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UDOT RESEARCH DIVISION ANNUAL WORK PROGRAM

Prepared For:

Utah Department of Transportation
Research Division

Submitted By:

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RESEARCH



This work program was prepared by T. Y. Lin International for the Utah Department of Transportation Division of Research. Contributions were received from the UDOT Research Staff, and the Federal Highway Administration, Utah Division Office.

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16. Abstract This document outlines the FY 2012 Annual Work Program for the Utah Department of Transportation Research Division. The main objective of the program is to promote, conduct and implement research activities and initiatives, to aid UDOT in achieving its mission. The UDOT Research Division works to supply a valuable service to the UDOT divisions and regions, as well as other key customers in the transportation community. Innovation within the Department is highly desired, and the Research Division is the focal point for new and improved ways of doing business. The division works in collaboration with the Federal Highway Administration, other public agencies, academic institutions, and many private sector partners. This document describes the progress on all new, continuing, and completed research projects. It outlines the budget line items for the Research Division.					
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Section 1- Strategic Direction

The UDOT Research Division supplies a valuable service to the UDOT divisions and regions, as well as other key customers in the transportation community. Innovation within the Department is highly desired, and the Research Division is the focal point for new and improved ways of doing business.

The Research Division exists to promote, conduct and implement research activities and initiatives, to aid UDOT in achieving its mission. The division works in collaboration with the Federal Highway Administration, other public agencies, academic institutions, and many private sector partners.

Research Division Mission

The foremost purpose of the UDOT Research Division is to help the Department meet its short and long-term goals. This is reflected in the division slogan:

“Tools for Better Transportation Tomorrow”

The general strategy to achieve this objective is described in the mission of the Research Division:

“The Research Division will be at the forefront of transportation innovation, providing information, tools, and resources to improve planning, design, construction, operation and maintenance of Utah’s highways.”

Research Management

The Research Division performs the following research management services that help improve the way UDOT does business:

- Identifies implementable research ideas
- Manages UDOT research projects
- Participates in pooled-fund studies with other states
- Manages innovative and special projects
- Supports implementation of research results
- Publishes reports on research projects
- Presents research results and recommendations
- Conducts scanning tours of new technologies

Research Coordination

The Research Division performs the following research coordination activities to advance transportation research:

- Provides access to national research resources
- Supports participation in national conferences and workshops
- Shares market ready ideas with Technology Implementation Group (TIG)
- Engages UDOT experts in national committees & project panels
- Applies for research grants
- Utilizes Research In Progress (RIP) database of on-going research
- Collects and distributes conference reports and published materials
- Participates in peer exchanges with other state research divisions

Technology Transfer

The technology transfer program exchanges information acquired through research that leads to the adoption of innovations and transfer of knowledge. Under this program the Division performs the following services:

- Provides literature searches & research updates
- Coordinates FHWA Priority Market-Ready Technologies & Innovations
- Produces quarterly research newsletter
- Prepares literature summaries
- Provides technology transfer sessions & webinars
- Publishes UDOT Research Reports
- Manages the Local Technical Assistance Program (LTAP)
- Creates research project trading cards
- Offers library services to UDOT

Product Evaluation and Experimental Features Evaluation

The performance of new products, experimental features, and other new concepts are evaluated by the Research Division. These activities include:

- Evaluate proprietary products for federally funded construction projects
- Conduct studies on new products of interest to UDOT
- Publish experimental features reports online
- Assist divisions with product implementation and specifications
- Participate on UDOT's New Product Evaluation Panel
- Coordinate product demonstrations with vendors and interested divisions
- Participate in national transportation product evaluations

UDOT Strategic Goals and Vision

The Utah Department of Transportation has identified four major goals known as the Final Four as follows:

- 1. Take Care of What We Have**
- 2. Make the System Work Better**
- 3. Improve Safety**
- 4. Increase Capacity**

The Systems Planning and Programming Group, of which the Research Division is a part, supports UDOT's overall efforts through four major business areas:

- 1. Monitor Transportation System Conditions**
- 2. Identify Transportation Needs**
- 3. Establish Transportation Plans**
- 4. Determine Program and Project Schedule**

The UDOT Research Division is committed to aiding the Department in achieving these goals by aligning every aspect of the research program to one or more of these objectives. Every Research project and program is scrutinized for alignment with the Department's goals and plans on a routine basis. This commitment will be achieved by working closely with all groups, divisions, regions and districts within UDOT.

New Direction and Management Processes

The Research Division has undertaken some steps to improve the way they conduct business. These processes will be adopted during the first part of FY 2012, and used to facilitate the management of some of the new projects and programs. These UDOT initiatives were aided by T Y Lin International by publishing reports on the subject, and two are described briefly in the following paragraphs:

Streamlined Research Project Selection and Reporting

Procedures have been developed to streamline some aspects of the Research Program to improve efficiency. This fast-track process, when applicable, aids in developing a work plan, allocating funding, selecting a principal investigator, completing the project, and distributing the deliverables.

The research staff has been provided with tools to utilize the methods. These include criteria to determine if streamlining various aspects of the project is feasible. The use of fast-track processes is more appropriate for certain project types, and can be applied more effectively to specific aspects of a project. Certainly high profile projects mandated by upper management should be placed on a fast track when possible.

Critical path planning has been recommended for use when seasonal considerations are needed to schedule tasks. The use of existing committees to streamline Technical Advisory Committee (TAC) oversight will be encouraged, and the use of phasing can reduce the project time when early project objectives are not successful. The best use of pooled-fund projects is described for both in-house and participation in other states.

A flow chart aids in selecting the best project type to facilitate work plan preparation, PI selection, and identifying deliverables. Abbreviated report templates have been created for the preparation of literature summaries, policy research, state-of-the-practice studies, executive summaries, and scanning tours.

Resource Matching for Research

Development is also underway to implement processes to acquire more resources from partners and stakeholders. Advantages and disadvantages of using multiple funding sources are listed to aid in project budget planning. A list of potential funding partners is provided to the research staff, and ways to encourage their participation. This includes partners from the private sector, academia, and cross-cutting fields such as environmental groups, and multi-modal organizations.

It is important for the Research Division to generate both hard and soft match contributions. Ways to best program the use of these resources related to the project tasks and deliverables are documented. A Multiple Funding Source Work Plan Template has been provided to aid in this effort. A flow chart is also available to use in project funding selection.

Section 2- Research Division Staff

During the past 18 months the Research Division has undergone some major changes. The Division was moved from the Project Development Group to the Systems Planning and Programming Group.

The number of FTEs assigned to the division was reduced to seven positions. The New Products Unit, along with the main FTE for this operation, was transferred to the Materials Division. These reductions have resulted in reassignment of duties throughout the division, and some outsourcing of certain functions.

