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Yet another year has come and gone! We here at ITRE continue to work hard and strive to improve each and every year. You do not have to take my word for it, since 2014 saw the first external evaluation of the Institute that many of us could ever remember having. Early this year, a team of five reviewers from academia, government and the private sector (three of whom serve on our advisory council) evaluated the magnitude and quality of our research and educational programs across all areas, along with our current and projected state of finances. The team also made a site visit in April, where it met with our program directors, all of our EPA and SPA staff and the Vice Chancellor for Research, Innovation, Engagement and Economic Development (ORIED). All in all the visit and the review were very positive. Quoting from the review report, the review team observed that “Overall, ITRE is a valuable asset to NCSU and the State of North Carolina, as evidenced by the body of work the staff contribute to the field of transportation and the return on investment for the State. ITRE staff continue to expand the national footprint of the institute and have made great strides in the acquisition of research funding from new sources over the past five years”. So, I would like to thank and congratulate our staff for a job well done, and for the impressive record we have accumulated over the past five years, which formed the basis of the evaluation. Most impressive of course is our double digit leverage ratio of state appropriations of 15.8:1. This year, our overall annual expenditures have increased by 6.3%, to nearly $7.6 million, the highest amount since 2008, and we have increased our share of direct federal dollars from 19% to 25%. In addition, for the third year in a row our funded activities generated over a million dollars in overhead funds.

I am also pleased to report that ITRE was the NC State lead in a successful National Transportation Center (NTC) Consortium proposal, led by the University of Maryland. Other consortium members are Old Dominion, Arizona State, Morgan State, Louisiana State and the University of New Orleans. This honor will provide NC State and ITRE with more federal research dollars and more opportunities to collaborate with peer institutions across the nation. The NTC focuses on themes related to freight, congestion mitigation and high speed rail.

Early this year Debbie Collins, who co-directed our public transportation group for many years, left ITRE for a great opportunity to become the Director of the Public Transportation Division at NCDOT. We miss Debbie’s presence, but know she is providing excellent leadership in her position at DOT. And only a few weeks ago, we were apprised of the news that Vice Chancellor Terri Lomax was leaving NC State to become the executive vice president over the Research Triangle Institute (RTI) lab and engineering businesses. Terri has been a strong supporter of ITRE since she became Vice Chancellor, and we all owe her a debt of gratitude for her leadership at NC State and for her appreciation of what ITRE has accomplished over the years.

Naguï Rouphail, PhD
This report summarizes ITRE’s activities for the year 2014 and provides background information on the Institute’s history, mission, goals, and objectives. It also provides an overview of ITRE’s finances, personnel, and technical activities during the year. As in years past, the Institute has maintained and, in some instances, expanded its programmatic activities.

**Center Description**

The Institute for Transportation Research and Education (ITRE) is an Institutional Center of the University of North Carolina system. Chartered by the North Carolina General Assembly in 1978, ITRE continues to carry out research, training, technical support activities, and most air transportation for a host of national, state, and local clients in order to address the nation’s critical transportation issues. ITRE is committed to developing leadership in its study of transportation issues through fostering analytical thinking, integrating technology in education and research, serving as a catalyst for problem solving, and cultivating professionals and students dedicated to excellence in transportation.

Since 2012 ITRE has been reorganized into seven programmatic areas namely 1) Center for Transportation and the Environment (CTE), 2) Highway Systems, 3) Local Technical Assistance Program (LTAP) 4) Next Generation Air Transportation Center (NGAT), 5) Travel Behavior Modeling (now a separate program outside of Highway Systems), 6) Geovisual Analytics and Decision Management Group (GADA) and 7) Public Transportation. A high-level organizational chart of our new structure is depicted in Exhibit I. As always our programs are guided and monitored by the ITRE Advisory Council, whose membership is shown in Exhibit II.

**Summary of ITRE Goals**

ITRE’s strategic plan, developed in 2002, has set forth five major institute-wide goals:

- Increase national visibility
- Conduct and disseminate research that impacts the transportation community
- Sustain and enhance educational opportunities to improve the knowledge and skills of transportation professionals
- Strengthen the relationship with, and gain recognition within, the University system
- Provide superior technical assistance

These goals are currently being achieved through various objectives, such as increasing national exposure through conference presentations, published research, outreach efforts, and increased national project awards. Additionally, the Institute continues its training efforts on a national, regional, and state level, while promoting collaboration with faculty in the department of Civil, Construction, and Environmental Engineering at North Carolina State University and at other UNC system institutions.

This report provides a glimpse of this year’s activities and accomplishments in reaching these goals and objectives. More information about ITRE’s programs and staff are available through ITRE’s website:

http://www.itre.ncsu.edu

*ITRE is housed in the Research IV Building on NC State’s Centennial Campus*
In the next few pages, a synthesis is provided of each program area as indicated in Exhibit I.
The Center for Transportation and the Environment (CTE) was established at ITRE in 1992 through the Intermodal Surface Transportation Efficiency Act of 1991. CTE is a national University Transportation Center, funded in part by the U.S. Department of Transportation Research and Innovative Technology Administration and is located administratively at NCSU. CTE’s mission is to conduct research, education, and technology transfer programs focused on the effects of surface transportation on the human and natural environment. CTE helps both transportation and environmental agencies collaborate with stakeholder groups to design and implement solutions that improve transportation systems, while protecting the nation’s critical natural resources and the vitality and livability of its communities.

CTE’s research program has focused on wetlands and water quality issues, air quality and global climate change, which is linked with transportation planning and the National Environmental Policy Act process, Context Sensitive Solutions (CSS), and social and economic issues. CTE’s education program develops course materials, as well as experiential research and internship opportunities, for undergraduate and graduate students. CTE also developed and delivered the NCDOT CSS Training Program, one of the largest CSS workforce training programs in the country. The center’s technology transfer program uses webcasting technology to develop national broadcasts, Web courses, and other Web-based forums to foster the national dialogue on transportation and environmental topics. CTE also sponsors numerous conferences, workshops, and symposia.

The center serves as a lead organizer for the International Conference on Ecology and Transportation and has facilitated national initiatives including a CSS Peer Exchange and the CSS National Dialog. CTE has received several awards for innovative research and public outreach.

CTE offered workshops in October and November on “LEGO® Robot Vehicle Lesson Plans for Secondary Education.” Participants included high school students in Robinsonville, NC and 6th and 7th grade students at Centennial Campus Magnet Middle School in Raleigh, NC.

The curriculum was developed at the University of Florida for the purpose of introducing students to transportation engineering and showing how transportation impacts their every-day lives. The lesson plans introduced the concept of using intelligent transportation systems to assist in the mitigation of traffic congestion.

Students programmed LEGO® Robot Vehicles to perform a variety of activities that illustrated how intelligent vehicles use sensors to perform tasks that can help mitigate traffic congestion.

The workforce development outreach efforts were funded by the Southeastern Transportation Research, Innovation, Development and Education Center (STRIDE).

CTE has been working with the North Carolina Department of Transportation (NCDOT) and the Women’s Transportation Seminar (WTS) NC Triangle on a series of workshops to offer transportation engineering as a viable career option for girls. The Workshops provided experiential activities, speakers, role models, and mentoring opportunities.

“Introduce a Girl to Engineering” consisted of three four-hour workshops for junior and senior high school girls. The workshops were held in February and March in Raleigh, Winston-Salem, and Greenville, NC. This series of workshops aimed to help girls understand engineering as a potential career choice, and it was hosted by the NCDOT with support from the WTS NC Triangle and CTE.

“Transportation YOU” offered four two-hour workshops for girls ages 13-18 that addressed a variety of transportation-related engineering topics. These after school workshops were held throughout the school year in Raleigh and were hosted by WTS NC Triangle with support from CTE.
The Geovisual Analytics and Decision Management Group (GADA) was formed in 2012 by combining the Operations Research and Education Laboratory (OREd) and the Commercial Vehicle Enforcement Resource Lab (COVERLAB) under their common specialties of GIS, geospatial and traditional statistics, and mathematical modeling to support operations management decisions and to guide public policy. GADA continues to grow in 2014 in terms of number of active projects and national presence.

In addition to these two programs, GADA supports on-site GIS training at ITRE’s GIS Lab. Through its partnership with eGIS Associates Inc., GADA continues to provide quality GIS training opportunities and has seen significant increases in class enrollments and an expanded GIS course list, including preparatory courses for GISP certification.

COVERLAB (coverlab.org) is a university-based program, helping the North Carolina State Highway Patrol’s (NCSHP) Motor Carrier Enforcement (MCE) section develop, in addition to planning and improving their operational enforcement programs. COVERLAB staff provide operational planning support, decision management services, data analysis, research, and education for improving enforcement effectiveness.

COVERLAB staff, in partnership with the NCSHP, have developed an online data visualization decision management platform called COVERLAB Analytics. The purpose of COVERLAB Analytics is to track, measure, and prioritize enforcement activities for improving operational effectiveness for the expressed purpose of reducing truck-involved fatal crashes, as well as protecting federally funded road and bridge infrastructure, from heavy truck damage.

With assistance from the North Carolina Governor’s Highway Safety Program (NC GHSP), these mapping and analytical capabilities have been extended to the non-MCE portion of the NCSHP. The first version of Vision Zero Analytics was released in October, 2014 with continuing updates planned in the coming years. Vision Zero Analytics provides common views of crash reduction goal tracking among the Patrol, GHSP, and statewide safety stakeholders. Troop supervisors can track their crash reduction performance goals, visualize data for in-depth trend and comparison analysis, and streamline and simplify reporting requirements with interactive reports. A map analytics application is currently being developed to prioritize times and locations for targeted enforcement.

OREd provides school districts in North Carolina, South Carolina and Virginia decision management tools based on Land Use-based membership forecasts, GIS analysis, and operations research techniques. By integrating school and community planning data, OREd can assist school districts in developing data-driven and policy-based facility and assignment plans.

