# Oklahoma Department of Transportation
## Planning and Research Division

# State Planning and Research Work Program
# FFY 2014
**(October 1, 2013 to September 30, 2014)**

## Part 1—Planning
## Part 2—Research

**Prepared by the**
**Oklahoma Department of Transportation**
**in cooperation with the**
**US Department of Transportation**
**Federal Highway Administration**

**October 2013**

U.S. Department of Transportation
**Federal Highway Administration**

**Oklahoma Division**

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September 25, 2013

In Reply Refer To:
HDA-OK

J. Michael Patterson
Executive Director
Oklahoma Department of Transportation
200 NE 21st Street
Oklahoma City, OK 73105

Dear Mr. Patterson:

The FHWA-OK Division has reviewed Fiscal Year 2014 State Planning and Research (SPR) Part I (Planning) and Part II (Research) Work Programs and Budget for the Oklahoma Department of Transportation (ODOT) as submitted by Mr. John Bowman, Planning and Research Division Engineer, on September 25, 2013. Part I (Planning) also includes metropolitan planning (PL) program funds we reviewed previously as part of our approval of FY 2014 Unified Planning Work Programs (UPWP) and budget for MPOs in Tulsa, Oklahoma City, Lawton, and Frontier (Bi-State) MPO, respectively.

The FY 2014 SPR program was developed in accordance with Title 23 CFR 420 - regarding the development of work programs for statewide transportation planning activities. The scope of the program includes an outline of work tasks for Part I and Part II, as well as the budget associated with each task. Each task is subdivided into five categories, including: 1) Purpose & Scope 2) FY 2013 Accomplishments, 3) FY 2014 Activities, 4) Financial Table, and 5) Contact Information. The Financial Table provides FY2013 programmed/estimated costs and FY 2014 cost estimates. Additionally, the work program budget identifies federal, state and local funding sources as required under 23 CFR 420.111(b)(1), as well as funding for the Local Technical Assistance Program (LTAP), administered by Oklahoma State University, Center for Local Government Technology (CLGT).

The proposed (FY 2014) work program also supports Subpart B of 23 CFR 420 – which addresses research, development, and technology (RD&T) transfer activities ODOT will undertake in FY 2014. These RD&T activities are designed to mitigate transportation issues before they become critical problems. In addition, Part II also includes technology transfer initiatives that facilitate the dissemination of new research findings and promotion of new technology. The major Part II activities include General Activities, Continuing Research and New Research Projects, Joint ODOT/Oklahoma Transportation Center (OkTC) Interagency Projects, and Pooled Fund Studies.

ODOT supports continuing, as well as new research activities, and participates in national pooled fund studies. Examples of on-going research initiatives include Instrumented Pavement Construction and Use of CNG as a Locomotive Fuel. Some new research initiatives include Development of a Prototype Geotechnical Report Database, and Regional Economic Impact Study for the McClelland-Kerr Arkansas River Navigation System. Details of these and other research activities are provided in the work program document.

In addition, ODOT collaborates with the OkTC on a variety of transportation research studies and initiatives. The OkTC is a nationally designated University Transportation Center (UTC) and includes researchers from the University of Oklahoma (OU), Oklahoma State University (OSU), and Langston University (LU).

We commend ODOT for their continuing support of the Local Technical Assistance Program (LTAP), administered by Oklahoma State University, Center for Local Government Technology (CLGT), and for partnering with the OkTC on a variety of research initiatives. The LTAP program is a valuable resource for local governments in Oklahoma.

We thank you for your cooperation in developing the FY 2014 SPR Work Program and Budget. Our special thanks go to Mr. John Bowman and his staff for providing a forum for FHWA/ODOT to jointly review and discuss the initial draft of the FY 2014 SPR work program and budget.

Based on our review of the draft document and our joint discussions, we concur with your request for approval of the FY 2014 Work Program and Budget as submitted. If you have questions or comments regarding our approval action, please contact Mr. Isaac N. Akem, Community Planner, at 405-254-3343.

Sincerely,

Elizabeth A. Romero
Planning and Technical Services Team Leader

ec: David Streb, ODOT Director of Engineering
John Bowman, ODOT Planning and Research Division Engineer

# Introduction

This document describes the Federal Fiscal Year (FFY) 2014 State Planning and Research Work Program for the Oklahoma Department of Transportation (ODOT). This program is prepared and submitted according to provisions of Title 23, United States Code, regulated under 23 CFR Part 420. Part 1 of the work program describes the Planning activities and Part 2, the Research activities. The work program is developed and updated annually in cooperation with the Federal Highway Administration.

Planning activities to be conducted in FFY 2014 include data collection/analysis/reporting, mapping, public involvement, and planning coordination/studies. Additional efforts are planned for data collection related to air quality and pavement structural condition. Funding for the planning portion of the work program is approximately $12 million.

Research activities for FFY 2014 will include eleven new projects and twelve continuing projects in addition to three projects jointly shared with the Oklahoma Transportation Center. Some of the focus areas for current research projects include: design/construction/maintenance of infrastructure and safety. In addition, ODOT is participating in twenty three national pooled fund projects. Funding for the research program totals nearly $5 million in FFY 2014.

The detailed projects for each section are listed by item number and include a description of the purpose and scope of the project, the accomplishments during the current federal fiscal year (FFY 2013) and the proposed activities for the upcoming fiscal year (FFY 2014). In addition, the Financials Section shows the amount programmed for the FFY 2013 in the last work program, an estimate of the total funds that will be expended by the end of FFY 2013, and the projected costs for the upcoming fiscal year (FFY 2014).

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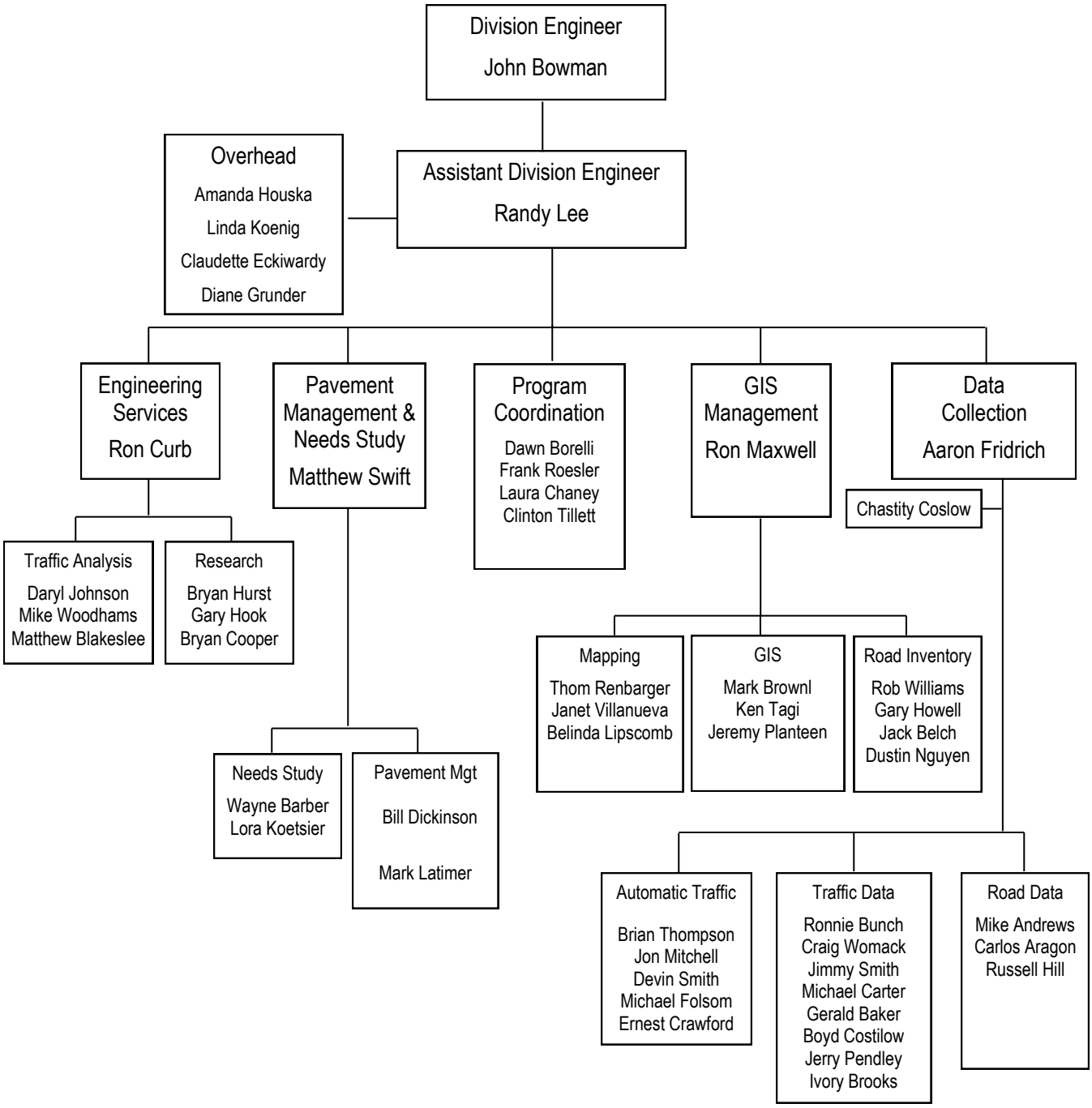
# Planning and Research Table of Organization

October 1, 2013



**OKLAHOMA DEPARTMENT OF TRANSPORTATION**
**State Planning & Research (SPR) Financial Summary Sheet**
**Federal Fiscal Year 2014**
**Program Period October 1, 2013 through September 30, 2014**

**SPR Part 1 - Planning, SPRY-0010(59)PL, JP# 01946(61)**

**A. Estimated Costs**

| | |
|---|---|
| SPR Part 1 - Planning | $9,561,300.00 |
| LTAP (SPR Part 1) | $242,366.00 |
| Metropolitan Planning (PL) | $3,504,216.00 |
| ***Total Estimated Costs*** | ***$13,307,882.00*** |

**B. Available Funds**

| | |
|---|---|
| SPR Part 1 Unobligated Balance | $11,980,000.00 |
| PL Funding | $2,922,456.00 |
| Local | $581,760.00 |
| ***Total Available Funds*** | ***$15,484,216.00*** |

**C. Proposed Financing**

| Type | Federal | Ratio | State | Local | Total |
|---|---|---|---|---|---|
| SPR | $9,803,666.00 | 80% | $0.00 | $0.00 | $9,803,666.00 |
| PL | $2,922,456.00 | 80% | $0.00 | $581,760.00 | $3,504,216.00 |
| | | | ***Total Proposed Financing*** | | ***$13,307,882.00*** |

**SPR Part 2 - Research, SPRY-0010(60)RS, JP# 01946(62)**

**A. Estimated Costs**

| | |
|---|---|
| SPR Part 2 - Research | $4,564,334.00 |
| ***Total Estimated Costs*** | ***$4,564,334.00*** |

**B. Available Federal Funds**

| | |
|---|---|
| SPR Part 2 Unobligated Balance | $2,388,000.00 |
| SPR Part 1 Unobligated Balance (remainder) | $2,176,334.00 |
| ***Total Available Funds*** | ***$4,564,334.00*** |

**C. Proposed Financing**

| Type | Federal | Ratio | State | Local | Total |
|---|---|---|---|---|---|
| SPR Part 1 & 2 | $4,564,334.00 | 80% | $0.00 | $0.00 | $4,564,334.00 |
| | | | ***Total Proposed Financing*** | | ***$4,564,334.00*** |

**SPR Part 1 & Part 2 Totals**

| | |
|---|---|
| **Total SPR Unobligated Balance** | $14,368,000.00 |
| **Total Other Funds (PL, State, Local)** | $3,504,216.00 |
| **Total Available Funding** | ***$17,872,216.00*** |
| **Total SPR Part 1 and Part 2 Estimated Costs** | ***$17,872,216.00*** |
| | |
| **Total SPR Pooled Fund Commitments** | **$1,311,508.00** |
| **Total SPR Research Funding** | **$5,875,842.00** |
| **% of SPR Funds for Research** | **37%** |
| | |
| **Total LTAP ($176,029.62 Fed LTAP; $184,000 SPR; $58,366 Local)** | **$418,395.62** |

# SPR PART 1 - PLANNING, SPRY-0010(59)PL, JP# 01946(61)
# FEDERAL FISCAL YEAR 2014

| | | *2014 SPR* | *STATE* | *PL* | *LOCAL* | *TOTAL* |
|---|---|---|---|---|---|---|
| **GIS AND DATA MANAGEMENT** | | | | | | |
| 1101 | Continuing Inventory Data Studies | $775,000.00 | $0.00 | | | $775,000.00 |
| 1102 | Highway Performance Monitoring System | $100,700.00 | $0.00 | | | $100,700.00 |
| 1103 | Geographical Information Management System for Transportation | $795,000.00 | $0.00 | | | $795,000.00 |
| | ***Total GIS and Data Management*** | ***$1,670,700.00*** | ***$0.00*** | | | ***$1,670,700.00*** |
| **MAPPING** | | | | | | |
| 1201 | County, City and other Planning Maps | $387,300.00 | $0.00 | | | $387,300.00 |
| | ***Total Mapping*** | ***$387,300.00*** | ***$0.00*** | | | ***$387,300.00*** |
| **TRAFFIC AND DATA COLLECTION** | | | | | | |
| 1301 | Coverage Count Program | $975,000.00 | $0.00 | | | $975,000.00 |
| 1302 | Permanent Traffic Count Program | $890,000.00 | $0.00 | | | $890,000.00 |
| 1304 | Purchase of Traffic Counting Equipment | $265,000.00 | $0.00 | | | $265,000.00 |
| 1305 | Vehicle Classification Counting Program | $620,000.00 | $0.00 | | | $620,000.00 |
| 1306 | Weigh-in-Motion Program | $460,000.00 | $0.00 | | | $460,000.00 |
| 1308 | Traffic Monitoring System | $305,000.00 | $0.00 | | | $305,000.00 |
| 1309 | Traffic Analysis and Projections | $182,000.00 | $0.00 | | | $182,000.00 |
| 1310 | Skid Studies Program | $175,000.00 | $0.00 | | | $175,000.00 |
| | ***Total Traffic and Data Collection*** | ***$3,872,000.00*** | ***$0.00*** | | | ***$3,872,000.00*** |
| **ECONOMIC, SAFETY, AND FISCAL STUDIES** | | | | | | |
| 1404 | Safety Planning | $50,000.00 | $0.00 | | | $50,000.00 |
| 1510 | Justification Studies | $20,000.00 | $0.00 | | | $20,000.00 |
| | ***Total Economic, Safety, Fiscal Studies*** | ***$70,000.00*** | ***$0.00*** | | | ***$70,000.00*** |
| **SYSTEMS AND PROGRAMS** | | | | | | |
| 1601 | Federal-Aid Systems Coordination | $93,300.00 | $0.00 | | | $93,300.00 |
| 1603 | Highway Needs Study | $339,000.00 | $0.00 | | | $339,000.00 |
| 1604 | Pavement Management Systems | $1,158,000.00 | $0.00 | | | $1,158,000.00 |
| | ***Total Systems and Programs*** | ***$1,590,300.00*** | ***$0.00*** | | | ***$1,590,300.00*** |
| **URBAN / REGIONAL TRANSPORTATION PLANNING** | | | | | | |
| 1700 | General Urban Transportation Planning | $6,000.00 | $0.00 | | | $6,000.00 |
| 1701 | Oklahoma City Area Regional Transportation Study (OCARTS) | $55,000.00 | $0.00 | $1,414,711.00 | $282,942.00 | $1,752,653.00 |
| 1702 | Tulsa Metropolitan Area Transportation Study | $35,000.00 | $0.00 | $1,255,538.00 | $251,107.00 | $1,541,645.00 |
| 1703 | Lawton Metropolitan Area Transportation | $15,000.00 | $0.00 | $225,957.00 | $45,191.00 | $286,148.00 |
| 1709 | Ft. Smith Transportation Study | $15,000.00 | $0.00 | $26,250.00 | $2,520.00 | $43,770.00 |
| 1710 | Substate Planning | $250,000.00 | $0.00 | | | $250,000.00 |
| 1719 | Statewide Transportation Improvement Program (STIP) | $85,000.00 | $0.00 | $0.00 | $0.00 | $85,000.00 |
| | ***Total Urban Transportation Planning*** | ***$461,000.00*** | ***$0.00*** | ***$2,922,456.00*** | ***$581,760.00*** | ***$3,965,216.00*** |
| **LONG RANGE PLAN / OTHER PLANNING ACTIVITIES** | | | | | | |
| 1902 | Statewide Long Range Transportation | $700,000.00 | $0.00 | | | $700,000.00 |
| 1903 | Intelligent Transportation Systems Planning | $125,000.00 | $0.00 | | | $125,000.00 |
| 1904 | Air Quality Transportation Planning | $100,000.00 | $0.00 | | | $100,000.00 |
| 1905 | Freight Planning | $200,000.00 | $0.00 | | | $200,000.00 |
| 1906 | Rail Planning | $100,000.00 | $0.00 | | | $100,000.00 |
| 1910 | Public Involvement & Visualization | $285,000.00 | $0.00 | | | $285,000.00 |
| 1911 | Inventory of Depression Era Structures | $0.00 | $0.00 | | | $0.00 |
| | ***Total Long Range Plan and Planning*** | ***$1,510,000.00*** | ***$0.00*** | | | ***$1,510,000.00*** |
| | ***Grand Total SPRY-0010(059)PL*** | ***$9,561,300.00*** | ***$0.00*** | ***$2,922,456.00*** | ***$581,760.00*** | ***$13,065,516.00*** |
| **LOCAL TECHNICAL ASSISTANCE PROGRAM** | | | | | | |
| | | | | | ***LTAP (Fed)*** | |
| 1440 | Local Technical Assistance Program | $184,000.00 | $58,366.00 | | $176,029.62 | $418,395.62 |
| | ***Total LTAP*** | ***$184,000.00*** | ***$58,366.00*** | | ***$176,029.62*** | ***$418,395.62*** |

## 1101 Continuing Inventory Data Studies

**PURPOSE AND SCOPE**: To collect, record, and compile data on the physical characteristics for all statewide public roads and streets implementing established road inventory procedures and GPS/GIS technology. Catalogue cultural features used to update the Departments official County Highway Maps. Generate detailed maps used to conduct inventory meetings with County Commissioners pertaining to roadway modifications. Maintain current Oracle Spatial Database tables of inventory data and update the Department's Central Data file. Write SQL procedure definitions necessary to extract needed summary data from the files. Produce and publish various mileage summary tables for the state, federal and public needs. Maintain necessary information for the National Network of Defense and NHS systems. Develop and maintain Control Section numbers and other unique identification systems for all public roads. Produce AVMT figures that will be used for the calculation for Annual Accident and Fatality Rates.

**ACCOMPLISHMENTS DURING FFY 2013**: The County Road inventory procedures were continued with seven county inventories completed, and the changes verified with the Boards of County Commissioners for each county; (Alfalfa, Coal, Dewey, Latimer, Major, Murray and Nowata ) and four counties (Caddo, Choctaw, Craig and Roger Mills) with field work completed and scheduling verification of results with County Commissioners. Two counties were reassessed and coded; (Custer, Ellis) and one (Canadian) is currently in progress. Approximately 95% of the local road network has been geo-located (GIS). All County Action Reports were verified, and processed. All Highway construction projects pertaining to the Department’s Highway, Graphical Roadway Network (NLF), Reference Point, and Open to Traffic databases were completed. The following annual publications and reports were completed; 2013 Certification of County Road Mileage, 2013 Statewide Mileage Table Book, and 2013 HPMS mileage, and Travel Summary Tables.

**PROPOSED ACTIVITIES FOR FFY 2014**: An additional 5% of the local road network will be geo-located this year, and is currently in progress. Continue coding and updating the Department's Central Database files. Incorporate on technology advancements in data collecting to insure the process of efficient information. Continue to improve on all procedural inventory operations. Seven of the following ten counties are scheduled to be inventoried; (Creek, Delaware, Garfield, Grady, Mayes, Okfuskee, Oklahoma, Pittsburg, Stephens, and Wagoner). Six of the following ten counties are scheduled to be reassessed and coded; (Alfalfa, Choctaw, Coal, Dewey, Latimer, LeFlore, McCurtain, Major, Nowata, and Woods). Continue monitoring all County Action Reports, and Highway Construction projects. Continue collecting HPMS data items. Continue identifying traffic count sites, statewide, using GPS technology. Compile and publish various state and federal reports including the 2014 Oklahoma Statewide Statistics Book, 2014 Certification of County Road Mileage, 2014 Control Section Map Book, and 2013 HPMS Mileage and Travel Summary Tables. Keep abreast of the latest technological advances through attendance of seminars, conferences, and workshops. Process and update all inventory files/tables for modifications to the functional classification, and urban boundaries, due to the latest 2010 census.

## 1101 Continuing Inventory Data Studies (cont.)

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $670,500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $715,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $775,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Ron Maxwell, GIS Management Branch Manager, 405-521-2728

## 1102 Highway Performance Monitoring System

**PURPOSE AND SCOPE**: To collect, process, and compile data and information as needed to prepare and submit an accurate and timely HPMS submission to the Federal Highway Administration (FHWA) according to the reporting requirements established in the HPMS Reassessment 2010+ Data Specifications.

**ACCOMPLISHMENTS DURING FFY 2013**: ODOT continues to modify our existing web based HPMS Console V2 to accommodate changes occurring to the new FHWA HPMS Version 8 software. We added 14 new validation constraints from the previous submittal year. Field Review documents were produce for 30 sample sections with the primary vicinity located around Lawton, or the south-southwestern region of Oklahoma. Our overall sample size increase from 1499 to 1579 sections, we added 80 new samples from the previous year, and are in-line with latest FHWA guidelines. The 2012 HPMS data submittal was completed in a timely manner, delays were caused by data overload issues on the FHWA uploading methods. Created an web based pull-down form for MPO's, so they can update their required information accordingly. MPO's can also select a Google-Earth (KML file) that displays the location of their samples and the data stored at a given time. We currently have 15 fields that can be updated and linked to our HPMS tables/spreadsheets from this form. We continue to update and verify sample items through field inspection, ODOT Video-Log, Google-Streetview, Bing-StreetSide, etc.

