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Author
Shaheen, Susan

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CALIFORNIA PATH RESEARCH REPORT

UCD-ITS-RP-03-9

October 2003

By

Susan A. Shaheen, Ph.D.

with

Caroline Rodier, Ph.D.

and

Rachel S. Finson

Institute of Transportation Studies
One Shields Avenue
University of California
Davis, California 95616
Tel: 530-752-0247 Fax: 530-752-6572
http://www.its.ucdavis.edu/
email: itspublications@ucdavis.edu

CALIFORNIA PATH PROGRAM
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Final Report for Task Order 4302

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CALIFORNIA PATH PROGRAM
INSTITUTE OF TRANSPORTATION STUDIES
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Smart Mobility Model:
A Case Study of the University of California & Davis Region

Final Report MOU 4302

Susan A. Shaheen, Ph.D.
Policy & Behavioral Research, Program Leader, California PATH
Innovative Mobility Research, Director, California Center for Innovative Transportation
2105 Bancroft Way, Third Floor, MS 3830; Berkeley, CA 94720-3830
510-642-5059 (O); 510-642-0910 (F); E-mail: sashaheen@path.berkeley.edu

Caroline J. Rodier, Ph.D.
Innovative Mobility Research, Post-Doctoral Researcher
California Center for Innovative Transportation
2105 Bancroft Way, Third Floor, MS 3830; Berkeley, CA 94720-3830
510-642-5079 (O); 510-642-0910 (F); E-mail: cjrodier@path.berkeley.edu

Rachel S. Finson
Research Specialist, Innovative Mobility Research
California Center for Innovative Transportation
2105 Bancroft Way, Third Floor, MS 3830; Berkeley, CA 94720-3830
510-642-5 (O); 510-642-0910 (F); E-mail: rfinson@path.berkeley.edu

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I. Introduction

The goal of the Smart Mobility Model project was to optimize individual mobility options through improved connectivity among modes, enhanced techniques to link land-use planning and transportation system design, advanced information technologies, and clean-fuel vehicles. The California PATH/Caltrans partnership with the University of California, Davis (UC Davis) was initiated after campus planners expressed interest in learning how innovative mobility services and technologies (such as carsharing and smart parking management) might help to alleviate the transportation impacts of a campus expansion, expected to result in the arrival of more than 9,000 additional students, staff, and faculty in the coming decade. The campus is in the midst of a multi-year process to approve a Long Range Development Plan (LRDP) that will guide all aspects of this expansion. The study also focused on residents and impacts on Davis and the surrounding region.

Additional project supporters included: UC Davis Office of Resource Management and Planning, UC Davis Student Housing, and UC Davis Transportation and Parking Services. The UC Davis Institute for Transportation Studies was also a project partner.

This report reflects analyses completed under Memorandum of Understanding (MOU) 4144 and 4302 and the UC Davis campus survey. This report includes the following sections:

- The UC Davis campus-planning environment including a description of the campus long-range development plan.
- A summary of innovative mobility options and their potential opportunities and barriers associated in the context of the campus-planning environment.
- Focus group results, reflecting response of UC Davis participants to a range of innovative mobility options.
- A simulation analysis of innovative mobility options favored by focus group participants to estimate potential future reductions in auto travel and emissions as well as increases in net economic benefits.
- A summary of the results of the UC Davis Travel Survey to assess current travel patterns and needs.
- A narrowed list of innovative mobility options that reflect the results of the focus groups, simulation study, and survey.
- Conclusions about the need for innovative mobility services in the community and near term prospects.

II. Campus Planning Environment

The purpose of this project phase was to gain a stronger understanding of the campus-planning environment and to define roles, timelines, working relationships and lines of communication for the remainder of the Smart Mobility Model project. The following five tables summarize findings.

Table 1: Smart Mobility Advisory Team documents the roles and responsibilities of the project steering committee. This group met monthly From November 2001 through November 2002. (Please see Appendix A for meeting agendas and summaries.)

Table 1: Smart Mobility Advisory Team

Smart Mobility Project Advisory Team		
Name	**Affiliation**	**Project Role**
Cliff Contreras	Director, UC Davis Transportation and Parking Services	Advisory Team participant. Link to broader campus transportation and planning committees.
Ann Davies-Nesbitt	Alternative Transportation Coordinator, UC Davis Transportation and Parking Services & Board Member, Yolo Transportation Management Association	Advisory Team participant. Active in identifying transportation areas on campus that might be amenable to innovative solutions. Liaison with Yolo Transportation Management Association (TMA).
Matt Dulcich	Associate Planner, Office of Resource Management and Planning	Advisory Team participant. Smart Mobility Model Project liaison to the Office of Resource Management and Planning. Campus representative for campus survey planning and execution.
Karl Mohr	Associate Director, Public and Private Partnerships, Office of Resource Management and Planning	Advisory Team participant. Smart Mobility Model project liaison to the Long Range Development Plan and environmental planning.
Pat Kearny	Director, Student Housing (now retired)	Advisory Team participant. Retired mid-way through the project.
Ramona Clark	Manager, Privatized Housing, Student Housing	Advisory Team participant. Smart Mobility liaison to campus Student Housing.
Anthony Palmere	Assistant General Manager, Unitrans	Advisory Team participant. Taught a class on transit options for the LRDP and the Neighborhood Master Plan.

Nancy Chinlund	Caltrans Headquarters	Advisory Team participant. Represented Caltrans' interests. Left Advisory Team due to changing responsibilities within Caltrans.
Lea Rees	Caltrans Headquarters student intern	Advisory Team Participant. Frequently attended meetings with Nancy Chinlund.
Bruce De Terra	Caltrans, District III	Briefly participated on Advisory Team.
Katie Eastham	Caltrans, District III	Briefly participated on Advisory Team.
Gabriel Corely	Caltrans, District III	Last District III Advisory Team participant.
Susan Shaheen	Partners for Advanced Transit and Highways. Program Leader, Policy & Behavioral Research	Principal Investigator
Caroline Rodier	UC-Davis Institute for Transportation Studies and Post-Doctoral Research, CCIT, UC Berkeley	Principal Investigator. Responsible for all modeling and survey planning and implementation.
Rachel Finson	Research Specialist, CCIT, UC Berkeley	Project Manager

Table 2, below, lists other UC Davis Campus affiliations with the project.

Table 2: UC Davis Affiliations

Other Campus Players		
Name/Position	**Affiliation**	**Relation to Project**
Bob Segar	Assistant Vice Chancellor, Office of Resource Management and Planning	Project sponsor
Ed English	Environmental Planner, LRDP	Project associate
Jack Harris	Manager, Fleet Services	Consulted on feasibility of proposed projects.
Marge Dickenson	Assistant Vice Chancellor, Government and Community Relations	Project associate and offered to assist with relations between the project and the City of Davis.
Dan Sperling	Director, Institute of Transportation Studies	Project associate
Joe Krovoza	Development Director, Institute of Transportation Studies	Project associate

Table 3, below, provides project affiliates in the Davis area.

Table 3: Davis Area Affiliations

Davis Area Affiliations		
Name	**Affiliation**	**Relation to Project**
Bill Fairbairn	Executive Director, Yolo Transportation Management Association	Project associate
Willa Pettagrove	City of Davis Alternative Fuel Committee Chair	Project associate
Jamie Knapp	City of Davis Alternative Fuel Committee participant. Active Davis Citizen.	Project associate
Yolo Carsharing	Grassroots attempt to start carsharing in Davis.	Project associate

Table 4, below, lists Sacramento area affiliations. Although the focus of this project was primarily on the UC Davis campus, some of the potential demonstration projects explored—such as carsharing—would benefit from a strong linkage with the Sacramento region. While some projects may have benefited from the campus atmosphere and small town feel of the City of Davis, others required greater scale to attract business partners.

Table 4: Sacramento Area Affiliations

Sacramento Area Affiliations		
Name/Position	**Affiliation**	**Relation to Project**
Dwight McCurdy	SMUD	Project associate. Host of monthly carsharing lunch discussions.
Bill Warf	SMUD	Project associate. Host of monthly carsharing lunch discussions.
David Shabazian	Associate Planner SACOG	Project associate
Martin Tuttle	Executive Director, SACOG	Meeting to discuss possible synergies between Smart Mobility project and SACOG land-use community project.
Jody Lonegan	Caltrans District 3	Meeting to discuss possible synergies between Smart Mobility project and District 3 goals.

Jeff Weir	CARB	Project associate
Rebecca Garrison	Executive Director, Corridor 50 TMA	Project associate. Participated in TMA tour and discussion of possible joint projects.
Rhonda Abell	Executive Director, North Natomas TMA	Project associate. Participated in TMA tour and discussion of possible joint projects.
Debbie Maus	Executive Director, South Natomas TMA	Project associate. Participated in TMA tour and discussion of possible joint projects.
Marilyn Bryant	Executive Director, Downtown Sacramento TMA	Project associate. Discussion of downtown carsharing program.
Sarah Fodge	Executive Director Power Inn TMA	Project associate. Participated in TMA tour and discussion of possible joint projects.
Marie Collins	UC Medical Center Fleets Manager	Project associate. Provided tour of UC Medical Center in GEM neighborhood electric vehicle.

Finally, Table 5, below, lists the private sector innovators with whom PATH researchers explored interest in possible Davis area pilot demonstration projects.

Table 5: Private Sector Innovators and Ideas

Possible Technology Partners ***(Technologies are described in project Part Two discussion below)***		
Name	**Affiliation**	**Relation to Project**
Lawrence Avidan	Mobious Traffic Technologies	Wanted to implement OmniTaxi "sign-post" mobility system to enhance taxi service and reduce single occupancy vehicle travel.
Matt Dailida	Segway, LLC	Potential to test the Segway Human Transporter in mobility service context (shared-use vehicle system) along with GEM neighborhood electric vehicles.
Dan Sturges	Representative of Global Electric Motorcars, LLC	Possible donation of 75 GEM neighborhood electric vehicles for proposed shared-use vehicle system pilot project.
Gower Smith Philippe Violette	Zoom systems	High-end vending machines. Interested in placing one to two Zoom vending machines in campus setting to test market and travel impacts.
Rick Warner	Acme Innovation	Intelligent parking management system to inform drivers of space availability and better utilize parking resources.
Hans-Henning Judek and Marc Hagan	The Grando Corporation	North American representatives of an automated parking structure with a spiral lift to maximize parking space utility.
Dan Kirshner	Environmental Defense, Dynamic Ridesharing	Use of the internet and cell phones for real-time ride matching.
Daniel Luke and CashCar system tested in Germany	Private Entrepreneur, Personal Vehicle Sharing	A twist on carsharing, where the carsharing organization acts as a broker between private car owners and car users.

Steve Raney	Carpool Assistant	Use of internet and personal digital assistants to assist carpoolers in planning and maintaining schedules.
German contacts	Carfree Neighborhoods/One-Car Households	Limited car ownership/parking plan, which could be pursued in conjunction with the LRDP Neighborhood Master Plan.

Campus Long Range Development Plan

The purpose of the UC Davis Long Range Development Plan (LRDP) is to create a plan for how the campus will accommodate an additional 6,600 students and 2,500 faculty and staff by the 2015-16 academic year, compared to the 1999-2000 academic year. The additional growth is mandated as part of an overall expansion of 60,000 students that the University of California is expecting beyond 1999-2000 enrollment levels. The LRDP creates a physical framework to accommodate projected growth.

The first year of the UC Davis LRDP process began in October 2000. During this first year, campus planners focused on defining growth needs and establishing parameters for how to address identified needs. The second year of the process, beginning in fall 2001, was devoted to developing and refining options to address the identified growth needs. Numerous public workshops were held during this timeframe, and the LRDP underwent multiple revisions. In the final year, beginning fall 2002, campus planners planned to refine the LRDP, complete the environmental impact report, and other technical analysis. The campus anticipates presenting a recommended LRDP to the UC Regents for approval in November 2003.

A unique feature of the LRDP, and of primary interest to the Smart Mobility Model research team, is the Neighborhood Master Plan (NMP). The current campus policy is to house 25 percent of students on campus. The remaining students and virtually all faculty and staff live in Davis or the surrounding area. Currently approximately 90 percent of the students, 70 percent of faculty, and 40 percent of staff live within the immediate Davis community, including those on campus. One of the goals of the LRDP is to maintain a strong campus community. Unless significant additional housing is built in the City of Davis, or on campus, many more students, staff, and faculty will be forced to move out of the immediate Davis region, thus weakening the strong sense of community that campus and city residents highly value. To prevent this, the LRDP includes the development of a Neighborhood Master Plan (NMP). The NMP is unique in that the campus has proposed to develop a community immediately adjacent to campus (on property already owned by the campus) to house students, staff, and faculty in affordable apartments and houses. The NMP calls for a denser, pedestrian and transit-friendly design.

The transportation proposal for the NMP includes a transit green through the middle of the development. The transit green would provide pedestrian and bicycle facilities in addition to a dedicated bus rapid transit lane. All housing would be within 1/4 mile of the transit green, and private cars would not be allowed on the transit green. To discourage

residents of the NMP from driving to campus, they would generally be unable to purchase on-campus parking permits.

The proposed NMP with transit-oriented development and denser housing offers significant opportunities for innovative mobility solutions and garnered significant interest of the project researchers. Although the timeline for the NMP (breaking ground in 2005) is beyond the timeframe of this project, many of the innovations that were evaluated could be well suited to this setting. These include carsharing, smart parking management, car free or one-car housing, advanced vending machines, shared-use neighborhood electric vehicles and shared-use Segway Human Transporters. Each of these options is discussed in more detail in the next section.

For further information on the LRDP see: http://www.ucdavislrdp.org/.

III. Summarize Mobility Opportunities

During 2002, project researchers evaluated a range of innovative transportation ideas and technologies for potential application to the UC Davis Campus with special consideration to the Long-Range Development Plan and the Neighborhood Master Plan. The overarching goal was to improve transportation on the campus and between campus and the community. Four categories of options to enhance innovative mobility were evaluated. These options included: 1) Innovative Mobility, 2) Access, 3) Information, and 4) Parking Management.

Innovative Mobility: The provision of a variety of modes for individuals to choose from when planning a trip can greatly enhance accessibility. These modes may include an automobile for some trips, public transit, bicycles, electric bikes, small electric cars, e-commerce, smart shuttles, or similar low-speed mode for other trips. An innovative mobility service would enable users to evaluate cost, convenience, and impacts before making a modal choice. Results could include reduced negative environmental impacts, improved social connectivity, better resource utilization, and a high degree of user (consumer) satisfaction.

Access: Improved access minimizes the separation between people and the goods, services, and activities they desire. Mixed-use neighborhoods, where residential dwellings and commercial buildings are in close proximity to each other, are a classic example of improved access. Internet shopping is another means to increase access to goods and services without requiring additional mobility.

Information: Instant access to information and the ability to be connected at almost any time from almost any location is a recent phenomenon. Cell phones and wireless technology can alter how we think about transportation and mobility. In the context of innovative mobility, real-time information is critical to making alternative modes competitive with the single occupancy vehicle. Real-time information can provide time sensitive information about routes, transit schedules, and even other people's schedules. Communication allows a degree of flexibility not traditionally associated with alternative

modes. Together instant access to information and communication can be used to bundle modes together to facilitate “door-to-door” mobility services.

Parking Management: The goal of smart parking management is to apply advanced technologies to help direct drivers efficiently to available parking spaces, reducing driver frustration and congestion on highways and arterial streets. Advanced payment allows for seamless parking transactions and enhanced efficiency. Smart parking approaches range from dynamic displays on roadway signs informing drivers of location and parking lot capacity, to the use of the internet, and cell phones—providing space availability, location, pricing information, and reservations. Smart parking can make better use of existing parking infrastructure by creating market-based systems to improve utilization rates and manage vehicle throughput.

Researchers considered synergies among the options, compatibility with current campus infrastructure, costs, barriers, and beneficial impacts. Following is a brief description of each of the options (as listed in Table 5 above).

Omni Taxi (Innovative Mobility):
Omni Taxi is a concept developed by Mobious Traffic Technologies based in Sausalito, California, to facilitate taxi-sharing on an ad hoc basis. A typical fleet of taxis would be deployed with sophisticated metering capability to track the fares for multiple riders with different origins and destinations. The purpose is to offer the same door-to-door service that taxis currently provide with more passengers and at a lower cost per passenger. Omni Taxi believes this would provide a substitute for private automobiles, which is cost and time competitive, and would encourage more people to use shared taxis more frequently.

The mechanism for identifying shared-use taxis would be a series of sign-posts installed throughout a city, each numbered in a consecutive fashion. Taxi drivers would inform dispatch of their location using sign-post numbers or they might be tracked via GPS. If a person wanted a taxi, they would call dispatch and provide the number of the nearest sign-post (trip origin) and the desired location (trip destination). Omni taxi dispatch would locate the trip destination and the nearest sign-post number. Dispatch would call the taxi whose current origin and destination most closely match that of the new customer. This taxi would pick up the new passenger, start a separate meter and deliver both passengers to their destinations. Taxis would not be allowed to deviate from their original route by more than a small amount to pick up or drop off a new customer.

Innovative Mobility Research evaluated this concept within the context of UC Davis Campus and the City of Davis. The barriers to pilot demonstration or full implementation appear challenging and the potential benefits limited.

Benefits include:

1) The service could potentially replace some single occupancy vehicle trips with shared-use taxi vehicles.

2) While the project would require the taxi drivers and dispatch staff to learn how to operate a new service, the passengers would not necessarily have to use advanced technologies. For many this could lower barriers to use, for instance, internet access would not be necessary.
3) There would be little risk or commitment for the user (passenger) beyond immediate ride.
4) Customers may also begin to use other alternative modes, as well, such as biking, walking, and carpooling (i.e., the experience of variable vehicle use costs versus fixed vehicle ownership costs).

Barriers include:

1) It would be necessary to work with the campus, city, and citizens to install signposts throughout the entire city and campus. There may be potential resistance from residents because signposts may be perceived as unwanted street pollution and even present a safety hazard.
2) The taxi industry has a very strong lobby and may resist Omni Taxi (at least initially).
3) The City of Davis does not appear to have the density to initially support a shared-use taxi service.
4) Passengers may resist driving even a small distance away from the quickest route to share a ride with another.
5) Taxi riders may resist sharing their taxi space with strangers.
6) Pilot demonstration (i.e., limited deployment and controlled user group) would not likely lead to viable business since the concept relies on broad geographic scale, high population density, and a high number of users.

Segway Human Transporter (Innovative Mobility):

The Segway Human Transporter (HT) is an electric mobility device for individual travel over short distances. The operator stands upright on the Segway HT and "steers" it, utilizing hand controls and weight distribution. The Segway HT is easy to operate, recharges from a standard 110 outlet and requires minimal storage space.

The Innovative Mobility Research group of the California Center for Innovative Transportation (CCIT) has developed a joint project with the California Department of Transportation (Caltrans), Segway LLC, and the Bay Area Rapid Transit (BART) District. The goal of this project is to evaluate safety issues pertaining to the use of low-speed modes, including the Segway HT, e-bikes, and bikes, on sidewalks and to test the utility of low-speed modes as a shared-use mobility device to enhance transit station access and for employees of businesses surrounding a suburban BART station to use during the day for errands.

Research staff investigated the use of the Segway HT within the context of the UC Davis campus and the Long Range Development Plan. In the campus setting, the goal of a Segway HT shared-use pilot demonstration project would be to capture trips that may otherwise have been taken in automobiles. A challenge to bringing the Segway HT to the

UC Davis campus may be designing a program that did not shift bicycle riders and pedestrians onto the Segway HT and conflict with bikes and pedestrians on campus roads and paths. Focus groups indicated concern about the Segway HT conflicting with bikes and pedestrians on existing paths. The Segway HT could be ideal for short trips around campus and between campus and the City of Davis. Preferably, the Segway HT would be deployed in a context that would reduce single occupancy vehicles arriving on campus and encourage greater use of buses and Amtrak. For example, the Segway HT could offer an ideal mobility solution for covering the distance between the Amtrak station and campus (e.g., for those individuals who do not have access to a bicycle or whose work attire is not amenable to bike riding).

Research staff recommended testing the Segway HT as part of a shared-use vehicle GEM neighborhood electric vehicle pilot demonstration (see below). However, significant questions about safety and interactions between the Segway HT and surrounding pedestrians and other sidewalk users must be evaluated before deployment. (Innovative Mobility Research program staff is currently evaluating safety and institutional issues pertaining to the Segway HT under a separate agreement with Caltrans, Segway LLC, and the BART District.)

Benefits include:

1) The Segway HT may potentially reduce some single occupancy vehicle trips.
2) It is considered to be leading edge technology and is exciting to many.
3) For those not able or interested in biking (e.g., dress or disability), the Segway HT may provide an alternative mode for short distance trips, which dominate campus travel.
4) The Segway HT may be an ideal technology to enhance connectivity in the city and on campus.

Barriers include:

1) Training and education would be required to ensure that students and other users understand the Segway HT is not a toy.
2) There may be conflicts with bicycles and pedestrians on campus roads and paths.
3) It would be necessary to secure approval from the City of Davis to allow the Segway HT on city sidewalks. Despite recent motions to the Davis City Council, Segway HTs have not been banned from sidewalks or other infrastructure.
4) Rain and other inclement weather may be a barrier to use.
5) Safety issues surrounding the Segway HTs are not well understood.

<u>GEM Neighborhood Electric Vehicles (Innovative Mobility & Information)</u>:

Neighborhood Electric Vehicles (NEVs) are small electric vehicles that are approved to drive on roads of 35 miles per hour or less. GEM, a subsidiary of DaimlerChrysler, expressed an interest in working with the Innovative Mobility Research group of CCIT and the Smart Mobility Model project to deploy a large number of GEM NEVs. GEM

had two levels of market interest in Davis. First, they wanted to sell 25 of GEMs to Davis city residents at very low cost and to form a GEM user group to gain feedback from the users about their vehicle experience. Second, GEM offered to donate 50 of the vehicles to the UC Davis campus for the Smart Mobility Model project to be deployed in a shared-use setting.

Both the campus and project research staff were excited about this prospect. Research staff investigated different options for placing the vehicles into a carsharing system to test consumer education and choice pertaining to low-speed electric vehicles. Transportation and Parking Services at UC Davis agreed to designate premium parking for the shared-use GEMs. Since the campus was not able to operate this carsharing system, initial discussions were held to bring in an outside operator. Although project staff explored the idea of GEM donating the vehicles to an outside operator, GEM was not comfortable making a donation to a commercial carsharing vendor.

Research staff also worked with a graduate student class at UC Davis (taught by Patrick Conroy) to investigate use and marketing of GEMs in the City of Davis. The class assessed the ability of GEMs to use public roadways in Davis and found that almost all roads were less than 35 miles per hour, the legal upper limit for NEVs. Thus, there were few roadway barriers to driving vehicles around the Davis community. The class also scouted for parking and recharging spaces for the GEMs that would not reduce conventional vehicle parking. These spaces were called "NEV nooks," a term coined by the City of Davis Alternative Fuels Committee. This parking analysis revealed that there were a number of locations in downtown Davis where NEV nooks could be created that would not obstruct existing flow of traffic or safety. Finally, the class evaluated the use of the Amtrak station to act as the transit anchor for a "CarLink style" carsharing system (i.e., a carsharing system directly linked to transit) using the GEMs. The "last mile" link between the campus and the train station has been difficult for the campus in encouraging more staff and faculty to use the train for their commute to work and the use of GEMs (and later Segway HTs) could have provided such a solution.

Although all the indications were positive for this project, and it appeared to meet both the research requirements for the Smart Mobility project and UC Davis identified mobility needs, the project was not able to proceed because the issue of a recipient/operator for the GEM donation to a carsharing fleet was not resolved. Furthermore, affordable insurance for students under the age of 21 was also a potential barrier, but this was not pursued further as a vehicle donation was not made to the campus.

Zoom Systems (Access):

Zoom Systems are advanced technology, smart vending machines that have the ability to serve customers with a wide range of products. Unlike traditional vending, which is typically associated with low value cash purchases—primarily snacks and beverages—Zoom Systems focuses on developing a channel for general merchandize of both high- and low-value products. Zoom e-Stores include a touch screen merchandizing

and selection system to help consumers easily select and obtain products, even those that typically require sales assistance in a traditional retail store. A variety of electronic payment options ensure secure and convenient transactions. Smart sensors and remote monitoring of inventory and technical alerts ensure operational and supply chain efficiencies. The Zoom e-Store System includes remote management and data collection capabilities. This back-end solution gathers real-time data from the e-Stores, records sales, and system status. Inventory in each e-Store is tracked remotely and re-stock alerts and other status report can be generated when necessary. (See www.zoomsystems.com for more information.)

Zoom had not yet entered the college market and was eager to work with UC Davis and project research staff to test the Zoom System machines in this niche. Smart Mobility Model research staff proposed a joint research project between the UC Davis Campus and Zoom Systems to test the viability of automated e-stores as a means to reduce tripmaking, congestion, and parking circulation. The strategic placement of Zoom System e-Stores on the UC Davis Campus would provide a 24/7 service to students, staff, and faculty at zero cost to campus. During a one-year pilot, researchers proposed to conduct surveys and research to gain a stronger understanding of the impact of e-Stores on travel throughout the campus, the City of Davis, and the broader region. In addition, Zoom Systems had the ability to collect information automatically as well as to query users about product and even transportation mode choice and distance traveled to arrive at the Zoom e-store. Zoom Systems agreed to place and service the machines, assuming all financial risk during the one-year pilot phase of the project. The campus would be responsible for finding a secure location for the vending machines with high visibility and access to a power supply and phone line to operate the machines. At the close of the demonstrated pilot phase, Zoom Systems and the UC Davis campus could (at their discretion) then negotiate a longer-term agreement that might include revenue sharing.

Benefits include:

1) Zoom system access may potentially replace some single occupancy vehicle trips.
2) The technology is leading edge and exciting to many.
3) There would be minimal risk to campus.
4) The system would allow campus to provide freshmen dormitory students, who were not be allowed to bring cars on campus as of September 2002, with another venue for purchasing necessary goods.
5) School supplies and other necessities could be accessed 24/7.
6) Implementation of the system would be relatively easy and low cost (from a research perspective).

Barriers include:

1) Campus was concerned that providing power and phone service might require infrastructure modification.
2) There were other concerns regarding competition with the campus bookstore.

3) The project might conflict with the current campus vending machine operator contract.
4) The machines would need protection from vandalism.

Although the project had significant support from the Smart Mobility Model Advisory team, especially the Director of Transportation and Parking Services, two barriers: 1) conflict with contract between campus and existing vending machine operator, and 2) competition with the bookstore were significant enough that the project was unable to move forward.

ParkingCarma (Parking Management and Information):

ParkingCarma is an entrepreneurial business that uses advanced technology to optimize parking services at locations that are at capacity, such as transit stations. The company was formed in 2002 to address the impact of inefficient parking resources by providing tools to increase efficiency and reduce congestion. Their primary service, ParkingCarma, uses wireless services, mobile phones, the web and in-vehicle communication devices to provide smart, flexible, and efficient solutions for managing parking resources. ParkingCarma continuously analyzes usage data and can provide market-pricing adjustments in real time.

Benefits include:

1) The system could increase the efficiency of parking and reduce the number of vehicles circulating in search of parking.
2) If linked to a transit station where parking is limited, transit use may increase.
3) The system may reduce driver frustration associated with searching for parking spaces.

Barriers include:

1) For UC Davis, the smart transit parking lot application was not available.
2) Students are unlikely to pay for parking services.
3) Innovative Mobility Research is currently testing ParkingCarma in the San Francisco Bay Area and would not be able to test this system in Davis until this pilot demonstration is complete.

Grando Parking Complex (Parking Infrastructure):

The Grando Corporation, based in Larkspur, California, is a licensee for an automated parking garage structure that could fit many more vehicles into the same space than a conventional stacked parking garage. The Grando system uses a spiral track to lift the vehicles and position them in open parking slots. The driver leaves the vehicle at a designated area on the first floor of the structure. The car is lifted to a space and stored until the driver returns. The structure is completely automated with fail-safe, back-up systems.

Benefits include:

1) Grando Corporation was willing to absorb a lot of the costs because they were interested in demonstrating a prototype system to show other prospective customers.
2) Cost per space to build is comparable with conventional stacked parking (e.g., $12,000 per space).
3) The system may reduce driver frustration due to difficulties finding parking.
4) Safety may be improved by removing drivers from cars that are being parked, minimizing exposure to exhaust fumes, and avoiding the risks of walking through an empty parking garage.
5) The land footprint dedicated to parking may be reduced.

Barriers include:

1) There are no successful Grando parking structures worldwide.
2) No operating prototypes imply a high risk to campus.
3) Planning, approval, and environmental impact report (EIR) for new type of stacked garage may be needed.

Dynamic Ridesharing (Information and Mobility):

Dynamic ridesharing attempts to improve upon traditional ride-matching programs, by using the Internet to provide flexible, real-time assistance in identifying ride matches. In a campus setting, students often share rides with friends and use bulletin boards to find riders and drivers. The benefit to campus students of a dynamic ridesharing system is the ability to find and offer rides on a "real-time" basis.

Los Angeles Smart Traveler and Bellevue Smart Traveler are examples of dynamic ridesharing projects that relied on telephone and pagers to assist registered members in offering and finding rides. The Seattle Smart Traveler program tested a dynamic ride matching system employing the Internet and electronic mail at the University of Washington in Seattle between 1995 and 1997. Neither of these systems is currently operating.

