RESEARCH TECHNOLOGY TRANSFER EDUCATION

Kentucky Transportation Center

Annual Report 2012

UK
UNIVERSITY OF KENTUCKY

www.ktc.uky.edu

KENTUCKY TRANSPORTATION CENTER VISION FOR 2015

The following paragraphs describe the vision of what we would like to achieve by 2015. It provides a target to guide the development of our goals, objectives, and strategic plan.

Customer Satisfaction and Customer Relationships
The Kentucky Transportation Center has developed and implemented tools for measuring our customers' perceptions regarding the quality and value of the products and services we provide. These tools are consistently utilized for all projects, regardless of who the client is. Feedback provided by these tools is scrutinized on a regular basis to identify improvements that can be made in policies and/or procedures.

Research Excellence / National Prominence
The Kentucky Transportation Center (KTC) enjoys a strong national reputation in selected, high-priority areas of research and technology transfer. KTC researchers are widely known for their subject matter expertise, group facilitation skills, effective communications, and project management skills. KTC's technology transfer professionals are nationally recognized for excellence in information delivery and workforce development. This reputation is reflected in strong name recognition at all applicable national and regional meetings and conferences.

Size of Program and Diversity of Funding Sources
The size of KTC's research and technology transfer program has grown substantially over the past five years, primarily due to the identification and cultivation of new funding sources (federal, state, local, and private-sector) and the growth of non-SPR (State Planning and Research) funding. The Center has strategically targeted areas of research and technology transfer that are important to the Kentucky Transportation Cabinet (KYTC) and to the nation. KYTC receives substantial benefits from having direct access to KTC's research results and technology transfer resources. The SPR program remains strong and vital.

Work Environment / Employee Satisfaction
KTC is a rewarding and enjoyable place to work. Employee retention is high, as is employee morale. KTC provides opportunities and support for all employees to continue learning and to grow professionally throughout their careers. Exceptional employee performance is recognized and rewarded. Employees are highly motivated and highly productive. Co-workers treat each other with courtesy and respect. The workforce includes a strong and increasing presence of minorities and women.

Implementation and Value of Research
Tools and processes have been put in place to promote, facilitate, and track the implementation of research results. Implementation is a priority for KTC and is accomplished through a team effort, involving practitioners, researchers, and technology transfer professionals. Implementation is considered from the earliest stages of each research project. The benefits resulting from the implementation of research findings are well-documented and well-disseminated. This information is used to promote the value of transportation research and technology transfer programs both within Kentucky and nationally.

The full version of the Vision can be found on our website at www.ktc.uky.edu/vision.html

DIRECTOR'S MESSAGE

Twenty-twelve was a successful and exciting year for the Kentucky Transportation Center. For the fiscal year ending June 30, 2012, we brought in $11.85 million in sponsored project awards, and our total program expenditures were $11.4 million, both of which were the highest in our 32-year history at the University of Kentucky. Our sponsored projects revenue ranked us as the number-one department in the College of Engineering (accounting for more than 40 percent of the College's total) and also ranked us number five on the entire University of Kentucky campus.

We continued to enjoy and appreciate our unique and close relationship with the Kentucky Transportation Cabinet, and we had the opportunity to work with new research sponsors, including the National Waterways Foundation, the Louisiana Transportation Research Center, and the West Virginia Department of Motor Vehicles.

Early in 2012, we received notice that our consortium with Marshall University (lead), the University of Louisville, and Hampton University had been selected as one of 12 Tier One University Transportation Centers through the federal UTC Program. This not only marked KTC's first entry as a significant player in the federal UTC Program, but it also provided us with a funding source to continue our expansion into multimodal transportation, freight and logistics, and inland waterways. Through the efforts of Dr. Reg Souleyrette and Dr. Jerry Rose in Civil Engineering, we were also part of another consortium selected for funding. That consortium is focused on rail transportation and led by the University of Illinois.

The UTCs selected in early 2012 were only promised one year of funding. However, we received word in the summer that a second year of funding would be provided as well. Then, in December, it was announced that the program would be re-competed in 2013, using the new rules established by Congress in the transportation reauthorization bill known as MAP-21. Like most University Transportation Centers across the U.S., we are actively preparing our strategies and our responses for the re-competition.

In the midst of these new developments, we continued to carry out research, technology transfer, and educational activities across the broad spectrum of transportation issues. We continue to strive to address all facets and all modes of transportation, and to truly be THE Kentucky Transportation Center. We are proud of what we accomplished in 2012, and we are excited about the opportunities that await us in 2013 and beyond.

Joe Crabtree, Ph.D., P.E.

