

RAHALL TRANSPORTATION INSTITUTE



EDUCATION



RESEARCH



TECHNOLOGY
TRANSFER

PART A

“Intermodal Transportation and Economic Development in the Appalachian Region”

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The Nick J. Rahall, II Appalachian Transportation Institute (RTI) is a University Transportation Center funded by the U.S. Department of Transportation's Research and Innovative Technology Administration (RITA).

This publication is an annual report of RTI's transportation education, research and technology transfer activities for July 1, 2008 through June 30, 2009.

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DIRECTOR'S MESSAGE

Rebuilding and redesigning our aging infrastructure will require an integrated approach through research, technology, education and workforce development. Our staff has established a solid reputation for expertise, quality, service and reliability. Our growing network of partners - public agencies, nonprofit organizations and corporate entities - are working with us to develop practical but inventive solutions. And while our work may seem regional in scope, the outcomes have global implications.



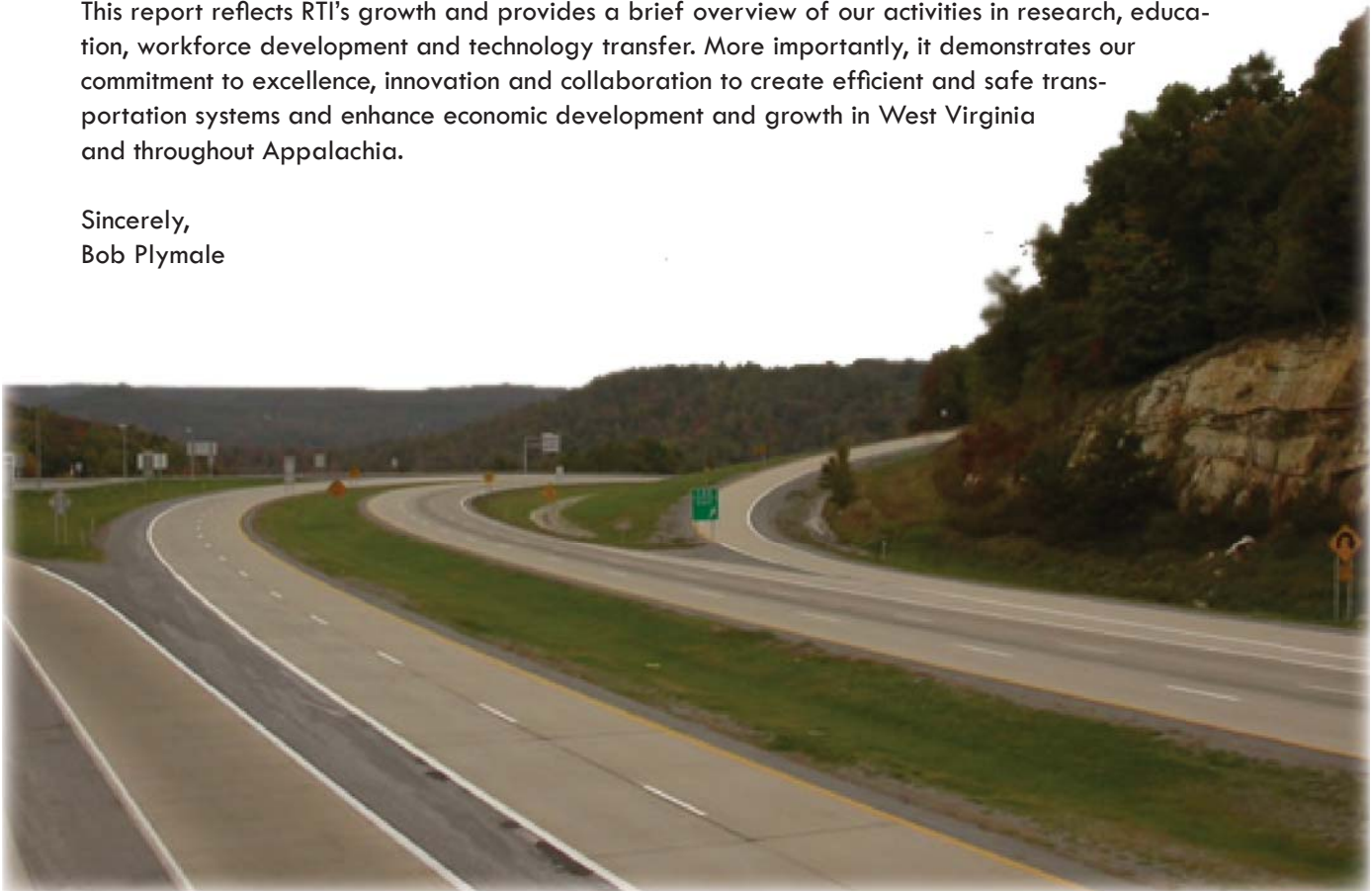
Located in the heart of Appalachia, RTI understands the unique challenges facing transportation in rural, mountainous regions.

Since our inception nearly 10 years ago, RTI has evolved into a multi-modal research institute with an increasing emphasis on Intelligent Transportation Systems, and customized web-based Geographic Information Systems. Additionally, research conducted at RTI has led to two patents and significant contributions to the transportation industry.

In addition to research, RTI is fully engaged with the educational community to address the critical shortage of transportation professionals. The restoration of the four-year, undergraduate engineering program at Marshall University has led to a close working relationship with the College of Information Technology and Engineering (CITE) and the College of Science. Our collaborative efforts include new courses in transportation, shared faculty, experiential learning opportunities for undergraduate and graduate students, and K-12 programs to introduce younger children to the transportation industry.

This report reflects RTI's growth and provides a brief overview of our activities in research, education, workforce development and technology transfer. More importantly, it demonstrates our commitment to excellence, innovation and collaboration to create efficient and safe transportation systems and enhance economic development and growth in West Virginia and throughout Appalachia.

Sincerely,
Bob Plymale



CENTER THEME

The Nick J. Rahall, II Appalachian Transportation Institute's (RTI) center theme is "Intermodal Transportation and Economic Development in the Appalachian Region."

The dispersed population and terrain in West Virginia, and the other 12 states in the Appalachian region, make planning, construction and maintenance of an efficient and safe transportation infrastructure a significant economic and technical challenge. West Virginia's abundant natural resources are geographically and economically land-locked, and the current reliance on coal has been challenged by increased regulation and social and economic uncertainties.

RTI is a national center for technical expertise related to intermodal transportation in the Appalachian region. RTI performs site-specific research to support intermodal planning and analysis to improve mobility and global connectivity in the Appalachian region. RTI focuses on developing transportation technologies, particularly Intelligent Transportation Systems, and customized web-based Geographic Information Systems.

RTI's strategic plan for 2007-2011 titled "Intermodal Transportation and Economic Development in the Appalachian Region" guides RTI's work as a National University Transportation Center and addresses United States Department of Transportation strategic objectives for surface transportation research in the United States.

West Virginia is the only state entirely encompassed within the Appalachian Region, a 200,000-square-mile area that follows the spine of the Appalachian Mountains from southern New York to northern Mississippi.

Headquartered in Huntington, W.Va., RTI is located in the center of the 13-state region. This location provides easy access to the Port of Huntington, the largest inland river port in the nation (and 4th largest overall), and to the Ohio and Great Kanawha rivers. The location is also in close proximity to current and planned major highway systems, including the Heartland Corridor; the intersection of two major rail lines

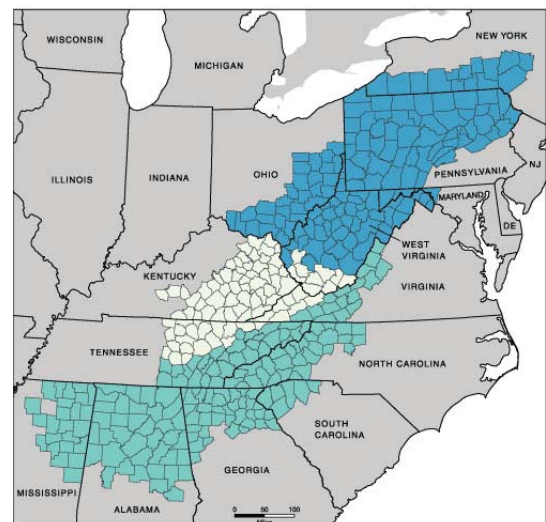
(CSX and Norfolk Southern); and a number of intermodal facilities, both rail/river and rail/highway. The Port infrastructure, combined with several assets nearby (some under development), places RTI in close proximity to one of the most unique combination of living laboratories for site-specific intermodal transportation research in America.

Intermodal transportation is broadly defined as more than one form of transportation, within the same mode or between different modes.

In 2000, Kenneth R. Wykle, Administrator of the Federal Highway Administration (FHWA), said:

"I think all of the elements for a great intermodal system and program are right here in Appalachia." He encouraged broadening the transportation vision, "Certainly in this particular area, rail is much more important.... primarily because of coal..... but inland water transport is also important."

He provided data illustrating that 11 percent of the total freight flows in the entire nation are within the Appalachian region.



This theme not only supports the national strategy for surface transportation research by specifically addressing the United States Department of Transportation (USDOT) strategic objectives of “mobility” and “global connectivity” for a critical region of our nation, but also addresses the remaining strategic objectives of USDOT through crosscutting mechanisms.

One objective at RTI is to advance the body of knowledge that is needed to help create, maintain and secure: the safest, most environmentally conscious, and most cost efficient intermodal transportation system for the Appalachian Region. RTI is ideally positioned to address the USDOT Strategic Objectives for the Appalachian region thematically through the human resources and partnerships previously developed and physically through proximity to “national critical” transportation assets.

The authorization of a SAFE-TEA-LU University Transportation Center (UTC) has empowered RTI with the resources to build a comprehensive, broadly based, multidisciplinary research, education and technology transfer program focused upon this region’s unique intermodal transportation and intermodal transportation-related economic development challenges.

