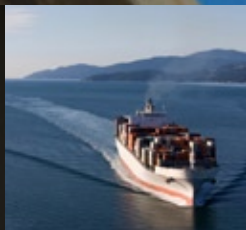


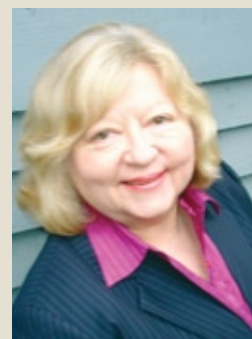
# 2008 Annual Report

University Transportation Centers Program:  
Region X



## Table of Contents

Message from the Director . . . . .	1
TransNow Center Overview. . . . .	3
Long-Term Development: Success Stories . . . . .	6
Research Projects and Success Stories . . . . .	8
Education Overview and Success Stories . . . . .	21
Outreach . . . . .	26
Technology Transfer . . . . .	27
Funding and Expenditures . . . . .	30



## Message from the Director

TransNow, the Transportation Northwest Regional University Transportation Center (UTC), is now 20 years old!

I'm Nancy Nihan, TransNow Director. This annual report summarizes our 20th year of operation, from July 1, 2007 through June 30, 2008—another year of research, education, outreach, and technology transfer—with a look back on our first two decades.

### TWO DECADES OF GROWTH AND SUCCESS

TransNow was one of the original 10 centers in the United States Department of Transportation's (USDOT) UTC Program. We provided funds for a consortium of six universities: the University of Alaska at Fairbanks (UAF), the University of Idaho (UI), Oregon State University (OSU), Portland State University (PSU), Washington State University (WSU), and the University of Washington (UW).

TransNow helped make possible impressive gains in transportation education, training, research, and technology transfer by our members. Our partnerships with state DOTs and local and regional transportation organizations have grown stronger. Our research has been successfully implemented in the "real world." Our UTC graduates have gone on to distinguished careers in transportation. And we've watched TransNow's members develop UTCs of their own, so there is now a UTC in every state of our four-state region!

### RESEARCH PROGRAM GROWTH

In September 1988, TransNow was created and became the University Transportation Center for Federal Region X. It represented a consortium of all six universities in the region with established transportation research programs, with the UW as lead university. Under the auspices of the new UTC Program at the USDOT,

TransNow provided research funding for faculty at each of these universities.

As their research programs and partnerships grew, the original TransNow consortium universities developed strong, collaborative transportation research programs throughout Region X. Twenty years later, the seed that was planted by initial UTCP funding for a single center is in full bloom. Now:

- UAF is the lead university for a consortium that comprises the Alaska University Transportation Center (AUTC),
- UI is the lead university for the National Institute for Advanced Technologies (NIATT),
- PSU is the lead university and OSU is a member of the Oregon Transportation Research and Education Consortium (OTREC), and
- UW is the lead university and WSU is a member of Transportation Northwest.

AUTC ([www.alaska.edu/uaf/cem/ine/autc](http://www.alaska.edu/uaf/cem/ine/autc)) and OTREC ([otrec.us/content](http://otrec.us/content)) are national UTCs, NIATT ([www.webs1.uidaho.edu/niatt/index.htm](http://www.webs1.uidaho.edu/niatt/index.htm)) is a Tier I UTC, and TransNow ([www.transnow.org](http://www.transnow.org)) remains the regional UTC for Region X.

We continue to work together. A new Region X consortium has been formed; it includes all four state DOTs and all four UTCs (10 participating university campuses). The newly formed regional consortium is developing a pooled fund of \$200,000 per year for collaborative UTC research that addresses key Region X transportation issues.

## EDUCATION PROGRAM GROWTH

In September, 1991, the 10 original UTCs established Advanced Institutes of Education. The core education program of the TransNow Advanced Institute (AI) was the graduate transportation program in the Department of Civil Engineering at the UW. In autumn, 1991, there were 29 graduate transportation students at the UW; this was TransNow's first AI class. Now there are over 40 graduate students in TransNow's core AI class and many others in the AI classes of AUTC, OTREC, and NIATT. TransNow also funds transportation students at WSU and internships and scholarships for UW undergraduates who are interested in transportation careers.

The overwhelming majority of TransNow graduates enter transportation careers in the United States and rise to prominent positions. For example, the first TransNow AI class produced three university transportation faculty and 22 professionals in local and regional transportation organizations, state DOTs, and federal transportation administrations in the United States. Altogether, 86 percent of the first class of graduates (and 89 percent of the second class) continued on as transportation professionals in the U.S. The 80th percentile of our graduates that enter the U.S. workforce continues today.

Two members of our first two classes deserve special mention:

- Debbie Niemeier joined the faculty in the Department of Civil & Environmental Engineering at UC Davis, eventually became the Chair of the CEE department and is now Associate Vice Chancellor for the Office of Research.
- David Dye progressed through several leadership positions in the Washington State Department of Transportation and is currently serving as Deputy Secretary.

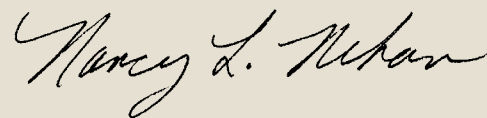
We continue to watch the careers of our graduates and are proud of their successes as they rise to leadership positions in our country's public and private transportation organizations. For a quick look at the starting positions of some of our latest graduates, read the "Where Are They Now" section of this report.

## THE FUTURE "GREENING" OF TRANSNOW

As we begin our 21st year of operation, TransNow is encouraging development of research and education projects that emphasize "Green and Resilient Transportation" in both Operations and Infrastructure.

This year we supported a few research projects in this area such as *Greenroads: An Environmental Rating System for Roadway Design and Construction*, *Rapid Construction of Earthquake-Resistant Bridges*, *Washington State Freight System Resiliency Study*, *A Self-adaptive Toll Rate Algorithm for High Occupancy Toll (HOT) Lane Operations*, and *Freight Performance Measures*. These are projects aimed at reducing the environmental impacts of infrastructure materials, construction operations, and traffic congestion. Next year, we will be adding more research projects that address sustainable and resilient transportation systems and supporting new education projects that address this area.

We're looking forward to another decade of success at TransNow!



## Center Overview

Transportation Northwest at the University of Washington is a Regional University Transportation Center (UTC) administered by the United States Department of Transportation through its Research and Innovative Technology Administration (RITA).

TransNow is a showcase for transportation research and education in the Pacific Northwest (Federal Region X) which includes Alaska, Idaho, Oregon, and Washington. The TransNow Center, in its role as regional conference planner, research coordinator, and educational liaison, has made a significant contribution to the leadership of the transportation community in Region X which serves as a microcosm of transportation for the entire country, with a diversity of modes, infrastructure systems, and area types, that make it a prime testing ground for studies in transportation operations and planning.

The TransNow center also provides support for research, education, and technology transfer through our consortium university, Washington State University (WSU). Students and faculty at WSU play a key role in their respective local area and have developed strong relationships with state transportation departments and other regional organizations.

## Mission

Transportation Northwest is committed to the development and maintenance of a center of excellence in transportation research and education. It will serve as a primary source of and resource for competent transportation professionals for the 21st century.

## Center Theme

The Center theme is Transportation Operations and Infrastructure. Research projects funded by TransNow fall within one of the three major theme focus areas:

- 1) Traffic Operations with an emphasis on ITS
- 2) Freight Operations and Logistics with an emphasis on freight mobility
- 3) Infrastructure Construction with an emphasis on smart infrastructure



## Management Structure

The management structure of TransNow consists of the Director and staff, Board of Directors, and an Advisory Committee. The Center Director coordinates research and educational activities with the Board of Directors (BOD), which exercises oversight authority over TransNow.

The TransNow BOD includes the TransNow Center Director and Associate Center Directors, senior faculty from the UW and WSU programs, Washington State Transportation Center (TRAC) Directors, and a non-voting Federal Highway Administration representative. The BOD meets twice a year to discuss and vote on TransNow research, education, and technology transfer activities.

TransNow's Advisory Committee consists of 35 members representing universities, local and state agencies, and industries of the Region X area. The members review proposals, contribute to TransNow workshops and conferences, and are involved in other TransNow activities.