BRIDGE PRESERVATION
Ted Hopwood, Program Manager

INSPECTION OF STRANDS AND DECK ANCHORAGES OF THE US 231 WILLIAM H. NATCHER BRIDGE

Shortly after the US 231 William H. Natcher Bridge was completed in 2002, cracks were detected in the plastic piping of the 92 stay cables that contain the strands that support the bridge. A concern arose when a follow-on inspection revealed the presence of water inside several cracked cables. Water can contact the strands and cause them to corrode, weakening the bridge and reducing the anticipated lives of the stay cables. KTC Bridge Preservation Section personnel conducted several investigations from 2007 to 2011 to scope the extent of the problem. During that period, the number of stay cables with cracked piping increased. Nearly every cable had cracks in the transition piping, connecting the stay pipes to the anchorages either at the decks or at the towers.

Bridge Preservation Personnel developed a long-term inspection plan consisting of several follow-on phases to address the problem. Phase I is intended to evaluate the deck anchorages to assess their condition and determine any damage, such as strand corrosion, occurring at the locations. Phase IA, conducted in 2012 and 2013, consisted of consultant inspections at the deck anchor blocks. Siva Corrosion Services conducted field and laboratory corrosion assessments on all 92 stay cable deck anchorages including collection and analysis of water entrained inside the cable piping. KPFF Consultants Inc. performed ultrasonic testing of the strands at the anchorages to detect any broken wires or possible wire damage due to corrosion at inaccessible locations inside the cable anchorages.

Cracks in the stay cable piping prompted the work.

KTC supervised the field work and reviewed resulting reports from the consultants. Those documents have been provided to the Kentucky Transportation Cabinet for review and comments. In spring 2013, KTC will conduct follow-on investigations of cracked piping at deck level. They will conduct various nondestructive evaluations of the cables, both externally and internally. Late in 2013, the results of the work will be evaluated and in-depth material analyses will be planned for Phase II work.

KPFF personnel performed ultrasonic testing of the strands at the deck anchorages to look for broken wires.

CURRENT RESEARCH PROJECTS

1. Preventive Maintenance for Bridges
2. Thin Film Concrete Coatings
3. Investigation of Stay Cable Piping of the US 231 Natcher Bridge
4. Experimental Bridge Maintenance Painting on I 275
5. Deck Sealing on I 471
6. Evaluation of Weld Cracking on the I 65 JFK Bridge

CONSTRUCTION MANAGEMENT
Timothy Taylor, Program Manager

CHANGE ORDERS AND LESSONS LEARNED: KNOWLEDGE FROM STATISTICAL ANALYSES OF ENGINEERING CHANGE ORDERS ON KENTUCKY HIGHWAY PROJECTS

Although change orders occur on many construction projects, many can be avoided through improved project planning and scoping. From 2005-2008, statistical analyses of change orders on 610 Kentucky roadway construction projects examined how the causes of change orders varied for construction versus maintenance projects, road type, and construction type. The research examined the risk posed by engineering change orders by measuring the frequency and average percentage change in project costs for different types of change orders.

The leading causes of change orders within the state consistently included contract omissions, owner-induced enhancements, and contract item overrun. Evidence proves that improved front-end planning can help to avoid many high-risk change orders on roadway construction projects. However, avoidance of other change orders, such as fuel and asphalt price adjustments, are more challenging due to the rapidly changing market conditions. The results show distinctive trends that are useful for constructability reviews on future projects, and identify the need for new directions in front-end planning and project scoping to minimize change orders on highway projects. More information can be found in the on-line report available at http://www.ktc.uky.edu/projects/change-orders-and-lessons-learned/.

CURRENT RESEARCH PROJECTS

1. Contractor Evaluations in the Contractor Selection Process
2. Contract Time Determination
3. Forecasting Construction Staffing Needs on Future Projects
4. Methods to Expedite and Streamline Utility Relocations for Road Projects
5. Project Planning and Scoping to Improve the Execution of Highway Projects

