

Workforce Development

MPC's technical training program has a major impact in the region. Online modules, short courses, webinars, and on site/ videoconferencing events are reaching state and local transportation department employees and tribal transportation planners. By harnessing the capabilities of the four LTAP centers located at the MPC universities and the multimedia capabilities of the Transportation Learning Network (which was founded and is partly funded by MPC) 299 technical training events were offered in 2014 with nearly 9,800 transportation professionals participating. These training modules and short courses are critical to transportation agencies that need to improve or renew the skills of engineering technicians and other frontline workers. Many MPC courses or training events result in the certification of workers. Even when certification is not required, TLN's online learning management systems allow employees and employers to set learning goals and monitor progress towards these goals.

University of Wyoming Ph.D. student named MPC Student of the Year

Recent University of Wyoming graduate Debbie Shinstine was honored in January as the MPC Outstanding Student of the Year at the 17th Annual Council of University Transportation Centers Winter Banquet.

A Cheyenne, WY, native, Shinstine earned a B.S. in civil engineering at the University of Wyoming and an M.S. in civil engineering at the University of Arizona. Shinstine earned a Ph.D. in civil engineering from the University of Wyoming in May 2014. For her dissertation, she developed a method for identifying high-risk crash locations on Indian reservation roads for the purpose of assisting tribes improve safety on their roadways. The method has been implemented on the Wind River Indian Reservation. This work included crash data analysis, incorporating logistic statistical modeling of crash severity, and implementation of livability and sustainability measures.



Since her graduation, Shinstine has expanded her research as a post-doctorate to implement this methodology on reservations throughout the Mountain-Plains region and is currently working with three tribes in North Dakota and South Dakota.

She has 25 years of professional experience in civil engineering both in private practice and public service with a PE in three states. Prior to returning to the university to pursue her Ph.D., she worked for the Virginia Department of Transportation managing maintenance, construction, and land use.

The U.S. Department of Transportation honors outstanding students each year for their achievements and their potential future contributions to the transportation field. Students are selected based on their accomplishments.

Summer transportation camp hosted

The University of Utah Department of Civil and Environmental Engineering held the first annual summer transportation camp sponsored by the Federal Highway Administration. The week-long program introduced high school students to the transportation industry and created a STEM focus experience. During the camp, the Utah Department of Transportation and the Utah Transit Authority provided field trips to the Warm Springs FrontRunner Control and Maintenance Facility, Jordan River Light Rail Facility, Traffic Operations Center, and an active bridge building project. The students also participated in hands-on activities in the traffic and materials labs on campus. A student produced video about the camp can be viewed at <http://youtu.be/UDT4OgHS6Us>. The video was entered in the American Road and Transportation Builders Association Student Transportation Video Contest.

STEM outreach targets Salt Lake City students

The Utah Transit Authority, the Women in Transportation Seminar, and the Transportation YOU program recently brought a group of junior high and high school girls from the Salt Lake Center for Science Education Charter School to participate in a lab experience on the University of Utah campus. The effort, hosted by the University of Utah Department of Civil and Environmental Engineering Department, introduced the students to opportunities in civil engineering and related STEM careers. At the University of Utah Traffic Lab they learned about tools used by traffic and transportation engineers. While touring the Earthquake Mobile Lab, the students gained hands-on experience on the causes and implications of earthquake faulting and soil liquefaction as well as the types of damage caused following large earthquake events.

In October, students from several area high schools traveled to the University of Utah campus to explore and learn more about STEM disciplines and various aspects of engineering through discussions, project demonstrations, and exhibits prepared by the university's engineering student chapters. As part of engineering day, the Utah Traffic Lab allowed high school students to know and learn more about transportation, and how a transportation engineer's work impacts daily life. Participants experienced driving the simulator, seeing how traffic operations and simulations work, and learning about the different fields in transportation engineering.

Courses offered for post-baccalaureate certificate program

North Dakota State University was among the institutions that offered online courses in 2014 for a post-baccalaureate certificate program sponsored by the Regional University Transportation Centers. Universities offering courses for the fall semester included North Dakota State University, Kansas State University, Texas A&M University, and the University of Illinois at Urbana-Champaign.

The award-winning, nationally recognized program allows students to take transportation courses online through the Transportation Leadership Graduate Certificate program. By enrolling in online graduate level courses for transportation professionals, the program prepares future leaders of the transportation industry. The online course format provides a flexible and convenient education opportunity for professionals to advance in their careers. Some of the most prominent courses offered for the fall semester were High-Speed Rail Construction Management, Logistics Systems, Transportation and the Environment, Sustainable Transportation Asset Management, and Urban Transportation System Analysis.

Through the collaborative efforts of 60 university transportation centers and transportation industry professionals, the program offers high-quality instruction from transportation experts across the country. Visit www.transleader.org for additional information on the program and to register.

Engineering event held for high school students

Utah State University hosted an event on campus for high school students to learn about engineering. The Civil Engineering faculty hosted a challenge session on bridge design, stressing the importance of our nation's infrastructure and associated needs. Students designed their own bridges using the West Point Bridge Software and then constructed their own bridge (using the steel bridge that was used in the ASCE).

Students see course applications

Members of the North Dakota State University student chapter of the Association of Transportation and Logistics learned how knowledge from transportation and logistics courses are used in the real world during a visit to the Fargo-Moorhead Metropolitan Council of Governments.

Nine students, all Ph.D. students in transportation and logistics, visited the FM Metro COG's offices for a Feb. 28 tour. Students attending included Vu Dang, Yasaman Kazemi, Nimish Dharmadhikari, Zijian Zheng, Chijioke Ifepe, Yong Shin Park, Aslaam Mohamed Muhammad, Sardar Muhammad Zahid, and Hamad Al Qublan. Also participating was Eunsu Lee, an associate research fellow with North Dakota State University's Upper Great Plains Transportation Institute (UGPTI).

Discussion focused on travel demand modeling, environmental justice and impacts for existing and proposed transportation projects, public input meetings and stakeholders' influence in the decision-making processes, MATBUS involvement in transit routes, and corridor studies in the metro area.

Metro COG and the Upper Great Plains Transportation Institute have a working partnership and Metro COG relies on UGPTI's Advanced Traffic Analysis Center for travel demand models. "It is very good to see our transportation and logistics students taking a look at how some of our end products are being used to enhance transportation at the MPO level," noted Bradley Wentz, Advanced Traffic Analysis Center program director.

Front-line rail workers bring expertise to class

Students in North Dakota State University's railroad planning and design class were able to hear from experts in rail operations and regulation during the fall semester. Instructors for the course, MPC director Denver Tolliver and civil engineering assistant professor Ying Huang, invited managers from a North Dakota short line railroad and officials from the Federal Railway Administration to be guest lecturers in the class.

Early in October, two FRA specialists, Michael Bachmeier, a railroad safety specialist, and Blaine Luck, a rail integrity specialist, visited the class and discussed safety programs and enforcement as well as potential careers in railroad regulation. In particular, Bachmeier and Luck discussed safety challenges associated with rapidly growing rail volume across the country in general, and, in particular, related to the movement of oil from the Bakken oil fields of North Dakota.

Later in the month, Mike Bazan, director of marketing and sales for the Northern Plains Railroad, and Larry Jamieson, former president of the railroad, discussed short line rail operations with the class. Jamieson continues to consult with NPR on large engineering projects. The railroad, based in Fordville, ND, leases 388 miles of branch line track in northern North Dakota and Minnesota from the Canadian Pacific Railway and operates lines owned by Mohall Railroad, Inc. and Mohall Central Railroad.

With 34 students in the class, enrollment has grown over the past several years, Huang noted, "Students are recognizing the importance of railroads in the economy and in the transportation system. They are interested in the career opportunities the engineering challenges associated with railroads."



Scholarships awarded with MPC support

Four \$1,500 scholarships were awarded to undergraduates at North Dakota State University with funding provided by the Mountain-Plains Consortium. The scholarships were awarded at the Upper Great Plains Transportation Institute Annual Awards Banquet in October.

Kenneth Bahm and Daniel Julson received the Paul E.R. Abrahamson Transportation Scholarship, which is awarded to students who demonstrate interest in the transportation and logistics of agricultural commodities and processed agricultural products. Bahm is a senior in agricultural economics from Mandan, ND. Julson is a senior in agribusiness from Wahpeton, ND.

Sean Kelly and Joseph (Alex) Zikmund received the Transportation Engineering Scholarship which is awarded to students who have an interest in transportation and display academic excellence. Both are seniors in civil engineering. Kelly is from Dickinson, ND, and Zikmund is from Aberdeen, SD.



Bahm



Julson



Kelly



Zikmund

Student Program Activities

Student selected for NSF program and named Eisenhower Fellow

University of Colorado-Denver Ph.D. student Alejandro Henao was selected as a recipient of the NSF Bridge to Doctorate program as well as a Dwight D. Eisenhower Fellow. He is working with Dr. Wesley Marshall on transportation resiliency and beginning his doctoral work on mode share and travel behavior changes due to evolving technology, transportation services (e.g., app-based on-demand ride services, car-sharing, etc.), and information proliferation.



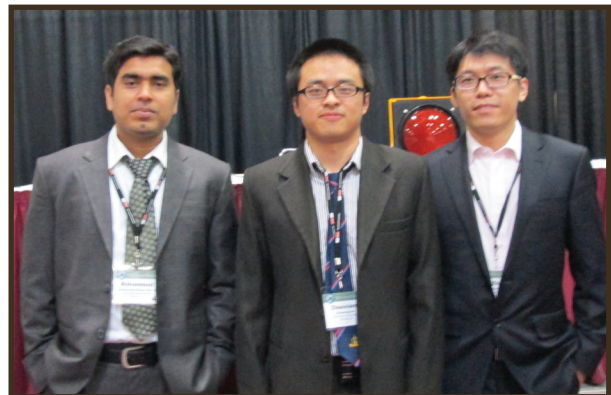
Henao

Student is intern with Kittelson & Associates

University of Utah M.S. student Anusha Musunuru was a transportation intern at Kittelson & Associates, Inc. during summer 2014. The internship provided broad exposure to the firm and profession. She worked on the basic areas of technical analysis: traffic operations, transportation planning, and traffic and functional design, along with engaging in technical, creative services, administrative, and business services aspects of the firm.

University of Utah students win ITE data contest

The University of Utah Institute of Transportation Engineers Student Chapter was selected to conduct data collection in the ITE Western District Data Collection Competition. The chapter conducted data collection for a trip generation and parking utilization study at a Smith's grocery store with a gas station in Salt Lake City, UT. The student chapter members and students from transportation engineering courses volunteered to help with the data collection. Funds from the data collection competition will support student travel to the ITE Intermountain Section Annual Meeting in May in Jackson, WY.



University of Utah students win scholarships

Ivana Tasic and Scott Shea, University of Utah Ph.D. students in transportation, received this year's Ellis L. Mathes scholarships awarded by the ITE Intermountain Section. The two annual scholarships are awarded to undergraduate or graduate students in the Intermountain Section area (Idaho, Montana, Nevada, and Utah) enrolled in engineering with an emphasis in transportation. The scholarships were awarded during the 54th Annual ITE Intermountain Section Meeting, held in Jackson, WY.

Anusha Musunuru, a Ph.D. student in transportation engineering, received this year's Women's Transportation Seminar (WTS) Scholarship awarded by WTS Northern Utah chapter. The scholarships are based on the applicant's specific transportation goals, academic record, and transportation-related activities or job skills. The scholarships were awarded during the WTS Northern Utah Chapter's 6th Annual gala held in April in Salt Lake City, UT.

Students at ASCE Transportation and Development Institute Congress

University of Utah transportation students attended the ASCE Transportation & Development Institute 2014 Congress. Ivana Tasic, a Ph.D. student at the University of Utah, presented "Evaluating the Performance of Innovative Intersections in Potential Transit Oriented Development Environments," co-authored by Dr. Milan Zlatkovic. Anusha Musunuru, an M.S. student at the University of Utah, presented "A Reliability-Based Geometric Design Approach to Freeway Number of Lanes Decisions," co-authored by Dr. Richard J. Porter.

Tasic presents at ITE Western Annual Conference

Ivana Tasic, University of Utah Ph.D. student, presented her work on the effect of street connectivity on traffic operations in transit-oriented environments at the 2014 joint ITE Western-Midwestern Annual Meeting in Rapid City, SD. The presentation featured results from a three-year project sponsored by the Utah Transit Authority and the MPC, where multiple effects of transit-oriented design on traffic operations were explored by the University of

Utah Traffic Lab research team. The annual meeting gathered ITE members from 24 states to present their transportation projects, represent their schools through student competitions, and network with experts from a variety of transportation fields.

University of Utah forms first ASCE Transportation and Development Institute Student Chapter

The first ASCE Transportation and Development Institute Student Chapter at the University of Utah was recently formed with MPC researchers Richard J. Porter, Pedro Romero, and Amanda Bordelon serving as advisors. The chapter will help students in their research and careers by creating a student network and connecting them with transportation professionals. Chapter officers were selected in November and new student members are being recruited. The Transportation and Development Institute Student Chapter is already involved in the University of Utah Engineering Day and in helping to plan a student conference in spring 2015.

Student earns award for airline research

Ju Dong Park, a North Dakota State University transportation and logistics doctoral student, was awarded the Best Paper Award from the Transportation Research Forum at its 55th annual forum, which was held March 13-15 in San Jose, CA.



Park

Park's paper, "The Magnitudes of Economic and Non-Economic Factors in Demand for U.S. Domestic Air Passengers," analyzed air carriers' behavior in capturing market share by examining demand for air-passenger services, and price structure and economic factors affecting passenger behaviors toward air travel. The study also examined other non-economic factors such as seasonality, unexpected events, or airline mergers affecting passenger behaviors. Co-author of the paper was Won W. Koo, Chamber of Commerce distinguished professor in the NDSU Department of Agribusiness and Applied Economics.

University of Utah students participate at local conferences and workshops

The Western Regional Alliance (WRA) held a transportation symposium Sept. 30 to discuss global trends and the changes needed in the transportation field in order to maintain competitiveness in the rapidly changing economy. Several CEOs from across the western states were in attendance with transportation and planning students at the Rice Eccles Stadium in Salt Lake City.

The Wasatch Front Regional Council (WFRC) held a conference in the Salt Palace Oct. 23. Ph.D. students M. Scott Shea and Kiavash Fayyaz Shahandashti represented the University of Utah in a poster session, explaining the research performed by the Traffic Lab and highlighting the driving simulator, simulation, GIS, and other research capabilities of the University of Utah. Several contacts were made for possible collaboration of presentations and projects around the state and country.

Utah Traffic Lab students also attended Citilabs CUBE training Oct. 9-10 hosted by the Wasatch Front Regional Council. The two-day training included a user group meeting and a hands-on training on the software, particularly in public transit modeling.

Students participate in Traffic Bowl and ITE Annual Conference

South Dakota State University civil engineering graduate students attended the 2014 Joint Western/Midwestern District ITE Annual Meeting, June 29-July 2 in Rapid City, SD. For the first time, a group of three transportation engineering students Md. Razaur Shaon, Zhaoxiang He, and Zhao Shen, competed in the Traffic Bowl, a competition similar to TV game show, Jeopardy, but with a transportation and traffic engineering flavor. SDSU students attended technical sessions and workshops and presented five posters in the conference. All the posters received certificates from ITE for their outstanding accomplishments.