More recently, in the Bay Area, the Alameda County Congestion Management Agency, Environmental Defense, Bay Area Rapid Transit District, and Metropolitan Transportation Commission have proposed a project that includes dynamic ridesharing.

Benefits include:

1) The system has a low cost to implement and operate.
2) Campus would be able to assist students (especially freshmen) in finding rides.
3) The system may reduced single occupancy vehicle and increase higher vehicle occupancy travel.

Barriers include:

1) Campus would need to operate the system.
2) In focus groups, students expressed concern about riding with strangers.
3) There are also concerns about operator liability should there be an accident or criminal activity associated with drivers or riders who are "matched" via the system.

Personal Vehicle Sharing (Mobility):

Shared-use vehicle services or carsharing allows customers to use a car only when they need to, without incurring the fixed costs of ownership. Individuals pay just for the time they use the car and the miles they drive. Shared-use vehicles remove the incentive to drive and make the real costs of each car trip more visible (promoting transit use, walking, and bicycling). In a personal vehicle sharing service, a carsharing organization could use private vehicles to supplement their shared-use fleets brokering a relationship between private vehicle owners and potential users who might need a car for a short errand. The private vehicle owners would gain a revenue stream from sharing their car when it is not being used.

Benefits include:

1) There is a potential revenue stream to attract individuals to share their personal vehicles.
2) Better utilization of resources (cars that would otherwise be unused).

Barriers include:

1) High levels of attachment to personal vehicles may make individuals reluctant to place their vehicle into a carsharing system to be used by strangers.
2) It would be necessary to obtain insurance for such a system.
3) This is not a likely option for a university to operate due to liability.

Carpool Assistant (Mobility):

Carpool assist provides another level of communication between carpoolers, allowing more people to carpool in the same vehicle and reducing the stress and worry of whether fellow carpoolers are on time. Using personal digital assistants, the Internet, and telephones, carpool assist reminds riders and drivers of their schedule and allows carpoolers to communicate last minute adjustments in their schedule (for example, someone is five minutes late).

Benefits include:

1) This device can help to improve quality of carpooling/ridematching experience of users, particularly staff and faculty.
2) It could be synergistic with dynamic ridesharing service.

Barriers include:

1) Campus would need to operate the system.
2) There are cost considerations to campus and users.

Car-Free Neighborhoods (Smart Mobility and Growth):

While carfree or one-car housing policies are not innovations that can be tested by the research team, the campus should consider testing this approach in conjunction with the Neighborhood Master Plan (NMP). Policies could range from strict enforcement of a no-car policy, to one-car households, and to simply pricing and selling parking spaces separately from housing. Under this last scenario, homebuyers and renters would need to consider whether they wanted to pay extra to park one or more cars. Such policies would be more effective if there is a range of mobility options for residents, including transit, bicycles, and carsharing. Issues of concern include the impact of these policies on the price and resale of houses and apartment complexes in the NMP, as well as upon nearby neighborhoods where the vehicles of carfree housing residents may be parked (as was found to result from several carfree experiments in Germany). Potential benefits include increased use of transit and other low-speed modes by carfree housing residents. In addition, less land would need to be dedicated to parking and roads. This land could be available for green spaces, bike and pedestrian paths, and even additional housing units.

IV. UC Davis Student, Staff, and Davis Resident Focus Groups

A series of focus groups, including UC Davis students and staff and Davis residents, were conducted to gain deeper understanding of attitudes toward conventional transportation alternatives as well as innovative mobility options. Focus groups are a valuable research tool for exploring relatively new and unstudied areas, such as innovative mobility services. The major advantage of focus groups is the rich insight they provide into the complexities of this new research area. In this study, the focus groups provided a social setting in which people came together to explore larger visions of the Davis community, as they imagine it might be with several innovative transportation services. Focus groups were held with the following target populations:

- First year UC Davis student living in the dormitories,
- Students living in graduate and family housing,
- Students living in the City of Davis,
- Students living outside the City of Davis,
- Staff living in the City of Davis,
- Staff living outside the City of Davis, and
- Residents of the City of Davis working both in the city and commuting outside the city for work.

Focus group participants were recruited through a variety of mechanisms. Flyers were posted throughout the campus and in the City of Davis (for the Davis resident focus group) and placed in staff mailboxes. Short descriptions of the project were placed in the

Campus paper for student and staff focus groups. Davis residents were recruited by placing an ad in the local Davis newspaper and by using the white pages to make random cold calls. These recruitment strategies were successful in obtaining a satisfactory number of participants for all focus groups with the exception of faculty. This group was unresponsive to any recruitment method, and the faculty focus groups were cancelled.

At the beginning of each focus group, participants were given a consent form to sign indicating that they understood their rights as focus group participants. Participants were asked to complete a questionnaire to assist researchers in capturing the basic demographic profile of each group. The questionnaire queried participants about their current transportation modes, their exposure to several innovative mobility ideas, use of some communication technologies, such as cell phones and personal digital assistants (PDAs) (See Appendix B for a focus group questionnaire).

Because many participants had limited to no experience with the innovative mobility options presented in the focus groups, graphic representations of the options were prepared in advance of the focus groups. Five posters were created:

1) Shared-Use Vehicles, including NEVs and Segway HTs;
2) Bus Rapid Transit;
3) E-Stores;
4) Smart Parking, including the use of PDAs, cell phones, and the Internet; and
5) Advanced Information Systems.

The images included in the posters are in Appendix C. All focus group participants were exposed to the same images when they responded to questions about innovative mobility options. The posters proved to be very helpful, not only in the focus groups, but also for the duration of the project, as researchers discussed innovative mobility options with decisionmakers and the public.

Consistent protocols were applied to each focus group (See Appendix B for a sample protocol). Participants were asked to introduce themselves and their current mode of transportation for commute to work and for non-commute trips. Next, participants discussed the positive and negative attributes of conventional transportation modes, such as automobile, bus, train, and biking. During the focus group break, participants were asked to take time to view the five posters that were on the walls (described above) to assist in the discussion of innovative transportation options. As part of the second half of the focus groups, the moderator introduced various concepts including bus rapid transit, e-stores, shared-use vehicles, advanced information systems, smart parking, dynamic ridesharing, neighborhood electric vehicles, and the Segway Human Transporter.

At each focus group, participants were introduced to various innovative mobility solutions and asked to rank their preferred choices. The following is a brief overview of the each focus groups' preferred innovative mobility solutions and current transportation modes. For full summaries of the focus groups see Appendix B.

UC Davis Staff Focus Groups

Two focus groups were held with UC Davis staff. One included staff that lived in the City of Davis and the other was dedicated to staff that commuted to Davis to work.

Staff Living in Davis

Most staff participants, who live in Davis, biked to campus at least two days a week. Some drove alone to work and others carpooled. A few participants took a variety of modes (e.g., carpool and bus or bike and drive). The group indicated that the primary reason for favoring biking over driving to campus was the hassle/cost of car parking. However, many noted the advantages of cars, such as protection against the weather, ability to carry passengers and objects, and overall convenience.

The preferred alternative for this group was carsharing or shared-use vehicle services, including a mixed fleet of vehicles such as Segway HTs, four-door vehicles, sports cars, and pick-up trucks. This innovation was followed by real-time bus stops, although none of the participants reported using the bus as their primary commute mode and only one reported occasional bus use. Among this group, smart parking received no first tier interest, and each of the other alternatives (e-stores, smart shuttles, smart bus stops) elicited only one supporter each.

Staff Commuting to Davis

Most of the UC Davis staff commuting to Davis staff carpooled to work. A couple of drove alone and the rest used a variety of modes including a bus/carpool, bike/shuttle, and a drive/bike/bus mix.

Participants voiced strong dissatisfaction with many aspects of paid parking policies at UC Davis and were most supportive of a smart parking management project. Most expressed that they would like to have the option of reserved, inexpensive, or free parking. According to this focus group most of the spaces reserved for carpools at UC Davis are full by 7:30 AM. Participants also expressed interest in an overflow parking structure with a shuttle to take them to campus. Some suggested including carsharing or shared-use vehicle services with reserved parking on campus, so they could use carsharing vehicles to run errands or get lunch during the day. Not surprisingly, smart parking was ranked the highest, followed by smart shuttles, carsharing, e-stores, and real-time bus stops.

Students Living on Campus Focus Groups

Two focus groups were conducted with students living on campus. The first was for first-year students living in the dorms. These students were the first dorm residents that were not allowed to bring their cars to campus. The second group included students living in family and graduate campus housing.

First-Year Students

Most first-year students reported biking and/or walking on campus and using a combination of biking or carpooling when leaving campus.

The first-year students expressed concern over cost of all the innovations and there were no outstanding first or second innovation choices. Some interest was expressed in carsharing and dynamic ridesharing.

Students Living in Graduate and Family Housing

Most students, who live in graduate and family housing, reported biking and/or walking to and around campus. Only one reported driving regularly to campus. To travel off-campus, most students stated that they bike, carpool, and/or drive. Participants voiced strong dissatisfaction with many aspects of local and regional transit. More specifically, transit connections are too time consuming, and driving is more efficient than transit.

Most of these students expressed interest in Bus Rapid Transit (BRT) and advanced information services. Some participants, however, thought that BRT would be best applied in Sacramento, rather than Davis.

Students Living Off Campus Focus Groups

Two focus groups were held for students living off campus. The first included students living in the City of Davis, and the second focused on students commuting to Davis for school. Both groups had at least eight participants.

Students Living in Davis

Most of the UC Davis students, who live in Davis, traveled to campus by bus and/or bike. Some also walked, carpooled, and drove.

This group expressed the most interest in smart parking/shuttles, real-time transit information at bus stops, and carsharing. Carsharing was particularly attractive to students who were interested in access to a diverse fleet of vehicles, such as pickup trucks for moving and convertibles in the spring. Some wanted real-time transit signs on campus because they do not carry Unitrans schedules with them to campus. Others also requested signage at bus stops within Davis because buses are sometimes late and often too full to stop.

Students Living Outside of Davis

Most students who lived outside of Davis drove alone to campus at least two days a week, and one carpooled regularly.

This focus group reported significant interest in parking closer to their department building on a consistent basis. All participants ranked smart parking as their top innovation interest. Carsharing was generally ranked second. Participants indicated that they are reluctant to move their cars because of parking difficulties and carsharing would provide them with mobility during the school day. Others expressed some interest in e-store, dynamic ridesharing, and real-time bus information.

City of Davis Residents Focus Group

One focus group was held with City of Davis residents, including those who worked in Davis and those who commuted outside of Davis to work.

City of Davis Residents

Most participants reported that they drive alone to work. The remaining participants use a combination of modes that include bus, biking, driving, and walking.

Real-time transit information was the first choice of most participants because of its potential to enhance existing city bus service and better serve UC Davis students. E-stores were the second choice of most of the participants. Carsharing was the third choice for participants. Smart parking was the least appealing option to participants.

Summary Overview of the Focus Groups

A number of general conclusions can be drawn from the focus groups summaries. Students who live on campus typically bike and walk to campus and favor carsharing and advanced information services. Students and staff who live in Davis are more likely to take the bus and bike to campus; however, they also tend to favor carsharing and advanced information services. Davis residents who do not work on campus typically drive to work and are interested in advanced information services. Staff and students who live outside of Davis are more likely to drive or carpool to campus and favor smart parking management. Bike and transit use is strongly related to proximity to campus. Those who live on campus or in Davis are more likely to travel by bike or bus, and those who live outside of Davis are more likely to drive. Carsharing and advanced information services appear to be favored by those who live on campus or in Davis, perhaps, because these individuals are less likely to own a vehicle and have a greater need for higher quality alternatives modes, such as carsharing and more efficient transit service. Smart parking management appears to be very popular among those who live outside of Davis because of their auto dependence and the relatively high cost and low availability of campus parking.

V. Analysis of Innovative Mobility Scenarios

As discussed in the previous section, the advantage of focus groups is the rich insight they provide into new research areas, such as innovative mobility options. Their limitation, however, is that the results may not be representative (sample sizes are too

small and the sample is not randomly selected). Thus, the results cannot be expanded to the larger population to assess the potential magnitude of the travel and environmental effects. Simulation tools, such as travel demand models, can be used to gauge the effects of innovative mobility options on the larger population. However, these tools may be limited with respect to the complexity of their representation of options.

To gain a better understanding of the potential effects of the innovative mobility options in the City of Davis and the Sacramento region, an advanced regional travel demand model[1] was used to simulate some of the options that were favored in focus groups. These included combinations of 1) carsharing that served the UC Davis campus as well as regional light rail and bus rapid transit, 2) advanced transit information (ATI) that provided real-time transit scheduling information through displays, phones, or the Internet, and 3) a carfree housing policy in which auto ownership was modestly reduced in areas served by carsharing. A twenty two-year time horizon was chosen for the analysis because higher roadway congestion in the future may provide a greater demand for enhanced transit service options.

The specification of the available model limited, to some degree, the representation of the innovative mobility options. The literature on preferred options were reviewed, but very little evidence was available on potential travel effects that could be applied to model.

A regional and Davis analysis was deemed appropriate because those in the UC Davis community travel throughout the region, and mode choice to Davis is affected by the regional transportation systems. In addition, during the course of this project, partners expressed interest in expanding the scope of the project from Davis specific to a more regional focus.

A detailed report on the literature review, methods, scenarios, and results of this study are presented in Appendix D.

The future innovative mobility scenarios (2025) were evaluated against travel, emissions, and net benefit criteria. The results indicated relatively modest reductions in vehicle travel and emissions. The *Carsharing Only Scenario* increased transit mode share by 2.78% and reduced vehicle miles traveled (VMT) by 0.02% and emissions (NOx) by 0.04%, compared to a base case scenario that represents the future transportation plan for the region. The *ATI and Carsharing Scenario* increased transit mode share by 19.06% and reduced VMT by 0.15% and NOx by 0.19%. The difference between the magnitude of effect for the carsharing and ATI services in these two scenarios can be explained by their scope of application. Carsharing was applied to selected areas in the region, while the ATI service was applied region-wide. The *Carfree Housing, ATI and Carsharing*

[1] The 2001 Sacramento Regional Travel Demand model (SACMET01) was used in this study. The study did not use the UPLAN land use model in conjunction with the SACMET01 travel demand model. When this study was proposed, the Sacramento Area Council of Governments (SACOG) staff was calibrating the UPLAN land use model to a base year. However, SACOG determined that the UPLAN model in its current form could not adequately replicate a base year and thus the model was not implemented for official use. As a result, the UPLAN model could not be used in this study.

Scenario increased transit mode share by 17.96% and reduced VMT by 0.17% and NOx by 0.21%. The restricted access to the auto in the carfree housing policy tends to promote ridesharing rather than transit use in the simulation method. This increase in ridesharing, however, could be accommodated by a carsharing service that was more flexible than the light rail or bus rapid transit based-service modeled in this study.

In general, the relatively limited penetration of traditional transit in the region restricts the effectiveness of carsharing and ATI services and the carfree housing policy. The results for the City of Davis, which contains a much more dense transit network, illustrate this point. The mode choice effects for transit in the City of Davis are approximately double those found regionally in the *ATI and Carsharing Scenario* and the *Carfree Housing, ATI, and Carsharing Scenario*. The mode choice results for Davis are presented in Table 6.

Table 6: Daily Mode Choice for the 2025 Innovative Mobility Scenarios in Davis

	Drive Alone	Shared Ride	Transit	Walk	Bicycle
Base Case	40.43%	40.43%	5.41%	10.33%	2.28%
Carsharing	40.42% (-0.02)	40.42% (-0.02)	5.41% (0.02)	10.33% (0.05)	2.28% (0.08)
ATI & Carsharing	39.62% (-2.02)	39.62% (-2.02)	7.35% (35.80)	10.12% (-2.03)	2.23% (-2.12)
Carfree Housing, ATI & Carsharing	39.95% (-1.18)	39.95% (-1.18)	7.16% (32.41)	10.18% (-1.47)	2.28% (0.14)

Despite the modest travel effects of the scenarios, the economic analysis indicates a net benefit for all of the innovative mobility scenarios. The total per work trip benefit for the *Carsharing Scenario* was $0.01, for the *ATI and Carsharing* is $0.03, and for the *Carfree Housing, ATI, and Carsharing Scenario* is $0.05. Again, the ATI service has a greater scope than the carsharing service and thus provides a greater benefit. The carfree housing policy increases benefits because of avoided auto operating costs.

VI. UC Davis Student, Staff, and Faculty Transportation Survey

To assess current travel patterns and transportation needs of the UC Davis community, a web-based travel survey of 1,024 students, faculty, and staff members was conducted in the fall of 2002. A better understanding of current travel would assist with the LRDP process and the evaluation of the innovative mobility options.

The survey consisted of a travel diary for the respondents to record their travel activities over specified time periods and questionnaires that included demographic, transportation, health, and exercise questions. Respondents were asked to record travel activities on weekdays and weekends. The survey process began with a recruitment email, followed

by the survey, two reminder emails (if the survey had not been completed), and finally a thank-you email (once the survey had been submitted).

A stratified random sampling method was applied to UC Davis emails, which are classified by faculty, students, and staff. The sample was stratified to represent the actual distribution of those campus roles. The retrieval goal of 1000 completed surveys was met; however, students were under-represented in the sample, and staff and faculty were over represented. Weights were developed and applied to the sample to replicate the actual distribution of faculty, staff, and students. The weighted sample is analyzed in this section.

The emails could not be stratified by any variable other than faculty, staff, and students because no other information was attached to emails. In the analysis of the sample, it was discovered that those who live outside the City of Davis were represented disproportionately in the sample. It may be that these individuals face greater transportation challenges and thus had a greater interest in completing the survey.

For a more detailed description of the survey methods and implementation process see Appendix E for NuStat's Methodology Report on the UC Davis Transportation Study and Appendix F for the survey instruments. A detailed discussion of the results of the survey is presented in Appendix G, Analysis of the UC Davis Travel Survey. A brief discussion of the more relevant results is presented here.

An analysis of the demographic characteristics of the survey sample indicate relatively greater numbers of households without autos and high levels of bicycle ownership:

- Only 5.7% of the households in the sample have no vehicle. This figure is higher than the 3% figure for the region in 2000 (SACOG, 2001). Undergraduates make up approximately 58% of the 5.7% figure; graduate students comprise 18%; and post-graduate researchers make up 22%.

- The average number of bicycles per household in the sample is 2.3. The average number of bicycles per household ranges from a low of 1.9 for graduate/professional students to a high of 2.7 for undergraduate students. Only 10% of respondents belong to households without a bicycle.

In addition, the campus community appears to have a relatively high rate of technology subscription services:

- The most popular services subscribed to by the total sample households are online or Internet access (71.2%), cellular phone (66.4%), cable TV (58.5%), and satellite TV (19.5).

- Undergraduate households have the highest rates of online Internet access (87.1%), cellular phone (75.7%), and cable TV (67.9%) services.

An analysis of the travel behavior for the UC Davis campus suggests relatively high bicycle and transit use and relative low auto use. The share of typical modes of travel to UC Davis (see Table 6) indicates the following:

- In general, bicycle and transit mode shares for the sample are relatively large, and the drive mode share is relatively small. The mode shares for the total sample are 39.9% for drive, 1.7% for carpool/vanpool, 17.1% for transit, 3.1% for walk, and 38.3% for bicycle. The bicycle mode share is almost as large as the drive mode share, and the transit mode share is significant. By comparison, the work mode shares for the Sacramento region are 80.9% for drive, 9.7% for carpool, 3.4% for transit, 2.6% for walk, and 3.3% for bicycle travel.

- Undergraduate students have the lowest drive (18.1%) and the highest bicycle (43.1%) and transit (35.0%) mode shares.

- Staff has the highest drive (73.9%) and the lowest transit (5.2%) and bicycle mode shares (16.1%).

- For the faculty, post-graduate researchers, and graduate/professionals students, mode shares for driving range from 33.8 to 53.8%, mode shares for bicycling range from 36.8 to 49.2%, and mode shares for transit range from 4.0 to 9.2%.

Table 7: Shares for Typical Travel Model to UC Davis by Role

	Undergraduate student	Graduate/ professional student	Faculty	Staff	Post-Graduate Researcher	Other	Total
Drive	18.1%	43.5%	53.8%	73.9%	33.8%	86.2%	39.9%
Carpool/Vanpool	1.3%	0.0%	2.4%	3.6%	1.5%	0.0%	1.7%
Transit	35.0%	4.3%	4.0%	5.4%	9.2%	0.0%	17.1%
Walk	2.5%	4.3%	2.8%	1.0%	6.2%	0.0%	3.1%
Bicycle	43.1%	47.8%	36.8%	16.1%	49.2%	13.8%	38.3%

The mode shares for *all* weekday trips by UC Davis role indicate the following:

- When *all* work/school trips are evaluated, mode shares are higher for walking and lower for bicycling (with the exception of students), transit, and driving (with the exception of post-graduate researchers) compared to the typical mode of travel to the UC Davis campus.

- When *all* other and total trips are evaluated, the mode shares for driving and carpooling tend to be higher, and transit, walk, and bike are lower than the typical mode of travel to UC Davis and for all work/school trips. However, transit, walk, and bike mode shares and drive modes still tend to be lower than the average for the region.

The weekend mode of travel by origin location (inside and outside of Davis) indicates the following:

- In general, the weekend mode of travel for all trips is higher for driving and lower for transit, walking, and bicycling compared to the results for all weekday trips.

- When the origin of the weekend trip is outside of the City of Davis, then drive mode shares are higher and walk and bicycle mode shares are lower than when the origin of the trips is inside Davis.

- Transit use is minimal on the weekend, particularly when the origin of the trip is inside the City of Davis.

- Undergraduate students tend to carpool and vanpool quite a bit on the weekends.

The mode choice results from the survey are relatively consistent with those obtained from the focus groups. The comprehensive network of bicycle paths and transit in the City of Davis to the UC Davis Campus has encouraged higher bicycle ownership, allowed for more households to live without autos, and significantly increased the rate of bicycle and transit use and discouraged the rate of driving (relative to the regional average). In addition, relatively high cell phone and Internet phone service subscriptions in the community may facilitate use of advanced traveler information systems.

VIII. Narrowing Innovative Mobility Options to Preferred Scenarios

At the close of the project there were four innovative mobility options that appeared to be good fits for the UC Davis campus, and the greater Sacramento area. These options were as follows:

e-Stores

The concept of e-stores to reduce auto travel, if placed strategically and stocked with the correct items, appeared to be one promising innovative mobility option. E-stores did generate interest in the focus groups. In addition, the results of the UC Davis travel survey indicated that trips for purposes other than on campus school and work (i.e., shopping) had much higher rates of driving. Thus, the opportunity to shop at e-stores on campus with good bike, transit, and walk access may reduce auto travel in the community.

Researchers proposed a one-year pilot project in conjunction with UC Davis housing and food services and Zoom Systems. The goal was to place one to two Zoom e-stores in strategic locations on campus and then query users on where they had come from to use the e-store and where they would have gone to purchase the product if the e-store had not been there. The technology integrated into the Zoom System machines is such that users could be queried via an interactive touch screen. A second project was contemplated that

would have placed the Zoom e-stores in office parks in Sacramento with the same goal of understanding the impact on VMT.

Zoom Systems were excited about the project and agreed to place and maintain the Zoom e-stores at no cost to campus and even to share revenue with the campus. Although the project had support of the Advisory Team, including the Director of Transportation and Parking Services, the campus food service was concerned that this project would constitute a breech of agreement with their current vending contracts. In addition, there was concern about competition with the bookstore. Due to these concerns, project researchers were not able to move this project forward. In the future, the Campus may want to consider the smart vending machine option to reduce vehicle travel between the campus and retail locations. The Neighborhood Master Plan could provide an ideal situation for e-stores.

Carsharing with GEM Neighborhood Electric Vehicles

Global Electric Motors (GEM) a subsidiary of DaimlerChrylser approached project researchers with a proposal to place up to 75 GEM neighborhood electric vehicles (NEVs) on campus and in the surrounding Davis community. Researchers worked with GEM and Campus to determine the best shared-use configuration. Researchers also collaborated with a graduate seminar class at UC Davis to evaluate driving routes, "NEV nook" parking spaces, and marketing strategies for the GEM NEVs. In addition, researchers opened discussions with two telematics providers to determine whether it would be possible to outfit the GEMs with smart technology to assist with route selection and parking availability. The research goal for this project was to evaluate how people make choices about the vehicles they choose to use for a specific trip and to understand how to educate members about using neighborhood electric vehicles to meet their trip needs. A second phase was contemplated that would have placed some GEM vehicles into a Sacramento carsharing organization.

As discussed above, significant interest for shared-use vehicles was expressed among focus group participants who lived on campus or in Davis. The simulation analysis of the carsharing scenarios in Davis and the Sacramento region indicated some auto travel and emission reductions as well as more significant net economic benefits. Moreover, the results of the UC Davis survey indicated that members of the campus community have a significantly higher rate of zero car ownership households (almost double) compared to the region.

Although all parties were enthusiastic to move ahead with this project, legal issues pertaining to the ownership of the vehicles prevented researchers from launching this project. GEM wanted to donate them to campus, not a carsharing organization, but campus did not want to take ownership or operate the shared-use service. During the project, there were a few efforts among citizens, the local Transportation Management Authorities, and the Sacramento Municipal Utility District to start carsharing in Sacramento, Woodland, and Davis. If a carsharing organization begins operations in the

Sacramento/Davis region, the Campus should consider negotiations to bring the service to the University.

Carfree Housing

The transportation proposal for the NMP includes a transit green through the middle of the development. The transit green would provide pedestrian and bicycle facilities in addition to a dedicated bus rapid transit lane. All housing would be within 1/4 mile of the transit green, and private cars would not be allowed on the transit green. To discourage residents of the NMP from driving to campus, they would generally be unable to purchase on-campus parking permits. Carfree housing policies that could be linked to the NMP include strict enforcement of a no-car policy, to one-car households, to simply pricing and selling parking spaces separately from housing. Under this last scenario, homebuyers and renters would need to consider whether they wanted to pay extra to park one or more cars. The results of the simulation analysis suggest that a modest carfree housing policy in conjunction with improved transit may reduce auto travel and emissions and increase net economic benefits.

Advanced Traveler Information

The results of the focus groups indicated that advanced traveler information was a popular innovative mobility option. During the focus groups, many participants voiced frustration over not knowing when to expect the next bus, erratic bus schedules, and schedules that change over the summer and during school breaks. Real-time bus information, available through the Internet, via phone, and at bus stops could improve the quality of transit service at UC Davis and the City of Davis. The results of the simulation analysis indicated that advanced traveler information services may provide relatively large benefits with respect to reduction in auto travel and increases in transit travel in Davis because of its comprehensive transit service. The results of the survey indicate that the UC Davis community has a relatively high rate of cell phone and Internet phone service subscriptions, which may facilitate use of advanced traveler information systems.

IX. Conclusion

Due to circumstances particular to the proposed research projects, none of the projects are recommended for further study at this time. The difficult economic situation in California has also dampened industry interest in supporting research projects in campus-like settings at present. In addition, the focus groups and survey revealed that the current pedestrian, bicycle, and transit systems on campus and in Davis serve the community very well. Congestion and parking, although frustrating in Davis, have not reached the level of difficulty necessary to require such innovative mobility ideas.

APPENDIX A

ADVISORY MEETING AGENDAS AND NOTES

November 2001 - November 2002

Agenda

Davis Smart Mobility Model Project

November 29, 2001
12:30-1:30 pm

Attendees:
Joan Borucki, Caltrans
Susan Harrington, Caltrans
Nancy Chinlund, Caltrans
Susan Shaheen, California PATH
Caroline Rodier, UC Davis, Institute of Transportation Studies
Rachel Finson, California PATH
Bruce De Terra, Caltrans District 3

Working Agenda:

I) Introduction/Purpose of Meeting

II) Project Overview
- 25k PATH proposal
- SP&R PATH proposal
- TAPS survey proposal

III) Review of Project Tasks and Timelines

IV) Discussion/assignment of tasks and responsibilities

V) Next steps

Agenda

Davis Smart Mobility Model Project
Advisory Team Meeting

December 17, 2001
2:30-3:30 pm

Location: UCD, Transportation and Parking Services

Attendees (in no particular order):
Joan Borucki, Caltrans
Susan Harrington, Caltrans
Nancy Chinlund, Caltrans
Bruce De Terra, Caltrans
Bob Segar, UCD (absent)
Sid England, UCD
Pat Kearney, UCD
Cliff Contreras, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Caroline Rodier, UC Davis, Institute of Transportation Studies
Rachel Finson, California PATH

Working Agenda:

I) Introductions/Purpose of Meeting

II) Updates on the LRDP and the Mobility Project

III) Modeling presentation/discussion (Caroline Rodier)

IV) Discussion of broader community that we should be contacting about this project

V) Wrap-up
Date for next meeting
Next steps

Agenda

Davis Smart Mobility Model Project
Advisory Team Meeting

January 22, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services

Attendees (in no particular order):
Susan Harrington, Caltrans
Nancy Chinlund, Caltrans
Bruce De Terra, Caltrans
Bob Segar, UCD
Sid England, UCD
Pat Kearney, UCD
Cliff Contreras, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Caroline Rodier, UC Davis, Institute of Transportation Studies
Rachel Finson, California PATH

Working Agenda:

I) Updates on the LRDP and the Mobility Project

II) Discussion of broader community that we should be contacting about this project.