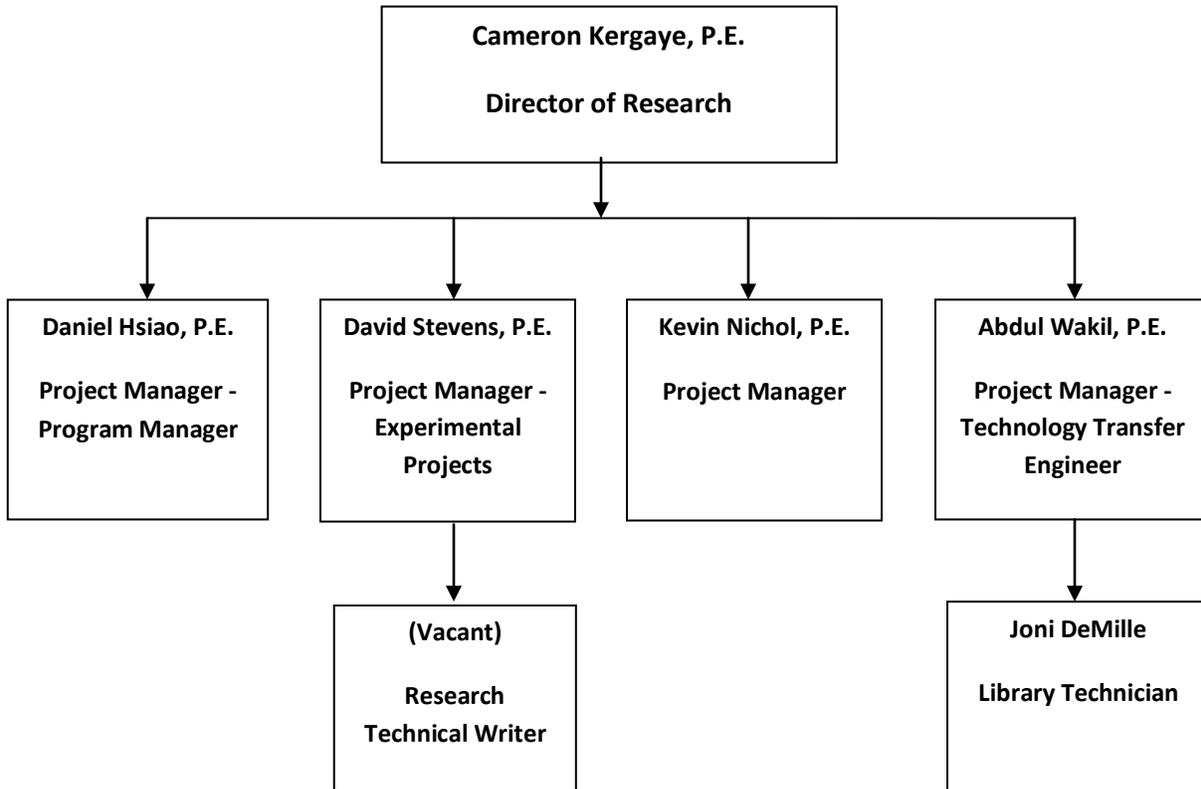
The division staff has also experienced significant changes in the past 18 months. The Director of the Division, Deputy Director, Research Program Manager, and the Product Evaluation Engineer have all left the program for other assignments within UDOT. The current Research Staff is committed to a broad scope of expertise, and a high level of professionalism. The current staff brings renewed approaches and enhancements to the Research Program, while maintaining the high standards of excellence established in the Research Program in the past.

Research Staff

The current research staff is listed below along with the general assigned areas:

Cameron Kergaye	Director of Research
Daniel Hsiao	Research Project Manager/Program Manager
David Stevens	Research Project Manager/Experimental Projects
Kevin Nichol	Research Project Manager
Abdul Wakil	Research Project Manager/Technology Transfer
(Vacant)	Research Technical Writer
Joni DeMille	Library Technology Transfer Technician

Research Division Organization Chart



Section 3- Research Projects

Research projects funded, managed, and conducted by the UDOT Research Division are solicited and approved through the Utah Transportation Research Advisory Council (UTRAC) process. The council provides oversight of the program under the direction of the Research Director, Cameron Kergaye. The Research Staff is responsible to manage the various projects and programs in compliance with Federal and State guidelines. The main focus of these projects is to address “applied” research topics.

The UTRAC Workshop, held on April 7, 2011, was sponsored by the Research Division and the UTRAC Council. The workshop is held on an annual or bi-annual basis depending on the availability of funding. Attendees to the UTRAC Workshop are experts from the UDOT divisions, UDOT regions, FHWA, the three major universities in the state, transportation consultants and contractors, new product vendors, and visitors.

The workshop generates problem statements through a process of discussions and a project balloting method. The successful problem statements are used to generate detailed work plans for each project. This includes selecting a principal investigator, project objectives, required tasks, a project schedule, and funding requirements. A Technical Advisory Committee (TAC) is formed for each project to provide oversight of the project along with an assigned project manager. The lead TAC member is generally the project champion, typically a UDOT division leader or delegate who helps steer the research project toward successful implementation.

New Projects

The UTRAC Workshop results along with projects mandated by administrative personnel produced the following new projects for approval in the FY 2012 Annual Work Program:

Implementation of Low Temperature Test for Asphalt Mixtures					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Pedro Romero	U of U	Kevin Nichol	Kevin VanFrank	MOI & Specs	36 months
Characterize the low temperature properties of asphalt mixtures. Determine the effect of RAP on these materials. Establish a specification limit to balance the high and low temperature properties of these mixes.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.105	

Performance Evaluation for Various Preservation Treatments					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
TBD	TBD	Kevin Nichol	Gary Kuhl	Data collection plan & Condition reports	10 years
Document the long-term performance of preservation treatments, and identify the most cost-effective strategies. Identify the possible reasons for poor performance. Identify any side benefits such as noise, constructability, etc.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.110	

Cost Effective Selection of Snow Plow Blades					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
TBD	TBD	Abdul Wakil	Ackermann/Bernhard	Lessons learned & Blade longevity/cost curves	18 months
Test the various snow plow blades, and create cost equations for each by pavement type or condition. Develop a list of pros and cons for each blade by roadway type or condition.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.204	

Utah Winter Severity Index					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
TBD	TBD	Abdul Wakil	Bernhard/Jones	Documentation of Index, Spreadsheet model & PowerPoint	11 months
Identify factors affecting winter severity in the various Utah climate zones. Prepare a statewide winter severity index to normalize snow removal spending between stations.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.206	

Evaluating the Feasibility of Incorporating Mobility-Related Work Zone Traffic Control Performance Measures in Highway Reconstruction Contracts					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Mitsuru Saito	BYU	Kevin Nichol	Jesse Sweeten & Robert Hull	Mobility criteria, testing technologies & process to include at work zones	18 months
Evaluate NCHRP 2010 Best Practices in Work zone assessment, Data Collection, and Performance Measurements and other literature. Identify potential performance measurement technologies for use by a task force. Develop a plan for testing selected mobility performance measuring technologies, and estimate costs of implementation.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.301	

Evaluating the Safety Effects of Signal Improvements					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Grant Schultz & Mitsuru Saito	BYU	Kevin Nichol	Larry Montoya	Procedure for estimating benefits	16 months
Estimate the benefits of signal improvements. Utilize databases to estimate the safety benefits of these intersections. Develop crash modification factors for each specific improvement related to crash type. Make recommendations on the benefit/cost of each improvement type.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.303	