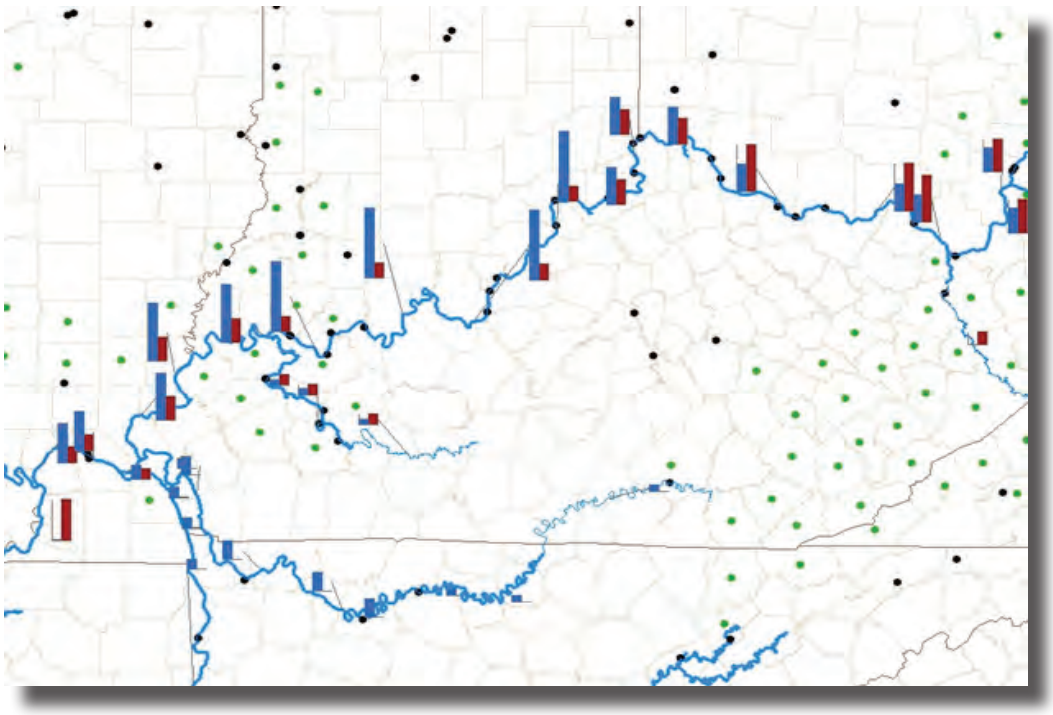
DECISION SUPPORT SYSTEMS
Ted Grossardt, Program Manager

INTEGRATED FREIGHT NETWORK MODEL

The Intermodal Freight Network Model uses Geographic Information Systems (GIS) to demonstrate the flows of commodities along the highways, railroads, and waterways of Kentucky and the surrounding region. Using data obtained from the U.S. Energy Information Administration, the model captures all shipments of coal from origin (county of coal mine) to destination (power plant), including the mode of transportation used and the route taken. Modeling of the coal movement data enables the volumes of the combined shipments to be tabulated for each section of the network. Mapping visualizations created from the model demonstrate which corridors along the network are most heavily utilized for coal shipments. It subsequently reveals which segments of the network are most vital to the nation's energy sector. Additionally, the model is able to predict how shipments of coal may be altered on the network according to changes in the system, such as a temporary river lock closure, low water, or other disruptions.

CURRENT RESEARCH PROJECTS

1. Archeological Predictive Modeling
2. Assessing the Economic Impact of America's Inland Waterways
3. Assessing the Future of Transit for West Virginia
4. Historic Truss Bridge Rehabilitation
5. Transportation Systems Management Education Program
6. Use of Simulators for Inland Waterways Education and Training
7. Workforce Needs for the Inland Waterways



Volume of Coal Shipped Up (blue) and Down (red) Kentucky's Inland Waterways.
Green Dots are Coal Producing Counties. Black Dots are Coal-Burning Power Plants.

FREIGHT & LOGISTICS
Doug Kreis, Program Manager

INLAND PORT SUSTAINABILITY PROJECT

The evolution of the flow of goods, technology, and information has transformed the port industry. In recent decades, the intensity of activity at US ports has escalated as the rate at which imports and exports move through them has increased. This rapid expansion in trade and freight movement poses opportunities and challenges to ports. While it is crucial to the future of national and international trade, the sustainability of inland ports remains an understudied aspect of the transportation network. While a number of studies have looked at the implementation of sustainable practices in the coastal port industry and the sustainability challenges facing coastal ports, researchers have neglected the implications of sustainability for inland waterways and ports.

The inland port sustainability project examines sustainability within the inland port industry and provides an audit template by which inland port operators can assess sustainability. As crucial steps in this process, a comprehensive literature review of port sustainability was compiled and researchers conducted a series of 13 site visits to coastal and inland ports along the U.S. East Coast and Gulf of Mexico. From these visits with operators, stakeholders, and key supply chain entities, a report on the state of inland port sustainability has been completed which determines the auditable sustainability characteristics of inland port operations and provides a self-assessment tool by which all inland ports can improve their sustainability. Moreover, the project also lays out the step-by-step process which successful coastal ports undertook when beginning the process of becoming sustainable and tailors that process to the inland port industry.