III) News from TRB

IV) Overview of Technology

V) Wrap-up

Next meeting is February 26
2:00-3:00 at TAPS

Agenda

Davis Smart Mobility Model Project
Advisory Team Meeting

February 26, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services

Attendees (in no particular order):
Susan Harrington, Caltrans
Nancy Chinlund, Caltrans
Bruce De Terra, Caltrans
Matt Dulcich, UCD
Cliff Contreras, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Caroline Rodier, UC Davis, Institute of Transportation Studies
Rachel Finson, California PATH

Working Agenda:

I) Introduce Matt Dulcich

II) Updates on the LRDP and the Mobility Project
---Looking ahead to years two and three of the project

III) Update on survey and discussion

IV) Wrap-up

Next meeting is March 26
2:00-3:00 at TAPS

Davis Smart Mobility Model Project
Advisory Team Meeting

March 26, 2002
2:00-3:00 pm

Meeting cancelled

Agenda

Smart Mobility and Growth Model Project
Advisory Team Meeting

April 23, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services
(See front reception for parking permit)

Attendees (in no particular order):
Nancy Chinlund, Caltrans
Katie Eastham, Caltrans
Cliff Contreras, UCD
Matt Dulcich, UCD
Karl Mohr, UCD
Ramona Clark, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Caroline Rodier, UC Davis, Institute of Transportation Studies
Rachel Finson, California PATH

Working Agenda:

I) Welcome Katie Eastham (Introductions)

III) Updates on the LRDP and the Mobility Project

II) Update on survey and discussion

III) Focus groups

IV) Wrap-up

Next meeting is May 28
2:00-3:00 at TAPS

cc: Susan Harrington, Caltrans
Jeff Pulverman, Caltrans

Agenda

Smart Mobility and Growth Model Project
Advisory Team Meeting

May 28, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services
(See front reception for parking permit)

Attendees (in no particular order):
Nancy Chinlund, Caltrans
Katie Eastham, Caltrans
Rebacca Covington, Caltrans
Cliff Contreras, UCD
Ann Davies-Nesbitt, UCD
Matt Dulcich, UCD
Karl Mohr, UCD
Ramona Clark, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Caroline Rodier, UC Davis, Institute of Transportation Studies
Rachel Finson, California PATH
Knute Ayhnes-Johnson, California PATH

Working Agenda:

I) Introduce Knute Ayhnes-Johnson

II) Updates on the LRDP and the Smart Mobility Project

III) Update on survey and discussion

IV) Project timelines for the rest of '02

V) Wrap-up

Next meeting is June 25
2:00-3:00 at TAPS

cc: Susan Harrington, Caltrans
Jeff Pulverman, Caltrans

Smart Mobility Advisory Team Meeting Summary
May 28, 2002

1) New Faces:
Knute Ayhens-Johnson, has joined PATH/CCIT and is assisting us with the Smart Mobility Project. We're looking forward to having some help with logistics and research. He is beginning to look into recent smart growth studies, with a focus on the link to transportation and quantitative data. If you have any ideas about reports or studies that he should investigate, please send suggestions to me, and I'll forward them on to him.

Ron Hall: Caltrans District 3 ITS specialist

2) Matt Dulcich gave us an update on the campus LRDP. Due to comments from the public, campus has added another alternative, the Olive Tree Lane Alternative. This alternative will receive full analysis along with the other alternatives. For more information, see: www.ucdavislrdp.org.

3) Survey returns are slow. (See following e-mail for most recent survey update.)

4) We are planning to launch focus groups in August (staff and faculty), continuing into the fall (students). We are working with a graphic artist for web design and to help us with visuals (posters, etc.) to help the focus group participants understand the concept of "smart mobility."

5) The group decided to take a "summer break" from meetings. Therefore, the June 25th Advisory Team meeting has been cancelled. The next meeting is scheduled for July 23, 2:00-3:00 at the TAPS conference room.

Since we won't be meeting as often during the summer, I will do my best to keep the group updated via e-mail. If you have specific questions or comments please feel free to contact me.

Thanks for all your support for the Smart Mobility project,
Rachel Finson
rfinson@path.berkeley.edu
510-381-2569

Agenda

Smart Mobility and Growth Model Project
Advisory Team Meeting

July 18, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services
(See front reception for parking permit)

Attendees (in no particular order):
Nancy Chinlund, Caltrans
Katie Eastham, Caltrans
Rebacca Covington, Caltrans
Cliff Contreras, UCD
Ann Davies-Nesbitt, UCD
Matt Dulcich, UCD
Karl Mohr, UCD
Ramona Clark, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Rachel Finson, California PATH
Knute Ayhnes-Johnson, California PATH

Working Agenda:

I) Updates on the LRDP and the Smart Mobility Project

III) Survey and focus group overview

IV) Outreach beyond Campus

V) Wrap-up

cc: Jeff Pulverman, Caltrans

Smart Mobility Advisory Team Meeting Summary
July 23, 2002

Updates on LDRP and Smart Mobility Project

Karl Mohr of UC Davis' Office of Resource Management and Planning reported that two alternatives for the Neighborhood Master Plan are being evaluated. They are: 1) the Full neighborhood Program Alternative, and 2) the Olive Tree Drive Alternative. Fiscal and infrastructure evaluations are being conducted on both of these alternatives, and campus hopes to have the choice narrowed to one alternative by the middle of October. The preferred alternative will be included in the full Environmental Impact Report. Campus planners are still on target for final approval November 2003.

Survey Overview

Rachel Finson, California PATH (Partners for Advanced Transit and Highways) and Matt Dulcich, Office of Resource management and Planning, reported that the UC Davis on-line travel survey did not obtain the expected response rate due to technical difficulties experienced by NuStats. NuStats has taken full responsibility for the problem and will correct the technical problems and administer the survey this October at no additional charge.

Although the delay in the survey is unfortunate, the research team will now be able to compare spring and fall semester travel data. The fall survey will also capture data on the freshman dormitory students that will not be allowed to bring cars on campus for the first time.

Focus Groups

The focus groups are on target to begin this fall and should be completed by the end of the year. There will be eight focus groups composed of different community populations, including staff, students and faculty. Ramona Clark, with Student Housing suggested that the research team include family housing units on Campus as a target group. Ann Davies-Nesbitt of TAPS reminded the group that not all staff has access to e-mail, and these people will be eliminated from the focus groups if the research team relies on e-mail invitations to participants.

Susan Shaheen, the primary investigator on the project outlined innovative mobility ideas for discussion at the focus groups, including: smart parking, carsharing, shared-use Segway Human Transporters and NEVs, dynamic ridesharing, and smart vending machines.

Miscellaneous Items

Ann Davies-Nesbitt suggested that the Smart Mobility project have a booth/table at the Transportation Fair at the Silo Union Courtyard in early October.

Ramona Clark of Student Housing reported that so far only 33 incoming first year students have completed the exemption form requesting that they be allowed to bring their cars onto campus.

Cliff Contreras, Director of TAPS would like to update campus and the Vice Chancellors about the Smart Mobility project. The group agreed that November 2002 would be a good month for this presentation, since the survey will be completed and many of the focus groups will be done.

Next Meeting

The next Smart Mobility Advisory Team meeting will be September 24 from 2:00-3:00 at the TAPS conference room.

Agenda

Smart Mobility and Growth Model Project
Advisory Team Meeting

September 24, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services (TAPS)
(See front reception for parking permit)

Attendees (in no particular order):
Cliff Contreras, UCD
Matt Dulcich, UCD
Lea Rees, Caltrans
Katie Eastham, Caltrans
Gabriel Corley, Caltrans
Ann Davies-Nesbitt, UCD
Karl Mohr, UCD
Ramona Clark, UCD (absent)
Anthony Palmere, UCD
Susan Shaheen, California PATH
Rachel Finson, California PATH
Knute Ayhens-Johnson, California PATH

Working Agenda:

I) Update on the LRDP

II) Focus Group Update
- Thank you to Matt Dulcich for reserving focus group rooms.
- Thank you to Ann Davies-Nesbitt for attending the first focus group.
- Show posters
- Review and approve focus group protocol and questionnaire

III) Survey Update
- May survey data
- October survey

IV) GEM Neighborhood Electric Vehicle (NEV) Donation

V) Wrap-up

Next Meeting is October 22nd, 2-3pm

cc: Jeff Pulverman, Caltrans and Nancy Chinlund, Caltrans

Smart Mobility Advisory Team
September 24, 2002 Meeting Summary

Meeting Attendees:
Cliff Contreras, UCD
Matt Dulcich, UCD
Ann Davies-Nesbitt, UCD
Lea Rees, Caltrans Headquarters
Gabriel Corley, Caltrans District III
Karl Mohr, UCD
Anthony Palmere, UCD
Rachel Finson, PATH
Guest: Bill Fairbairn, Yolo TMA

Updates on LDRP and Smart Mobility Project

Karl Mohr of UC Davis' Office of Resource Management and Planning reported that a new alternative for the LRDP will be evaluated. This alternative further reduces the Olive Tree Drive alternative and includes increased density for students. The Environmental analysis will be flexible and accommodate both plans. There will be a formal presentation to the City Council on October 16. The draft EIR will be released October 24. The next public workshop will be on November 4. The Office of Resource Management and Planning hopes to narrow the options to one plan by the end of November for further fiscal, infrastructure, and other analyses.

Survey Update

Matt Dulcich will send out results of the May survey once the data are available. The October survey will take place the week of October 28.

Focus Group Update

The first two focus groups (staff living in Davis and staff living outside of Davis) were conducted September 10. Ann Davis-Nesbitt observed these focus groups. The focus groups will continue through December 2002. Members of the Smart Mobility Advisory Team are invited to observe. The group reviewed and approved the focus group protocol and the questionnaire that is given to participants before the focus group starts.

The initial drafts of the posters that project staff is developing to assist in explaining innovative mobility at the focus groups were viewed.

GEM Neighborhood Electric Vehicle (NEV) Donation

GEM has offered a substantial donation to ITS-Davis and Partners for Advanced Transit and Highways for testing in the Smart Mobility project. It is planned that 25 GEMs will be sold at very low cost to residents in the Davis community, who would also participate in a GEM user group. Additional vehicles (up to 50) could also be donated to the project and could be placed in a carsharing program to operate in the city of Davis and on campus. A third-party carsharing organization will be identified to partner with the project so the University will not assume liability and maintenance responsibility.

Miscellaneous Items

Cliff Contreras introduced the Zoom System vending machine test project to bookstore representatives and others on campus. These machines were viewed as direct competition for customers and in conflict with exclusive agreements campus has developed for foodservice. This project will not be pursued on campus.

Ann Davies-Nesbitt is working on a transportation/Air Quality Fair, which will involve test drives of clean-fuel vehicles. The Fair will be on October 23 and Ann has invited the Smart Mobility project to participate.

Next Meeting

The next Smart Mobility Advisory Team meeting will be October 22 from 2:00-3:00 pm at the TAPS conference room.

Agenda

Smart Mobility and Growth Model Project
Advisory Team Meeting

November 21, 2002
2:00-3:00 pm

Location: UCD, Transportation and Parking Services (TAPS)
(See front reception for parking permit)

Attendees (in no particular order):
Cliff Contreras, UCD
Matt Dulcich, UCD
Scott Williams, Caltrans
Lea Rees, Caltrans
Gabriel Corley, Caltrans
Ann Davies-Nesbitt, UCD
Karl Mohr, UCD
Ramona Clark, UCD
Anthony Palmere, UCD
Susan Shaheen, California PATH
Rachel Finson, California PATH

Working Agenda:

I) Update on the LRDP

III) Focus Group Update

III) Survey Update

IV) GEM Neighborhood Electric Vehicle (NEV) Donation Update

V) Next Steps
This will be the final meeting for 2002

cc: Jeff Pulverman, Caltrans
Nancy Chinlund, Caltrans

Smart Mobility Advisory Team
November 21, 2002 Meeting Summary

Meeting Attendees:
Cliff Contreras, UCD
Matt Dulcich, UCD
Ann Davies-Nesbitt, UCD
Lea Rees, Caltrans Headquarters
Gabriel Corley, Caltrans District III
Karl Mohr, UCD
Anthony Palmere, UCD
Ramona Clark, UCD
Rachel Finson, PATH

Updates on LDRP and Smart Mobility Project

Karl Mohr reported that comments to the draft initial study were due November 22. This included the Neighborhood Master Plan, the Research Master Plan, and the Habitat Conservation Plan. Campus has conducted many meetings including local school districts and the Davis City Council.

Survey Update

The survey was launched in late October. Matt Dulcich reported that, although there have been some glitches in the survey related to NuStats, the survey has been successful. The return rate is approximately 25-30 percent overall. Faculty and staff have a slightly higher response rate, while students appear to have a lower response rate. There is a high completion rate once participants log on to the survey. On average the survey took 20-24 minutes to complete. NuStats will provide data in approximately one month and then Smart Mobility project staff will begin to analyze the data.

Focus Group Update

Six focus groups with different campus cohorts have been completed. The groups were: staff living in Davis, staff commuting from outside of Davis, off-campus students living in Davis, off-campus students commuting from outside of Davis, first-year students living in the dorms, and students living in graduate and family housing on campus). Smart Mobility project staff has had a difficult time recruiting faculty for the focus groups. Per Matt Dulcich's suggestion, we will contact the Academic Senate for ideas on outreach/recruitment of faculty.

GEM Neighborhood Electric Vehicle (NEV) Donation

GEM's commitment to the donation to campus remains strong. However, the process is moving slower than anticipated due to GEM internal reorganization and difficulty retrofitting the four-seater GEMs with rigid door.

Miscellaneous

This Thursday, December 5, Sacramento Municipal Utility District (SMUD) is hosting a lunch meeting including Sacramento area Transportation Management Associations, and other regional players for a monthly carsharing discussion. The featured speaker this month is a representative from Caltrans to talk about the $2.9 million for statewide carsharing.

The lunch meeting will be held at SMUD, Forestview Room 2 & 3 from 11:30-1:30. If you plan on attending please advise Marie Henry (mhenry@smud.org) by noon on Wednesday so she can order enough pizza and salad. You are on your own for drinks. Also, please advise Dwight MacCurdy (dmaccur@smud.org) so he will know that you are attending and that you are part of the Smart Mobility Advisory Team.

Future Meetings

November 21 was the last meeting of the Smart Mobility Project Advisory Group in 2002.

Thanks everyone for participating in the Smart Mobility project and for all your useful input, comments, and help during the past year.

APPENDIX B

FOCUS GROUP SUMMARIES, PROTOCOL AND QUESTIONNAIRE

TRANSPORTATION FOCUS GROUPS
WITH UNIVERSITY OF CALIFORNIA DAVIS STAFF
September 10, 2002

Two transportation focus groups composed of University of California, Davis staff were conducted in mid-September on the UC Davis campus. This summary describes the findings from both focus groups as part of the evaluation phase of the University of California's Partners for Advanced Transit and Highways (PATH) Sacramento-Davis Smart Mobility Model Project. Dr. Susan Shaheen facilitated each of the staff focus groups with PATH researchers assisting and taking notes.

The target population for each of the two focus groups were: 1) UC Davis staff living in Davis and 2) UC Davis Staff living outside of Davis. Following this overall summary are separate accounts of each focus group.

Both groups were well attended with at least 12 participants. The two groups were comprised mostly of women. The staff group living in Davis included four men of 12 total, and the staff group living outside of Davis included one man of 14 total. The majority of staff participants in both groups were Caucasian. Eleven of the 12 Davis resident participants were between the ages of 41-64 years old. Twelve of the 14 non-Davis resident participants were between 41-64 years old. Both groups reported varied household incomes, although Davis residents reported a slightly higher income. Five out of the 12 Davis residents recorded household incomes between $50,000-$79,999/year, while six out of 14 non-Davis residents reported household incomes between $20,000-$49,000/year.

After the focus group introduction, the sessions opened with a discussion of individuals' likes and dislikes about cars as well as alternative transportation modes. The discussion moved to possible innovative transportation solutions such as ridesharing, smart parking, carsharing, e-store smart vending machines, smart shuttles, and smart bus stops. The two groups reflected different transportation needs (one commutes to Davis while the other commutes within Davis) and hence expressed different innovation responses. The staff commuting from outside of Davis expressed more concern over campus parking policies and were most interested in smart parking innovations. The staff who lived in Davis expressed the most concern about biking and walking on days with inclement weather and were most interested in carsharing.

Current Travel Behavior: Davis Residents
In the written survey administered before the focus groups, five participants reported biking to campus at least two days a week and listed no other modes. Three reported that they drive alone to work, while two stated that they carpool primarily. One person reported alternating between carpooling and taking the bus, and another alternates between biking and driving.

Key Responses to Transportation Innovations: Davis Residents
Participants were asked to rank order innovations presented, ranging from most to least appealing. Smart parking received no first tier interest, and all other projects (e-stores, smart shuttles, smart bus stops) elicited only one supporter each. The preferred alternative was carsharing or shared-use vehicle services, including a mixed fleet of vehicles such as Segways (a two-wheeled electric standing scooter), four-door vehicles, sports cars, and pick-up trucks. This innovation was followed by real-time bus stops, although none of the participants reported using the bus as their primary commute mode and only one reported occasional bus use. The group indicated that the primary reason for favoring biking over driving to campus is the hassle/cost of car parking. However, many noted the advantages of cars, such as protection against the weather, the ability to carry passengers, objects, and overall convenience.

Current Travel Behavior: Non-Davis Residents
On the initial questionnaire eight non-Davis residents reported carpooling to work at least two days a week and listed no other modes. Two stated that they drive alone while the remaining reported mixing or bundling two or more modes. Two reported a bus/carpool mix, one reported a bike/shuttle mix, and another reported a drive/bike/bus mix.

Key Responses to Transportation Innovations: Non-Davis Residents
Participants voiced strong dissatisfaction with many aspects of paid parking policies at UC Davis and were most supportive of a smart parking management project. Most expressed that they would like to have the option of reserved, inexpensive, or free parking. According to this focus group most of the spaces reserved for carpools are full by 7:30 AM. Participants also expressed interest in having an overflow parking structure with a shuttle to take them to campus. Some suggested including carsharing or shared-use vehicle services with reserved parking on campus, so they could use carsharing vehicles to run errands or get lunch during the day. Not surprisingly, smart parking was ranked the highest, followed by smart shuttles, carsharing, e-stores, and real-time bus stops.

UC DAVIS STAFF LIVING IN DAVIS:
FOCUS GROUP SUMMARY
September 10, 2002
UC Davis campus

Participant Background
According to June 2002 payroll data, 40.4 percent of UC Davis staff live in Davis. Focus group participants living in Davis included eight women and four men. Eleven participants were between the age of 41 to 64. One participant reported was between the ages of 24-40. Five participants reported pre-tax household incomes between $50,000 and $79,999, three listed household incomes of $20,000 to $49,999, three reported household incomes of $80,000 to $109,000, and one declined to respond.

Participants' Current Modes of Transportation

UC Davis Staff, Davis Residents Principal Modes of Commuting

Bike	5
Single Occupancy Vehicle (SOV)	3
Carpool/Vanpool	2
Mix of Bike & Car	1
Mix of Carpool & Bus	1
Train	0
Bus	0
Walk	0
Work from Home	0

Attitudes About Current Transportation Options

- Participants reported that they liked the following attributes associated with cars**:**

- Convenience
- Freedom to run errands
- Space for transporting items
- Ability transport multiple people
- Safety over biking
- Comfort
- Privacy
- Option to take relaxing drives.

- Participants reported that they disliked the following attributes associated with cars:

    - Parking hassles such as the time spent searching and parking costs
    - Overall cost of ownership
    - Congestion
    - Air pollution

- Maintenance hassle
- Dislike supporting car-centered culture, such as highways and congested streets
- Cars take up a lot of space in garages
- Danger of driving.

- Participants reported liking the following attributes of bicycles:

  - Easy parking
  - Run errands quickly
  - Best way to get downtown
  - Bikes last a long time
  - Getting exercise
  - Avoid automobile infrastructure (highways, congestion)
  - One can see their surroundings better than from a car
  - Relaxing
  - Good bike lanes on streets and campus roads
  - There are campus funds for bike commuters that reimburse up to $300 to pay the cost of a commuter bike.

- Participants reported disliking the following attributes of bicycles:

  - Getting flat tires
  - Locking hassles: time to lock/unlock, carrying locks around
  - Theft (one person mentioned having three bikes stolen)
  - Vandalism done to bikes
  - Effects of bad weather on parked bikes
  - Weather being too hot or rainy on bikes
  - Dangers of biking at night
  - Hassle of registering bikes (waiting in line on campus)
  - Bike circles on campus are dangerous.
  - Bikes cannot transport a lot.
  - Bike tunnel is unsafe (though there is a police phone in tunnel).
  - Blocked bike lanes (with yard clippings, etc.)
  - Dangerous car traffic in south Davis
  - Not enough air pump stations on UC Davis campus for maintaining bikes
  - Few outdoor drinking fountains on UCD campus
  - Few accommodations are in place for bike commuters in campus buildings, such as showers and changing rooms with lockers. Thus, biking in work clothes can be inconvenient.
  - Danger of bike wrecks
  - Many riders bike dangerously and will not stop at stop signs.
  - No emergency service (such as help with flat tires and mechanical problems)
  - Not enough rewards for bike commuters

    - Biking is hard for older staff.

- Participants reported that bus transportation was reasonably convenient.

- Participants reported disliking the following about bus transportation:

    - Summer schedules are reduced and less reliable than during UCD school year.
    - Commuting by bus to south Davis is too time consuming.
    - UC Davis staff must pay for bus, while City of Davis employees ride for free.
    - Yolo bus causes air pollution. (Unitrans buses run on natural gas.)
    - Unitrans does not front load bikes.
    - Both Unitrans and Yolo buses cause too much noise.
    - It takes 1/2 hour to get to campus from home, which is too long (it takes 10 minutes maximum to drive).
    - Lack of mobility in case of family emergency.

- Dislikes of campus parking (no likes were mentioned):
    - There should be a shuttle transporting staff from remote parking lots to reduce staff walking distance to work.
    - There is too much congestion caused by people looking for parking spaces.

Participants' Preferences for Innovative Transportation Ideas

Table 1: UC Davis Staff, Davis Residents Innovative Transportation Rankings

Innovation	**Choice**		
	1	**2**	**3**
Carsharing (cars, Gems, Segways, scooters)	9	1	1
Bus stops with smart kiosks	1	7	1
Dynamic ridesharing	1	2	3
Smart shuttles	1	0	3
Smart parking	0	1	3
E-stores	0	1	1

Carsharing and Shared-Use Vehicle Services

Participants from this group reported feeling uncomfortable riding with strangers or in strangers' cars but expressed a strong interest in having access to public vehicles, like those belonging to a carsharing organization. In addition, participants showed interest in a diverse fleet of vehicles, including the Segway, four-door vehicles, sports cars, and pickup trucks.

Real-Time Bus Stops
Some staff doubted the reliability of dynamic message signs providing real-time bus schedules. Others commented on the helpfulness of real-time bus stops, especially if they also communicated whether or not the next bus coming is full.

Smart Parking
Participants remarked that many UC Davis staff do not have a mobile phone to check on parking, and some may not have access to an internet connection at home since most will utilize the internet while at work. One participant noted that some UC Davis staff do not speak English well, so information should be provided in Spanish as well as English. However, parking on campus is considered a hassle, and smart parking was noted a good idea.

Dynamic Ridesharing
Although dynamic ridesharing received no votes, some supported the idea of a web-based dynamic ridesharing program for UC Davis students. This could prove useful for first year students without cars taking weekend trips home or elsewhere or students interested in spending evenings or weekends outside of Davis.

Smart Shuttles
Shuttles were called “bumpy” or uncomfortable by one participant.

E-Stores
Two participants showed interest in being able to buy a hot meal without driving off campus.

UC DAVIS STAFF LIVING OUTSIDE OF DAVIS:
FOCUS GROUP SUMMARY
September 10, 2002
UC Davis Campus

Participant Background
Over 59 percent of UC Davis staff live outside of Davis. Focus group participants living outside of Davis included 13 women and one man. Twelve participants were between the ages of 41-64. Two were between the ages of 24-40. Household income levels were varied though lower than staff participants living in Davis. Six participants reported pre-tax household incomes between $20,000 and $49,999, four reported $50,000 to $79,999, three reported incomes between $80,000 to $109,000, and one declined to respond.

Participants' Current Mode for Travel to Campus

UC Davis Staff, Non-Davis Residents Principal Modes of Commuting:

Carpool/Vanpool	8
Single Occupancy Vehicle (SOV)	2
Mix of Bike, Bus, & Drive	1
Mix of Carpool & Bus	1
Train	0
Bus	0
Walk	0
Work from Home	0

Attitudes About Current Transportation Options

- Participants reported that they liked the following attributes of cars:
    - Freedom and flexibility
    - Time savings
    - Can carry more things than when traveling by bike
    - Option to listen to music.

- Participants reported that they disliked the following attributes associated with cars:
    - Overall cost of ownership
    - Maintenance hassle
    - Air pollution
    - Parking
    - Stress
    - Congestion
    - Danger
    - Rude drivers
    - Other drivers dangerously talking on cell phones

    - Road construction.

- Motorcycle likes (Three participants have motorcycles, although they are not primary commute modes):
    - Fun
    - Good gas mileage.

- Motorcycle dislikes:
    - Noise Pollution
    - Dangerous.

- Participants' carpooling likes:
    - Pay less money for parking (SOV pay $48/month to park on campus. Two person carpool is $11/month and three person carpool is $8/month)
    - More relaxing than driving alone
    - Less wear and tear on own vehicle
    - Access to designated parking
    - There are 24 complimentary non-carpool parking permits/year for days when carpoolers need to drive alone.

- Participants' carpooling dislikes:
    - Carpools must arrive by 9:30 AM or lose reserved spaces, and carpoolers often lose spaces if they drive off campus during the day.
    - Designated spaces are often full by 7:30 AM.
    - The 24 complimentary non-carpool parking permits, given to carpoolers, are not enough to cover necessary drive-alone days.

- Participants' likes about UC Davis parking:
    - Transportation and Parking Services (TAPS) consistently responds to reported car failure within 10 minutes, such as a dead battery or being locked out of one's car.
    - TAPS can be flexible with waiving parking tickets.
    - Stacked (or valet) parking is efficient and people working in this capacity are friendly.

- Participants' dislikes about UC Davis parking:
    - $48/month is too expensive.
    - Lack of reserved spaces for SOV drivers
    - The time it takes to find a parking space and walk to work location
    - 45-minute meters on Russel Street parking structure are too short.
    - Some payment machines are confusing and don't work.
    - There is not enough visitor parking.
    - Visiting performing artists need reserved spaces or a south Davis parking structure with shuttle or courtesy van.

- Special events take parking spaces normally used by staff three to four times/month without warning.

- Parking does not support variable/flexible scheduling. For example, arriving at campus before 7:15 AM requires paying for two days of parking.
- TAPS carpool "match" system does not work because it does not have enough people to match drivers and riders.
- Parking tickets are given too strictly and too often.
- TAPS employees are not helpful, not flexible and give misinformation.
- There are long lines at TAPS.
- Not all parking lots are well lit.

- Participants reported liking the following about bus transportation:
  - Reasonably convenient
  - Unitrans is free if one shows a valid parking permit.
  - UC Davis Medical Center Shuttle (Sacramento) is on time, not overcrowded, and only $30/month.

- Participants reported disliking the following about bus transportation:
  - Yolo bus just changed their bus schedule.
  - The memorial union Yolo bus stop was eliminated, and the Yolo bus leaves at 5:37 PM from the Silo, which is later than people want to depart.
  - Poor connectivity between Yolo bus and other buses
  - Unitrans does not run early enough.
  - Sometimes the Yolo bus to Winters is late or does not show up.
  - A monthly bus pass is not a good incentive to ride the bus, blocks of tickets would be better.

Preferences for Innovative Transportation Options

Table 1: UC Davis Staff, Non-Davis Residents Innovative Transportation Rankings

Innovation	**Choice**		
	1	**2**	**3**
Smart parking	7	2	5
Smart shuttles	3	10	0
Carsharing/shared-use vehicles	3	0	3
E-stores	1	1	3
Smart bus stops	0	1	3

Smart Parking

This focus group spent a lot of time discussing and complaining about their difficulties parking on UC Davis campus. They showed the most support for a smart parking management project. Participants were interested in inexpensive and consistent access to

parking spaces near their offices. Some ideas that people expressed included reserved spaces for each vehicle (with a monthly pass), more reserved spaces for individuals who carpool, a shuttle from overflow parking structures, and more warning that special events are going to displace parking spaces.

Carsharing and Shared-Use Vehicle Services
Participants showed little support for carsharing or dynamic ridesharing (ridesharing was not polled but was discussed by the group). Specifically, these individuals did not see how supporting such programs would help their commute to Davis or they were already satisfied with their current carpooling arrangements. In addition, most people in this group were unfamiliar with the Segway Human Transporter and suspected it would be too loud and too difficult to use.

E-Stores
Some staff reported feeling intimidated by the technological sophistication of the machines and suggested that students would be a better audience. One participant suggested stocking basic things like underwear or socks that students complain they cannot buy cheaply within Davis. One participant reported wanting organic foods, bottled water, and whole grains. Two participants requested hot lunches so that they could buy lunch without having to drive off of campus and lose their parking. One participant expressed concern that the machines would be broken into, and another wondered what would happen to the machines if there was a blackout and the electricity was turned off. One participant showed concerns over privacy and wondered if her department would keep track of her purchases.

