



**Year 15 (2001-2002)**  
**Semi-Annual Progress Report**  
**For the**  
**University of California Transportation Center**

**February 20, 2003**

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## **Success Stories**

The University of California Transportation Center funds faculty research, underwrites graduate student fellowships and PhD dissertation grants, supports new educational initiatives, and sponsors conferences, symposia, and other technology transfer activities. We receive equal funding from the US Department of Transportation (for whom we are the designated Region IX University Transportation Center) and the California Department of Transportation. In our most recent Strategic Plan, we made a commitment to increase our outreach efforts and to make special efforts to help put research into practice. The following examples document some of our results to date in the first half of the UCTC's 2002-2003 grant year – Year 15 of the Center.

### **Conferences and Symposia**

#### **The Art of Designing Bridges and Highways**

September 20, 2002

Alumni House - University of California

Berkeley, California

Conference Organizer: Julia Trilling, UC Berkeley

This interdisciplinary symposium examined the concepts and practices that inform the design of bridges and freeways and analyzed the policy processes that shape their form. Participants examined ways to improve the aesthetic quality of these two critical types of transportation infrastructure, and to promote good design as an integral objective of transport planning and investment. The symposium brought together over 200 engineers, planners, architects and designers from government, academia, and the private sectors. An exhibit of bridge and freeway design accompanied the symposium.

### **IURD Seminar Series**

UCTC provided support for the Institute of Urban and Regional Development (IURD) Dinner Seminar Series. Each seminar brings together a small group of 20-30 faculty members, state and local elected officials, senior staff members from state and local agencies and the Legislature, and other interest group members to hear a talk about a current policy issue and to discuss the issue in depth. The seminars this fall addressed environmental concerns, development practices, and growth issues. Seminars in the Winter will discuss the implementation of new transportation technologies, among other topics.

### **Transportation Research Board Annual Meeting**

Three dozen faculty members and graduate students affiliated with UCTC presented papers at sessions of the annual meeting of the Transportation Research Board this January in Washington, DC. In addition, the UC Transportation Center jointly hosted a reception at TRB with its ITS partners from the Berkeley, Irvine, Davis, and LA campuses, the UC PATH program, the UC Center for Traffic Safety, and the National Center of Excellence for Aviation Operations Research. Over 300 faculty and students from all UC campuses, alumni of the UC transportation programs and UCTC, and friends from many other transportation

centers and research groups joined us in the Cotillion Foyer of the Marriott Wardman Park Hotel on Monday, Jan. 13, 2003.

## **Awards and Honors**

### **Student of the Year**

Pablo Durango-Cohen was elected the University of California's Student of the Year for 2002-2003. Pablo recently completed his Ph.D. in U.C. Berkeley's Dept. of Industrial Engineering and Operations Research, where he also won awards as Outstanding Student and Outstanding Student Instructor. Pablo's dissertation, which was supported by a UCTC project, combines methods from control theory, optimization, and artificial intelligence to develop methods that decision-makers can use to manage infrastructure when there is limited information about facility performance.

Pablo recently joined the Transportation faculty in the Department of Civil and Environmental Engineering at Northwestern University, where he holds the position of Louis Berger Junior Professor of Civil Engineering.

### **Research Prizes**

Berkeley Prof. Martin Wachs received the Council of University Transportation Centers (CUTC) Award for Distinguished Contribution to University Transportation Education and Research at the organization's annual awards banquet on January 11, 2002. The CUTC award has been given annually since 1998 to honor individuals who have had a long history of outstanding contributions to university transportation education and research.

Prof. Wachs also received the W.N. Carey, Jr., Award at the Transportation Research Board's Chairman's Luncheon on January 15. The award honors individuals who have provided leadership and distinguished service to the TRB. Earlier in the year he was named a National Academy of Sciences Associate in recognition of his contributions to research and practice.

Prof. John Quigley, Professor of Economics and Public Policy at UC Berkeley, received the Walter Isard Award for Contributions to Regional Economics at the Annual Meetings of the Regional Science Association International. Quigley's research on the transport problems of low wage workers was one of two bodies of work cited in the presentation of the award. UCTC sponsored Quigley's research on these problems in a series of grants over the past 15 years.

Prof. Carlos Daganzo has been named "convenor" (chair) of the international advisory committee of the International Symposium on Transportation and Traffic Theory (ISTTT), the primary gathering for the world's experts in transportation and traffic theory. The convenor may hold the position until retirement. The symposium, which is held every three years, is the oldest meeting devoted exclusively to the scientific aspects of transportation and traffic phenomena, and the proceedings define the international state of the art of research in transportation and traffic science. Topics range from traffic flow theory and travel demand modeling to road safety and logistics and supply chain modeling. Daganzo's committee will

suggest future directions for the symposiums as well as decide where the meetings will take place.

## **Research into Practice**

**Advising Congress on CMAQ.** Prof. Martin Wachs of UC Berkeley chaired the National Academy of Sciences Committee charged with investigating the Congestion Management Air Quality (CMAQ) Program's performance. Profs. Robert Sawyer of UC Berkeley and Ken Small of UC Irvine also served on the committee. The committee's report, *The CMAQ Program: Assessing Ten Years of Experience*, is published by the National Academy of Sciences Press as Special Report 264.

**Advising Congress on Transportation Environmental Research.** Prof. Elizabeth Deakin of UC Berkeley chaired the 17-member Board charged with the development of a surface transportation environmental research agenda. UC Davis Prof. Daniel Sperling was also a member of the Board. The Board's report is published by the National Academy of Sciences Press as Special Report 268, *Surface Transportation Environmental Research: A Long Term Strategy*.

**Advising the House on New Vehicle Partnerships.** Prof Dan Sperling of UC Davis testified to the House Science Committee on the Bush Administration's proposal to replace the Partnership for a New Generation of Vehicles with a new public-private R&D program called FreedomCAR. His testimony was based on a UCTC grant about public-private research partnerships.

**Research Exchange on Trucking Issues.** Professor Amelia Regan presented her UCTC research as an invited speaker at the Entretiens J. Cartier, an international conference of primarily French, French Canadian and Belgian researchers in Montreal in October, 2000. The work addressed the issue of the impacts of congestion on various sectors of the trucking industry.

**Assisting Sacramento Regional Modeling Improvements.** Professor Bob Johnston has been implementing the MEPLAN integrated land use and transportation model in the Sacramento, California region for several years, partly supported with UC Transportation Center funds. SACOG, the region's MPO, has recently decided to use this model for alternatives analysis in a program investigating land use and transportation scenarios. SACOG will now join Johnston in funding the continuing work to further improve the model and apply it. SACOG is also using a GIS-based model designed by Johnston to disaggregate the zonal land use projections from MEPLAN. This model development was supported by UCTC a few years ago. Together, the economic model and the GIS model permit the simulation of a great variety of policies and the resultant travel and land use patterns. Related GIS and other models allow the agency to project the impacts of the policy sets on habitats, service costs, costs from flooding and wildfires, erosion, and mobile emissions.

**Implementing Advanced Survey Methods.** REACT!, a computer-aided self-administered interview to survey travel and activity behavior, is being used for the evaluation of travel behavior impacts resulting from participation in ZEVNET, a shared-use station car program in Irvine CA. ZEVNET, a unique public/private partnership, is utilizing electric vehicles

provided by Toyota to local corporations for use in daily business travel as well as to access rail service at the Irvine Transportation Center. A GPS-based vehicle monitoring system provides tracings of vehicle use as part of the REACT! survey. REACT! Was developed by a team led by Professor Michael McNally and Ming S. Lee of UC Irvine with support from a 1998-2000 UCTC faculty grant.

**Explaining Vision to Improve Safety.** Prof. Theodore Cohen's UCTC escalator project dealt with how we judge our distance to objects. Insights gained from that and from other studies have led to proposed new warning signals for transit vehicles (to prevent rear-end collisions) that will be field tested in Ann Arbor during the coming year. Further down the road are (1) rear-end collision warning devices for passenger vehicles to be tested at VTTI with NHTSA funding, based upon principles that Cohen developed in follow-on studies, (2) improved railroad crossing signals, and (3) embedded pavement warning signals for rail crossings. Each of these research thrusts based upon a mixture of engineering and the biology of vision, but all require serious and competent understanding of policy issues to achieve deployment.

**Developing Wearable Computers for Data Collection.** Professor Reginald Golledge presented material from his research on wearable computers as activity data collection devices as part of a presentation on "Smart Environments" at the NSF/NIH/NASA sponsored workshop on Converging Technologies - Nanotechnology, Biotechnology, Information Technology and Cognitive Technology. The workshop was held in Washington, D.C. on December 3-4, 2001.

**Advising on Transit-Oriented Development.** Professor Robert Cervero has given a number of speeches to public officials and public organizations over the past year, drawing upon his two most recent UCTC projects one on induced demand, and the other on ridership impacts of transit-oriented developments - TODs. His overseas lectures include talks at Simon Fraser University, Vancouver, British Columbia; the South Asia Urban Management Course, Jaipur, India; the Indian Institute of Technology, Kanpur, India; the Annual Congress, Beurs van Berlage, Amsterdam, The Netherlands; and the Universidade Federal do Cear, Fortaleza, Brazil. He also has spoken recently at the Pat Brown Institute, California State University, Los Angeles, the School of Architecture, University of Maryland, College Park, Maryland, and the UCLA Public Policy Program California Futures Conference.

