Program Progress Performance Report

for University Transportation Centers

Prepared for the USDOT Research and Innovative Technology Administration (RITA)

Project title: **Pacific Northwest Transportation Consortium (PacTrans): Using Advanced Technologies to Develop Data-driven, Sustainable Solutions for the Diverse Transportation Needs of the Pacific Northwest**

RITA Sponsor Award Number: DTRT12-G-UTC10

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January 1, 2012 – December 31, 2013

Report #2, PPPR reporting on second six months (July 1, 2012 – December 31, 2012)

1. Accomplishments

- **What are the major goals and objectives of the program?**

PacTrans focuses on using advanced technologies to develop data-driven, sustainable solutions for the diverse transportation needs of the Pacific Northwest. Major goals and objectives of PacTrans include: serving as Region 10's research engine, applied technology showcase, workforce development base, educational leader, information center, and collaboration platform.

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

During the second six months (July 1 – December 31, 2012) of the project:

- The PacTrans logo and website were completely redesigned for improved communications with transportation professionals and the general public. The new logo replaced a temporary logo the PacTrans UTC adopted in the first couple of months of operation. The website represents a significant departure from that of its predecessor. There is improved navigation and functionality, and the look and feel of it is much cleaner.

- After much consideration, the PacTrans Board of Directors decided that a part-time fiscal staff person was insufficient for the UW Center and made the decision to hire a full-time fiscal staff person, who started working in September. As a result of further discussion, a decision was made to bring on a part-time graduate assistant to start in January to help with event planning, daily office tasks, and communications with students.

- The PacTrans Board of Directors established an External Board of Directors (EAB) to provide strategic guidance. The PacTrans EAB met with the PacTrans Board of Directors for the first time in late October on the UW campus. The meeting resulted in a meaningful set of next steps for the Board of Directors to consider.

- PacTrans leadership established external project monitoring teams to review and provide regular feedback on the multi-institution projects that target critical regional transportation issues. Each monitoring team is composed of a PacTrans Board member, an expert from an external research institution, and a third from a local transportation agency or company. The monitoring team assures that the project goals and activities are in line with the strategic mission of PacTrans and that the agency or private industry sponsor's concerns are sufficiently accounted for. This fall, the project monitoring teams provided the principal investigators of each multi-institutional PacTrans project with early written feedback on the project design and scope of work. After each PI was given

an opportunity to review the feedback, conference calls were set up with each team and each PI to further exchange ideas.

- PacTrans launched its high-level seminar series last fall and has held two high-level seminars on the UW campus, attracting a variety of students and professors engaged in transportation research and transportation professionals from around the Pacific NW region. PacTrans Seminar talks were also broadcasted over the Internet in real time to benefit remote audience.

- A number of PacTrans graduate students and professors attended academic conferences in the late summer and fall 2012, presenting early research findings from PacTrans projects.

- **What opportunities for training and professional development has the program provided?**

By the second six months of the project, all projects were under way, with graduate students working in the vast majority of them. By involving graduate students in the actual research projects, all of which involve a great deal of collaboration with public transportation agencies, we are providing our students with invaluable opportunities to develop the skills they will need after they leave university.

PacTrans has actively approached to ITE Washington for collaborative training. The November 2012 PacTrans Seminar was a joint event with ITE Washington to promote PacTrans and benefit more working professionals.

- **How have the results been disseminated? If so, in what way/s?**

Preliminary research findings have found their way into numerous invited talks, conference presentations, and publications by participating professors and graduate students working on individual projects.

- **What do you plan to do during the next reporting period to accomplish the goals and objectives?**

- We will follow the implementation plan to ensure that all the PacTrans funded research, education, and outreach activities move forward as scheduled.

- PacTrans will play an active role during the 2013 TRB Annual Meeting by hosting a Region 10 UTC reception and actively supporting UTC related activities.

- PacTrans board will proactively identify critical regional transportation issues deserving research and work with public and private collaborators to develop new research problem statements for Year Two research.

- Since the Region 10 Transportation Conference (including a Region 10 Student Transportation Conference) is scheduled in the fall of 2013, a conference committee will be set to ensure a fruitful conference.

- We are currently planning several public talks as part of the PacTrans seminar series. Confirmed upcoming guests for the January 1 – June 2013 reporting period include Carnegie Mellon University and Green Design Institute Co-Director Chris Hendrickson on February 27th and Region 9 UTC (at UC Berkeley) Director Robert Cervero on April 19th. As with our fall 2012 PacTrans seminars, the talks will be open to not only the PacTrans university community, but also to the Pacific NW transportation community. For those who cannot attend in person, we will make the talk available as a webinar through WebEx.

- We will continue to grow our new website to include increasingly more information about our projects and research findings.