## TransNow Center Personnel

**Nancy L. Nihan**, Director; Professor, Transportation and Construction Division, UW CEE Department

**Peter M. Briglia**, Associate Director, Communications; Associate Director, New Initiatives in Freight & ITS

**G. Scott Rutherford**, Associate Director, Operations; Director, Professional Development and Internships; Professor, UW CEE Department

**John Stanton**, Associate Director, New Initiatives in Transportation Infrastructure; Professor, UW CEE Department

**Jennifer Sheldon**, Program Manager

**Rebekah Diana**, Program Assistant

**Larisa Petrik**, Fiscal Specialist

**Thalia Freamon**, Office Assistant

**Anthony Curreri**, Information Technology Specialist

## Board of Directors

### CHAIR

**Nancy L. Nihan**

Director, TransNow  
Professor, UW CEE Department  
University of Washington

### MEMBERS

**Peter M. Briglia**

Associate Director of Communications  
Associate Director of New Initiatives in Freight & ITS  
University of Washington

**Kenneth L. Casavant**

Professor, School of Economic Sciences  
Washington State University

**Megan Hall\***

Research Engineer, Federal Highway Administration  
United States Department of Transportation

**Mark Hallenbeck**

Director, Washington State Transportation Center (TRAC)  
University of Washington Branch

**David McLean**

Professor and Chair, Department of Civil and Environmental Engineering  
Washington State University  
Director, Washington State Transportation Center (TRAC)  
Washington State University Branch

**G. Scott Rutherford**

Associate Director, Operations  
Director, Professional Development and Internships  
Professor, UW CEE Department  
University of Washington

**John Stanton**

Associate Director, New Initiatives in Transportation Infrastructure  
Professor, UW CEE Department  
University of Washington

\*non-voting participant



## Advisory Committee

### **Bruce Agnew**

Program Director, Cascadia  
Discovery Institute  
Seattle, WA

### **Sean Ardussi**

Coordinator, Regional Freight Mobility  
Roundtable  
Puget Sound Regional Council  
Seattle, WA

### **Amit Armstrong**

Technology Deployment Engineer,  
Western Federal Lands Highway Division  
Federal Highway Administration  
Vancouver, WA

### **Jeannie Beckett**

Sr. Director, Inland Transportation  
Port of Tacoma  
Tacoma, WA

### **Kim Becklund**

Transportation Policy Advisor  
City of Bellevue Transportation  
Department  
Bellevue, WA

### **Chris A. Bell**

Associate Dean, College of Engineering  
Oregon State University  
Corvallis, OR

### **Robert L. Bertini**

Director, Oregon Transportation  
Research and Education Consortium  
Associate Professor, CEE Department  
Portland State University  
Portland, OR

### **Ron Borowski**

Sr. Project Manager/Freight Facilitator,  
Policy, Planning and Major Projects  
Seattle Department of Transportation  
Seattle, WA

### **David Brooks** (non-voting participant)

Regional Administrator, Railroad Safety  
Federal Railroad Administration  
Vancouver, WA

### **Billy Connor**

Director, Alaska University Transportation  
Research Center  
University of Alaska, Fairbanks  
Fairbanks, AK

### **Morgan D. Cowling**

Policy Manager for Governance,  
Transportation, and Human Services  
Association of Oregon Counties  
Salem, OR

### **Crystal Donner**

Executive Vice President  
Pertee Engineering Inc.  
Everett, WA

### **Scott Drumm**

Manager, Research & Market Information  
Port of Portland  
Portland, OR

### **Anne Ford**

Administrator, Commercial Vehicle  
Services  
Washington State Department of  
Transportation  
Tumwater, WA

### **Mark Haselkorn**

Professor, Technical Communication  
Co-Director, Interdisciplinary Program  
on Humanitarian Rule  
University of Washington  
Seattle, WA

### **Paula Hammond**

Secretary of Transportation  
Washington State Department of  
Transportation  
Olympia, WA

### **Barbara Ivanov**

Director, Freight Strategy and Policy  
Washington State Department of  
Transportation  
Olympia, WA

### **Barnie Jones**

Research Manager  
Oregon Department of Transportation  
Salem, OR

### **Rick Krochalis**

Regional Administrator  
Federal Transit Administration  
Seattle, WA

### **Michael Kyte**

Director, National Institute for Advanced  
Transportation Technology  
Professor, Department of Civil Engineering  
University of Idaho  
Moscow, ID

### **Steve Lepi**

Manager, Simulation Technology  
PACCAR Technical Center  
Mount Vernon, WA

### **Pam Lowe**

Executive Director  
Idaho Transportation Department  
Boise, ID

### **David P. McCormick**

Manager, Maintenance and Traffic  
Operations  
Washington State Department of  
Transportation  
Seattle, WA

### **Leni Oman**

Director, Office of Research and  
Library Services  
Washington State Department of  
Transportation (WSDOT)  
Olympia WA

### **Jeff Ottesen**

Division Director, Program Development  
Alaska Department of Transportation &  
Public Facilities  
Juneau, AK

### **Geraldine Poor**

Manager, Regional Transportation  
Port of Seattle  
Seattle, WA

### **Larry Pursley**

Executive Vice President  
Washington Trucking Association  
Federal Way, WA

### **Steve Queen**

Manager, Container Terminals  
Port of Seattle  
Seattle, WA

### **Gordon Rogers**

Planning Director  
Whatcom Council of Governments  
Bellingham, WA

### **Karen Schmidt**

Executive Director  
Freight Mobility Strategic  
Investment Board  
Olympia, WA

### **Gregory Shelton**

Managing Director & Instructor, Global  
Trade, Transportation & Logistics Studies  
University of Washington  
Seattle, WA

### **Sidney Stecker** (non-voting participant)

Planning and Research Program  
Manager  
Federal Highway Administration  
Olympia, WA

### **James Strathman**

Professor, School of Urban Studies and  
Planning  
Portland State University  
Portland, OR

### **Jay Weber**

Executive Director  
Washington State County Road  
Administration Board  
Olympia, WA

### **Christine Wolf**

Regional Transportation Planner, Seaport  
Strategic Planning & Policy  
Port of Seattle  
Seattle, WA

## Long-term Development and Success Stories

A significant number of TransNow success stories that emerge each year are the fruition of several years of investment. Successful research projects, for example, lead to demands for further research and new funding for follow-up projects. Investments in young transportation professionals who are developing their research areas can lead to new sources of funding for their support. This year, TransNow can proudly give two examples of success stories that are the product of long-term and continuing development efforts: The Goods Movement Collaborate and the Eastern Washington Intermodal Transportation Study. Additionally, our faculty and executive staff continue to achieve recognition for their long-term work and are highlighted under Honors and Awards.

## Expanded Collaboration in the Transportation Community

### GOODS MOVEMENT COLLABORATE

Professor Anne Goodchild (UW) and student research assistants in the Goods Movement Collaborate have been actively researching operations on the northern border between the United States and Canada, with particular focus on the Cascade Gateway which connects the Lower Mainland of British Columbia and Whatcom County, Washington. This is an important border region with a high degree of economic integration between the greater Vancouver, BC and Puget Sound economic regions. Researchers have been working closely with Professor Ed McCormack, and several groups focused on regional and international cooperation including the International Trade and Mobility Trade Corridor, particularly through funding of a new project titled the “Cascade Gateway Circulation Analysis”. This study will evaluate current policies for expediting freight movements across the western US/Canada border and identify regionally appropriate solutions.

Professor Goodchild and her research assistants have been studying this border for the last two years through a series of grants from the Border Policy Research Institute and the US Department of Transportation. An early study titled “Understanding the Impact of Variability in Border Crossing Times on Regional Supply Chains” identified supply chain responses to border congestion through primary interviews with cross-border carriers. This study showed that regional carriers internalize two standard deviations in crossing time into their schedules, but that the real cost of this inefficiency is low due to slack in regional trucking operations. In

response to this study, the researchers conducted a second study focused on lengthy border delays, which are highly problematic for supply chain operations. This study used delay observations from a private carrier and loop detector volume counts to isolate the cause of lengthy delays. This study showed a weak correlation between arrival volume and delay, and a surprisingly large proportion of delay due to factors other than primary booth delay, suggesting significant benefit from improved border preparedness or readiness to cross the border. A third study characterized the cross border trucking industry in Cascadia, an area which includes the Cascade Gateway crossings. This profile is distinct from that of the eastern US/Canada border regions (typically characterized by the automotive industry and just-in-time supply chains) and the southern border, and provides important context for considering policy solutions.

Professor Goodchild and her research assistants have presented this work at numerous conferences, including the Transportation Research Board Annual Meeting and the Border Regions in Transition Conference held in Bellingham, WA and Victoria, BC. Goodchild has been an invited speaker on this topic at the Trans-Border Working Group meeting in Coeur d’Alene Idaho, the Canadian/American Border Trade Alliance in Bellingham, WA, the North American Agrifood Market Integration Conference in Austin, TX, and the Border Policy Research Institute

## HONORS & AWARDS

**Nancy Nihan** (UW) received the American Road and Transportation Builders Association (ARTBA) S. S. Steinberg Award in January 2007. Nancy is recognized for making remarkable contributions to transportation education as well as for her successes as the past President of the ARTBA Research and Education Division during 2005-2006.

**Joe Mahoney** (UW) was awarded the honor of Outstanding Faculty Mentor by Civil and Environmental students at the department's graduation ceremony in June 2008.

**Pete Briglia** (UW) was appointed to Chair the Transportation Research Board's (TRB) Operations Section (AHBOO) for a three year appointment. Pete's role will be to support and coordinate the work of 13 committees and serve as a liaison between the section and TRB management.

in Bellingham, WA. The work has also been published by the Journal of the Transportation Research Board, and two additional papers are under consideration.