In 2014 OREd began working on a multi-year assignment plan for the Wake County Public School System (WCPSS). Serving over 155,000 students in 171 schools, WCPSS is the largest district in North Carolina and is growing by more than 3,000 students per year. After completing the second full Land Use Update for WCPSS in 2013, OREd responded to the district’s need for data-driven planning for student assignment that has been used successfully in membership forecasting.

With 13 new schools opening by 2018-19, the creation of a multi-year phased student assignment plan is a challenging task by itself. WCPSS also offers a variety of program options for parents and students - from choosing a preferred school calendar to choosing among magnet and academy programs. OREd is developing a student behavior model that will better predict these choices and in turn, provide a more reliable forecast for optimizing attendance zones.

Besides WCPSS, OREd continues to work with many other school districts to assist school leaders make the best decisions for the communities they serve.

For more information on the services OREd provides visit ored-outcomes.itre.ncsu.edu.
The **Highway Systems Group** was formed in the early 1980s to assist the North Carolina Department of Transportation (NCDOT) with pressing surface infrastructure challenges. Since that time, many research and development projects were conducted for maintenance and construction, while central office staff have helped NCDOT provide implementable solutions to pressing needs. Group staff are also engaged in many national research projects under FHWA, ITE, NCHRP, NCFRP, and SHRP2 research programs, and the group is involved in teaching and professional development for the National Highway Institute (NHI).

The following list comprises eight key research focus areas of the Highway Systems group, which highlight the diverse expertise and involvement of our staff in local, state, and national level research.

- Blind Pedestrian Access to Complex Intersections
- Unconventional Intersection Analysis
- Identification and Evaluation of Roadway Assets
- Video-Based Detection and Assessment of Traffic Patterns
- Work Zone Evaluation and Safety Training
- Economic and Financial Assessment
- Freeway Performance Assessment, Modeling, and Monitoring
- Education and Training

Staff also provide job-specific training and education for transportation professionals at every level along with supplementary reference materials. For more information on these key themes, please visit http://www.itre.ncsu.edu/HWY/research.html

**Major Accomplishments in 2014**

- Continued growth of the group with new permanent staff and increased student involvement.
- Successful lead agency for new NCHRP research on Signal Timing Strategies for Diverging Diamond Interchanges (DDI - NCHRP 03-113) and Guidelines for Pedestrian Access to Roundabouts and Intersections with Channelized Turn Lanes (NCHRP 03-78b).
- Participation on various successful teams for national research projects, including NCHRP 3-107 (Work Zone Capacity Methods for the Highway Capacity Manual, HCM), NCHRP 03-115 (Production of a Major Update to the HCM), and NCHRP 07-22 (HCM Planning Guide).
- Lead authorship of the 2014 FHWA Informational Guide for the Diverging Diamond Interchange (DDI)
- Lead researchers for over twelve research contracts for the NCDOT, with staff involvement in several other projects.
- Completion of the largest mesoscopic simulation model in the country to assist NCDOT in the continued evaluation and monitoring of the I-40 “Fortify” work zone project.
- Publication of over a dozen peer-reviewed papers and conference proceedings.
- Participation in several national task order contracts for FHWA and NHI.
- Growth in training with delivery of customized courses outside of North Carolina.
- Development of new online curriculum FE and PE Review courses.
- Full-semester instruction of two semester-long courses in Civil Engineering.

**Our Vision for the Future**

- Increase course offerings and training in other states and increased online and web-based training focus.
- Continue to grow group with one to two additional full-time staff positions.
- Continue to diversify research portfolio across state and federal sponsors.
- Enable junior staff to take leadership roles in teaching and research.
- Collaboration with other ITRE groups and leveraging joint expertise.
The North Carolina Local Technical Assistance Program (NC LTAP) is one of 58 LTAP centers nationwide, funded by the Federal Highway Administration. The NC LTAP center was established at ITRE in 1986 and plays a leading role in helping state and local government agencies assess and apply new transportation technologies through training, technical materials, technical information services, and a quarterly newsletter. More than 80 training workshops are conducted annually for approximately 1,500 transportation personnel. Topics range from asphalt pavement maintenance to work zone traffic control.

The center also contributes to the professional development of the state’s local transportation personnel through the Roads Scholar Program. This certificate program provides a curriculum of training to enable transportation workers to study road fundamentals, safety, drainage, snow and ice removal, and training management among other topics. The courses help participants develop a sense of professionalism and advance their careers.

An Advanced Roads Scholar Program is also available for local agency staff, who seek to develop their technical and managerial skills further.

The Roads Scholar and Advanced Roads Scholar programs provide special training administered by North Carolina’s Local Technical Assistance Program (NC LTAP) at ITRE, allowing local government agencies access to high quality training for their employees at a reasonable cost. The Roads Scholar Program consists of 14 different one- or two-day training sessions that are regularly offered each year. To become a Roads Scholar, 7 of the 14 training sessions must be completed.
In 2014 the NextGen Air Transportation Program (NGAT) officially became recognized as an NC State University Consortium. NGAT remains a program inside of ITRE, while it works with the external community through a membership model as well. NGAT’s mission and charter continue to be to discover, evaluate, implement, and disseminate advanced air transportation technologies at the regional, national, and international level to improve the capacity, safety, and environment surrounding air transportation.

In 2012 NGAT was relaunched with an emphasis on Unmanned Aircraft Systems (UAS) integration in North Carolina, while maintaining a broad “NextGen” scope for research and development opportunities.

In 2013 NGAT began performing UAS operations and building on the foundation previously established. The main focus was to establish flight operations and develop a unified UAS Ecosystem for the state.

The 2014 NGAT UAS focus centered on developing and executing a Governance Plan, conducting research using approved equipment at select locations, and expanding UAS integration across the state.

NGAT 2014 Highlights

♦ Started the year with 5 Certificates of Authorization for UAS research, ended the year with 16 COAs. NGAT COAs presently cover 6 flight locations with 11 aircraft used to conduct airspace integration research.

♦ Recorded more than 100 UAS flights, totaling over 25 hours of flight time.

♦ Awarded $1.5M contract from NCDOT to support UAS research activities at FAA approved flight locations

♦ Became a member of the ASSURE Alliance pursuing the FAA UAS Integration Center of Excellence. Selection announcement expected in late December 2014.

♦ Hosted the NGAT Spring 2014 reception, attended by more than 120 people from across the state, who were interested in the status of the UAS Program.

♦ Helped recruit Precision Hawk to base primary headquarters in Raleigh.

♦ Provided live demonstrations of UAS capabilities at the 2014 State Fair.

♦ Continued developing industry partnerships with Digital Harvest, L-3 Communications, Olaeris, Trimble, Precision Hawk, FourthWing, ESUS, Academi, and CrescoAg.


The 2015 primary objectives aim to increase UAS research activities, support NCDOT licensing and permit developments, and grow industry partnerships.
ITRE’s Public Transportation Group conducts research, training, and technical assistance involving transit, bicycle and pedestrian, and pupil transportation.

- **The Transit Program** assists North Carolina transit systems, having contracts with the North Carolina Department of Transportation’s Public Transportation Division (PTD) and with both transit systems and local governments. The program’s primary focus is to provide technical assistance to the 18 urban and 82 rural public transportation systems as well as the state’s intercity bus program. Transit Program staff provide online and on-site training as well as direct support to NCDOT/PTD for research, policy papers and recommendations, and policies and procedures manuals.

- **The Bicycle and Pedestrian Program** focuses on improving non-motorized transportation through planning assistance, training, and research. The staff have developed policies and procedures manuals, along with safety education materials and curricula, administered NCDOT grants initiatives (planning and SRTS grants), and offered training on planning, design, and accessibility. Currently, the staff are developing the Pedestrian and Bicycle Infrastructure Network - a geodatabase of all existing and planned non-motorized facilities within North Carolina. ITRE is also testing methods and will make recommendations to NCDOT to establish a non-motorized traffic monitoring program, which would be one of the first state programs of its kind. Recent research topics include rumble strips and bicycling, in addition to a before-and-after study determining the impacts of a pedestrian bridge that completed the American Tobacco Trail.

- **The Pupil Transportation Program** addresses school travel safety and operations activities. In addition to conducting school transportation research, the program also provides technical assistance to, and is responsible for, supporting the Transportation Information Management System (TIMS) for the North Carolina Department of Public Instruction (DPI). The TIMS staff provide support and consultation for a Geographic Information System (GIS) based on school bus routing and a scheduling software system used by nearly all public school districts in North Carolina. Technical assistance activities include website hosting and maintenance for several nationally-recognized organizations, including
  - the National Association for State Directors of Pupil Transportation Services (www.nasdpts.org),
  - the National Congresses on School Transportation (www.nasdpts.org/ncstonline.index.html),
  - the Transportation Research Board School Transportation Subcommittee (www.itre.ncsu.edu/anb10_6),
  - two state organizations: the North Carolina Bus Safety (www.ncbussafety.org) and the North Carolina Pupil Transportation Association (www.ncbussafety.org/ncpta).

PTD created a statewide geodatabase on regional mobility services and public transportation facilities. This map displays the output, showing intercity bus, passenger rail, and ferry routes, as well as multimodal and bus stations, and other passenger transportation facilities.

A test subject crossing a gap in rumble strips simulated with raised pavement markers.

TIMS training has begun to ramp up as the State undergoes a major revision and subsequent upgrade of the bus routing software.
The Travel Behavior Modeling Group performs research on travel behavior and travel demand forecasting topics.

Research work includes:
- The effect of various alternative development strategies on travel behavior in small communities and rural areas,
- Surveys of travel behavior of university students in North Carolina at six university campuses, and
- A regional land-use transportation decision support tool for Mississippi.

The Travel Behavior Modeling Group includes the Triangle Regional Model Service Bureau, which develops the travel forecasting models for the Triangle region of North Carolina. The Service Bureau is developing a new Version 6 of the Triangle Regional Model, which will add new commercial vehicle and university student models, along with an improved parking capacity and constraint model.

