FHWA Approved Modifications to Work Program

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Project Number: 0-6936 **University:** CTR

Project Title: Development of Integral/Semi-integral Abutments for TxDOT bridges

Project Start Date: 9/1/2016 **Old Termination Date:** 8/31/2023
New Termination Date: 12/31/2023

Project Status: Continuation **Project Budget:** $1,049,627.10

RTI Project Manager: Jade Adediwura **Researcher:** Jorge Zornberg

Project Objectives: While the use of integral and semi-integral bridge abutments has reportedly been increasing nationwide, their construction in Texas has remained limited. These systems have been reported to minimize the costs associated with the installation, maintenance, and repair of bridge deck joints and bearings. In addition, they have the potential to minimize the "bump at the end of the bridge," which results in reduced maintenance costs. Although this technology has not been widely adopted in Texas, a reassessment of its potential cost and performance benefits is timely. This requires assessment of key design and construction aspects, including the characteristics of common soils in Texas, the details typically adopted for foundation, superstructure, and substructure, and the local pavement standards. Accordingly, this project proposes to assess the use of this technology in Texas by producing: (1) a review of US and international practices, as well as of existing data, to assess the applicability to conditions prevailing in Texas, (2) a thorough evaluation of structures already constructed in Texas, as well as of an integral bridge that will be constructed in 2016 in Texas by FHWA Federal Lands, and (3) a set of design details for using this technology in Texas conditions.

Modification: Amend the contract to extend the termination date, revise the budget, and update the project schedule to allow time to deliver the pilot short course for Task 10. The FY19-FY22 Budgets remain the same. The FY2023 Budget is decreased by $1,875.00 from $117,672.26 to $115,797.26; the FY2024 Budget is established at $1,875.00; the Itemized Project Budget Estimate remains $1,049,627.10.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$1,875.00	$1,500.00	$375.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-6872-01 **University:** UTA-TTI

Project Title: Use of Geothermal Energy for De-icing Approach Pavement Slabs and Bridge Decks - Phase II

Project Start Date: 10/9/2020 **Old Termination Date:** 8/31/2023
New Termination Date: 8/31/2024

Project Status: Continuation **Old Project Budget:** $950,556.07
New Project Budget: $1,219,936.89

RTI Project Manager: Shelley Pridgen **Researcher:** Xinbao Yu

Project Objectives: De-icing using geothermal energy can provide the Receiving Agency with a better alternative than the existing method of using deicing with sands and/or salts. This research project shall explore the potential for retrofitting bridges with a hydronic pipe geothermal heating system and achieve Technology Readiness Levels (TRL) level 6 through prototype demonstration in a relevant environment. At the end of the project, the geothermal deicing technology shall be ready for prototype demonstration in an operational environment (TRL level 7).

Modification: Amend the contract to extend the termination, to revise the Project Schedule and the Project Work Plan to move testing the newly completed pilot geothermal bridge over one winter and add a new Task 11, Develop an Automatic and Optimized De-Icing Operation Control Strategy. The FY 2023 budget for CTR remains $220,549.73; an FY 2024 budget for CTR is established in the amount of $134,939.32; the Total Project Cost for CTR is increased by $134,939.32 from $556,386.42 to $691,325.74. The FY 2023 budget for TTI remains $158,979.15; an FY 2024 budget for TTI is established in the amount of $134,441.50; the Total Project Cost for Performing Agency 2 is increased by $134,441.50 from $394,169.65 to $528,611.15. The Total Itemized Project Budget Estimate is increased by $269,380.82 from $950,556.07 to $1,219,936.89.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
CTR's Project Budget	$134,939.32	$107,951.46	$26,987.86
TTI's Project Budget	$134,441.50	$107,553.20	$26,888.30

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7006 **University:** TTI

Project Title: Design, Construction, and Performance Monitoring of Stabilization of Expansive Soils and Cement

Project Start Date: 4/24/2019 **Termination Date:** 8/31/2024

Project Status: Continuation **Project Budget:** $1,730,912.76

RTI Project Manager: Jade Adediwura **Researcher:** Dar Hao Chen

Project Objectives: The Receiving Agency is actively looking for alternatives to stabilize expansive soils and cement treated bases with polypropylene fiber. Polypropylene fiber, hereafter is referred to as fiber. Many areas in Texas have problems stabilizing expansive soils with traditional stabilizers (i.e. lime, cement, fly ash, or in combination) because of the high levels of sulfates in the soil. Many major pavement failures have occurred due to lime/cement induced sulfate heaves. In addition, reflection cracks from cement treated bases have been reported in numerous projects. Expansive soils have caused extensive pavement heaves, bumps and longitudinal cracks. The repetitive shrinking and swelling is responsible for the development of cracks, heaves and bumps on Texas roads. Roadway surface cracks allow water intrusion which degrades underlying pavement layers, and prematurely fails the pavement structure. Surface heaves and bumps are a driver safety issue. Cracks, heaves, and bumps are extremely expensive to repair over the life of the pavement, and it would be more economical and safer to the public to mitigate their occurrences during construction. Previous research results indicate that the fiber-reinforced cement treated bases has shown to increase performance. Significant improvements in both shear and compressive strengths, as well as flexibility, have been reported in fiber reinforced soils and fiber reinforced cement treated bases. Also, fiber reinforced clays and sands were able to reduce volumetric shrinkage strains and swell pressures. It is expected that these types of improvements would directly mitigate the aforementioned distresses. There are huge potential benefits of applying polypropylene fiber to stabilize expansive soils and cement treated bases to (1) increase strength, (2) reduce shrinkage potential, (3) reduce chemical stabilizer content, and (4) increase flexibility/ductility. There is a critical need to incorporate fiber in the Receiving Agency's "Modification and Stabilization of Soils and Base for Use in Pavement Structures" guidelines. Therefore, this study will develop appropriate laboratory test methods to evaluate mix designs for (1) fiber reinforced cement treated base, (2) fiber reinforced clay, and (3) fiber reinforced sandy soil. In addition, this study will provide assistances to Receiving Agency Districts to develop optimum fiber application rates and establish specifications

and construction QC/QA plans for uniform mixing. The Performing Agency shall conduct laboratory tests to determine optimum fiber application rates for cement treated base and 6 different subgrade soils: (1) PI < 15, (2) 15 ≤ PI < 35, (3) PI ≥ 35, (4) sulfate concentration > 3000 ppm but ≤ 8000 ppm, (5) sulfate concentration > 8000 ppm, and (6) organics content exceeds 1%. Over the last few years, the Receiving Agency has successfully constructed several Full Depth Recycling (FDR) sections with foamed asphalt using innovative reclaiming equipment. One key issue that the Performing Agency shall address in this study is an evaluation of the mix technologies that ensure fibers are mixed uniformly in the field. The Performing Agency shall use the Wirtgen Reclaimer as the initial device for mixing fibers into the material being stabilized. The Performing Agency shall progress to other common construction equipment and processes to achieve the optimum mixing results. This study shall investigate innovative Nondestructive Testing (NDT) tools to (1) assist site characterization, (2) select candidate test sections, (3) identify sampling locations, (4) provide input on mix design process, (5) provide Input during QC/QA process, and (6) monitor field performance of the test section. The Performing Agency shall document the optimal construction techniques and identify time and cost savings.

Modification: Amend the contract to revise the budget to postone the fiber purchase until FY24 due to construction delays. The FY19-FY22 Budgets remain the same. The FY 2023 budget is decreased by $85,000.00 from $401,623.75 to $316,623.75. The FY 2024 budget is increased by $85,000.00 from $397,898.75 to $482,898.75. The Itemized Project Budget Estimate remains $1,730,912.75.

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Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$397,898.75	$318,319.00	$79,579.75
New Project Budget	$482,898.75	$386,319.00	$96,579.75

Project Number: 0-7017 **University:** TXST

Project Title: Use of Rapid Setting Hydraulic Cement (RSHC) for Structural Applications

Project Start Date: 7/3/2019 **Old Termination Date:** 8/31/2023
New Termination Date: 12/31/2023

Project Status: Continuation **Project Budget:** $572,509.00

RTI Project Manager: Martin Dassi **Researcher:** Federico Aguayo

Project Objectives: The goal of this project is to determine feasibility of using rapid setting cements as a cost effective solution for structural applicationsin Texas, specifically in bridge structural componentsand decks. The PERFORMING AGENCY, or "research team", will(1) synthesize relevant information available on rapid cements in published (and unpublished) literature, (2) conduct a survey of domestically available and structurally feasible rapid setting cements for use in TxDOT bridge deck construction, (3) perform a comprehensive experimental evaluation covering a range of fresh and hardened material propertiesfor calcium sufloaluminate (CSA) cement, calcium aluminate cement (CAC), Type III cement,and combinations of all three,(4)verify and demonstrate adequate performance characteristic and durability performance based on laboratory testing,(5) correlate performance characteristics with material and placement costs (6) and develop guidelines and specification for implementation of rapid setting cements for bridge structures and decks in Texas.

Modification: Amend the contract to extend the termination date, and to revise the budget and the project schedule due to additional time needed for testing and final reporting of those results. The update to the project schedule will be done at no additional cost and support an extension to the project period. The FY19 Budget remains at $16,640.00; the FY20 Budget remains at $160,227.00; the FY21 Budget remains at $186,337.00; the FY22 Budget remains at $101,796.00; the FY23 Budget of $107,509.00 is decreased by $23,790.00 from $107,509.00 to $83,719.00. FY24 Budget is established in the amount of $23,790.00. The Itemized Project Budget Estimate remains at $572,509.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$23,790.00	$19,032.00	$4,758.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7023-01 **University:** UTA

Project Title: Ecological Impacts of Sediment Derived from Bridge Construction

Project Start Date: 11/10/2022 **Old Termination Date:** 8/31/2025
New Termination Date: 12/31/2025

Project Status: Continuation **Project Budget:** $392,000.00

RTI Project Manager: Jade Adediwura **Researcher:** Habib Ahmari

Project Objectives: The release of sediment due to bridge construction may change the sediment regime and geomorphology of receiving streams causing short- and long-term effects on aquatic habitat. A GIS-based Predictive Sediment Toolbar is already developed and coupled with the Hydraulic Engineering Center's River Analysis System (HEC-RAS) 2D to determine the potential depositional area and suspended sediment concentration at bridge construction sites. The toolbar was submitted to the Receiving Agency in Phase I. The performance of the toolbar was assessed using field data and observations at a bridge construction site. The toolbar showed a promising performance; however, to reduce modeling uncertainties and develop an understanding of the uncertainties, and increase the accuracy of the approaches and model capabilities, the Performing Agency shall perform following tasks:

i. develop a guideline for selecting stream flow events to be used in HEC-RAS 1D model and for determining the extent of modeling downstream of the bridge;
ii. develop a new 1D sediment transport model coupled with HEC-RAS 1D and add to the current GIS toolbar;
iii. investigate alternative methods for defining eroded sediment characteristics from a typical bridge replacement site and incorporate into the model;
iv. examine the performance of the new tool using field data collected from a number of bridge sites with a wide range of flow and sediment characteristics.

In this Phase II of the project, the Performing Agency shall conduct this research at a Technology Readiness Level (TRL) of 7.

Modification: Amend the contract to extend the termination date, revise the budget and update the project schedule due to delays in executing the agreement and additional time needed for field monitoring. The FY 2023 budget is decreased by $70,728.00 from $152,000.00 to $81,772.00. The FY 2024 budget is increased by $16,353.00 from $136,125.00 to $152,478.00. The FY 2025 budget is increased by $12,500.00 from $103,375.00 to $115,875.00. The FY 2026 budget is established at

$33,125.00. The Total Itemized Project Budget Estimate is $392,000.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$136,125.00	$108,900.00	$27,225.00
New Project Budget	$152,478.00	$121,982.40	$30,495.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7034 **University:** CTR

Project Title: Exploring the Use of Artificial Intelligence to Leverage TxDOT Data for Enhanced Corridor Management and Operations

Project Start Date: 8/1/2019 **Old Termination Date:** 8/31/2023
New Termination Date: 10/31/2023

Project Status: Continuation **Project Budget:** $608,862.28

RTI Project Manager: Joanne Steele **Researcher:** Natalia Ruiz Juri

Project Objectives: This project will develop a thorough understanding of the concrete and tangible benefits that artificial intelligence (AI) may offer to the Receiving Agency when considering the vast volumes of data currently collected and will explore emerging planning and operations applications. A twofold research approach will provide both a broad, high-level summary of the state of the art/practice in AI and its relevance to the Receiving Agency, and an in-depth analysis of one or two selected applications. The review of the state of the art will include a literature and data survey and creation of a prospectus summarizing the techniques and tools relevant to the Receiving Agency given data availability and planning/operation priorities. For the use cases, the Performing Agency will consider applications involving system performance estimation and system control using Markov and non-Markov decision processes. After completing a preliminary research phase, the Performing Agency will host a workshop for the Receiving Agency and its partners to demonstrate the explored concepts and collect feedback to inform the model application and testing. Project deliverables will include a comprehensive report, including a quantitative and qualitative evaluation of the selected use cases, and access to the datasets and code-base used in this project.

Modification: Amend the contract to update the project schedule, revise the budget and termination date to allow for additional research time for completion of the project. The FY23 Budget is decreased from $107,767.54 to $94,642.54; the FY24 Budget is established at $13,125.00; Total Project Budget Estimate will remain at $608,862.28.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$13,125.00	$10,500.00	$2,625.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7037 **University:** TTI

Project Title: Develop Models for Freight Flows and Commercial Travel Patterns within Texas Urban Regions

Project Start Date: 3/3/2020 **Old Termination Date:** 8/31/2023
New Termination Date: 8/31/2024

Project Status: Continuation **Project Budget:** $1,654,330.00

RTI Project Manager: Jade Adediwura **Researcher:** Curtis Morgan

Project Objectives: This project will use a phased work plan to develop a freight model within one or more urban areas of the state of Texas using the most current state of the practice methods and data sources. The Performing Agency shall produce a freight model through an interactive and iterative process by the Performing Agency, Receiving Agency, and Metropolitan Planning Organizations (MPO) partners using the concept of first creating a "minimum viable product" as used in commercial software development. Key initial steps to this process will be investigation of similar recent freight modeling efforts in the United States (U.S.), early identification of freight model requirements for both Receiving Agency and local/regional planning efforts, selection of the type/function of model that will address those requirements, and an assessment of data availability and of any fatal flaws that might be encountered. The Performing Agency shall then work cooperatively with the selected MPO partner to build and implement a state-of -the practice model that can be iteratively improved over time as additional data or methods emerge. Training for model users and an ongoing, web-based forum for users to share insights and questions are also part of the work plan. Reporting of results and transferability to diverse MPOs are other key features of the project.

Modification: Amend the contract to extend the termination date, revise the budget, and the Project Schedule due to delays completing Tasks 6-8. The FY 2020 budget remains $190,726.00. The FY 2021 budget remains $453,582.00. The FY 2022 budget remains $315,353.00. The FY 2023 budget is decreased by $350,004.25 from $694,669.00 to $344,664.75. The FY 2024 budget is established at $350,004.25. The Total Project Budget remains $1,654,330.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$350,004.25	$280,003.40	$70,000.85

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7088 **University:** CTR

Project Title: Develop Closure Joint Materials Specification and Evaluate Performance for Side-By-Side Accelerated Bridge Construction (ABC) Superstructure Systems

Project Start Date: 9/1/2020 **Old Termination Date:** 8/31/2023
New Termination Date: 5/31/2024

Project Status: Continuation **Project Budget:** $778,500.00
New Project Budget: $832,093.98

RTI Project Manager: Martin Dassi **Researcher:** Kevin J. Folliard

Project Objectives: The Performing Agency shall develop, investigate, and implement optimized concrete mixtures to be used in closure pour connections between precast elements in side-by-side accelerated bridge construction (ABC) superstructure systems. The Performing Agency shall:

- Involve the use of innovative materials and mixture proportions that are intended to provide high early strengths to facilitate accelerated bridge construction, while ensuring that good long-term durability is also achieved.
- Develop mixtures including rapid-setting, fiber-reinforced concrete (RSFRC) and ultra-high-performance concrete (UHPC).
- Evaluate in the laboratory (materials and full-scale structural testing) and on outdoor exposures to fully characterize the critical fresh, hardened, structural, and durability properties that are need for closure pour connections.
- Select for full-scale implementation and monitoring in ABC projects scheduled for construction in the Amarillo, Bryan, and Dallas Districts based on the findings of the literature review and laboratory/exposure site tests, candidate RSFRC and UHPC mixtures.
- Develop a suite of mixtures by developing a wide range of mixtures with varying rheological properties, strength gain characteristics, and toughness values from which the Receiving Agency may select for any given closure pour connection.

Modification: Amend the contract to extend the termination date, and revise the budget and the project schedule to facilitate the completion of large-scale structural testing, the continuation of long-term durability testing, and additional monitoring of UHPC bridges in Amarillo and Bryan Districts. The FY 2023 Budget is remains $271,355.26; the FY 2024 budget is established at $53,593.98; the Itemized Project Budget

Estimate is increased by $53,593.98 from $778,500.00 to $832,093.98.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$53,593.98	$42,875.18	$10,718.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7089 **University:** CTR

Project Title: Use of Larger Diameter Shear Studs for Composite Steel Bridges

Project Start Date: 9/1/2020 **Old Termination Date:** 8/31/2023
New Termination Date: 8/31/2024

Project Status: Continuation **Old Project Budget:** $991,199.72
New Project Budget: $1,065,724.09

RTI Project Manager: Jade Adediwura **Researcher:** Oguzhan Bayrak

Project Objectives: Efficient steel bridge girder design makes use of composite action between the concrete bridge deck and the steel girders. Shear studs welded to the girder top flange provide the critical link between the deck and girders. Satisfying AASHTO fatigue requirements normally leads to a very large number of shear studs, which makes placing partial-depth precast panels extremely difficult and results in a safety hazard for workers during erection or early construction stages. Using larger-diameter shear studs shall significantly reduce the number of studs required on composite steel girders.

Modification: Amend the contract to extend the termination date, revise the project schedule and budget to allow the completion of full-scale testing due to an unforeseen delay in Task 5 and Task 7. The FY 2021 Budget remains $269,145.46. The FY 2022 Budget remains $367,742.98. The FY 2023 Budget remains $354,311.28. The FY 2024 Budget is established at $74,524.37. The Itemized Project Budget Estimate is increased by $74,524.37 from $991,199.72 to $1,065,724.09.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$74,524.37	$59,619.50	$14,907.87

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7095 **University:** CTR/USGS

Project Title: Evaluate Improved Streamflow Measurement at TxDOT Bridges

Project Start Date: 9/1/2020 **Old Termination Date:** 8/31/2023
New Termination Date: 10/31/2023

Project Status: Continuation **Old Project Budget:** $6,459,839.00
New Project Budget: $6,602,641.36

RTI Project Manager: Jade Adediwura **Researcher:** David R. Maidment

Project Objectives: The Receiving Agency maintains 30,000 bridges, some of which have been threatened by flooding, especially during the past four years. Better information on forecast flood inundation would help anticipate bridge and road flooding; inform decisions before, during, and after flooding; and help deploy resources for bridge inspection after flooding is over. The National Weather Service began in August 2016 operating a National Water Model, continually providing real-time forecasting on 190,000 miles of Texas streams and rivers. This project shall establish and maintain a Receiving Agency Flood Monitoring Network that consists of 80 gauges—60 new gauges installed as part of this project and 20 existing gauges installed as part of a previous Receiving Agency project. The new gauges shall be located in watersheds as defined by the USGS or TWDB, selected to provide a range of observation on main stem and tributary rivers and on soil and slope conditions in Texas river and coastal basins, and shall be complementary to existing observation networks. Observational data from the gauges and flood forecast information shall be made accessible through a Receiving Agency Flood Forecast System and Operational Data Website.