Continued research under TransNow funding will further expand collaboration between researchers at the UW and community partners in order to improve trade policies and systems for the western US/Canada border, and therefore ensure this project's long-term success.

### WHERE DID THEY GO AND WHAT DID THEY CARRY? NATIONALLY RECOGNIZED STUDY CONTINUES AT WASHINGTON STATE UNIVERSITY

Dr. Ken Casavant, member of the TransNow Board of Directors, and his colleague Dr. Eric Jessup, both of the Transportation Research Group (TRG) at WSU, have been leading a nationally recognized freight data gathering effort for the past 13 years. New funding for the TRG will continue this effort.

A study during 1994–1998, the Eastern Washington Intermodal Transportation Study (EWITS), included the first statewide truck survey done in the United States. Almost 28,000 truckers, at 28 locations, using 300 interviewers were interviewed four times during the year, in some cases over 24 hours. This origin-destination study, by personal interviews of truckers, provided a wealth of information on freight flows throughout the state: specific routes traveled, inter and intra city, origin, destination, weight of truck unloaded

and loaded, type of facility shipping to and from, commodity/product carried, carrier location, hazard materials, and so forth. The value and importance of these freight data was readily apparent and is in continual use by local planners and policy makers in the WSDOT.

But, databases become outdated and decisions based on them could become, at best, misdirected, and the worst, wrong. A new project during 2004–2008, Strategic Freight Transportation Analysis (SFTA), undertook a new freight origin-destination study to solve that problem. This study produced similar amounts of successful truck interviews, using the same methodology as the first survey. It was found that freight traffic had doubled on some state highways but with great variance by highway and commodity. Average freight payload weights increased 20 percent over the two surveys. These data now form the heart of corridor flow information for local economic development agencies as well as the WSDOT Transportation Plan.

This work also helped engender the start-up of the Freight Policy Transportation Institute at WSU. The mission of the institute is to provide a broader perspective on transportation research, enhancing synergies among and between other technical research efforts in the state, region and nation, while reducing redundancies and overlap by using economic analysis as the performance norm.

## Research Projects and Success Stories

TransNow sponsored research primarily responds to the needs of the WSDOT and other transportation agencies in the state. It naturally follows that it is focused on solving current and anticipated transportation problems. Whether the research involves new techniques to seismically retrofit transportation structures or the development of a new tolling rate algorithm, the emphasis is on research that can be implemented and that can quickly provide benefits to users of the transportation system.

The research falls into TransNow's three theme areas: infrastructure, traffic operations/ Intelligent Transportation Systems (ITS), and freight. These research projects are primarily conducted by Civil Engineering professors although some projects involve professors in other disciplines such as Electrical Engineering, Urban Planning and Economics. Research is conducted at both the UW and WSU and a few projects involve the collaboration of professors from both universities.

Research proposals are subject to a peer review process that is overseen by the TransNow Director and Board of Directors. The proposals are evaluated to determine the

- Technical Merit
- Alignment with regional and national priorities
- Capabilities and resources of the research team
- Project scope

Upon completion of the research a draft technical report is submitted and subject to a peer review prior to publication of the final report.

During 2007–2008, TransNow funded a total of 14 research projects. Seven of these are new research projects of which five are two-year projects that will continue to receive funding in 2008-2009. The remaining seven projects are continued from the previous year. Some projects that break new ground include the development of a Greenroads rating system, the investigation of freight performance measures, and a study to determine how to assess the resiliency of the State's freight system.

This section provides more detail on these research projects. They are listed under the following headings:

- Research Projects and Success Stories — New
- Research Projects and Success Stories — Continuing
- Research Projects and Success Stories — Completed (These include projects completed before 2007–2008 that continued to report new success stories in the current year.)

## Simulation and Experimental Study of 802.11a/RA Based Networking for Vehicular Management and Safety

This proposal focuses on the use of new wireless networking techniques for their potential impact in providing information for traffic management, control and public safety goals. The premise of this work is based on the reasonable expectation that vehicles in the near future will be equipped with integrated wireless communication and positioning capabilities, enabling vehicle-to-vehicle and vehicle-to-roadside communications based on the emerging IEEE 802.11a/RA standard.

Significant progress has been made in calibrating and modifying vehicle trackers, though the project is under a six month extension. In January 2009, a final report will be posted to the website at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).



Project number: 61-5921

**Contact:**

Dan Dailey, University of Washington  
 dan@its.washington.edu  
 206-543-2493

## Greenroads: An Environmental Rating System for Roadway Design and Construction

While the idea of sustainable infrastructure has caught on in the building world (US Green Building Council, LEED standards, Built Green, etc.) it remains in its infancy in the transportation infrastructure world. Recently, Martina Soderlund, a master's student at the UW developed an environmental ratings system for roadway design and construction, called "Greenroads". Her work led to the discovery of gaps in information necessary for proper sustainability evaluation and this research will address several of those gaps. The ultimate goal is to fully develop the concept and have it adopted as the first environmental ratings system for roadway design and construction in the U.S.

The first year of research yielded much progress in research and implementation activities. Several presentations of the research have been made and more are scheduled during the second year of research. The idea is receiving significant support from private companies, the government, and research organizations.

Second year research tasks include (1) finalizing a system of credits, (2) calibrating credits to reflect sustainability impact, (3) completing a dynamic online system to upload, evaluate, and track project information, (4) developing an online life cycle analysis tool for roads, (5) completing case studies to test the rating system, (6) presenting a preliminary working system to agency and industry groups for revision, and (7) creating or negotiating for a governing body to manage Greenroads.



Project number: 61-5914

**Contact:**

Steve Muench, University of Washington  
 stmuench@u.washington.edu  
 206-616-1259



Project Number: 61-6022

**Contact:**

Yinhai Wang, University of Washington  
 yinhai@u.washington.edu  
 206-616-2696

## Development of a Statewide Traffic Data System

This research targets improvements to data, data collection, and data management that will make WSDOT traffic data across the state better and more consistent. The project involves a series of data analysis, data management, data query tasks, and data transmission tasks. The basic problem being examined is how to obtain data from multiple sources and databases currently supported by WSDOT, identify those data which are invalid, remove those data from further analysis, and provide a common interface that can be used by WSDOT staff to obtain roadway performance measures. Currently, none of these tasks is done in a standardized way within WSDOT. The successful research will need to develop and apply consistent data quality tests, develop meta-data standards for WSDOT, and develop (or recommend the purchase of) software tools that can function across unlike data structures.

This two-year project is on its way to completion next year. Thus far, researchers have completed (1) data collection and extraction, (2) investigation of loop detector errors, (3) development of loop error correction algorithms, and (4) implementation and testing of the algorithms. Researchers have also begun (1) central database design and implementation and (2) central web server design and implementation. In addition, a research paper titled, "Google-Map-Based Online Platform for Arterial Traffic Information and Analysis" has been presented at the 87th Annual Meeting of TRB in January 2008. A paper titled "A Practical Algorithm for Identifying and Correcting Single-Loop Sensitivity Problems" has been submitted for the 88th Annual meeting of TRB as well as for publication in Transportation Research: Part A.



Project Number: 430820

**Contact:**

David Pollock, Washington State University  
 dpollock@wsu.edu  
 509-335-4922

## Ultrasonic Detection of Cross-Section Loss in Tieback Rods Due to Corrosion

Corrosion of tieback rods in sheet piling systems can compromise the reliability of associated transportation structures due to loss of cross-section and reduced strength of the tieback rods. Common inspection techniques currently involve excavating to the location of a few tieback rods for visual appraisal. This process is typically expensive and labor-intensive. Furthermore, the actual condition of the vast majority of tieback rods in a sheet piling system remains unknown, since only a few tieback rods are typically inspected.

Ultrasonic inspection of tieback rods will provide a more comprehensive technique for detecting loss of cross-section associated with corrosion. Ultrasonic inspection is already used to successfully detect fracture of anchor bolts in transportation sign structures by coupling ultrasonic transducers to one end of an anchor bolt and propagating a bulk wave along the bolt length. Cracks and fractures are detected by reflected signals that arrive prior to reflections from the back wall (far end) of the anchor bolt. The proposed research regarding tieback rods will involve similar propagation of bulk ultrasonic waves at the exposed end of a tieback rod. However, instead of looking for "early echoes" in the signal associated with cracks or fracture, the portion of the ultrasonic signal following the back wall echo will be investigated for evidence of loss of cross-section due to corrosion.

The development of an effective ultrasonic technique for inspecting tieback rods in sheet piling systems has the potential to save money by avoiding the costs of periodic excavation. Furthermore, an efficient ultrasonic inspection technique will improve safety and structural reliability by facilitating condition assessment of every tieback rod in a sheet piling system.

The first year of research included the completion of ultrasonic transducer optimization, and the beginning of tieback rod corrosion characterization and ultrasonic signal analysis. The second year's tasks include completing the ultrasonic inspection procedure. At the project's completion, a final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).