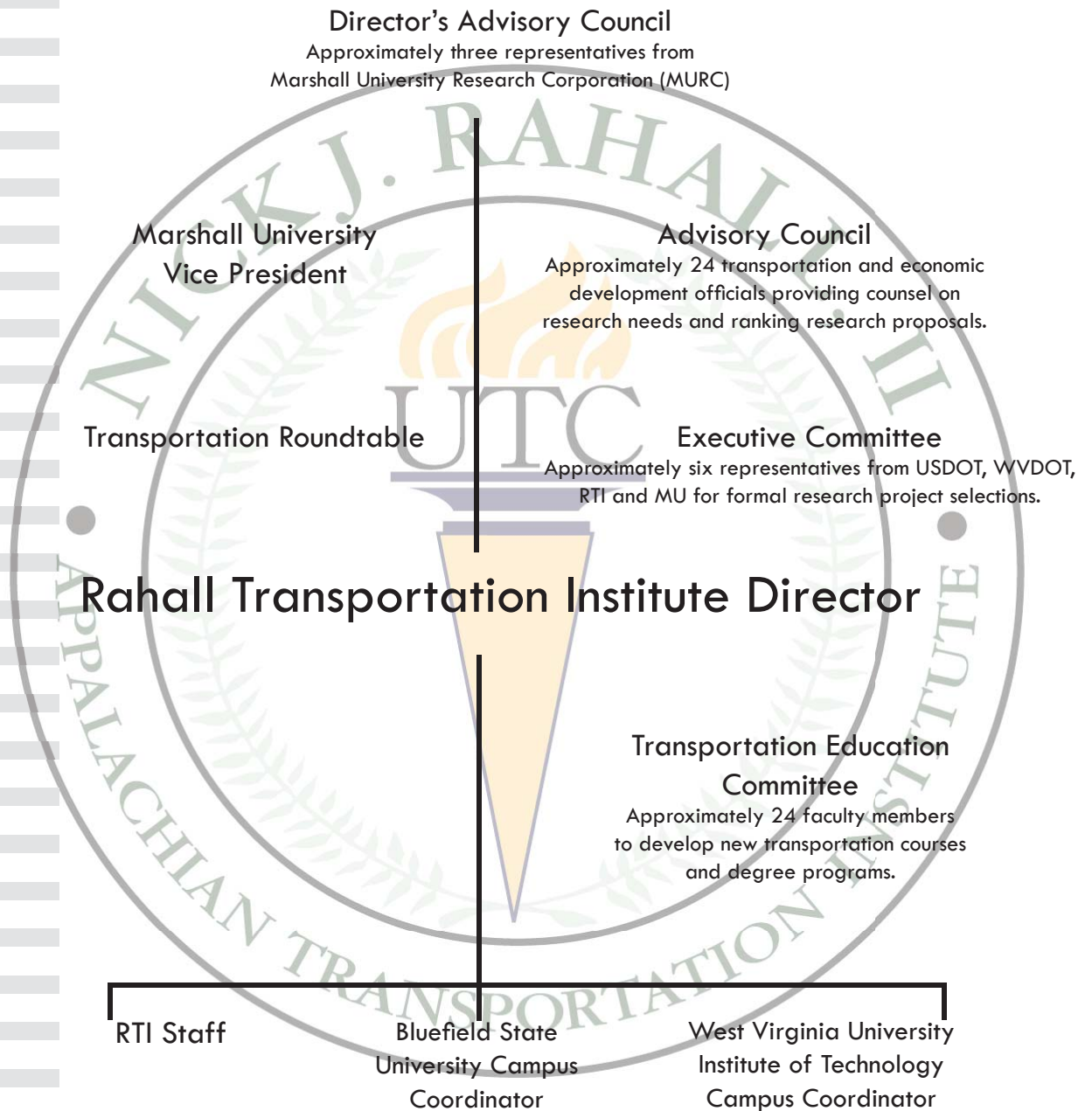
The Institute performs site-specific research in the Appalachian region that can support intermodal planning and analysis to help improve the mobility and global connectivity for the region. In order to help accomplish this objective, RTI assumed a leadership role in the development and deployment of transportation technologies. These include Intelligent Transportation Systems (ITS) and their application to highways, public transit, railways and inland waterways. New information/data collection and management tools will be developed through the customization of web-based Geographical Information Systems (GIS) for the region. These site-specific studies will include

advanced, basic and applied research projects that can contribute to:

- 1) Technologies to increase the number of efficient transportation modes for freight including rail and the inland waterways in addition to improving the in transit visibility (ITV) of the critical commodities in the region;
- 2) Accurate and comprehensive inventories of the physical and non-physical assets, their security and incident response parameters in addition to their capacities for, and challenges to, increasing intermodal transportation efficiencies for freight and passengers;
- 3) Identification of locations and types of intermodal transportation investments needed to allow coal, other natural resources and industries to improve their capability to compete in the global market place.
- 4) Reduced planning, design, construction and maintenance cost in addition to improving safety and minimization of environmental impacts for the various surface transportation modes while ensuring opportunities for concurrent infra- and info- structure development during new road construction are realized;
- 5) An enhanced trail/scenic byway system that will support continued growth of the emerging tourism industry; and,
- 6) Improved access to healthcare (non-emergency), work and education for the public through transit and a better equipped first responder community.

RTI intends to be a national center for technical expertise related to intermodal transportation in the Appalachian region and similar mountainous and rural areas. While the programmatic activities of RTI primarily focus on Appalachia, research projects and other types of activities outside the region may also be undertaken as opportunities arise.

MANAGEMENT STRUCTURE



KEY STAFF

Robert H. “Bob” Plymale, CEO, Executive Director

As CEO and director of the Rahall Transportation Institute (RTI), Bob Plymale leads a dynamic team of business, academic and research professionals working to enhance safety and economic development opportunities through transportation. Under his leadership, RTI has received two US patents, developed the National Maritime Enhancement Institute at RTI, and produced the award winning Electronic Commercial Drivers Licensing (eCDL) program.

In addition to managing the day-to-day operations at RTI, Plymale is a highly effective and well-regarded public servant. He is currently serving his fifth term in the WV State Senate, District 5. He is chairman of the Senate Education Committee and serves on the Budget Conferees, Rules, Finance, Pensions, Confirmations, and Transportation and Infrastructure committees respectively.

In 2003, Plymale was appointed by Governor Wise to the Board of Control for the Southern Regional Education Board. He was reappointed by Governor Joe Manchin in 2006 and now serves on the executive committee. In 2004, Plymale was named to the National Council of State Governments (NCSL) National Task Force on “No Child Left Behind” and from 2005-2006, he was Chairman of the NCSL Education Committee and Blue Ribbon Commission on Higher Education. He is also President of the Council of University Transportation Centers.

He is the recipient of the Presidential Citation from Glenville State College, a Distinguished Service Award from the West Virginia Athletic Directors Association, and the Michael Prestera Award of Excellence in recognition of his efforts to improve the lives of individuals living with behavioral health issues. In 2005, Plymale received the Distinguished Service to the Community Award from Marshall University. More recently, he was named co-President of the Keith Albee Theater Performing Arts Center, Inc., and has been instrumental in reviving and maintaining this Huntington landmark as a performing arts and community center.

Plymale is a graduate of Marshall University.

Richard Begley, Ph.D., Director of Research, COO

Dr. Richard Begley is director of research and COO at the Rahall Transportation Institute (RTI). Under his direction, RTI established the Transportation and Economic Development System (TEDIS), the National Maritime Enhancement Institute, and a railroad safety research project, which produced the best academic research paper award at the 2005 International Conference on Railroad Engineering. His research has resulted in two US patents, one of which produced the first royalty stream for Marshall University.

Begley has authored and co-authored numerous publications and peer reviewed research documents. He received his Ph.D. and Master’s degree from West Virginia University and a Bachelor of Science in Mining Engineering Technology from West Virginia Institute of Technology. He received the Marshall University Distinguished Artists and Scholars Award (Team) in 2003.

A tenured full professor in engineering, Begley previously served as the assistant dean for special projects and outreach for the Marshall University Graduate School for Information Technology and Engineering and chairman of the Marshall University engineering department. His experience includes more than 15 years in higher education, consulting and research project management.

RTI HEADQUARTERS STAFF

Kim Baker, B.S., C.P.M.
Administrative Operations Officer

Andrew Gooding, M.A.
Research and Technical Writer

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Research Associate

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Technology Transfer Specialist

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Research Associate - GIS

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Barbara Roberts, M.A.
Program Coordinator

Jeremy Boykin, M.S.
Research Associate - GIS

Errin Jewell, M.A.
Public Affairs and DTP Specialist

(Ret.) Col. Dana Robertson, M.S.
Director of Maritime Enhancement
Institute

Amy Blankenship, M.S.
Research Associate

Sandra Jones
Administrative Secretary

Brianne Salmons, B.A.
Project Management Specialist

Brad Cains, B.S.
Research Associate - GIS

Curtis Jones, M.S.
Research Associate

Alejandro Sanchez-Badillo, M.S.
Research Associate - FRA

E. David Cartwright, M.S.
Research Associate – Engineering

David B. Lawson, MS
Chief Information Officer

Gael Setliff
Office Administrator

Junwook Chi, Ph.D.
Transportation Economist

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Kent Sowards, M.B.A.
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Jordan Cox
Trails Specialist

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Research Associate - GIS

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Sanghong Yoo, M.S., M.S.E.
Research Associate – GIS

Peter J. Dailey, M.S.
Research Associate - FRA

Diana Long, Ed.D.
Transportation Workforce Coordinator

David Paul Young Jr., B.S.
Information Technology Consultant

Linda Delaney, A.S.
Operations Specialist

Sara Mullen, B.S.
Director of Marketing, Communications
and Strategic Planning

Wael Zatar, Ph.D.
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Greg Dudding, B.S.
Research Associate - GIS

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EDUCATION

HIGHER EDUCATION

RTI's efforts in higher education focus on creating and supporting a multidisciplinary program through undergraduate, graduate and continuing education coursework and experiential learning that reinforces the transportation theme of the Institute and represents the uniqueness of Appalachia. RTI also seeks to increase the number of students, faculty and staff who are substantially involved in higher-level and professional education programs at Marshall University.

Through RTI's higher education efforts, new transportation-related courses, minors and degree programs have been created at Marshall Community and Technical College, Marshall University and Marshall University Graduate College. Instructional content is geared to prepare students to support transportation systems in Appalachia and the United States.

Faculty from programs in Business, Engineering, Environmental Science, Geography, Geology and Physics have assisted in the additions to the transportation college course baseline in addition to contributing to a successful continuing education program reaching more than 1000 transportation professionals each year.

A partnership between RTI and Marshall University's College of Information Technology and Engineering (CITE) resulted in a new degree emphasis in Transportation Systems and Technologies. Technology Management combines concepts and methods from management, business, science and engineering with a specific technology emphasis to address organizational needs. Through CITE, an Engineering undergraduate degree is now available on the Marshall University (MU) campus in addition to new areas of emphasis in transportation for two advanced degrees. The RTI grant attracts students to the degree programs by funding student employment and experiential learning opportunities at RTI, while supporting faculty development of new courses.

A partnership between RTI and the Marshall University Lewis College of Business (LCOB) also created a new emphasis in Transportation and Logistics for the Master's Degree in Business Administration.