2. Products (for the reporting period of Jan. 1 – Dec. 31, 2012)[1]

Peer reviewed journal articles

1. Bradbury, K., J. Stevens, L.N. Boyle, and S. Rutherford. To go or not to go: Pedestrian behavior at intersections with standard pedestrian call buttons. *Transportation Research Record: Journal of the Transportation Research Board.* Transportation Research Board of the National Academies, Washington D.C., In press. (2011 Impact Factor: 0.471.)
2. Cao, J., X. Liu, Y. Wang, and Q. Li. Accessibility Impacts of China's High-speed Rail Network. *Journal of Transport Geography,* Vol. 28, 2013, pp. 12-21.
3. Cheevarunothai, P., G. Zhang, J. Zheng, Y. Wang, and S. An. Using Precise Time Offset to Improve Freeway Vehicle Delay Estimates. *Journal of Intelligent Transportation Systems: Technology, Planning, and Operations.* Vol. 16, No. 2, 2012, pp. 82-93.
4. Haraldsson, O.S., T.M. Janes, M.O. Eberhard, and J.F. Stanton. Seismic Resistance of Socket Connection between Footing and Precast Column. *Journal of Bridge Engineering*, ASCE, 2012.
5. Hou, L., Y. Lao, Y. Wang, Z. Zhang, Y. Zhang, and Z. Li. Modeling Freeway Incident Response Time: a Mechanism-based Approach. *Transportation Research Part C*, In press, Dec., 2012.

[1] Please note that although this report is for the July 1 – December 31, 2012 reporting period, all products listed in the report are from the January 1 – December 31, 2012 reporting period. We chose to include January 1 – June 30, 2012 products in this report because we were not able to collect this information from faculty during the summer for PPPR#1.

6. Khaleghi, B., E. Schultz, S. Seguirant, M.L. Marsh, O.S. Haraldsson, M.O. Eberhard, and J.F. Stanton. Accelerated Bridge Construction in Washington State -- From Research to Practice. *PCI Journal,* Preacast/Prestressed Concrete Institute. Fall, 2012, pp. 34-49.
7. Lao, Y., G. Zhang, J. Corey, and Y.Wang. Gaussian Mixture Model-based Speed Estimation and Vehicle Classification Using Single Loop Measurements. *Journal of Intelligent Transportation Systems: Technology, Planning, and Operations*, Vol. 16, No. 4, 2012, pp. 184-197.
8. Lao, Y., Y. Wu, Y. Wang, and K. McAllister. Fuzzy Logic-based Mapping Algorithm for Improving Animal-Vehicle Collision Data. *ASCE Journal of Transportation Engineering,* Vol. 138, No. 5, 2012, pp. 520–526,
9. Lehman, D.E., and C. W. Roeder. Foundation connections for circular concrete-filled tubes. *C.W.Journal of Constructional Steel Research,* Vol. 78, 2012, pp. 212-225.
10. Liu, X., G. Zhang, and Y. Wang. Modeling Traffic Flow Dynamics on Managed Lane Facility: a Cell Transmission Model based Approach. *Transportation Research Record: Journal of The Transportation Research Board,* No. 2278, Transportation Research Board of the National Academies, Washington, D.C., 2012, pp. 163-170.
11. Liu, X., Y. Wang, B. Shroeder, and N. Rouphail. Quantifying Cross-Weave Impact on Capacity Reduction for Freeway Facilities with Managed Lanes. *Transportation Research Record: Journal of The Transportation Research Board,* No. 2278, Transportation Research Board of the National Academies, Washington, D.C., 2012, pp. 171-179.
12. Liu, X.,Y. Wang, B. Schroededr, and N. Rouphail. An Analytical Framework for Managed Lane Facility Performance Evaluation. *ITE Journal*, Oct., 2012, pp. 30-36.
13. Ma, X., Y. Wang, F. Chen, and J. Liu. Transit Smart Card Data Mining for Passenger Origin Information Extraction. *Journal of Zhejiang University-Science C*, Vol. 13, No. 10, 2012, pp. 750-760.
14. Malinovskiy, Y., N. Saunier, and Y. Wang. Pedestrian Travel Analysis Using Static Bluetooth Sensors. *Transportation Research Record: Journal of The Transportation Research Board,* In press, Oct. 2011.
15. Moon, J., C. W. Roeder, D. E. Lehman, and H. Lee. Analytical modeling of bending of circular concrete-filled steel tubes. *Engineering Structures*, Sept., 2012, pp. 349-361.
16. Neyens, D. and L.N. Boyle. Crash risk factors related to individuals sustaining and drivers following traumatic brain injury. *Accident Analysis and Prevention*, Vol. 49, 2012, pp. 266-273. (ISI Impact: 1.867)
17. Peng, Y. and L.N. Boyle. Run-Off-Road Crashes of Commercial Vehicle Drivers. *Transportation Research Record: Journal of the Transportation Research Board*, No. 2281, Transportation Research Board of the National Academies, Washington D.C., 2012, pp. 128-132. (2011 ISI Impact Factor: 0.471.)
18. Peng, Y., L.N. Boyle, and S. Hallmark. Driver's lane keeping ability while distracted: insights from a naturalistic study. *Accident Analysis and Prevention*, Vol. 50, 2013, pp. 628-634. (2011 ISI Impact: 1.867.)
19. Pitera, K., L.N. Boyle, A. Goodchild. Economic Analysis of Onboard Monitoring Systems in Commercial Vehicles. *Transportation Research Record: Journal of the Transportation Research Board,* accepted, Transportation Research Board of the national Academies, Washington D.C. (2011 Impact Factor: 0.471)
20. Pitera, K., L.N. Boyle, A. Goodchild. Process Comparison of Hours of Service Recording for Commercial Vehicle Operations: Electronic versus Paper. *ASCE Journal of Transportation Engineering,* in press. (2011 Impact Factor: 0.620).
21. Shroeder, B., S. Aghdashi, N. Rouphail, X. Liu, and Y. Wang. Deterministic Approach to Modeling Managed Lanes on Extended HCM Freeway Facilities. *Transportation Research Record: Journal of The Transportation Research Board*, No. 2286, Transportation Research Board of the National Academies, Washington, D.C., 2012, pp. 122-132.