Smart Shuttles
Participants showed interest in a smart shuttle that would take them from an overflow parking structure/lot near their building.

Real-Time Bus Stops
Many participants supported this idea but did not rank this option highly. One participant suggested providing information regarding other transportation providers (e.g., Amtrak) as well.

TRANSPORTATION FOCUS GROUPS
WITH UNIVERSITY OF CALIFORNIA DAVIS STUDENTS
LIVING OFF CAMPUS
October 10, 2002

Two transportation focus groups composed of University of California, Davis students were conducted on October 10 at the UC Davis campus. This summary describes the findings from both focus groups as part of the evaluation phase of the University of California's Partners for Advanced Transit and Highways (PATH) Sacramento-Davis Smart Mobility Model Project. Dr. Susan Shaheen facilitated each of the student focus groups with PATH researchers assisting and taking notes.

The target population for each of the two focus groups was: 1) UC Davis undergraduate and graduate students living in the city of Davis and 2) UC Davis undergraduate and graduate students living outside of Davis. Following this overall summary are separate accounts of each focus group.

Both groups were well attended with at least eight participants. The two groups had a good mix of men and women. The student group living in Davis included four men and seven women, and the student group living outside of Davis included four men and four women. The majority of student participants in both groups were Caucasian. Seven of the 11 Davis resident participants were under the age of 23, while four were between 24 and 40 years old. Five of the eight non-Davis resident participants were between 24-40 years old, and three were under the age of 23. Both groups reported varied household incomes, although students living outside of Davis reported a significantly higher income. Five out of the 11 Davis residents recorded household incomes between $10,000- $19,000/year, two between $20,000- $49,000, two under $10,000, and two declined to respond. Three of eight students living outside of Davis reported 2001 household earnings between $80,000 and $110,000, two between $50,000-$79,000, two between $20,000-49,000/year, and one declined to respond.

After the focus group introduction, the sessions opened with a discussion of individuals' likes and dislikes about cars as well as alternative transportation modes. The discussion moved to possible innovative transportation solutions such as ridesharing, smart parking, carsharing, e-store smart vending machines, smart shuttles, and smart bus stops. The two groups reflected different transportation needs (one commutes to Davis while the other commutes within Davis), and this influenced how each group responded to the innovations that were introduced. The students that lived in Davis expressed the most interest in real-time transit information at Unitrans bus stops and on campus. The majority of the Davis-based resident student focus group consisted of students asking basic questions about the innovative ideas presented by the moderator. Nine of 11 students living in Davis reported using a mix of alternative modes, including biking, riding the bus, and walking. In the focus group composed of students commuting from outside of Davis, participants expressed strong concern about parking and the difficulty of finding parking close to their buildings on campus. In fact, all eight reported driving to campus before 9:00am to park close to their department buildings. Many mentioned that

they did not mind paying the parking fee, but they did not leave for lunch due to the difficulty finding a parking space after they returned. In addition, one of the focus groups expressed concern that getting around on and off campus on foot is difficult due to the campus size and distance from downtown Davis. Five of the eight students in this group either brought or kept bikes on campus to use after they drive to campus.

Current Travel Behavior: Students Living in Davis
In a written survey administered before the focus groups, UC Davis students living in Davis reported using varied modes to commute to campus. Two participants reported riding the bus to campus at least two days a week and listed no other modes. Two reported that they bus and bike equally to campus, two stated that they bike and walk equally, one bikes and carpools, another carpools only, one walks another drives and one reported alternating between driving and walking.

Key Responses to Ranked Transportation Innovations: Students Living in Davis
Participants were asked to rank order innovations presented, ranging from most to least appealing. Smart parking /shuttles real-time transit information at bus stops, and carsharing. Carsharing was particularly interesting to students who were interested in access to a diverse fleet of vehicles, such as pickup trucks for moving and convertibles in the spring. Some wanted real-time transit signs on campus because they do not carry Unitrans schedules with them to campus, while others also requested signage at bus stops within Davis because buses are sometimes late and often too full to stop.

Current Travel Behavior: Students Living Outside of Davis
In the initial focus group questionnaire, seven non-Davis residents reported driving alone to campus at least two days a week and listed no other modes. One indicated carpooling regularly.

Key Responses to Ranked Transportation Innovations: Students Living Outside of Davis
This focus group reported significant interest in parking closer to their department building on a consistent basis. All eight participants voted for smart parking as their top innovation interest. For their second ranked choice, five voted for carsharing, indicating that this would provide them with mobility during the day since they are reluctant to move their personal cars due to parking difficulties. The remaining votes were for e-store, dynamic ridesharing, and real-time bus information.

UC DAVIS STUDENTS LIVING IN DAVIS:
FOCUS GROUP SUMMARY
October 10, 2002
UC Davis campus

Participant Background
According to Karl Mohr, Associate Director of Public and Private Partnerships at UC Davis, 90 percent of UC Davis undergraduate and graduate students lived in Davis in June 2002. Focus group participants living in Davis included seven women and four men. Seven participants were between the ages of 19 and 23, while four reported ages between 24-40. Five participants reported 2001 pre-tax household incomes between $10,000 and $19,999; two listed household incomes of $20,000 to $49,999; two reported household incomes of under $10,000; and two declined to respond.

Participants' Current Modes of Transportation

UC Davis Students, Davis Residents Principal Commute Modes:

Bus	2
Bus & Bike	2
Bike & Walk	2
Bike & Carpool	1
Carpool	1
Drive	1
Drive & Walk	1
Walk	1

Attitudes About Current Transportation Modes

- Participants reported that they liked the following attributes associated with cars:
    - Faster mobility than any other mode,
    - Ability to carry/store items,
    - Ability to get closer to actual destination than bus
    - Comfort,
    - Ability to carry passengers,
    - No stops like on bus/train, which lengthen travel time,
    - Option to listen to music, and
    - No wait time, for transit vehicles.

- Participants reported that they disliked the following attributes associated with cars:
    - Cars are not faster on campus,
    - Paying for parking,
    - Maintenance hassles,
    - Insurance costs,

- Air pollution/smog,
- Dislike of obeying speed limits,
- Danger to bicyclists,
- Less interactive with other people,
- Dislike of car-centered urban/suburban design,
- Dislike of auto and oil companies lobbying our political system,
- Dislike of current prioritization of highway maintenance, and
- Noise pollution.

- Participants reported liking the following bicycle attributes:

    - Easy parking;
    - Biking on campus and in Davis is faster and easier;
    - Biking is healthy;
    - Interacting with other bikers; and
    - The on campus bike shop ("the bike barn") is cheap and has fast service.

- Participants reported disliking the following bicycle attributes:

    - People biking four across and blocking entire street/lane
    - Bikers often do not follow rules of the road, like stopping at stop signs
    - Tiring/requires physical energy
    - Theft of bike or items on bike
    - Maintenance/flat tires
    - Lack of air pumps on campus
    - Bike lanes are sometimes blocked by piles of leaves, parked cars, and this is hard to see at night
    - Inhospitable weather, like heat or wind
    - Too many bikers
    - Arrive at destination sweaty and hot
    - Limits clothing that one can wear
    - Cannot carry many things
    - Slower than a car
    - Limits how far one can go

- Participants reported liking the following attributes of bus transportation:

    - Unitrans stops close to people's homes;
    - Not having to park on campus;
    - Unitrans is free for undergraduate students;
    - Unitrans comes often; and
    - One can study on the bus.

- Participants reported disliking the following attributes of bus transportation:

    - Unitrans bus schedule limitations, especially in the evenings, weekends, and summer;
    - Riding Unitrans is uncomfortable;
    - Graduate students have to pay $.75/ride; and
    - Buses are overcrowded or full, especially in winter and on G and W lines

- Participants reported liking the following about carpooling:

    - Reserved, closer parking, and
    - Social aspects of carpooling.

- Participants reported disliking the following about carpooling:

    - If one person is late, everyone is late;
    - Reserved carpool parking spaces are full too early in the morning; and
    - There are not enough parking places reserved for carpoolers.

- Participants reported liking the following about alternative modes:

    - More relaxing than driving,
    - Time to read or think, and
    - Cheaper than buying and maintaining a car.

- One participant reported using the UC Davis/UC Berkeley shuttle three days per week, and other participants noted having used this shuttle before. Their dislikes included:

    - $5.50 each way is too expensive;
    - Limited schedule (leaves UC Davis at 7:15am & 3:15am); and
    - The alternative to the intercampus shuttle (Amtrak and BART) is too expensive.

Health and Mobility

- Participants were asked how often they intentionally exercise, such as taking a run or going to the gym**.**

  Five participants indicated they did not exercise regularly, four exercised three to five times each week, and two stated that they exercised more than five times per week.

- Participants were asked if they perceived alternative transportation modes as good for their health and fitness.
    - Six stated that they think about health and fitness when choosing alternative transportation modes.
    - Seven reported that biking and walking helps to reduce stress.

Participants'Ranked Preferences for Innovative Transportation Concepts

UC Davis Students Living in Davis: Ranked Innovative Mobility Options

Transportation Innovations	**Choice**		
	1	**2**	**3**
Real-time transit information	5	0	1
Smart parking with shuttles	5	1	1
Carsharing	1	7	0
Dynamic ridesharing	0	2	5
E-stores	0	1	3
Total votes	11	11	10 *

*One person did not vote

Real-Time Bus Stops
Participants commented that real-time bus schedule information would be very helpful. Some noted that they would prefer a large dynamic message sign on campus because they often do not have bus schedules with them while at school. Others stated that they would prefer dynamic message signs that included bus schedules and carrying capacity as often buses are full, especially in winter and along the G line of North Davis and the W line of South Davis.

Smart Parking with Shuttles
Participants remarked that while all UC Davis students have access to the Internet on campus some may not have access at home to check parking availability.
Overall smart parking ideas such as dynamic message signs showing parking availability was noted as a good idea and preferred over web-based information.

Carsharing and Shared-Use Vehicle Services
Participants from this group expressed confusion regarding how a carsharing project would work. They asked basic questions about what kinds of vehicles carsharing organizations use, member costs, how insurance is covered, and how a diverse fleet of cars could be best utilized. They also mentioned that Segway Human Transporters and electric bicycles would make already crowded bike lanes on campus too congested.

Dynamic Ridesharing
Dynamic ridesharing was not discussed in depth by participants.

E-Stores
Participants liked the idea of being able to browse products from behind a screen and expressed interest in being able to buy food and school supplies like printer paper at any time. Participants spent a significant amount of time discussing problems that they anticipated with e-stores (e.g., limitations of a credit card based payment system for students, sale of unhealthy food, and over packaged products). The issue of safety was also raised, specifically if e-store staff had dorm access.

UC DAVIS STUDENTS LIVING OUTSIDE OF DAVIS:
FOCUS GROUP SUMMARY
October 10, 2002
UC Davis Campus

Participant Background
Karl Mohr, Associate Director of Public and Private Partnerships at UC Davis reports that as of June 2002 approximately ten percent of UC Davis students lived outside of Davis. Focus group participants living outside of Davis included four women and four men. Five participants were between the ages of 23-40. Three were under the age of 23. Household income levels were varied though significantly higher than student participants living in Davis. Three participants reported 2001 pre-tax household incomes between $80,000 and $110,000; two reported $50,000 to $79,999; two listed incomes of between $20,000 to $49,999;and one declined to respond.

Participants' Current Mode for Travel to Campus

UC Davis Students, Non-Davis Residents Principal Commute Modes:

Single Occupancy Vehicle (SOV)	7
Carpool	1
Bus	0
Bike	0
Walk	0
Work from Home	0

Attitudes about Current Transportation Modes

- Participants reported that they liked the following attributes of cars:
  - Demand responsive;
  - Ability to carry/store items;
  - Ability to stay dry when it rains;
  - Quicker/easier for going long distances;
  - Privacy;
  - Control of one's environment, such as listening to the radio;
  - Safer than riding a bike;
  - Decompression time; and
  - Faster than alternatives, such as a bus.

- Participants reported that they disliked the following attributes of cars:
  - High gas prices;
  - The exit off of Highway 113 onto Russell is often backed up;
  - The new road design leading to the Mondavi Center has created traffic congestion at the campus exit from 80 West;
  - Exiting the parking lot near the Howard Way tennis courts is difficult;

- Insurance cost;
- Maintenance;
- Traffic;
- Parking availability;
- Air pollution; and
- Impossible to, work, one can on a bus or train.

- Participants reported that they disliked the following aspects of parking on campus:
  - Parking hassle and cost;
  - Campus parking structures do not provide enough parking spaces;
  - Stacked parking is inconvenient because after 6pm users must walk to a central location to pick up car keys. Participants often fear that their car could be damaged when moved during the day to provide more spaces. Also, individuals are concerned that the valet drivers are not responsible; for example, a participant reported observing one drive a car recklessly and another found their keys left on the windshield.
  - There are open parking places, such as at the Mondavi Center, but this facility is too far from the campus, and there is no shuttle.

- Participants did not indicate any likes about parking on campus.

- Participants reported that they disliked the following bicycles attributes (people did not mention bicycle likes):
  - Bicyclists do not follow motor vehicle laws;
  - It is hard to bike in the hot sun or wind;
  - Locking and unlocking bike is time consuming;
  - Limited payload capacity;
  - Constrains one's ability to dress formally, especially women;
  - Construction in bike lanes;
  - Hard to find bike parking because many leave bikes locked-up indefinitely;
  - Lack of overnight bike storage on campus; and
  - UC Davis medical center shuttle only has room for front loading two bikes, and it is often full.

Health and Mobility

- Participants were asked how often they intentionally exercise, such as taking a run or going to the gym.

  Three reported that they did not exercise regularly; three exercise three to five times each week, and two exercise more than five times each week.

- Participants were asked if they received alternative transportation modes as good for their health and fitness.
    - Five stated that they think about their health when deciding which mode to use.
    - One person noted that commuting by car means that she will walk longer from a parking space, than if she were to take an alternate mode.

Participants' Preferences for Innovative Transportation Ideas

UC Davis Students Living Outside of Davis: Ranked Innovative Mobility Options

Transportation Innovations	**Choice**		
	1	**2**	**3**
Smart parking with shuttles	8	0	1
Carsharing	0	5	1
Real-time transit information	0	1	5
E-stores	0	1	1
Dynamic ridesharing	0	1	0
Total votes	8	8	8

Smart Parking with Shuttles
Participants showed a significant interest in smart parking to alleviate the hassles of looking for a parking space on campus. Only one participant from this group reported carpooling regularly. This group supported dynamic message signs that could lead a driver to an available parking space, perhaps from as far away as the freeway exit. Most participants also expressed a willingness to use the internet and their cellular phones to check on parking availability. One participant noted that although she has a cellular phone, this system would favor individuals who had access to advanced technologies and this would be unfair to those who do not.

Carsharing and Shared-Use Vehicle Services
Participants were concerned that they would not be able to store personal belongings in a shared-use car. One participant noted that animal science has shared vehicles, including a bike for department of business. There was a concern that shared-use vehicles would cause more traffic. Another person reported feeling scared that they would be dependent on a shared car for a trip and find that all of the vehicles had already been taken. Individuals expressed interest in an inexpensive collective bike service, where bikes are stored safely in convenient locations. A participant suggested that first-year students could have access to a fleet of, neighborhood electric vehicles for grocery shopping, since they are not allowed to park on campus.

Real-Time Bus Stops
Participants commented that real-time signage at bus stops is a great idea. Although none regularly take the bus because it is “inefficient” and “too time-consuming,” some supported the introduction of real-time information, especially in conjunction with extended bus and train services.

Dynamic Ridesharing
Only one participant reported carpooling. This group consisted primarily of graduate students who felt that their schedules' were too variable to rideshare. One participant mentioned that she often needs to pick up groceries or things after work. Another participant noted that she felt unsafe riding in a car with a stranger, especially someone who may not be a good driver.

E-Stores
One participant noted that she would like to be able to buy coffee and aspirin in an e-store. Another person expressed concern over the safety of going to an e-store after dark. Some stated that a late night store in downtown Davis would serve just as well as an e-store, since they commuted by car and could drive there on their way home. In addition, one participant reported that he would be reluctant to buy something that costs more than $10 from the e-store in case that there was a machine malfunction.

TRANSPORTATION FOCUS GROUPS
UNIVERSITY OF CALIFORNIA DAVIS FIRST-YEAR STUDENTS
& STUDENTS LIVING IN FAMILY AND GRADUATE CAMPUS HOUSING
October 22, 2002

Two transportation focus groups composed of University of California, Davis first-year students living in the dorms and students living in family and graduate campus housing were conducted in late-October on the UC Davis campus. This summary describes the findings from both focus groups as part of the evaluation phase of the California Partners for Advanced Transit and Highways (PATH) Smart Mobility Model project. Rachel Finson facilitated these focus groups with PATH researchers assisting and taking notes.

The target populations for each of the two focus groups were: 1) UC Davis first year students living in the dorms, and 2) UC Davis students living in family and graduate campus housing. Following this summary are separate accounts of each focus group.

Both groups were well attended with at least nine participants. The two groups had a fairly even mix of men and women. The first-year student group included four men and five women, and the family and graduate student housing group included seven men and three women. Both groups were comprised of ethnically diverse compositions. Fifty percent of the group living in family and graduate student housing were graduate students from outside of the United States.

All nine of the first-year students reported an age under 23. Nine of the family and graduate housing group participants were graduate students and one an undergraduate. Nine of the 10 were between the ages of 24-40, and one reported being under 23 years of age. Both groups reported low household income levels (household for the dorm students was defined as the income available to that person). Eight of the first-year student participants claimed to have less than $10,000 family income, and one declined to respond. Four of the participants living in graduate student and family housing reported a household income between $10,000 and $19,999, three reported between $20,000 and $49,999, and two stated having a household income of less than $10,000.

After the focus group introduction, the sessions opened with a discussion of individuals' likes and dislikes about cars as well as alternative transportation modes. The discussion moved to possible innovative transportation solutions such as vehicle sharing, smart parking and shuttles, dynamic ridesharing, bus rapid transit, e-stores, and information services.

The two groups had similar transportation needs (live on campus and study and/or work on campus), but because one group was more likely to live with a spouse and perhaps a child, they had different transportation needs. Most in the group of participants living in graduate student and family housing reported at least one person in the household using a car regularly for things like grocery shopping and taking a child to daycare. Both groups had significant variation in their interest among the different innovations as well as their modal choice for leaving campus. Many of the first-year students complained about not

being able to have a car on campus. However, most did appreciate the necessity of this rule from the campus perspective. Seven of nine first-year students stated that they bike off campus at least two days a week, while six of nine reported carpooling (catching a ride with a friend) to leave campus at least two days a week.

Eight of 10 participants in the focus group comprised of individuals living in graduate and family housing on campus have cars, which they used for shopping and driving a child to daycare. All ten reported biking around campus though some reported walking sometimes, and seven of ten reported leaving campus by bike at least two days a week. This group found transit in the area too slow and inefficient compared to driving.

Current Travel Behavior: First-Year Students
In the written survey administered before the focus group, one participant reported leaving campus by bike for a job. Four first-year students reported getting around campus on a bike only, four stated that they bike and walk, and one reported only walking. To leave campus, one stated that he only carpools, one only walks, and another only bikes. Most others left campus using a combination of biking or carpooling, seven of nine included biking in their modal mix, and six of nine included carpooling.

Key Responses to Transportation Innovations: First-Year Students
Participants were asked to rank order innovations presented, ranging from most to least appealing. The first-year students expressed concern over cost of all the innovations, and there were no outstanding first or second innovation choices. Carsharing received two first tier and four second tier votes, while dynamic ridesharing received two first and two second tier votes. Smart parking gained three first tier votes and no second tier votes, while bus rapid transit and e-store each received one initial vote, and information services received none.

Current Travel Behavior: Students Living in Graduate and Family Housing
On the initial questionnaire, three people reported leaving campus to go to a job. Two reported biking or walking, and one reported driving regularly. Seven individuals living in graduate and family housing reported regularly biking around campus, while three stated that they alternate between walking and biking. To leave campus, seven of ten reported a mixture including biking at least two days a week. Four reported leaving campus using a mixture of modes including carpooling at least two days a week. One reported driving only, one reported biking only, and one reported carpooling only.

Key Responses to Transportation Innovations: Students Living in Graduate and Family Housing
Participants voiced strong dissatisfaction with many aspects of local and regional transit; specifically, connecting between transit systems takes too long, and alternative modes are not as efficient as driving. Bus rapid transit (BRT) received five first tier votes, though some people mentioned BRT as being more applicable to Sacramento than Davis. Information services received three first tier votes and four second tier votes. Other innovation options reflected very low numbers, including zero first tier votes for shared-

use vehicles, dynamic ridesharing, and e-stores. None of these three innovations received more than two votes in either the second or the third rounds of voting.

FIRST-YEAR UC DAVIS STUDENTS LIVING ON CAMPUS:
FOCUS GROUP SUMMARY

October 22, 2002
UC Davis campus

Participant Background

According to UC Davis residential housing, first-year students who apply in time are promised space in UC Davis dormitories. Four thousand two hundred lived in these dorms in the 2002-2003 school year. Focus group participants included four men and five women. All nine were under the age of 23. Eight reported a household income of less than $10,000, and one declined to respond.

Participants' Current Transportation Modes

UC Davis First-Year Students in Dorms Principal Modes of Commuting On-Campus:

Mix of Bike & Walk	4
Bike	3
Walk	1
Mix of Bike & Bus	1

UC Davis First-Year Students in Dorms Principal Modes of Commuting Off-Campus:

Mix of Bike & Carpool	2
Bike	1
Walk	1
Carpool	1
Mix of Bike & Walk	1
Mix of Bike, Walk, & Carpool	1
Mix of Carpool, Bus, & Amtrak	1
Mix of Carpool, Bus, Amtrak & Bike	1
Bus	0
Amtrak	0

Attitudes about Current Transportation Options

- Participants reported that they liked the following attributes associated with cars**:**
    - Convenience
    - Speed
    - Control over time schedule
    - More comfortable than bus
    - Ability to choose music
    - Can transport people and things
    - Climate control/protection from weather
    - Status symbol
    - Racing other cars

    - Personal relationship with car.

- Participants reported that they disliked the following attributes associated with cars:

    - Gas prices
    - Insurance costs
    - Chance of accident
    - Older drivers on the road
    - Traffic congestion
    - Air pollution
    - Maintenance hassle
    - Chance of getting "dents and dings"
    - Isolation from world around you
    - Parking hassle and cost
    - SOVs on the road
    - Road rage
    - OEM TV commercials making emotional appeals about cars and identity.

- Participants reported liking the following attributes of bicycles:

    - Exercise
    - Speed
    - Can keep your own schedule
    - Can go fast or slow (without cars honking)
    - Inexpensive compared to driving a car
    - No air pollution
    - Access to places that cars cannot reach
    - Bike maintenance is cheaper than auto maintenance (4 people maintain their own bikes from this group)
    - Can bike along with a date (romantic)
    - Social aspect to bikes
    - Social pressure to ride bike like other students.

- Participants reported disliking the following attributes of bicycles:

    - Vulnerability to weather (like cold hands in the morning)
    - Painful for one's bottom
    - Wet seats
    - Limits the clothes one can wear
    - Can put grease onto pants
    - Bike theft
    - Hassle of finding bike parking
    - Hassle of locking bike
    - Bike maintenance

    - Can only travel a limited distance
    - Hassle to register it on campus and the $8 fee
    - No cargo room.

- Participants reported liking the following about the bus:
    - No parking hassle
    - Unitrans is free for undergraduate students
    - It is often convenient to use
    - Better than biking when it is raining
    - Social
    - One can study or relax
    - Cheaper than having a car and paying for gas.

- Participants reported disliking the following about the bus:

    - Have to mind the schedule
    - Unitrans B line is consistently not on schedule
    - Exhaust
    - Crowded
    - Sometimes inside is dirty
    - Transferring buses/modes can take a long time
    - Schedules are hard to read
    - Annoying to bike behind
    - Adds to congestion
    - Stops are not directly in front of destination
    - Some Unitrans drivers are poor drivers.

- Participants reported liking the following about ride-sharing:
    - Not the same person driving all the time
    - Fun with lots of people in the car
    - Keeps you awake on long drives
    - Reduces traffic and pollution.

- Participants reported disliking the following about ride-sharing:
    - Safety. Seven of the nine would only ride-share with a friend. (Two of the nine would use the rideshare board and ride with a stranger.)

Participants' Preferences for Innovative Transportation Ideas

Table 1: UC Davis First Year Students Living on Campus PATH Transportation Innovation Rankings

Innovation	Choice		
	1	**2**	**3**
Real-time transit information	0	2	3
Smart parking with shuttles	3	0	1
Carsharing (cars, Gems, Segways, scooters)	2	4	0
Dynamic ridesharing	2	2	1
E-stores	1	0	3
BRT	1	1	1

Bus Rapid Transit
Participants liked the idea of using a smart card on BRT for fast payment. One person suggested connecting BRT to smart parking. Others felt it had similar downsides to riding a regular bus because of its lack of connectivity to final destination, and the constraints in scheduling. They felt that, since not many people take the bus the BRT would need to be low-cost, efficient, fast, and attractive enough at the moment of implementation to gain riders. They also believed that it would be hard to accommodate BRT with the current system, because bus lanes take away road space.

Smart Parking
Participants liked the idea of smart parking but felt that the logistics would be difficult. Some felt it would be stressful to see Changeable Message Signs (CMS) that indicated a parking lot was full. Some said that they did not mind circling to find a parking space. The group was very curious about how smart parking would work with cell phones, but were also worried about equity issues due to limited technology access. There was concern over educating the public on how to use the system and if the technology would raise the cost of parking. One student stated his satisfaction with using Sony Metreon's system of CMS but disliked paying for parking. Another mentioned if there were going to be fees for parking she would like to see more advanced technology.

Real-Time Information
Participants liked the idea of real-time information and having this information available in a centralized location. One participant liked San Francisco's MUNI bus system's real-time information. One participant thought the current information that she could find on Amtrak's website was good, but the real-time information on signs at stations would be most useful. Many students felt that real-time information would help with Unitrans. Participants thought that real-time information would not be cost effective.

E-Stores
The participants liked the 24-hour access e-store. They would be willing to use an e-store if the prices were competitive. In general there was concern about credit card irresponsibility among younger students, and one person was turned off by the e-store idea because she does not want to own a credit card. A student suggested using student ID cards instead of a credit card. Some participants felt the e-store would be too impersonal. Students also expressed their distrust of purchasing fresh food from the e-store. One student thought that having the e-store located in the dorms would encourage laziness, causing students to never leave the dorms. There was also a concern that there would be long lines at the e-stores because customers would be browsing for products on the screen, and people in line could not browse at the same time.

Carsharing and Shared-Use Vehicle Services
Participants felt it was "cool" to have a diverse fleet to choose from, such as trucks and sports cars, but were worried about the inability to obtain a desired car if it was already in use. They suggested providing value (or dynamic) pricing to give benefits to people who used vehicles during off-peak hours. Nevertheless, many students wanted to own their own cars. Some participants thought shared-use vehicles would be really useful. One student thought that people would be more careful driving a shared-use vehicle. Most students would not mind advertising on the vehicles indicating that the vehicle was from a carsharing program.

Participants thought that the Segway HT and NEVs were good ideas. They liked the fact that they could dress nicely while riding the Segway HT versus a bicycle. One student thought the Segway HT was a good option, but she was concerned about the safety of having it on crowded sidewalks. Students liked the security that NEVs provided while protecting the riders. Participants also liked the independence that these two modes provide, and in the context of share-use vehicles services these would be a nice addition to the Davis campus.

Dynamic Ridesharing
Students liked the idea of dynamic ridesharing generally. Students indicated that there was a ride-sharing board in the Memorial Union on campus. This would be useful for taking weekend trips home or elsewhere. However, these students had safety and discrimination concerns. They were also worried about the cost of dynamic ridesharing.

Concerns with Using Technology
Most students were comfortable using new technology. They expressed safety concerns in using advanced technology while in traffic. Most felt that their parents would not be as likely to adopt the technology and that their grandparents would not even understand the new technology. There was concern that if the entire transportation system was dependent on technology, it would be vulnerable to glitches. Privacy issues were expressed. Some felt that identity security issues are always there, but with technology it is now easier to gather personal information. There was a discussion among participants concerning whether people who are not using transit right now would use it if advanced technology was applied. One student pointed out that using transit is easier than driving

in traffic. Another student argued that the system could be great, but people would not be patient enough to wait for transit. She felt that investing in technology would not be a solid investment.

Health

The participants were surveyed on their exercise habits per week:

Frequency/wk	# of People
0	0
1-3	3
4-5	2
6+	4

Six participants indicated that they thought about fitness when considering their mode choice.

STUDENTS LIVING IN FAMILY AND GRADUATE STUDENT HOUSING: FOCUS GROUP SUMMARY

October 22, 2002

UC Davis Campus

Participant Background

The Atriums graduate student housing holds up to 112 single graduate students. Family housing includes Orchard Park, Solano Park apartments managed by UC Davis and Russell Park managed by Tandem Properties. The total number of units in these three areas approximates 600 units, with the majority including two bedroom apartments. Focus group participants living in family and graduate student housing included seven men and three women. Nine participants were between the ages of 23-40. One was under 23. Four of the participants living in graduate student and family housing reported a household income between $10,000 and $19,999, three reported between $20,000 and $49,999, and two stated having a household income of less than $10,000.

Participants' Current Transportation Modes

UC Davis Graduate Students in Family Housing Modes of Commuting On-Campus:

Bike	7
Mix of Bike & Walk	3.