Undergraduate courses that have been created, expanded or enhanced by RTI staff include:

- The reestablishment of an undergraduate degree in Engineering at Marshall University
- Nine upper-division undergraduate marketing courses
- Six undergraduate safety courses (five of which are

upper division)

- Two online, upper-division parks and leisure services/Off-Highway Vehicle Management (OHV) undergraduate/graduate courses
- Two additional online OHV courses are under development. Completion of the four courses earns a minor in OHV Management.
- Ten graduate safety courses

Two master's degree emphasis areas at Marshall University were developed through RTI:

- A Master of Science in Technology management with Emphasis in Transportation Systems and Technologies
- Master of Business Administration with an Emphasis in Transportation and Logistics (Accelerated Executive Program)

RTI awards a limited number of Graduate Research Assistantships (GRA) to full-time students pursuing the Transportation Systems and Technologies and Transportation and Logistics programs. GRAs provide a tuition waiver and a stipend to fully-admitted students who meet eligibility criteria. These students also work for RTI principal investigators gaining valuable, hands-on experiences and learning about transportation-related economic development challenges in the Appalachian region and other rural regions of the United States. RTI also financially supports additional students through graduate assistantships, internships and undergraduate hourly stipends. Students work with faculty to complete research, education and technology transfer projects. Faculty employed in the advanced degree programs will potentially be participating in transportation research or technology transfer projects that offer continuous opportunities to recruit students for relevant part time employment.

Partner school relationships will also continue to be utilized to recruit graduate students to the advanced transportation degrees developed at Marshall University as a result of the UTC grant. The RTI Director and Director of Research will also continue to work with the appropriate student recruitment entities at the University to help develop a recruitment and marketing strategy in addition to specific activities such as summer transportation camps for future college students to help recruit students for the undergraduate transportation programs at the University.

- Faculty employed in the advanced degree programs will potentially be participating in transportation research or technology transfer projects that offer continuous opportunities to recruit students for relevant part time employment.

HIGHER EDUCATION HIGHLIGHTS

Dr. Andrew Nichols Emphasizes the Role of Environments in Fostering Effective Critical Thinking (Effects) at Transportation Education Conference



On June 20, 2009, Dr. Andrew Nichols, research associate, presented “Environments For Fostering Effective Critical Thinking (Effects)” to Transportation Education Conference attendees at Portland State University, Portland, Oregon. His academic and research interests include traffic signal control, real-time simulation applications, intelligent transportation system technology evaluation, weigh-in-motion, truck weight enforcement, and animal-vehicle interactions.

The purpose of the three-day program was to: learn the latest ideas in transportation engineering education; address three important questions to help instructors improve how they deliver transportation engineering education; and learn how to improve their teaching skills. Questions considered were: how to map the learning domain for transportation engineering; how to create active learning environments for undergraduate transportation engineering students; and how to develop collaborative tools for sharing transportation engineering curricular materials.

Given needs in both workforce and academia, there is a need and an opportunity to bring together university faculty and transportation professionals to focus on the undergraduate transportation engineering program and to identify ways in which it can be collectively improved.

Dr. Wael Zatar Receives 2009 Young Educator Achievement Award

Research Associate Dr. Wael Zatar was honored by the Precast/Prestressed Concrete Institute (PCI) with the Young Educator Achievement Award in April 2009.

This award acknowledges one distinguished, young educator in the fields of engineering, architecture, and construction technology who has made significant contributions to the precast/prestressed concrete industry. Nominees are evaluated based on their academic career achievements, rather than a onetime recognition. Tenure-track and tenured faculty members at all ranks in engineering, construction and architectural programs are eligible for the award.



The Precast/Prestressed Concrete Institute (PCI) is a professional organization for engineers, producers, suppliers, architects, researchers, and professors. The PCI professional members guide the Institute’s efforts in product innovation, new technology adaptation, design methods development, training, and quality assurance. As the world’s largest organization in the field of precast and prestressed concrete, the PCI is dedicated to fostering greater understanding of the design and use of infrastructures. It utilizes one of the leading edge technologies of the North American sustainable construction Industry. The PCI is composed of more than 1400 members striving to improve the quality, economy and innovation of the construction industry by establishing new levels of design and engineering.

HIGHER EDUCATION HIGHLIGHTS

Marshall University Society of American Military Engineers (SAME) Premiere Winter Technical Conference

On January 29, 2009, Marshall University's student chapter of the Society of American Military Engineers (SAME) hosted its Premiere Winter Technical Conference. The event was made possible by RTI and the West Virginia Division of Highways. More than 100 professional engineers attended the educational conference during which they could earn up to six professional development hours.

Marshall University President Stephen J. Kopp along with Betsy Dulin, dean of the College of Information Technology and Engineering, welcomed the local engineering community to campus with opening remarks. Engineering students had the opportunity to observe eight professional presentations and interact with the speakers.

The six local presenters included: Tom Smith of the Federal Highway Administration discussing the future direction of the nation's transportation program; Mark Hammond, a technical specialist in Plan Formulation/Economics with the Army Corps of Engineers, discussing the Ohio River Mainstem System Study, Draft System Investment Plan; Paul Mattox, Jr., Secretary of Transportation and Commissioner of the West Virginia Division of Highways, discussing the agency's 2009 program; Donald Williams, director of Research and Special Studies, Program Planning and Administration Division, WVDOH, presenting "Challenges in Transportation – Building and Maintaining Highways in West Virginia". Peter J. Dailey, research associate with the Nick J. Rahall II Transportation Institute, presenting "Automatic Classification Yard Surveying with GNSS During Revenue Operations"; and Wael A. Zatar, professor with the Nick J. Rahall II Transportation Institute, College of Information Technology and Engineering, Marshall University, presenting "Sustainable Structures with Fiber Reinforced Polymer Composites - Innovations and Applications."

The two national content experts were Jeff Russell, chair of Civil and Environmental Engineering, University of Wisconsin, presenting "Body of Knowledge: Preparing Civil Engineers for the Challenges of the 21st Century"; and Hany J. Farran, professor of structural engineering, California State Polytechnic University, Pomona, Calif., presenting "Long-Span Suspension Bridges and Cable-Stayed Bridges: The State-of-the-Art."

First GIS Student Competition Recognizes Students Work



RTI's first Student GIS Project Competition challenged Marshall University undergraduate and graduate students to demonstrate the development and use of Geographic Information Science and Technology in their fields of study and the community in May 2009.

Won Hwang received the first place award for his project, "Urban Heat: The Effect of Vegetation on its Surrounding Areas." As winner, Hwang was awarded \$500 and a certificate.

Chad Pyles received the second place award of \$300 and a certificate for his project, "A Spatial Analysis of the Relationship between Alcohol Retailers and Violent Crime in Huntington." Four graduate and two undergraduate students who were Geography, Integrated Science and Technology or Technology Management majors, entered the competition.

The winning project was based on the following criteria:

- The project makes significant contribution to advance new theories and methods of Geographic Information Science and Technology.
- The project demonstrates excellence and innovation in applying theories and methods of Geographic Information Science and Technology.

PARTNER SCHOOL HIGHLIGHTS

CART at Bluefield State University Receives “Innovation Award” at Southwestern Virginia Technology Council’s Annual Awards Banquet

By developing a “smart system” that anticipates failures and pinpoints problem locations within a conveyor belt system, Fenner Dunlop and the Center for Applied Research & Technology (CART) @ Bluefield State University were named recipients of the “Innovation Award” at the recent Southwestern Virginia Technology Council’s (SWVTC) 10th annual gala, tech expo and awards ceremony. Lyn McDermid, Senior VP and Chief Information Officer for Dominion Resources, was the featured speaker at this year’s program hosted by Virginia Highlands Community College.



CART and Fenner Dunlop have collaborated for several months at their location in the Bluestone Business and Technology Park to develop the smart conveyor belt system. The technology permits belt operators to plan repairs rather than just react to failures, saving business owners a substantial amount of money by preventing unscheduled downtime due to unanticipated belt breakage. “Conveyor belt systems are primarily utilized in this region by the coal industry,” explained Bruce Mutter, CART CEO. “A single broken belt can result in a production loss of more than \$250,000 per day.”

At the Bluestone Business and Technology Park, Fenner Dunlop and CART are working together on the product manufacturing process and they anticipate the start of production later this summer. Fenner Dunlop has received approximately 50 orders prior to product completion, and a full scale belt is in place at their facility, while the technology continues to be refined and augmented on a daily basis. In accepting the award on behalf of Fenner Dunlop, their Bluefield, Virginia research team, and CART, Mutter and Mick Twigger, Senior Electrical Engineer, Fenner Dunlop, thanked the SWVTC and Tazewell County officials Sam Wolford and Jim Spencer.

“There is abundant literature suggesting that southwestern Virginia and southern West Virginia are difficult regions from which to create technology innovations,” Mutter said. “However, our specific experience proves positively different. We think the uncommon decency, pride, diversity, resourcefulness, adaptability, persistence, resilience, and good common sense of our people has been an excellent foundation for developing quality technology products.”

The Southwestern Virginia Technology Council was organized in 1999 and exists to lead the region’s residents in addressing technology issues for business, education, and government with the purpose of enhancing the vitality and social well-being of Southwestern Virginia.

PARTNER SCHOOL HIGHLIGHTS

Bluefield State University Student Team Finishes Third, Overall in World During 2009 Intelligent Ground Vehicle Competition

“Anassa V,” an autonomous ground vehicle developed, designed, programmed and created by Bluefield State University students, contended for another world championship and finished third, overall, during the recent “2009 Intelligent Ground Vehicle Competition (IGVC) Autonomous Challenge” at Oakland University, MI, in June 2009. The four-day competition attracted 52 entries from institutions of higher education in the U.S. and abroad.

The student team included Justin Milam, Matthew Duncan, Chris Thompson, Saleh Alobaishi, Justin Pennington, Louis McAllister and Toni Villanueva. “Our students did an outstanding job,” observed Dr. Robert Riggins, Professor of Electrical Engineering Technology. “They came really close to winning championships in both the autonomous and the navigation challenges. Out of 52 robots from around the world, ours was one of three that competed ‘neck and neck’ in the autonomous race.” It was extremely encouraging, Riggins noted, to see the robot do so well against vehicles developed by teams of students representing major universities and graduate programs.

“We placed third in Autonomous, fourth in Land Navigation, and third overall (Lesko Award). We encountered some challenges, like a thunderstorm at the wrong time, interruptions in electrical power, and the constant threat of rain, but our students worked through them,” Riggins continued. “Anassa held first place for about three hours during the final day of the competition. I’m extremely proud of this year’s team. Our students performed very well in a pressure-filled situation.”