Version 5 of the Triangle Regional Model was used by the Capital Area Metropolitan Planning Organization and the Durham Chapel Hill Carrboro Metropolitan Planning Organization for preparing forecasts and air quality analysis for the 2040 Metropolitan Transportation Plan. This version of the Triangle Regional Model added improvements including a bicycle and pedestrian model, an airport passenger model, and a parking cost and capacity constraint model.
Summary of ITRE’s Finances

*Exhibit III* shows expenditures for the most recent Fiscal Year, from July 1, 2013 through June 30, 2014, broken down by the funding source.

- Overall, about 6% of all 2014 ITRE expenditures represent *State Appropriated Funds* related to administration, with additional operations support of 4% derived from *Indirect Cost Return*. The overall percentage of support from State Appropriations is unchanged from FY 11/12 and FY 12/13.
- *State of North Carolina and Federal Contracts* total 77% of all activity. Those figures have increased by about 7% compared to 70% for FY 12/13. State contracts increased by 2% while federal funding increased by 5%.
- *Sales and Service* activity (9%) is derived mainly from registration fees for workshops. The Institute no longer has *Pass-through* projects to other departments at NCSU and other UNC universities. NCDOT now has master agreements with all NC universities individually.
- *Other Contracts* accounting for 4% include project activity primarily for municipalities and may include funding from other states have decreased from the previous fiscal year by 8%.

*Exhibit IV* shows how ITRE’s FY14 expenditures are allocated to each program area. As has been the norm in the past few years, the Highway Systems program is ITRE’s largest generator of expenditures, accounting for nearly 26% of all ITRE expenditures. This is a 6% increase over last year. Due to some senior personnel changes, we have this year combined the Public and Pupil Transportation into one group. Although the overall expenditures for this group have decreased by 6%, several of the Highway Systems projects include personnel from public transportation.

Highways is followed by Public Transportation with 14% and CTE and GADA at 12%. Other groups and administration contribute at various rates. The “Institute” expenditures include state appropriations, facilities and administrative receipts, professional development and other accounts managed by the Institute as a whole.
Exhibit V shows the distribution of expenditure sources by program area. This chart serves to highlight where each group derives its primary funds. Funds are categorized as State, Federal, and Other. This last category includes expenditures from contracts ITRE has with other states, non-profit organizations, the private sector, and course registrations. Many of these contracts have their primary sources from federal funds. The distribution varies widely across groups, showing a good diversity in funding sources.

Exhibit VI tracks ITRE’s total annual expenditures over the past five years. As can be seen, ITRE’s total expenditures have gone up in FY13/14 to $7,597,381, an increase over the previous cycle by more than $450,000 (or by about 6.3%). In fact, the past three years represent the highest levels of expenditures by ITRE since the great recession of 2008.
Exhibit VII summarizes ITRE’s productivity trends over the past five years. The top line represents the ratio of total annual expenditures divided by ITRE’s annual state appropriated funds. Total annual expenditures are utilized when calculating the ratio, basically reflecting the value of our research and education activities. The ratio continues to be well above the indicated 4.0 minimum threshold cited in the UNC Office of the President Report (lower line). In 2013, the 2.7 value represents the average leverage ratio of all NC State University Centers and Institutes, as reported by the Office of the Vice Chancellor for Research, Innovation and Economic Development. ITRE has consistently been shown to be a cost effective investment by the state of North Carolina with 15.8 dollars generated for every dollar expended by the state.

Finally, Exhibit VIII shows the trend in Facilities and Administrative (F&A) funds’ generated by ITRE, which are used for its operations, as well as for University support. In the last fiscal year we generated almost $1,110,000 of F&A dollars from our local, state, and federal projects, an increase of 1% over the previous FY. This is the third year in a row that we broke the million dollar mark in overhead generation. In past years between 33-35% of the F&A funds were returned to operate the institute and provide incentives for improving ITRE’s national visibility, but now about 25.23% is being returned due to a newer allocation formula.
Summary of Project Activities

The following list summarizes ITRE’s research and education projects at the national, state, and local levels for FY 13/14.

National Research and Development

National research efforts at ITRE continue to be quite significant in terms of magnitude and funding levels.

Accelerating Safety Activity Programs (ASAP), 2013-2014
Sponsor: Federally Funded through NCDOT (J. Martin)

Blind Pedestrians’ Access to Complex Intersections, 2007-2013
Sponsor: Western Michigan University and National Eye Institute (N. Rouphail)

Community Transportation Camera Implementation, 2012-2013
Sponsor: Federally funded through NCDOT (D. Collins)

Sponsor: US Department of Transportation/Federal Highway Administration (J. Martin)

Field Evaluation of Double Crossover Diamond Interchanges, 2010-2014
Sponsor: US Department of Transportation (N. Rouphail)

Framework for Mobile Source Emission Inventories, 2010-2014
Sponsor: US Environmental Protection Agency (N. Rouphail)

Guidelines for the Application of Crossing Solutions at Roundabouts, 2012-2014, NCHRP 3-786
Sponsor: National Academy of Sciences (B. Schroeder)

Sponsor: US Department of Agriculture, Forest Service (J. Martin/E. Murray)

Livability and Economic Analysis Study, 2012-2013
Sponsor: Louis Berger Group, Inc. (L. Lane)

Local Technical Assistance Program, 2012-2014
Sponsor: Federally funded through NCDOT (J. Martin)

Maintenance Leadership Academy Pilot Presentations, 2012-2013
Sponsor: Applied Pavement Technology (T. Baughman)

Migration of NC State Highway Patrol Geographic Information Systems Decision Support from Motor Carrier Enforcement to Traditional Enforcement - The First Step, 2012-2013
Sponsor: Federally funded through NCDOT (G. Ferrara)

Sponsor: Kittelson & Associates, Inc. (G. List)

Southeastern Transportation Research Innovation, Development and Education (STRIDE), 2012-2014
Sponsor: University of Florida (D. Brill)

The Future City Competition, a program of National Engineers Week Foundation, is a national competition where middle school students use Sim City® software to design a city of the future, which is later developed into a physical model and described through a narrative essay and research essay. Teams from Wake Forest-Rolesville Middle School and Centennial Campus Magnet Middle Schools have been a part of the ITRE mentoring effort over the past three years. The teams have achieved several awards, including fourth place in the state, Best Virtual Model, and Best Land Surveying Practices by Centennial Campus Magnet Middle School, while the team from Wake Forest-Rolesville Middle School won Best Energy Systems.

The People's Republic of China Ministry of Transport (MOT) Delegation visited ITRE on December 3, 2014. The twenty-four person delegation included senior personnel from MOT as well as a number of Provincial and city representatives. The delegation was interested in learning more about ITRE’s cutting edge research initiatives, as well as its wide range continuing education and training initiatives, delivered both in person and online. Stephanie Ayers (shown above), NC Ports Authority, Wilmington, and ITRE council member, presented to the group.
ITRE conducted research to evaluate how variations in rumble strip gap lengths and shoulder widths affect a bicyclist’s ability to maneuver through the gaps when riding at higher than average bicycling speeds reached on steep downgrades. Image shows a test subject crossing a gap in rumble strips simulated with raised pavement markers.

In this project, NCHRP 03-115, ITRE researchers lead the development and production of all Highway Capacity Manual (HCM) chapters on freeway operations. ITRE is updating existing chapters on basic freeway segments, merge and diverge segments, and weaving segments. In addition, ITRE is leading the development of a new Freeway Facilities chapter, which integrates new methodologies for analysis of managed lanes and freeway work zones.

These new methods were developed by ITRE in previous research under NCHRP projects 3-96 and 3-107, respectively. Also, ITRE is writing a new chapter on Freeway Reliability and Strategy Assessment, which integrates a new freeway reliability method developed by ITRE under SHRP-2 project L08 with FHWA research on Active Traffic Management. Finally, ITRE is developing the FREEVAL computational engine to integrate all freeway methodology in a new user-friendly and state-of-the-art JAVA-based software tool.

Support for NC Department of Motor Vehicles Participation in Secure Driver License Grant Program, 2012-2013
Sponsor: Federally funded through NCDOT (J. Martin)

Triangle Regional Model Service Bureau at ITRE, 2012-2014
Sponsor: Federally funded through Triangle Transit (J. Huegy)

Triangle Regional Model Service Bureau at ITRE, Capital Area Metropolitan Planning Organization, 2012-2014
Sponsor: Federally funded through the City of Raleigh (J. Huegy)

Triangle Regional Model Service Bureau at ITRE, 2012-2014
Sponsor: Federally funded through the City of Durham, Chapel Hill, and Carrboro Metropolitan Planning Organization (J. Huegy)

Triangle Regional Model Service Bureau at ITRE, NC Department of Transportation, 2013-2014
Sponsor: Federally funded through NCDOT (J. Huegy)

University of Maryland National University Transportation Center, 2013-2015
Sponsor: USDOT (N. Rouphail)

Web-Based Tool to Locate Data on Community Preference Characteristics, 2012-2013
Sponsor: Louis Berger Group, Inc. (L. Lane)

Other Projects Funded From Federal Sources

Sponsor: Virginia Polytechnic Institute (B. Schroeder)

Sponsor: Kittelson & Associates, Inc. (N. Rouphail)

Dissemination of Airport Cooperative Research Program Research Results: Value and Utility Assessment, Scoping and Pilot-Testing (Previously Airport Cooperative Research Program 11-05, Task 2 - Value and Utility Assessment), 2011-2013
Sponsor: National Academy of Sciences (J. Martin)

Sponsor: Project Performance Corporation (J. Martin)

Sponsor: SAIC (B. Schroeder)

Sponsor: Kittelson & Associates, Inc. (B. Schroeder)

Sponsor: Kittelson & Associates, Inc. (N. Rouphail)
Pedestrian Counting System Evaluation, 2012-2014  
Sponsor: Migma Systems, Inc. (N. Rouphail)

Phase I AMS Testbed Selection, 2013-2014  
Sponsor: Kittelson & Associates, Inc. (N. Rouphail)

Planning and Preliminary Engineering Applications Guide for the HCM (NCHRP-7-22), 2013-2014  
Sponsor: Kittelson & Associates, Inc. (B. Schroeder)

Sponsor: Cambridge Systematics, Inc. (N. Rouphail)

ITRE administered ongoing, statewide projects mostly in conjunction with the NC Department of Transportation (NCDOT) and local municipalities. See the pages that follow for additional project categories.

