



## Program Progress Performance Report for University Transportation Center at Portland State University

Submitted to: U.S. Department of Transportation  
Research and Innovative Technology Administration (RITA)

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Project Title: University Transportation Center  
National Institute for Transportation and Communities (NITC)

*Consortium members: Portland State University (PSU),  
University of Oregon (UO), Oregon Institute of Technology (OIT),  
University of Utah (UU)*

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Signature:

A handwritten signature in black ink, appearing to read 'Jennifer Dill'.

# 1. ACCOMPLISHMENTS: What was done? What was learned?

## What are the major goals of the program?

The major goals for NITC as described in our application fall into five categories:

### *Research*

- **Competitive, peer-review project selection process.** NITC projects are selected through an open RFP process. All faculty at the member campuses, as well as approved Faculty Associates, are eligible to submit research, education and technology transfer project proposals responsive to our theme. The proposal evaluation process emphasizes external peer review and draw on the expertise of practitioners and researchers nationally.
- **Transportation for Livable Communities Pooled-fund research.** To help maximize implementation of U.S. DOT's commitment to livable communities, NITC's Transportation for Livable Communities Pooled-Fund Research program will provide regional and local agencies, such as metropolitan planning organizations and municipalities, more opportunity to be invested in research
- **Transportation Data for Livable Communities.** This initiative aims to create a model for data collection, management and dissemination that will foster the wider, national use of data resources collected on a local level.
- **Engaging Citizen Leaders.** This initiative will expand NITC's scope of work to reach a wide range of current and future transportation leaders.

### *Leadership*

- **Shape national & international conversations on transportation research and education.** NITC faculty are well regarded nationally and internationally as leaders in their fields. They will continue to demonstrate this leadership through publishing in the top journals and presenting their work at conferences. NITC will take the concept of leadership far beyond academic circles, as evidenced by the wide dissemination of research results in professional, technical and general publications and other media.
- **Serve on national committees and panels.** NITC faculty help address national transportation problems through volunteer leadership on TRB committees and in other positions, including journal editorial boards, national and international conference organizing committees, NSF panels, and other advisory boards. To continue and reinforce this practice, NITC will mentor our new, junior faculty to apply for committee and panel membership and recognize the activities of all faculty members.
- **Respond to needs of practitioners and policymakers.** NITC researchers have a long history of conducting research that is useful in solving the problems practitioners and decision-makers face every day. Our theme and project selection process will ensure that our research continues to address our nation's transportation problems. We will work with

key staff at the DOT administrations (FHWA, FTA, etc.), both in Washington, D.C., and within the region, whose work relates to our theme to determine the most effective way for our researchers to learn from and inform agency activities.

#### *Education and Workforce*

- **Offer degrees and courses in multiple disciplines.** NITC will continue to offer a rich array of degrees that serve the transportation profession.
- **Provide experiential learning.** A key component of our education strategy is experiential learning, which will help attract and retain students. Our campuses will continue to provide these opportunities, and NITC will seek ways to expand them.
- **Attract and support undergraduate students.** NITC will build upon existing and effective mechanisms to expose K-12 students to transportation, attract and retain new undergraduate students to our degree programs, and involve undergraduates in our research.
- **Attract and support graduate students.** NITC will support graduate students directly through the following: Research assistantships; Dissertation fellowships; Funds for scholarships at each campus to recruit new and retain existing high-performing students; and Funds for transportation student group activities.
- **Sponsor a student conference.** NITC will host a national student conference focusing on our theme.
- **Educate professionals.** NITC will maintain a vibrant program of seminars, workshops, professional courses and other training opportunities that provide transportation practitioners with the latest tools and techniques.

#### *Technology Transfer*

- **Move research into practice.** Our competitive project selection process will help ensure that we select projects that have direct implications for practitioners in the short- or long-term. In addition, we will use practitioners to help inform projects after selection and review final products. Additional efforts will include short workshops to share research results, one-page research briefs, presenting work at conferences aimed at practitioners, holding one-day conferences, funding technology transfer projects, and encouraging the commercial application of research results when possible.
- **Inform researchers.** The quality of scientific inquiry depends upon researchers sharing their findings with other researchers through the peer-review publication processes. We will accomplish this through two primary activities. First, NITC's faculty will continue to publish extensively in peer-reviewed journals. Second, TREC will support our faculty in presenting their work at nationally recognized academic conferences by including travel funds for each project.

- **Use innovative technologies to communicate research results.** NITC will embark on an ambitious program of sharing information through traditional and new media.

### *Collaboration*

- **Collaborating within our consortium.** NITC's governance structure is cooperative and leadership is distributed. The Executive Committee includes one faculty member from each campus. The Executive Committee provides overall direction for the Center, makes project funding decisions, and selects Center award recipients, including student of the year. They will meet in person at least twice a year, rotating the location between campuses, and hold regular conference calls.
- **External collaboration.** In addition to the partnerships that occur through individual projects and the pooled-fund program, NITC will foster collaboration with a range of "end-users" of our work through an External Advisory Board.

### **What was accomplished under these goals?**

#### *Research*

- **Competitive, peer-review project selection process.**

The first round of NITC projects were awarded in the fall of 2012. Nineteen projects were selected through the competitive, peer-review process and have been completed.