## Rapid Construction of Earthquake-Resistant Bridges

Earthquakes cause damage to bridges. In many cases that damage is repairable, but the bridge is permanently deformed and may be unusable while it is brought back into plumb and the repairs are made. For example, the Alaskan Way Viaduct in Seattle had to be closed after the 2001 Nisqually earthquake because of a large offset at the joint between two parts of the structure at Bent 97.

This proposal addresses the adaptation to bridges of a technology that would ensure minimal residual seismic deformations of the bridge, thereby permitting its use in the critical hours after the earthquake strikes. The technology also leads to seismic damage levels that are much lower than those that typically occur in conventional construction. When used in combination with precasting techniques, it also allows a significant reduction in on-site construction time. This feature provides benefits to DOTs by minimizing both traffic congestion and exposure of workers to hazardous conditions. The system thus provides three benefits at once (rapid construction, immediate post-earthquake use and low earthquake damage and repair costs).

The concept was first developed at UW in the 1990s for beams in building frames. It uses conventional materials, combined in an innovative way, to give the structure "self-righting" or "self-healing" properties. Many buildings, including the tallest concrete building in San Francisco, have now been constructed using it. Building codes are now being changed to allow its use without special proof-testing and permitting. This research works to adapt it for use in bridge columns.

The primary tasks of planning and executing physical tests, analyzing the data, and making recommendations for the subsequent use of the system are all complete. In September 2008, Prof. Stanton will travel to Chicago to attend the International Association of Bridge and Structural Engineering (IABSE) conference to present a paper based on the project results. This project is under a six month extension and a final report will be available in January 2009 at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).



Project number: 61-5915

### Contact:

John Stanton, University of Washington  
[stanton@u.washington.edu](mailto:stanton@u.washington.edu)  
 206-543-6057



Project Number: 61-5913, 430882

**Contact:**

Anne Goodchild, University of Washington  
 annegood@u.washington.edu  
 206-543-3747

Eric Jessup, Washington State University  
 eric\_jessup@wsu.edu  
 509-335-5558

## Washington State Freight System Resiliency Study

The economic viability and well-being of Washington State is significantly influenced by the freight transportation system serving the region. An increased understanding of the vulnerability of this freight system to natural disasters, weather, terrorist acts, work stoppages and other potential freight transportation disruptions will provide the state with the information necessary to assess the resiliency of the transportation system, and provide policy makers with the information required to improve it. This research project will: (1) identify a set of threats or categories of threats to be analyzed; (2) assess the likelihood of each event occurring within certain time horizons; and (3) with the threats and their probabilities, analyze the resiliency of the Washington transportation system. This will include: (a) identifying the most valuable and least valuable components, both infrastructure and operational characteristics, of the transportation system with respect to moving freight; (b) identifying the most likely events and the impact of those events; and (c) developing strategies for making WSDOT investments that would support improvements in the resiliency of the transportation system.

This year, following the completion of the literature review, the research team contacted research staff at the Oak Ridge National Laboratories in Knoxville, Tennessee to discuss utilizing information they developed such as national network data for truck, rail, and water freight movements that they have already compiled and synthesized from various sources. The research team is also compiling geographic network data and information. As part of this task, much of the statewide GIS information that has been developed in the Transportation Research Group at WSU has been made available to researchers at the UW via an FTP site. The research team is currently identifying what additional information is necessary, including the statewide forest products information that is to be used as part of the case study.

This project is under a six month extension. A final report will be available in January at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).

# assessing freight transportation disruptions

## A Self-Adaptive TOL Rate Algorithm for High Occupancy Toll (HOT) Lane Operations

Research on the usage of HOV lanes indicates that HOV facilities are frequently underutilized even when General Purpose (GP) lanes of the same section are congested. HOV lanes have the room to play a bigger role in addressing urban traffic congestion.

Over the past decade, a new concept called High Occupancy Toll (HOT) lane has been developed for better utilizing these HOV facilities. A HOT lane allows Single Occupancy Vehicles (SOVs) to use it, but on basis of a toll. Through adjusting the toll rate, demand on a HOT lane can be effectively controlled and congestion can be avoided.

Setting the toll rate properly is crucial for HOT lane operations. On the one hand, if the toll rate is set too high, the HOT lane capacity may not be fully utilized. On the other hand, if it is too low, the HOT lane may break down and reduce the total throughput of the road. Therefore, the strategy for setting up the toll rate should be carefully determined.

During this two-year project, researchers will develop a new toll rate determination algorithm using the state-space-based optimization theory. Direct traffic measurements from on-road sensors, such as speed, volume, and occupancy, and variables calculated from them, such as travel time and vehicle delay, are used to establish a discrete control state space. This toll rate algorithm is expected to generate system-optimal toll rate dynamically based on real-time traffic detector measurements and predicted traffic information.

Thus far, researchers have completed (1) research preparation and studies of related control theories, (2) HOT lane system modeling, (3) Digital tolling controller design, and (4) SATRA implementation. In addition, two research papers titled "A Feedback-Based Dynamic Tolling Algorithm for High Occupancy Toll (HOT) Lane Operations" and "Piecewise Optimum Delay Estimation for Improved Signal Control" were presented at the 87th Annual Meeting of TRB in January 2008. Both papers will be published by the *Transportation Research Record: The Journal of the Transportation Research Board* as well. A paper titled, "Optimizing Minimum and Maximum Green Time Settings for Traffic Actuated Control at Isolated Intersections" has been submitted to *Transportation Research: Part B* for publication, and another paper titled, "Impacts of HOT Lane Operations on HOV Travelers" has been submitted to the 88th Annual Meeting of TRB for presentation and publication.

Second year project tasks include: (1) simulation model development and calibration, (2) system evaluation, and (3) documentation of research. Upon the project's completion, a final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).



Project number: 61-4160

### Contact:

Yinhai Wang, University of Washington  
yinhai@u.washington.edu  
206-616-2696



Project Number: 61-6327

**Contact:**

Ed McCormack, University of Washington  
 edm@u.washington.edu  
 206-543-3348

## Freight Performance Measures

The State of Washington began to test truck performance measures in 2004, and this project will build upon lessons learned from that effort. The WSDOT and the Freight Mobility Strategic Investment Board funded the earlier study at the UW to develop a data collection system to cost effectively measure truck movements along specific roadway corridors against preset benchmarks. The study assumed that the proposed benchmarks could be used both as part of the project selection process and to report on speed and volume improvements resulting from completed infrastructure investments. The findings from that report recommended that with a much higher density of data points and clear goals set by freight customers, on-board GPS devices may allow the public sector to track performance against goals, and the use of these devices will form the foundation for this project.

With the growth in transponder, satellite, and cellular phone technology since 2004, it may now be feasible to track trucks at a lower cost. Tracking truck trips from origin to destination will help locate, measure, and analyze causes of delay and other performance attributes to determine where problems exist and whether highway improvements are closing performance gaps for freight customers. Combining data from these new technologies with more traditional sources of truck data, such as roadside counters and surveys, may increase the feasibility of developing useful performance measures.

The first year of research included documentation of truck-oriented freight performance measures and programs that are planned or in use in North America. A resulting report was shared with the project's external advisory committee and WSDOT staff. Researchers also generated working relationships with GPS vendor companies Qualcomm, Trimble/@-Road, and Xata in order to obtain and track truck data. The research team is developing a tool to manipulate and analyze this data which will be stored in a high capacity server at the TransNow center.

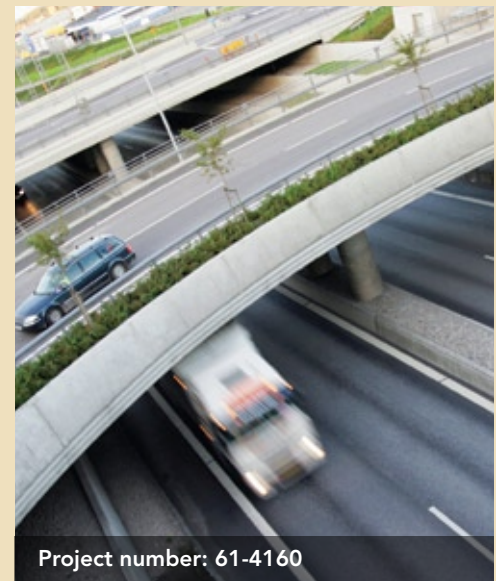
The second year's tasks include completing the design and implementation of a truck data collection system. A final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).

measuring  
 truck movements  
 against preset  
 benchmarks

## Structural Health Monitoring of Reinforced Concrete Columns Confined with FRP

In the last few decades, an extensive research has been carried out to develop strengthening techniques for reinforced concrete (RC) infrastructures using fiber reinforced polymer (FRP). When a RC structure is strengthened using FRP sheets, the bond between FRP and concrete plays a crucial role in the performance of the strengthened structure. The failure process of RC columns strengthened using FRP starts from debonding of the most highly stressed FRP strip. Early detection of debond using structural health monitoring (SHM) of the strengthened member is the key to avoid such brittle failure. SHM will provide information concerning the development of debond, which can be used to implement timely action for maintenance/repair to ensure the safety of structures. The research proposed here aims to perform SHM of RC structures strengthened with FRP using Lamb waves.