Sponsor: Cambridge Systematics, Inc. (G. List)

Sponsor: Cambridge Systematics, Inc. (N. Rouphail)

Surveys to Generate Data for Updated Passenger Rail Ridership Estimates, 2012  
Sponsor: AECOM Technology Corporation (T. Cook)

Sponsor: Kittelson & Associates, Inc. (N. Rouphail)

Sponsor: Kittelson & Associates, Inc. (B. Schroeder)

State of North Carolina and Local Research and Development

ITRE and NC State University joined forces last year in a consortium of seven universities, led by the University of Maryland, to compete for and ultimately win one of only five national transportation centers funded through the U.S. Department of Transportation 2013 University Transportation Centers (UTC) program. Consortium members include Arizona State, Louisiana State, Morgan State, Old Dominion and the University of New Orleans.

The center theme focuses on the DOT’s strategic goal of enhancing the nation’s economic competitiveness with three thrust areas on freight transportation, high speed rail transportation, and congestion mitigation. NC State is expected to receive nearly three quarters of a million dollars in funding for research, education, and technology transfer projects related to the three thematic areas during the two years of the grant.

Both research and educational projects carried out under the auspices of the center are selected competitively. In the first year of the grant, ITRE and NC State researchers have already started working on projects aimed at improving freight systems reliability by using in-vehicle sensing to develop connected vehicle protocols and by developing methods to validate mobility and reliability models for freeway corridors.

In addition, ITRE’s faculty and staff will be engaged in developing a short course on high speed rail and will be running a webinar series for the national center. In the second year of the grant, the focus of the activities will be on collaborative projects across the various campuses comprising the consortium, as well as continuing to advance the state of transportation by disseminating and translating ITRE’s research results for the benefit of society at large.

Aerospace Industry Development in North Carolina, 2013  
Sponsor: NC Department of Transportation (D. Findley)

Americans with Disabilities Act Training, 2013-2014  
Sponsor: NC Department of Transportation (D. Collins)

Sponsor: NC Department of Transportation (T. Cook)

Sponsor: NC Department of Transportation (C. Cunningham)

Bicycle and Pedestrian Data Collection, 2013-2014  
Sponsor: NC Department of Transportation (S. O’Brien)
Through a STRIDE project, the application of math concepts in transportation engineering was demonstrated to a high school pre-calculus class. This activity preceded a LEGO robot programming exercise, which utilized math concepts, and integrated earlier discussion about vehicle-to-vehicle communication technology with the power of accurate instruments in a roadway setting to improve safety and performance.

ITRE has been involved in NCHRP 03-107: Work Zone Capacity Methods for the Highway Capacity Manual (HCM). In the project, ITRE led the development of new methodlogies for evaluating work zones on freeways, including literature synthesis, data collection, analysis, model development, and production of new text for the HCM. The results of the research are currently integrated into the next version of the HCM by ITRE under NCHRP project 03-115.

Bicycle and Pedestrian Geo-Spatial Data Update and Management, 2012-2014
Sponsor: NC Department of Transportation (S. O’Brien)

Bicycle and Pedestrian Technical Assistance, 2012-2014
Sponsor: NC Department of Transportation (S. O’Brien)

Comparison of Data Collection Vehicles to Human Collection Methods, 2010-2012
Sponsor: NC Department of Transportation (C. Cunningham/J. Hummer)

Defining North Carolina’s Transportation Disadvantaged Populations, 2012-2013
Sponsor: NC Department of Transportation (L. Lane)

Delay and User Cost Estimation for Work Zones on Urban Arterials, 2012-2014
Sponsor: NC Department of Transportation (B. Schroeder)

Development and Packaging of Statewide Curriculum Materials for the Safe Routes to School Program, 2012
Sponsor: NC Department of Transportation (S. O’Brien)

Development of Near Real Time Performance Measurements for Closed-Loop Signal Systems Using Historical Traffic Data from Existing Loop Detectors, 2011-2014
Sponsor: NC Department of Transportation (N. Rouphail)

Development of Web-Based Training Modules to Support NCDMV Driver Services, 2013-2014
Sponsor: NC Department of Transportation (J. Martin)

Economic Contribution of the North Carolina Ports, 2013-2014
Sponsor: NC State Ports Authority (D. Findley)

Economic Performance Measurements, 2013-2014
Sponsor: NC Department of Transportation (L. Lane)

Ecosystem Enhancement Program, 2008-2013
Sponsor: NC Department of Environment and Natural Resources (J. Martin)

Evaluating the Use of License Plate Agencies by NCDMV, 2014
Sponsor: NC Department of Transportation (J. Martin)

Evaluation of Life Cycle Impacts of Intersection Control Type Selection, 2014
Sponsor: NC Department of Transportation (C. Cunningham)

Exploring Corridor Operations in the Vicinity of a Diverging Diamond Interchange (DDI), 2014
Sponsor: NC Department of Transportation (B. Schroeder)

Facilitation of NC Department of Transportation Technical Assistance Program, 2012-2014
Sponsor: NC Department of Transportation (L. Lancaster)

High Speed Rail Technical Assistance, 2010-2013
Sponsor: NC Department of Transportation (J. Martin)

IMAP-Assessment of Benefits / Costs, Route Selection, and Prioritization, 2014
Sponsor: NC Department of Transportation (N. Rouphail)
Dr. Nagui M. Rouphail, director of ITRE, was interviewed for an article in the July 2014 issue of Planning and Policy, a monthly journal published by the Korea Research Institute for Human Settlements (KRIHS). The interview for “Transportation Safety Improvement: Methods and Culture” was conducted by Sangkey Kim, a graduate research assistant and PhD candidate at NC State who works on research projects at ITRE that involve mobility and safety. KRIHS is a national research institute that conducts policy research on land development and quality of life issues.

The focus of the interview was on traffic safety, and Rouphail was asked about several safety-related projects he is involved in at ITRE. Rouphail discussed pedestrian accessibility at complex intersections, including roundabouts and channelized turn lanes, and explained how the goal of keeping traffic flowing has generated conditions with unpredictable traffic movements and confusing auditory environments that make it difficult for pedestrians with vision disabilities to navigate those intersections. Options that improve driver yielding behavior at such intersections are currently being evaluated by ITRE researchers.
Dr. Bastian Schroeder, Assistant Director of ITRE’s Highway Systems Group, was named the recipient of the 2014 Jay Quinn Technical Excellence Award by the North Carolina Section of the Institute of Transportation Engineers (ITE). The award is given annually to a recipient with “excellent technical knowledge,” who “shares their knowledge/insight with NCSITE through presentations at sponsored meetings or training sessions, or active participation in councils or committees, task forces, or work groups.” This is the second time this award was received by an ITRE staff person, with former ITRE researcher Katie McDermott having received the award in 1995.

ITRE graduate student, Shannon Warchol, recently received two prestigious awards: the Jack E. Leisch Memorial National Graduate Fellowship and an Engineering Graduate Student Scholarship from the Carolina Triangle Section of the American Society of Highway Engineers (ASHE).

The Jack E. Leisch Memorial is a national award given annually by the American Society of Civil Engineers (ASCE) to one outstanding full-time graduate student in eligible academic programs specializing in highway geometric design, traffic engineering, traffic safety, and transportation planning with an emphasis on geometric design and traffic engineering. The ASHE Engineering Graduate Student Scholarship is an annual award given to a full-time graduate student in a related field. Photo above (left to right) Nagui Rouphail, Shannon Warchol, and Joel Leisch.

Sponsor: NC Department of Transportation (B. Schroeder)

TDM Program, 2012-2014
Sponsor: NC Department of Transportation (D. Collins)

Teach Fundamental Engineering Principles Program, 2012-2014
Sponsor: NC Department of Transportation (C. Cunningham)

Technical Assistance: Developing and Implementing NC Department of Transportation’s Sustainability Blueprint, 2010-2013
Sponsor: NC Department of Transportation (J. Martin)

Technical Assistance to the NC Department of Public Instruction in the Implementation of the Transportation Information Management System, 2012-2014
Sponsor: NC Department of Public Instruction (T. Cook)

Technical Support for the Safe Routes to School Program, 2012-2014
Sponsor: NC Department of Transportation (T. Cook)

Technical Support of NC State Highway Patrol Motor Carrier Enforcement Size and Weight Enforcement Program, 2012-2014
Sponsor: NC Department of Crime and Control and Public Safety (G. Ferrara)

Technical Support Services for the NC Department of Transportation Division of Bicycle and Pedestrian Transportation, 2012-2014
Sponsor: NC Department of Transportation (T. Cook)

Traffic Signal Inspection Course Presentation and Update, 2014
Sponsor: NC Department of Transportation (C. Cunningham)

Trip Making Patterns of North Carolina’s University Students, 2012-2014
Sponsor: NC Department of Transportation (J. Huegy)

Unmanned Aircraft Systems Development Initiative, 2012-2013
Sponsor: NC Department of Transportation (K. Snyder)

Updating Crash Map Content for NC State Highway Patrol Traditional Operational Enforcement Planning, 2013-2014
Sponsor: NC State Highway Patrol (G. Ferrara)

Vision Zero, 2014
Sponsor: NC Department of Transportation (D. Findley)

Work Zone Monitoring and Assessment for TIP I-5311/I-5338, 2014
Sponsor: NC Department of Transportation (B Schroeder)

Work Zone Traffic Analysis & Impact Assessment, 2012-2013
Sponsor: NC Department of Transportation (B. Schroeder)
Additional Projects

ACRP Tasks, 2011-2013
Sponsor: Project Performance Corporation (J. Martin)

Behavioral Effects of Completing a Critical Link in the American Tobacco Trail/East Coast Greenway, 2013-2014
Sponsor: Helen & William Mazer Foundation (T. Cook)

