



PROGRAM PROGRESS PERFORMANCE REPORT

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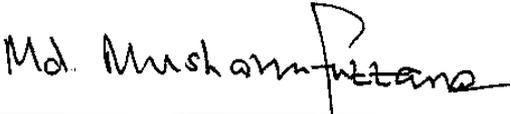
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1 ACCOMPLISHMENTS

1.1 Goals The two complementary goals of the Southern Plains Transportation Center (SPTC) are: (i) to develop comprehensive, cost-effective and immediately implementable solutions to critical infrastructure-related issues facing the transportation system in Region 6 and the nation; and (ii) to prepare aspiring transportation personnel and students for leadership roles in professional and research careers that support sustainment and improvement of the nation's transportation systems. We particularly focus on under-represented professionals – Hispanic, Native Americans and African Americans – capable of leading public and private sector efforts aimed at providing U.S. citizens a sustainable and resilient transportation system. Our focus is climate adaptive freight and transportation infrastructure.

1.2 Accomplishments The Southern Plains Transportation Center is making significant progress toward realizing its vision of developing a diverse and inclusive, regionally-based and nationally recognized research, education and outreach center. During the reporting period, our primary accomplishments included: (i) delivering research and education/outreach programs and project outputs, outcomes and impacts; (ii) delivering the 2015 Oklahoma Transportation Research Day; (iii) participating in Region 6 transportation conferences; (iv) conducting many other education and outreach activities at member institutions across the consortium, including tribal outreach; (v) continuing the 2015 SPTC Workshop Series; (vi) delivering the 2016 Annual Leadership and Advisory Board Retreats; (vii) enhancing collaborations; (viii) and preparing for the Transportation-Climate Summit and TRIP. An overview of some of these activities is provided in the following sections.

1.2.1 Research and Technology Transfer In the reporting period, the SPTC was engaged in advancing the following activities: delivering the new research solicitation programs of SPTC15.1 and SPTC15.2, facilitating the SPTC14.3 program, facilitating SPTC Research and Education project progress, delivering the 2015 Oklahoma Transportation Research Day, and participating in the 53rd Annual Paving and Transportation Conference and 2016 Louisiana Transportation Conference. An overview of each of these activities follows.

SPTC15 Programs: The SPTC sought proposals for the SPTC15.1 and SPTC15.2 funding competitions. Two well-attended, webinar-based workshops were developed and delivered to assist investigators in the competitions' proposal preparation process. The SPTC sought preproposals for the SPTC 15.1 funding competition. Because of the short funding cycle (1-year) and limited funds available, the SPTC leadership created a preproposal process to reduce the effort required by interested investigators and the cost of review associated with the competition. The program focus is on high impact and implementable projects consistent with the priorities of the SPTC that can produce meaningful deliverables within the one-year project period. The SPTC received 42 preproposals in response to its solicitation. These preproposals represented seven consortium members as well as one non-consortium institution from Region 6 with transportation expertise. In total, the preproposals requested \$2.3M. The preproposals have been reviewed by domain experts and the SPTC local review panel, and 21 preproposal submitters were invited to submit a full proposal for funding consideration based upon the outcome. Full proposals were recently reviewed for merit, impact and implementation potential and award decisions are being made. Although the Oklahoma Department of Transportation's (ODOT's) State Planning & Research (SPR) program provides funds for the SPTC15.2 competition, it was open to all academic institutions and the private sector in Region 6. ODOT-defined research topics were proposed. The SPTC15.2 program resulted in 19 *Intents to Apply* from three consortium institutions and one industry partner. Eight full proposals were received, which were reviewed for potential merit, impact and collaboration. In total, the proposals requested \$1.4M. All proposals included some level of collaboration among consortium and/or industry members, which will facilitate the SPTC's goal of developing a collaborative and inclusive culture by supporting projects with multi-institutional collaborations. Four proposals were awarded. A summary of each funded project is listed in the following table and posted on the SPTC website (<http://www.sptc.org>).

SPTC Project	Title	PI (Institution)	Co-PI (Institution)
15.2-04	Development of statewide WIM data quality control and axle load spectra and traffic volume adjustment factors for Oklahoma	Joshua Li (OSU)	Nur Hossain (Kleinfelder), Cheng Chen and Kelvin Wang (OSU), Musharraf Zaman (OU)
15.2-08	Incorporation of Speed/Travel- time Data Sets in Traffic Performance Analysis	Hazem Refai (OU)	Samir A. Ahmed (OSU)
15.2-18	Development of Guidelines for High-Volume Recycled Materials for Sustainable Concrete Pavement	Jeff Volz (OU)	Musharraf Zaman (OU), Julie Ann Hartell (OSU)
15.2-19	Development of a SFE Database for Screening of Mixes for Moisture Damage in Oklahoma	Rouzbeh Ghabchi (OU)	Rifat Bulut (OSU), Richard Steger (InVia), Musharraf Zaman (OU)

SPTC14.1 Program (continuation):

SPTC Project	Title	PI (Institution)	Co-PI (Institution)
14.1-92	A Novel Approach for the Characterization of the Rutting Performance of Pavement Foundations	Reza Ashtiani (UTEP)	Bill Tseng (UTEP)
14.1-94	Development of Numerical Simulation Tool for Continuously Reinforced Concrete Pavements	Cesar Carrasco (UTEP)	Soheil Nazarian (UTEP)
14.1-96	Understanding Impact of Climate Change on Highway Hydraulic Design Procedures	Vivek Tandon (UTEP)	Vinod Kumar (UTEP)
14.1-97	Quantifying Thermomechanical Fatigue of Hot Mix Asphalt: A Feasibility Study	Calvin M. Stewart (UTEP)	Imad N. Abdallah (UTEP)
14.3-06	Design Data for Rigid Pavements in New Mexico	Rafiqul Tarefder (UNM)	Mahmoud Reda Taha (UNM)

2016 Early Career Development Program (2016-ECDP): The SPTC announced its Early Career Development Program (ECDP) program in February. The SPTC competitively awards up to two ECDP projects to teams from the Oklahoma State University (OSU) in Stillwater and the University of Oklahoma (OU) in Norman to solicit and develop new research opportunities to advance the transportation systems in the state and the nation. Topics strongly related to the objectives and goals of the SPTC and of ODOT are especially encouraged. The goal of this program is to provide seed funding to promote collaboration between tenure-track faculty members at OSU and OU. This funding should allow these groups to share their expertise in hopes of obtaining additional funding, publishing joint papers, and cross training students. ECDP projects will be selected in the next reporting period and are expected to promote new multi-campus collaborations.

Research Project Progress: The following institutions are currently reporting research progress for the SPTC14.1 and 14.2 programs: Arkansas State University (ASU); Langston University (LU); Louisiana State University (LSU); Louisiana Tech University (LTU); Oklahoma State University (OSU); The University of Oklahoma (OU); Prairie View A&M University; University of Tulsa (TU); Texas Tech University (TTU); University of Arkansas (UArk); University of New Mexico (UNM); The University of Texas at Austin (UT-Austin); The University of Texas - Pan American (UT-PA); and The University of Texas at El Paso (UTEP). A short summary of progress by project category follows.

Climate and Safety

- “Enhancing Driver Safety during Severe Weather Conditions” (Project team includes Mohammed Atiquzzaman (OU), Ron Barnes (OU), Joseph Havilcek (OU) and Majeed Hayat (UNM).) A safety application is being developed to analyze information from neighboring vehicles and create a threat map to alert drivers of potentially hazardous road conditions. During the reporting period, progress has included testing the OBE and RSE for their ability to talk to each other using the DSRC protocol. Communication has proven to be effective using the DSRC protocol. Implementation of results will contribute to a reduction in vehicle crashes, fatalities and injuries due to adverse weather conditions.
- “Identifying Dust Emission ‘Hot Spots’ in the Southern Plains Region of New Mexico, Oklahoma and Texas:

Effect of Blowing Dust on Highway Safety” (Project team includes Junran Li (TU), Thomas Gill (UTEP) and Jeffrey A. Lee (TTU).) This study is identifying and quantitatively assessing the spatial and temporal patterns of wind erosion hot spots that contribute blowing dust to the highways of New Mexico, Oklahoma and Texas. During the reporting period, progress has included identifying and mapping dust sources in New Mexico, Texas, and Oklahoma using the MODIS satellite images. Data from the MODIS satellite has been analyzed to improve the distinction between windblown dust and other phenomena, particularly clouds. The GIS database is being prepared for use. Implementation of the developed integrated modeling and monitoring system will assist in highway safety management and mitigate the hazardous impacts of dust. See Products section for related products.