The first year of research included (1) literature review, (2) design, construction, and testing of substrata specimens, and (3) design and construction of the column type specimens. This research will continue into fiscal year 2008. A final report will then be posted to the website at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).



Project number: 61-4160

### Contact:

Mohamed ElGawady,  
Washington State University  
[melgawady@wsu.edu](mailto:melgawady@wsu.edu)  
509-335-1927

# reinforced concrete infrastructures



Project Number: 61-6020

**Contact:**

Yinhai Wang, University of Washington  
 yinhai@u.washington.edu  
 206-616-2696

## Occlusion Robust Vehicle Tracking Using Motion-Based Features

This two-year project is working toward an improved method of tracking vehicles for traffic data collection and operations. The development of an occlusion robust vehicle tracking algorithm using the Kanade-Lucas-Tomasi (KLT) feature tracking algorithm will improve vehicular tracking where there were previous troubles with vehicle occlusion and camera shaking. The algorithm is functional on highways even under light changing conditions because most feature points tracked will not be affected by luminance change. The algorithm also reduces the effect of camera vibrations, which influences algorithm performance, due to relaxed requirements of the stable background.

This project is under a six month extension; however significant headway has been achieved. A research paper titled "Video-Based Vehicle Detection and Tracking Using Spatio-Temporal Maps" has been submitted to the 88th Annual Meeting of TRB in January 2009. Another paper titled "Video-Based Monitoring of Pedestrian Movements at Signalized Intersections" has been accepted for publication by the *Transportation Research Record: Journal of the Transportation Research Board*. A third research paper, "A Simple and Model-Free Algorithm for Real-Time Pedestrian Detection and Tracking," has been submitted to *Computer-Aided Civil and Infrastructure Engineering* for publication.

Several transportation agencies including the WSDOT, US Department of Transportation, Puget Sound Clean Air Agency, Portland State University, University of California at Berkeley, and Texas Technical University have shown great interests in this study. The methodologies and systems developed in this study will be greatly helpful for transportation agencies to improve data quality and reduce the cost for data collection.

In January 2009, a final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).

# vehicle tracking algorithm

## Incorporation of Forward-Directivity into Seismic Hazard Analysis

Ground motions in close proximity to the causative fault of an earthquake can be significantly affected by the propagation of rupture. In particular, when the rupture and slip direction relative to a site coincide and a significant portion of the fault ruptures towards the site, the ground motion can exhibit the effects of Forward-Directivity (FD). Much research has been conducted recently on the seismological aspects leading to forward-directivity. The goal of this two-year research project focuses on the development of a methodology for the inclusion of the effects of near-fault forward-directivity into the determination of seismic demand for a structure or a geotechnical system. Another focus of the research is on the potential for near-fault effects associated with the Seattle and Tacoma faults in Washington State, and how these near-fault effects can affect the transportation infrastructure in the state.

This two-year project is under a six month extension, however, significant headway has been achieved. Completed tasks include (1) selection of appropriate damage measures, (2) characterization of the seismicity of the Seattle and Tacoma Faults, (3) analyses of seismic hazard of sites located near the Seattle and Tacoma faults, (4) generation of earthquake scenarios and ground motions, (5) computation of damage measures for all earthquake scenarios, (6) development of a numerical model for selected damage measures, and (7) computation of damage measures for selected systems. In addition, "Strength Reduction Factors for Near-Fault Forward-Directivity Ground Motions" and "Response of Multi-Story Structures to Near-Fault Ground Motions and Equivalent Pulses" were submitted to *Engineering Structures*. "Design Ground Motions Near Active Faults" was submitted to the *Bulletin of the New Zealand Society for Earthquake Engineering* in May 2008.

Upon completion of the project, a final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).

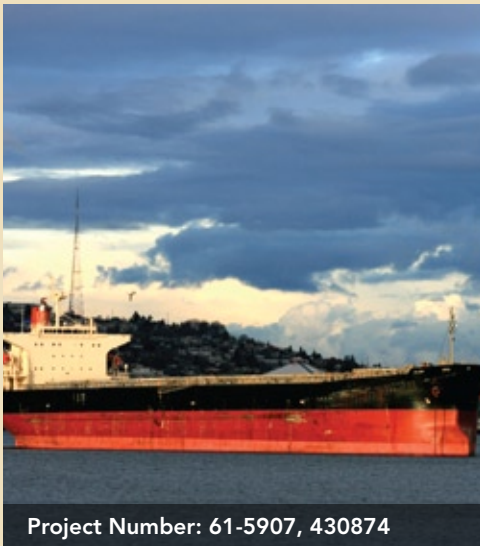


Project number: 430846

### Contact:

Adrian Rodriguez-Marek,  
Washington State University  
[adrian@wsu.edu](mailto:adrian@wsu.edu)  
509-335-7088

# effects of near-fault forward-directivity



Project Number: 61-5907, 430874

#### Contact:

Anne Goodchild, University of Washington  
 annegood@u.washington.edu  
 206-543-3747

Eric Jessup, Washington State University  
 eric\_jessup@wsu.edu  
 509-335-5558

## Improved Freight Modeling of Supply-Chain Shipments between Ocean Port, Handling Facility, and Final Market for Regional Policy and Planning Improved Freight

Washington State and the Puget Sound ocean ports at Seattle and Tacoma have become a significant international gateway for U.S. freight and container movements. This two-year project addresses the emerging need by local, state and regional transportation planners and policymakers to better understand the dynamics of ocean port-to-handling facility and handling facility-to-final market freight movements as a function of the regional transportation network, land values, volume, and value of goods moved. This research focuses on the development and refinement of a regional freight model of urban container movements from the port to a handling facility and beyond, which will be an improvement to existing models that do not capture the business decisions and economic influences driving urban freight flows.

This project has significant regional and national appeal, as already expressed by the WSDOT and the Ports of Seattle and Tacoma.

A presentation of the research results was given at the Transportation Research Board conference: Research Issues in Freight Transportation—Congestion and System Performance, in Washington D.C. on October 22 and 23, 2007. In addition, a research paper will be submitted for the Transportation Research Forum's annual meeting in Portland, Oregon in March 2009 and the Annual Transportation Research Board Meeting in Washington, DC in January 2009. A final report is available online at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/).



Project Number: 61-5916

#### Contact:

Steve Muench, University of Washington  
 stmuench@u.washington.edu  
 206-616-1259

## De-Bonding Cracking in Hot Mix Asphalt Pavement

De-Bonding cracks result when a surface HMA layer is not adequately bonded to underlying HMA layers (often through the inadequate or inappropriate use of tack coat). The goal of this two-year project is to identify and perform statistical and forensic analyses on pavements thought to suffer from de-bonding cracks. The project's completion will provide an understanding of this failure phenomenon in order to improve specifications for tack coat application, and result in pavements with lower life-cycle costs.

The second year of research included on-going investigations, interviews, data mining, and technology transfer activities. This project is under a six month extension and its final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/). A current record of the research progress is maintained at [pavementinteractive.org/index.php?title=De-Bonding\\_Cracking\\_in\\_Hot\\_Mix\\_Asphalt\\_Pavement](http://pavementinteractive.org/index.php?title=De-Bonding_Cracking_in_Hot_Mix_Asphalt_Pavement).

## Developing an Area-Wide System for Coordinated Ramp Meter Control

The enlarging gap between travel demand and infrastructure supply has increased the level of traffic congestion nationwide. Ramp metering has been broadly accepted and deployed as an effective countermeasure against both recurrent and non-recurrent congestions on freeways. However, current ramp metering algorithms tend to optimize only freeway travel using local detectors' inputs and overlook the negative impacts on local streets. This generates two problems: (1) the optimal local settings may not result in a system-wide optimum in terms of traffic operations; and (2) the increased congestion on local streets due to ramp metering may counteract the gains in freeway operations. This two-year project aims to develop an area-wide ramp metering system that coordinates the previously isolated ramp meters for system-wide optimization and thereby decreases congestion on local streets surrounding freeway ramps.

This project is under a six month extension however significant headway has been made. Data collection, ramp meter control strategy design, simulation model development and calibration, and system evaluation is completed. In addition, a paper titled, "An Area-Wide System for Coordinated Ramp Meter Control" has been submitted to the 88th Annual Meeting of TRB in January 2009. Another paper titled, "Simulation-based Investigation on High Occupancy Toll Lane Operations for Washington State Route 167" has been accepted for publication at the ASCE: *Journal of Transportation Engineering*.

In the coming months, researchers will perfect system evaluation and complete documentation of the research. Upon the project's completion, a final report will be available at [www.transnow.org/publication/final-reports/](http://www.transnow.org/publication/final-reports/). The findings of this project will provide valuable insight into ramp metering control optimization and congestion mitigation. Several transportation agencies including the WSDOT and US Department of Transportation showed great interest in this study. The methodologies and systems developed in this study will be greatly helpful for traffic operations.