The second round of NITC projects were selected in the fall of 2013 and awarded in the winter of 2014. Ten projects were selected through a competitive, peer review process and have been completed.

We awarded a round of NITC small starts funds in the fall of 2013. These project awards are for preliminary research to help PIs further develop their research idea so they can be more competitive in future NITC RFPs. These projects have been completed.

The third round of NITC funds were selected in June of 2014. Nine projects were selected, and all have been completed.

- **Transportation for Livable Communities Pooled-fund research.**

Our center funded one pooled-fund research project, Online Non-motorized Traffic Count Archive. Funding partners on the project include the Oregon Department of Transportation, FHWA, City of Boulder, Lane Council of Governments, Metro, City of Eugene, City of Austin, City of Bend and the Bend MPO.

The goal of the project is to create a national non-motorized count archive where agencies can add data, counts are checked for quality, and data can be exported and visualized through mapping and basic graphic functions.

The anticipated impacts include jurisdictions being more easily able to share and access data, because data can be exported in a standard format and thus are easier to manipulate and data can be incorporated into other national databases.

The project is complete, and a beta version of the archive was developed. The archive contains over 4.8 million non-motorized count records from five states and 11 counties. Practitioners can upload data to the live Bike-Ped Portal Site: <http://bp.its.pdx.edu/>

Thus far the project has resulted in one paper titled “Creating a National Non-Motorized Traffic Count Archive: Process and Progress that was published in an issue of Transportation Research Record (TRR)”. Four presentations have been given on the project to approximately 135 people. Further, an overview of the project was given to 325 attendees, many of whom were practitioners, during a NITC supported webinar on how to measure pedestrians.

The project also involves seven area high school students (from diverse backgrounds) in alpha testing software, two of whom also were also engaged in software development tasks using Python. Phase 2 is underway to improve the site usability and to develop a webpage component that will provide data visualizations. One graduate and three undergraduate students are involved in this next phase of the project.

- **Transportation Data for Livable Communities.**

Nineteen of the 45 research projects funded create a model for data collection, management or dissemination. The results of this research will foster the wider, national use of data resources collected at the local level. The Online Non-motorized Traffic Count Archive discussed above has been very successful in this effort.

- **Engaging Citizen Leaders.**

NITC hosted the 2016 Open Street Summit in Portland, Oregon, which was held Aug 18-21, 2016 on the Portland State University Campus. The Summit offered opportunities for practitioners and policy makers to be exposed to innovative ideas and solutions that promote the open streets concept and help shape livable communities. The event drew attendees from five continents, who work in varied areas including research, practice, and advocacy. During four breakout sessions, 198 participants could choose between 31 different workshops that ranged in themes from inspiring community resilience, making the case for open streets to policy makers, building a movement, and using different approaches to re-imagining streets.

The project, Transportation Leadership Education, developed a case study and national model of the Portland Bureau of Transportation’s Traffic and Transportation Course. Over 1,300 citizens have taken this 10-week course to learn how to engage in transportation issues in their community. A case study of the Portland Traffic and Transportation course has been completed. The case study found that course participants received a good understanding of factors that influence the transportation landscape, and of the fiscal and policy constraints and available tools for transportation agencies. Participants were also much more involved in local transportation activities after taking the course. Of 102 participants surveyed, 68 students proposed a specific solution to an observed transportation problem, 28 of which were implemented, and 22 were attributable at least in part to the student’s actions. The case study

and curriculum materials will be distributed and shared with various constituencies. Currently, funding is being sought to launch demonstration courses in 2-3 additional U.S. cities.

The research informed a course curriculum and implementation handbook for a “Citizen Transportation Academy” which seeks to replicate the Portland Traffic and Transportation course model in other U.S. cities. Congressman Blumenauer promotes the course at various speaking engagements across the country. Interviews and surveys have confirmed that the Portland Traffic and Transportation Course presents a unique approach to educating interested citizens about transportation.

The project, Disseminating the Sustainable City Year Program (SCYP) Educational, expands upon the success of the SCYP by supporting universities across the country to implement the program. The SCYP educates local politicians, citizens and agency staff on the components and benefits of livable communities. The fourth annual Sustainable City Year Program Conference was held in April 2015 in collaboration with the Resilient Cities Program at the University of Minnesota. More than sixty individuals, representing 24 universities and cities from around the country, attended this conference. A series of professionally produced podcasts were created that assist with the development of new programs, the development of transportation based SCYP projects.

The work from this grant has assisted in establishing numerous new SCYP programs throughout the country. This includes programs in various stages of development at the University of Colorado, Denver, Arizona State University, California State University, Monterey Bay, University of Southern Florida, California State University, East Bay, California State University, Sonoma, and University of California, Chico. This represents the engagement of hundreds of students, faculty, city staff, community members and elected officials.

Our programmatic scoring criteria gave higher points to projects that actively engage external partners and addressed equity and diversity issues. A number of our projects focus on equity including: Is HUD Affordable Housing Really Affordable?; Understanding the Transit-Dependent Population; Assessing Transit Fare Equity in Utah Using a Geographic Information System; and Latino Immigrant Communities and Equity in Transit Oriented Development.