Students present at Mid-Continent Transportation Research Conference

South Dakota State University transportation engineering graduate students Zhaoxiang He and Md. Razaur Shaon presented their MPC-funded research at the Mid-Continent Transportation Research Conference August 21-22 in Madison, WI. The conference focused on recent development in transportation research, including planning, traffic safety, and transportation infrastructure. He's presentation, "Using GIS to Evaluate Rural Emergency Medical Services (EMS)," was based on the MPC project "Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements." Shaon presented "Lane Specific Traffic Parameters to Lane Change Crashes." SDSU students also exchanged research ideas with students and professors from other universities.

University of Utah students place in concrete canoe competition

University of Utah students took fourth place in the national ASCE Concrete Canoe Competition held at the University of Pittsburgh at Johnstown in June. The team was awarded best final product, third in the design paper competition, and fifth in their oral presentation. The competition highlights students' efforts to combine engineering excellence and hydrodynamic design in the construction of a water-worthy canoe.

NDSU researcher inducted into Phi Kappa Phi honor society

Raj Bridgelall, Ph.D. student and researcher with the Upper Great Plains Transportation Institute at North Dakota State University, was recently inducted into the Honor Society of Phi Kappa Phi. Membership is by invitation and requires nomination and approval by a local chapter. Graduate students in the top 10 percent of the number of candidates for graduate degrees. Faculty, professional staff and alumni who have achieved scholarly distinction are also eligible.

Bridgelall receives Rising Star Award

Raj Bridgelall, Ph.D. student and researcher with the Upper Great Plains Transportation Institute at North Dakota State University, recently received the "Rising Star Award" by Sensors Magazine at the 2014 Best of Sensors Expo in Rosemont, IL. Bridgelall's award was one of 11 awards presented to focus attention on applications and innovations in sensors. Bridgelall has been leading development of sensor, wireless, software, and big data technology and business solutions. His current project is to assess and develop a means of optimizing hyperspectral remote sensing for use with lightweight unmanned aircraft systems.



2014 Graduates

Colorado State University

Paula Miller graduated with an M.S. during the summer of 2014. Her thesis was "Numerical Simulation of Out-of-Plane Distortion Fatigue Crack Growth in Bridge Girders."

Tyler Sobiek graduated with an M.S. during the summer of 2014. His thesis was "Predicting Fatigue Life Extension of Steel Reinforcement in RC Beams Repaired with Externally Bonded CFRP."

Chris Bright graduated with an M.S. during the summer of 2014. His thesis was "Evaluation of New Reactive FRP Reinforcement Assemblies for Reinforced Concrete."

North Dakota State University

James Fuller graduated in the fall 2014 with a certificate in transportation and urban systems. Fuller is a native of Columbia, SC, and plans to work in state and federal government in the transportation field. Fuller is currently working for the Virginia Department of Transportation as an Architect/ Engineer I.

Maher Itani graduated with a Ph.D. in transportation and logistics during the summer of 2014. Itani's research focused on identifying the logistical challenges faced by today's humanitarian organizations. His dissertation was "Dynamics of Deprivation Cost in Last Mile Distribution: The Integrated Resource Allocation and Vehicle Routing Problem." Upon completion of his doctorate degree Itani returned home to Beirut, Lebanon.

Sam Julius completed his certificate in transportation and urban systems during the summer of 2014. His research interests are primarily in public transportation and high speed trains. Julius is a transit planner/grants manager for the Greenville-Area Transportation Study, an MPO located in the Greenville, SC, area.

Major Richard Mendenhall completed his M.S. in managerial logistics in the fall 2014. He is a native from Hazel, SD, and became interested in logistics from his experience as a squadron logistics officer in the U.S. Army and from working 6 Sigma at Caterpillar Inc. His research interests include army personnel force reduction planning. Mendenhall plans serve as a combined arms battalion operations officer and executive officer.

Sumadhur Shakya earned his Ph.D. in transportation and logistics during the summer of 2014. His degree specialized in logistics and supply chain systems in agribusiness with a focus on stochastic spatial optimization of supply chains applied to the nitrogen fertilizer industry in North America. His dissertation was "Structural Changes in North America Fertilizer Logistics." Shakya is now at California State University - Monterey Bay in Seaside, CA, as an assistant professor of production and operations management and agribusiness.

Colonel Matthew Shatzkin completed his Ph.D. in transportation and logistics during the fall of 2014. Shatzkin's concentration was in supply chain management and his research focused on the role of automated requisitioning on emergency supply chains and introducing modeling & simulation at lower levels. His dissertation was "The Impact of Automated Requisitioning Systems on the Effectiveness of Emergency Supply Chains." Shatzkin is now at the Army Logistics University in Fort Lee, VA, as the commandant and military deputy.

Fang Xu graduated with a M.S. in transportation and urban systems program in fall 2014. Xu is originally from Wuhan, China, and studied logistics systems, transportation systems security, and transportation planning and environmental compliance. Xu's plans to move back to China to pursue a career there.

Zijian Zheng graduated with a M.S. in transportation and urban systems from NDSU in the fall of 2014. His thesis was "Heavy Vehicle Impact on Rural Two Lane Highway Segments Operating Under Various Levels of Service Conditions." Zheng's research interests include highway planning, transportation planning, and traffic engineering. He plans to earn his Ph.D. in transportation and logistics at NDSU.

South Dakota State University

Zhao Shen completed his M.S. in civil engineering in December. His thesis was "A Risk Analysis Method for Evaluating Collisions between Trucks and Overpass Bridges." University of Colorado Denver

Recent University of Colorado Denver graduate **Dan Piatkowski** joined the Department of Political Science and Public Affairs at Savannah State University as an assistant professor. His research centers on the intersection between sustainability, health, urban design, and transportation.

University of Utah

Kevin Croshaw began work with Horrocks Engineers in Pleasant Grove after graduating with his M.S. in April. He coordinated the ITE student chapter in their portion of the traffic counts for the University of Utah Transportation Master Plan that Horrocks was creating. He continues to work on the Master Plan, as well as other traffic signal timings and design projects in his work with Horrocks Engineers.

Ph.D. graduate **Thanh Le** is a transportation safety engineer at Vanasse Hangen Brustlin in Raleigh, NC. He is primarily focusing on transportation safety, geometric design, and operations.

Uma Ramassy is a post-doctoral researcher at the University of Utah after recently earning her Ph.D. there. Her dissertation was on "Alkali-Silica Reaction Resistant Concrete Using Pumice-Blended Cement." This project used locally mined pumice from Malad, ID, and characterizing how it was more effective to reduce ASR by reducing the free calcium in the hydrated concrete. Her current work focuses on finite element modeling of the dynamic loading from transporting nuclear-containment steel casks.

New Students

Colorado State University

Brendan McGuire earned his B.S. in civil engineering and is currently pursuing an M.S. in structural engineering, both at CSU. His engineering interests include the mechanics, design, and modeling of bridges. He is currently working on a method to utilize building information modeling (BIM) software to track and assess the structural condition of bridges.

David Turner is a second-year M.S. student. He earned his bachelor's degree in civil engineering from the Virginia Military Institute. His MPC project deals with optimizing bridge elevation to avoid the isolation of a community during a flood event.

Patrick Sanders earned his bachelor's degree in civil engineering with an emphasis in structural engineering from Clemson University in the spring of 2013. He is a second-year master's student, working on research considering the effect of uncertainty in bridge inspection results on bridge inspection scheduling.

University of Colorado Denver

Nick Ferenchak is a Ph.D. student working with Dr. Wesley Marshall on the "Why are Bike-Friendly Cities Safer for All Road Users?" project. He recently received his master's degree in geography and planning (with a focus on active transportation planning) from West Chester University.

North Dakota State University

Andrew Andrusko is an M.S. student in transportation and urban systems. Originally from Brooklyn Center, MN, he attended Minnesota State University, Mankato, where he quadruple majored in urban & regional studies, social studies, professional geography, and geology. Andrusko hopes to work with diverse transportation and transit projects in his current role as assistant planner with the Minnesota Department of Transportation.

Jared Annexstad is an M.S. student in transportation and urban systems. Originally from Saint Peter, MN, he attended Saint Cloud State University and earned a B.S. in aviation with a concentration on airline management. Annexstad's research focuses on the challenges facing the National Airspace System, which allows him to draw on his involvement with aviation from planning to execution. He wants to enhance his career as an aviation officer in the U.S. Army by gaining experience in transportation planning. He currently flies a UH-60 Black Hawk helicopter for the U.S. Army.

Craig Banner of Houston, TX, is a master's student in managerial logistics. He earned a B.S. in human resource development from Texas A&M University. Banner entered the U.S. Army as a logistics officer in 2007 and was deployed to Iraq in 2008 and 2010. He currently serves in a second company command in the division headquarters battalion with the 3rd Infantry Division at Fort Stewart, GA. He plans to further his knowledge of logistical operations in the civilian sector in order to help him progress as a U.S. Army officer in the logistics field.

Nicole (Serafin) Berthiaume of Enfield, CT, is an M.S. student in the Transportation and Logistics Certificate Program. She earned a B.S. in civil engineering from Northeastern University. Her undergraduate degree in civil engineering sparked her interest in transportation. She plans to work for a nonprofit or government organization such as FEMA.

Stephanie Grossmann is an M.S. student in the Master of Managerial Logistics Program. Originally from Vernon, NJ, Grossmann earned a B.S. in business management from The Richard Stockton College of New Jersey. Her interest in logistics began when she studied business as an undergraduate. Grossmann plans to pursue a career in logistics and business management while traveling around the country.

Becky Hoffart of Rugby, ND, is an M.S. student in the Masters of Managerial Logistics Program. She earned her B.S. in microbiology with a minor in food safety from NDSU in 2004. She has received the SOLE Demonstrated Logistician Award and is currently in the U.S. Army as a medical logistics officer. She is interested in learning how to incorporate medical logistics into the broad spectrum of logistics.

Lauren Delaney is an M.S. student in the Transportation and Logistics Certificate Program. Originally from St. Louis, MO, she attended Northwestern University and earned a B.S. in civil engineering with a minor in transportation and logistics. She hopes that her knowledge of transportation and modeling will assist in planning and design. Her goal is to develop a process to easily calibrate micro-simulation models to use in local planning projects in order to choose cost-efficient, sustainable designs.

Kathryn Ferguson of Alpena, MI, is a doctoral student in transportation and logistics. She earned B.S. degrees in transportation and logistics and computer information systems from the University of Wisconsin-Superior in 2006. Ferguson then attended the University of Minnesota-Duluth and earned a master's degree in business administration. She became interested in transportation and logistics during her undergraduate career and hopes to pursue a career in higher education.

Robert Froberg was raised in numerous locations throughout the United States as well as the Federal Republic of Germany but calls the central valley of California home. While continuing to serve as an active duty logistics officer in the U.S. Army at Fort Lee, VA, he is attending NDSU part time as a Ph.D. student in the Transportation and Logistics Program. He earned his M.S. in logistics management from Florida Institute of Technology and his B.S. in industrial technology from California State University-Fresno. He was awarded the Demonstrated Master Logistician designation in 2012 from the International Society of Logistics.

Azadeh Jaber Jahromi is a civil engineering doctoral student. Originally from, Tehran, Iran, she earned a B.S. in civil engineering from Tabriz University and then completed an M.S.

in structural engineering at the Iran University of Science and Technology. She has had four articles published in multiple journals and has presented publications at conferences across the United States. Her research focuses on the rehabilitation of aging bridges and infrastructure to enhance their strength and ductility.

Bryan King of West Haven, CT, is an M.S. student in transportation and urban systems. He earned a B.A. in economics from the University of Connecticut in 2009. King has a strong interest in macro and micro economic studies of both domestic and international markets and their economies. He also studies the constant flux of supply and demand within different industries and the resulting effects on the global economy. King plans to apply his graduate degree to his work with Metro North where he hopes to further his career advancement in management or capital planning.

John Szum is an M.S. student in the Masters of Managerial Logistics Program. Originally from Amherst, NH, he earned his B.S. in economics from the University of New Hampshire. Szum is currently in California in the United States Army. Szum's research interests focused on economic growth modeling of India. He plans to retire after a career in the Army.

Jeffrey Valliere of Cleveland, OH, is a student in the Transportation and Urban Systems Certificate Program. He earned a B.A. degree from Ohio State University and his J.D. from Louisiana State University. He served as the lead manager and attorney for the Transportation Division of the Louisiana Public Service Commission. He was involved in regulating aspects of passenger transportation and transportation related to the oilfield industry. He plans to use this degree to assist him in the transition from attorney to planning with the transportation industry. He would like to be involved in planning or operations of a transportation system in a major city.

Yuan Xu is a transportation and logistics doctoral student. Originally from Xian Tao, China, she earned her master's degree from Dalian Maritime University. While earning her undergraduate degree, Yuan earned an award for learning excellence and won

multiple math competition prizes. She plans to become an economist and a researcher so that she can provide input on important social and economic issues or help entrepreneurs maximize their businesses potential.

Fangzheng Yuan of Jiangxi, China is a Ph.D. student in the Transportation and Logistics Program. In 2014 Yuan earned his master's degree in transportation and urban systems from NDSU. His bachelor's degree is in aircraft design at Nanchang University. He also holds a B.S. in manufacturing engineering from NDSU. Yuan is studying GIS modeling, network analysis, pavement design, and gravel road modeling.

South Dakota State University

Hasan Md Moonam of Dhaka, Bangladesh, is a graduate research assistant in the Department of Civil and Environmental Engineering. He graduated with a B.S. in urban and regional planning in March of 2009. The focus of his research, which is funded by Wisconsin Department of Transportation, is the development of a statewide crash mapping automation tool. Hasan worked for TechnoVilla Solutions Ltd. in Bangladesh for two years. He anticipates earning his M.S. in civil engineering in May of 2016.

University of Utah

Catalina Arboleda is a Ph.D. student working on smog-reducing coatings for infrastructure and fiber-reinforced concrete pavements.

Zhuo Chen is a Ph.D. student working as a graduate researcher on MPC-444, Data-driven Freeway Performance Evaluation Framework for Project Prioritization and Decision Making.

Margaret A. Corrigan is an M.S. student serving as a graduate on MPC-465, Development of Performance Matrices for Evaluating Innovative Intersections and Interchanges.

Kiavash Fayyaz is a Ph.D. student working on MPC-469, Improving Efficiency and Reliability of Bus Rapid Transit.

Mingde Lin is an M.S. student.

Jem Locquiao is an M.S. student working on MPC-466, First- and Last-Mile Strategies for Transit Systems.

Yu Song is a Ph.D. student serving as a graduate researcher on MPC-469, Improving Efficiency and Reliability of Bus Rapid Transit.

Faculty Activities

Porter and Wood earn TRB Best Paper Award

The Transportation Research Board's Geometric Design Committee awarded its 2013 Best Paper Award to Richard J. Porter, assistant professor of civil and environmental engineering at the University of Utah, and Jonathan S. Wood (2013 MPC Student of the Year) at the 2014 TRB Annual Meeting. The title of the paper is "Safety Impacts of Design Exceptions on Non-Freeway Segments" and is based on work from project MPC-360, Safety Impacts of Design Exceptions in Utah, sponsored by the Mountain-Plains Consortium and Utah Department of Transportation. The paper is published as: Wood, J.S. and Porter, R.J. "Safety Impacts of Design Exceptions on Non-Freeway Segments," in Transportation Research Record, Journal of the Transportation Research Board No. 2358, 2013, pp. 29-37. This is the second straight best paper award from the Geometric Design Committee awarded to Porter.