**Identifying Designs to Reduce Bus Stop Crime.** Professor Anastasia Loukaitou Sideris' UCTC project on the environmental attributes of bus stop crime led has the Los Angeles County Metropolitan Transportation Authority (MTA) to allocate over \$500,000 for the environmental retrofit a dangerous bus stops in downtown Los Angeles, and another \$500,000 for similar retrofit of dangerous bus stops in other municipalities of the L.A. County.

## Publications

UCTC helps put research into practice by making our publications available free of charge. Publications include final reports – brief statements of the work performed on each completed UCTC project. However, most UCTC projects produce many other products, including technical reports, working papers, journal article reprints, monographs, and even books and films. Our publications are listed on our web page, where we have about 1800 visitors per month. All final reports and an increasing number of other UCTC publications can be directly downloaded from the web; others are mailed to anyone who requests a copy.

Publications added to the UCTC list Aug.1, 2002 - Jan. 31, 2003 are shown in Table 1.

**Table 1 UCTC Publications - Fall 2002-Winter 2003**

Madanat, Samer M., Jorge A. Prozzi, and Michael Han	<u>Effect of Performance Model Accuracy on Optimal Pavement Design</u>	2002, Fall	561
Prozzi, Jorge A., and Samer M. Madanat	<u>A Non-linear Model for Predicting Pavement Serviceability</u>	2002, Fall	562
Guillaumot, Vincent M., Pablo L. Durango, and Samer M. Madanat	<u>Adaptive Optimization of Infrastructure Maintenance and Inspection Decisions under Performance Model Uncertainty</u>	2002, Fall	563
Prozzi, Jorge A., and Samer M. Madanat	<u>Development of Pavement Performance Models by Combining Experimental and Field Data</u>	2002, Fall	564
Cohn, Theodore E., Sabrina Chan, Johnny Liang, and Jessica Vann	<u>Photometric Insights Gained from Watching an Audi</u>	2002, Fall	565
Cohn, Theodore E.	<u>Roadwise Signaling in the New Millennium</u>	2002, Fall	566
Cohn, Theodore E.	<u>Can We Save Energy Used to Power Traffic Signals Without Disrupting the Flow of Traffic?</u>	2002, Fall	567
Cohn, Theodore E., and Daniel Greenhouse	<u>Looking Beyond Photometry: What Can We Predict About the Effect of Light on the Human Eye?</u>	2002, Fall	568
Ong, Paul M., Douglas Houston, John Horton and Linda L. Shaw	<u>Los Angeles County CalWORKs Transportation Needs Assessment</u>	2002, Fall	569
Golob, Thomas F., and David A. Hensher	<u>Searching for Policy Priorities in the Formulation of a Freight Transport Strategy: An Analysis of Freight Industry Attitudes</u>	2002, Fall	570
Golob, Thomas F., and Amelia C. Regan	<u>Freight Industry Attitudes Towards Policies to Reduce Congestion</u>	2002, Fall	571
Golob, Thomas F., and Amelia C. Regan	<u>Impacts of Information Technology on Personal Travel and Commercial Vehicle Operations</u>	2002, Fall	572
Golob, Thomas F.	<u>TravelBehavior.Com: Activity Approaches to Modeling the Effects of Information Technology on Personal Travel Behavior</u>	2002, Fall	573
Golob, Jacqueline M., and Thomas F. Golob	<u>Studying Road Pricing Policy with Panel Data Analysis: The San Diego I-15 HOT Lanes</u>	2002, Fall	574
Brownstone, David, Thomas F. Golob, and Camilla Kazimi	<u>Modeling Non-Ignorable Attrition and Measurement Error in Panel Surveys: An Application to Travel Demand Modeling</u>	2002, Fall	575

Golob, Thomas F., and Amelia C. Regan	<u>Trucking Industry Adoption of Information Technology: A Structural Multivariate Discrete Choice Model</u>	2002, Fall	576
Golob, Thomas F., and Amelia C. Regan	<u>The Perceived Usefulness of Different Sources of Traffic Information to Trucking Operations</u>	2002, Fall	577
Gould, Jane, and Thomas F. Golob	<u>Consumer E-Commerce, Virtual Accessibility and Sustainable Transport</u>	2002, Fall	578
Golob, Thomas F., and Amelia C. Regan	<u>Traffic Congestion and Trucking Managers' Use of Automated Routing and Scheduling</u>	2002, Fall	579
Golob, Thomas F.	<u>Structural Equation Modeling for Travel Behavior Research</u>	2002, Fall	580
Brownstone, David, Arindam Ghosh, Thomas F. Golob, Camilla Kazimi, and Dirk van Amelsfort	<u>Drivers' Willingness-to-Pay to Reduce Travel Time: Evidence from the San Diego I-15 Congestion Pricing Project</u>	2002, Fall	581
Blumenberg, Evelyn	<u>En-gendering Effective Planning: Transportation Policy and Low-Income Women</u>	2002, Fall	582
Blumenberg, Evelyn, and Daniel Baldwin Hess	<u>Measuring the Role of Transportation in Facilitating the Welfare-to-Work Transition: Evidence from Three California Counties</u>	2002, Fall	583
Kean, Andrew J., Robert F. Sawyer, Gary R. Kendall, and Robert A. Harley	<u>Trends in Exhaust Emissions from In-Use California Light-Duty Vehicles, 1994-2001</u>	2002, Fall	584
Sperling, Daniel	<u>Public-private technology R&amp;D partnerships: lessons from US partnership for a new generations of vehicles</u>	2002, Fall	585
Nesbitt, Kevin, and Daniel Sperling	<u>Fleet purchase behavior: decision processes and implications for new vehicle technologies and fuels</u>	2002, Fall	586
Brodrick, Christie-Joy, Timothy E. Lipman, Mohammed Farshchi, Nicholas P. Lutsey, Harry A. Dwyer, Daniel Sperling, S. William Gouse, III, D. Bruce Harris, and Foy G. King, Jr.	<u>Evaluation of fuel cell auxiliary power units for heavy duty diesel trucks</u>	2002, Fall	587
Sperling, Daniel	<u>Updating Automotive Research</u>	2002, Fall	588
Muñoz, Juan Carlos, and Carlos F. Daganzo	<u>Fingerprinting traffic from static freeway sensors</u>	2002, Fall	589
Brownstone, David, and Xuehao Chu	<u>Multiply Imputed Sampling Weights for Consistent Interference with Panel Attrition</u>	2003, Winter	590
Golob, Thomas F., Jane Torous, Mark Bradley, David Brownstone, Soheila Soltani Crane, and David S. Bunch	<u>Commercial Fleet Demand for Alternative-Fuel Vehicles in California</u>	2003, Winter	591
Brownstone, David	<u>Discrete Choice Modeling for Transportation</u>	2003, Winter	592
Brownstone, David, and Robert G. Valletta	<u>Modeling Earnings Measurement Error : A Multiple Imputation Approach</u>	2003, Winter	593
Brownstone, David	<u>Multiple Imputation Methodology for Missing Data, Non-Random Response, and Panel Attrition</u>	2003, Winter	594
Brownstone, David, David S. Bunch, Thomas F. Golob, and Weiping Ren	<u>A Transactions Choice Model for Forecasting Demand for Alternative-Fuel Vehicles</u>	2003, Winter	595
Brownstone, David, and Kenneth Train	<u>Forecasting New Product Penetration with Flexible Substitution Patterns</u>	2003, Winter	596
Brownstone, David, David S. Bunch, and Kenneth Train	<u>Joint Mixed Logit Models of Stated and Revealed Preferences for Alternative-Fuel Vehicles</u>	2003, Winter	597
Golob, Thomas F., David S. Bunch, and David Brownstone	<u>A Vehicle Use Forecasting Model Based on Revealed and Stated Vehicle Type Choice and Utilization Data</u>	2003, Winter	598