### *Leadership*

- **Shape national & international conversations on transportation research and education.**
  - NITC staff are helping to shape a TRB training initiative Task Force ABG05T, Ahead of the Curve: Mastering the Management of Transportation Research. The mission of the Task Force is to develop a TRB training program that enhances the knowledge, skills, and abilities of those who manage transportation research programs and innovation activities.
  - Seventeen NITC faculty and staff serve on editorial, policy and other advisory boards.
  - NITC staff are active in the AASHTO-RAC liaison group.
  - NITC faculty are part of the team (led by ICF International) developing FHWA’s Strategic Agenda for Pedestrian and Bicycle Transportation.

- NITC's Director, Jennifer Dill, was elected to the Executive Committee of the Council of University Transportation Centers (CUTC).
- NITC's Director, Jennifer Dill, is serving on a special TRB policy committee on Innovative Mobility Services. The committee was established at the request of the TRB Executive Committee. She also chaired the 2016 UTC-TRB Spotlight Conference focused on Pedestrian and Bicycle Safety.
- NITC Associate Director Hau Hagedorn is the co-chair of the TRB Conduct of Research Committee. She also serves on the NCHRP 20-44 panel to improve methods of delivering research findings and promoting their use.
- NITC continues to shape bicycle and pedestrian curriculum by training educators from across the country on integrating these topics into university planning and engineering courses.

- **Serve on national committees and panels.**

Faculty, staff and students at the NITC campuses currently serve on 34 TRB committees/task forces and 10 NCHRP/SHRP2/NCFRP/TRB panels.

- **Respond to needs of practitioners and policymakers.**

NITC sponsored two workshops (July 25-29, Aug 16-21, 2016) through the Initiative for Bicycle and Pedestrian Innovation (IBPI) that covered fundamentals of bikeway design and planning through an intensive week of interactive classroom and field experience and one-on-one problem solving with instructors. The workshops were attended by 38 participants.

The Transportation and Communities Summit was held on September 8th and 9th, 2016 at Portland State University. The event hosted 272 practitioners, policymakers, students, and researchers. The goal of the Summit is to educate professionals, advance the state of research and to facilitate a conversation between practitioners and researchers to shape future research. This year's Summit also included five workshops that offered participants training opportunities on topics ranging from modeling health impacts, bike and pedestrian access to transit, transportation impact analysis, use of online data for address transportation questions, and using livability as a framework to engage the public. A total of 113 individuals participated in these workshops.

In the fall of 2016, NITC hosted three live webinars on funded projects. The webinars were attended by practitioners and policymakers.

- Transit Signal Priority Evaluation and Performance Measures, 62 attendees
- The Association Between Light Rail Transit, Streetcars and Bus Rapid Transit on Jobs, People and Rents, 73 attendees
- State-wide Pedestrian and Bicycle Miles Traveled-- Can we estimate it?, 162 attendees

In addition, NITC made four previously recorded webinars on funded projects available on the website of the American Planning Association (<https://www.planning.org/>) for live-streaming on demand, including:

- Investigations in Transportation: Partnering Industry Professionals and Elementary Teachers in a STEM Unit of Study, 13 attendees
- Development of a Pedestrian Demand Estimation Tool, 29 attendees
- State Efforts to Reduce Greenhouse Gas Emissions from Transportation, 19 attendees
- Evaluation of an Electric Bike Pilot Project in Portland, Oregon, 29 attendees

All webinars allowed participants to earn professional development credits.

### *Education and Workforce*

- **Offer degrees and courses in multiple disciplines.**

The four NITC campuses continue to offer 16 degrees in transportation and closely related fields.

- **Provide experiential learning.**

Our campuses continue to incorporate access to community partners and employment opportunities in a number of ways. Over 165 students participated in one of the four campus student groups and 96 students affiliated with the NITC program attended conferences. Fifteen students held transportation-related internships. Student groups are also active in hosting events and attending conferences.

The University of Utah student group, Point B, continues their partnership with the local WTS chapter and participates in the TransportationYOU program with middle school girls in the Salt Lake City area. This group also hosted and/or participated in the following events during the reporting period:

- National Association of City Transportation Officials Designing Cities conference in Seattle, WA (1 student)
- Students presented papers on transportation topics at the Association of Collegiate Schools Planning Annual Conference (ACSP; 4 students)
- Point B hosted a research presentation on protected bike intersections (35 students)

The Oregon Institute of Technology student group, ITE, hosted and/or participated in the following events during the reporting period:

- Transportation & Communities Summit in Portland, OR (3 students)
- ASCE/ITE Civil engineering fall banquet, a networking event that included technical presentations (128 students)
- ITE Oregon Section Traffic Bowl and student Tours in Portland, OR, a networking event that included a transportation trivia contest and visits to transportation firms and agencies (8 students)
- Two OIT scholarship winners attended the Coral Sales Scholarship Dinner

- Three OIT students attended the Asphalt Pavement Association of Oregon Annual Meeting and Scholarship Banquet and were awarded APAO scholarships
- With funding from NITC and the ITE student chapter, students attended several webinars, including:
  - ACI Alaska Chapter concrete paving (4 students)
  - Rural Road Safety Center, Defining the Future for Safe Rural Transportation in America (5 students)
  - Kittelson Associates, Careers in Transportation (21 students)
  - TRB, Effective Presentations (5 students)

The Portland State University student group, STEP, hosted and/or participated in the following events during the reporting period:

- Two students presented their research at the Pro Walk Pro Bike Pro Place conference in Vancouver, BC
- ITE Oregon Section Traffic Bowl, in Portland, OR, and won second place (4 students)
- Viewing and discussion of the documentary 'City on Speed: Bogota Change' (6 students)

At Portland State University, the College of Urban and Public Affairs continues to offer the Pedestrian and Bicycle Planning Lab. The source provides the opportunity to participate in a workshop-based planning process and is taught by top professionals in the field of bicycle and pedestrian planning and design.