Modification: Amend the contract to extend the termination date, add scope, revise the budget, and update the project schedule to complete the Streamflow II deliverables. CTR budget: The FY2021 budget remains $1,728,999.21; The FY2022 budget remains $564,944.78; The FY2023 budget remains $620,745.01; The FY2024 budget is established for $142,802.36; CTR's Total Project Budget shall increase by $142,802.36 from $2,914,689.00 to $3,057,491.36. USGS budget: The FY2021 budget remains $893,350.00; The FY2022 budget remains $1,316,800.00; The FY2023 budget is decreased by $311,814.00 from $1,334,000.00 to $1,022,186.00; The FY2024 budget is established for $311,814.00. USGS's Total Project Budget remains $3,545,150.00. The Itemized Project Budget Estimate increased by $142,802.36 from $6,459,839.00 to $6,602,641.36.

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Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
CTR Project Budget	$142,802.36	$114,241.89	$28,560.47
USGS Project Budget	$311,814.00	$249,451.20	$62,362.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7100 **University:** TTI/SFASU

Project Title: Sediment Control Approved Products List

Project Start Date: 9/1/2021 **Old Termination Date:** 8/31/2023
New Termination Date: 10/31/2023

Project Status: Continuation **Project Budget:** $293,890.57

RTI Project Manager: Shelley Pridgen **Researcher:** Jett McFalls

Project Objectives: The Environmental Protection Agency (EPA) guidance document National Management Measure to Control Nonpoint Source Pollution from Urban Areas (November 2005, EPA-841-B-05-004) requires all construction site activities to reduce the amount of sediment generated (erosion control) and reduce the off-site transport of sediment and construction-related chemicals (sediment and chemical control). While there are several pollutants of concern (oils, gasoline, degreasers, paints, etc.), sediment from construction sites is by far the largest pollutant source (Canning, 1988). Eroded sediment from construction sites causes many problems, including adverse impacts on water quality as well as decreased capacity of reservoirs and streams, resulting in possible flooding.

Sediment control devices (SCDs) are used on construction sites to retain sediment and prevent stormwater from adversely affecting adjacent waterways. SCDs include silt fences, wattles, sediment logs and basins, filter dams, and inlet protection devices. These products are designed to be installed for specific applications (curb inlets, drop inlets, perimeter protection, etc.) However, there is no scientifically sound, repeatable testing methodology that replicates field conditions to test and determine SCD performance. This project shall develop a formal testing protocol, test apparatus and propose thresholds for a performance-based sediment control device testing program that will assist the designer/engineer in selecting the most effective sediment control best management practice..

Modification: Amend the contract to revise the budget for Performing Agency 1 (TTI) and Project Schedule to allow time to collect required performance data on the sediment control devices. TTI's FY 2022 budget remains $92,167.00; the FY 2023 budget is decreased by $4,999.75 from $191,039.75 to $186,040.00; the FY 2024 budget is established at $4,999.75. TTI's Total Project Budget remains $283,206.75. Performing Agency 2's (SFASU) FY 2022 budget remains $5,341.91; the FY 2023 budget remains $5,341.91; SFASU's Total Project Budget

remains $10,683.82. The Itemized Project Budget Estimate remains 293,890.57.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
TTI's Project Budget	$4,999.75	$3,999.80	$999.95
SFASU's Project Budget	$0.00	$0.00	$0.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7123 **University:** CTR

Project Title: Define a Statewide Plan for a Sustainable Real-Time Travel Time Network for Texas Hurricane Evacuations and Safe Citizen Return

Project Start Date: 9/1/2021 **Old Termination Date:** 8/31/2023
New Termination Date: 2/29/2024

Project Status: Continuation **Project Budget:** $399,868.11

RTI Project Manager: Darrin Jensen **Researcher:** Zhanmin Zhang

Project Objectives: Hurricanes in Texas have posed considerable challenges to the evacuation of large populations and the transmission of information from the real-time traffic monitoring infrastructure. Given the societal, economic, and strategic significance of the hurricane evacuation route network, ensuring sufficient coverage and resilience against disruptions is essential. The limited available resources and the expanded network size, which includes rural areas, presents several technical and economic difficulties. To implement an effective strategy to address these issues, it is crucial for the Receiving Agency to develop a statewide plan for the sustainability and sufficiency of the evacuation network.

The Performing Agency shall provide guidance for decision-makers in assessing the needs for determining additional monitoring stations on an expanded evacuation network including major Texas cities. To do so, the Performing Agency shall assess the availability and maintainability of different resources by collecting input from multiple stakeholders and developing a prioritized list of interventions based on socioeconomic criteria. Based on the projected usage of information transfer technologies, the project shall explore and recommend alternatives for failsafe systems.

Modification: Amend the contract to extend the termination date, to revise the project schedule, and reallocate funds in the budget to allow additional time due to the recent change in Project Supervision. The FY2023 budget is decreased by $25,464.47 from $203,041.56 to $177,577.09. The FY 2024 budget is established at $25,464.47. The Total Itemized Project Budget Estimate remains $399,868.11.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$25,464.47	$20,371.58	$5,092.89

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7124 **University:** TTI

Project Title: Develop A New Tool for Evaluating Infrastructure and Planning Impacts from Changes in Truck Traffic and Truck Technologies

Project Start Date: 9/1/2021 **Old Termination Date:** 8/31/2023
New Termination Date: 12/31/2023

Project Status: Continuation **Old Project Budget:** $470,090.50
New Project Budget: $510,652.50

RTI Project Manager: Martin Dassi **Researcher:** Curtis Morgan

Project Objectives: The overall project goal shall further improve freight planning and strategy tools used in Receiving Agency Research Project 0-6984, Evaluate Potential Impacts, Impediments, and Solutions of Automated Trucks and Truck Platooning on Texas Highway Infrastructure to better assess the operational and physical impacts of freight traffic on the Texas Highway Freight Network. The Performing Agency's tool enhancements shall allow for better evaluation of specific infrastructure impacts and resiliency considerations (bridges and pavements) from new truck automation and platooning technologies, as well as changes in truck loads, all of which are expected to increase over time, thus also allowing for analysis of alternative routes. The Performing Agency shall tailor the tool to perform detailed analysis of the heavy freight corridors designated for early adoption of autonomous and platooned truck traffic in Texas, such as IH-10, IH-35, and IH-45. The Performing Agency shall build a user interface allowing input of various planning strategies and scenarios giving planners a means to identify and evaluate potential design, operational, and physical hardening modifications that can minimize any negative impacts of new trucking technologies. The tool shall incorporate real-world condition histories from pavement and bridge asset management databases to identify infrastructure vulnerabilities due to changes in freight traffic and better prioritize future roadway maintenance project selection. Additionally, the Performing Agency shall perform targeted modeling to identify best lane use options for automated and platooned trucks under a variety of operational scenarios and at varying traffic levels.

Modification: Amend the contract to add a new task and revise the budget and the Project Schedule due to Task 5 delays and the addition of Task 6. The FY 2023 budget is decreased by $19,402.00 from $283,886.50 to $264,484.50; the FY 2024 budget is established at $59,964.00; the Itemized Project Budget Estimate is increased by $40,562.00 from $470,090.50 to $510,652.50.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$59,964.00	$47,971.20	$11,992.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7127 **University:** TTI/TAMUCC

Project Title: Examine Reconnaissance Scanning of Underground Utilities in the ROW

Project Start Date: 9/21/2021 **Old Termination Date:** 8/31/2023
New Termination Date: 8/31/2024

Project Status: Continuation **Old Project Budget:** $746,899.00
New Project Budget: $1,135,880.75

RTI Project Manager: Shelley Pridgen **Researcher:** Gary Young

Project Objectives: Mapping of buried utilities using rigorous subsurface utility engineering (SUE) quality level B (QLB), as is frequently performed or recommended, can be costly. It can also be ineffective for unknown utilities (i.e., utilities that exist but for which no information is available). This is particularly common and problematic in areas of oil and gas operations. When undiscovered until construction, these unknown utilities may cause serious scheduling disruptions as well as higher construction costs, along with safety and environmental risks. There is a need for a faster, less expensive method of scanning the right of way (ROW) for these unknown utilities. This research shall evaluate, select and test the application of newly available geophysical measurement systems. These systems would allow quickly and cheaply detecting and mapping unknown pipelines or other utilities in the ROW. It compares the effectiveness and cost of deployment to standard QLB SUE and reports on technologies that are both technically and cost effective for identifying unknown utilities.

Modification: Amend the contract to extend the termination date, update the Project Schedule and Work Plan to revise Tasks 3-8 and revise the budget for the purpose of using the newly developed artificial intelligence data processing capability, gather data at new sites to complete the testing and evaluation of the technologies. TTI: The FY 2022 budget remains $364,873.75; the FY 2023 budget is decreased by $62,504.00 from $299,620.25 to $237,116.25; the FY 2024 budget is established at $401,875.75; TTI's Total Project Budget is increased by $339,371.75 from $664,494.00 to $1,003,865.75. TAMUCC: The FY 2022 budget remains $55,856.25; the FY 2023 budget remains $26,548.75; the FY 2024 budget is established at $49,610.00; TAMUCC's total Project Budget is increased by $49,610.00 from $82,405.00 to $132,015.00. The Itemized Project Budget Estimate is increased by $388,981.75 from $746,899.00 to $1,135,880.75.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
TTI Project Budget	$401,875.75	$321,500.60	$80,375.15
TAMUCC Budget	$49,610.00	$39,688.00	$9,922.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7152 **University:** TTI

Project Title: Estimating Latent Bicyclist and Pedestrian Demand for Shared Use Path Design

Project Start Date: 9/1/2022 **Old Termination Date:** 2/29/2024
New Termination Date: 12/31/2024

Project Status: Continuation **Project Budget:** $250,173.25

RTI Project Manager: Tom Schwerdt **Researcher:** Ipek Nese Sener

Project Objectives: The Receiving Agency's Roadway Design Manual was updated in July 2020 and incorporates considerations for and accommodations of bicyclists and pedestrians, including preferred design order toward Shared Use Paths (SUPs) compared to bicycle lanes and shared lanes. However, the Guidance does not include specific procedures to estimate the anticipated volumes of non-motorized path users. The Receiving Agency's Bicycle Accommodation Design Guidance makes it clear that anticipated user volumes should be considered when designing facilities.

Performing Agency shall develop a simple sketch planning-level demand estimation tool that provides anticipated user volumes for SUPs. The project shall also incorporate the results into the future editions of The Receiving Agency's design guidance/manuals. Given the uncertainty in resources, Performing Agency shall not use an overly complicated method or a method that requires complex data or data architecture. The project shall benefit from existing data sources, including The Receiving Agency's Texas Bicycle and Pedestrian Count Exchange and other count data resources in the State as well as other secondary and spatial data sources. Performing Agency shall develop an easy-to-use tool responding to the needs and requirements of the intended audience while incorporating advancements to improve the accuracy of the demand estimation..

Modification: Amend the contract to revise the budget, Work Plan to add TASK 5 and TASK 6 and Project Schedule to determine the benefit of obtaining a tool based on a model and additional data visualization. The FY 2023 budget is decreased by $67,265.00 from $187,517.00 to $120,252.00. The FY 2024 budget is increased by $49,732.00 from $62,656.25 to $112,388.25. The FY 2025 budget is established at $17,533.50. The Itemized Project Budget Estimate remains $250,173.25.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$62,656.25	$50,125.00	$12,531.25
New Project Budget	$112,388.25	$89,910.60	$22,477.65

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7154 **University:** UTSA

Project Title: Evaluate Use of 300ksi Strands for TxDOT Prestressed Girders

Project Start Date: 9/19/2022 **Termination Date:** 8/31/2025

Project Status: Continuation **Project Budget:** $849,245.00

RTI Project Manager: Martin Dassi **Researcher:** Wassim M. Ghannoum

Project Objectives: Advances in material and fabrication processes have allowed the prestressing-strand industry to increase the strength of strands from 270 ksi to 300 ksi. Several state DOTs around the nation are already considering incorporating higher strength strands into their designs. The impetus is to obtain longer bridge span lengths for a given section depth.

The main goal of this research project is to update the designs of standard Texas DOT prestress girders to incorporate 300 ksi 0.6 inch diameter strands. The main concern for upgrading to 300 ksi strands revolves around the increased spalling and bursting stresses associated with higher prestressing forces. Such increases in stresses can cause increased cracking in girders at prestress transfer. The Performing Agency will conduct tests on full-scale prestressed girders for all standard TX girder section sizes. These tests will allow the research team to hone in on optimal detailing for girders using 300 ksi strands. As a result, new designs for all TX girder sections shall be produced for 300 ksi strands. Updates to design specifications shall also be proposed to reflect research findings. The expected benefits are more economical bridges that can span longer distances for a given section depth.

Modification: Amend the contract to revise the project budget due to regulatory delays and sourcing issues which have impacted the ability to purchase the 300ksi strands needed for tests. FY23 budget is decreased by $64,047.61 from $275,253.75 to $211,206.14. FY24 budget is increased by $64,047.61 from $308,900.00 to $372,947.61. FY25 budget remains $265,091.25. The Itemized Project Budget Estimate remains $849,245.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$308.900.00	$247,120.00	$61,780.00
New Project Budget	$372,947.61	$298,358.09	$74,589.52

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7196 **University:** UTA

Project Title: Data-Driven Prioritization of Roadway Segments for Treatment during Severe Weather Events

Project Start Date: Cancelled **Termination Date:** Cancelled

Project Status: Cancelled **Project Budget:** $365,727.10

RTI Project Manager: Darrin Jenson **Researcher:** Jinzhu Yu

Project Objectives: Effective maintenance is critical to ensure mobility, equity, and safety when roadways are experiencing severe weather events. Conventional approaches for prioritizing road segments for treatment (i) are empirical, (ii) are mostly based on static data about weather, traffic, road users, and road conditions, and (iii) do not account for important mobility, equity, and safety concerns. Therefore, conventional approaches (i) can lead to suboptimal road treatment effectiveness during extreme events, (ii) fail to prioritize the mobility of vulnerable populations and first responders, and (iii) may not guarantee a desired level of safety during extreme weather. To fill these gaps, the Performing Agency shall develop a risk-informed data-driven optimization (RIDDO) framework (Fig. 1) to enhance the effectiveness of the prioritization of road segments for treatment in response to weather extremes, accompanied by case studies that transportation authorities can use to improve their future road treatment prioritization. The Performing Agency shall leverage previous efforts on the Snowplow Operations Management System and Population Vulnerability Map to develop a software tool for the prioritization of roads for treatment during extreme weather events. This project will support the big data initiative by TxDOT to explore emerging data to improve traffic mobility, equity, and safety.

Reason: TxDOT currently has internal project underway to accomplish similar concept and approach. The research is no longer needed.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$178,775.48	$143,020.38	$35,755.10
New Project Budget	$0.00	$0.00	$0.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-9050-02 **University:** TTI

Project Title: Provision of Select Computer-Aided Dispatch Data to Traffic Management Centers for Enhanced Incident Detection and Tracking

Project Start Date: 11/9/2021 **Old Termination Date:** 8/31/2023
New Termination Date: 12/31/2023

Project Status: Continuation **Project Budget:** $125,000.00

RTI Project Manager: Shelley Pridgen **Researcher:** Jeff Kaufman

Project Objectives: The Receiving Agency's Traffic Management Centers (TMCs) are responsible for monitoring freeways within their respective metropolitan areas for crashes, stalls, and other incident impacting traffic flow, contacting the appropriate responding agencies (police/fire/emergency medical services/tow), and tracking incident progress. TMC staff predominantly use Closed Circuit television (CCTV) camera feeds to find incidents, as well as volume/speed detectors on the Receiving Agency Intelligent Transportation Systems (ITS) map, and the traffic layer on Google Maps. While these methods help to some degree, they are not always effective or efficient. CCTV tours (which show 5-10 second feeds of a freeway segment) can miss an incident if the camera is pointing in a different direction. TMC staff focusing on one freeway may miss an event on another freeway. Google traffic indicators only show the level of traffic but not incidents that caused the traffic. Often, those involved in incidents immediately contact 9-1-1 for assistance. The Performing Agency shall develop a system that collects essential incident management information from 9-1-1 systems and transmits said information to regional TMCs to speed up the identification and response to an incident, and collect needed incident management data to better assess incident management programs in the region.

Modification: Amend the contract to extend the contract and to revise the budget and project schedule due to delays in developing an Interlocal Agreement between the Receiving Agency and participating law enforcement entities, and subsequently, additional delays in the law enforcement recruiting process between the Receiving Agency and local law enforcement agencies. Additional time is needed to solidify agreements with law enforcement agencies to participate in the data provision. The FY 2023 budget is decreased by $18,640.00 from $92,365.00 to $73,725.00; the FY 2024 budget is established at $18,640.00; the Itemized Project Budget Estimate remains $125,000.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$18,640.00	$14,912.00	$3,728.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 9-1531 **University:** TTI

Project Title: Development and Evaluation of Roadside Safety Systems for Motorcyclists

Project Start Date: 9/1/2021 **Termination Date:** 8/31/2024

Project Status: Continuation **Project Budget:** $780,000.00

RTI Project Manager: Chris Glancy **Researcher:** Chiara Silvestri Dobrovolny

Project Objectives: This pooled fund study shall provide a cooperative approach to conducting research addressing roadside safety issues specifically related to improving motorcyclist safety. The study shall provide participating states an opportunity to collaborate on best practices, new regulatory issues, risk management strategies, and other research pertaining to roadside safety improvements for motorcyclists. The research activities shall include the identification, development, and evaluation of strategies and devices for mitigating the frequency and severity of roadway departure motorcyclist crashes.

Modification: Amend the contract to contract to revise the budget and update project schedule to modify Deliverables R2 to R2A and R2B. The FY 2022 budget remains $72,654.25; the FY 2023 budget is decreased by $121,028.50 from $413,287.50 to $292,259.00; the FY 2024 budget is increased by $121,028.50 from $294,058.25 to $415,086.75; the Total Project Budget remains at $780,000.00.

Financials:	FY '24 Budget	100% Federal
Old Budget	$294,058.25	$294,058.25
New Budget	$415,086.75	$415,086.75

*Non-Federal Match provided by Transportation Development Credits (TDCs)

FY 2024 AASHTO Technical Service Program's (TSP's)		
ITEM	**SPR Part (B) 100%**	**Non-SPR Funds**
Design Guidelines	$ 15,000.00	
Enviromental Management	$ 10,000.00	
Equipment Management	$ 5,000.00	
Innovation Management	$ 6,000.00	
Material Guidelines	$ 10,000.00	
Technical Service Program	$ 15,000.00	
Operations Technical Services Program	$ 15,000.00	
Performance Management	$ 15,000.00	
Preservation Management	$ 20,000.00	
Product Evaluation and Audit Solutions	$ 25,000.00	
Rail Management	$ 5,000.00	
Re:source	$ 22,000.00	
Resilience and Sustainablitly Mangement	$ 10,000.00	
Safety Management	$ 10,000.00	
Safety Hardware Management	$ 10,000.00	
STEM Outreach Solutions		$ 14,000.00
Structures Guidelines	$ 15,000.00	
Technical Training Solutions	$ 20,000.00	
Transit Management	$ 5,000.00	
Winter Weather Management	$ 4,000.00	
Total:	**$ 237,000.00**	**$ 14,000.00**

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Project Number: 0-7181 **University:** UH

Project Title: Development of Digital Twins for Texas Bridges

Project Start Date: 9/1/2023 **Termination Date:** 8/31/2026

Project Status: Continuation **Project Budget:** $505,286.00

RTI Project Manager: Wade Odell **Researcher:** Vedhus Hoskere

Project Objectives: Bridges are a critical component of transportation infrastructure, providing safe and efficient travel for millions of people every day. However, bridge maintenance can be complex and expensive, and it is challenging to detect problems early before they become more significant and costly to repair. Digital twins offer a solution to this challenge, providing a comprehensive and efficient means of obtaining, integrating, processing, and storing high-fidelity information about the current geometry and condition of a bridge. Developing digital twins of Texas bridges is a significant undertaking, as it requires collecting and integrating data from multiple sources, including sensors and unmanned aerial systems (UASs). Moreover, the resulting data must be complete and usable without overtaxing existing computer systems at TxDOT, which presents challenges related to data compression and redundancy. To address these challenges, this research proposes an outcome-based framework for the development of digital twins of TxDOT bridges. This framework will be extensively validated across real-world conditions through data collection and digital twin construction efforts from 30 (or as many as requested and agreed to) TxDOT bridges. The resulting guidelines and procedures will provide a means for comprehensively and efficiently collecting, integrating, processing, and storing geo-referenced, multi-sensor, and high-fidelity information about the current geometry and condition of a bridge. To enable early identification of bridge maintenance needs, the researchers will investigate and assess feasibility and requirements for aligning multi-temporal models and detecting and quantifying changes over time both with manual observation and automatically. The prototype routines for alignment and change detection developed will be integrated into the digital twinning framework for direct use by TxDOT. Additionally, the performing agency will prepare and test training materials to teach project managers, maintenance supervisors, and other personnel on field collection and planning of 3D data, digital twin development, and data processing and modeling. These training materials will include operational recommendations and guidance on data collection plans, reviews and approval, and safety. The proposed research will provide a clear path for the digital transformation and integration of TxDOT bridge inspections, design, and maintenance activities, enabling more

scientific decision-making and bridge management practices with broad impacts to TxDOT operations.