Design and Construction Monitoring of Surcharged Embankment					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Steve Bartlett & Evert Lawton	U of U	David Stevens	Grant Gummow	Surcharge design method & Design guide	12 months
Develop design guidance for determining the amount of surcharge required for settlement performance goals. Recommend laboratory testing and in situ methods to support the design. Develop methods to monitor and release surcharge fills. Apply methods to a project.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.402	

Lateral Pile Resistance Near MSE Walls (Lead-State Pooled-Fund Project)					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Kyle Rollins	BYU	David Stevens	Jon Bischoff	Design equations	24 months
Determine the reduced lateral pile resistance vs. distance behind MSE wall for single and group piles from dedicated full-scale testing. Determine the increase in wall force, develop design rules to account for reduced pile resistance, and develop equations to predict forces.					
<i>Status:</i> New Project		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT11.404	

Passive-Force Displacement for Skewed Abutments					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Kyle Rollins	BYU	David Stevens	Darin Sjoblom	Procedure to calculate passive force for abutments	14 months
Determine the passive force-displacement curves for a skew abutment with and without MSE wing walls. Evaluate the effect of MSE wing walls on the response. Provide comparisons with behavior of skewed abutments in comparison with normal abutments. Develop procedures for calculating passive force-displacement curves for skewed abutments.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.406	

Full-Scale Shake Table Testing to Evaluate Seismic Performance of Reinforced Soil Walls (Non-lead state pooled-fund project TPF SOL 1294)					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Fox/Elgamal/Allen	UCSD/WSDOT	David Stevens	Jim Higbee	Seismic design recommendations	24 months
Utilize full-scale shake tables to measure the movements and overall performance of reinforced soil walls.					
<i>Status:</i> New Project		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT11.410	

Spliced-Sleeve Connection for Precast RC Bridge Piers (TPF SOL 1307 Lead state pooled-fund project)					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Chris Pantelides	U of U	Daniel Hsiao	Swanwick	Standard drawings for use in ABC	12 months
Evaluate the use of a splice sleeve connection between precast columns and the footings. Evaluate this connection in a seismic setting. Develop ABC Standard Drawings for precast concrete bridge elements using splice sleeve connections in a seismic application.					
<i>Status:</i> New Project		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT11.502	

Develop Design Guidelines for Skewed or Curved Integral Abutment Bridges					
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Deliverables:</i>	<i>Duration:</i>
Barr	USU	Daniel Hsiao	Swanwick	Design guidelines, Repair strategies & Modeling	18 months
Determine the causes of cracking in skewed or curved abutment bridges, and develop design guidelines to eliminate problems in the future. Develop repair strategies to fix existing problems.					
<i>Status:</i> New Project		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT11.503	

Continuing Projects- Federal

The following projects were underway in FY 2011, and will receive scheduled funding from the FY 2012 federal budget to continue the tasks outlined in their respective work plans:

COLD-IN-PLACE RECYCLING FIELD DATA COLLECTION				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Tim Biel	CME T. G.	Kevin Nichol	Kevin VanFrank	April 2012
Identify field test practices for use in collecting real-time data on the proper opening to traffic of the CIR material. Collect data from three projects, and summarize the ability of the trial protocols to judge conditions for openings.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT11.106

FHWA PEER EXCHANGE				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
TBD	TBD	Kergaye	UTRAC Council	June 2012
Hold a peer exchange session with research managers from other states to improve operations.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i>

FREEWAYS TO FUEL: A NOVEL APPROACH TO BIOFUELS PRODUCTION				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Whitesides	USU	Wakil	Kergaye	2011
Investigate the possibility of growing biodiesel producing, drought-tolerant crops such as canola, safflower and perennial flax adjacent to state highways.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> AM07.001

TESTING OF GFRP WITH LIGHTWEIGHT BRIDGE DECK				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Pandelides	U of U	Hsiao	Swanwick	2011
Conduct laboratory load testing of normal weight precast GFRP reinforced deck panels and lightweight concrete precast GFRP reinforced deck panels. Develop recommendations for design of the lightweight version.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT08.801

IMPROVING CONCRETE PERFORMANCE WITH SUSTAINABLE LONG-LIFE CONCRETE SPECIFICATIONS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Tikalsky	U of U	Wakil	Andrus	2011
Define environmentally obtainable levels of cement content required for long-lasting concrete in Utah, modify specifications to allow the use of long-lasting concrete, and identify methods and incentives to encourage its use.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.305

I-15 EMBANKMENT AND INNOVATIVE FOUNDATION TREATMENTS STUDY				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Steve Bartlett	U of U	Stevens	Bischoff	2011
A 10-year study of the performance of innovative foundation treatments and embankment construction, including Geofoam fill, wick drains, lime cement columns, and MSE walls. Embankments were instrumented in several locations, and the reading evaluated to determine whether performance matches predicted performance.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> TB98.029a

PROGRAMMING OF STRONG GROUND MOTION INSTRUMENTATION OF NEW BRIDGES				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Marv Halling	USU	Nichol	Swanwick	2011
Develop a set of standard plans for installing strong ground motion instrumentation on significant bridges, and outline a plan for identifying the appropriate bridges.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT05.702

DETERMINING WILDLIFE USE OF WILDLIFE CROSSING STRUCTURES UNDER DIFFERENT SCENARIOS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Cramer	USU	Stevens	Weston/West	2011
This study evaluates the effectiveness of wildlife crossing structures by setting up cameras at various locations to verify use and passage. Cameras have been installed on I-15, I-80, and other highway locations in Utah, and thousands of animal crossing images collected for analysis.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT07.401

EVALUATION OF UTAH WORK ZONE PRACTICES				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Heaslip	USU	Hsiao	Hull	2011
Review the current state of the art in work zone safety operations, determine the attitudes and practices of local contractors, review the practices prevalent in Utah, and provide recommendations to UDOT for improved and enhanced operations.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.603

UNDERSTANDING THE ECONOMICS OF TRANSPORTATION IN UTAH				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Schultz	BYU	Wakil	Thomas	2011
Develop a better understanding of the relationship between economy and transportation projects, primarily to be used to enhance the long range project planning and decision-making efforts.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.501

EVALUATION OF OVERLAY RUTTING SUSCEPTIBILITY				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Guthrie	BYU	Stevens	Andrus/Westover	2011
Determine whether 9mm asphalt overlays perform better (less rutting and showing) than 12.5 mm overlays. Also includes an evaluation of microsurfacing treatments.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT06.206

RETROFITTING CULVERTS AND FISH PASSAGE - PHASE 2				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Tullis	USU	Wakil	Stuhff/Ularich	12/2011
Evaluate various methods and materials for slip lining culverts and provide training materials.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT07.905a

REDUCTION IN WICK DRAIN EFFECTIVENESS IN SENSITIVE CLAYS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Rollins	BYU	Stevens	Bischoff	2011
Evaluate the influence of wick drain spacing and mandrel/anchor geometry of drain effectiveness in Utah Valley clays. Determine the “critical drain spacing” for typical Utah Valley interchange locations using CPT and vane shear testing, field test data from other sites, and new field tests.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT08.702

LATERAL PILE RESISTANCE NEAR MSE WALLS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Rollins	BYU	Stevens	Bischoff/Sjoblom	2012
Perform full-scale, lateral load testing on driven pipe piles behind MSE walls to determine the load transfer impact between the piles and the walls and recommend appropriate pile spacing. Also evaluate corrosion of piles in existing embankments/abutment fills.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.705

