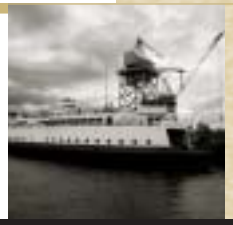
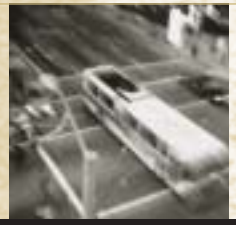
2000/2001 Annual Report



REGION TEN UNIVERSITY TRANSPORTATION CENTERS PROGRAM

TRANSNOW

TRANSPORTATION NORTHWEST

Transportation Northwest is committed to the development and maintenance of a Center of excellence in transportation research and education in the theme area of “transportation operations and planning.” It will serve as a primary source of and resource for competent transportation professionals for the 21st century.

Transportation Northwest

2000-2001 Annual Report

Region Ten, University Transportation Centers Program

Table of Contents

Director's Message

TransNow entered its thirteenth year of operation in September 2000. Faced with additional cuts in federal funding, the Center's annual federal budget for year 13 was 14% lower than the annual budgets for Years 3-11, resulting in further reduction in research project funding.

EDUCATION

Although research support was cut, the level of federal support for TransNow's educational component, i.e., the Advanced Institute (AI), which was established in year 3, was kept stable. The TransNow internship program continued to prosper, allowing federal fellowship funds to stretch further, offsetting previous reductions in matching fellowship support. (These reductions in local match support were the result of major reductions in Washington State transportation revenues over the past few years.)

The highly successful internship program, coupled with the TransNow fellowship, scholarship, and award programs, provided much-needed support for transportation students throughout our region. Fellowships and internships went to 17 undergraduate and 32 graduate students in Year 13. An additional number of financial awards and scholarships were given to 7 undergraduate and 10 graduate students.

TransNow research projects at each of our consortium universities provided further financial support for students in the TransNow AI program through research assistantships.

Additionally, TransNow continued to provide numerous support services for students and faculty, including a major upgrade and expansion of the Transportation Computer Laboratory during Year 13.

RESEARCH

Even with reduced federal funding, the research program continued to attract excellent proposals for new projects and matching support from local and regional transportation organizations.

Two research studies at the University of Washington (UW) addressed critical freight movement issues. One of these projects was a continuing study of intermodal freight movement systems and the impact of freight mobility on regional ports, shippers, and their clients. This project received matching funds from APEC, the Washington State Department of Transportation (WSDOT), the Ports of Seattle and Tacoma, and the Kent Chamber of Commerce. The other study, initiated this year with matching support from the WSDOT, addressed the problems of collecting reliable truck transport data using freeway dual-loop measurements.

UW researchers are forming new partnerships to expand TransNow's freight research resources. The TransNow Intelligent Transportation Systems (ITS) group at the UW is working with the University at Albany, NY (part of the Region 2 UTC) and the Washington State Transportation Center (TRAC) to develop new research projects addressing freight mobility and security concerns in our increasingly competitive global economy. This newly formed research partnership is currently developing proposals for both the tracking of hazardous cargo and the application of ITS at border crossings for increased freight mobility and security.

Washington State University (WSU) researchers recently completed another TransNow-sponsored regional freight study, which investigated the energy and environmental impacts of intermodal grain transportation. The preliminary findings of this study of the Snake River drawdown were that salmon, energy, and the environment might not be in conflict with each other after all.

Transit research continued to be a high priority. A second WSU study developed and demonstrated a methodology for evaluating rural transit benefits.

Another study of rural public transportation, at the University of Alaska at Fairbanks (UAF), investigated the use of geographic information systems to guide service planning. UAF researchers also worked with the Anchorage People Mover (APM) in a study of seasonal variations in transit needs for a tourist destination.

Researchers at Portland State University (PSU) teamed up with UW researchers on a new project to develop a real time predictive algorithm of transit vehicle arrivals under adverse conditions. Prior research sponsored by TransNow and Tri-Met developed a method to predict transit bus arrival times under normal operating conditions.

Four continuing TransNow projects were completed this year. PSU researchers completed their report on performance monitoring and evaluation of the automated bus dispatching system, developed by PSU investigators for a previous TransNow study and implemented by Tri-Met in the Portland area.

A UW transit study, which was initiated in year 12 and completed in year 13, established pedestrian infrastructure priorities for transit stations. These were adopted by the Puget Sound Regional Council in an update of the Seattle Metropolitan Transportation Plan.

Two continuing UW investigations on the application of advanced technologies to collection of real-time freeway speed data were also completed this year. These addressed the use of vehicle probes and Uncalibrated CCTV cameras as speed sensors. Phase two of the Uncalibrated CCTV project is being sponsored by TransNow and WSDOT in Year 14.

NEW FACULTY

Five new faculty members joined the TransNow research and teaching team this year.

Dr. Robert Bertini joined the Civil Engineering faculty at PSU as an assistant professor of Transportation Engineering. He is also affiliated with the PSU Transportation Research Group and the College of Urban and Public Affairs.

The UW Department of Civil and Environmental Engineering (CEE) added two research associates to its research faculty this year. Dr. Gudmundur Ulfarsson, who specializes in econometric analysis of urban systems with a focus on transportation safety, will supervise TransNow graduate student research and serve as co-PI on research projects in this specialty area.

Dr. Yinhai Wang also joined the TransNow research faculty as a research associate in the UW CEE Department this year. Dr. Wang serves as the coordinator of the TransNow ITS program and is currently supervising Master's and PhD students in the application of advanced technologies for the performance monitoring and tracking of truck freight movements.

Dr. Beth Kolko joined the UW faculty in Year 13 as an associate professor in the Department of Technical Communications. She is currently overseeing a TransNow/WSDOT project on electronic dissemination strategies for traveler information.

Dr. George Turkiyyah became a first-time TransNow PI this year and joined the TransNow research faculty. He is an associate professor in the UW CEE Department specializing in computational simulation and design, and in computer-aided engineering.

These new additions to the TransNow faculty are already making exciting contributions to our education, research, and technology transfer programs.

OUTREACH AND TECHNOLOGY TRANSFER

TransNow students and faculty continued to enthusiastically participate in outreach and technology transfer activities.

The UW/Ballard Maritime Academy project, chosen as one of nine pilot projects nationwide as part of the Building Linkages Program, neared completion. This project, to develop a secondary/post-secondary link for transportation students, was sponsored by the U.S. Department of Education and the U.S. Department of Transportation.

The successful results of this pilot project were showcased at the October freight conference co-sponsored by TransNow and other Northwest transportation organizations.

This three-day event entitled, “Northwest Freight Conference: Moving Our Economy”, brought together professionals, students, and policymakers from all over the Pacific Northwest to solve problems related to the efficient movement and security of freight.

In another project to interest younger students in transportation careers, TransNow, once again, participated in the UW College of Engineering annual Open House for students in grades K-12. TransNow students and faculty developed and staffed seven learning centers for the two-day event.

In addition to the PNW Freight Conference, TransNow technology transfer activities, including the annual report, the semi-annual newsletter, website, etc., continued to reach a wide audience of transportation professionals.

Approximately 750 persons (11,000 hits) visited the TransNow web page each month during fiscal year 2000-2001. The newsletter was distributed in November and May to approximately 3000 addresses, and the annual report distributed to approximately 500. TransNow research reports produced during year 13 were distributed and placed on the TransNow website. A list of all reports, including those from previous years, is also available on the website.

It has been another productive year with exciting prospects for new research and education programs. TransNow is moving toward expanding its intermodal program by introducing new courses in freight mobility and supply chain management, border crossing simulation and analysis, and ITS applications to freight monitoring. Additionally, we are forming new research partnerships to investigate the application of ITS techniques to intermodal freight issues.

As director, I look forward to a year of continued success in building upon established, proven programs and to a series of exciting new initiatives.

CENTER THEME

Transportation Northwest's Center theme is Transportation Operations and Planning. The Center theme encompasses Operations Management and Planning of all surface transportation modes, including ferry transit. Research projects funded by TransNow fall within one of the three major theme areas.

Operations and Planning for:

1) **Traffic,**
2) **Transit,**
3) **Rail, Port, Terminal, and Intermodal Systems**

Transportation in Federal Region 10 serves as a microcosm of transportation in the entire country. This region has the diversity of modes, infrastructure systems, and area types to make it a prime testing ground for all sorts of studies in transportation operations and planning. ITS research and implementation possibilities are just one example. Such researchable ITS issues range from ATIS applications for emergency vehicle location on isolated roads in Alaska to the application of advanced technologies to manage traffic problems in Seattle, one of the nation's most congested cities. Seattle was one of the original four cities in the country chosen for the ITS Model Deployment Initiative (MDI). UW students and faculty were directly involved and were major contributors to this ATIS initiative, which was named Smart Trek. The TransNow Center sponsored research for Smart Trek on development of the ITS Backbone, and development of the on-line Bus-View System, a case study of the decision-making involved in development of the ATIS business plan, and other ATIS research.

A number of other regional efforts, such as the design and planning of a new light rail system for the Seattle area, are going forward with UW student and faculty involvement. Student internships with Sound Transit, Metro Transit, WSDOT, and other Seattle regional transportation organizations are adding to this effort. The individual consortium universities are also playing a key role in each of their respective local regions. Students and faculty in these universities are directly involved in regional efforts and have developed strong relationships with regional organizations.

The TransNow Center serves as a focal point for important interchanges regarding transportation issues for the entire region. In our role as a regional conference organizer, regional transportation information resource, regional education and research coordinator, etc., we make a significant contribution to the leadership of the transportation community in Federal Region 10.

The Consortium

TransNow's lead university is the University of Washington (UW), located in Seattle's University District. The UW is home to approximately 35,000 students.

The University of Alaska Fairbanks (UAF) emphasizes research in rural transit through the Transportation Research Center.

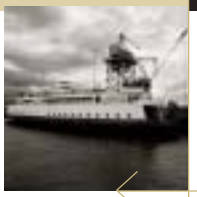
Oregon State University (OSU) in Corvallis, as a Land, Sea and Space Grant University, hosts the Transportation Research Institute.

At Portland State University (PSU), the Center for Urban Studies is the focal point for research and training in urban transportation.

Washington State University (WSU), in cooperation with TransNow, the Washington State Department of Transportation, and the Washington State Transportation Center, undertakes research in the field of rural and intermodal transportation.

The University of Idaho (UI) is the home of UTC's National Institute for Advanced Transportation and Technology, and as a neighboring UTC, cooperates with TransNow in supporting educational outreach and conferences. Although the UI does not receive research or education funds from TransNow, it is still a member of the TransNow regional consortium and is represented on the TransNow Board of Directors.

The Management Structure of TransNow consists of the Director and Staff, a Board of Directors, and an Advisory Board. Please see pages 10 and 11 for a staff listing.



TransNow Board of Directors

The TransNow Center Director coordinates research and educational activities with the TransNow Board of Directors (BOD), which exercises oversight authority over our efforts. The BOD includes one senior university representative (University Director) for each of the six consortium universities and two USDOT representatives, Helen Knoll (FTA) and Michael Brower (FHWA). The BOD meets three or more times a year to discuss and vote on TransNow research, educational, and technology transfer activities.

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Nancy L. Nihan
Professor and Director, TransNow
Department of Civil and Environmental Engineering
University of Washington

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Oregon State University

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Region 10

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University of Idaho

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University of Alaska - Fairbanks

Martin Pietz
Director of Transportation Research
Washington State Department of Transportation (WSDOT)

James Strathman
Professor, School of Urban Studies and Planning
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Portland State University

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Regional Administrator, Railroad Safety
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Region 10
Vancouver, WA

Billy Connor
Research Manager
Design and Engineering Services
Alaska State Department of Transportation
Fairbanks, AK

King Cushman
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Transportation Planning
Puget Sound Regional Council
Seattle, WA

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Perteet Engineering, Inc.
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Dan Farmer
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Kenworth Truck Company
Kirkland, WA

Rick Gerhart
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Projects and Analysis
TRI-MET
Portland, OR

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Regional Administrator
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Seattle, WA

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Maritime Program Specialist
US Department of Transportation
Seattle, WA

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Regional Traffic Engineer
Past President, WA State Section ITE
Washington State Department of Transportation
Seattle, WA

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Association of Oregon Counties
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Idaho Transportation Department
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Oregon State Department of Transportation
Salem, OR

Jay Weber
Executive Director
County Road Administrative Board
Olympia, WA

Alan Willis
Manager, Channel Improvement
Port of Portland
Portland, OR

Peggy Willis
Manager
Metro Transit Research/Market Strategy
Seattle, WA

TransNow has an Advisory Committee that consists of 22 representatives from local, state, and regional agencies and industries. Members of the Advisory Committee serve as proposal reviewers, as do representatives from the consortium universities and other regional Centers. Advisory Committee members contribute to TransNow workshops and conferences and are kept abreast of TransNow activities.

During fiscal year September 1, 2000 to August 31, 2001, TransNow funded nine new research projects. Three of these projects have been extended into 2001-2002. These projects fall within the major theme areas of traffic, transit and intermodal operations. New research projects are submitted to a review process that includes both an extensive peer review and further review by the TransNow Director and Board of Directors.

PROJECT IDENTIFYING NUMBER 62-4203

PROJECT TITLE **Evaluation of Dual-Loop Errors in Measurement of Freeway Traffic Composition**

PRINCIPAL INVESTIGATOR Nancy Nihan

INSTITUTION University of Washington

RESEARCH SUMMARY

The overall objective of this study is to identify problems with dual-loop detectors in Washington State and investigate potential methods for correcting these problems. The three study stages toward this goal included: 1) sample selection and collection of dual-loop data and corresponding ground-truth data, 2) identification of dual-loop errors based on comparison of video data (ground truth data) with dual-loop measurements, and 3) investigation of potential methods for correcting the identified problems.

Because of the significant performance differences between long and short vehicles, knowledge of the vehicle composition of traffic streams is critical to good traffic control and management. The Washington State Department of Transportation (WSDOT) has installed dual-loop detectors at key stations along the Seattle Freeway system to provide real-time vehicle-length information. Speeds, vehicle lengths, and bin volumes (for various vehicle-length categories) should be available from these dual-loop detectors in 20-second intervals. However, our preliminary study found that these inductance dual-loop systems are subject to serious malfunctions and more than 80% of the dual-loop detectors do not provide correct bin-volume measurements. Some of the malfunctions may be due to hardware problems, and some may be due to the current underlying system algorithm.

To identify the malfunctions caused by the algorithm, the researchers selected sample stations along the Seattle Freeway system for analysis. The selected stations had no hardware malfunctions or very minor malfunctions. Both video data and dual-loop measurements were collected from the three stations. Detailed comparisons between the

CONTACT INFORMATION

Professor Nancy L. Nihan
Department of Civil and Environmental Engineering
University of WA
Box 352700
Seattle, WA 98195-2700

(206) 543-8255
nihan@u.washington.edu

dual-loop measurements and ground-truth data were made and five major problems with the dual-loop detectors were identified: over counts, under counts, false alarms, omission of small vehicles, and misclassifications among bins.

The first two study stages of this project have been completed and the third stage, investigating and developing potential algorithms for repairing the faulty measurements, is currently in progress. The final product will be a set of improved algorithms for vehicle classification with dual-loop systems.

SUCCESS STORIES

Since the findings of this study are directly related to the quality of WSDOT's archived truck-data, several freight-related project teams of the Washington State Transportation Center (TRAC) have shown great interest in the study results. For example, an ongoing project, entitled "Monitoring of Freight on Puget Sound Freeways," analyzes the characteristics of freight transport based on the dual-loop measured bin volumes. The quality of dual-loop measurements directly affects the accuracy of this WSDOT research. Therefore our research team works closely with other WSDOT project teams.