Modification: Update for FY24 budget which increased by $5,747.00 from $184,489.00 to $190,236.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$184,489.00	$147,591.20	$36,897.80
New Project Budget	$190,236.00	$152,188.80	$38,047.20

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7194 **University:** UTSA/TARL

Project Title: Evaluating the Risks that Erosion Control Products Pose to Protected Species and Other Wildlife

Project Start Date: TBD **Termination Date:** 8/31/2025

Project Status: New **Project Budget:** $310,621.25

RTI Project Manager: Katelyn Kasberg **Researcher:** Heather Mathewson

Project Objectives: Although many erosion control products (ECPs) are marketed as wildlife friendly, few assessments of the risk of such products to wildlife exist. Current knowledge focuses primarily on reptiles, specifically snakes, thus, the effects on other species such as terrestrial arthropods, mammals, or birds remains unknown. This research would provide evaluations on wildlife friendly ECPs from the Approved Product List (APL) based on their risk of wildlife entanglement. Our objectives are to (1) determine entanglement potential for different sizes and categories of animals in different products on APL, (2) evaluate the temporal window in which an erosion control blanket poses a risk to wildlife entanglement from pre-vegetative growth through post-vegetative growth, (3) determine which types of materials pose greater and lesser risk to protected species and other wildlife, (4) determine if weaving type or mesh size impacts entanglement, and (5) identify which products contain non-biodegradable materials. We shall address these objectives through the integration of wildlife camera trapping, surveys of construction workers for observational data, and controlled field experiments. We shall cross-reference species of concern within TxDOT districts with our study results, to produce a region-specific list of rankings of ECPs and risk to wildlife specific to each district's ecological region.

Modification: Update to include UTSA FY24 budget.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
NEW: UTSA Project Budget	$34,723.75	$27,779.00	$6.944.75
TARL Project Budget	$129,820.00	$103,856.00	$25,964.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-6048-07 **University:** CTR

Project Title: Implementation of Centrifuge Technology for Pavement Design on Expansive Clays – Phase 2

Project Start Date: TBD **Termination Date:** 8/31/2026

Project Status: New **Project Budget:** $939,433.17

RTI Project Manager: Darrin Jensen **Researcher:** Jorge G. Zornberg

Project Objectives: The Receiving Agency Pavement Manual establishes thresholds of the Potential Vertical Rise (PVR) that shall not be exceeded in the design of roads founded on expansive clays (e.g., a maximum allowable PVR of 1.5 in. for main lanes). Using the PVR as an index, these thresholds have been established from field empirical evidence collected over decades to identify roads with excessive levels of distress triggered by the presence of expansive clays. However, there are two significant sources of uncertainty in the thresholds adopted by the Pavement Manual, which have heavily compromised roadway designs: (1) Inaccuracies in the determination of the PVR, the original version of which relies heavily on outdated data and correlations, and (2) Inconsistencies in the documentation of the levels of distress typical of roadways founded on expansive clays. The Receiving Agency developed both the technology for accurate determination of PVR and adequate protocols for roadway performance over expansive clays. The primary objective of this implementation project is to generate accurately determined PVR data and calibrate it against consistently obtained levels of roadway distress.

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Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$294,139.19	$235,311.35	$58,827.84

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-9905-24 **University:** CTR

Project Title: Innovation Consortium (TTTF, TxSTIC, EDC)

Project Start Date: TBD **Termination Date:** 8/31/2025

Project Status: New **Old Project Budget:** $2,000,000.00
New Project Budget: $998,124.00

RTI Project Manager: Lauren Freriks **Researcher:** Kristie Chin

Project Objectives: The Texas Department of Transportation (TxDOT) needs support to manage the Innovation Consortiums – projects or programs that facilitate collaboration, dissemination, and development of innovative transportation technologies and practices. The Innovation Consortiums include three previous standalone programs: Texas Technology Task Force (TTTF), the Texas State Transportation Innovation Council (TxSTIC), and the Everyday Counts (EDC) program. Closer coordination of these programs will further help to accomplish each programs individual goals.

The TTTF, authorized by Texas's 83rd Legislature General Appropriations Bill, S.B. No. 1, Item 44, VII-31, was established in 2013 to enhance its vision for the future of Texas's transportation systems. The TTTF began with a core knowledge group of transportation experts and has grown into a successful program that is responsible for managing the Emerging Technology Portfolio, publishing white papers on critical topics, delivering strategic plans such as the Technology Utilization Plan, developing communication strategies, and conducting TTTF meetings with in-depth technical analysis.

The TxSTIC was the 51st STIC established on the 22nd of March 2016, by the STIC State of Texas Charter and renewed the 20th of November 2019. The TxSTIC was established to foster a collaborative culture for the rapid implementation of ready to deploy and beneficial innovations and technologies among stakeholders to efficiently deliver a safe and effective transportation system to the State of Texas.

Everyday Counts (EDC) is a Federal Highway Administration (FHWA) initiative to advance a culture of innovation in the transportation community. FHWA works with State transportation departments, local governments, tribes, private industry, and other stakeholders to identify a new collection of innovations to champion every two years that merit accelerated deployment.

The TTTF, TxSTIC and EDC program, together serve as a catalyst for rapid deployment of nationally and state identified new technologies, strategies, and methods that have already been demonstrated to be successful in real world applications and would lead to improved performance and effectiveness of the transportation system within the State of Texas..

Modification: Update to Project Budget and FY24 budget. FY24 budget decreased from by $136,629.00 from $631,257.00 to $494,628.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$631,257.00	$505,005.60	$126,251.40
New Project Budget	$494,628.00	$395,702.40	$98,925.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 9-1532 **University:** CTR

Project Title: TPF-5(508) Concrete Bridge Engineering Institute (CBEI)

Project Start Date: 6/21/2023 **Termination Date:** 5/31/2027

Project Status: Continuation **Project Budget:** $2,917,900.00

RTI Project Manager: Joanne Steele **Researcher:** Oguzhan Bayrak

Project Objectives: The objective of TPF-5(508) Concrete Bridge Engineering Institute (CBEI) Transportation Pooled Fund (TPF) is to create a national resource for innovative workforce development programs and implementation of new technologies in the field of concrete bridges, establishing a consortium of member states. CBEI shall be the center of concrete bridge related research, education, and training at the Performing Agency, the University of Texas at Austin in the Cockrell School of Engineering.

The Performing Agency shall work with bridge stakeholders (primarily state and federal transportation agencies) and seek input from industry groups representing the concrete bridge community to develop pioneering, practical, and effective programs that will have national impact with the goal of addressing issues encountered in concrete bridges and implementing plans to work toward ensuring resiliency expectations for concrete bridges. The Performing Agency's specific objectives are to develop and implement the following services with coordinated input from members of the pooled fund:

- Three training programs which will include both classroom and hands-on training
  - Concrete Bridge Deck Construction Inspection Program
  - Concrete Materials for Bridges Program
  - Post-tensioning (PT) Laboratory
- The Concrete Solutions Center
- The Bridge Component Collection
- The Technology Development Program

The Performing Agency shall also implement the components of the Concrete Solutions Center comprised of workshops, seminars, and project technical support. The Performing Agency shall develop and administer the Technology Development Program for the evaluation and implementation of new and emerging technologies in the field of concrete bridges.

Modification: Revise the budget to move funds for the subcontractor for Task 4, Site Preparation. The FY2023 budget is decreased by $34,246.25 from $222,841.25 to $188,595.00; the FY2024 budget is increased by $34,246.25 from $1,009,426.31 to $1,043,672.56; the FY2025 budget remains $885,822.70; the FY2026 budget remains $522,507.25; the FY2027 budget remains $277,302.49; the Itemized Project Budget Estimate remains $2,917,900.00.

Financials:	FY '24 Budget	100% Federal
Old Project Budget	$1,009,426.31	$1,009,426.31
New Project Budget	$1,043,672.56	$1,043,672.56

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Table of Contents

Project Number: 9-1532 **University:** CTR

Project Title: TPF-5(508) Concrete Bridge Engineering Institute (CBEI)

Project Start Date: 6/21/2023 **Termination Date:** 5/31/2027

Project Status: Continuation **Project Budget:** $2,917,900.00

RTI Project Manager: Joanne Steele **Researcher:** Oguzhan Bayrak

Project Objectives: The objective of TPF-5(508) Concrete Bridge Engineering Institute (CBEI) Transportation Pooled Fund (TPF) is to create a national resource for innovative workforce development programs and implementation of new technologies in the field of concrete bridges, establishing a consortium of member states. CBEI shall be the center of concrete bridge related research, education, and training at the Performing Agency, the University of Texas at Austin in the Cockrell School of Engineering.

The Performing Agency shall work with bridge stakeholders (primarily state and federal transportation agencies) and seek input from industry groups representing the concrete bridge community to develop pioneering, practical, and effective programs that will have national impact with the goal of addressing issues encountered in concrete bridges and implementing plans to work toward ensuring resiliency expectations for concrete bridges. The Performing Agency's specific objectives are to develop and implement the following services with coordinated input from members of the pooled fund:

- Three training programs which will include both classroom and hands-on training
  - Concrete Bridge Deck Construction Inspection Program
  - Concrete Materials for Bridges Program
  - Post-tensioning (PT) Laboratory
- The Concrete Solutions Center
- The Bridge Component Collection
- The Technology Development Program

The Performing Agency shall also implement the components of the Concrete Solutions Center comprised of workshops, seminars, and project technical support. The Performing Agency shall develop and administer the Technology Development Program for the evaluation and implementation of new and emerging technologies in the field of concrete bridges.

Modification: Update to FY23 & FY24 budgets. The FY2023 budget is decreased by $6,250.00 from $188,595.00 to $182,345.00; the FY2024 budget is increased by $6,250.00 from $1,043,672.56 to $1,049,922.56.

Financials:	FY '24 Budget	100% Federal
Old Project Budget	$1,009,426.31	$1,009,426.31
New Project Budget	$1,043,672.56	$1,043,672.56

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 8-8545

Study Number: Pending

Project Title: Western Transportation Research Consortium

Lead Agency: Utah Department of Transportation

Status: (Solicitation 1599)

Project Objectives: Address high priority transportation research topics of common interest and for which expertise exists in these states.

Financials:	Year	Commitment
TxDOT	2024	$15,000

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Project Number: 0-6701-02 **University:** TTI

Project Title: Planning and Environmental Linkages Toolkit

Project Start Date: 3/3/2023 **Termination Date:** 8/31/2024

Project Status: Continuation **Project Budget:** $388,735.50

RTI Project Manager: Wade Odell **Old Researcher:** Jolanda Prozzi
New Researcher: Tina Geiselbrecht

Project Objectives: The Receiving Agency funded research project 0-6701 in FY 2012 to investigate potential methods of linking transportation planning in Texas with the environmental clearance process required of the National Environmental Policy Act (NEPA). The study approach and findings were documented in a guidance document entitled Texas Department of Transportation (TxDOT) Resource for Linking Planning with Project Planning in Support of NEPA (0-6701-P1). The research that produced 0-6701-P1 was developed a decade ago prior to the Receiving Agency's participation in the NEPA Assignment program under 23 U.S.C. 327 and the Memorandum of Understanding with FHWA.

In early FY2022, the Performing Agency renewed this effort in 0-6701-01 by conducting structured interviews with the Receiving Agency's planning and environmental subject matter experts, five of the state's Metropolitan Planning Organizations (MPOs), and five state Departments of Transportation (DOTs) that pioneered Planning and Environmental Linkages (PEL) to determine the need for updated/new PEL guidance.

The structured interviews conducted in 0-6701-01 revealed the need for updated/additional PEL guidance. In 0-6701-02 the Performing Agency shall develop a user-friendly PEL Toolkit that the Receiving Agency's Divisions and District staff, as well as transportation partners can reference when using PELs in the state of Texas.

Modification: Amend the contract to change the Principal Investigator due to the departure of the Principal Investigator.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$226,443.00	$181,154.40	$45,288.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7184 **University:** UTA

Project Title: Develop an Interactive Unit Price Estimation and Visualization Tool

Project Start Date: 9/1/2023 **Termination Date:** 8/31/2025

Project Status: Continuation **Project Budget:** $199,997.00

RTI Project Manager: Joanne Steele **Researcher:** Mohsen Shahandashti

Project Objectives: The unit prices could be significantly different for various Receiving Agency's districts considering several factors (e.g., soil conditions, weather conditions, urban vs. rural conditions, regional construction market conditions) impacting construction costs in these districts. The objectives of this project are to (1) conduct an overview analysis of factors affecting unit prices, (2) identify factors affecting unit prices in Texas, (3) create a unit price estimation database, (4) create a geospatial statistical unit price estimation model considering the factors affecting unit prices, the interactions between factors, and the factors' spatial variability, (5) develop the GIS-based visualization tool with color-coded map, and automatic data updating function, and (6) implement, demonstrate, and validate the interactive unit price estimation and GIS-based visualization tool on five ongoing Receiving Agency's projects (located in 5 different districts in North, South, East, West, and Center of Texas) to cover for different project-specific factors (e.g., urban vs. rural conditions, geotechnical site conditions, weather conditions) and external factors (e.g., regional construction market conditions). The deliverables shall provide the Receiving Agency with implementation details of the interactive unit price estimation and visualization tool, enabling their workforce to quickly and accurately estimate unit prices based on the estimation and visualization tool.

Modification: Amend the contract to revise the budget and the Project Schedule to correct the fiscal years indicated. The FY 2023 budget is decreased by $99,605.50 from $99,605.50 to $0.00 and deleted in its entirety. The FY 2024 budget is decreased by $786.00 from $100,391.50 to $99,605.50. An FY 2025 budget is established at $100,391.50. The Itemized Project Budget estimate remains $199,997.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$100,391.50	$80,313.20	$20,078.30
New Project Budget	$99,605.50	$79,684.40	$19,921.10

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7157 **University:** TTI/TAMUCC

Project Title: Develop Guidelines for Integration of UAS LiDAR and Photogrammetry to Enhance Land Surveying Capabilities

Project Start Date: 9/1/2022 **Termination Date:** 8/31/2024

Project Status: Continuation **Old Project Budget:** $499,992.00
New Project Budget: $543,334.00

RTI Project Manager: Chris Glancy **Researcher:** Michael Starek

Project Objectives: Unmanned aircraft systems (UASs) equipped with digital cameras, light detection and ranging (LiDAR) sensors, or both enable the collection of high spatial resolution three-dimensional (3D) quantitative geospatial data. This data may be used to support a variety of surveying and mapping activities, potentially with lower costs and greater safety than traditional survey methods. When using a camera, the technique is called Structure-from-Motion photogrammetry or UAS-SfM. In practice, there are important differences between UAS-SfM and UAS-LiDAR including measurement fidelity, operational considerations, post-processing workflows, and cost-effectiveness. With a lack of clear guidance on when UAS-SfM versus UAS-LiDAR is the best fit for a specific task, there is a need to evaluate the real-world performance capabilities and limitations of both technologies..

Modification: Amend the contract to revise the budget due to the additional field sites being added to survey and additional evaluation of georeferencing solutions, trajectory processing and integration of 3D data products into Bentley compatible data formats for digital delivery initiative, to extend licenses for processing of data and to continue funding the current research assistant that aids with data processing. TTI: The FY 2024 budget is increased by $43,342.00 from $133,426.00 to $176,768.00. Total Project Budget is increased by $43,342.00 from $320,776.50 to $364,118.50. TAMUCC's budget remains the same at $179,215.50. The Itemized Project Budget Estimate is increased by $43,342.00 from $499,992.00 to $543,334.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
TTI's Old Project Budget	$133,426.00	$106,740.80	$26,685.20
TTI's New Project Budget	$176,768.00	$141,414.40	$35,353.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-9908-22 **University:** TTI

Project Title: Planning Innovation and Technology Deployments at TxDOT

Project Start Date: 3/10/2022 **Old Termination Date:** 12/31/2023
New Termination Date: 3/9/2024

Project Status: Active **Total Project Budget:** $3,152,815.00

RTI Project Manager: Shelly Pridgen **Researcher:** Bob Brydia

Project Objectives: From time to time, TxDOT districts produce ITS and other technology innovations that improve roadway and/or worker safety, roadway efficiency and/or produce cost savings. By failing to recognize and scale these innovations across the state, TxDOT does not receive the full benefit of 25 diverse centers of excellence. This contract utilizes TTI, which is an organization that excels at innovation in and of itself, to investigate innovative district practices and to develop plans at a district and statewide level to share and scale innovation across the state. By harvesting the knowledge already contained within TxDOT, new avenues will open to improve roadway safety, efficiency and produce cost savings. Due to the breadth of TxDOT, these innovations may have very large impacts on the millions of Texans across the state and their visitors. Additionally, by cataloging and bringing together these innovations, divisions and districts can work together to make sure that solutions are developed in such a way that unified systems and interoperability occur throughout the state. This project also complements a wider effort to catalog, share and grow innovation at TxDOT. The end result for Planning for Innovation and Technology Deployments at TxDOT is a programmatic set of documents that compile and recommend innovative ITS and advanced technology roadway projects and system improvements that TxDOT districts can execute, customized to each district. To arrive at this, the consultant team will interact with districts and industry professionals as unique stakeholders across the state and the nation to compile insights of innovative projects that may include data analysis, operational improvements or deployment of advanced technologies along the roadway, among others. The consultant team will develop high level scope and cost estimates for each offered transportation project. The consultant may also be directed to develop a strategy blueprint (goal, purpose, scope, timeline, responsibilities) for how innovation and technology deployment can be progressed as an integral part of the Receiving Agency's functions and to develop evaluation plans and/or templates for Department innovation and technology deployment projects.

Modification: Amend the contract to extend the termination date, revise the deliverables schedule and revise the budget to redistribute funds among the tasks and remove administrative scope that because unnecessary as the project progressed.