22. Thamsuwan, O., R.P. Blood, R.P. Ching, L.N. Boyle, and P.W. Johnson. Whole body vibration exposures in bus drivers: A comparison between a high-floor coach and a low-floor city bus. *International Journal of Industrial Ergonomics*, Vol. 43, 2013, pp. 9-17. (ISI Impact: 1.260)
23. Thomson, T., X. Liu, Y. Wang, B. Shroeder, and N. Rouphail. Operational Performance and Speed-Flow Relationships for Basic Managed Lane Segments. *Transportation Research Record: Journal of The Transportation Research Board*, No. 2286, Transportation Research Board of the National Academies, Washington, D.C., 2012, pp. 94-104.
24. Wang, Y., X. Ma, Y. Wang, H. Mao, and Y. Zhang. Location Optimization of Multiple Distribution Centers under Fuzzy Environment. *Journal of Zhejiang University-Science A*, Vol. 13, No. 10, 2012, pp. 782-798.
25. Westlake, B., and L.N. Boyle. Perceptions of Driver Distraction among Teenage Drivers. *Transportation Research Part F*, Vol. 15, 2012, pp. 644-653. (ISI Impact: 1.989)
26. Wu, Y., G. Zhang, and Y. Wang. Link Journey Speed Estimation for Urban Arterial Performance Measurement using Advance Loop Detector Data under Congested Conditions. ASCE Journal of Transportation Engineering. Vol. 138, No. 11, 2012, pp. 1321-1332.
27. Xiong, H., and L.N. Boyle. Driver's adaptation to adaptive cruise control: examination of automatic and manual braking. *IEEE Transactions on Intelligent Transportation Systems*, Vol. 13, No. 3, 2012, pp. 1468-1473 (2011 ISI Impact: 3.452).
28. Xiong, H., L.N. Boyle, J. Moeckli, B. Dow, and T. Brown. Use Patterns Among Early Adopters of Adaptive Cruise Control (ACC). *Human Factors*, Vol. 54, No. 5, 2012, pp. 722-733. (2011 ISI Impact: 1.187)
29. Yu, R., Y. Lao, X. Ma, and Y. Wang. Short-Term Traffic Flow Forecasting for Improved Estimates of Freeway Incident Delays. *Journal of Intelligent Transportation Systems*, In press, Jan., 2013.
30. Zhang, G., and Y. Wang. Gaussian Kernel Based Approach for Modeling Vehicle Headway Distributions. *Transportation Science*, In press, Aug., 2012.
31. Zhang, G., and Y. Wang. Optimizing Coordinated Ramp Metering – A Preemptive Hierarchical Control Approach. Computer-Aided Civil and Infrastructure Engineering, Vol. 28, No. 1, 2013, pp. 22–37.
32. Zheng, J., Y. Wu, X. Ma, and Y. Wang. Measuring Signalized Intersection Performance in Real Time with Traffic Sensors. *Journal of Intelligent Transportation Systems*, In press, Jan., 2013.

Book chapters and other edited manuscripts

1. Kun, A., L.N. Boyle, B. Reimer, and A. Reiner. Interacting with technology in vehicles: Perspectives from the Automotive UI 2012 conference. *IEEE Pervasive Computing* (Impact Factor: 1.55) –
2. Tarko, A., L.N. Boyle, A. Montella, Guest editors, Emerging Research Methods and Their Application to Road Safety. *Accident Analysis and Prevention*, Forthcoming.
3. Kun, A., L.N. Boyle, B. Reimer, A. Riener, J. Healey, and W. Zhang. Program Chairs, Proceedings of the 4th International Conference on Automotive User Interfaces and Interactive Applications in the Car. Portsmouth NH, 2012.
4. Manser, M., J. Creaser, and L.N. Boyle. Behavioral adaptation methodological and measurement issues. M. Rudin-Brown and S. Jamson (Eds.), Behavioral *Adaptation and Road safety: Theory, Evidence and Action,* 2013.
5. Richard, C.M., J.L. Campbell, M. Lichty, J.L. Brown, S. Chrysler, J.D. Lee, L.N. Boyle, and G. Reagle. *Motivations for Speeding, Volume I: Summary report*. Report No. DOT HS 811 658, National Highway Traffic Safety Administration, Washington, D.C., 2012.