USING UNMANNED AIRCRAFT TO HELP SOLVE UDOT PROBLEMS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Barfuss/McKee	BYU	Hsiao	Stuhff	2012
Use high-resolution aerial photography from unmanned aerial vehicles to improve UDOT’s understanding of state roadways, including providing timely updates to GIS databases of new highway construction, culvert locations, wetlands, structures, and maintenance issues. Focus of current study is wetlands.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.201

OCCURRENCE OF WATER VAPOR FLOW IN NON-FROST-SUSCEPTIBLE AGGREGATE BASE MATERIALS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Guthrie	BYU	Stevens	Andrus/Neeley	2012
The research findings will enable engineers to assess the susceptibility of base/sub-base material to thaw weakening due to water vapor flow and assist them in determining whether or not a soil/aggregate stabilizer may be warranted. Combined with UT07.208.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT07.305 & UT07.208

IMPROVED STABILITY AND CONSOLIDATION ASSESSMENT OF EMBANKMENTS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Lawton/Bartlett	U of U	Stevens	Higbee	2012
Evaluate the methods used to predict settlements caused by large embankments over very soft soils, and recommend better ways to predict the magnitude and timing of this settlement. Project includes instrumentation of a large embankment on two construction projects, and laboratory testing of the native subsoils.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT07.704

FULL-DEPTH RECLAMATION WITH EMULSION				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Guthrie	BYU	Stevens	Andrus	2012
Evaluate the moisture and frost susceptibility and in-situ properties of emulsion-treated base material associated with full-depth reclamation of asphalt pavements.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT08.303

DEVELOPMENT OF A SIGN MANAGEMENT PLAN & SYSTEM FOR UDOT				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Kevin Heaslip	USU	Abdul Wakil	Lindsey	December 2012
Recommend a cost-effective method to implement a sign management plan. Develop a process to maintain the plan in the future, including data collection and storage.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT11.201

CULVERT ROUGHNESS ELEMENTS FOR NATIVE UTAH FISH PASSAGE PHASE II				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Hotchkiss	BYU	Nichol	Stuhff	2012
Test roughness elements in culverts with native fish species to guide the development of culvert retrofit schemes. Phase II involves testing placement of gravel substrate in culverts to improve fish passage using in-service culverts for the study.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.903a

MECHANISTIC CHARACTERIZATION OF SOILS AND AGGREGATES				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Guthrie	BYU	Nichol	Andrus/Anderson	2013
Pavement design methods being proposed require input related to base and subbase layer properties. This study will measure those properties for Utah's soils and aggregate sources for input into the new design software.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT09.301

AASHTO CLIMATE CHANGE				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
TBD	TBD	Kergaye		2011
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i>

POOLED-FUND PROJECT MANAGEMENT				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Various	Various	Hsiao	Various	2011
Provide oversight and management of UDOT's involvement in pooled-fund projects.				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i>

SAFETY IMPACTS OF DESIGN EXCEPTIONS IN UTAH				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Porter	U of U	Nichol	Hull	2012
Evaluate how design exceptions affect safety on Utah highways. (Additional funding provided by Traffic & Safety Division, University of Utah, and U.S. Department of Transportation.)				
<i>Status:</i> In progress		<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> MP11.002

Continuing Projects- State Funded

The following on-going projects will receive scheduled funding from the current state research budget to continue the tasks outlined in their respective work plans:

AS-BUILT SCANNING - PHASE 2				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
	UCI	Wakil	Kergaye	2011
Scan and archive historical construction as-built drawings.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> AM10.002

ISOLATION BEARINGS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Ryan/Boyle	USU	Hsiao	Cook	2011
Investigate the use of lead-rubber and friction pendulum seismic isolation bearing for bridges. Based on the findings, propose recommendation for future UDOT bearing design and selection. Also investigate the effectiveness of partially isolated bridges.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT07.809

EVALUATION OF AN INDEPENDENT CADD PLATFORM FOR UDOT				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Heaslip	USU	Wakil	Hancock	2011
Evaluate the advantages, disadvantages and portability of the various CAD file types and provide recommendations for possible changes to the CAD standard used by UDOT.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT09.002

DETERMINING NATIONAL REGISTER ELIGIBILITY FOR POST-WAR HISTORIC BRIDGES				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Roland	Mead & Hunt	Wakil	Giraud	2011
Determine the eligibility of about 450 historical bridges on the National Register of Historic Places and establish procedures for more efficient environmental reviews.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT09.402

EVALUATION OF BRIDGE DECK SEAL TREATMENTS FOR ABC DECKS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Pantelides	U of U	Wakil	Potter	2011
Evaluate the effectiveness of a number of different waterproofing membranes on concrete bridge decks.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT09.803

MONITORING GFRP PRECAST DECK STRESSES				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Pantelides	U of U	Hsiao	Swanwick	2011
Instrument and monitor the performance of pre-cast bridge deck panels manufactured with GFRP reinforcement on the US-6 Emma Park Road Bridge, Phase II, including truck load testing and monitoring of prestressed girders.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> AM09.002

UTILITY DATA MANAGEMENT PROCESS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Meis	UMS, Inc.	Stevens	Quinn	2011
Develop a system to track utility data and better manage the process for utility relocations during construction. This is a change in scope and title (formerly GIS Project Tracking).				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT06.103

EVALUATION OF EPM PROJECT SCHEDULING				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Ernest Nielsen	Resource Connections	Hsiao	Hancock	2012
Evaluate UDOT's ePM project scheduling process to help UDOT create reliable project schedules, track project progress, and measure project delivery performance.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT09.102

PERFORMANCE OF ASPHALT AND CONCRETE PAVEMENTS: CLIMATIC EFFECTS AND WINTER MAINTENANCE COSTS (INCLUDES UT07.305 SCOPE)				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Guthrie	BYU	Stevens	Andrus/Neeley	2012
Evaluate and compare costs to clear asphalt and concrete pavements to UDOT requirements. There will be one to three sites of each pavement type. (Scope includes UT07.305)				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT07.208

MONITORING OF PIPES INSTALLED IN RICH COUNTY (EXP FEATURE 1007)				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Folkman	USU	Stevens	Stuhff	July 2013
Monitor and compare deflection performance of 24-inch diameter DuroMaxx culverts and typical HDPE culverts.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> XF10.007

RESEARCH ON CALL SERVICE FROM T Y LIN				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Eixenberger	T Y Lin	Hsiao	Kergaye	2013
Various reports recommending funding strategies, project management processes, and work plan documents.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> AM11.01

QUALITY AND SAFETY DURING NIGHTTIME CONSTRUCTION ACTIVITIES				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
		Hsiao	Wright	2011
Determine the implications to quality, productivity and safety of night-time construction work. Develop guidelines to determine when it is appropriate to perform construction activity at night.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT06.102

RELOCATION OF SEISMIC SHED 7208				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
Stevens	In house	Stevens	Bischoff	2012
Continue instrumentation monitoring and site coordination following relocation of the seismic monitoring equipment shed at 2200 South 600 West in SLC to accommodate the new light rail alignment in the area.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> MP08.001

HMA TEMPERATURE PLACEMENT LIMITATIONS				
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>	<i>Completion date:</i>
TBD	In house	Stevens	Negus	2011
Evaluate available materials, products, and procedures for cold weather asphalt paving. Develop guideline to allow asphalt paving at ambient temperatures below 50 degrees. Incorporate findings from recent warm-mix asphalt test section projects at UDOT.				
<i>Status:</i> In progress		<i>Funding Agency:</i> State		<i>Project ID Code:</i> UT08.102

Completed Projects

The projects described below were completed during the last year. These projects have been managed by Technical Advisory Committees, and the planned deliverables have been received, reviewed, and approved. Implementation of the findings and products may be underway.