**PROPOSED ACTIVITIES FOR FFY 2014**: Primary focus will be implementing the new 2010 Urban boundaries, along with the functional classifications changes into the system. ODDT will continue to focus on data quality improvement and add more validations cross-checks to the console for submittal. Our Visidata video log along with Google Earth will be used to verify and collect HPMS sample data. A HPMS sample adequacy review will be conducted and additional samples will be added in the appropriate strata. Any changes in the HPMS data structure and HPMS console interface as required by changing FHWA requirements will be implemented and tested. Field review documents will be generated and a HPMS data field review will be conducted in cooperation with FHWA Oklahoma Division. The 2013 HPMS data submittal will be transmitted to FHWA using the HPMS Console V2 and the FHWA Version 8 web-based software.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $96,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $100,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $100,700 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Ron Maxwell, GIS Management Branch Manager, 405-521-2728

## 1103 Geographical Information Management System for Transportation

**PURPOSE AND SCOPE**: To design, develop, implement and maintain a Geospatial Information Management System for Transportation (GIMS-T). The system supports transportation related decision making by producing high quality map products and reports generated from Enterprise data. The maps convey specific topics of interest that require customer input and the use of complex GIS software. GIMS-T staff also supports GIS projects initiated by other ODOT Divisions. GIS services are offered to ODOT staff and customers outside the Department. An intranet GIS enterprise-wide portal is available to anyone having access to the ODOT network. The web portal is known as the Geographical Resource Intranet Portal (GRIP). An internet application known as GRIPLite is also supported and is made available to the general public. The efficient use of resources require a considerable investment in training for GIMS-T staff. The system utilizes aerial photography, global positioning data and other sources of data. The data provided includes but is not limited to 8 Year Construction Work Plan, 4 yr STIP, Road Characteristic Inventory, Highway Needs Study Reports, Construction and Transportation Improvement Programs, Projects under Construction, Crashes and Speed Limits, Pontis Bridge Inventory and Rating Systems, Pavement Management International Roughness Indexes and Structural History, Highway Performance Monitoring System (HPMS), Rail Crossing Inventory, Videolog Inventory, Environmental themes and datasets including the ODOT Storm water layer and Regulated Routes and Outdoor Advertising location data and information. These systems are continuously undergoing review for ways which they can be improved, made to be more cost effective or more user-friendly. New methods and software are continuously being investigated and tested in order to improve the effectiveness and usability of the Departments applications.

**ACCOMPLISHMENTS DURING FFY 2013**: Statewide Transportation Improvement Plan (STIP) maps were completed as well as creation of map products for the Long Range Plan. Staff generated numerous custom maps such as Bridge Vertical Clearance and Posted Load/Design Load maps used for routing oversize/overweight trucks,; updates to the Posted Load Bridge Maps, and continued support for the Environmental Programs Division, with detour, wetland maps, Sensitive Waters-Right of Way Parcels, and other maps requested by the NEPA Coordinators, biologists, and others. Both the Rural and Urban Functional Classification Map Books continue to be redesigned and updated. Provided all customers with working and final map products during the urban boundary revision process due to the 2010 Census. The GIS Team is in the process of contracting with a vendor to create a replacement of the legacy GRIP and GRIPLite Browser Applications. The new application will support the use of KML, Open Source API's, Widgets as well as developing various role based dashboards for use by divergent users to access and query against the departments data, The staff have created KML files for, Regulated Routes, Billboards, Vertical Clearance, 2013-2020 Work plan, Environmental Sediment-Siltation, COG's with links to COG webpages, At Grade Rail Crossings, On and Off System Bridges and Culverts and Counties. Many of the KML files contain links to both internal and external document vaults. A network including all of the grade-separated ramps for Interstate, U.S. and State Highway Systems as well as Climbing Lanes and Frontage Roads continues to be updated with new data as it becomes available. Staff continues to work with DPS in creating KML files for use in the event that the Okie Pros OSOW site goes down. Staff is also assisting the Traffic Division by creating maps showing the location of road segments with narrow or no shoulders, along with the crash data associated with those segments, and also supplying them with the tabular data used to create the maps for use in their analysis of the crash data in relation to the roadway shoulder width type. GIS staff continues to attend training whenever the opportunity presents. GIS Staff is currently working with the OK GIS Council and the ODOT Training Division to schedule training in ArcGIS10. Create maps for the use of the Emergency Management team in the Moore tornado disaster relief effort.

## 1103 Geographical Information Management System for Transportation (cont.)

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue maintenance of the Point to Point Mileage LRS and Applications. Create a more efficient method for creating the 8 Year Work Plan and STIP Map products. Continue to provide support to Senior Staff as well as others within the Department in the creation of GIS Map products which facilitate and improve the decision making process within ODOT. Provide Urban Areas with working and final map products to assist them in adjusting of their Functional Classification necessitated by the 2010 Census. Award a contract to a vendor(s) to create a Web based application to replace the legacy GRIP and GRIPLite Applications. This application will contain all of the functions of GRIP plus more robust query tools, generate reports from those queries, bookmark by location, allow for COG's, MPO's, and Counties to upload data to a staging area for ODOT personnel to perform QA/QC then import into our Oracle database, as well as other yet to be determined functions.
Using GIS software, continue to improve on the design and creation of updated County/Urban Functional Classification Atlas. In coordination with the ODOT Environmental Programs Division, the Outdoor Advertising Branch and the ODOT Rail Programs Division continue to identify needs and develop solutions that will enable them to efficiently and accurately perform their individual missions. Make use of the training in HTML, XML, and JAVA Script to create an Index of Workflows for the various products and applications created by the GIS Team and have them published to a web enabled document for use by ODOT personnel. Continue the major initiative aimed at CADD integration into the GIS Environment. Continue coordination with the Traffic Data section in creating map products to assist in collecting AADT for Ramps. Continue to conduct certified training to personnel in the software products required for the GIMS-T staff to continue to provide efficient and high quality GIS products to customers. Continue to search for and provide certified GIS Training to the GIS Section and others within the GIS Management Branch. Redesign data loaders for construction work plans for use in data mapping. Create and distribute as much ODOT data as possible in KML format for viewing in the Google Earth platform

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $490,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $425,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $795,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Mark Brown, GIS Management Branch, 405-522-1036

## 1201 County, City, and Other Planning Maps

**PURPOSE AND SCOPE**: The purpose and scope of the Cartographic Design Section is to produce county and city CADD maps showing current reliable, accurate and legible information for roads, drainage features, street names, city limits, boundaries with symbology indicating man-made culture and features. The scope also includes the creation of other special purpose planning maps and supporting graphics.

**ACCOMPLISHMENTS DURING FFY 2013**: Fifteen counties and one hundred and eleven cities were completed using CADD software from the latest available information. Counties completed were Atoka, Beaver, Blaine, Bryan, Cimarron, Garvin, Grant, Harper, Johnston, Logan, McClain, Ottawa, Pontotoc, Seminole and Texas. The Cartographic Design Section's city and county designs are implemented using Micro station Geographics allowing integration into most G.I.S. databases. Updated all county and city maps to reflect the latest 2010 Census populations.

The one hundred eleven cities following incorporated city maps, listed by county, were drafted using CADD software:
(City formatting also uses geospatially referenced aerial photography and topographic maps to match all data to the Oklahoma Coordinate System.) Ten urban cities of over 5,000 in 2010 U.S. Census populations are shown in bold letters.

**Atoka County:** Atoka, Caney, Stringtown, Tushka

**Beaver County:** Beaver, Forgan, Gate, Knowles

**Blaine County:** Canton, Geary, Greenfield, Hitchcock, Hydro, Longdale, Okeene, Watonga

**Bryan County:** Achille, Armstrong, Bennington, Bokchito, Caddo, Calera, Colbert, Durant, Hendrix, Kent, Kenefic, Mead, Silo, Wynona

**Cimarron County:** Boise City, Keyes

**Garvin County:** Elmore City, Erin Springs, Lindsay, Maysville, Paoli, Pauls Valley, Stratford, Wynnewood

**Grant County:** Deer Creek, Jefferson, Lamont, Manchester, Medford, Nash, Pond Creek, Renfrow, Wakita

**Harper County:** Buffalo, Laverne, May, Rosston

**Johnston County:** Bromide, Mannsville, Milburn, Mill Creek, Ravia, Tishomingo, Wapanucka

**Logan County:** Cashion, Cedar Valley, Cimarron City, Coyle, Crescent, Guthrie, Langston, Marshall, Meridian, Mulhall, Orlando

**McClain County:** Blanchard, Byars, Cole, Dibble, Goldsby, Newcastle, **Purcell,** Rosedale Washington, Wayne

## 1201 County, City, and other Planning Maps (cont.)

**Ottawa County:** Afton, Commerce, Fairland, Miami, N. Miami, Peoria, Quapaw, Wyandotte

**Pontotoc County:** Ada, Allen, Byng, Fitshugh, Francis, Roff, Stonewall

**Seminole County:** Bowlegs, Cromwell, Konawa, Lima, Maud, Sasakwa, Seminole, Wewoka

**Texas County:** Goodwell, Guymon, Hardesty, Hooker, Optima, Texhoma, Tyrone

Special map graphics and other graphic projects were produced as needed for Planning & Research Division studies and to facilitate other ODOT personnel's SPR assignments.

**PROPOSED ACTIVITIES FOR FFY 2014**: The Cartographic Design Section will continue drawing all county and city maps in a geospatially referenced format and improved accuracy. Four county maps are in progress: Greer, Harmon, Kiowa, and McIntosh, with a goal to complete fifteen or more counties in the coming year. All maps currently in CADD format will be updated as highway system revisions are completed affecting alignments, interchanges or numbers of lanes. Map design features will be integrated into the Oracle Spatial database to facilitate the use of map features from Cartographic Design to other GIS Management Sections needs and for future use by other governmental agencies.

| | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| **FINANCIALS** | | | | |
| Programmed Amount for FFY 2013 | $310,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $310,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $387,300 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Thom Renbarger, Mapping Section, GIS Management Branch, 405-521-2526

## 1301 Coverage Count Program

**PURPOSE AND SCOPE**: To collect traffic data on state highways, interstates and the National Functional Classified System for establishing average daily traffic volumes. Approximately 3,300 short duration locations are counted on the highway system and 11,700 on the secondary system that includes the county road coverage and urban city street coverage in cities populations over 5,000. State highway and interstate locations are counted on a three-year cycle along with the county and city system coverage. Counts collected on the highway system are incorporated into an Annual Average Daily Traffic (AADT) map published annually for distribution. Counts collected on the county and city system are recorded and retained for office use. Highway traffic maps are published for public distribution.

**ACCOMPLISHMENTS DURING FFY 2013**: Short duration traffic counts were completed on the state highway system, county off-system and small urban system in the 25 counties scheduled for FY 2013. In addition to the normal coverage counts, small city counts were collected in select cities with populations under 5,000. Also, in addition to the above, the Traffic Data Section began collecting 15 minute interval counts on the new Ramp/Frontage Road Count System. Continuous updating of the GPS coordinates and site characteristics for all traffic count sites on all systems was performed. A project to completely overhaul the Oklahoma Traffic Count Information System Web Page was begun with no interruption to the current web page.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to analyze all road systems for areas where coverage is deficient, establish new count locations as needed and retire locations that are no longer needed. Collect short duration traffic counts on the state highway system in the 27 counties scheduled for FY 2014. Collect 15 minute interval counts for the new Ramp/Frontage Road Count System. As time allows, collect short duration counts for the county off-system and small urban system in the 27 counties scheduled for FY 2014. Collect and update GPS coordinates and site characteristics for all traffic count sites on all systems as needed. We will be implementing a new enhanced version of the Oklahoma Traffic Count Information System Web Page which will include enhanced maps, report printing and possibly truck traffic information. Attend seminars, conferences and workshops to keep abreast of the latest technological advances in traffic counting equipment and data collection processes.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $834.000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $620.000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $975,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Aaron Fridrich, Transportation manager II, 405-736-9466

## 1302 Permanent Traffic Count Program

**PURPOSE AND SCOPE**: To collect hourly and 15 minute increment traffic data by lane for traffic monitoring design needs. There are 72 Automatic Vehicle Classification (AVC) station locations and 23 Weigh-in-Motion (WIM) station locations in Oklahoma. The traffic data obtained are the basis for seasonal and axle factor variation as recommended for traffic monitoring in FHWA's Traffic Monitoring Guide. A biennial traffic characteristic report is generated from the data collected at these sites. Utilities provided for operational support are maintained for permanent WIM stations through accounts with 12 different electric power companies and 6 different telephone companies.

**ACCOMPLISHMENTS DURING FFY 2013**: The Traffic Monitoring Systems (TMS) Operations and Maintenance Services are provided through two contracts, the TMS Data Collection Contract and the TMS Site Repair Contract. The contractors provided enhanced services and expertise particularly in the area of data collection, systems validation, TCIS web page support and TMS site repair. The TMS site operational rate experienced a marked increase. Additionally, improved systems diagnostics and trend analysis provided by contract data systems experts have resulted in a much needed systems approach towards operations and maintenance support as evident in the detailed construction and renovation project coordination executed during this period. The scope of work accomplished during FY 2013 included renovation of twenty-seven (27) existing sites (11 WIM and 16 AVC) . The remaining 15 WIM sites were converted to wireless communication to enhance efficiency. 8 WIM sites were converted to solar power to reduce energy costs and improve equipment dependability.

**PROPOSED ACTIVITIES FOR FFY 2014**: The TMS Data Collection Contract will continue to improve data collection efficiency and renovate the Traffic Count Information Web Page. The TMS Site Repair Contract addressed in this section will commence with ongoing repair and replacement construction projects identified and planned during FY 2013. The ongoing conversion of WIM sites to solar power will reduce energy costs and enhance equipment dependability. The scope of work to be accomplished in FY 2014 is as follows:

1) Complete solar power conversion to remaining 13 WIM sites.
2) Continue improvements to TCIS web page.
3) Execute schedule maintenance for up to 95 sites.
4) Complete site renovations and repairs to estimated 30 permanent sites.
5) WIM Site calibrations.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $879,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $815.000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $890.000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Aaron Fridrich, Transportation Manager II, 405-736-9466

## 1304 Purchase of Traffic Counting Equipment

**PURPOSE AND SCOPE**: To improve the efficiency of the traffic counting operation by systematic replacement of older outdated equipment and stolen or damaged equipment as well as support of increased equipment requirements resulting from expanded operations.

**ACCOMPLISHMENTS DURING FFY 2013**: Equipment purchases executed in FY 2013 continued to support on-going projects in traffic monitoring systems operations in both permanent sites and short-duration count site locations. Specifically, these purchases consisted of 1) traffic counters and traffic count / classifiers for the Permanent Traffic Count Program and the Weigh-in-Motion Program, 2) solar panels and accessories for the on-going project for site power conversion, 3) wireless communications terminals for the on-going wireless communications deployment in support of data collection at the permanent traffic monitoring stations.
The Road Data Section executed purchases in support of instruments and hardware required to meet data collection requirements under the HPMS program. Due to the advanced age of the Skid Testing Vehicle, replacement is expected in FY 2013.

**PROPOSED ACTIVITIES FOR FFY 2014**: The proposed construction of new traffic monitoring stations, the conversion to solar power and the continuing requirement for additional GPS equipment comprises the majority of the expenditure requirement for FY 2014. As older, out-dated data recorders become uneconomically repairable and obsolete, timely replacement becomes vital to maintaining data integrity and continuity of operations in the permanent traffic monitoring stations and particularly the short duration count program which depends on hardware availability and continuous replacement of road tubes and accessories. In FY 2014, the department will experience a significant surge in solar energy conversion at 19 permanent sites.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $265,500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $65,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $265,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Aaron Fridrich, Transportation Manager II, 405-736-9466

## 1305 Vehicle Classification Counting Program

**PURPOSE AND SCOPE**: To gather vehicle classification data and develop estimates of the composition of traffic on the various Functional Classifications of roadways in the state and to collect complex traffic data required for planning, traffic and design studies. Data gathered and used to facilitate these studies includes machine counts, vehicle classification counts and turning movement studies with pedestrian counts.

**ACCOMPLISHMENTS DURING FFY 2013**: Vehicle classification data collection continued at the short term sites in support of the traffic analyst's effort in the development of updated annual average truck volumes. All
2-lane highway classification site locations where counted for 24 hours using Peek Traffic ADR-1000 Automatic Traffic Recorders. The vehicle classification counting program for FY 2013 was supplemented with a contract with RDSC for collection of multi-lane urban and rural classification data statewide. During FY 2013, various special studies were conducted throughout the year providing timely data for traffic engineers, planners and designers in the department's central office division as well as for traffic engineers, construction and maintenance managers in the eight field divisions. The type and scope of these various special studies and the activities to which the data was provided are as follows:

(A) For the Data Collection Branch

TBD - Turning movements with pedestrian counts
TBD - (24 hour) Hourly Machine Counts
TBD - (24 hour) Cumulative Machine Counts
TBD - (24 hour) Vehicle Classification Counts

(B) For the Engineering Services Branch

TBD - Turning movements with pedestrian counts
TBD - (24 hour) Hourly Machine Counts
TBD - (24 hour) Cumulative Machine Counts
TBD - (24 hour) Vehicle Classification Counts

(C) For the Traffic Engineering Division (and field divisions)

TBD - Turning movements with pedestrian counts
TBD - (24 hour) Hourly Machine Counts
TBD - (24 hour) Cumulative Machine Counts
TBD - (24 hour) Vehicle Classification Counts
TBD - Gap Study (AM, noon & PM peak hours)

(D) For other Divisions

TBD - Turning movements with pedestrian counts
TBD - (24 hour) Hourly Machine Counts
TBD - (24 hour) Cumulative Machine Counts
TBD - (24 hour) Vehicle Classification Counts

## 1305 Vehicle Classification Counting Program (cont.)

**PROPOSED ACTIVITIES FOR FFY 2014**: The vehicle classification counting program for FY 2014 will be performed by contract awarded to RDSC. RDSC will be responsible for the collection of all classification data statewide including multi-lane urban, multi-lane rural and all 2-lane highway sites. During FY 2014, various special studies will be conducted throughout the year providing timely data for traffic engineers, planners and designers in the department's central office division as well as for traffic engineers, construction and maintenance managers in the eight field divisions. We will continue to provide resources to fulfill the requests for various types of traffic studies and produce all reports associated with those studies.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $593,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $600,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $620,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Aaron Fridrich, Transportation Manager II, 405-736-9466

## 1306 Weigh-in-Motion Program

**PURPOSE AND SCOPE**: To collect and conduct preliminary analysis of data describing vehicle characteristics and vehicle weight trends. The Department uses this data as an intricate part of the traffic monitoring system. These data collection systems provide axle weight factors used in design and pavement management studies and to fulfill FHWA requirements for the Strategic Highway Research Program (SHRP) and the Long Term Pavement Performance (LTPP) program. The Department operates 23 permanent weigh- in- motion (WIM) data collection sites and 72 Automatic Vehicle Classifier (AVC) sites located throughout the state.

**ACCOMPLISHMENTS DURING FFY 2013**: The progress made in the TMS Data Collection contract resulted in the collection of monthly data from 72 AVC and 23 WIM sites. The contractor is continuing efforts to develop data validation software using historical data. The contract also provides ongoing support for the digital wireless communication network. The wireless network conversions have dramatically improved the speed and dependability of traffic data transfers as compared to land line telephone service. The contract provided traffic data transfers to an IP address on the internet which allowed import into the department's Traffic Operations and Planning Software data base. The contractor is improving software to remotely program and configures traffic data recorders. Software improvements are ongoing to monitor "downtime" of wireless sites and also to monitor charge & consumption rates of batteries at the sites. The solar power conversion project has reduced electric utility costs and increased site operational rates, 19 WIM sites remain to be converted to solar. The contractor is finalizing a new webpage for real time monitoring of WIM sites similar to the existing webpage for AVC sites. The ODOT Traffic Count Information System webpage is nearing completion; the site requires final software adjustment before release to the public. The TMS Repair contract provided ongoing, essential repairs/replacements of defective sensors and equipment to maintain operational efficiency. Calibration of the WIM sites was completed during the summer of 2013.

**PROPOSED ACTIVITIES FOR FFY 2014**: The TMS Data Collection Contract will focus on: 1) Data collection, 2) development of data validation software using historical data, 3) support services for the digital wireless data communications network, 4) development of software supporting remote programming and configuration of traffic data recorders, 5) development of software allowing for the addition of multiple analog sensors to the communications terminal unit, 6) development of remote monitoring and diagnostics for trouble shooting, 7) development of a power monitoring system for calculating charging rate and power consumption rate to adjust wireless transmission frequency and 8) improvements to existing ODOT Traffic Count Information Web Page. The TMS Site Repair Contract will focus on repair or replacement of sensors and equipment at all AVC and WIM sites and WIM site calibration.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $444,500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $455,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $460,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Aaron Fridrich, Transportation Manager II, 405-736-9466

## 1308 Traffic Monitoring System

**PURPOSE AND SCOPE**: The Oklahoma Traffic Monitoring System (TMS) is a comprehensive statewide traffic data gathering, editing, and reporting system created to fulfill the requirements of the Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and Moving Ahead for Progress in the 21st Century (MAPS-21). The purpose of TMS is to computerize traffic estimation and reporting, including data from public and private non – state government entities, as specified in the Highway Performance Monitoring System.