Highway Safety and Capacity Workshops for Minnesota Department of Transportation, 2013
Sponsor: University of Minnesota (B. Schroeder)

Sponsor: Golden Leaf Foundation (K. Snyder)

Operations Research and Education Lab (OREd) Program
Sponsor: Various counties and school districts (M. Miller)

Phase I AMS Testbed Selection, 2013-2014
Sponsor: Kittelson & Associates, Inc. (N. Rouphail)

Staff Honors and Recognitions in 2014

State and National Committee and Panel Participation

TRB Committees

ABG20: Transportation Education and Training
   (D. Findley, friend)

ABG50: History Committee (D. Findley communication
   coordinator, member)

ABJ40: Travel Survey Methods (J. Huegy, friend)

ADC10: Transportation Research Board, Committee on
   Environmental Analysis in Transportation
   (D. Brill, member)

ADB40: Transportaton Demand Forecasting (J. Huegy, friend)

ADB50: Transportation Planning Applications (J. Huegy, member)

ADC30: Transportation Research Board, Committee on Ecology
   and Transportation (J. Martin, member, D. Brill, friend)

ADD100: Social, Economic and Cultural Issues (L. Lane, chair)

AFB10: Geometric Design (D. Findley, friend)

AFB20: Roadside Safety Design (D. Findley, friend)

AFB30: Low-Volume Roads (D. Findley, friend)

AHB10: Maintenance and Operations Management
   (C. Cunningham, friend)

AHB25: Signal Systems (C. Cunningham, friend)

AHB30: Vehicle-Highway Automation (C. Vaughan, friend)

AHB45: Traffic Flow Theory (G. List, member)

AHB65: Operational Effects of Geometrics (D. Findley, member; C. Cunningham, friend)

AHB70: Access Management Committee (C. Cunningham, member)

Katy Salamati and Bastian Schroder accepted the Best Paper Award entitled “Event-Based Modeling of Driver Yielding Behavior to Pedestrians at Two-Lane Roundabout Approaches” from the TRB Roundabout Committee at the annual TRB Meeting in Washington, DC.

The NCSU Chapter of ITE won the Cribbon’s Cup for being the best student chapter of the year, as well as the Quiz Bowl Championship again this year. Pictured above (left to right) Briana Phillips, Shannon Warchol, Andy Wagner.

Linda Collier, Assistant Director of the NC Local Technical Assistance Program at ITRE, was presented with the APWA -NC Streets Division Appreciation Award for excellent service to the organization.
AHD15: Maintenance and Operations Personnel (J. Martin, member)
ANB40: Traffic Law Enforcement (D. Findley, C. Cunningham, members)
ANB75: Roundabouts (B. Schroeder, member)
ANF10: Pedestrian (S. O’Brien, friend)
ANF20: Bicycle Transportation (S. O’Brien, member)
APO55: Rural Public and Intercity Bus Transportation (T. Cook, member)
APO60: Paratransit (K. Monast, member, T. Cook, friend)
APO85: Ferry (T. Cook, friend)

TRB Subcommittees
ABJ40(1): Household Travel Surveys (J. Huegy, member)
ABJ40(2): Freight Surveys (J. Huegy, member)
ABJ40(3): Stated Response Surveys (J. Huegy, member)
ABJ40(4): New Technologies (J. Huegy, member)
Joint ADD30 and ADB40: Integrated Transportation and Land Use Modeling (J. Huegy, member)
ADD50-01: Health and Transportation Joint Subcommittee (S. O’Brien, friend)
AHB40: Traffic Simulation Applications (B. Schroeder, secretary, member)
AHB40: Freeway and Multilane Highways (B. Schroeder, member)
AHB45(1) Joint Traffic Simulation (G. List, chair)
AHB65(1) Joint Intersections (C. Cunningham, friend)
ANB10(6): School Transportation (S. O’Brien, M. Miller, friends)
ANF20(6): Joint Subcommittee on Pedestrian and Bicycle University Education (S. O’Brien, friend)
ANF10: Pedestrian Research (S. O’Brien, friend)

TRB Task Force, Panel Participation and Awards
2014 Winner of the Jack E. Leisch Fellowship, American Society of Civil Engineers Award (Shannon Warchol)
NCHRP 01-17: Pedestrian and Bicycle Transportation Along Existing Roads (S. O’Brien, panel member)
NCHRP 15-49: Geometric Design Guidelines for Manager Lanes (C. Cunningham, friend)
NCSITE Traffic Quiz Bowl Regional Winners, November 2014 (B. Phillips, A. Wagner, S. Warchol)

For the second year in a row, the Best Paper Award for the TRB Committee on Highway Capacity and Quality of Service (AHB40) was awarded to ITRE researchers at TRB. Congratulations to (left to right) Nagui Rouphail, Billy Williams, Thomas Chase, and Yilun Xu for the recognition of their paper, “Methodology for Developing an HCM-based Oversaturated Speed Flow Model.” Both Thomas and Yilun received their Masters degree at NCSU/ITRE last year - Thomas is now a Ph.D. Student at the University of Florida; while Yilun works for the Transportation Department at the University of Minnesota. Also in the picture is AHB40 committee chair, Dr. Lily Elefteriadou.
Special Awards - Other Organizations

2014 Nominees for Award for Excellence in Outstanding Job Performance from North Carolina State University Office of Research and Innovation (L. Lane, S. O’Brien, A. LaPierre)
American Council of Engineering Company Award for Excellence, Competition Judge (N. Rouphail)
APWA-NC Streets Division Appreciation Award (L. Collier)
ATSIIP Traffic Records Forum 2013, Data Visualization Category, COVERLAB Analytics Project Award, (COVERLAB staff)
Best of ITS Award, Research and Innovation, Intelligent Transportation Society (ITS) America, Capital District ATIS Project, June 2007 (G. List)
Institute for Operations Research and Management Science (INFORMS) (L. Collier)
APWA-NC Streets Division, Special Advisor to Board
APWA-NC Executive Board Past President (J. Martin)
NCSITE Jay Quinn Technical Excellence Award 2014, (B. Schroeder)
Project of the Year Award, Intelligent Transportation Society - New York, Wireless Solar-Powered ETTM Project, June 7, 2007 (G. List)
Project of the Year Award, Intelligent Transportation Society – New York, NCSITE Jay Quinn Technical Excellence Award 2014, (B. Schroeder)
Best of ITS Award, Research and Innovation, Intelligent Transportation Analytics Project Award, (COVERLAB staff)
ATSIP Traffic Records Forum 2013, Data Visualization Category, COVERLAB (G. List, Edelman prize finalist)
Institute for Operations Research and Management Science (INFORMS) (L. Collier)
APWA-NC Streets Division Appreciation Award (L. Collier)
Community Transportation Association of America (T. Cook, member)
National Transportation Center at the University of Maryland (N. Rouphail, associate director)
North Carolina Public Transportation Association (K. Monast, member)
NCSITE Simulation and Capacity Model User Group (B. Schroeder, chair)
NCSITE Traffic Analysis Tools Task Force (B. Schroeder, chair)
NCSITE Traffic Engineering Council (B. Schroeder, member)
North Carolina Section of ITE (NCSITE) (B. Schroeder, member)
Saturation Flow and Queue Task Force (C. Cunningham, member)
Signal Systems User Group (C. Cunningham, chair)
Simulation and Capacity Models Users Group (C. Cunningham, member)
Traffic Analysis Tools Task Force (C. Cunningham, member)
Traffic Engineering Council (C. Cunningham, member)
Wake Forest Middle School (C. Cunningham, future city mentor)

Membership - Other Organizations

American Public Transportation Association (K. Monast, member)
American Society of Civil Engineers (ASCE) Street and Highways Operations of T&DI (N. Rouphail, committee member)
American Society of Civil Engineer (ASCE) (G. List, fellow)
APWA-NC Executive Board Past President (J. Martin)
APWA-NC Streets Division, Special Advisor to Board (L. Collier)
Association of Pedestrian and Bicycle Professionals (S. O’Brien, member)
Community Transportation Association of America (T. Cook, member)
National Transportation Center at the University of Maryland (N. Rouphail, associate director)
North Carolina Public Transportation Association (K. Monast, member)
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Wake Forest Middle School (C. Cunningham, future city mentor)

Joseph Huey, Director of the Travel Behavior Modeling Group at ITRE, helped present Impacts of Land Use Strategies on Travel Behavior in Small Communities and Rural Areas (NCHRP 52-36) at the 14th National TRB Tools of the Trade Conference on July 22, 2014 in Burlington, Vermont. The report was based on work analyzing the impact of different development patterns on the travel behavior in small communities and rural areas. Combined land use and transportation models were built to assess different growth strategies, from isolated growth areas to growth in the largest towns in commuting zones. Visualizations of the land development patterns were prepared and presented.

Leigh Lane, senior research associate at ITRE, has been selected to serve as a panel member on a Transportation Research Board Cooperative Research Program project. As part of the panel, Lane will provide oversight on the National Cooperative Highway Research Program (NCHRP) Project 52-52: Developing a Context-Sensitive Functional Classification System for More Flexibility in Geometric Design. Panel members are responsible for drafting and editing problem statements, reviewing and selecting proposals, and reviewing working plans and reports.

Three members of the Institute for Transportation Research and Education (ITRE) at North Carolina State University were recently recognized with nominations for the 2014 Awards for Excellence at the Office of Research, Innovation and Economic Development (ORIED) level. Each year, the University rewards the accomplishments and achievements of permanent employees at both the unit and University levels. (left to right) Leigh Lane, James Martin, Sarah O’Brien, Anne LaPierre (not shown).
Based on research conducted in 2014, ITRE staff will present and contribute to various meetings with the Transportation Research Board (TRB) at the Annual Meeting in January 2015. Many of these papers will also be considered for publication in upcoming issues of the Transportation Research Record.