Financials:	FY24 Total Budget	80% Federal	20% Estimated TDCs*
Project Budget	$ 481,339.00	$385,071.20	$96,267.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number:	5-9905-24	**University:**	CTR
Project Title:	Innovation Consortium (TTTF, TxSTIC)		
Project Start Date:	9/1/2023	**Termination Date:**	8/31/2025
Project Status:	Active	**Project Budget:**	$998,124.00
Project Manager:	Lauren Freriks	**Researcher:**	Bob Brydia

Project Objectives: The Texas Department of Transportation (TxDOT) needs support to manage the Innovation Consortiums – projects or programs that facilitate collaboration, dissemination, and development of innovative transportation technologies and practices. The Innovation Consortiums include two previous standalone programs: Texas Technology Task Force (TTTF) and the Texas State Transportation Innovation Council (TxSTIC). Closer coordination of these programs will further help to accomplish each programs individual goals.

The TTTF, authorized by Texas's 83rd Legislature General Appropriations Bill, S.B. No. 1, Item 44, VII-31, was established in 2013 to enhance its vision for the future of Texas's transportation systems. The TTTF began with a core knowledge group of transportation experts and has grown into a successful program that is responsible for managing the Emerging Technology Portfolio, publishing white papers on critical topics, delivering strategic plans such as the Technology Utilization Plan, developing communication strategies, and conducting TTTF meetings with in-depth technical analysis.

The TxSTIC was the 51st STIC established on the 22nd of March 2016, by the STIC State of Texas Charter and renewed the 20th of November 2019. The TxSTIC was established to foster a collaborative culture for the rapid implementation of ready to deploy and beneficial innovations and technologies among stakeholders to efficiently deliver a safe and effective transportation system to the State of Texas.

The TTTF and TxSTIC programs, together serve as a catalyst for rapid deployment of nationally and state identified new technologies, strategies, and methods that have already been demonstrated to be successful in real world applications and would lead to improved performance and effectiveness of the transportation system within the State of Texas.

Modification: Contract was executed without the Everyday Counts (EDC) scope or budget. The decision was made that the Everyday Counts program would be better managed under a separate contract. Project title also revised to remove reference to EDC.

Financials:	FY24 Total Budget	80% Federal	20% Estimated TDCs*
Project Budget	$494,628.00	$395,702.40	$98,925.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Grant: TX-2023 STIC Incentive Program

Project No.: 5-9056-01

Project Title: Improving Emergency Response to Roadway Incidents Using Traffic Speed Deviation Alerts from Crowdsourced Data

Project Start Date: TBD **Project End Date:** 8/31/2025

Project Status: Pending **Project Budget:** $125,000.00

TxDOT Project Manager: Shelley Pridgen **Vendor:** NCTCOG

Description: The goal of the project is for NCT9-1-1 and its client agencies to be the first in the country to improve emergency response to roadway incidents by giving them alerts of traffic speed deviations that may signal roadway incidents that will require emergency response. As part of the Project, NCT9-1-1 will customize the existing traffic speed deviation alert tool to provide 9-1-1 centers notice of traffic speed anomalies in a manner that is helpful to them and will improve emergency response to roadway incidents. NCT9-1-1 will document in training materials the tool it develops for use by 9-1-1 centers and other emergency response agencies throughout the state and nation. NCT9-1-1 will actively engage in national outreach through the EDC Program and other venues to expand the usage of this tool from the Dallas-Fort Worth region to the rest of the US.

Financials:	Budget	80% Federal	20% Estimated TDCs*
Project Budget	$125,000.00	$100,000.00	$25,000.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Grant: AID Grant – 2021 Accelerated Innovation Deployment Demonstration

Project No.: TBD

Project Title: Traffic Speed Deflection Devices Project

Project Start Date: TBD **Project End Date:** 12/31/2027

Project Status: Pending **Project Budget:** $1,250,000.00

TxDOT Project Manager: Jenny Li **Vendor:** MNT Division

Description: TxDOT will deploy Traffic Speed Deflection Device technology in select TxDOT districts to collect data on the structural condition of pavements using a non-contact doppler laser without the need for traffic control. Data collected as part of the project is expected to improve TxDOT's annual treatment planning program.

Financials:	Budget	80% Federal	20% Estimated TDCs*
Project Budget	$1,250,000.00	$1,000,000.00	$250,000.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7108 **University:** UTEP

Project Title: Evaluate the Importance of Fine Aggregates in Achieving Adequate Skid Resistance in TxDOT Hot Mix Asphalt Mixtures

Project Start Date: 9/1/2021 **Termination Date:** 8/31/2024

Project Status: Continuation **Old Project Budget:** $477,000.00
New Project Budget: $515,000.00

RTI Project Manager: Tom Schwerdt **Researcher:** Imad Abdallah

Project Objectives: The lack of skid resistance has been an important issue for Receiving Agency pavement as many of them cannot hold adequate skid resistance in the long run, and even some newly constructed roads are observed to have poor skid resistance. Skid resistance is a function of the quality of the aggregate as well as the micro-and macro-texture of the surface. Those textures can be modified by using the appropriate type and amount of fine aggregates and fines in asphalt concrete. The main focus of the research is understanding the effects of fine aggregates and fines on the skid resistance of asphalt concrete since their impacts on the skid resistance and performance.

The Performing Agency shall evaluate the current practices and research studies commissioned by Receiving Agency (in particular) and other states (in general) on the use of fine aggregates and fines in asphalt concrete to improve skid resistance. The major objective of this project shall be critical to evaluate the influence of fine aggregates and high-quality fines on the skid resistance of asphalt concrete.

Modification: Amend the contract to revise the project team, the budget, the Project Schedule, and the Work Plan to perform research of additional mix design types. The FY22 Budget remains at $153,500.00; the FY23 Budget remains at 159,500.00; the FY24 Budget is increased by $38,000.00 from $164,000.00 to $202,000.00; the Total Project Budget is increased by $38,000.00 from $477,000.00 to $515,000.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$164,000.00	$131,200.00	$32,800.00
New Project Budget	$202,000.00	$161,600.00	$40,400.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7132 **University:** TTI-UTEP

Project Title: Quantify the Real Impact of Transportation Activity on Regional Ozone and Near-Road PM Concentrations

Project Start Date: 9/7/2021 **Old Termination Date:** 7/31/2024
New Termination Date: 8/31/2024

Project Status: Continuation **Total Project Budget:** $537,321.00

RTI Project Manager: Wade Odell **Old Researcher:** Jolanda Prozzi
New Researcher: Bumsik Kim

Project Objectives: The Receiving Agency and its partner agencies are required to comply with the requirements of the transportation conformity requirement. Transportation conformity is an emissions control-centric process built on the assumption that that reducing emissions from transportation activities would lead to better air quality. However, the air quality observations collected since the onset of the COVID-19 pandemic shows ambient ozone and particulate matter of less than 2.5 micrometer in aerodynamic diameter (PM2.5), concentrations have a mixed response to the significant changes in traffic activities and emissions. This trend has raised questions regarding the extent of the transportation's impacts on air quality. This study will bridge the gap in the understanding of the actual extent of transportation activities' impacts on regional and near-road air quality. The Performing Agency shall study three major activities for selected case study areas:

- Analysis of before- and during-pandemic traffic activity and air quality monitoring data.
- Evaluate the performance of air dispersion modeling in capturing the changes of near-road PM2.5 concentrations in near-road environment resulting from traffic activity variations.
- Evaluate the performance of photochemical modeling in capturing the changes of regional ozone in response to changes of traffic activities.

The study will also result in a characterization of COVID-19 restrictions' impacts on traffic activities and air quality..

Modification: Amend the contract to replace the Principal Investigator and to revise the termination date and the project schedule to allow for additional time to model and analyze vital elements in Task 6, Regional Ozone Modeling and Analysis, and Task 7, Near-Road PM Modeling and Analysis, due to the departure of the Principal Investigator.

Financials:	FY24 Total Budget	80% Federal	20% Estimated TDCs*
TTI Project Budget	$92,433.00	$73,946.40	$18,486.60
UTEP Project Budget	$25,016.25	$20,013.00	$5,003.25

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-7007-01 **University:** CTR

Project Title: Weather Responsive Management Strategies Implementation

Project Start Date: TBD **Termination Date:** 8/31/2025

Project Status: New **Project Budget:** $467,045.35

RTI Project Manager: Darrin Jensen **Researcher:** Chandra Bhat

Project Objectives: Receiving Agency personnel who work in responding to extreme weather can greatly benefit from the ability to monitor live activities and analyze recent treatment progress. Handwritten brine logs can be supplemented with automated recordkeeping. Sensing of winter operations (WinterOps) such as plowing, brine spraying, and gravel spreading is accomplished through the use of the GPS fleet tracking system already equipped in all Receiving Agency vehicles, along with the installation of a few low-cost items. WinterOps activities are then tracked without any special interaction required from the driver or operations personnel. Integration of visualizations with GIS systems provide powerful ways to use the collected data for improving safety, operations, and public communications.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$231,772.07	$185,417.66	$46,354.41

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7145 **University:** TTI-CTR

Project Title: Develop Rapid New Tests for Detecting Poor Quality Binders and RAP Materials

Project Start Date: 9/1/2022 **Old Termination Date:** 10/31/2024
New Termination Date: 8/31/2025

Project Status: Continuation **Old Project Budget:** $635,610.78
New Project Budget: $1,054,240.28

RTI Project Manager: Joanne Steele **Researcher:** Fujie Zhou

Project Objectives: Asphalt binders are one of the most expensive and critical materials used in the construction of the roadways in Texas, costing taxpayers hundreds of millions of dollars annually. It has been widely recognized that asphalt binders with the same performance grade (PG) can perform very differently due to changes in crude source, refining processes used, modification technique, and other factors. Several districts recently reported early cracking issues with some mixes which had historically performed well, while other districts had mix design and quality assurance (QA) problems when the binder source was switched and/or a different recycled asphalt pavement (RAP) stockpile was used. Thus, the objective of this project is to develop rapid new tests for detecting poor quality binders and RAP materials. To achieve this objective, the Performing Agencies shall review the literature to identify candidate tests that can be used for screening binders and RAP materials. The Performing Agencies shall further refine the most promising tests using laboratory mixture performance tests as a benchmark. The Performing Agencies shall also provide a standard test method and specification limit for each of the final test methods.

Modification: Amend the contract to extend the termination date, revise the budget, the Work Plan, and the Project Schedule to purchase a portable Gas Chromatography Mass Spectrometry (GCMS) and to conduct laboratory evaluations. TTI Budget: The FY 2023 Budget remains $174,880.50; the FY 2024 Budget is increased by $228,630.00 from $178,822.00 to $407,452.00; the FY 2025 Budget is increased by $134,999.50 from $18,355.50 to $153,355.00; TTI's Total Project Budget is increased by $363,629.50 from $372,058.00 to $735,687.50. CTR Budget: The FY 2023 Budget remains $121,620.28; The FY 2024 Budget is decreased by $34,999.99 from $137,034.57 to $102,034.58. The FY 2025 Budget is increased by $90,000.00 from $4,897.92 to $94,897.92. CTR's Total Project Budget is increased by $55,000.00 from $263,552.77 to $318,552.78. The Itemized Project Budget Estimate is increased by $418,629.50 from $635,610.77 to $1,054,240.28.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
TTI Old Project Budget	$178,822.00	$143,057.60	$35,764.40
TTI New Project Budget	$407,452.00	$325,961.60	$81,490.40
CTR Old Project Budget	$137,034.57	$109,627.66	$27,406.91
CTR New Project Budget	$102,034.58	$81,627.66	$20,406.93

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-7025-01 **University:** TTI

Project Title: Pilot Implementation of Surface Aggregate Classification of Reclaimed Asphalt Pavement

Project Start Date: TBD **Termination Date:** 8/31/2027

Project Status: New **Project Budget:** $660,716.00

RTI Project Manager: Darrin Jensen **Researcher:** Fujie Zhou

Project Objectives: The Performing Agency shall assist the Receiving Agency with implementing the surface aggregate classification (SAC) for reclaimed asphalt pavement (RAP) developed in research project 0-7025, Develop Surface Aggregate Classification of Reclaimed Asphalt Pavement. The Performing Agency shall implement and verify the methodology of SAC-A RAP classification in a minimum of four (4) Receiving Agency Districts. In each selected Receiving Agency District, the Performing Agency shall work with lab and pavement engineers and their staff to characterize the RAP in terms of SAC, design surface mixtures with the RAP, evaluate the friction and skid resistance of mixtures, and construct and monitor the selected test sections in each Receiving Agency District. The Performing Agency shall then use the data generated in these test sections to develop and teach implementation workshops for Receiving Agency Districts.

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Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$131,549.00	$105,239.20	$26,309.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7171 **University:** TTI-TXST

Project Title: Barrier Striping for the Reduction of Accidents

Project Start Date: 9/1/2023 **Termination Date:** 11/30/2024

Project Status: Continuing **Old Project Budget:** $241,942.50
New Project Budget: $288,679.00

RTI Project Manager: Katelyn Kasberg **Researcher:** Boniphace Kutela

Project Objectives: The Traffic Safety Division (TRF) of the Receiving Agency drafted a special specification (SS) for the vertical application of a retroreflective solid stripe on concrete barriers, approximately six (6) inches below the barrier's top. During the phase of new product approval, this SS describes an application similar to three (3) locations already installed on Texas roadways in previous years. Barrier striping increases motorist awareness of the roadway's edge and the barrier itself, particularly in low-visibility conditions (i.e., heavy rain and snow). These existing implementation sites have not been formally evaluated. Furthermore, the short-term effectiveness of the treatments has not been investigated; therefore, there is a need for long-term and short-term safety effectiveness evaluation of these treatments. The Performing Agencies shall collect before-and-after collision data from Crash Record Information System (CRIS) and near-collision data from connected vehicle data vendor (e.g., Wejo) to evaluate the effectiveness of vertical application of a retroreflective solid stripe on concrete barriers. Furthermore, the Performing Agencies shall install these treatments at six (6) high crash locations with different barrier types including, but not limited to concrete barriers and metal beam guard fences to evaluate their short-term effectiveness using non-traditional safety evaluation approaches. The Performing Agencies shall utilize the findings to update the drafted SS for the future use across the state and beyond.

Modifications: Amend the contract to revise Task 3 of the Work Plan and the budget, to add equipment and training. TTI: The FY 2024 budget is increased by $46,736.50 from $167,703.25 to $214,439.75; the FY 2025 budget remains $6,308.00; TTI's Total Project Budget is increased by $46,736.50 from $174,011.25 to $220,747.75. TXST: The FY 2024 budget remains $62,673.75; the FY 2025 budget remains $5,257.50; TXST's Total Project Budget remains $67,931.25. The Itemized Project Budget Estimate is increased by $46,736.50 from $241,942.50 to $288,679.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
TTI-Old Budget	$167,703.25	$134,162.60	$33,540.65
TTI-New Budget	$214,439.75	$171,551.80	$42,887.95
TXST Budget	$62,673.75	$50,139.00	$12,534.75

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-6936-01 **University:** CTR

Project Title: Implementation of Semi-integral Bridges in Texas

Project Start Date: TBD **Termination Date:** 12/31/2026

Project Status: New **Project Budget:** $780,032.31

RTI Project Manager: Jade Adediwura **Researcher:** Jorge Zornberg

Project Objectives: The Performing Agency shall validate predicted semi-integral bridge performance against actual semi-integral bridge performance; particularly regarding backfill placement requirements. In particular, the geotextile-confined backfill will be monitored to assess its impact on (1) the lateral earth pressures induced due to cycles of temperature-induced backfill movements and (2) the settlements of the backfill material. The new approach, developed in research project 0-6936, is expected to reduce lateral earth pressures and decrease settlements. This validation of field performance shall facilitate the development of a standard detail and commentary for the Bridge Design Manual as well as the compilation of additional design and construction guidelines.

The Performing Agency shall also monitor the semi-integral bridge at China Creek, in the Wichita Falls District using the wireless field monitoring system installed during research project 0-6936.

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Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$220,603.92	$174,483.14	$44,120.78

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-7025-01 **University:** TTI

Project Title: Pilot Implementation of Surface Aggregate Classification of Reclaimed Asphalt Pavement

Project Start Date: TBD **Termination Date:** 8/31/2027

Project Status: New **Project Budget:** $660,716.00

RTI Project Manager: Darrin Jensen **Old Researcher:** Fujie Zhou
New Researcher: Sheng Hu

Project Objectives: The Performing Agency shall assist the Receiving Agency with implementing the surface aggregate classification (SAC) for reclaimed asphalt pavement (RAP) developed in research project 0-7025, Develop Surface Aggregate Classification of Reclaimed Asphalt Pavement. The Performing Agency shall implement and verify the methodology of SAC-A RAP classification in a minimum of four (4) Receiving Agency Districts. In each selected Receiving Agency District, the Performing Agency shall work with lab and pavement engineers and their staff to characterize the RAP in terms of SAC, design surface mixtures with the RAP, evaluate the friction and skid resistance of mixtures, and construct and monitor the selected test sections in each Receiving Agency District. The Performing Agency shall then use the data generated in these test sections to develop and teach implementation workshops for Receiving Agency Districts.

Modifications: The Principal Investigator was revised in the pending contract.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$131,549.00	$105,239.20	$26,309.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number:	5-9905-24	**University:**	CTR
Project Title:	Innovation Consortium (TTTF, TxSTIC)		
Project Start Date:	9/1/2023	**Termination Date:**	8/31/2025
Project Status:	Active	**Project Budget:**	$998,124.00
Project Manager:	Lauren Freriks	**Old Researcher:** **New Researcher:**	Bob Brydia Kristi Chin

Project Objectives: The Texas Department of Transportation (TxDOT) needs support to manage the Innovation Consortiums – projects or programs that facilitate collaboration, dissemination, and development of innovative transportation technologies and practices. The Innovation Consortiums include two previous standalone programs: Texas Technology Task Force (TTTF) and the Texas State Transportation Innovation Council (TxSTIC). Closer coordination of these programs will further help to accomplish each programs individual goals.

The TTTF, authorized by Texas's 83rd Legislature General Appropriations Bill, S.B. No. 1, Item 44, VII-31, was established in 2013 to enhance its vision for the future of Texas's transportation systems. The TTTF began with a core knowledge group of transportation experts and has grown into a successful program that is responsible for managing the Emerging Technology Portfolio, publishing white papers on critical topics, delivering strategic plans such as the Technology Utilization Plan, developing communication strategies, and conducting TTTF meetings with in-depth technical analysis.

The TxSTIC was the 51st STIC established on the 22nd of March 2016, by the STIC State of Texas Charter and renewed the 20th of November 2019. The TxSTIC was established to foster a collaborative culture for the rapid implementation of ready to deploy and beneficial innovations and technologies among stakeholders to efficiently deliver a safe and effective transportation system to the State of Texas.

The TTTF and TxSTIC programs, together serve as a catalyst for rapid deployment of nationally and state identified new technologies, strategies, and methods that have already been demonstrated to be successful in real world applications and would lead to improved performance and effectiveness of the transportation system within the State of Texas.

Modification: Researcher listed is corrected to show Kristi Chin.

Financials:	FY24 Total Budget	80% Federal	20% Estimated TDCs*
Project Budget	$494,628.00	$395,702.40	$98,925.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 5-7007-01 **University:** CTR

Project Title: Weather Responsive Management Strategies Implementation

Project Start Date: TBD **Old Termination Date:** 8/31/2025
New Termination Date: 1/31/2026

Project Status: New **Project Budget:** $467,045.35

RTI Project Manager: Darrin Jensen **Researcher:** Chandra Bhat

Project Objectives: Receiving Agency personnel who work in responding to extreme weather can greatly benefit from the ability to monitor live activities and analyze recent treatment progress. Handwritten brine logs can be supplemented with automated recordkeeping. Sensing of winter operations (WinterOps) such as plowing, brine spraying, and gravel spreading is accomplished through the use of the GPS fleet tracking system already equipped in all Receiving Agency vehicles, along with the installation of a few low-cost items. WinterOps activities are then tracked without any special interaction required from the driver or operations personnel. Integration of visualizations with GIS systems provide powerful ways to use the collected data for improving safety, operations, and public communications.