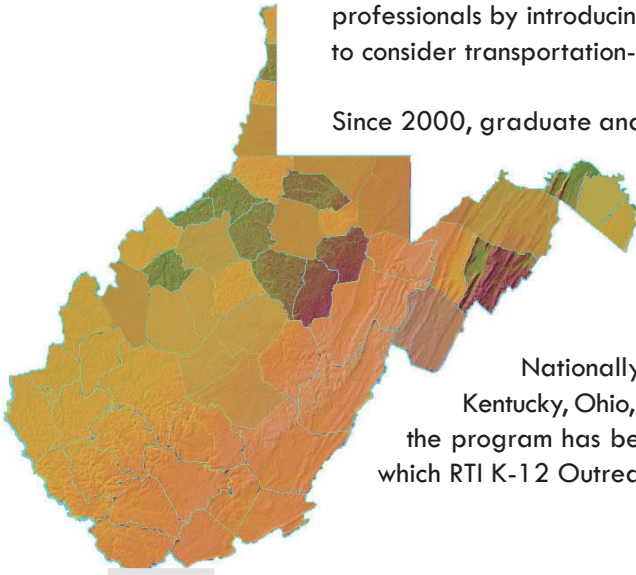
The fact that Bluefield State was the smallest school in the competition and was one of only a very few college or universities there without an engineering graduate school makes our performance even more meaningful,” Riggins concluded.

K-12 EDUCATION OUTREACH

The goal of RTI's K-12 Outreach programs is to nurture a new generation of transportation professionals by introducing transportation issues during the school years and to encourage students to consider transportation-related careers after graduation.

Since 2000, graduate and undergraduate education students from RTI's Transportation Outreach on Wheels (TO²W) program have traveled to schools, libraries and civic organizations throughout Appalachia. Each year, thousands of student contacts from kindergarten through high school at approximately 55 schools benefit from the program's activities. Workshops vary in length from one-half day to five days.

Nationally, RTI's outreach activities have attracted students from West Virginia, Kentucky, Ohio, Virginia, New York, Pennsylvania, Indiana and Montana. More specifically, the program has benefitted students from more than 40 West Virginia counties. Counties in which RTI K-12 Outreach activities have taken place are indicated in orange in the state map.



K-12 EDUCATION OUTREACH HIGHLIGHTS



LEGO ROBOTICS

Linda Hamilton, RTI Coordinator of K-12 Outreach Intelligent Transportation Systems Workshops, introduces Pre-K through 12th grade students to real-world engineering challenges by building LEGO®-based vehicles and robots. Students, who are guided by their imaginations, discover exciting career possibilities, and through the process, learn to make positive contributions to society.

Younger students (ages 3-5) assemble vehicles, tracks and cargo carriers using pictorial charts and LEGO® DUPLO blocks and factor time, distance and weight into the transportation process.

Elementary students receive transportation-related "story challenges," which must be solved using LEGO® DUPLO®, CAD and WeDotm software to design vehicles and simple machines. Middle school students assemble intelligent MINDSTORM® RCX equipped vehicles and automated traffic control devices using LEGO® robotics kits and software to write programs. High school students explore careers in automobile assembly, engineering, manufacturing, computer programming, education, transportation and robotics.

Hamilton works with teams of 9-14 year olds on the FIRST LEGO® League competition. The most recent focus was "Climate Connections." Teams researched the effects of climate on two different communities and presented a single solution for both. Junior FIRST LEGO® League prepares younger children for the competition. Hamilton works with elementary schools in Cabell and Wayne counties, and takes them to RTI headquarters LEGO® Robotics City where they program the Red Rover, which simulates the communication NASA has with the Mars Rover Lunar Lander. During summer, Hamilton visits libraries and community groups with the program "Building Fun," which challenges children to build neighborhoods, places to work and vehicles using DUPLO® and LEGO®. Hamilton also conducts LEGO® camps sponsored by RTI, 4-H clubs and MCTC's Division of Continuing Education.

K-12 EDUCATION OUTREACH HIGHLIGHTS

Exploring Engineering: Academy of Excellence

Exploring Engineering: Academy of Excellence (EEAE) is a week-long summer camp designed to encourage high school students to explore engineering as a career by participating in hands-on engineering activities, touring engineering-related facilities and interacting with practicing, licensed engineers.

The annual Academy is open to any high school student who has completed 9th, 10th, or 11th grade. Preference is given to students who are rising juniors. A committee of faculty and staff members from the Marshall University College of Information Technology and Engineering (CITE) reviews all application materials and selects students based on academic performance and school references. Thirty-six students from high schools in seven states participated last year.



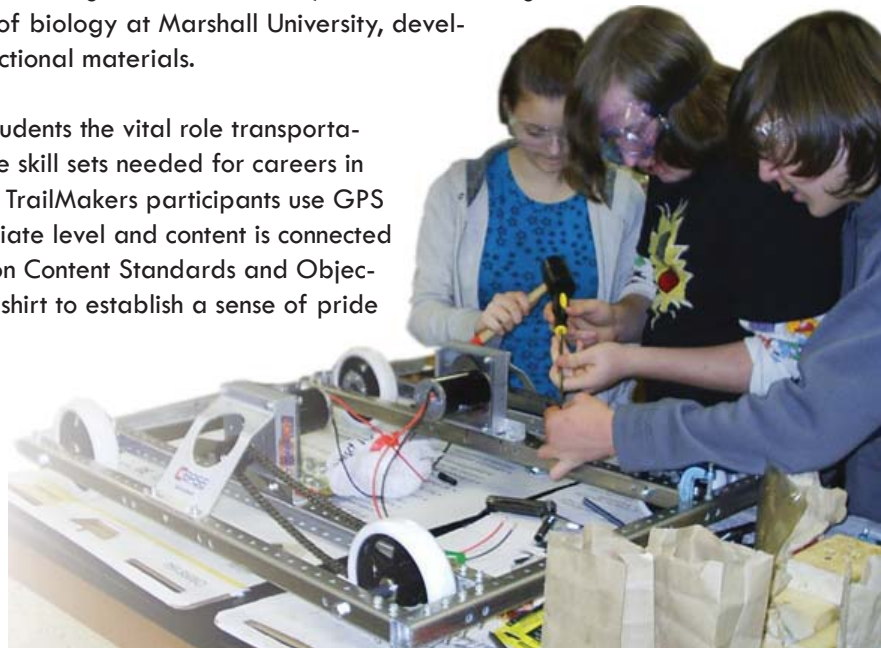
Students are assigned to teams to complete such tasks as building trebuchets (catapults), LEGO robots, and race cars. They also meet current Marshall University engineering students and practicing professional engineers. Field trips to facilities such as the West Virginia-American Water Plant in Charleston, the Toyota assembly plant in Buffalo and J.H. Fletcher & Co. in Huntington are an important part of the experience.

Students are housed with 24-hour supervision in the Marshall University Commons Residence Halls to expose students to campus life. Support from individuals and corporations fund the Academy. This year's premier sponsors, Chesapeake Energy and RTI, contributed a combined \$50,000 in monetary and in-service donations to allow the academy to increase the number of participants and expand activities at no cost to students.

TrailMakers Clubs

“TrailMakers” are transportation clubs for elementary through high school students in a four county region of rural southeastern West Virginia. RTI Principal Investigators Frank Adkins, who is also a long-time educator in Greenbrier County, and Dr. Mike Little, a professor of biology at Marshall University, developed the Trailmakers curricula and instructional materials.

The purpose of TrailMakers is to teach students the vital role transportation plays in their lives and to provide the skill sets needed for careers in transportation and related industries. All TrailMakers participants use GPS and LEGO® robotics at an age appropriate level and content is connected to West Virginia Department of Education Content Standards and Objectives. Each club member receives an RTI shirt to establish a sense of pride and identity.



TIPS (Transportation Injury Prevention and Safety) Activities

RTI and Saint Mary's Medical Center partner to provide transportation safety education and injury prevention programs to school-aged children (pre-K-12). The Transportation Injury Prevention and Safety (TIPS) program focuses on preventing injury while operating motorized and non-motorized recreation equipment, such as all-terrain vehicles, motorbikes, bicycles and motorized scooters, as well as vehicle safety including the dangers of drugs and alcohol. The program includes instruction on user behavior, equipment, demonstrations, special events and activities in the community, and education programs delivered to schools within the project area.

Throughout the year, TIPS also brings a Bike Rodeo & Car Seat Clinic to local health fairs and public parks. During the clinics, participants learn to properly maintain their bicycles and maneuver them safely. Often, free helmets are given away, and car seats are also checked to ensure they are properly installed.

West Point Bridge Design Contest

The United States Military Academy offered the eighth annual West Point Bridge Design Contest. The nationwide Internet-based competition promotes math, science, and technology education in U. S. middle schools and high schools. The contest provides students with a realistic introduction to engineering through a hands-on design experience. All U. S. students age 13 through grade 12 are eligible to compete for national-level recognition. Contestants may compete individually or in teams of two.

Students form a team, download and install the free West Point Bridge Designer software from the contest website; use the software to design, test and optimize a highway bridge; upload the design to the contest website for automated judging; receive instant feedback on their standing in the contest; and submit as many designs as they wish. During the national contest, students may collaborate with their peers, teachers, parents and contest volunteers.

The U.S. Military Academy provides this contest as a service to education and as a tribute to the Academy's 200 years of service to the United States of America. In 2009, nearly 100 middle-school and high-school teachers organized local bridge design contests as class projects for their students.



Professional Engineers from RTI, the American Society of Civil Engineers (ASCE) West Virginia Younger Member Forum and the West Virginia Department of Transportation coach students to create computer models of the most cost effective bridge able to sustain AASHTO load conditions in this high-energy, mentoring and training program. Teams begin to create their designs in January and compete at a statewide competition in April.

West Virginia Operation Lifesaver Presentations and Rail Camp

RTI teams with West Virginia Operation Lifesaver (WVOL) throughout the year to stress the importance of rail grade crossing safety to students, educators and adults in our region. These events reach thousands of children and adults through classroom visits, drivers' education courses, school bus driver in-service, first responder trainer, public transit driver or anyone requesting an OL presentation. Each presentation is tailored to specific age or groups, and consists of a video presentation, discussion and distribution of literature. During the 2008 annual WVOL board meeting, WV State Coordinator John Perry said nearly 60 presentations or activities reached more than 200,000 contacts that year. Many of these contacts were made possible by volunteers and support from RTI.



2008-09 presentations and events include:
Collis P. Huntington Model Train Show
Camp Virgil Tate
Cross Lanes YMCA
Health & Safety Fairs at Local Schools
New River Excursion Train and Bridge Day
Norfolk Southern Train Excursion
Progressive Agriculture Farm Safety Days
St. Mary's TIPS for Extreme Fun and Bike Rodeos
State Fair of West Virginia
West Virginia Pumpkin Festival

Students age 10-17 may apply to attend a free, six-day Rail Camp that takes place at Camp Echo in Petersburg, West Virginia, during the last week of June. The camp provides an in-depth introduction to rail history, railroad operations, and career opportunities. Students attend OL classes, learn how to operate a train, maintain rail tracks, visit a machine shop, interpret rail history, visit a dispatch office and participate in camp activities such as a GPS scavenger hunt, a dinner train ride and building dioramas of safe rail crossings. Boys and girls participate in hands-on learning activities that develop team building skills by interacting with peers and counselors from other states. Many young rail enthusiasts become future OL presenters. RTI staff members Errin Jewell and LeAndria Reed were Co-Activities Directors, while Andrew Gooding was a Counselor/Team Leader.