**ACCOMPLISHMENTS DURING FFY 2013**: Annual AADT processing including continuous counter analysis and annualized factor generation was completed for the traffic year 2012. The traffic count data was checked for accuracy along with the correction of count site placement in the Highway Inventory File. 2012 AADT, Peak Hour, Truck estimates, and Forecast AADTs were estimated on 76 new HPMS Sample locations. The HPMS samples were updated with 2012 Truck counts. 2012 Truck counts from contract, state forces, and the Oklahoma Turnpike Authority were also used to update the 2012 NHS Truck System. One third of the counties had truck counts taken by contract and state forces, beginning the cycle in calendar year 2012. A three year contract to take statewide vehicle classification counts was bid, and RDSC was selected. The annual publication of the 2012 AADT Map was completed. The new statewide ramp estimation process was initiated with complete GEOMEDIA maps and inventory files developed in-house and error checked. The ramp AADT estimation system, first required in 2010 HPMS Field Manual, was initiated with all ramps scheduled to be counted by state forces and contract (classification counts) in calendar year 2013.

**PROPOSED ACTIVITIES FOR FFY 2014**: Revise and streamline the process of recording and compiling short term counts and producing seasonal and axle factors for AADT estimation in the HPMS System and 2013 AADT Map. Develop an estimation system for statewide ramp AADTs. A new branch employee will be added to replace an employee retirement in 2010 and to keep up with additional workloads. Keep personnel informed of technological advances through attendance of seminars, conferences, and workshops.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $192,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $185,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $305,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Daryl Johnson, Traffic Data Analyst, 405-522-6376

## 1309 Traffic Analysis and Projections

**PURPOSE AND SCOPE**: Traffic forecasts provide the basis for geometric and structural design of new highways, roadway planning functions, roadway maintenance, and improvement of existing highways. The existing or assigned traffic volumes are projected twenty (20) years into the future for design purposes. Design Hourly Volume (DHV) of the Annual Average Daily Traffic (AADT), percent of trucks of the AADT and DHV, and the percent of heavy trucks ( of AADT) are prepared for each request of design traffic information. Writing specifications, review and correction, and approval of consultant Design Traffic Projects and Research Projects is to be performed as needed.

**ACCOMPLISHMENTS DURING FFY 2013**: Design traffic was furnished to the city and county governments, consultants and various divisions within ODOT. Information prepared for the larger population areas was based on the comprehensive area and regional transportation studies in those cities. Information for urban, rural communities and small cities was prepared utilizing historical data, such as traffic volumes, vehicle use, population trends, special traffic counts and other related traffic information gathered through special studies. Approximately 206 requests for design traffic were completed. Several consultant traffic analyses were overseen and edited, including the US 81 Chickasha Bypass and the US 70 Madill Bypass. The Portable WIM research project was overseen. The Vehicle Classification Accuracy in Oklahoma Research Project was initiated.

**PROPOSED ACTIVITIES FOR FFY 2014**: Design traffic data will continue to be furnished for cities, counties and to ODOT divisions upon approved requests. Traffic analysis and projections will be completed, as requested for all programmed construction and maintenance projects. Project Planning Reports and other required special studies will be developed. Remain informed of technological advances through attendance of seminars, conferences and workshops. A new engineer will be added to the Engineering Services Branch of Planning and Research Division as an eventual replacement for the ODOT Traffic Analyst. An additional TM I will also be added to the section to assist with additional work load.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $148,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $95,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $182,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Daryl Johnson, Traffic Data Analyst, 405-522-6376

## 1310 Skid Studies Program

**PURPOSE AND SCOPE**: To assess the skid resistance for pavement surfaces of Oklahoma's highway system in accordance with the guidelines of the Highway Safety Improvement Program and ASTM standards. The scope of the program includes: scheduled testing of all roadways comprising the National Highway System in a three-year test cycle. This includes the annual testing of all interstate highways and the Strategic Highway Research Program (SHRP) sites. Conduct special skid resistance testing as requested.

**ACCOMPLISHMENTS DURING FFY 2013**: The annual test cycle for FY 2013 encompassed pavement friction testing of highways in Divisions 5, 6 & 7, US 69 and all Interstates. The new Pavement Friction (Skid) Testing System purchased in FY 2007 was in its 7th year of use in this year's test cycle and again experienced increased productivity in test miles. This year's testing cycle totaled 10,623 miles. The new system's software provides a more efficient and streamlined reporting process. Highway mileage with less than adequate skid resistance value registers an average of approximately 8 percent of all pavements tested. The annual test cycle was prematurely ended in June/2013 due to vehicle accident that rendered the vehicle and trailer inoperable. It is anticipated that a new replacement skid truck & trailer will be operational in August/2013 and an attempt will be made to complete this year's test cycle.

**PROPOSED ACTIVITIES FOR FFY 2014**: The new Pavement Friction Skid Equipment is scheduled to be operational in August/2013, and will be calibrated before delivery and ready for use. The FY 2014 test cycle encompasses state, federal and interstate highways totaling approximately 7,366 miles in Division 4 & 8, US 69 and all interstates. Completion is scheduled for the fall of 2014. Calibration of the skid testing equipment is done on a biannual basis and will be scheduled for FY 2015.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $456,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $465,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $175,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Aaron Fridrich, Transportation Manager II, 405-736-9466

## 1404 Safety Planning

**PURPOSE AND SCOPE**: To address transportation safety in the development and implementation of the Statewide Intermodal Transportation Plan (Long Range Plan) and the Oklahoma Statewide Transportation Improvement Program (STIP). To collaborate with ODOT Traffic Engineering Division in implementation and update of Oklahoma's Strategic Highway Safety Plan (SHSP).

Provide review of projects and programs to ensure consistency with the Long Range Plan and inclusion in the STIP.

**ACCOMPLISHMENTS DURING FFY 2013**: Provided interface to include safety and security considerations in Long Range Transportation Plan and STIP. Worked with ODOT Traffic Engineering staff on implementation of SHSP and development of goals and target performance measures for updated SHSP. Assisted with successful Highways for Life grant application for funds for a bridge replacement project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Address transportation safety in implementation of Long Range Plan and development and implementation of STIP. Continue review and update for SHSP 2. Continue monitoring implementation of adopted SHSP. ODOT Traffic Engineering Division implementation focus in 2013 includes, but is not limited to: carrying out the Oklahoma Systemic Intersection Safety Plan by developing and constructing both low cost intersection safety improvements and safety improvements on curves on a system wide basis.

| FINANCIALS | AMOUNT | FUND | AMOUNT | FUND |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $100,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $100,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $50,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Linda Koenig, Transportation Planner, 405-522-0171

## 1405 Motorcycle Safety & Education Program

**PURPOSE AND SCOPE**: The Statewide motorcycle safety and education program seeks to reduce motorcycle crashes that result in fatalities and injuries. The program seeks to curb aggressive driving and speeding by motorcycle users. The Oklahoma Highway Patrol will implement a motorcycle safety course as a means of improving motorcycle user safety on the public roadways.

**ACCOMPLISHSMENTS DURING FFY 2013**: The Oklahoma Highway Patrol, in partnership with ODOT, continued the development and implementation of a statewide motorcycle safety and education program; delivered publication education/information materials through various venues including public service announcements, community events, and public forums.

**PROPOSED ACTIVITIES FOR FFY 2014**: None

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $400,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $400,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $-0- | SPR | 0 | STATE |

**CONTACT INFORMATION**

Linda Koenig, Transportation Planner, 405-522-0171

## 1440 Local Technical Assistance Program

**PURPOSE AND SCOPE**: The Local Technical Assistance Program (LTAP) is a training program contracted through Oklahoma State University's Center for Local Government Technology to provide technical maintenance training and assistance to Oklahoma's 77 counties' personnel in the areas of road and bridge construction, repair and maintenance and other transportation related issues. This is accomplished by (1) conducting workshops, seminars and other training opportunities; (2) providing on-site technical assistance: (3) maintaining a lending library for publications, videotapes, DVDs and other technology resource documents; (4) providing information on new and existing technology; (5) coordinating with faculty and staff at OSU and ODOT to provide technical expertise and support; and (6) publishing a quarterly newsletter and (7) maintaining a database of rural, local and state transportation officials and other resources in Oklahoma and nationwide.

**ACCOMPLISHMENTS DURING FFY 2013**: Conducted Right of Way Acquisition class in conjunction with ODOT's Right of Way Division and FHWA. Personnel attended the Every Day Counts 2 Summit in Kansas City Mo. in October 2013. The LTAP center conducted FHWA's EDC2 Virtual Safety Summit and Traffic Incident Command in Stillwater, Ok. A class on Crash Data Collection was held in OKC. Continued the Roads Scholar curriculum in conducting numerous training sessions, with a record number of 84 participants completing the program; placed student interns into six local government agencies; developed and conducted new training courses as requested by the LTAP Advisory Board and counties, with emphasis on safety; continued to develop hands on training through cooperation efforts with industry; continued to maintain website, publish various literature, tapes, DVD, etc. for distribution.

## 1440 Local Technical Assistance Program (cont.)

**PROPOSED ACTIVITIES FOR FFY 2014**: Develop more activities to facilitate the implementation of FHWA's Every Day Counts initiatives. Provide training and technical assistance in conjunction with ODOT, to develop data dictionaries from data collected by the counties, to integrate into ODOT's GIS mapping features. A new Basic Signal Technician class will be developed and offered. A formerly offered class, Backhoe and Excavator Class, will be offered again, due to demand. Continue the Roads Scholar, Road Safety Audit, Welding Safety, OSHA Forklift, Comprehensive MUTCD, and Wildland Fire Training; provide Infrastructure Management training to include Motor Grader Operation, Chip Seal Class, and Asphalt operations. Participate in Assoc. of County Commissioner of Oklahoma (ACCO) conferences and County Officer & Deputies Association (CODA) conferences; continue to lead Workforce Development classes; continue to improve and serve as the state office of the Oklahoma Chapter of the American Public Works Assoc. (APWA) in handling daily office functions, organizing and conducting the annual conference and attendance of board meetings; revise the Transportation Intern Program developed by the Center for Local Government Technology (CLTG) in light of the restructuring of the Oklahoma Transportation Center; serve on various local and national committees such as the Association of County Commissioners of Oklahoma Strategic Planning, National LTAP Association Conference. Planning, etc.; attend various conferences including the TRB Annual Conference and the National LTAP Conference.; provide technical assistance in all areas; continue to provide website, literature, tapes, DVD's, etc. for distribution; provide program progress reports.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|---|---|
| Programmed Amount for FFY2013 | $220,000 | SPR | $58,366 | STATE | $140,000 | FHWA |
| Estimated Cost for FFY 2013 | $220,000 | SPR | $58,366 | STATE | $140,000 | FHWA |
| Estimated Cost for FFY 2014 | $184,000 | SPR | $58,366 | STATE | $140,000 | FHWA |

**CONTACT INFORMATION**

Bryan Cooper, Transportation Research Section, 405-736-9475

## 1510 Justification Studies

**PURPOSE AND SCOPE**: To study the economic, environmental and other effects of design features of roadway improvements such as interchanges, grade separations, bypasses, utility structures, pedestrian structures, etc., for the purpose of determining the economic and engineering feasibility of such proposals.

**ACCOMPLISHMENTS DURING FFY 2013**: Reviewed consultant studies as needed.

**PROPOSED ACTIVITIES FOR FFY 2014**: Consultant studies will be overseen as needed. Keep informed of technological advances through attendance of seminars, conferences, and workshops.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $20,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $2,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $20,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Daryl Johnson, Traffic Data Analyst, 405-522-6376

## 1601 Federal-Aid Systems Coordination

**PURPOSE AND SCOPE**: To be responsible for the coordination of the State and United States Highway System, Federal-aid Highway System (includes the Interstate System and National Highway System) and the Functional Classification System. Prepare and coordinate all highway and classification revisions pertaining to these systems. To record, maintain, research, and provide any documents and historical data relating and pertaining to these systems. To communicate, inform and coordinate with city, county, state and federal officials pertaining to these systems.

**ACCOMPLISHMENTS DURING FFY 2013**: A total of 2 highway revisions were approved by the Transportation Commission. A total of 5.97 miles of highways were added and 4.34 miles were removed for a grand total of 1.63 highway miles added from the State Highway System. There were 54 existing urban area boundaries were adjusted for the Functional Classification System. Watonga and Muldrow-Roland were two new urban area boundaries added to the Functional Classification Systems. There were over 12,000 miles driving this year, so to complete the adjustment of Functional Classification Urban Area Boundaries. New forms were designed to be used for reviewing roadways that are proposed revisions to the Functional Classification Systems. These forms were designed to be completed online to help reduced paper cost and filing. Many highway history questions this office received were extensive researched and answered. The *Oklahoma's Memorial Highways & Bridges* book is presently being updated for publication in 2014.

**PROPOSED ACTIVITES FOR FFY 2014**: Continue to coordinate all necessary highway revisions within the State. Complete the process for revising the Functional Classification due to the adjustment of the urban boundaries and the growth within each county and urban areas. Approximately 10,000 miles will be driven to do necessary on-site reviews of revisions as needed. New classification books for both urban and rural will be published. The *Oklahoma's Memorial Highways & Bridges* book for 2013 will be updated with the new 2012 and 2013 data. This book should be reprinted by February, 2014.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $89,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $95,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $93,300 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Gary Howell, Systems Coordinator, GIS Management Branch, 405-522-1041

## 1603 Highway Needs Study

**PURPOSE AND SCOPE**: To estimate the current and future needs of the state highway system using up-to-date software and techniques. To publish a Needs Study and Sufficiency Report biennially showing the physical and financial needs of the state highway system over a twenty-year period for construction, maintenance, and administration. To maintain a file of geometric deficiencies on the state highway system. To maintain a construction and maintenance status log of highway projects. To develop, maintain, and recommend a list of highway segments for potential removal from the state highway system and its associated cost. To maintain a database indicating sufficiency ratings for roadways and bridges along with suggested improvements and costs.

**ACCOMPLISHMENTS FOR FFY 2013**: Continued field data collection for upcoming 2013 Needs Study Report. Met with Field Division personnel to coordinate their participation in data collection. Updated the Sufficiency file highway subsections, inventory, and improvement data for use in the collection of field data. The geometric data contained in the Needs Study Deficiency database file was updated. Processed collected field data. Ran programs to produce graphs, charts, and tables for Report. Compiled maintenance and construction costs for Report. Continued assembling the 2013 Needs Study and Sufficiency Rating Report, Volumes I & II and the 2013 Needs Study Potential Removals from the State Highway System Report. Updated the Sufficiency Rating Manual, Field Division Pavement Preservation Manual, and the Needs Study Procedure Manual.

**PROPOSED DURING FFY 2014**: Meet with Field Division personnel to coordinate their participation in data collection. Collect field data for 2015 Needs Study Report. Update the highway sufficiency file subsections, inventory, and improvement data for use in the collection of field data. Update the geometric data contained in the Needs Study Deficiency database file. Process collected field data. Run programs to produce graphs, charts, and tables for Report. Compile maintenance and construction costs for Report. Begin assembling the 2015 Needs Study and Sufficiency Rating Report, Volumes I & II and the 2015 Needs Study Potential Removals from the State Highway System Report. Update the Sufficiency Rating Manual, Field Division Pavement Preservation Manual, and the Needs Study Procedure Manual.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $172,371 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $222,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $339,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Wayne Barber, Needs Study Program Manager, 405-522-6705

## 1604 Pavement Management Systems

**PURPOSE AND SCOPE**: To develop and implement the Department's Pavement Management System (PMS); maintain a computer database of pavement distresses and other roadway characteristics used for the analysis of pavement condition and performance and as an aid to pavement design; maintain application software necessary to analyze roadway information for pavement management; and supply data for inclusion in the Highway Performance Monitoring System (HPMS).

**ACCOMPLISHMENTS DURING FFY 2013**: Performed PMS analysis of the Interstate and Statewide Highway Systems in Oklahoma. Continued refinement of PMS procedures by updating performance curves, treatment costs, and triggers. Provided technical support for the video log software. Initiated pavement condition data collection on all NHS routes (primary direction IRI and Right-of-way video only), all non-NHS routes in Divisions 1, 2, 5, 6 and 7, and HPMS non-highway sample sections in Divisions 1, 2, 5, 6 and 7. Kept informed of the latest technological advances and practices by attending the Transportation Research Board 92nd Annual Meeting in Washington, D.C..

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform PMS analysis of the National and Statewide Highway Systems in Oklahoma. Continue refinement of PMS procedures by updating performance curves, treatment costs, and triggers. Provide technical support for the video log software, both in-house and web-based. Keep informed of the latest technological advances and practices through seminars, conferences, and workshops. Initiate a Request for Proposal regarding a new Quality Assurance tool to check data. Initiate a Request for Proposal regarding a new pavement condition data collection contract and data collection on the following:

- All NHS routes (primary and secondary directions; full data and video)
- All non-NHS routes in Divisions 3, 4, and 8
- HPMS non-highway sample sections in Divisions 3, 4, and 8

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $983,290 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $1,223,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $1,158,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

William Dickinson, Pavement Management System Project Manager, 405-522-1448

## 1700 General Urban Transportation Planning

**PURPOSE AND SCOPE**: This item includes coordinating with staff members in the Program Coordination Branch in conducting general planning and research activities which cannot be ascribed to specific transportation studies contained in the unified planning work programs or the SPR Report. These activities include: a) coordination between ODOT Central Office and Field Divisions; b) coordination with and among local, state, and federal officials; c) dissemination of social and economic data and traffic counts to the public and private sector on request; d) providing technical assistance on planning and research activities/studies upon request; e) tracking federal and state legislation and regulations affecting the Department, and; f) keeping abreast of the latest technology advances and federal regulations in transportation planning, ITS, etc. through seminars, workshops and reading materials.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued coordination with appropriate ODOT staff members and Field Divisions. Provided socioeconomic data, benefit-cost analyses, and traffic counts upon request, to local and state officials and to citizens. Attended various seminars and workshops related to transportation planning and policies in order to maintain, upgrade and develop needed expertise, proficiency and professionalism. Coordinated with and among local, state and federal officials. Provided assistance at public meetings. Submitted applications for federal discretionary funds. Monitored federal and state legislation and regulations affecting the Department. Provided review and comment on Moving Ahead for Progress in the 21st Century (MAP-21) guidance.

**PROPOSED ACTIVITIES FOR FFY 2014**: Provide coordination with ODOT staff members, Field Divisions and local, state and federal officials will be continued. Disseminate pertinent planning data and information as needed. Provide technical assistance as requested concerning transportation planning and reauthorization of MAP-21. Pursue professional enrichment through attendance at workshops, seminars and conferences.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $5,500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $5,500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $6,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Linda Koenig, Transportation Planner, 405-522-0171

## 1701 Oklahoma City Area Regional Transportation Study

**PURPOSE AND SCOPE**: To maintain up-to-date socioeconomic and land use data and a viable Long Range Transportation Plan in compliance with the provisions of existing federal regulations and SAFETEA-LU provisions and all applicable transportation planning regulations and requirements for the Oklahoma City urbanized area.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and Policy Committee approved the Encompass 2035 OCARTS Long-Range Transportation Plan. Continued to serve as Coordinated Public Transit-Human Services Transportation Plan guide. Continued implementation of strategies to alleviate congestion problems in OCARTS area. Continued work with the Air Quality by monitoring and evaluating levels and administrating a comprehensive public education program. Partnered in funding an Intermodal Transportation Hub Study. Updated local government projects included in the TIP.

**PROPOSED ACTIVITIES FOR FFY 2014**: As defined in UPWP, Data collection and monitoring of social, economic, environmental and transportation system data; Continue calibration and application regional land use distribution model; Long Range Planning including major streets and highways; Short Range Planning coordination; Transit Route Performance and Service Plans; Congestion Management; Elderly and Disabled Transportation Planning; Program implementation of the TIP, Urbanized Area Surface Transportation Program and project coordination and monitoring; Alternative Transportation planning including Pedestrian and Bicycle, Public Transit, Human Services Transportation and Passenger Rail; Transportation Effects of air quality, ozone reduction and environmental programs; Public education planning of the Citizen Participation and public information, nondiscrimination compliance plan and conducting broad-based public involvement activities; Program administration and implementation. Updated local government projects included in the TIP as well as develop and adopt the FFY 2015-2018 TIP.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|---|---|
| Programmed Amount for FFY2013 | $55,000 | SPR | $1,127,400 | PL | $200,000 | In-Kind |
| Estimated Cost for FFY 2013 | $55,000 | SPR | $1,127,400 | PL | $200,000 | In-Kind |
| Estimated Cost for FFY 2014 | $55,000 | SPR | $1,414,711 | PL | $282,942 | In-Kind |

**CONTACT INFORMATION**

Dawn Borelli, Transportation Manager I, 405-521-6433

## 1702 Tulsa Metropolitan Area Transportation Study

**PURPOSE AND SCOPE**: To maintain up-to-date socioeconomic and land use data and a viable Long Range Transportation Plan in compliance with the provisions of existing federal regulations and SAFETEA-LU provisions and all applicable transportation planning regulations and requirements for the Tulsa urbanized area.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued development of the Regional Transportation Plan, Connections 2035. Preparation and finalization of the FY 2013 UPWP was completed. The FY 2013 Agreement was executed and authorization to expend federal funds effective July 1, 2012 through June 30, 2013 was granted by FHWA. The Transportation Improvement Program (TIP) for FFY 2013-2016 was developed and adopted. Continued the coordination of the Ozone Alert! Clean Cities and Green Traveler Alternative programs. Reviewed and analyzed the Congestion Management Process and implemented modified system. Assisted in the planning, funding and development of the Bicycle/Pedestrian Trail system as well as developed a pedestrian master plan for the region.