Clark, William A. V., and Youqin Huang	<u>Commuting Distance Sensitivity by Race and Socio-Economic Status</u>	2003, Winter	599
Zhou, Jack, and Reginald Golledge	<u>A GPS-based Analysis of Household Travel Behavior</u>	2003, Winter	600
Golledge, Reginald G., and Tommy Gärling	<u>Cognitive Maps and Urban Travel</u>	2003, Winter	601
Golledge, Reginald G., and Tommy Gärling	<u>Spatial Behavior in Transportation Modeling and Planning</u>	2003, Winter	602
Ong, Paul, and Douglas Houston	<u>Travel Patterns and Welfare to Work</u>	2003, Winter	603
Cervero, Robert, and Michael Duncan	<u>Residential Self Selection and Rail Commuting: A Nested Logit Analysis</u>	2003, Winter	604
Brownstone, David, and Charles Lave	Transportation Energy Use	2003, Winter	605
Bagley, Michael N., and Patricia Mokhtarian	The Role of Lifestyle and Attitudinal Characteristics in Residential Neighborhood Choice	2003, Winter	606
Bagley, Michael N., and Patricia Mokhtarian	The Impact of Residential Neighborhood Type on Travel Behavior: A Structural Equations Modeling Approach	2003, Winter	607
Bagley, Michael N., Patricia L. Mokhtarian, and Ryuichi Kitamura	A Methodology for the Disaggregate, Multidimensional Measurement of Residential Neighbourhood Type	2003, Winter	608
Salomon, Ilan, and Patricia L. Mokhtarian	What Happens When Mobility-Inclined Market Segments Face Accessibility-Enhancing Policies?	2003, Winter	609
Salomon, Ilan, and Patricia L. Mokhtarian	Driven to Travel: The Identification of Mobility-Inclined Market Segments	2003, Winter	610
Koenig, Brett E., Dennis K. Henderson, and Patricia L. Mokhtarian	The Travel and Emissions Impacts of Telecommuting for the State of California Telecommuting Pilot Project	2003, Winter	611
Bunch, David S., David Brownstone, and Thomas F. Golob	A Dynamic Forecasting System for Vehicle Markets With Clean-Fuel Vehicles	2003, Winter	612
Liggett, Robin, Anastasia Loukaitou-Sideris, and Hiroyuki Iseki	Bus Stop - Environment Connection: Do Characteristics of the Built Environment Correlate with Bus Stop Crime?	2003, Winter	613
Liggett, Robin, Anastasia Loukaitou-Sideris, and Hiroyuki Iseki	Journeys to Crime: Assessing the Effects of a Light Rail Line on Crime in the Neighborhoods	2003, Winter	614
Shoup, Donald C.	Buying Time at the Curb	2003, Winter	615
Shoup, Donald C.	Truth in Transportation Planning	2003, Winter	616
Bedsworth, Louise Wells, and William E. Kastenberg	Science and Uncertainty in Environmental Regulation: Insights from the Evaluation of California's Smog Check Program	2003, Winter	617
Quinet, Emile, and Daniel Sperling	Environmental Protection	2003, Winter	618
Sperling, Daniel, and Timothy Lipman	International Assessment of Electric-Drive Vehicles: Policies, Markets, and Technologies	2003, Winter	619
Cairns, Shannon, Jessica Greig, and Martin Wachs	Environmental Justice & Transportation: A Citizen's Handbook	2003, Winter	620

## New Academic Courses

The design of several new courses has been initiated at the various campuses, but will not be offered until Winter 2003 or the following academic year. Reports on these courses will be included after they have been fully developed.

## **New Academic Programs**

A new undergraduate major in Urban Studies is underway at UC Berkeley. This major is sponsored by the Dept. of City and Regional Planning in cooperation with several social sciences departments, including Political Science, Sociology, and Economics. Course offerings for this new major include the undergraduate courses in transportation planning previously supported by UCTC. In addition, most of the core courses in the major have transportation content.

## **B. Research Project Status**

A total of 17 new projects were selected for funding with Year 15 (2002-3) grants. Several of these projects are funded at the seed project level, \$10,000-\$15,000. This level of funding will support a part time graduate student to work with the faculty PI.

The seventeen new projects, which started this past August, are well underway. In addition, twelve Year 14 (2001-2) projects were continued into Year 15; one has been completed and the rest are on target for completion by the end of this grant cycle. Consequently, we are reporting on 27 projects: 12 Year 14 projects, plus 17 Year 15 projects.

The projects for each year are listed in Tables 2 and 3. Please note that all UCTC projects include funding for one or two graduate student research positions and for one or two faculty summer months. Other faculty time during the academic year is donated. In addition, the California Department of Transportation and the US DOT jointly sponsor all projects. The External Project Contact is Sallybeth Scott, Caltrans, 1120 N St., Sacramento, CA 94305, tel. 916 324-2440. Caltrans' dollar-for-dollar match of federal funds for UCTC has been critical to our success.

Following the tables are brief reports that present the status of each faculty research project underway at UCTC in 2002-3. The reports cover performance through January 2003.

**Table 2. Year 14 (2001-2002) Research Projects  
--15 Projects, 12 Continuing in 2002-3**

**A. Completed in Previous Years (3 Projects)**

**How Does Travel Behavior Change When Households Change Jobs?**

William Clark, UCLA

**Design of Vehicle Routes and Driver Shifts for Systems with Uncertain Demand**

Carlos Daganzo, UC Berkeley

**Effect of Driving Mode on Light-Duty Vehicle Emissions Measured On-Road**

Robert Harley, UC Berkeley

**B. Completed Fall-Winter 2002-2003 (1 Project)**

**Equity and Environmental Justice in Transportation**

Martin Wachs, UC Berkeley

**C. Continuing Projects (11 projects - extensions to July 31, 2003 unless otherwise stated.)**

**Using the Spatial Configuration of Cities to Estimate the Impact of Commuting Time on Hours of:**

Antonio Bento, UC Santa Barbara

**Evaluation of the California Safe Routes to School Program**

Marlon Boarnet and Kristen Day, UC Irvine

**Forecasting Demand and Values of Travel Time Savings for Freeway HOV,  
Toll and HOT Facilities: Incorporating Attitudes and Perceptions into Commuter  
Choice Models**

David Brownstone and Thomas Golob, UC Irvine

**Transit-Based Housing: Residential Sorting and Its Influence on Mode Choice**

Robert Cervero, UC Berkeley

**Real-time Travel Data Collection System Augmented with Speech Interface**

Reginald Golledge, UC Santa Barbara

**Life -Cycle Environmental and Economic Assessment of Using Recycled Materials for Asphalt  
Pavements**

Arpad Horvath, UC Berkeley

**Reinforcement Learning in Transportation Infrastructure Management**

Samer Madanat, UC Berkeley

**Dissonance between Desired and Current Residential Neighborhood Type: Relationships to Travel-  
Related Attitudes and Behavior**

Patricia Mokhtarian and Ilan Salomon, UC Davis

**Optimal Control Policies for Urban Corridor Management**

Wilfred Recker, UC Irvine

**The Impact of Motor Vehicle Transportation on Water Quality**

Jean Daniel Saphores, UC Irvine

**Putting Back the Pleasure in the Drive: Reclaiming Urban Parkways for the 21<sup>st</sup> Century**

Anastasia Loukaitou-Sideris, UCLA

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### **Table 3. Year 15 (2002-2003) Research Projects**

#### **--15 New Projects**

**Expanded Evaluation of the California Safe Routes to School Program**

Marlon Boarnet, Kristen Day, and Kenneth Anderson, UC Irvine

**Verifying Regularities in Queued Freeway Traffic**

Michael Cassidy, UC Berkeley

**Neighborhood Design, Physical Activity, and Travel**

Robert Cervero, UC Berkeley

**Comparing White and Minority Household Commuter Behavior**

William Clark, UCLA

**Storage System Dynamics and Management Policies**

Carlos Daganzo, UC Berkeley

**Judging the Speed of Pedestrians and Bicycles at Night**

Karen DeValois, UC Berkeley

**Safer and More Efficient Truck Operations on Urban Freeways**

Thomas Golob and Amelia Regan, UC Irvine

**High-Coverage Point-to-Point Transit**

R. Jayakrishnan and T. Golob, UC Irvine

**Incorporating Seismic Risk Considerations in Transportation Infrastructure Management**

Samer Madanat, UC Berkeley

**Handheld Travel Survey Technology to Supplement Vehicle Tracking**

Michael McNally, UC Irvine

**I/O Analysis of Communications and Travel for Industry**

Patricia Mokhtarian, UC Davis

**Car Ownership, Insurance Premiums and Employment Outcomes**

Paul Ong, UCLA

**Public Transit and Residential Location Choices of Minorities and Transit Dependents**

John Quigley and Steven Raphael, UC Berkeley

**An Evaluation of Employer-Based Transit Programs**

Donald Shoup, UCLA

**Effects of Contracting on Fixed-Route Bus Cost-Efficiency**

Brian Taylor, UCLA and Martin Wachs, UC Berkeley

**Exploring the Marketability of Fuel-Cell Electric Vehicles**

Thomas Turrentine and Kenneth Kurani, UC Davis

**Experimental and Theoretical Investigations of Traffic Flow at Highway Merges**

Michael Zhang, UC Davis

## **B. Year 14 (2001-2002) Project Status Reports**

### **Projects Completed to Date in 2002-2003**

#### **Equity and Environmental Justice in Transportation**

**Principal Investigator:**

Prof. Martin Wachs  
109 McLaughlin Hall  
UC Berkeley  
Berkeley CA 94720  
Tel 510 5423585  
Email mwachs@uclink.berkeley.edu

**Abstract:**

The Environmental Justice movement in transportation has based many claims on concerns for equity in transportation finance and in the distribution of direct and indirect costs and benefits of transportation. Under Title VI of the Civil Rights Act and under several executive orders, the U.S. Department of Transportation requires transit agencies and metropolitan planning agencies to report on the equitability of their programs. In addition, there is a body of scholarly literature on the theme of equity and its measurement. This project has produced a report on environmental justice and equity in transportation for use by practitioners and citizens. The report reviews alternative definitions of equity and discusses analytical measures by which equity in transportation can be measured. It also reviews concepts and measures of equity used by public agencies and by environmental justice advocacy groups. The report discusses ways to advance the cause of environmental justice by providing better measures for use in the analysis of transportation projects or programs. **Key Words:** equity, environmental justice, civil rights, social impact

**Work Completed to Date:**

This project is complete, and the final product has been delivered to UCTC.