A German Approach to Freeway Facility Evaluation, Martin Hartmann/Peter Vortisch/Bastian J. Schroeder

A Novel Collision Classification Methodology Based on Temporal Link Speed Data and Congestion Thresholds, Tai Jin Song/Sangkey Kim/Billy M. Williams/Ali Hajbabaie/Nagui M. Roupail/George F. List

A Methodology to Compute Roundabout Corridor Travel Time, Zachary Bugg/Bastian J. Schroeder/Pete Jenior/Marcus Brewer/Lee Rodegerdts


Application of the Upcoming HCM Managed Lane Procedure to Pylon-Separated Managed Lane Analyses, Samaneh Khazraei/Yan Xiao/Mohammed Hadi/Seyedbehzad Aghdashi

A Probit-based Pedestrian Gap Acceptance Model for Mid-block Crossing Locations, Shrikanth V. Mamidipalli/Virginia P. Sisiopiku/Bastian J. Schroeder/Lily Elefteriadou/Katy Salamati/Nagui M. Roupail

Accessing Emissions Impacts of Transportation Management Strategies for Large Scale Regional Networks, Shams Tanvir/Bin Liu/Xuesong Zhou/H. Christopher Frey/Nagui M. Roupail

Assessment Of Corridors With Different Types Of Intersections: An Environmental And Traffic Performance Analysis, Paulo Fernandes/Tânia Fontes/Mark Neves/Sérgio Ramos Pereira/Jorge M. Bandeira/Margarida C. Coelho/Nagui M. Roupail

Considerations for a Retaining Wall Inventory and Condition Assessment System, Cedrick J. Butler/Mohammed A. Gabr/William Rasdorf/Daniel Findley/Jeffrey Chang/Britton E. Hammit

Driver Yielding at Unsignalized Midblock Crossings, Elizabeth E. Hunter/Katayoun Salamati/Lily Elefteriadou/Virginia P. Sisiopiku/Nagui M. Roupail/Briana N. Phillips/Bastian J. Schroeder

Dynamic Traffic Flow Model for Travel Time Estimation, Ting Yi/Billy M. Williams

Estimating and Forecasting Truck Trip Tables for Statewide Analyses, George F. List


Estimating Saturation Headways at Work Zones on Urban Arterials, Bastian Schroeder/Sangkey Kim/Ali Hajbabaie/Seyedbehzad Aghdashi/Nagui Roupail/Tai-Jin Song/Kambiz Tabrizi

Exploring the Association of Crash Propensity and Micro-scale Driver Behavior, Tai Jin Song/Sangkey Kim/Nagui M. Roupail/Seyedbehzad Aghdashi/Ana Amaro/Gonçalo Gonçalves

Flow Allocation at Congested Freeway Ramp Merges, Nagui Roupail/Seyedbehzad Aghdashi/Kwanpyo Ko/Mohammed Hadi/Samaneh Khazraeian

Freeway Reliability Scenario Generation: A Hybrid Approach, Seyedbehzad Aghdashi/Ali Hajbabaie/Joseph Trask/Bastian J. Schroeder/Nagui M Roupail

Freeway Work Zone Speed Prediction from Multi-State Sensor Data, Ali Hajbabaie/Chunho Yeom/Nagui M. Roupail/William J. Rasdorf/Bastian J. Schroeder
Generic Speed Flow Models for Basic Freeway Segments on General Purpose and Managed Lanes, Seyedbehzad Aghdashi/Nagui M. Rouphail/Ali Hajbabaie/Bastian J. Schroeder

Geometric and Signal Timing Strategies to Improve Corridor Operations in the Vicinity of Diverging Diamond Interchanges, Shannon Warchol

Identifying Transportation Disadvantage: Mixed-Methods Analysis Combining GIS Mapping with Qualitative Data, Elizabeth Shay/Tabitha Combs/David Salvesen/Michele Madeley/Carl Kolosna/Daniel Findley

Innovative Work Zone Capacity Models from Nationwide Field and Archival Sources, Chunho Yeom/Ali Hajbabaie/Bastian J. Schroeder/Chris Vaught/Xingyu Xuan/Nagui M. Rouphail

On the Treatment Of Trucks For Freeway Capacity Analysis, George F. List/Bo Yang/Nagui M. Rouphail

Non Motorized Site Selection Methods for Continuous and Short-Duration Volume Counting, Kristy Jackson/Liz Stolz/Chris Cunningham

Parallel Processing and Agent-Based Representations of Traffic Signal Control, George F. List/Mehdi Mashayekhi

Pedestrian And Bicyclist Accommodations On Superstreets In North Carolina, Anne M. Holzem/Joseph Hummer/Chris Cunningham/Sarah O’Brien/Bastian Schroeder/Katy Salamati

Rumble Strip Gaps for High Speed Bicycles, Sarah O’Brien/Kristy Jackson/Erik Vosburgh/Daniel Findley

Simplified Macroscopic Planning-Level Methodology to Compare the Emissions of Roundabouts and Signalized Intersections, Katy Salamati/Nagui Rouphail/Chris Frey/Bin Liu/Bastian Schroeder

Travel Time Estimation from fixed Point Detector Data, Ting Yi/Billy M. Williams

Where Do Pedestrians Jaywalk And How Do Drivers React? A Study Within A Campus Environment, Yinan Zheng/Thomas Chase/Lily Elefteriadou/Bastian J. Schroeder/Virginia P. Sisiopiku

Innovative Work Zone Capacity Models from Nationwide Field and Archival Sources, Chunho Yeom/Ali Hajbabaie/Bastian J. Schroeder/Chris Vaught/Xingyu Xuan/Nagui M. Rouphail

Multi-criteria Assessment Of Crosswalk Location In Urban Roundabout Corridors, Paulo Fernandes/Tânia Fontes/Sérgio Ramos Pereira/Nagui M. Rouphail/Margarida C. Coelho

Long-Term Monitoring of Wrong-Way Maneuvers at Diverging Diamond Interchanges, Christopher Vaught/Chaithra Jagadish/Shreyas Bharadwaj/Chris Cunningham/Bastian J. Schroeder/Joseph E. Hummer/Daniel Findley/Nagui M. Rouphail

On The Treatment Of Trucks For Freeway Capacity Analysis, George F. List/Bo Yang/Nagui M. Rouphail

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Where Do Pedestrians Jaywalk And How Do Drivers React? A Study Within A Campus Environment, Yinan Zheng/Thomas Chase/Lily Elefteriadou/Bastian J. Schroeder/Virginia P. Sisiopiku
Conference and Workshop Attendance, Participation and Exhibits in 2014

Center for Transportation and the Environment (CTE)

Context Sensitive Solutions National Dialog 2 Workshop, Tallahassee, FL, March, 2014 (J. Martin, N. Bailey, E. Murray, attended)
Context Sensitive Solutions National Dialog 2 Workshop, Boise, ID, June, 2014 (L. Lane, N. Bailey, E. Murray, attended)
Context Sensitive Solutions National Dialog 2 Workshop, Washington, DC, August, 2014 (J. Martin, E. Murray, attended)
NCHRP Project 15-52 Developing a More Flexible and Context-Sensitive Functional Classification System for Geometric Design, ongoing 2014-15 (L. Lane, panel member)
2015 Environmental Excellence Awards Judge, Federal Highway Administration, Web meeting, October 2014 (L. Lane)
TRB AFB40 Midyear Meeting, September 2014 (J. Martin, presented)

Geovisual Analytics and Decision Management Group (GADA)

CVSA Spring Workshop Committee Presentation - COVERLAB Analytics Demo April, 2014 (G. Ferrara, presented)
Southeast Regional GIS User Conference - A Performance-Based Visual Analytics Platform for Improving Motor Carrier Enforcement Operational Effectiveness, April, 2014 (A. Belcher, presented)
NCSHP Motor Carrier Enforcement Conference and Workshop - COVERLAB Analytics Training Workshop, April, 2014 (G. Ferrara, A. Belcher, B. Foley and M. Kuliani, hosted)

Highway Systems

FHWA Alternative Intersection Informational Guides, Webinar as part of TOPR#62. Online, August 2014 (C. Cunningham, presented)
Safety Effects of Unsignalized Superstreets in NC. 2014 Alternative Intersections & Interchanges Symposium. Salt Lake City, UT, July 2014 (C. Cunningham, presented)
Operational Effects of Signalized Superstreets in NC. Alternative Intersections & Interchanges Symposium. Salt Lake City, UT, July 2014 (C. Cunningham, presented)
FHWA Alternative Intersection Informational Guides. Webinar as part of TOPR#62. Alternative Intersections & Interchanges Symposium. Salt Lake City, UT, July 2014 (C. Cunningham, presented)
Alternative Intersections and Interchanges Symposium - Salt Lake City, UT, July, 2014 (C. Cunningham, presented)
NCDOT Roundtable, Hickory, NC, September, 2014 (B. Schroeder, presented)
Alternative Intersections and Interchanges Symposium, Salt Lake City, UT, July, 2014 (B. Schroeder presented)
NCSITE Annual Meeting, Raleigh, NC, November, 2014 (B. Schroeder, presented)
NCSITE SimCap Users Group Meeting, Raleigh, NC, September 2014, (B. Schroeder, presented)
PTV America Users Group Meeting, Orlando, FL, October, 2014 (B. Schroeder presented)
TRB Highway Capacity Committee Midyear Meeting, Lexington, KY. June, 2014 (B. Schroeder, presented)
TRB Roundabout Conference, Seattle, WA. April, 2014 (B. Schroeder, presented)
**ITRE Director**


“ITRE@ NC State University: Mission, Vision, and Our Role in the Future of Transportation,” Presented to China MOT Delegation, Raleigh, NC, December, 2014 (N. Rouphail, presented)


“NSF Workshop on Large-Scale Traffic and Driving Activity Data,” DriveSense 2014 Workshop, Old Dominion University, Norfolk, VA, October, 2014 (N. Rouphail, presented)

Workshop on HCM Major Update, at the TRB Highway Capacity and Quality of Service Committee Mid-Year Meeting,” Lexington, KY, June, 2014 (N. Rouphail, presented)

University of Aveiro, Portugal, April, 2014 (N. Rouphail, invited speaker)