**PROPOSED ACTIVITIES FOR FFY 2014**: As defined in UPWP, Data collection and monitoring of social, economic, environmental and transportation system data. Development and maintenance of the Geospatial Information System and integration with the travel demand model. Update and maintain a major street and highway plan for the region. Review and assess congestion and congestion management strategies, revise CMP document. Initiation of development of a comprehensive pedestrian, bicycle plan for the region, implementation of bicycle elements of the Regional Transportation Plan. Implement High Speed Passenger Rail plan and initiate Alternative Analysis of commuter corridors in the region. Review and update the Public Participation Plan.

| FINANCIALS | Amount | Fund | Amount | Fund | Amount | Fund |
|---|---|---|---|---|---|---|
| Programmed Amount for FFY2013 | $35,000 | SPR | $823,900 | PL | $164,780 | In-Kind |
| Estimated Cost for FFY 2013 | $35,000 | SPR | $823,900 | PL | $164,780 | In-Kind |
| Estimated Cost for FFY 2014 | $35,000 | SPR | $1,255,538 | PL | $251,107 | In-Kind |

**CONTACT INFORMATION**

Laura Chaney, Transportation Manager I, 405-521-2705

## 1703 Lawton Metropolitan Area Transportation Study

**PURPOSE AND SCOPE**: To maintain up-to-date socioeconomic and land use data and a viable Long Range Transportation Plan in compliance with the provisions of existing federal regulations and SAFETEA-LU provisions and all applicable transportation planning regulations and requirements for the Lawton Metropolitan area.

**ACCOMPLISHMENTS DURING FFY 2013**: As defined in UPWP, Transportation planning for the Lawton Metropolitan Planning Area was carried out as described in the FY 13 Unified Planning Work Program (UPWP). During FY 12 staffing shortages and lack of transportation, planning experience by employees of the Lawton Metropolitan Planning Organization (LMPO) postponed numerous projects. Accomplishments during FY 12 included: published the Annual Listing of Obligated Projects, adoption of the FFY 2013-2016 Transportation Improvement Program (TIP), preparation of the annual transportation planning funding documents, assisted Lawton Public Schools in Safe Routes to Schools application process, implemented a feasibility study for providing transit service to the West Lawton Industrial Area, developed an air quality education program in cooperation with the Lawton Metropolitan Area Air Quality Committee, participated in Transportation Air Quality Work Group meetings, and participated in committee to review transportation enhancement grant applications.

**PROPOSED ACTIVITIES FOR FFY 2014**: As defined in UPWP, Data collection and monitoring of social, economic, environmental and transportation system data. Prepare a study in relocating the transit transfer center, administer the contract for the Lawton Metropolitan Bicycle and Pedestrian Plan, review the Public Participation Plan to ensure it is in compliance with Title VI and LEP requirements, review and update the traffic analysis zones, review pedestrian facilities and connectivity to transit in proximity to secondary schools, collect date and convert date into GIS maps for sidewalks, bus shelters, traffic reports, and increase public awareness of air quality through various outreach efforts.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $15,000 | SPR | $120,000 | PL | $24,000 | In-Kind |
| Estimated Cost for FFY 2013 | $15,000 | SPR | $120,000 | PL | $24,000 | In-Kind |
| Estimated Cost for FFY 2014 | $15,000 | SPR | $225,957 | PL | $45,191 | In-Kind |

**CONTACT INFORMATION**

Laura Chaney, Transportation Manager I, 405-521-2705

## 1709 Ft. Smith Transportation Study

**PURPOSE AND SCOPE**: To maintain up-to-date socioeconomic and land use data and a viable Long Range Transportation Plan in compliance with the provisions of existing federal regulations and SAFETEA-LU provisions and all applicable transportation planning regulations and requirements for the Fort Smith urbanized area.

**ACCOMPLISHMENTS DURING FFY 2013**: Transportation planning for the Frontier Metropolitan Planning Area was carried out as described in the FY 12 Unified Planning Work Program (UPWP). Accomplishments during FY 12 included published the Annual Listing of Obligated Projects, adoption of the FFY 2013-2016 Transportation Improvement Program (TIP), preparation of the annual transportation planning funding documents and maintenance and update of the Frontier MPO website.

**PROPOSED ACTIVITIES FOR FFY 2014**: The Oklahoma Department of Transportation will continue coordination with the Frontier Metropolitan Planning Organization and the Arkansas Highway and Transportation Department (AHTD) in maintaining the 3-C planning process in the Fort Smith area. Monitor the transportation planning process for compliance with administrative, financial and legal requirements for maintaining a continuous, cooperative and comprehensive process. Continue staff education, training and attendance at workshops and seminars. Develop Travel Demand Model for Oklahoma Counties including:

- Network area links and nodes
- Identification of O-D (Generators/Attractors)
- Population and employment

| FINANCIALS | Amount | Fund | Amount | Fund | Amount | Fund |
|---|---|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $15,000 | SPR | $40,824 | PL | $3,940 | In-Kind |
| Estimated Cost for FFY 2013 | $15,000 | SPR | $40,824 | PL | $3,940 | In-Kind |
| Estimated Cost for FFY 2014 | $15,000 | SPR | $26,250 | PL | $2,520 | In-Kind |

**CONTACT INFORMATION**

Laura Chaney, Transportation Manager I, 405-521-2705

## 1710 Substate Planning

**PURPOSE AND SCOPE**: To provide transportation planning assistance for the non-metropolitan areas of the State thru the Oklahoma Association of Regional Councils (OARC). The rural transportation program will assist ODOT in meeting Federal and State requirements for the Statewide Planning Process to address the transportation needs in non-metropolitan areas. Develop and provide ongoing public participation for the transportation planning process.

**ACCOMPLISHMENTS DURING FFY 2013**: Developed an Oklahoma Rural Transportation Planning Manual. Preparation of annual transportation planning funding documents, agreement between ODOT and OARC signed and Planning Work Program (PWP) in development.

**PROPOSED ACTIVITIES FOR FFY 2014**: Implement the public participation process thru OARC. Begin the development of long range regional transportation planning.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $250,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $250,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $250,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Laura Chaney, Transportation Manager I, 405-521-2705

## 1719 Statewide Transportation Improvement Program

**PURPOSE AND SCOPE**: To develop, administer and revise a financially-constrained federally funded transportation improvement program for the State of Oklahoma in compliance with SAFETEA-LU and in cooperation with the FHWA, FTA, the four Metropolitan Planning Organizations (ACOG, INCOG, LMPO, and Frontier MPO), the Bureau of Indian Affairs, and Tribal Governments.

**ACCOMPLISHMENTS DURING FFY 2013**: Developed the Statewide Transportation Improvement Program (STIP) for approval and implementation. The STIP webpage was revised to reflect the Amendments and Statewide Line Items. The FFY 2011 – 2014 STIP contains an Executive Introduction of the Transportation Commission; Explanation of STIP; Balancing Process including Clarification, Anticipated Revenues and Expenditures; Project Selection and Prioritization including Construction Program Maps by Division and Project Listing by Year; Transit Program including Project listing by Year; MPO TIPs; Indian Reservation Roads TIP; County Improvements for Roads and Bridges (CIRB); Federal Lands Program including Applications; ODOT Certification; Public Involvement Process including the *Procedures for Developing and Amending the STIP and TIP.*

The current STIP was administered through administrative modifications, statewide line items and amendments. All amendments to the STIP and TIPs were in accordance with the federally approved revised *Procedures for Developing and Amending the STIP and TIP.* The Process includes publication of proposed amendments for a minimum of 14 days for review and comment. The public involvement process was completed in accordance with TEA 21 and SAFETEA-LU, regarding publication of project amendments. Revised the Definitions included in the *Procedures for Developing and Amending the STIP and TIP* in coordination with the FHWA, FTA, and MPOs.

**PROPOSED ACTIVITIES FOR FFY 2014**: Develop the FFY 2015 - 2018 Statewide Transportation Improvement Program (STIP) for approval and implementation. Continue administration of current STIP using currently approved procedures. Amend the FFY 2014 portion of the STIP based upon revision of the ODOT 8 Year Construction Work Plan.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $85,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $85,000 | SPR | 0 | STATE |
| Estimated Cost for F FY 2014 | $85,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Dawn Borelli, Transportation Manager I, 405-521-6433

## 1902 Statewide Long Range Transportation Planning

**PURPOSE AND SCOPE**: To initiate update of the Statewide Long Range Transportation Plan (LRTP) and other associated statewide planning activities in accordance with the provisions of federal and state law. To conduct and/or participate in the development of plans related to Improvement Studies and other activities identified Statewide Plan.

**ACCOMPLISHMENTS DURING FFY 2013**: Managed completion of contract for Statewide Plan with PB Americas Inc. Continued management of and oversaw completion of Transit Gap Study. Provided updated information and/or edited Improvement Studies as needed. Prepared ODOT Strategic Plan for Governor's Cabinet. The Strategic Plan was written to address short term (2013 to 2021) and long term (2021-2029) policy goals, and utilized the 2035 Oklahoma Long Range Transportation Plan as the primary source. Continued review of projects and programs for consistency with Statewide Plan.

**PROPOSED ACTIVITIES FOR FFY 2014**: Develop request for proposals and arrange for necessary financial and policy approvals to proceed with development of 2040 Long Range Plan. Continue coordination with MPOs and other local governments in relation to long range transportation plans. Review Moving Ahead for Progress in the 21st Century (MAP-21) and related guidance, in relation to Statewide Plan requirements.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $2,500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $2,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $700,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Linda Koenig, Transportation Planner, 405-522-0171

## 1903 Intelligent Transportation Systems Planning

**PURPOSE AND SCOPE**: Incorporate Intelligent Transportation Systems (ITS) into the transportation planning process in compliance with the provisions of Federal regulations [23 Code of Federal Regulations, Parts 655 and 940, Intelligent Transportation System (ITS) Architecture and Standards]. Use an ITS integration strategy by defining roles, responsibilities and shared operational strategies to address key policy and operational issues creating and / or updating the conceptual design for ITS within the planning area. Ensure the interoperability and institutional / technical integration of ITS efforts through compliance with ITS Statewide / Regional Architectures and related ITS standards.

**ACCOMPLISHMENTS DURING FFY 2013**: Oklahoma's CVO Program Plan and Top Level Design for CVISN Core and Expanded Deployment update on hold. The Department has initiated efforts with SAIC under a standing planning contract (EC1406B) to update the Statewide Architecture

**PROPOSED ACTIVITIES FOR FFY 2014**: Update the Statewide ITS Plan, ITS Architecture and Implementation Plan via EC 1406B. Continue to process ITS funded contracts / invoices for the systems analysis / design and deployment of Oklahoma's CVISN Program plan projects. Coordinate ITS and other technology based transportation research contracts and activities. Work toward the development of a Real-Time System Management Information Program (RTSMIP) as required by 23 CFR 511.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $10,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $500 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $125,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Randy Lee, Assistant Division Engineer, (405) 522-1447

## 1904 Air Quality Planning

**PURPOSE AND SCOPE**: Monitor and participate in air quality transportation planning developments relating to requirements of the Clean Air Act Amendments and SAFETEA-LU. Represent the Department in air quality nonattainment and transportation conformity actions. Analyze and comment on air quality nonattainment and transportation regulations and laws. Maintain information flow to and from decision-makers regarding air quality/transportation issues, developments, regulations and laws. Continue staff education, training and attendance at workshops and seminars. Assist the Department to be a progressive participant in reducing the impacts of transportation-related pollution.

**ACCOMPLISHMENTS DURING FFY 2013**: Participated in the air quality/transportation planning activities of Lawton, Association of Central Oklahoma Governments (ACOG), and Indian Nations Council of Governments (INCOG) Metropolitan Planning Organizations (MPO). Attended air quality meetings with partners at the Federal Highway Administration (FHWA) and Oklahoma Department of Environmental Quality. Researched and maintained resource materials on air quality/transportation issues; and reviewed and commented on MPO air quality education programs. Coordinated the planning process for air quality modeling funding and actions between the States, MPOs, ODOT and the ODEQ. Monitored regulations on National Ambient Air Quality Standards (NAAQS), Climate Change and Greenhouse Gas Emissions.

**PROPOSED ACTIVITIES FOR FFY 2014**: Maintain research and participation in air quality/transportation issues, developments, regulations and laws. Assist in providing data for air quality modeling efforts. Continue to develop education materials and resources for Department personnel regarding air quality and transportation. Continue to monitor the air quality regulations and impact to the Department. Attend air quality/transportation planning activities of the Lawton, ACOG, and INCOG MPO. Participate in MPO and ODEQ air quality/transportation initiatives, educational programs, and efforts to reduce pollution. Continue partnership with INCOG and ACOG to enhance and extend data collection and modeling outside of the study areas to establish base data for air quality issues in rural/donut areas. Facilitate meetings of the Oklahoma Transportation Air Quality Work Group. Continue staff education through courses, seminars, and conferences.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $100,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $100,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $100,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Laura Chaney, Transportation Manager I, 405-521-2705

## 1905 Freight Planning

**PURPOSE AND SCOPE**: To coordinate freight planning and freight analysis with the Long Range Transportation Plan, Oklahoma Statewide Freight and Passenger Rail Plan, and Statewide Transportation Improvement Program (STIP), and project development processes.

**ACCOMPLISHMENTS DURING FFY 2013**: Coordinated with consultant and waterways, rail, and other divisions to prepare and finalize Freight Flow report and subsequent summary information brochure. Tracked guidance on National Freight Network and related MAP-21 legislation. Continued Review potential freight projects in relation to Statewide Intermodal Transportation Plan and the Oklahoma Statewide Freight & Passenger Rail Plan.

**PROPOSED ACTIVITIES FOR FFY 2014**: Define Oklahoma portion of National Freight Network to include primary freight network, interstate system not on the primary freight network, and critical rural freight corridors in accordance with the Moving Ahead for Progress in the 21st Century Act (MAP-21) Act of 2012. Conduct an intermodal freight needs assessment to include inventory of existing freight facilities and systems, identification of current and anticipated future freight issues and concerns (bottlenecks, safety, commodity growth, etc.), development of recommended performance measures, and description of freight system needs in coordination with Oklahoma Departments of Commerce, Agriculture, and other agencies as appropriate. Assessment will include, but not be limited to waterway, highway, railroad, and air modes – both public and private facilities.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $200,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $200,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $200,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Linda Koenig, Transportation Planner, 405-522-0171

## 1906 Rail Planning

**PURPOSE AND SCOPE**: To coordinate rail planning in the state in accordance with the recently approved Oklahoma Statewide Freight and Passenger Rail Plan (State Rail Plan) and relevant elements of MAP-21.

**ACCOMPLISHMENTS DURING FFY 2013**: Initiate contract for Feasibility Study regarding Use of Natural Gas Powered Locomotives. Initiated Tulsa to Oklahoma City Passenger Rail Study.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue work on Tulsa to Oklahoma City Passenger Rail Study. Focus on implementing State Rail Plan recommendations to improve freight rail capacity. In particular, analyze need for upgrading to a heavier car standard and improving rural freight connectivity. (The national rail industry has begun adopting a heavier car standard of 286,000 lbs (286k) per car, up from 263,000 lbs per car. Under certain conditions, the 286k standard will improve capacity and efficiency for shippers, increase train speeds, save fuel, and reduce maintenance of the track.) Evaluate the need for Oklahoma short line rail operators to adopt a 286k rail car standard. Work on CNG locomotives will continue under a separate funding source but will seek SP&R funds again in FFY 2015.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $100,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $100,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $100,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Johnson Bridgwater, Rail Programs Division, 405-521-4203

## 1910 Public Participation and Visualization Techniques

**PURPOSE AND SCOPE**: To develop and maintain a Public Participation Plan (PPP) to encourage full public participation in the transportation planning and programming process including the Statewide Transportation Improvement Plan (STIP), the Long Range Plan, and the National Environment Protection Act (NEPA) Process.

**ACCOMPLISHMENTS DURING FFY 2013**: Held several public meetings statewide. Visualization techniques were implemented utilizing 3-dimensional design, video, and animation and were incorporated into public outreach. The current ODOT Public Involvement web page was updated and improved. Successfully completed the public involvement plan for the updated STIP. Brought forward new methods for public outreach.

**PROPOSED ACTIVITIES FOR FFY 2014**: Provide public involvement for environmental, planning and construction projects. Include special outreach to non-metropolitan public officials, and the traditionally underserved. Develop and improve upon presentation processes and techniques. Provide visualization of proposed projects for the STIP. Provide visualization of existing and proposed conditions for presentation to public and other agencies at public and stakeholders meetings for planning purposes. Update the current PPP as necessary.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount for FFY 2013 | $275,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2013 | $275,000 | SPR | 0 | STATE |
| Estimated Cost for FFY 2014 | $285,000 | SPR | 0 | STATE |

**CONTACT INFORMATION**

Frank Roesler, Transportation Manager I, 405-521-2350

## 1911 Inventory of Depression Era Structures

**PURPOSE AND SCOPE**: Executive Order 11593 and Sections 106 and 110 of the National Historic Preservation Act require the identification and evaluation of historic properties that are under agency ownership or jurisdiction. This project will identify and evaluate Depression-era road-related resources in the State of Oklahoma. ODOT completed two previous studies and NRHP assessments of bridges in the state: *Spans of Time: Oklahoma Historic Highway Bridges* (1993) and a 2007 re-evaluation and update. The two studies are useful management tools as references for early planning and mitigation of potential adverse effects to these resources. Depression-era resources have become increasingly significant to the history of Oklahoma and it is necessary to incorporate them into transportation planning. Preliminary assessments indicate that WPA alone was involved in the construction of 2712 bridges and 50,306 culverts on Oklahoma's highway and county transportation system. The total number of Depression-era work relief resources in the state, however, is unknown.

**ACCOMPLISHMENTS DURING FFY 2013**: Data collection, establishment of review criteria, and bridge "stratification"

Mead & Hunt completed several tasks during FY 2013 to support the determination of which bridges dating to the subject time period would be subject to field investigation. A database field list was created and submitted to ODOT-CRP and SHPO for review and comment. The consultant compiled this information and prepared a questionnaire for submittal to County Commissioners and County Engineers to obtain information at the local level for potential Depression-era Works Program structures not identified in the research. The consultant also obtained bridge inventory databases from ODOT Bridge Division for on-system bridges and completed bridge inspection file reviews at each of the eight field divisions for off-system bridges of the subject period. The consultant obtained bridge inventory records from SHPO as well. Upon completion of the review of the data of some 5000 bridge files collected from the Counties, Bridge Division, Field Divisions, and SHPO, the Consultant prepared a Draft Data Collection Summary Report, which stratified the bridges and resulted in a determination of bridges recommended for field study. ODOT-CRP reviewed the Draft Summary and the Consultant will complete a revised draft for SHPO review, proposed for submittal to SHPO by September 15, 2013.

## 1911 Inventory of Depression Era Structures (cont.)

**PROPOSED ACTIVITIES FOR FFY 2014**: Revise stratification, as needed, and conduct field review of selected bridge

Upon SHPO review, the consultant will address comments from SHPO on the Draft Summary Report. The Consultant will conduct local research and initiate field survey. Local research will be used to establish associations with federal relief programs and assist with determining National Register significance. Field survey will be used to collect additional data to assist with National Register evaluations. The Consultant will conduct field survey to document and complete a National Register evaluation for selected bridges outlined in the data summary report and will evaluate these structures for inclusion in the NRHP.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $330,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $330,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $0 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Dawn Sullivan, Engineering Manager IV, 405-521-2927