- “Trends in Cold Temperature Extremes and Winter Weather for the SPTC Region” (Project team includes Renee A. McPherson (OU), Esther Mullens (OU), Derek Rosendahl (OU), Mark Shafer (OU) and Michael Richman (OU).) This project is quantifying historical and future trends in winter precipitation (ice, snow and rainfall), cold air outbreaks (frequency, intensity), and freeze-thaw cycles for the southern plains region. During the reporting period, progress has included collecting data from various databases and analyzing historical datasets for winter storm trends. It has also included development of metrics for extreme heat, and heavy precipitation, based upon the impacts of heat and floods on infrastructure. Project outcomes will be of benefit across a broad range of sectors, covering the necessary “first step” in climate risk assessment. See Products section for related products.
- “Safety Evaluation of Pavement Surface Characteristics with 1mm 3D laser Imaging” (Project Principle Investigator – Kelvin Wang (OSU).) PaveVision3D technology data is being used to evaluate various benchmarks for surface characterization related to pavement safety. During the reporting period, progress has included calibrating of the DMI, IMU, and GPS devices for positioning data sets of the 3D data. Techniques have also been developed to use the positioning data to provide geometric references to the 3D pavement surface. Commonly used hydroplaning models have been validated. The research outcomes will be particularly relevant when extreme weather conditions cause substantial water on the pavement surface that contribute to hydroplaning conditions. An SPTC Brief contains highlights of this project and can found at: <http://www.sptc.org/briefs/>.
- “Crash Severity Formulation and Analysis under Extreme Weather Conditions” (Project team includes Guohui Zhang and Rafiqul A Tarefder, (UNM).) A new approach is being developed for discovering the underlying patterns behind crash data. A series of significant contributing attributes on crash severities impacted by weather extremes in the southwest region will be identified. During the reporting period, progress has included design of the preliminary relational database schema for crash, vehicle, and occupant tables. Implementation will help transportation agencies to develop cost-effective countermeasures to reduce crash severities under extreme weather conditions and minimize weather-related risks to traffic safety in the southwest region. See Products section for related products.

Bridge Structures

- “Impact of Extreme Summer Temperatures on Bridge Structures” (Project team includes Micah Hale (UArk) and Royce Floyd (OU).) This multi-institutional project is assessing the effects of recent heat events on prestressed concrete bridges in Region 6. During the reporting period, progress has included verifying AASHTO and proposed thermal gradient models with experimental data. The project’s outcomes will support the management and design of current bridges subjected to extreme temperatures, reduce maintenance costs and increase the service life, safety and effectiveness of our transportation infrastructure.
- “Evaluation of Surface Treatments to Mitigate ASR” (Project Principle Investigator – Micah Hale (UArk).) This project is examining the effectiveness of silane (and other sealers) in reducing the internal relative humidity of ASR-infected concrete. During the reporting period, progress has included starting the laboratory phase of the project. Sealed field exposure blocks containing reactive silica were cast and instrumented so that expansion and relative humidity could be monitored. See Products and Impacts sections for related work. An SPTC Brief contains highlights of this project and is posted to: <http://www.sptc.org/briefs/>.
- “Temperature Effects in Bridge Condition Evaluation and Capacity Rating in Oklahoma” (The OU project team includes Naiyu Wang, K.K. Muraleetharan and Luther White.) This research is using Finite Element Analysis to perform heat flow and thermal stress analysis. During the reporting period, progress has included analyzing the Oklahoma Mesonet database and developing daily and seasonal temperature profiles for all counties in Oklahoma, as well as developing statistical descriptions of thermal stresses in bridges using simplified MatLab

models. Implementation of the developed guidelines for considering temperature effect in capacity rating will enhance efficient estimation of temperature-induced stresses in bridges with different construction materials, skewnesses and cross section geometries and lateral constraints, which will be economically beneficial to the improvement of our region's and nation's transportation systems.

- “Impact of Deicing Salts on Corrosion Rates of MSE Reinforcement” (The TTU project team includes Priyantha Jayawickrama, Sang-Wook Bae, Andrew Jackson, William Lawson and Hoyoung Seo.) This research is evaluating corrosion rates in steel MSE reinforcement and embedded MSE backfill materials under different levels of exposure to deicing chemicals. During the reporting period, progress continues for measuring rates of corrosion in MSE reinforcement specimens embedded in backfill and monitoring changes in backfill electrochemical properties after the material had been subjected to the wet-dry cycles with salt and fresh water. The effort will result in a comprehensive test protocol and assessment criteria that can be used to evaluate the complete range of MSE backfill materials, including coarse graded fill, under specified levels of exposure to deicing chemicals.
- “Development of Mixture Designs for Pumpable Concrete for Extreme Weather” (Project Principle Investigator – Tyler Ley (OSU).) This study is investigating the concrete pumping process and evaluating if frost durable concrete can be achieved. During the reporting period, progress has included development of an aggregate based specification, which has been submitted to the Oklahoma Department of Transportation. Implementation will allow immediate changes to be made to the optimized graded concrete specifications for structural concrete. See Products section and link (www.optimizedgraded.com) for related information.
- “Design of Integral Abutment Bridges (IABs) in Extreme Climate” (The OU project team includes K.K. Muraleetharan and Gerald A. Miller.) This project is utilizing data collected from an instrumented IAB in Oklahoma and computer models to develop readily implementable design and construction guidelines for IABs in areas with extreme variations in temperature and moisture. During the reporting period, parametric analysis was conducted to investigate the behavior of pile supported integral abutments having varying values of soil stiffness around the pile and behind the abutment (backfill). The effect of backfill materials on the south abutment pile was also investigated. SPTC Brief contains highlights of this project and can found at: <http://www.sptc.org/briefs/>. This project was also highlighted by the UTC: http://www.rita.dot.gov/utc/publications/spotlight/spotlight_2015_09.
- “Evaluation and Repair of Bridges in Extreme Environments” (Project team includes Royce Floyd (OU) and Gary Prinz (UArk).) This project is investigating comprehensive strategies for evaluation and resilient repair of prestressed concrete and steel bridge girders subjected to extreme environments in order to increase the longevity of existing structures. During the reporting period, progress has included shear testing two specimens after exposure to the chloride solution for two months. Investigating steel bridge types common to Region 6 and determining critical fatigue regions has been completed. Implementation will allow agencies to better evaluate and repair bridges with exposure to extreme environments.
- “Improving Fatigue of Polymer Concrete Overlays using Nanomaterials” (The UNM project team includes Mahmoud Reda Taha and Rafiqul Tarefder.) The objective of this work is to improve the bond, fracture and fatigue performances of PC overlays using nanomaterials such as carbon nanotubes (CNTs), graphene nanoparticles (GNPs) or alumina nanoparticles (ANPs). During the reporting period, progress has included finite element modeling of PC overlays with steel substrate to simulate the behavior of PC overlay under flexural loading. Implementation will produce significant improvement in the mechanical, durability, fracture and fatigue characteristics of PC. See Products section for related products.
- “Monitoring Extreme Loading and Climate Impact on Infrastructure” (The OSU project team includes Julie Ann Hartell, Tyler Ley, Phil Lewis and Yongwei Shan.) This project is evaluating climate and overload impact on transportation infrastructure, determining extent of damage and monitoring damage progression. During the reporting period, progress has included fabricating samples of a mixture design and compiling quality control tests results. The specimens are currently being conditioned prior to exposure terms. Implementation of the developed guidelines will facilitate an effective condition assessment system that will provide the transportation industry a monitoring tool so that infrastructure problems can be detected and corrected sooner, resulting in improved public safety and reduced maintenance costs.

Freight Movement

- “Web-Based Routing Assistance Tool to Reduce Pavement Damage by Overweight and Oversize Vehicles” (The TTU project team includes Hongchao Liu and Sanjaya Senadheera.) This project is developing a web-based

routing assistance tool to optimize the overweight/oversize routes based on the historical and expected number of repetitions of super heavy loads. During the reporting period, progress has included adding a new feature to the GIS-based assistance tool called the Heavy Vehicle Impact Projection Feature. It can project the future condition of the pavement with or without the impact of heavy vehicles. The results will contribute to efficient vehicle permitting and routing of oversize/overweight vehicles to significantly reduce road damage.