The preliminary findings of this study were summarized and presented to interested parties, including Dr. Mark Hallenbeck, Director of TRAC, on Sept. 28, 2000, at the Department of Civil and Environmental Engineering, UW. Since the malfunctions identified with the WSDOT dual-loop detector systems are serious, the findings of this study may generate several new projects for analysis and correction of the problems.

The final report of phase one of this project has been forwarded to TransNow and WSDOT for review and distribution. In addition, study results will be summarized in a paper to be submitted to a professional transportation journal.

PROJECT IDENTIFYING NUMBER 62-4197

PROJECT TITLE **Transportation Infrastructure Design Construction—Virtual Training Tools**

PRINCIPAL INVESTIGATORS Joe Mahoney and George Turkiyyah

INSTITUTION University of Washington

SUMMARY

The research team developed a "virtual laboratory" for hot mix laboratory tests. This task included "Flash" integration of hot mix tests into an overall pavement-training tool. This pavement-training tool will be issued on a CD or DVD upon completion of the product. Currently, the focus is on asphalt binder tests. Flash animation is used to describe the principles involved in the test. This task is still at an early stage of development.

The next step was to develop a pavement construction simulator, or "virtual compactor." Please see the description below, under Success Stories.

SUCCESS STORIES

The "virtual compactor" is the first product intended to be a training tool for the paving industry. This includes both agency personnel (mostly paving inspectors) and contractor equipment operators. The current version is about to be "beta" tested and contains the following features:

visualization of roller and asphalt concrete mat—all controllable from a PC

ability to set the allowable time to achieve compaction. This currently is done via the use of the Pave Cool software developed at the University of MN, which is in turn a function of climate and hot mix temperatures. The mat changes color as it cools. This provides the "roller operator" the ability to gauge progress against cooling rates—a critical issue in hot mix paving.

CONTACT INFORMATION

Professor Joe Mahoney
Department of Civil and Environmental Engineering
University of WA
Box 352700
Seattle, WA 98195-2700

(206) 685-1760
jmahoney@u.washington.edu

Ability to assess the effectiveness of a roller operator for a fixed time. This can be done in real time or after the fact.

The initial beta version was demonstrated at a paving seminar held in Honolulu on July 27, 2001. In attendance were personnel from the Hawaiian DOT and paving contractors. They were very supportive and offered to beta test the CD when ready. This beta testing started during September or October 2001. Beta testing will also include the Washington State DOT and local paving contractors. This might be expanded to the agencies that are participants in the Pacific Coast on Asphalt Specifications (AK, AZ, CA, HI, NE, OR, and WA), including some type of assessment to be conducted by the PCCAS states.

The virtual roller was demonstrated to representatives from the National Asphalt Pavement Association in Washington DC on September 4, 2001.

The virtual roller will be featured in an upcoming issue of the Washington State DOT LTAP newsletter.

This roller computer simulation was developed for the study.

PROJECT IDENTIFYING NUMBER 922927–TASK 1

PROJECT TITLE

Adaptation of Workshops for Northwest Transportation Training and Education Alliance

PRINCIPAL INVESTIGATORS

Katharine Hunter-Zaworski and Robert Layton

INSTITUTION

Oregon State University

SUMMARY

The Adaptation of Workshops for the NW Training Alliance is a project that involves universities and state departments of transportation from Oregon, Idaho, and Washington. The purpose of the project is to extend the teaching and education opportunities of short courses and workshops that are currently taught in the three states. The specific purpose of the project is to provide distance-learning enhancements to the Highway Capacity Workshop that is currently taught by TRANSPEED and Oregon State University. The project was initiated as a result of the workshop sponsored by TransNow in July of 1999 on Distance Education. In addition to direct distance-learning opportunities, the project provides an opportunity for faculty, state transportation professionals, and technology transfer staff to meet regularly to exchange information on common interests.

CONTACT INFORMATION

Professor Katharine Hunter-Zaworski
Civil and Environmental Engineering Department
Oregon State University
Apperson Hall 202
Corvallis, OR 97331

(541) 737-4982
hunterz@engr.orst.edu

SUCCESS STORIES

Technology Transfer, training and education are the core of this project. The involvement of technology transfer staff, DOT staff and faculty provide an opportunity for additional outreach activities.

PROJECT IDENTIFYING NUMBER PSU 922910–TASK2, UW 62-4204

PROJECT TITLE	**Development of a Statistical Algorithm for the Real-Time Prediction of Transit Vehicles Under Adverse Conditions**
PRINCIPAL INVESTIGATORS	PSU Ken Dueker, UW Dan Dailey
INSTITUTION	Portland State University, University of Washington

SUMMARY

Part of this research relies on an "algorithmic approach" that employs a synthetic "time-to-arrival" function, or average speed from the current location to the location of interest. This function can be modified for abnormal conditions. This approach is employed by the University of Washington and is described in a separate technical report. In addition, a "statistical approach" focuses on systematic delays that occur at unexpected times, such as traffic delays resulting from drawbridge interruptions and excess dwell time resulting from bus-lift operations for disabled persons. The statistical approach provides an estimate of delay at the time of occurrence, which is updated with the actual time of delay at the ending time of the occurrence. The statistical approach was employed by Portland State University and is described in this report.

BRIEF DESCRIPTION OF APPROACHES

Algorithmic Approach

The UW received one month, November 2000, of archived status and exception reports to calibrate the model for normal conditions. Status reports of time and position of all buses at regular time intervals were augmented with exception reports for buses that are not running on schedule. This data was analyzed to model operations for baseline conditions. Traffic closures for Hawthorne Bridge draw bridge operation for November 2000 has been forwarded to the UW for calibration under abnormal conditions. In addition, bridge closure data for November 2001 will provide for validation.

CONTACT INFORMATION

Professor Ken Dueker
PO Box 751
Portland State University
Portland, OR 97207

(503) 725-4042
duekerk@pdx.edu

The UW part of the project expanded on a previous project that created a new algorithm to predict the arrival/departure time for transit vehicles. In the previous project, a prediction algorithm appropriate for use with Tri-Met's scheduling and AVL system was documented (Cathey and Dailey, 2001). This algorithm provides a clearly defined open and independent mechanism to assign vehicles to trips and predict arrival/departure. In addition this work documents a methodology for performing data fusion in making predictions. This data fusion incorporates information existing outside of transit schedules. This may include traffic, weather or historical information.

Three assumptions are made in solving this general problem: 1) there is a fleet of transit vehicles that travel along prescribed routes, 2) there is a "transit database" that defines the schedule times and the geographical layout of every route and time point, and 3) there is an automatic vehicle location (AVL) system, where each vehicle in the fleet is equipped with a transmitter and periodically reports its progress back to a transit management center.

The predictive algorithm employs a Kalman filter approach. A central tenet of the algorithm is that a synthetic "time-to-arrival" function for every destination can be created. This time-to-arrival function can be evaluated at each position along a linear route estimating the time remaining until arrival. This function is analogous to the speed the vehicle would have to travel if it were to travel at a constant speed from location to the goal. (This is not to be confused with the speed of the vehicle, which is not used in this approach.) This arrival function is used in the time update equations for the linear Kalman filter, as well as the data update equations. This time-to-arrival function represents the best estimate of the behavior of a vehicle on a particular route at a specific time of day. As such, changes in the environment such as snow or traffic incidents can be factored into the arrival prediction algorithm by substituting a modified arrival function that reflects the adverse conditions. This new arrival function is created by first identifying a "normal" arrival function using a set of recorded data. Then data from abnormal conditions are used to characterize the transformation necessary to reflect the new conditions.

The normal arrival function was created by: 1) estimating a set of discrete arrival function values for a route, and 2) approximating this set using a continuous polynomial. This function is used to make estimates of the prediction errors in the normal case that will be characterized statistically so that a threshold for deviation from normal can be identified. The new arrival function is created by optimally weighting the original arrival function to replicate the

travel times under the adverse conditions. Creating the transformation and identifying the threshold for deviation from normal are the principal contributions of the research effort. With these two tools, the previously developed optimal filter techniques can be used directly to estimate arrival times under adverse conditions.

Detailed description of the algorithmic approach and its application to this problem is provided in a separate technical report (Cathey and Dailey, 2002).

Statistical Approach

The PSU portion of the project focuses on statistical analysis of two types of systematic delays: drawbridge interruptions of traffic and bus lift operations to accommodate disabled persons. These kinds of delays are expected, but the times at which they occur cannot be anticipated. Thus, they cannot be scheduled. The statistical approach generates estimates of delay that can be added to a "time-of-arrival" estimate using a "schedule deviation approach" for estimating downstream arrival times.

At the beginning of a systematic delay event, an estimate of the time of delay should be incorporated into the time-of-arrival estimate. This statistical approach is intended to provide such an estimate of delay, which is used until the event is over and at which time the actual delay can be used in estimating time-of-arrival at a downstream location. For these selected types of events, "delay-event reports" would have to be generated and sent to the bus dispatch center at the beginning of the event to invoke the estimate of delay and at the conclusion of the event to replace the estimate with actual amount of delay. Similarly, an "algorithmic approach" would utilize the beginning and ending delay-event reports into estimating a revised time of arrival function.

PSU obtained data on the time and duration of bridge closures for the Hawthorne Bridge and Tri-Met bus stop-level data between two locations on either side of the bridge. These data are for trips on routes that use the Hawthorne Bridge for a time period that includes one-half hour before and after each closure. For purposes of simplicity, we refer to these two locations as time points though they are not the same as "official" time point locations used in Tri-Met scheduling. Statistical analysis of these data yielded delay factors to add to time estimates used under normal conditions.

Also, PSU developed a statistical model of dwell time to serve passengers at bus stops. This model includes passenger boardings (ons) and alightings (offs), whether a bus lift operation occurs, type of bus (low floor or not), schedule deviation, and whether a bus is fully loaded. The lift operation parameter can be used to predict the additional dwell time associated with a lift operation, which can be added to the schedule deviation or can be included into the time-to-arrival function for the algorithmic approach.

SUCCESS STORIES

Prior TransNow-funded research by Portland State University (PSU) and the University of Washington (UW) in cooperation with Tri-Met, the transit provider for the Portland metro area, has utilized a rich set of archived data from the Automatic Vehicle Location (AVL)-based Bus Dispatch System (BDS). Tri-Met is one of the few transit agencies that archive AVL data for analysis and research.

Prior research on predicting transit bus arrival times for customers has focused on normal operating conditions. Yet, customers are most interested in knowing transit vehicle arrival time when the conditions are not normal. Consequently, this research focuses on making predictions under adverse conditions.

PROJECT IDENTIFYING NUMBER 922910-2

PROJECT TITLE

Rural Public Transportation: Using Geographic Information Systems to Guide Service Planning

PRINCIPAL INVESTIGATOR

Thomas Sanchez

INSTITUTION

Portland State University

SUMMARY

The purpose of this project is to create a GIS methodology to help transportation, social service, and governmental organizations design effective public transportation service in rural areas. Few examples or resources currently exist on this topic. Most guidance on designing service approaches are focused on densely populated urban areas. New methods are emerging as GIS technology is being used to better understand rural transportation planning issues. The partners in this project have recognized common interests in targeting transportation services for agency consumers and communities at large. Biennially, the Oregon Department of Human Services (DHS) spends approximately 38 million dollars on transportation for their clients. Working with communities to develop better public transportation services can improve the quality of life, not just for persons receiving public assistance, but for the community as a whole. The Department of Transportation (ODOT) works with local providers to fund rural, small city, and elderly-disabled transportation systems. Through collaboration with DHS, there is an opportunity to coordinate resources in communities statewide and enhance the service and stability of some of the more than two hundred providers. This project provides another opportunity by placing MPO's in the role of facilitating joint planning for transit services between programs funded through USDOT Federal Transit Administration and the US Department of Health and Human Services as outlined in the Transportation Efficiency Act of the 21st Century (TEA-21).

CONTACT INFORMATION

Professor Thomas Sanchez
Transportation Studies Center
Portland State University
PO Box 751
Portland, OR 97207

(503) 725-8743
sanchezt@pdx.edu

SUCCESS STORIES

The results of this research will be of particular interest to transportation service and social service planners in rural areas throughout the US. The project will represent a step beyond current GIS applications that rely on mapping and visual/subjective analysis. The research will enhance the information from welfare-to-work pilot projects, providing successful transportation service models and key performance measures. Participating agencies will assist by sharing information, testing models and disseminating research findings to local and regional agencies. State agency participants will utilize the information to recommend policy and program improvements. The data analysis, framework and findings will be published in hard copy, CD-ROM, and Internet accessible formats. Data products and training materials will be made available in a standard format.

PROJECT IDENTIFYING NUMBER 217281

PROJECT TITLE

Categorization of Expectations and Requirements for Seasonal Variations in Transit Needs for a Tourist Destination

PRINCIPAL INVESTIGATOR

Stephen Mattingly

INSTITUTION

University of Alaska Fairbanks

SUMMARY

This project offers numerous opportunities for tech transfer because UAF is receiving the full support of the Anchorage People Mover (APM). The survey and sampling strategy as well as the proposed models to be developed contain merit. The researchers expect to present the survey, sampling strategy and initial results at the Transportation Research Board Annual Meeting in January 2003, the final survey results and developed models at the Transportation Research Board Annual Meeting in January 2004. In addition to presenting the results, the researchers expect to publish their findings in Transportation Research Record - Journal of the Transportation Research Board or another similar journal. Upon completion of the project, the research team expects to present their findings to APM at a small workshop where the techniques used and results discovered can be covered in detail. This research affords the opportunity to advance the state-of-the-art by investigating the impacts of high levels of tourism on transit ridership; therefore, the dissemination of these results represents an important goal. The involvement of the APM provides a user for the findings from this research endeavor.

CONTACT INFORMATION

Professor Stephen Mattingly
Department of Civil and Environmental Engineering
University of AK Fairbanks
PO Box 755900
Fairbanks, AK 99775-5900

(907) 474-7977
ffspm@aurora.uaf.edu

SUCCESS STORIES

The Anchorage People Mover (APM), the transit agency for the City of Anchorage, is excited about working with the University of Alaska-Fairbanks (UAF) on this project. In fact, they have begun to identify further research needs. APM expects to combine this research effort with other efforts to increase their understanding of the demographics of their riders. The models developed as part of this research should assist the APM in forecasting changes in the temporal and spatial demand for transit trips. The relationship that UAF is developing with APM links the university with the community and creates the opportunities for future collaborative activities. This project serves to introduce an undergraduate student to the transportation field. Reduced data sets from this project will be utilized in future transportation-related classes to demonstrate a real-world example of model development.

PROJECT IDENTIFYING NUMBER 217297–TASK 1

PROJECT TITLE

Answering Aggregation Questions in Contingency Valuation of Rural Transit Benefits

PRINCIPAL INVESTIGATOR

Ken Casavant

INSTITUTION

Washington State University

SUMMARY

Quantifying benefits for publicly provided services and goods is an essential but difficult task for determining optimum provision levels. Often the arguments over provision of these public goods stem from measurement problems; we truly do not know the overall community benefits of providing free public transit, or the future impact of the loss of a particular species. In a recent TransNow study by Ken Casavant and Kate Painter of Washington State University a contingent valuation survey method was used to measure user and non-user benefits for publicly provided regional transit services in rural areas. Then, researchers answered the question of which specific aggregation techniques should be used.

Nearly all forms of travel, including public transit, receive government support in the form of financial subsidies, land allocation, and agency resources. The rationale for such support, from personal or institutional perspectives, relates to benefits that can be broadly classified as mobility and efficiency benefits. The very nature of rural areas means that passenger needs are usually met by privately owned and operated personal vehicles but publicly provided services are increasingly available.