Project number: 61-6023

### Contact:

Yinhai Wang, University of Washington  
 yinhai@u.washington.edu  
 206-616-2696

# coordinated ramp meter control



Project Number: 61-4535  
Final Report Number: TNW2008-01

**Contact:**

Anne Vernez Moudon, University of Washington  
moudon@u.washington.edu  
206-685-4057

## Managing Pedestrian and Bicyclist Safety II

The safety of non-motorized transportation systems is essential to the public acceptance and overall success of Washington State and local jurisdictions efforts to reduce congestion. The state and the jurisdictions goals to increase non-SOV travel options and the use of transit need to be combined with those to insure the safety of these alternatives.

This project was the continuation of current work developing and using a database of 13,914 individual pedestrian and bike collisions. This database is the first in the nation to have geocoded individual collisions in Geographic Information Systems (GIS) for the entire state (1999-2004). Having the precise location of a large number of collisions over a period of several years promises that significant progress can be made in explaining factors associated with collisions and in identifying underlying causes. The new Washington State collision database is particularly momentous that the state also has some of the most advanced data on road characteristics and land uses associated with trip origins and destinations. These latter data are accessible in GIS for all populated areas of the state and available at the finest resolution.

The project's tasks included (1) analyses of pedestrian motor vehicle collisions on city streets; (2) Analyses of bicycle motor vehicle collisions on SR and on city streets; (3) Longitudinal analyses of the collision data to identify potential causes of collisions; (4) Scenario planning examinations of safety-dependent locations, such as (a) freight routes, (b) transit hubs, (c) areas that are experiencing major development and growth, (d) areas subject to substantial infrastructure investments, and (e) areas with different levels of transportation efficiency (measured as travel options available beyond SOV travel, and derived from the Transportation Efficient Land Use Mapping Index TELUMI).

There are continued research successes after the project's completion. A paper titled, "Risk of Pedestrian Injury and Fatality in Collisions with Motor Vehicles, An Ecological Study of State Routes and City Streets in King County, Washington" was submitted to the Annual Transportation Research Board Meeting in January 2009. The research team also received a small grant from the Washington Traffic Safety Commission to continue its work on pedestrian and bicyclist safety.

# safety of non-motorized transportation

## Education Overview and Success Stories

The TransNow Advanced Institute (AI) was established in September 1991 at the UW where the core TransNow AI is still located. In 2007-2008, the institute included transportation programs at the UW and WSU. Each year TransNow provides scholarships, fellowships, research assistantships, teaching assistantships, and internships to students at consortium universities. TransNow also provides match dollars for student awards from other transportation organizations such as the Women's Transportation Seminar (WTS) and the Institute of Transportation Engineers (ITE). In addition, TransNow sponsors transportation students' attendance at various field-related conferences and meetings.

We invite interested students to visit us at [www.transnow.org](http://www.transnow.org) and contact the center at [transnow@u.washington.edu](mailto:transnow@u.washington.edu) for more information.

## Student Events

### QUARTERLY STUDENT WELCOME EVENTS

TransNow sponsors welcome events for transportation students, faculty, and staff at the beginning of fall, winter, and spring quarters. These events acquaint newcomers with returning members of the CEE community at the UW. The receptions also allow students to become familiar with funding procedures and academic resources provided by TransNow. This year, fall quarter commenced with a pizza party, winter quarter included a coffee and pastry reception, and spring quarter closed with an ice cream party.



**Kelly Pitera, Kelly Clark, and visiting scientist Felipe Sandoval**

### ANNUAL TRB MEETING

Each year TransNow provides travel funds for students to attend the Transportation Research Board annual meeting in Washington, DC. Students are able to participate in presentations on the research projects for which they provided assistance as well as view other presentations on transportation research projects sponsored by other organizations from around the country. This year, participating students included: Lin Lin, Guohui Zhang, Michael Lowry, Yegor Malinovskiy, Kari Watkins, Yao-Jan Wu, and Kelly Pitera.



**Kelly Pitera and her guest Cristen Shopay**

### TRANSNOW STUDENT CONFERENCE AT PORTLAND STATE UNIVERSITY

The Fifth Annual TransNow Student Conference, open to transportation students in Federal Region X, was hosted by Portland State University in November 2007. TransNow sponsored 10 students from the University of Washington: Tsit Lam, Yegor Malinovskiy, Ken Perrine, Kelly Pitera, Evan Siroky, Chilan Ta, Oran Viriyincy, Kari Watkins, Yao-Jan Wu, and Runze Yu. Students spent part of the day listening to presentations on transportation research. Students also learned about transportation education opportunities at the universities in Region X. In addition, transportation professionals from the Northwest addressed students about possible careers in the transportation field. The conference concluded with a game of transportation trivia.



**Runze Yu, Yao-Jan Wu, Oran Viriyincy, Evan Siroky, Ken Perrine, and Kelly Pitera**

## Student Support Services

### ADVANCED INSTITUTE: INTERNSHIPS AND FELLOWSHIPS

The TransNow AI program supports students through tuition assistance by partnering with various internship and fellowship programs offered by government agencies and private industries. Graduate and undergraduates were paid stipends by their employers while TransNow funded their tuition expenses. The following organizations partner with TransNow to provide this support:

- Washington State Department of Transportation
- WHPacific, Incorporated
- DKS Associates
- CH2M Hill
- KPFF Consulting Engineers

### ADVANCED INSTITUTE: RESEARCH AND TEACHING ASSISTANTSHIPS

The AI program also provides financial support for student teaching and research assistantships, which allows students to advance their education through valuable field experience and training in the classroom and the laboratory.

### STUDENT AWARDS

The center matches student awards given by transportation organizations to further extend student opportunities. Recent participating organizations include:

- Eno Transportation Foundation
- Coral Sales Company
- Women's Transportation Seminar
- Institute of Transportation Engineers

### TRANSNOW LIBRARY

TransNow serves students and faculty at the UW CEE Department by offering a library facility equipped with copies of frequently requested journals, research reports, theses, transportation-related agency materials, newsletters, and textbooks. The library is also used as a meeting room and study area.

### EQUIPMENT FOR TRANSPORTATION STUDENTS

TransNow equipment available to students includes one Canon PowerShot SD1100 IS digital camera, four Kustom Signal radar guns, two Cannon L2A 8mm video cameras, one Sony Mini-DV camcorder, and one Dell laptop projector. A rental library of nine Dell Inspiron 630m laptops is also available for transportation research and class work. Installed software includes: Microsoft Office, Microsoft Visual Studio, HCM 2000, and HCS+.



## Student Awards

### **KELLY PITERA NAMED 2007 TRANSNOW OUTSTANDING STUDENT**

Kelly Pitera, UW, was awarded the TransNow 2007 Outstanding Student of the Year Award for Federal Region X. The award was presented at the Council of University Transportation Centers annual banquet, held in conjunction with the annual meeting of the Transportation Research Board in January 2008 in Washington, DC. To recognize Kelly's achievement, TransNow sponsored her trip to DC and provided a \$1000 scholarship.

Prior to arriving at the UW, Kelly received a BSCE at Villanova University. Upon graduation she was employed by Berger/ABAM Engineers, a structural and civil engineering consulting firm located in Seattle, Washington. At Berger/ABAM, Kelly was responsible for bridge and roadway design for numerous transportation and public works projects. She obtained her professional engineering (PE) license in 2005.

Kelly is completing a Master of Science in Civil Engineering with a certificate in Global Trade, Transportation and Logistics. Her research interests include freight mobility and logistics. Currently she is exploring relationships between supply chain structure and transportation resiliency. Kelly's future goals include pursuing a PhD at the UW and teaching.



**Kelly Pitera**

### **KARI WATKINS ATTENDS ENO LEADERSHIP CONFERENCE**

TransNow sponsored UW Graduate student Kari Watkins' attendance to the Eno Leadership Conference in Washington, DC in May 2008. TransNow awarded Kari for her ability to demonstrate excellence in academic and leadership efforts. The conference is especially designed for transportation engineers who are future leaders in the industry.



**Kari Watkins**

### **KEN PERRINE WINS BEST PRESENTATION AT REGION X STUDENT CONFERENCE**

UW Graduate student Ken Perrine received first-place recognition for his presentation, "Rate My Roads.org: A Place to Give Feedback on Roads" at the annual Region X Student Conference at PSU. RateMyRoads.org is a prototype web site that allows people to write feedback about the roadways they use. The system guides users through a set of simple questions that allow people's observations to contain details that are important to traffic operation and maintenance personnel. People can use stars to rate pavement conditions, signage, street lighting, and other features. Observations are tied to Google Maps, allowing the system to be used in any location in the world. The system is now targeted for use in cities and campuses, but with simple changes to a database can be made to work for other environments. Go to [www.ratemyroads.org](http://www.ratemyroads.org) and give it a try for your neighborhood.