**Papers to date:**

Cairns, Shannon, Jessica Greig, and Martin Wachs, Environmental Justice and Transportation: A Citizens Handbook. Institute of Transportation Studies, UC Berkeley, 2003, UCTC working paper 620.

**Conferences Attended:**

Paper presented at TRB 2003.

**Other Accomplishments:**

None to date

**Percent Complete:** 100%

**Direct Cost:** \$53,937

## **Continuing Projects (Extensions Granted to July 31, 2003)**

### **Using the Spatial Configuration of Cities to Estimate The Impact of Commuting Time on Hours of Work**

**Principal Investigator:**

Antonio M. Bento  
Donald Bren School of Environmental Science and Management  
University of California, Santa Barbara  
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**Abstract:**

We are investigating the causal impact of fixed time costs (commuting) on labor supply. While a limited number of studies have estimated the correlation between hours of work and observed commuting, they have not dealt with the endogeneity of commuting and thus yield biased estimates. We propose to isolate the exogenous impact of commuting using a novel instrumental variables approach based on the dispersion of residential locations within and across cities. A credible estimate of the elasticity of hours of work with respect to commuting time is clearly important to our understanding of labor supply behavior and therefore the reaction of people to urban transportation policies aimed at changing commuting patterns **Key Words**: commuting time; labor supply; urban spatial structure

**Work Completed to Date:**

The vast majority of the research tasks are complete or substantially complete. We have put together the data set (this includes both the census data and the GIS data that characterizes the spatial configuration of cities) and have constructed our instrument to commuting. At this point we are running our empirical model. A preliminary version of the paper was presented to the Summer Institute of the National Bureau of Economic Research.

**Papers to Date:**

None

**Conferences Attended:**

None

**Other Accomplishments:**

None to date

**Percent Complete:** 85%

**Direct Cost:** \$38,514

## Evaluation of the California Safe Routes to School Program

### Principal Investigator:

Prof. Marlon Boarnet  
Department of Urban and Regional  
Planning;  
Institute of Transportation Studies  
University of California, Irvine  
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### Other Key Participants:

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**Email:** [clanders@uci.edu](mailto:clanders@uci.edu)

### Abstract:

We are conducting a pre and post-evaluation of the California Safe Routes to School (SR2S) construction program, which allocates \$20 million to local governments for street, sidewalk, and neighborhood and/or traffic design and construction projects to improve the safety and feasibility of walking and bicycling to school. We are observing pedestrian and bicyclist behavior and are surveying parents before and after SR2S construction at a sample of sites to obtain information on attitudes and perceptions of safety. These data allow an evaluation of the effectiveness of different neighborhood and traffic interventions in improving the safety of children's non-motorized travel near schools, the frequency of walking and bicycling among children, and the interaction between perceived safety, traffic patterns, the physical environment, and walking and bicycling behavior. **Key Words:** school access, safety, pedestrians, bicycles, sidewalks

### Work Completed to Date:

We have completed a detailed literature review, site selection, and the development of research instruments - a written protocol for the urban design observations, a written protocol for traffic observations, and the survey of parents (or guardians) of 4<sup>th</sup> and 5<sup>th</sup> grade students. All three instruments are being used to assess the urban design, motorized and non-motorized traffic, and child behavior and parental attitudes before and after SR2S project construction. The urban design protocol specifies objective measures of the environment near schools that we hypothesize (based on our literature review and preliminary focus groups) will have an impact on walking and bicycling safety and frequency. The traffic observation protocol similarly specifies characteristics of traffic, with detailed instructions for how those characteristics will be measured. The parent survey includes questions about the child's walking or bicycling behavior, the parents' schedule and other constraints, and parental attitudes toward walking, bicycling, and perceptions of safety, social expectations, and child abilities that will influence parental decisions regarding whether children can walk or bicycle to school.

### Papers to Date:

None

### Conferences Attended:

1. Cooper Institute Conference on Public Health Interventions to Promote Physical Activity, October 2001, "Analytical Methods and Data for Understanding Walking Behavior." (Marlon Boarnet)
2. Symposium on Cities and Transportation: Choices and Consequences, Simon Fraser University, February 2002, "Science and Land Use-Travel Behavior Interactions." (Marlon Boarnet)

### Other Accomplishments:

None to date

**Percent Complete:** 85%

**Direct Cost:** \$71,902

## Forecasting Demand and Values of Travel Time for Freeway HOV, Toll and HOT Facilities

### Principal Investigators:

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### Abstract:

Accurate forecasts of demand for restricted roadway facilities – high occupancy vehicle (HOV) lanes, toll lanes (including congestion pricing), or combined HOV and toll (HOT) lanes on freeways and bridges – are key to the success of such projects. Yet the track record for predictions for such projects throughout the U.S. is dismal; transportation professionals have not been successful in understanding traveler behavior regarding such choice alternatives. The objective of the proposed research is to explore reasons for these failings and to make recommendations regarding priorities for better models. Alternative model specifications documented in the literature are compared on a common dataset. The most effective dataset for this purpose is the panel survey collected in 1997-1999 for evaluation of the San Diego I15 Congestion Pricing Project, combined with recorded toll data and traffic speed data from freeway loop detectors and floating car measurements. The key new feature of this work is the joint modeling of commuters' choices, perceptions of key trip attributes, and attitudes about road pricing. These variables are related to commuter's socio-demographic information as well as objective traffic network data typically used in demand analysis. This new model is designed to predict both the economic and political feasibility of a project. **Key words:** travel demand forecasting, hot lanes, HOV lanes, value pricing

### Work Completed to Date:

We have assembled and merged freeway loop detector, floating car, and panel survey data, with imputation of the missing data in the floating car measurements. The methodology we are using is an extension of our earlier UCTC-funded work in Brownstone et al. (2001). We are now estimating models and writing papers based on these models.

### Papers to Date:

"Modeling Non-ignorable Attrition and Measurement Error in Panel Surveys: An Application to Travel Demand Modeling." (with C. Kazimi and T.F. Golob), in Groves, R.M., D. Dillman, J.L. Eltinge and R.J.A. Little (eds.), Survey Non-response. New York: Wiley, pp. 373-388, 2001. Based on earlier UCTC funded work using earlier waves of the panel data.

### Conferences Attended:

None

### Other Accomplishments:

TRB 2003

**Percent Complete:** 80%

**Direct Costs:** \$14,690

## **Transit-Based Housing: Residential Sorting and Its Influence on Mode Choice**

### **Principal Investigator:**

Prof. Robert Cervero  
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University of California  
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### **Abstract:**

This research examines the impacts of transit-based housing on both residential location and mode choice. The degree to which ridership benefits are a product of self-selection or the inherent advantages of proximity to transit is being gauged. An operative hypothesis is that high ridership is a product of households sorting themselves into rail station areas for the very purpose of economizing on commuting. Living near rail stops is thought to also lower vehicle ownership rates. The combination of “residential sorting” and fewer cars are thought to be dominant factors in explaining mode choice for journeys to work. This hypothesis is tested using nested logit models and year 2000 data on residential location, car ownership, and commute mode choice from the San Francisco Bay Area. Models predict whether households reside within a half-mile ring of a rail station and how this in turn influences mode choice. Separate analyses are carried out for the BART heavy rail system, the CalTrain commuter rail system, and the VTA light rail system. The results of the research will help inform policymaking in the areas of transit joint development and affordable housing production, including policy initiatives like Location Efficiency Mortgages. **Key Words:** mode choice, location choice, housing policy, transit policy

### **Work Completed to Date:**

A literature review of nested logit modeling in the transportation and land use planning field was conducted. The year 2000 Bay Area Travel Survey (BATS) was acquired and trip data were extracted. Once the database was organized, Geographic Information System (GIS) tools were used to identify whether the residences and workplaces of persons in the trip data file were within one quarter, one half, or one mile radii of BART, CalTrain, ACE, and Santa Clara County light rail transit services. Highway and transit job accessibility metrics then were developed for all records. Currently, work is underway to estimate a nested multinomial logit model, using the ALOGIT software package, of residential choice and mode choice. The degree to which residential sorting explains large shares of the ridership among residents of TODs will be determined.

### **Papers to date:**

Cervero, Robert, and Michael Duncan, Residential Self Selection and Rail Commuting: A Nested Logit Analysis, UCTC #604, Winter 2003.