Pavement and Materials

- “Resistance of Asphalt Mixes with Recycled Materials to Withstand Extreme Temperatures” (The project team includes Amit Bhasin (UT-Austin) and Zahid Hossain (ASU).) This research is investigating the use of low-temperature tests on asphalt binders, as well as mortars with and without RAP, to determine the resistance of asphalt materials to low temperature cracking. During the reporting period, progress has included PG testing and development of a preliminary test matrix for analyzing the creep compliance of the mortar specimens. This effort will result in a user-friendly test method and analysis program that can be used by material and pavement engineers to evaluate cracking resistance of asphalt materials for any pavement cooling scenario.
- “Numerical Modeling of Asphalt Crack Resistance” (The project team includes Enad Mahmoud (UT-Pan American) and Soheil Nazarian (UTEP).) This study is developing a Discrete Element Method (DEM)-based model of the resistance to cracking exhibited by asphalt mixtures using the Overlay Tester, which will be beneficial to asphalt design programs within state DOTs. During the reporting period, progress has included adding rigid walls to represent the loading plates rather than the discrete element assemblies.
- “Asphalt Binder Rheological Characterization for Extreme Climate Events” (The TTU project team includes Sanjaya Senadheera and Rajesh Khare.) This research is analyzing climate data to predict future weather patterns, relating climate to pavement condition, and using techniques of molecular modeling to elucidate the relationship between asphalt chemical composition and rheological properties. During the reporting period, progress has included continued laboratory testing of asphalt binders and beginning the development of new material protocols for extreme climates. Research findings will contribute to the building of highways that better adapt to new climate realities. See Products section for related products.
- “Evaluating Rutting and Stripping Potentials of Asphalt Mixes using Hamburg Wheel Tracking Device” (Project Principle Investigator – Rafiqul A. Tarefder (UNM).) The issue of repairing transportation infrastructure by preventing damage resulting from extreme weather conditions is addressed. During the reporting period, progress has included testing of asphalt mix samples and determining IDT strength test results of AC mixtures shows poor correlation with HTWD results in evaluating moisture susceptibility. The outcome of this study will be a specification that addresses rutting due to extreme temperatures that will be useful in areas with extreme hot climate.
- “Impact of Severe Drought on the Compacted Expansive Clays (Subgrade) in Northern Louisiana” (Project Principle Investigator – Jay Wang (LTU).) This study is evaluating the fundamental volume change behaviors of compacted expansive clays in Louisiana, with a focus on severe drought conditions. During the reporting period, progress has included development and calibration of a heave prediction model. The research will advance in-depth understanding of the volume change properties of expansive clays. See Products section to see related work. See Products section for related products.
- “Characterization of Asphalt Binders Exposed to Extreme Temperatures through Simple and Effective Test Methods” (Project team includes Nazimuddin Wasiuddin (LTU), Zahid Hossain (ASU), Rouzbeh Ghabchi (OU) and Louay N. Mohammad (LSU).) The research is developing a simple and dynamic shear rheometer based test method that can be used as an alternative to PG Plus tests (elastic recovery and force ductility) to accurately determine high temperature performance of asphalt materials. During the reporting period, progress has included testing asphalt binders (including virgin, WMA-additive modified and RAP binders) using the BBR test. Additionally, binders are being MSCR Graded, an MSCR database is being created and guidelines are being developed. Implementable specifications for commonly used extreme temperature asphaltic materials will be developed to reduce cost and testing time. See Products section for related products.
- “Development of the MASW Method for Pavement Evaluation” (Project Principle Investigator – Clinton Wood (UArk).) This research is developing the MASW method into a tool for characterization of concrete and asphalt pavements, bases, and subgrades for transportation projects. During the reporting period, progress has included developing testing procedures for MASW on concrete and asphalt pavements. Implementation will assist agencies in early detection of delaminations, cracks, and concrete deterioration, which can be critical for planning

- future repairs or replacement of the existing infrastructure.
- “Validating Field Employed X-Ray Fluorescence (XRF) on Stabilized Subgrade Projects to Assess Impact of Extreme Precipitation Events, Improve Construction Quality Control and Facilitate Geotechnical Forensic Investigations” (The OU project team includes Amy Cerato and Gerald A. Miller.) This research is validating the portable field employed XRF (PFXRF) test by assessing its detection accuracy on selected roadway stabilization projects. During the reporting period, progress has included obtaining commercial results and comparing them with the PFXRF results to support recommendations. Recommendations will be developed for transportation officials to employ PFXRF and to implement a laboratory XRF testing protocol that will enhance jobsite quality control, impact of extreme precipitation events assessment and geotechnical forensic investigations. See Products section for related products.
 - “Special Provisions for Intelligent Compaction (IC) of Stabilized Soil Subgrades” (The OU project team includes Sesh Commuri, Musharraf Zaman and Manik Barman.) This study is developing and validating Oklahoma Department of Transportation “Special Provisions” for the use of IC rollers during compaction of stabilized subgrades. During the reporting period, progress has included selecting existing roadway projects for suitability of evaluation Intelligent Compaction of Stabilized Subgrades to validate the draft specification.

Education and Outreach

- “STEM Teacher Professional Development – Transportation Series/Student Outreach and Education Companion Proposals” (The TTU project team includes Cathy H. Allen, Sanjaya Senadheera, Priyantha Jayawickrama and Hongchao Liu.) This project produced continuing education workshops that presented educators with current /emerging transportation infrastructure issues and will equip them with classroom implementation materials to inform and inspire students about STEM careers in the transportation industry. It is also focused on outreach/recruitment efforts for 6th – 12th grade students. During the reporting period, progress has included developing plans to execute education efforts now that the T-STEM Center has closed. The SPTC Brief highlighting these accomplishments can be found at: <http://www.sptc.org/briefs/>.
- “Technology-Rich Transportation Engineering Projects” (Project team includes Sanjay Tewari (LTU), Norman Pumphrey Jr. (LaTech), David Hall (LaTech) and Raghava Kommalapati (Prairie View A&M University).) This project is generating interest among K-12 and college freshman students towards transportation related degrees and careers by exposing them to modern technology related projects. During the reporting period, progress has included development of additional hands-on projects to implement in the classroom to engage students in transportation engineering applications. A training workshop for Louisiana Tech Faculty is being developed for delivery this summer. The effort should increase the population of qualified transportation professionals. The SPTC Brief highlighting these accomplishments can be found at: <http://www.sptc.org/briefs/>.
- “Sustainability and Training Materials for In-Place Recycling” (The OSU project team includes Phil Lewis and Stephen A. Cross.) This study is developing a sustainability calculator and training materials for in-place recycling (web-based training courses). During the reporting period, progress has included development of the final report. Implementation will provide pavement design professionals and highway agencies with the knowledge and tools necessary to use in-place pavement recycling as a feasible, sustainable, competitive alternative to traditional pavement maintenance and rehabilitation strategies.



Oklahoma Transportation Research Day: The ODOT-SPTC Oklahoma Transportation Research Day (OTRD) is a major technology transfer event in Oklahoma. It consists of oral presentations, poster presentations, discussions, and identification of potential research topics for ODOT, Oklahoma Turnpike Authority (OTA), FHWA, and other transportation stakeholders. SPTC worked with the Oklahoma Department of Transportation in delivering the 2015 Oklahoma Transportation Research Day on October 20th. For this event, 219 guests were in attendance, with many representing academia, state/federal agencies, tribal organizations, and the private sector. The theme of this event corresponds with ODOT’s 2040 Long Range Transportation goals. The program highlights included opening remarks from the Oklahoma Department of Transportation. The invited guest speaker was Dr. Yinhai Wang, Ph.D., (University of Washington) who spoke about “DRIVE Net: A Large Scale Online Data Platform for Performance Analysis and Decision Support”. Additionally, there were numerous project presentations focusing on transportation, geotechnical and climate related research.

Eligible participants had the opportunity to receive eight (8) Professional Development Hours (PDH). Students were invited to showcase their research presentation and to compete for one of three cash prizes. A total of 32 poster submissions were received and entered into the competition, with several projects reflecting collaborative research within the consortium. Winners were then selected by a panel of independent judges based on overall rankings. The first place topic was “Geosynthetic Reinforced Soil Integrated Bridge Systems (GRS-IBS) Prospects of Cost-Effective Bridges” Each winner then received a monetary award in addition to a certificate of achievement. More information about this event can be found at: <http://www.sptc.org/ok-trans-res-day/>.