Estimation in a quantitative, rather than qualitative manner, of these transit benefits is difficult, requiring estimation and summing those benefits ascribed to users, non-users, and those who want the option for them and others to use it, if and when needed.

The total benefits of two regional transit systems in rural areas in Washington State had been quantified in a previous study by the researchers. Alternative estimates of the total benefits for the two regions under study were presented,

CONTACT INFORMATION

Ken Casavant
Professor, Agricultural Economics
Washington State University
HLBT-103H
Pullman, WA 99164-6210

(509) 335-1608
casavantk@wsu.edu

based on different methods of aggregating the results. The new study narrowed down the range of benefits as aggregation occurs.

Slightly more than half (56%) of survey respondents indicated that their initial "willingness to pay or accept" responses were their estimates for their entire household. Forty-four percent of the contacted panel indicated their responses had been based on the value of the transit system, in the various scenarios, to them as individuals, allowing a point estimate.

The size and composition of the households allowed an alternative-weighting scheme. Since the benefits to a household of six family members may be significantly different than a one-person household, the data were evaluated using the household membership information. The average family size was 2.59 people but there was a significant difference between those stating they responded as a household and those responding as individuals. Incorporating these findings, and weighting the initial response distribution by the household information, produced a family weighted distribution of 63% of respondent family members being in the "response reflects household" versus 37% responding "as individuals". This provided an alternative method for developing point estimates of the aggregated value of transit benefits.

SUCCESS STORIES

Use of these extended datasets and methodology narrowed the estimate of broad community benefits to $3,670,000 to $3,813,000. A third valuation question asked respondents to value their current public transit system (V-CURRENT SYSTEM), in addition to any fares currently being paid. The original aggregated benefit range of the current system of $2,535,000 to $4,578,000 decreased to $3,679,000 to $3,822,000 in the new analysis. Finally, the range for value of compensation to give up their access to public transit, originally a range of $16,395,000 to $29,609,000, now narrowed substantially to $23,795,000 to $24,720,000.

In summary, this analysis was able to provide preliminary point estimates of value of rural transit benefits. What the study found was that concerns about how to aggregate individual responses, whether by household or population, can be answered with the appropriate survey approach and design.

PROJECT IDENTIFYING NUMBER 217297–TASK 1

PROJECT TITLE

Impact of Snake River Drawdown on Energy Consumption And Environmental Emissions from Intermodal Transportation of Grain

PRINCIPAL INVESTIGATOR

Ken Casavant

INSTITUTION

Washington State University

SUMMARY

The latest discussion on salmon recovery efforts in the Columbia-Snake River centers around breaching Lower Granite, Little Goose, Lower Monumental and Ice Harbor dams on the lower Snake River in eastern Washington. If the slack water pools behind the dams were drawn down, the draft in the Snake River would be too low for barge traffic, making barge transportation unavailable on the Snake River and to the region.

Disruptions in barge service due to breaching are likely to have economic and environmental effects since the grain which is currently transported by barge must then rely on rail or longer hauls by truck, both of which have different tariff rates, energy consumptions and emissions profile. An earlier study, by Lee and Casavant, used national energy efficiency coefficients for both rail and barge to investigate potential environmental effects of losing the barge mode.

Several organizations in the Pacific Northwest have argued that the use of national coefficients does not accurately depict the regional energy efficiency of barges. Researchers Trent Ball and Ken Casavant in a recent TransNow study responded by using regionally specific coefficients to determine the impact on energy consumption and emissions production of a drawdown of the Snake River.

A close at hand source, Columbia River provided useful estimates of energy efficiency coefficients for the Columbia-Snake River system, barge firm self-reports (economic engineering estimates in response to a telephone survey). The regional coefficients were applied to wheat and barley movements using the same model as the Lee and Casavant study, a GIS/GAMS model. The model analysis was run for the base case, where barge transportation was available, and then the case where barge was not available on the Snake River due to a breaching of the dams. The ton-modes

CONTACT INFORMATION

Ken Casavant
Professor, Agricultural Economics
Washington State University
HLBT-103H
Pullman, WA 99164-6210

(509) 335-1608
casavantk@wsu.edu

by mode, for each case, were converted into energy consumption and emissions production data by the proportionate application of the energy coefficients.

The researchers found that modal energy consumption decreases if regional coefficients, rather than national aggregate figures are used, as had been suggested by organizational spokesmen. Both rail and barge modes have significantly better energy efficiency (25% and 11%, respectively) under the estimates for the Pacific Northwest. However, the relative energy competitive position between the modes also shifts. Using current national coefficients, rail had an 11% advantage over barge; regional coefficients increased this advantage for rail over barge to 24%.

Comparing the results of the analysis, using regional versus national coefficients, found that a Snake River drawdown would decrease energy consumption. The amount of the decrease increases from 0.61% to 2.16% (4.0 billion BTUs to 12.1 billion BTUs) when using regionally specific coefficients. Emissions production incurs a dramatic turnaround, going from an increase of 1.29% to a decrease of 2.08% (a positive 32,000 lbs to a decrease of 45,000 lbs). Thus, use of regional coefficients showed that, looking narrowly at energy and emissions environmental concerns, a drawdown of the Snake River to improve the salmon's environment does not have a negative impact on human environment. However, this finding assumes the existing rail infrastructure can handle the increased tonnage, which the two researchers say, is their next area of inquiry.

SUCCESS STORIES

Salmon have been an important component of the Columbia and Snake River ecosystems since well before human activities in the region contributed to the demise of their habitat. The breaching of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams on the lower Snake River in eastern Washington would make the draft in the river too low for barge traffic; hence water transportation would be lost to the region. Opponents to dam breaching cite the energy efficient barge mode and the lower truck miles (and lower pollutions costs) as one important reason for maintaining the dams

This study seeks to provide that information, by using GIS/DAMS programming model results on future traffic flows and then adding energy coefficients to build an energy intensity model. Since pollutants are determined on the amount of energy consumed, the amount of pollutant, increase or decrease, will be an accompanying outcome.

The debate now focuses on the correct energy coefficient to be using. In the pilot study for this issue, national figures were used and implications were drawn. Now, energy coefficients specific to the northwest, the Columbia-Snake River, and railroads in the producing region are used.

The variation in energy coefficients is startling. Responses from the appropriate barge company produce estimated coefficients that are barely half of that estimated by existing Corps and proprietary costing models. Correspondingly, estimates of energy consumed by ton mile by railroad in this region vary by almost 60% from earlier, existing studies. Even truck estimates, derived from interviews with actual truckers in the movement of the product, vary up to 30% from estimates at the national level.

The preliminary findings are that salmon, energy and the environment may not be in conflict with each other after all. A breaching does cause slight increases in energy consumption and has a mixed effect on emission output. Projected future rail energy intensity coefficients show that rail continues to become more fuel efficient, therefore, the products transferred from barge to rail will create relatively fewer energy impacts over time. The same preliminary results indicate that there is more conflict in terms of emissions, resulting in a negative impact on the environment if river drawdown were to occur.

PROJECT IDENTIFYING NUMBER 62-2513

PROJECT TITLE **Beyond Congestion Points: Freight Infrastructure System Investment Evaluation**

PRINCIPAL INVESTIGATOR Nancy Nihan

INSTITUTION University of Washington

SUMMARY

UW Ph.D. student researchers Karl Westby and Kevin Chang worked with Professor Nancy Nihan to evaluate and make recommendations about the Freight Infrastructure System in the Pacific Northwest

The limitations of the existing infrastructure present a difficult challenge for those involved with the movement of freight and goods. Faced with congestion and greater demand for services in an increasingly competitive market, development of a more efficient distribution network is desired. Infrastructure improvements to our roads, rails, and ports are invaluable, but there will never be sufficient financial resources to make all the improvements needed to ensure fast, reliable, and low-cost movement of freight. Therefore, a reliable project improvement selection approach that ensures efficient usage of the available infrastructure is required. Reducing system waste in the form of delay, high inventory, duplication, and lack of consistency will yield more capacity regardless of the shape and size of the infrastructure.

For this Freight Mobility System Improvement study, members of the freight community were brought together across several modal boundaries to analyze the existing freight distribution network and determine the specific needs of the target customer. Regional transportation leaders involved with this process comprised a highly cross-functional team, with representatives from trucking companies, labor groups, manufacturers, freight forwarders, shipping lines, terminal operators, ports, counties, cities, pipeline operators, and staff from the Washington State Department of Transportation. Based on customer needs and the expertise of panel members, supply chains regarding the operations at terminal facilities and in-state delivery were evaluated. Specific bottleneck causes were identified, and development

of near-term and long-term non-infrastructure improvements was subsequently recommended. As a final step, future research opportunities were identified for areas where further study was needed.

One component of this project, TSHIPS system project (Transportation Shipping Harmonization and Integration Planning System) that was completed in 2001, developed the methodology for analysis and evaluation of freight transportation improvement projects. Specifically it created tools for planners and engineers to use in developing and testing potential physical or operational improvements. The tools included methodologies for calculation of travel-time savings, choke-point identification, and benefit/cost comparison of alternate strategies.

SUCCESS STORIES

In addition to freight applications, the methodology has been successfully applied to local area transportation projects to assess potential improvements associated with all modes (bus, HOV, truck, and passenger vehicle) of a large-scale transportation project.

Researcher Karl Westby presented the TSHIPS project at the Pacific Northwest Freight conference held in Seattle in September 2001. The TSHIPS report has been published by TransNow (TNW2001-03).

Researcher Kevin Chang attended the TRB 2001 Summer Meeting on Freight: Facilities, Logistics and Planning in Vail, CO, July 19-21, 2001. This meeting was sponsored by the TRB Committees on Economics, Data, Finance, Freight Transportation, and Planning.

CONTACT INFORMATION

Professor Nancy Nihan
University of Washington
Department of Civil and Environmental Engineering
Box 352700
Seattle, WA 98195-2700

(206) 543-8255
nihan@u.washington.edu

PROJECT IDENTIFYING NUMBER 62-2514

PROJECT TITLE	**The Use of Un-Calibrated CCTV Cameras as Quantitative Speed Sensors**
PRINCIPAL INVESTIGATOR	Dan Dailey
INSTITUTION	University of Washington

SUMMARY

This project proposed to expand on a previous project that created a new algorithm to estimate speed using a sequence of video images from an un-calibrated camera. This algorithm uses frame differencing to isolate moving edges and track vehicles between frames. The algorithm uses a known vehicle length distribution with image information to estimate speed. The previous development phase of this project demonstrated a proof of principle for the algorithm. The current project investigates the automation of the algorithm to create a new speed sensor from the existing CCTV cameras deployed by and WSDOT for video surveillance. The development process is using WSDOT cameras in the Seattle metropolitan region.

The next project phase will be funded by WSDOT and has the objectives stated below: “The UW has developed and published algorithms that can estimate speed using un-calibrated cameras. Examples of these algorithms appear in Transportation Research Record as well as in the computer vision related IEEE Transactions on Intelligent Transportation Systems, and a variety of proceedings. However, such algorithms are in the prototype stage and need to be automated if they are to be useful as a tool for traffic management operations. This proposal is to investigate taking the prototype algorithms and automating them. In actual deployment, the algorithm must detect camera motion that requires the camera to be re-calibrated. The previous work focused on speed measurements but did not address the operational need to automatically identify when the scene has changed and the camera needs re-calibration. The existing algorithm was developed in the lab interactively in Matlab and Mathematica. The goal of this project is to produce a “black box” computer into which NTSC roadway video is fed and that outputs a stream of speed estimates analogous in character to those available from inductance loops.

SUCCESS STORIES

The effectiveness of this research is demonstrated using two measures, first the publication and dissemination of knowledge and second, the potential for implementation in the operations of the transportation agencies. The first results of this project were published at TRB 2000 as a paper titled, "An Algorithm to Estimate Vehicle Speed Using Un-Calibrated Cameras," by D. J. Dailey and L. Li. These results were then reviewed and the revised version was published as "An Algorithm to Estimate Traffic Speed Using Uncalibrated Cameras," D. J. Dailey and L. Li, in Transportation Research Record 1719, 2000. An extension of these methods appears as "An Algorithm to Estimate Mean Traffic Speed Using Un-Calibrated Cameras," by D. J. Dailey, F. Cathey, and S. Punrin, in the IEEE Transactions on Intelligent Transportation Systems, Vol. 1, No. 2, June 2000.

The potential of this research is further demonstrated by the fact that the local operating agency, WSDOT, after reviewing the status will be funding the next phase.

CONTACT INFORMATION

Professor Dan Dailey
University of Washington
Department of Electrical Engineering
Box 352500
Seattle, WA 98195-2700

(206) 543-2493
dan@ee.washington.edu

PROJECT IDENTIFYING NUMBER 62-2515

PROJECT TITLE **The Use of Transit Vehicles for Speed and TTM in Support of Performance Monitoring**

PRINCIPAL INVESTIGATOR Dan Dailey

INSTITUTION University of Washington

SUMMARY

A previously funded joint TransNow/WSDOT project began the development of technology and software to use Metro's AVL-equipped fleet as a set of probe vehicles both on freeways and arterials. That project created the ability to capture AVL data on the fly and to measure individual transit vehicle travel-times. While travel-time is one measure for performance monitoring, the goal of this project is to extend the use of the AVL data stream to estimate both speed and travel-time. In past work, several techniques and technologies have been used to estimate travel-time, each of which have various strengths and limitations. For this reason, "data fusing," the principled integration of multiple data sources, is seen as a desirable way to estimate travel conditions. The fusing of data from both WSDOT and Metro will allow the development of the techniques necessary to truly use transit vehicles as probes.

This project expands the methodology for using transit coaches as probe vehicles to estimate freeway corridor speed and travel-time in support of performance monitoring, describes a system to provide real travel-time and speed measures using this methodology, and demonstrates these capabilities by providing the travel-time speed information to researchers and planners when it is available.

SUCCESS STORIES

Under the rubric of Advanced Public Transportation Systems (APTS), a number of projects have been implemented to improve distribution of pertinent information (departure time, vehicle delay, vehicle position) about mass transit systems directly to the rider. MyBus.Org has implemented a web-based system that makes predictions for 1200

operating vehicles at each of the 1500 time points identified in the Metro King County's schedule database. The AVL-equipped vehicles operate on 240 bus services routes within King County's 2000-square mile service area. MyBus.Org started operation on February 15, 2001 and after 225 days of operation 3,002,253 bus status pages were viewed. The greatest usage occurs during the Monday through Friday period, indicating that MyBus.org is being used to assist in commuting behavior. Further, peaks in the usage occurred during the morning and evening commute, with the evening peak being larger. This indicates that MyBus's most frequent use is by riders at work who plan the evening commute. Visit http://mybus.org

Findings have been presented in the following journals and seminars:

"Irregularly Sampled Transit Vehicles Used as a Probe Vehicle Traffic Sensor," C. Elango and D. J. Dailey, *Transportation Research Record 1719,* pp. 33-44, 2000.

"Transit Vehicles as Traffic Probe Sensors," F. W. Cathey, D. J. Dailey, *Proceedings of the Transportation Research Board 81st Annual Meeting,* January 2002.

"Transit Vehicles as Traffic Probe Sensors," F. W. Cathey, D. J. Dailey, *Proceedings of the IEEE Intelligent Transportation Systems Conference 2001,* Oakland, CA, August 2001.

"Irregularly Sampled Transit Vehicles Used as a Probe Vehicle Traffic Sensor," C. Elango and D. J. Dailey, *Proceedings of the Transportation Research Board 79th Annual Meeting,* January 2000.

"Irregularly Sampled Probe Vehicles as a Traffic Sensor," D. J. Dailey and C. Elango, *Proceedings of the 1999 fall Informs Meeting,* Philadelphia, PA, November, 1999.