RESEARCH OVERVIEW

Research projects selected will be consistent and complementary to RTI's center theme and to the strategic goals of the USDOT to ensure the research supports the national strategy for surface transportation research. The research program includes relevant, useful, research projects related to intermodal transportation that would enhance the economic growth and development of the Appalachian Region.

Research and scholarly activities advance knowledge and understanding, strengthen instruction, improve the quality of life and enhance economic development. Research results are published following peer review by university, government and private sector participants in the program. Research papers and technical reports are available at <http://www.njrati.org>.

RTI has developed a variety of methods to disseminate relevant applied research and development projects that enhance the region's economic development potential for use by the public and private sector. Activities include sponsoring a broad spectrum of symposia to share best transportation practices, funding post-research travel for researchers to address groups of end-users, developing cost-effective materials for distributing the research summaries to practitioners and transferring research results to the public domain via patenting and licensing of technologies. RTI's research selection goal is to maintain an objective process for selecting and reviewing research that balances multiple objectives of the program.

The selection process for individual research projects must include peers and experts in the field, including at least one member of the USDOT per the instructions for preparation of a UTC strategic plan. Every successful research project must also support the national strategy for transportation research. The selection process, in order for RTI to maintain compliance with this stipulation, will include, but may not be limited to, the following.

- RTI will continue to work with the WVDOT and the FHWA in West Virginia in the research project selection process for the WV Statewide Planning and Research (SPR) program administered by the WV Division of Highways. This research selection development process was modified recently with input from RTI by: four members of the USDOT-FHWA; two members of the WV-DOT; and five members of the WV Division of Highways (VDOH). The names of these persons and their positions are provided in the Appendix.

- The WV-SPR selection process starts with an annual solicitation of research problem statements from WVDOT technical staff, which are then inventoried and those warranting funding considerations are determined before soliciting formal proposals from the RTI research staff that include faculty from Marshall University and the RTI Partner Schools.

- The successful research proposals are selected by the team identified above and in the Appendix in addition to the RTI Director and Director of Research for those projects to be funded or co-funded by RTI with additional subject matter experts as needed.

In addition to the WV Statewide Planning and Research program, RTI will continue to leverage its federal funding through a variety of sources, and in certain cases, a traditional cyclical solicitation and review process may not be able to incorporate all of the opportunities to assist in doubling the value and acceleration of the institutionalization of the UTC.

Research Performance Goal: an ongoing program of basic and applied research, the products of which are judged by peers or other experts in the field to advance the body of knowledge in transportation.

Research Performance Outcome: The outcome will be a body of research including reports and research papers in addition to new technology products that have been provided oversight from external peers from project conception to completion of a technical report.

Planned Activities : Per the UTC instructions for preparing a Strategic Plan, all research conducted with UTC funding is to be subjected to external merit-based peer review and the following activities are planned to achieve the desired research performance outcome.

The research selection advisory team has quarterly meetings where project results are presented by the research project managers at least once during the project lifecycle for projects conducted through the WV-SPR program. Final reports are also approved by this team in addition to other subject matters experts assigned as technical monitors for the project.

Projects not originating through the WV-SPR program have and will continue to have an external project technical monitor (from other DOT, the ARC or the transportation industry) that monitors and approves the final product before it is posted on the RTI web site and distributed to the five entities required by the UTC program.

All research project managers will continue to be encouraged to present results (and extra funding provided as needed) when appropriate at local, regional or national peer reviewed technical conferences.

RTI will also continue to sponsor conferences as part of planned activities through the technology transfer component of this Plan to facilitate additional peer-review opportunities for RTI research papers.

NEW RESEARCH PROJECTS 2008-09

TRP 09-02 West Virginia Parkways Authority: 2009 Traffic and Toll

Primary Investigator: Junwook Chi, Ph.D.

External Project Contact: David Cramer

RTI will estimate toll revenues supporting road and bridge construction and maintenance in the following categories: alternative toll rate plans; substitution effect of an increase in toll rates on traffic volume; and forecasted traffic and revenues.

Potential Benefits: Information delivered by this project can be essential for evaluating the viability of generating the West Virginia Parkways Authority. RTI will provide the motivation for building a successful West Virginia Parkways Authority and perform economic and statistical analyses to provide statistically reliable estimates of toll revenues.

TRP 09-03 Integrated Track Infrastructure Assessment Tools

Primary Investigator: Dr. Richard Begley

This project demonstrates how scientific instruments, combined with high-accuracy Global Positioning Systems (GPS) and innovative software programming, can be packaged to equip railroad track inspectors with tools necessary to proactively monitor and measure infrastructure as well as identify track and subsurface problems before they have a negative impact on rail operations and safety. RTI and CSX have discussed track stability assessments using GPS, geo-technical/spatial tools and remote sensing technologies and the potential benefits of deploying such technologies with rail road track inspectors.

The pilot project tests the use of several software and hardware configurations and protocols over a period of several months. Two initial sites were selected in West Virginia, namely the Huntington to Parkersburg mainline along the Ohio River and the Big Sandy mainline. A third site is under consideration. The project will focus on testing configurations that can be pulled or attached to a mobile platform and/or high rail vehicle. It will be conducted in a series of three phases, each designed to investigate and measure infrastructure conditions and/or identify a specific set of potential problems.

TRP 09-04 Estimating Commodity Values of Domestic Inland Waterway Using Commodity Movements

Primary Investigator: Dr. Junwook Chi

External Project Contact: Dr. Denver Tolliver, North Dakota State University

The objective of TRP 09-04 is to research and develop estimated commodity valuations for commodity movements on the inland waterway system. This project updates a 2004 Tennessee Valley Authority (TVA) study that assessed waterway commodity values per ton by using the Waterborne Commerce Statistic Center (WCSC) database to analyze the 5-digit WCSC commodity code level, calculate and document these movements. Significant commodity movements were identified and recommended plans were developed for three inland waterway systems: the Columbia-Snake

system, the Great Lakes and all other U.S. domestic traffic excepting coastwise moves. The capability to develop and report commodity values for the earlier years, 2005 and 2006, were also determined by the availability of data.

Potential Benefits: The results will support the Corps of Engineers in its investment planning and description of the value of the inland system.

TRP 09-05 Estimating Transportation Rates of Waterborne Movements the Columbia-Snake Waterway

Primary Investigator: Dr. Junwook Chi

External Project Contact: Denver Tolliver

The objective of the study is to document the methodology including the research and development of Columbia-Snake waterway and alternative land transportation rates. The project centers on a 50 origin/destination commodity sample of waterborne movements on the Columbia-Snake waterway and includes collecting and developing transportation rates by interviewing and surveying shippers and industry participants, using published rates and the utilization of the TVA's barge costing model.

Potential Benefits: The results will support the Corps' investment planning for navigation projects including alternative improvements to specific waterways.

TRP 09-06 Development of New Process for Collecting Information on Piers, Wharves, Docks and facilities in the Great Lakes Amendment 01

Primary Investigator: Junwook Chi

External Project Contact: Dr. Peter Lindquist, University of Toledo

This project is a continuation of a long term effort to collect, store and maintain current data of the Great Lakes piers, wharves, docks and facilities for the U.S. Army Corps of Engineers. The initial phase focused on the development of a new process that uses current technology to minimize the time and effort required of the out-dated site visit process. This phase continues developing and testing the new process, for accuracy and feedback. The University of Toledo project team determines the character of the port area's viable facilities. Each facility, including piers, wharves and docks, that are capable of handling cargo or providing services to commercial craft will be assessed.

Potential Benefits: The results will be used to recommend process improvements, and future maintenance and support for the data of the Great Lakes piers, wharves, docks and facilities.

TRP 09-07 Transportation Rate Update for Great Lakes Waterway Movements

Primary Investigator: Dr. Junwook Chi

External Project Contact: Peter Lindquist, University of Toledo

This study develops a transportation rate update for Great Lakes waterway movements. The study provides a set of transportation rates, which includes relevant alternatives, for 857 waterborne commodity movements that are routed, in total or in part, on the GLSLS system, which extends

from Montreal to the head of Lake Superior. Using the 2006 commodity tonnage data for 857 commodity movements in the GLSLS, this study develops detailed transportation rate data for 86 origin/destination commodity triples and for each of these movements' least-cost all overland alternate routes and nodes.

Potential Benefits: Comparative rate analysis as provided by this study is essential for determining the value of an investment.

TRP 09-08 2008 Ohio River Basin Regional Input-Output Analysis

Primary Investigator: Dr. Junwook Chi

External Project Contact: Larry Bray, University of Tennessee

The purpose of this project is to develop input-output (IO) analysis to estimate the direct and indirect employment and income impacts of river navigation in the Ohio River Basin (ORB).

From a policy perspective, most Ohio River navigation investment decisions are based on a strict set of benefit-cost criteria as determined by established procedures and guidelines. From time to time, however, there are questions regarding the broader economic implications of available Ohio River navigation. Accordingly, the Corps' Huntington District has solicited proposals for an economic impact analysis that captures the full implications of available Ohio River navigation both within and outside the basin.

Potential Benefits: The results will help understand economic impacts of commercial barge transportation on river systems in support of the Great Lakes and Ohio River Division (LRD) FY 11 Navigation Business Line O&M budget.

TRP 09-09 Estimating Transportation Rates of Waterborne Movements Using the Gulf-Intracoastal Waterway – West

Primary Investigator Contact Information: Dr. Junwook Chi

External Project Contact: Jim Kruse, Texas Transportation Institute (TTI), Texas A&M University

This project identifies ultimate origins and final destinations, and the development, analysis, and documentation of transportation rates and charges on a sampling of the commercial domestic waterborne traffic that moved via the Gulf Intracoastal Waterway–West (GIWW), which stretches from New Orleans, Louisiana to Brownsville, Texas.

This project will develop, analyze, and document transportation rates and charges (expressed in 2008 dollars) for the waterborne commodity movements in the sample, and for the least cost, all overland, alternative routing as required.

Potential Benefits: The results will support the Corps' investment planning for navigation projects including alternative improvements to specific waterways.

TECHNOLOGY TRANSFER OVERVIEW

The goal of the technology transfer mechanism is to make RTI's research results available to potential users in a form that can be directly implemented, utilized or otherwise applied. Appropriate modes of multidisciplinary technology transfer include, but are not limited to:

- publication of research papers, technical reports and a newsletter
- transfer and licensing of intellectual property
- practical and commercially relevant workshops and industry specific seminars that impact the economy
- an interactive website with links to national transportation resources.