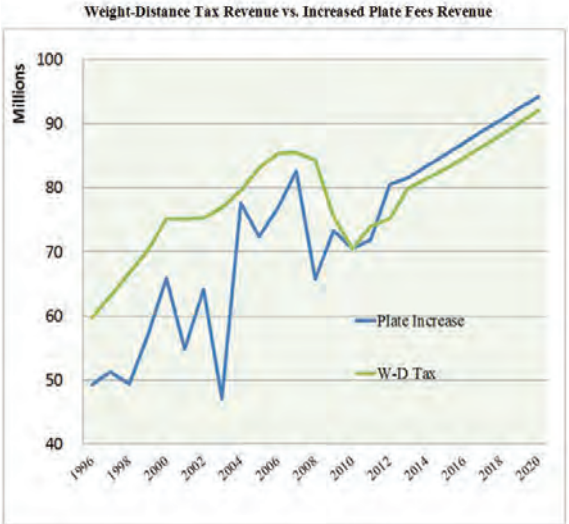
CURRENT RESEARCH PROJECTS

1. Inland Waterway Funding Mechanisms Assessment
2. Inland Waterway Predictive Model
3. Inland Waterway Port Sustainability
4. Certain Dangerous Cargo Analysis for the Inland Waterway System
5. 2013 Inland Waterway and Freight Rail Multi-Modal Transportation Symposium
6. Implementation Study of Temporary Flood Barriers
7. Fedtrak
8. Assessment of the Sufficiency of Kentucky's Road Fund

ITS & TRAFFIC MANAGEMENT
Jennifer Walton, Program Manager

THE MOTOR CARRIER TAX CONSOLIDATION STUDY

The Motor Carrier Tax Consolidation Study analyzed the tax and fee structure for Kentucky motor carriers and detailed a policy scenario for eliminating the weight-distance tax. The report analyzed detailed revenue and rate information for various motor carrier taxes and fees. Consolidation policies in Idaho and Ohio were reviewed, as well as a previous consolidation proposal in Kentucky. A new consolidation framework was developed, where the International Registration Plan (IRP) and intrastate plate fees were increased by 180 percent and the weight-distance tax was eliminated. Projections for weight-distance tax and IRP fees (both current and proposed) were compared to evaluate the revenue impact on the Road Fund. The below figure compares past weight-distance tax revenues, as well as future projections, with IRP revenues at the proposed rate of increase (280 percent). IRP revenues were manipulated by multiplying the revenue by 280 percent for past years, and linking them to future projections. For a large part of the time period, the IRP projections fall well below weight-distance tax revenue. However, this trend changes in the late 2000s, as gasoline usage begins to plateau and slower rates of economic growth slows the growth of W-D tax revenues. The result is slower projected growth for weight-distance tax revenues. In fiscal year (FY) 2010, the two revenue plots intersect, and IRP increases are projected to outpace weight-distance tax revenues by an average of $2.16 million per year from FY 2013 to FY 2020 under the proposed alternative fees. The revenue tradeoff should be roughly even, assuming the model assumptions hold true. However, it should be noted that intrastate carriers, interstate carriers with a high percentage of miles logged in Kentucky, and low-mileage carriers will likely see an increased tax/fee burden if the proposed policy change were enacted.



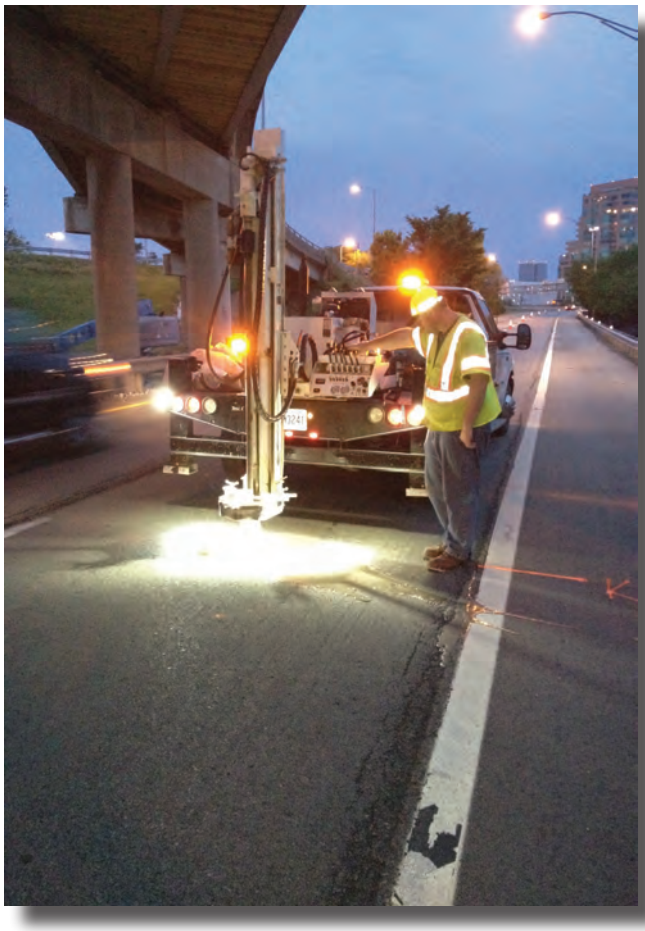
CURRENT RESEARCH PROJECTS

1. Coordinating the Use and Location of Weigh-in-Motion Technology
2. Implementation and Evaluation of a Virtual Weigh Station
3. Implementation of Three Ramp-Based Screening Systems at Kentucky Weigh Stations
4. PRISM and CVISN Administrative and Technical Support for KYTC
5. West Virginia Motor Carrier Services Consolidation Study