The success of this research is further demonstrated by the fact that the local operating agency, WSDOT, after reviewing the status will provide matching funding with TransNow for the next project phase.

CONTACT INFORMATION

Professor Dan Dailey
University of Washington
Department of Electrical Engineering
Box 352500
Seattle, WA 98195-2700

(206) 543-2493
dan@ee.washington.edu

PROJECT IDENTIFYING NUMBER 62-2517

PROJECT TITLE **Prioritizing Pedestrian Infrastructure Improvements**

PRINCIPAL INVESTIGATOR Anne Vernez Moudon

INSTITUTION University of Washington

SUMMARY

Researchers have completed an analysis of two approaches proposed to target pedestrian infrastructure, and as part of a methodology to assist providers in identifying suburban locations with potential increases in pedestrian travel. One approach, the Manual Approach, involves census-based analysis of socio-demographic data and visual reading of aerial photographs. The second approach, the Automated Approach, involves parcel-level GIS database analysis. Researchers are preparing a Powerpoint presentation of these approaches to use in workshops with local planners and engineers, and are also in the process of selecting the demonstration sites that will serve to test the approaches over the course of the second year of the project.

SUCCESS STORIES

Both WSDOT and the Puget Sound Regional Council have expressed interest in applying the automated approach as part of a FHWA grant to support the Transit Stations Communities Project. This means that the method developed in the project will be applied to monitoring the performance of Sound Transit's new station areas in meeting conditions that support pedestrian travel. Publications include:

Hess, P. M., Moudon, A. V., Snyder, M. C., Stanilov, K. (1999). "Site design and pedestrian travel." *Transportation Research Record, 1674,* 9-19.

Hess, P. M. (2001). *Pedestrians, networks, and neighborhoods: A study of walking and mixed-use, medium-density development patterns in the Puget Sound region.* PhD Dissertation. University of Washington.

Hess, P. M., Moudon, A. V., and Logsdon, M. G. (in press). Measuring land use patterns for transportation research. *Transportation Research Record.*

McOmber, J. Martin. (1999) "New strategy for growth: City life in suburbia." *Seattle Times* (January 31) A: 1, 10-11.

Moudon, Anne Vernez. (2001). Targeting pedestrian infrastructure improvements: A methodology to assist providers in identifying suburban locations with potential increases in pedestrian travel. Transportation Northwest (TransNow) and Washington State Transportation Center (TRAC). WA_RD 519.1. Also available at http://depts.washington.edu/transnow/Research/Reports/TNW 2001-05.pdf

Moudon, Anne Vernez, Paul M. Hess, Mary Catherine Snyder, and Kiril Stanilov. (1997). "Effects of site design on pedestrian travel in mixed-use, medium-density environments." *Transportation Research Record* 1578:48-55.

Moudon, A. V., and Hess, P. M. (2000). Suburban clusters: The nucleation of multifamily housing in suburban areas of the central Puget Sound. *Journal of American Planning Association.* 66(3), 243-264.

Moudon, Anne Vernez, Paul M. Hess, Julie M. Matlick, Nicholas Pergakes (In progress). Pedestrian location Identification tools: Identifying suburban areas with potentially high latent demand for pedestrian travel. *Transportation Research Record.*

Puget Sound Regional Council. *Concentrated urban development in the central Puget Sound region. Metropolitan Transportation Plan 2000-2001* Update. April 13, 2000.

Puget Sound Regional Council. *Destination 2030.* Draft, March 15, 2001.

CONTACT INFORMATION

Professor Anne Vernez Moudon
University of Washington
Department of Urban Design and Planning
Box 355740
Seattle, WA 98195-5740

(206) 685-4057
moudon@u.washington.edu

PROJECT IDENTIFYING NUMBER 922910–TASK2, 1999-2000

PROJECT TITLE	**Use of Bus Dispatching and TM Systems Data in Transit Service Planning**
PRINCIPAL INVESTIGATOR	James Strathman
INSTITUTION	Portland State University

SUMMARY

The final report for this project, TNW2001-04, is available through the TransNow Website http://depts.washington.edu/transnow/

SUCCESS STORIES

"Bus Transit Operations Control: Review and an Experiment Involving Tri-Met's Automated Bus Dispatching System," J. Strathman, Journal of Public Transportation, publication pending.

Papers presented at TRB 2001:

"Bus Transit Operations Control: Review and an Experiment Involving Tri-Met's Automated Bus Dispatching System," J. Strathman and T. Kimpel

Time Point-Level Analysis of Passenger Demand and Transit Service Reliability, T. Kimpel

The Effects of Roadway Capacity on Peak Narrowing—Evidence from the 1995 NPTS

CONTACT INFORMATION

Professor James Strathman
Center for Urban Studies
Portland State University
PO Box 751
Portland, OR 97207-0751

(503) 725-4069
strathmanj@pdx.edu

TransNow Welcomes New Principal Investigators

George Turkiyyah, UW, is an Associate Professor in the department of Civil and Environmental Engineering. He received his Bachelor's degree from the American University of Beirut, and Master's and PhD degrees from Carnegie Mellon University in 1986 and 1990 respectively. His research interests are in finite element modeling, computational simulation and design, and computer-aided engineering. He has developed a number of software systems that have been widely distributed including Everfe, a finite element system for the simulation of jointed rigid pavements, Caesar, a system for the inspection and evaluation of bridge scour, and more recently Hotmix, an online multimedia database for lifecycle information of asphalt pavements.

Beth Kolko, UW, joined the UW faculty in the Fall of 2000 as Associate Professor in the Department of Technical Communication, College of Engineering. Professor Kolko received a BA in 1989 from Oberlin College, and a Master of Arts (1991) and PhD (1994) from the University of Texas at Austin. She was a faculty member at the University of Wyoming and the University of Texas at Arlington before joining the Technical Communications Department at UW. Professor Kolko's research interests include computer-mediated communication and educational/business/social/gaming virtual environments; cross-cultural patterns of information and communication technology [ICT], adoption and adaptation (specialist on Central Asia); issues of diversity such as race, gender, and disability with respect to ICT use. She has authored numerous articles on virtual communities and social and educational uses of new information and communication technologies. In addition, she is co-editor of *Race in Cyberspace* (Routledge, 2000), co-author of *Writing in an Electronic World* (Addison Wesley Longman, 2001), and editor of the forthcoming *Virtual Publics: Policy and Community in an Electronic Age* (Columbia UP, 2002). In the fall of 2000 she spent 5 months in Uzbekistan as a Fulbright Scholar, conducting research on cross-cultural patterns of technology adoption and adaptation, and a new component of her research program includes ICT as a development tool, specifically in Central Asia. Her current research funded by TransNow is titled, "Content Management and Electronic Dissemination Strategies for Multiple Types of Traveler Information."

Robert Bertini, PSU, The Department of Civil Engineering at Portland State University is pleased to announce that Dr. Robert L. Bertini, P.E. has joined the faculty as an Assistant Professor of Transportation Engineering. Dr. Bertini is also affiliated with the Transportation Research Group housed within the College of Urban and Public Affairs. He received a BS in Civil Engineering from California Polytechnic State University, San Luis Obispo (1988), an MS in Civil Engineering from San Jose State University (1991) and a PhD in Civil Engineering (transportation) from the University of California at Berkeley in 1999, where his research focused on the empirical analysis of freeway bottlenecks. A registered professional engineer in Oregon and California, Bertini brings many years of public and private sector experience to bear, encompassing planning, design and construction of highway, transit and public works projects. He also spent a year with Daimler Chrysler Research and Technology, where he helped develop new vehicle-based telematics systems for future generation vehicles. At PSU, he has begun working with the Oregon Department of Transportation to evaluate several programs in the area of Intelligent Transportation Systems, while continuing some of his empirical investigations of highway traffic. His main interest is in the use of "real" data to improve the operation of transportation systems. He has also begun working with the city of Vancouver, Washington, to design and implement a pedestrian safety research program. On the personal side, as this is the first time he has lived outside of the San Francisco Bay Area, Rob is enjoying the remarkably friendly people in Portland, the wonderful scenery, slightly more relaxed pace, and the affordable housing prices! His TransNow research in 2001-2002 will be entitled, "Using Archived Data to Measure Operational Benefits of ITS Investments." Dr. Bertini is an accomplished French horn player as well.

TransNow Research Feature: Ongoing Transportation Service And Infrastructure Assurance

A proposed collaborative project between two UTC programs was featured at the recent Northwest Freight Conference in Seattle, WA. PI's are Nancy Nihan, (University of Washington, TransNow) and Catherine Lawson (University at Albany, NY).

Background. The concept of "harvesting" real-time data flows for analysis can be traced to the early 1970s, and has been used in Seattle area freeway research since 1981. Currently archived ITS data is used for a wide variety of planning and policy making tasks, including biennial reports on freeway performance and congestion.

Current Research. The events of September 11, 2001 and subsequent threats to national security from hazardous materials being transported on the nation's highway system require a secure real-time tracking and monitoring system. Such a system needs to be inexpensive, for the trucking industry, easily adapted to existing equipment, and accessed from one secure site only (Homeland Security Operations). The system also needs to be capable of supplying data for "day-later" analysis needed for identifying and prioritizing roadway safety and performance improvements. The urgent need for increased security with minimal impacts on productivity requires the rapid development of a prioritized action agenda and a "proof-of-concept" demonstration—identifying components that are readily available, for the least cost with the greatest impact. Recent advances in ITS applications under development in existing research programs and projects offer a unique opportunity to contribute to this effort.

Key developments described below illustrate how a feasible program can be implemented to meet the needs of both Homeland Security and various transportation agencies. The Washington State Department of Transportation (WSDOT), in partnership with the UW, has been successful in developing performance monitoring of Interstate facilities and in the development of a data handling structure that: 1) allows tracking of secure containers from their arrival at the Ports of Tacoma and Seattle to the Canadian border, and 2) allows use of that same data for roadway performance analysis. The information resides on individual websites and is exchanged with the appropriate parties, including customs, state safety officials and individual trucking firms.

The UW is a leader in the post-processing of ITS information, combining various types of data (data fusion) for operations and planning. UAlbany has a working relationship with various Geographic Information Systems (GIS) software providers who are key partners for implementing hazardous material tracking and roadway performance monitoring at a nationwide level. UAlbany recently received a grant from the University Transportation Research Center (UTRC) to perform a fusion of archived ITS data and local GIS map systems. The process being developed allows computation of route-specific information necessary for the development of performance measures. These combined University-based research projects demonstrate the ability to design, construct, and implement a system

that allows secure tracking and monitoring of hazardous materials, while that same system also provides otherwise unavailable facility performance data that can be used for planning, safety, and system improvements.

Data Fusion and Processing Data fusion, as defined by the U.S. Department of Defense (DOD), is a multilevel, multifaceted process dealing with the automatic detection, association, correlation, estimation, and combination of data and information from single and multiple sources. Data fusion technology was first developed for the DOD to support the identification and tracking of objects in a military environment and to assess the tactical situation and enemy threat under circumstances that lead to hostilities. Though this technology is still in its infancy, applications to commercial endeavors and non-military government projects have been increasing rapidly since the 1980s.

The TransNow ITS group applies data fusion techniques for real-time traveler information estimation, traffic forecasting, incident detection, and vehicle surveillance. Data fusion is also an essential technique for identifying abnormal movements of hazardous materials in truck tracking research. Quick and accurate identification of such abnormalities depends on effective real-time analysis of important information obtained from multiple data sources.

Geographic Information Systems (GIS) Data Interface Techniques. The University at Albany is completing a study using archived ITS data (generated transit Automatic Passenger Counters (APC)) fused to GIS coverage to examine transportation activities. This technology can be transferred to the analysis of truck movement, using latitude/longitude data generated from various ITS technologies. Potential truck data include TransCore's "trackable" transponder data; additional Weigh in Motion (WIM) data; with potential for GPS units (i.e., Safeway Trucks in Washington State).

Proposed Research Project. The proposed research is based on the application of Web-based archived data services using mandatory transponders on all hazardous transport loads/vehicles. Each commercial vehicle carrying hazardous material would be outfitted with a GPS equipped device with wireless communications. Vehicle location would be reported at several different levels of detail and at different time frames. Each vehicle would report its position periodically.

This "mixed mode" of operations allows complete tracking of hazardous cargo movements, both in real-time, and over long periods of time. It maximizes system flexibility and utility, while minimizing operational costs (the largest of which is wireless airtime). The project team would work with Homeland Security Operations, USDOT, and the participating trucking firms to develop web based services that meet the needs of all participants.

CONTACT INFORMATION

Professor Catherine Lawson
Department of Geography and Planning
The University at Albany
Albany, NY 12222

(518) 442-4775
Portland, OR 97207-0751

TransNow Research Feature: Injury Severity Analysis

Gudmundur Freyr Ulfarsson, UW, graduated with a PhD in Civil and Environmental Engineering in 2001. His dissertation is entitled: Injury Severity Analysis for Car, Pickup, Sport Utility Vehicle, and Minivan Drivers: Male and Female Differences.

The objective of the dissertation is to explore gender differences and driver injuries in vehicle accidents, exploring the effects of various factors, such as, the environment, vehicle, and road design. Econometric methods are used to estimate predictive models of injury severity that can then be analyzed for significant factors and their marginal effects. Data was obtained from the WSDOT Master Accident Record System.

The results show that some main factors increase the probability of more severe injuries for both genders, independent of whether they drove a car, pickup, sport utility vehicle or minivan. Some of those factors are: driver youth, driving while intoxicated, driver didn't use restraints, vehicle rollover, or driver fell asleep. Other important factors show differences between the probabilities of injury severities for drivers of cars and sport utility vehicles, for example, drivers of sport utility vehicles or minivans that are in an accident on a wet road are more likely to suffer greater severity than drivers of passenger cars under the same circumstances. When accounting for different vehicle types, important differences between the genders are found. For example, women who drive sport utility vehicles or minivans and are in an accident caused by defective tires or wheels are more likely to receive more serious injury then male drivers under the same circumstances. Men who were the drivers of passenger cars that had an accident with a sport utility vehicle or a minivan had a higher probability of receiving more serious injuries than women under the same circumstances. The causes of these differences are manifold. It is not improbable that in an accident, men and women behave differently. It can also be expected that various design features of vehicles, roads, roadside safety objects and other safety features affect people differently depending on their physiology, size, and weight.

Dr. Ulfarsson has a B.S. degree in Physics from the University of Iceland, a B.S. degree in Computer Science from the University of Iceland, and an M.S. degree from the Dept. of Civil Engineering at the University of Washington. Dr. Ulfarsson currently serves as a Research Associate in the Department of Civil and Environmental Engineering at the University of Washington.

The TransNow Advanced Institute was established in 1991 as part of the UTC program grant. UW transportation engineering students take courses in the senior or graduate transportation curriculum offered by the Civil and Environmental Engineering Department (CEE). The Advanced Institute provides student, faculty, and course support for the UW transportation curriculum. The Advanced Institute also provides student support for students at other consortium universities.

Fellowship and Internship Students 2000-2001

Each year TransNow provides fellowships and tuition stipends to worthy students in its transportation education program. Additional TransNow students not listed here, receive support from research and teaching assistantships provided by TransNow and by local match sources. TransNow-funded graduate students who received a Master's or Ph.D. degree from the UW during 2000-2001 majored in one of the three emphasis areas of Operations and Planning for:

1) **Traffic**
2) **Transit**
3) **Rail, Port, Terminal, and Intermodal.**

OREGON STATE UNIVERSITY

Michelle Alexander (prev. Meloy; BS & MS) worked as an intern for JRH Engineering in Eugene, Oregon. She is interested in transportation and structures. Michelle was chosen as UTC's 2001 Outstanding Student for Region 10.