53rd Annual Paving and Transportation Conference: Organized by the Alliance for Transportation Research Institute (ATRI) at University of New Mexico (SPTC consortium partner), this is a highly successful technology transfer event that occurred on January 4-5, 2016. In its fifth decade, this annual meeting is focused on critical transportation issues. The conference was held in January this year in Albuquerque, NM and its theme was “Innovations in Paving and



Transportation to Help Local Economy and Better Serve Citizens”. There were 43 presentations and approximately 641 people in attendance. Participants included engineer, scientist, educator, administrator, contractor, consultant, material supplier, planner, student, vendor and policymaker from New Mexico and the southwest. Some participants were from Sandia and Los Alamos National Laboratories. The conference attracted many of the largest

transportation contractors, consulting engineering firms, and other related transportation businesses and industries in New Mexico. There were more than 55 vendors’ display tables. The 2016 Program can be found at: <http://civil.unm.edu/about/paving-and-transportation-conference.html>.

Louisiana Transportation Conference 2016: Organized by the Louisiana Department of Transportation and Development (LaDOTD) and the Louisiana Transportation Research Center (LTRC; has member on the SPTC Advisory Board), the Louisiana Transportation Conference provides idea exchange for transportation professionals from government, academia and private industry. The conference also provides for the educational enhancement of the transportation engineering community, presenting information on innovative technologies and offering professional development opportunities. The conference was held in March this year in Baton Rouge, LA and its theme was “Transportation: Making Connections that Matter”. United States Secretary of Transportation Anthony Foxx led a special session. There were approximately 1600 people in attendance. There were 79 vendor display tables. SPTC Researcher, N. Wasiudden (LaTech), presented his research entitled “Replacement of Elastic Recovery (AASHTO T301) and Force Ductility (AASHTO 300) Tests by DSR-Based Tests” (SPTC Project 14.1-80). SPTC Researcher, Jay Wang (Program Chair of Civil Engineering at LaTech) presented his research entitled “Characterization of Expansive Soils in Northern Louisiana” in one of the UTC sessions. SPTC TLC students from LaTech also received an award during the program (see more information in the TLC section of this report). The 2016 Program can be found at: http://www.ltrc.lsu.edu/ltrc_16/program.html.

1.2.2 Workforce Development, Education and Outreach: In the reporting period, the SPTC was engaged in advancing the following activities: Transportation Leadership Council (TLC); preparing for Transportation Regional Internship Program (TRIP); Tribal Safety Champions Workshop; SPTC Workshop/Seminar Series and other education/outreach events; and SPTC Briefs. An overview of some of these activities follows.

Transportation Leadership Council (TLC) Chapters: TLC chapters have been formed at each member institution (for more information, see <http://www.sptc.org/tlc/>). These are student-led groups that provide opportunities for developing leadership. The chapters have autonomy to perform leadership development activities locally; however, a central mission is to develop regional collaborative activities with other chapters. The following activities have occurred during this reporting period:

- OU TLC is planning an April 6th joint meeting with ASCE and ODOT to discuss transportation and leadership opportunities. The chapter, in conjunction with the Jerry Holmes Leadership Program at OU, are in preliminary

discussions regarding the development of leadership training modules. Work continues on developing the constitution so that the TLC can be officially recognized as a group on campus. The TLC is discussing opportunities to engage the TLCs at the consortium institutions in the 2016 Transportation-Climat Summit in November.

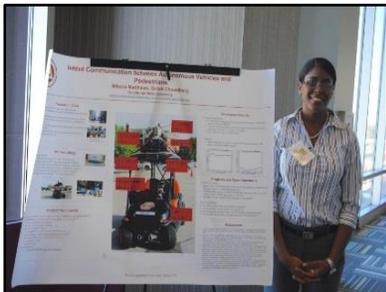
- UTEP TLC convened its General Meetings in February and March. Ricardo Romero was the guest speaker in March. Members attended a presentation by the TransitCenter entitled “A People’s History of Recent Urban Transportation Innovation”. The TLC also hosted a BBQ cookout to encourage recruitment and are lining up additional speakers. TLC members submitted applications for the SPTC paper/poster awards competition. More info is available at <http://ctis.utep.edu/utc/tlc/>.

- LaTech TLC members (civil engineering students; right) won first place in the senior design project competition at the Louisiana Transportation Conference 2016. The project, sponsored by the Louisiana Purchase Council, was incorporated into a senior design course taught by an SPTC member, Nazimuddin Wasiuddin, associate professor of civil engineering and construction engineering technology and advisor for the Transportation Leadership Council (TLC). David Hall, director of civil engineering, construction engineering technology and mechanical engineering at Louisiana Tech, also serves as the associate director of the SPTC and supported the Louisiana Tech students through the TLC student chapter. The TLC received approval to organize as a subgroup under ASCE on campus. A meeting is scheduled for April 21 to discuss opportunities in transportation industry. Officers will be selected and members recruited.



- Other TLC members reported the following activities during the reporting period. UARK TLC is pursuing University recognition as a student organization. TTU TLC members are planning to participate in Ranch Day, which has a RAIL transportation focus, on April 9th. OSU TLC is lining up guest speakers and has twelve student members.

2nd Tribal Safety Champions Workshop: Southern Plains Tribal Technical Assistance Program (SPTTAP) at OSU hosted the Tribal Safety Champions Workshop in Oklahoma City, Oklahoma in November 2015. The two-day workshop focused on transportation tools for saving lives in Oklahoma and featured safety presentations and training sessions. The event was sponsored by Southern Plains Tribal Technical Assistance Program and the Federal Highway Administration and supported by the SPTC. More than 100 attendees participated in safety presentations and training. The workshop brought together participants from tribal, local, county, state, federal, academic, and industry to focus on safety issues specific to Oklahoma, which is a FHWA safety focus state. Tribal outreach was focused on transportation improvements and youth driving safety in Tribal Communities.



Several of the sessions focused on the human factors of transportation safety and others focused on the engineering aspect by providing ideas and strategies to help implement safety improvements. The workshop featured engineering topics such as *Smarter Work Zones*, *Collecting Crash Data for Road Improvement Projects*, *Data Driven Analysis for Bridge Safety*, *MUTCD*, *High Friction Surface Treatment and Centerline Rumble Strips*, as well as a selection of education sessions, including *A Public Health Approach to Motor Vehicle Injury Prevention*, *Defensive Driving for Youth*, *DUI Prevention and Education* and *Tribal Safety Education Initiatives*. The SPTC moderated sessions and sponsored the workshop lunch and the student poster session on the Center for Intelligent Transportation Systems. SPTC researchers Joseph Havlicek and Ronald Barnes presented on the OU Center for Intelligent Transportation Systems (CITS) and its significant impact on transportation safety in the State of Oklahoma. An overview of the latest developments on several important projects was provided, including the Statewide Intelligent Transportation System, PARIS electronic police forms system, and SAFE-T crash reporting system. The new PARIS features were presented related to combatting Oklahoma’s DUI problem.

Driverless Vehicles on Roads – Exploring Future Transportation Systems: In recent years, there have been developments in driverless vehicles, and there is need to explore not only the vehicles, but also the changes needed to

the transportation systems to support driverless vehicles. Additionally, DOTs are faced with the challenge of attracting significant number of engineers and researchers to pursue careers in transportation. With many DOT employees approaching retirement, there is a pressing need to attract and prepare a workforce to meet current and future transportation challenges. On November 19th, the “Driverless Vehicle Challenge” was held at the Oklahoma School of Science and Mathematics. The competition: (1) provided students with experiential opportunities to learn about transportation safety and next generation transportation systems, and (2) energized high-school students to pursue education in STEM, especially in disciplines related to transportation.



2015 SPTC Student Dissertation and Thesis Awards: These student awards have been established to recognize scholarly research conducted by graduate students in engineering or a closely related field on transportation topics important to the region. Part of the regional mission of the SPTC is to support graduate study and research to develop the next generation of transportation leaders. One award was given under each category (dissertation/thesis). Timothy Wood (Texas Tech University) won the dissertation award for his work entitled “Improved Culvert Load Rating through an Evaluation of the Influence of Cover Soil Depth, Demand Model Sophistication, and Live Load Attenuation”. Brittany Cranor (The University of Oklahoma) won the thesis award for her work entitled “Analysis and Experimental Testing for Shear Behavior of an AASHTO Type II Girder in Service for Several Decades”. The awards ceremony took place at the 53rd Paving and Transportation conference on January 4, 2016, in Albuquerque, New Mexico.