“Dynamic Traffic Control Interventions for Enhanced Economic Competitiveness, Poster Session,” STRIDE—UTC Conference for the Southeastern Region, Georgia Institute of Technology, Atlanta, GA, March, 2014 (N. Rouphail, presented)

“Reliability In the Next Highway Capacity Manual,” at the Transportation, Planning Land Use and Air Quality Conference, Charlotte, NC, March, 2014 (N. Rouphail, presented)

**NC Local Technical Assistance Program (NC LTAP)**

APWA-NC State Chapter Conference, New Bern, NC, June 2014 (J. Martin, L. Collier, B. Woods, attended)

APWA-NC Combined Equipment Services and Streets Conference, Hickory, NC, September 2014 (J. Martin, L. Collier, B. Woods, attended)

APWA-NC Meet and Greet and Leadership Training, Raleigh, NC, 2014 (J. Martin, L. Collier attended)

APWA-NC State Chapter monthly board meetings, Greensboro, NC, 2014 (J. Martin, L. Collier attended)

APWA-NC Streets Division monthly board meetings, Greensboro, NC 2014 (L. Collier, attended)

FHWA Every Day Counts 3 Summit, Charlotte, DC, December 2014 (J. Martin, attended)

LTAP National Meeting, St Louis, MO, July, 2014 (J. Martin, attended)

LTAP Region 4 Meeting, St. Augustine, FL, May, 2014 (L. Collier, attended)

**NextGen Air Transportation (NGAT) Program**

UAS Statewide Integration Meeting to present NC CIO Governance Plan at NC Emergency Management HQ, Raleigh, NC, April, 2014 (K. Snyder, hosted)

UAS for Ag Information Session in Moyock, NC, February, 2014 (K. Snyder, hosted)

NGAT UAS Local Reception, May, NCSU Raleigh, NC, 2014 (K. Snyder, hosted)

NC Northeast State of the Region, Williamston, NC, February 2014 (K. Snyder, presented)

NC Airports Association Conference, Asheville, NC, April 2014 (K. Snyder, presented)

NC State ENCORE Program, Raleigh, NC, February, 2014 (K. Snyder, presented)

UNC Program in the Humanities Seminar: “Minds and Machines in the 21st Century”, Chapel Hill, NC, July, 2014 (K. Snyder, presented)

NC Society of Surveyors “UAS for GIS” Workshop Series, across the state, 2014 (K. Snyder, presented)

Duke Energy Aviation Seminar, Charlotte, NC, May, 2014 (K. Snyder, presented)

NC Federal Advanced Technologies Symposium, Raleigh, NC, May, 2014 (K. Snyder, presented)

Professional Engineers of North Carolina Chapter Annual Meeting, Pinehurst, NC, June, 2014 (K. Snyder, presented)

DeltaAg Tech Symposium, Memphis, TN, July, 2014 (K. Snyder, presented)

South Carolina AgriBiz Expo, Florence, SC, January, 2014 (K. Snyder, presented)

Tidewater Research Station Field Day, Plymouth, NC, August, 2014 (K. Snyder, presented)

National Aviation Day Event, Kitty Hawk, NC, August, 2014 (K. Snyder, presented)

NCSU CALS Butner Field Day, Butner, NC, August, 2014 (K. Snyder, presented)

Extension Disaster Education Network (EDEN) Annual Meeting, Florence, AL, October, 2014 (K. Snyder, presented)

Pre-SFIREG Region 4 Meeting, Chattanooga, TN, October, 2014 (K. Snyder, presented)
Catawba College Community Forum, Salisbury, NC, November, 2014 (K. Snyder, presented)  
National Agriculture Aviation Association Annual Conference, Louisville, KY, December, 2014 (K. Snyder, presented)  
AUVSI Unmanned Systems North America, Orlando, FL, May, 2014 (K. Snyder, attended) 
NC House UAS Legislative Research Committee meetings, 2014 (K. Snyder, attended)  
Oklahoma UAS Summit, Tulsa, OK, March 2014 (K. Snyder, attended)  
GEOINT 2014 through partnership with L-3 Communications, Tampa, April, 2014 (K. Snyder, attended)  
TAAC 2014, Albuquerque, NM, December, 2014 (K. Snyder, attended)  
ASPRS UAS Mapping 2014, Reno, NV, October, 2014 (K. Snyder, attended) 

**Public Transportation**

21st Rural Public & Intercity Bus Conference, Monterey, CA, October 2014 (T. Cook, presented; K. Monast, attended) 
34th NCDOT Community Transportation Conference, Raleigh, NC, January 2014 (T. Cook, K. Monast, J. Scott, presented)  
*A Bridge to Somewhere - How Completing a Critical Link of the American Tobacco Trail Changed a Community, Pro Walk/Pro Bike/Pro Place, Pittsburgh, PA. September 2014,* and Greensboro NC, October, 2014  (S. O’Brien, presented)  
APC User Group, Raleigh, NC, February 2014 (K. Monast attended)  
Americans with Disabilities Act Training, Greensboro, NC, May 2014 (K. Monast, J. Scott attended)  
International Paratransit Conference, Monterey, CA, October 2014 (K. Monast attended)  
Maintaining and Contributing to North Carolina’s Bicycle and Pedestrian Counting Program Workshop, Greensboro, NC. September 2014.  (S. O’Brien, C. Cunningham, K. Jackson co-instructed)  
Navigating MAP-21 Workshop, Advocacy Advance, Carrboro, NC. June 2014  (S. O’Brien and K. Jackson attended)  
NC DOT Community Transportation Conference, Raleigh, NC, January 2014 (D. Collins, K. Monast, and J. Scott presented)  
NC DOT Community Transportation Conference, Raleigh, NC, September 2014 (K. Monast presented, J. Scott attended)  
NCDOT MPO/Urban Transportation Meeting, Raleigh, NC, April 2014 (K. Monast presented, J. Scott attended)  
NCDOT Grantee Training, Hickory, NC, August 2014 (K. Monast attended)  
NCDOT PTD Staff Performance Planning training, Raleigh, NC August 2014 (K. Monast presented, J. Scott attended)  
NCDOT PTD Staff AssetWorks training, Raleigh, NC, August 2014 (J. Scott presented, K. Monast attended)  
NCPTA Conference, Dare County Public Schools, Kill Devil Hills, NC, June 2014 (M. Perez, L. Beasley, T. Cook, all presented)  
NC Public Transportation Conference, Charlotte, NC, April 2014 (K. Monast, J. Scott attended)  
NC Transportation Leadership Development Program - Clemmons, Salisbury, Raleigh, Durham, Spring and Fall 2014 (K. Monast presented)  
Pedestrians and Bicyclists Emphasis Area Working Group, NC Strategic Highway Safety Plan update, May 2014  (S. O’Brien, participated)  
Safe Routes to School Statewide Advocacy Workshop, Raleigh, NC, May 2014  (S. O’Brien, attended)  
Skillbuilding Workshop: Building and Maintaining Effective Organizations Through Good Employees, Raleigh, NC, June 2014 (K. Monast attended)  
Skillbuilding Workshop: Building and Maintaining Effective Organizations Through Good Employees, Raleigh, NC, October 2014 (J. Scott attended)  
SQL Level 1 Training, Raleigh, NC, October 2014 (J. Scott attended)  
The Path Forward: *North Carolina’s GIS for Bicycling and Walking Facilities,* North Carolina Association of Metropolitan Planning Organizations Conference, Wilmington, NC, May 2014 (K. Jackson, presented)  
NC’s *Statewide Geodatabase for Bicycling and Walking Facilities,* ProWalk ProBike ProPlace Conference, Pittsburgh, PA, June 2014 (K. Jackson presented)
Travel Behavior Modeling Group

14th National TRB Tools of the Trade Conference, Burlington, Vermont, July, 2014 (J. Huegy, presented)

Student Presentations

NCSITE Student Led Meeting, Diverging Diamond Interchange Right Turn Treatments, Charlotte, NC, April 2014 (S. Warchol presented)


PTV America Users Group Meeting, Optimization and Modeling of Corridor Operations in the Vicinity of a DDI Using Vistro & Visim, Orlando, FL October, 2014 (S. Warchol presented)

Refereed Journal Papers


Kristy Jackson, Research Assistant in the Bike/Ped Program at ITRE, tests out the inductive loops installed on West End Boulevard in Winston-Salem. The location is one of 12 continuous count stations, installed as part of a pilot program to establish a non-motorized traffic monitoring program in North Carolina. (photo credit: Matthew Burczyk)

The image on the right shows the American Tobacco Trail Bicycle and Pedestrian Bridge over I-40. ITRE conducted a before-and-after study to determine the transportation, health, and economic effects of the installation of the bridge, which connected two existing trail segments and completed the now 22-mile long trail.
Other Publications and Reports


Cars and passenger trucks use significant amounts of fuel and emit air pollutants that are harmful to human health. Researchers at NC State, in collaboration with Arizona State University (ASU), have developed a new framework to accurately predict emissions of individual vehicles as they operate on a large road network. A new traffic simulation model, DTAlite, takes into account the second-by-second acceleration, deceleration, and idling of thousands of vehicles operating on the network. Within DTAlite is a new high resolution computationally efficient vehicle emissions model, MOVES Lite, that predicts tailpipe emissions of carbon monoxide, nitrogen oxides, hydrocarbons, and carbon dioxide based on speed, acceleration, and road grade. The emissions model was validated based on comparisons to measurements made by NC State of 100 light duty gasoline vehicles. The new modeling framework allows researchers and policy makers to explore the effects of vehicle technology, emissions regulations, demand management, changes to infrastructure, and traffic control on energy use and emissions. The project, sponsored by a U.S. Environmental Protection Agency STAR grant, was led by H. Christopher Frey of CCEE, Nagui Rouphail of the Institute for Transportation Research and Education, and Xuesong Zhou at ASU, with contributions from CCEE and ITRE graduate students including Bin Liu, Shams Tanvir, Abseen Anya (MSCE, 2013) and Hassan Swidan (MSCE, 2011).
Support for Scholars and Students

ITRE research and technical assistance projects continue to engage and support a large number of students from various disciplines at both the undergraduate and graduate levels. The tables on the next page summarize our record of accomplishments in providing student support. This year is yet another banner year where we had a significant increase in graduate and undergraduate student participation in ITRE research. In 2014, we again broke the record and had the highest number of research-supported graduate (43) and undergraduate (40) students in our history. Twenty of our graduate students were supported as Graduate Research Assistants (GRA) on projects. Much of the graduate student support continues to derive from federal research dollars from agencies, such as the National Science Foundation, the National Cooperative Highway Research Program (NCHRP), the Strategic Highway Research Program (SHRP-2), the Federal Highway Administration, and the Environmental Protection Agency. We also provided meaningful research experiences for our undergraduate students, primarily in the areas of highway systems, rail operations, and a variety of other fields. ITRE also recruited a high school student, Calvin Schneider, from the Academy of Information Technology (AOIT) program, Apex High School.