Modifications: The FY24 budget is decreased by $93,006.27 from $231,772.07 to $138,765.80 and the termination date has been revised in the pending contract.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$231,772.07	$185,417.66	$46,354.41
New Project Budget	$138,765.80	$111,012.64	$27,753.16

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7090 **University:** CTR

Project Title: Evaluate the Deployment of High Strength Reinforcing Steel in Texas

Project Start Date: 9/1/2020 **Old Termination Date:** 8/31/2024
New Termination Date: 12/31/2024

Project Status: Continuation **Project Budget:** $1,175,887.21

RTI Project Manager: Martin Dassi **Researcher:** Oguzhan Bayrak

Project Objectives: The Performing Agency shall:

- Demystify the use of high strength reinforcing steel in Texas bridge design in Phase 1. This shall be accomplished through examination of Texas bridge components and systems. Phase 1 shall address where and when it makes sense to use high strength reinforcing, what benefits can be realized, who else is using high strength reinforcing and how they are using it.
- Supplement Phase 1 through a series of analytical and experimental test programs covering a wide range of structural bridge components in Phase 2. This shall include realistically scaled structural testing in combination with numerical modeling to address data gaps related to serviceability performance and ultimate strength behavior.

Modification: Amend the contract to extend the termination date, update the project schedule and revise the budget to allow for the completion of testing and reporting due to unforeseen delays in Task 7, Task 8, and Task 13. The FY2024 budget is decreased by $34,263.30 from $175,988.91 to $141,725.61; The FY2025 budget is established for $34,263.30; The Itemized Project Budget Estimate remains $1,175,887.21.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$175,988.91	$140,791.13	$35,197.78
New Project Budget	$141,725.61	$113,380.49	$28,345.12

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7095-01 **University:** CTR-USGS

Project Title: Flood Assessment System for TxDOT (FAST)

Project Start Date: Pending **Termination Date:** 1/31/2027

Project Status: New **Project Budget:** $5,850,241.20

RTI Project Manager: Jade Adediwura **Researcher:** David Maidment

Project Objectives: The Receiving Agency wishes to move from a reactive to a proactive response during flood emergency operations. Real-time flood map services provide valuable information for the Receiving Agency flood decision making. The National Weather Service initiated the operation of real-time flood inundation maps for Texas in October 2023. Performing Agency 1 shall create a Flood Assessment System for the Receiving Agency as an additional set of real-time flood maps to describe flood impact on the road and bridge system. These maps shall be distributed to the Receiving Agency's Maintenance Division staff as web services and tested in large scale flood emergency response exercises conducted with The Receiving Agency Districts. Performing Agency 2 shall operate and maintain 80 RQ-30 stream gages to support flood forecasting and decision making. Performing Agency 2 shall refine the targeted approach for RQ-30 velocity sensor calibrations to support timely rating development using velocimetry. As many of the 80 RQ-30 gauges as possible shall be added to the Interagency Flood Risk Management (InFRM) Flood Decision Support Toolbox. Combining novel gauging techniques with inundation mapping provides real-time streamflow information and transportation flood impacts that enable scenario planning and proactive actions to flood events. This project shall be a continuation of Project 0-7095 "Evaluating Improved Streamflow Measurement at TxDOT Bridges."

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
CTR Project Budget	$842,899.65	$674,319.72	$168,579.93
USGS Project Budget	$564,151.14	$451,320.91	$112,830.23

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 9-1532 **University:** CTR

Project Title: TPF-5(508) Concrete Bridge Engineering Institute (CBEI)

Project Start Date: 6/21/2023 **Termination Date:** 5/31/2027

Project Status: Continuation **Old Project Budget:** $2,917,900.00
New Project Budget: $5,313,706.25

RTI Project Manager: Darrin Jensen **Researcher:** Oguzhan Bayrak

Project Objectives: The objective of TPF-5(508) Concrete Bridge Engineering Institute (CBEI) Transportation Pooled Fund (TPF) is to create a national resource for innovative workforce development programs and implementation of new technologies in the field of concrete bridges, establishing a consortium of member states. CBEI shall be the center of concrete bridge related research, education, and training at the Performing Agency, the University of Texas at Austin in the Cockrell School of Engineering.

The Performing Agency shall work with bridge stakeholders (primarily state and federal transportation agencies) and seek input from industry groups representing the concrete bridge community to develop pioneering, practical, and effective programs that will have national impact with the goal of addressing issues encountered in concrete bridges and implementing plans to work toward ensuring resiliency expectations for concrete bridges. The Performing Agency's specific objectives are to develop and implement the following services with coordinated input from members of the pooled fund:

- Three training programs which will include both classroom and hands-on training
  - Concrete Bridge Deck Construction Inspection Program
  - Concrete Materials for Bridges Program
  - Post-tensioning (PT) Laboratory
- The Concrete Solutions Center
- The Bridge Component Collection
- The Technology Development Program

The Performing Agency shall also implement the components of the Concrete Solutions Center comprised of workshops, seminars, and project technical support. The Performing Agency shall develop and administer the Technology Development Program for the evaluation and implementation of new and emerging technologies in the field of concrete bridges.

The Performing Agency shall conduct structural tests on Inverted-T Caps and prepare a state of the practice report on mixed, bonded and unbonded post-tensioned, reinforcement.

Modification: Amend the contract to revise the scope, budget, and schedule to adjust for the additional State Departments of Transportation that have joined the CBEI Transportation Pooled Fund and the change in funding from FHWA, and to add Task 9, Strength Evaluation of Existing Inverted-T Caps, and Task 10, Technical Report - Bridge Components with Mixed Reinforcement. The FY2023 budget remains $182,345.00. The FY2024 budget is increased by $1,900,898.21 from $1,049,922.56 to $2,950,820.77. The FY2025 budget is increased by $429,644.01 from $885,822.70 to $1,315,466.71. The FY2026 budget is increased by $65,264.03 from $522,507.25 to $587,771.28. The FY2027 budget remains $277,302.49. The Itemized Project Budget Estimate is increased by $2,395,806.25 from $2,917,900.00 to $5,313,706.25.

Financials:	FY '24 Budget	100% Federal*	80% Federal**	20% State***
Old Project Budget	$1,049,922.56	$737,422.56	$250,000.00	$62,500.00
New Project Budget	$2,950,820.77	$2,638,320.77	$250,000.00	$62,500.00

* Corresponds to the states' FY '24 contributions (100% federal share), funding for FHWA's special project, and funding for Texas' special project.

** Corresponds to FHWA's FY '24 contribution.

***Corresponds to Texas' state match of FHWA's FY '24 contribution.

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Project Number: 0-7168-01 **University:** CTR

Project Title: Support XRF Determination of Tire Rubber Content in Asphalt Binders

Project Start Date: TBD **Termination Date:** 8/31/2024

Project Status: New **Project Budget:** $60,205.98

RTI Project Manager: Darrin Jensen **Researcher:** Amit Bhasin

Project Objectives: Tire rubber (TR) is required in certain asphalt binders, e.g., AC-205TR, used for chip seal construction. These binders are specified and used in several districts across the state. Current Receiving Agency Standard Specification Item 300, Asphalts, Oils, and Emulsions, includes using test procedure Tex-533-C, Determining Polymer Additive Percentages in Polymer Modified Asphalt Cements. This test procedure has been only performed in the Receiving Agency Materials and Tests Division (MTD).

In a previous project the Performing Agency provided a portable XRF device and training to three districts (including generating calibration curves to support determining TR content) for them to be able to conduct this testing at the district or field level. Under the previous project, the Performing Agency also revised Tex-553-C and initiated a round robin testing plan to determine the accuracy of the tire rubber determination.

In this project, the Performing Agency shall provide the three districts with technical support in XRF TR determination for the 2024 seal coat season.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$60,205.98	$48,164.78	$12,041.20

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-9055-01 **University:** UTA

Project Title: Workforce Development Lifecycle for Road and Bridge Agencies

Project Start Date: 7/21/2023 **Old Termination Date:** 8/31/2024
New Termination Date: 10/31/2024

Project Status: Continuation **Project Budget:** $125,000.00

RTI Project Manager: Katelyn Kasberg **Researcher:** Ray Belk

Project Objectives: The Workforce Development Lifecycle for Road and Bridge Agencies project proposes a multi-faceted approach to educate Texas Local Public Agencies (LPAs) about FHWA's Every Day Counts, Round 6 and Round 7 Strategic Workforce Development innovation, implementation methods, and valuable resources as well as encourage the adoption and implementation of recommended best practices at the local level. LPAs across the state are faced with the critical challenge of attracting and retaining Road and Bridge (R&B) personnel to maintain Texas local roadways. The proposed project builds on the successful FY21 Texas Local Technical Assistance Program (TxLTAP) Strategic Workforce Development, Texas State Transportation Innovation Council (TxSTIC) Incentive Program, project entitled Texas Transportation Workforce Development for Cities and Counties that reached 25 Texas counties who had not previously utilized TxLTAP's services. The project achieved an 87% statewide adoption rate of deliverables, products, and services.

Modification: Amend the contract to extend the termination date, revise the budget, and update the project schedule due to delays in executing the agreement. The FY 2023 budget is decreased by $52,290.00 from $56,107.50 to $3,187.50. The FY 2024 budget is increased by $52,290.00 from $68,892.50 to $121,812.50. The Itemized Project Budget Estimate remains the same at $125,000.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$68,892.50	$55,114.00	$13,778.50
New Project Budget	$121,812.50	$97,450.00	$24,362.50

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7028-01 **University:** CTR

Project Title: Integrated SiteManager and Pavement Analyst Database on an Online Platform4

Project Start Date: 9/1/2022 **Old Termination Date:** 4/30/2024
New Termination Date: 8/31/2024

Project Status: Continuation **Project Budget:** $139,964.98

RTI Project Manager: Tom Schwerdt **Researcher:** Amit Bhasin

Project Objectives: The Receiving Agency maintains several databases to record materials, construction, and performance information for roadway projects: materials and test records in the SiteManager database; construction related information in TxDOT Connect or Design and Constructions Information System; and performance measures in the Pavement Analyst database. Data from these databases has been compiled in a recent project to identify relationships between the materials and construction records and observed long-term performance of hot mix asphalt pavements. The objective of this project is to implement this work through a visualization and analysis tool via a commercially available software and that can be accessed in near real time by the Receiving Agency on an ongoing basis. The Performing Agency shall utilize Tableau Prep Builder to integrate data from all data sources and develop the visualization and identification interface on Tableau Packaged Workbook. In addition to the aforementioned databases, maintenance history from Compass and GIS information from the Receiving Agency Open Portal to locate and map all projects shall be incorporated. A text and visual guide on how to use the Tableau interface shall be developed, and an online workshop shall be held to demonstrate the functionality of the interface to the Receiving Agency's Divisions and Districts. Such a tool shall allow the Receiving Agency to investigate all construction and maintenance projects performed on a pavement section and understand the effect of materials, design and construction processes on the long-term pavement performance.

Modification: Amend the contract to to revise the project schedule, extending Tasks 3 and 4, and to extend the termination date to enhance the outcome and products of the project.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$43,942.73	$111,971.98	$27,993.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-9908-24 **University:** TTI

Project Title: Innovative Transportation Project at TxDOT

Project Start Date: TBD **Old Termination Date:** 12/31/2026
New Termination Date: 2/28/2027

Project Status: New **Old Project Budget:** $3,000,000.00
New Project Budget: $7,108,387.00

RTI Project Manager: Shelley Pridgen **Researcher:** Bob Brydia

Project Objectives: From time to time, TxDOT districts produce ITS and other technology and process innovations that improve Roadway/worker safety, improve roadway efficiency, and/or produce cost savings. This contract leverages the capabilities of TTI to identify, develop, and scale district innovations that are ready to deploy across the state, so that TxDOT can capture the full benefit of 25 different districts with particular insights, creativity and innovative thinking.

TTI will investigate innovative district practices and develop plans at a district and statewide level to share and scale innovation across the state. By harvesting the real-world knowledge already contained within TxDOT, new avenues will open to improve roadway safety, efficiency and produce cost savings impacting the millions of travelers across the state. Additionally, by cataloging and bringing together these innovations, divisions and districts can work together to make sure that solutions are developed in such a way that unified systems and interoperability occur throughout the state.

Modification: Revise the Project Agreement prior to signature to to revise the scope, the termination date, and the budget. The FY24 budget is increased by $60,300.00 from $750,000.00 to $810,300.00. The Total Project Budget is increase by $4,108,387.00 from $3,000,000.00 to $7,108,387.00.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$750,000.00	$600,000.00	$150,000.00
New Project Budget	$810,300.00	$648,240.00	$162,060.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Pooled Fund Studies

Project Number:	8-8528
Study Number:	TPF-5(510)
Project Title:	2023 through 2025 Innovations in Freight Data Workshop
Lead Agency:	Iowa State Department of Transportation
Status:	Contract Signed
Project Objectives:	Building on lessons learned from the 2017, 2019 and 2021 workshops, the objective of the 2023 and 2025 Innovations in Freight Data Workshops will be: to once again bring together freight data users and decision makers to learn and share the latest applications of emerging "big" data sources to improve freight planning, freight operations and mobility, and freight visualization; to showcase data applications, with particular emphasis on identifying adaptable/open source user-friendly tools; to invite participation from across the modal spectrum of goods movement, including highway, rail, marine, and air; and to invite participation from data scientists and technology developers to move the conversation beyond making incremental improvements to traditional freight planning and analysis methods.

Financials:	Commitment Years	FY24 Commitment
TxDOT	2023-2024	$14,000

Project Number: 8-8546

Study Number: TPF-5(527)

Project Title: International Conference on Ecology and Transportation 2025

Lead Agency: Washington State Department of Transportation

Status: Cleared by FHWA

Project Objectives: Provide one ICOET Conference in May of 2025 for communication, technology transfer and information sharing among transportation professionals on ecology issues and transportation. The ICOET Conference for 2025 will be in Colorado cohosted by the Colorado Department of Transportation and the Colorado Parks & Wildlife Department, with support from FHWA and organized by the Road Ecology Center at Davis. There will also be a hybrid component to the conference that folks can attend virtually.

Building on the 2023 ICOET Conference this 14th biennial conference in 2025 will:

- Bring experts around the world to exchange knowledge & best practices on the interrelationship of ecology & transportation.
- The sharing of ideas through presentations, panel discussion, breaks, lunches, receptions, and field trips.
- Expand the shared knowledge and learn about the cutting edge of science on the topic of ecology and transportation.

Financials:	Commitment Years	FY24 Commitment
TxDOT	2024	$2,000

Project Number: 8-8547

Solicitation Number: 1605

Project Title: Improving the Quality of Highway Profile Measurement

Lead Agency: Illinois Department of Transportation

Status: Solicitation Posted

Project Objectives:

1. Deliver sample procurement specifications and maintenance guidelines
2. Direct and support development and maintenance of pavement profile analysis software
3. Implement criteria for profile verification that include emerging technologies (e.g., low-speed profilers, start and stop profilers, and non-inertial profilers)
4. Verify pavement profile reference devices
5. Develop and deliver profiler operation and profile analysis training
6. Implement methods for maximizing the use of pavement profiles for network, project, and forensic analysis, with a focus on cutting-edge methodologies.
7. Provide technical support for the Road Profile Users' Group and conduct annual face-to-face meetings in conjunction with the group.

Financials:	Commitment Years	FY24 Commitment
TxDOT	2024-2028	$30,000

Project Number:	8-8548
Solicitation Number:	1606
Project Title:	Ahead of the Curve - Migration from NCHRP to AASHTO Technical Training Solutions (TTS)
Lead Agency:	Louisiana Department of Transportation and Development
Status:	Solicitation Posted
Project Objectives:	The primary objectives of this pooled fund study are as follows: • Transfer AOTC information from NCHRP to AASHTO • Update and transfer existing information into AASHTO Technical Training Solutions (TTS) format • Make all courses 508 compliant

Financials:	Commitment Years	FY24 Commitment
TxDOT	2024-2025	$10,000

Project Number: 8-8549

Solicitation Number: 1601

Project Title: Accelerated Performance Testing on the 2024 NCAT Pavement Test Track with MnROAD Research Partnership

Lead Agency: Alabama Department of Transportation

Status: Solicitation Posted

Project Objectives: The primary objectives of the pooled fund project described herein will be

1. Constructing, maintaining, and/or rebuilding experimental pavements on the existing 1.7-mile NCAT test oval and the MnROAD mainline bypass that are representative of in-service roadways on the open transportation infrastructure;
2. Applying accelerated performance truck traffic after construction for the duration of the 3-year research cycle;
3. Assessing/comparing the functional and structural field performance of trafficked sections on a regular basis via surface and subsurface measures;
4. Validating/calibrating new and existing methodologies for analysis and design using pavement surface condition, pavement load response, precise traffic and environmental logging, and cumulative damage;
5. Correlating field results with laboratory data for both mix and structural performance; and
6. Answering practical questions posed by research sponsors through formal (i.e., reports and technical papers) and informal (e.g., one-on-one responses to sponsor inquiries) technology transfer. For example, can pavement thickness be reduced as a result of the addition of mix additives, and if so does the thickness reduction offset any additional cost of construction?

Financials:	Commitment Years	FY24 Commitment
TxDOT	2024-2026	$266,667

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Project Number: 5-7074-01 **University:** CTR

Project Title: Implementation of Recycled Crushed Concrete Aggregate in Class P Concrete

Project Start Date: TBD **Termination Date:** 3/31/2027

Project Status: New **Project Budget:** $498,500.00

RTI Project Manager: Jade Adediwura **Researcher:** Kevin J. Folliard

Project Objectives: The successful use of recycled concrete aggregate (RCA) in continuously reinforced concrete pavement (CRCP) in a field trial near Sealy, TX under TxDOT Project 0-7074 demonstrated the potential for increasing the sustainability of concrete paving while still achieving target performance. Based on the progress made under TxDOT 0-7074 and in line with ongoing TxDOT and FHWA initiatives to reduce the carbon footprint of new concrete construction, this implementation project aims to build upon the previous trial near Sealy, while expanding the depth and breadth of the implementation to include significantly longer trial sections with a wider range of RCA replacement levels. The Performing Agency shall facilitate implementation of the project findings by documenting the results of laboratory and field studies in the Research Report of the TxDOT Research project "Increase the Allowable Content of Recycled Crushed Concrete Fine Aggregate in Class P Concrete ". The Research Report shall include specific recommendations on the use of recycled crushed concrete fine and coarse aggregate into Class P concrete.

Financials:	FY '24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$50,689.04	$40,551.23	$10,137.81

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7150 **University:** TXST

Project Title: Artificial Intelligence for Pavement Condition Assessment from 2D/3D Surface Images

Project Start Date: 09/01/2022 **Termination Date:** 08/31/2025

Project Status: Active **Project Budget:** $451,875.00

RTI Project Manager: Jade Adediwura **Researcher:** Feng Wang

Project Objectives: While manual quality assurance is inefficient and expensive, the proprietary data storing and processing methods have prevented the Receiving Agency from developing automated methods for data validation. Recently, with the national initialization of standard format for two-dimensional/three-dimensional (2D/3D) pavement surface images and the development of Artificial Intelligence (AI)/Machine Learning (ML) in Computer Vision, the Receiving Agency sees the opportunity of developing new methods for automated pavement condition assessment, with more independence from vendors and their equipment. The main objective of this research is to develop ML-based application software to assess pavement conditions using the standard format 2D/3D pavement surface images. The three main components of this research include the development of a standard format 2D/3D pavement surface image library, a set of ML models for pavement distress measurement, and application software for pavement condition evaluation. The proposed project will assist the Receiving Agency to enhance the quality of the automated pavement condition data, which would eventually help the State of Texas improve its pavement performance.