# SPR PART 2 - RESEARCH, SPRY-0010(60)RS, JP# 01946(62)
## FEDERAL FISCAL YEAR 2014

| | | SPR | STATE | LOCAL | TOTAL |
|---|---|---|---|---|---|
| **GENERAL ACTIVITIES** | | | | | |
| 2100 | Transportation Research Board | $150,000.00 | | | $150,000.00 |
| 2115 | Long Term Pavement Performance | $5,000.00 | | | $5,000.00 |
| 2120 | Technical Assistance - Special Studies | $80,000.00 | | | $80,000.00 |
| 2130 | General Research Activity | $868,663.00 | | | $868,663.00 |
| 2160 | Oklahoma Transportation Center | $314,820.00 | | | $314,820.00 |
| 2300 | Research Implementation | $250,000.00 | | | $250,000.00 |
| 2700 | Experimental Product Evaluation Program | $20,000.00 | | | $20,000.00 |
| | ***Total General Activities*** | ***$1,688,483.00*** | | | ***$1,688,483.00*** |
| **ANNUAL RESEARCH PROJECTS** | | | | | |
| 2102 | Research Library Services | $150,000.00 | | | $150,000.00 |
| 2103 | Transportation Research Day | $6,393.00 | | | $6,393.00 |
| 2156 | Roadside Vegetation Management | $222,167.00 | | | $222,167.00 |
| 2157 | Herbicide Research Program | $76,036.00 | | | $76,036.00 |
| | ***Total Annual Research Projects*** | ***$454,596.00*** | | | ***$454,596.00*** |
| **CONTINUING RESEARCH PROJECTS** | | | | | |
| 2200 | Instrumented Pavement Construction | $259,052.00 | | | $259,052.00 |
| 2208 | Development and Implementation of an MEPDG for Rigid Pavements Ph II | $106,702.00 | | | $106,702.00 |
| 2228 | Overturning Forces at Bridge Abutments | $80,263.00 | | | $80,263.00 |
| 2229 | Expected Life of Silanes - Phase 2 | $73,323.00 | | | $73,323.00 |
| 2243 | Recommended Fatigue Test for Oklahoma DOT | $225,778.00 | | | $225,778.00 |
| 2245 | Fatigue Performance of Asphalt Pavements Containing RAS and RAP | $107,832.00 | | | $107,832.00 |
| 2246 | Evluation of Performance of Asphalt Pvmt Constructed using ICT | $119,417.00 | | | $119,417.00 |
| 2248 | Creep Compliance and Percent Recovery of OK Cert. Binders Using MSCR | $99,285.00 | | | $99,285.00 |
| 2249 | Black Ice Detection and Road Closure Control System for Oklahoma | $112,997.00 | | | $112,997.00 |
| 2250 | Study of Vehicle Classification Equipment with Solution to Imp. Acc - Ph 2 | $88,875.00 | | | $88,875.00 |
| 2251 | 3D Laser Imaging for ODOT Interstate Network at True 1-mm Resolution | $117,003.00 | | | $117,003.00 |
| 2263 | Use of CNG as a Locomotive Fuel - Phase 2 | $0.00 | | | $0.00 |
| | ***Total Continuing Research Projects*** | ***$1,390,527.00*** | | | ***$1,390,527.00*** |
| **NEW RESEARCH PROJECTS** | | | | | |
| 2252 | Develop of Inexpensive Vehicle Sensor Node System | $102,021.00 | | | $102,021.00 |
| 2253 | Investigation of Optimized Graded Concrete for Oklahoma - Phase 2 | $105,835.00 | | | $105,835.00 |
| 2254 | Energy Dissipation in 30' Broken-back Culverts Using Laboratory Models | $94,802.00 | | | $94,802 |
| 2255 | Regional Economic Impact Study for the McClellan-Kerr Arkansas River | $60,188.00 | | | $60,188.00 |
| 2256 | Understanding the Behavior of Prestressed Concrete Girders | $127,339.00 | | | $127,339.00 |
| 2257 | Understanding A+B Bidding Patterns and Policy Implications for ODOT | $60,046.00 | | | $60,046.00 |
| 2258 | Evaluate D-O-S Treatment Performance for Pavements and Bridge Decks | $117,932.00 | | | $117,932.00 |
| 2259 | Development of a Prototype Geotechnical Report Database | $85,366.00 | | | $85,366.00 |
| 2260 | Shrinkage Induced Deformations in Steel Bridges made Composite | $70,584.00 | | | $70,584.00 |
| 2261 | Selection of Long Lasting Rehab Treatment using LCCA & PSR | $121,527.00 | | | $121,527.00 |
| 2262 | Feasibility Study of GRS Systems for Bridge Abutments in Oklahoma | $85,088.00 | | | $85,088.00 |
| | ***Total New Research Projects*** | ***$1,030,728.00*** | | | ***$1,030,728.00*** |
| | ***Grand Total SPRY-0010(52)RS*** | ***$4,564,334.00*** | | | ***$4,564,334.00*** |
| **FFY 2014 JOINT ODOT/OkTC INTERAGENCY AGREEMENT PROJECTS Item 2160** | | | | | |
| 2160 | Interpretation of In Situ Tests as Affected by Soil Suction | $93,602.00 | | | |
| 2160 | Prototype Reinforced Soil Embankment for Reconstruction of US-62 Slope Failu | $112,781.00 | | | |
| 2160 | The Effects of Soil Suction on Shallow Slope Stability | $108,437.00 | | | |
| | ***Total ODOT/OkTC 2160 Projects*** | ***$314,820.00*** | | | |
| **POOLED FUND STUDIES** | | | | | |
| TPF-5(408) | NCHRP | $661,508.00 | | | $661,508.00 |
| 1338 | Improving Specifications to Resist Frost Damage in Modern Concrete Mixtures | $17,500.00 | | | $17,500.00 |
| TPF-5(099) | Evaluation of Low Cost Safety Improvements | $30,000.00 | | | $30,000.00 |
| TPF-5(159) | Technology Transfer Concrete Consortium | $7,500.00 | | | $7,500.00 |
| TPF-5(231) | ITS Pooled Fund Program (ENTERPRISE) | $30,000.00 | | | $30,000.00 |
| TPF-5(232) | Study of the Impacts of Implements of Husbandry on Bridges | $10,000.00 | | | $10,000.00 |
| TPF-5(243) | Motorcycle Crash Causation Study | $50,000.00 | | | $50,000.00 |
| TPF-5(255) | Highway Safety Manual Implementation | $25,000.00 | | | $25,000.00 |
| TPF-5(267) | Accelerated Performance Testing on the 2012 NCAT Pavement Test Track | $370,000.00 | | | $370,000.00 |
| TPF-5(269) | Development of an Improved Design Procedure for Un-bonded Concrete | $20,000.00 | | | $20,000.00 |
| TPF-5(278) | Real-Time Quality Control Monitoring and Characterization of Aggregate | $75,000.00 | | | $75,000.00 |
| TPF-5(286) | Next Generation Concrete Pavement Road Map | $15,000.00 | | | $15,000.00 |
| | ***Total Pooled Fund Projects*** | ***$1,311,508.00*** | | | ***$1,311,508.00*** |
| | ***Total Research Funding*** | ***$5,875,842.00*** | | | ***$5,875,842.00*** |

**ENDING RESEARCH PROJECTS**

| | | | |
|---|---|---|---|
| 2231 | Stainless Steel Reinforcement as a Replacement for Epoxy Coated Steel | $0.00 | $0.00 |
| 2235 | Distress Modeling for DARWin-ME-Phase 1 | $0.00 | $0.00 |
| 2236 | Drying Shrinkage Problems in High PI Subgrade Soils | $0.00 | $0.00 |
| 2237 | Reduction in Strom Water Runoff | $0.00 | $0.00 |
| 2239 | Develop Draft Chip Seal Cover Aggregate Specifications Based on AIMS | $0.00 | $0.00 |
| 2240 | Portable WIM for Pavement Design - Phase 2 | $0.00 | $0.00 |
| 2241 | Real-Time Monitoring of Slope Stability in Eastern | $0.00 | $0.00 |
| 2247 | Energy Dissipation in 12" Broken-back Culverts | $0.00 | $0.00 |
| 2250 | The Study of Vehicle Classification Equip w/ Sol. to Improve Accuracy in Ok- Ph 1 | $0.00 | $0.00 |
| 2252 | Natural Gas Locomotive Research | $0.00 | $0.00 |

**RECENTLY COMPLETED RESEARCH PROJECTS**

| | | | |
|---|---|---|---|
| 2160 | Evaluation of the Enhanced Integrated Climatic Model | $0.00 | $0.00 |
| 2200 | Instrumented Pavement Construction - Phase 1 | $0.00 | $0.00 |
| 2208 | Development and Implementation of an MEPDG for Rigid Pavements - Phase 1 | $0.00 | $0.00 |
| 2218 | QCQA Testing Differences Between HMA & WMA - "Foamed Asphalt" | $0.00 | $0.00 |
| 2226 | Hamburg Rut Tester for Field Control of HMA - "Use of MIST" | $0.00 | $0.00 |
| 2227 | Applied Approach Slab Settlement Research | $0.00 | $0.00 |
| 2228 | Overturning Forces at Bridge Abutments - Phase 1 | $0.00 | $0.00 |
| 2229 | Expected Life of Silanes - Phase 1 | $0.00 | $0.00 |
| 2230 | Effect of Y-Cracking on CRCP Performance | $0.00 | $0.00 |
| 2234 | Energy Dissipation in 18" Broken-Back Culverts | $0.00 | $0.00 |
| 2238 | New Asphalt Mix Design Program for ODOT | $0.00 | $0.00 |
| 2242 | Efficacy of Road Bond and Condor as Soil Stabilizers | $0.00 | $0.00 |
| 2244 | Field Verification of Geogrid Properties for Base Course Reinf. Applications | $96,081.00 | $96,081.00 |

**ACTIVE AND PAID POOLED FUND STUDIES**

| | | | |
|---|---|---|---|
| TPF-5(063) | Improving the Quality of Pavement Profiler Measurement | $0.00 | $0.00 |
| TPF-5(145) | Western Maintenance Partnership | $0.00 | $0.00 |
| TPF-5(174) | Construction of Crack-Free Concrete Bridge Decks, Phase II | $0.00 | $0.00 |
| TPF-5(187) | Updating U.S. Precipitation Frequency Estimates for the Midwestern Region | $0.00 | $0.00 |
| TPF-5(197) | The Impact of Wide-Base Tires on Pavement Damage: A National Study | $0.00 | $0.00 |
| TPF-5(205) | Implementation of Concrete Pavement Mixture Design and Analysis (MDA) | $0.00 | $0.00 |
| TPF-5(209) | Support of the Transportation Curriculum Coordination Council (TCCC) | $0.00 | $0.00 |
| TPF-5(229) | Characterization of Drainage Layer Properties for MEPDG | $0.00 | $0.00 |
| TPF-5(251) | Relative Operational Performance of Geo-synthetics Used as Subgrade | $0.00 | $0.00 |
| TPF-5(256) | HY-12 Storm Drain Hydraulic Analysis Program - Phase Two of Development | $0.00 | $0.00 |
| TPF-5(275) | 2014 Asset Management Conference and Training on Implementation | $0.00 | $0.00 |

**PAID AND ENDED IN 2013 POOLED FUND STUDIES**

| | | | |
|---|---|---|---|
| TPF-5(117) | Development of Performance Properties of Ternary Mixes | $0.00 | $0.00 |
| TPF-5(184) | Investigation of Highway Asset Inventory and Data Collection Methods | $0.00 | $0.00 |
| TPF-5(208) | Accelerated Performance Testing on the 2009 NCAT Pavement Test Track | $0.00 | $0.00 |

## 2100 Transportation Research Board Core Program

**PURPOSE AND SCOPE**: This item will cover TRB subscription costs, travel expenses and time for ODOT personnel to attend the annual TRB meeting.

**ACCOMPLISHMENTS DURING FFY 2013**: Attended annual TRB meeting.

**PROPOSED ACTIVITIES FOR FFY 2014**: Attend annual TRB meeting and fund core program.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $5,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $5,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $150,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Planning and Research Div. Engineer: John Bowman, 405-521-2175

## 2102 Research Library Services

**PURPOSE AND SCOPE**: Provide the Oklahoma Department of Transportation (ODOT) and customers with an information clearinghouse. The primary goals are to allow for a sound, progressive, flexible library available to ODOT and Oklahoma Transportation Center's university personnel statewide and to keep them informed of recent innovations in transportation technology, methodologies and programs. Aligning with this is the goal of providing proficient systematic searches of all resources when requested. Additional services are aimed at providing ODOT with editing and publishing capabilities to assist the Planning & Research Division in generating and distributing reports and publications.

**ACCOMPLISHMENTS DURING FFY 2013**: Provided transportation information, services and updates to ODOT and other state universities; developed procedures to enhance services and accessibility to Transportation Library resources by ODOT and Oklahoma Transportation Center's university personnel; continued to convert and implement the Paradox 10 Database System to the Library of Congress System; reproduced, bound and distributed research reports as required; retrieved new publications, reports and various documents from ODOT for Library inclusion; distributed and delivered documents as requested; produced progress reports; submitted FFY 2012 Annual Report; FFY 2013 Annual Report submission is pending.

The PI has requested a 3 month no cost time extension for the completion of the Annual Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to provide current information, publications, articles, services and updates to ODOT, other state universities and transportation industry entities; maintain data base of pertinent resources for each information category; perform literature and information searches both electronically and manually as requested; coordinate and distribute research information, executive summaries, surveys, reports and journals to ODOT personnel; maintain records and track borrowed materials; continue to conduct data entry in the Paradox system and/or Library of Congress system of publications; continue to convert the Paradox system to a Library of Congress system; retrieve and deliver research materials between ODOT and LU; perform report reproduction, binding and distribution as documents become available; produce progress reports; submit FFY 2014 Annual Report.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $150,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $150,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $150,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Wilson B. Brewer, Langston University, 405-521-1379

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

## 2103 Transportation Research Day Technical Support Services

**PURPOSE AND SCOPE**: To provide technical assistance in preparing for and organizing the Oklahoma Department of Transportation (ODOT) & Oklahoma Transportation Center (OkTC) Transportation Research Day program activities.

**ACCOMPLISHMENTS DURING FFY 2013**: Assisted ODOT and OkTC in all areas of the ODOT/OkTC Transportation Research Day event where needed, including attendance in necessary pre-event meetings, provided easels for poster presentations, assisted in tables & chairs assembly and disassembly for snack areas and luncheon, assisted with attendee sign in, distributed name tags and all other areas where assistance may have been needed; produced progress reports; submitted FFY 2012 Annual Report; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Assist ODOT and OkTC in all areas of the ODOT/OkTC Transportation Research Day event where needed or requested; produce progress reports; submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $6,593 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $6,593 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $6,393 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Wilson B. Brewer, Langston University, 405-521-1379

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

## 2115 Long Term Pavement Performance (LTPP)

**PURPOSE AND SCOPE**: The purpose of this project is to maintain LTPP test sites, markings and current status, report maintenance to Southern Region Contract Office (SRCO), assist SRCO with data gathering as necessary, act as general liaison between SRCO and ODOT. Maintain working knowledge related to SHRP product implementation, act as general liaison between FHWA and ODOT for product implementation activities.

**ACCOMPLISHMENTS DURING FFY 2013**: Performed annual site investigation observations and reported findings; replaced pavement markings at section 404157 US-69 at Wagoner / Mayes County line; monitored mill and overlay projects in section 404154, US-81, Grady County, Rush Springs and GPS sections 4005 westbound US-62, Comanche County, near Cache; pavement markings were replaced in 4005 sections; assisted SRCO in traffic control and testing statewide; ordered a new supply of section ID numbers and stationing for maintaining sections and an upcoming rehabilitation project.

**PROPOSED ACTIVITIES FOR FFY 2014**: The SPS 4001 eastbound US-62, Comanche County near Cache will undergo a mill and overlay project in the spring of 2014. Construction will be monitored and pavement markings replaced; perform annual site investigation observations and report findings; obtain information from the SRCO for specific continued data collection locations, as well as, sites recently removed from the LTPP study; arrange for continued testing plans and monitoring of current SPS and GPS site locations in Oklahoma during spring 2014.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $5,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $5,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $5,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

ODOT Field Research Manager: Bryan Cooper, 405-736-9475

## 2120 Technical Assistance Special Studies

**PURPOSE AND SCOPE**: Provide ongoing technical support or special investigations to the Department when a full-scale research project is not warranted or when a quick turnaround is required.

**ACCOMPLISHMENTS DURING FFY 2013**: Provided support for the Department with assistance and equipment in special investigations, and other activities where needed; performed pipe inspections at 17 locations on US-64/412, Pawnee County Division VIII; monitored and collected photographic documentation of the SH-82 landslide project in Latimer County; collected other still photographs for various in-house and SP&R research projects; attended the annual county commissioners meeting and provided presentation of the ODOT research branch and a CUES Inspector General storm drain inspection equipment demonstration; continued to consult with ODOT staff to address situations where further technical support may be needed.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to provide support for the Department with assistance and equipment in special investigations, storm drain inspections, bridge deck testing, pavement testing, traffic control and any other activities or services as requested; acquire, calibrate, test and/or compare new equipment or instruments to existing equipment or instruments where necessary.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $80,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $80,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $80,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

ODOT Field Research Manager: Bryan Cooper, 405-736-9475

## 2130 General Research Activities

**PURPOSE AND SCOPE**: This activity covers various research activities which are necessary for the operation of a research section but which cannot be accurately included in other projects. Examples of this type of activity include: attending quality task force meetings; writing work plans for emerging research projects which have not been assigned an item number; reviewing research reports; meeting with university and private researchers regarding proposed projects; attending industry seminars, conferences, etc. This item also covers costs of various professional services contracts for research projects which fill needs of the Department but were not foreseen when the SP&R budget was written and therefore were not included as separate items. This may include special technical assistance on multiple projects, and providing matching funds for leveraging research program funds, such as, OCAST/IDEA programs for research significant to the Department. This activity would also include routine maintenance of the ODOT Planning & Research internet and intranet websites.

**ACCOMPLISHMENTS DURING FFY 2013**: Solicited ODOT subject matter experts, Field Division personnel, university and private industry staff for new research ideas and problem statements for possible FFY 2014 research project funding; coordinated and carried out two Research Advisory Committee (RAC) meetings; received and compiled 43 new research problem statements; reviewed 20 new research ideas and/or problem statements for priority ranking; generated and posted 12 FFY 2014 Request for Proposals (RFP's) for research proposal submissions; reviewed 16 new research proposals submitted for possible FFY 2014 project funding; discussed proposed project work with researchers and ODOT subject matter experts; awarded and prepared 9 continuing research contract modifications for FFY 2014; awarded three annual research projects for FFY 2014 and prepared research contracts for each; awarded 14 new FFY 2014 research projects and prepared research contracts for each; awarded and prepared 10 no cost time extension contract modifications for FFY 2013; organized initiation and final SP&R project meetings; performed technical reviews of final SP&R research project reports for formatting and ADA compliance; prepared Part 2 of the FFY 2014 SP&R Work Program.

**PROPOSED ACTIVITIES FOR FFY 2014**: Solicit for new research ideas for possible FFY 2015 research project funding; coordinate two RAC meetings for review of new FFY 2015 research ideas and proposals; generate FFY 2015 RFP's; generate FFY 2015 research project contracts and modifications; organize initiation and final project meetings; continue to perform technical review of final research project reports for required formatting and ADA compliance; make funds available for various research contracts/activities which may not be foreseen while this work plan and budget is being prepared; prepare Part 2 of the FFY 2015 SP&R Work Program.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $421,542 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $421,500 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $868,663 | SPR | -0- | STATE |

**CONTACT INFORMATION**

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

## 2156 Roadside Vegetation Management Training & Consultation

**PURPOSE AND SCOPE**: The objectives of this program are to 1. Conduct yearly herbicide applicator certification schools related to Roadside Vegetation Management (RVM); 2. Collect and maintain accurate records of attendance of both certified and noncertified ODOT personnel; 3. Provide ODOT personnel with technical consultation on an 'as needed' basis; 4. Conduct calibration workshops to train newly hired and/or newly Certified ODOT applicators; 5. Assist ODOT Maintenance and Purchasing personnel in maintaining the Approved Herbicide & Adjuvant List (AHAL); 6. Provide the ODOT Maintenance Division and the State of Oklahoma Department of Central Services (DCS) personnel with technical expertise on herbicides and spray adjuvants.

**ACCOMPLISHMENTS DURING FFY 2013**: Conducted and completed Annual Pesticide Applicator Certified Training and Continuing Education Applicator Workshops for all ODOT field divisions and maintained records on all ODOT certified applicators; provided consultation to ODOT office and field personnel as needed; conducted Sprayer Equipment inspection and calibration workshops; assisted ODOT in maintaining and producing an updated AHAL; assisted ODOT in Statewide Herbicide Contract review; attended the Oklahoma Vegetation Management Association "National Southern Weeds Science" meeting and the "National Roadside Vegetation Management Association" meeting; produced project progress reports; completed and produced 5 FFY 2012 comprehensive research reports; FFY 2013 comprehensive report submissions are pending.

The PI has requested a 3 month no cost time extension for continued project operations and the completion of the comprehensive reports.

**PROPOSED ACTIVITIES FOR FFY 2014**: Conduct Annual Pesticide Applicator Certified Training and Continuing Education Applicator Workshops for all ODOT field divisions and maintain records on all ODOT certified applicators; provide as needed consultation to ODOT office and field personnel; coordinate Herbicide Application and Equipment Calibration Workshops for new employees; assist ODOT in maintaining the AHAL; assist ODOT in Statewide Herbicide Contract review; produce project progress reports; produce FFY 2014 comprehensive reports as proposed.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $219,971 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $219,900 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $222,167 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Dennis Martin, Oklahoma State University, 405-744-5419

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Luis Malave, ODOT Maintenance Division, 405-521-2557

## 2157 Herbicide Research Program

**PURPOSE AND SCOPE**: The objectives of this program are to 1. Evaluate new herbicide active ingredients and new generic formulations of existing active ingredients for potential integration into existing ODOT Roadside Vegetation Management (RVM) programs or inclusion in the Approved Herbicide & Adjuvant List (AHAL); 2. To evaluate new or reformulated herbicides and drift control products for their compatibility with commonly-used ODOT herbicide treatments.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed evaluations of new and generic herbicide formulations for integration into the ODOT RVM programs and implemented findings in winter CEU Training Workshops, as well as, in the AHAL; completed evaluation of adjuvants and recommended herbicides for tank mix compatibility and included findings into the AHAL; constructed research test plots and completed field experiments, data collection and analysis; conducted semi-annual meeting; produced project progress reports; completed and produced 2 FFY 2012 Annual Reports; submission of FFY 2013 Annual Reports is pending.

The PI has requested a 3 month no cost time extension for continued project operations and the completion of the Annual Reports.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to perform evaluations of new and generic herbicide formulations for integration into the ODOT RVM programs and implemented findings in winter CEU Training Workshops; complete evaluation of adjuvants and recommended herbicides for tank mix compatibility and included findings into the AHAL; pending weather conditions, construct research test plots and complete field experiments, data collection and analysis and collect digital photographs of each plot treatment; produce project progress reports; complete and produce 2 FFY 2014 Annual Reports.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $78,344 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $78,300 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $76,036 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Dennis Martin, Oklahoma State University, 405-744-5419

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Luis Malave, ODOT Maintenance Division, 405-521-2557

## 2160 Oklahoma Transportation Center

**PURPOSE AND SCOPE**: The Oklahoma Transportation Center (OkTC) is a nationally-designated University Transportation Center (UTC) composed of researchers at the University of Oklahoma, (OU) Oklahoma State University, (OSU) and Langston University (LU). Research personnel in this organization have expertise and experience covering a wide range of transportation-related topics. The purpose of this item is to coordinate and contract research activities covering various topics on behalf of ODOT and to provide matching funds to OkTC.

**ACCOMPLISHMENTS DURING FFY 2013**: Supported OkTC with matching funds in the amount of $484,120 for continuing joint ODOT/OSU interagency contracted research projects; participated in board and committee meetings; provided ODOT expert review of research reports; participated and assisted in proposal review processes; coordinated research project meetings; OkTC continued to provide ODOT with research project progress reports and Annual Reports for all jointly funded projects.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue support of previously OkTC managed projects; continue to participate in board and committee meetings; participate and assist in proposal review process; continue to provide ODOT expert review of research reports; coordinate research project meetings; continue to provide ODOT with project progress reports, Annual Reports, as well as, Draft and Final Reports for all jointly funded projects as they are submitted.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $984,120 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $484,120 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $314,820 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Ron Curb, ODOT Research Engineering Manager II, 405-522-3795

## 2200 Instrumented Pavement Construction – Phase 2

**PURPOSE AND SCOPE**: Conduct instrumented pavement research to collect and analyze mechanistic-empirical pavement design data on I-35 in McClain County, Oklahoma in an accelerated manner. Field Division 3 will construct an 800' flexible pavement test section. The National Center for Asphalt Technology (NCAT) will purchase equipment and install pavement monitoring instrumentation of test section. The University of Oklahoma (OU) will conduct monitoring and modeling of the test section over a five year period.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued weekly downloading and processing of traffic data; continued quarterly field testing and processing of data; continue to update rut prediction models and compare predicted and measured ruts; performed distress modeling using MEPDG software; produced project progress reports; submitted FFY 2012 Phase 1 Final Report; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue weekly downloading and processing of traffic data; continue quarterly field testing and processing of data; continue to update rut prediction models and compare predicted and measured ruts; collect block samples and cores and conduct laboratory testing; continue to perform distress modeling using MEPDG software; tentatively, perform forensic investigations through trenching operations; produce project progress reports; prepare and submit Final Report.