PAVEMENTS, MATERIALS & GEOTECH

Clark Graves, Program Manager

FORENSIC PAVEMENT EVALUATION: LOUISVILLE, SOUTHERN INDIANA, AND OHIO RIVER BRIDGE PROJECT



KTC conducted a forensic evaluation along the I-64 corridor in Jefferson County to provide the design-build contractors with information relating to the subsurface pavement conditions along the route, prior to their responding to the request for proposals. This information was used by the contractors to prepare Innovative Technical Concepts (ITC) for the pavement design structure. This information allowed the contractors to streamline potential designs along the roadway which could result in cost and/or time savings during the construction of the project. KTC provided Ground Penetrating Radar (GPR) data to verify pavement thicknesses and underlying subsurface conditions, pavement coring to review the conditions of the pavement layers, and Falling Weight Deflectometer (FWD) data to determine the strengths of the various pavement layers.

The evaluation indicated varying multiple pavement conditions present along the roadway. The pavement design included in the initial proposal was developed based on the worst-case scenario of removing and replacing the entire pavement structure over the entire length of the project. The results of the forensic analysis allowed the worst-case scenarios to be isolated and treated appropriately, with other more efficient designs using various rehabilitation strategies used along other sections of the roadway. These changes have the potential to save millions of dollars in pavement construction costs throughout the project.

CURRENT RESEARCH PROJECTS

1. Evaluation of Chip Seals for Low Volume Roads
2. Culvert and Storm Sewer Inspection Criteria
3. Performance of Subgrade Stabilization
4. Improvement of Longitudinal Joint Construction
5. Evaluation of Intelligent Compaction
6. Utilization of Geotextiles and Geogrids in Highway Construction
7. Improving Asphalt Pavement Durability
8. Evaluation of the use of LIDAR for Highway Applications
9. Design Guidelines for Mechanically Stabilized Earth Walls
10. Temperature Movement in Bridges

STRUCTURES
Issam Harik, Program Manager

REPAIR AND STRENGTHENING OF BRIDGES USING TRI-AXIAL CFRP FABRIC

The precast box beam girders located on the two-span bridge on KY100, over CSX Railroad and South Railroad Street, had developed cracks close to the pier and abutments. The cracks observed on the beams were mostly diagonal; however, some vertical and horizontal cracks were also present. In addition to the box beams, several concrete pedestals on the east abutment had cracks that exposed the reinforcing bars.

The retrofit consisted of filling the cracks with repair epoxy and strengthening the cracked locations with Tri-axial Carbon Fiber Reinforced Polymer (CFRP) fabric. The Tri-axial fabric was chosen because of the varying crack orientations observed on the beams. U-wraps of the CFRP fabric were applied along the beams, beyond the last observed crack. Horizontal strips were applied to the vertical faces of the beam, over the U-wraps, for added strength and to prevent any debonding. The cracked concrete pedestals were also retrofitted by wrapping them with the Tri-axial CFRP to provide strength and confinement. In order to prevent future cracking, the remaining uncracked concrete pedestals on the east abutment were also strengthened with CFRP fabric.

Application of CFRP fabric over the pier

Application of CFRP fabric at an abutment

CURRENT RESEARCH PROJECTS

1. Aluminum Bridge Deck Testing, Design, Deployment, and Monitoring
2. Bridge Deck Rapid Repair
3. Bridge Load Testing vs. Bridge Load Rating
4. Bridge Repair Using High Performance Materials
5. Effect of Thermal Loads on Bridge Substructures
6. GFRP Stay-in-Place Forms
7. Remote Monitoring of Bridge Piers for Barge Impact
8. Retrofit of AASHTO Girders Using High Strength Steel Wire Fabric
9. Stainless Steel Reinforcement for a Concrete Bridge Deck
10. Temperature Movement in Bridges

TECHNOLOGY TRANSFER
Martha Horseman, Program Manager

The Technology Transfer (T2) Program provides new and existing technology and research practices to transportation agencies across Kentucky. The program accomplishes this through the Roads Scholar and Road Master Training Programs and other specialized training courses, newsletters, how-to manuals, legislative and regulatory news, a lending library, and on-site technical assistance.

During 2012, the T2 training team conducted 222 workshops with over 6,300 participants. The Roads Scholar and Road Master Training Programs continueds to grow, with 158 Roads Scholars and 140 Road Masters completing the programs.