Modification: Amend the contract to to revise the budget to reallocate unused funds. The FY23 Budget is decreased from $150,625.00 to $108,883.19; the FY24 Budget is decreased from $150,625.00 to $148,057.50; the FY25 Budget is increased from $150,625.00 to $194.934.31; the Total Itemized Project Budget Estimate remains at $451,875.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$150,625.00	$120,500.00	$30,125.00
New Project Budget	$148,057.50	$118,446.00	$29,611.50

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7145 **University:** TTI/CTR

Project Title: Develop Rapid New Tests for Detecting Poor Quality Binders and RAP Materials

Project Start Date: 09/01/2022 **Old Termination Date:** 08/31/2025
New Termination Date: 02/29/2028

Project Status: Active **Old Project Budget:** $1,054,240.28
New Project Budget: $1,725,534.03

RTI Project Manager: Darrin Jensen **Researcher:** Fujie Zhou

Project Objectives: Asphalt binders are one of the most expensive and critical materials used in the construction of the roadways in Texas, costing taxpayers hundreds of millions of dollars annually. It has been widely recognized that asphalt binders with the same performance grade (PG) can perform very differently due to changes in crude source, refining processes used, modification technique, and other factors. Several districts recently reported early cracking issues with some mixes which had historically performed well, while other districts had mix design and quality assurance (QA) problems when the binder source was switched and/or a different recycled asphalt pavement (RAP) stockpile was used. Thus, the objective of this project is to develop rapid new tests for detecting poor quality binders and RAP materials. To achieve this objective, the Performing Agencies shall review the literature to identify candidate tests that can be used for screening binders and RAP materials. The Performing Agencies shall further refine the most promising tests using laboratory mixture performance tests as a benchmark. The Performing Agencies shall also provide a standard test method and specification limit for each of the final test methods.

Modification: Amend the contract to extend the termination date, revise the budget, the Work Plan, and the Project Schedule to identify, construct and monitor field test projects to validate binder quality test parameters and criteria. TTI's Budget: The FY 2023 Budget remains $174,880.50; The FY 2024 Budget remains $407,452.00; the FY 2025 Budget is increased by $104,568.00 from $153,355.00 to $257,923.00; the FY2026 Budget is established for $170,461.00; the FY2027 Budget is established for $143,000.00; the FY2028 Budget is established for $54,185.00. TTI's Total Project Budget is increased by $472,214.00 from $735,687.50 to $1,207,901.50. CTR's Budget: The FY 2023 Budget remains $121,620.28; the FY 2024 Budget remains $102,034.58; the FY 2025 Budget is increased by $13,542.09 from $94,897.92 to $108,440.01; the FY2026 Budget is established for $70,862.65; the FY2027 Budget is established for $73,041.64; the FY2028 Budget is established for $41,633.38. CTR's Total Project Budget is increased by $199,079.75 from $318,552.78 to

$517,632.53. The Itemized Project Budget Estimate is increased by $671,293.75 from $1,054,240.28 to $1,725,534.03.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
CTR	$102,034.58	$81,627.66	$20,406.92
TTI	$407,452.00	$325,961.60	$81,490.40

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7180 **University:** UTSA

Project Title: Select High Risk Pedestrian Midblock Crossings and Perform Safety Evaluations for Developing Pedestrian Crossings Countermeasures

Project Start Date: 09/14/2023 **Old Termination Date:** 02/29/2025
New Termination Date: 08/31/2025

Project Status: Active **Project Budget:** $393,865.00

RTI Project Manager: Katelyn Kasberg **Researcher:** Hatim Sharif

Project Objectives: In 2018, there were 6,227 pedestrian fatalities in the United States. Of those, 4,612 (74%) occurred outside of intersections, including midblock locations. This means that nearly 3 out of every 4 pedestrian deaths in the U.S. occur at midblock locations. Midblock pedestrian crashes are often more severe than crashes that occur at intersections. This is because drivers are not expecting pedestrians to cross at midblock locations, and they may not be paying as close attention. San Antonio, Houston, and Dallas have historically had the highest number of pedestrian crashes annually; consequently, there is a need to identify the high-risk locations within these cities and their optimal countermeasures. Several pedestrian midblock treatments can be implemented to improve pedestrian safety; however, there is a need to better understand the safety effects of some of the more promising treatments on pedestrian crashes in Texas. There is a need to develop crash modification factors (CMFs) specific to Texas for appropriate types of treatments at midblock crossings to guide the development of countermeasures. The goal of this research is to develop a system for Texas Department of Transportation districts to help identify high-risk pedestrian midblock crossings and select the most effective treatments for them. The project tasks include an information search on midblock pedestrian crossing safety, the collection and analysis of safety and operational data, the identification of high-risk locations for occurrence of midblock crossings and appropriate treatments, the development of crash modification factors for midblock crossings, including benefit-cost ratios.

Modification: Amend the contract to extend the termination date and revise the project schedule to allow more time to collect information regarding midblock crossings.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Contract Total	$198,141.25	$158,513.00	$39,628.25

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7189 **University:** TTI - TXST

Project Title: Safety Assessment of Shared Use Paths at Roadway Crossings using Exposure-Based Models

Project Start Date: 09/1/2023 **Termination Date:** 08/31/2025

Project Status: Active **Project Budget:** $349,999.35

RTI Project Manager: Wade Odell **Researcher:** Bahar Dadshova

Project Objectives: Shared or multiuse paths invite a wide range of users, including pedestrians, bicyclists, and other wheeled users, with a range of transportation purposes such as commuting, exercise, and recreation. Although shared use path (SUP) users are physically separated from traffic, they remain vulnerable at roadway crossings. In the absence of roadway cross-section designs for accommodating pedestrians and bicyclists, SUP crossings can present users with complex tasks including gap selection, scanning for turning vehicles, and interacting with other path users. Ensuring safe crossings for all users at these locations is essential. Pedestrian and bicycle treatments have been developed and their safety effectiveness has been assessed in several studies and practices. Although technically these designs can be applied to SUPs, it is not clear how to integrate treatments for different types of path users, road classifications, land-use contexts, and crossing geometries. With the increasing implementation practices of SUPs across Texas, there is a need to assess the potential safety concerns involving pedestrians, bicyclists, micromobility users, and people with disabilities at these locations and develop guidance for treatment selection, including for paths next to railroads. The Performing Agencies shall explore the pedestrian and bicyclist crashes at the vicinity of SUPs and develop design and planning guidance for implementation purposes.

Modification: Amend the contract to revise the budget due to Performing Agency 1 taking additional time in Fiscal Year 2024 to collect data at a wider variety of locations in Task 3, and needing additional time to analyze this data in Task 4. TTI: The FY 2024 Budget is increased by $40,398.75 from $145,215.50 to $185,614.25; the FY 2025 Budget is decreased by $40,398.75 from $150,470.50 to $110,071.75; the Total Project Budget remains $295,686.00. TXST: The FY 2024 Budget remains $31,040.30; the FY 2025 Budget remains $23,273.05; the Total Project Budget remains $54,313.35. The Itemized Project Budget remains $349,999.35.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TTI Old Budget	$145,215.50	$116,172.40	$29,043.10
TTI New Budget	$185,614.25	$148,491.40	$37,122.85
TXST Budget	$31,040.30	$24,832.24	$6,208.06

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-6048-07 **University:** CTR

Project Title: Implementation of Centrifuge Technology for Pavement Design on Expansive Clays – Phase 2

Project Start Date: 10/11/2023 **Old Termination Date:** 08/31/2026
New Termination Date: 08/31/2027

Project Status: Active **Project Budget:** $939,433.17

RTI Project Manager: Darrin Jensen **Researcher:** Jorge Zornberg

Project Objectives: The Receiving Agency Pavement Manual establishes thresholds of the Potential Vertical Rise (PVR) that shall not be exceeded in the design of roads founded on expansive clays (e.g., a maximum allowable PVR of 1.5 in. for main lanes). Using the PVR as an index, these thresholds have been established from field empirical evidence collected over decades to identify roads with excessive levels of distress triggered by the presence of expansive clays. However, there are two significant sources of uncertainty in the thresholds adopted by the Pavement Manual, which have heavily compromised roadway designs: (1) Inaccuracies in the determination of the PVR, the original version of which relies heavily on outdated data and correlations, and (2) Inconsistencies in the documentation of the levels of distress typical of roadways founded on expansive clays. The Receiving Agency has developed technology for accurate determination of PVR and has also developed adequate protocols for roadway performance over expansive clays. The primary objective of this implementation project is to generate accurately determined PVR data and calibrate it against consistently obtained levels of roadway distress.

Modification: Amend the contract to extend the termination date, revise the budget, and update the project schedule due to a staffing issue at the Performing Agency. The FY2024 budget is decreased by $268,238.38 from $294,139.19 to $25,900.81; the FY2025 budget remains $303,626.30; the FY2026 budget remains $341,667.68; the FY2027 budget is established for $268,238.37; the Itemized Project Budget Estimate remains $939,433.17.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$294,139.19	$235,311.35	$58,827.84
New Project Budget	$25,900.81	$20,720.65	$5,180.16

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7201 **University:** UTA

Project Title: Synthesis of Hydrologic Approaches to Playa Lakes, Areas of Significant Karst Geology, and Arid Regions

Project Start Date: 09/01/2023 **Old Termination Date:** 08/31/2024
New Termination Date: 12/31/2024

Project Status: Active **Project Budget:** $54,322.00

RTI Project Manager: Katelyn Kasberg **Researcher:** Habib Ahmari

Project Objectives: Hydrology of karst terrains, playas, and arid zones is complex, and designing transportation infrastructure in these regions is challenging and requires a deep understanding of the unique hydrologic processes in these areas. In absence of consistent, scientifically-based standards for hydrologic design of transportation infrastructures in these regions, designers consider the specific conditions in each region and adopt design measures and management strategies based on their judgment. The Performing Agency shall develop a summary of the state of knowledge, the state of practice, and approaches and models for flood forecasting and design of drainage structures in these regions. By adopting the outcomes of this project, the Receiving Agency can better understand the hydrological behavior of these regions and make informed decisions toward developing hydrological design guidance and standards of practice for these areas.

Modification: Amend the contract to revise the termination date, the Project Schedule, and the budget to allow more time to obtain responses to surveys and analyze the data. The FY 2024 budget is decreased by $26,611.31 from $54,322.00 to $27,710.69. The FY 2025 budget is established at $26,611.31. The Itemized Project Budget Estimate remains $54,322.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$54,322.00	$43,457.60	$10,864.40
New Budget	$27,710.69	$22,168.55	$5,542.14

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7112 **University:** TTI-UTEP

Project Title: Development of a Continuous for Live Load Prefabricated Steel Accelerated Bridge Construction (ABC) Unit for Texas Bridges

Project Start Date: 09/01/2021 **Old Termination Date:** 08/31/2024
New Termination Date: 02/28/2025

Project Status: Active **Old Project Budget:** $689,994.50
New Project Budget: $759,994.50

RTI Project Manager: Martin Dassi **Researcher:** Stefan Hurlebaus

Project Objectives: The overall goal is to develop a system where prefabricated steel ABC unit perform continuous for live load. The system must be: easily constructible, fast to assemble, durable long-term, safe, and cost-effective. The Performing Agencies shall conduct a literature review to first synthesize what has been done by state departments of transportation and other agencies. The Performing Agencies shall also evaluate the behavior of related Receiving Agency bridges through visual inspection and monitoring. The Performing Agencies shall perform a system development program utilizing this information in conjunction with expert feedback from an Industry Review Panel (IRP) workshop (including the Receiving Agency Panel). The three (3) best system designs shall be selected for full-scale laboratory testing followed by an analytical parametric study. The Performing Agencies shall compile and present the results at an IRP meeting with the Receiving Agency, where the final system shall be selected. The Performing Agencies shall develop full Microstation details and specifications along with a user-friendly design guide. The guide shall identify the following:

- Span length capabilities for girder sizes/depths/spacings.
- General details for establishing live load continuity.
- Closure pour details at interior bents and how to achieve acceptable deck stresses.
- Structural steel splice details and acceptable tolerances.
- Bearing layout to meet the Receiving Agency substructure details.

Modification: Amend the contract to extend the termination date, revise the budget, the Work Plan, and the Project Schedule to build and test an additional system. TTI Budget: The FY 2022 Budget remains $103,593.50. The FY 2023 Budget remains $275,527.75. The FY 2024 Budget remains $191,254.50. The FY2025 Budget is established for $70,000.00. TTI Total Project Budget is increased by $70,000.00 from $570,375.75 to $640,375.75. UTEP Budget: The FY 2022 Budget remains $20,845.00. The FY 2023 Budget remains $48,796.25. The FY 2024 Budget remains $49,977.50. UTEP Total Project Budget remains $119,618.75. The Itemized Project Budget Estimate is increased by $70,000.00 from $689,994.50 to $759,994.50.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TTI Budget	$191,254.50	$153,003.60	$38,250.90
UTEP Budget	$49,977.50	$39,982.00	$9,995.50

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7095-01 **University:** CTR/USGS

Project Title: Flood Assessment System for TxDOT (FAST)

Project Start Date: 02/26/2024 **Termination Date:** 01/31/2027

Project Status: Active **Old Project Budget:** $5,850,241.20

RTI Project Manager: Jade Adediwura **Researcher:** David R. Maidment

Project Objectives: The Receiving Agency wishes to move from a reactive to a proactive response during flood emergency operations. Real-time flood map services provide valuable information for the Receiving Agency flood decision making. The National Weather Service initiated the operation of real-time flood inundation maps for Texas in October 2023. Performing Agency 1 shall create a Flood Assessment System for TxDOT (FAST) as an additional set of real-time flood maps to describe flood impact on the road and bridge system. These maps will be distributed to the Receiving Agency Maintenance staff as web services and tested in large scale flood emergency response exercises conducted with The Receiving Agency Districts. Performing Agency 2 shall operate and maintain 80 RQ-30 stream gages to support flood forecasting and decision making. Performing Agency 2 shall refine the targeted approach for RQ-30 velocity sensor calibrations to support timely rating development using velocimetry. As many of the 80 RQ-30 gauges as possible will be added to the Interagency Flood Risk Management (InFRM) Flood Decision Support Toolbox. Combining novel gauging techniques with inundation mapping provides real-time streamflow information and transportation flood impacts that enable scenario planning and proactive actions to flood events. This project will be a continuation of Project 0-7095 "Evaluating Improved Streamflow Measurement at TxDOT Bridges."

Modification: Amend the contract to revise the budget and move funds to allow the subcontractors to continue their tasks into FY2025. CTR Budget: the FY2024 budget is decreased by $179,250.00 from $842,899.65 to $663,649.65. The FY2025 budget is increased by $179,250.00 from $874,163.55 to $1,053,413.55. The FY2026 budget remains $994,396.82, and the FY2027 budget remains $298,162.71. USGS Budget: The FY2024 remains $564,151.14, the FY2025 remains $926,533.43, the FY2026 remains $987,214.09, and the FY2027remains $362,719.79. USGS Total Project Budget remains $2,840,618.46. The itemized Project Budget Estimate remains $5,850,241.20.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
CTR Old Budget	$842,899.65	$674,319.72	$168,579.93
CTR New Budget	$663,649.65	$530,919.72	$132,729.93
USGS Budget	$564,151.14	$451,320.91	$112,830.23

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7115 **University:** CTR

Project Title: Investigate Live Load Distribution and Stability of Prestressed Concrete Girders During Construction

Project Start Date: 09/01/2021 **Old Termination Date:** 01/15/2025
New Termination Date: 06/30/2025

Project Status: Active **Project Budget:** $998,766.67

RTI Project Manager: Martin Dassi **Researcher:** Todd Helwig

Project Objectives: The Performing Agency shall focus on the stability of long-span prestressed concrete I- and U-girders during erection and construction. The Performing Agency shall consider the distribution of live load in the completed bridge as well the role of diaphragms in stability and live load distribution and develop methods of analysis of the girder behavior. The Performing Agency shall focus on the stability of long-span prestressed concrete I- and U-girders during erection and construction. The Performing Agency shall consider the distribution of live load in the completed bridge as well the role of diaphragms in stability and live load distribution and develop methods of analysis of the girder behavior.

Modification: Amend the contract to extend the termination date and revise the budget, the Project Schedule and the Work Plan to remove Task 4, Field Studies, due to no bridges being under construction for the field studies, to allow the research team to complete the computational studies and improve the quality of the deliverables. The FY2022 budget remains $270,027.64; the FY2023 budget remains $352,562.00; the FY2024 budget is decreased by $40,000.00 from $301,063.14 to $261,063.14; the FY2025 budget is increased by $40,000.00 from $75,113.89 to $115,113.89; the Itemized Project Budget Estimate remains $998,766.67.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$301,063.14	$240,850.51	$60,212.63
New Budget	$261,063.14	$208,850.51	$52,212.63

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7157 **University:** TAMUCC/TTI

Project Title: Develop Guidelines for Integration of UAS LiDAR and Photogrammetry to Enhance Land Surveying Capabilities

Project Start Date: 09/01/2022 **Old Termination Date:** 08/31/2024
New Termination Date: 10/31/2024

Project Status: Active **Old Project Budget:** $543,334.00
New Project Budget: $553,669.00

RTI Project Manager: Chris Glancy **Researcher:** Michael Starek

Project Objectives: Unmanned aircraft systems (UASs) equipped with digital cameras, light detection and ranging (LiDAR) sensors, or both enable the collection of high spatial resolution three-dimensional (3D) quantitative geospatial data. This data may be used to support a variety of surveying and mapping activities, potentially with lower costs and greater safety than traditional survey methods. When using a camera, the technique is called Structure-from-Motion photogrammetry or UAS-SfM. In practice, there are important differences between UAS-SfM and UAS-LiDAR including measurement fidelity, operational considerations, post-processing workflows, and cost-effectiveness. With a lack of clear guidance on when UAS-SfM versus UAS-LiDAR is the best fit for a specific task, there is a need to evaluate the real-world performance capabilities and limitations of both technologies.

Modification: Amend the contract to extend the termination date, revise the budget, the Work Plan and the Project Schedule due to the discovery of new documentation in development related to UAS aerial mapping, airborne LiDAR and a geospatial data archive repository that needs to be added to the scope of the project for review. TAMUCC budget: The FY 2023 budget remains $187,350.50; the FY 2024 budget remains $176,768.00; the FY 2025 budget is established at $10,335.00; TAMUCC's Total Project Budget is increased by $10,335.00 from $364,118.50 to $374,453.50. TTI budget: The FY 2023 budget remains $66,931.25; the FY 2024 budget remains $112,284.25; TTI's Total project budget remains $179,215.50. The Itemized Project Budget Estimate is increased by $10,335.00 from $543,334.00 to $553,669.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TAMUCC Budget	$176,768.00	$141,414.40	$35,353.60
TTI Budget	$112,284.25	$89,827.40	$22,456.85

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7200 **University:** TTI/UTA

Project Title: Utilizing Telematics to Understand Driving Behavior During Missed Exits and Wrong Turns

Project Start Date: 09/01/2023 **Termination Date:** 08/31/2025

Project Status: Active **Project Budget:** $306,215.21

RTI Project Manager: Jade Adediwura **Researcher:** Jason Wu

Project Objectives: Texas is currently experiencing its largest population growth in decades. More and more lands are being urbanized and complex design methods are often adopted. As a result, drivers are likely confused at certain locations such as ramps, roadway exits and intersections. The overarching goal of this project is to identify unsafe and inefficient locations of Texas state highways, where driving behaviors often reveal excessive abnormities (e.g., hard brakes, control stops and/or missing of road entrances/exits). Problematic locations are due to misleading roadway designs or signage configurations in many cases. In the past, the Receiving Agency could not identify such locations until either a driver called to complain or crashes occurred frequently. The emerging telematics data from connected vehicles (CVs) will enable such possibility to identify and fix problematic locations proactively. Applying the state-of-the-art big data analytics and Artificial Intelligence (AI) techniques on the emerging vehicle telematics data (delivered by Wejo and INRIX), the Performing Agencies shall demonstrate how to identify problematic locations within the selected area. The Performing Agencies shall also integrate multiple advanced computing techniques (e.g., high-performance computing, cloud-computing etc.) to cost-effectively streamline the process of traffic big data fusion, cleaning, and reduction for the Receiving Agency' future practices.