Amy East (BS) was the recipient of the OSU Provost's Scholarship.

Garrick Hays (MS) was a graduate teaching assistant and is interested in Control Theory.

Cody Kenny (BS) is interested in environmental impacts of automobiles and their contributions to non-point source pollution that runs into streams and rivers. He has graduated and is planning to work for a while in the private sector and then return to school to pursue a graduate degree.

James Kirby (BS) worked as an intern with Marion County and graduated in 2001.

Renee Minor (BS) is interested in general civil engineering issues, structures and surveying. She has graduated and is now working for SS&W, Inc., Engineers.

Sio Ng (BS) is interested in commercial vehicle operations. Sio is currently working on the project, "Determination of Motor Carrier Attitudes Toward Electronic Screening."

Troy Plum (BS) is researching the use of GPS in transportation. He has graduated and plans to join Pac-West and later go to graduate school.

Susan Yake (BS) graduated with her BS in 2001. She is now working as a Transportation Analyst at Kittelson and Associates, where she was an intern.

PORTLAND STATE UNIVERSITY

Brian Azevedo (MURP) graduated with a J.D. from the University of Oregon in 1998. He is interested in vehicle safety inspection programs.

Paul Bender (MURP) is working with Dr. Ken Dueker on creating and maintaining a statewide coverage of a digital roadmap database for the Oregon Road Base Information Team (ORBIT). After graduation, Paul plans to pursue a Ph.D.

April Bertleson (MURP) is interested in bicycle and pedestrian planning. She received a BA from Lewis and Clark College in 1996, and received her master's this year.

Stacy Burnett (MURP) is an RA with Prof. Thomas Sanchez.

Tom Kimpel (PhD) was Region Ten's UTC Outstanding Student in 2000. He graduated in June of 2001 and is currently working as a Research Associate at the Center for Urban Studies at OSU.

Catherine Richards (MURP) is an RA with Prof. Thomas Sanchez.

Greg Thiesen (MURP) received his BA from the University of Oregon in 1986. He is currently working on a freight weight enforcement study.

UNIVERSITY OF ALASKA-FAIRBANKS

Vincent Autier (BS) is from France and was an RA with Prof. Steve Mattingly.

Alison Spees (BS) is an RA with Prof. Steve Mattingly.

UNIVERSITY OF WASHINGTON

Pamela Arora (MSCE) was awarded a Valle Scholarship in 2000. She earned her degree in the summer of 2001.

Tim Bailey (BS) served his internship at WSDOT. He has graduated, and continues his WSDOT internship as a graduate student. He is interested in transportation and construction.

Andrew Barash (MS) has graduated with a BS and as a graduate student is interested in transportation planning and design. He continues his internship at CH2M Hill.

Lindsay Baynes (BS) is working as an intern for WSDOT.

Mike Boonsripisal (BS) has graduated and is interested in developing new ways to keep up with the increasing number of motorists on major roadways. He is currently working at WSDOT.

Kevin Chang (PhD) is a Teaching Assistant for Dr. Nancy L. Nihan as he works toward his Ph.D. He received his MSCE in 1997 from the UW. Research interests include: freight logistics and institutional analysis. Kevin is also involved in the non-motorized disciplines of transportation planning.

Nicole Conrad (BS) received a Women's Transportation Seminar/ TransNow Scholarship in 2000 and earned her degree that same year. She is currently interning with Mirai Associates and is working toward her MSCE.

Michelle Dewey (BS) is currently a WSDOT intern. She hopes to work for an engineering design firm with emphasis on transportation when she graduates.

Brianna Gastfield (BS) received an ITE/TransNow Scholarship.

Jason Gibbens (BS) had been an intern for WSDOT. He graduated in December, 2000 and continues to work for WSDOT.

Janet Hall (MSCE) graduated from the program in March 2001. Her thesis involved developing a binary logit model related to identifying the physical characteristics of intersections, which are associated with a high probability of elderly pedestrian/motor vehicle incidents. She is returning from a year in Nepal and will keep TransNow informed of her next career move.

Paul Hess (PhD) was an RA with Prof. Anne Vernez Moudon He graduated in August 2001.

Jason Holdridge (MSCE) received a Valle Scholarship in 2000. He also won a cash prize in the TransNow College of Engineering Open House demonstration contest. He is currently finishing his MSCE.

Summer Howard (MURP) graduated in June 2001 and was an RA with Prof. Anne Vernez Moudon.

Megan Hoyt (MSCE) received a Valle Scholarship in 2000 and graduated with an MSCE in March 2001. She is currently working for the City of Seattle as a Pedestrian Safety Specialist.

Huang, Yee-Fan (BSCE) received an ITE/TransNow scholarship.

Robert Jaeger (MS) has his own consulting firm, Jaeger Designs. He is interested in someday consulting for NASA.

Ken Johnson (PhD) worked as Prof. Nancy Nihan's TA through Autumn 2000. He is currently working toward his PhD.

Owen Kehoe (BS) received an ITE/ TransNow scholarship and graduated in December 2000. He is currently working on his MSCE and is a TransNow intern.

Cindy Larkin (MSCE) received her BSCE from UW in June of 1997 and graduated with an MSCE after working as a WSDOT intern. She hopes to obtain a management role with WSDOT in the future.

Jacob McCann (BS) is continuing his TransNow internship with WSDOT.

Susan Merlitti (BS) received a Coral Sales/TransNow Scholarship in 2000. She received her BS in December 2000.

Kevin Mizuta (BSCE) was a TransNow intern at WSDOT. He graduated in December of 2000 and is working at WSDOT as a TSMC Engineer.

Steve Muench (PhD) worked as an RA with Prof. Joe Mahoney.

MaryLou Nebergall (MSCE) received a Coral Sales/TransNow Scholarship and earned her MSCE in December 2001.

Michael Nichols (BS) was also a WSDOT intern. He graduated in March 2001 and is now a Transportation Engineer for the ITS Design Group of WSDOT's Northwest Region.

Jennica Ottenbreit (BS) received an ITE/TransNow Scholarship.

Jon Pascal (MSCE) is an intern with Earth Tech, Inc. in Bellevue. He has graduated and his interests include ITS and traffic planning. Jon is employed by Transpo Group.

Shannon Patterson (MSCE) received her BA in Psychology from UW in 1994. She did her graduate internship at David Evans and Associates, Inc. She has graduated and is taking some time off before continuing her professional career activities.

Nicholas Pergakes (MURP) was a Research Assistant with Prof. Anne Vernez Moudon and is currently finishing his MURP.

David Rosen (BS) received an ITE/TransNow Scholarship and graduated with his BS in June of 2001. He is currently working on his MSCE.

Naomi Selove (BSCE) served an internship at WSDOT and will graduate December 2001.

Patrick Vu (MSCE) was a Coral Sales/TransNow Scholar and is currently finishing his MSCE. He also won a cash prize in TransNow's College of Engineering Open House Demonstration contest.

Constance Walker (MS) is serving an internship with the City of Seattle Strategic Planning Office. She will graduate in 2002.

Zachary Wall (PhD) was an RA with Prof. Dan Dailey.

Kurt Watanabe (MSCE) has graduated, and has been in the internship program with WSDOT. He received his BSCE from the University of Portland in May 2000. He is currently employed as a Transportation Engineer with WSDOT.

Karl Westby (PhD) is currently working as a freight mobility manager for Entranco Engineering. He is an active member of the US delegation to the APEC transportation group. He is planning to continue work in freight transportation education and research as well as applied systems analysis.

Kimberly Willoughby (MSCE) received her BS from Pacific Lutheran University in 1994. She is serving an internship with WSDOT.

Rhonda Young (PhD) was a WTS/TransNow Scholarship recipient.

Daming Zhang (MS) worked briefly on the Video Imaging project.

Xiao Ping Zhang (MSCE) received her Master's Degree in Autumn 2000. She is currently working on her PhD and is an RA with Prof. Nancy Nihan.

Pamela Zilius (MSCE) has graduated after an internship with CH2M-Hill. She is a Design Engineer for David Evans and Associates' Planning/Traffic Group.

WASHINGTON STATE UNIVERSITY

Trent Ball (MS) was an RA with Prof. Ken Casavant. He graduated in June of 2001 and is currently working as a Research Associate at WSU.

Nancy Lee (PhD) was an RA with Prof. Ken Casavant.

Student News, Scholarships and Other Awards

In addition to our Advanced Institute and Internship program, TransNow funds or partially funds scholarships awarded by the consortium universities as well as by local organizations. The portion of the scholarship funded by an outside organization is considered matching funds for the TransNow contribution.

STUDENT OF THE YEAR

Thomas Kimpel, of Portland State University (PSU), was awarded the 2000 USDOT, Region X, Outstanding Student of the Year Award on January 8, 2001. Secretary of Transportation, Rodney Slater and Deputy Secretary, Mortimer Downey, presented the award during the Transportation Research Board Annual Meeting in Washington, D.C.

Dr. Kimpel received his BS in Environmental Design from the University of Oklahoma, and his Master of Urban Planning degree from the University of Virginia. Dr. Kimpel and another graduate student from PSU recently started a business named Spatial Logic that provides custom GIS and data analysis services. His research interests include transportation, GIS, and econometric modeling. Other interests include snow boarding, fishing, and live music. Dr. Kimpel is a Research Associate for the Center for Urban Studies at PSU.

TRANSNOW STUDENT WELCOME

Transportation students at the UW were treated to a TransNow-sponsored pizza party on the first Friday of the academic year. Approximately 25 students, faculty and staff attended this annual event. The reception gave students a chance to meet each other and their professors, and to learn procedures for tuition reimbursement and other aspects of study at the Advanced Institute.

FOCUS ON OREGON STATE UNIVERSITY

Oregon State University has participated in the Advanced Institute since 1990-1991. In 2000-2001, the total of students participating in the institute was 106. Students have received fellowships of $500 to $5,000, and some have been supported for more than one year. The fellowships have been matched with internship salary, scholarships and assistantships. More than 50% of the institute fellows have been undergraduates and participating in the program has developed their interests to a level that they have pursued successful careers in transportation. One example is Darlene Maddux (1995 and 1996), a single mom raising two teenagers. The fellowship was critical to her budget as she finished her degree. She is now Bicycle and Pedestrian coordinator for Oregon DOT's Region 1 (Portland). Another example is Marty Hron, who was also supported for two years as an undergraduate and graduate student. She had driven a bus for 10 years before embarking on a degree in Civil Engineering - transportation was a natural fit. She is now working as an ITS specialist for the FHWA in Washington DC.

FOCUS ON PORTLAND STATE UNIVERSITY

Brian Azevedo is pursuing a Master's in Urban and Regional Planning. With support provided by a departmental graduate research assistantship and a TransNow Advanced Institute fellowship, he worked with Prof. James Strathman in a review of state vehicle safety inspection programs in the U.S.

Greg Theisen is pursuing a Master's in Urban and Regional Planning. With support provided by a graduate research assistantship and the TransNow Advanced Institute, he worked with Prof. James Strathman on a project sponsored by the Oregon DOT evaluating the effectiveness of truck weight enforcement practices.

Paul Bender is pursuing a PhD in Urban Studies and Planning. With support provided by a departmental graduate research assistantship and the TransNow Advanced Institute, he worked with Prof. Ken Dueker in developing a GIS framework for integrating transportation data.

April Bertelsen is pursuing a Master's in Urban and Regional Planning. With support provided by a departmental graduate research assistantship and the TransNow Advanced Institute, she worked with Prof. Martha Bianco in a study of the transportation planning process in the Portland metropolitan area.

INTERNATIONAL INSTITUTE OF TRANSPORTATION ENGINEERS (ITE)

The Washington State Chapter of ITE presented seven $800 scholarships in 2000-2001. Students receiving these scholarships were chosen on the basis of academic achievement and their contribution to their field.

The recipients of the Outstanding Juniors in Transportation were Jennica Ottenbreit, Brianne Gastfield, and Yee-fan Huang.

Four scholarships for Outstanding Seniors in Transportation were awarded to Andrew Barash, Mike Boonsripisal, Owen Kehoe, and David Rosen.

CORAL SALES COMPANY

TransNow provided $600 scholarships to each of the Coral Sales Company's current scholarship recipients. Coral Sales, based in Clackamas, OR, offered four, $1000 scholarships this year. Recipients of these awards must have lived in the Northwest for a period of at least six years, intend to pursue a career in Highway/Transportation Engineering or Highway Construction, and show outstanding leadership qualities and participation in extracurricular activities, both civil and professional.

This year's recipients were Andrew Barash, Marylou Nebergall, Patrick Vu, and Stacy Merlitti.

THE WOMEN'S TRANSPORTATION SEMINAR (WTS)

TransNow provided scholarships of $750 each to two WTS scholarship recipients. Each year, WTS offers scholarships to female student members based on academic achievement and a commitment to excellence in the transportation industry. This year the WTS award was $1,250.

Nicole Conrad and Rhonda Young were the scholarship recipients.

VALLE SCHOLARSHIP AND SCANDINAVIAN EXCHANGE PROGRAM

David Rosen was this year's recipient of the Valle Scholarship and Scandinavian Exchange Program at the UW. TransNow uses this award as matching funds for other TransNow student stipends.

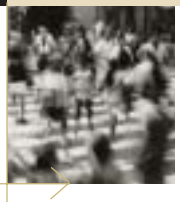
TransNow Welcomes New Faculty

GUDMUNDUR ULFARSSON, UNIVERSITY OF WA

Gudmundur Ulfarsson has a B.S. degree in Physics from the University of Iceland, a B.S. degree in Computer Science from the University of Iceland, and M.S. and Ph.D. degrees from the Dept. of Civil Engineering at the University of Washington. Dr. Ulfarsson currently serves as a Research Associate at the Department of Civil and Environmental Engineering at the University of Washington. As a member of the research faculty he can supervise TransNow graduate student research and be co-PI on TransNow research proposals. Dr. Ulfarsson's research interests are in the general areas of statistical and computational methods in transportation and urban planning—specifically, econometric analysis of urban systems, with focus on transportation safety, intelligent transportation systems, urban development and policy. Current research projects include, injury analysis, real-estate development, the effectiveness of variable message signs, Markov Chain Monte Carlo methods, and forecasting pavement quality.

YINHAI WANG, UNIVERSITY OF WA

Yinhai Wang recently joined the Civil and Environmental Engineering Department at the University of Washington as a research associate. As a member of the research faculty he can supervise TransNow graduate student research and be co-PI on TransNow research proposals. He received his Bachelor's degree, and Master's degree in Civil Engineering from Tsinghua University, Beijing, P.R. China, in 1989 and 1991, respectively. After working for Tsinghua University as assistant professor for four years, he received a Japanese Government Scholarship for Ph.D. study at the University of Tokyo. In 1998, he received his PhD in transportation engineering and came to TransNow as visiting scientist to assist Dr. Nihan with two ITS projects. He has developed several algorithms and corresponding computer applications for traffic data collection and real-time traffic information provision. Dr. Wang has several years' industry experience from different countries. His research field covers traffic safety modeling, loop data application, traffic control, video image processing, and computer vision.



Student Support Services

TRANSNOW TRANSPORTATION LIBRARY

TransNow serves students and faculty at the University of Washington Civil and Environmental Engineering Department by offering a library facility equipped with copies of frequently requested journals, research reports, theses, transportation-related agency materials, newsletters and textbooks, many of which are also available at the UW Engineering Library. Students and faculty may use TransNow library's Internet-access computer to search the TransNow website for links to scientific databases. The library is also used as a meeting room or study area.