### **Conferences Attended:**

TRB 2003

### **Other Accomplishments:**

None to date

**Percent Complete:** 80%

**Direct Costs:** \$45,284

## **Real-Time Travel Data Collection System Augmented with Speech Interface**

### **Principal Investigator:**

Prof. Reginald Golledge  
Dept. of Geography  
UC Santa Barbara  
Santa Barbara, CA 93106  
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### **Abstract:**

In this research we are developing a conceptual model of a real time activity data collection device, to be operationalized as a wearable computer complete with GPS recorder and speech input card. The wearable computer will be tied to a wireless local area network (WLAN) and real-time travel decisions (e.g. en-route changes in destinations and routes) can be immediately entered by voice into a database contained in a central server. We will pilot the results using pedestrian travel on the UCSB campus, and suggest ways of extrapolating from a localized pedestrian domain to a larger scale vehicular environment at an urban scale. **Key Words:** equity, environmental justice, civil rights, social impact

### **Work Completed to Date:**

This project is now back underway after a delay in Summer and Fall 2001. An extension to July 31, 2003 has been granted.

### **Publications to date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 40%

**Direct Cost:** \$54,537

## **Life Cycle Environmental and Economic Assessment of Using Recycled Materials for Asphalt Pavements**

### **Principal Investigator:**

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### **Abstract:**

The public, industry and governments have become increasingly interested in green design and engineering to improve environmental quality and sustainability. Pavement construction is one of the largest consumers of natural resources. Recycling of pavements represents an important opportunity to save the mining and use of virgin materials, conserve energy, divert materials away from landfills, and save scarce tax dollars. How much pollution, energy, natural resources, and money could be saved by using secondary materials in road construction? What are the engineering limits of using recycled materials in roads? Can we recycle over and over again pavements that contain rubber, glass, and other secondary materials? This research will quantify the environmental and economic costs and benefits of recycling asphalt pavements, and using secondary materials for their construction. The impacts will be traced through the related lifecycles and supply chains for material and energy inputs, water consumption, hazardous and non-hazardous waste generation, toxic discharges, and greenhouse gas as well as particulate matter emissions. Lifecycle environmental and economic assessment methods will be coupled with construction process models. Stakeholders will be able to use the resulting computer tool for decision-making and scenario analysis as parameters of the pavement recycling model change over time and from region to region. **Key Words:** pavement management, lifecycle costs, environmental costs

### **Work Completed to Date:**

Our literature review is complete and we are in the process of conducting an economic assessment of asphalt pavement construction considering the price of recycled materials, the economics of pavement recycling technologies, and the amount of landfill tipping fees, in order to estimate the costs and benefits associated with recycled materials use. To estimate the environmental effects of substituting recycled for virgin materials, we use data on the material inputs of pavement construction, estimated energy use and emissions associated with mining aggregates, constructing, and recycling pavements (including various equipment). We are attempting to trace environmental effects (greenhouse gas, particulate matter, and toxic emissions, releases to water, and waste generation) through the related lifecycles and supply chains using lifecycle assessment (LCA) models. Both U.S. and international sources of information have been reviewed and synthesized.

### **Publications, presentations:**

None

### **Conferences Attended:**

A. Horvath, presentation at the conference "Beneficial Use of Recycled Materials in Transportation Applications", Washington, DC, November 13, 2001.

### **Other Accomplishments:**

None to date

**Percent Complete:** 85%

**Direct Costs:** \$45,546

## Putting Back the Pleasure in the Drive: Reclaiming Urban Parkways for the 21<sup>st</sup> Century

<b>Principal Investigator:</b> Anastasia Loukaitou-Sideris Department of Urban Planning School of Public Policy and Social Research 3250 Public Policy Building, Box 951467 University of California, Los Angeles Los Angeles, CA 900951467 3102069679 <a href="mailto:sideris@ucla.edu">sideris@ucla.edu</a>	<b>Other Key Participants:</b> Robert Gottlieb Urban and Environmental Policy Institute, Occidental College 1882 Campus Road Los Angeles, CA 90041 3232592712 <a href="mailto:gottlieb@oxy.edu">gottlieb@oxy.edu</a>
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### Abstract:

This research investigates the problems and prospects of urban parkways by focusing on the "first freeway of the West," the celebrated Arroyo Seco Parkway. Hailed in the 1920s and 1930s as marvels of engineering innovation, and as safe and efficient alternatives to conventional arterials, urban parkways are facing a series of problems today that include high accident rates and congestion. The Arroyo Seco Parkway was originally built to carry 27,000 automobiles per day at 45mph. Today it carries over 120,000 cars per day at speeds often exceeding the official limit of 55mph. While the parkway is a cherished part of the area's heritage, is eligible for the National Register of Historic Places, and has been recently designated as an American Civil Engineering Landmark, the historic and aesthetic significance of the road is not recognized from an operational and legal perspective. The parkway is being used as a case in point to evaluate the prospects for managing existing historic parkways, and to investigate the relationship between the physical qualities of parkways, their usefulness as transportation corridors, and their relative safety. **Key Words:** Urban parkways, Arroyo Seco Parkway

### Work Completed to Date:

We have reviewed the literature on historic parkways in general and the Arroyo Seco Parkway in particular. We have conducted a safety audit of the Arroyo Seco Parkway and a spatial analysis of all accidents on the parkway in the last five years, and have conducted an experiential analysis of the driving experience along the parkway. Analysis of accidents and compilation of policies for the management of urban parkways are underway.

### Papers to date:

None

### Conferences Attended:

The project has received significant attention from community residents, transportation officials, policymakers, and a wide range of government and on-governmental organizations. As part of this interest, we were asked to highlight project findings to be included as part of an historic event in October 2002, the ArroyoFest Freeway Walk and Bike Ride.

### Other Accomplishments:

None to Date

**Percent Complete:** 80%

**Direct Cost:** \$49,284

## **Reinforcement Learning in Transportation Infrastructure Management**

### **Principal Investigator:**

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### **Abstract:**

Infrastructure Management Systems support agencies in developing efficient policies to monitor, maintain and repair deteriorating facilities in transportation infrastructure networks. Traditionally, Infrastructure Management Systems have been based on a time-invariant characterization of a facility's deterioration process. However, a constant single model of a facility's deterioration may not be appropriate given the variability over time of causal factors such as traffic and environmental conditions. When this variability over time is accounted for, the infrastructure management problem becomes a Reinforcement Learning problem. One possible approach for solving this Reinforcement Learning problem would be to represent the facility deterioration process using a time-varying stochastic model. The problem of finding optimal policies to manage infrastructure facilities and networks can then be formulated as an adaptive control problem, where observations of facility condition over time can be used to update the parameters of the models. An alternative to this approach is to use temporal difference learning. This approach allows us to develop policies without having to model a facility's deterioration process. Instead, the information that is gathered by the transportation agency is used to evaluate maintenance and repair policies directly, without using a stochastic process to represent facility deterioration. **Key Words:** infrastructure deterioration, infrastructure management, difference learning models

### **Work Completed to Date:**

A review of the literature and initial data gathering are completed and model specifications and estimations are underway. Several papers have been prepared.

### **Papers to date:**

Durango, P. and Madanat, S., "Maintenance and Repair Decision-Making for Infrastructure Facilities without Models: A Reinforcement Learning Approach", submitted for publication in the Proceedings of the AATT 2002 conference.

Madanat, Samer M., Jorge A. Prozzi, and Michael Han, Effect of Performance Model Accuracy on Optimal Pavement Design, UCTC #561, Fall 2002.

Prozzi, Jorge A., and Samer M. Madanat, A Non-linear Model for Predicting Pavement Serviceability, UCTC #562, Fall 2002.

Guillaumot, Vincent M., Pablo L. Durango, and Samer M. Madanat, Adaptive Optimization of Infrastructure Maintenance and Inspection Decisions under Performance Model Uncertainty, UCTC #563, Fall 2002.

Prozzi, Jorge A., and Samer M. Madanat, Development of Pavement Performance Models by Combining Experimental and Field Data, UCTC #564, Fall 2002.

### **Conferences Attended:**

Annual Meeting of the Transportation Research Board, January 2002, January 2003.

### **Other Accomplishments:**

None to date

**Percent Complete:** 80%

**Direct Cost:** \$70,582

## Telecommuting over the Long Term: Patterns of Engagement and Impacts on Residential Location

<b>Principal Investigator:</b> Patricia L. Mokhtarian Department of Civil and Environmental Engineering University of California, Davis One Shields Ave. Davis, CA 95616 (530) 7527062 plmokhtarian@ucdavis.edu	<b>Other Key Participants:</b> Professor Ilan Salomon, Researcher Institute of Transportation Studies University of California, Davis One Shields Ave. Davis, CA 95616 msilans@mscc.huji.ac.il
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### Abstract:

Although studies show that telecommuting reduces vehicle miles traveled in the short term, there is little empirical evidence with respect to the longer-term impacts on residential relocation (and hence travel). This study continues the analysis of a unique and valuable data set providing 10-year retrospective telecommuting and residential/job relocation histories for a sample of 227 employees of the State of California (including non-telecommuting control group cases), many of whom have been telecommuting for at least five years. We analyze telecommuting frequencies, durations, and patterns of engagement for the current and former telecommuters, and will compare their residential relocation behavior to that of the non-telecommuters to ascertain whether the long-term net impact of telecommuting is to reduce or increase VMT. This research provides first look at the answers to some important questions with respect to the long-range effects of telecommuting questions that have been raised for many years but for which, until now, the data were not available. The findings will serve as useful background to policies that promote telecommuting as a trip reduction strategy. **Key Words:** telecommuting, residential location, cluster analysis

### Work Completed to Date:

New data files were created to restructure the available data into formats useful for analysis. We now are in the process of analyzing the transportation impacts of telecommuting over the 10-year retrospective period of data collection.