Bordelon achieves PE status

MPC researcher Amanda Bordelon recently became a licensed professional engineer in Utah. Bordelon is an assistant professor in the University of Utah Department of Civil and Environmental Engineering. Her research focuses on concrete and fiber-reinforced concrete pavement design.

Porter honored for educational excellence

Richard J. (R.J.) Porter, assistant professor in civil and environmental engineering at the University of Utah, recently received the American Society of Civil Engineers (ASCE)

2014 ExCEED New Faculty Excellence in Teaching Award. The ExCEED, or Excellence in Civil Engineering Education, award recognizes Porter for his outstanding teaching record, commitment to education, and contributions to the academic and local communities since joining the University of Utah in 2009.

Porter leads faculty and students in research at the Utah Traffic Lab to ensure motorist safety and reduce congestion. He received a plaque commemorating the award in June during the Civil Engineering Division Banquet at the annual American Society for Engineering Education conference in Indianapolis in June.

MPC researchers re-appointed to TRB committees

The Transportation Research Board recently reappointed the following faculty from the University of Utah Department of Civil and Environmental Engineering to various committees:

- Pedro Romero – AFK-20, Technical Committee on Characteristics of Asphalt Materials.
- Amanda Bordelon – AFD-70, Pavement Rehabilitation, and AFN-10, Basic Research and Emerging Technologies Related to Concrete.
- Xiaoyue Cathy Liu – AHB-35, Managed Lane Committee.
- Dan Fagnant – AHB-30, Vehicle-Highway Automation, and ANF-30, Motorcycles & Mopeds.
- Chris Pantelides – AFF-50, Seismic Design and Performance of Bridges.
- Richard Porter – ANB-20, Safety Data, Analysis, and Evaluation, and AHB-65, Operational Effects of Geometrics



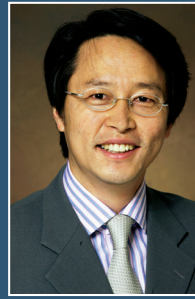
Bordelon



Bareither



Gerdes



Lee



Mahmoud



Porter



Tolliver



Wehbe



Wood

Wehbe elected SEI Fellow

Nadim Wehbe, professor and head of the Department of Civil and Environmental Engineering at South Dakota State University, was elected Fellow of the Structural Engineering Institute (SEI) of the American Society of Civil Engineers. He and 28 other individuals were recognized as new Fellows of SEI on April 5 at the 2014 Structures Congress in Boston, MA.

Bareither receives ASCE award

Christopher Bareither, assistant professor of civil and environmental engineering at Colorado State University, was awarded the ASCE 2013 Thomas A. Middlebrooks Award, which recognizes a paper contributing to geotechnical engineering. The award was for the paper entitled, "Deer Track Bioreactor Experiment: Field-Scale Evaluation of Municipal Solid Waste Bioreactor Performance," published in the June 2012 issue of the ASCE Journal of Geotechnical and Geoenvironmental Engineering.

Mahmoud presents Dexter Memorial Lecture

Hussam Mahmoud, assistant professor of civil and environmental engineering at Colorado State University, was the recipient of the 2014 Robert J. Dexter Memorial Lecture from the American Iron and Steel Institute (AISI) Steel Market Development Institute Steel Bridge Task Force and the AASHTO Technical Committee for Structural Steel Design. The program was instituted in 2005 in memory of Robert Dexter, an internationally recognized expert on steel fracture and fatigue problems. The honoree presents a lecture on his/her steel bridge activities to the SMDI Steel Bridge Task Force and participates in its semi-annual three-day meeting. The award was presented at the SMDI Steel Bridge Task Force meeting in Denver in August.

Work to prevent vehicle hacking highlighted

Ryan Gerdes, University of Utah assistant professor of electrical and computer engineering, was highlighted on Salt Lake City television station KSL with regard to an NSF grant he received. The \$1.2 million grant was based on the work he did with a UTC grant focused on preventing hackers from interfering with computer-controlled vehicles. View the story at <http://www.ksl.com/?nid=148&sid=31252693>.

New Faculty

University of Colorado Denver

Farnoush Banaei-Kashani

joined the faculty in the Department of Computer Science and Engineering at UC-Denver after more than a decade as a research at University of Southern California. His research focuses on big data management and mining with a special interest in transportation.



Caroline Clevenger

joined the faculty of the Department of Civil Engineering at UC Denver after spending the last five years at Colorado State University. She was recently named the assistant director of the Construction Engineering and Management Program. Clevenger's research interests include sustainability and building information modeling.



University of Utah

Daniel J. Fagnant joined the University of Utah as an assistant professor in civil engineering. He holds civil engineering doctoral and master's degrees from the University of Texas and a computer engineering bachelor's degree from Gonzaga University. Fagnant is a member of the TRB's Vehicle-Highway Automation Committee and Motorcycle and Moped Committee. His research on autonomous vehicles has been presented to the U.S. House Subcommittee on Highways and Transit. Other research interests include project planning and evaluation, transportation safety, motorcycles, bicycles, and



pedestrians. Fagnant also worked for five years with the Alaska Department of Transportation.

Lee presents webinar for FHWA

EunSu Lee, a researcher with the Upper Great Plains Transportation Institute at NDSU, presented a webinar June 26, "Using FAF Data in Economic Analysis/Case Study: North Dakota," to about 160 participants across the United States. The webinar was one of FHWA's Quarterly Freight Analysis Framework (FAF) Webinars. Lee described the use of FAF in transportation modeling and planning in North Dakota as an example of how practitioners across the country can use FAF data to support economic analysis, such as cost-benefit studies, freight investment scenarios, and other activities. Slides from the webinar can be viewed at <http://www.ugpti.org/resources/presentations/>.

MPC director invited to comment at meeting with U.S. Secretary of Transportation

MPC director Denver Tolliver was invited to make comments at a rural transportation roundtable discussion with U.S. Secretary of Transportation Anthony Foxx, April 24 in West Fargo, ND. Tolliver was part of a panel that also included state and local officials. Tolliver's comments focused primarily on the need to upgrade regional rail infrastructure as well as the need for government help for those upgrades. The event was organized by ND Senators Heidi Heitkamp and John Hoeven. For more on the meeting, visit: <http://www.agweek.com/event/article/id/23183/>.

Outreach Activities

Bordelon provides outreach for concrete results

MPC researcher and University of Utah assistant professor of civil and environmental engineering Amanda Bordelon presented “Smog-Eating Concrete” at the Utah Society of Professional Engineers Continuing Education seminar in Salt Lake City and “What is New About Concrete” at the ASCE Utah Branch luncheon seminar. Bordelon also presented, organized, and ran concrete mixing activity at Hi-GEAR girls summer camp and attended, along with several UDOT employees, a demonstration of BASF’s microsphere technology.

TRB features Wyoming work on roadway safety on Indian reservations

MPC work at the University of Wyoming was featured in the “Research Pays Off” section of the September–October 2014 edition of TR News. The feature article explores the Wyoming Rural Road Safety Program (WRRSP), which was developed to help local and tribal governments improve highway safety at high-risk locations. “Research Pays Off” is a regular series highlighted in TRB’s bimonthly magazine, TR News. The article highlights efforts by the Wind River Indian Reservation, which now has a comprehensive traffic safety program developed through the use of the WRRSP. The projected reduction in the annual crash rate—and in injuries and fatalities—by 50 percent across the Wind River Indian Reservation would yield a potential savings of more than \$4 million per year. The methodology developed in the UW research can be adapted to the specific needs of tribes across the United States. WYT2-LTAP has been working with Tribal Technology

Assistance Program centers across the country to facilitate implementation. Read the article at <http://onlinepubs.trb.org/onlinepubs/trnews/trnews294rpo.pdf>.

MPC researcher co-authors chapter in Guide to Concrete Overlays

A new book, *Guide to Concrete Overlays*, was recently released by the National Concrete Pavement Technology Center. Amanda Bordelon assistant professor of civil and environmental engineering at University of Utah is a co-author for the chapter on design and the appendix on fiber-reinforcement. View the book at http://www.cptechcenter.org/technical-library/documents/Overlays_3rd_edition.pdf.

MPC students and researchers to help host ND GIS meeting

For the first time, the North Dakota GIS Users Conference will be held in Fargo in 2015. The event will be Sept. 28-29 at the Fargo Holiday Inn. EunSu Lee, an MPC researcher at the Upper Great Plains Transportation Institute at North Dakota State University, is serving on the planning committee for the conference. The Upper Great Plains Transportation Institute is developing a homepage for the conference. Staff and students in North Dakota State University’s Transportation and Logistics Program will have the opportunity to assist with pre-conference preparations, as well as host sessions, greet attendees and assist with registration during the conference. In addition, staff and students will be encouraged to submit abstracts for poster or presentations.

Project Updates

Impact of urban arterial streets on neighborhood residents studied



As part of a study to develop design guidelines, Students and researchers at the University of Colorado Denver hit the streets in the summer and fall of 2014 to learn how urban arterial streets – those with fast and heavy traffic – impact residents of local Denver neighborhoods through the Denver Neighborhood Connections Survey. The survey is part of the Livable Arterials project, an MPC research endeavor that aims to determine how street design features affect residents' perceived safety and comfort and improve quality of life in neighborhoods near arterial streets. Wesley Marshall, assistant professor of civil engineering, and Carolyn McAndrews, assistant professor of planning and design, are leading the effort. Members of the team went door-to-door conducting the survey, asking residents to answer a few short questions about their neighborhood, their travel patterns, their transportation choices, their local street, and about an arterial street located near their residence. The research team is currently analyzing the data to help better understand the connections between street and street network characteristics and the livability of these nearby neighborhoods.

Researchers use big data to evaluate highways for decision making

Researchers at the University of Utah are looking for innovative ways to use the large volume of data from roadway sensors to help transportation planners find ways to reduce congestion and accidents.

Assistant professor of civil and environmental engineering Cathy Liu, with Ph.D. student Zhuo Chen have developed data-driven algorithm to determine the incident-induced delay on highway segments and to identify secondary incidents based on UDOT's incident database and the traffic sensor data archived in its freeway performance measurement system. The algorithm builds upon multi-dimensional databases and is able to identify the shockwave front for each individual incident to determine its spatial and temporal impact. After a pattern matching procedure is used (background subtraction) to eliminate the effect of recurrent congestion, the delay solely induced by incident and the secondary incidents are determined.

The algorithm is being tested along a segment of the I-15 corridor, and if it proves to be effective it will be incorporated into the transportation planning and programming to assist with decision making and project prioritization.

Liu notes that incident management is increasingly recognized by transportation agencies as a critical component of effective freeway performance monitoring and assessment. Traffic operators must understand the characteristics associated with different types of incidents to respond to the emergency appropriately and efficiently. Meanwhile, the increasing availability of traffic data from the large-scale deployment

of roadway sensor networks facilitates the observation and modeling of the congestion evolution through data mining techniques.

Study predicts performance of fiber-reinforced concrete overlays

Making sure that pavement overlays last as long as possible is critical to cost-effective maintenance of highways. Researchers at the University of Utah are studying fiber-reinforced concrete (FRC) overlays to better understand how the fibers affect their performance. University of Utah assistant professor Amanda Bordelon notes that despite years of research, cracking, and debonding of pavement overlays remains a serious issue because they often limit the service life of pavement structures. Many studies have been carried out to predict crack spacing and crack width of jointed plain or continuously reinforced concrete pavements. However, there is no existing equation which predicts crack spacing or crack widths of FRC overlay pavements.

Bordelon says this is partially because there is a limited number of FRC pavements and there are even fewer projects which have attempted to correlate the FRC lab-tested properties to an FRC pavement performance. "This is a growing interest in applying fibers to concrete pavements in order to prevent and/or minimize cracking. So it will be useful to have improved design parameters that take into account an accurate effect of fibers."

Bordelon and graduate student Min Ook Kim are studying cracking and debonding of thin FRC overlays cast over existing aged asphalt pavements. A previous research project involved creating a full-scale field constructed FRC overlay that is 5 cm (2 inches) thick over a milled asphalt pavement. The cracked joint spacing, crack widths, and debonding were all monitored for five years of thermal and shrinkage loading (no traffic loading at this time). These field measurements will be compared to a

theoretical predictive crack width equation and to finite element modeling of the same temperature and shrinkage loading.

The theoretical equation that is being developed to predict crack width of thin FRC overlay combines the joint opening calculation from AASHTO's pavement design guide and is modified to consider the fiber effect based on either the fiber aspect ratio from a structural RILEM reference or the FRC flexural strength and post-cracking properties. The two-dimensional finite element model (FEM) being developed investigates the cracking and FRC-asphalt interfacial debonding when subjected to temperature loading within the FRC overlay layer. The model uses fracture energy of the FRC to characterize the opening of cracking at joints. A maximum bond strength criterion was applied to the interface cohesion layer between FRC and the underlying asphalt layer.

Figure 1 shows the tensile stress distribution when the cracking and debonding are occurring based on FEM. Preliminary calculations indicate that the crack widths from the proposed theoretical equation and from the analytical FEM results were closely matched to the measured field investigation data. Figure 2 shows the comparison between

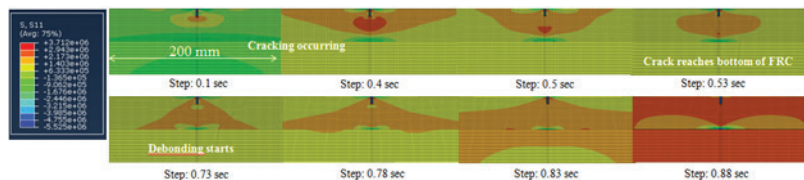


Figure 1. Stress distribution when cracking and debonding are occurring in an FRC overlay on asphalt.

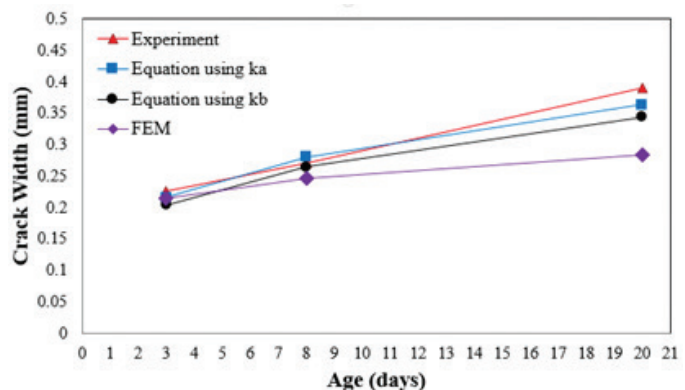


Figure 2. Comparison of calculated crack width to field measurements for FRC overlays subjected to temperature loading.

the calculated crack widths and field measurements. Again, these calculated crack widths show good agreement with measured crack widths.

The finite element model developed by the researchers will be used to investigate the effects of joint spacing, slab thickness, tensile bond strength, and fiber dosage on cracking and debonding of thin FRC overlay. In addition, lab-scale experiments determine how the hardened properties of FRC change as they age. These experiments include measuring restrained shrinkage, coefficient of thermal expansion, residual flexural strength, fracture energy, tensile bond, and shear bond. These properties and their function with time can be implemented into developed equation and the finite element analysis for better prediction of crack opening of FRC overlay at early ages. These tests will be done on both plain concrete and FRC mixtures to verify the effect of fiber on each property. The early age properties are needed for 1, 3, and 7 days in addition to later age properties at 28 and 90 days. The material variables for this research are three different fiber types (one steel fiber and two synthetic fibers) and three different fiber contents (0.25, 0.5, and 1.0% volume fraction) in concrete. The same mix proportions as used in the field experiment will be re-created in the lab for these new specimen experiments.