SOLITATION 950: DYNAMIC PASSIVE PRESSURE ON ABUTMENTS & PILE CAPS (Lead State Pooled Fund Project TPF-5(122)).			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
ROLLINS	BYU	HSIAO	BISCHOFF/ SWANWICK
Develop passive force-deflection relationships for static and dynamic loads. Measure damping coefficients. Determine the effects of pile cap connection details. Evaluate existing design.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT05.703

RAPID BRIDGE REPLACEMENT - 4500 S SHOWCASE			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
McQUILLEN	URS	HSIAO	MCMINIMEE
Provide lessons learned on various rapid bridge replacement technologies to UDOT Project Managers and bridge designers from consultants and in house.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> AM07.003

ACCELERATED BRIDGE CONSTRUCTION AND PREFABRICATED DECKS			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
BARR/BOYLE	USU	HSIAO	SWANWICK
Evaluate the behavior of precast composite deck panel connections. Establish standard design methods and details for placing precast decks on existing bridges. Establish design guidelines for new bridges to facilitate deck replacement with precast deck panels.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA		<i>Project ID Code:</i> UT07.801

MATERIALS CHARACTERIZATION FOR THE AASHTO 2002 PAVEMENT DESIGN GUIDE			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
DARTER	ARA INC.	STEVENS	LUKES
In the second phase of MEPDG implementation at UDOT, use software, lab testing equipment and procedures, traffic data input, and changes in design policy to provide a User's guide and a Materials Library for UDOT and training on these.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT03.203	

DEVELOPMENT OF A DECISION SUPPORT TOOL FOR ASSESSING VULNERABILITY OF TRANSPORTATION NETWORKS			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
CHEN	USU	STEVENS	STEINVORTH/LEONARD
Develop a decision support tool for assessing vulnerability of highway freight networks in Utah, and conduct a case study based on the disruption scenarios of highway bridges using the highway system in the state of Utah to evaluate the decision support tool.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT07.604	

MACHINE CONTROL GUIDANCE			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
R YOUD	HORROCKS	LEONARD/FAZIO	HANCOCK
Evaluate the various construction machine control guidance systems available, and provide assistance in preparing Department guidelines and policies.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT07.107	

REFINEMENT AND ENHANCEMENT OF UDOT'S HABITAT QUALITY INDEX			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
TWEDT	BIO-WEST	LEONARD/FAZIO	STROMNESS
Refine and validate the operational capability of the Habitat Quality Index (HQI). Coordinate results with resource agencies and facilitate implementation for a broader range of uses. (Additional funding provided by Utah Division of Forestry, Fire and State Lands.)			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT08.401	

ASSESSING CORROSION OF MSE WALL REINFORCEMENT			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
GERBER	BYU	STEVENS	GUMMOW
Extract samples of metallic reinforcement from existing MSE walls, establish some baseline data for comparison with current and future extraction/evaluation efforts, and evaluate the current extent of corrosion in the reinforcing strips.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT09.703	

COLD TEMPERATURE AND FATIGUE QUALITY CONTROL TEST FOR ASPHALT MIXES			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
ROMERO	U OF U	STEVENS	VANFRANK
Adapt the Superpave binder test to measure creep compliance of hot-mix asphalt at cold and intermediate temperatures, develop a repeatable test protocol and determine its precision, and develop draft QC specifications.			
<i>Status:</i> Complete	<i>Funding Agency:</i> State	<i>Project ID Code:</i> UT07.301	

PROJECT DEVELOPMENT SUPPORT			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
DESLIS	PB	HSIAO	
Consultant support for activities required by the Project Development Group.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> AM09.007	

UDOT RESEARCH MANUAL/BENEFITS OF RESEARCH			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
ANDERSON	U OF U	FAZIO	FAZIO
Update the Research Division Manual of Instruction and prepare an analysis of the benefit/cost of research projects.			
<i>Status:</i> Complete	<i>Funding Agency:</i> State	<i>Project ID Code:</i> MP09.001	

AUTOMATED DELAY ESTIMATES & OTHER TRAFFIC SIGNALS - PHASE I: CONCEPT AND ALGORITHM DEVELOPMENT			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
Saito	BYU	Leonard/Nichol	Taylor/Kinnecom
Develop a concept and algorithm that effectively measures delay and other measures of effectiveness (MOEs) automatically using detector data at traffic signals. Simulate the concept and algorithm to evaluate their feasibility for practical application, and determine hardware and software requirements for field implementation.			
<i>Status:</i> Complete	<i>Funding Agency:</i> State	<i>Project ID Code:</i> UT08.608	

STONE COLUMN TREATMENT WITH WICK DRAINS IN SILTY SANDS			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
Rollins	BYU	Leonard/Stevens	Bischoff
Assess the effectiveness of using wick drains in conjunction with the installation of stone columns to enhance the densification of surrounding silty sands on the NOW Project, with additional review of case histories for other sites.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT06.706	

DEVELOPMENT OF MSE WALL INSPECTION PLAN BASED ON FAILURE MODE ANALYSIS AND RISK ASSESSMENT			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
Bay	USU	Leonard	Bischoff
Develop an inventory of existing mechanically stabilized earth (MSE) walls, review their condition, consider the potential failure mechanisms of these walls, and assess the level of risk associated with each failure mechanism. Recommend improved inspection methods.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT06.710	

CULVERT ROUGHNESS ELEMENTS FOR NATIVE UTAH FISH PASSAGE PHASE I			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
Hotchkiss	BYU	Stevens	Stuhff
Test various roughness elements in culverts (laboratory flume) with native fish species to guide the development of culvert retrofit schemes for field application.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT09.903	

SEISMIC VULNERABILITY ANALYSES OF UDOT LIFELINES IN SALT LAKE COUNTY			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
Steve Bartlett	U of U	Leonard/Stevens	Steinvorth
An assessment of the importance and seismic vulnerability of the transportation network and an evaluation of the disruption to the traffic network caused by damage to the transportation infrastructure.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT06.506	

EVALUATION OF THE EFFECT OF VARIABLE ADVISORY SPEED SYSTEMS ON QUEUE MITIGATION IN WORK ZONES			
<i>Principal Investigator:</i>	<i>Organization:</i>	<i>Project Manager:</i>	<i>Champion:</i>
Mitsuru Saito	BYU	Leonard/Stevens	Negus
Evaluate an automated variable speed advisory system to determine if it can be effective in reducing the variance in speed of the vehicles upstream of a work zone.			
<i>Status:</i> Complete	<i>Funding Agency:</i> FHWA	<i>Project ID Code:</i> UT07.101	

Section 4- Experimental Projects

The Research Division has the responsibility to manage the UDOT Experimental Projects Program in coordination with the UDOT Materials Division. These projects are typically small initiatives aimed at the evaluation of a unique aspect of a construction project, transportation facility or innovative process. The common practice is to install the product or concept into an onsite highway project and/or conduct appropriate laboratory testing.