RTI incorporates a technology transfer element as an integral part of each funded project and activity. The vision is for RTI to be recognized beyond the Appalachian Region as a source of essential technical knowledge that enhances the development of new transportation products and systems.

The results of each research, education or outreach project will be presented by principal investigators in at least one refereed or conference paper in a transportation focused journal/conference. Although journal publications are favored for advanced research, conferences such as TRB or ASEE may be more appropriate for other types of research or educational development.

The webpage is being revamped to include new publications available online; the newsletter is published and distributed in hard copy and on-line, and a major portion of the annual research needs assessment, request for proposal distribution, and proposal responses are conducted via e-mail and the webpage.

Besides producing cost-saving planning and management technologies, several RTI research projects have also produced safety improving technologies. New technologies are in various stages of being transferred into the transportation industry. Furthermore, several other research projects have contributed to improvements in the physical railway and recreational trail infrastructure in the region with the potential to not only increase the number of trips drivers take but also decrease the amount of freight on the Region's highways while helping to eliminate several dozen freight transportation physical restraints for a "Corridor of National Significance."

In addition to transferring specific research project results, RTI also partnered with the Transportation Research Board (TRB) for several national conferences on transportation and economic development, and RTI developed the Geo-hazards in Transportation in the Appalachian Region Technical Forum. RTI also sponsored several other conferences and seminars in cooperation with the local FHWA and other state DOTs.

TECHNOLOGY TRANSFER HIGHLIGHTS

eCDL Program Wins Council of State Governments' Innovations Award

RTI's eCDL Testing System (electronic commercial drivers license testing system), which was created through a partnership between RTI and the West Virginia Division of Motor Vehicles Commercial Drivers License section, recently won a Council of State Governments' Innovations Award.

The eCDL Program was developed to make the Commercial Driver's License test free of fraud and paperless by using a laptop computer with a Global Positioning System (GPS) to track the test. Other benefits of the program include savings of \$500,000 to the state and the decrease of the WVDMV state fleet by 60 percent. RTI is now working with the WVDMV on Phase III of the project, which will further enhance the program through biometrics, crash data analysis and enhanced reporting and fraud prevention tools.

Representatives from RTI and the WVDMV accepted the Innovations Award, Tuesday, August 18, in Winston-Salem, North Carolina at the Southern Legislative Conference of the Council of State Governments' (CSG) Annual Meeting. There, the eCDL program will compete against other regions, including the other Southern Region winner, the Kentucky Reentry Hotline, for the national award.

"This program is a model of accomplishment by a partnership of state and federal government, agencies and authorities, and the private sector," said Rahall. "Winning this award is an honor for the Rahall Institute, our State, the agencies and organizations who worked hard on this project, and it serves as an inspiration and signal of opportunity for the people of West Virginia."

Out of 110 submissions, the field was narrowed to eight. Six of the eight finalists gave presentations, and the eCDL Program was named one of two winners for CSG's Southern Region. Programs demonstrate the vision and innovative use of technology to maximize resources, increase productivity and ultimately improve safety on the highways.

"We're very proud that West Virginia is receiving national recognition for this deserving program," Gov. Joe Manchin said. "The WV eCDL Program was the first system of its kind in the nation. It was invented, developed, and directed by the DMV, in partnership with the Rahall Transportation Institute, and funded by DMV and federal grants through the Federal Motor Carrier Safety Administration. I appreciate everyone's efforts on this because it is truly a top-quality program."

RTI Director and CEO Bob Plymale expressed the importance of this nationally recognized partnership. "The eCDL represents the best of West Virginia – creativity, innovation, and collaboration. We couldn't have asked for better partners than the WV DMV and the FMCA. RTI continuously fosters a collaborative environment and we look forward to more successful partnerships to develop new technology, improve safety, and enhance economic development in West Virginia and abroad."

In 2003, 2007, and 2009, the West Virginia DMV CDL Program received funding from the Federal Motor Carrier Safety Association. This funding was used to develop the software that applied the capabilities of the GPS to record and document verifiable skills tests.

TECHNOLOGY TRANSFER HIGHLIGHTS

Transportation Workforce Summit

Transportation workforce professionals convened with educators from West Virginia's universities, community and technical colleges, vocational training centers, workforce development boards, private employers and other groups to address how they may solve transportation workforce shortages throughout the State, October 29-31, 2008.

The conference, which was presented by the Nick J. Rahall, II Appalachian Transportation Institute (RTI), took place at Tamarack Conference Center in Beckley, W.Va., and was based on a 2007 study completed by RTI. The study determined that by 2011, nearly half (43%) of workers employed by the West Virginia Department of Transportation (WVDOT) will be eligible for



retirement. In addition, the WVDOT is experiencing an increasing difficulty in attracting and retaining new employees. The purpose of the conference is to bring together educators, trainers and employers, to find preliminary solutions to the workforce shortage.

U.S. Rep. Nick J. Rahall, II, said, "RTI has already contributed to inventories, capacity and sustainability assessments of our State's transportation infrastructure, including the Workforce Development Study on which this summit is based. As everyone here already knows, the challenges of solving our problems in transporta-

tion workforce development are great, but not impossible. To get our State's system back on track, we must do more than talk about the problems. We must bring stakeholders together to talk about solutions—and that's why this summit is so important."

RTI Director Bob Plymale said, "because of the importance of maintaining existing and building new transportation infrastructure throughout our mountainous region, I thank each educator, employer and trainer for attending this summit with the purpose of finding solutions and fostering economic development in West Virginia."

A panel of private employers convened Wednesday, October 29, 2008 from 8 a.m. to 4:30 p.m. to discuss the preparation and training of new engineers. A reception sponsored by the Contractor's Association of West Virginia began at 5 p.m., during which Plymale, Rahall, Gov. Joe Manchin and Clark Martin of the Federal Highways Association spoke before 2008 retirees were honored.

The conference began Thursday, October 30, at 8:30 a.m. with a welcome by Plymale and an overview by RTI Transportation Workforce Coordinator Diana Long. At 10 a.m., presentations by representatives from the road, river and rail industries began. Instant audience participant polling, which measures responses and potential solutions, took place from 11:30 a.m. to 4:30 p.m. On Friday, October 31, 2008, recommendations and outcomes were presented to a West Virginia panel of policy makers, which consists of government leaders, transportation workforce leaders and higher education professionals.



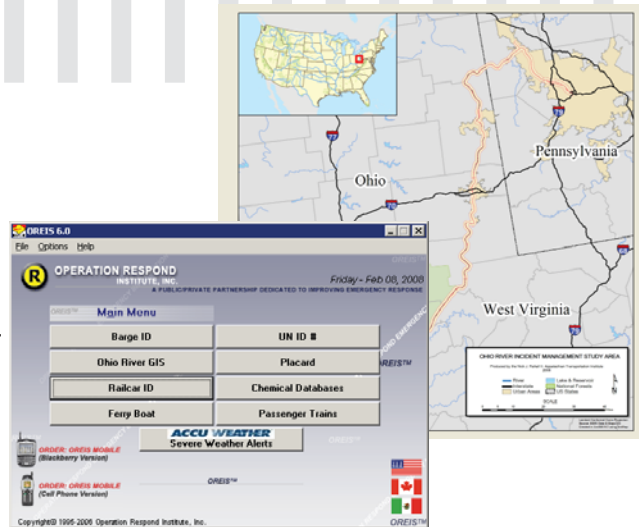
TECHNOLOGY TRANSFER HIGHLIGHTS

NATIONAL MARITIME ENHANCEMENT DEMOS

Rahall Transportation Institute's National Maritime Enhancement Institute Director presented the results of RTI's Ohio River Responder Demonstration Project Results at the Lakeside Technology Conference, an international safety in mobility conference in Klagenfurt, Austria, July 8-11, 2008.

The project was developed for the U.S. Army Corps of Engineers to demonstrate the capabilities of a fully operational alert and messaging system in responding to navigation accidents along the Ohio River. Upon input of latitude/longitude coordinates, street address or river mile, the system graphically indicates to the user the location of those inputs on a GIS map. The system indicates the location of both the upstream and downstream access points and provides the user with the county names and the telephone number for county emergency management officials nearest the accident. The system has the potential to provide the identity of cargo contained in vessels.

The system provides data, regarding substances/materials contained in vessels, which would be useful to the emergency management community, by linking to existing databases maintained or made available from organizations such as the Chemical Transportation Emergency Center and other publicly available organizations. Information of potential use includes: health, fire or explosive hazards associated with the substance; precautionary actions to take to protect first responders and the public to include recommendations/requirements for protective clothing and evacuation limits; response actions required for substances that are spilled/leaking or on fire, as well as information for administering first



aid to individuals impacted/affected by such.

Customized weather data provided by AccuWeather Inc. was integrated into the system to provide first responders with weather data that may impact upon rescue and clean up operations. Critical weather data provided to first responders includes lead time regarding approaching storms that allows first responders to adjust their rescue and clean up operations accordingly.

Transportation professionals from across Europe and the United States attended the conference, which highlighted the latest technology in intelligent weather information services and services for traffic and transportation applications. The Lakeside Conference '08 provided a global forum for presenting the most recent advances, the future technical challenges and business opportunities that comprise the contemporary landscape in safety-related intelligent weather systems and services. Conference participants were technology providers, transportation infrastructure operators and construction firms, research and development bodies, transportation technology consultants and engineers and public administrators.

TECHNOLOGY TRANSFER ACTIVITIES

PAPERS PUBLISHED

Nichols, A., D. Bullock, W. Schneider. "Detecting Differential Drift in Weigh-in-Motion Wheeltrack Sensors," Accepted for publication in Transportation Research Record, Journal of the Transportation Research Board.

Cetin, M., A. Nichols. "Improving the Accuracy of Vehicle Reidentification Algorithms by Solving the Assignment Problem," Accepted for publication in Transportation Research Record, Journal of the Transportation Research Board.

CONFERENCES HOSTED/ SUPPORTED

"Council of University Transportation Centers Annual Awards Banquet," - January 10, 2009.

"West Virginia Division of Federal Highways Planning Conference," September 24-25, 2008, Big Sandy Arena, Huntington, W.Va.

"Geo-hazards in Transportation in Appalachia-9th annual Technical Forum"- August 5-7, 2008, Charleston, W.Va.

"National Maritime Days Celebration," Labor Day Weekend, September 4-6, 2008, Harris Riverfront Park, Huntington, W.Va.

"Transportation Workforce Summit" - October 29-31, 2009, Beckley, W.Va.

"International ITS Conference" - November 16-20, 2008, New York, New York.

"National RITS Conference" - September 2-5, 2009, Anchorage, Alaska.

"Transportation Research Board" - Annual Meeting, January 11-15, 2009, Washington, D.C.