UC Davis Graduate Students in Family Housing Modes of Commuting Off-Campus:

Mix of Carpool & Bike	2
Carpool/Vanpool	1
Single Occupancy Vehicle (SOV)	1
Mix of Bike, Carpool, & Drive Alone	1
Mix of Bike & Walk	1
Bike	1
Mix of Drive Alone & Carpool	1
Mix of Drive Alone & Bike	1
Mix of Bus, Bike, Carpool, Walk & Amtrak	1.

Attitudes about Current Transportation Options

- Participants reported that they liked the following attributes of cars:
    - Freedom and flexibility
    - Mobility
    - Enjoy driving
    - Time savings
    - Can carry more things than when traveling by bike
    - Option to listen to music.
    - Can drive further to go shopping for cheaper products
    - Recreational destinations

    - Safer than walking at night
    - Not worried about accidents.

- Participants reported that they disliked the following attributes associated with cars:
    - Overall cost of ownership
    - Maintenance hassle–distrusting mechanics
    - Noise pollution near Orchard Park and at apartment parking lots
    - Poor fuel efficiency
    - Wasteful use of resources in terms of building cars and parts
    - Driving around seems sedentary
    - Driving without an airbag is scary, but does not want to buy a newer car for only occasional use
    - Parking costs everywhere: UC Davis, meters in town, San Francisco
    - Parking lots are ugly and take up space, could be more efficiently designed
    - Variability of vehicle size (preferred all vehicles smaller for safety)
    - Gas prices
    - Encourages materialism
    - Impersonal
    - People's driving etiquette versus person-to-person etiquette is poorer
    - Traffic congestion.

- Participants reported liking the following about bus transportation and Amtrak (no one rides regularly):
    - Convenient
    - Low-Cost (Davis to Sac airport for $1)
    - Not worried about parking
    - Not worried about driving
    - Largest vehicle on road—feels safer
    - Less demanding
    - Concerning Amtrak: going to Bay Area enjoys the sightseeing aspect and the comfort
    - Bart and MUNI on-time and good.

- Participants reported disliking the following about bus transportation and Amtrak:
    - Longer. Indirect routes
    - Slow. One hour to go from Davis to Sacramento
    - Long waiting times at stations
    - Off-schedule
    - Different systems are not integrated, like Bart & Caltrain
    - Amtrak is often late and is expensive. ($24 for round trip to San Francisco)
    - Amtrak has Infrequent service in Davis
    - Limited station locations, often in middle of nowhere with no connectivity to final destination.

- Participants reported liking the following about bikes (everyone owns a bike):
    - Bike is part of you, a "friend"
    - Versatile, functional and also can be fun
    - Can take shortcuts
    - Cheap to use (Four of the participants bought new and five participants bought used bikes)
    - Good feeling that you're doing something good for environment and traffic, not burning fuels
    - Davis has a peer pressure to ride your bike (Embarrassed to drive to campus from 6 blocks away)
    - Faster than walking within Davis and campus
    - Easier to maintain than a car (Most participants did at least small bike repairs)
    - Davis is bike-friendly, but if they moved out of Davis they would likely stop biking.

- Participants reported disliking the following about bikes:
    - Biking to Sacramento the causeway is very dusty and noisy
    - Not good in rain
    - More prone to getting dirty
    - People don't always obey rules of road and this is dangerous, especially in beginning of school year
    - Hard to dress nice in bike, especially wearing skirts
    - More vulnerable in an accident
    - Bikers in big cities breaking rules
    - Hard to negotiate when you have a lot of stuff with you, or grocery shopping
    - Need to plan ahead if you have to carry stuff with you back from work
    - Prevalence of bike theft, two had their bikes stolen, things taken off of bike.

Preferences for Innovative Transportation Options

Table 1: UC Davis Graduate Students living in Family Housing Innovative Transportation Options Rankings

Innovation	**Choice**		
	1	**2**	**3**
Real-time information	3	4	3
Smart parking & shuttles	2	2	0
Carsharing/shared-use vehicles	0	2	2
Dynamic Ridesharing	0	1	2
E-stores	0	1	2
BRT	5	0	1

Shared-Use Vehicles
The concept of carsharing seemed to be new to many of the participants because they did not understand the difference between car rental and carsharing. The participants were concerned about the convenience and whether they could get a car spontaneously. Some thought that people would reject carsharing because of the culture of ownership in the United States. They thought the program would work better in big cities, like Boston. Most participants said there was too little demand for cars in Davis to support carsharing.

When participants were questioned about the utility of shared-use vehicles for undergraduate students, there was a more favorable response. Cost was a major factor. Participants felt that the ideal customers of carsharing would be short-term visitors (three to four months) to use when visiting surrounding cities as tourists and graduate students that do not live in Davis. The incentive for carsharing could be reserved parking spaces. One participant gave an example of City Car Share vehicles getting privileged parking in San Francisco.

Smaller Motorized Vehicles

Segway HT
Participants felt that the Segway HT was a good product technologically, but that it was too expensive. Some felt they might as well walk if the Segways were too slow. They also thought they would feel silly and would not want to be the first to use it.

Neighborhood Electric Vehicles
Participants disliked not being able to use the NEV to get out of town to buy groceries at larger discount stores (due to speed restrictions). Other students indicated they did not need a NEV since they already have a bike and/or car. Students expressed a concern for safety, because it would be dangerous if NEVs were used on campus in no car zones. Also using a NEV in a big city would be unsafe. But overall, they felt that NEVs would be great in Davis and may work on campus if there were not too many. The idea of designated parking was proposed for NEVs. One student had heard of rental NEVs in Golden Gate Park, the Presidio, and Fisherman's Wharf.

BRT
Participants felt a BRT system would be perfect for sprawling cities like Sacramento. However, it needs to be more frequent, because Unitrans only comes every half hour.

Real-Time Information Systems
The group thought that real-time information systems could help inform users of bus and train arrival times and thought that both PDA and changeable message signs could work. Most students wanted smart signs for parking availability, traffic issues on highway and alternative routes, and for buses and train times.

E-Stores
Participants felt that there was an unclear connection between the e-store and transportation. One participant commented on the positive aspect of being open 24 hours.

However, participants disliked not being able to browse prices and find sales. They feared high prices, like buying one coke for .75 versus buying a 6 pack for $1 at a store. Some students commented on the impersonal nature of the store, with no sense of community or social interaction. One participant commented on his need to touch things before he buys. There was concern over the ability to return products.

Concerns with Using Technology

Most participants thought their parents would never check e-mail. Only four out of ten participants own a cell phone. Everyone has Internet access at home. The group expressed concern that the information services would be inequitable for the segment of the population without internet or cell phones and those persons with lower incomes could not be able to afford vehicle sharing.

Health

The participants were surveyed on their exercise habits per week:

Frequency/wk	# of People
0	4
2-3	3
3+	3

Seven of the ten participants considered the health benefits of biking when they made a decision to bike. Many participants were concerned that the Segway HTs and NEVs would result in reduced walking and biking. The group felt that cars were bad for personal health because of the stress of driving and air pollution. They suggested that less mobile population, such senior citizens, would be perfect for Segway HTs and NEVs.

COMMUTER FOCUS GROUP:
DAVIS RESIDENTS WORKING WITHIN DAVIS
AND OUTSIDE DAVIS
June 2003

A transportation focus group composed of Davis residents was conducted on June 26, 2003 at the Davis Art Center. This summary describes the findings of the focus group as part of the evaluation phase of the California Partners for Advanced Transit and Highways (PATH) Sacramento-Davis Smart Mobility Model Project. Rachel Finson facilitated the focus group, with PATH researchers assisting and taking notes.

The target population for the focus group was Davis residents who: 1) commute to work within Davis or 2) commute to work outside of Davis. Following this summary is a detailed separate account of the focus group.

The focus group was well attended with 12 participants. The group included five males and seven females. The majority of the participants were Caucasian. Five participants commuted to work outside of Davis, four commuted to work within Davis, and three worked out of their Davis home, and one did not commute. Most of the participants (nine of 12) were between 41 to 64 years of age. Only two participants were between the ages of 24 to 40, and one participant was 23 or younger. Five of the Davis residents recorded yearly household incomes between $20,000-$49,000, four between $50,000-$79,000, one between $10,000-$19,000, and two declined to respond.

Focus group introductions began with participants discussing the location of their work and what modes of transportation they most frequently use. The discussion then concentrated on individuals' likes and dislikes about cars, bicycles, and transit in general. The discussion transitioned into possible innovative transportation solutions such as real-time bus rapid transit, smart parking, carsharing, e-stores, and dynamic ridesharing. Following the discussion, participants were asked to rank the possible innovative transportation solutions, from most to least appealing.

Current Travel Behavior
In a written survey administered before the focus group, participants were asked to indicate the modes of transportation they use more than two days a week. Four people reported that they drive alone to work, two participants alternate between driving and biking, and one participant drives, bikes, and walks to work. Two people reported that they only bike to work, one takes the bus to work only, and another switches between biking and the bus. One person currently does not commute to work.

Key Responses and Rankings of Transportation Innovations
Participants were asked to rank order innovations presented, from the most to least appealing. Real-time transit information was the first choice of most participants (six votes) because of its potential to enhance existing city bus service and better serve UC Davis students. E-stores were the second choice of most of the participants (six votes).

Carsharing was the third choice for participants (four votes). Smart parking was the least appealing option to participants.

DAVIS RESIDENTS COMMUTING TO WORK:
FOCUS GROUP SUMMARY
June 26, 2003
Davis Art Center

Participant Background
Focus group participants included five males and seven females. Most of the participants (nine) were between 41 to 64 years of age. Only two participants were between the ages of 24 to 40 and one participant was 23 or younger. Five of the Davis residents recorded yearly household incomes between $20,000-$49,000, four between $50,000-$79,000, and one between $10,000-$19,000.

Participants' Current Modes of Transportation

Davis Residents Principle Commute Modes:

Bus	1
Bus & Bike	1
Bike	2
Drive & Bike	2
Drive	4
Drive, Bike & Walk	1
Doesn't Presently Commute	1

Attitudes About Current Transportation Options

- Participants reported that they liked the following attributes of cars:
    - Storage capacity
    - Ability to carry heavy loads
    - Door-to-door convenience
    - Flexibility
    - Climate control
    - Entertainment from radio
    - Safety over biking
    - Safety at night
    - Ability to personalize car
    - Opportunity for time alone
    - Travel time savings
    - Productive time (e.g., listen to the news).
- Participants reported that they disliked the following attributes of cars:
- Traffic

- Emissions and pollution
- Maintenance and ownership costs
- Depreciation of asset
- Trunks in sedans not ergonomically designed
- Isolation from community
- Road rage
- Risk of accidents
- Lack of parking
- Inefficient for short distance travel
- Loud noises and bad odors
- Noise pollution from stereos
- Uncomfortable temperature (i.e., in the summer car is hot when entering).

- Participants reported liking the following attributes of bicycles:

  - Exercise
  - Fresh air
  - Economical and efficient
  - Connection to the environment
  - Easy parking
  - Good door-to-door mobility
  - Congestion reduction
  - Improvement in social community
  - Allows for multi-modal transportation
  - Accessibility is greater than cars
  - Egalitarian (e.g., transportation for youths)
  - Scenic bike paths around Davis.

- Participants reported disliking the following attributes of bicycles:

  - Cannot ride in cold weather
  - Greater vulnerability relative to cars
  - Scary in heavy traffic
  - Less safe at night
  - Bicyclists inexperienced with the system cause accidents
  - Crowded bike paths
  - Lack of storage space
  - Difficult to lock up, liable to be stolen
  - Flat tires, hard seats, and ruined hairstyles
  - Limited bike parking infrastructure
  - Cost of bike permits
  - Lack of enforcement of bike and safety laws.

- Participants reported liking the following attributes of transit:

- Generally reliable schedule
- Sometimes can avoid traffic
- Economical
- Increases leisure time
- Ability to multi-task (e.g., work on bus)
- Helps regulate the work day
- Social aspects (i.e., the opportunity to meet and visit with people)
- Helps build community
- Clean and climate controlled
- Egalitarian in some forms.

- Participants reported disliking the following about transit:

  - Disrespectful and impolite commuters
  - Some people exhibit bad hygiene
  - Spread of colds and flu
  - Must work around transit time schedule
  - Breakdowns or schedule changes make it unreliable
  - Uncomfortable seats or lack of available seating
  - Incomplete stop schedules listed
  - Buses subject to same traffic as cars
  - Complicated schedule timetables and maps
  - Without direct routes, can take up to three times longer than cars.

Health and Mobility

Participants were asked whether personal health was taken into consideration when choosing a mode of transportation. Eight responded that they do think about health consequences when selecting transportation, while the other four thought about convenience factors when deciding on transportation. As far as staying physically active, eight participants reported exercising five to seven times a week, two people exercise three to four days a week, one exercises one to two days a week, and one does not exercise at all.

Preferences for Innovative Transportation Options

Table 1: Davis Residents: Innovative Transportation Rankings

Transportation Innovations	Choice		
	1	**2**	**3**
Real-time transit information	6	4	2
Smart parking	0	0	3
Carsharing	3	2	4
Dynamic ridesharing (if users are screened)	2	0	3
E-stores	1	6	0
Total votes	12	12	12

Real-Time Bus Rapid Transit
Participants expressed a need to improve bus transit by reducing travel times on the bus and by reducing access times to the bus stop. Some suggested that more efficient bus routes would encourage transit use, especially among Davis students. In general, participants were in favor of real-time updates of bus schedules or allowing buses more privileges, such as priority traffic signal control. They were, however, skeptical of providing lanes dedicated to bus travel and believed this idea would be more practical for a large, urban city.

Smart Parking
Participants remarked how smart parking would primarily benefit people who use technology such as the Internet, cellular phones, and PDAs. One person was concerned about a lack of access to the system for the disabled or senior citizens. Other concerns included implementation and additional costs incurred for reserving parking spaces. However, participants generally liked the idea of renting other people's driveways as parking spots. Many of them were also willing to allow their driveway space to be rented out. One participant commented that this idea was already taking place among freshman Davis students who are not issued parking permits. They simply offer money to friends for use of their driveway or parking space.

Carsharing and Shared-Use Vehicles
Most participants liked the idea of carsharing, but questioned the application in Davis. Some participants found the opportunity to drive various car models appealing. Others remarked that the carsharing concept was difficult to understand, both technologically and economically. Upon further consideration, some commented that the concept did make sense when the total costs of owning and running a car are considered. Some

participant were concerned about accessibility to shared-use vehicles (e.g., location of cars and walking distance to pick up the cars). Others preferred a system in which shared-use vehicles were economically priced for both short- and long-term usages, instead of being designed for a few hours of use.

Dynamic Ridesharing

The dynamic ridesharing concept was briefly discussed among the participants. Most participants liked the idea, but there were immediate security concerns. Participants said they would partake in ridesharing only if all members were screened.

E-Stores

Participants were familiar with comparable e-stores at some BART stops and like the application. Most participants were concerned that e-stores could not offer low enough prices and a wide enough selection of goods to compete with grocery stores. Some remarked that most gas stations already serve a dual function as a gas stand and convenience store. One participant mentioned that she enjoys the human interaction that is a part of the traditional shopping experience and expressed concern about the impersonality of e-stores.

Real-Time Information for Transit

Real-time information appealed to most participants, but they cited the need to have a central monitor for providing the information to those without cellular phones or PDA-type technology. Participants liked the idea of being able to weigh their options for public transportation, reduce wait times, and find alternative routes during heavy traffic. Overall, most participants felt this technology made sense and would facilitate intermodal transportation.

Smart Mobility Model Project

Draft Focus Group Protocol (Staff Focus Groups)
University of California, Davis

Part I: Introduction (10 minutes)

- Moderator introduction and focus group purpose
- Permission to record (i.e., video and/or audio)
- Focus group overview
- Participant introductions
  --Transit ridership
  --Bike usage
  --Auto ownership
- Attitudes towards driving, parking and congestion on Campus
- Attitudes towards transit, bikes, alternative modes

Part II: What is Innovative Mobility (20 minutes)

- Explanation of Innovative Mobility (Susan Shaheen)
  --Connectivity
  --Telematics
  --Advanced information systems
- Examples of innovative mobility systems in the Davis/Sacramento area.

Part III: Auto Likes and Dislikes (20 minutes)

- Costs (ownership, insurance, gas, maintenance, etc.)
- Parking on Campus/off Campus
- Car usage during the week
- Car usage on weekends
- General attitudes about cars and car ownership
- Benefits auto. Travel
- Difficulties of auto travel

Break (10 minutes with refreshments)

Part IV: Alternative Modes (Transit, Bike, etc.) Likes and Dislikes (20 minutes)

- Usage of transit (Unitrans and other) during the week
- Usage of transit (Unitrans and other) on weekends
- Bicycle usage
- General attitudes about alternative modes
- Benefits and difficulties of alternative modes

Part V: Innovative Mobility Concepts and Technologies with Focus on System Access and Connectivity (20 minutes)

- Carsharing
- Scooters/Segway
- Bus rapid transit

Part VI: Innovative Mobility Concepts and Technologies with Focus on Information (20 minutes)

- Access to schedules, routes
- Attitudes about cell phone, PDA, internet for info.
- Real time information

Adjourn and Disperse Incentives

TRANSPORTATION QUESTIONNAIRE

Thank you for filling out this questionnaire. All answers are completely confidential.

1. How many persons (including yourself) are there in your household? _____

2. How many commuters, (including yourself), are there in your household?_____
   A commuter is defined as someone traveling to work 3-5 days/week.

3. How do you usually get from home to work? Please check the modes you use more than two days a week.

   o Drive alone
   o Bus
   o Bike
   o Carpool/Vanpool
   o Walk
   o Don't presently commute
   o Other, please specify :_____

   How do you get around for non-work trips?_____

4. What is your work location?_____

5. How many miles one way between your home and your work? _____

6. Have you ever heard of carsharing before being recruited for this focus group?

   o Yes. o No. (Please go to question 5)

   If **yes,** from what sources? Check **all** that apply:

   o Friend or colleague
   o Newspaper, magazine, or other print media
   o TV/radio spot
   o Internet
   o Household member
   o Other, please specify:_____

7. Have you ever heard about alternative fuel vehicles?

   o Yes. o No. (Please go to question 6)

   If **yes,** what specifically have you heard about?

   From what sources? Check **all** that apply:

   o Friend or colleague
   o Newspaper, magazine, or other print media
   o TV/radio spot

o Internet
o Household member
o Other, please specify:_____

8. Have you ever heard about the Segway Human Transporter?

o Yes. o No. (Please go to question 7)

If **yes,** from what sources? Check **all** that apply:

o Friend or colleague
o Newspaper, magazine, or other print media
o TV/radio spot
o Internet
o Household member
o Other, please specify:_____

9. Have you ever heard about Smart Parking Management Systems?

o Yes. o No. (Please go to question 8)

If **yes,** what specifically have you heard of?

If **yes,** from what sources? Check **all** that apply:

o Friend or colleague
o Newspaper, magazine, or other print media
o TV/radio spot
o Internet
o Household member
o Other, please specify:_____

10. Do you use a cellular phone o a PDA o or both o?

11. Are you... o female o male

12. What is your current marital status?

o Single o Married o Separated o Divorced o Widowed

13. What is your age?

o 23 or younger o 24-40 o 41-64 o 65-74 o 75 or older

14. What is the last level of school that you completed?

o Grade school o Associate's Degree
o Some high school o Bachelor's Degree
o Graduated high schoolo Some graduate school
o Some college o Master's Degree
o Ph.D. or higher o Other, please specify:_____

15. Please indicate the number of your household members (including yourself) that fall into the different age groups listed below.

____persons 0-5 years old ____persons 19-23 _____persons 65-74

____persons 6-15 ____persons 24-40 _____persons 75 or older

____persons 16-18 ____persons 41-64

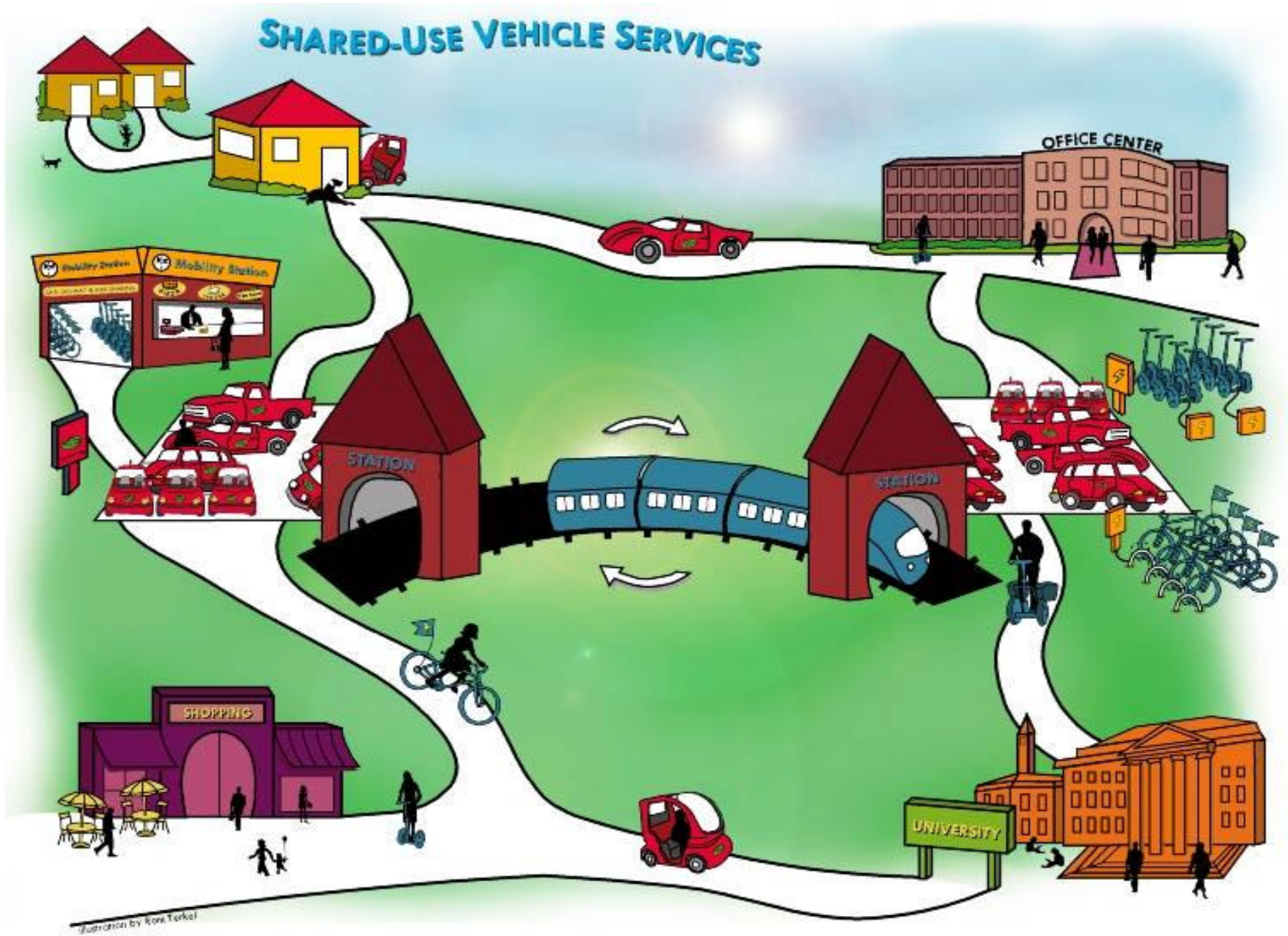
16. What was your household's 2002, pre-tax income?

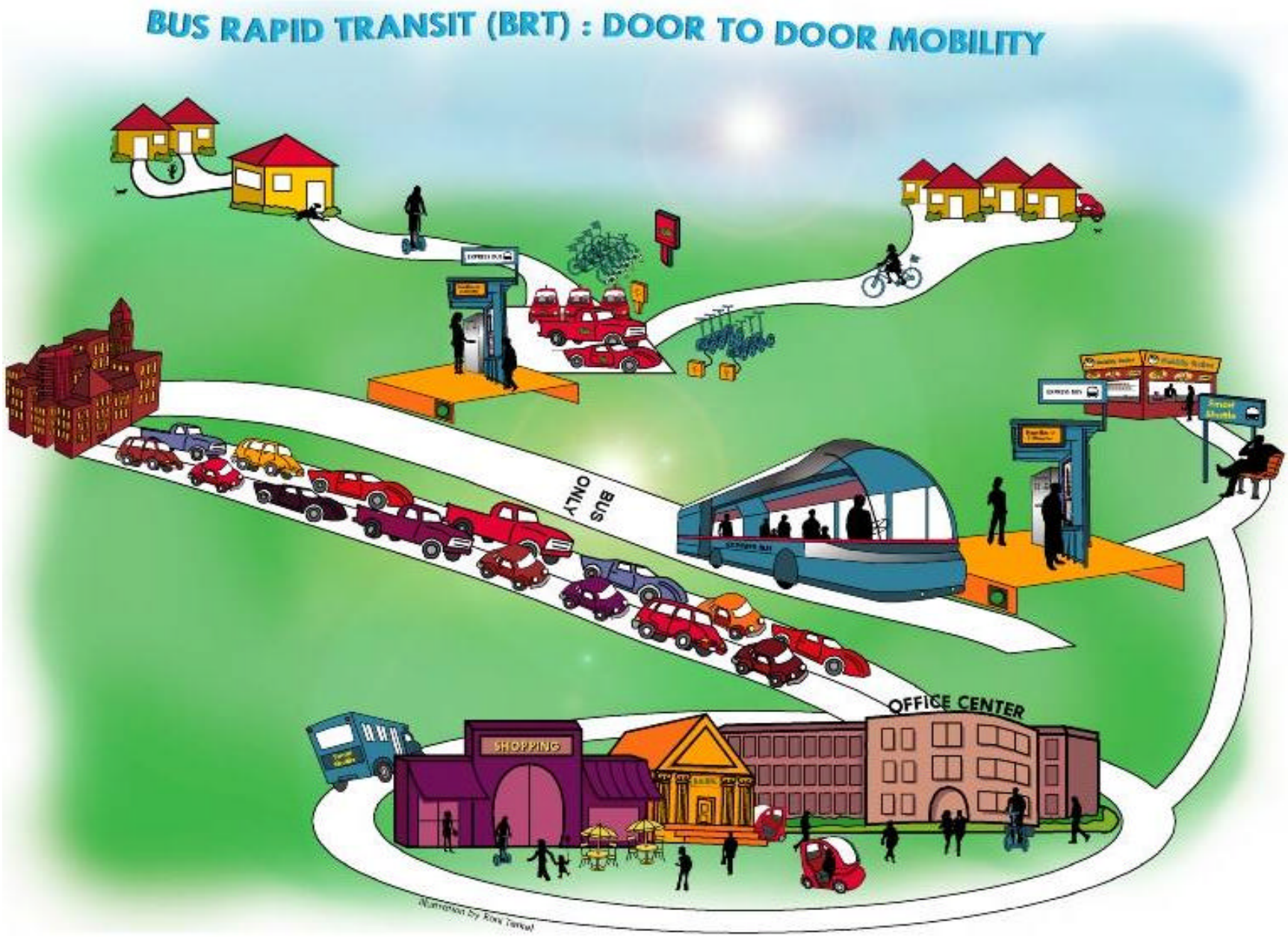
oUnder $10K o$10K - $19.9K o$20K - $49.9K
o$50K - $79.9K o$80K - $109.9K oMore than $110K
oDecline to respond

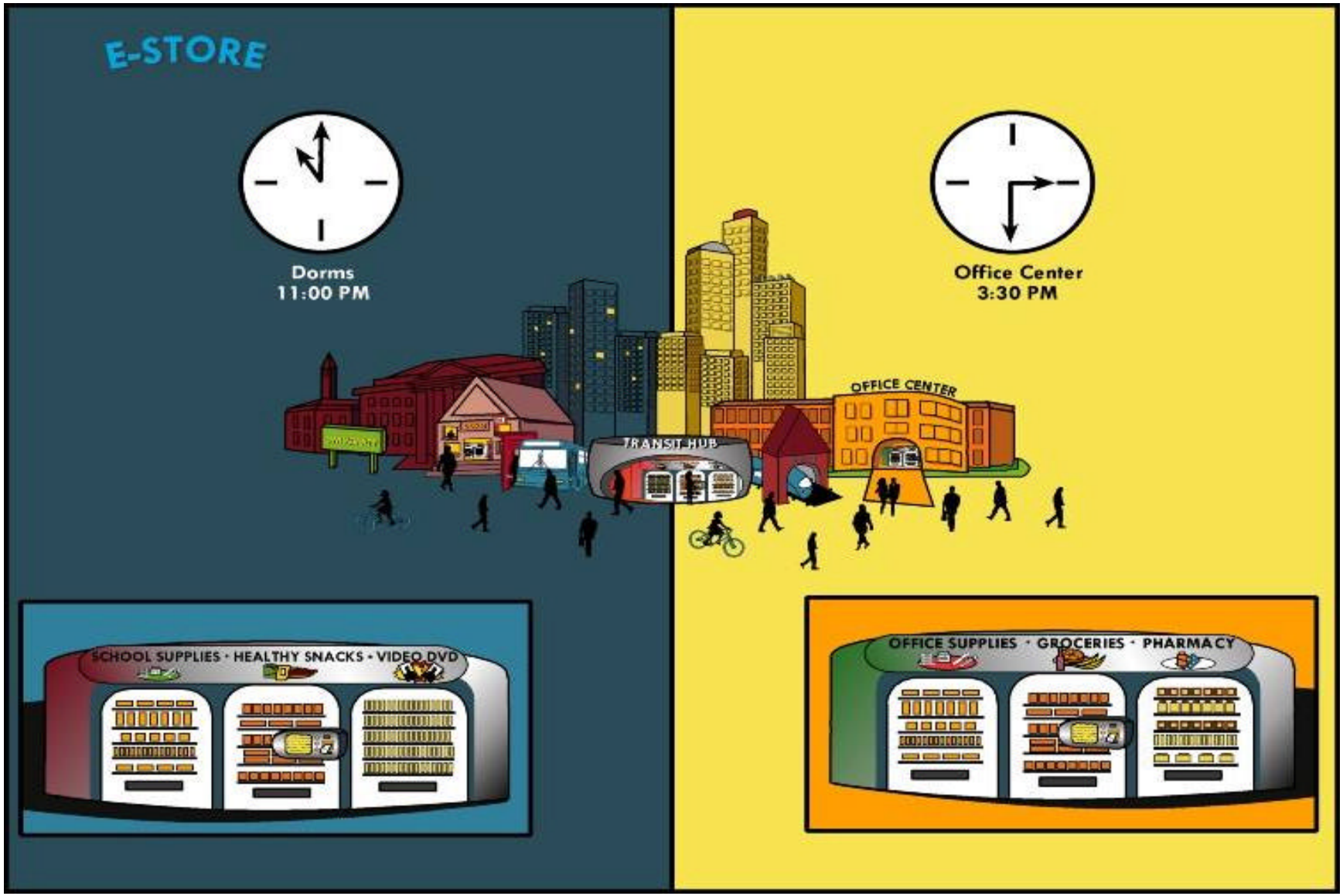
Thank you very much for your cooperation!