The main goals of these projects is to determine if the innovative concept is more cost- effective, longer-lasting, improves safety, or reduces user impacts over currently used methods. Deliverables may include reports, user’s manuals, training materials, policies, procedures, specifications, design methods, laboratory test methods, construction processes, or computer software.

These Experimental Projects are proposed in one of the following ways:

- UTRAC Workshop Problem Statement
- New Product Evaluation
- Innovative aspect of a construction project requested by Region Staff
- Innovative aspect of a UDOT program requested by Division Staff
- Concept evaluation requested by a UDOT Key Leader

The Experimental Projects Program has had a strong tradition of successful deliverables for many years. This program promotes opportunities to evaluate products and processes on actual transportation highway sections and facilities.

A listing of the on-going Experimental Projects managed by the UDOT Research Division is shown in Table 1.

Table 1- Experimental Projects Listing

<i>Project ID Code</i>	<i>Description</i>	<i>Project Manager</i>	<i>Region/District</i>	<i>Anticipated Completion Date</i>
XF04.006	0406- Thinner Delineators on I-80 in R-2	Stevens/Sharp	Region 2	2011
XF05.007	0507- Deck Corrosion Monitoring on SR-79 in R-1	Stevens/Sharp	Region 1	2015
XF08.004	0804- Pavement Rehab Comparison, I-15 in R-3 and R-4	Stevens/Sharp	Region 3 and Price	2012
XF08.014	0814- Crack Repair on I-80 in R-2	Stevens/Sharp	Region 2	2011
XF09.004	0904- Durability of Small Reflectors on Raised Median on 800 N. in Orem in R-3	Stevens/Sharp	Region 3	2012
XF09.013	0913- Geogrids on SR-10 in R-4	Stevens/Sharp	Price	2020
XF10.002	1002- WMA on Wall Ave. in Ogden	Stevens/Sharp	Region 1	2014
XF10.003	1003- SmartDitch on I-15 at Santaquin in R-3	Stevens/Sharp	Region 3	2012
XF10.004	1004- WMA Using Evotherm on SR-36 in R-2	Stevens/Sharp	Region 2	2012
XF10.007	1007- DuroMaxx Steel Reinforced HDPE Pipe in Rich County	Stevens	Region 1	2013
XF10.009	1009- Monticello US-191 Deer Deter Evaluation in R-4	Stevens	Price	2012
XF10.010	1010- Compare GFRP Dowels with Steel Dowels on SR-68 in R-1	Stevens/Sharp	Region 1	2015

Section 5- Technology Transfer

The mission of the Technology Transfer Section is to research recent advancements in the transportation community and make them available to the appropriate UDOT professionals and managers. This includes any innovative concepts developed by UDOT that should be made available to agencies in other states. The main focus is to introduce new and innovative concepts to UDOT experts that may improve the way they do business.

This mission is accomplished through a number of Technology Transfer programs. These services are promoted on a routine basis through region visits, division meetings, UDOT committee meetings, UDOT conferences, the Research Web Site, project TAC meetings, and other channels.

Literature Searches

A main function of the Technology Transfer section is to research and provide answers to questions posed by technical experts, and help solve problems facing UDOT personnel. Literature Searches are generated on a request basis from management personnel, division specialist, and region experts. This material provides useful reports, papers, and other information on the topic requested.

Literature Summaries

If a significant amount of information is acquired during a Literature Search, a Literature Summary may be prepared on the topic. A Literature Summary describes the topic in detail, including any advancement related to the concept, and examples of how other agencies may be using the initiative.

State-of-the-Practice Reports

If a more complete overview of a topic is needed, a state-of-the-practice report may be prepared. This document not only provides information and examples related to the concept, but includes details related to items such as policies, specifications, design methods, materials needed, equipment required, and available scanning tours to observe the placement of the concept. The advantages and disadvantages of using the concept are documented along with conditions when the idea should and should not be utilized. National or international surveys are often used to acquire the most accurate and current information on how other agencies are using the technology.

Newsletter

A quarterly newsletter is published for the Research Division. The newsletter describes current activities in the division and innovative advancements within UDOT operations. Articles are

published to inform transportation personnel on recent advancements and products available by the division and by national sources.

Web Page

The Research Division maintains a web page that allows UDOT experts, personnel from other agencies and the public in general to review activities and resources in the Division. Information related to the Research Staff, published documents, and program activities are available over the Internet.

The Research Division uses the web page to advertise upcoming conferences, training sessions, and other meetings. Agendas and registration capabilities are included on the web page.

Scanning Tours

Scanning tours are a very beneficial technology transfer tool that provides direct exposure of innovative concepts to experts in multiple agencies. Successful scanning tours have been completed both with UDOT as the host state, and by providing UDOT experts with travel resources to other locations.

Local Technical Assistance Program (LTAP) Center Coordination

The Technology Transfer section of the Research Division provides oversight and coordination of the activities carried out by the LTAP Center located at Utah State University in Logan, Utah. The LTAP Center receives funding allocated through UDOT to carry out its mission.

The LTAP Center enables local counties, cities and towns to improve their roads and bridges by supplying them with a variety of training programs, an information clearinghouse, new and existing technology updates, personalized technical assistance, and newsletters.

Through these core services the LTAP Center provides access to training and information that may not otherwise be accessible. The center is able to provide local road departments with workforce development services; resources to enhance safety and security; solutions to environmental, congestion, capacity and other issues; technical publications; and training videos and materials.

Webinars, Videoconferencing and Library Sessions

The use of webinars, videoconferencing and library sessions have been valuable technology tools over the last decade. These sessions put experts with similar interests in the same room together either physically or virtually. These sessions have been promoted from a wide range of sources, including national topics, regional issues, and local problems and concepts.

Section 6- Library Sciences

The Lester Wire Library has been a significant asset for the UDOT Research Division and transportation experts in the state for many years. The library is used to house documents, maps, periodicals, and other materials. It operates as a “virtual library” by providing access over the Internet to download information from the Transportation Research Information Service (TRIS), the National Cooperative Highway Research Program (NCHRP), and other library services around the world.

The research library also is used as an information center, training facility, and technology transfer resource on a regular basis. The first floor of the Complex location and the facilities contained in the library are very useful for holding informational sessions, training courses, videoconferencing sessions, and other transportation related activities.

The Lester Wire Library operates in part using a grant from the Lester Wire trust dedicated to UDOT many years ago. Lester Wire was the inventor of the traffic light, and received money from patents on the concept. The librarian’s salary is not subsidized by the grant, but equipment, computers, and office supplies used in the library may be covered by the grant. Only the interest from the grant is typically used in an attempt to keep the grant viable for an indefinite period of time.