Bartlett studies use of expanded polystyrene geofoam for transportation infrastructure

The University of Utah Transportation Center, in conjunction with the Mountain-Plains Consortium, is researching the use of expanded polystyrene geofoam for use in transportation infrastructure. One MPC-funded project is being conducted in corporation with the Norwegian Public Roads Administration (NPRA). The project is evaluating the use of geofoam to support bridges on soft ground without the use of deep foundation systems. A preliminary concept paper was presented in Berlin, Germany, last year at the 10th International Conference on Geosynthetics (bridges on geofoam). The research and evaluations are currently ongoing. In this project, laboratory testing and calculations are being performed to evaluate the feasibility of supporting 1- to 2-lane single span temporary or permanent

bridges on geofoam abutments. This technology provides for accelerated bridge construction on soft ground without causing significant settlement of the bridge or the associated approach embankments.

Additionally, Dr. Steven Bartlett visited Istanbul and Ankara, Turkey, in June 2014 to present various topics regarding the use of [PS geofoam for transportation engineering applications to the Turkish Highway Administration and others. Topics included lightweight embankments, preventing settlement at bridges, culverts, etc. and the use of geofoam in light-rail and commuter rail systems (geofoam transportation). For his efforts, the Expanded Polystyrene Board of Directors of Turkey presented him a recognition award.

The University of Utah, in conjunction with the University of Memphis and NPRA, continues research in this area. More information can be found at: <http://www.civil.utah.edu/~bartlett/Geofoam/>. An international PS conference is planned for Istanbul, Turkey, in early summer of 2017. Contact Bartlett@civil.utah.edu for more information.

Research aims to reduce collision damage to bridge columns

Current AASHTO load and resistance factor design bridge design specifications require unprotected bridge columns within close proximity to the traveling lanes be designed for a collision force of 600 kips (1000 pounds-force) applied laterally at 5 ft. above ground. The collision force provision is set to prevent bridge collapse under the extreme event of a semi tractor-trailer collision with the bridge column. The majority of existing overpass bridges on interstates and other major highways were designed and constructed prior to the introduction of these collision load design requirements.

Researchers at South Dakota State University are concluding a three-phase study to develop risk assessment and mitigation plans for collision loads to existing bridge columns on South Dakota interstates. In the first phase of the study, the researchers developed risk assessment of the likelihood of truck collision with bridge columns. The second phase included experimental work to examine the

structural performance under collision loads of bridge bents that had been identified in the first phase of the study as “high-risk” structures. Two one-third scaled specimens representing as-built and retrofitted bents were tested to failure under simulated collision loads. Results indicate that the as-built bent failed at less than one-half the prescribed collision load while the addition of a concrete crash strut between the columns increased the bent collision load capacity to at least 1.5 times the demand imposed by AASHTO. In the third and final phase, a finite element computer simulation using LS-DYNA is being conducted to evaluate the accuracy of the AASHTO prescribed collision load when trucks hit the prototype bridge bent at different speeds.

The study is co-sponsored by MPC and the South Dakota Department of Transportation. The research team includes SDSU civil and environmental engineering professor Nadim Wehbe, associate professor Xiao Qin, and graduate students Zhao Shen, Brett Tigges, and Abdullah Boudaqa.

Research focuses on improved performance of bridge girder systems

Precast double-tee bridge girder systems are routinely used by local governments in South Dakota for bridge construction on local roads. Many existing double-tee bridges have exhibited early signs of deterioration along the joints between adjacent girders. South Dakota State University civil and environmental engineering professor Nadim Wehbe and graduate research assistant Michael Konrad are developing a new connection between adjacent girders to improve performance of precast-prestressed double-tee bridge girder systems.

The researchers tested two full-scale specimens of a 23' deep double-tee girder bridge system under fatigue loading at SDSU's Lohr Structures Lab. The researchers wanted to determine the long-term performance of longitudinal joints built according to current detailing and an alternative proposed detailing. The current detailing requires adjacent girder decks to be connected by welding 5' long steel plates to steel angles embedded in each girder at 5' intervals. A longitudinal non-shrink grout shear key, which

tapers from 2' to 1.5' in width, runs the length of the girder. In the proposed joint detail, the wire mesh reinforcement in the girder deck is extended 6' beyond the deck edge. During bridge construction, the wire mesh extension of adjacent girders is overlapped inside a non-shrink grout shear key. The overlapped mesh and shear key run the length of the girder.

The fatigue test results revealed severe inadequacy of the currently used joint detail and exceptional performance of the proposed joint detail. The shear key of the specimen with the current joint detail exhibited signs of progressive and rapid deterioration with increased number of loading cycles. The joint started to leak at the equivalent of four years of service and the first weld failure in the connecting plates occurred at the equivalent of 12 years of service. Most of the welded connections failed at the equivalent of 16 years of service. On the other hand, the specimen with the proposed joint detailing was subjected to fatigue loading equivalent to more than 100 years of service without showing any significant joint or stiffness degradation.

The study is co-sponsored by MPC and the South Dakota Department of Transportation.

Testing of full scale bridge connection recently completed

Research into the behavior of Simple Made Continuous (SMC) bridges with exposed steel diaphragms has been ongoing at Colorado State University. SMC bridges are constructed as simple spans for the dead load of the girders and the composite concrete slabs. Additional top reinforcing is placed in the deck slab from roughly the center of the first span to the center of the last span. Once the concrete attains its design strength, this reinforcing allows the girders to achieve continuity at the interior supports and thus, the composite girders become continuous for live loads.

This project studies a unique SMC connection designed by the Colorado Department of Transportation. While most steel SMC bridges use steel girders cast into concrete diaphragms, the connection

under investigation does not use concrete diaphragms, leaving the girders exposed. The exposed steel connection has several advantages, including greater accessibility for inspections and potentially quicker construction.

Following investigation of the connection performance with basic mechanics and subsequent finite element analysis, a full scale test on the continuity connection was conducted in the structures lab at the CSU Engineering Research Center. The physical test spanned two consecutive days and consisted of applying increasingly higher loads at both ends of the cantilevered beams to simulate a negative moment at the SMC connection at the center of the model; the maximum applied load at each end was 198 kips, which would cause a centerline moment of 2,376 kip-feet. The model was instrumented with 32 strain gages to measure strains in the concrete, the reinforcing, the steel girders, and the girder bearing plate. Additionally, seven potentiometers were installed to measure displacements at the girder ends and at the center of the connection to measure girder displacements.

Based on the results of the physical test, internal forces in the various elements of the connection were determined in order to verify the internal moment at the center of the support. The internal moment and resulting internal forces will be further investigated for correlation with the hand calculations in order to develop a design methodology for this type of connection.

Research predicts infrastructure needs for North Dakota

An average of \$407 million per year will need to be invested in North Dakota's county and township roads and bridges to maintain them over the next 20 years, according to a recent study from the Upper Great Plains Transportation Institute at North Dakota State University. Researchers there estimate the total investment needed over the next 20 years will be \$8.1 billion, with about half of the estimated amount going to needs in the oil and gas producing counties of western North Dakota. Unpaved road funding needs comprise approximately 67% of the total. If averaged over the next 20 years, the

annualized infrastructure need is equivalent to \$407 million per year.

With a dramatic increase in traffic from North Dakota's oil and agricultural industries over the past several years, there has been a significant impact on the state's county and township road system. To plan for maintenance and upgrades to the system, the North Dakota Legislature directed the Upper Great Plains Transportation Institute at NDSU to project infrastructure need for those roads.

This is the third such study conducted by the Upper Great Plains Transportation Institute. For each study, researchers included additional data on production forecasts, traffic estimates, and roadway conditions.

During the past two years, researchers undertook a significant data collection effort to provide the most complete and current data on the condition of county and township roads. Condition information was collected in conjunction with the North Dakota Department of Transportation using its Pathways van, which utilizes scientific instruments and software to provide objective assessments. Falling weight deflectometer and ground penetrating radar analyses were conducted to develop a clear picture of the existing pavement and subgrade structure. In addition, more than 1,000 traffic counts were collected to calibrate a statewide travel demand model, which was used to forecast traffic levels.

Upper Great Plains Transportation Institute developed a detailed Geographic Information System (GIS) model, which includes the origins of key inputs to the oil production process, destinations for crude oil and saltwater shipments, and the capacities of each source or destination. The origins of movements on the highway network include railroad stations where sand, pipe, and other inputs are transferred from rail to truck. The destinations of crude oil shipments include refineries and railroad and pipeline transfer facilities. In the model, the estimated capacities of transfer sites are expressed in throughput volumes per day, while the capacities of material sources are expressed in quantities of supplies available during a given time period.

A similar model is used to predict the trips of each crop produced in each township to elevators and/or processing plants, subject to the demands of these facilities. Using truck characteristics and typical weights, these trips are converted to equivalent axle loads and trips per day. These two factors, in conjunction with the condition ratings and structural characteristics of roads, are used to estimate the improvements and maintenance expenditures needed for the expected traffic. While the focus is on agricultural and oil-related activities, other movements (such as farm inputs and shipments of manufactured goods) are included in the analysis.

Researchers apply for Provisional Patent for UAS antenna concept

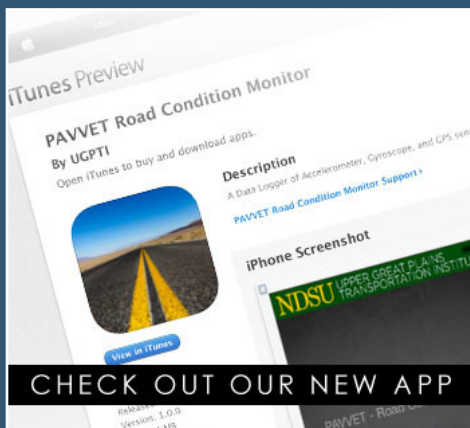
North Dakota State University and the University of North Dakota UND have filed a provisional patent application for technology that integrates antennas into the body or other large components of manned and unmanned aircraft systems (UAS). This whole-body antenna concept will reduce the weight of the aircraft and reduce the drag associated with traditional antennas. That's important, particularly with the relatively small UAS, because the concept will allow for greater range, longer endurance and enhanced reliability of UAS.

The antenna system will also enhance the ability to collect and transmit data from stationary antennas or electronics such as RFID tags. In one configuration, rotating or moving sections of the vehicle such as

propellers, wheel rims, ailerons, elevators or rudders would allow for the physical movement of antenna beam patterns to improve communications and reliability.

Collaborators on the project are Michael Corcoran, UAS Course Manager with the John D. Odegard School of Aerospace Sciences at UND and Raj Bridgelall, program director for the Upper Great Plains Transportation Institute's Center for Surface Mobility Applications & Realtime Simulation environments at NDSU. Corcoran has extensive experience at UND and in the military with UAS. Bridgelall is an expert on RFID and other electronic data collection and communication technology.

A provisional patent application with the U.S. Patent and Trademark office signals the intent of NDSU and UND to patent the technology and establishes a date for locking in any potential patent rights and benefits. This is the second provisional patent application filed jointly by the two universities in the past year. Earlier, researchers filed a provisional patent application for a concept in which aircraft bodies serve as capacitors for storing electrical charges. The capacitors could be assembled in such a way that they increase the structural strength of the aircraft while increasing efficiency and stored power available for flight time or other functions. Bridgelall notes that the joint patent applications are evidence of the growing collaboration between UGPTI and UAV researchers at UND.



App released on iTunes for pavement testing

Upper Great Plains Transportation Institute's first-ever smartphone app is available via iTunes. The app logs inertial, orientation, and position data from the phone's internal sensors to monitor condition data. The data is then transmitted to a database to be used for research and road condition monitoring. For more information on this research at North Dakota State University, go to <http://www.ugpti.org/research/projects.php?view=226&program=smartse>

Publications, Articles, and Presentations

Since 1991, the MPC has published more than 300 reports detailing the work of consortium universities. The reports can be found at www.ugpti.org/resources/reports/. Following are titles of reports published in the last year.

PI(s)	Institution	Report Title
C. Clevenger M. Ozbek H. Mahmoud B. Fanning	CSU	MPC 14-272. Impacts and Benefits of Implementing BIM on Bridge Infrastructure Projects.
T. Dao J. van de Lindt	CSU	MPC 14-273. Safety Factor Increase to Fatigue Limit States through Shear Spiking for Timber Railroad Bridge Rehabilitation - Phase I.
A. Huseth	NDSU	MPC 14-277. Anticipatory Guidance Provision Related to Driving Safety/Cessation for Older Drivers: A Rural-Urban Comparison.
S. Jansuwan S. Ryu A. Chen K. Heaslip	USU	MPC 14-269. A Two-Stage Approach for Estimating a Statewide Truck Trip Table.
J. Kim	U of CO Denver	MPC 14-266. A Novel Methodology for Quantifying the Performance of Constructed Bridges in Cold Regions.
A. Kubas K. Vachal	NDSU	MPC 14-271. Impact of Energy Sector Growth on Perceived Transportation Safety in the Seventeen-County Oil Region of Western North Dakota: A Follow-Up Study.
P. Lu A. Bratlien D. Tolliver	NDSU	MPC 14-274. North Dakota Implementation of Mechanistic-Empirical Pavement Design Guide (MEPDG).
J. Mielke D. Winchell A. Murphy	NDSU	MPC 14-276. Emergency Preparedness Handbook for Tribal Governments.
E. Offei R. Young	U of WY	MPC 13-265. Quantifying the Impact of Large Percent Trucks Proportion on Rural Freeways.

MPC Reports (continued)

PI(s)	Institution	Report Title
X. Qin K. Wang Z. Wang	SDSU	MPC 14-275. Selection of Interest and Inflation Rates for Infrastructure Investment Analyses.
H. Samra X. Qin Z. He	SDSU	MPC 14-267. Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements.
S. Simpson M. Ozbek C. Clevenger R. Atadero	CSU	MPC 14-268. A Framework for Assessing Transportation Sustainability Rating Systems for Implementation in U.S. State Departments of Transportation.
X. Zhou P. Martin M. Zlatkovic I. Tasic	USU	MPC 14-270. Traffic Modeling of Transit Oriented Development: Evaluation of Transit Friendly Strategies and Innovative Intersection Designs in West Valley City, UT.

Publications and Presentations

The following is a listing of selected publications, scholarly articles, and presentations authored and/or presented by Mountain-Plains Consortium researchers and students during 2014.