2016 SPTC Student of the Year (SOY) Award: Nathan Ferraro is pursuing his MS degree in civil engineering at the University of Oklahoma. He was awarded the SPTC’s Student of the Year award based upon his achievements. His research is entitled, “Validating Field Employed X-Ray Fluorescence (XRF) on Stabilized Subgrade Projects”. He was recognized at the Council of University Transportation Center’s awards banquet on January 10, 2016 in Washington, D.C. in conjunction with the annual meeting of the Transportation Research Board.

SPTC SEED Scholar 2016: Ollie Mount was named the SPTC SEED Scholar for 2016. She has been a part of the SEED program for two years. She has revised an activity called “Egg Car” by reconstructing the ramp used in the activity to simulate real world conditions. Ollie is currently working on revising another activity called “Make it fly.” Her plans are to use new materials, like balsa wood, to create better gliders and teach students about Aerospace Engineering. In the midst of making old activities new again, she has learned a few things about creativity, time management and teamwork. Ollie continues to develop this program.



SPTC Seminar Series 2015: On November 13th, Atorod Azizinamini, Ph.D., P.E. (University of Florida) conducted an SPTC Seminar related to the topic *Accelerated Bridge Construction (ABC)* at the ODOT Training Center. PDHs were provided. Atorod has developed several bridge engineering products and systems that are being used nationally and internationally. Under SHRP2 R19A, he led the development of the first and most comprehensive document worldwide and devoted to service life design of bridges. This document is now being implemented by AASHTO and FHWA.



On November 16th, Chandrakant S. Desai (University of Arizona) conducted an SPTC Seminar related to the topic *Modeling of Rutting Using the Unified Disturbed State Concept (DSC)* at the ExxonMobil Lawrence G. Rawl Engineering Practice Facility on the OU campus. PDHs were provided. In this presentation, numerical modeling of rutting was discussed. The presentation specifically focused on material modeling using the unified disturbed state concept (DSC), developed by Desai and used by the geomechanics community world-wide for modeling of materials and interfaces.

Pertinent laboratory testing and evaluation of material parameters were also discussed along with validations (specimen-level and boundary value problem-level) of the DSC model.

On December 9th, Jorge G. Zornberg, Ph.D., P.E. (University of Texas – Austin; member, SPTC Advisory Board)



conducted an SPTC Seminar related to the topic *Swelling Clays and Pavement Applications: Their Characterizations and Stabilization Using Geosynthetics* at the Devon Energy Hall on the OU campus. PDHs were provided. A novel approach for characterization of the swelling of clays, involving centrifuge technology that has been recently developed was presented. A comprehensive field evaluation was conducted as part of this study, which involved the construction of 32 test sections with multiple types

of geosynthetic reinforcement, lime treatment, and control sections. The benefits of using geosynthetic reinforcements were clearly quantified.

College of the Muscogee Nation SPTC Student Programs: Students at the College of the Muscogee Nation (CMN) are conducting research correlating local road condition to vehicle repairs. Two of the CMN students have been selected for a \$900 SPTC incentive award. These student researchers will be presenting their findings at the EPSCOR Climatic Change and Food Security conference that will be held at CMN and involves a competitive poster display. Additionally, the SPTC gave a presentation to the CMN on roadway safety.

SPTC Dissemination: The SPTC has begun to develop monthly SPTC Briefs, which are two-page summaries of SPTC projects to be published, distributed and posted to the website to enhance impact. To date, seven briefs have been posted that highlight specific SPTC projects (<http://www.sptc.org/briefs/>). The SPTC has engaged a PR firm in an effort to disseminate SPTC findings to users and the general public. Three meetings were held to discuss SPTC research and dissemination opportunities. The SPTC also provided the firm with a list of SPTC researchers and their areas of expertise for public interviewing/story release purposes.

1.2.3 Leadership: In the reporting period, the SPTC leadership was engaged in advancing the following activities (in addition to participating in regularly scheduled meetings): making changes in SPTC leadership and delivering the 2016 Annual Leadership and the Annual Advisory Board Retreats. An overview follows.

Dawn Sullivan replaces John Bowman on SPTC Advisory Board: SPTC Advisory Board Chair, John Bowman, retired



from ODOT and the SPTC Advisory Board in January 2016. SPTC is grateful to Mr. Bowman for his service. Dawn Sullivan will now serve as the SPTC Advisory Board Chair. Dawn Sullivan was recently named the Director of Capital Programs at ODOT, the first woman to serve on ODOT's executive staff. She is a civil engineering graduate of the University of Oklahoma, and a Registered Professional Engineer. She has worked in various capacities for the Oklahoma Department of Transportation for 27 years, most recently as the Environmental Programs Division Engineer, and prior to 2007, the Planning & Research Division Engineer. In her role as Director of Capital Programs, she oversees ODOT's Project Management Division, with responsibility for delivery of ODOT's 8 Year Construction Work Plan; Strategic Assets and Performance Management Division; Local Government Division; Facilities Management Division; Rail Programs Division; as well as Waterways Branch, and ODOT's Tribal Liaison Program.

Marshan Marick Replaces Sharon Lewis as the SPTC Associate Director at Langston University:

Mrs. Marick obtained a Bachelor of Arts degree in Sociology from the University of Tulsa, and a Masters degree in Public Health from the University of Oklahoma Health Sciences Center. She is currently pursuing her doctorate in Public Health, with an emphasis in Public Health Leadership. She is an Instructor and Director of the Public Health undergraduate program at Langston University. As a certified health education specialist, Mrs. Marick is continually looking for ways to place public health, including transportation safety related issues, in the forefront of the communities in which she serves. She will contribute her education and experience to SPTC related to transportation safety.





Kathy Volz joins the team as the SPTC Industry Workforce Development Coordinator. Kathy Volz received her General Engineering degree and M.B.A from the University of Illinois. Her private sector experience includes working for consulting engineers, construction contractors, and not-for-profit entities. She is responsible for coordinating all outreach, workforce development, and tech transfer activities of the SPTC. She is responsible for increasing private sector support for TRIP, liaising with private sector entities, and developing public-private partnerships.

SPTC Delivers the Annual Advisory Board and Leadership Retreats: In February, SPTC held its Retreats in Dallas, Texas to discuss the SPTC strategic plan, performance deliverables, changes needed, challenges, opportunities and future direction. The SPTC Advisory Board plays a key role in maintaining communications with the greater transportation community and advises the Center Director and Leadership Core as to the critical transportation needs both regionally and nationally. The Board met in Dallas, Texas on February 4th to discuss the strategic plan, accomplishments and progress, ideas for the next UTC Request for Proposals, challenges, opportunities and future direction. The Dean of Engineering at The University of Oklahoma, Dr. Thomas Landers, attended the meeting and discussed collaboration and support. SPTC Leadership met for its Annual Retreat in Dallas, Texas on February 5th to discuss ideas for the next UTC Request for Proposals, performance deliverables, changes needed, challenges, opportunities and future direction. Kevin Hall (UARK) moderated the event. The Dean of Engineering at The University of Oklahoma, Dr. Thomas Landers, attended the meeting. His presentation was focused



on collaboration and support. The following tables show attendees that participated in these productive, one-day retreats.



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Attendee (Board Retreat)	Role	Institution
Dawn Sullivan	SPTC Board Chair	Oklahoma Department of Transportation
Harold "Skip" Paul	SPTC Board Member	Louisiana Transportation Research Center
David Hadwiger	SPTC Board Member	New Mexico Department of Transportation
C. Michael Lee	SPTC Board Member	Texas Department of Transportation
Michael Kelly	SPTC Board Member	Arkansas State Highway and Transportation Dept.
Basharat Siddiqi	SPTC Board Member	Federal Highway Administration
Angel Correa	SPTC Board Member	Federal Highway Administration
Sheldon Drobot	SPTC Board Member	Environmental Solutions Space/Intelligence Systems
Jorge G. Zornberg	SPTC Board Member	The University of Texas at Austin
Musharraf Zaman	SPTC Director	The University of Oklahoma
Sonya Brindle	SPTC Program Coordinator	The University of Oklahoma
Martina Sanchez	SPTC Financial Associate	The University of Oklahoma
Dominique Pittenger	SPTC Technical Director Coordinator	The University of Oklahoma
Kathy Volz	SPTC Workforce Development	The University of Oklahoma

Attendee (Leadership Retreat)	Role	Institution
Kevin Hall	SPTC Associate Director	University of Arkansas
Kelvin Wang	SPTC Associate Director	Oklahoma State University
Rafiqul Tarefder	SPTC Associate Director	University of New Mexico
David Hall	SPTC Associate Director	Louisiana Tech University
Soheil Nazarian	SPTC Associate Director	The University of Texas at El Paso
Sanjaya Senadheera	SPTC Associate Director	Texas Tech University
Marshan Marick	SPTC Associate Director	Langston University
D. Chongo Mundende	SPTC Emerging Leader	Langston University
Nazimuddin "Wasi" Wasiuddin	SPTC Emerging Leader	Louisiana Tech University
Imad Abdallah	SPTC Emerging Leader	The University of Texas at El Paso
Ron Barnes	SPTC Emerging Leader	The University of Oklahoma
Musharraf Zaman	SPTC Director	The University of Oklahoma
Sonya Brindle	SPTC Program Coordinator	The University of Oklahoma
Martina Sanchez	SPTC Financial Associate	The University of Oklahoma
Dominique Pittenger	SPTC Technical Director	The University of Oklahoma
Kathy Volz	SPTC Workforce Development	The University of Oklahoma

More information can be found at <http://www.sptc.org/advisory-board/> and <http://www.sptc.org/leadership/>.