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Section 7- Research Budget

An estimated budget for the Research Program is \$2.33 million for FY2012. This funding comes from a number of sources as follows:

- State Planning and Research (SPR)
- State Matching Funds
- State Administration and Construction Funds
- Other dedicated funding

The Research Division portion of the SPR Budget has been used to contribute funding from UDOT to support a number of national transportation programs. These national research programs include the following:

- TIG
- TRB
- NTPEP
- NCHRP
- FHWA Peer Exchange
- LTAP

Table 2 provides line items for each of the federal and state programs, and identifies other budget allocations. Any shortfall in the budget will be covered using state research funding.

The funds remaining after national program payments, contingencies, and other dedicated line items is about \$1.93 million. This amount is available to fund new and continuing projects managed by the Research Division. Included in these funds are overhead costs for the projects.

Many of the projects listed in the following tables contain funding from the two University Transportation Centers (UTCs) located at Utah State University and the University of Utah. The UTC funds are not included in the UDOT research budget, but are provided by the universities to supplement these studies.

The new projects initiated for FY 2012 are listed in Table 3. These 12 projects include some pooled-fund projects and were approved by the UTRAC council for inclusion in this work program. The funding source for these projects will be assigned as the detailed work plans are drafted and reviewed by each individual TAC. Some limited modifications in the project costs may result during the preparation of the detailed work plans.

Thirty-eight projects will be continued into FY2012 from previous years. Table 4 contains the 24 continuing projects funded in the SPR budget and Table 5 lists the 14 projects continuing using state funding. More detail on these projects is included in Section 3.

During FY 2012 the Research Division will participate in ten pooled-fund projects listed in Table 6. These consist of five projects that UDOT will take the lead, and in five UDOT will be a participant.

Table 2- Research Budget - 2012

	2012 Budget	Projected Expenses
<u>Federal Program (5H066xxH) (80% Federal, 20% State)</u>		
Roll Over Federal (80%):	\$100,000	\$476,000
Roll Over State Match (20%):	\$25,000	\$119,000
SPR 2012:	\$1,076,000	
Dues and Pooled fund (100% Federal):		
Pooled Fund:		\$60,000
TIG:		\$6,000
TRB:		\$85,430
NTPEP:		\$7,500
NCHRP:		\$301,565
Peer Exchange:		\$8,500
State Match (20%):	\$121,401	
2012 SPR Projects:		\$0
<u>Federal Program Total:</u>	\$1,322,401	\$1,063,995
<u>State Program (8RD12xxH) (100% State)</u>		
Before 2012 State Projects:	\$0	\$194,000
2012 Obligated State 2012:	\$725,700	\$472,000
<u>State Program Total:</u>	\$725,700	\$666,000
<u>LTAP</u>		
Federal:	\$140,000	\$140,000
State UCF 50% Match:	\$140,000	\$140,000
<u>Overhead</u>		
Personal Services:		\$560,000
Current Expense:		\$100,000
Sub Total:	\$2,328,101	\$2,669,995
<u>Grand Balance:</u>		(\$341,894)

TABLE 3 NEW PROJECTS - ALL

PIC - PROJECT ID CODE	FUNDING TYPE	DESCRIPTION	DIVISION	BUDGET AMT.
UT11.105	State	IMPLEMENTATION OF LOW TEMPERATURE TEST FOR ASPHALT MIXTURES (Total of 111,000 and Research will pay \$50,000)	MATERIALS	\$50,000
UT11.110	State	PERFORMANCE EVALUATION FOR VARIOUS PRESERVATION TREATMENTS	ASSET MANAGEMENT	\$2,000
UT11.204	State	COST EFFECTIVE SELECTION OF SNOW PLOW BLADES	MAINTENANCE	\$10,000
UT11.206	State	UTAH WINTER SEVERITY INDEX	MAINTENANCE	\$35,000
UT11.301	State	EVALUATING THE FEASIBILITY OF INCORPORATING MOBILITY-RELATED WORK ZONE TRAFFIC CONTROL PERFORMANCE MEASURES IN HIGHWAY RECONSTRUCTION CONTRACTS	TRAFFIC OPS & SAFETY	\$60,000
UT11.303	State	EVALUATING THE SAFETY EFFECTS OF SIGNAL IMPROVEMENTS	TRAFFIC OPS & SAFETY	\$60,000
UT11.402	State	DESIGN AND CONSTRUCTION MONITORING OF SURCHARGED EMBANKMENT	GEOTECHNICAL	\$40,000
UT11.404	TPF-SPR-L	LEAD-STATE POOLED FUND: LATERAL PILE RESISTANCE NEAR MSE WALLS (Total cost of \$250,000 and Research will pay \$25,000)	GEOTECHNICAL	\$25,000
UT11.406	State	PASSIVE-FORCE DISPLACEMENT FOR SKEWED ABUTMENTS (Total of \$65,000. Research will pay \$30,000)	GEOTECHNICAL	\$30,000
UT11.410	TPF-SPR	TPF 1294 , NON-LEAD-STATE POOLED FUND: FULL-SCALE SHAKE TABLE TESTING TO EVALUATE SEISMIC PERFORMANCE OF REINFORCED SOIL WALLS	GEOTECHNICAL	\$20,000
UT11.502	TPF-SPR_L	TPF 1307 , LEAD-STATE POOLED FUND: SPLICED-SLEEVE CONNECTION FOR PRECAST RC BRIDGE PIERS (Total of \$100,000 and Research will pay \$50,000)	STRUCTURES	\$50,000
UT11.503	State	DEVELOP DESIGN GUIDELINES FOR SKEWED OR CURVED INTEGRAL ABUTMENT BRIDGES (Total of \$100,000 and Research will pay \$50,000)	STRUCTURES	\$50,000