Post-Doctoral Fellows and Visiting Scholars

PhD student Flavia De Simone, spent six months at ITRE working under the advisement of Dr. Billy Williams and Nagui Rouphail. She attends the Sapienza University of Roma, Italy. Her doctoral research focuses on predictive modeling of traffic safety using ubiquitous network sensor information.

ITRE continues to recruit post-doctoral candidates and host many international visiting students, scholars, and professional delegations.

Post-Doctoral Fellows

Dr. Ali Hajbabaie, who has completed his doctoral work at the University of Illinois at Urban Champaign (UIUC) in the areas of traffic operations, focused on signal optimization, and safety, and he continued his research at ITRE at the national level, including several SHRP-2 and NCHRP projects, as well as an NCDOT project on arterial work zones.

Dr. Behzad Aghdashi graduated from North Carolina State University with a doctoral degree in Operations Research (OR). His dissertation research focused on ramp metering optimization on freeways with consideration of stochastic capacity. Dr. Aghdashi was subsequently appointed to a permanent Research Associate position at ITRE.

Dr. Frederick Livingston graduated from NC State University with a doctoral degree in Electrical and Computer Engineering. Dr. Livingston is working with NGAT, leading our sensor integration, testing, and evaluation research activities.

Dr. Xiaozhao “George” Lu graduated from the University of Wisconsin with a doctoral in Transportation Civil Engineering. His research deals with multimodal transportation systems for sustainability purposes.

Visiting Delegations, Scholars and Students

The People’s Republic of China Ministry of Transport (MOT) Delegation visited ITRE on December 3, 2014. The twenty four person delegation included senior personnel from MOT as well as a number of Provincial and city representatives. The delegation was interested in learning more about ITRE’s cutting edge research initiatives, as well as its wide range continuing education and training initiatives, delivered both in person and online. The delegation, which was heavily representing water transportation issues, also met with representatives from the Port of Wilmington and visited the port the following day.

NEXCO WEST Japanese Delegation visited ITRE in September. Twenty researchers from ITRE, NC State University, and the NEXCO WEST delegation were in attendance. The topic of conversation was focused on bridge maintenance, highways, and tolling. NGAT discussed the use of remotely piloted unmanned helicopters for bridge inspection, which is of interest to our state’s transportation department.

Dr. Junggon Sung is a Senior Research Fellow at the Korea Institute of Civil Engineering and Building Technology (KICT). KICT is a government sponsored research institute in Goyang, South Korea. His research interests are highway safety and highway management systems. Dr. Sung received his doctoral degree in Transportation Engineering at the University of Wisconsin in Madison.

Dr. Margarida Coelho, Assistant Professor from the University of Aveiro, continues to collaborate with Dr. Rouphail on research on transportation and vehicle emissions.

PhD student, Paulo Fernandes, from the University of Aveiro, Portugal and the co-advisee of Dr. Coelho and Dr. Rouphail visited ITRE in January 2014, continuing his research collaboration on roundabout corridor operations and their impact on safety, efficiency, and vehicle emissions.

Dr. Tiago Farias and Dr. Patricia Baptista from the Technical University of Lisbon (TUL) in Portugal visited ITRE in February 2014 to continue the collaboration on the Intelligence to Drive (i2D) system, jointly supported by ITRE and TUL. Initial prototype testing of a Vehicle-Infrastructure-Vehicle (VIV) took place during the visit.

Dr. Hyejung Hu visited ITRE in March 2014, following attendance at the Land Use Conference held in Charlotte. She received her doctoral degree in Civil Engineering at NC State University and worked as a post-doctoral candidate at ITRE. Dr. Hu discussed an upcoming project at ITRE, sponsored by KICT on the integration of a simplified emissions model along with a Dynamic Traffic Assignment model (DTA).

Ms. Lu “Lucy” Yu has a master’s degree in Automobile Engineering from Harbin Institute of Technology at Weihai, Shandong Province, China. Her research studies focused on travel time reliability.
### 2014 Supported Graduate Students

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>Graduate Students</th>
<th>Undergraduate Students</th>
<th>High School Interns</th>
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Helena Bell  
Yi Chen  
Georgina Crepps  
Joy Davis  
Darshan Divakaran  
Tristan Dyer  
Jonah Freedman  
Alfred Garshong  
Adrienne Heller  
Dylan Horne  
Elizabeth Hunter  
Nabaruna Karmakar  
Sangkey Kim  
Kwanpyo Ko  
Shu Liu  
Yijun Ma  
Nicholas Machak  
Ted Mansfield  
Mehdi Mashayeki  
Philip McNeilly  
Brian Narron  
Ashley Newby  
Ryan Paul  
Briana Phillips  
Gowtham Ramesh  
Stu Rouse  
Parth Satra  
Shams Tanvir  
Andy Wagner  
Shannon Warchol  
Elizabeth Williams  
Lindsay Patterson  
Adam Pendlebury  
Sarah Searcy  
J. Douglas Small  
Tai Jin Song  
Anna Stokes  
Kambiz Tabrizi  
Joseph Trask  
Xingyu Xuan  
Bo Yang  
Rui Yang  
Chunho Yeom

### 2014 Supported Undergraduate Students

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Evan Arnold  
John Bauman  
Caroline Bojarski  
Riyad Brothers  
Emily Capps  
Chris Carnes  
Katherine Cassidy  
Ryan Castillo  
Jacob Clayton  
Daniel Coble  
Matthew Conrad  
Michael Corwin  
Roderick Cox  
Edward Foyle  
Charles Getz  
Zhu Gong  
Regan Hale  
Steven Hill  
Kyle Hovey  
Hamilton James  
Stacey Jennings  
Maddie Lawson  
Alyssa Little  
Caleb Lowman  
Rodniqua Minor  
Teresa Pincus  
Margaret Ray  
Thomas Rickabaugh  
Andrew Robinson  
Scott Sallade  
Corey Steiss  
Adam Stewart  
Dawson Stott  
Michael Strickland  
Wah Tran  
Katelyn Tsai  
Viktoria Van Cantfort  
Erik Vosburgh  
Matthew Wright  
Andy Wagner

### 2014 High School Interns

Calvin Schneider, Apex High School

Students supported by ITRE projects have designated work areas in the student workroom where they have access to research data stored on ITRE servers.
ITRE brings customized Americans with Disabilities Act training to work with North Carolina public transportation professionals every year. Participants at the 26th North Carolina Transportation Leadership Development Program are shown above interactively applying their new leadership skills.
<table>
<thead>
<tr>
<th>Program</th>
<th>Training/Workshops in 2014</th>
<th>Instruction Hours per Session</th>
<th>Sessions Offered</th>
<th>Total Hours</th>
<th>Attendees</th>
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<td>Classroom Training</td>
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<td>Professional Enhancement Courses</td>
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Traffic forecasters at ITRE used a regional transportation computer model to predict how beltline traffic will spread onto other roads that also serve as school bus routes. The Beltline repair project affects thousands of students and their families across the county. There are 223 bus routes, about 20 percent of the county’s buses, that travel either on the parts of the Beltline that will be rebuilt or on other roads that will get more traffic as motorists look for alternate routes.

For instance, the Beltline backups are expected to push as many as 1,000 cars an hour onto N.C. 55 between I-40 and U.S. 64 in western Wake County which is already a big route for Research Triangle Park commuters. The extra traffic will affect 72 school buses on N.C. 55 and it will be difficult for those buses to avoid trouble.
Marketing/Public Relations

As ITRE works to position itself as a world-class transportation research center, the Institute continues to focus its efforts on increasing national visibility. Whether making presentations in conferences and seminars, both nationally and abroad, receiving awards and recognition for contributions to the field, establishing collaborations with universities in foreign countries, or working to solve transportation problems and educating transportation professionals, ITRE staff continues to work toward achieving this goal.

Sharing the accomplishments and successes brought about by these efforts has been the focus of marketing and public relations for 2014. ITRE staff members provide services to support the goals and objectives of ITRE that relate to marketing and public relations.

On the ITRE Website:

- Activities, events, programs, and research are featured in ITRE Directions, a quarterly online newsletter available on the “News and Events” page.
- News items are featured on the home page.
- Current research papers and reports continue to be made available through either source links or PDF files from a searchable database in the “Research” section of the website.
- ITRE recognized staff, who presented at the TRB Annual Meeting, through listing session papers and providing a photo gallery available on the website.
- ITRE worked with its centers and program groups, as well as other transportation-related organizations, to maintain over 15 websites.
- ITRE continues to share items of interest on Facebook. It is accessible through the Facebook button on the home page of the website.
- Website analytics show that the total number of pages viewed on the ITRE website has increased from the same period in 2013.

Articles in TRB Transportation Research E-Newsletter

- Announcements about ITRE Directions and Annual Reports

ITRE participated in the newly formed NCSU Outreach and Engagement Marketing and Communications Committee.
ITRE Staff Participation in Community Service

Habitat for Humanity in March

Food Bank in July

Again in September at the Habitat for Humanity

Inter-Faith Food Shuttle in October

Last, but not least, we helped out at the Walnut Creek Wetland Center in December
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