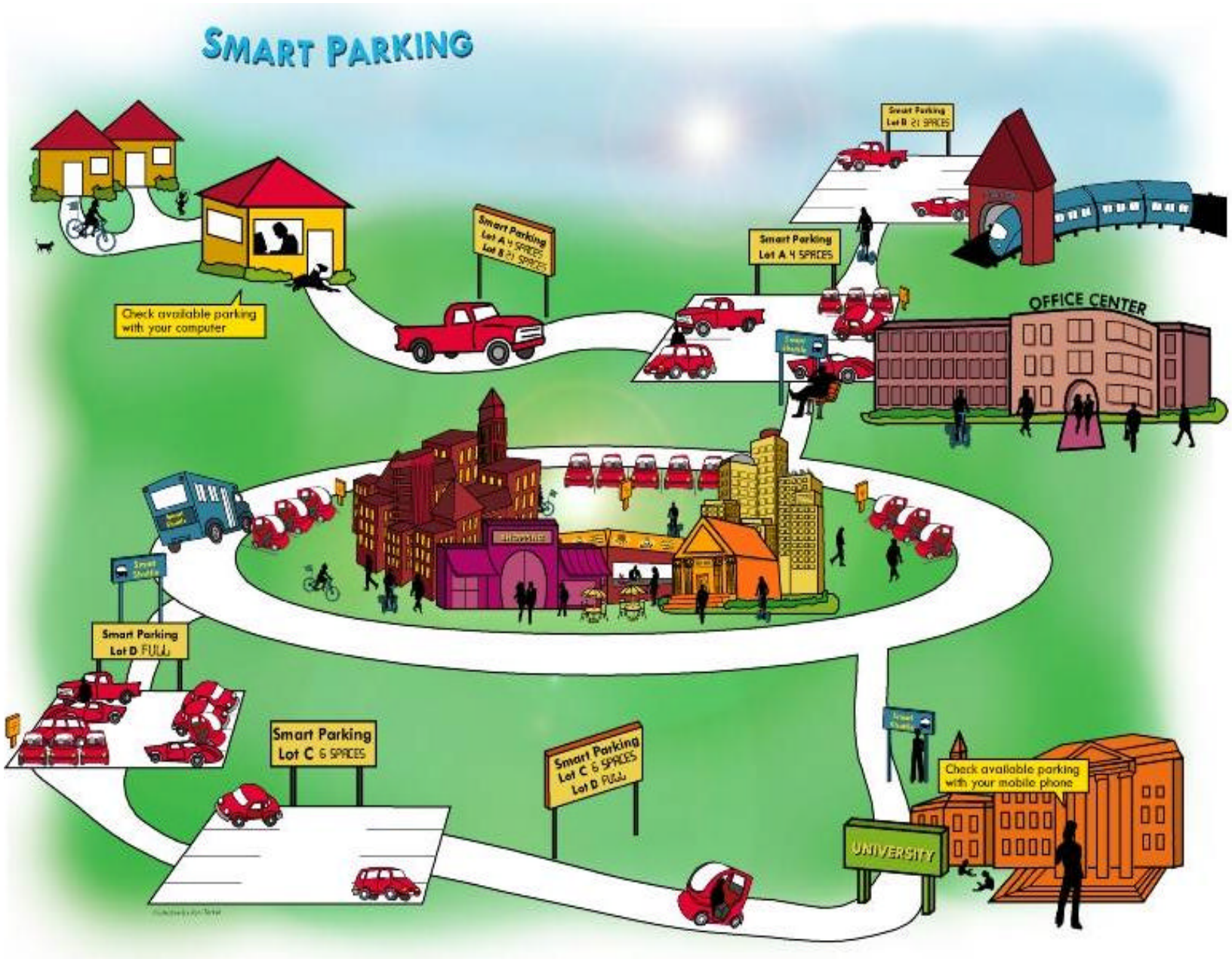
APPENDIX C

FIVE MOBILITY POSTERS


SHARED-USE VEHICLE SERVICES
OFFICE CENTER
Mobility Station
STATION
STATION
SHOPPING
UNIVERSITY
Illustration by Ron Tarkel


BUS RAPID TRANSIT (BRT) : DOOR TO DOOR MOBILITY
BUS ONLY
OFFICE CENTER
SHOPPING


E-STORE
Dorms
11:00 PM
Office Center
3:30 PM
OFFICE CENTER
TRANSIT HUB
SCHOOL SUPPLIES · HEALTHY SNACKS · VIDEO DVD
OFFICE SUPPLIES · GROCERIES · PHARMACY


SMART PARKING
Check available parking with your computer
Smart Parking Lot A 4 SPACES Lot B 21 SPACES
Smart Parking Lot A 4 SPACES
Smart Parking Lot B 21 SPACES
OFFICE CENTER
Smart Parking Lot D FULL
Smart Parking Lot C 6 SPACES
Smart Parking Lot C 6 SPACES Lot D FULL
Check available parking with your mobile phone
UNIVERSITY


INFORMATION SERVICES FOR ENHANCED MOBILITY
Smart Parking
Lot B 14 SPACES
Smart Parking
Lot A FULL
UNIVERSITY
SHOPPING
OFFICE CENTER
Check available parking with your mobile phone
Lot "A" Full, Lot "B" 14 Spaces
Check bus schedule and other mobility options at kiosk, and purchase your ticket
Check carsharing options with your PDA
Check dynamic ridesharing possibilities with your mobile phone or PDA
DOWNTOWN

APPENDIX D

CARSHARING AND CARFREE HOUSING:

PREDICTED TRAVEL, EMISSION, AND ECONOMIC BENEFITS

A Case Study of the Sacramento, California Region

Caroline Rodier, Ph.D.
Post-Doctoral Researcher
California Center for Innovative Transportation (CCIT)
University of California; 2105 Bancroft Way, Third Floor
Berkeley, CA 94720-3830
916-451-8088 (O); 916-451-8188 (F)
cjrodier@path.berkeley.edu

and

Susan A. Shaheen, Ph.D.
Policy and Behavioral Research, Program Leader,
California Partners for Advanced Transit and Highways (PATH) &
Special Assistant to Director's Office, Caltrans
University of California; 2105 Bancroft Way, Third Floor
Berkeley, CA 94720-3830
510-642-5059 (O); 510-642-0910 (F)
sashaheen@path.berkeley.edu; sashaheen@ucdavis.edu

CARSHARING AND CARFREE HOUSING: PREDICTED TRAVEL, EMISSION, AND ECONOMIC BENEFITS

A Case Study of the Sacramento, California Region

Caroline Rodier, Ph.D. and Susan Shaheen, Ph.D.

ABSTRACT

In this paper, researchers present simulation findings from three innovative mobility scenarios (forecast to 2025) using an advanced regional travel demand model. This model was employed to approximate the effects of transit-based carsharing (short-term vehicle access linked to transit), real-time transit information services, and carfree housing (residential developments designed with limited parking provisions) in the Sacramento region. The scenarios are evaluated against travel, emission, and economic benefits criteria. The results indicate relatively modest reductions in vehicle travel and emissions, in part, due to limited transit service penetration in the region. Despite the modest travel effects of the scenarios, the economic analysis indicates a net benefit for all of the innovative mobility scenarios. The total per trip benefit ranges from $0.01 to $0.05. The yearly total benefit for all scenarios would be significant.

Key words: Carsharing, advanced transit information, carefree housing, travel demand modeling, economics benefits, emissions, and travel impacts

INTRODUCTION

In the coming decade, the population of California is expected to increase by 18 percent (6 million) with a corresponding 27 percent increase in vehicle miles of travel (VMT) increasing congestion and degrading air quality (*1*). Smart growth policy strategies attempt to tame VMT growth and emissions by redirecting new community development with a high-intensity mix of shopping, jobs, and housing served by high-quality modal alternatives to the single occupant vehicle (SOV). Numerous studies show that the effectiveness of smart growth policy strategies in reducing VMT and emissions hinge on the quality of modal alternatives to the SOV (*2, 3, 4, 5, 6*). The integration of innovative mobility services (e.g., real-time modal information and carsharing (short-term vehicle rentals)) with traditional modal options in smart growth communities may be key to providing high quality multi-modal alternatives that can effectively compete with the SOV.

In this paper, researchers provide findings from a recent study funded by the California Department of Transportation; California Partners for Advanced Transit and Highways (PATH); and the University of California, Davis (UC Davis), called the *Davis Smart Mobility Model Project*. This project evaluated a range of innovative mobility services that could be integrated into smart growth strategies of the UC Davis Campus, the City of Davis, and the Sacramento region. Institutional evaluations, a campus-wide survey, focus groups, and travel demand analyses were conducted in 2002-2003 to identify current or future locations with smart growth characteristics, document current travel patterns, and evaluate innovative mobility options.

The innovative mobility scenarios, forecast to 2025, are simulated with an advanced regional travel demand model to approximate the effects of carsharing, real-time transit information services, and a carfree housing policy in the Sacramento region. These scenarios are evaluated against travel, emission, and economic benefits criteria. This paper includes four sections. First, researchers provide background on each of the innovative strategies examined: carsharing, advanced transit information, and carefree housing. Second, the simulation methods used in this analysis are documented. Third, the scenarios are described. Fourth, findings are discussed. Finally, conclusions and recommendations are made based on the study results.

CARSHARING, CARFREE HOUSING & ADVANCED TRANSIT INFORMATION: A BRIEF OVERVIEW

This section provides an overview of each of the innovative strategies examined in this paper. The first discussion focuses on shared-use vehicle services, as the application of carsharing examined in this study is primarily a hybrid carsharing model (i.e., a blending of carsharing and station car concepts). In applying the carsharing concept in the Sacramento region, the authors specified a carsharing model, with close transit linkages. Limitations in the model (i.e., detail of spatial representation and modal options) required that we examine transit-based carsharing rather than traditional neighborhood carsharing. Next, the authors provide a brief discussion on advanced transit information, which can enhance carsharing and a carfree lifestyle. Finally, the authors present a brief overview of carfree housing. This concept focuses on residential development designs with limited parking; not surprisingly, these developments promote alternative transportation modes and limited car use.

U.S. Shared-Use Vehicles: Carsharing & Station Cars

U.S. shared-use vehicle services are described in a number of sources (*7*, *8*, *9*, *10*, *11*). Members of shared-use vehicle organizations pay a fee to gain access to a personal vehicle for a trip or segment of a trip. Typically, this service is viewed as short-term vehicle rental. Two types of shared-use vehicle services have been identified: station cars and carsharing. Station cars—generally linked to transit—can be shared, although not always, while carsharing vehicles are always shared. Today, the majority of carsharing programs place vehicles in neighborhood lots (not typically linked to transit), where members access and return carsharing vehicles to the same lot. In contrast, station cars largely serve transit/rail commuters, assisting in transit access either on the home-, destination-end, or both. Increasingly, the carsharing and station car concepts are merging in the U.S., so that they include both elements: transit linkages and distributed lots (*12*).

Shared-use vehicle services started to become popular in the U.S. in the mid- to late-1990s. In a recent study, Shaheen et al. (*13*) report that there are 15 shared-use vehicle programs in the U.S. consisting of eleven carsharing organizations, two station car programs, and two carsharing research pilot programs as of July 2003. Station car programs claimed 112 members and 91 vehicles, and carsharing accounted for 25,615 members and 692 vehicles. While survey findings demonstrate a decline in the number of organizational starts between June 2002-2003 and in station car programs overall, including members and vehicles, carsharing membership and fleet size continue to increase. This survey also revealed exponential growth in U.S. carsharing membership.

As interest in shared-use vehicle services continues to grow, decision makers and transit operators are increasingly interested in understanding program impacts. Potential benefits include: 1) promotion of alternative transportation modes by enhancing and supporting existing transit systems (resulting in increased fare box revenues and decreased subsidies needed); 2) greater mobility at substantial savings for people who do not drive everyday (considering 80 percent of private vehicle costs are fixed and 20 percent of a household's expenditures support transportation); 3) increased incentives for compact growth by reducing parking needs through carsharing in new and existing communities and improving transit services by promoting transit-oriented development; 4) energy and emission benefits due to modal shifts from private vehicle trips to alternative transportation, as well as use of energy-efficient cars including ultra-clean internal combustion vehicles, electric, hybrid, and early fuel cell vehicles; and 4) reduced parking needs by alleviating pressure for public funding of parking structures; and 5) more economically efficient use of limited public highways and reduced need for higher taxes to support capacity expansions.

To date, evaluations of station-car programs (vehicle rentals directly linked to transit) universally support the notion that increased transit connectivity can dramatically reduce VMT by program participants. This is not surprising as many of these programs specifically recruit individuals who would otherwise drive to work rather than commute via public transit. CarLink I, a carsharing pilot program, with a station-car component yielded a net reduction in VMT of approximately 18.5 miles per day. CarLink also resulted in 20 *new* daily BART trips among CarLink commuters (with a limited sample of 20 individuals). Several participants stated that if CarLink became a permanent service, they would sell one of their personal cars, which could greatly reduce their transportation costs (*14*). Findings from the San Francisco Bay Area Station Car Demonstration also revealed substantial reductions in commute-related VMT. These findings indicate that personal vehicle mileage declined from 45 percent of all VMT to 3 percent, with drivers substituting toward a combination of rail and electric vehicles (*8*).

Results are less clear in the case of neighborhood carsharing largely due to limited samples, length of time studied, modest behavioral changes, or combination of factors. A study of CarSharing Portland membership behavior after two years of operation indicates that aggregate VMT decreased among members by 7.6 percent. This reduction was largely driven by members who previously owned/leased a car prior to carsharing. For these individuals, VMT decreased by 25 percent, implying that carsharing may impact vehicle ownership decisions. For members without access to a household vehicle, VMT increased by 19 percent (*15*). A similar outcome was observed in a two-year evaluation of City CarShare in San Francisco, which revealed a two percent VMT reduction among members (*16*). Although modest, it is important to note that this measure may underestimate carsharing’s impact on VMT. Among a comparable group of non-members (control group), VMT increased by 49 percent over the same period, suggesting that carsharing may have reduced total VMT beyond the slight two percent reduction reported. The authors hypothesize that over the period of these studies, the influence of carsharing membership on vehicle ownership is likely reflected in reduced VMT among households that either sold or forfeited a car purchase.

With respect to modal shifts, the early program studies support differing conclusions. CarSharing Portland's two-year study indicated a slight increase in transit use and walking/cycling, while the City CarShare year-two study reported declines in walking/cycling and transit use among members who substituted these modes with carsharing and other motorized vehicles (*16*, *15*, *10*).

Neighborhood carsharing appears to have a more tangible impact on vehicle ownership. Most U.S. carsharing studies demonstrate that shared-use vehicles have a mitigating influence on vehicle ownership behavior, motivating members to either sell or avoid a vehicle purchase. For instance, Katzev et al. (*10*) reported that 26 percent of members sold a personal vehicle, and 53 percent were able to avoid purchasing one.

To summarize, these early studies provide indications of the potential of shared-use vehicle services to increase mobility, reduce auto ownership, and promote transit use and walking. Nevertheless, there is significant diversity among methodological approaches and findings, which confound aggregate-level analysis. To evaluate program-wide effects, a more systematic method of data collection and analysis is needed in the future. This study attempts to gauge social and environmental benefits of transit-based carsharing, carfree housing, and advanced transit information using a different technique: regional travel demand modeling. This approach can be used to estimate the demand for and effects of innovative mobility options on the larger population. For example, more typical carsharing studies may indicate potential mode shifts from the auto to transit among individuals participating in a carsharing study. A modeling study can predict the demand for a specified service among an area's population and the subsequent travel and environmental impacts. It is important to note, however, that service representation may be limited due to the model's structure and the underlying data used to estimate it. The next section includes a brief literature review of advanced transit information.

Advanced Transit Information

Advanced transit information systems provide travelers with real-time transit and traffic information. Travelers access pertinent information about the transportation system through the telephone, television, internet, kiosks, variable message signs, handheld electronic devices, pagers, and cell phones. With this information, individuals can make more informed travel decisions.

Transit information systems can be categorized broadly into three groups: pre-trip, in-terminal, and in-vehicle. Pre-trip information provides travelers with accurate and timely information about transit travel before making a trip. In general, most pre-trip information consists of transit routes, fares, schedules, and locations. In-terminal information provides travelers with arrival and departure times, schedule updates, and transfer information while a traveler is waiting in a transit terminal; in contrast, in-vehicle information is provided en route, allowing vehicle drivers and transit users to choose alternative routes or modes for their destination.

Many transportation authorities including those of Los Angeles, California; Williamsport, Pennsylvania; and King County, Washington offer riders advanced transit information. "To expand customer service and ridership, transit properties are investing in high-tech methods of providing passengers with real-time information via displays, annunciator systems, the Internet and e-mail" (*17*). King County, for example, uses the Web and e-mail to provide transit customers with arrival information as well as unforeseen delays.

In a Northern California study, Abdel-Aty et al. (*18*) employed computer aided telephone interviews in the Sacramento and San Jose areas of California to identify transit service information most desired by non-transit users. Customized stated preference choice sets were used to identify the likelihood of a commuter's choice to use transit. The study found that 38 percent of respondents—who did not use transit—would likely consider using it, if improved information were provided.

To summarize, the modal shift benefits of advanced transit information appear promising. Furthermore, focus groups conducted by the authors among UC Davis students, staff, and Davis residents reflected significant participant interest in this innovative mobility service (*19*). The next section provides an introduction to carfree housing.

Carfree Housing

Carfree housing policies include restrictions on the number of cars owned by residents, limited parking availability, or increased parking costs. The largest existing example of a carfree city is Venice, Italy (*20*). In fact, most European cities include at a small carfree neighborhood typically located near the city center. In the U.S., there are a few carfree areas, for instance, Fire Island and the Ithaca Commons of Ithaca, both in New York State (*20*).

Carfree housing should ideally integrate several factors, including: 1) frequent public transit services (preferably rail); 2) basic shopping and services (or be located in easy walking distance of them); 3) a good cycling network; 4) shelter from traffic noise and pollution; and 5) open space for children to play outdoors without supervision and pleasant enough for adults to spontaneously congregate and use as a natural extension of a private dwelling (*21*).

One study of carfree housing in European cities found that there is a market for carfree housing whether buyers or tenants own vehicles or not (*21*). In German cities, the author found that while the number of carfree households had declined since 1945, this appears to be changing in a few larger cities because of a lifestyle trend towards more single and two-person, young adults, and over-65 households. The author also surveyed carfree households in Dortmund, Germany, and found that 74 percent of respondents were satisfied with not owning a car; 75 percent stated that a car was not necessary for their travel requirements; and 92 percent did not plan to own a vehicle in the near future. In an examination of Amsterdam's carfree housing project, it was also found that a majority of carfree households live a practically carfree lifestyle. One out of 48 carfree households used a car for over 50 percent of all trips, and 57 percent of households only used a car for less than 10 percent of their trips (*21*).

Another study (*22*) examined the travel behavior of residents living in carfree areas and found a correlation between the number of carfree households and the number of private vehicles per resident. The share of carfree households amounted to 92 percent in Vienna, 74 percent in Edinburgh, 62 percent in Amsterdam, and 25 percent in Hamburg. The number of private vehicles was 1 per 27.8 residents in Vienna, 1 per 8.8 in Edinburgh, 1 per 5.8 in Amsterdam, and 1 per 2 in Hamburg. Also, it was reported that Vienna public transport was used three times more, and Edinburgh public transport was used twice as often as public transport in Amsterdam and Hamburg (*22*).

While these study results are quite positive, it is unclear how successful carfree housing might be in the U.S. Anecdotally, the authors have learned that several carfree housing experiments in Germany (where this concept is predominantly used) are less successful than those reported in above. For example, it has been reported that several carfree developments in Germany attract residents due to reduced rental rates; however, many individuals still own vehicles but park them down the street from their residence. If this is indeed true, then, carfree housing would not address the goal of a carfree lifestyle. Given this concern, the authors modeled scenarios that also incorporated carsharing services to offer convenient vehicle access when needed. The next section includes a discussion of the methodology employed by the authors.

METHODOLOGICAL APPROACH

As discussed above, the studies cited in the literature review largely evaluate the social and environmental effects of innovative mobility approaches on participants only. This study, however, uses a relatively advanced travel demand model to gauge the demand for and effects of scenarios on the total population in a region. The drawback of this approach is the level of sophistication with which the model can represent the innovative mobility scenarios (see discussion of scenarios below). Scenario travel results from the simulation are input into an emissions model to estimate emissions effects. An economic model is applied to the mode choice model in the travel demand model to estimate potential scenario benefits. Detailed descriptions of each of these models are provided below.

The Sacramento Regional Travel Demand Model

The Sacramento regional travel demand model (SACMET01) is typical of a traditional four-step travel demand model that has been improved to better meet the current demands of transportation planning. This is accomplished by enhancing the representation of travel time and cost variables throughout the model hierarchy, expanding the range of modal options, including land use variables, and improving the detail of zone and network structures. The model was originally developed with a 1991 regional travel behavior survey and has recently been recalibrated with a 2000 regional travel behavior survey. This discussion highlights key model features. Complete model documentation is provided in the SACMET01 Model Update and Validation Report (*23*).

The SACMET01 model's representation of geographic detail is relatively fine. It includes a detailed transportation network composed of over 10,000 links and 1,142 travel analysis zones. Traffic analysis zones are the geographic units used by travel demand models. Zones contain area-specific information (e.g., number of households and employment) and are the location at which trips begin and end in a model. The network of a travel demand model represents the roadways and transit lines of a region with a series of links connected by nodes. All of the model links are described in terms of key variables (e.g., type of road, speed, and number of lanes).

The SACMET01 model differs from the traditional four-step travel demand model in that it includes an auto ownership step that precedes the trip generation step. The auto ownership step is a logit model that predicts the probability of owning zero, one, two, three, or more autos. The variables in this model include retail employment within one mile; total employment within 30 minutes by transit; a pedestrian environmental factor; and household size, workers, and income.

The trip generation step in the SACMET01 model estimates the number of person-trips that begin or end in a zone, based on the number and type of households (number of persons and workers), employment, and school enrollment (college and K through 12^{th} grade). A retail accessibility measure is also included in the trip generation model for some trip purposes.

The SACMET01 model represents six trip purposes: home-work, home-shop, home-school, home-other, work-other, and other-other. The first part of the trip purpose title (i.e., home, work, and other) refers to the activity location at which the trip begins, and the second part refers to the activity location at which the trip ends.

The trip distribution step in the SACMET01 model links the trips from trip generation in an origin-destination pattern using travel times that reflect street traffic as opposed to free-flow travel times. This is accomplished by travel time feedback from the traffic assignment step to the trip distribution step until convergence is achieved. The home-based work trip is a joint destination and mode choice logit model and includes travel time and cost variables (or

composite utility). The other trip purposes use the traditional gravity model formulation and include only the travel time variable.

The mode choice step predicts the probability that a traveler will choose a particular mode from a range of available modes. The modes included in the SACMET01 model are drive-alone, shared-ride (2 and 3+), transit (walk and drive access), walk, and bike modes. Modes are chosen as a function of modal attributes (time and cost), household characteristics (auto ownership, income, size, workers), and land use variables (pedestrian amenities and employment distance).

In the traffic assignment step, vehicle trips are assigned to routes with preference given to the fastest routes. The well-known user-equilibrium traffic assignment algorithm is used to assign vehicle trips by separate peak (A.M. and P.M.) and off-peak (midday and evenings) periods. The traffic assignment outputs are link volumes, link speed, vehicle miles traveled (VMT), and vehicle hours of delay. These outputs play an important role in the evaluation of travel effects of transportation alternatives and are key inputs to emission analyses. The next section describes the emission models used.

Emission Models

The California Department of Transportation's Direct Travel Impact Model 2 (DTIM2) emission model and the California Air Resources Board's EMFAC7F emission factors were used in this analysis. The outputs from the SACMET01 model used in our emission analysis included the results of assignment for each trip purpose by time period (AM peak, PM peak, midday, and evening). SACOG provided regional cold-start and hot-start coefficients for each hour in a twenty-four hour summer period. EMFAC7G could not be used in the analysis because necessary data are not currently available in this region. Because the emphasis of this study is on the comparison of alternative scenarios (as opposed to a comparison to some fixed criteria), the use of the EMFAC7F emission factors should not affect the authors' study conclusions. The final section provides a brief overview of the benefit measures employed.

Economic Benefit Measures

Transportation agencies in the U.S. typically use criteria such as lane-miles of congestion, hours of travel delay, VMT, and mode share to evaluate proposed transportation policies. Such criteria are limited because they fail to account for travel time and cost effects resulting from transportation policy changes. Benefit measures that capture travel time and cost changes for all modes, resulting from a policy scenario, can be used to measure gains or losses to specific groups (usually income groups) or the region as a whole.

Kenneth Small and Harvey Rosen (*24*) show how a benefit measure known as compensating variation (CV) can be obtained from discrete choice models:

$$CV = 1/\lambda \left\{ \left[\ln \sum_{m \in M} e^{V_m(p^f)} \right] - \left[\ln \sum_{m \in M} e^{V_m(p^0)} \right] \right\} \qquad (1)$$

where λ is the individual's marginal utility of income, V_m is the individual's indirect utility of all m choices, p^0 indicates the initial point (i.e., before the policy change), and p^f indicates the final point (i.e., after the policy change). The change in indirect utility is converted to dollars by the

factor, 1/λ, or the inverse of the individual's marginal utility of income. Small and Rosen show how marginal utility of income can be obtained from the coefficient of the cost variable in discrete choice models.

The compensating variation formula (1) from above was adapted to suit the specifications of the SACMET01 mode choice models. In these models, households are segmented into income/worker categories and person trips are generated for those categories. To obtain compensating variation for each income/worker category *h* the following formula was applied for all modes *m* and for all trips *Q* between all origins *i* and all destinations *j*:

$$CV_h = 1/l_h \left\{ \sum_{i \in I} \sum_{j \in J} \left[\left(\ln \sum_{m \in M} e^{V_{ijmh}(p^f)} * Q_{ijh} \right) - \left(\ln \sum_{m \in M} e^{V_{ijmh}(p^0)} * Q_{ijh} \right) \right] \right\} \qquad (2)$$

where λ is provided by the coefficient of the cost variable in the mode choice equations. Total compensating variation was obtained by summing the compensating variation obtained from each income/worker group.

The benefit analysis includes avoided parking costs, carsharing service fees, and operation and maintenance costs of advanced transit information. In the analysis, the cost of the carsharing service to the consumer is assumed to be $1.10 per trip, which approximates a $300 monthly fee. This monthly service fee is consistent with that charged for a carsharing pilot project in the San Francisco Bay Area (Shaheen and Wright, 2001). The yearly operation and maintenance costs for the advanced transit information services are assumed to be $160,000 per year and are based on estimates from the SMART TRAVELER project in Los Angeles (*26*). The next section includes a description of the innovative scenarios modeled.

INNOVATIVE MOBILITY SCENARIOS

The authors developed three innovative scenarios to model. To begin, a base case scenario was specified, reflecting the Sacramento region's 2025 Metropolitan Transportation Plan (MTP). Next, the authors specified three innovative scenarios based on the following innovations: 1) carsharing (a transit-based carsharing model), 2) carfree housing, and 3) advanced transit information. A brief description of each follows. Scenario One consists of *Carsharing Only*. Scenario Two includes *ATI and Carsharing*, and Scenario Three is a combination of *Carfree Housing, ATI, and Carsharing*.

Base Case Scenario

The Base Case scenario represents the region's 2025 MTP, which includes a significant expansion of light rail, addition of bus rapid transit, and new or widened freeways. The 2025 MTP map is illustrated in Figure 1 (below).