Conference papers

1. Boyle, L.N., H. Xiong, and J. Lee. Drivers' ability to respond to traffic conflicts using Adaptive Cruise Control. Invited for the 5th International Conference on Traffic and Transport Psychology, Netherlands, Aug. 29-31, 2012.
2. Corey, J., Y. Lao, X. Xin, and Y. Wang. Improving Intersection Performance with Left Turn Phase Reservice Strategies. Proceedings of the 14th International IEEE Conference on Intelligent Transportation Systems, Sept., 2012.
3. Ghazizadeh, M., Y. Peng, J.D. Lee, and L.N. Boyle. Augmenting the Technology Acceptance Model with Trust: Commercial Drivers' Attitudes towards Monitoring and Feedback. Proceedings of the Human Factors Society 56th Annual Meeting, Boston, MA, Vol. 56, No. 1, 2012, pp. 2286-2290.
4. Ma, X., R. Yu, and Y. Wang. Developing Regional Map-Based Platform for Spatial and Temporal Assessment of Traffic Emission Inventory. Proceedings of the 12th COTA International Conference of Transportation Professionals (CICTP 2012), Aug., 2012.
5. Malinovskiy, Y., and Y. Wang. Pedestrian Travel Pattern Discovery Using Mobile Bluetooth Sensors (Paper 12-2351). Preprint CD-ROM, the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
6. Peng, Y., M. Ghazizadeh, L.N. Boyle, and J.D. Lee. Commercial Drivers' Initial Attitudes toward an On-Board Monitoring System. Proceedings of the Human Factors Society 56th Annual Meeting, Boston, MA, Vol. 56, No. 1, 2012, pp. 2281-2285.
7. Wu, Y., L.N. Boyle, D.M. McGehee, L. Angell, and J. Foley. Task Analysis of Vehicle Entry and Backing. Proceedings of the 4th International Conference on Automobile User Interfaces and Interactive Vehicular Applications, Portsmouth, NH, 2012, pp. 195-200.
8. Zhang, G., J. Zheng, and Y. Wang. Numerical Examinations of Traffic Accident Characteristics Using Analytical Statistical Methods. Proceedings of the 12th COTA International Conference of Transportation Professionals (CICTP 2012), Aug., 2012.

Conference presentations

1. Cao, J., X. Liu, Y. Wang, and Q. Li. Accessibility Impacts of China's High-Speed Rail Network. Presented by Jing Cao at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
2. Corey, J., Y. Lao, X. Xin, and Y. Wang. Improving Intersection Performance with Left Turn Phase Reservice Strategies. Presented by Jonathan Corey at the 14th International IEEE Conference on Intelligent Transportation Systems, Sept., 2012.
3. Corey, J., Y. Lao, and Y. Wang. Detection and Correction of Loop Detector Sensitivity Level Errors. Presented by Jonathan Corey at NATMAC 2012, Dallas, TX, June, 2012.
4. Haraldsson, O. Precast, Pretensioned Column using HyFRC in the Plastic Hinge Region. Presented by Olafur Haraldsson at the Pacific Earthquake Engineering Research Center Annual Meeting, Berkeley, California, Oct., 2012.
5. Hou, L., Y. Lao, Y. Wang, Z. Zhang, Y. Zhang, and Z. Li. Exploring Time-Varying Effects of Influential Factors on Incident Clearance Time Using a Non-Proportional Hazard-based Model. Presented by Yunteng Lao at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.

6. Hou, L., Y. Lao, Y. Wang, Z. Zhang, Y. Zhang, and Z. Li. Modeling Freeway Incident Response Time: a Mechanism-based Approach. Presented by Yunteng Lao at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
7. Lehman, D. and C. Roeder. Design Requirements for Concrete Filled Steel Tubes (CFST) Bridge Piers and Connections. Presented by Dawn Lehman and Charles Roeder at the AASHTO Steel Bridge Committee, Aug. 9, 2012.
8. Lehman, D. and C. Roeder. Rapid Construction of Bridges with Concrete Filled Tubes. Presented by Dawn Lehman and Charles Roeder at the Skyline Steel 2012 Lecture Series, Houston TX, Nov. 8, 2012.
9. Lao, Y., G. Zhang, J. Corey, and Y. Wang. Gaussian Mixture Model-based Speed Estimation and Vehicle Classification Using Single Loop Measurements. Presented by Yunteng Lao at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
10. Liu, X., G. Zhang, and Y. Wang. A Twin Cell Modeling Approach for Parallel Freeway Facilities – A Managed Lane Example. Presented by Yinhai Wang at TRB Joint Meeting of Highway Capacity and Quality of Services (AHB40) and Traffic Flow Theory Committee (AHB45), Fort Lauderdale, FL, June 19-22, 2012.
11. Liu, X., G. Zhang, and Y. Wang. Modeling Traffic Flow Dynamics on Managed Lane Facility: a Cell Transmission Model based Approach. Presented by Xiaoyue Liu at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
12. Liu, X., T. Thomson, and Y. Wang. Analysis of Managed Lanes Speed-Flow Relationships – An Empirical Research Based on Field Observations. Presented by Xiaoyue Liu at the 14th International Managed Lanes Conference, Oakland, CA, May 23-24, 2012.
13. Liu, X., Y. Wang, B. Shroeder, and N. Rouphail. Quantifying Cross-Weave Impact on Capacity Reduction for Freeway Facilities with Managed Lanes. Presented by Xiaoyue Liu at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
14. Ma, X., J. Corey, and Y. Wang. DRIVE Net: an E-Science Platform for Transportation Data Management, Visualization, and Decision Support. Presented by Jonathan Corey at Seattle Department of Transportation, Seattle, WA, July, 2012.
15. Ma, X., J. Corey, and Y. Wang. New Online Platform for Transportation Data Management, Visualization, and Decision Support. Presented by Yinhai Wang at NATMAC 2012, Dallas, TX, June, 2012.
16. Ma, X., R. Yu, and Y. Wang. Developing Regional Map-Based Platform for Spatial and Temporal Assessment of Traffic Emission Inventory. Presented by Xiaolei Ma at the 12th COTA International Conference of Transportation Professionals (CICTP 2012). Aug., 2012.
17. Malinovskiy, Y., N. Saunier, and Y. Wang. Pedestrian Travel Analysis Using Static Bluetooth Sensors. Presented by Yegor Malinovskiy at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
18. Malinovskiy, Y. and Y. Wang. Pedestrian Travel Pattern Discovery Using Mobile Bluetooth Sensors. Presented by Yinhai Wang at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
19. Malinovskiy, Y. and Y. Wang. Sensing with Ubiquitous Mobile Devices: Travel Pattern Discovery. Presented by Yegor Malinovskiy at NATMAC 2012, Dallas, TX, June, 2012.
20. Malinovskiy, Y. and Y. Wang. Technologies for Pedestrian and Bicycle Data Collections. Presented by Yegor Malinovskiy at Seattle Department of Transportation, Seattle, WA, July, 2012.
21. Shroeder, B., S. Aghdashi, N. Rouphail, X. Liu, and Y. Wang. Deterministic Approach to Modeling Managed Lanes on Extended HCM Freeway Facilities. Presented by Bastian Shroeder at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.