### Papers to date:

None

### Conferences Attended:

TRB 2003

### Other Accomplishments:

None to date

**Percent Complete:** 70%

**Direct Cost:** \$46,489

## **Optimal Control Policies for Urban Corridor Management**

### **Principal Investigator:**

Professor Will Recker  
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University of California, Irvine  
Irvine, CA  
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**Abstract:** This project develops an integrated traffic operations-travel demand modeling approach for use in developing optimal control systems. The embedded travel demand model reflects drivers' response to the control system that determines on-ramp metering rates and vehicle-actuated arterial signal timing settings in corridor networks. A primary goal of the work is to demonstrate that congestion within corridor networks can be reduced more effectively if the control strategies for each sub-network are geographically integrated and coordinated to reflect interaction among systems, allowing the various traffic control measures to cooperate rather than compete. The integrated control problem relating to on-ramp and urban signal control strategies is formulated as an optimal control problem of determining such control variables as the on-ramp metering rates, the minimum green duration, the maximum green duration (or force off), background cycle length (if coordinated) and the critical time gap for vehicle actuated urban signals, subject to the control constraints, so as to minimize the system total travel time. The approach takes into consideration the interaction between the control strategy and drivers' response to it. A numerical method is used for the solution of the formulated optimal control problem. **Key Words:** signal timing, ramp metering, demand analysis, optimal control strategy

### **Work Completed to Date:**

A logic-based method has been developed for the modeling of a transportation network of surface streets where traffic is controlled by fully-actuated traffic signals. The formulation is shown to have high efficiency, both in terms of modeling and solution time. The model developed consists of a set of linear inequalities of discrete and continuous variables. This structural property allows the development of an integrated control strategy as a linear optimal control problem which can be solved as a large-scale mixed integer programming problem.

### **Papers to Date:**

Pavlis, Y. and W. Recker (2001). A Methodological Framework for Integrated Control in Corridor Networks. Proceedings, IEEE Conference on Intelligent Transportation Systems, Oakland, CA, 637642.

### **Conferences Attended:**

IEEE Conference on Intelligent Transportation Systems, Oakland, CA

### **Other Accomplishments:**

None to date.

**Percent Complete:** 75%.

**Direct Cost:** \$33,784

## **The Impact of Motor Vehicle Transportation on Water Quality**

### **Principal Investigator:**

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**Abstract:** This research analyzes the impact of road transportation by motor vehicles on water quality in California. Air pollution and noise externalities have been extensively studied, but the water quality impact of motor vehicle operations has not received much attention. Our investigation includes the impacts on water quality from constructing motor vehicles and road infrastructure, operating vehicles, and disposing of used motor vehicles. We review the engineering, planning, and economic literatures; collect information about relevant policies in OECD countries and at the federal, state, and local levels; quantify pollution impacts whenever possible; identify data gaps; and critically review the policies that have been proposed to deal with this problem. Better understanding of the sources of water pollution is important at a time where the population of California is growing and there are few options for new supplies of water. We will develop policy recommendations tailored to the situation in California. **Key Words:** road transportation, water quality, environmental quality

### **Work Completed to Date:**

Together with a student, we have conducted a review of the economic, planning, and transportation literatures. We also have collected data from local, federal, and international agencies. We are working on the quantification of the impacts of motor vehicle operation on water quality using these data and are looking into alternative policy responses for California.

### **Papers to Date:**

1. Nixon, H. and J.D. Saphores (2001), Used Oil Policies to Protect the Environment: An Overview of Canadian Experiences, Proceedings of the Third International Conference on Traffic and Transportation Studies in China, July 2002
2. Nixon, H. and J.D. Saphores (2002), The Environmental Impacts of Motor Vehicle Operation on Water Quality: A Preliminary Assessment, Working Paper, University of California Irvine.

### **Conferences Attended:**

None

### **Other Accomplishments:**

None to date

**Percent Complete:** 65%

**Direct Cost:** \$48,109

## Year 15 (2002-2003) Project Status Reports – New Projects

### 17 Projects

#### Expanded Evaluation of the California Safe Routes to School Program

<b>Principal Investigator:</b> Marlon Boarnet Institute of Transportation Studies University of California, Irvine Irvine, CA 92697-3600 Tel. 949 824-7695 <b>Email:</b> <a href="mailto:mgboarne@uci.edu">mgboarne@uci.edu</a>	<b>Other Key Participants:</b> Kristen Day Institute of Transportation Studies University of California, Irvine Irvine, CA 92697-3600 Tel. 949 824-5880 <b>Email:</b> <a href="mailto:kday@uci.edu">kday@uci.edu</a>
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**Abstract:** This research expands an ongoing pre- and post-evaluation of the California Safe Routes to School (SR2S) construction program, which allocates \$44 million to local governments for infrastructure projects to improve the safety and feasibility of walking and bicycling to school. We are evaluating 12 SR2S sites in Southern California and sites in Northern California. The research includes: (1) assessment of changes to SR2S sites that are associated with the construction program; (2) observations of pedestrian, bicyclist, and driver behavior before and after SR2S construction at each site; and (3) surveys of parents before and after SR2S construction at each site to assess attitudes and perceptions of safety. The evaluation examines the effectiveness of different neighborhood and traffic interventions in improving the safety of children's non-motorized travel near schools, the frequency of walking and bicycling among children, and the interaction between perceived safety, traffic patterns, the physical environment, and walking and bicycling behavior. **Key Words:** school, pedestrian, bicycle, safety, sidewalks

**Work Completed to Date:** We have refined the study design and selected additional sites for this continuing study.

**Papers to Date:**

None

**Conferences Attended:**

None

**Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$62,690

## Verifying Regularities in Queued Freeway Traffic

### Principal Investigator:

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**Abstract:** This work seeks to make sense of at least two puzzling phenomena of queued freeway traffic: 1) stop-and-go oscillations and 2) the wide scatter invariably observed in plots of queued flows vs. density or occupancy. Recent (preliminary) evidence suggests these are not the results of chaotic driver behavior as has been commonly theorized, but to behaviors that are more regular and easily explained. By measuring queued freeway traffic from video and processing these data in careful ways, we expect to verify that stop and go oscillations are created by the vehicle lane-changing maneuvers that abound near ramps. The details of this suspected cause and effect relation remain questions to be examined here. We further expect to confirm that the scatter observed in flow-density plots is merely the result of extracting (and plotting) data from transition zones between queued and un-queued traffic; these zones may be (spatially) long and likely arise because drivers respond to shocks by changing speeds gradually. The findings should advance current understanding of vehicular traffic and help sort-out which theories adequately describe certain traffic phenomena and which phenomena are not yet described by theory. **Key Words:** traffic theory, queues, freeway on-ramps

**Work Completed to Date:** We have assembled data for the study and have begun the analysis.

### Papers to Date:

None

### Conferences Attended:

None

### Other Accomplishments:

None to date

**Percent Complete:** 45%

**Direct Cost:** \$50,614

## Neighborhood Design, Physical Activity, and Travel

### Principal Investigator:

Robert Cervero

UC Berkeley

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**Abstract:** There's a growing interest in the relationships among neighborhood design, physical activity, and travel choices. Research has linked obesity and other public-health problems to sedentary lifestyles. Some evidence further suggests that postwar residential designs are associated with increased reliance on automobile travel and low levels of walking and cycling. This project will use the BATS 2000 (activity based) survey to extract trip records for limited trip purposes over limited trip ranges – e.g., personal services, convenience-neighborhood shopping, eating, social-recreation, and school travel (over 0 to 5 mile distance ranges). Mode choice for these short trips will be investigated, using metrics that capture walking-scale attributes of built environments – namely street connectivity and block dimensions - along with land-use data and density measures, other attributes of built-environments.. **Key Words:** public health, biking, walking, mode choice

**Work Completed to Date:** Data have been assembled and extracted from the BATS survey. Model building is underway.

### Papers to Date:

None

### Conferences Attended:

None

### Other Accomplishments:

None to date

**Percent Complete:** 45%

**Direct Cost:** \$15,000

## **Comparing White and Minority Household Commuting Behavior: Measuring the Differences**

### **Principal Investigator:**

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UCLA  
Los Angeles, CA  
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**Abstract:** Previous research developed a model of the responses to work-residence separation that linked the probability of moving closer to the job to increasing distance from the work place. Households beyond a threshold distance moved closer to the job when they changed residence. The current project uses that model to examine the commuting behavior of white and minority households, and is specifically interested in how race affects the probability of moving closer to the job when households change residence. Do black, Hispanic and Asian households also move closer to their jobs when they relocate? Do black and Hispanic households who have “constrained” residential choices incur greater commuting costs which arise from the greater spatial separation. The research project uses a specialized data set of work residence relationships from the Fulton County school district to examine the patterns of commutes of middle income households, and their dispersed commuting in the Atlanta metropolitan region. The study will provide important new data, on how relatively affluent minority households make commuting decisions in a complex metropolitan environment. **Key Words:** commuting behavior, commuting costs, spatial separation, dispersed commuting