Carsharing

Carsharing was provided in key areas throughout the region to allow people to more quickly access light rail and bus rapid transit and/or a key employment center (UC Davis). Again, the limitations of the travel demand model used in this study required that we specify a transit-based

carsharing service rather than a neighborhood service. These areas included downtown Sacramento, North Natomas, South Sacramento, Elk Grove, Folsom, Roseville, Carmichael, Rancho Cordova, Citrus Heights, and Woodland (to UC Davis). The areas served by carsharing are highlighted in Figure 1. The carsharing service was coded as a transit access link with very short direct routes and frequent service between zones and light rail station locations or the UC Davis employment center.

Carfree Housing

This scenario was represented in the model by adjusting auto ownership in the zones in which carsharing was provided. For all zones outside of the downtown area with carsharing services, 10 percent of households with two or more cars became one-car households. In downtown, 5 percent of the households with two or more cars became zero-car households, and 5 percent of the households became one-car households.

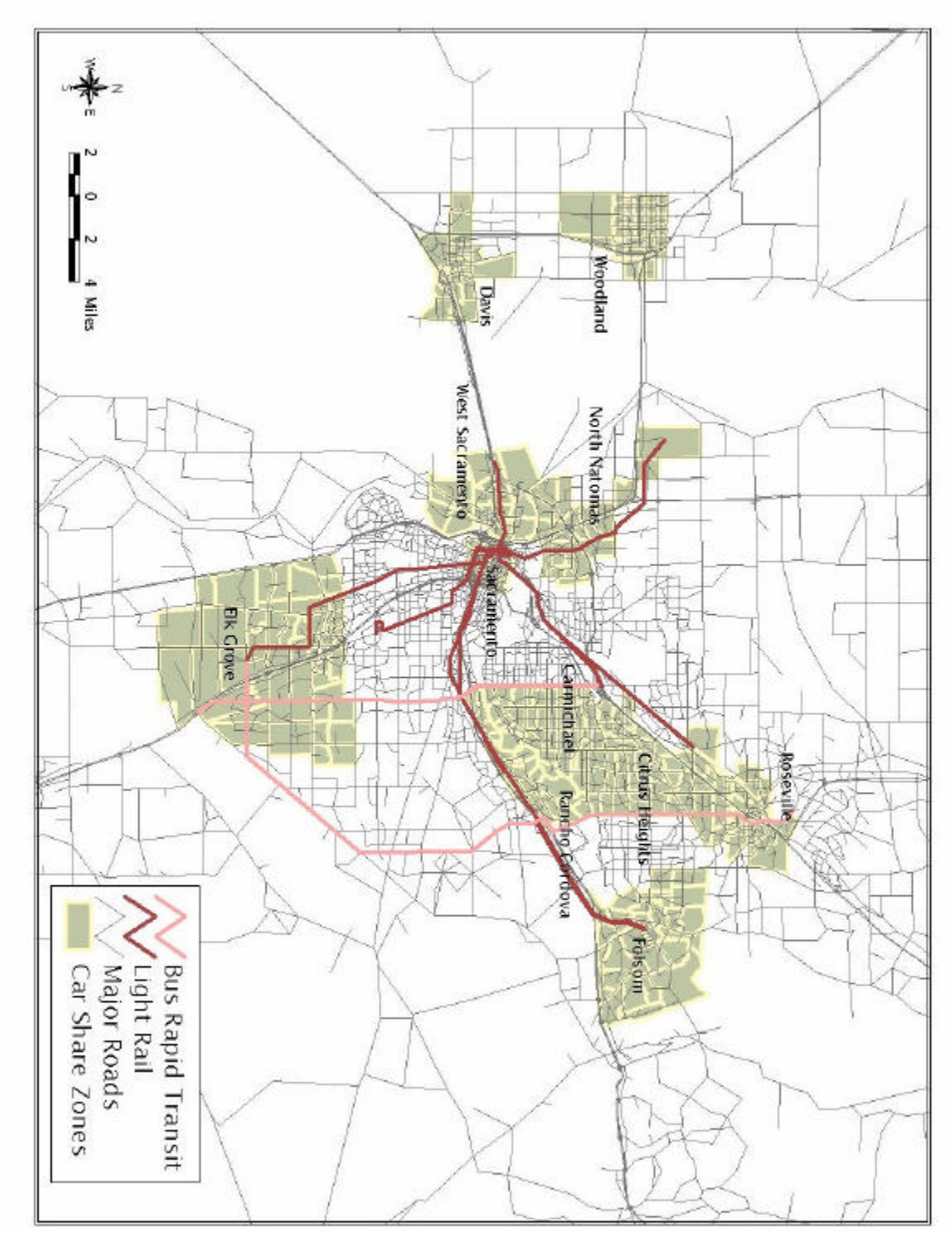
Advanced Transit Information (ATI)

Transit users are assumed to access real-time transit scheduling information through signs located at transit stations and phones, the Internet, and cable television. Given a high-degree of access to advanced transit information (ATI), the maximum initial wait times for all transit services in the model were reduced by one-half. The variables in SACMET01 that are available to simulate ATI are limited, and thus the only stated ATI effect is on passenger wait time.

Limitations in the Representation of the Scenarios

This study attempts to approximate the effects of carsharing, carfree housing, and advanced traveler information systems using a more advanced regional travel demand model. As indicated in the discussion above, carsharing and advanced traveler information are not directly represented in the SACMET01 model. Since advanced transit systems have not been widely implement in the U.S. (much less Sacramento), potential benefits attributable to these technologies, over and above those of traditional transit modes, are not represented in the underlying data used to estimate the SACMET01 mode choice models. As a result, our analysis likely underestimates travel and net benefits.

FIGURE 1. 2025 MTP map with carsharing zones.



MODELING RESULTS

Modeling results for each of the innovative mobility scenarios developed are discussed below. Findings are discussed according to: 1) regional travel effects, 2) economic benefits, and 3) vehicle emissions.

Regional Travel Results

At the regional level, each scenario provides relatively modest increases in transit mode share and fairly small reductions in auto mode share. It is important to note the distinction between this study and innovation analyses described in the literature review to understand the difference in the magnitude of findings. The current study specifies model scenarios, and then, estimates the region-wide demand for these services and their effects on total travel. Again, as described above, there are some limitations to the representation of our innovative scenarios in the model. The studies cited in the literature review, particularly with respect to carsharing, evaluate programs that may be different than the scenarios in this study and, typically, evaluate effects on particular program users not the total regional market.

The daily mode choice results are presented in Table 1 (below). Carsharing and ATI improve access to and egress from regional light rail and bus rapid transit and thus improve transit travel time relative to the auto for some trips. The addition of advanced transit services tends to boost the increase in transit mode share and the reduction in auto mode share. In the *Carsharing Only* scenario, the daily transit mode share is increased by 2.78 percent, and the drive alone and shared ride mode shares are decreased by 0.15 and 0.31 percent, respectively. (Note that all reported percentages are percentage change from the Base Case to the innovative mobility scenarios.) Carsharing is applied to selected areas in the region, but the ATI service reduces transit wait times across the region, and thus ATI produces a greater magnitude of shifts relative to the *Carsharing Only* scenario. In the *ATI and Carsharing* scenario, the daily transit mode share is increased by 19.06 percent, and the drive-alone and shared-ride mode shares are decreased by 0.39 and 0.55 percent, respectively. After adding the carfree housing policy to the ATI and Carsharing scenario (*Carfree Housing, ATI, and Carsharing* scenario), the daily transit mode share is increased by 17.96 percent, and the drive-alone and shared-ride mode shares are decreased by 0.48 and 0.44 percent, respectively. It appears that the restrictive auto access of the carfree housing policy in the SACMET01 model tends to promote ridesharing rather than transit use. This increase in ridesharing, however, could be accommodated by a carsharing service that was more flexible than the light rail based-service represented in this study. If such a service was integrated into carfree development with reduced parking, then more dramatic reductions in the auto mode share could be possible. These types of developments are now occurring in the U.S.

TABLE 1. Daily Mode Share for 2025 Sacramento Innovative Mobility Scenarios

	Drive-Alone	Shared-Ride	Transit	Walk	Bicycle
Base Case	49.51%	42.89%	1.50%	5.23%	0.87%
Carsharing	49.43% (-0.15%)[1]	42.75% (-0.31%)	1.54% (2.78%)	5.25% (0.27%)	0.87% (0.27%)
ATI & Carsharing	49.32% (-0.39%)	42.65% (-0.55%)	1.79% (19.06%)	5.23% (-0.07%)	0.87% (-0.63%)
Carfree Housing, ATI & Carsharing	49.27% (-0.48%)	42.70% (-0.44%)	1.77% (17.96%)	5.24% (0.05%)	0.87% (0.17%)

[1] Figures in parentheses are percentage change from the base case scenario.

The daily travel results (see Table 2 below) are consistent with the daily mode share results, presented in Table 1 (above). The modest increases in transit mode share and reduction in auto use tend to produce modest reductions in vehicle trips, VMT, and vehicle hours traveled. Again, the layering of innovative strategies in each of the three scenarios increases overall effectiveness. The *Carsharing Only* scenario reduces vehicle trips by 0.01 percent, VMT by 0.02 percent, and vehicle hours of travel by 0.04 percent. The *ATI and Carsharing* scenario reduces vehicle trips by 0.16 percent, VMT by 0.15 percent, and vehicle hours of travel by 0.23 percent. The *Carfree Housing, ATI, and Carsharing* scenario reduces vehicle trips by 0.23 percent, VMT by 0.17 percent, and vehicle hours of travel by 0.26 percent.

TABLE 2. Daily Travel Results for the 2025 Sacramento Innovative Mobility Scenarios

	Vehicle Trips	VMT	Vehicle Hours Traveled
Base Case	7,898,314	65,387,054	1,774,724
Carsharing	7,897,227 (-0.01%)[1]	65,376,657 (-0.02%)	1,774,058 (-0.04%)
ATI & Carsharing	7,885,380 (-0.16%)	65,289,479 (-0.15%)	1,770,600 (-0.23%)
Carfree Housing, ATI & Carsharing	7,880,165 (-0.23%)	65,278,085 (-0.17%)	1,770,065 (-0.26%)

[1] Figures in parentheses are percentage change from the MTP Base.

The City of Davis

The City of Davis is unique in the Sacramento region because it contains a strong transit and bicycle network that supports bus and bike travel throughout the city and, in particular, to the University of California. Table 3 (below) provides daily mode choice results, both for trips produced in and attracted to the City of Davis. As discussed above, carsharing is simulated between Woodland (north of Davis) and UC Davis. The modest increase in transit and decrease in auto mode share reflects the limited carsharing market between Woodland and the City of Davis. In this context, it is important to note that light rail does not extend from Sacramento to Davis in the 2025 Base Case scenario, thus transit modal shifts between these two cities is somewhat limited (i.e., to bus service only). However, because the City of Davis has a strong transit network, the effect of the ATI service is significantly greater in the City of Davis compared to the Sacramento regional analysis above. The increase in transit mode share is approximately 35 percent, and the reduction in the drive alone and shared ride modes is approximately two percent. As in the Sacramento regional analysis, the addition of carfree housing to the *ATI and Carsharing Scenario* tends to reduce drive alone and shared ride mode shares and dampen the increase in the transit mode share. Again, it appears that the restricted auto access of carfree housing in the SACMET01 model tends to promote ridesharing rather than transit use.

TABLE 3. Daily Mode Share for the 2025 Sacramento Innovative Mobility Scenarios in the City of Davis

	Drive Alone		Shared Ride		Transit		Walk		Bicycle	
	P	A	P	A	P	A	P	A	P	A
Base Case	39.04%	40.43%	40.55%	40.43%	5.89%	5.41%	11.20%	10.33%	3.32%	2.28%
Carsharing	39.03% (-0.01)[1]	40.42% (-0.02)	40.55% (0.01)	40.42% (-0.02)	5.89% (0.01)	5.41% (0.02)	11.20% (0.00)	10.33% (0.05)	3.32% (0.00)	2.28% (0.08)
ATI & Carsharing	38.16% (-2.25)	39.62% (-2.02)	39.72% (-2.04)	39.62% (-2.02)	7.90% (34.15)	7.35% (35.80)	10.98% (-2.02)	10.12% (-2.03)	3.24% (-2.30)	2.23% (-2.12)
Carfree Housing, ATI & Carsharing	37.84% (-3.06)	39.95% (-1.18)	40.10% (-1.10)	39.95% (-1.18)	7.67% (30.28)	7.16% (32.41)	11.04% (-1.48)	10.18% (-1.47)	3.34% (0.67)	2.28% (0.14)

[1] Figures in parentheses are percentage change from the MTP Base.

Percentage change in transit travel time (relative to the Base Case) in the City of Davis was calculated. No significant change was estimated for the *Carsharing Only* scenario; however, the reduction in travel time for the *ATI and Carsharing* and *Carfree Housing, ATI, and Carsharing* scenarios ranged from 0.64 to –0.06 percent. The standard deviation was 0.35 percent for the *ATI and Carsharing* scenario, and the standard deviation was 0.36 percent for the *Carfree Housing, ATI, and Carsharing* scenario.

Economics Benefits

The daily regional traveler benefit results for home-based work trips for the innovative mobility scenarios are presented in Table 4 (below). As described in the methods section, these figures include avoided parking costs, carsharing service fees, and operation and maintenance costs for the ATI services. All the scenarios yield a positive net total benefit and a net benefit for all income groups. Value of travel time increases with income, and thus benefits increase from the lowest income class (one) to the highest income class (three). As the transit services and carfree housing policy are layered onto carsharing, total benefits increase. The total per trip benefit for the *Carsharing Only* scenario is $0.01, *ATI and Carsharing* scenario is $0.03, and *Carfree Housing, ATI, and Carsharing* scenario is $0.05. Again, the ATI service has a greater scope than the carsharing service and thus provides a greater benefit. The *Carfree Housing* strategy appears to improve benefits because of avoided auto operating costs. The yearly total, however, for all scenarios would be significant.

TABLE 4. Daily Benefit Results (in 2000 dollars) for Home-Based Work Trips for the 2025 Sacramento Innovative Mobility Scenarios

	Income Class One (Lowest)		Income Class Two		Income Class Three (Highest)		Sum Total	
	Total	Per trip	Total	Per trip	Total	Per trip	Total	Per trip
Carsharing	73.61	0.00	1,581.10	0.00	8,877.72	0.01	10,532.43	0.01
ATI & Carsharing	267.78	0.02	10,028.21	0.02	37,935.81	0.04	48,231.80	0.03
Carfree, ATI & Carsharing	439.60	0.02	9,568.41	0.03	78,246.65	0.06	88,254.65	0.05

Vehicle Emission Benefits

The vehicle emission results (see Table 5 below) are consistent with the daily travel results (presented in Table 2 above). All scenarios produce modest vehicle emission reductions because of the decrease in vehicle travel described above. The layering of innovative strategies in each of the scenarios increases the overall effectiveness with respect to emission reductions.

TABLE 5. Daily Vehicle Emissions Results (tons) for the 2025 Sacramento Innovative Mobility Scenarios

	TOG	CO	Nox	PM
Base Case	25.06	228.20	80.93	88.98
Carsharing	25.00 (-0.24%)[1]	227.97 (-0.10%)	80.90 (-0.04%)	88.80 (-0.20%)
ATI & Carsharing	24.98 (-0.32%)	227.64 (-0.25%)	80.78 (-0.19%)	88.61 (-0.42%)
Carfree, ATI & Carsharing	24.96 (-0.40%)	227.53 (-0.29%)	80.76 (-0.21%)	88.55 (-0.48%)

[1] Figures in parentheses are percentage change from the Base.

SUMMARY AND CONCLUSIONS

In this paper, the authors presented results from future innovative mobility scenarios (2025) simulated with an advanced regional travel demand model for the Sacramento region. The SACMET01 travel demand model was used to approximate the effects of carsharing, ATI services, and carfree housing in the Sacramento region. Overall, results indicate relatively modest reductions in vehicle travel and emissions. The *Carsharing Only* scenario increases transit mode share by 2.78 percent and reduces VMT by 0.02 percent and NOx by 0.04 percent, compared to a *Base Case* scenario that represents the future transportation plan for the region. The *ATI and Carsharing* scenario increases transit mode share by 19.06 percent and reduces VMT by 0.15 percent and NOx by 0.19 percent. The difference between the carsharing and ATI effects in these two scenarios can be explained by their scope of application. *Carsharing Only* is applied to selected areas in the region, while the ATI service is applied regionwide. The *Carfree Housing, ATI, and Carsharing* scenario increases transit mode share by 17.96 percent and reduces VMT by 0.17 percent and NOx by 0.21 percent. Restricted auto access in carfree housing tends to promote ridesharing rather than transit use in the simulation method. This ridesharing increase, however, could be accommodated by a carsharing service that was more flexible than the light rail based-service represented in this study. If such a service was integrated into carfree development with reduced parking, then more dramatic reductions in the auto mode share could be possible. These types of developments are now occurring in the U.S.

In general, the relatively limited penetration of traditional transit in the region restricts the effectiveness of carsharing, ATI services, and a carfree housing policy. Results for the City of Davis, which contains a much more dense transit network than Sacramento, illustrates this point. Indeed, the mode choice effects for transit in the City of Davis are approximately double those found regionally in the *ATI and Carsharing* scenario and the *Carfree Housing, ATI, and Carsharing* scenario.

Despite the modest travel effects of the scenarios, the economic analysis indicates a net benefit for each of the innovative mobility scenarios for home-based work trips. The total per trip benefit for the *Carsharing Only* scenario is $0.01, $0.03 for the *ATI and Carsharing*, and $0.05 for the *Carfree Housing, ATI, and Carsharing* scenario. Again, the ATI service has a greater

scope than the carsharing service and thus provides a greater benefit. The carfree housing policy increases benefits due to avoided auto operating costs. The yearly total, however, for all scenarios would be significant. Thus, the study results suggest that a combination of services and policies increase benefits. It is possible that carsharing organizations may reap greater benefits by linking their services with other innovations, such as advanced transit information or partnerships to develop carfree housing or both.

This study used a relatively advanced travel demand model to assess the potential demand for carsharing, advanced transit information, and carfree housing scenarios and their travel, emission, and economic effects in the Sacramento region. Past studies of these services and policies have typically evaluated the effects of individual programs on participants only. This is particularly true with respect to carsharing. The primary limitation of the modeling approach taken in this study is the complexity of scenario representation allowed by the model. For example, the model's structure allowed for the representation of a largely transit-based approach to carsharing. The simulation analysis results indicated relatively small travel and emission effects. A more sophisticated representation of carsharing would have allowed for more flexible carsharing services with different payment methods (e.g., per mile charges that reflect variable transportation costs versus more traditional fixed costs) and a more detailed representation of the land use characteristics of carfree housing developments (e.g., fewer parking spaces). A more complex representation of policies and services in the model could provide for a greater magnitude of effects in our results.

Travel demand models are estimated on current data and largely replicate the current transportation system. Thus, it is difficult for these models to predict a future that is different from the past. The lack of tools to evaluate innovative mobility service/policy effects could be a barrier to their implementation on a regional level. Models are needed that offer a more detailed representation of land use and demographic characteristics as well as modal options. One step toward achieving these objectives may be to coordinate model development efforts with data collection (stated preference and revealed preference) of innovative mobility pilot projects.

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APPENDIX E

NUSTATS METHODOLOGY REPORT

UNIVERSITY OF CALIFORNIA-DAVIS

METHODOLOGY REPORT

ON

UC DAVIS TRANSPORTATION STUDY

December 2002

2034 Eisenhower Ave., Suite 100, Alexandria, Virginia 22314
(703) 739-2727 . Fax (703) 739-3838 . *www.nustats.com*

Contact: Tatyana Gurikova, Project Manager

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INTRODUCTION

This report documents the methodology of the 2002 UC Davis Transportation Study. NuStats conducted the web survey with 1,025 students, faculty and staff members of the UC Davis campus in the spring and fall of 2002. Because the survey conducted in the spring of 2002 was incomplete, this report describes the methodology of the fall 2002 survey. The survey examined daily travel behavior of students, faculty and staff and researched whether the extensive bicycle and pedestrian facilities in the Davis area contributed to their increased health and physical activity. The objective was to determine transportation patterns and flows as well as transit, bike, and pedestrian access on campus. Study findings will help improve transportation planning as well as make UC Davis campus more transit-, bike- and pedestrian-friendly.

This report begins with an overview of the basic elements of the study and sampling methods presented in the Instrument Design and Sampling section. The Survey Phases section examines two stages of the survey implementation. The report concludes with an analysis of overall survey response rate and presentation of sample distribution as well as drawing winners.

INSTRUMENT DESIGN AND SAMPLING

INSTRUMENT DESIGN

Because sample bias was not a great concern due to the universal Internet access on UC Davis campus, NuStats and UC Davis chose web data collection method. There were six elements of the study: 1) recruitment e-mail, 2) travel diary, 3) web questionnaire, 4) reminder e-mail #1, 5) reminder e-mail #2, and 6) thank you e-mail.

Travel Diary

NuStats designed the travel diary which collected information on places respondent went to, time he/she left the place, time he/she arrived at the new destination, and activities performed at these places during his/her assigned travel day. According to the agreement between NuStats and UC Davis, the diary was an exact copy of the SCAG diary.

Web Questionnaire

NuStats developed a questionnaire which included travel, demographic as well as health and exercise activity questions. Only students, faculty and staff members over the age of 18 who were studying on UC Davis campus and/or whose primary employer was UC Davis were eligible for the web questionnaire. In appreciation of respondent's participation, UC Davis and NuStats set up a drawing of four $250 gift certificates on the South West airlines. While UC Davis supplied the certificates in the Phase One of the study (Spring 2002), NuStats supplied them in the Phase Two (Fall 2002).

Recruitment E-Mail, Reminder E-Mail #1, Reminder E-Mail #2 and Thank You E-mail

NuStats and UC Davis designed all e-mail letters. Robert B. Segar, Assistant Vice Chancellor-Campus Planning of UC Davis, approved and signed the recruitment e-mail. Other e-mail letters did not require Segar's signature. NuStats scheduled to send out recruitment e-mail one day before the assigned travel day, reminder e-mail #1 one day after the assigned travel day and reminder e-mail #2 two business days after the travel day. Table Three describes the e-mail schedule.

The recruitment e-mail explained, first, what the study was about and the steps through which respondents could participate. Second, the e-mail explained the reason respondents' participation was crucial as well as the process through which respondents were selected. Third, the e-mail guaranteed confidentiality of the respondents' personal information and stated gratification for their participation. Finally, the e-mail contained respondents' individual access code and assigned travel day as well as links to the travel diary and the survey itself.

Reminder e-mails #1 and #2 asked those respondents who had not completed the survey to do so by a specific date (originally November 20, extended to November 30) and contained the survey link. Reminder e-mails stated the participants' individual access codes and assigned travel days. At the end of the study NuStats sent out 'Thank you' e-mails to all respondents who completed the study.

Because of a mistake made when sending out reminder e-mail #1 on Wednesday, November 6, NuStats and UC Davis designed and sent out an apology to the affected respondents via e-mail. Because of some interruptions in the e-mail schedule on Wednesday, November 13, when two replicates[1] of sampled

[1] A replicate is a sub-sample which mirrors the stratified proportions of a sample.

participants received recruitment e-mails the day after or the day of their assigned travel day (Tuesday, November 12, and Wednesday, November 13, respectively) NuStats sent out an apology and offered them an option to report their travel for Wednesday and Thursday of the next week (i.e., Wednesday and Thursday, November 20 and 21).

SAMPLING

NuStats used a stratified sampling method to select students, faculty and staff members from the UC Davis population. For the purposes of this study, we oversampled faculty and undersampled students in order to ensure a sufficient number of completed surveys from each group. While the master e-mail file consisted of 8.3 percent of faculty addresses and 65 percent of student addresses, the sample included 25 percent of faculty addresses and 45 percent that of students. The sampling frame consisted of 7,333 e-mail addresses and included 2,083 e-mail addresses of faculty members, 3,000 e-mail addresses of staff members and 2,250 e-mail addresses of students. The original sample consisted of 3,600 pieces carved into 12 replicates each 300-strong: 900 (25%) faculty members, 1,080 (30%) staff members and 1,620 (45%) students.

Because the survey objective was to present an accurate picture of travel volumes and flows, NuStats and UC Davis administered the survey over a period of two weeks, sampling every day of the week (Monday through Friday as well as Saturday and Sunday). As a result, the survey covered every weekday (Monday through Friday) twice and one pair of weekend days (Saturday and Sunday). Because Monday, November 11 was a holiday on the campus and thus could not serve as a travel day, NuStats included Monday, November 18, in the sampled travel days in order to represent Monday twice. Table Three presents the distribution of travel days.

SURVEY PHASES

NuStats administered the study in two phases: Phase One in the Spring of 2002 and Phase Two in the Fall of 2002.

PHASE ONE, SPRING 2002

NuStats had to stop the study in the spring 2002 because of lower than expected response rates. After examining the results of the Phase One study, we have concluded that:

1) A large proportion of UC Davis respondents had difficulties with accessing the web survey because it was programmed using advanced techniques that made it not compatible with many browsers except Netscape and Internet Explorer 5 and more advanced versions.

2) Many respondents had difficulties with accessing the web survey because they used a variety of browsers and software some of which (such as Opera and Mozella, for instance) were not supported by the web survey software.

3) The study was conducted at the end of the spring semester when many students were busy with final exams or have already left the campus due to summer break or graduation.

4) Comparison of the retrieval goals to the actual retrieval rates for Phase One (Table One), shows that NuStats has obtained a slightly insufficient response (retrieval rates) from staff members (27%), while getting a slightly greater than desired response from students (46%) and faculty (27%).

TABLE ONE: COMPARISON OF RETRIEVAL GOALS, RETRIEVAL RATES AND RESPONSE RATES FOR PHASE ONE

	Retrieval Goals		Retrieval Rates		Sample Distribution		Response Rates	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Faculty	250	25	130	27	1250	25	130	10.4
Staff	300	30	128	27	1500	30	128	8.5
Students	450	45	221	46	2200	44.4	221	10
Total	1000	100	479	100	4950		479	

To summarize, we have concluded that the main reasons for obtaining low response rates for the Phase One (Table One) were:

- incompatibility of browsers and software available to the respondents with the advanced techniques of web survey administration, and
- timing of the survey.

PHASE TWO, FALL 2002

Strategies for Phase Two

After examining the results, NuStats proposed strategies that helped resolve the problems identified in Phase One. The strategies focused on the incompatibility of browsers and software available to the respondents with the advanced techniques of the web survey administration. Taking into consideration our concern for student population as students make up the biggest part of the university body and the one

that underwent the most extensive changes, NuStats also suggested retrieving new student data while keeping and using faculty and staff data in order to conduct the Phase Two study in the most time-, and cost-efficient way. However, there were two major changes in transportation policy on campus over the summer of 2002 that made the data NuStats collected over the Spring 2002 incompatible with the data collected over the Fall of 2002. First, freshmen were no longer allowed to bring cars on campus starting with Fall 2002. Second, parking rates on campus had increased between 15 and 25 percent. Therefore, UC Davis and NuStats revised their strategies and decided to collect travel data anew in the Fall 2002. Below follows a summary of the revised strategies.

1) In order to address the incompatibility problem, NuStats changed the programming techniques of the web survey so that it was compatible with many different versions of Netscape and Internet Explorer.

2) To address issues with the scheduling of the survey, NuStats and UC Davis decided to start Phase Two in the middle of the Fall semester to reduce the likelihood of loosing students who were leaving the campus for the winter break or graduating.

3) In addition to changes in transportation policy on the campus, starting the survey in the Fall semester resulted in changes in the university sampling frame because of the addition of the new cohort of freshmen and loss of the whole cohort of senior students as well as changes in the cohorts of faculty and staff. Therefore, a fresh sample was drawn for the Phase Two.

4) Based on the third consideration above and assuming 12 percent response rates for faculty, ten percent response rate for staff and 20 percent response rate for students, we proposed the following sample distribution for the Phase Two: faculty–28.4 percent, staff–41 percent, and students–30.7 percent. For comparison of sample distributions and for the Phase One and Phase Two and retrieval goals see Table Two below.

TABLE TWO: COMPARISON OF SAMPLE DISTRIBUTIONS FOR PHASE ONE AND PHASE TWO, RETRIEVAL GOALS AND ASSUMED RESPONSE RATES FOR PHASE TWO

	Sample Distribution, Phase 1		Retrieval Goals		Assumed Response Rates, Phase 2, Percent	Sample Distribution, Phase 2	
	Number	Percent	Number	Percent		Number	Percent
Faculty	1250	25.3	250	25	12	2083	28.4
Staff	1500	30.3	300	30	10	3000	41
Students	2200	44.4	450	45	20	2250	30.7
Total	4950	100	1000	100		7333	100.1

While using the above assumed response rates and calculated total sample size of 7,333 pieces for generating the sampling frame for the study, we assumed an average response rate of 28 percent for all sampled categories for sample draw. The original sample totaled 3,600 e-mail addresses and included 900 (25%) e-mail addresses of faculty members, 1,080 (30%) e-mail addresses of staff members and 1,620 (45%) e-mail addresses of students (as discussed in the Sampling section). Hoping that we could reach our recruitment goals by using a smaller sample, we reduce the number of recruitment and reminder e-mails sent out daily according to the schedule presented in Table Three. However, later we increased the sample because of the low retrieval rates.