22. Thomson, T., X. Liu, Y. Wang, B. Shroeder, and N. Rouphail. Operational Performance and Speed-Flow Relationships for Basic Managed Lane Segments. Presented by Timothy Thomson at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
23. Xu, Y., L. Yu, G. Song, X. Liu, and Y. Wang. GA-based Approach to Operating Mode Distributions via Link Average Speeds. Presented by Yaofang Xu at the Transportation Research Board 91st Annual Meeting, Washington, D.C., Jan., 2012.
24. Zheng, J. and Y. Wang. Estimating the Impact of Near-Side Bus Stop on Transit Delays at Transit Signal Priority Enabled Intersections. Presented by Jianyang Zheng at the 12th COTA International Conference of Transportation Professionals (CICTP 2012). Aug. 2012.

Lectures/Seminars/Workshops/Invited Talks

1. Boyle, L.N. Transportation Research Board ABJ70 Fall Webinar series: Artificial or Real Intelligence? (2/5): Understanding driver behavior at yellow lights: do various statistical methods serve to clarify or confuse. Dec. 7, 2012.
2. Boyle, L.N. Driver safety and the car of the future. Nathan Hale High School, Seattle, WA, Dec. 5, 2012.
3. Boyle, L.N. Human Factors & Ergonomics Society Workshop [with John Lee, U. Wisconsin-Madison]: Introduction to R and Basic Statistical Analysis, Oct. 22, 2012.
4. Boyle, L.N. Human Factors & Ergonomics Society Workshop [with John Lee, U. Wisconsin-Madison]: Data Exploration and Visualization with R, Oct. 22, 2012.
5. Boyle, L.N. US Dept. of Transportation - RITA Transportation Innovation Series: The Car of the Future: Do Drivers Know How to Adapt to New Technology? Washington, D.C., July. 18, 2012.
6. Wang, Y. Advanced Methods for Pedestrian Detection. 2012 IEEE Intelligent Transportation Systems Conference Workshop on Pedestrian and Bicycle Detection, Sept. 16, 2012.
7. Wang, Y. Criteria for Selection and Application of Advanced Traffic Signal Systems. Northwest Transportation Conference for 2012, Corvallis, Oregon, Feb. 8, 2012.
8. Wang, Y. Cyber Urban Data Net: Toward Informed Decisions in Transportation Planning and Engineering. Seminar on Managing Urban Transportation Database hosted by China Academy of Transportation Science, Aug. 6, 2012.
9. Wang, Y. From Empirical Decisions to Informed Decisions in Transportation Planning and Engineering: What Is Missing? 2012 China – U.S. Bilateral Forum on Strategic Development in Transportation, Aug. 7, 2012.
10. Wang, Y. HOT Lane Gets Hot: Data-Driven Investigations on HOT Issues. Beijing Institute of Technology Transportation Seminar, Dec. 18, 2012.
11. Wang, Y. HOT Lane Gets Hot: Tolling for Travel Reliability and Sustainability. Keynote speech at the 12th COTA International Conference of Transportation Professionals (CICTP 2012), Aug. 4, 2012.
12. Wang, Y. STAR Lab Research on Traffic Sensing and Sensor Data Analysis. Zhejiang University Transportation Seminar, Dec. 12, 2012.
13. Wang, Y. Traffic Sensing Technologies and Sensor Data Mining. Research Institute of Tsinghua University in Shenzhen, June 29, 2012.
14. Wang, Y. Vehicle and Pedestrian Sensing for Enhanced Traffic Management Intelligence. Sun Yat-Sen University, June 27, 2012.
15. Wang, Y. Traffic Sensing and Sensor Data Mining. Peking University, Mar. 20, 2012.