**Work Completed to Date:** Data have been assembled and evaluated and model specification is underway.

### **Papers to Date:**

Clark, William A. V., and Youqin Huang, Commuting Distance Sensitivity by Race and Socio-Economic Status, UCTC #599, Winter 2003

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$36,658

## Storage System Dynamics and Management Policies

### Principal Investigator:

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**Abstract:** This study investigates the dynamics of networks with link-to-link interactions caused by storage effects and develops effective management policies. Street networks, supply chains and transit lines are the kinds of systems in which instabilities commonly arise when the outflow of a sub-network decreases if some input flows increase. The phenomenon receives different names for different modes (“gridlock” for freeways, “bullwhip effect” for supply chains, and “pairing” for transit systems), but its causes are similar. Instabilities undermine system performance and make management difficult. This research shows how the behavior of storage networks of various kinds can be predicted and managed effectively with new methods. The work focuses on two difficult but related problems: (i) managing the morning commute in a congested city, and (ii) stabilizing freight networks driven by inventory considerations. The morning commute problem is a prototype of systems with centralized management. For this problem, we will quantify (based on a physically realistic network model) the connection among residence location and the distribution of congestion costs. Government policies such as tolls, taxation and land-use regulations will be evaluated. The freight network problem is a prototype of decentralized systems with multiple managers. For this problem, we will demonstrate how to eliminate the “bullwhip effect” and minimize costs with decentralized policies. **Key Words:** networks, flows, congestion, freight management

### Work Completed to Date:

Work is well underway and will produce a PhD thesis, the beginning of another one, and search monograph on the management of supply chains and several papers. Applications to transit systems will also be explored if time permits.

### Papers to Date:

None

### Conferences Attended:

None

### Other Accomplishments:

None

**Percent Complete:** 45%

**Direct Cost:** \$54,544

## **Judging the Speed of Pedestrians and Bicycles at Night**

### **Principal Investigator:**

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**Abstract:** Flashing lights are often worn by both pedestrians and cyclists in an attempt to increase their visibility to drivers. The question we raise is whether the temporal properties of the variation in light intensity affect observers' ability to judge the translational speed of the wearer. With partial funding from the U. C. Transportation Center, we will assess the apparent speed of light dots that flash off and on as they move across the visual field. If initial measures show that repetitively flashing a moving light affects an observer's judgment of its translational speed, we will systematically examine the effects of waveform and temporal frequency to determine whether there are combinations that can eliminate the perceptual error. **Key Words:** safety improvements, bicycles, pedestrians, vision

**Work Completed to Date:** Detailed experimental design is complete and testing is underway.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

**Policies for Safer and More Efficient Truck Operations on Urban Freeways**

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**Abstract:** Trucks carry 63% of all freight shipments in California by ton-mile and 72% of all shipments by value. The shippers and receivers of most of this trucked freight, as well as the major intermodal facilities (particularly seaports and airports) are located within California’s major urban areas. Consequently, freeways with the heaviest truck traffic are also those that carry heavy volumes of commuters. Customer schedules for pickup and delivery and intermodal operations require that trucks operate on these freeways during congested periods. The California Department of Transportation monitors truck traffic volumes and also maintains a database of traffic accidents. Preliminary analyses of these crash data in combination with truck volume data factored by time of day show that truck-involved crashes are more likely on certain freeway segments, after controlling for differences in levels of truck exposure. We propose to use appropriate statistical analysis methods to identify freeway locations and times at which trucks mixes are problematic. We then propose to survey the literature and consult both trucking industry and metropolitan planning sources to identify and evaluate policy initiatives that can be used to re-route and re-schedule some truck traffic to safer places and times. **Key Words:** trucks, crashes, freeway management

**Work Completed to Date:** Previous work on the topic has been reviewed and data have been assembled. Analyses are underway.

**Papers to Date:**  
None

**Conferences Attended:**

**Other Accomplishments:**  
None

**Percent Complete:** 45%

**Direct Cost:** \$65,826

## **High-Coverage Point to Point Transit: Institutional Feasibility and Demand Study of Agencies, Users and Operators**

### **Principal Investigator:**

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**Abstract:** We examine demand for and acceptability of a new design for private-public transit, named High-Coverage Point to Point Transit (HCPPT.) The technical and design details of HCPPT are currently under development by the PI in a separately funded project. The design is based on jitney or shuttle-style operations with a large number of deployed vehicles coordinated using advanced information supply and fast routing and route optimization. The system design ensures that no more than one transfer is needed for the travelers, by using transfer hubs and re-routable and non-re-routable portions in vehicle travel plans. Simulation studies have shown that with enough deployed vehicles, the system can be substantially better than more conventional fixed route and demand-responsive transit systems. In the UCTC funded research we investigate (1) the acceptability of the system to public and private transit agencies, (2) acceptability to operators, primarily drivers; and (3) the responses from potential travelers. **Key Words:** transit, advanced transit technologies, simulation, demand

**Work Completed to Date:** We have developed descriptive material for use in discussions with operators and travelers and have begun to design survey approaches and instruments for the study.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

## **Incorporating Seismic Risk Considerations in Transportation Infrastructure Management**

### **Principal Investigator:**

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**Abstract:** The objective of this research is to incorporate seismic hazard and risk analysis considerations, which are concerned with the occurrence of earthquakes and the vulnerability of structures, into transportation infrastructure management systems, with an emphasis on bridges. This will require developing a decision model for optimizing bridge MR&R policies that takes into account the occurrence of earthquake events. This model is not meant to be very detailed or comprehensive, but rather to allow us to obtain qualitative implications of including seismic considerations in Bridge Management Systems. Seed funding for this research will allow us to develop a case study design and initiate 1-2 case studies. We expect to find that accounting for the probability of earthquake occurrence in a bridge MR&R decision-making model will have a significant impact on the probability distribution of the bridge condition-state, the optimal policies, and their total cost. Possible policy implications from this research may include the need to account explicitly for natural hazard risk considerations, or more generally unexpected events, in the process of managing transportation infrastructure facilities. **Key Words:** seismic hazard, risk analysis, bridge management systems

**Work Completed to Date:** We have reviewed previous work on the topic and begun the process of identifying promising case studies. We also have worked on the model for incorporating seismic risk.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

## **Handheld Travel Survey Technology to Supplement Vehicle Tracking in a Shared-Use Station Car Program**

### **Principal Investigator:**

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**Abstract:** An experimental shared-use station car program using electric vehicles is being implemented in association with several public and private sector organizations in Irvine, CA. The goal of this program is to demonstrate the potential of linking shared-use electric vehicles with conventional line-haul public transit services to provide automobile-like accessibility at the ends of the commute trip. GPS-based in-vehicle tracking technologies are being utilized with web-based travel surveys to determine how participants schedule activities before and after shared-use vehicles become a travel option. In this project we supplement the survey research using a GPS-based handheld device to track travel and activity when not using program vehicles. The handheld device continuously records and stores spatial position, and dumps the data via a wireless link to the in-vehicle device when completing activities. In conjunction with current program technologies and as a stand-alone technology, the handheld technology will be assessed relative to its efficacy in the acquisition of comprehensive data on daily travel and activities, while minimizing user effort and inconvenience. These devices will also be evaluated as a means of providing remote access to reservation systems and as keyless access to program vehicles. **Key Words:** travel surveys, new technologies, GPS

**Work Completed to Date:** The basic experiment is underway; the GPS hand-held technologies are being added to the ongoing work.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$53,659

## **An Input-Output Analysis of the Relationships between Communications and Travel for Industry**

### **Principal Investigator:**

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**Abstract:** Numerous public policies have been promulgated on the assumption that telecommunications will be a useful trip reduction instrument. However, many scholars have suggested that the predominant effect of telecommunications may be complementarity – increasing travel. Although short-term, disaggregate studies of single applications such as telecommuting have tended to find a substitution effect, more comprehensive studies, on the aggregate scale, are needed. One of the few such studies used input-output analysis to examine relationships between transportation and communication input intensities across 44 industry classes in Europe for 1980, and found strong evidence of complementarity. The present study would apply a similar methodology to the input-output accounts for the US across multiple points in time (at least 1982, 1987, 1992, 1996, 1997, 1998). This important extension would permit analysis both of industry-specific differences in the relationships of interest, and of how those relationships change over time (e.g. with the increasing adoption of the Internet and other telecommunication technologies). The result will be a more informed view of the extent to which it is realistic to expect telecommunications to substitute for travel, at least in the industrial context, which constitutes a sizable proportion of the total demand for telecommunications and transportation. **Key Words:** telecommunications, industrial development, input-output analysis

**Work Completed to Date:** Previous work on the topic has been reviewed in detail. Data available for a US comparison are being assembled and reviewed, after which model estimation will occur.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$59,200