**Ken Perrine**



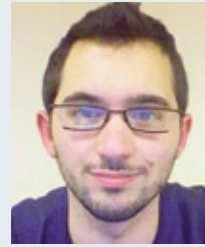
Kit Leong



Chilan Ta



Carly McArdle



Adam Parast



Yegor Malinovskiy

### STUDENTS AWARDED WTS SCHOLARSHIPS

In January 2008, UW students Chilan Ta, Kelli Yamamoto, Kit leong and Kari Watkins were awarded scholarships from WTS for their excellence in education and research. TransNow provided an additional 60 percent of the award amount to match their scholarships. Chilan is a graduate student of Civil Engineering as well as Urban Design and Planning. She is a Research Assistant for Professor Anne Goodchild and works on freight planning and resiliency. Kelli and Kit are undergraduate students in the UW CEE Department. Kari Watkins is a PhD student in the UW CEE Department.

### WSU AND UW STUDENTS WIN CORAL SALES SCHOLARSHIPS

Keith Ireland (WSU), Kolleen Carlson (WSU), Kelly Pitera (UW), Yegor Malinovskiy (UW), Adam Parast (UW), and Carly McArdle (UW) were awarded scholarships from the Coral Sales Company in fall 2007. TransNow provided an additional 60 percent in matching funds to honor their achievement. Students are undergraduates and graduates at Washington State University and the University of Washington.



Aivis Grisulis and Ken Perrine



Jerome Drescher and Will Kim

## Where Are They Now?

The 292 graduates of the Transportation Northwest AI core program continue to excel in various transportation-related fields. Below are highlights from a few graduates.

**Craig Bosman** (BSCE 2006) worked for HDR Inc., in Bellevue, WA, in the Water Resources group. His responsibilities included designing drainage systems for transportation projects. Since May 2007, Craig has been in the Philippines as a Peace Corps volunteer working on management of coastal resources and solid waste management. He plans to finish his assignment in August 2009, and is considering various options for furthering education upon return to the US.

**Patikhom Cheevarunothai** (Num) (PhD 2008) is a transportation engineer for INCA Engineers, Inc. in Bellevue, WA. Currently, he is responsible for developing a traffic demand forecasting model for the Bellevue-Redmond area.

**Jerome Drescher** (BSCE 2008) is an engineer in the Freeway Operations division of WSDOT. He manages operators in the Traffic Management Center, conducts traffic studies, and manages ramp meters on Seattle area roadways.

**Will Kim** (BSCE 2008) works as an engineer for Parsons Brinckerhoff. Currently, he is working on the 520 Floating Bridge Replacement Team to design components of the bridge replacement.

**Clint Monken** (BSCE 2008) is a Civil Design Engineer for KPFF Consulting Engineers. Currently, he works on a number of projects including the North Twin Bridge in the city of Des Moines and the Link Light-Rail in Seattle.



## Student Spotlight

**Chilan Ta**—Chilan joined the CEE Department in spring of 2008, formalizing her pursuit of a double Master's Degrees program. She is pursuing a Master in Urban Planning and a Master of Science in Civil Engineering in the transportation program, set for graduation in spring 2010. During 2007-2008, Chilan received the WTS Graduate Student Scholarship (with additional matching funds provided by TransNow) and the Donald H. Miller Scholarship from the Urban Design and Planning Department. With the passing of her first year in the double Master Degree Program, Chilan has fulfilled the majority of the requirements for the MSCE. However, beyond academics, she also met with and encouraged prospective students to explore a future in transportation at UW. Chilan significantly contributed to the transportation community through her research work, working under Professor Anne Goodchild on a project exploring the value and meaning of resilience to freight transportation systems. As a result of Chilan's research she has composed a paper for TRB publication and presentation that is currently under review. Professor Goodchild says of Chilan that

*[She] was able to make a unique contribution to our research on Freight Transportation System Resilience as she could draw both upon her knowledge in Transportation Engineering, but also her ability to structure new ideas and thoughts from her background in Sociology. In addition to her assistance on the resiliency project, Chilan acted as a TA for CEE 320. She was very dedicated to helping the students, often working on the weekend and at odd hours to provide assistance. She has been a great addition to the Goods Movement Collaborative and takes an interest in the research of her peers, engaging in the development of their projects and providing useful feedback.*

Outside of her presence at the UW, Chilan has also participated in a national internship program organized by the USDOT, the Summer Transportation Internship Program for Diverse Groups (STIPDG), which has taken her to Lakewood, CO (Denver) with an internship at the Federal Highway Administration Resource Center. In September of 2008, Chilan will spend three weeks in Copenhagen with other UW students in the Public Space Public Life study program, administered by the College of Architecture and Urban Planning, where she will learn about pedestrian and bicycle design. For the following year, Chilan looks forward to applying her knowledge on pedestrian and bicycle design principles to a site in downtown Seattle. She will also continue research work with Professor Mark Hallenbeck on the links between road status information and traveler behavior and with Professor Ed McCormack on freight truck trip generation. This coming year, Chilan plans to attend the TRB 88th Annual Meeting, American Planning Association National Conference, and the Washington State Planning Association Chapter Conference to present her work on resilience and freight transportation systems.

## Outreach

Outreach programs are a well-recognized activity in each university. The collaborative effort that has been realized under the leadership of TransNow has greatly enhanced and focused these individual university activities.

## Events

### COLLEGE OF ENGINEERING / CIVIL AND ENVIRONMENTAL ENGINEERING OPEN HOUSE 2007

This spring TransNow partnered with Civil and Environmental Engineering (CEE) to provide a weekend of educational outreach at the annual UW College of Engineering Open House. This year's open house was attended by over 8,000 local K-12 students and family members. With the help of transportation student volunteers, faculty, and staff, the TransNow center sponsored activities including a magnetic levitation car demonstration, a radar gun foot race, and transportation jeopardy.



Radar Gun Foot Race

### REGION X RECEPTION AT 2008 TRANSPORTATION RESEARCH BOARD MEETING

TransNow joined with the other Region X UTCs to invite students, faculty, transportation professionals, and guests to a reception at the 87th Transportation Research Board Annual Meeting. This year approximately 200 people attended. The reception is an excellent setting for students, aspiring faculty candidates, industry professionals, and others to meet.



Bruce Agnew, Nancy Nihan, and Steve Marshall

## Technology Transfer

Technology Transfer is an important part of the Center's program. At the proposal stage TransNow requires each PI to submit an implementation plan describing what steps they will take to disseminate the results of their research. At each semi-annual period PIs are required to submit an implementation report describing any technology transfer activities accomplished during the period. To ensure that research results are readily available to potential users in a form that can be directly implemented, utilized, or otherwise applied, the TransNow staff also performs technology transfer activities. These technology transfer activities include maintaining publications such as final reports, newsletters and annual reports on the TransNow website. Newsletters and annual reports are also distributed to the organization's contact list and can be sent via email. To take advantage of receiving our publications via email, contact [transnow@u.washington.edu](mailto:transnow@u.washington.edu).

## Website and Newsletters

**WEBSITE: [WWW.TRANSNOW.ORG](http://WWW.TRANSNOW.ORG)**

TransNow's website was visited by approximately 3,852 individuals in 2007-2008. There was an average of 321 website hits per month. The website consists of the following sections:

### Home

- Contains up-to-date news information about the center and Region X

### About Us

- Provides information about TransNow's mission, staff, location, directory, and the Washington Consortium of UW and WSU

### Education

- Provides an overview of the TransNow Advanced Institute program as well as helpful information for and about alumni and current students

### Research

- Contains information about current and past research projects, reporting requirements and deadline information for principal investigators, and information regarding the process for submitting research proposals for new and continuing research, Advanced Institute funding, and conducting proposal reviews

### Publications

- Contains TransNow's annual reports, newsletters, research project descriptions, and final reports

### Links

- Contains links and contact information for many agencies and transportation related resources

### Region X Consortium

- Contains an overview of the region and consortium universities, and contact information for members of the regional transportation community

## NEWSLETTERS

The TransNow Newsletter provides information to transportation professionals about research and outreach activities at TransNow. It contains highlights of research, student achievements, events, and news pertaining to the Region X Consortium. The newsletter is published three times per year and posted to the TransNow website as well as distributed to approximately 3500 people.

## Conferences & Meetings

EVENT	DATE
<b>ITE Annual Meeting</b>	<b>August 5-7, 2007</b>
<b>ARTBA Annual Meeting</b>	<b>October 9-12, 2007</b>
<b>UW Transportation Student Welcome</b>	<b>October 26, 2007</b>
<b>Region X Consortium Meeting (UW)</b>	<b>October 15-16, 2007</b>
<b>Region X Student Conference (PSU)</b>	<b>November 6, 2007</b>
<b>TRB Annual Meeting</b>	<b>January 14-17, 2008</b>
<b>Region X Reception at TRB</b>	<b>January 13, 2008</b>
<b>UW Transportation Student Reception</b>	<b>January 24, 2008</b>
<b>TransNow Graduate Student Recruitment Reception</b>	<b>February 22, 2008</b>
<b>TransNow Board of Directors Meeting</b>	<b>April 7, 2008</b>
<b>UW College of Engineering Open House</b>	<b>April 25-26, 2008</b>
<b>RITA Site Visit (UW)</b>	<b>April 30, 2008</b>
<b>Region X Consortium Meeting (UAF)</b>	<b>May 19-20, 2008</b>
<b>UW Transportation Student Send-Off</b>	<b>May 30, 2008</b>
<b>CUTC Summer Meeting</b>	<b>June 24-27, 2008</b>

## Paper Presentations at the 2008 Annual Meeting of the Transportation Research Board

The following papers are products of collaboration between Transportation Northwest and other transportation-related entities.