TABLE 4 CONTINUING PROJECTS - FEDERAL

PIC - PROJECT ID CODE	FUNDING TYPE	CID - PROJECT #	DESCRIPTION	DIVISION	BUDGET AMOUNT	CURRENT BALANCE
UT11.106	SPR		COLD-IN-PLACE RECYCLING FIELD DATA COLLECTION	MATERIALS	\$60,000	60,000
	SPR	5H06487H	FHWA PEER EXCHANGE	ADMIN		
AM07.001	SPR	5H06452H	FREEWAYS TO FUEL: A NOVEL APPROACH TO BIOFUELS PRODUCTION	ADMINISTRATIVE	\$52,000	\$0
UT08.801	SPR	5H06480H	TESTING OF GFRP WITH LIGHTWEIGHT BRIDGE DECK	STRUCTURES	\$80,000	\$0
UT09.305	SPR	5H06495H	IMPROVING CONCRETE PERFORMANCE WITH SUSTAINABLE LONG-LIFE CONCRETE SPECIFICATIONS	MATERIALS	\$50,000	\$12,000
TB98.029a	SPR	5H06415H	I-15 EMBANKMENT AND INNOVATIVE FOUNDATION TREATMENTS STUDY	GEOTECHNICAL	\$150,000	\$77,606
UT05.702	SPR	5H06439H	PROGRAMMING OF STRONG GROUND MOTION INSTRUMENTATION OF NEW BRIDGES	STRUCTURES	\$30,000	\$0
UT07.401	SPR	5H06473H	DETERMINING WILDLIFE USE OF WILDLIFE CROSSING STRUCTURES UNDER DIFFERENT SCENARIOS	ENVIRONMENTAL	\$220,000	\$15,000
UT09.603	SPR	5H06492H	EVALUATION OF UTAH WORK ZONE PRACTICES	TRAFFIC	\$25,000	\$25,000
UT09.501	SPR	5H06491H	UNDERSTANDING THE ECONOMICS OF TRANSPORTATION IN UTAH	PLANNING	\$50,000	\$0
UT06.206	SPR	5H06439H	EVALUATION OF OVERLAY RUTTING SUSCEPTIBILITY	MAINTENANCE	\$35,000	\$15,000
UT07.905a	SPR	5H06470H	RETROFITTING CULVERTS AND FISH PASSAGE - PH 2	HYDRAULICS	\$85,000	\$42,393
UT08.702	SPR	5H06479H	REDUCTION IN WICK DRAIN EFFECTIVENESS IN SENSITIVE CLAYS	GEOTECH	\$51,238	\$51,238
UT09.705	SPR	5H06493H	LATERAL PILE RESISTANCE NEAR MSE WALLS	GEOTECH	\$60,541	\$34,015
UT09.201	SPR	5H06489H	USING UNMANNED AIRCRAFT TO HELP SOLVE UDOT PROBLEMS	ENVIRONMENTAL	\$50,000	\$50,000
UT07.305	SPR	5H06463H	OCCURRENCE OF WATER VAPOR FLOW IN NON-FROST SUSCEPTIBLE AGGREGATE BASE MATERIALS (SEE UT07.208)	MATERIALS	\$40,000	\$0
UT07.704	SPR	5H06461H	IMPROVED STABILITY AND CONSOLIDATION ASSESSMENT OF EMBANKMENTS	GEOTECHNICAL	\$177,902	\$95,902
UT08.303	SPR	5H06477H	FULL-DEPTH RECLAMATION WITH EMULSION	MATERIALS	\$75,000	\$75,000
UT11.201	SPR	5H06414H	DEVELOPMENT OF SIGN MANAGEMENT PLAN & SYSTEM FOR UDOT	MAINTENANCE	\$50,000	\$50,000
UT09.903a	SPR	5H06416H	CULVERT ROUGHNESS ELEMENTS FOR NATIVE UTAH FISH PASSAGE PHASE II	HYDR	\$40,100	
UT09.301	SPR	5H06490H	MECHANISTIC CHARACTERIZATION OF SOILS AND AGGREGATES	MATERIALS	\$0	\$0
	SPR	5H06497H	AASHTO CLIMATE CHANGE	ADMIN	\$10,000	
	SPR	5H06498H	POOLED FUND PROJECTS MANAGEMENT	ADMIN		
MP11.002	SPR	5H06421H	SAFETY IMPACTS OF DESIGN EXCEPTIONS	Traffic & Safety	\$14,883	\$ 14,883

TABLE 5 CONTINUING PROJECTS - STATE

PIC - PROJECT ID CODE	FUNDING TYPE	CID - PROJECT #	DESCRIPTION	DIVISION	BUDGET AMOUNT	CURRENT AMOUNT
AM10.002	STATE	8RD1158H	AS-BUILT SCANNING, PHASE 2	ADMIN	\$15,000.00	
UT07.809	STATE	8RD1139H	ISOLATION BEARINGS	STRUCTURES	\$41,000	
UT09.002	STATE	8RD1156H	EVALUATION OF AN INDEPENDENT CADD PLATFORM FOR UDOT	ENG TECH	\$15,000	
UT09.402	STATE	8RD1153H	DETERMINING NATIONAL REGISTER ELIGIBILITY FOR POST-WAR HISTORIC BRIDGES	ENVIRO	\$50,000	
UT09.803	STATE	8RD1154H	EVALUATION OF BRIDGE DECK SEAL TREATMENTS FOR ABC DECKS	STRUCT	\$50,000	
AM09.002	STATE	8RD1151H	MONITORING GFRP PRECAST DECK STRESSES	STRUCTURES		
UT06.103	STATE	8RD1128H	UTILITY DATA MANAGEMENT PROCESS	ENGINEERING SERVICES	\$95,000	
UT09.102	STATE	8RD1152H	EVALUATION OF EPM PROJECT SCHEDULING	CONST	\$47,000	
UT07.208	STATE	8RD1143H	PERFORMANCE OF ASPHALT AND CONCRETE PAVEMENTS: CLIMATIC EFFECTS AND WINTER MAINTENANCE COSTS (INCLUDES UT07.305 SCOPE)	MAINTENANCE	\$20,000	
XF10.007	STATE	8RD1192H	MONITORING OF PIPES INSTALLED IN RICH COUNTY (EXP FEATURE 1007)	HYDR	\$13,506	
AM11.01	STATE	8RD1160H	RESEARCH ON CALL SERVICE FROM T Y LIN	RESEARCH	\$200,000	
UT06.102	STATE	8RD1126H	QUALITY AND SAFETY DURING NIGHTTIME CONSTRUCTION ACTIVITIES	CONSTRUCTION	\$10,000	
MP08.001	STATE	8RD1145H	RELOCATION OF SEISMIC SHED 7208	GEOTECHNICAL	\$10,000	
UT08.102	STATE	8RD1146H	HMA TEMPERATURE PLACEMENT LIMITATIONS	CONSTRUCTION	\$10,000	

TABLE 6 POOL PROJECTS

PIC - PROJECT ID CODE	FUNDING TYPE	CID - PROJECT #	DESCRIPTION	DIVISION	BUDGET AMOUNT	CURRENT AMOUNT
	TPF-SPR-L	42008	WESTERN MAINTENANCE PARTNERSHIP	MAINTENANCE	\$0	
	TPF-SPR-L	42009	WESTERN ALLIANCE FOR QUALITY TRANSPORTATION TPF-5(064)	MATERIALS	\$10,000	
	TPF-SPR-L	42021	AASHTO DRAINAGE MANUAL	HYDRAULICS		
	TPF-SPR		ABC DECISION MAKING AND ECONOMIC MODELING			
	TPF-SPR-L	42022	TESTING OF CFRP COLUMNS	STRUCTURES		
UT07.708	TPF-SPR-L	5H06474H	SHAKING TABLE TESTING TO EVALUATE EFFECTIVENESS OF VERTICAL DRAINS FOR LIQUEFACTION MITIGATION TPF-5(244)	GEOTECHNICAL	\$40,000	
	TPF-SPR		TRANSPORTATION ASSET MANAGEMENT RESEARCH PROGRAM	MAINTENANCE		
	TPF-SPR		CLEAR ROADS	MAINTENANCE		
	TPF-SPR		OPTIMIZATION OF MIXTURE DESIGNS USING TERNARY BLENDS OF CEMENTITIOUS MATERIALS	MATERIALS	\$60,000	
UT11.410	TPF-SPR		TPF 1294, NON-LEAD-STATE POOLED FUND: FULL-SCALE SHAKE TABLE TESTING TO EVALUATE SEISMIC PERFORMANCE OF REINFORCED SOIL WALLS	GEOTECHNICAL	\$20,000	

Appendix

(letter of approval from FHWA)