**NOTE**: $37,742 has been allocated for the FFY 2014 "Projected Cost", while $221,310 has been allocated for the full depth replacement of the pavement section at the completion of this study.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 2) | $275,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $53,600 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 2) | $259,052 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Musharraf Zaman, University of Oklahoma, 405-325-2626

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Jeff Dean, ODOT Pavement Design Engineer, 405-522-0988

## 2208 Development and Implementation of Mechanistic and Empirical Pavement Design Guide (MEPDG) for Rigid Pavements – Phase 2

**PURPOSE AND SCOPE**: ODOT intends to use the DARWin-ME as the standard method to analyze the capacity of concrete pavements for new construction. However, the default values for the material properties used in the MEPDG may not be appropriate for the materials and construction practices that are common in Oklahoma. Because of this, it is suggested in the MEPDG manual that testing be completed to determine these values for local materials. The research for Phase II of this project aims to provide these inputs and to therefore improve the analysis results of the MEPDG. This would allow a greater economy and improvement in the predicted performance for ODOT designs for rigid pavement. This research will provide several new tools that can assist ODOT to design and specify a high quality concrete pavement product at an economical price.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued to monitor instrumented CRCP pavement section and collect data; obtained data from LTPP sites in Oklahoma and compared to measured values; continued investigations of the impact of different curing methods on the curling and warping of concrete pavements; performed a comparison of DARWin-ME predicted performance vs. actual field performance; began an investigation of DARWin-ME adjustments for local calibration factors; continued to characterize different pavement mixtures used in Oklahoma; produced project progress reports; submitted FFY 2012 Annual Report; submitted Phase 1 Final Report; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to monitor instrumented CRCP pavement section and collect data; continue to compare DARWin-ME predicted performance vs. actual field performance; complete investigations of DARWin-ME adjustments for local calibration factors; complete different curing method investigations of curling and warping impact of concrete pavements; complete Oklahoma pavement mixture characterizations; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 2 of 3) | $148,176 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $148,100 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 3 of 3) | $106,702 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Tyler Ley, Oklahoma State University, 405-744-5257

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Jeff Dean, ODOT Pavement Design Engineer, 405-522-0988

## 2218 QCQA Testing Differences Between Hot Mix Asphalt and Warm Mix Asphalt

**PURPOSE AND SCOPE**: The objectives of this study are to develop testing protocols for the different WMA additives for mix design and QC/QA procedures. For mix design, testing protocols need to be developed for rut testing and moisture sensitivity testing. For QC/QA, protocols need to be developed for lab-molded void properties and asphalt content. To meet the objectives, equivalent compaction temperatures and/or compactive efforts need to be established for WMA additives. Once this is established, the effect of WMA additives on lab-molded volumetric results from Superpave Gyratory Compactor (SGC) samples (QC/QA properties) and mix design results (moisture sensitivity and rutting) could be determined. If properties/results differ significantly from those obtained from the same conventional HMA mix, standard testing protocols using the SGC would be developed that would provide test results consistent with conventional HMA test results. Test protocols could be dependent upon the specific WMA technology. The proposed research is essential in formulating the design requirements necessary to write new QC/QA specifications and mix design tests that will produce quality WMA, allowing full implementation of this new technology.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Steve Cross, Oklahoma State University, 405-744-7200

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2226 Evaluation of Hamburg Rut Tester for Field Control of HMA

**PURPOSE AND SCOPE**: The Asphalt Pavement Analyzer (APA) and AASHTO T 283, Resistance of Compacted Bituminous Mixture to Moisture-Induced Damage, are currently used in mix designs to evaluate rutting and moisture damage potential of hot mix asphalt (HMA) mixtures. AASHTO T 283 is also used for field control of HMA mixtures. ODOT is moving toward replacing the APA with the Hamburg Wheel Test. Variability of T 283 field test results has always been an issue and currently ODOT does not check rutting potential of field produced mixtures. The Hamburg rut tester is being used by other DOTs to monitor field produced mixtures for rutting and moisture susceptibility. Use of the Hamburg rut tester needs to be evaluated for field control of HMA mixtures in Oklahoma. Laboratory prepared (mix design) samples and field produced mix from across Oklahoma will be sampled and tested for Hamburg rutting resistance and AASHTO T 283. APA testing could be included for comparison. Results of this research could lead to the implementation of the Hamburg Rut Tester as a viable test method for evaluating the field performance of HMA.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Steve Cross, Oklahoma State University, 405-744-7200

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2227 Applied Approach Slab Settlement Research, Design/Construction

**PURPOSE AND SCOPE**: Approach slab settlement is a recurring problem in Oklahoma, resulting in countless repair efforts and utilizing limited labor and dollars. Substantial research has been conducted on the mechanisms involved with bridge approach embankment settlement both nationally and locally. Further research is needed to validate the design and construction procedures currently being used for bridge approach slabs in Oklahoma. An effort is needed to identify lessons learned and the determine ways in which ODOT is not applying state of the practice in design or construction of approach slabs. Proposed research for this project includes performing a thorough literature search in addition to surveying other state DOTs about how they have dealt with bridge approach slab settlement issues and to investigate the problems associated with settling of bridge approach slabs in Oklahoma. With assistance from ODOT personnel, a select number of problem bridge approach slabs will be investigated from design through the construction practices used to complete the approach slab construction. From these findings, the researcher will provide ODOT with the state of practice solutions for mitigating the potential for approach slab settlement problems both in design and construction.

**ACCOMPLISHMENTS DURING FFY 2013**: Submitted draft Final Report; Final Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Gerald Miller, University of Oklahoma, 405-325-4253

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Christopher Clarke, ODOT Geotechnical Engineer, 405-522-4994

## 2228 Overturning Forces at Bridge Abutments and the Interaction of Horizontal Forces From Adjacent Roadways – Phase 2

**PURPOSE AND SCOPE**: ODOT has numerous bridges throughout the state where the expansion joints have closed up, roller support bearings tilted, and beams have pushed up against the abutment backwall. Abutments are not performing as expected which has led to frequent and costly repairs that strain limited maintenance budgets. After repairs, some of these bridges experience more movement resulting in further damage. Factors needing further exploration are the thermal expansion of rigid pavements exerting horizontal forces perhaps combining with the embankment forces on the abutments to cause movement of the abutment, premature expansion joint failure, damage to back walls, and tilting of roller bearings. Due to the numerous bridges that are affected by expansion joint failure and the resulting problems caused to the various bridge elements (e.g. roller bearing failure, abutments rotated, beam ends with lack of clearance to the backwall) there is a need to instrument roadways adjacent to bridges, the embankments, and the abutments themselves to monitor and better understand what is taking place. Results of this research could result in modifications to standard abutment details and may influence the way ODOT approaches repair projects. Phase 2 will address additional instrumentation for the SH-3 North Bridge, pre- and post-repair monitoring of the instruments, evaluation of the results, and recommendations. This will provide ODOT with a rare opportunity to monitor the behavior of a bridge before and after repairs to understand the effects of the repairs and therefore perform future repairs effectively. Ultimately, repair guidelines for bridges with similar distresses will be developed based on the results of this study.

**ACCOMPLISHMENTS DURING FFY 2013**: **Phase 1**: performed monthly data collection and analysis; completed computer simulations and validation; executed a parametric study using computer simulations; produced synthesis of computer simulation(s) results to develop implementable guidelines and specifications for the design and construction of new bridges; produced project progress reports; submitted FFY 2012 Phase 1 Annual Report; FFY 2013 Phase 1 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: **Phase 2**: install an inclinometer in the west approach embankment; install strain gages and thermistors on the west side of the north bridge; install tiltmeters; provide input to ODOT Bridge division personnel on repairs to the SH-3 north bridge; start pre and post repair monitoring of instrumentation; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 3 of 3) | $86,122 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $86,100 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $80,263 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Kanthasamy Muraleetharan, University of Oklahoma, 405-325-4247

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Walt Peters, ODOT Assist. Bridge Division Engineer, 405-521-2606

## 2229 Expected Life of Silane Water Repellant Treatments on Bridge Decks – Phase 2

**PURPOSE AND SCOPE**: With the ever increasing costs to the maintenance of concrete bridge decks due to corrosion of reinforcing steel from the environment and routine maintenance applications of salt, it is important to have a better understanding of the effectiveness and durability of silane-treated bridge decks. Historically, bridge decks in Oklahoma are treated once at the time of construction. Little is known of the time frame for which silane remains as an effective barrier to prevent the intrusion of corrosive salts into the bridge deck. Through an extensive literature search, survey of state DOT's, and coring and analyzing of bridge deck cores from bridges of various ages, the researcher will determine the life expectancy of a onetime application of silane. ODOT Bridge Division will assist the PI in the selection of bridges to be used in this study. It is expected that an effective duration range can be determined. With these findings it is expected that a routine maintenance practice can be established for the re-treatment of bridge decks based on environment, salt application, regional and age considerations resulting in extended bridge deck life expectancy and lower life cycle costs. As part of Phase 2 the research team plans to continue to answer questions raised in Phase 1 of the testing while investigating a new sealer that ODOT plans on using on several critical bridge structures in high traffic areas. The examination methods established in the previous project will provide a suite of useful tools to evaluate these new products. This research is timely and will help ODOT to make sound investments in the long term performance of their bridges. This research has the potential to greatly extend the service life of these bridges and therefore could likely save the state of Oklahoma millions of dollars.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Phase 1 Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: **Phase 2**: Investigate a new coating system by which a silane treatment is applied first, followed by a subsequent epoxy based flood coat covered in sand; increase inspections of additional In-Service silane coated bridge decks; investigate the service life of long-lasting silane coatings in greater detail; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $73,323 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Tyler Ley, Oklahoma State University, 405-744-5257

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Walt Peters, ODOT Assist. Bridge Division Engineer, 405-521-2606

## 2230 Effect of Y-Cracking on CRCP Performance

**PURPOSE AND SCOPE**: Performance of Continuously Reinforced Concrete Pavement (CRCP) is thought to be highly dependent on the early age cracking pattern. Punchouts, the primary failure mechanism in CRCP, are found to occur more frequently at Y-crack and other irregular or closely spaced crack locations. In 1996, Y- cracking was observed on some newer ODOT CRCP projects and there was a concern about the effect it might have on future performance. This project would determine if the early age Y-cracking observed on those projects has had a detrimental effect on the long-term performance of the pavements. The researcher will gather information from previous reports, the pavement management condition database, and the ODOT CRCP database to attempt to correlate present condition to the presence or absence of early age Y-cracking. If Y-cracking is correlated to poor performance in Oklahoma CRC pavements, further examination would include looking at different variables (base type, % reinforcement, absence of transverse steel, tied vs. free or AC shoulders, tube fed vs. tied steel, season and or time of construction, and other design features) that could have contributed to Y- cracking on those specific pavements. The results of this study are anticipated to lead to improved CRCP design, construction, and performance

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Tyler Ley, Oklahoma State University, 405-744-5257

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Jeff Dean, ODOT Pavement Design Engineer, 405-522-0988

## 2231 Stainless Steel Reinforcement as a Replacement for Epoxy Coated Steel in Bridge Decks

**PURPOSE AND SCOPE**: Corrosion of reinforcing steel is a primary cause of bridge deck deterioration. Epoxy coatings have been used since the 1980s to protect reinforcing steel from penetration of de-icing salts and anti-icing chemicals and delay the onset of corrosion. However, epoxy coatings are imperfect and defects allow intrusion of corrosive salts and chemicals. Stainless steel reinforcing has emerged as one alternative to epoxy coated steel but it is substantially more expensive. Little is known about the time to corrosion for stainless steel reinforcing as compared to epoxy coated reinforcing. Research is also needed to quantify the costs and benefits of using stainless steel reinforcement as a replacement for epoxy coated steel in conventional bridge construction. This study will compare the basic performance of stainless steel, epoxy coated, and other commonly used bridge deck reinforcing steels. The researcher will perform a thorough life cycle cost analysis of stainless steel reinforcement and identify when it is cost effective to use in bridge construction. The study will also document the construction of a specific bridge using stainless steel deck reinforcement.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued to perform accelerated corrosion lab testing procedures on various forms of steel; estimated life expectancy, cost effectiveness and life cycle cost parameters of tested steels; produced project progress reports; submitted FFY 2012 Annual Report; submitted draft Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 3 of 3) | $35,107 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $35,100 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: David Darwin, Kansas University, 785-864-3827

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Walt Peters, ODOT Assist. Bridge Division Engineer, 405-521-2606

## 2234 Energy Dissipation in Eighteen-Foot Broken-back Culverts Using Laboratory Models

**PURPOSE AND SCOPE**: To develop a methodology to analyze broken-back culverts in Oklahoma such that the energy is mostly dissipated within the culverts or downstream of the culverts in order to minimize the degradation downstream. This project will study dissipation efficiency and appurtenances design for 18 foot drop using laboratory scale modeling technique by investigating vertical drops of 6 and 18 feet that may result in effective energy dissipation and consequently minimize scour downstream of broken-back culverts, thus, reducing construction and rehabilitation costs of culverts in Oklahoma.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Avdhesh Tyagi, Oklahoma State University, 405-744-9307

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Bob Rusch, ODOT Bridge Division Engineer, 405-521-2606

## 2235 Distress Modeling for DARWin-ME – Phase 1

**PURPOSE AND SCOPE**: The objective of this study will be to investigate data needs for distress models in the new DARWin-ME, based on past ODOT research work, to establish a workflow in using local level data sets on cracking, rutting, and roughness for DARWin-ME prediction models, and to assist ODOT in implementing DARWin-ME in the next decade as part of ODOT long-term plan in studying and deploying DARWin-ME in a production environment. The PI will provide an assessment of the results of this study which should include expected benefits and action needed for successful implementation, draft specifications, if applicable, with final recommended implementation activities, methods or schedules to meet ODOT goals. Specifically, toward the end of the research, the research team shall provide four day training to ODOT pavement design staff on DARWin-ME basics, data inputs, model calibrations, and sample runs of pavement design and analysis. Results of this research would result in documentation and technical procedure on using ODOT historical distress and roughness data bases for DARWin-ME implementation. This step is critical in ODOT's effort to use the next-generation design software for pavement engineering in Oklahoma.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued to performed data analysis; presented a recommended distress model master plan for ODOT implementation; completed and documented DARWin-ME analysis; compared field survey data to DARWin-ME data; revised analysis using new WIM data sets; produced project progress reports; submitted FFY 2012 Annual Report; Final Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: None.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 2 of 2) | $96,079 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $96,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Kelvin Wang, Oklahoma State University, 405-744-5189

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Jeff Dean, ODOT Pavement Design Engineer, 405-522-0988

## 2236 Drying Shrinkage Problems in High PI Subgrade Soils

**PURPOSE AND SCOPE**: Longitudinal cracking in pavements due to drying shrinkage of high PI subgrade clays has been a major problem in Oklahoma. These cracks occur close to the shoulder of the pavement where the climate plays a significant role in terms of changes in water content (suction). This research project will evaluate the current Enhanced Integrated Climatic Model (EICM) of the Mechanistic-Empirical Pavement Design Guide (MEPDG) for analyzing the moisture regimes underneath the pavement. The formations and network of the shrinkage cracks will be investigated in the light of unsaturated soil mechanics. The study will include laboratory soil testing, field forensic investigation of problem sites, and modeling. The research will lead to practical analyses and recommendations for design of pavements on potentially shrinking clay soils.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed testing on laboratory produced subgrade soil samples; completed testing on field produced subgrade soil samples; continued to utilize the EICM, TMI and Oklahoma Mesonet to evaluate seasonal moisture content changes in subgrade soils; completed numerical modeling; completed feasibility study; completed numerical and statistical analysis of data; produced project progress reports; submitted FFY 2012 Annual Report; Final Report submission is pending.

The PI has requested a 3 month no cost time extension for continued project operations and the completion of the Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: None.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 2 of 2) | $90,204 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $90,200 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Rifat Bulut, Oklahoma State University, 405-744-5189

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Christopher Clarke, ODOT Geotechnical Engineer, 405-522-4994

## 2237 Reduction in Storm Water Runoff

**PURPOSE AND SCOPE**: The proposed Storm water Rules recently passed by the US EPA are expected to mandate construction sites to meet a numeric standard for turbidity in storm water runoff from rainfall events less than a 2-year, 24-hour storm. Due to the high clay content in many Oklahoma soils, most construction sites in Oklahoma, including highway construction sites, will almost assuredly be required to employ chemical addition to induce flocculation to decrease their runoff turbidity to the required level. The proposed project address this problem by continued development and demonstration of a system for turbidity control at highway construction sites in Oklahoma that is effective, predictable, and practical. Because of the high clay content of many Oklahoma soils, construction sites will most likely not be able to reach the new US EPA turbidity standard without the use of this type of system. Results of this project will lead to the implementation of this new technology that will result in compliance with the new US EPA Construction Effluent Limitation Guidelines (ELG) for turbidity. This has the potential to result in fewer penalties and fines for construction activities. In addition, this technology allows construction activities to meet the Clean Water Act requirements and protect our valuable water resources.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued to analyze soils for turbidity and flocculant parameters and interpreted results; continued to conduct jar tests and interpret results; continued to monitor field demonstration site; produced project progress reports; submitted FFY 2012 Annual Report; Final Report submission is pending.

The PI has requested a 3 month no cost time extension for continued project operations and the completion of the Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: None.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 2 of 2) | $92,465 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $92,400 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Jason Vogel, Oklahoma State University, 405-744-7532

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Michelle Dolan, ODOT Environmental Storm Water Manager, 405-521-6771

## 2238 New Asphalt Mix Design Program for ODOT

**PURPOSE AND SCOPE**: Oklahoma Department of Transportation (ODOT) has been using the Superpave mix design software for several years [9]. The original Superpave mix design software was built around Fox Database and did not meet ODOT requirements. The software currently being used by ODOT is implemented using two Microsoft Excel® files to create asphalt mix designs and is customized for ODOT use. However, the implementation is inefficient and cumbersome to maintain. This proposal is being submitted to ODOT with the specific aim of developing a Microsoft Visual Basic 2010® based Asphalt Mix Design Software that is efficient and easy to use. The software architecture will allow for the transition to a networked SQL server based version and simplify the revisions and the maintenance of the software in the future. The objective of the proposed work is the software implementation of the ODOT Asphalt Mix Design method. This work will include the migration of the existing Microsoft EXCEL® based software to Microsoft Visual Basic 2010® Express. The Express version of Visual Basic is freely available and does not require the purchase of additional software licenses. The upgrade of the ODOT Asphalt Mix Design software will also include a systematic redesign of the current software to improve its efficiency. The software will be thoroughly tested and the output will be compared with the mix designs obtained using the current Excel® based process to verify the accuracy of the software. The project team will work with the relevant personnel from ODOT to facilitate the transition to the new software. On successful completion of the project, complete documentation of the software will be provided along with user manuals and training modules to facilitate the adoption of the software by the user community.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Sesh Commuri, University of Oklahoma, 405-325-4302

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2239 Develop Draft Chip Seal Cover Aggregate Specifications Based on AIMS Test Results

**PURPOSE AND SCOPE**: The proposed study seeks to improve ODOT chip seal design and performance through introducing new criteria for the selection of cover aggregate and binder. These criteria exploit the recent technological advances in the characterization of aggregate shape and texture as well as aggregate-binder compatibility in a creative way. The proposed work will include aggregate index properties obtained from the Aggregate Imaging System (AIMS) and performance-based uniformity coefficients (PUC) in tweaking ODOT chip seal cover aggregate specifications and the surface free energy (compatibility ratio) approach in evaluating the aggregate-binder compatibility. Moreover, the chip seal construction practice followed by different ODOT Maintenance Divisions will be documented and the best practice will be identified. The proposed study involves both laboratory testing and construction and performance evaluation of chip seal test sections and has three objectives: 1. To evaluate the shape and texture-related index properties, as well as durability, of commonly used cover aggregates in chip seal programs in Oklahoma, and provide a methodology for inclusion as a metric in future chip seal specifications; 2. To quantify how well the newly developed performance-based uniformity coefficient (PUC) correlate with chip seal performance in Oklahoma, and if it should be incorporated into state chip seal specifications; 3. To generate aggregate-binder compatibility data, based on the surface free energy (compatibility ratio) approach, for commonly used aggregates and asphalt emulsion binders in Oklahoma, which will be a useful resource for ODOT maintenance divisions.

**ACCOMPLISHMENTS DURING FFY 2013**: Continued literature review; continued laboratory evaluation of aggregate-binder compatibility; completed field testing and monitoring for performance evaluation of chip seals; completed review of division chip seal practices; continued draft cover aggregate specifications; conducted second tech transfer workshop; produced project progress reports; submitted FFY 2012 Annual Report; Final Report submission is pending.
The PI has requested a 3 month no cost time extension for continued project operations and the completion of the final report.

**PROPOSED ACTIVITIES FOR FFY 2014**: None.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 2 of 2) | $85,810 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $85,800 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Musharraf Zaman, University of Oklahoma, 405-325-5625

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Scott Seiter, ODOT Assist Materials Division Engineer, 405-521-2677

## 2240 Portable Weigh-In-Motion (WIM) for Pavement Design – Phase 2

**PURPOSE AND SCOPE**: Keeping the public's roads, highways and bridges in good condition is not only vital to safety, economical productivity and success, but also necessary to save billions of dollars used for road repair and replacement each year. Road deterioration depends on many factors: road characteristics (pavement materials and thickness); weather conditions (temperature cycles and precipitation); and dynamic interaction between vehicle and road (speed, suspension characteristics, and surface roughness), in addition to loads distinguished by axles spacing, tire pressure, and weight per axle. Of these, vehicle axle weight proves to be the factor that most extremely increases road wear. Therefore, both appropriately weighted and overweight trucks are chiefly responsible for the rapid deterioration of roads. Reducing the average weight of truck axles would substantially reduce the rate of pavement wear. Analyzing historical WIM data collected by ODOT to aid in the improvement of pavement design, and collecting weight data at strategic temporary sites using the OTC funded portable system could accomplish this.