16. Wang, Y. Increasing the Chance of Success: Research Needs Identification and Problem Statement Preparation. Symposium on Innovations in Traffic Flow Theory, and Highway Capacity, and Quality of Service, June 19, 2012.

***Technologies or techniques*:** none at this time

Inventions, patent applications, and/or licenses

Wang, Y. USPTO Provisional Patent Application in preparation: Travel Pattern Discovery Using Mobile Device Sensors, the UWC4C tracking number 45830.01US1, filed in 2012.

***Other products*:** none at this time

Scheduled academic talks for upcoming reporting period (Jan. 1 – June 30, 2013)

1. Alam, A., L. Haselbach, G. DeRooy, C. Poor and M. Wolcott. Green Rating Integration Platform – A Decision-Making Tool for Multi-Modal Facilities: Sustainable Water and Material Practices. Presented at the 92nd Annual Meeting of Transportation Research Board, Jan., 2013.
2. Boyle, L.N. Driver Distraction, Roosevelt High School, Seattle, WA, Jan. 9, 2012.
3. Boyle, L.N. Transportation Research Board Workshop: How do you turn this driving simulator on? Tutorial for traffic engineering & road design research using driving simulation. Jan. 13, 2013.
4. Corey, J., Y. Lao, and Y. Wang. Quantifying and Comparing Left-Turn Strategy Performance. Presented by Jonathan Corey at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
5. Grislis, A., Y. Lao, Y. Wu, and Y. Wang. Parameters Influencing Single-Vehicle Large-Truck Accidents on Rural Two-Lane Roads in Washington State. Presented by Yinhai Wang at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
6. Haque, M., A.D. Ohlhauser, S. Washington, L.N. Boyle, Examination of distracted driving and yellow light running: analysis of simulator data. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
7. Holmgren, M., K. Casavant, and J. Sage. After 35 Years, Does it Need to Change? Evaluating the Fuel Usage Factor for Structures. (Poster Presentation). Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
8. Hurwitz, D., H. Tuss, M. Olsen, G. Roe, and M. Knodler. Transportation Applications for Mobile Lidar Scanning: State-of-the-Practice Questionnaire. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
9. Lao, Y., G. Zhang, and Y. Wang. Generalized Nonlinear Models for Rear-End Crash Risk Analysis. Presented by Yunteng Lao at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
10. Li, X., H. Wen and B. Muhunthan. Modeling and Prediction of the Effects of Moisture on the Unconfined Compressive and Tensile Strength of Soils. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
11. Liu, X., G. Zhang, and Y. Wang. Twin Cell Modeling Approach for Parallel Freeway Facilities: Managed-Lane Example. Presented by Xiaoyue Liu at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.

12. Liu, X., G. Zhang, C. Kwan, Y. Wang, and B. Kemper. Simulation-Based Scenario-Driven Integrated Corridor Management Strategy Analysis. Presented by Xiaoyue Liu at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
13. Lu, X., and S. Shen. Fracture healing properties of asphalt materials under controlled damage. Presented by Xin Lu at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
14. Ma, X., Y. Wang, F. Chen, and J. Liu. Transit Smart Card Data Mining for Passenger Origin Information Extraction. Presented by Xiaolei Ma at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
15. Ma, X., Y. Wu, Y. Wang, F. Chen, and J. Liu. Mining Smart Card Data for Transit Riders' Travel Patterns. Presented by Xiaolei Ma at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
16. Malinovskiy, Y., and Y. Wang. Interpreting Opportunistic Mobile Device Encounter Data for Transportation. Presented by Yegor Malinovskiy at the 16th COTA Annual Symposium Sustainable Transportation and Development in China, Jan., 2013.
17. McCormack, E. Applications of Truck GPS Data Truck (Freight Data Users Forum). Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
18. Moore, D., and D. Hurwitz. Traffic Control Devices Fuzzy Logic for Improved Dilemma Zone Identification: A Driving Simulator Study. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
19. Pitera, K., L.N. Boyle, A. Goodchild, Economic Analysis of Onboard Monitoring Systems in Commercial Vehicles. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
20. Saeedi, A., S. Park, D.S. Kim, and J.D. Porter. Improving Bluetooth-based Travel Time Accuracy and Efficiency Using Signal Strength Data. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
21. Shen, S., H. Yu, K.A. Willoughby, J.R. DeVol, and J.S. Uhlmeyer. Local Practice of Assessing Dynamic Modulus Properties for Washington Mixtures. Presented by Shihui Shen at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
22. Simmons, S., K. Casavant, and J. Sage. A Real Time Assessment of the Columbia-Snake River Extended Lock Outage: Process and Impacts. Presented by Ken Casavant at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
23. Taylor, J., K. Casavant, D. Moore, J. Sage, and B. Ivanov. The Economic Impact of Increased Congestion for Freight Dependent Business in Washington State. Presented by Jeremy Sage at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
24. Timm, T., H. Wen, S. Sharma, and M. Rose. Evaluation of Non-nuclear Density Gauges for Measuring In-place Density of Hot Mix Asphalt. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
25. Tran, H. New Methods to Accelerate Bridge Construction in Seismic Regions. Vietnam Education Foundation 2013 Annual Conference, Tallahassee, Florida, Jan., 2013.
26. Tupper, S., M. Knodler, C. Fitzpatrick, and D. Hurwitz. Estimating Critical Gap: Comparison of Methodologies Using Robust, Real-World Data Set. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
27. Turochy, R., J. Fricker, G. Hawkins, D. Hurwitz, S. Ivey, M. Knodler, and R. Young. Assessment of Introductory Transportation Engineering Course and General Transportation Engineering Curriculum. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.