Work Zone Traffic Control participants

T2 conducted the Asphalt Certification Program, leading to the certification of 49 new technologists and requalification of 15 technologists. The Asphalt Field Technician Certification resulted in 105 individuals earning their certification. The Kentucky Erosion Prevention & Sediment Control (KEPSC) for Roadway Inspectors training resulted in 240 individuals earning their certification. The Pesticide Continuing Education classes were attended by 781 participants, and 218 participants were certified through the Training and Testing program. The Work Zone Employee Qualification Program qualified 413 flaggers, 293 technicians and 76 supervisors.

A free service provided to local governments is the Safety Circuit Rider Program, which uses crash data to locate high-incident sites along roadways and assists communities in finding low-cost roadway safety improvements. The Safety Circuit Rider works with local governments to remove fixed objects, such as trees, brush, stumps, etc., and to install signage per Manual on Uniform Traffic Control Devices (MUTCD) guidelines. This program is helping communities across the state of Kentucky save lives every day. The Safety Circuit Rider program is made possible through funding from the Federal Highway Administration in coordination with the Kentucky Transportation Cabinet.

Bourbon County's Brentsville Road before

Bourbon County's Brentsville Road after

T2 has made a great effort to expand the use of social media sites (Facebook and Twitter) to better reach our customers with immediate information such as regulatory news, new training courses, and press releases for local and state government activities. We continually update our website to make it more user-friendly. The number of visits to the website has continued to increase over the past year, and it has been viewed in over 70 countries. New informational fliers were developed for several programs, including Safety Circuit Rider, the Equipment Loan Program, and the Roads Scholar and Road Master Training Programs.

The Transportation Library serves state and local governments, the university, transportation professionals, and the general public, and is the only transportation library in Kentucky. The library has resources available for loan and access to transportation-related databases and internet resources for responding to information and research questions. The Online Video Lending Library is a free and user-friendly resource for individuals to find videos for safety meetings and training. The library also produces an eNewsletter and a Library@Work series, providing easy access to a wide range of transportation-related subjects. The library continues to expand their holdings with the addition of Transportation Research Board (TRB) and other national publications through an agreement with the Kentucky Transportation Cabinet.

HORIZONTAL CURVE

In the past five years, 17% of collisions with a fixed object occurred on a curve. It's important to have curves assessed and the correct advisory speed posted in order to prevent deadly crashes. Technology Transfer, in partnership with the Kentucky Transportation Cabinet, has developed the Horizontal Curve Alignment Signing training course to help improve crash numbers in the Commonwealth.

As a participant in the one-day course, individuals will be taught to assess curve speed with a ball bank indicator, record the data found, and install the correct signs including curve speed. Participants will learn how to find and use crash statistics. Individuals will be able to determine which curves need signage and the proper speed to post; this will aid in the reduction of crashes. Horizontal Curve Alignment Signing training is now an optional course for the Road Master Program.

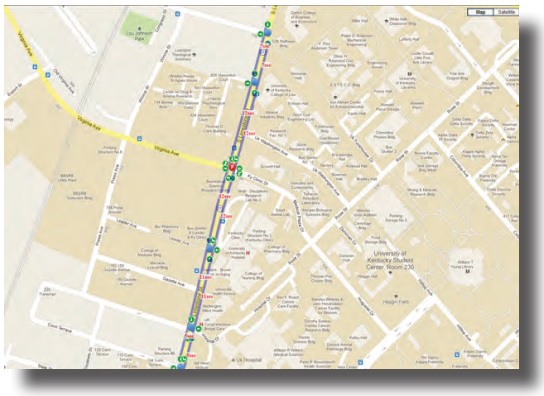
TRAFFIC & SAFETY
Jerry Pigman, Program Manager

EVALUATION OF ADAPTIVE TRAFFIC SIGNAL SYSTEMS

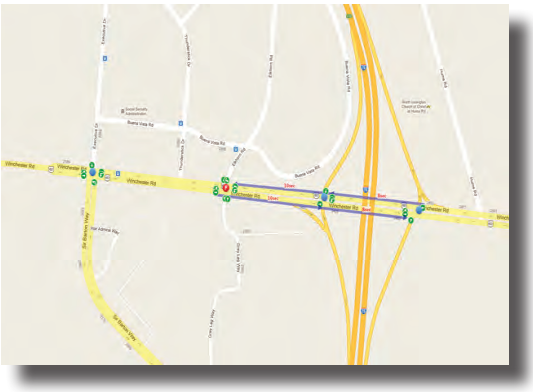
Traffic congestion is becoming an increasingly significant problem in many large and small cities across the commonwealth of Kentucky. The negative impacts of traffic congestion can affect economic productivity, environmental quality, and public safety. A challenge for transportation practitioners on a local and state level is managing and operating transportation systems with limited resources, which is further complicated by the need to deliver services in the face of growing travel demand and capacity limitations. The challenges of limited resources and growing travel demand have led to increased emphasis on successfully deploying cost-effective and practical arterial-based Adaptive Traffic Control Systems (ATCSs) to assist in reducing congestion, delays, fuel consumption and congestion-related crashes.