NITC also aims to attract and retain new undergraduate students to transportation-related degree programs and increase the number of women and students of color in these programs. Exposing these students to transportation concepts at a young age will eventually expand the workforce pool and diversity of new professionals. To this end, NITC offered the National Summer Transportation Institute (NSTI) at Portland State University, a free two-week day camp for 15 to 25 girls entering 9th through 12th grade. The program was held from 11<sup>th</sup> -22<sup>nd</sup>, 2016 and 22 high school girls participated. The focus of NSTI is to provide experiential learning opportunities on transportation that supports livable communities, connect high school girls with women in transportation-related fields and attracts young women from diverse backgrounds to transportation-related course work in their higher education pursuits.

- **Attract and support undergraduate and graduate students.**

From Fall 2012 to Spring 2016, NITC awarded 160 scholarships to support student-led research projects. Seventy of the scholarships went to Portland State University, 32 to University of Oregon, 35 to University of Utah and 23 to the Oregon Institute of Technology. Each student who receives a NITC scholarship develops a research product (such as a thesis or conference paper) that fits within the NITC themes.

OIT students won several addition awards including Coral Sales scholarships (Jordan Preston and Kevin Baker), scholarships from the Asphalt Pavement Association of Oregon (Joshua Havig, Jordan Preston, Erik Johnson) and the WTS/CH2M National Graduate Student award

(Miranda Barrus). PSU's Patrick Singleton continues to be recognized. He received an Eno and Eisenhower fellowship in 2014, ranked as the top Eisenhower recipient at TRB in 2015, named the 2015 UTC student of the year, and won the best presentation award at TRB's annual meeting in 2017. Steven Gehrke, another PSU student, received the best presentation award at the 2016 TRB meeting. PSU's, Tara Goddard, who is also a recipient of the Eisenhower fellowship, was named the 2016 UTC student of the year.

- **Sponsor a Transportation and Livable Communities Student Competition.**

NITC staff developed with leaders from the student groups a student video competition for the Fall of 2016. Six student teams from Portland State University, the University of Oregon, Oregon Institute of Technology, and the University of Utah submitted entries to the competition. Entries were reviewed and scored by a panel of distinguished judges from across the country, representing academic, public, and private sector professionals. The winning video was screened at the Transportation and Communities Summit, and all finalist videos are available on the NITC web site, <http://nitc.trec.pdx.edu/content/student-video-contest>.

- **Educate professionals.**

During the reporting period, NITC supported 23 events offering 92 continuing education credits totaling 1293 attendees. Specifics of these events are detailed below.

- NITC hosted seven webinars on funded research. The webinars were broadcasted live or could be streamed on demand and were attended by practitioners and policymakers.
  - Transit Signal Priority Evaluation and Performance Measures, 62 attendees
  - The Association Between Light Rail Transit, Streetcars and Bus Rapid Transit on Jobs, People and Rents, 73 attendees
  - State-wide Pedestrian and Bicycle Miles Traveled-- Can we estimate it?, 162 attendees
  - Investigations in Transportation: Partnering Industry Professionals and Elementary Teachers in a STEM Unit of Study, 13 attendees
  - Development of a Pedestrian Demand Estimation Tool, 29 attendees
  - State Efforts to Reduce Greenhouse Gas Emissions from Transportation, 19 attendees
  - Evaluation of an Electric Bike Pilot Project in Portland, Oregon, 29 attendees
- Each Friday during the quarter, Portland State University holds a Friday Transportation Seminar that is open to the public. We do a live webcast of the event. The fall semester had 283 non-student participants (primarily professionals) at either the in-person event or live webcast.
- The Initiative for Bicycle and Pedestrian Innovation (IBPI) offered two different workshops on comprehensive bikeway design in July and August, 2016. These workshops were attended by 38 professionals.

- The Open Streets Summit, Aug. 18-21, 2016, provided opportunities for practitioners and policy makers to learn about innovative ideas and solutions that promote the open streets concept and help shape livable communities. This event attracted 198 attendees.
- The Transportation and Communities Summit that took place September 8-9, 2016 on the PSU campus and was attended by 222 practitioners, policy makers, and researchers. Five different workshops were offered during the summit:
  - Using Integrated Transport and Health Impacts Model (ITHIM) to integrate health impacts into transportation decision-making tools
  - Enhancing bicycle and pedestrian access to transit
  - PORTAL data archive workshop
  - Transforming transportation impact analysis: A new vision for coordinating transportation and land development
  - Livability: A strategic frame for public engagement

### *Technology Transfer*

- **Move research into practice.**

NITC launched a Technology Transfer Pool program in the Spring 2015 which allows the opportunity to support implementation or translation of research results. Grants are limited to disseminating results stemming from previously funded and completed research funded by OTREC or NITC. The purpose of these awards is to turn research into products that can be used by practitioners and/or researchers to further advance implementation. The following projects received funding:

- Adding Value to GPS Travel Data with New Open-Source Processing Software for Everyone, Jennifer Dill (PSU). This tool will be presented at a workshop at the annual conference of Active Living Research that will be held Feb. 26<sup>th</sup> – Mar 1<sup>st</sup>, 2017 in Clearwater Beach, Fl.
- Tools for Assisting Low Income Households with Finding Location-Efficient Housing, Andree Tremoulet (PSU). This project is available on the NITC website.