Colorado State University		
Papers/Publications	Celik, B.G. Ozbek, M.E. Attaran, S. Jalili, M.	"Comparison of Environmental Responsibility of Construction Management Students Based on Exposure to Sustainability in Curricula and on Campus." <i>International Journal of Construction Education and Research</i> 10 (2) (2014): 96-110.
	Crew, W. de la Garza, J.M. Ozbek, M.E. Dai, J.	"Long-term Significance of a CII Best Practices Course." <i>ASCE Practice Periodical on Structural Design and Construction: Special Issue on Construction Engineering: Leveraging Project and Career Success</i> 19 (1) (2014): 30-35.
	Ozbek, M.E. Clevenger, C.M.	"Teaching Sustainability Competencies to High School Students using Small-Scale Community-Based Construction Projects." <i>Handbook of Research on Pedagogical Innovations for Sustainable Development</i> , K.D. Thomas and H.E. Muga, eds. IGI Global, Hershey, PA, 270-327. (2014)
Presentations	Inguva, G. Clevenger, C.M. Ozbek, M.E.	"Differences in Skills Reported by Construction Professionals who use BIM/VDC." In: <i>Proceedings of the 2014 Construction Research Congress</i> , 61-69, May 19-21, Atlanta, GA. (2014)
	Simpson, S. Clevenger, C.M. Ozbek, M.E. Rabbani, E. Atadero, R.	"A Framework for Assessing Transportation Sustainability Rating Systems for Implementation in U.S. State Departments of Transportation." In: <i>Proceedings of the 2014 TRB 93rd Annual Conference</i> , 18 pages (Electronic Proceedings with no page numbers), January 2014, Washington D.C. (2014)
	Jehring, M.M. Bareither, C.A.	Effect of tailings composition on the shear behavior of co-mixed mine waste, <i>Proc. Tailings and Mine Waste 2014</i> , Information Technology, Creative Media, University of British Columbia, Vancouver, BC, 391-401. (2014)
	Gorakhki, M.R.H. Bareither, C.A.	Salinity effects on the geotechnical characterization of mine tailings, <i>Proc. Tailings and Mine Waste 2014</i> , Information Technology, Creative Media, University of British Columbia, Vancouver, BC, 117-126. (2014)

North Dakota State University

North Dakota State University		
Papers/Publications	Enyinda, C. Gebremikael F. Ogbuehi, A.	"An analytical Model for Healthcare Supply Chain Risk Management." <i>African Journal of Business and Economic Research</i> 9(1) (2014): 13-27.
	Lee, EunSu	"Designing Service Coverage and Measuring Accessibility and Serviceability of Rural and Small Urban Ambulance Systems." <i>Systems</i> 2 (1) (2014) 34-53.
	Lee, E.	P.G. Odour, K.Farahmand, D. Tolliver. "A Coupled Linear Programming Model with Geospatial Dynamic Trip Assignment for Global-Scale Intermodal Transportation." <i>Maritime Economics and Logistics</i> 16 (2014): 33-54.
	Lee, E. Rhim. H	"An Application of Conjoint Analysis to Explore Use Perceptions on Management Information Systems: A Case Study." <i>Management Research Review</i> 37(1) (2014): 69-88.
Presentations	Gebremikael, F.	"An Agriculture Feed Processing Supply Chain Modeling." INFORMS Annual Meeting, Nov. 9-12, San Francisco, CA.
	Holt, L.	"Dynamic Routing Model for Large Urban Lab Collection Networks." INFORMS Annual Meeting, Nov. 9-12, San Francisco, CA.
	Kazemi, Y.	"Modeling the Petroleum Supply Chain under Disruption and Mitigation Strategies." INFORMS Annual Meeting, Nov. 9-12, San Francisco, CA.
	Kubas, A.	"Oil County Traffic Safety: A Perspective of Western North Dakota Residents." 4th North Dakota Conference on Injury Prevention and Control, Bismarck, ND, October 2, 2014.
	Kubas, A	"A Follow-Up Study of Oil County Traffic Safety: Perspectives from Western North Dakota Residents." The Great Plains Sociological Association's annual conference, Sioux Falls, SD, October 23, 2014.
	Lee, E.	"Linear Referencing Systems and Management: Applications." Summer Pine to Prairie (P2P) GIS User Group Meeting, Fergus Falls, MN. Aug. 6, 2014.
	Lee, E.	"Designing Service Coverage and Measuring Accessibility and Serviceability." INFORMS Annual Meeting, Nov. 9-12, San Francisco, CA.
	Park, Y.S.	"Life Cycle Based Environmental Impact Intensity Assessment of National Freight Transportation." INFORMS Annual Meeting, Nov. 9-12, San Francisco, CA.

South Dakota State University		
Papers/ Publications	Qin, X. Wehbe, N	“Evaluation of Truck Impact Hazards for Interstate Overpasses.” Transportation Research Record 2402, (2014): 1-8.
Presentations	Wehbe, N. Pauly, T.	“Square SCC Bridge Columns under High Lateral Drifts.” American Concrete Institute Spring Convention. Reno, NV, March 2014.
	Wehbe, N. Tigges, B. Boudaqa, A.	“Low Flexural and Shear Capacity Bridge Columns under Truck Collision Loads.” American Concrete Institute Fall Convention. Washington, DC, October 2014.
	Wehbe, N. Tigges, B.	“Vulnerability of Concrete Bridge Columns to Truck Collision Loads.” Future Concrete, Beirut, Lebanon, June 2014.
	Wehbe, N. Tigges, B.	“Experimental Evaluation of As-Built and Retrofitted Two-Column Bridge Bents under Vehicular Collision Force at the Bent Column.” European Bridge and Structural Faults and Repair 15th International Conference. London, UK. June 2014.
	Pei, S. Wehbe, N.	“Experimental Study on River Ice Load for Bridge Substructures in South Dakota.” American Concrete Institute Fall Convention. Washington, DC, October 2014.
	Qin, X.	“Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements.” South Dakota Emergency Medical Service (EMS) Association Conference. Sioux Falls, SD. October 2014.

UC Denver

Papers/Publications	Al Wakeel S. Kim, Y.J. Deng, Y.J.	"Performance of bridge decks in a cold region and a high-fidelity sensing system for damage detection." American Concrete Institute (ACI) Special Publication on Advanced Materials and Sensors toward Smart Concrete Bridges: Concept, Performance, Evaluation, and Repair, 187-206, 2014.
	Bronson, R. Marshall, W.	"Alternative and adaptive transportation: What household and neighborhood factors support recovery from a drastic increase in gas price?" International Journal of Environmental Science and Technology, (doi: 10.1007/s13762-014-0583-2), 11(8): 2245-2258, 2014.
	Dumbaugh, E. Tumlin, J. Marshall, W.	"Decisions, Values, and Data: Understanding Bias in Transportation Performance Measures." ITE Journal, 84 (8) (2014).
	Henao, A. Piatkowski, D. Luckey, K. Nordback, K. Stonebraker, E. Marshall, W. Krizek, K.	"Sustainable Transportation Infrastructure Investments and Mode Share Changes: A 20- year case study of Boulder, Colorado." Transport Policy, 37 (2015): 64-71, 2015.
	Hmidan, A. Kim, Y.J. Yazdani, S.	"Correction factors for stress intensity of CFRP-strengthened wide-flange steel beams with various crack configurations." Construction and Building Materials, 70 (2014): 522-530.
	Kim, Y.J.	"Moment-shear interaction mechanism for CFRP-strengthened RC beams in flexure." ACI Structural Journal, 111(4) (2014): 967-975.
	Kim, Y.J. Allard, A.	"Thermal response of precast concrete sandwich walls with various steel connectors for architectural buildings in cold regions." Energy and Buildings, 80 (2014): 137-148.
	Kim, Y.J. Hyun, S.W. Kang, J.Y. Park, J.S.	"Anchorage configuration for post-tensioned NSM CFRP upgrading constructed bridge girders." Engineering Structures, 79 (2014): 256-266.
	Kim, Y.J. Hyun, S.W. Yoshitake, I. Kang J.Y.	"Residual performance of a sylil-modified polymer adhesive for CFRP-steel interface exposed to thermally-induced stress states." International Journal of Adhesive and Adhesion, 51 (2014): 117-127.
	Kim, Y.J. Yoshitake, I. Liu, R.	"Composite hull structures subjected to wave-induced slamming impact." Journal of Reinforced Plastics and Composites, 33(1) (2014): 3-13.
	Kim, J. Marshall, W. Pal, I.	"Disaster Quantification of Constructed Infrastructure Due to the 2013 Flood in Colorado, USA." Journal of Civil Engineering, ICE, 167(4) (2014): 186-191.
	Kim, Y.J. Siriwardanage, T. Hmidan, A. Seo, J.	"Material characteristics and residual bond properties of organic and inorganic resins for CFRP composites in thermal exposure." Construction and Building Materials, 50 (2014): 631-641.
	Knight, P. Marshall, W.	"The Metrics of Street Network Connectivity: Their Inconsistencies." Journal of Urbanism (doi: 10.1080/17549175.2014.909515).
	Marshall, W. Piakowski, D. Garrick, N.	"Community Design, Street Networks, and Public Health." Journal of Transport & Health 1(4): 326-340 (doi:10.1016/j.jth.2014.06.002).

UC Denver (continued)

UC Denver (continued)

Papers/Publications	Marshall, W.E.	"Understanding the impacts of integrating New Urbanist neighborhood and street design ideals with conventional traffic engineering standards: the case of Stapleton." <i>Journal of Urbanism</i> , (8) 2:148-172 (doi: 10.1080/17549175.2014.896826).
	McAndrews, C. Marcus, J.	"Community-Based Advocacy at the Intersection of Public Health and Transportation: The Challenges of Addressing Local Health Impacts within a Regional Policy Process." <i>Journal of Planning Education and Research</i> , 34(2)(2014): 190-202.
	Namrou, A.R. Kim, Y.J.	"An experimental investigation into the behavior of concrete elements retrofitted with NSM composite strips at elevated temperatures." <i>American Concrete Institute (ACI) Special Publication on Advanced Materials and Sensors toward Smart Concrete Bridges: Concept, Performance, Evaluation, and Repair</i> , 225-239, 2014.
	Nordback, K. Marshall, W. Janson, B.	"Bicyclist Safety Performance Functions for a U.S. City." <i>Accident Analysis and Prevention</i> , 65 (2014): 114-122.
	Piakowski, D. Bronson, R. Marshall, W. Krizek, K.	"Measuring the Impacts of Bike to Work Day Events for Different Populations." <i>Journal of Urban Planning and Development</i> (doi: 10.1061/(ASCE)UP.1943-5444.0000239).
Presentations	Bronson, R. Marshall, W.	City Resilience and Active Transportation Infrastructure. Congress for the New Urbanism Annual Meeting, Buffalo, NY, June 2014.
	Fisher, C. Marshall, W. McAndrews, C.	Street Vitality and Urban Design. ITE Colorado-Wyoming Section Transportation Symposium, Denver, April 2014.
	McAndrews, C. Marshall, W. Mitchell, L. Fisher, C.	Livable Streets, Livable Arterials? Association of Collegiate Schools of Planning (ASCP), Philadelphia, PA, November 2014.
	Mitchell, L. McAndrews, C. Marshall, W.	Measuring the Livability of Streets: Community Surveys. ITE Colorado-Wyoming Section Transportation Symposium, Denver, April 2014.

University of Utah

Papers/Publications	Bordelon, A. Roesler, J.	"Spatial Distribution of Synthetic Fibers in Concrete with X-Ray Computed Tomography," <i>Cement and Concrete Composites</i> , 53 (2014): 35-43.
	Bordelon, A.	"Chapter 4 and Appendix D", In Dale Harrington and Gary Fick. <i>Guide to Concrete Overlays: Sustainable Solutions for Resurfacing and Rehabilitating Existing Pavements</i> , 3rd edition. National Concrete Pavement Technology Center: Ames, IA, 2014.
	Fagnant, D.	"How Self-Driving Cars Can (and Should) Improve Transit." Planetizen. August 1, 2014. http://www.planetizen.com/node/70590
	Ray, B.L. Ferguson, E.M. Knudsen, J.K. Porter, R.J. Mason, J.	"Performance-Based Analysis of Geometric Design of Highways and Streets," NCHRP Report 785, National Cooperative Highway Research Program, Transportation Research Board, Washington, D.C., 2014.
	Tasic, I. Musunuru, A. Porter, R.J.	"Quantifying Accessibility of Non-Motorized Transportation Modes in Recreational Areas: Case Study of Mill Creek Canyon, Utah." <i>Journal of Park and Recreation Administration</i> , 32 (3) (2014): 49-73.
	Wu, Q. Chen, F. Zhang, G. Liu, C. X. Wang, H. Bogus, S.	"Mixed Logit Model-Based Driver Injury Severity Investigations in Single- and Multi-Vehicle Crashes on Rural Two-Lane Highways." <i>Accident Analysis & Prevention</i> , 72 (11) (2014): 105-115.
	Yu, R. Liu, C.X Larson, T. Wang, Y.	"Coherent approach for modeling and nowcasting hourly near-road Black Carbon concentrations in Seattle, Washington." <i>Transportation Research Part D</i> . 34(2015): 104-116 (DOI: 10.1016/j.trd.2014.10.009).
Presentations	Behrends, A.A. Sanbonmatsu, D.M. Medeiros-Ward, N. Watson, J. M. Strayer, D. L.	"Why do people use cell phones while driving and support legislation to restrict this practice?" Annual Meeting of the Association for Psychological Science, San Francisco, CA, May 21, 2014.
	Bordelon, A.C. Hiller J.E. Roesler J.R. Cervantes, V.G.	"Investigation of ESALs Versus Load Spectra for Rigid Pavement Design," ASCE T&DI Conference, Miami, FL, June 2015.
	Fagnant, D.	Implementation Issues and Emerging Frameworks for Self-Driving Vehicles. University of Denver "Great Issues" Public Policy Course. Denver, CO, October 2014.
	Fagnant, D.	Shared Autonomous Vehicles: Impacts on Travel, Land Use and Urban Planning. Urban Land Institute Community Development Council (Keynote Address). New York, NY, October 2014.
	Musunuru, A. Porter, R.J.	"A Reliability-Based Geometric Design Approach to Freeway Number of Lanes Decisions," Session C7 of the 2nd T&DI Congress of the American Society of Civil Engineers, Orlando, FL, June 2014 [refereed paper].
	Pantelides, C.	"Grouted Splice Sleeve Connectors for ABC Bridge Joints in High Seismic Regions." UDOT Annual Conference, Sandy, UT, October 2014.
	Porter, R.J.	"Incorporating Road Safety Analysis into the Transportation Project Development Process: Recent Advancements," Utah Society of Professional Engineers Annual Conference, Salt Lake City, UT, May 2014.
	Zlatkovic, M. Zhou, X.	"Simplified Web-Based Decision Support Method for Traffic Management and Work Zone Analysis." UDOT Annual Conference, Sandy, UT, October 2014.

University of Utah (continued)

University of Utah (continued)

Presentations	Zlatkovic, M. Tasic, I.	"Multimodal Corridors Assessment with Transit Priority Enhancements: Case Study of the Future Airport Light Rail Line in Salt Lake City." UDOT Annual Conference, Sandy, UT, October 2014.
	Zlatkovic, M.	"Performance Matrix for Evaluating Alternative Designs." Alternative Intersections & Interchanges Symposium, Salt Lake City, UT, July 2014.
	Zlatkovic, M. Tasic, I. Stevanovic A. Ostojic, M.	"Assessment of LRT and TSP Impacts on Urban Corridors in Salt Lake City." ITE Intermountain Section 54th Annual Meeting, Jackson, WY, May 2014.