Modification: Amend the contract to revise the Budget, Project Schedule, Project Abstract, and Work Plan to align with Receiving Agency priorities in response to a request from the Project Monitoring Committee. TTI Budget: The FY 2024 budget is increased by $33,112.50 from $95,591.50 to $128,704.00. The FY 2025 budget is increased by $14,496.00 from $110,600.50 to $125,096.50.The Total Project Budget increased by $47,608.50 from $206,192.00 to $253,800.50. UTA Budget: The FY 2024 budget remains $35,155.04. The FY 2025 budget for is increased by $49,871.60 from $64,868.17 to $114,739.77.The Total Project Budget is increased by $49,871.60 from $100,023.21 to $149,894.81.The Itemized Project Budget Estimate is increased by $97,480.10 from $306,215.21 to $403,695.31.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TTI Old Budget	$95,591.50	$76,473.20	$19,118.30
TTI New Budget	$128,704.00	$102,963.20	$25,740.80
UTA Budget	$35,155.04	$28,124.03	$7,031.01

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Grant: TX-2023 STIC Incentive Program

Project No.: 5-9056-01

Project Title: Improving Emergency Response to Roadway Incidents Using Traffic Speed Deviation Alerts from Crowdsourced Data

Project Start Date: N/A **Project End Date:** 8/31/2025

Project Status: Cancelled **Old Project Budget:** $125,000.00
New Project Budget: $0.00

TxDOT Project Manager: Shelley Pridgen **Vendor:** NCTCOG

Description: The goal of the project is for NCT9-1-1 and its client agencies to be the first in the country to improve emergency response to roadway incidents by giving them alerts of traffic speed deviations that may signal roadway incidents that will require emergency response. As part of the Project, NCT9-1-1 will customize the existing traffic speed deviation alert tool to provide 9-1-1 centers notice of traffic speed anomalies in a manner that is helpful to them and will improve emergency response to roadway incidents. NCT9-1-1 will document in training materials the tool it develops for use by 9-1-1 centers and other emergency response agencies throughout the state and nation. NCT9-1-1 will actively engage in national outreach through the EDC Program and other venues to expand the usage of this tool from the Dallas-Fort Worth region to the rest of the US.

Modification: Amend Round 7 Template for the FY 24 SPR-B Work Program to align with the deobligation of the STIC Incentive Program due to the primary project manager leaving the local agency (sub-recipient).

Financials:	Budget	80% Federal	20% Estimated TDCs*
Old Project Budget	$125,000.00	$100,000.00	$25,000.00
New Project Budget	$0.00	$0.00	$0.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7006 **University:** TTI

Project Title: Design, Construction, and Performance Monitoring of Stabilization of Expansive Soils and Cement

Project Start Date: 04/24/2019 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2025

Project Status: Active **Old Project Budget:** $1,730,912.75
New Project Budget: $2,095,912.75

RTI Project Manager: Jade Adediwura **Researcher:** Dar Hao Chen

Project Objectives: The Receiving Agency is actively looking for alternatives to stabilize expansive soils and cement treated bases with polypropylene fiber. Polypropylene fiber, hereafter is referred to as fiber. Many areas in Texas have problems stabilizing expansive soils with traditional stabilizers (i.e. lime, cement, fly ash, or in combination) because of the high levels of sulfates in the soil. Many major pavement failures have occurred due to lime/cement induced sulfate heaves. In addition, reflection cracks from cement treated bases have been reported in numerous projects. Expansive soils have caused extensive pavement heaves, bumps and longitudinal cracks. The repetitive shrinking and swelling is responsible for the development of cracks, heaves and bumps on Texas roads. Roadway surface cracks allow water intrusion which degrades underlying pavement layers, and prematurely fails the pavement structure. Surface heaves and bumps are a driver safety issue. Cracks, heaves, and bumps are extremely expensive to repair over the life of the pavement, and it would be more economical and safer to the public to mitigate their occurrences during construction. Previous research results indicate that the fiber-reinforced cement treated bases has shown to increase performance. Significant improvements in both shear and compressive strengths, as well as flexibility, have been reported in fiber reinforced soils and fiber reinforced cement treated bases. Also, fiber reinforced clays and sands were able to reduce volumetric shrinkage strains and swell pressures. It is expected that these types of improvements would directly mitigate the aforementioned distresses. There are huge potential benefits of applying polypropylene fiber to stabilize expansive soils and cement treated bases to (1) increase strength, (2) reduce shrinkage potential, (3) reduce chemical stabilizer content, and (4) increase flexibility/ductility. There is a critical need to incorporate fiber in the Receiving Agency's "Modification and Stabilization of Soils and Base for Use in Pavement Structures" guidelines. Therefore, this study will develop appropriate laboratory test methods to evaluate mix designs for (1) fiber reinforced cement treated base, (2) fiber reinforced clay, and (3) fiber reinforced sandy soil. In addition, this study will provide assistances to Receiving Agency Districts to develop optimum fiber application rates and establish specifications and construction QC/QA plans for uniform mixing. The Performing Agency shall conduct laboratory tests to determine optimum fiber application rates for cement treated base and 6 different subgrade soils: (1) PI < 15, (2) 15 ≤ PI < 35, (3) PI ≥ 35, (4) sulfate concentration > 3000 ppm but ≤ 8000 ppm, (5) sulfate concentration > 8000 ppm, and (6) organics content exceeds 1%. Over the last few years, the Receiving Agency has successfully constructed several

Full Depth Recycling (FDR) sections with foamed asphalt using innovative reclaiming equipment. One key issue that the Performing Agency shall address in this study is an evaluation of the mix technologies that ensure fibers are mixed uniformly in the field. The Performing Agency shall use the Wirtgen Reclaimer as the initial device for mixing fibers into the material being stabilized. The Performing Agency shall progress to other common construction equipment and processes to achieve the optimum mixing results. This study shall investigate innovative Nondestructive Testing (NDT) tools to (1) assist site characterization, (2) select candidate test sections, (3) identify sampling locations, (4) provide input on mix design process, (5) provide Input during QC/QA process, and (6) monitor field performance of the test section. The Performing Agency shall document the optimal construction techniques and identify time and cost savings.

Modification: Amend the contract to extend the termination date, revise the budget and the project schedule to facilitate the postponement of the fiber purchase until FY25 due to construction expansion, and to revise the scope to include the evaluation of the degradation of fibers used in reinforced base. The FY2019 budget remains $59,000.00; the FY2020 budget remains $154,999.50; the FY2021 budget remains $283,174.25; the FY2022 budget remains $434,216.50; the FY2023 budget remains $316,623.75; the FY2024 budget is decreased by $100,000.00 from $482,898.75 to $382,898.75; the FY2025 budget is established at $465,000.00; the Total Project Budget is increased by $365,000.00 from $1,730,912.75 to $2,095,912.75.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$482,898.75	$386,319.00	$96,579.75
New Budget	$382,898.75	$306,319.00	$76,579.75

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7141 **University:** CTR

Project Title: Evaluation of Nano-Materials in Concrete for Improved Durability

Project Start Date: 09/01/2022 **Termination Date:** 05/31/2026

Project Status: Active **Old Project Budget:** $611,267.44
New Project Budget: $630,022.25

RTI Project Manager: Jade Adediwura **Researcher:** Raissa Ferron

Project Objectives: The application of nanotechnology in the construction industry has led to significant advancements in enhancing the mechanical properties of concrete through changing concrete's structure at the nanolevel. However, advancements in understanding how to leverage nanomaterials to combat durability issues has lagged behind the progress made on the mechanical property side. Concrete is susceptible to various physical and chemical degradation mechanisms that can reduce its service life. Historically, Class F fly ash has been used to address many of these degradation issues. However, with changes in fly ash quality and availability, identifying other materials that the Receiving Agency can use to protect concrete against durability issues are needed. Over the last 20 years, much progress has been made in using nanomaterials in concrete mixtures, for example, nanoparticles have even been used in high-volume fly ash cementitious systems to offset the negative effects of fly ash on rate of hydration and early-age strength gain. This project shall investigate the use of nanomaterials on the properties of concrete mixtures, with special emphasis placed on durability properties and self-healing capabilities. Various nanomaterials shall be used, alone and in combination with supplementary cementing materials (SCMs). The most promising mixtures shall be selected for field trails to validate laboratory findings.

Modification: Amend the contract to revise the budget, and update the project schedule due to an increase of scope, cost of materials/supplies, and personnel. The FY2023 budget remains $165,843.84. The FY2024 budget is increased by $12,386.40 from $167,586.54 to $179,972.94.The FY2025 budget is increased by $5,118.40 from $164,630.45 to $169,748.85.The FY2026 budget is increased by $1,250.01 from $113,206.61 to $114,456.62. The Itemized Project Budget Estimate is increased by $18,754.81 from $611,267.44 to $630,022.25.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$167,586.54	$134,069.23	$33,517.31
New Budget	$179,972.94	$143,978.35	$35,994.59

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7159 **University:** TAMUCC-TTI

Project Title: Develop Guidelines for the Use of Unmanned Aerial Systems (UASs) and Smartphones for Construction and Utility Inspections

Project Start Date: 09/01/2022 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2025

Project Status: Active **Old Project Budget:** $482,278.00
New Project Budget: $821,985.50

RTI Project Manager: Martin Dassi **Researcher:** Cesar Quiroga

Project Objectives: Unmanned aircraft systems (UASs) equipped with miniaturized cameras enable the collection of high resolution, three-dimensional (3D) geospatial data at lower costs than traditional techniques. New technologies also make it possible to gather pictures and video using smartphones, which can be fed to Structure from Motion (SfM) software to develop highly accurate 3D products. Operating UASs requires trained pilots and observers, but smartphones do not. There is a need to test whether construction contractor crews in the field can gather data using either of these technologies and upload the imagery and video to a server to enable inspectors to conduct inspections remotely. The Performing Agencies shall conduct a literature review of UAS-SfM and smartphone technologies; prepare a list of use cases and case studies to test relevant technologies; conduct field tests to document advantages, disadvantages, complementary capabilities, and potential implementation scenarios and costs; prepare recommended settings, procedures, use cases, and operational workflows to ensure repeatable data collection and processing; and prepare guidelines for quality assurance and control of inspections conducted with UAS- and smartphone-based SfM photogrammetry, as well as identify project suitability for the adoption of these technologies to support construction and utility inspection activities at the Receiving Agency.

Modification: Amend the contract to extend the termination date, revise the budget, Work Plan, and Project Schedule to align Task 5 with Receiving Agency priorities to test REDUCT ABM probes. TAMUCC's Budget: The FY2023 Budget remains $203,697.25; the FY2024 Budget remains $178,119.50; the FY2025 Budget is established at $289,753.75. TAMUCC's Total Project Budget is increased by $289,753.75 from $381,816.75 to $671,570.50. TTI's Budget: The FY2023 Budget remains $50,311.25; the FY2024 Budget remains $50,150.00; the FY2025 Budget is established at $49,953.75. TTI's Total Project Budget is increased by $49,953.75 from $100,461.25 to $150,415.00. The Itemized Project Budget Estimate is increased by $339,707.50 from $482,278.00 to $821,985.50.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TAMUCC Budget	$178,119.50	$142,495.60	$35,623.90

TTI Budget	$50,150.00	$40.120.00	$10,030.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7176 **University:** TTI

Project Title: Develop and Updated Methodology for Calculation of Reimbursement Levels for Utility Relocations

Project Start Date: 09/01/2023 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2025

Project Status: Active **Old Project Budget:** $250,971.50
New Project Budget: $423,896.25

RTI Project Manager: Katelyn Kasberg **Researcher:** Cesar Quiroga

Project Objectives: Of the various situations in which a utility relocation is eligible for reimbursement at the Receiving Agency, one of the most complex situations is when parts of the existing utility facility involve a property interest. For utility facilities that involve a private property interest, the Receiving Agency uses an eligibility ratio, which is defined as the percentage of utility facilities that are reimbursable in relation to the total amount of utility facilities being relocated. In practice, eligibility calculations can be convoluted or complex, particularly in situations where the utility facility spans multiple property interest locations. The Performing Agency shall develop and test an improved methodology to determine reimbursement eligibility and calculate utility reimbursement amounts. The Performing Agency shall document a significant sample of utility relocations and their associated reimbursement costs to develop a reliable baseline of practices throughout the state, evaluate practices in other states, develop and test an updated methodology for utility reimbursement eligibility criteria and calculations, prepare a guidebook with examples on how to determine utility reimbursement criteria and calculate reimbursement amounts, and prepare and test training materials.

Modification: Amend the contract to extend the termination date, revise the budget, Work Plan, and Project Schedule due to the delay in receiving utility agreement samples. The FY2024 Budget remains $250,971.50; the FY2025 Budget is established at $172,924.75. The Total Project Budget is increased by $172,924.75 from $250,971.50 to $423,896.25.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$250,971.50	$200,777.20	$50,194.30

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-6701-02 **University:** TTI

Project Title: Planning and Environmental Linkages Toolkit

Project Start Date: 03/03/2023 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2025

Project Status: Active **Project Budget:** $388,735.50

RTI Project Manager: Wade Odell **Researcher:** Tina Geiselbrecht

Project Objectives: The Receiving Agency funded research project 0-6701 in FY 2012 to investigate potential methods of linking transportation planning in Texas with the environmental clearance process required of the National Environmental Policy Act (NEPA). The study approach and findings were documented in a guidance document entitled Texas Department of Transportation (TxDOT) Resource for Linking Planning with Project Planning in Support of NEPA (0-6701-P1). The research that produced 0-6701-P1 was developed a decade ago prior to the Receiving Agency's participation in the NEPA Assignment program under 23 U.S.C. 327 and the Memorandum of Understanding with FHWA. In early FY2022, the Performing Agency renewed this effort in 0-6701-01 by conducting structured interviews with the Receiving Agency's planning and environmental subject matter experts, five of the state's Metropolitan Planning Organizations (MPOs), and five state Departments of Transportation (DOTs) that pioneered Planning and Environmental Linkages (PEL) to determine the need for updated/new PEL guidance. The structured interviews conducted in 0-6701-01 revealed the need for updated/additional PEL guidance. In 0-6701-02 the Performing Agency shall develop a user-friendly PEL Toolkit that the Receiving Agency's Divisions and District staff, as well as transportation partners can reference when using PELs in the state of Texas.

Modification: Amend the contract to extend the termination date, revise the Budget, Project Schedule, and Work Plan to allow for a suspension of work while the Receiving Agency determines how to proceed in FY2025. The FY2023 budget remains $162,292.50. The FY2024 budget is decreased by $80,924.00 from $226,443.00 to $145,519.00. The FY2025 budget is established at $80, 924.00. The Total Project Budget remains $388,735.50.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$226,443.00	$181,154.40	$45,288.60
New Budget	$145,519.00	$116,415.20	$29,103.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7023-01 **University:** UTA

Project Title: Determining Downstream Ecological Impacts of Sediment Derived from Bridge Construction

Project Start Date: 11/10/2022 **Old Termination Date:** 08/31/2025
New Termination Date: 06/30/2024

Project Status: Active **Old Project Budget:** $392,000.00
New Project Budget: $209,000.00

RTI Project Manager: Jade Adediwura **Researcher:** Habib Ahmari

Project Objectives: The release of sediment due to bridge construction may change the sediment regime and geomorphology of receiving streams causing short- and long-term effects on aquatic habitat. A GIS-based Predictive Sediment Toolbar is already developed and coupled with the Hydraulic Engineering Center's River Analysis System (HEC-RAS) 2D to determine the potential depositional area and suspended sediment concentration at bridge construction sites. The toolbar was submitted to the Receiving Agency in Phase I. The performance of the toolbar was assessed using field data and observations at a bridge construction site. The toolbar showed a promising performance; however, to reduce modeling uncertainties and develop an understanding of the uncertainties, and increase the accuracy of the approaches and model capabilities, the Performing Agency shall perform following tasks:

i. Develop a guideline for selecting stream flow events to be used in HEC-RAS 1D model and for determining the extent of modeling downstream of the bridge;
ii. Develop a new 1D sediment transport model coupled with HEC-RAS 1D and add to the current GIS toolbar;
iii. Investigate alternative methods for defining eroded sediment characteristics from a typical bridge replacement site and incorporate into the model;
iv. Examine the performance of the new tool using field data collected from a number of bridge sites with a wide range of flow and sediment characteristics. In this Phase II of the project, the Performing Agency shall conduct this research at a Technology Readiness Level (TRL) of 7.

Modification: Amend the contract termination date, revise the Budget, Project Schedule, and Work Plan due to regulatory certainty. The FY2023 budget remains $81,772.00. The FY2024 Budget is decreased by $25,250.00 from $152,478.00 to $127,228.00. The FY2025 Budget is decreased by $122,125.00. The FY2026 Budget is decreased by $35,625.00. The Total Itemized Project Budget Estimate is reduced by $183,000.00 from $392,000.00 to $209,000.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$152,478.00	$121,982.40	$30,495.60

New Budget	$127,228.00	$101,782.40	$25,445.60

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 5-6936-01 **University:** CTR

Project Title: Implementation of Semi-integral Bridges in Texas

Project Start Date: 02/15/2024 **Old Termination Date:** 12/31/2026
New Termination Date: 08/31/2027

Project Status: Active **Project Budget:** $780,032.31

RTI Project Manager: Jade Adediwura **Researcher:** Jorge Zornberg

Project Objectives: The Performing Agency shall validate predicted semi-integral bridge performance against actual semi-integral bridge performance; particularly regarding backfill placement requirements. In particular, the geotextile-confined backfill will be monitored to assess its impact on (1) the lateral earth pressures induced due to cycles of temperature-induced backfill movements and (2) the settlements of the backfill material. The new approach, developed in research project 0-6936, is expected to reduce lateral earth pressures and decrease settlements. This validation of field performance shall facilitate the development of a standard detail and commentary for the Bridge Design Manual as well as the compilation of additional design and construction guidelines. The Performing Agency shall also monitor the semi-integral bridge at China Creek, in the Wichita Falls District using the wireless field monitoring system installed during research project 0-6936.

Modification: Amend the contract to extend the termination date, revise the budget, and update the project schedule due to delayed contract execution and consequent additional time needed to complete various project components. The FY2024 budget is decreased by $93,241.42 from $220,603.92 to $127,362.50; the FY2025 budget remains $235,587.51; the FY2026 budget remains $238,107.07; the FY2027 budget is increased by $93,241.42 from $85,733.81 to $178,975.23. The Itemized Project Budget Estimate remains $780,0321.31

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$220,603.92	$176,483.14	$44,120.78
New Budget	$127,362.50	$101,890.00	$25,472.50

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 9-1531 **University:** TTI

Project Title: Development and Evaluation of Roadside Safety Systems for Motorcyclists

Project Start Date: 09/01/2021 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2025

Project Status: Active **Old Project Budget:** $780,000.00
New Project Budget: $900,000.00

RTI Project Manager: Chris Glancy **Researcher:** Chiara Silvestri Dobrovolny

Project Objectives: This pooled fund study shall provide a cooperative approach to conducting research addressing roadside safety issues specifically related to improving motorcyclist safety. The study shall provide participating states an opportunity to collaborate on best practices, new regulatory issues, risk management strategies, and other research pertaining to roadside safety improvements for motorcyclists. The research activities shall include the identification, development, and evaluation of strategies and devices for mitigating the frequency and severity of roadway departure motorcyclist crashes.