28. Wang , Z., J. Sage, A. Goodchild, E. Jessup, K. Casavant, and R. Knutson Framework for Determining Highway Truck-Freight Benefits and Economic Impacts. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
29. Wang, H., W. Quan, Y. Wang, and X. Liu. Safety Distance Modeling on the Basis of Vehicle-to-Vehicle Communication. Presented by Hua Wang at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
30. Wang, Y. NCHRP 03-96: Analysis of Managed Lanes on Freeway Facilities. Presented at the Freeway Simulation Subcommittee Meeting (AHB20(2)), Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
31. Wang, Y. Twin Cell Modeling Approach for Parallel Freeway Facilities – A Managed Lane Example. Session jointly organized by TRB AHB40 and AHB35 at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan. 15, 2013.
32. Wang, Y., X. Ma, Y. Lao, Y. Wang, and H. Mao. Location Optimization of Multiple Distribution Centers Based on Fuzzy Clustering Algorithm. Presented by Xiaolei Ma at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
33. Wang, Y., X. Ma, Y. Lao, Y. Wang, and H. Mao. Vehicle Routing Problem: Simultaneous Deliveries and Pickups with Split Loads and Time Windows. Presented by Xiaolei Ma at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
34. Wen, H. Ten Year Case Study of Performance Evaluation of Asphalt Pavement with Fly Ash Stabilized Full Depth Reclaimed Base. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
35. Wen, H. Workshop on Pavement Recycling: NCHRP 04-36 Update. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
36. Wu, Y., and L.N. Boyle. Adaptive Cruise Control: Driver Characteristics that Influence Frequency of Use. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
37. Xiao, S., R. Yu, and Y. Wang. Modeling Framework for Long Distance Pleasure Travel Supply Analysis. Presented by Sa Xiao at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
38. Yu, R., X. Liu, and Y. Wang. Coherent Approach for Modeling and Nowcasting Hourly Near-Road Black Carbon Concentrations in Seattle, Washington. Presented by X. Liu at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
39. Yu. W., S. Ko, S. Park, and D.S. Kim. Arterial Incident Detection Procedure Utilizing Real-Time Vehicle Re-Identification Travel Time Data. Presented at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
40. Zhang, G. and Y. Wang. Innovative Coordinated Ramp Metering Control Strategy for Freeway Congestion Mitigation. Presented by Guohui Zhang at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
41. Zhang, W. and S. Shen. Evaluation of Semi-Flexible Composite Mixture Using Indirect Tensile Tests. Presented by Shihui Shen at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.
42. Zhang, W., L. Cantrell, and S. Shen. Design of 4.75mm Nominal Maximum Aggregate Size Mixtures Based on Aggregate Packing. Presented by Weiguang Zhang at the Transportation Research Board 92nd Annual Meeting, Washington, D.C., Jan., 2013.

3. Participant and Collaborating Organizations: Who has been involved?

- **What individuals have worked on the program?**

PacTrans Director, Yinhai Wang, Ph.D., professor of Civil and Environmental Engineering at the University of Washington (UW), devotes 50 percent of his time directing PacTrans. Dr. Wang has overall responsibility for program management, oversight of PacTrans operations, including the Research Committee, the Education and Workforce Development Committee, and the Outreach and Technology Transfer Committee, and Student Leadership Council. He is the regional and national leadership for PacTrans, and the contact person for management relationships with USDOT Research and Innovative Administration (RITA) and other USDOT organizations.

PacTrans Associate Director in Research, Lind Ng Boyle, Ph.D., associate professor with joint appointments in Industrial and Systems Engineering, and Civil and Environmental Engineering at the UW spends 15 percent of her time managing the research program as the research committee chair for PacTrans and organizing the research collaboration across the five partner institutions.

PacTrans Associate Director in Education and Workforce Development, Anne Vernez-Moudon, Dr. es SC, Professor of Architecture, Landscape Architecture, and Urban Design and Planning, Adjunct Professor of Epidemiology and in Civil and Environmental Engineering, devotes 10 percent of her time leading the Education and Workforce Development Committee. She is involved in curriculum changes, professional training program development, and educational enhancements among the partner institutions.

PacTrans Associate Director in Outreach, Mark Hallenbeck is also the Director of the Washington State Transportation Center (TRAC) office located at the UW. Mr. Hallenbeck works closely with Associate Director Anne Vernez-Moudon on organizing student seminars, internships and fellowship programs.

PacTrans Associate Director in Oregon State University (OSU), Chris Bell, Ph.D., professor of Civil and Environmental Engineering at OSU, devotes 10 percent of his time to managing and organizing the education, outreach, and research activities within OSU. He coordinates all results and outcomes with the UW on a regular basis.