Utah State University

Papers/Publications	Desiraju, D. Chantem, T. Heaslip, K	"Minimizing the Disruption of Traffic Flow of Automated Vehicles During Lane Changes." IEEE Transactions on Intelligent Transportation Systems, Accepted for publication, Sept. 2014. Doi: 10.1109/TITS.2014.2356932.
	Chen, A. Ryu, S. Xu, X. Choi, K.	(2014) "Computation and application of the paired combinatorial logit stochastic traffic equilibrium problem." Computers and Operations Research 43(1), 68-77. Doi:10.1016/j.cor.2013.08.022.
	Boggs, W. Heaslip, K. Louisell, C.	"Analysis of Sign Damage and Failure: Utah Case Study." Transportation Research Record: Journal of the Transportation Research Board, 2337 (2013): 83–89.
	Fishelson, J. *Freckleton, D. Heaslip, K.	"Evaluation of Automated Electric Transportation Deployment Strategies: Integrated Against Isolated." IET Intelligent Transport Systems, 7 (3) (2013): 337-344.
	Kitthamkesorn, S. Chen, A.	(2014) "An unconstrained weibit stochastic user equilibrium model with extensions." Transportation Research Part B 59: 1-21. Doi:10.1016/j.trb.2013.10.010.
	Ryu, S. Chen, A. Choi, K.	(2014) "A modified gradient projection algorithm for solving the elastic demand traffic equilibrium problem." Computers and Operations Research 47: 61-71. Doi: 10.1016/j.cor.2014.01.012.
	Ryu, S. Chen, A. Xu, X. Choi, K.	(2014) "A dual approach for solving the combined distribution and assignment problem with link capacity constraints." Networks and Spatial Economics 14(2), 245-270. DOI: 10.1007/s11067-013-9218-2.
	Shao, H. Lam, W.H.K. Sumalee, A. Chen, A. Hazelton, M.L.	(2014) "Estimation of mean and covariance of peak hour origin-destination demands from traffic counts with seasonal effects." Transportation Research Part B, 68: 52-75. DOI: 10.1016/j.trb.2014.06.002.
	Wang, J.Y.T Ehrgott, M. Chen, A.	(2014) "A bi-objective user equilibrium model of travel time reliability in a road network." Transportation Research Part B, 66: 4-15. Special issue on "Advances in Equilibrium Models for Analyzing Transportation Reliability". Doi:10.1016/j.trb.2013.10.007.
	Xu, X. Chen, A. Cheng, L. Lo, H.	"Modeling distribution tail in network performance assessment: A mean-excess total travel time risk measure and analytical estimation method." Transportation Research Part B, 66 (2014): 32-49. Special issue on "Advances in Equilibrium Models for Analyzing Transportation Reliability". Doi: 10.1016/j.trb.2013.09.011.
	Xu, X. Chen, A. Zhou, Z. Cheng, L.	"A multi-class mean-excess traffic equilibrium model with elastic demand." Journal of Advanced Transportation 48(3) (2014): 203-222. Doi: 10.1002/atr.205.
	Yao, J. Chen, A.	(2014) "An analysis of logit and weibit route choices in stochastic assignment paradox." Transportation Research Part B, 69:31-49. Doi: 10.1016/j.trb.2014.07.006.
	Yao, J. Chen, A. Ryu, S. Shi, F.	"A general unconstrained optimization formulation for the combined distribution and assignment problem." Transportation Research Part B, 59 (2014): 137-160. Doi: 10.1016/j.trb.2013.11.007.

Utah State University (continued)

Utah State University (continued)

Presentations	Barnes, R. Bosworth, R. Heaslip, K. Soltani Sobh, A. Prestrud, C.	(2014). Under What Price Conditions Do CNG-Powered Passenger Vehicles Make Economic Sense? Presented at the 93rd Transportation Research Board Annual Meeting, Washington, DC, January 2014.
	Dong, S. Wang, H. Hurwitz, D. Heaslip, K.	Vehicle-Type Specific Headway Distribution in Freeway Work Zones: A Nonparametric Approach. In the Proceedings of the 93rd Transportation Research Board Annual Meeting, Washington, DC, January 2014.
	Heaslip, K.	(2014). Continuing Momentum in Communicating Your Message: Getting Through the Valley of Death. Presented at the Council of University Transportation Centers Annual Meeting. Lincoln, NE. June 2014.
	Heaslip, K. Louisell, W.	Characterization of Damage of UDOT's Sign Population. Presented at the 2nd American Society of Civil Engineering Transportation and Development Institute Congress. Orlando, FL. June 2014.
	Jansuwan, S. Chen, A. Subprasom, K. Indra-Payoong, N.	Assessing redundancy of freight transportation network for pre-disaster highway planning. Paper presented at the 19th National Convention on Civil Engineering, 14-16 May 2014, Khon Kaen, Thailand.
	Jansuwan, S. Chen, A. Ryu, S.	An alternative approach for estimating a statewide truck origin-destination trip table: A case study in Utah. Paper presented at the 93rd Transportation Research Board Annual Meeting, Jan. 12-16, 2014, Washington D.C.
	Jansuwan, S. Christensen, K. Chen, A.	"Assessing the transportation needs of low-mobility individuals: Case study of a small urban community in Utah." Journal of Urban Planning and Development 139 (2) (2013): 104-114. Doi:10.1061/(ASCE)UP.1943-5444.0000142.
	Kitthamkasorn, S. Chen, A.	A path-size weibit stochastic user equilibrium model. Proceedings of the 20th International Symposium of Transportation and Traffic Theory, July 17-19, 2013, Noordwijk, the Netherlands.
	Kitthamkasorn, S. Chen, A. Xu, X. Ryu, S. Yang, C.	Combined model with go-green modes. Paper presented at the 18th Hong Kong Society of Transportation Studies Conference: Travel Behavior and Society, December 14-16, 2013, Hong Kong, P.R. China.
	Ryu, S. Chen, A. Xu, X. Choi, K.	Modeling demand elasticity and route overlapping in stochastic user equilibrium through paired combinatorial logit model. Paper presented at the 93rd Transportation Research Board Annual Meeting, Jan. 12-16, 2014, Washington D.C.
	Sharifi, M.S. Stuart, D. Christensen, K. Chen, A. Kim, Y. Chen, Y.	Analysis of walking speeds involving individuals with disabilities in different walking environments. Paper presented at the 93rd Transportation Research Board Annual Meeting, Jan. 12-16, 2014, Washington D.C.
	Yang, C. Chen, A. Xu, X.	"Improved partial linearization algorithm for solving the combined travel-destination-mode-route choice problem." Journal of Urban Planning and Development 139 (1) (2013): 22-32. Doi:10.1061/(ASCE)UP.1943-5444.0000130.
	Yang, C. Chen, A. Xu, X. Wong, S.C.	"Sensitivity-based uncertainty analysis of a combined travel demand model." Transportation Research Part B 57, (2013): 225-244. Doi:10.1016/j.trb.2013.07.006.
	Zhu, S. Cheng, L. Chu, Z. Chen, A. Chen, J.	Identification of network sensor locations for traffic flow estimation. Paper presented at the 93rd Transportation Research Board Annual Meeting, Jan. 12-16, 2014, Washington D.C.

University of Wyoming

Presentations	Werbelow, W. Ksaibati, K.	“Developing a Methodology to Assess and Prioritize Culvert Conditions on County Roads”. International Low Volume Roads Conference, July, 2015.
	Savan, C. Ng, K.W. Ksaibati, K.	(2014). “Intelligent Compaction for roadway Construction and Quality Assurance.” Proceedings of the 65th Annual Highway Geology Symposium, Laramie, WY.
	Ng K. Ettema R. Kempema E. Chakradhar R.	Geotechnical Challenges in Laboratory Investigation of Bridge Abutment Scour. The 65st Highway Geology Symposium, Laramie WY, July, 2014.
	Shinstine, D. Ksaibati, K.	“Indian Reservation Safety Improvement Program,” 2014 Intertribal Transportation Association Mid-Year Meeting”, Polson, Montana, June 5, 2014.
	Shinstine, D. Ksaibati, K.	“Safety Improvement Programs for Indian Reservations,” Advisory Board Meeting for the Northern Plain TTAP Center, Fort Morgan, SD. South Dakota Tribal Safety Summit, May 21, 2014.
	Shinstine, D. Ksaibati, K.	“Strategic Plans for Indian Reservations”, Round table discussions, Standing Rock Safety Meeting, Standing Rock Indian Reservation, North Dakota. June, 18, 2014.
	Shinstine, D. Pokharel, S. Ksaibati, K.	“Livability on Indian Reservations,” Livability Stakeholders Workshop, Ft. Washakie, Wyoming, March 19, 2014.
	Ettema, R. Ng K. Chakradhar R. Fuller J. Kempema E.W.	Failure of Spill-through Bridge Abutments during Scour: Flume and Field observations. ASCE Journal of Hydraulic Engineering.
	Ng, K. Chakrahda, R. Ettema, R. Kempema, E.	(present in 2014), “Laboratory Investigation of Embankment Soil Strength Influence on Abutment Scour: Early Findings.” ASCE-EWRI Conference, Portland, Oregon, June 1-5.
	Huntington, G. Jones, J. Ksaibati, K.	“Risk Assessment of Oil and Gas Drilling Impacts on County Roads,” Transportation Research Board, Washington D.C., 2014.
	Parks, J.E. Brown, D.N. Ameli, M.J. Pantelides, C.P. Reaveley, L.D.	Repair of damaged precast RC bridge columns with grouted splice sleeve connections using CFRP shells and plastic hinge relocation. Proceedings of the 10th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Anchorage, AK, 2014. DOI: 10.4231/D38C9R473.
	Tucker, C. Ibarra, L.F.	Seismic Performance of Circular Concrete Filled Tube Columns for Accelerated Bridge Construction. Proceedings of the 10th National Conference in Earthquake Engineering, Earthquake Engineering Research Institute, Anchorage, AK, 2014. DOI: 10.4231/D3GF0MX2G.

Research Project Status

September 30, 2013 – September 31, 2018

Grant – DTRT13-G-UTC38 – September 30, 2013

Expiration Date – September 31, 2018

Ongoing Research Projects

PI(s)	Institution	Project Title
H. Mahmoud	CSU	A Modified Approach for Predicting Fracture of Steel components under Combined Large Inelastic Axial and Shear Strain Cycles
C. Bareither P. Heyliger	CSU	Post-Fire Ground Treatments for Protection of Critical Transportation Structures
J. van de Lindt S. Bolivar	CSU	Reducing Flood Vulnerability of Communities with Limited Road Access by Optimizing Bridge Elevation
R. Atadero C. Clevenger M. Ozbek	CSU	Using Building Information Modeling to Track and Assess Structural Condition
S. Chen	CSU	Analytical Modeling of Progressive Failure Assessment of Curved and Skewed Highway Bridges Subjected to Seismic Hazards
K. Ksaibati G. Huntington	UWY	Assessing the Cost-Effectiveness of Wyoming's CMAQ Unpaved Road Dust Suppression Program
M. Ahmed K. Ksaibati	UWY	Updating the Highway Safety Manual 2010- Part C: Regional Consideration of the Rocky Mountains and Plains Regions
R. Young	UWY	Speed Selection Behavior during Winter Road Conditions
K. Ksaibati	UWY	Regional Implementation of Tribal Transportation Safety Program
W. Marshall C. McAndrews K. Nordback B. Janson	UC Denver	Why Are Bike-Friendly Cities Safer for All Road Users?
Y. Kim	UC Denver	Performance of Steel Girders Repaired with Advanced Composite Sheets in a Corrosive Environment: A Multi-Physics Approach Leading to Practical Design Recommendations
J. Mielke D. Winchell A. Murphy	NDSU	Application of a Multi-Agent System with the Large-Scale Agent-Based Model for Freight Demand Modeling
J. Rafert R. Bridgelall	NDSU	Technology and Workforce Development for Remote Sensing of the Transportation Infrastructure
Z. Song	USU	Implementation of Aerial LiDAR Technology to Update Highway Feature Inventory
Z. Song	USU	Rehabilitation Project Selection and Scheduling in Transportation Networks
A. Chen	USU	Development of Network-Based Measures and Computational Methods for Evaluating the Redundancy of Transportation Networks
M. Zlatkovic	U of UT	Development of Performance Matrices for Evaluating Innovative Intersections and Interchanges
X. Cathy Liu	U of UT	First and Last Mile Strategies for Transit Systems
D. Sanbonmatsu D. Strayer	U of UT	Self-Regulation and Distraction

PI(s)	Institution	Project Title
P. Romero	U of UT	Performance Evaluation of Highway Surface Treatments (Phase I: Short-Term Performance)
M. Zlatkovic	U of UT	Improving Efficiency and Reliability of Bus Rapid Transit

MPC Completed Research Projects

PI(s)	Institution	Project Title
J. Mielke D. Winchell A. Murphy	NDSU	Tribal Emergency Preparedness Planning North Dakota State University / Eastern Washington University. MPC 14-276

MPC Terminated Research Project

PI(s)	Institution	Project Title
P. Lu A. Bratlien (PI left university)	NDSU	Comparison between 1993 AASHTO Pavement Design Guide and Mechanistic-Empirical Pavement Design Guide with North Dakota Case Study

Research Project Status

January 1, 2012 – January 31, 2016
 Grant – DTRT12-G-UTC08 - January 1, 2012
 DTRT12-G-UTC08, Modification 1 – January 1, 2013
 Expiration Date – January 31, 2016

Ongoing Research Projects

PI(s)	Institution	Project Title
R. Ettema	UWY	Geotechnical Limit to Scour at Spill-Through Abutments
K. Ksaibati D. Tolliver	UWY	Improved Understanding of Pavement Impacts and Cost-Effective Designs based on Mechanistic Empirical Methods
R. Schmidt R. Erickson H. Heining	UWY	Structural Health Monitoring of Highway Bridges Subjected to Overweight Trucks, Phase I – Instrumentation Development and Validation
K. Ksaibati	UWY	Developing Statistical Models for Crash Severity Comparing Statewide, County and Indian Reservation Roads
K. Vachal	NDSU	Effectiveness of Advisory Letter in Preventing At-Risk Teen Driver Crashes: Pilot Project
F. Yazdani J. Kim M. Yang	NDSU	Damage Assessment, Characterization, and Modeling for Enhanced Design of Concrete Bridge Decks in Cold Regions
M. Yang J. Kim F. Yazdani	NDSU	An integrated real-time health monitoring and impact/collision detection system for bridges in cold remote regions
D. Tolliver D. Benson	NDSU	Small Railroad Capital Investment Needs and Financial Options
P. Heyliger	CSU	MEMS Sensors for Transportation Structures
P. Heyliger	CSU	Plastic-Aluminum Composites in Transportation Infrastructure
S. Chen	CSU	Investigation of interactions between traffic law enforcement and driving behavior on rural highways in Colorado
S. Chen	CSU	Performance-based Interaction Analysis of Damage on Bridge Expansion Joints and Heavy Traffic
H. Mahmoud R. Atadero	CSU	Seismic Behavior of Steel Bridges with Fatigue-prone Details
H. Mahmoud	CSU	Seismic Performance of Highway Embankments
M. Ozbek R. Atadero	CSU	Understanding Public Perceptions of Different Revenue Generation Systems for Highway Construction and Maintenance
R. Atadero	CSU	Education & Workforce Dev, STEM Outreach at Colorado State University
R. Young	UWY	Use of Travel Time, Travel Time Reliability, and Winter Condition Index Information for Improved Operation of Rural Interstates
P. Lu D. Tolliver	NDSU	Comprehensive GIS-Based Rural Regional Transportation Planning Models
S. Bartlett E. Lawton	U of UT	Design and Construction Monitoring of Surcharged Embankment
C. Pantelides L. Reaveley	U of UT	Evaluation of Spliced Sleeve Connections for Precast Reinforced Concrete Bridge Piers
R. Atadero M. Ozbek	CSU	Quantifying Uncertainty in Nondestructive Bridge Inspection Methods for use in Performance Based Inspection