Modification: Amend the contract to extend the termination date, revise the budget and the Project Schedule to include an additional year to allow the Transportation Pooled Fund state members to investigate and research additional motorcycle safety topics. The FY2022 budget remains $72,654.25; the FY2023 budget remains $292,259.00; the FY2024 budget remains $415,086.75; the FY2025 budget is established at $120,000.00; the Total Project Budget is increased by $120,000.00 from $780,000.00 to $900,000.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Project Budget	$415,086.75	$332,069.40	$83,017.35

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7144 **University:** TTI/TXST

Project Title: Develop a Real-time Decision Support Tool for Urban Roadway Safety Improvement

Project Start Date: 01/09/2023 **Old Termination Date:** 12/31/2024
New Termination Date: 06/30/2025

Project Status: Active **Project Budget:** $465,010.00

RTI Project Manager: Katelyn Kasberg **Researcher:** Subasish Das

Project Objectives: Due to the complex nature of urban roadways, conventional crash prediction models are limited as these models omit operating speed, short-duration volume, and weather data. To mitigate this research gap, the following three national databases can be utilized: (1) National Performance Management Research Data Set (NPMRDS) with passenger and freight speed data, (2) Travel Monitoring Analysis System (TMAS) data with both temporary traffic counting and continuous traffic counting programs, and (3) real-time weather data from the National Oceanic and Atmospheric Administration (NOAA). The fatality rate on Texas roadways for 2020 was 1.50 deaths per hundred million vehicle miles traveled, which is an 18.94% increase from 1.26 in 2019. From 2011 to 2020, the fatalities on rural roadways increased by 19%, and this increase on urban roadways is disproportionately high (31%). Research and a supporting decision support tool are necessary to improve urban safety. The Performing Agencies shall leverage ongoing staff leadership and engagement in several national and state Department of Transportation (DOT) speed-safety projects. The Performing Agencies shall provide updated safety performance functions (SPFs) for urban roadways and a real-time decision support tool on risk scoring with the applicability of new data input and model updating pipeline.

Modification: Amend the contract to extend the Termination Date, revise the Budget, and the Project Schedule due to the delays in acquiring driveway types and driveway density measures for Texas urban roadway networks. TxST's Budget: The FY2024 budget is decreased by $50,000.00 from $222,507.50 to $172,507.50. The FY2025 budget is increased by $50,000.00 from $17,613.50 to $67,613.50. TxST's Total Project Budget remains $359,018.50. TTI's Budget: The FY2023 budget remains at $23,499.25. The FY2024 budget remains at $71,882.75. The FY2025 budget remains at $10,609.50. TTI's Total Project Budget remains $105,991.50. The Itemized Project Budget Estimate remains $465,010.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TXST Old Budget	$222,507.50	$178,006.00	$44,501.50
TXST New Budget	$172,507.50	$138,006.00	$34,501.50
TTI Budget	$71,882.75	$57,506.20	$14,376.55

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7167 **University:** TTI

Project Title: Evaluate Performance of Sealers and Coatings Applied to TxDOT Bridge Substructures

Project Start Date: 09/01/2022 **Old Termination Date:** 08/31/2024
New Termination Date: 10/31/2024

Project Status: Active **Old Project Budget:** $499,972.00
New Project Budget: $519,972.00

RTI Project Manager: Tom Schwerdt **Researcher:** Anol Mukhopadhyay

Project Objectives: The Performing Agency shall perform a comprehensive evaluation of concrete sealers and coatings applied to bridge substructure in the state of Texas. The Performing Agency shall investigate the need for and extent of surface preparation on both new and existing concrete surfaces including those with previously applied coatings. A focus is placed on material testing to evaluate the performance of coatings applied with various surface preparation methods and exposed to environmental conditions. The potential benefits are the development of recommendations for the level of surface preparation required for various sealer or coating systems and for the optimal coating type for the Receiving Agency's substructures with or without previously applied coatings.

Modifications: Amend the contract to extend the termination date, revise the Work Plan, the Budget and Project Schedule due to the Receiving Agency requesting that the number of materials tested be increased from 6 to 8 and adding water absorption testing after completion of initial laboratory testing. The FY2023 Budget remains $249,983.50; the FY2024 Budget remains $249,988.50; the FY2025 Budget is established at $20,000.00; the Total Project Budget is increased by $20,000.00 from $499,972.00 to $519,972.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Contract Total	$249,988.50	$199,990.80	$49,997.70

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7171 **University:** TTI/TXST

Project Title: Barrier Striping for the Reduction of Accidents

Project Start Date: 09/01/2023 **Old Termination Date:** 11/30/2024
New Termination Date: 05/31/2025

Project Status: Active **Project Budget:** $288,679.00

RTI Project Manager: Katelyn Kasberg **Researcher:** Boniphace Kutela

Project Objectives: The Traffic Safety Division (TRF) of the Receiving Agency drafted a special specification (SS) for the vertical application of a retroreflective solid stripe on concrete barriers, approximately six (6) inches below the barrier's top. During the phase of new product approval, this SS describes an application similar to three (3) locations already installed on Texas roadways in previous years. Barrier striping increases motorist awareness of the roadway's edge and the barrier itself, particularly in low-visibility conditions (i.e., heavy rain and snow). These existing implementation sites have not been formally evaluated. Furthermore, the short-term effectiveness of the treatments has not been investigated; therefore, there is a need for long-term and short-term safety effectiveness evaluation of these treatments. The Performing Agencies shall collect before-and-after collision data from Crash Record Information System (CRIS) and near-collision data from connected vehicle data vendor (e.g., Wejo) to evaluate the effectiveness of vertical application of a retroreflective solid stripe on concrete barriers. Furthermore, the Performing Agencies shall install these treatments at six (6) high crash locations with different barrier types including, but not limited to concrete barriers and metal beam guard fences to evaluate their short-term effectiveness using non-traditional safety evaluation approaches. The Performing Agencies shall utilize the findings to update the drafted SS for the future use across the state and beyond.

Modifications: Amend the contract to extend the Termination Date and to revise the Budget and the Project Schedule due to the delays in procuring the barrier striping equipment and the increased cost of materials. TTI: The FY2024 budget is decreased by $34,809.00 from $214,439.75 to $179,630.75; the FY2025 budget is increased by $47,309.00 from $6,308.00 to $53,617.00; TTI's Total Project Budget is increased by $12,500.00 from $220,747.75 to $233,247.75. TXST: The FY2024 budget is decreased by $13,920.00 from $62,673.75 to $48,753.75; the FY 2025 budget is increased by $13,920.00 from $5,257.50 to $19,177.50; TXST's Total Project Budget remains $67,931.25. The Itemized Project Budget Estimate is increased by $12,500.00 from $288,679.00 to $301,179.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TTI Old Budget	$214,439.75	$171,551.80	$42,887.95
TTI New Budget	$179,630.75	$143,704.60	$35,926.15

TXST Old Budget	$62,673.75	$50,139.00	$12,534.75
TXST New Budget	$48,753.75	$39,003.00	$9,750.75

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 9-1531 **University:** TTI

Project Title: Development and Evaluation of Roadside Safety Systems for Motorcyclists

Project Start Date: 09/01/2021 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2025

Project Status: Active **Old Project Budget:** $780,000.00
New Project Budget: $900,000.00

Old RTI Project Manager: Chris Glancy
New RTI Project Manager: Martin Dassi

Researcher: Chiara Silvestri Dobrovolny

Project Objectives: This pooled fund study shall provide a cooperative approach to conducting research addressing roadside safety issues specifically related to improving motorcyclist safety. The study shall provide participating states an opportunity to collaborate on best practices, new regulatory issues, risk management strategies, and other research pertaining to roadside safety improvements for motorcyclists. The research activities shall include the identification, development, and evaluation of strategies and devices for mitigating the frequency and severity of roadway departure motorcyclist crashes.

Modification: Amend the contract to extend the termination date, revise the budget and the Project Schedule to include an additional year to allow the Transportation Pooled Fund state members to investigate and research additional motorcycle safety topics. The FY2022 budget remains $72,654.25; the FY2023 budget remains $292,259.00; the FY2024 budget remains $415,086.75; the FY2025 budget is established at $120,000.00; the Total Project Budget is increased by $120,000.00 from $780,000.00 to $900,000.00.

Financials	FY 24 Budget	100% Federal
Project Budget	$415,086.75	$415,086.75

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Project Number: 0-7108 **University:** UTEP

Project Title: Evaluate the Importance of Fine Aggregates in Achieving Adequate Skid Resistance in TxDOT Hot Mix Asphalt Mixtures

Project Start Date: 09/01/2021 **Old Termination Date:** 08/31/2024
New Termination Date: 08/31/2026

Project Status: Active **Old Project Budget;** $515,000.00
New Project Budget: $863,000.00

RTI Project Manager: Tom Schwerdt **Researcher:** Imad Abdallah

Project Objectives: The lack of skid resistance has been an important issue for Receiving Agency pavement as many of them cannot hold adequate skid resistance in the long run, and even some newly constructed roads are observed to have poor skid resistance. Skid resistance is a function of the quality of the aggregate as well as the micro-and macro-texture of the surface. Those textures can be modified by using the appropriate type and amount of fine aggregates and fines in asphalt concrete. The main focus of the research is understanding the effects of fine aggregates and fines on the skid resistance of asphalt concrete since their impacts on the skid resistance and performance. The Performing Agency shall evaluate the current practices and research studies commissioned by Receiving Agency (in particular) and other states (in general) on the use of fine aggregates and fines in asphalt concrete to improve skid resistance. The major objective of this project shall be critical to evaluate the influence of fine aggregates and high-quality fines on the skid resistance of asphalt concrete.

Modifications: Amend the contract to extend the Termination Date, replace the Project Team, add new tasks, revise the Project Schedule and the Budget due to the need to include field trials and monitor test sections as well as coordinate with other related projects. The FY2022 Budget remains $153,500.00. The FY2023 Budget remains $159,500.00. The FY2024 Budget remains $202,000.00. The FY2025 Budget is established at $172,000.00. The FY2026 Budget is established at $176,000.00. Total Project Budget is increased by $348,000.00 from $515,000.00 to $863,000.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Contract Total	$202,000.00	$161,600.00	$40,400.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7127 **University:** TTI/TAMUCC

Project Title: Examine Reconnaissance Scanning of Underground Utilities in the ROW

Project Start Date: 09/21/2021 **Old Termination Date:** 08/31/2024
New Termination Date: 02/28/2025

Project Status: Active **Old Project Budget:** $1,135,880.75
New Project Budget: $1,264,144.00

RTI Project Manager: Wade Odell **Old Researcher:** Gary Young
New Researcher: Cesar Quiroga

Project Objectives: Mapping of buried utilities using rigorous subsurface utility engineering (SUE) quality level B (QLB), as is frequently performed or recommended, can be costly. It can also be ineffective for unknown utilities (i.e., utilities that exist but for which no information is available). This is particularly common and problematic in areas of oil and gas operations. When undiscovered until construction, these unknown utilities may cause serious scheduling disruptions as well as higher construction costs, along with safety and environmental risks. There is a need for a faster, less expensive method of scanning the right of way (ROW) for these unknown utilities. This research shall evaluate, select and test the application of newly available geophysical measurement systems. These systems would allow quickly and cheaply detecting and mapping unknown pipelines or other utilities in the ROW. It compares the effectiveness and cost of deployment to standard QLB SUE and reports on technologies that are both technically and cost effective for identifying unknown utilities.

Modifications: Amend the contract to extend the Termination Date, replace the Project Supervisor, revise the Project Schedule and the Budget due to the delay in purchasing the Ground Penetrating Radar (GPR) unit. TTI's budget: The FY2022 Budget remains $364,873.75. The FY2023 Budget remains $237,116.25. The FY2024 Budget is increased by $43,638.25 from $401,875.75 to $445,514.00. The FY2025 Budget is established at $84,625.00. TTI's Total Project Budget is increased by $128,263.25 from $1,003,865.75 to $1,132,129.00. TAMUCC's budget: The FY2022 Budget remains $55,856.25. The FY2023 Budget remains $26,548.75. The FY2024 Budget remains $49,610.00. TAMUCC's Total Project Budget remains $132,015.00. The Itemized Project Budget Estimate is increased by $128,263.25 from $1,135,880.75 to $1,264,144.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
TAMUCC Budget	$49,610.00	$39,688.00	$9,922.00
TTI Old Budget	$401,875.75	$321,500.60	$80,375.15
TTI New Budget	$445,514.00	$356,411.20	$89,102.80

*Non-Federal Match provided by Transportation Development Credits (TDCs)

Project Number: 0-7138 **University:** CTR/TTI

Project Title: Driver Distraction in an Era of Rapid Technological Change, Digital Advertising Billboards

Project Start Date: 09/01/2022 **Old Termination Date:** 08/31/2024
New Termination Date: 11/30/2024

Project Status: Active **Old Project Budget:** $404,050.89
New Project Budget: $432,453.89

RTI Project Manager: Katelyn Kasberg **Researcher:** Adam Pike

Project Objectives: Outdoor advertising signs impact millions of travelers around the world every day. These signs are designed to attract driver attention thus taking it away from the driving task. Driver inattention and distraction are two of the most critical factors for road safety. Receiving Agency regulation of outdoor advertising signs must deal with changing technologies, including digital billboards, which allow for modifications to sign illumination, motion, and content. Regulations are not keeping pace with changing sign trends and must be updated to address potential impacts on road user safety. This research project focuses on the degree of driver distraction caused by typical and digital advertising sign contents. The project includes a comprehensive state-of-the-practice review, crash investigation, and an on road human factors evaluation. The illumination levels and content (including motion) during daytime and nighttime travel for dry and wet-weather conditions are considered. This research project shall provide the Receiving Agency with tools and resources to help manage outdoor digital advertising billboards by establishing practical criteria for sign illumination and content. These resources shall allow the Receiving Agency to manage the advertising signs such that road user safety is accounted for while maintaining the ability of sign owners to develop effective means of communicating with the public.

Modifications: Amend the contract to extend the Termination Date, revise the Budget, and revise the Project Schedule due to delays in acquiring the necessary project equipment. TTI's budget: The FY2023 Budget remains $155,276.00. The FY2024 Budget remains $177,798.25. The FY2025 Budget is established at $20,465.50. TTI's Total Project Budget is increased by $20,465.50 from $333,074.25 to $353,539.75. CTR's Budget: The FY2023 Budget remains $35,165.51. The FY2024 Budget remains $35,811.13. The FY2025 Budget is established at $7,937.50. CTR's Total Project Budget is increased by $7,937.50 from $70,976.64 to $78,914.14. The Itemized Project Budget Estimate is increased by $28,403.00 from $404,050.89 to $432,453.89.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
CTR Budget	$35,811.13	$28,648.90	$7,162.23
TTI Budget	$177,798.25	$142,238.60	$35,559.65

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 0-7158 **University:** UTSA

Project Title: Calibration of Bridge Performance Models Using Element Data

Project Start Date: 09/02/2022 **Old Termination Date:** 08/31/2024
New Termination Date: 12/31/2024

Project Status: Active **Project Budget:** $393,835.00

RTI Project Manager: Tom Schwerdt **Researcher:** Jose Weissmann

Project Objectives: The Performing Agency shall develop element deterioration models covering all bridge elements, including culverts, known as National Bridge Elements (NBEs) and Bridge Management Elements (BMEs), which shall forecast the probabilities that each statistically validated family of bridge elements and culverts will deteriorate to lower condition states within certain time frames. The Performing Agency shall also develop, test and validate Element Health Indices (EHIs), and aggregate them into a Texas Bridge Health Index (TxBHI) representing the entire bridge or culvert, ensuring that it prioritizes at-risk structures while balancing overall maintenance needs. These products shall have a Technology Readiness Level (TRL) of 8 or higher, and be easily implementable into AASHTOWare BrM software and/or other desired Receiving Agency software. The project shall also use the deterioration forecasts in conjunction with the historical inspection database to identify and recommend structural details that warrant further improvements on design and construction specifications at TRL 2 or 3. All products shall be based on statistical analyses of a historical database with combined NBE, CoRe, NBI, climatic and environmental data.

Modifications: Amend the contract to extend the termination date and revise the budget and project schedule due to the Principal Investigator and lead Researcher experiencing hospitalization and a long recovery time. The FY 2023 budget remains $198,205.00. The FY 2024 budget is decreased by $17,500.00 from $195,630.00 to $178,130.00. The FY 2025 budget is established at $17,500.00. Itemized Project Budget Estimate remains $393,835.00.

Financials	FY24 Budget	80% Federal	20% Estimated TDCs*
Old Budget	$195,630.00	$156,504.00	$39,126.00
New Budget	$178,130.00	$142,504.00	$35,626.00

*Non-Federal Match provided by Transportation Development Credits (TDCs)

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Project Number: 9-1532 **University:** CTR

Project Title: TPF-5(508) Concrete Bridge Engineering Institute (CBEI)

Project Start Date: 6/21/2023 **Termination Date:** 5/31/2027

Project Status: Continuation **Old Project Budget:** $5,313,706.25
New Project Budget: $6,354,048.90

RTI Project Manager: Darrin Jensen **Researcher:** Oguzhan Bayrak

Project Objectives: The objective of TPF-5(508) Concrete Bridge Engineering Institute (CBEI) Transportation Pooled Fund (TPF) is to create a national resource for innovative workforce development programs and implementation of new technologies in the field of concrete bridges, establishing a consortium of member states. CBEI shall be the center of concrete bridge related research, education, and training at the Performing Agency, the University of Texas at Austin in the Cockrell School of Engineering.

The Performing Agency shall work with bridge stakeholders (primarily state and federal transportation agencies) and seek input from industry groups representing the concrete bridge community to develop pioneering, practical, and effective programs that will have national impact with the goal of addressing issues encountered in concrete bridges and implementing plans to work toward ensuring resiliency expectations for concrete bridges. The Performing Agency's specific objectives are to develop and implement the following services with coordinated input from members of the pooled fund:

- Three training programs which will include both classroom and hands-on training
  - Concrete Bridge Deck Construction Inspection Program
  - Concrete Materials for Bridges Program
  - Post-tensioning (PT) Laboratory
- The Concrete Solutions Center
- The Bridge Component Collection
- The Technology Development Program

The Performing Agency shall also implement the components of the Concrete Solutions Center comprised of workshops, seminars, and project technical support. The Performing Agency shall develop and administer the Technology Development Program for the evaluation and implementation of new and emerging technologies in the field of concrete bridges.

The Performing Agency shall conduct structural tests on Inverted-T Caps and prepare a state of the practice report on mixed, bonded and unbonded post-tensioned, reinforcement.

Modification: Amend the contract to revise the budget and project schedule to adjust for the additional costs associated with Task 9, Strength Evaluation of Existing Inverted-T Caps. The FY2023 budget remains $182,345.00. The FY2024 budget is decreased by $1,081,333.61 from $2,950,820.77 to $1,869,487.16. The FY2025 budget is increased by $2,121,676.26 from $1,315,466.71 to $3,437,142.97. The FY2026 remains $587,771.28. The FY2027 budget remains $277,302.49. The Itemized Project Budget Estimate is increased by $1,040,342.65 from $5,313,706.25 to $6,354,048.90. CALTRANS has contributed $150,000.00 to the pooled fund which is not yet represented in the total New Project Budget of $6,354,048.90.

Financials:	FY '24 Budget	100% Federal*	80% Federal**	20% State***
Old Project Budget	$2,950,820.77	$2,638,320.77	$250,000.00	$62,500.00
New Project Budget	$1,869,487.16	$1,111,076.06	$606,728.88	$151,682.22

* Corresponds to the states' FY '24 contributions (100% federal share) and funding for Texas' special project (100% federal share).

** Corresponds to FHWA's FY '24 contribution and funding for FHWA's special project.

***Corresponds to Texas' state match of FHWA's FY '24 contribution and special project.