1.3 Dissemination of Results SPTC uses both electronic and printed materials as well as social media and a public relations firm for the dissemination of results. For example, the results of the 14.1 and 14.2 competitions are posted on the Center website and are included in our recently published Briefs. The Briefs are being distributed widely to all UTCs through OST-R, state DOTs, and other stakeholders. A summary of each funded project and SPTC activities are posted on the website. Also, conferences, seminars, workshops, summits and professional meetings are used to disseminate SPTC results. Basecamp and e-mails are also used regularly as vehicles for communication and dissemination of results. SPTC is regularly using WebEx technology to facilitate webinars delivered by SPTC researchers and serve to disseminate project results.

1.4 Activities for the Next Reporting Period As noted throughout this progress report, the SPTC14 and SPTC15 competitions have resulted in several research, education and outreach projects. Talented teams across Region 6 are working on these projects, which represent a major component of SPTC's work plan for the next period. Other activities for the next reporting period include: 2016 TRIP, 2016 Transportation-Climate Summit, TLC activities, Seminars, Webinars and Workshops. A number of experiential learning and outreach activities are also planned.

2 PRODUCTS

2.1 Publications, Conference Papers and Presentations The SPTC consortium members have been actively sharing their achievements during the reporting period through associated activities supported by matching and leveraging funds. Publications/ Conference Papers and Presentations produced and delivered by SPTC researchers stemming from the 14.1 and 14.2 programs for this reporting period are listed in this section. To date, researchers have disseminated SPTC research through 38 journal publications or conference papers and 83 presentations.

Publications/Conference Papers

Cook, D., Ley, M.T., Ghaeezadeh, A., "Effects of Aggregate Concepts on the Workability of Slip Formed Concrete", American Society of Civil Engineering, in press, 2016.

Garner, A., Genedy, M., Tarefder, R., Reda Taha, M. M., "Monitoring Fatigue Damage in PC using Carbon Nanotubes", Submitted for Review. Proceedings of International Congress on Polymers in Concrete (ICPIC), Singapore, October 2015, 9 p.

- Senadheera, S, F. Khabaz and R. Khare. "Effects of Polymer Additives on the Structural, Dynamic and Rheological Properties of Asphalt," Paper accepted for presentation at the 87th meeting of The Society of Rheology to be held in Baltimore, Maryland, October 11-15, 2015.
- Li J. Shifting from grassland to shrubland: New insights from recent studies in the Chihuahuan Deserts. American Geophysical Union Annual Meeting, Dec 14-18, 2015 San Francisco, CA.
- Li, J et al. (2015c). On the prediction of threshold friction velocity of wind erosion using soil reflectance spectroscopy. *Aeolian Research*, 2015, 10.1016/j.aeolian.2015.10.001.
- Qiong Wu and Guohui Zhang. Analysis of Driver Injury Severity in Single-Vehicle Crashes on Rural and Urban Roadways in New Mexico. *Accident Analysis and Prevention*. 2016. DOI: 10.1016/j.aap.2016.03.026
- Cong Chen, Guohui Zhang, Jinfu Yang, John C. Milton, and Adélar "Dely" Alcántara. An Explanatory Analysis of Driver Injury Severity in Rear-end Crashes Using a Decision Table/Naïve Bayes Hybrid Classifier. *Accident Analysis and Prevention*. Vol. 90. 2016. pp. 95-107.
- Qiong Wu, Guohui Zhang, Cong Chen, Haizhong Wang, and Heng Wei. Heterogeneous Impacts of Gender-Interpreted Contributing Factors on Driver Injury Severities in Single-Vehicle Rollover Crashes. *Accident Analysis and Prevention*. In Press. 2016.
- Qiong Wu and Guohui Zhang. Formulating Alcohol Influenced Driver Injury Severities in Intersection-related Crashes. *Transport*. 2015. DOI: 10.3846/16484142.2016.1144221.
- Wasiuddin, N., Orr, M. K., and Tewari, S., Traffic study using a video camera and an image processing software: Lessons learned, Second Mid Years Engineering Experience Conference Slump to Jump!, Texas A&M University, College Station, TX, March 30 - April 1, 2016.
- Garner, A., Genedy, M., Tarefder, R., Reda Taha, M. M., "Monitoring Fatigue Damage in PC using Carbon Nanotubes", Submitted for Review. *Proceedings of International Congress on Polymers in Concrete (ICPIC)*, Singapore, October 2015, 9 p
- ## Presentations
- Mullens, E. D., and R. A. McPherson, 2016: A high-resolution freezing precipitation dataset for the South-Central U.S (Presentation). *AMS 32nd Conference on Environmental Information Processing Technologies, New Orleans LA, January 14, 2016*.
- Mullens, E. D., and R. A. McPherson, 2016: A multi-algorithm Reanalysis-based freezing precipitation dataset for climate studies in the South Central U.S. (Presentation), *AMS 22nd Conference on Applied Climatology, New Orleans, LA, January 14 2016*
- N. Wasiuddin (LaTech), "Replacement of Elastic Recovery (AASHTO T301) and Force Ductility (AASHTO 300) Tests by DSR-Based Tests" (SPTC Project 14.1-80), Louisiana Transportation Conference 2016, Baton Rouge, LA, March 2016
- Jay Wang, "Characterization of Expansive Soils in Northern Louisiana" (SPTC Project 14.1-76), Louisiana Transportation Conference 2016, Baton Rouge, LA, March 2016
- Micah Hale. "Evaluation of Surface Treatments to Mitigate ASR," SPTC/ODOT Trans Day, October 20, 2015.
- Micah Hale. "Evaluation of Surface Treatments to Mitigate ASR," SPTC/MBTC Advisory Board, November 13, 2015.
- Micah Hale. "Evaluation of Surface Treatments to Mitigate ASR," Arkansas Highway and Transportation Department (AHTD), November 2015.
- Micah Hale. "Evaluation of Surface Treatments to Mitigate ASR," Annual Arkansas Chapter ACI meeting, January 2016.
- Julie Hartell. "The Use of Resistivity Testing to Improve Concrete Quality," RE-CAST Webinar, December 1, 2015.
- Amy Cerato, "Determination of Soil Stabilization Content using X-Ray Fluorescence (XRF)," 2015 SPTC-ODOT Research Day, October 2015.
- Gill, T.E. (2016), Arizona Dust Storm Workshop, Mar, Casa Grande, Arizona.
- Cong Chen, Guohui Zhang, Hua Wang, Peter J. Jin, and C. Michael Walton. Examining Toll Road Utilization Supported by Traffic Information Provision Using a Nested-Logit-Based Bayesian Network Approach. *The 95th Annual Meeting of Transportation Research Board, Washington, D.C., Jan. 2016*.
- Qiong Wu, Guohui Zhang, Xiaoyu Zhu, Xiaoyue Liu, and Hua Wang. Driver Injury Severity Analysis of Single-Vehicle Crashes on Rural and Urban Roadways. *The 95th Annual Meeting of Transportation Research Board, Washington, D.C., Jan. 2016*.
- Sikai Xie, Cong Chen, Qiong Wu, Qi Lu, Su Zhang, Kelly Montoya, Guohui Zhang, and Yin Yang 3D Pavement Surface Reconstruction and Cracking Recognition Based on Kinect Fusion Techniques. *The 95th Annual Meeting of*