The project, Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S., designed and implemented by PI Chris Monsere and his colleagues and students shed significant insights on the value and design of protected bike lanes and captured the attention of the media and the professional community. Since its publication on the NITC website in June of 2014, 28 news stories have been published on this research and the project's final report has been downloaded 1461 times from 32 countries and 6 different continents. Practitioners made up 50% of those downloading the report, both nationally and internationally. The practitioners who downloaded the report and responded to our survey primarily used its findings and recommendations to make decisions about practice or to provide public input. They gave the report high scores for readability (81% of respondents) and usefulness (78% of respondents). Since the publication of the final report, its insights were incorporated into the Traffic Engineering Handbook published by ITE (Chapter 10), and the research team has also published three additional peer-reviewed publications. Professor Monsere also incorporated

findings and recommendations from this report into his chapter 'Bicycle Transportation' that is part of the most recent edition of the Routledge Handbook of Transportation.

Kelly Clifton's research on trip generation, which was one of the projects supported by this grant, made a direct impact on how the City of Portland assesses the impact of new developments on infrastructure. Professor Clifton testified in December 2016 in front of the City Council about her research on trip generation. Her testimony ultimately led the council to adopt an ordinance that allows city planners consider person trips when charging fees to developers to defray infrastructure and transportation costs incurred by the city because of new developments. Her work on trip generation was also included in the latest edition of the ITE Trip Generation Handbook.

Reid Ewing's project, Trip and Parking Generation at Transit-Oriented Developments (TODs), published in 2016 provided results that already have drawn significant attention from planners. His team studied vehicle trip generation and parking demand at TODs in five cities. They found fewer vehicle trips and significantly reduced parking demand than predicted by the Institute for Transportation Engineers' Trip Generation and Parking Generation manuals. The difference between predictions and actual data indicate a need to re-evaluate ITE parameters as they pertain to TODs as well as current land use near transit. Smart Growth America is hosting a webinar on this research on Jan. 31, 2016 called 'Empty Spaces' that provides a lay summary of the research team's findings and will also include the participation of a panel of national land-use policy experts.

- **Inform researchers.**

NITC encourages PIs to present on their research at conferences all over the world. Over the course of the grant, researchers reported 120 presentations on NITC projects with 8889 people in attendance. In addition, NITC sponsored research has resulted in 40 peer-reviewed articles and 27 publications in professional journals or on websites.

- **Use innovative technologies to communicate research results.**

We launched a new NITC website in the fall of 2014. The site contains an updated look, functionality and improved interface for users such as PIs. We continue to add new functionalities to our project proposal management system (PPMS) with the goal of tracking student data, maintaining a robust data archive, and increasing the ease of entering and retrieving data from the database. For example, after adding a feature that allows PIs to enter student information with their progress reports, we have been able to track student engagement in research more reliably. We are now adding several report features that will facilitate data extraction from the database for reporting purposes. We have shared this online system with CUNY and Carnegie Mellon. San Jose State University and University of Washington are interested in developing a similar system.

We use our social media resources such as Twitter and Facebook to bring awareness to the release of a report or highlighted produce. We promote final reports and resulting papers in peer reviewed journals on our website and alert our subscriber base to these new publications

via email. Using the report download tracking from our website, we are also able to assess if our promotion efforts are successful. For example, the publishing of the final report with an accompanying news story of Feng Lui's project "Utilizing Ego-centric Video to Conduct Naturalistic Bicycling Studies" on our website lead to 53 downloads of the final report for this project. This was a significant higher number of downloads than the baseline number that ranges from 6 to 11 downloads per month for this report (based on subsequent months) – suggesting that our promotion increased the visibility of this research.

### *Collaboration*

- **Collaborating within our consortium.**

A combined NITC Advisory Board and Executive Committee meeting was held on September 8<sup>th</sup>, 2016 at Portland State University. Most members participated in person, a few connected via conference call.

- **External collaboration.**

The pooled-fund project referenced in the *Research* section demonstrate strong partnerships with a number of agencies in Oregon, Austin, Texas and Boulder, Colorado.