"Trails Day at the Legislature" - April 9, 2009, Charleston, W.Va.

"Transportation Research Board 88th Annual Meeting," January 11-15, 2009, Washington, D.C.

"West Virginia Green Highways Partnership (GHP) Workshop," October 27-28, 2008, Huntington, W.Va.

CONFERENCE PROCEEDINGS/ PRESENTATIONS

Barrios, J. "Historical Landsat Images for Rivers and Streams." National Science Foundation ESPCor Water Workshop, Burlington, Vermont, November 9-11, 2009.

Caicedo, J., J. Flora, C. Pierce, A. Nichols, B. Timmerman, and W. Graf. "Environments For Fostering Effective Critical Thinking (Effects)." American Society of Engineering Education Annual Conference and Exposition, June 14-17, 2009, Austin, Texas.

Comert, G., M. Cetin, G. Comert, A. Nichols. "Incorporating Queue Length Measurements into Actuated Signal Control: Evaluation of Efficiency Benefits at an Intersection." In the Proceedings of the 88th Annual Meeting of the Transportation Research Board, Washington D.C., January 11-15, 2009.

Long, D. "WVDOT Workforce Study and Transportation Workforce Summit." West Virginia Department of Education, Non-Traditional Education Conference, Flatwoods, W.Va., April 22, 2009.

Inglis-Smith, C., et. al. "RTI's eCDL Program." Presentation to: the Department of Vehicles CDL Administrators Conference, San Diego, Calif., January 2009; West Virginia State Senate Finance Committee, Charleston, W.Va., March 2009; and the Southern Legislative Conference, August 2009.

Hart, F., B. Mutter. "Operating a Center for Applied Research and Technology (CART, Inc.) at Bluefield State College," 2009 American Society of Engineering Education Annual Conference and Exposition, Austin, Texas, June 15-18, 2009.

Monsere, C., and A. Nichols. "Building a WIM Data Archive for Improved Modeling, Design, and Rating." Presentation at the North American Travel and Monitoring Exposition and Conference (NAT-MEC), Washington, D.C., August 6, 2008.

Nichols, A. "Environments For Fostering Effective Critical Thinking (Effects)." Presentation to the Transportation Education Conference, Portland, OR, June 20, 2009.

Nichols, A., D. Bullock, W. Schneider. "Detecting Differential Drift in Weigh-in-Motion Wheeltrack Sensors," Presentation to the 88th Annual Meeting of the Transportation Research Board, Washington D.C., January 11-15, 2009.

Owensby, R., M. Plumley, F. Hart, B. Mutter. "Development of a Web-Based Course in Miner Safety Training," 2009 American Society of Engineering Education Annual Conference and Exposition, Austin, Texas, June 15-18, 2009.

Wait, I.W. and Nichols, A.P. (2009) "Effect of a university-operated Intensive English Program (IEP) on engineering student academic success." American Society of Engineering Education Annual Conference and Exposition, Austin, Texas, June 14-17, 2009.

TECHNOLOGY TRANSFER TRAINING

49 CFR 214, SUBPART C-- ROADWORKER PROTECTION

The purpose of 49 CFR Part 214 Subpart C--Roadway Worker Protection training is to prevent accidents and casualties caused by moving railroad cars, locomotives or on-track equipment striking roadway workers; prescribe minimum safety standards for roadway workers; and prescribe safety standards for roadway maintenance machines as they apply to the safety of roadway workers.

In 2008-2009, John Ball, RTI Professional Engineer, served as an instructor for 49 CFR Part 214 Subpart C--Roadway Worker Protection training for 35 transportation professionals. Groups represented included: WV Department of Highways, WV Port Authority, RTI's FRA research group, Goal Technical (Environmental Construction/Clean-Up), and Turman Construction.

PASS - Americans with Disabilities Act (ADA) Training

RTI and the W.Va. Division of Public Transit (DPT) conducted several PASS training sessions in Grant Year 10. PASS training ensures that drivers have current expertise in passenger assistance techniques plus sensitivity and safety skills appropriate for serving persons with disabilities. Parkersburg, Morgantown, Huntington and Beckley were selected based on access to the W.Va. highway system and proximity of facilities to urban and rural transportation providers.

John Ball, P.E., RTI Research Associate and PASS instructor explains, "Improved mobility for transportation-dependent populations, such as the elderly and disabled, is a crucial concern. In rural areas, community transportation drivers must know how to safely and efficiently serve passengers requiring mobility assistance. West Virginia has the third oldest population in the

U.S., with a median age of 40.7 and 15.3 % age 65 years and older. The continuing increase in ridership, due to population density in general and elderly population in particular, demonstrates the vital need for paratransit and bus transportation. Upgrading skills, sharing solutions and networking with peers enhance the quality of community transportation services."

RTI's PASS training is conducted by Ball and Research Associate LeAndria Reed.

TDAT - Truck Driver Awareness Training

This free training for truck drivers, dispatchers, trucking company owners and representatives from professional trucking organizations, is made possible through RTI and the West Virginia Public Service Commission (PSC).

Research Associates John Ball and LeAndria Reed and representatives from the WVPSC Transportation Enforcement Division instruct TDAT training and distribute certificates of attendance.

During training, topics that were addressed included: 21st Century Transportation and Transportation Workforce Issues, Definition of Commercial Motor Vehicles, Definition of Inter-State and Intra-State Commerce, Definition of Private Carrier, Definition of For-Hire Carrier, Hours-of-Service, CDL Requirements, Types of CDLs, Driver Qualifications, Seat-Belt Enforcement Initiative, Share-the-Road PSA for Schools, SAFE 07 and Highway Watch Program, and Driver/Carrier Education and Training Opportunities.

TDAT Training Sessions participants typically receive a West Virginia Operation Lifesaver rail-grade crossing safety presentation as well.

GIS Training for the WVDOT

RTI began training West Virginia Department of Transportation (WVDOT) professionals in 2006. Each consecutive year, RTI has contracted with the WVDOT to provide four levels of Geographical Information Systems (GIS) Training. As of Grant Year 10, approximately 650 WVDOT participants have completed one or more levels of GIS training. More than 200 professionals from West Virginia were trained by RTI instructors in four levels and two industry specific GIS training courses in Grant Year 10.

Diana Long, RTI Transportation Workforce Coordinator, said, "Geospatial Information Systems usage is exploding in all business sectors. Professionals and support staff are finding GIS a tool that gives them the ability to integrate and relate any data with a spatial component. The visualization of data provides a basis for decisions in the design, implementation and support of projects."

Training is customized to meet the needs of clients and courses include hands-on work inside classrooms as well as site-based field work. Engineers, surveyors, community police, emergency responders, health agency representatives, county mapping staff, environmental agency employees and sales and marketing representatives have benefitted from RTI's GIS training.

GIS Level 1 and Level 2

GIS Level 1 and Level 2 programs facilitates three levels of GIS Training throughout West Virginia and the Appalachian Region. Level 1 and Level 2 training takes place over the course of three days and provides experiential and project learning experiences to enable participants to immediately begin to use the latest version of ArcGIS. Students gain basic awareness of GIS concepts, including the ability to successfully navigate ArcGIS software. They

learn to produce their own maps using attribute and spatial data, and also learn how to perform some initial types of spatial analysis. Continuing Educational Unit credits are available to those who complete the courses.

GIS Level 3 and Level 4

Level 3 and Level 4 training are advanced GIS courses for those who have completed Level 1 and Level 2 training.

GPS Training for Utility Workers and Advanced Global Positional Systems for Utility Workers

These courses are advanced and/or industry specific training sessions that provide additional, customized training. In 2008, RTI designed a course to teach GPS skills for workers responsible for the management of utility assets. This project was funded to design, develop and implement training for WVDOT Utility Workers who successfully completed GPS Training for Utility Workers. The training covers applications of linear referenced data, attributes, field data sheets and the procedures established to transfer field data into files for the WVDOT.

GPS Training for Outdoor Advertisement Inspectors

As part of the professional training provided by RTI, the GIS section of the WVDOT identified additional job classifications which need GIS/GPS training. RTI designed, developed and implemented a three-day training session to teach WVDOT Outdoor Advertisement Inspectors the following skills: produce a field sketch containing attribute specific data, define GPS and trilateration, determine the latitude and longitude measurement of a location, convert data into decimal degrees, operate a simple GPS unit, navigate to a point using a GPS unit, use route and tracking features of a GPS unit, calculate perimeter and square footage of an area with a GPS unit, make a digital map using GPS data and collect coordinate points using an offset method.

PRIVATE GIS TRAINING

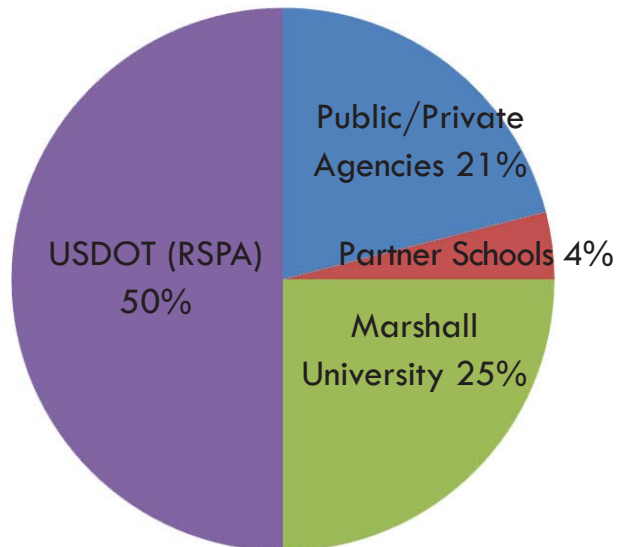
Publicity from the GIS training courses RTI provided to the WVDOT resulted in numerous requests from private industry customers who sought similar training.

Due to this demand, RTI developed courses that provide the public with two levels of GIS training. The Course "Hit the Ground Running with GIS Training" was marketed to the general public.

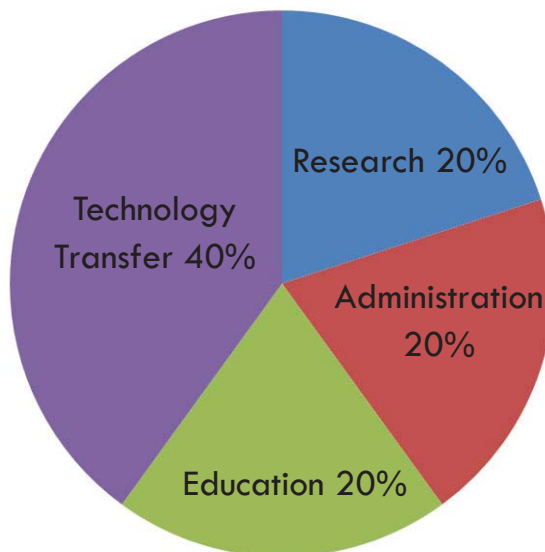
The following public courses have been conducted by RTI:

- 1 six-day Public Session in September 2008 with 21 participants;
- 1 six-day contracted session for Equitable Resources in February 2009 with 13 participants
- 1 six-day Public Session in May-June 2009 with 15 participants in Level 1 and 13 in Level 2.