PRESENTER/AUTHOR	CO-PRESENTERS/AUTHORS	TITLE OF SESSION	TITLE OF PAPER/PROJECT
Ryan Avery (UNIVERSITY OF WASHINGTON)		<i>Advances on the Urban Data Front</i>	<i>An Interactive Tool for Collecting Traveler Behavior Information</i>
Anne Goodchild (UNIVERSITY OF WASHINGTON)	Steven Globerman (WESTERN WASHINGTON UNIVERSITY), Susan Albrecht (UNIVERSITY OF WASHINGTON)	<i>Issues in Cross-Border Trucking</i>	<i>Service Time Variability at Blaine, Washington, International Border Crossing and Impact on Regional Supply Chains</i>
Mark Hallenbeck (UNIVERSITY OF WASHINGTON)	John Ishimaru, Katherine Davis, Jaime Kang (WASHINGTON STATE UNIVERSITY)	<i>Performance-Based Traffic Signal Systems (Poster Session)</i>	<i>Transportation Infrastructure Investment and Economic Activity: Evidence Using Vector Autoregression, Error Correction, and Directed Acyclic Graphs</i>
Jianhua Li (UNIVERSITY OF WASHINGTON)	Joe Mahoney, Stephen Muench, (UNIVERSITY OF WASHINGTON) Linda Pierce, (WASHINGTON STATE DEPARTMENT OF TRANSPORTATION)	<i>Pavement Rehabilitation: Project Selection Techniques</i>	<i>Bituminous Surface Treatment Protocol for the Washington State Department of Transportation</i>
Michael Lowry (UNIVERSITY OF WASHINGTON)	Timothy Nyerges, G. Scott Rutherford (UNIVERSITY OF WASHINGTON)	<i>Developments in Transportation Programming and Decision Making</i>	<i>Internet Portal for Large-Group Participation in Transportation Programming Decisions</i>

PRESENTER/AUTHOR	CO-PRESENTERS/AUTHORS	TITLE OF SESSION	TITLE OF PAPER/PROJECT
Yegor Malinovskiy (UNIVERSITY OF WASHINGTON)	Yao-Jan Wu, Yinhai Wang, (UNIVERSITY OF WASHINGTON)	<i>Modeling and Planning for Pedestrians</i>	<i>Video-Based Monitoring of Pedestrian Movements at Signalized Intersections</i>
Anne Vernez Moudon (UNIVERSITY OF WASHINGTON)	Lin Lin, Phil Hurvitz (UNIVERSITY OF WASHINGTON), Paula Reeves (WASHINGTON STATE DEPARTMENT OF TRANSPORTATION)	<i>Studies of Pedestrian Safety and Behavior</i>	<i>The Risk of a Pedestrian Collision Occurrence: A Case-Control Study of Collision Locations on State Routes in King County and Seattle, Washington</i>
Heather Munden (KBA, INC.)	Linda Pierce, Mia Waters, Jeffrey Uhlmeyer (WASHINGTON STATE DEPARTMENT OF TRANSPORTATION), Joe Mahoney, Stephen Muench (UNIVERSITY OF WASHINGTON)	<i>Recent Research on Pavement Noise Issues</i>	<i>Low-Noise Pavement Evaluation in Washington State</i>
Martina Soderlund (STANTEC, INC.)	Stephen Muench (UNIVERSITY OF WASHINGTON), Kim Willoughby, Jeffrey Uhlmeyer, Jim Weston (WASHINGTON STATE DEPARTMENT OF TRANSPORTATION)	<i>Streamlining Transportation Decision Making While Sustaining and Analyzing the Environment</i>	<i>Green Roads: Sustainability Rating System for Roadways</i>
Steve Muench (UNIVERSITY OF WASHINGTON)		<i>Asphalt Pavement Sustainability</i>	<i>Green Roads Rating Systems</i>
Yao-Jan Wu (UNIVERSITY OF WASHINGTON)	Yinhai Wang (UNIVERSITY OF WASHINGTON), Atli Bjorn Levy (VST CONSULTING ENGINEERS, LTD.)	<i>Crash Prediction Models and Accident Modification Factors</i>	<i>Accident Risk Modeling for Two-Lane Rural Roads in Washington State</i>
Yao-Jan Wu (UNIVERSITY OF WASHINGTON)	Yinhai Wang (UNIVERSITY OF WASHINGTON)	<i>Information Technology – An Agent for Change in Transportation</i>	<i>Google-Map-Based Online Platform for Arterial Traffic Information and Analysis</i>
Tianze Xu (UNIVERSITY OF CINCINNATI)	Yinhai Wang (UNIVERSITY OF WASHINGTON), Heng Wei, Anastasios Ioannides (UNIVERSITY OF CINCINNATI)	<i>Capacity and Level of Service: Intersections, Urban Streets, and Work Zones</i>	<i>Modeling Capacity Reliability of Minor Roads at At-Grade Unsignalized Intersections for Potential Operational Performance Evaluation</i>
Ping Yi (UNIVERSITY OF AKRON)	Yinhai Wang (UNIVERSITY OF CINCINNATI), Chun Sao (UNIVERSITY OF AKRON)	<i>Performance-Based Traffic Signal Systems</i>	<i>Piecewise Optimum Delay Estimation for Improved Signal Control</i>
Jianyang Zheng (UNIVERSITY OF WASHINGTON)	Guohui Zhang, Pete Briglia, Yinhai Wang (UNIVERSITY OF WASHINGTON)	<i>Simulation and Modeling for Urban Bus Operations</i>	<i>Comprehensive Evaluation of a Transit Signal Priority System Using Observed and Simulated Traffic Data</i>
Guohui Zhang (UNIVERSITY OF WASHINGTON)	Shuming Yan (WASHINGTON STATE DEPARTMENT OF TRANSPORTATION), Yinhai Wang (UNIVERSITY OF WASHINGTON)	<i>High-Occupancy-Vehicle and High-Occupancy-Toll Operations (Poster Session)</i>	<i>Simulation-Based Investigation on High-Occupancy-Toll Lane Operations for Washington State Route 167</i>
Guohui Zhang (UNIVERSITY OF WASHINGTON)	Yinhai Wang (UNIVERSITY OF WASHINGTON), Heng Wie (UNIVERSITY OF CINCINNATI), Ping Yi (UNIVERSITY OF AKRON)	<i>High-Occupancy-Vehicle and High-Occupancy-Toll Operations (Poster Session)</i>	<i>Feedback-Based Dynamic Tolling Algorithm for High-Occupancy-Toll Lane Operations</i>

## Funding and Expenditures

### FINANCIAL PARTNERSHIPS

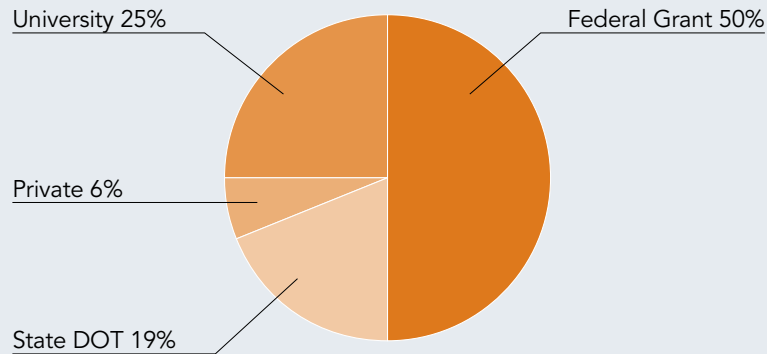
Strong financial partnerships and solid financial commitments from local, state, and regional organizations throughout Federal Region X have evolved through the UTC 100 percent match requirement. In addition to cash and in-kind match for research projects, all scholarships, fellowships, and internships provided by TransNow require a non-federal cash match.

- Microsoft Gift Fund
- Private Software Funds
- Ford Gift Funds
- Los Angeles Alliance for a New Economy
- Washington State Department of Transportation
- Washington State University
- University of Washington
- ENO Transportation Foundation

The following companies, public agencies, professional societies, and scholarship programs teamed up with TransNow during the 2007-2008 year to provide matching dollars for TransNow funded research and scholarships and internships to TransNow's students.

- Washington State Section Institute of Transportation Engineers
- Women's Transportation Seminar
- Valle Scholarship and Scandinavian Exchange Program
- Coral Sales
- WHPacific, Inc.
- KPFF Consulting Engineers
- DKS Associates

### FUNDING SOURCES



### EXPENDITURES