PacTrans Associate Director in the University of Alaska Fairbanks (UAF), Billy Connor, Director of the Alaska University Transportation Center (AUTC), devotes 10 percent of his time to managing and organizing the education, outreach, and research activities within UAF. He coordinates all results and outcomes with the UW on a regular basis.

PacTrans Associate Director in University of Idaho (UI), Karen Den Braven, Ph.D., professor of Mechanical Engineering at UI, devotes 10 percent of her time to managing and organizing

the education, outreach, and research activities within UI. She coordinates all results and outcomes with the UW on a regular basis.

PacTrans Associate Director in Washington State University (WSU), Dave McLean, Ph.D., professor of Civil and Environmental Engineering at WSU, devotes 10 percent of his time to managing and organizing the education, outreach, and research activities within WSU. He coordinates all results and outcomes with the UW on a regular basis.

Center staff at the UW includes full-time Assistant Director, Ms. Meghan MacKrell, who devotes 100 percent of her time to the day-to-day operations in support of the PacTrans mission. Her responsibilities include project management, grant management, social media and outreach, and managing the PacTrans operations team. Additionally, as of September 2012, PacTrans has had a second full-time Fiscal Specialist, Ms. Eva Lu, on board. In the late October 2012, the half-time program assistant, Ms. Wanjiku Gitahi, resigned to take a full-time position on the UW campus in another department. In her absence, PacTrans had a number of grad students who helped out on various projects in the fall. (PacTrans now has a half-time graduate assistant, Mr. Kristian Henrickson, who started Jan. 2013.)

The Student Leadership Council, composed of graduate students at all Consortium partner universities, is an active part of the PacTrans management structure. The Student Leadership Council facilitates student and center communications and plans their own activities. For example, one important student event already on the PacTrans schedule is the Region 10 Student Conference, set to be held on the UW campus in October 2013. Leaders of the three UTCs in this region – (PacTrans, the National Institution for Transportation and Communities (NITC), and Transportation for Livability by Integrating Vehicles and the Environment (TranLIVE) – will all assist in the sponsorship of this conference.

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

The state DOTs in Alaska, Idaho, Oregon, and Washington, have all been very much involved in the funding and implementation of the PacTrans research projects. Additionally, members from each of the four state DOTs serve on the PacTrans External Advisory Board, which provides strategic oversight to the PacTrans Board of Directors. In addition to the state DOTs, other public transportation agencies and private companies are also involved in PacTrans research, education, and technology transfer activities.

The PacTrans External Advisory Board met for the first time on the UW campus in Seattle, Washington, on October 29th 2012. In addition to state DOT members on the PacTrans EAB, membership includes a representative from Toyota Corporate, Port of Portland, the Puget Sound Regional Council (PSRC), as well as a representative from Idaho industry, Western Trailers.

During the second six month period, PacTrans has also collaborated with three other University Transportation Centers: the UNL Mid-America Transportation Center (MATC),

Transportation for Livability by Integrating Vehicles and Environment (TranLIVE), and the Oregon Transportation Research and Education Consortium (OTREC).

On November 14, 2012, PacTrans invited MATC Director Dr. Laurence R. Rilett to give the talk "Calibration of Micro-Simulation Models Using ITS Data: Lessons Learned" as part of the ongoing PacTrans Seminar Series. The talk was well-attended by UW students and faculty, as well as by members of private industry and the Seattle DOT. The ITE Washington chapter helped sponsor the talk.

PacTrans also collaborated with Portland State University's UTC (NITC) and University of Idaho's TranLIVE on the Region X Student Conference, sending a large contingent of graduate students from PacTrans consortium universities UW, WSU and OSU to Portland, Oregon to participate in the event.

- **Have other collaborators or contacts been involved?**

On October 24, 2012, PacTrans invited Professor Baibing Li from Loughborough University in the UK to deliver the talk "Discrete Analysis for Travelers: A Semi-parametric Approach" as part of the PacTrans Seminar Series. As with the talk by MATC Director Laurence R. Rilett, the talk was well attended by UW students and faculty, as well as members of the greater Pacific NW transportation community.

Also in the fall of 2012, PacTrans hosted a delegation of transportation researchers from Japan, who visited the UW and were curious about PacTrans' current transportation research.

4. Impact

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

While it is still very early to report on PacTrans' impact on the full development of the principal disciplines the program, we can state with confidence that preliminary research results are promising.

- **What is the impact on other disciplines?**

It is still too early to report on the full impact on other disciplines, but based on the strong level of interest in our research from disciplines outside Engineering and Urban Planning, we can assume that we will have some impact to report at a later date.

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

At the moment, it is too early to report anything significant. However, we strongly believe our collaborative work on the online programs and the seminars is contributing positively to transportation workforce development in the Pacific Northwest.

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

Nothing to report at this time.

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

Nothing to report at this time.

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

At this time, it is still too early to judge the impact of PacTrans research on society beyond science and technology, but we strongly believe our work is contributing to a greater understanding and appreciation of the importance of collaboration between the public and private spheres around transportation issues in not only the Pacific Northwest, but across the U.S. and abroad.

5. Changes/Problems

No changes or problems at this time to report.

6. Special Reporting Requirements

Nothing at this time to report.