The following people and organizations were members of the NITC Advisory Board during this reporting period:

- Alan Lehto, Director of Planning & Policy, TriMet
- Michael Baltes, ITS Program Manager, Office of Mobility Innovation, Federal Transit Administration
- Michael Bufalino, Research Section Manager, Oregon Department of Transportation
- Wendy Cawley, Traffic Safety Engineer, Portland Bureau of Transportation
- Tyler Deke, Executive Director, Bend MPO
- Susan Handy, Director, National Center for Sustainable Transportation
- Matthew Hardy, Program Director, Policy and Planning, AASHTO
- Susan Herbel, Principal, Cambridge Systematics
- Craig Honeyman, Legislative Director, League of Oregon Cities
- Cameron Kergaye, Director of Research, Utah DOT
- Wayne Kittelson, Founding Principal, Kittelson & Associates, Inc.
- Ted Knowlton, Sustainability Director, Wasatch Front MPO
- Brian Lagerberg, Director, Public Transportation Division, WSDOT
- Alan Lehto, Director of Planning & Policy, TriMet
- Ivan Marrero, Division Administrator, Utah Division, Federal Highway Administration
- Gabe Rousseau, Safety Operations Team Leader, FHWA
- Brian Saelens, Professor of Pediatrics and Psychiatry & Behavioral Sciences, Seattle Children's Hospital
- Tom Schwetz, Planning & Development Manager, Lane Transit District
- Ted Trepanier, Director of Product Management, Traffic, Inrix
- Yinhai Wang, Director, PacTrans

## **How have the results been disseminated?**

The NITC communications director works with each of the PIs to create a plan on report dissemination. Thus far, 39 final reports have been published. These reports are available for download on the project page on the NITC website. We regularly use e-newsletters and social media (Twitter, Facebook) to promote completed research. As referenced in the education section, NITC hosted seven webinars during the reporting period that were attended or viewed by 387 individuals.

## **What do you plan to do during the next reporting period to accomplish the goals?**

This is the last report for this grant.

## **2. PRODUCTS: What has the program produced?**

### **Publications, conference papers, and presentations**

Forty-seven projects were funded by this grant and have been completed. This research has resulted in 40 peer-reviewed articles that were cited 86 times in peer-reviewed journals. In addition, 27 reports were published in professional journals or on websites that were cited 10 times. Researchers from the NITC projects reported 120 presentations about those projects at conferences and events. NITC researchers also reported that 8889 people were in attendance for these presentations.

Below is a complete list of the supported projects:

- Tech Transfer: Tools for Assisting Low Income Households With Finding Location-Efficient Housing, Andree Tremoulet, PSU
- Tech Transfer: Adding Value to GPS Travel Data with New Open-Source Processing Software for Everyone, Jennifer Dill, PSU
- Utilizing Ego-centric Video to Conduct Naturalistic Bicycling Studies, Feng Liu, PSU
- Assessing State Efforts to Integrate Transportation, Land Use and Climate , Rebecca Lewis, UO
- Improving Walkability Through Control Strategies at Signalized Intersections, Sirisha Kothuri, PSU
- Evaluation of an Eco-driving Intervention: Changing Knowledge, Attitudes, and Behavior by Means of Supervisor Support, Donald Truxillo, PSU
- The Effects of Commuter Rail on Population Deconcentration and Commuting: A Salt Lake City Case Study, Joanna Ganning, UU
- Disseminating the Sustainable City Year Program (SCYP) Educational Model to UTC Campuses, Nico Larco, UO
- Exploiting New Data Sources to Quantify Arterial Congestion and Performance Measures at a Regional Scale, Miguel Figliozzi, PSU
- Trip and Parking Generation at Transit-Oriented Developments, Reid Ewing, UU

- Street Portals: Urban User Interface 'Test Bed' Prototype for Bike Shares, Jason Germany, UO
- Methods to Increase Fuel Efficiency in Post-Production Automobiles, Hope Corsair, OIT
- Mobility versus Accessibility: Applications for Shrinking Cities, Joanna Ganning, UU
- Characterization of Li-air batteries as an option to increase Electrical Vehicle range, Claudia Torres Garibay, OIT
- Inclusive planning to evaluate improved non-emergency medical transportation services for patients with End Stage Renal Disease, Jenny Liu, PSU
- Exploring Racial Bias in Drivers' Behavior at Pedestrian Crossings, Kimberly Kahn, PSU
- Is HUD Affordable Housing Really Affordable?, Reid Ewing, UU
- Agent-Based Model Simulating Pedestrian Behavioral Response to Environmental Structural Changes, Amy Lobben, UO
- Investigations in Transportation, Carol BiskupicKnight, PSU
- Development of a Pedestrian Demand Estimation Tool, Kelly Clifton, PSU
- Connecting people to places: spatiotemporal analysis of transit supply using travel-time cubes, Steven Farber, UO
- Crowdsourcing the Collection of Transportation Behavior Data, Christopher Bone, UO
- National Study of BRT Development Outcomes, Arthur C. Nelson, UU
- Strategic Design and Policy for Improving the Livability and Multi-modal Use of U.S. Urban Arterials and Commercial Highways, Michael Larice, UU
- Effect of Light-Rail Transit on Traffic in a Travel Corridor, Reid Ewing, UU
- Vehicle acquisition and disposal/ Multi-modal Household Vehicle Fleets and Residential Location Choices, Roger Chen, PSU
- Lessons from the Green Lanes: Evaluating Protected Bike Lanes in the U.S. , Christopher Monsere, PSU
- Continuous Data Integration for Land Use and Transportation Planning and Modeling, Liming Wang, PSU
- Application of Interactive Video Sensing and Management for Pedestrian and Bicycle Safety Studies, Feng Liu, PSU
- Evaluation of Electric Bike Use at Three Kaiser Permanente NW Employment Centers in Portland Metro Region, John MacArthur, PSU
- Evaluation of Bicyclists Exposure to Traffic-Related Air Pollution along Distinct Facility Types, Miguel Figliozzi, PSU
- OLIS Sustainable Transportation Class, Vicki Elmer, UO
- Combined Traction and Energy Recovery Motor for Electric Vehicles, James Long, OIT
- Encouraging Active School Travel by Making it "Cool" A quasi-experimental study using Boltage, Phase II, Yizhao Yang, UO
- Do TODs Make a Difference?, Arthur C. Nelson, UU
- Latino Immigrant Communities and Equity in Transit Oriented Development, Gerardo Sandoval, UO
- Understanding Market Segments for Current and Future Residential Location and Travel Choices, Kelly Clifton, PSU