- Transportation Research Board, Washington, D.C., Jan. 2016.
- Stephen Lujan, Cong Chen, Guohui Zhang, Rafiqul Tarefder, Timothy Parker, and Francisco Sanchez. Enhancing Safety Performance of Rumble Strips Through the use of Reflective Striping: An Empirical Study on U.S. 285 in New Mexico. The 95th Annual Meeting of Transportation Research Board, Washington, D.C., Jan. 2016.
- Ley, T. "Why the Box Test & Super Air Meter are Important to Your QA Program", National ACPA meeting, Bonita Springs Florida, 12/3/15.
- Ley, T. "Intelligent Aggregate Design for Concrete Mixtures", National American Concrete Institute, ACI 302 slabs on ground committee, Denver, CO, 11/9/15.
- Ley, T. "Update on the SAM and the Box Test", AASHTO Subcommittee on Materials, 11/9/15.
- Garner, A., Genedy, M., Tarefder, R., Reda Taha, M. M., "Monitoring Fatigue Damage in PC using Carbon Nanotubes", Submitted for Review. Proceedings of International Congress on Polymers in Concrete (ICPIC), Singapore, October 2015, 9 p

2.2 Website or Other Internet Sites The SPTC website, <http://www.sptc.org>, disseminates the results of the research and program activities, such as seminar, workshop and research related events. It also hosts the *SPTC Newsletters* and *SPTC Briefs*. UTEP developed a website for its Transportation Leadership Council (TLC) Student Chapter <http://ctis.utep.edu/utc/tlc/>. SPTC Researcher Tyler Ley developed the following website to disseminate his findings: www.optimizedgraded.com.

2.3 Technologies and Techniques For this reporting period, SPTC Researcher Micah Hale has transferred his silane application technique to the Arkansas State Highway and Transportation Department (AHTD). The AHTD is planning to implement the technology on the I-49 pavement during Spring 2016.

2.4 Inventions, Patent Applications and/or Licenses For this reporting period, SPTC Researcher Nazimuddin Wasiuddin filed a Report of Invention (ROI#2015-12), for the Improved Warm Mix Asphalt Formulation. The invention has been documented with Louisiana Tech University.

2.5 Other Products Nothing to report.

3 PARTICIPANTS AND COLLABORATING ORGANIZATIONS

The SPTC consortium is tied together by its collaborative culture, *sharing to gain*, and its core values of communication and collaboration. Each consortium member (<http://www.sptc.org/consortium>) is committed to sharing its human expertise and facilities to serve Region 6 through research, education, outreach and workforce development effort. This willingness to share extends not just to the members of the consortium, but to all stakeholders including state and local transportation agencies, the private sector, international collaborators and any educational institution in the region that is willing to work with the SPTC. Examples of collaborations for the reporting period are outlined as follows.

3.1 Individuals

Name	Title	Supporting Institution(s)	Activities
SPTC Advisory Board			
Basharat Siddiqi	Non-Voting Member	FHWA (OK)	- Retreat Participation - Quarterly Conference Call Participation
Michael A. Brown	Member	TxAPA	- Retreat Participation - Quarterly Conference Call Participation
John Bowman	Chair (through January)	ODOT	- Quarterly Conference Call Participation - Execution of the 2015 Oklahoma Transportation Research Day - Exploring industry collaborations

Dawn Sullivan	Chair (starting February)	ODOT	- Retreat Participation - Quarterly Conference Call Participation
Harold "Skip" Paul	Member	LTRC	- Retreat Participation - Quarterly Conference Call Participation
David Soherr-Hadwiger	Member	New Mexico DOT	- Retreat Participation - Quarterly Conference Call Participation
Danny Gierhart	Member	Asphalt Institute	- Quarterly Conference Call Participation
Jorge Zornberg	Academic Member	University of Texas at Austin	- Retreat Participation - Quarterly Conference Call Participation
Sheldon Drobot	Member	NCAR	- Retreat Participation - Quarterly Conference Call Participation
Michael Kelly	Member	Arkansas State Highway & Transp. Dept.	- Retreat Participation - Quarterly Conference Call Participation
Michael Lee	Member	Texas Department of Transportation	- Retreat Participation - Quarterly Conference Call Participation
Angel Correa	Non-Voting Member	FHWA, Arkansas Div.	- Retreat Participation - Quarterly Conference Call Participation
The University of Oklahoma			
Musharraf Zaman	SPTC Director	OST-R, OU and ODOT match	- Overseeing the overall operation of the Center - Representing the Center and/or the UTC Program at external meetings - Working closely with the Advisory Board and the Leadership Core to set goals and priorities - Working closely with stakeholders - Enhancing collaborations with both consortium members and non-consortium institutions including international institutions - Working closely with TTAP and LTAP to set-up new opportunities and execute them - Conducting Associate Director's monthly meeting - SPTC15.1 RFP development and program coordination
Gerald A. Miller	SPTC Associate Director	OU, OST-R and ODOT Match	- Retreat Participation - Monthly AD Conference Call Participation - Weekly Core Group Meeting Participation - Managing SPTC Requirements - SPTC15.1 RFP development and program coordination
Ronald Barnes	Emerging Leader	OST-R, ODOT match and OU	- Retreat Participation - TSI-ITS collaboration lead - Weekly Core Group Meeting Participation - Thesis/Dissertation Awards
Sonya Brindle	SPTC Program Coordinator	SPTC grant and the ODOT match	- Coordinating committee and industry meetings - Coordinating TRIP program, Transportation Research Day, and Retreats - Recording minutes, posting information for current activities - Coordinating seminars/ workshops/special SPTC events including webinar-based activities - Facilitating international collaborations at individual and group levels - CEC site visit - manage SPTC website content
Martina Sanchez	SPTC Financial and	Match from OU's Vice	- Managing all financial aspects of the grant and match accounts

	Outreach Associate	President of Research	<ul style="list-style-type: none"> - Serving as financial liaison with partners and Office of Research Services - Coordinating and participating in outreach activities, including tribal outreach activities -Coordinated TTAP Activities
Frank Nguyen	Webmaster & Social Media Manager	ODOT match	<ul style="list-style-type: none"> - Develop SPTC webpage - Managing the SPTC website - Social media
Arnulf P. Hagen	SPTC Technical Director	Partly by the SPTC Grant and partly by the ODOT match	<ul style="list-style-type: none"> - SPTC15.2 program coordination
Dominique Pittenger	SPTC Technical Director	Partly by the SPTC Grant and partly by the ODOT match	<ul style="list-style-type: none"> - Facilitating 15.1 and 15.2 competitions - Preparing/participating SPTC/ODOT research day - Managing the review and reporting processes - Drafting institutional reports - Compiling newsletter articles and developing briefs
Kathy Volz	SPTC Workforce Development Coordinator	Match from OU's Vice President of Research	<ul style="list-style-type: none"> - Site visits with CEC and WDT - Public/Private Partnership Luncheon - Contact with Vieux & Associates - Tribal Outreach – TTAP, SIPI, NTGISC & Chickasaw Nation - SPTC/OU/OSU Joint Certificate Program
Langston University			
Marshan Marick	Associate Director	SPTC grant and Langston University	<ul style="list-style-type: none"> - Retreat Participation - Monthly Conference Call Participation
Darlington Mundende	Emerging Leader	Langston University	<ul style="list-style-type: none"> - Organizing the 2016 Transportation Academy - Recruiting students for Academy
Louisiana Tech University			
David Hall	Associate Director	Louisiana Tech University	<ul style="list-style-type: none"> - Retreat Participation - Monthly Conference Call Participation - Managing SPTC Requirements - SPTC15.1 RFP development and program coordination
Nazimuddin "Wasi" Wasiuddin	Emerging Leader	LA Tech and SPTC grant	<ul style="list-style-type: none"> - TLC Advisor - Assisting the Associate Director and REOC Member in various activities - Finding co-sponsorships for TRIP participants - Conducting undergraduate research program and reporting activities - Attended Associate Director meeting at TRB
Norm Pumphrey	SPTC Assistant	LA Tech	<ul style="list-style-type: none"> - Advising research, education and outreach activities - Assisting in the proposal review process
Jay Wang	Project PI	LA Tech	<ul style="list-style-type: none"> - Attending one Associate Director/Core Leadership Meeting
Oklahoma State University			
Kelvin C.P. Wang	Associate Director	OSU	<ul style="list-style-type: none"> - Retreat Participation - Monthly Conference Call Participation - Managing SPTC Requirements - Attended Associate Director meeting at TRB - Attended Transportation Climate Summit and made presentation - SPTC15.1 RFP development and program coordination