ATCSs have been promoted as one of the technologies with potential to ease congestion problems. ATCSs continuously detect vehicular traffic volume, compute "optimal" signal timings based on this detected volume, and simultaneously implement them. Adapting signal timing to these volume variations generally results in reduced delays, shorter queues, and decreased travel times.

The objective of this study is to perform a comprehensive evaluation of an Adaptive Traffic Control System deployed along Winchester Road and along South Limestone near the University of Kentucky. The Center will utilize hardware-in-the-loop micro-simulation to test and evaluate the ATCS under a wide range of conditions and develop guidance for ATCS deployments.



South Limestone ATCS Corridor



Winchester Road ATCS Corridor

CURRENT RESEARCH PROJECTS

1. Development of Safety Performance Functions
2. Crash Plug-ins for Desktop Apps
3. Signal Timing Needs and Training
4. Land Surveyor Training
5. Alternate Snowplow Procedures and Markers
6. Two-Lane Road Capacity
7. Transition Zone Design
8. ESAL Update and Forecasting
9. Crash Corridor Analysis

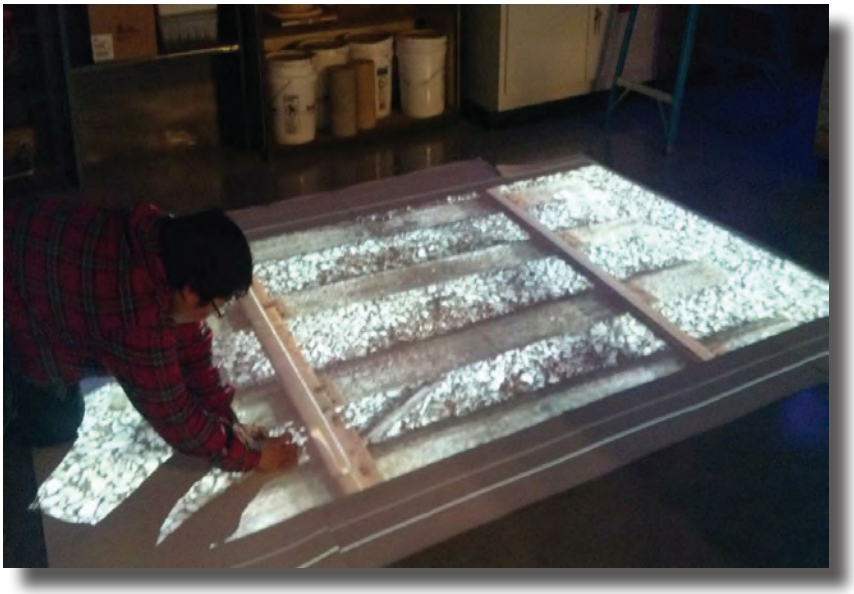
EDUCATION & PROFESSIONAL DEVELOPMENT
Reg Souleyrette, Program Manager

NATIONAL UNIVERSITY RAILROAD TRANSPORTATION CENTER (NURAIL)

The Kentucky Transportation Center (KTC) and the Kentucky Transportation Cabinet provided matching funds for the University of Kentucky's participation in NURail — a USDOT-designated University Transportation Center. NURail is led by the University of Illinois. Reg Souleyrette, Commonwealth Professor of Transportation Engineering, is Principal Investigator. Civil Engineering Professor and internationally known railroad expert Jerry Rose is serving as Co-Principal Investigator. Along with UK, NURail partners with five other colleges and universities including Massachusetts Institute of Technology, University of Tennessee - Knoxville, University of Illinois at Chicago, Michigan Technological University and Rose-Hulman Institute of Technology.

Three projects are highlighted in NURail that include three-dimensional analysis of rail grade crossing performance and safety, automated tie inspection, and in-situ sensing of tie ballast interaction. These projects feature application of advanced technologies such as structured light scanning, in collaboration with Electrical Engineering Professor Dan Lau, track simulation for training inspectors that is in collaboration with CSX's Sam Carter, and use of tactile sensors, in collaboration with Association of American Railroad's Transportation Technology Center Inc. to monitor micro-pressures.

Workforce development and capturing institutional memory and expertise is also a program focus, with international cooperation being a NURail priority. Dr. Peng Xu from Beijing Jiaotong University, Ph.D. students Alex Wang and Shushu Liu, and Master's students Brett Malloy, Mike McHenry, and Brittany Stewart are supported.



PhD student Alex Wang measures track gage
on the virtual inspection track.