TRANSNOW TRANSPORTATION LABORATORY

TransNow's Transportation Laboratory at More Hall on the University of Washington campus now has double the capacity of last year, going from 6 PC's to 12. The latest in computer technology is available for use by researchers, faculty, and transportation students in the Advanced Institute Program. TransNow has made a commitment to maintain the lab at an advanced technological level. Software and equipment are updated as they come on the market. Currently, the TransNow Lab offers a variety of imaging, planning, simulating, and monitoring systems. The lab is equipped with eight Pentium 3 500MHz computers running Windows 2000; each with 256MB of RAM, 17" monitors, and 15GB hard drives. The lab also has four Pentium 4 1-gigahertz computers each with 17" monitors, 256 MB of RAM and 40 GB hard drives running Windows 2000. The system is connected to the University LAN for high-speed Internet research. There are also two HP LaserJet 2100s available for high-speed laser printing. Transportation Northwest also offers 20 laptops for student checkout. Each laptop has at least a Pentium Processor and 32MB of RAM and uses Windows ME as an operating system. State-of-the art transportation and transit software packages are available, including: Traffic Reporter, Autoscope-2002, TRANSYT-7F, Synchro Plus, Highway Capacity Software (HCS), HCM/Cinema 2.0, and EMME/2.

TRANSNOW INTERNSHIP PROGRAMS

In this academic year, TransNow continued its highly effective Transportation Internship Program at the UW. Graduate and undergraduate interns were paid by their employers to work 15 to 20 hours per week, and TransNow covered their tuition. G. Scott Rutherford, CEE Department Chair at the UW, is coordinator for the TransNow Internship Program. Dr. Rutherford has been a CEE professor at the UW since 1981, and has also been Adjunct Professor of Urban Design and Planning at the UW. Graduate students participating in the program receive tuition funding from TransNow and a stipend from a community transportation agency. In order to encourage more flexible funding for Master's level students, and in an effort to assist the professional community, the UW CEE Department began a 42 credit "course-work-

only" masters degree in 1997-1998 designed for students with professional experience or those wanting to obtain experience through internships with local agencies and firms. This year UW's CEE transportation students included two students employed by public transportation agencies and five by transportation consulting firms. The UW TransNow Internship Program continues to grow as business partners provide stipends and work experience. There are currently more employers asking for interns than the number of students available. TransNow also includes undergraduate students in its internship program.

Oregon State University also used the internship model this year, with five transportation students employed by transportation agencies and three interns placed in transportation consulting firms.

INTERNET-BASED LABORATORY MATERIALS AVAILABLE

The combined research efforts of TransNow Consortium members, Oregon State University, Portland State University, and University of Idaho, has made an online transportation engineering lab manual available to TransNow's website visitors. To review the manual log on to universityhttp://www.its.uidaho.edu/niatt_labmanual/ or see the education section of the TransNow website.

TRAFFIC SIGNAL SUMMER CAMP

The University of Idaho: NIATT (National Institute for Advanced Transportation Technology) at the University of Idaho held its second annual Traffic Signal Summer Camp August 13-17,2001 on the UI campus in Moscow, ID. During this intensive weeklong experience, twelve top transportation engineering students from the U.S. and abroad worked hands-on with the latest traffic control hardware and software. Each of the camp's five days focused on a specific aspect of advanced traffic signal systems, and included a blend of lecture, lab, and hands-on exercises. Several students from the TransNow consortium attended. UW students Jon Pascal and Pam Zilius won TransNow camperships by developing technical demonstrations for the UW College of Engineering Open House in April 2001. Each of the camp's five days focused on a specific aspect of advanced traffic signal systems, and included a blend of lecture, lab, and hands-on exercises:

Day One: Introduction to Traffic Signal System Design
Day Two: Fixed Time & Actuated Signal Timing and Design
Day Three: Actuated Signal Controller Operations
Day Four: Video Traffic Detection and Loop Detectors
Day Five: Hardware-in-the-Loop Simulation

The labs and exercises were built around a case study consisting of three arterial intersections in the city of Moscow. Students visited the intersections on the first day of camp, and spent the remainder of the week working in NIATT's newly upgraded Highway Design Lab and Traffic Controller Lab. During the course of the week, they developed timing plans for the intersections, programmed late-model traffic controllers, and used the latest version of NIATT's Controller Interface Device (CID II) to test their timing plans with hardware-in-the-loop simulation. Students also used state-of-the-art video detection equipment, built and tested loop detectors, and worked with the latest versions of software such as MicroStation, SYNCHRO, CORSIM and TRANSYT.

Instructors for the week were Darcy Bullock of Purdue University, faculty from the University of Idaho that included Michael Kyte, Zaher Khatib, Ahmed Abdul-Rahim, and Michael Dixon, Joe Marek of Clackamas County, Oregon, John Ringert of Kittelson & Associates, Inc., Portland, Oregon, Dale Moore, Idaho Transportation Department, and Mike Boydstun of Ada County, ID Highway District.

"NIATT's Traffic Signal Summer Camp is the only place in the country where students can learn to use the same hardware and software that professional traffic engineers use in the field," said Michael Kyte, Director of NIATT and instructor for the Video Traffic Detection session. "Engineers with practical experience using these advanced ITS technologies are in great demand by government agencies and consulting firms alike, and we wanted to offer a program that would help fill that gap," he added.

The camp is funded under the DOT's University Transportation Centers grant, and students also pay a $250.00 registration fee.

For more details on the camp, visit the web site at http://www.its.uidaho.edu/niatt_tssc/index.htm

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.

INVITATIONAL CONFERENCE IN SEOUL, KOREA

The ninth World Conference on Transport Research was held in Seoul, Korea from July 22-27, 2001. A paper by Yinhai Wang and Nancy Nihan, entitled "Quantitative Analysis On Single-Accident Risk At Signalized Intersections" was presented by Dr. Yinhai Wang, Research Associate at the UW. Dr. Wang was also the session chair for "Enroute Driver Behavior: Issues and Methods."

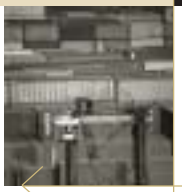
The conference focused on the following broad areas: Transport Modes; Transport Systems; Planning, Operation, Management and Control; Transport Modeling; Assessment, Appraisal and Scenarios; Spatial and Environmental Economics and Engineering; Transport in Developing Countries; Transport Policy, (De-) regulation, Subvention and/or Investment; and Information Networks on Transport Knowledge (SIG). Dr. Wang chaired a session entitled, "Enroute Driver Behavior: Issues and Methods." For more information about the conference, please visit ww.wctr2001.org.

HOSPITALITY SUITE AT THE TRANSPORTATION RESEARCH BOARD ANNUAL MEETING

In cooperation with the Civil and Environmental Engineering Department at the University of Washington, TransNow maintains an annual hospitality suite at the Transportation Research Board Annual Meeting in Washington, DC. The suite features a display about UW CEE and the TransNow Consortium. There are approximately 75 guests.

BUILDING LINKAGES PROJECT

The Ballard High School Maritime Academy (a four-year concentration on the maritime industry) was featured in a conference presentation at the Northwest Freight Conference held at the Seattle Airport Hilton October 7-9, 2001, as an example of a success story in the field of secondary-school transportation education. The lead teacher for the Maritime Academy, John Foster, successfully applied for one of only nine grants given to high schools around the country to develop a course in Transportation, Distribution and Logistics (TDL). One of the requirements of the program is that the high school curriculum be "linked" with post-secondary educational opportunities. TransNow joined with Ballard High School and the UW GTTL Program (Global Trade, Transportation and Logistics) to build the linkages required. The TDL Building Linkages Consortium Project is sponsored by the US Departments of Education, Labor and Transportation and the National School-to-Work Office. Ballard High School is located in Seattle. This new addition to the curriculum at Ballard High gave students an opportunity to receive both academic credit and occupational training for careers in the expanding transportation, distribution, and logistics industries.



Contests and Awards

PARTICIPATION IN COLLEGE OF ENGINEERING OPEN HOUSE

TransNow presented six hands-on demonstrations, run by students, for UW's annual College of Engineering Open House April 20-21. Demonstrations included these titles:

The Virtual Road
Computer Simulated Traffic Conditions
Beat Your Speeding Ticket—Measuring Vehicle Speed
SimTraffic—Build a Computer Road Network and Animate It
Your Auto and the Global Positioning Satellite
Magnetic Levitation Cars

Most of the attendees for the Open House are families with elementary or secondary students who are interested in learning more about the field of engineering. The Open House featured a treasure hunt for young would-be engineers. TransNow awarded cash prizes to four students who created new demonstrations.

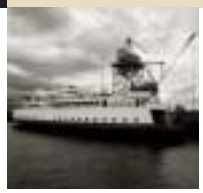
NATIONAL CONCRETE CANOE COMPETITION

In the summer 2001 competition, the UW's CEE Department's Concrete Canoe Team placed 5th at the annual ASCE/MBT National Concrete Canoe Competition held in Golden, CO. This was the third consecutive top-5 finish by the team. The national competition attracts over 250 entries from 21 regions across the US. The UW CEE canoe Explorer weighs approximately 120 lbs and is 21 feet long. The concrete hull of Explorer is reinforced with three layers of Kevlar®.

NATIONAL BUS RAPID TRANSIT (BRT) AND THE AMERICAN COMMUNITY DESIGN COMPETITION

(sponsored by the Federal Transit Administration and Weststart)

The PSU/OSU entry in the competition received an "Innovative Ideas Award" of $1000. The award was presented at an awards ceremony in Washington DC on June 18, 2001, by Hiram J. Walker, Acting Deputy Administrator of the FTA and Michael Gage, CEO of WestStart. Faculty and students from PSU and OSU included: Robert Bertini, PSU Civil Engineering, team leader, James Strathman, PSU Urban Studies and Planning, Kate Hunter-Zaworski, OSU Civil Environmental and Construction Engineering, Annette Von Jouanne, OSU Electrical Engineering, Alan Wallace, OSU Electrical Engineering.



TRAFFIC BOWL COMPETITION

University of Idaho students took first place at the Annual Traffic Bowl Competition in Portland, OR. Nov. 11. This was the second year in a row for a UI win. UI's engineering student team Craig Dierling, Chang Ream, Murali Basavaraju and Philip S. Rust joined transportation engineering students and professionals from five other universities and the Oregon section of the Institute of Transportation Engineers (ITE). The competition, sponsored by ITE, is a transportation engineer's version of "Jeopardy." ITE is a large worldwide professional organization that furthers safe and efficient surface transportation systems and supports more than 90 student chapters. Dierling is a civil engineering major from Bend, OR. Ream is from Boise, Basavaraju is from Bangalore, India, and Rust is from Ferndale, WA. All work as research assistants on NIATT transportation engineering projects while pursuing master's degrees. Nov. 2, the students also visited traffic management centers at the City of Portland and Oregon's Department of Transportation; Kittelson and Associates, a Transportation Engineering consulting firm; and Portland's Transit Dispatch Center (Tri-Met).

OREGON GREEN LIGHT PROJECT WINS 2000 ITSA AWARD

The Green Light Project was initiated in 1995 to fulfill Oregon's vision of creating an automated and intelligent truck transportation system. As the project neared completion in 2000, it had proved successful, by improving the safety and efficiency of the commercial trucking industry while at the same time increasing the performance of roadside facilities without physically expanding them, and protecting the public investment in the infrastructure. Through the Green Light weigh station modernization program, Oregon installed Mainline Pre-clearance Systems at 21 weigh stations to electronically screen trucks as they approach at highway speeds. Weigh-in-motion (WIM) systems check the vehicle's weight and height, and, automatic vehicle identification (AVI) systems check records for registration, tax status, and safety inspection status. The driver is signaled with an in cab device to either Report to the station or to Bypass. The Green Light project won an ITSA "Best of ITS" Award in 2000.

Chris Bell of Oregon State University's Transportation Research Institute was PI for the Evaluation contract for the Green Light Project. Chris and his colleague Paul Montagne worked with state and federal officials, as well as with their subcontractors from Iowa State University and researchers involved in other ITS deployments. They delivered a set of final reports earlier this year. Chris has worked on ITS projects (truck operations) since 1984 when Oregon installed its first mainline WIM system. A TransNow and ODOT funded project developed an Integrated System for Evaluation of Oregon's Truck Data. This project was completed in 1994. Further information is available at www.odot.state.or.us/trucking/its/green/whatsnew.htm

Technology Transfer is an important part of the Center's program. TransNow requires each PI to submit a 1-page implementation report at the end of their project describing their plans to disseminate the results of their research. To ensure that research results are readily available to potential users in a form that can be directly implemented, utilized or otherwise applied we also perform additional technology transfer activities. Some of these include the maintenance of an up-to date web page with current technical reports, lists of TransNow publications, TransNow newsletters and transportation course material. In addition to publication on the web we distribute our semi-annual newsletter to approximately 3000 addresses.

TRANSNOW WEBSITE

http://depts.washington.edu/transnow/
http://www.transnow.org

Visited by approximately 750 individuals (an average of 11,000 “hits”) per month during 2000-2001, TransNow’s web page was redesigned to make it easier to access and read the available information. After accessing the front page you can choose from several subcategories, a sample of which is listed below. Our website continues to be a work in progress. Additions planned for the upcoming year include a section on all students receiving TransNow funding, throughout the consortium. Visit us at http://depts.washington.edu/transnow or http://www.transnow.org.

TransNow Research

Abstracts of all research funded by TransNow dating back to 1990
Research final reports, beginning with those finished during 1999. (complete documents)
List of Final Reports Available (Beginning in 1999, the website has a link to the electronic version of the final report.)

Directory

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TransLinks includes several subcategories:

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TransNow Consortium Universities
Government Agencies, including USDOT’s University Transportation Centers Program (UTCP)
Professional Agencies and Societies
Engineering Research Databases and Libraries

TRANSPORTATION RESEARCH BOARD ANNUAL MEETING 2001

The following papers were presented at the Transportation Research Board Annual Meeting in Washington DC, January 7-11, 2001. Participants from the University of Washington included TransNow Director, Nancy Nihan, Research Faculty Member Yinhai Wang, and graduate students Kevin Chang, Paul Hess, Ken Johnson, and Zach Wall. Also attending were Thomas Kimpel from Portland State University, chosen to be the Year 2000 Outstanding Student for University Transportation Centers Region 10, and various faculty from TransNow's six consortium universities.