- Transportation Leadership Education, Nathan McNeil, PSU
- Assessing Transit Fare Equity in Utah Using a Geographic Information System, Steven Farber, UO
- Making Streets into Complete Streets: An Evidence based Design Manual, Marc Schlossberg, UO
- Online Non-motorized Traffic Count Archive, Krista Nordback, PSU
- Washington State Pedestrian and Bicycle Miles Traveled Project, Krista Nordback, PSU
- Promoting Active School Travel by Making it “Cool”: a quasi-experimental study using Boltage – Phase II, Yizhao Yang, UO
- Measuring the Impacts of Social Media on Advancing Public Transit, Jenny Liu, PSU
- Modeling and Analyzing the Impact of Advanced Technologies on Livability and Multimodal Transportation Performance Measures in Arterial Corridors, Miguel Figliozi, PSU
- Understanding Types of Cyclists Nationally, Jennifer Dill, PSU
- Understanding the Transit-Dependent Population, Jennifer Dill, PSU

### **Website(s) or other Internet site(s)**

The NITC website is located here: <http://nitc.trec.pdx.edu/>.

### **Technologies or techniques**

Kelly Clifton’s project, Development of a Pedestrian Demand Estimation Tool, developed statistical models of pedestrian choice behavior, predicting the distribution of walk trips generated to destinations at a small spatial scale. Her expertise in the field of multi-modal trip generation has made a significant contribution to the state of the practice. Trip generation methods have always been challenged to provide adequate support for sustainable development and multi-modal transportation. Professor Clifton and her team has been asked to participate in a number of national forums led by the Institute of Transportation Engineers, Caltrans and the National Association of City Transportation Officials (NACTO) on how to revise current methods in light of her research. Her work was included in the latest edition of the ITE Trip Generation Handbook. Additionally, her research on pedestrian modeling has received interest from across the globe. Her aim is to advance the analytical tools available for non-motorized modes in order to plan for the safety, health, and environment of all transportation system users. Professor Clifton and her team have presented this work at numerous domestic and international conferences including the United Kingdom, Chile, and Portugal and recently in Mexico, Sweden, and the UK. Because the methods developed in this research are designed to integrate with existing demand modeling tools, the work has been well received by professional and academic audiences alike. Most recently, she led a workshop at the Transportation and Communities Summit that focused on her vision and proposed methods for transportation impact analyses.

Feng Liu and colleagues developed for the project, Utilizing Ego-centric Video to Conduct Naturalistic Bicycling Studies, the hardware and software to capture the first-person cycling

experience. Combining video and sensor data, their method record a cyclist’s experience along a route and allows researchers to gain insights into bike riders’ actual on-the-road experience, including stress levels. This information provides researchers keen insights into cyclists’ perceptions of road conditions and danger zones along a route and can be used by transportation engineers and planners to evaluate real-world performance of different types of facilities.

Sirisha Kothuri’s project, Improving Walkability Through Control Strategies at Signalized Intersections, used a simulations and field testing to evaluate the effectiveness of control strategies in reducing delays for pedestrians as well as other users. Simulations permitted the research team to test a novel algorithm as well as compare current control methods to evaluate the efficiencies of different strategies and the impact of each strategy on all users. Implementation of these methods in the field allowed real life testing of strategies. Based on their findings, they provide recommendations to traffic engineers on how to prioritize available methods based on objectives, intersection, and time of day. They also developed a guidebook outlining these recommendations in further detail, which accompanies the final report and is also available for download on the project’s page of the NITC website.

**Inventions, patent applications, and/or licenses**

Nothing to report for this period.

**Other products**

Nothing to report for this period.

**3. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS: Who has been involved?**

**What organizations have been involved as partners?**

The members of the consortium include Portland State University, University of Oregon, Oregon Institute of Technology, and University of Utah. Each NITC funded project is required to have 100% match. The organizations providing match appear in Table 1.