Tyler Ley	Emerging Leader	OSU	<ul style="list-style-type: none"> - Attending various SPTC meetings and activities - Serving on REOC activities
Suzette Lavoie	Grant Manager	OSU	<ul style="list-style-type: none"> - Assisting with SPTC compliance, contractual documents, finances, and relations
Doug Wright	Director, CLGT	FHWA and OSU	<ul style="list-style-type: none"> - Coordinating participation in the TRIP program
Texas Tech University			
Sanjaya Senadheera	Associate Director	Texas Tech University	<ul style="list-style-type: none"> - Retreat Participation - Monthly Conference Call Participation - Managing SPTC Requirements - Attended Associate Director meeting at TRB - SPTC15.1 RFP development and program coordination
Cathy Allen	REOC Member, Senior Director	Texas Tech University	<ul style="list-style-type: none"> - Education and outreach activities – planning meetings and conference calls only
Kim Harris	SPTC Coordinator and Editor	TxDOT (SPR Contract 0-9911-13), SPTC grant and Texas Tech University	<ul style="list-style-type: none"> - Providing administrative support and coordinating activities with SPTC at OU, SPAR, and ORS at TTU - Preparation of proposal, submission, and accounting aspects
Rita Schumacher	Senior Business Assistant	TxDOT and SPTC grant	<ul style="list-style-type: none"> - Administrative support - Processing HR/Payroll forms
Gloria Moralez	Business Assistant	TxDOT and SPTC grant	<ul style="list-style-type: none"> - Administrative support - Processing travel & purchasing forms
Priyantha Jayawickrama	Member of Coordinating Group	TTU and SPTC grant	<ul style="list-style-type: none"> - Providing support with research proposal development and collaborative activities
Hongchao Liu	Member of Coordinating Group	Texas Tech University	<ul style="list-style-type: none"> - Providing support with research proposal development and collaborative activities (Data and highway safety) - Review of proposals
Hoyoung Seo	Emerging Leader – Mid-Career	Texas Tech University	Faculty Advisor for TechFLT, the TTU TLC
The University of New Mexico			
Rafiqul A. Tarefder	Associate Director of SPTC	UNM	<ul style="list-style-type: none"> - Presiding over 52nd Paving/Transp. Conference - Retreat Participation - Monthly Conference Call Participation - Managing SPTC Requirements - Attended Associate Director meeting at TRB - SPTC15.1 RFP development and program coordination
Vanessa Valentin	Emerging Leader	UNM	<ul style="list-style-type: none"> - Attending SPTC related meetings - REOC member
The University of Texas at El Paso			
Soheil Nazarian	Associate Director of SPTC	UTEP, SPTC grant and TxDOT	<ul style="list-style-type: none"> - Retreat Participation - Monthly Conference Call Participation - Managing SPTC Requirements - Attended Associate Director meeting at TRB - SPTC15.1 RFP development and program coordination
Cesar Carrasco	REOC Member	UTEP	<ul style="list-style-type: none"> - REOC efforts - Attending SPTC meetings

Imad Abdallah	SPTC Manager	UTEP, SPTC and TxDOT	<ul style="list-style-type: none"> - Assisting the Assoc. Director with the center operation - Attending SPTC meetings - Reviewing/writing proposals
Patricia Acevedo	SPTC Staff	UTEP and SPTC	<ul style="list-style-type: none"> - Assisting in all administrative issues as they relate to SPTC
University of Arkansas / Mack-Blackwell Rural Transportation Center (MBTC)			
Kevin Hall	Associate Director of SPTC	University of Arkansas	<ul style="list-style-type: none"> - Led and moderated leadership retreat - Retreat Participation - Monthly Conference Call Participation - Managing SPTC Requirements - Attended Associate Director meeting at TRB - SPTC15.1 RFP development and program coordination
Norman Dennis	Interim Associate Dean, Eng.	University of Arkansas	<ul style="list-style-type: none"> - Point of contact for UArk on SPTC Advisory Board teleconferences - Other SPTC-related tasks
Heather Nachtmann	Director of MBTC	University of Arkansas	<ul style="list-style-type: none"> - SPTC-related tasks - Budget reviews - SPTC Advisory Board POC
Andrew Braham	Emerging Leader; Co-Director TLC	University of Arkansas	<ul style="list-style-type: none"> - Involvement in proposal development - TLC activities
Sarah Hernandez	Co-Director TLC	University of Arkansas	<ul style="list-style-type: none"> - TLC activities

3.2 Other Organizations

Departments of Transportation: State DOTs are an important stakeholder. With one representative from each DOT in Region 6, the SPTC Advisory Board provides a unique opportunity to identify and address some complex and challenging problems in Region 6 and the nation. The Oklahoma Department of Transportation is providing cash match to the SPTC. New Mexico DOT and Louisiana Transportation Center (LTRC) are providing substantial cash match to support a number of SPTC projects. These projects constitute an integral component of the SPTC work plan.

Private Sector: The private sector is another key stakeholder of the SPTC. Two at-large members from the private sector serve on the SPTC Advisory Board. A number of companies, within Region 6 and outside, are contributing substantial cash match and in-kind match for several of the projects funded from the 14.1 and 15.1 competitions. During the reporting period, the SPTC met with engineers from CEC Infrastructure Solutions to discuss collaboration opportunities in the areas of research and workforce development.

Tribal Entities: Collaboration with Tribal entities is an important goal of the SPTC. During the reporting period, the SPTC finalized a Partnership Agreement with the Southwestern Indian Polytechnic Institute (SIPI). The SPTC also participated in a Regional GIS conference @ Chickasaw Nation. TTAP was contacted about developing non-degree programs and supporting the TRIP program with internship opportunities (Chickasaw, Cheyenne and Arapaho Tribes) in addition to collaborating for the Road Safety Evaluation for Cheyenne and Arapaho Tribes. SPTC is discussing the implementation of an outreach program with the Pawnee Nation College.

Securing 2016 TRIP Sponsors: An important element of SPTC's collaborative effort is the Transportation Regional Internship Program (TRIP). During the reporting period, the TRIP program focused on securing summer internship sponsors.

3.3 Other Collaborations International collaborations are important to the SPTC's visibility and success. During the reporting period, SPTC and the Tashkent Automobile and Road Construction Institute developed a partnership agreement.

4 IMPACT

4.1 Impact on the Principal Discipline

SPTC Researcher N. Wasiuddin filed a Report of Invention, ROI#2015-12, for Improved Warm Mix Asphalt Formulation that will be useful for DOTs and contractors.

SPTC Researcher Micah Hale has transferred his silane application technique to the Arkansas State Highway and Transportation Department (AHTD). The AHTD is planning to implement the technology on the I-49 pavement during Spring 2016, which will enhance the agency's ability to preserve assets.

4.2 Impact on Other Disciplines

The tribal safety efforts noted in the Accomplishment and Collaboration sections will impact other disciplines related to law enforcement, driver safety and education.

4.3 Impact on Workforce Development

Tribal Safety Champions Workshop: Represented among the attendees at this event, as noted in the Accomplishments section of this report, were numerous tribes, state agencies, federal agencies, municipalities, colleges and consulting firms. This workshop afforded the opportunity for new partnerships to be forged and existing partnerships to be strengthened. Local and tribal roads personnel were enlightened on new low cost methods for handling difficult engineering safety situations by interacting with their peers and hearing from highway safety experts.

Continuing Education Seminars, Workshops and Conferences: Events, as noted in the Accomplishments section of this report, provided important educational experience to hundreds of participants, including current workforce seeking to advance their knowledge and others considering transportation as potential career opportunities.

Developed and Disseminated New Educational Materials and Awarded Scholarships: New materials and scholarship award, as stated in the Accomplishments section of this report, provided important educational experience and motivation to college students, including current workforce, seeking to advance their knowledge and others considering transportation as potential career opportunities.

4.4 Impact on Physical, Institutional and Information Resources

SPTC Researcher Tyler Ley developed the following website to disseminate findings from his SPTC project to users: www.optimizedgraded.com. This impacts agencies, such as DOTs, by allowing the agencies that are interested in implementing his products (specifications) to directly access them.

4.5 Impact on Technology Transfer

SPTC Researcher Micah Hale has transferred his silane application technique to the Arkansas State Highway and Transportation Department (AHTD). The AHTD is planning to implement the technology on the I-49 pavement during Spring 2016.

SPTC Products noted in the Products section of this report are facilitating an impactful technology transfer program.

4.6 Impact Beyond Science and Technology

Nothing to report.

5 CHANGES/PROBLEMS

Nothing to report.