## **Car Ownership, Insurance Premiums and Employment Outcomes**

### **Principal Investigator:**

Paul Ong  
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**Abstract:** This study examines the interaction between car ownership, automobile insurance premiums, and employment outcomes, with a focus on disadvantaged populations and neighborhoods. The existing literature indicates that car ownership has an impact on improving employment outcomes, but appropriate methods must be used to account for simultaneity. Minorities face both a “spatial mismatch” and a “transportation mismatch” that limit their opportunities. The central hypothesis is that a higher cost of ownership due to insurance “red lining” lowers car ownership, which in turn adversely affects employment. **Key Words:** car ownership, auto insurance, low income / minority households

**Work Completed to Date:** A review of the literature has been conducted and data on insurance costs is being assembled.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

**Public Transit Systems and the Residential Location Choices of Minority and Transit-Dependent Households Seed Grant**

<b>Principal Investigator:</b> John M. Quigley Dept. of Public Policy 2607 Hearst Avenue University of California Berkeley, CA 94720 Tel. 510-642-4670 <b>Email:</b> <a href="mailto:quigley@econ.berkeley.edu">quigley@econ.berkeley.edu</a>	<b>Other Key Participants:</b> Steven P. Raphael University of California Berkeley, CA 94720 <b>Email:</b> <a href="mailto:raphael@socrates.berkeley.edu">raphael@socrates.berkeley.edu</a>
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**Abstract:** In this project, we analyze the impact of several recent extensions of the Bay Area Rapid Transit (BART) system on the residential location choices of minority households and other households that are particularly dependent on public transit. We compare before-after changes in the resident populations of census tracts serviced by the new stations to similar changes in comparable areas located in the region's suburbs but located far from the new stations. Data from the 1990 and 2000 U.S. census will be used to measure population change. We will: (1) characterize the distance between each census tract in the East Bay suburbs to each of the three new BART stations, e.g., physical distance between the centroids of each tract and the nearest station, or commute time estimates between each tract and the nearest station, and (2) construct a merged data set at the census tract level describing the residential populations of each for 1980, 1990, and 2000. This data set will be constructed using 1990 tract definitions (and will require some imputation of 1980 variables). This data set will be used to construct the dependent variables, measures of population change, as well as to construct a set of variables from the 1980 and 1990 data describing initial conditions. **Key Words:** residential location, transit impacts, minority households

**Work Completed to Date:** Data have been assembled and data merging is well underway, as is the construction of variables.

**Papers to Date:**  
None

**Conferences Attended:**  
None

**Other Accomplishments:**  
None

**Percent Complete:** 45%

**Direct Cost:** \$10,752

## **Unlimited Access to Work: An Evaluation of Employer-Based Transit Programs**

### **Principal Investigator:**

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**Abstract:** Transit agencies have found a new way to increase ridership: offer transit-pass programs that cater to specific user groups. In these programs, a group purchases the right for all its members to ride public transit without paying a fare. Because all members of the group can ride free, they ride public transit more often. We refer to these programs collectively as Unlimited Access. Unlimited Access programs have been developed for the university, the workplace, and the home. Previous research has examined university programs, and has shown that they increase transit ridership, reduce vehicle travel, reduce parking demand, and increase transit riders' incomes. The largest potential market for Unlimited Access is for workplace transit programs, but there have been few studies of these programs. We examine these workplace programs and: 1) explain how the programs work, 2) examine the programs' effects on employee transit ridership, vehicle travel, and parking demand, 3) analyze the programs' effects on transit agency performance, 4) calculate the programs' costs and benefits, and 5) recommend best practice guidelines. Unlimited Access appears to be a promising innovation with great potential, and we will evaluate its potential benefits for employers, transit agencies, and society. **Key Words:** transit fares, transit pass, commuting

**Work Completed to Date:** Employer-based programs have been identified and reviewed, and detailed design of the evaluation approach has been carried out. Data collection is underway.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$54,827

## The Effects of Contracting for Service on the Cost-Efficiency of Fixed-Route Bus Transit in the U.S.

<b>Principal Investigator:</b> Brian Taylor SPPSR University of California, Los Angeles Box 951656, 5383 Public Policy Bldg. Los Angeles, CA 90095-1656 310-825-7442 Email: <a href="mailto:btaylor@ucla.edu">btaylor@ucla.edu</a>	<b>Other Key Participants:</b> Martin Wachs Dept. of Civil and Environmental Engineering 110 McLaughlin Hall University of California Berkeley, CA 94720-1712 Email: <a href="mailto:mwachs@uclink.berkeley.edu">mwachs@uclink.berkeley.edu</a>
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**Abstract:** This study examines the economic effects of contracting for fixed-route bus service. Previous research has examined whether contracting for bus service has reduced costs; our focus is on how contracting affects cost-efficiency, recognizing that earlier studies don't account for the fact that cost-efficiency problems are likely to motivate transit systems to contract for service in the first place. To account for such causality questions, we will use advanced regression analysis methods on a rich, new merged cross-sectional data set to examine the influence of contracting for transit service cost-efficiency. The merged data set for this study will be drawn primarily from two sources: (1) the National Transit Database maintained by the FTA and 2) a transit service contracting database compiled from a recent Transportation Research Board survey of transit agencies nationwide. **Key Words:** transit, contracting, costs, efficiency

**Work Completed to Date:** Data sets have been assembled and analysis is underway.

**Papers to Date:**

None

**Conferences Attended:**

None

**Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

## Exploring the Marketability of Fuel-Cell Electric Vehicles

<b>Principal Investigator:</b> Thomas Turrentine Institute of Transportation Studies University of California, Davis Davis, CA 95616 530-752-6500 <b>Email:</b>	<b>Other Key Participants:</b> Kenneth Kurani Institute of Transportation Studies University of California, Davis Davis, CA 95616 <b>Email:</b> <a href="mailto:knkurani@ucdavis.edu">knkurani@ucdavis.edu</a>
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**Abstract:** Fuel-cell vehicles (FCVs) promise to reduced greenhouse gases and criteria pollutants, as well as improve fuel efficiency for light-duty motor vehicles. But lack of a developed “green-car” market and uncertainty that such a market is possible has limited industry and government commitment to current green car technologies. We take two first steps in market research for FCVs: 1. A FCV focused review of recent research on consumer response to refueling range, fuel types, social benefits, and fuel distribution; 2. A design and pilot test of custom interactive stated-preference methods for FCV markets with a sample of vehicle owners who currently use and understand in-vehicle power plants—such as RV owners and small businesses who carry generators. **Key Words:** fuel cells, market research, stated preference surveys

**Work Completed to Date:** Review of previous research has been completed and design of survey instruments is well underway.

**Papers to Date:**

None

**Conferences Attended:**

None

**Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

## **Experimental and Theoretical Investigations on Traffic Flow at Highway Merges**

### **Principal Investigator:**

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**Abstract:** In this project, we gather and analyze empirical data at merge sites to study the possible combinations of stationary states at merges. To get a clearer picture of the underlying relations between stationary states at merges, we study isolated merges, especially those without the presence of significant immediate upstream/downstream diverges, so as to avoid the complications arising from interactions between merges and diverges. We examine a number of data sources to find such merges with usable data, such as the PEMS database, the Berkeley Highway Lab database, the Toronto QEW database. Our study will identify, from a large amount of data collected at certain merges, all possible combinations of stationary states existing in these merges. Stationary states will be categorized into recurrent and non-recurrent, according to whether they appear from day to day or not. Besides stationary states in congested peak hours, we will also be interested in those in free flow. The findings of this study would help further investigations on merge traffic dynamics, and its implications to traffic management and control. **Key Words:** transit fares, transit pass, commuting

**Work Completed to Date:** Previous work on the topic has been reviewed. We have been examining data sets and extracting usable data, with preliminary analyses carried out as we go.

### **Papers to Date:**

None

### **Conferences Attended:**

None

### **Other Accomplishments:**

None

**Percent Complete:** 45%

**Direct Cost:** \$15,000

### C. Project Financial Status

It is the UCTC's longstanding policy to commit all funds received from our sponsors, the US Department of Transportation and the California Department of Transportation, in the year that they are received. Occasionally funds are not fully expended in the year received; in such cases the funds may be carried over into the next fiscal year with the permission of the UCTC Director, but remain committed to the categories to which they were initially allotted.

Our report is based on 2002-2003 program allotments using 2002-2003 funds received. Allocated amounts differ in some cases from amounts initially budgeted because of changes in salaries or expense items, or reallocations of administrative budget amounts to research and technology transfer accounts.

**Table 4. Allocated Amounts as of February 2003  
University Transportation Centers Program**

**Grantee: University of California  
Grant Year: Aug. 1, 2002 - July 31, 2003 (Year 15)**

ITEM	BUDGET
Center Director Salary	65,000
Faculty Salaries	92,875
Administrative Staff Salaries	47,000
Other Staff Salaries	69,000
Student Salaries	227,447
Staff Benefits	53,070
Total Salaries and Benefits	554,392
Scholarships	902,014
Permanent Equipment	5,000
Expendable Property & Supplies	21,422
Domestic Travel	44,200
Foreign Travel	0
Other Direct Costs (Specify)	266,572
Total Direct Costs	1,793,600
Facilities & Admin. (Indirect) Costs	39,000
TOTAL COSTS	1,832,600
Federal Share	916,300
Matching Share	916,300
TOTAL AVAILABLE FUNDS YR. 15	1,832,600