**Table 1: Partner Organizations**

Match Partner	Type	Financial/ Cash	In-Kind
1000 Friends of Oregon	Non-profit/Foundation		X
Bend, OR MPO	Regional government	X	
Bike Belong	Non-profit/Foundation	X	
City of Austin, TX	Local government	X	
City of Bend, OR	Local government	X	
City of Boulder, CO	Local government	X	
City of Flagstaff, AZ	Local government		X
City of Meza, AZ	Local government		X

<b>Match Partner</b>	<b>Type</b>	<b>Financial/ Cash</b>	<b>In-Kind</b>
City of Portland, OR	Local government		X
City of Salem, OR	Local government	X	
Conscious Commuter	Private industry		X
Drive Oregon	Non-profit/Foundation	X	
ESRI, Inc	Private industry		X
Federal Highway Administration	Federal agency	X	
Intel	Private industry		X
KersTech Vehicle Systems	Private industry		X
King County Metro	Regional government	X	
Lane County MPO	Regional government	X	
Lane Transit District	Transit agency	X	
Metro	Regional government	X	X
Mountainlands Association of Governments	Regional government		X
National Association of Realtors	Non-profit/Foundation	X	
Northern Arizona University	University		X
Oregon Department of Land Use and Conservation	State government		X
Oregon Department of Transportation	State DOT	X	X
Oregon Environmental Council	Non-profit/Foundation		X
Oregon Institute of Technology	University		X
Oregon Leadership in Sustainability (UO)	University	X	
Portland State University	University	X	X
Provo City	Local government	X	
Regional Transportation Commission of Southern Nevada	Regional government	X	
Regional Transportation Commission of Washoe County	Regional government	X	
Rensselaer Polytechnic Institute	University		X
Robert Wood Johnson Foundation	Non-profit/Foundation		X
Rowell Brokaw Architects	Private industry	X	X
Salt Lake County	Local government	X	
SFMTA   Municipal Transportation Agency	Local government		X
Sustainable Cities Initiative (UO)	University	X	
Toole Design	Private industry		X
Transportation for America	Non-profit/Foundation	X	
TriMet	Transit agency	X	X
University of Minnesota	University	X	
University of North Carolina, Chapel Hill	University		X
University of Oregon (UO)	University	X	X
University of Utah	University	X	X
Utah Transit Authority	Transit agency	X	X

Match Partner	Type	Financial/ Cash	In-Kind
Wasatch Front Regional Council	Regional government	X	X
Washington Department of Transportation	State DOT	X	
Washington Metropolitan Area Transit Authority	Transit agency	X	

#### Have other collaborators or contacts been involved?

During the Pooled-Fund process, NITC staff communicated and collaborated with numerous agency representatives across the country regarding data management issues and needs. These agency representatives include the Minnesota and Colorado departments of Transportation, Boulder County, and City of Austin.

The role of the NITC Advisory Board is described and the members are listed in the *External Collaboration* section above.

#### 4. IMPACT: What is the impact of the program? How has it contributed to transportation education, research, and technology transfer?

##### What is the impact on the development of the principal discipline(s) of the program?

We send a survey every three to four weeks to those that download the final reports from the NITC website. We received 439 responses regarding the final reports. Below are selected results from the survey:

##### Please indicate which best describes you?

Student	15%
Faculty/Researcher	20%
Practitioner	47%
Other	17%

##### What was your purpose for downloading the report? (Choose all that apply)

Help make decisions about practice	29%
Research project	17%
Other	12%
Inform public input process about a project	10%
Research for a class project, paper, thesis, dissertation, etc.	11%
Refer to a colleague	9%
Research proposal	4%
Thesis/ dissertation proposal	2%

I was involved in this project	3%
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**How useful was the report in meeting these purposes?**

Very useful for my intended purpose	38%
Somewhat useful for my intended purpose	38%
Not useful for my intended purpose, but may be for other parts of my work	3%
Not what I was looking for	1%
I don't know yet	18%
Not very useful	1%

NITC encourages PIs to present on their research at conferences all over the world. Over the course of the grant, researchers reported 120 presentations on NITC projects with 8889 people in attendance. In addition, NITC sponsored research has resulted in 40 peer-reviewed articles and 27 articles published in professional journals or on websites.

**What is the impact on the development of transportation workforce development?**

By supporting students through the funded research projects, scholars program, and the student groups, we are expanding the number of students interested in transportation as a career and exposing them to the interesting and rewarding aspects of how transportation can help create livable communities. Ninety-seven former students affiliated with NITC either as a student research assistant or as a member of a campus transportation student group have transportation related jobs after graduation.

**What is the impact on physical, institutional, and information resources at the university or other partner institutions?**

Nothing to Report for this period.

**What is the impact on technology transfer?**

NITC hosted three webinars that highlight NITC sponsored research during the reporting period that were attended by 297 individuals. One AICP credit was offered per webinar. NITC also made four previously recorded NITC sponsored webinars available through American Planning Association (<https://www.planning.org/>) that allowed professionals to view the webinars on demand while earning one AICP credit. Ninety practitioners took advantage of this opportunity.

**What is the impact on society beyond science and technology?**

Nothing to Report for this period.

## **5. CHANGES/PROBLEMS**

### **Changes in approach and reasons for change**

Nothing to Report for this period.

### **Actual or anticipated problems or delays and actions or plans to resolve them**

Nothing to Report for this period.

### **Changes that have a significant impact on expenditures**

Nothing to Report for this period.

### **Significant changes in use or care of human subjects, vertebrate animals, and/or biohazards**

Nothing to Report for this period.

### **Change of primary performance site location from that originally proposed**

Nothing to Report for this period.

### **Additional information regarding Products and Impacts**

Nothing to Report for this period.