**ACCOMPLISHMENTS DURING FFY 2013**: Investigate various sensor layouts for multi-lane portable WIM systems; develop a portable WIM system to monitor multiple lanes at once; deploy portable WIM systems at two additional sites; develop data patterns/models for detection of site mis-calibration; develop software to monitor and track data patterns and alerts; correct data inaccuracy; produced project progress reports; submitted FFY 2012 Annual Report; Final Report submission is pending.

The PI has requested a 3 month no cost time extension for continued project operations and the completion of the final report.

**PROPOSED ACTIVITIES FOR FFY 2014**: None.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $89,340 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $89,300 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Hazem Refai, University of Oklahoma, 918-660-3243

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Daryl Johnson, ODOT Traffic Analyst Engineer, 405-52-6376

## 2241 Real-Time Monitoring of Slope Stability in Eastern Oklahoma

**PURPOSE AND SCOPE**: This research project is focused on landslides occurring in the eastern portion of Oklahoma with the idea that this research will be continued to encompass all of Oklahoma, as landslides occur in almost every division of the state. Even with well-established slope stability codes (i.e., Corps of Engineers EM 1110-2-1902 and Federal Highway Administration FHWA-SA-94-005), there is currently a lack of technical understanding about why certain soil deposits and road cuts fail at commonly used slope geometries. Several roadway embankments and road cuts in Oklahoma failed in the past few years for various reasons, rendering many miles of high vehicle traffic roadways inoperable or severely impaired for months, years or in some cases, permanently. The goals of this research project are to assist the state in understanding, recognizing, and addressing landslide prone areas by creating a functional landslide hazard map that may be used by ODOT and others when building and maintaining infrastructure to predict and prevent future transportation corridor blockages.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed installation of remote sensing in situ equipment into a selected slide mass and observed slope behavior to obtain data to validate future landslide prediction models; validated and verified the model on a landslide “hotspot” and provided results; produced project progress reports; submitted FFY 2012 Annual Report; Final Report submission is pending.

The PI has requested a 3 month No Cost Time Extension for continued project operations and the completion of the final report.

**PROPOSED ACTIVITIES FOR FFY 2014**: None.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 2 of 2) | $113,912 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $113,900 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Amy Cerato, University of Oklahoma, 405-325-5625

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Christopher Clarke, ODOT Geotechnical Engineer, 405-522-4994

## 2242 Efficacy of Road Bond and Condor as Soil Stabilizers

**PURPOSE AND SCOPE**: The goal of this research is to test the effectiveness of Road Bond and Condor as soil stabilizers for three typical fine-grained Oklahoma soils. Test soils will include a moderately plastic and highly plastic clayey soil, as well as, a clayey soil containing at least 10,000 ppm sulfate. At the completion of this study, it is expected that ODOT will have a comprehensive set of laboratory testing data demonstrating the degree of effectiveness of Roadbond and Condor for stabilizing clayey soils and sulfate-bearing soils. If conclusions of this study suggest Roadbond and/or Condor are potentially viable for soil stabilization, particularly those soils containing sulfate, then a test(s) section(s) could be incorporated on an actual highway construction project. Although some questions may remain regarding long-term durability, a successful pilot project may lead to gradual implementation of the project recommendations. Possibly, results of this research may suggest that one or both products are not viable and/or other testing should be performed.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed and produced Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Gerald Miller, University of Oklahoma, 405-325-4253

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Christopher Clarke, ODOT Geotechnical Engineer, 405-522-4994

## 2243 Recommended Fatigue Test for ODOT

**PURPOSE AND SCOPE**: Fatigue cracking and rutting are two dominant distresses in flexible pavements. Oklahoma Department of Transportation (ODOT) currently evaluates the rutting potential of asphalt mixes through the Hamburg rut test in accordance to OHD L-55, which is similar to AASHTO T324. However, no standard test procedure is currently available to ODOT for screening of mixes for fatigue resistance, which is extremely important for quality control and quality assurance of flexible pavements. The proposed study will investigate selected test methods and procedures to measure fatigue resistance or fatigue life of different types of asphalt mixes. Mechanistic frameworks, namely dissipated energy, fracture mechanics, and viscoelastic continuum damage, will be utilized to analyze the data, as appropriate. The variability and repeatability of each test method will be evaluated statistically. The results from this study will lead to test methods/protocols and the associated equipment will be recommended that can be used by ODOT for screening of asphalt mixes for their fatigue resistance during the mix design phase.

**ACCOMPLISHMENTS DURING FFY 2013**: Performed literature review; surveyed other DOT's practices and experiences; began evaluation of climate data; selected modified and unmodified asphalt mixes and began laboratory testing, including various fatigue testing; prepared cylindrical samples of asphalt mixes; began analysis of data using mechanistic framework for all laboratory tests; initiated a comparison of test results and ranking of asphalt mixes; performed analysis of repeatability and variability of selected test methods; produce project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue literature review; continue modified and unmodified asphalt mix selection(s) and laboratory testing, including various fatigue testing; prepare cylindrical samples of asphalt mixes; continue analysis of data using mechanistic framework for laboratory testing; continue to compare test results and rank of asphalt mixes; perform analysis of repeatability and variability of selected test methods; propose test method for screening mixes for fatigue; recommend and possible purchase of equipment for ODOT; perform comparison of equipment test results; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 3) | $132,749 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $132,700 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 3) | $225,778 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Musharraf Zaman, University of Oklahoma, 405-325-5625

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2244 Field Verification of Geogrid Properties for Base Course Reinforcement Applications

**PURPOSE AND SCOPE**: Research is needed to develop guidelines for acceptance and specification of available geogrids for such applications. This study will be complementary to a recently completed ODOT/OkTC-funded project, which is aimed at addressing the need for improved guidelines for base reinforcement applications that produced a significant amount of test data on a selection of geogrids and their in-aggregate performance. As a result, field verification of geogrid performance is in a position to be carried out in order to provide ODOT with a more complete picture of how geogrids with different mechanical properties are expected to perform as base reinforcement materials in commonly used aggregates in Oklahoma projects. A primary objective of this study is to help ODOT develop new design guidelines in their Specifications Manual for the use of geogrids in reinforced aggregate base roadway projects in Oklahoma. The benefits of using geosynthetics in enhancing the stability of aggregate bases and other pavement applications have been observed in terms of increased performance (i.e. serviceability), stability, durability and cost effectiveness of roadway-related applications ranging from subgrade and base layers to retaining walls, embankments, slopes and bridge abutments.

**ACCOMPLISHMENTS DURING FFY 2013**: Attended project initiation meeting; started literature search; continued a search to locate a suitable project test site; performed preliminary laboratory testing on new geogrids; produced project progress reports; Final Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Project will be terminated effective October 1, 2013. A suitable construction test site for this project was never secured.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 3) | $100,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $100,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Terminated) | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Kianoosh Hatami, University of Oklahoma, 405-325-5911

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Christopher Clarke, ODOT Geotechnical Engineer, 405-522-4994

## 2245 Fatigue Performance of Asphalt Pavements Containing RAS and RAP

**PURPOSE AND SCOPE**: Recycled asphalt shingles (RAS) and reclaimed asphalt pavements (RAP) are increasingly used in hot mix asphalt (HMA) for environmental, economic and other reasons. Although previous studies have shown improved resistance to rutting and moisture damage, contradictory results have been reported on fatigue life and thermal cracking of pavements constructed with mixes containing RAS and RAP. Several states have specifications for design of mixes containing RAS and RAP, but such specifications are not yet developed by the Oklahoma Department of Transportation (ODOT). The proposed study seeks to evaluate the fatigue performance of HMA mixes containing RAS and RAP. The primary objectives of this study are: (i) to generate laboratory data on fatigue performance or fatigue life of HMA mixes containing RAS and RAP in Oklahoma; and (ii) to make recommendations on guidelines/special provisions for the design of HMA containing RAS and RAP.

**ACCOMPLISHMENTS DURING FFY 2013**: Started literature review; performed review of other DOT's construction specifications in regards to RAS and RAP; performed evaluation of climate data; began collection of bulk materials and samples; started preliminary tests on collected materials; started volumetric mix designs; prepare cylindrical and beam samples; began various laboratory performance tests; perform analysis of test data; compare fatigue and low temperature cracking performance; perform analysis of repeatability and variability of selected test methods; produce project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue literature review; continue to collect bulk materials and samples; continue preliminary tests on collected materials; continue volumetric mix designs; prepare new cylindrical and beam samples; continue various laboratory performance tests; perform analysis of test data; continue to compare fatigue and low temperature cracking performance; continue to perform analysis of repeatability and variability of selected test methods; suggest recommendations for guidelines for incorporation of RAS and RAP in HMA; organize and execute an outreach and technology transfer workshop; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 2) | $109,421 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $109,400 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 2) | $107,832 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Musharraf Zaman, University of Oklahoma, 405-325-5625

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2246 Evaluation of Performance of Asphalt Pavements Constructed Using Intelligent Compaction Techniques

**PURPOSE AND SCOPE**: Improving the quality of asphalt pavements during construction can greatly enhance performance and longevity. Lack of adequate tools to determine the quality of compaction of the entire pavement in a non-destructive manner is a leading factor in the early deterioration of pavements. Tools that can estimate the quality in real-time can help avoid over/under-compaction during the construction process. Improved quality of the roads can minimize rutting, cracking and other forms of pavement distresses, while improving long-term performance of the pavement. Several original equipment manufacturers (OEMs) have proposed Intelligent Compaction (IC) as a means of achieving uniformity in the compaction of soil subgrades and asphalt pavements. Over the past nine years, the lead researchers of this proposal have developed the Intelligent Asphalt Compaction Analyzer (IACA) technology to estimate the density and stiffness (dynamic modulus, $|E^*|$) of an asphalt pavement during its construction. The technology has been extended to estimate the resilient modulus ($M_R$) of stabilized subgrades that form the base of asphalt pavements. Improvement in the quality obtained through the use of IACA during the construction of asphalt pavements, as well as the stabilized subgrades that form the base of these pavements, will be demonstrated and compared to conventional construction practices under this study.

**ACCOMPLISHMENTS DURING FFY 2013**: Selected 2 sites involving milling and overlay of HMA pavements; performed characterization of sites prior to construction and located IACA demonstration section; determined dynamic modulus master curves; constructed pavement test sections and implemented IACA technology; performed analysis of compaction quality data obtained using IACA; conducted roller pass testing over five test areas; pavement was graded and stabilized to 8”; produced project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Select site to demonstrate the use of IACA technology during compaction; collect bulk samples and perform laboratory testing and soil characterization; perform 500lb load cell testing on bulk samples; calibrate and perform field demonstration of IACA; perform evaluations of constructed pavement sections; perform compaction quality analysis; document findings and results of the demonstration; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 2) | $122,199 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $122,100 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 2) | $119,417 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Sesh Commuri, University of Oklahoma, 405-325-4302

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2247 Energy Dissipation in Twelve-Foot Broken-back Culverts Using Laboratory Models

**PURPOSE AND SCOPE**: To develop a methodology to analyze broken-back culverts in Oklahoma such that the energy is mostly dissipated within the culverts or downstream of the culverts in order to minimize the degradation downstream. This project will study dissipation efficiency and appurtenances design for 12 foot drop using laboratory scale modeling techniques that may result in effective energy dissipation and consequently minimize scour downstream of broken-back culverts, thus, reducing construction and rehabilitation costs of culverts in Oklahoma.

**ACCOMPLISHMENTS DURING FFY 2013**: Constructed a 150 foot long laboratory scale model with two barrels of 10 X 10 foot and a broken-back culvert with a vertical drop of 12 feet; simulated different flow conditions for 0.8, 1.0 and 1.2 times the hydraulic head in the scale model; evaluated the energy dissipation between upstream and downstream ends of the broken-back culvert with sills and/or friction blocks of different sizes and shapes; refined the sill design for easy drainage of water from the broken-back culvert; observed the efficiency of hydraulic jump with and without friction blocks between upstream and downstream ends of the culvert and the location of hydraulic jump from the toe of the drop in the culvert; produced project progress reports; submitted draft Final Report.

**PROPOSED ACTIVITIES FOR FFY 2014**: End of project.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $99,800 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $99,800 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Avdhesh Tyagi, Oklahoma State University, 405-744-9307

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Bob Rusch, ODOT Bridge Division Engineer, 405-521-2606

## 2248 Creep Compliance and Percent Recovery of Oklahoma Certified Binders Using the Multiple Stress Creep Recovery (MSCR) Method

**PURPOSE AND SCOPE**: To enhance the durability and strength of asphalt concrete (AC) pavements in order to sustain high traffic volume, coupled with heavier loads and extreme weather conditions, asphalt industries in the United States and around the world are increasingly using polymer-modified binders. The recently released Multi Stress Creep Recovery (MSCR) test (AASHTO TP 70) on short-term aged binders can better relate the predicted laboratory-based high temperature properties of asphalt binders (virgin and recovered) to actual rutting performance of in-service pavements. The objectives of this research are: (1) to evaluate the creep compliance and percent recovery of various asphalt binders used by the Oklahoma Department of Transportation (ODOT); and (2) to determine the feasibility of the adoption of the MSCR test by ODOT. If recommended, specific guidelines (MSCR letter grade and acceptable minimum percentage of elastic recovery) will be developed for use by ODOT. Furthermore, this study will evaluate binders recovered from reclaimed asphalt pavement (RAP) materials and assess the presence of polymer through the percent recovery of the MSCR test method.

**ACCOMPLISHMENTS DURING FFY 2013**: Began literature review; selected binder types and sources; recovered binders from RAP using Rotary Evaporator Method, i.e., "Rotovapor"® (as per AASHTO T 319); executed MSCR tests on 4 types of RTFO aged binders; performed Superpave grading tests of 3 virgin binders; conducted analysis of ODOT in-house MSCR data; generated statistical analysis of MSCR data; produced project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue literature search; continue selection of binders and sources; continue to recover binders from RAP using Rotary Evaporator Method; continue MSCR testing and Superpave grading; evaluate how climatic data can be used to select MSCR grades; develop a MSCR database; develop a custom Excel-base Module to calculate MSCR grades; continue to generate statistical analysis of MSCR data; produce project progress reports; prepare and submit Final Report.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 2) | $104,586 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $104,500 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 2) | $99,285 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Musharraf Zaman, University of Oklahoma, 405-325-5625

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenneth Hobson, ODOT Bituminous Engineer, 405-521-2677

## 2249 Black Ice Detection and Road Closure Control System for Oklahoma

**PURPOSE AND SCOPE**: Black ice is a thin coating of glazed ice on roadways or other transportation surfaces and has a similar appearance of a wet black pavement road. Black ice often forms during calm weather and is highly transparent and thus difficult to see. Black ice usually forms at night or early morning, first on bridges and overpasses, then on the roads as temperatures continue to drop. Black ice is especially hazardous and is a factor in many auto accidents, some of which are deadly, each year in Oklahoma and many other states. Unfortunately, the current static road-side warning signs (such as “Ice May Form on Bridge”) simply do not draw enough attention from drivers. Objectives of this study include, 1) the development of a decision support system (DSS) to predict and detect black ice formation and pin point dangerous road sections, 2) the development of an Oklahoma Black Ice Database and Black Ice Risk Index Prediction and 3) the development of a functionally competent and economically feasible sensing system for black-ice detection by using arrays of MEMS temperature and humidity sensors, together with existing road monitoring cameras.

**ACCOMPLISHMENTS DURING FFY 2013**: Initiated literature search; started black ice risk index prediction; began activities to generate GIS database for ice emergencies; initiated low-cost ice detection sensor system development; initiated sensing and remote warning system development; produced project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to perform literature search; proceed with black ice risk index prediction; complete GIS database for ice emergencies; complete the development of low-cost ice detection sensor system; complete the development of sensing and remote warning system; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 2) | $108,326 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $108,300 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 2) | $112,997 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Tieming Liu, Oklahoma State University, 405-744-9871

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Ron Curb, ODOT Research Engineering Manager II, 405-522-3795

## 2250 The Study of Vehicle Classification Equipment with Solutions to Improve Accuracy in Oklahoma – Phase 2

**PURPOSE AND SCOPE**: The Federal Highway Administration (FHWA) and Oklahoma Department of Transportation (ODOT) are unremittingly interested in ever-evolving vehicle classification systems. More accurate systems are essential for suitable roadway design and to ensure adequate capacity, surface durability, and commuter safety for all motorists. Proper Vehicle Classification is essential for proper roadway planning and design. Phase 2 of this study extensively examines vehicle misclassification made by ODOT AVC and WIM statewide systems and attempts to determine the causes for such errors. Among other benefits, the results of Phase 2 include improved vehicle classification, accurate traffic flows and vehicle type distribution data, enhanced roadway design and reduced construction costs and optimal algorithm (e.g., axle spacing) for statewide AVC and WIM deployments.

**ACCOMPLISHMENTS DURING FFY 2013**: **Phase 1**: Completed the development of portable video-based vehicle classification system and field testing; developed software for road tube vehicle classification system; performed field testing of video system at AVC and WIM sites; added portable class counter testing at AVC/WIM sites; performed short-term classification error analyses; prepared and completed Vehicle Class Testing Results comparison report; initiated equipment/ software corrections; investigated solutions to correct classification system errors; produced project progress reports; Phase 1 Final Report submission is pending.

The PI has requested a 3 month no cost time extension for continued project operations and the completion of the Phase 1 final report.

**PROPOSED ACTIVITIES FOR FFY 2014**: **Phase 2**: Develop ground truth system based on continuous video recording; Investigate optimal vehicle classification algorithm (e.g., axle spacing); Process video recording against classification AVC and WIM data; perform statistical analyses and modeling of the classification data; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 1) | $86,568 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $86,500 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $88,875 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Hazem Refai, University of Oklahoma, 918-660-3243

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Daryl Johnson, ODOT Traffic Analyst Engineer, 405-522-6376

## 2251 3D Laser Imaging for ODOT Interstate Network at True 1-mm Resolution

**PURPOSE AND SCOPE**: Pavement data collection technologies have improved gradually in the last few decades. Particularly after steady investments in pavement profile measurements since the 1980's, roughness, rutting, and macro-texture data can be inexpensively obtained at acceptable accuracy levels. Due to sensor and computing limitations and inadequate research funding, the hardware and software necessary to automatically obtain pavement cracking and other distress data at acceptable precision and bias levels have not been realized. With 3D image data representing actual pavement surface at full-lane coverage, it is possible to create a true representation of pavement surface at 1mm resolution which in turn can be used as input data for various condition evaluations and safety analysis. Results of this research would result in documentation and technical procedure on using the collected 3D pavement data of an ODOT network and the provided analysis software programs. Pavement management at ODOT will have a virtual tool to examine pavement surface characteristics through the provided software solutions to fulfill both data needs at network level and project level.