Presenter	Paper Number	Title
Baaj, Mohammed (UAF)	01-0155	Noise Impact Assessment of Airport Traffic Field Measurements and Mathematical Modeling
Baaj, Mohammed (UAF)	01-0160	Noise Impact Assessment of Multi-highway Traffic in Urban Areas: Model Calibration and Mitigation Measures
Bertini, Robert (PSU)	01-3258	Feasibility, Financial, and Environmental Analysis of Advanced Maglev-Based Intermodal System
Bertini, Robert (PSU)	01-3449	Market Perspectives for Micro Compact Car in Share-Use Fleet Application
Dailey, Daniel (UW)	01-3006	TOAD: An ITS Archived Date Use Services (ADUS) Data Mine
Dailey, Daniel (UW)	01-3226	TOAD: ITS Archived Date Use Services Data Mine
Dailey, Daniel (UW)	01-3036	Transit Vehicle Arrival Prediction: Algorithm and Large-Scale Implementation
Dueker, Ken (PSU)	01-2248	Primer on GIS-T Database
Dueker, Ken (PSU)	01-0438	Buys Transit Operations Control: Review and Experiment Involving Tri-Met's Automated Bus Dispatching System
Dueker, Ken (PSU)	01-2312	Clearinghouse Approach to Sharing Transportation GIS Data

Presenter	Paper Number	Title
Dueker, Ken (PSU)	01-2522	The Effects of Roadway Capacity on Peak Narrowing—Evidence from the 1995 NPTS
Dueker, Ken (PSU)	01-2083	Time Point-Level Analysis of Passenger Demand and Transit Service Reliability
Hunter-Zaworski (OSU)	01-2159	Progress in Wheelchair Securement: Ten Years Since the Americans With Disabilities Act
Khatib, Zaher (UI)	01-3280	Effect of Weather on Free-Flow Speed
Khatib, Zaher (UI)	01-2288	Control Strategy for Oversaturated Signalized Intersections
Khatib, Zaher (UI)	01-2999	Uncertainty in Projecting Level of Service of Signalized and Unsignalized Intersections
Kimpel, Thomas (PSU)	01-0438	Bus Transit Operations Control: Review and Experiment Involving Tri-Met's Automated Bus Dispatching System
Kimpel, Thomas (PSU)	01-2083	Time Point-Level Analysis of Passenger Demand and Transit Service Reliability
Kyte, Michael (UI)	01-3280	Effect of Weather on Free-Flow Speed
Kyte, Michael (UI)	01-2764	Pilot Study of the Impacts of Increasing Truck Weights in Idaho
Kyte, Michael (UI)	01-2019	Simulation-Based Study on Traffic Operational Characteristics at All-Way Stop-Controlled Intersections
Kyte, Michael (UI)	01-2999	Uncertainty in Projecting Level of Service of Signalized and Unsignalized Intersections
Larson, Nate (UW)	01-2824	Signalized Intersection Delay Estimation: Case Study Comparison of TRANSYT-7F, Synchro, and HCS
Larson, Nate (UW)	01-2430	Where Rubber Meets Rail: Light Rail Transit Simulation with CORSIM

Presenter	Paper Number	Title
Lawson, Catherine (PSU)	01-2528	"Time is of the Essence": Understanding Effects of Length of Stay on Mode Choice
Lawson, Catherine (PSU)	01-2382	"We're Really Asking For It:" Using Surveys to Engage the Freight Community
Mahoney, Joe (UW)	01-2459	Structural and Performance Characteristics of Granular Overlays in Washington State
Mattingly, Stephen (UAF)	01-3322	Application of Integrated Multiple Objective-Attribute Evaluation Methodology to New Traffic Control System
Mattingly, Stephen (UAF)	01-3354	Lessons Learned from Irvine Integrated Freeway Ramp Metering/ Arterial Adaptive Signal Control Field Operational Test
Mattingly, Stephen (UAF)	01-3017	Performance Study of SCOOT Traffic Control System with Nonideal Detectorization: Field Operational Test in the City of Anaheim
Mattingly, Stephen (UAF)	01-2536	Snowplow Survivability of W-Beam Slotted-Rail Terminal
Nihan, Nancy (UW) and Wang, Yinhai (UW)	01-2853	Dynamic Estimation of Freeway Large-Truck Volumes Based on Single-Loop Measurements
Nihan, Nancy (UW) and Johnson, Kenneth (UW)	01-0466	Three-Dimensional Modeling for Transportation Management
Nihan, Nancy (UW) and Johnson, Kenneth (UW)	01-3023	Three-Dimensional Modeling for Transportation Management and Highway Engineering Using 3D GIS
Painter, Kathleen (WSU)	01-0351	A United States Census-Based Approach to Demand Forecasting for Rural Transit
Raad, Lutfi (UAF)	01-3097	Field Aging Effects on Fatigue of Asphalt Concrete and Asphalt-Rubber Concrete
Rutherford, G. Scott (UW)	01-0270	Some Implications for Including Vanpools in Mode Choice Model Specifications
Rutherford, G. Scott (UW)	01-3511	Stated-Preference Survey Design and Analysis for Preimplementation Evaluation of Seattle Car Share Program

Presenter	Paper Number	Title
Rutherford, G. Scott (UW)	01-2588	Travel Impacts of Mixed Land Use Neighborhoods in Seattle
Strathman, James (PSU)	01-0438	Bus Transit Operations Control: Review and Experiment Involving Tri-Met's Automated Bus Dispatching System
Strathman, James (PSU)	01-2083	Time Point-Level Analysis of Passenger Demand and Transit Service Reliability
Strathman, James (PSU)	01-2522	The Effects of Roadway Capacity on Peak Narrowing—Evidence from the 1995 NPTS
Wall, Zachary (UW)	01-3034	General Automata Calibrated with Roadway Data for Traffic Prediction

Conferences

NORTHWEST FREIGHT CONFERENCE: MOVING OUR ECONOMY

Ten key agencies combined efforts to bring together professionals and students from all over the Pacific Northwest to solve problems related to the efficient movement of freight. This was a three-day conference October 7-9, 2001 with 149 people in attendance. TransNow, FHWA, Freight Mobility Strategic Investment Board, WSODT, Port of Seattle, Port of Tacoma, Port of Everett, Puget Sound Regional Council, Whatcom Council of Governments, and Cascadia Project/ Discovery Institute all participated in this pioneering event. Speakers included: Gov. Gary Locke, WA, and Sen. John Andreason, ID. Industry representatives from Weyerhaeuser, Boeing, and Lamb-Weston were also included. The conference also featured an education focus, and the following faculty and students from the University of Washington and other universities joined Nancy Nihan, Director of TransNow: Catherine Lawson (University at Albany), Steve Queen (UW GTTL—Global Trade, Transportation and Logistics—UW) and University of Washington participants Yinhai Wang, Karl Westby, Kevin Chang, Xiao Ping Zhang, Rhonda Young, Andrea Franklin, and Mary Andraws. The Seattle Airport Hilton proved to be a convenient conference location. Go to http://www.fmsib.wa.gov/documents/NWConfPPT/ breakout.ppt for slides from breakout sessions. Conference proceedings will be published by WSDOT.

ITE QUAD CONFERENCE

This year's annual ITE Quad meeting was an ITE/IMSA joint Conference held in Vancouver, B.C. from April 5 to 7, 2001. It included over 40 technical papers and a trade show. The conference began on Thursday evening with a social hour. Technical paper presentations ran from Friday morning to Saturday at noon. The Friday session on corridor management strategies included presentations on the Seattle-area I-405 corridor and BC's Highway 99 North, with a presentation on cross-border transportation issues completing the session. A buffet lunch gave the attendees a chance to network. After lunch, candidates for ITE national offices were introduced to the group; in short speeches they related their plans for ITE to those gathered. Rather than attend the traditional conference banquet, attendees were on their own for dinner, but gathered again to watch the Vancouver Grizzlies play professional basketball. This was a great way to end a full day of conference activities, and the mild weather allowed conference-goers to walk from stadium to hotel and see Vancouver's downtown nightlife. Saturday sessions started early with a presentations on ICBC's school road

safety planning project and impacts of the new salmon endangered species listing on road projects. Both sparked lively discussions. Running concurrently with the technical presentations, the trade show offered a chance to view products and demonstrations while meeting other professionals from the region. Pam Zilius and Kevin Chang from UW attended this conference. Kevin Chang presented a paper entitled "The Pedestrian Pathway Prioritization (3P) Program."

ITS NATIONAL SUMMIT

Director Nancy L. Nihan attended the ITS (Intelligent Transportation System) National Summit to discuss the ten-year ITS program plan and research agenda. The meeting took place in Washington DC, April 17-19, 2001 and was sponsored by ITS.

TransNow Technical Reports

In addition to required USDOT distribution, all TransNow technical reports are available at cost upon request. There is a listing of all available TransNow technical reports and their costs on the TransNow homepage http://depts.washington.edu/transnow/ or http://www.transnow.org. The following list is organized by report number, with the most recent reports listed first.

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW95-10	BELL C	OSU	ITS Applications to High Speed Rail Grade Crossing Safety	85	$7.50
TNW93-03	BELL C & RANDHAWA S	OSU	Development of an Integrated System for Evaluation of Oregon's Truck Data: Phase 1- Database Development and Preliminary Evaluation of Data	53	$5.75
TNW94-11	BELL C & RANDHAWA S	OSU	Development of an Integrated System for Evaluation of Oregon's Truck Data: Phase 2-Evaluation of Data	108	$8.75
TNW94-06	BISCHAK D & BOYCE J	UAF	Transit and Paratransit Planning Operations in Alaskan Rural Cities	68	$7.25
TNW90-20	BOTHA J	UAF	The Effect of Ice at Intersections on Optimal Signal Timing on Urban Arterials	233	$15.50
TNW90-21	BOTHA J & JOHNSON R	UAF	The Role of Transit and Paratransit in Rural Communities in Alaska	100	$9.25
TNW2001-06	CASAVANT K	WSU	Impacts of a Snake River Drawdown on Energy and Emissions, Based on Regional Energy Coefficients	26	$5.25
TNW2001-07	CASAVANT K	WSU	Answering Aggregation Questions in Contingency Valuation of Rural Transit Benefits	25	$5.25
TNW94-01	CASAVANT K	WSU	Methodology for Estimating Impact of Transportation Infrastructure on Business Location in Rural Northwest Communities: A Case Study of the Pullman Transit System	77	$5.00
TNW98-08	CASAVANT K	WSU	Demand Forecasting for Rural Transit	45	$5.75
TNW99-04	CASAVANT K	WSU	Condition of Rural Roads and Bridges and Status of Intermodal Operations in Washington State	72	$7.00
TNW99-08	CASAVANT K	WSU	Measuring Benefits for Rural Transportation Investments	74	$7.25
TNW91-01	CASAVANT K & JONES J & MCMULLEN S	WSU/UI/OSU	An Investigation of the Technological and Economic Factors Affecting the Future of Intermodal Transportation in the Pacific Northwest	53	7.00
TNW96-04	DAILEY D	UW	Automatic Transit Location System	53	$6.25
TNW97-08	DAILEY D	UW	Seattle Smart Traveler	31	$4.75
TNW99-01	DAILEY D	UW	Video Image Processing to Create a Speed Sensor	52	$6.00
TNW99-02	DAILEY D	UW	Irregularly Sampled Transit Vehicles Used as a Probed Vehicle Traffic Sensor	22	$5.50
TNW96-01	DAILEY D & HASELKORN M	UW	ITS Backbone Design and Demonstration	48	$7.50
TNW91-02	DAILEY D & HASELKORN M & NIHAN N	UW	Travel Time Estimation Using Cross Correlation Techniques	40	$6.50
TNW93-12	DAILEY D & HASELKORN M & NIHAN N	UW	Improved Estimates of Travel Time from Real-Time Inductance Loop Sensors	50	$6.50

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW90-18	DUEKER K	PSU	Geographic Information System Applications for TriMet: Needs Analysis and Preliminary Implementation Plan	34	$5.75
TNW98-02	DUEKER K	PSU	Transit Time Internet Access	48	$6.50
TNW90-01	DUEKER K & NELSON C	PSU	Motivations of Extended, Exurban Commuters Within a Region	77	$7.75
TNW93-06.1, TNW93-06.2	DUEKER K & RUFOLO A & STRATHMAN J	PSU	Congestion Management: Travel Behavior and the Use of Impact Fees, Volume 1, Effects of Household Structure and Selected Characteristics of Trip Chaining Volume 2, Traffic Impact Fees: Issues Regarding Calculation and Efficiency	90	$8.75
TNW91-03	DUEKER K & STRATHMAN J & VRANA R	PSU	Geographic Information System Applications in Transit Organizations: Phase 2	53	$7.00
TNW90-10	DUEKER, LYCAN R	PSU	An Analysis of Bus Ridership Potential to Oregon Health Sciences University Using a Geographic Information Systems Approach	29	$5.50
TNW90-02	EDNER S & ADLER C	PSU	Challenges Confronting Metropolitan Portland's Transportation Decision-Making Regime	52	$6.50
TNW90-03.1, TNW90-03.2, TNW90-03.3	EDNER S & DUEKER K	PSU	Assessing Oregon's Continuing Transit Financing System, Volume 1, 1988 Oregon Public Transportation Study Volume 2, Augmented Analysis of Oregon's Special Need Transportation Providers Volume 3, Constructing the Public Transportation Study Process: Reflections of the 1988 Research Team	135	$15.75
TNW90-04	GEIDL V	UI	Improved Design and Analysis of Pretressed Concrete Girders	33	$5.75
TNW92-12	HASELKORN M & BARFIELD W & CONQUEST L & SPYRIDAKIS J	UW	Real-Time Motorist Information for Reducing urban Freeway Congestion: Commuter Behavior, Data Conversion and Display, and Transportation Policy	40	$6.50
TNW95-09	HASELKORN M & BARFIELD W & SPYRIDAKIS J	UW	A Real-Time Freeway Traveler Information System: Expansion, Implementation, and Evaluation	90	$8.50
TNW96-04	HASELKORN M & DAILEY D	UW	Automatic Transit Location System	53	$6.25
TNW90-05	HINZE J	UW	An Evaluation of the Important Variables in Nighttime Construction	85	$8.00
TNW95-05	HODGE D	UW	Measuring Level of Service and Performance in Public Transportation	37	$6.00
TNW90-06	HULSEY J	UA	The No-Expansion Joint Bridge for Northern Regions	77	$12.25

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW95-06	HUNTER-ZAWORKSI K	OSU	Expanding Bicycle Accommodation in the Lane Transit District System	21	$4.75
TNW90-19	HUNTER-ZAWORSKI K	OSU	Securement of Nontraditional-Style Wheelchairs on Fixed-Route Transit Vehicles	118	$9.50
TNW92-03	HUNTER-ZAWORSKI K	OSU	Final Report and the Conference Summary: Second Conference on Mobility Aids and Public Transportation	81	$6.75
TNW94-02	HUNTER-ZAWORSKI K	OSU	A Feasibility Study for the Application of Advanced Public Transportation Systems Technology	9	$4.00
TNW94-09	HUNTER-ZAWORSKI K	OSU	Powell Blvd. Bus Signal Priority Pilot Project Powell Blvd. Bus Signal Priority Pilot Project	45	$5.75
TNW95-12	HUNTER-ZAWORSKI K	OSU	NE Multnomah Street Opticom Bus Signal Priority Pilot Study	43	$5.75
TNW96-02	HUNTER-ZAWORSKI K	OSU	Analysis of Computer Capabilities of Pacific Northwest Paratransit Providers	49	$6.00
TNW97-01	HUNTER-ZAWORSKI K	OSU	Bus Rapid Transit: A Smart Alternative for Medium Sized Communities	63	$7.00
TNW99-03, vol. 1	HUNTER-ZAWORSKI K	OSU	A Preliminary Assessment of the Effects of Access Management on Pedestrians, Bicycles and Transit	162	$13.00
TNW90-07	JAHREN C	UW	Railroad Research Needs in the Pacific Northwest	78	$7.75
TNW94-08.1, TNW94-08.2, TNW94-08.3, TNW94-08.4, TNW94-08.5, TNW94-08.6	JAHREN C & PALMER R	UW	Double Stack Planner, Volume 1, Double Stack Planner Users Manual Versions 2.1, 2.2 and 3.0 Including Automatic Suggestion Routines Volume 2, Prototype Demonstration Double Stack Planner Volume 3, Annotated Code Double Stack Planner Version 3.1 Volume 4, Technical Notes and Annotated Code Location Oriented Automatic Assignment Algorithm Volume 5, Database Record Layout Double Stack Planner Volume 6, Container Prediction Program Users Guide	v-1, 23 pp v-2, 7 pp v-3, 78 pp v-4, 73 pp v-5, 7 pp v-6, 15 pp	v-1 $4.75 v-2 $1.75 v-3 $7.25 v-4 $6.75 v-5 $1.75 v-6 $2.75
TNW94-07	JAHREN C & ROLLE S	UW	A Computerized Assignment Algorithm for Loading Intermodal Containers to Double-Stack Railcars	122	$9.75
TNW94-07	JAHREN C & SCHMITT T & PALMER R	UW	A Computerized Assignment Algorithm for Loading Intermodal Containers to Double-Stack Railcars	122	$9.75
TNW93-01	JONES J & CASAVANT K	UI, WSU	A Pacific Northwest Hinterland Wheat Shipment Projection Model	57	$5.75
TNW91-05	KHISTY J	WSU	Freeway Incident Management for Medium-Sized Urban Areas: Phase 2	56	$6.75