FINANCIAL SNAPSHOT
FY2012 Expenditures*

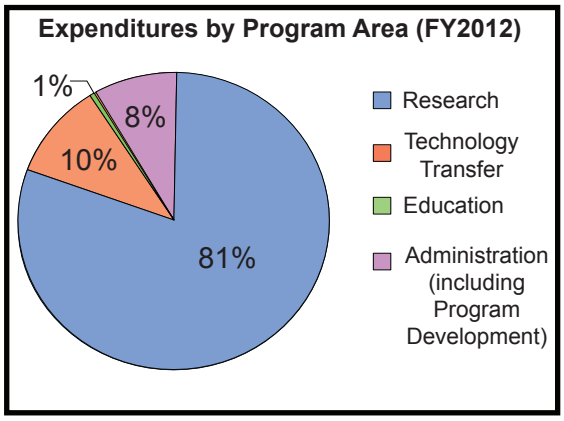
Expenses	Research **	Technology Transfer***	Education	Admin	Total Expenses
Personnel	4,450,000	540,000	50,000	790,000	$5,830,000
Operating****	2,500,000	660,000	8,000	65,000	$3,233,000
Equipment	270,000	11,000	0	0	$281,000
Indirect Costs	2,000,000	0	23,000	65,000	$2,088,000
Total Program	**$9,220,000**	**$1,211,000**	**$81,000**	**$920,000**	**$11,432,000**

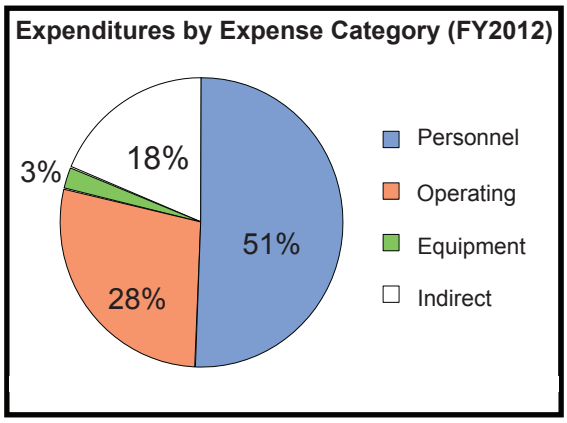
*Expenditure detail by subcategory of expense is available on request (859-257-5028).

**The research program for FY12 consisted of over 125 projects conducted for several agencies and organizations. Primary research sponsors included the Kentucky Transportation Cabinet, the Federal Highway Administration, the Federal Motor Carrier Safety Administration, and the US Department of Homeland Security. The center partnered with the University of Louisville, the University of Tennessee, the Asphalt Institute, and several other research organizations. Also, the Center began a unique partnership with the US Army Corps of Engineers focused on inland waterways. Near the end of FY12 the Center joined with Marshall University to become designated as a University Transportation Center consortium funded by USDOT's Research and Innovative Technology Administration.

***Technology Transfer includes workforce training and technical assistance.

****Includes subcontracts.





PROJECTS COMPLETED

Report Number	Title
KTC-12-2/FRT136-04-6F	"Railroad Subgrade Support and Performance Indicators," Michael T. McHenry, Jerry G. Rose, 2012
KTC-12-4/SPR380-09-1F	"Improving Intersection Design Practices," Nikiforos Stamatiadis, Adam Kirk, 2012
KTC-12-6/SPR413-10-1F	"Kentucky Department of Vehicle Regulation Internet Applications Study," Andrew Martin, Jennifer Walton, 2012
KTC-12-9/FR1254-03-1F	"Development and Deployment of Aluminum Bridge Decks," Ching Chiaw Choo, Abheetha Peiris, Issam Harik, 2012
KTC-12-10/KSPI-11-1F	"2012 Safety Belt Usage Survey in Kentucky," Kenneth R Agent, Eric R. Green, 2012
KTC-12-11/KSP1-11-2F	"Kentucky Safety Belt Methodology," Kenneth R. Agent, Eric R. Green, Ronald Langley, 2012
KTC-12-12/KSP4-12-1F	"2012 Attitudes and Awareness Survey," Kenneth R. Agent, Eric R. Green, 2012
KTC-12-13/KSP2-11-1F	"Analysis of Traffic Crash Data," Eric R. Green, Kenneth R. Agent, Jerry G. Pigman, 2012
KTC-12-14/SPR448-11-1F	"Temporary Flood Barriers," Sarah M. McCormack, Chris Van Dyke, Ashley Suazo, Doug Kreis, 2012
KTC-12-17/FRT190-11-1I	"Tools for Applying Constructability Concepts to Project Development - Interim Report," Nikiforos Stamatiadis, Paul Goodrum, Chen Wang, Emily Shocklee, 2012
KTC-12-18/SPR434-12-1F	"Motor Carriers Tax Consolidation Study," Andrew Martin, Mark Bell, Jennifer Walton, 2012

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