**ACCOMPLISHMENTS DURING FFY 2013**: Completed data collection of ODOT interstate network and SH 51 section; discussed and generated solutions for automated condition survey; discussed and started software solutions to identify pavement surface safety problems; conducted data analysis of flexible and rigid pavements using 3D surface data; produced project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue to generate solutions for automated condition survey; continue to prepare software solutions to identify pavement surface safety problems; conduct and complete data analysis of flexible and rigid pavement s using collected 3D surface data; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 (Yr 1 of 2) | $117,771 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $117,700 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 2 of 2) | $117,003 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Kelvin Wang, Oklahoma State University, 405-744-5189

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Matthew Swift, ODOT Pavement Management Engineer, 405-522-5904

## 2252 Development of Inexpensive Vehicle Sensor Node System for Volume, Turn Movement and Collision Avoidance

**PURPOSE AND SCOPE**: The U.S. Department of Transportation has recently expressed an interest in developing and implementing a method to more efficiently control and monitor traffic at road intersections. Highway-roadway intersection safety monitoring requires a number of studies. Turn Movement (TM) studies aid in evaluation and future planning. Either manual or automatic counters are used during testing periods and usually require a great deal of time and labor by experienced operators. Results are often plagued with errors. A more automated system that is simple, inexpensive, and highly configurable is needed to improve accuracy. This project will develop a nonintrusive, inexpensive, and portable vehicle detector that is programmable and supports various studies and applications, including vehicle count, intersection traffic flow, intersection capacity, intersection safety, and collision avoidance. This system will serve as a flexible, advanced extension of the current intersection collision avoidance system that can be easily installed and removed at required intersections using temporary adhesives and then reused elsewhere. With only two sensor nodes required per installation, per lane, each lane will encounter a temporary, semi-static, closure for a maximum of five minutes. The procedure can be accomplished one lane at a time so that the intersection remains open and traffic disturbance is minimal.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Develop software algorithms to configure one vehicle node for vehicle count; develop an energy aware communication protocol to maximize sensor node operational longevity; develop algorithms to perform sensor node auto calibration to prevent vehicle misdetection, as well as, minimize the number of inaccurate measurements; develop algorithms for deployment automation and self-configuration of sensor nodes; fabricate 32 sensor nodes and two base stations to instrument an intersection with four lanes in each direction; perform field-testing of the overall system on at least one intersection; validate the operability and accuracy of the system and its viability for preventing collisions at intersections; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $102,021 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Hazem Refai, University of Oklahoma, 918-660-3243

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Aaron Fridrich, Transportation Manager II, 405-736-9466

## 2253 Investigation of Optimized Graded Concrete for Oklahoma – Phase 2

**PURPOSE AND SCOPE**: Oklahoma has started to implement “optimized graded concrete”. These concrete mixtures are designed to use less cement, and proportionately more aggregate with a more optimized and continuous distribution of aggregate sizes. This allows a concrete mixture to achieve increased workability and strength through using less mortar (sand, cement and water). Cement is the most expensive ingredient in concrete, the largest contributor to the carbon footprint, and can also lead to increased cracking through shrinkage. Both the initial cost and long term performance of concrete would benefit from the reduction of cement content in concrete mixtures. The primary focus of this research will be to investigate the interplay between gradation and mortar content in a concrete mixture and how that impacts the necessary performance requirements for structural concrete: workability, strength, and durability. In addition the research team will also be available to work with any contractors that are implementing optimized graded concrete in the field. This is an important step in the validation of the research completed in the laboratory and is essential to the implementation of this new approach. Finally, the team will work with ODOT to create a new specification that will help implement optimized graded concrete for structural concrete in the state of Oklahoma.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform literature search; start developing tests to evaluate the constructability of optimized graded concrete for structures; perform laboratory testing to determine aggregate gradations; monitor contractor use of optimized graded concrete for ODOT; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $105,835 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Tyler Ley, Oklahoma State University, 405-744-5257

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Kenny Seward, ODOT Structural Materials Engineer, 405-522-4999

## 2254 Energy Dissipation in 30-Foot Broken-back Culverts Using Laboratory Models

**PURPOSE AND SCOPE**: To develop a methodology to analyze broken-back culverts in Oklahoma such that the energy is mostly dissipated within the culverts or downstream of the culverts in order to minimize the degradation downstream. This project will study dissipation efficiency and appurtenances design for 30 foot drop using laboratory scale modeling techniques that may result in effective energy dissipation and consequently minimize scour downstream of broken-back culverts, thus, reducing construction and rehabilitation costs of culverts in Oklahoma.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Construct a laboratory scale model for 150 feet long, two barrels of 10 X 10 feet and a broken-back culvert with vertical drop of 30 feet and to conduct a detailed review of literature; simulate different flow conditions for 0.8, 1.0 and 1.2 times the hydraulic head in the scale model; evaluate the energy dissipation between upstream and downstream ends of the broken-back culvert with sills and/or friction blocks of different sizes and shapes; refine the sill design for easy drainage of water from the broken-back culvert; observe, in physical experiments, the efficiency of hydraulic jump with and without friction blocks between upstream and downstream ends of the culvert and the location of hydraulic jump from the toe of the drop in the culvert; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $94,802 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Avdhesh Tyagi, Oklahoma State University, 405-744-9307

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Bob Rusch, ODOT Bridge Division Engineer, 405-521-2606

## 2255 Regional Economic Impact Study for the McClellan-Kerr Arkansas River Navigation System

**PURPOSE AND SCOPE**: With the growing backlog of critical maintenance and the decreased funding of Federal appropriations, it is imperative to maintain the infrastructure designed to move freight through the McClellan-Kerr Arkansas River Navigation System (MKARNS) for waterborne commerce, as well as provide hydropower generation, recreation, water supply, fish and wildlife and flood risk management for the State of Oklahoma. Among other objectives, the main objective of this study is to identify, evaluate, and measure—as comprehensively as possible—the full extent of regional economic benefits/impacts that are expected to accrue to the citizens of Oklahoma and Arkansas, as well as, other significantly affected areas of the country (e.g., the States of Kansas and Missouri) from operational activities of the MKARNS (waterborne commerce, hydropower, water supply, flood control, game and wildlife management, and recreation). The results of this project will lead to the implementation of a "state-of-the-art" regional economic impact assessment tool (the MKARNS-MRVIO Calculator) that can evaluate regional economic impacts due to all types of water resource investments (i.e., navigation, flood control, recreation, etc.) and is tailored especially for the MKARNS and its regional economies. The "Calculator" will be designed and the user guides will be written for use by non-economic experts within the Oklahoma Department of Transportation (ODOT). It is expected that the MKARNS-MRVIO Calculator will be able to be used by ODOT personnel responsible for the development of water resources in the State of Oklahoma

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform literature search; begin the construction of and compile a MKARNS-MRIO model; start building the MKARNS-RNWRIP/MRVIO spreadsheet calculator; start regional economic development analyses of MKARNS Water resources investment scenarios; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $60,188 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Dennis Robinson, University of Arkansas, 501-569-8519

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Deidre Smith, ODOT Waterways Branch Manager, 918-270-5804

## 2256 Understanding the Behavior of Prestressed Concrete Girders after Years of Services

**PURPOSE AND SCOPE**: The proposed project consists of a comprehensive study including both testing and analysis of two real-world AASHTO Type II girders to be obtained during replacement of the I-244 bridge over the Arkansas River in Tulsa after about 47 years in service. It also includes detailed study of composite action in the form of testing the real-world girders and a scaled composite bridge section. This research will provide critical supplemental information to and improve upon previous research focused on the shear capacity of one real-world girder sponsored by ODOT at the University of Oklahoma and answer numerous questions concerning bridge girders put into service during the same time period. It will provide detailed information concerning composite behavior of prestressed girder bridges critical to shear. It also has the potential to provide opportunities for a significant quantity of additional research during the process of determining shear capacity and studying prestress transfer. The results of this research would be used to evaluate the condition and safety of prestressed concrete girders designed for shear using the quarter-point rule described in the AASHTO Standard Specifications (AASHTO 1973) in comparison to the current AASHTO LRFD Specifications (AASHTO 2004). Additionally, improved procedures for using nondestructive methods to determine condition of in-service structural members would be recommended.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Transport 2 prestressed concrete girders to the OU Fears lab; prepare and load test 1 girder with no deck slab included; perform analysis of composite action, stresses, strains and shear obtained from load testing; perform literature searches on bond transfer, airy stress function and dynamics and entertain ideas learned; extract nonlinear backbone; perform other inverse analysis; perform transfer bond parameter analysis; start numerical analysis preparations; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 3) | $127,339 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Royce Floyd, University of Oklahoma, 405-325-1010

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Walt Peters, ODOT Assist. Bridge Division Engineer, 405-521-2606

## 2257 Understanding A+B Bidding Patterns and Policy Implications for ODOT Project Lettings

**PURPOSE AND SCOPE**: A key challenge for Departments of Transportation around the country is to keep the cost of construction low while ensuring that projects will be completed in a timely manner. Those goals can often be conflicting. The purpose of this research project is to investigate the empirical relationship between project cost and project duration to offer recommendations to the Department of Transportation on the optimal use of time incentives in the procurement process. We will utilize program evaluation techniques to assess the performance of "incentive/disincentive" (I/D) and A+B auctions in comparison to the standard contracting low bid practice. Using our statistical knowledge and information on alternative contracting methods adopted by ODOT and other state Departments of Transportation, we will conduct economic evaluation of contracting practices.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Assemble and complete the database using methodologies employed in a previous research project; prepare the database for statistical analysis; perform database empirical analysis; tabulate variables and calculate summary statistics; compare graph relationships; plan and execute econometric analysis, formally testing hypotheses about the determinants of project length and project cost, using different empirical strategies appropriate for each specific hypothesis; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $60,046 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Georgia Kosmopoulou, University of Oklahoma, 405-325-3083

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Brian Schmitt, ODOT Office Engineer, 405-521-2625

## 2258 Evaluate Densifier-Over-Shotblasting (DOS) Treatment Performance for Pavements and Bridge Decks

**PURPOSE AND SCOPE**: With increased demands on aging infrastructure, rapidly increasing truck traffic, and shrinking budgets, transportation agencies are continually being asked to "do more with less" in maintaining pavements and bridges. The proposed research provides a method for combining chemical treatment (densifier) and shot blasting, called Densifier-Over-Shot blasting (DOS), to economically harden the aggregates of concrete and asphalt pavements and bridge decks. The proposed DOS method will make surfaces safer and more durable, reduce maintenance costs and increase service life of pavements and bridge decks. The proposed study will have the following major benefits: (i) specifications of the required characteristics of DOS; (ii) identification of polishing tendency of aggregates that are available in each ODOT division; and (iii) documentation of effective construction practice and Inspector's guide.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform literature review; identify commonly-used aggregate sources and mix designs, including those used in pavements and bridge decks, and collect samples from each; conduct aggregate testing; conduct 2 types of accelerated polishing tests; characterize chemically-treated and non-treated aggregates; analyze and report laboratory test data; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $117,932 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Dominique Pittenger, University of Oklahoma, 405-325-4536

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Caleb Riemer, ODOT Purcell Resident Engineer, 405-527-5569

## 2259 Development of a Prototype Geotechnical Report Database

**PURPOSE AND SCOPE**: Historical ODOT geotechnical reports are a valuable resource of information which includes borehole data, laboratory and field test data, construction and maintenance records, etc. A proper use of these data will help the design decision-making and bring significant cost saving for future ODOT projects. The current practice of geotechnical data storage is cumbersome to access by users. The ODOT geotechnical branch has been scanning and storing project reports in portable document format (PDF) since 2007, however, the process of scanning and cataloging is time consuming and labor intensive. There is an urgent need to develop a new system to allow easy data archiving and instant data access by searching the key information of projects (e.g., location, project number, etc.). The primary objective of the current proposal is to develop a proof-of-concept geotechnical report database that best fit the current need of the ODOT geotechnical branch. As a minimum, the system will feature data stemming from (1) in-house archived files, (2) in-house files currently being recorded in a quasi-automated recall-system, and (3) data provided to the department via contract services. The Department will save time and costs associated with efforts to locate archived geotechnical information. Improved record keeping and accuracy in maintaining accounts of geotechnical work previously completed will prove a cost savings while decreasing redundancy in efforts. Further, the end user will be given the alternatives of Mapping and Querying geotechnical information in a fashion that is most valuable to their own task(s)

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform literature search; investigate the current practice in other state DOTs; visit ODOT offices to learn more about the in-house resource, work procedure, and software development standards of ODOT branches; design the geotechnical report database and ascertain its capabilities; develop a prototype ODOT geotechnical information database; demonstrate the project to ODOT and make final adjustments; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $85,366 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Xiaoming Yang, Oklahoma State University, 405-744-5223

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Christopher Clarke, ODOT Geotechnical Engineer, 405-522-4994

## 2260 Shrinkage Induced Deformation in Steel Bridges Made Composite with Concrete Deck Slabs

**PURPOSE AND SCOPE**: Concrete bridge decks are typically cast upon steel or precast concrete girders. The new concrete begins to change volume which can be caused by increased or decreased temperature, and by the natural drying shrinkage of concrete. It has been suggested that the excessive deflections are caused by drying shrinkage of concrete. Newly cast concrete will shrink. When new concrete is cast atop steel girders, the shrinkage of the concrete can cause the composite beam to deflect downward. These downward deflections were attributed, in part, to concrete shrinkage. However, shrinkage is only one consideration. Other considerations can include errors in design, errors in the computation of estimated deflections, or unexpected deformations of the forms, framing systems and/or screed rails that support the bridge decks during casting. All of these factors and perhaps more should be considered in a complete and thorough investigation. This research will investigate bridges constructed in Oklahoma where concrete decks are cast atop steel girders. The research team will specifically look at bridges that have experienced problems with excessive deflection and/or poor ride quality. The proposed research will investigate the shrinkage characteristics of concrete, examine analytically the likely effects of shrinkage on composite steel girder bridges, examine experimentally the system of concrete and steel bridge beams, perform field investigations of existing bridges, and develop rationale for the cause of excessive deflections. The work plan will provide reasonable and practical solutions that can help to mitigate excessive deflections and poor ride quality.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform literature search; conduct forensic investigation of in-situ bridges; perform laboratory fabrications, experiments and testing; perform field instrumentation and measurement of deflections, strains and temperatures of a bridge during and after construction of composite slabs; identify likely causes for excessive or unpredicted deflections; develop and refine design and construction methods for ODOT bridges; synthesize the results from the research, and develop conclusions and recommendations; produce project progress reports; prepare and submit Final Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | $70,584 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Bruce Russell, Oklahoma State University, 405-742-7450

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Walt Peters, ODOT Assist. Bridge Division Engineer, 405-521-2606

## 2261 Selection of Long Lasting Rehabilitation Treatment using Life Cycle Cost Analysis and Pavement Serviceability Rating

**PURPOSE AND SCOPE**: The desire for a more comprehensive assessment of pavement performance, reinforced by the emphasis on cost, is the purpose of the proposed research. Preserving the current pavement network has become one of the top priorities for many highway agencies including Oklahoma Department of Transportation (ODOT). There are many pavements on important routes that have exceeded their design lives and are in need of cost effective and sustainable rehabilitation. A well-planned preservation approach helps agencies like ODOT to determine the needs for enhancement of the system's functional ability with a multi-year maintenance and rehabilitation (M&R) treatment programs. It also helps the agency optimize the allocations of annual investment in pavement rehabilitation programs at network and project levels. Therefore the researchers and practitioners from two universities (Texas A&M University (TAMU) and Arizona State University (ASU)) team up to develop an innovative methodology that can be used by ODOT for determining the most cost-effective and long-lasting treatment alternatives. The objective of this research study is to develop an engineering decision tool that facilitates the selection of maintenance and rehabilitation activities and their timing for different types of high-volume asphalt pavement roads in the state of Oklahoma. This analysis tool will use historical data, materials characterization and performance testing, deterioration modeling and life-cycle cost analysis to establish and select the maintenance and rehabilitation program.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014**: Perform literature search; conduct review of current ODOT procedures; identify pavement groups and test sections; conduct and analyze various field and laboratory tests; develop and construct deterioration models; begin the development of a database catalog for future calibration plan; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $121,527 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Maryam Sakhaeifar, Texas A&M University, 979-845-9961

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Jeff Dean, ODOT Pavement Design Engineer, 405-522-0988

## 2262 Feasibility Study of GRS Systems for Bridge Abutments in Oklahoma

**PURPOSE AND SCOPE:** The primary objective of the proposed project is to carry out a feasibility study to identify the types of bridge projects that would be suitable candidates for the use of GRS bridge abutments in Oklahoma. The research team will review the state of the art and practice on the GRS technology and develop guidelines for its adoption and implementation in Oklahoma. The primary focus of this study will be on bridges that are built on the low-volume and rural roads, (i.e. off the National Highway System, NHS), which can directly and immediately benefit from a viable and speedy bridge construction technology involving recycled girders and bridge abutment construction materials that are produced locally. However, the research team will explore the circumstances in which GRS abutments could also be adopted for bridges on major roads and highways across the state, (i.e. on-NHS system bridges). The Principal Investigators (PIs), in collaboration with ODOT and FHWA-OK engineers, will provide an assessment of the results of the study which will include expected benefits and actions needed for successful implementation of the study to meet the ODOT goals and those of other state transportation agencies.

**ACCOMPLISHMENTS DURING FFY 2013**: New project.

**PROPOSED ACTIVITIES FOR FFY 2014:** Begin literature review including survey and documentation of existing and planned GRS bridge abutment projects in Oklahoma and other states across the U.S.; participation in the selection and planning for the construction of pilot GRS bridge abutments in a county in Oklahoma; develop and validate a numerical simulation tool for the analysis and design of the selected GRS bridge abutments; begin laboratory and field tests on the backfill, subgrade soils and the geosynthetic reinforcement; begin reduction and analysis of data; produce project progress reports; prepare and submit FFY 2014 Annual Report.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 2) | $85,088 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Kianoosh Hatami, University of Oklahoma, 405-325-5911

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Shannon Sheffert, ODOT Local Government Division Engineer, 405-521-2553

## 2263 Natural Gas Locomotive Research – Phase 2

**PURPOSE AND SCOPE**: To design/ test/ certify/ study an alternative locomotive fueling system based on the use of CNG. The project scope will focus on addressing all of the necessary safety concerns and any and all statutory requirements at the State and federal levels, while also addressing the testing and study of the entire fueling system from CNG fuel source to fueling infrastructure, down to the actual on-board system to be installed on the locomotive.

**ACCOMPLISHMENTS DURING FFY 2013**: **Phase 1**: Initiated contact with the Federal Railroad Administration (FRA) which in turn initiated the "Natural Gas Working Group"; produced project progress reports; FFY 2013 Annual Report submission is pending.

**PROPOSED ACTIVITIES FOR FFY 2014**: **Phase 2**: The FFY 2014 proposed activities will be supported using available funds within the ODOT Rail 210 account rather than using ODOT Planning & Research SP&R funds: Start the development of locomotive specifications and work with FRA, local and state entities to ensure compliance with establishing safety rules and regulations; produce project progress reports; prepare and submit FFY 2014 Annual Report. SPR funding for this program is anticipated to resume in FFY 2015.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $182,700 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $182,700 | SPR | -0- | STATE |
| Projected Cost FFY 2014 (Yr 1 of 1) | -0- | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Les Olsen, Strategic Development Consulting

SP&R-2 Program Administrator: Bryan Hurst, 405-522-3794

Project Sponsor: Johnson Bridgwater, ODOT Federal Programs Manager, 405-521-4203

## 2300 Research Implementation

**PURPOSE AND SCOPE**: Implementation is a crucial stage in the research process. Implementation is the incorporation of research results into everyday practices of the organization. Research findings from national and regional studies are also considered for implementation. No matter how the research is derived, it is of little importance if it is not implemented. .

**ACCOMPLISHMENTS DURING FFY 2013**: It was determined in 2013 that for any new project started an implementation committee will be established before a new project is approved to start. There were six projects that were completed at the end of 2012 that were considered for implementation. Those projects are as follows: Next Generation Smart Barrel System for Workzone Safety Enhancement(2232), Development of ODOT Guidelines for the use of Geogrids in Aggregate Bases(2220), Development of Best Practices Program for a Collaboration of Minority Truckers(2217), Test Methods for Use of Recycled Asphalt Pavement in Asphalt Mixes(2223), Energy Dissipation in Eighteen foot Broken Back Culvert using Laboratory Models(2234), and Evaluation of the Hamburg Rut Tester and Moisture Induced Stress Tester(2226). Implementation meetings were held to determine which of the six projects would be approved for implementation and to determine the process for the implementation. The following three projects were selected for implementation 2232, 2217 and 2234. The Development of Best Practices Program for a Collaboration of Minority Truckers(2217) has already been implemented, with the establishment of a working board group and state registration.

**PROPOSED ACTIVITIES FOR FFY 2014**: Continue on with the implementation of the projects 2232 and 2234 from FFY12. Establish the implementation committees for the projects that have closed out in FFY13. Set a priority on project implementation as determined by the various implementation groups. Start the implementation process on the FFY13 closeout projects.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | -0- | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | -0- | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $250,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

ODOT Research Engineer: Gary Hook, 405-522-1042

## 2700 Experimental Product Evaluation Program

**PURPOSE AND SCOPE**: This project was established to provide ODOT with a means of providing for the (experimental) use, monitoring, evaluation and implementation of products for highway and bridge construction where the products do not meet current ODOT standards and specifications.

**ACCOMPLISHMENTS DURING FFY 2013**: Maintained records of new products where manufacturers provided literature or made presentations; provided product information to and consulted with applicable ODOT division subject matter experts on new product evaluations; distributed product submissions to various ODOT divisions for review and interest; consulted with product vendors, representatives and firms; observed the installation of 3 types of bridge joint products and monitored their performance through site visits and photo documentation; transported erosion control blankets and staples received from US Erosion Control for installation at the SH-82 landslide project in Latimer County.

**PROPOSED ACTIVITIES FOR FFY 2014**: Monitor the effectiveness of SH-82 landslide erosion control blankets; continue to maintain records on products submitted to ODOT; meet with vendor representatives; circulate product literature and provide information to applicable ODOT division subject matter experts; coordinate product meetings and presentations for new product evaluation forms received; continue to conduct product performance evaluations and monitoring; continue collection of monthly photographic records for current and new product applications as they are implemented.

| **FINANCIALS** | **Amount** | **Fund** | **Amount** | **Fund** |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $20,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $20,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $20,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

ODOT Field Research Manager: Bryan Cooper, 405-736-9475

## TPF Solicitation 1338 Improving Specifications to Resist Frost Damage in Modern Concrete Mixtures

**PURPOSE AND SCOPE**: This is a pooled fund study with the lead agency contact of ODOT. Concrete can be damaged when it is (1) sufficiently wet and (2) exposed temperature cycles that enable freezing and thawing. This study will be a thirty six month study. The goal of this research is to produce improved specifications, and test methods; while improving the understanding of the underlying mechanisms of frost damage. There are four objectives of this study, (1) determine the necessary properties of the air-void system to provide satisfactory frost durability in laboratory and field concretes with different combinations of admixtures, cements, and mixing temperatures in salt environments, (2) determine the accuracy of a simple field test method that measures air void system quality with field and laboratory concrete, (3) determine the critical combinations of absorption and the critical degree of saturation on the frost durability in accelerated laboratory testing in the presence of deicer salts, (4) establish new test methods and specifications for fresh and hardened concrete to determine frost durability and field performance.

**ACCOMPLISHMENTS DURING FFY 2013**: In November, 2012 the solicitation for the pooled fund project was posted. To date there have been nine states that have elected to participate in this study, with total commitments of $362,500 received to date. The projected cost of the study is estimated to be $525,000. The solicitation for this study expires on November 7, 2013.

**PROPOSED ACTIVITIES FOR FFY 2014**: The following activities should be accomplished in FFY14: literature review and development of the testing matrix, sample preparation and validation of the super air meter. Possible other activities would include use of x-ray tomography of air voids and frost damage and ASTM c 666.

| FINANCIALS | Amount | Fund | Amount | Fund |
|---|---|---|---|---|
| Programmed Amount FFY 2013 | $20,000 | SPR | -0- | STATE |
| Estimated Cost FFY 2013 | $20,000 | SPR | -0- | STATE |
| Projected Cost FFY 2014 | $20,000 | SPR | -0- | STATE |

**CONTACT INFORMATION**

Principal Investigator: Dr. Tyler Ley, Oklahoma State University, tyler.ley@mail.okstate.edu

405.744.5257

Lead Agency Contact: Ron Curb, rcurb@odot.org, 405.522.3795

FHWA Technical Liason: Richard Meininger, Richard.meiniger@dot.gov, 202.493.3191