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW90-08.1, TNW90-08.2, TNW90-98.3	KYTE M	UI	Traffic Operations at All-Way Stop Controlled Intersections, Volume 1, Estimating Capacity and Delay at an All-Way Stop-Controlled Intersection Volume 2, Draft Procedures for Capacity and Level of Service Analysis Volume 3, TDIP Traffic Data Input Program	150	$15.50
TNW99-05	KYTE M	UI	Development of Joint Education Programs for TransNow Member Universities	22	$4.75
TNW99-07	KYTE M & HUNTER-ZAWORSKI K & LALL K	UI, OSU, PSU	Developing Laboratory Materials for the Introductory Transportation Engineering Course	6	$3.85
TNW93-07	LALL K & KYTE M & KHISTY J	PSU, UI, WSU	Development of an Automated Data Collection System for Two-Way and All-Way Stop-Controlled Intersections	266	$15.00
TNW94-04	LALL K & LU J	PSU, UAF	Traffic Characteristics at Two-Way Stop-controlled Intersections	65	$6.00
TNW96-03	LALL K & SIMON T	PSU	Development of Traffic Management Strategies in a Freeway Corridor	70	$7.00
TNW91-06.1, TNW91-06.2, TNW91-06.3, TNW93-06.4	LALL K (PSU) & KYTE M (UI) & KHISTY J (WSU)	UI, WSU, PSU	Traffic Operations at Two-Way, Stop-Controlled Intersections: Development of Procedures to Determine Capacity and Level of Service, Volume 1, Development of Procedures to Determine Capacity and Level of Service Volume 2, An empirical Method to Estimate Capacity and Delay on Minor Street Approach Volume 3, Evaluation and Testing of Theoretical Models for Analysis Traffic Operations at Two-Way, Stop-Controlled Intersections: Development of Procedures to Determine Capacity and Level of Service,	380	$28.00
TNW94-05	LARSON T	UW	Forecasting Carbon Monoxide Concentrations Near a Sheltered Intersection Using Video Traffic Surveillance and Neural Networks	32	$4.50
TNW97-09	LARSON T	UW	Particle Resuspension from Paved Urban Roadways	35	$5.25
TNW98-07	LAYTON R & WALLACE A	OSU	Evaluation of Integrated Communications and Control Technology for Traffic Operations	80	$7.25
TNW90-09	LOTTMAN R	UI	Practical Evaluation of Moisture Damage Cutoff Specifications for Asphalt Concrete	19	$5.00
TNW90-11.1, TNW90-11.2, TNW90-11.3, TNW90-11.4, TNW90-11.5	MANNERING F	UW	Generation and Assessment of Incident Management Strategies, Volume 1, Summary Report Volume 2, Management, Surveillance, Control and Evaluation of Freeway Incidents: A Review of Existing Literature Volume 3, analysis of Freeway Incidents in the Seattle Area Volume 4, Seattle-area Incident Impact Analysis: Microcomputer Traffic Simulation Results Volume 5, Seattle-Area Incident Impact Analysis: Assessment and Recommendations	311	$27.50

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW97-10	MCMULLEN S	OSU	The Impact of Deregulation on Technical Efficiency: The U.S. Motor Carrier Industry	55	$6.25
TNW92-04	MCMULLEN S & CASAVANT K	OSU, WSU	Methodology for Estimating Impact of Transportation Infrastructure on Business Location in Rural Northwest Communities	44	$5.00
TNW90-12	MCMULLEN S & MARTEN M	OSU/UHI*	Development of Rail Rates and Transportation Network Structure Following Deregulation: The Experience in the Pacific Northwest	40	$6.00
TNW2000-01.1-3	MELDRUM D	UW	Volume 1, Evaluation of a Fuzzy Logic Ramp Metering Algorithm: A Comparative Study Among Trhee Ramp Metering Algorithms Used in the Greater Seattle Area Volume 2, Algorithm Design, User Interface, and Optimization Procedure for a Fuzzy Logic Ramp Metering Algorithm: A Training Manual for Freeway Operations Engineers Volume 3, A Programmer's Guide to the Fuzzy Logic Ramp Metering Algorithm: Software Design, Integration, Testing, and Evaluation	1-137 2-143 3-45	1-$4.50 2-$11.00 3-$10.75
TNW95-11	MELDRUM D	UW	Simulation Testing of a Fuzzy Neural Ramp Metering Algorithm	65	$7.25
Not a TN Report TRAC 8286-16	NIHAN N	UW	Predictive Algorithm for a Real Time Ramp Control System (received copy for TN library from TRAC Nov 97)	n/a	n/a
TNW2001-03.1	NIHAN N	UW	TSHIPS: Transportation Shipping Harmonization and Integration Planning System	53	$6.00
TNW90-13	NIHAN N	UW	Freeway Database Storage and Loop Detector Data Validity	79	$7.75
TNW92-11	NIHAN N	UW	HOV Improvements on Signalized Arterials in the Seattle Area, Summary Report: A Study of the Planned NE Pacific St. HOV Facility	48	$6.50
TNW93-04	NIHAN N	UW	An Evaluation of a Recursive Microscopic Model for Forecasting Internal Transit Trips	137	$9.50
TNW93-10.1, TNW93-10.2, TNW93-10.3, TNW93-10.4	NIHAN N	UW	HOV Improvements on Signalized Arterials in the Seattle Area, Volume 1, 2 Case Studies Volume 2, State of the Art Review Volume 3, NE 85th HOV Study Volume 4, Simulation Planning and Evaluation	382	$23.50 (4 vol. price)
TNW93-11.1, TNW93-11.2, TNW93-11.3, TNW93-11.4, TNW93-11.5	NIHAN N	UW	Forecasting Freeway and Ramp Data for Improved Real-Time Control and Data Analysis, Volume 1, Summary Report Volume 2, Application of Pattern Recognition to Forecase Congested Conditions on the Freeway for Use in Ramp Metering Volume 3, Evaluation of a Predicting Algorithm for a Real-Time Ramp Control System Volume4, Short-term Forecasts of Freeway Traffic Volumes and Lane Occupancies, Phase 1 Volume 5, Short-term Forecasts of Freeway Traffic Volumes and Lane Occupancies, Phase 2	V-1, 23 pp v-2, 98 pp v-4, 103 pp v-5, 68 pp	$25.50 (5 vol. price)

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW93-14	NIHAN N	UW	The Impact of the NE Pacific Street HOV Facility	90	$8.00
TNW95-01	NIHAN N	UW	Improved Error Detection Using Prediction Techniques and Video Imaging	141	$10.25
TNW95-02	NIHAN N	UW	Freeway Congestion Prediction	86	$7.75
TNW95-03	NIHAN N	UW	Video Image Processing for Freeway Monitoring and Control: Evaluation of the Mobilizer	170	$12.00
TNW98-03	NIHAN N	UW	Estimating Link Travel Time with a Video Image Tracking System	3	$5.50
TNW99-09	NIHAN N	UW	Video Imagine Processing with the Mobilizer: An Analysis of Travel Time	110	$9.50
TNW98-05	RAAD L	UAF	Development of a Prototype Traffic Data Collection System Using Infrared Beam Sensor Array	34	$5.25
TNW98-06	RAAD L	UAF	Traction Performance of Transit and Paratransit Vehicles During Winter Season	57	$6.25
TNW92-02	RAAD L & HULSEY J	UAF	Revisiting Management Information systems for Allocation of Funds for Highway Activities/Projects/Maintenance	43	$10.75
TNW95-08	RUFOLO A	PSU	Assessment of Demand Responsive versus Fixed-Route Transit Service: Tri-Met Case Study	73	$7.25
TNW90-14	RUTHERFORD GS	UW	HOV Compliance Monitoring and the Evaluation of the HERO Hotline Program	178	$12.75
TNW2001-01	RUTHERFORD GS & BARNES JA	UW	Introduction to Urban Travel Demand Forecasting: Class Notes	442	$25.00
TNW2001-02	RUTHERFORD GS & BARNES JA	UW	Stated Preference Design and Analysis for Demand-Oriented Transportation Solutions: Phase One—Underlying Research and Proposed Methodology	75	$9.50
TNW92-10	RUTHERFORD GS & HALLENBECK M	UW	Use of Automatic Vehicle Identification Techniques for Measuring Traffic Performance: Performing Incident Detection	75	$8.25
TNW90-15	SCHNEIDER J	UW	Development of a Methodology for Subdividing Large Suburban Traffic Analysis Zones to Support Micro-Scale Traffic Impact Studies	142	$11.00
TNW91-09	SCHNEIDER J & KASPRISIN R & HODGE D	UW	Development of Methods of Analysis for Planning Transit System Components in and Around Major Activity Centers, 3 vols	462	$30.50
TNW97-06	SELIGA T	UW	The Nexrad Radar System as a Tool in Highway Traffic Management	59	$6.75
TNW90-16	SMITH T	PSU	Development of an Electronic Data Gathering System for Geotechnical Engineering (EDGGE) Unit for Highway Systems	95	$8.75
TNW2000-02	STRATHMAN J	PSU	Bus Transit Operations Control: Review and an Experiment Involving Tri-Met's Automated Bus Dispatching System	32	$4.50

Report Number	Author, Co-Author	Institution	Report Title	No. Pages	Price
TNW2000-03	STRATHMAN J	PSU	Time Point-Level Analysis of Passenger Demand and Transit Service Reliability	45	$6.00
TNW90-17	STRATHMAN J	PSU	An Evaluation of Automatic Passenger Counters: Validation, Sampling, and Statistical Inference	28	$5.50
TNW98-04	STRATHMAN J	PSU	Automated Bus Dispatching, Operations Control, and Service Reliability: Analysis of Tri-Met Baseline Service Data	29	$4.50
TNW99-06	STRATHMAN J	PSU	Automated Bus Dispatching, Operations Control, and Service Reliability: The Initial Tri-Met Experience	28	$5.00
TNW94-10	STRATHMAN J & DUEKER K	PSU	A Simultaneous Route-Level Transit Patronage Model	40	$5.50
TNW2001-04	STRATHMAN J & KIMPEL T & DUEKER K	PSU	Evaluation of Transit Operations: Data Applications of Tri-Met's Automated Bus Dispatching System	40	$6.50
TNW93-08	TUMEO M	UAF	Preliminary Development of a Stochastic Model to Analyze Risk Associated with the Transport of Hazardous Substances	26	$4.25
TNW93-09	ULBERG	UW	Vehicle Occupancy Forecasting	116	$9.25
TNW91-07	ULBERG C	UW	Evaluation of Transportation Management Plans on Residential Developments	66	$7.50
TNW93-09	ULBERG C	UW	Vehicle Occupancy Forecasting	116	$9.25
TNW95-04	ULBERG C	UW	An Evaluation of Public Opinion about Congestion Pricing and Tolls	65	$6.75
TNW2001-05	VERNEZ MOUDON A	UW	Targetin Pedestrian Infrastructure Improvements: A Methodology to Assist Providers in Identifying Suburban Locations with Potential Increases in Pedestrian Travel	91	$10.00
TNW93-02	WILLIAMS T & HASELKORN M	UW	Impact of Second Priority Signal Preemption on Kitsap Transit and Bremerton Travelers	49	$5.75

NEWSLETTER

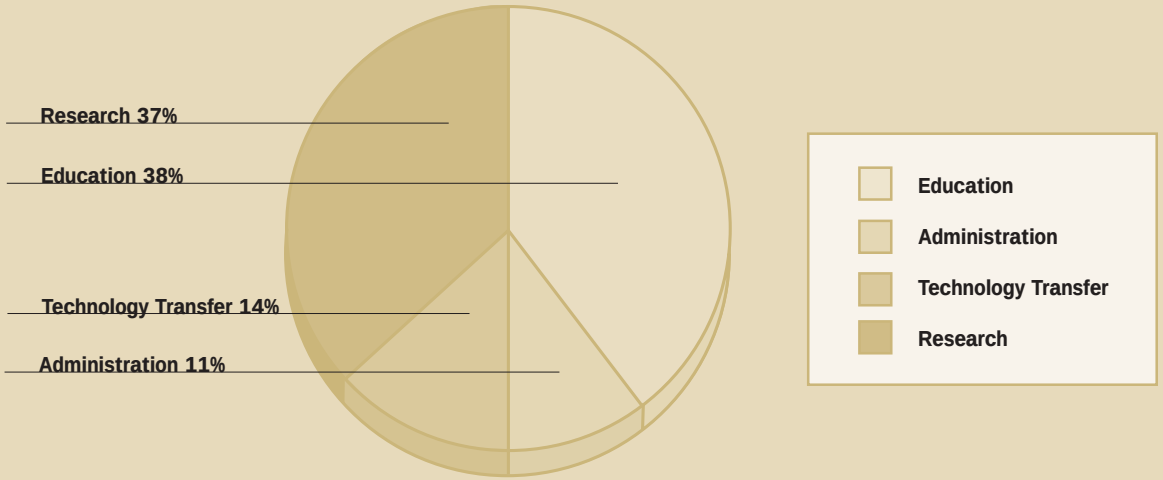
The TransNow Newsletter provides information to transportation professionals about research and outreach activities at TransNow and its consortium universities. The semi-annual newsletter has a distribution list of over 3,000 and is available on the TransNow website.

Building Links with Ballard High School
First Open House for TransNow Students
Projects in Progress: Targeting Pedestrian Infrastructure Improvements in Suburban Areas
Projects in Progress: Use of Bus Dispatching and TM Systems Data in Transit Services Planning
NW Transportation Training and Education Alliance (NWTTA)
TransNow Welcomes Two New Professors to Center Program
Fall Conference: The Pacific Northwest Freight Story
Projects in Progress: Transportation Infrastructure Design and Construction—Virtual Training Tools
Projects in Progress: Salmon, Energy and the Environment—At Odds or Helpful?
Meet the TransNow Fellowship/Internship Recipients
TransNow Welcomes New Professor to Center Program
TRB Student of the Year

UTC's 100% matching requirement has encouraged strong financial partnerships and solid financial commitments from local, state, and regional organizations throughout Federal Region 10.

EXPENDITURES

SEPTEMBER 1, 2000 TO AUGUST 31, 2001



Strong financial partnerships have evolved through the UTC matching requirement. In addition to match for research projects, all scholarships, fellowships, and internships provided by TransNow require a non-federal cash match from regional and national organizations.

Some of TransNow's current providers are:

- Anchorage People Mover
- Asia Pacific Economic Cooperation (APEC)
- CH2M Hill
- Engineering Professional Programs (UW)
- Federal Transit Authority
- JRH (Eugene, OR)
- Kent Chamber of Commerce
- Kittelson and Associates Inc.
- Marion County Public Works
- Municipality of Anchorage Public Transportation Department
- National Asphalt Pavement Alliance
- Northwest Transportation Education and Training Alliance
- Oregon Department of Human Services
- Oregon Department of Transportation (ODOT)
- Oregon State University
- Portland State University
- Puget Sound Regional Council (PSRC)
- Tri-Met
- University of Alaska Fairbanks
- University of Idaho
- University of Washington
- URS/BRW (Portland, OR)
- US Department of Human Services
- Washington State Department of Transportation
- Washington State University

Transportation Northwest
University of Washington
129 More Hall
Box 352700
Seattle, WA 98195-2700
Phone: 206-543-8255
Fax: 206-543-5965

For further information contact:
transnow@u.washington.edu
http://depts.washington.edu/transnow/