PI(s)	Institution	Project Title
S. Pei N. Wehbe	SDSU	Accelerated Bridge Construction in South Dakota: Pilot Study for Implementation Strategy
A. Jones	SDSU	Extent, Severity, and Location of Chip Seal Loss on the South Dakota State Road Network
N. Wehbe S. Pei	SDSU	Evaluation and Mitigation of Vehicle Impact Hazard for Overpass Bridges in South Dakota
S. Pei N. Wehbe	SDSU	Evaluation of Ice Loads on Bridge Piers in South Dakota
N. Wehbe S. Pei	SDSU	Seismic Performance of SCC Bridge Columns
X. Zhou	U of UT	Web-Based Decision Support Tool for Traffic Management and Work Zone Analysis
L. Ibarra	U of UT	Seismic Performance of Concrete Filled Steel Tube (CFST) Bridge Columns for Accelerated Bridge Construction
C.P. Pantelides	U of UT	Seismic Retrofit of Spliced Sleeve Connections for Precast Bridge Piers
R.J. Porter	U of UT	Risk- and Reliability-Based Approaches to Analyzing Road Geometric Design Criteria
D. Strayer D. Sanbonmatsu	U of UT	The Effect of Multi-tasking on Self-Assessments of Driving Performance Center for the Prevention of Distracted Driving
R. Atadero J. van de Lindt	CSU	Exploring Unique Plastic-Reinforced Bridge Decks: Phase I
P. Sherry	U of Denver	Identification of Low-Risk Adjusted Work Schedules Designed to Manage Fatigue during Peak Service Demand Periods in the Shortline Railroad Industry
R. Atadero	CSU	Predicted Fatigue Service Life Extension of RC Bridges with Externally Bonded CFRP
C. Bareither	CSU	Re-Use of Mine Waste Materials Amended with Fly Ash in Transportation Earthwork Projects
H. Mahmoud	CSU	Fatigue Strength of CFRP-repaired Reinforced Concrete Bridge Girders under Service Temperature
J. van Lindt S. Bolivar	CSU	Quantifying Sustainability Metrics for Trunkline Bridges in the Mountain Plains Region
S. Chen	CSU	Framework of Performance-Based Earthquake Design of Curved and Skewed Bridges
P. Heyliger	CSU	Development and Testing of Crashworthy IPE Bridge Rails
K. Ksaibati D. Shinstine	UWY	Evaluation and Development of Livability and Sustainability Programs for Indian Reservations
X. Zhou M. Zlatkovic	U of UT	400 South Corridor Assessment
A. Bordelon	U of UT	Experimental and Numerical Study for the Debonding Interface between an Existing Pavement and a New Concrete Overlay
C.P. Pantelides L. Ibarra	U of UT	Seismic Rehabilitation of Skewed and Curved Bridges Using a New Generation of Bulking Restrained Braces
S.F. Bartlett	U of UT	Highway Structures Supported on Expanded Polystyrene (EPS) Embankment without Deep Foundations
J. Hough	NDSU	Educational and Workforce Development Proposal: Ethics and Academic Conduct
E. Lee D. Tolliver	NDSU	Building a Sustainable GIS Framework for Supporting a Tribal Transportation Program
W. Marshall C. McAndrews	UC Denver	Does the Livability of a Residential Street Depend on the Characteristics of the Neighboring Street Network?
Y. Jimmy Kim	UC Denver	Fire Performance of Bridge Members Retrofitted with Near-Surface-Mounted Carbon Fiber Reinforced Polymer Composites
J. Tanner	UWY	Using Recycled Concrete Aggregate in New Concrete Construction
K. Ksaibati J. Jones	UWY	A Methodology for Developing a Replacement Strategy for County/City Owned Bridges
K. Ng K. Ksaibati	UWY	Implementation of Intelligent Compaction Technologies for Road Constructions in Wyoming
R. Young	UWY	Connected Vehicle Weather Data for Operation of Rural Variable Speed Limit Corridors

PI(s)	Institution	Project Title
P. Cramer	U of UT	Finding Innovative Solutions to Prevent Wildlife Access to Highways at Wildlife Guards
T. Chantem	USU	Real-Time Traffic Management to Maximize Throughput of Automated Vehicles
A. Chen	USU	A Bicycle Network Analysis Tool for Planning Applications in Small Communities
R. Gerdes	USU	Realization of a Coarse Position Verification System for an Automated Highway System
G. Hua	SDSU	Using Flocculation to Reduce Turbidity of Construction Site Runoff
N. Wehbe	SDSU	Fiber Reinforced Concrete for Structure Component
X. Qin	SDSU	Calibration of HSM Predictive Methods on Rural State and Local Highways
N. Wehbe	SDSU	Precast Bridge Girder Details for Improved Performance
N. Wehbe	SDSU	Tolerances for Placement of Tie Bars in Portland cement Concrete Pavements
X. Qin H. Wang	SDSU	Developing a Pavement Management System for Small Communities
H. Samra H. Qin	SDSU	Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements-Phase II
A. Jones	SDSU	Bridge Structure Alternatives for Local Roads
X. Liu	U of UT	Data-driven Freeway Performance Evaluation Framework for Project Prioritization and Decision Making
R. Bridgelall Y. Huang	NDSU	A Sensor Fusion Approach to Assess Pavement Condition and Maintenance Effectiveness

MPC Completed Research Projects

PI(s)	Institution	Project Title
P. Barr M. Halling	USU	Develop Design Guidelines for Integral Abutment Bridges. MPC 12-256
S. Jansuwan S. Ryu A. Chen K. Heaslip	USU	A Two-Stage Approach for Estimating a Statewide Truck Trip Table. MPC 14-269
A. Chen K. Heaslip	USU	Do Changing Prices Portend a Shift in Fuel Consumption, Diminished Greenhouse Gas Emissions, and Lower Fuel Tax Revenue? MPC 14-278
K. Vachal	NDSU	ND Motor Crash Analysis and Rider Assessment for Improved Conspicuity Project completed 10/1/12: http://www.ugpti.org/rtssc/briefs/downloads/2011_Motorcycles.pdf
A. Huseeth	NDSU	Anticipatory Guidance for Older Drivers. MPC 14-277
M. Berwick K. Vachal B. Lantz	NDSU	Decision Support for Strategic Truck Safety and Weight Enforcement Planning Motor Carrier Education Summary Posted, ND Truck Size and Weight Education Program posted RTSSC Website Dec 2013
J. Kim F. Yazdani M. Yang	NDSU	A Novel Methodology for Quantifying the Performance of Constructed Bridges in Cold Regions: Development, Assessment, and Repair. MPC 14-266
D. Tolliver P. Lu K. Ksaibati	NDSU	Improved Understanding of Pavement Impacts and Cost-Effective Designs Based on Mechanistic-Empirical Methods MPC 14-274
M. Ozbek C. Clevenger R. Atadero	CSU	Assessing Existing Transportation Sustainability Rating Systems for Use in the Mountain-Plains Consortium States. MPC 14-268
P. Romero	U of UT	Implementation of Low Temperature Test for Asphalt Mixtures to Improve the Longevity of Road Surfaces. MPC 13-260
P. Martin	U of UT	Traffic Modeling of Transit Oriented Development. MPC 14-270
X. Qin Z. Wang	SDSU	Selection of Discount Rates for Infrastructure Investment. MPC 14-275
H. Samra X. Qin	SDSU	Improving Rural Emergency Medical Services (EMS) through Transportation System Enhancements. MPC 14-267
X.Qin	SDSU	Review of Road User Costs (RUC) and Methods MPC 13-254
C. Clevenger M. Ozbek H. Mahmoud	CSU	A Pilot Case Study to Evaluate the Potential Impact and Benefit of Adopting and Implementing BIM on Bridge and Infrastructure Projects. MPC 14-272
K. Vachal	NDSU	Impact of Energy Sector Growth on Perceived Transportation Safety in the Seventeen County Oil Region of Western North Dakota: A Longitudinal Analysis. MPC 14-271

MPC Terminated Research Projects

PI(s)	Institution	Project Title
P. Martin	U of UT	Title- I-15 Express Lane Dynamic Pricing Assessment Project Terminated 5/16/12 – No Match
P. Martin	U of UT	Flex Lane Driver Analysis Project Terminated 5/16/12 – No Match
A. Hong O. Conroy	U of UT	Environmentally Benign Extraction of Bitumen from Oil Sands for Pavement Binder Project Terminated 12/1/13 – No Match

Research Project Status

July 1, 2007 – December 31, 2013

Grant – DTRT07-G-0008 – Close out December 31, 2013

Expiration Date – December 31, 2013

Ongoing Research Projects

PI(s)	Institution	Project Title
J. Ball	SDSU	The Assessment of Chloride Injury from De-Icing Salts in Trees along State Highways in the Black Hills
D. Benson	NDSU	Indian Reservation Roads (IRR) and Local Roads Modeling and Management Databases
A. Dybing	NDSU	Demand Estimation for Corn Transportation: A North Dakota Case Study
N. Wehbe	SDSU	Jointed Plain Concrete (JPC) Design and Construction Review
N. Wehbe	SDSU	Optimization of Pavement Marking Performance
K. Vachal	NDSU	Rural Road Signage: Simulated Driving to Evaluate Low-Cost Safety Improvements for Older Drivers
F. Ting	SDSU	Analysis of Compound Channel Flow with Two-Dimensional Models
N. Wehbe D. Medlin	SDSU	Mitigation of Corrosion in CRC Pavement
J. van de Lindt	CSU	Seismic Risk Assessment for the (-25/I-70 Corridor in the Mountain Plains Region of the U.S.
A. Dybing	NDSU	Estimation of the Generalized Truck Freight Elasticity of Demand: Case Study of the Seattle-Tacoma to Chicago Corridor
R. Atadero	CSU	Laboratory Testing of Innovative Steel Bridge Designs
A. Varma	NDSU	Modeling, Analysis and Evaluation of Urban Arterial Work Zone
A. Varma	NDSU	Modeling and Evaluation of Traffic Signal Preemption near Railroad Crossings in Small Urban Areas
N. Wehbe	SDSU	Concrete Structure Design Alternatives for Rural State and Local Roads
S. Pei	SDSU	Evaluation of Ice Loads on Bridge Piers in South Dakota
D. Tolliver	NDSU	Freight Railway Track Maintenance Cost Model
D. Tolliver	NDSU	Connecting Supply Chain Interregional Freight Flow
D. Tolliver D. Benson	NDSU	Tech Transfer: Assessment of Planning Models for Indian Reservation Roads

MPC Completed Research Projects

PI(s)	Institution	Project Title
B. Lantz	NDSU	An Evaluation of ITS/CVO Application Technology in Logistics and Supply Chain Management. MPC 06-0186
B. Hartnagel	CSU	Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment. MPC 03-148
B. Hartnagel	CSU	Moment-Rotation Tests of High Performance Steel (HPS) I-Girders. MPC 03-148
R. Gutkowski	CSU	Experimental Wood-Concrete Railroad Bridge. MPC 04-165
R. Gutkowski	CSU	Full-Scale Laboratory Testing of a Timber Railroad Bridge. Closed Letter on File 4/24/2014
R. Gutkowski	CSU	North Front Range Transportation Research Internships. MPC 01-124
R. Gutkowski	CSU	University Transportation Survey. MPC 03-150
K. Ksaibati	UWY	Evaluating the Long Term Pavement Performance Data. MPC 02-130
E. Wilson	UWY	Defining a Road Safety Audit Program for Enhancing Safety and Reducing Tort Liability. MPC 00-113
P. Martin	U of UT	Accident Data Availability. MPC 01-118
P. Martin	U of UT	Incident Detection Algorithm Evaluation. MPC 01-122
P. Martin	U of UT	Evaluation of Road Weather Information System Data & Dissemination of Data to the Public. MPC 01-119
O. Salem	NDSU	Survey of Educational and Human Capital Needs of the Transportation Construction Industry. MPC 02-134
B. Lantz	NDSU	An Evaluation of the Impacts of ITS/CVO Technologies throughout the Supply Chain. MPC 01-117A
J. Bitzan	NDSU	The Differential Effects of Deregulation on Rail Rates. MPC 03-144
M. Berwick	NDSU	Transportation and Logistics Characteristics of the Potato Industry: Implications for Highway Planning. MPC 01-123
G. Griffin	NDSU	Biennial Strategic Transportation Analysis. MPC 01-127.1-5
R. Gutkowski	CSU	Rigorous Computer Modeling of Timber Trestle Railroad Bridges. Closed Letter on File 4/24/2014
R. Gutkowski	CSU	Effects of Environmental Exposure on Timber Railroad Bridge/Track Members and Connectors. MPC 04-167
R. Gutkowski	CSU	North Front Range Transportation Research Internships. MPC 01-124
B. Hartnagel	CSU	Moment-Rotation Tests of High Performance Steel I-Girders. MPC 03-148
T. Sanders	CSU	Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment. MPC 04-156
C. Yavuzturk K. Ksaibati	CSU	MPC-198 Predicting the Fluctuations in Temperatures of Asphalt Pavements. MPC 02-136
K. Ksaibati	UWY	Low Volume Roads and Bridges. MPC 02-130
E. Wilson	UWY	Defining a Road Safety Audit Program for Enhancing Safety and Reducing Tort Liability. MPC 02-129
J. Bitzan	NDSU	Updating the Uniform Rail Costing System Regressions. Terminated 8/31/03
M. Berwick	NDSU	Truck Costing Model for Transportation Managers. MPC 03-152
K. Vachal	NDSU	Containerized Grain & Oilseed Exporters- Industry Profile and Survey. MPC 02-132 and MPC 03-151
G. Griffin	NDSU	Strategies for Improving DOT Retention and Motivation among Professional Staff. MPC 02-137
G. Griffin	NDSU	Predicting and Classifying Voluntary Turnover Decisions for Truckload Drivers. MPC 02-135
D. Benson	NDSU	An Evaluation of Region 8 State Departments of Transportation and Metropolitan Planning Organizations' GIS Technology Application. Terminated, corrupt data, unusable 2/2/14.
P. Martin	U of UT	Surface Street Level of Service Using Existing Detector Infrastructure. MPC 02-133