FUNDING SOURCES YEAR 10



EXPENDITURES YEAR 10



SOURCES OF FUNDING

SINCE RTI INCEPTION

- Appalachian Regional Commission (All 13 States' Departments of Transportation)
- Assumption College
- Benedum Foundation
- British Petroleum
- Business and Industrial Development Corporation
- CSX
- Cabell County Schools
- Federal Railroad Administration
- Greater Kanawha Resource Conservation and Development Area
- Hatfield-McCoy Regional Recreation Authority
- Huntington Area Development Council
- KYOVA Interstate Planning Commission
- Lincoln County Economic Development Authority
- Marshall Community and Technical College
- Meadow River Enterprises, Inc.
- Mid-Ohio Valley Regional Planning and Development Council
- Norfolk Southern
- Ohio Department of Transportation
- Ohio Rail Development Commission
- Operation Respond
- Putnam County Development Authority
- Raleigh County
- Raleigh County Assessor
- St. Mary's Medical Center Foundation
- Tennessee Department of Transportation
- Tennessee Valley Authority
- United States Army Corps of Engineers
- United States Department of Energy
- United States Department of Justice
- United States Department of Transportation Federal Highway Administration
- Wayne County of Commission
- West Virginia Bureau of Employment Programs
- West Virginia Department of Natural Resources
- West Virginia Department of Tax and Revenue
- West Virginia Department of Transportation/Division of Highways
- West Virginia Department of Transportation/Division of Motor Vehicles
- West Virginia Development Office
- West Virginia Disaster Recovery Board
- West Virginia Division of Highways
- West Virginia Governor's Office
- West Virginia Housing Development Fund
- West Virginia Public Port Authority
- West Virginia Public Service Corporation
- West Virginia Statewide Addressing and Mapping Board
- West Virginia Trails Coalition

RAHALL TRANSPORTATION INSTITUTE



EDUCATION



RESEARCH



TECHNOLOGY
TRANSFER

PART B

“Intermodal Transportation and Economic Development in the Appalachian Region.”

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NEW

NEW Projects

Project Number	Title	Principal Investigator
TRP 09-02	West Virginia Parkways Authority: 2009 Traffic and Toll	Dr. Junwook Chi
TRP 09-03	Integrated Track Infrastructure Assessment Tools	Dr. Richard Begley
TRP 09-04	Estimating Commodity Values of Domestic Inland Waterway Using Commodity Movements	Dr. Junwook Chi
TRP 09-05	Estimating Transportation Rates of Waterborne Movements the Columbia - Snake Waterway	Dr. Junwook Chi
TRP 09-06	Development of New Process for Collecting Information on Piers, Wharves, Docks and Facilities in the Great Lakes Amendment 01	Dr. Junwook Chi
TRP 09-07	Transportation Rate Update for Great Lakes Waterway Movements	Dr. Junwook Chi
TRP 09-08	2008 Ohio River Basin Regional Input-Output Analysis	Dr. Junwook Chi
TRP 09-09	Estimating Transportation Rates of Waterborne Movements Using the Gulf-Intracoastal Waterway - West	Dr. Junwook Chi

ONGOING

ONGOING Projects

Project Number	Title	Principal Investigator
TRP 08-04	WV DOT Workforce Study	Dr. Diana Long
TTP 08-01	Enhanced Appalachian Development Highway System GIS Portal Phase 1	Mr. Sang Yoo
TRP 08-02	Intelligent Transportation Systems in WV: Evaluation, Needs Assessment, and Professional Capacity Building	Dr. Andrew Nichols
TRP 07-01	Operate/Maintain Data Warehouse	Ms. C. Inglis-Smith
TTP 06-01	Phase III - GIS for the Appalachian Development Highway System 2007 Cost to Complete Estimate	Mr. Sang Yoo
TRP 05-09	Improving the Competitive Position of Appalachia's Wood Products Through Enhanced Transportation Alternatives	Dr. Mark Burton
TTP 03-01	Development of a Transportation and Economic Development Information System (TEDIS) Delivered over the Internet for WV-Phase II	Dr. Richard Begley
TTP 00-21	Three-Dimensional Laser Scanner Pilot Project	Dr. A. Szwilski
TTP 00-15	Harrison, Mingo and Webster County Tax Map Conversion	Mr. Jamie Wolfe
TTP 00-14	GIS of Major Transportation Corridors along the Ohio River	Dr. Thomas Jones
TRP 00-10	Improving Transportation Access to Rural Health Care in Lincoln County: Process Implementation	Dr. Robert Walker
TRP 00-08	Development of a Research Protocol That Relates Culvert Structure to Fish Migration in Southern WV	Dr. Mike Little
TRP 00-07	Opportunities to Improve Transportation Efficiencies through Enhanced Intermodal Capabilities and Increased Utilization of the Appalachian Development Highway System	Dr. Mark Burton
TRP 00-05	Integrated Track Stability Assessment and Monitoring System (ITSAMS): Phase III	Dr. Richard Begley

TRP 00-02	Master Land Use Plans for Southern WV Counties	Mr. Bob Plymale
TRP 00-01	Integrated Track Stability Assessment and Monitoring System (ITSAMS): Phase II	Dr. Richard Begley
TRP 99-27	Using FLI-Map Technology for Transportation Applications: Research Initiation Project	Dr. Richard Begley
TRP 99-18	ITS Research Initiative Project	Dr. A. Vaseashta
TRP 99-16	McDowell County Transportation Study	Ms. Jennifer Plymale
TRP 99-10	Endangered Species Identification along Corridors in West Virginia Using GIS	Dr. Mike Robinson
TRP 99-09	Pre-Construction Assessment of Wetlands to be along the Tolsia Highway	Dr. Mike Robinson
TRP 99-06	Potential Uses of Fly Ash and Other Recoverable Materials in New Transportation Infrastructure Components	Dr. A. Szwilski
TRP 99-05	Use of Electroluminescence Technology for Highway Signage	Dr. Richard Begley
TRP 99-04	Integrated Track Stability Assessment and Monitoring	Dr. Richard Begley
TRP 99-01	Automated Road Extraction Using Satellite Imagery	Dr. Herbert Tesser

COMPLETED Projects

Project Number	Title	Principal Investigator
TTP 05-01	Phase II – Enhanced GIS Mapping System for The Appalachian Regional Commission’s Appalachian Development Highway System (ADHS)	Mr. Sean Litteral
TTP 00-38	Proposed GIS Mapping System for South Carolina’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-37	Proposed GIS Mapping System for Georgia’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-35	Proposed GIS Mapping System for New York’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-34	Proposed GIS Mapping System for Ohio’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-32	Proposed GIS Mapping System for Pennsylvania’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-31	Proposed GIS Mapping System for Mississippi’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-28	Proposed GIS Mapping System for North Carolina’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-27	Proposed GIS Mapping System for Kentucky’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-24	Proposed GIS Mapping System for Maryland’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-22	Proposed GIS Mapping System for Alabama’s Appalachian Development Highway System (ADHS)	Mr. Sean Litteral
TTP 00-19	Proposed GIS Mapping System for Tennessee’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral
TTP 00-18	Proposed GIS Mapping System for West Virginia’s Appalachian Development Highway System (ADHS) Corridors	Mr. Sean Litteral

COMPLETED

TTP 00-17	Development and Evaluation of a GIS Mapping System for the West Virginia's Hatfield and McCoy Trail System	Mr. Sean Litteral
TTP 00-12	A Deployment Plan for the WV High Technology Corridor	Dr. Michael Hicks
TTP 00-11	Development of Transportation and Economic Development Information System (TEDIS) Delivered over the Internet for WV	Mr. Sean Litteral
TRP 00-06	Transportation and Market Feasibility Analysis for Innovative Coal Combustion Byproducts to be Manufactured Adjacent to the I-64 High Tech Corridor in Southern WV (Woodbrick)	Dr. Mark Burton
TRP 00-04	Expected Flood Damages to Transportation Infrastructure as a Proportion of Total Event Costs: A Methodological Exploration	Dr. Mark Burton
TRP 99-33	Highway Program Finance Options and Strategy	Dr. Herbert Tesser
TRP 99-32	GIS Implementation Strategy for WVDOT	Dr. Herbert Tesser
TRP 99-29	Development of a Plan for a Non-Motorized Transportation Corridor in Southern WV: Case Study for Alternate Sources of Transportation between Huntington and Charleston	Dr. Raymond Busbee
TRP 99-25	Improving Safety and Operational Conditions at Railroad Crossings: An Analysis of Bolt Installations, Designs and Torque Procedures	Dr. Richard Begley
TRP 99-24	Improving Efficiency of Truck/Rail Intermodal Transportation: The Case of West Virginia	Dr. Mark Burton
TRP 99-23	Survey of Truck Parking Places (Private) in WV	Ms. Jennifer Plymale
TRP 99-19	Public/Private Port Case Study	Dr. Mark Burton
TRP 99-15	Impacts of the Appalachian Corridor on Small Businesses	Dr. Michael Hicks
TRP 99-14	Drowsy Driving Problems in WV	Dr. Robert Walker
TRP 99-13	Commodity Flows in Northern West Virginia	Dr. Mark Burton
TRP 99-11	Maximizing Economic Benefits from a Rails to Trails Project in Southern WV: Case Study of the Greenbrier River Trail	Dr. Raymond Busbee
TRP 99-09	Pre-Construction Assessment of Wetlands to be Built along the Tolsia Highway	Dr. Mike Robinson
TRP 99-08	Abandoned Tire Health Risk Survey/Analysis	Dr. James Joy
TRP 99-07	Rockfall Rating System for Slopes along Highways in WV and KY	Dr. A. Szwilski
TRP 99-03	Lincoln County Transportation Study	Dr. Mark Burton
TRP 99-02	Preserving Branch Line Railroads	Dr. Mark Burton
TRP 99-00	Commodity Flows and Transportation Inventory	Dr. Mark Burton

DISCONTINUED Projects

Project Number	Title	Principal Investigator
TRP 99-26	Beckley Exhibition Mine Expansion: Project Management and Evaluation for a Transportation Enhancement Project to be Built along a National Scenic By-Way in WV	Dr. Richard Begley
TRP 99-17	Magnetic Levitation Planning for WV	Dr. Richard Begley

TRP = Transportation Research Project

TTP = Technology Transfer Project

DISCONTINUED