PI(s)	Institution	Project Title
P. Martin	U of UT	Advanced Traffic Management System Evaluation Data Collection Methodology. MPC 03-142
P. Martin	U of UT	Adaptive Signal Control for Downtown Salt Lake City. MPC 03-141
W. Cottrell	U of UT	Evaluating and Improving the Safety of Pedestrian Crossing in Utah. MPC 04-157
P. Martin	U of UT	Paratransit Coordination for Rural Communities. MPC 04-161
D. Radford	CSU	Pultruded Composite Shear Spike for Repair of Large Timber Members. MPC 04-163
R. Gutkowski	CSU	Support Motion Effects in a Timber Trestle Bridge: Physical and Analytical Modeling. MPC 06-184
R. Gutkowski	CSU	Experimental Thick-Deck Wood-Concrete Highway Bridge Construction Year 1 and 2. MPC 04-165
T. Sanders	CSU	Road Dust Suppression: Effect on Maintenance, Stability, Safety and the Environment. MPC 04-156
J. Bitzan	NDSU	Costs, Pricing, and Regulatory Alternatives for Mergers. MPC 03-145
D. Tolliver	NDSU	Trip Generation Rates for Grain Elevators: A Tool for State and Local Highway Planners. MPC 06-185
L. Kalnbach	NDSU	Strategies for Improving DOT Employee Retention and Motivation. MPC 02-137
K. Ksaibati	UWY	Evaluating the Impact of DOTs QC/QA Programs on Pavement Performance: Year 2. MPC 03-146 and MPC 04-160
K. Ksaibati	UWY	Utilizing the GLWT in Evaluating Moisture Susceptibility of Asphalt Mixes. MPC 02-138
P. Martin	U of UT	Evaluation of the I-15 High Occupancy Vehicle Lanes. MPC 04-158
P. Martin	U of UT	Adaptive Signal Control for Downtown Salt Lake City, Part II. MPC 03-141
J. Hough	NDSU	Small Urban University Transit: A Case Study. MPC 05-169
J. Rodriguez	NDSU	Trucking Industry Churn and Its Impact on Communities and ITS Adoption. MPC 08-193
K. Kruse	NDSU	Asset Management of Roadway Signs through Advanced Technology. MPC 03-149
P. Martin	U of UT	Automated Data Collection, Analysis, and Archival. MPC 03-153
P. Martin	U of UT	Detector Technology Evaluation. MPC 03-154
P. Martin	U of UT	Evaluate Effectiveness of Dilemma Zone Advanced Signal Warning. MPC 03-155
R. Gutkowski	CSU	Simplified Impact Testing of Traffic Barrier Systems. MPC 03-143 and 05-172
P. Heyliger	CSU	Highly Flexible Crash Barriers. MPC 04-162
K. Ksaibati	UWY	Evaluation of Moisture Susceptibility of Asphalt Mixtures Containing Bottom Ash. MPC 04-159
W. Grenney	U of UT	Affordable Trip Feasibility Scheduling for Rural Paratransit Systems. MPC 05-171
M. Berwick	NDSU	Evaluation of Strategic Logistics of Rural Firms. MPC 05-177
T. VanWechel	NDSU	Investment in Rural Roads: Willingness-to-Pay for Improved Gravel Road Services in Freight Transportation. MPC 04-168
K. Ksaibati	UWY	Evaluation of Moisture Susceptibility of Asphalt Mixtures Containing Bottom Ash. MPC 06-179
K. Ksaibati	UWY	Evaluation of Pavement Crack Filling Materials. MPC 06-180
R. Young	UWY	Wyoming Freight Movement and Wind Vulnerability. MPC 05-170
C. Yavuzturk	UWY	Assessment of Thermal Stresses in Asphalt Pavements Due to Environmental Conditions Including Freeze and Thaw Cycles. MPC 06-181
P. Martin	U of UT	Video Imaging System Evaluation. MPC 04-166
P. Martin	U of UT	High Occupancy Vehicle Evaluation II. MPC 04-164
K. Ksaibati	UWY	Utilizing Recycled Glass in Roadway. MPC 07-192
R. Young	UWY	Wyoming Freight Movement System Vulnerabilities and ITS. MPC 13-261
R. Gutkowski	CSU	Pultruded Composite Shear Spike for Repair of Timber Bridge Members. MPC 05-173
D. Tolliver K. Ksaibati	NDSU UWY	Interactive Effects of Traffic- and Environmental-Related Pavement Deteriorations. MPC 10-255B
P. Martin	U of UT	Adaptive Signal Control IV. MPC 06-182
P. Martin	U of UT	High Occupancy Vehicle Lanes Evaluation III. MPC Report No. 05-174

PI(s)	Institution	Project Title
P. Martin	U of UT	Effectiveness of Traveler Information. MPC 05-175
W. Cottrell	U of UT	Utah Intersection Safety: Issues, Contributing Factors and Mitigations. MPC 05-176
D. Tolliver	NDSU	Network Planning Model for Local and Regional Railroad Systems. Published in the State Rail Plan (2005).
K. Ksaibati	UWY	Legal Establishment of County Roads in Wyoming. MPC 07-191
K. Ksaibati	UWY	Legal Establishment of County Roads. MPC 07-191
K. Ksaibati	UWY	Utilizing Recycled Glass in Roadways. MPC 07-192
R. Young	UWY	Relating Vehicle-Wildlife Crash Rates to Roadway Improvements. MPC 07-189
R. Gutkowski	CSU	Impact Performance Testing of Roadway Safety & Security Barriers- Phase 3. Formal Report, Letter on File June 10.
R. Gutkowski	CSU	Time-Dependent Loading of Repaired Timber Railroad Bridge Members. MPC 07-190 (New Title: Durability and Ultimate Flexural Loading of Shear Spike Repaired, Large-Scale Timber Railroad Bridge Members)
R. Gutkowski	CSU	Cambering of Wood-Concrete Highway Bridges. Closed/letter on file 4/24/2013.
A. Smadi	NDSU	Traffic Operations in Small Urban and Rural Areas. Website: www.surtoc.org with on-line survey 11/1/07.
M. Berwick	NDSU	Evaluation, Definition, and Identification of the Criteria for Establishing Freight Corridors. MPC 08-201
P. Martin	U of UT	Design/Build vs. Traditional Construction User Delay Modeling: An Evaluation of the Cost Effectiveness of Innovative Construction Methods for New Construction. MPC 07-187A and MPC 07-187B
A. Smadi	NDSU	Small Urban and Rural Transportation- Phase II. Web Page established at http://www.surtc.org
K. Vachal	NDSU	Estimating Local Economic Impacts of Rail Investments and Rail Capacity Constraints in the HRS Wheat Market. Project Terminated 2/7/08
K. Vachal	NDSU	Accessing International Container Markets from the Northern Plains. Department Publication 149
M. Berwick	NDSU	Economic and Environmental Implications of Alternative Fuel Use and Regulations in the Mountain-Plains Region. MPC 08-203
M. Barker	UWY	Serviceability Limits and Economical Steel Bridge Design. MPC 08-203 (I)
K. Ksaibati	UWY	A Comprehensive Transportation Safety Evaluation Program in the State of Wyoming. MPC 09-215
J. Puckett	UWY	Use of Wind Power Maps to Establish Fatigue Design Criteria for Traffic Signal and Variable Message Structures. MPC 08-201
P. Heyliger	CSU	Low-Cost Soft Crash Barriers. MPC 08-198
J. Carraro	CSU	Beneficial Use of Waste Tire Rubber in Low-Volume Road and Bridge Construction. MPC 08-202
R. Gutkowski	CSU	Z-Spike Rejuvenation to Salvage Timber Railroad Bridge Members. MPC 08-208
R. Gutkowski	CSU	Use of Salvaged Utility Poles in Roadway Bridges. MPC 08-197
J. van de Lindt	CSU	Safety Factor Increase to Fatigue Limit States through Shear Spiking for Timber Railroad Bridge Rehabilitation. MPC 14-273
W. Charlie	CSU	Bus-Stop Shelters- Improved Safety. Closed/letter on file 10/25/2013.
N. Wehbe	SDSU	Structural Applications of Self-Consolidating Concrete. MPC 11-194
F. Ting	SDSU	Bridge Scour in Cohesive Soils. MPC 08-195
P. Martin	U of UT	Express Lane Genetic Algorithm Microsimulation Modeling. MPC 09-210
P. Martin	U of UT	Seismic Vulnerability and Emergency Response of UDOT Lifelines. Project Postponed until further discussion 6/7/07.
P. Martin	U of UT	Adaptive Signal Control Evaluation V. MPC 08-200
N. Wehbe	SDSU	Structural Performance of Self Consolidating Concrete Made with Limestone Aggregates. MPC 08-186

PI(s)	Institution	Project Title
R. Young	UWY	Developing System for Consistent Messaging on Interstate 80's Dynamic Message Signs. MPC 09-211
P. Martin	U of UT	Utah Department of Transportation Traffic Operations Center Operator Training. MPC 10-229C, 10-229D, 10-229E, 10-229F
K. Ksaibati	UWY	Effectiveness of Using Recycled Asphalt Materials and other Dust Suppressants in Gravel Roads. MPC 13-251
P. Martin	U of UT	Evaluation of Optimal Traffic Monitoring Station Spacing on Freeways. MPC 09-214
A. Stevanovic	U of UT	Evaluation of Transit Signal Priority Strategies for Bus Rapid Transit Project on 3500 South Street in Salt Lake City, UT (SP). MPC 09-215
J. van de Lindt	CSU	A New Generation of Emergency Escape Ramps. Merged and combined with MPC-328
S. Chen	CSU	Traffic Safety Vulnerability Information Platform for Highways in Mountainous Areas Using Geospatial Multimedia Technology. MPC 08-209
S. Mitra	NDSU	Development of GIS Multimodal Capacity Model for Northern Tier Freight Corridor. MPC 13-258
M. Lofgren	NDSU	Integrating Security into Small MPO Planning Activities. MPC 08-199
T. VanWechel	NDSU	Phase II, Driver Knowledge, Attitude, Behavior and Beliefs: Focus Group- Young Male Drivers. MPC 08-204
K. Vachal	NDSU	Understanding Influence of Transportation and Other Factors on the Economic Growth on Non-metropolitan Cities. Published at George Mason University, City Centers in Agricultural Regions: Nexus for Rural Economic Growth and Development, George Mason University, School of Public Policy, Dissertation Publication, 2005.
J. Mielke	NDSU	Generating Public Involvement in Transportation Policy and Funding Decision Making Process. Report on file with NDDOT due to confidentiality of data.
A. Smadi	NDSU	Integrating Planning and Operations Models to Predict Work Zone Traffic. MPC 08-205
R. Atadero	CSU	Sustainable Concretes for Transportation Infrastructure. MPC 10-220
J. van de Lindt	CSU	Enabling Innovate Steel Plate Grider Bridges: Simple Made Continuous. MPC 11-234
A. Carraro	CSU	Seed Project- Beneficial Use of Off Specification Coal Combustion Products to Increase the Stiffness of Expansive Soil-Rubber Mixtures. MPC 11-235
S. Chen	CSU	Feasibility Study of Mobile Scanning Technology for Fast Damage Detection of Rural Bridges Using Wireless Sensors. MPC 10-219
R. Ettema	UWY	Maximum Velocity and Shear Stress in Flow Fields around Bridge-Abutments in Compound Channels. MPC 11-237
T. VanWechel	NDSU	Phase I: Pilot Project to Develop Rural Youth Occupant Protection Education Platform. MPC 11-230
S. Birst M. Lofgren	NDSU	Evacuation Modeling for Small to Medium Sized Metropolitan Areas. MPC 10-222
S. Mitra D. Tolliver K. Johnson	NDSU	Forecasting Bridge Deterioration Rates and Improvement Costs. JTRF, Summer 2011
S. Mitra A. Dybing K. Johnson D.Tolliver	NDSU	A GIS Model for Bridge Management and Routing. JTRF, Summer 2011
A. Stevanovic P. Martin	U of UT	Evaluation of LRT and BRT Impact on Traffic Operations in Salt Lake City Metropolitan Region. MPC 09-213, 09-213B
P. Martin	U of UT	Assessing the User Impacts of Fast-Track Highway Construction (ABC). MPC 10-228A, 10-228B
X. Qin	SDSU	Development of Safety Screening Tool for High Risk Rural Roads. MPC 11-231
K. Ksaibati	UWY	Investigating Crashes and Geometric Conditions in the State of Wyoming. MPC 13-262
K. Ksaibati G. Huntington	UWY	Gravel Roads Management: Developing a Methodology. MPC 11-238
S. Boyles	UWY	Pricing Strategies for Rural Freeways. MPC 12-246

PI(s)	Institution	Project Title
P. Martin	U of UT	Salt Lake City Internship. Project terminated, unable to secure match funding.
P. Martin	U of UT	Driver Simulation. MPC 12-247
S. Chen	CSU	Risk-based Advisory Prevention System for Commercial Trucks Under Hazardous Conditions. MPC 11-242
J. Balough R. Atadero	CSU	Reliability-based Safety Risk and Cost Prediction of Large Trucks on Rural Highways. MPC 11-243
J. Balough R. Atadero	CSU	Fatigue Testing of Wood-Concrete Composite Beams. MPC 13-252
J. van de Lindt	CSU	Rapid Load Rating of Short Rural Bridges. MPC 11-236
P. Heyliger	CSU	Low-Impact High-Toughness Transportation Barriers. MPC 12-249
K. Vachal A. Huseth	NDSU	Traffic Safety: Pilot Study to Assess Sustained and Multifaceted Activity on North Dakota's Rural Roads. MPC 11-233
S. Mitra D. Tolliver	NDSU	Integrate Supply Chain Model in Urban Freight Planning. MPC 13-259
K. Vachal D. Malchose	NDSU	Using ND Traffic Records to Identify Higher Risk Teen Drivers. MPC 11-232
J. Baker K. Johnson M. Berwick K. Vachal	NDSU	Implementing Traffic Safety Evaluations to Enhance Roadway Safety. MPC 10-218
A. Huseth	NDSU	Proper Seat Placement of Children Aged 4 to 12 within Vehicles. MPC 10-227
A. Huseth	NDSU	Misinformation Contributing to Safety Issues in Vehicle Restraints for Children. MPC 13-264
K. Vachal D. Benson	NDSU	ND Wheat Transportation Knowledge for Market Enhancement. MPC 10-224
D. Tolliver D. Benson P. Lu	NDSU	Analysis of Freight Fuel Efficiency with Comparisons to Waterways and Truck Transportation. MPC 12-250
J. Puckett M. Barket	UWY	Use of Wind Power Maps to Establish Fatigue Design Criteria for Traffic Signal and High Mast Poles-Phase II. MPC 11-240
A. Carraro	CSU	MEPDG Analysis of ESR Subgrade Stabilized with Off-Specification Fly Ash. CSU Thesis, "Fatigue and Rutting Analyses of a Pavement Structure with Expansive Soil-Rubber (ESR) Base Stabilized with Off-Specification Fly Ash, Baudagher, Emily, Fall 2012.
R. Atadero	CSU	Long Term Performance of FRP Repair Materials. MPC 13-253
P. Heyliger	CSU	Off-grid MEMS Sensor Configurations for Transportation Structures. MPC 13-257
S. Chen	CSU	Seismic Vulnerability Analysis of Bridges in Mountainous States. MPC 13-255
K. Vachal	NDSU	What Can We Learn About Making Driving Safer for Teen Drivers from Crashes in Three Rural States? NDSU, Thesis, Early Experiences with Teen Graduated Driver Licensing in Wyoming, Nelson, Joshua, MS and Vachal, Kim UGPTI, NDSU, May 2012
K. Vachal	NDSU	Systems Analysis to Improve Local Road Safety; Phase I. Department Publication 256
J. Mattson	NDSU	Marginal Cost Pricing and Subsidy of Transit in Small Urbanized Areas. MPC 11-241
A. Huseth-Zosel	NDSU	Misinformation Contributing to Safety Issues in Vehicular Restraints for Children. MPC 13-264
D. Peterson	NDSU	Transit Ridership and the Built Environment. MPC 11-239
K. Ksaibati	UWY	Comparing Crash Trends and Severity in the MPC Region. Department Publication 241

PI(s)	Institution	Project Title
S. Boyles	UWY	Quantifying the Impact of Very High Heavy Vehicle Proportion on Rural Freeways. MPC 13-265
M. Berwick	NDSU	Truck Size and Weight Education (NDSU, M. Berwick) PowerPoint, ND Truck Size and Weight Education Program, NDSU, RTSSC, UGPTI
D. Tolliver	NDSU	Regional Roadway Surface Management Guidance Documents. Closed/Department Publication 2012
R. Porter	U of UT	Safety Impacts of Design Exceptions in Utah. C 11-248

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