TABLE THREE: PHASE TWO STUDY SCHEDULE

Travel Day	Assignment (Cohort) Number	Replica Size	Recruitment E-Mail	Reminder E-Mail #1	Reminder E-Mail #2
Wed, Oct 30	804	300	Tuesday, Oct 29	Thursday, Oct 31	Monday, Nov 4
Thursday, Oct 31	805	300	Wed, Oct 30	Friday, Nov 1	Monday, Nov 4
Friday, Nov 1	806	300	Thursday, Oct 31	Monday, Nov 4	Wed, Nov 6
Saturday, Nov 2	807	300	Friday, Nov 1	Monday, Nov 4	Wed, Nov 6
Sunday, Nov 3	808	300	Friday, Nov 1	Monday, Nov 4	Wed, Nov 6
Monday, Nov 4	809	300	Friday, Nov 1	Tuesday, Nov 5	Thursday, Nov 7
Tuesday, Nov 5	810	300	Monday, Nov 4	Wed, Nov 6	Friday, Nov 8
Wed, Nov 6	811	300	Tuesday, Nov 5	Thursday, Nov 7	Monday, Nov 11
Thursday, Nov 7	812	300	Wed, Nov 6	Friday, Nov 8	Tuesday, Nov 12
Friday, Nov 8	813	300	Thursday, Nov 7	Monday, Nov 11	Tuesday, Nov 12
Tuesday, Nov 12	817	600	Friday, Nov 8	Wed, Nov 13	Friday, Nov 15
Wednesday, Nov 13	818	600	Tuesday, Nov 12		
Thursday, Nov 14	819	600	Wednesday, Nov 13		
Monday, Nov 18	823	600	Friday, Nov 15	Tuesday, Nov 19	Thursday, Nov 21
Wednesday, Nov 20	825	600		Tuesday, Nov 19	
Thursday, Nov 21	826	600		Wednesday, Nov 20	
	Total	5400			

Pretest

Several days prior to the beginning of the main study, NuStats conducted a pretest with 26 participants. The main purpose of the pretest was to test the web instrument compatibility with browsers and software which was available for UC Davis faculty, staff and students as well as web retrieval processes. Overall, the pretest was a success. The survey was compatible with different types of browsers and software such as Netscape 7.7, Internet Explorer 5 and 6 and others. All built-in edit and range checks as well as skip patterns in the web survey program worked properly and smoothly. (However, the skip pattern at the end of the survey affected health and exercise activity questions in a way that only students got to answer these questions. We did not notice it until later when the survey was underway.) As a result of the pretest, NuStats introduced minor modifications to the web retrieval instrument, such as revised some question wordings. We also eliminated a question on parking fee when respondent drove home as Davis residents did not have to pay monthly fees for parking at home.

Main Study

Through the daily data reports, NuStats delivered updates on the distribution of the number of completed surveys by students, faculty and staff. At the end of the second week, we noticed that response from all sampled categories in general and students in particular was lower than expected. Because of that NuStats added six new replicates, i.e., 1800 sample pieces. The total sample then consisted of 5,400 pieces. NuStats added two new replicates to the scheduled travel days of Tuesday, November 12 and Monday, November 18, and two new travel days–Wednesday, November 13 and Thursday, November 14–to utilize four other replicates. Thus, the period of data collection was extended to three weeks. In addition, because of some interruptions in the e-mail recruitment schedule, we rescheduled two travel days, Wednesday and Thursday, November 13 and 14, for Wednesday and Thursday, November 20 and 21 for those respondents who could not participate on the original assigned days (i.e., Wednesday and Thursday, November 13 and 14).

In order to increase students participation (response from students was about ten percent as opposed to 20 percent anticipated), NuStats implemented the following strategy: first, we sent out an additional reminder e-mail to all sampled students who had not completed the survey, asking them to participate. Second, instead of assigning new travel days to students, we allowed them to choose their own travel day. We gave them an option to choose any weekday except Thursday and Friday, November 28 and 29 (Thanksgiving holidays). Third, we extended data collection period to one month (the close-out day was December 1). Lastly, we offered to locate their individual access codes in case students no longer had their recruitment e-mails.

As a result of the internal data analysis of the first batch of completed surveys, NuStats discovered that 320 respondents of faculty, staff and 'other' did not get health and exercise activity questions because of the skip pattern set up at the end of the questionnaire. (We added three questions on health and exercise activity after the question on students' loans which was asked only of students. Therefore, the skip pattern extended to the newly added questions as well and only students answered health and exercise activity questions.) To compensate for this loss of information, NuStats implemented a telephone data collection strategy. We sent out an e-mail to those 320 respondents who missed the questions asking them to call NuStats back by December 6 to verify some of their information. As a result, more than 130 respondents called in and answered the questions. To compensate for the loss of 189 answers to general health question, NuStats performed imputation procedures and flagged records with imputed data in the final data set. Because we thought that imputing exercise activity data will be inappropriate and because we offered respondents a call back option, we treated these missing responses as refusals and coded them as 'don't know/refused' in the final data set.

DATA WEIGHTING

In order to account for disproportionate sampling and ensure data reliability, NuStats performed weighting procedures. Through weighting, NuStats made data collected in the survey representative of the total number of e-mail addresses in the master UC Davis e-mail file. We added two weights to the final data set: 1) final weight which accounted for data representativeness in terms of proportions and 2) expansion weight which accounted for data representativeness in terms of level.

Final Weight

NuStats added a composite final weight (FINWGT) to account for the actual distribution of e-mail addresses of faculty, staff and students in the master e-mail file in terms of proportions. The distribution was as follows: 8.3 percent of faculty, 26.7 percent of staff and 65 percent of students

Expansion Weight

An expansion weight (EXPWGT) accounted for data the actual distribution of e-mail addresses of faculty, staff and students in the master e-mail file in terms of level. The distribution was as follows: 3,959 faculty, 12,656 staff and 30,804 students.

RESULTS

This section presents the overall survey response rate, sample distribution and drawing winners of the 2002 UC Davis Transportation Study. Table Four describes final sample disposition, i.e., the final result of attempts to contact respondents, while Table Five presents eligible and ineligible respondents. Table Six compares weighted and unweighted sample distributions of faculty, staff and students with the retrieval goals; and Table Seven presents cohort productivity rates by sampled categories. Finally, Table Eight examines sample distribution by faculty, staff and students and by travel day.

OVERALL SURVEY RESPONSE RATE

The response rate for the 2002 UC Davis Transportation Study was 20.3 percent. The response rate is a ratio of completed surveys (1,025) to the total number of eligible respondents in the study (5,052). Table Four offers a complete breakout of sample disposition. Eligible respondents are those who completed the survey, those who refused it, and others (Table Five). A detailed explanation of the disposition categories follows below.

For the purposes of this analysis:

- **Not Qualified** respondents are that are out-of-office or on sabbatical for the entire period of the study and respondents whose e-mail addresses are not valid.
- **Refusals** are respondents who refused to participate in the survey during the initial contact and at any time during the survey administration.
- **Other** respondents consist of those who partially completed the survey (PC), timed out while completing the survey (WO), and those who got disconnected when the survey got deactivated (W2).

Of the 444 returned e-mail and phone messages, 348 messages were undeliverable (such as host unknown, fatal error, respondent not known) or from respondents who were on sabbatical or out-of-office for the entire study period, 10 were refusals, and 86 messages asked for travel day reassignment. In total, the eligible respondents included 1,025 respondents who completed the survey, 4,046 respondents who refused, and 329 others which resulted in a total number of 5,052 respondents.

TABLE FOUR: SAMPLE DISPOSITION

	Frequency	Valid Percent	Cumulative Percent
Refusal (RF)	4046	74.9	74.9
Partial Complete (PC)	141	2.6	77.5
Timed Out (WO)	187	3.5	81.0
Completed (CM)	1025	19.0	100.0
Project Deactivated (W2)	1	0.01	100.01
Total	5400	100.0	

TABLE FIVE: DISPOSITION OF ELIGIBLE AND INELIGIBLE RESPONDENTS

Disposition Categories	Ineligible		Eligible		Total	
	Number	Percent	Number	Percent	Number	Percent
Not Qualified	348	100			348	6.4
Refused			3698	100	3698	68.5
Other			329	100	329	6.1
Completed			1025	100	1025	19.0
Total	348	6.4	5052	93.6	5400	100

SAMPLE DISTRIBUTION

NuStats obtained data from 1025 UC Davis respondents: 272 (26.5 percent) faculty, 421 (41 percent) staff members and 323 (31.5 percent) students.

TABLE SIX: WEIGHTED AND UNWEIGHTED SAMPLE DISTRIBUTION BY FACULTY, STAFF AND STUDENTS

	Retrieval Goals		Sample Distribution, Unweighted		Sample Distribution, Weighted	
	Number	Percent	Number	Percent	Number	Percent
Faculty	250	25	272	26.5	86	8.3
Staff	300	30	421	41	273	26.6
Students	450	45	323	31.5	650	63.4
Other			9	1	17	1.7
Total	1000	100	1025	100	1026[2]	100

[2] Due to rounding, the number of completed surveys weighted does not equal the number of completed surveys unweighted.

TABLE SEVEN: COHORT PRODUCTIVITY RATES BY FACULTY, STAFF AND STUDENTS (UNWEIGHTED)

Travel Day	Assignment (Cohort) Number	Replicate Size	Faculty	Staff	Students	Other/Rather Not Say	Total Retrieved Surveys	Retrieval Rate, Percent
Wed, Oct 30	804	300	11	28	21		60	20
Thursday, Oct 31	805	300	15	19	15	1	50	16.7
Friday, Nov 1	806	300	13	18	20		51	17
Saturday, Nov 2	807	300	15	21	31		67	22.3
Sunday, Nov 3	808	300	15	22	15		52	17.3
Monday, Nov 4	809	300	17	15	28	1	61	20.3
Tuesday, Nov 5	810	300	13	26	14		53	17.7
Wed, Nov 6	811	300	9	7	7		23	7.7
Thursday, Nov 7	812	300	13	18	22	1	54	18.0
Friday, Nov 8	813	300	13	34	20	1	68	22.7
Tuesday, Nov 12	817	600	43	60	33	3	139	23.2
Wed, Nov 13	818	600	30	63	23	1	117	19.5
Thursday, Nov 14	819	600	23	42	13	1	79	13.2
Monday, Nov 18	823	600	42	48	37	1	127	21.2
Wed, Nov 20	825				13		13	
Thursday, Nov 21	826				8		8	
Saturday, Nov 23	828				1		1	
Monday, Nov 25	830				2		2	
Total		5400	272	421	323	9	1025	19.0

TABLE EIGHT: SAMPLE DISTRIBUTION BY TRAVEL DAY AND BY FACULTY, STAFF AND STUDENTS (UNWEIGHTED)

Travel Day	Assignment (Cohort) Number	Replicate Size	Faculty		Staff		Students		Other/Rather Not Say		Total
			Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number
Wed, Oct 30	804	300	11	18.3	28	46.7	21	35			60
Thursday, Oct 31	805	300	15	30	19	38	15	30	1	2	50
Friday, Nov 1	806	300	13	25.5	18	35.3	20	39.2			51
Saturday, Nov 2	807	300	15	22.4	21	31.3	31	46.3			67
Sunday, Nov 3	808	300	15	28.8	22	42.3	15	28.8			52
Monday, Nov 4	809	300	17	27.9	15	24.6	28	45.9	1	1.6	61
Tuesday, Nov 5	810	300	13	24.5	26	49.1	14	26.4			53
Wed, Nov 6	811	300	9	39.1	7	30.4	7	30.4			23
Thursday, Nov 7	812	300	13	24.1	18	33.3	22	40.7	1	1.9	54
Friday, Nov 8	813	300	13	19.1	34	50	20	29.4	1	1.5	68
Tuesday, Nov 12	817	600	43	30.9	60	43.2	33	23.7	3	2.2	139
Wed, Nov 13	818	600	30	25.6	63	53.8	23	19.7	1	0.9	117
Thursday, Nov 14	819	600	23	29	42	53.2	13	16.5	1	1.3	79
Monday, Nov 18	823	600	42	33.1	48	37.8	37	29.1	1	0.8	127
Wed, Nov 20	825						13				13
Thursday, Nov 21	826						8				8
Saturday, Nov 23	828						1				1
Monday, Nov 25	830						2				2
Total		5400	272	26.5	421	41.1	323	31.5	9	0.9	1025

DRAWING WINNERS

The random drawing list consisted of 1361 e-mail addresses of UC Davis faculty, staff and students who participated in the study. The list included e-mail addresses of 1025 respondents who completed the survey, 141 participants who partially completed the survey, 187 timed out respondents, one participant who was disconnected while he was on-line and seven respondents who did not complete the survey but were added to the drawing list per UC Davis travel survey staff request. The winners are:

lpswanson@ucdavis.edu (CM)

sjchen@ucdavis.edu (PC)

jalast@ucdavis.edu (CM)

kmadcock@ucdavis.edu (WO).

APPENDIX F

NUSTATS SURVEY QUESTIONNAIRE

1: **SAMPN**

Single

min = 1 max = 1 l = 7

2002/11/01 14:42

SAMPLE NUMBER

9999999

=> /+1

if 1>0

«SAMPN »

2: **FNAME**

Single

min = 1 max = 1 l = 30

2002/11/01 14:42

FIRST NAME

=> /+1

if 1>0

«FNAME »

3: **ASSN**

Single

min = 1 max = 1 l = 3

2002/11/01 14:43

ASSIGNMENT NUMBER

=> /+1

if 1>0

Thursday, Oct 24 798
Wednesday, Oct 30.....804
Thursday, Oct 31 805
Friday, Nov 1.....806
Saturday, Nov 2 807
Sunday, Nov.....808
Monday, Nov 4.....809
Tuesday, Nov 5.....810
Wednesday, Nov 6 811
Thursday, Nov 7 812
Friday, Nov 8.....813
Tuesday, Nov 12.....817
Monday, Nov 18 823

«ASSN »

4: **PINNO**

Single

min = 1 max = 1 l = 7

2002/11/01 14:43

PIN NUMBER

=> /+1

if 1>0

«PINNO »

5: **IMAIL**

Single

min = 1 max = 1 l = 80

2002/11/01 14:43

IMPORTED EMAIL ADDRESS

=> /+1

if 1>0

«IMAIL »

6: **INTRO**

Single

min = 1 max = 1 l = 1

2002/11/01 14:43

Welcome back to the UC Davis Transportation Study. You can either go to where you left off or start the survey over again. Which would you prefer?

=> /+1

if ROLE=WR

Continue where I left off.....1 => LASTQ
Restart at the beginning .....2 => ROLE

«INTRO »

7: **ROLE**

Single, Open-ended

min = 1 max = 1 l = 1

2002/10/21 14:38

Before entering your trip information, we would like to begin with a few background questions. Which of the following University classifications best describes your main role at UC Davis?

Undergraduate student 1
Graduate/professional student 2
Post graduate researcher 3
Faculty (academic senate and nonsenate).....4
Staff.....5
Other, specify.....7 O
Rather not say.....9

«ROLE »

«O_ROLE »

8: **CYEAR**

Single, Open-ended

min = 1 max = 1 l = 1

2002/10/21 14:38

What year are you in?

=> +1

if NOT ROLE=1

Freshman.....1
Sophomore 2
Junior.....3
Senior 4
Other, specify.....7 O
Rather not say.....9

«CYEAR »

«O_CYEAR »

9: **EMAIL**

Single

min = 1 max = 1 l = 80

2002/10/21 14:38

For verification purposes, what is your university email address? This cannot be blank.

$@

«EMAIL »

[include haddr.htm]

10: **HADDR**

Single

min = 1 max = 1 l = 60

Screen [Template 8] -> HZIP1

2002/10/21 14:38

What is your current local street address? This cannot be blank.

Z**********

«HADDR »

11: **HSUIT**

Single

min = 0 max = 1 l = 20

2002/10/21 14:38

Do you have an apartment/suite/floor/room number? What is it? Press the TAB key if no apartment/suite/floor/room number, or just scroll to the next field.
«HSUIT »

12: **HXSTR**

Single
min = 1 max = 1 l = 30
2002/10/21 14:38
What is the name of the closest cross street to where you live? This cannot be blank.
Z**********
«HXSTR »

13: **HCITX**

Single, Open-ended
min = 1 max = 1 l = 3
2002/10/29 12:02
Which city is this in?
Berkeley.....001
Citrus Heights.....002
Davis.....003
Dixon.....004
Elk Grove.....005
Fair Oaks.....006
Fairfield.....007
Oakland.....008
.....
Roseville.....009
Sacramento.....010
San Francisco.....011
Vacaville.....012
West Sacramento.....013
Winters.....014
Woodland.....015
Other, specify.....997 O
Rather not say.....999
«HCITX »
«O_HCITX »

14: **HCNTY**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38
Which county do you live in?
Alameda.....01
El Dorado.....02
Placer.....03
Sacramento.....04
San Francisco.....05
Solano.....06
Yolo.....07
Yuba.....08
Other, specify.....97 O
Rather not say.....99
«HCNTY »
«O_HCNTY »

15: **HZIP1**

Single
min = 1 max = 1 l = 5
2002/10/21 14:38
What is your zip code? If you aren't sure, please ask someone.
99999
Rather not say..... 99999
«HZIP1 »

16: **HSTAT**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
HOME STATE
$S CO=CA IN=1>0 ;
California.....CA
«HSTAT »

17: **MHCIT**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE TEXT TO HCITY

```
=> *
if MST(HCITX,HCITY)
```

«MHCIT »

18: **HCITY**

Single
min = 1 max = 1 l = 25
2002/10/21 14:38
CURRENT HOME CITY

```
=> /+1
if 1>0
```

«HCITY »

19: **MAIL**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Do you have another permanent home address?
Yes.....1
No.....2 => HHSIZ
Rather not say.....9 => HHSIZ
«MAIL »

Permanent Address
{br}{br}
What is your other permanent street address? @MADDR
This cannot be blank, please enter your permanent street address.
{br}
Do you have an apartment/suite/floor/room number? What is it? @MSUIT
Press the TAB KEY if no apartment/suite/floor/room number.
{br}
Which city is this in? @MCITX
{br}
What is the zip code for your permanent address? @MZIP1

20: **MADDR**

Single
min = 1 max = 1 l = 60
Screen [Template 8] -> MZIP1
2002/10/21 14:38
What is your other permanent street address? This cannot be blank.
Z**********
«MADDR »

21: **MSUIT**

Single
min = 0 max = 1 l = 20
2002/10/21 14:38

Do you have an apartment/suite/floor/room number? What is it? Press the TAB key if no apartment/suite/floor/room number, or just scroll to the next field.
«MSUIT »

22: **MCITX**

Single, Open-ended
min = 1 max = 1 l = 3
2002/10/29 12:36
Which city is this in?
Berkeley 001
Citrus Heights 002
Davis.....003
Dixon.....004
Elk Grove 005
Fair Oaks 006
Fairfield 007
Oakland 008
.....
Roseville.....009
Sacramento.....010
San Francisco.....011
Vacaville 012
West Sacramento 013
Winters 014
Woodland 015
Other, specify.....997 O
Rather not say 999
«MCITX »
«O_MCITX »

23: **MZIP1**

Single
min = 1 max = 1 l = 5
2002/10/21 14:38
What is the zip code for your permanent address?
99999
Rather not say 99999
«MZIP1 »

24: **MSTAT**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
What state is that in?
Alabama ..... AL
Alaska..... AK
Arizona..... AZ
Arkansas..... AR
California ..... CA
Colorado..... CO
Connecticut .....CT
Delaware ..... DE
District of Columbia..... DC
Florida ..... FL
Georgia..... GA
Hawaii .....HI
Idaho.....ID
Illinois IL
Indiana.....IN
Iowa.....IA
Kansas .....KS
Kentucky.....KY
Louisiana..... LA
Maine .....ME
Maryland ..... MD
Massachusetts ..... MA
Michigan .....MI
Minnesota..... MN
Mississippi .....MS
Missouri ..... MO
Montana .....MT
Nebraska ..... NE
Nevada .....NV
New Hampshire .....NH
New Jersey..... NJ
New Mexico..... NM
New York.....NY
North Carolina .....NC
North Dakota .....ND
Ohio.....OH
Oklahoma.....OK
Oregon.....OR
Pennsylvania.....PA
Rhode Island.....RI
South Carolina.....SC
South Dakota .....SD
Tennessee..... TN
Texas ..... TX
Utah ..... UT
Vermont ..... VT
Virginia .....VA
Washington .....WA
West Virginia.....WV
Wisconsin.....WI
Wyoming .....WY
Rather not say.....99
«MSTAT »

25: **MMCIT**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE TEXT TO MCITY

```
=> *
if MST(MCITX,MCITY)
```

«MMCIT »

26: **MCITY**

Single
min = 1 max = 1 l = 25
2002/10/21 14:38
PERMAMENT CITY

```
=> /+1
if 1>0
```

«MCITY »

27: **TRVPM**

Single

min = 1 max = 1 l = 2

2002/10/21 14:38

How many times in the past month did you travel to your permanent address? Range: 1 - 30

$E 1 30

None 00
More than 30 times.....31
Rather not say 99

«TRVPM »

28: **HHSIZ**

Single

min = 1 max = 1 l = 2

2002/10/29 14:22

Including yourself, how many people live in your household?

One .....01 => HHLIC
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say .....99 => HHLIC
.....

«HHSIZ »

29: **HHFAM**

Single

min = 1 max = 1 l = 2

2002/10/22 11:43

How many of the <HHSIZ> people living in your household are family members or other relatives, including your spouse or partner?

None .....00 => HHFRN
One 01
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say .....99 => HHFRN

«HHFAM »

30: **MARIT**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

Do you live with a spouse or partner?

Yes.....1
No 2
Rather not say 9

«MARIT »

31: **HHFRN**

Single

min = 1 max = 1 l = 2

2002/10/22 11:43

How many of the <HHSIZ> people living in your household are friends or other nonrelatives, excluding your spouse or partner?

=> SHGRO
if HHSIZ-1==HHFAM

None 00
One 01
Two.....02
Three 03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99

«HHFRN »

32: **SHGRO**

Single

min = 1 max = 1 l = 2

2002/10/22 11:43

How many of the <HHSIZ> people living in your household share groceries?

None 00
One 01
Two.....02
Three 03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99

«SHGRO »

33: **HHU18**

Single

min = 1 max = 1 l = 2

2002/10/22 11:43

Including yourself, how many of the <HHSIZ> people living in your household are under the age of 18?

None .....00 => HHO65
One 01
Two.....02
Three 03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99

«HHU18 »

34: **HHU5**

Single

min = 1 max = 1 l = 2

2002/10/22 11:43

How many of the <HHSIZ> people living in your household are under the age of 5?
None 00
One 01
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99
«HHU5 »

35: **HHO65**

Single
min = 1 max = 1 l = 2
2002/10/22 11:43
Including yourself, how many of the <HHSIZ> people living in your household are over the age of 65?

```
=> HHSCH
if HHSIZ-1==HHU18
```

None 00
One 01
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99
«HHO65 »

36: **HHSCH**

Single
min = 1 max = 1 l = 2
2002/10/22 11:43
Including yourself, how many of the <HHSIZ> are taking courses in a post-secondary institution like a college or university?
None 00
One 01
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99
«HHSCH »

37: **HHLIC**

Single
min = 1 max = 1 l = 2
2002/10/22 11:44
Including yourself, how many people living in your household have a current driver's license?
None 00
One 01
Two.....02
Three 03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99
«HHLIC »

38: **HHVEH**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Including all cars, trucks, vans, motorcycles, or recreational vehicles, whether owned or leased or provided by an employer, how many vehicles in working condition are presently available to members of your household?
None .....0 => BIKES
One 1
Two.....2
Three 3
Four or more 4
Rather not say.....9 => BIKES
«HHVEH »

39: **VSAMP**

Single
min = 1 max = 1 l = 7
2002/10/21 14:38
VEHICLE SAMPLE NUMBER BEGIN
VEHICLE ROSTER

```
=> *
if SAMPN
```

«VSAMP »

40: **VEHNO**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
VEHICLE NUMBER
$E 1 8

```
=> *
if $R
```

Vehicle 1.....01
Vehicle 2.....02
Vehicle 3.....03
Vehicle 4.....04
«VEHNO »

41: **PRON5**

Single
min = 1 max = 1 l = 1
2002/10/29 14:20

CONVERSATIONAL PURPOSES

```
=> *
if IF ((VEHNO==1 AND HHVEH=1 ),9,IF((VEHNO==1 AND HHVEH>1),$R))
```

vehicle number one, the one that you drive the most?1
vehicle number two, the one driven second most? 2
vehicle number three, the one third most driven?3
vehicle number four, the least driven vehicle?..4
your vehicle?.....9

«PRON5 »

42: **YEAR**

Single

min = 1 max = 1 l = 4
2002/10/21 14:38

<***VEHNO*** >

Now think about your vehicles in order from being driven the most to being driven the least.
What is the year of <PRON5 > RANGE: 1900 TO 2003
$E 1900 2003
Don't know.....8888
Rather not say.....9999

«YEAR »

43: **MAKE**

Single, Open-ended

min = 1 max = 1 l = 2
2002/10/22 11:44

<***VEHNO*** >

What is the make of that vehicle?
Acura.....01
Audi.....02
BMW.....03
Buick.....04
Cadillac.....05
Chevrolet.....06
Chrysler.....07
Daewoo.....41
Dodge.....08
Ford.....09
Geo.....10
GMC.....11
Harley Davidson.....12
Honda.....13
Hyundai.....14
Infiniti.....15
Isuzu.....16
Jaguar.....17
Jeep.....18
Kawasaki.....19
Kia.....20
Other, specify.....97 O
Lexus.....21
Lincoln.....22
Mazda.....23
Mercury.....24
Mercedes.....25
Mitsubishi.....26
Nissan.....27
Oldsmobile.....28
Plymouth.....29
Pontiac.....30
Porsche.....31
Range Rover.....32
Saab.....33
Saturn.....34
Subaru.....35
Suzuki.....36
Toyota.....37
Volkswagen.....38
Volvo.....39
Yamaha.....40
Don't know.....98
Rather not say.....99

«MAKE »

«O_MAKE »

44: **GO2MD**

Single

min = 1 max = 1 l = 1
2002/10/21 14:38

GO TO MODEL PROCEDURE

```
=> /MOD1
if 1
```

GO TO MODEL PROCEDURE.....1 => /MOD1
.....2

«GO2MD »

45: **MODEL**

Single

min = 1 max = 1 l = 30
2002/10/21 14:38

VEHICLE MODEL

```
=> /+1
if 1>0
```

«MODEL »

46: **MVMOD**

Single

min = 1 max = 1 l = 1
2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MDFIN,MODEL)
```

«MVMOD »

47: **VREND**

Single

min = 1 max = 1 l = 1
2002/10/21 14:38

You have finished <VEHNO > of your <HHVEH> vehicle household.
Continue with next vehicle.....1
Finished with all vehicles.....2 => BIKES

«VREND »

48: **BIKES**

Single

min = 1 max = 1 l = 1
2002/10/21 14:38

How many working bicycles do members of your household own?
None.....0 => MODEC
One.....1
Two.....2
Three.....3
Four or more.....4
Rather not say.....9 => MODEC

«BIKES »

49: **USEBK**

Single

min = 1 max = 1 l = 1
2002/10/21 14:38

Of the working bicycles owned by members of your household, how many are available for your use?
None 0
One 1
Two.....2
Three.....3
Four or more 4
Rather not say 9
«USEBK »

50: **MODEC**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/22 11:43
What is the main means of transportation that you usually use to get to the UC Davis campus?
Walk 01
Bicycle.....02
Drive.....03 => PERMT
Passenger in car/truck/van .....04 => PERMT
Unitrans Bus 05
YoloBus or Fairfield Transit.....06
MedCenter or other UC Davis campus shuttle 07
Amtrak or Capitol Corridor Train 08
Other, specify.....97 O
Regional Transit LRT 10
Regional Transit Bus.....11
Roseville Transit Bus.....12
El Dorado Transit Bus.....13
Folsom Commuter Bus 14
Taxi/limousine 15
Motorcycle/moped.....16
Rather not say 99
«MODEC »
«O_MODEC »

51: **MODER**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/22 11:45
What mode of transportation do you typically use to get to campus on rainy days?
Walk 01
Bicycle.....02
Drive.....03
Passenger in car/truck/van 04
Unitrans Bus 05
YoloBus or Fairfield Transit.....06
MedCenter or other UC Davis campus shuttle 07
Amtrak or Capitol Corridor Train 08
Other, specify.....97 O
Regional Transit LRT 10
Regional Transit Bus.....11
Roseville Transit Bus.....12
El Dorado Transit Bus.....13
Folsom Commuter Bus 14
Taxi/limousine 15
Motorcycle/moped.....16
Rather not say 99
«MODER »
«O_MODER »

52: **PERMT**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Do you purchase parking permits from UC Davis?
Yes.....1
No.....2 => TRNPS
Rather not say .....9 => TRNPS
«PERMT »

53: **PRMTY**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
Which type of permit do you purchase?
A permit 1
C permit 2
R permit 3
Visitor permit.....4
Other, specify.....7 O
Rather not say.....9
«PRMTY »
«O_PRMTY »

54: **TRNPS**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Do you purchase a transit pass?
Yes.....1
No.....2 => HHWRK
Rather not say.....9 => HHWRK
«TRNPS »

55: **PASTY**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
Which transit pass do you purchase?
Unitrans Bus/10 ticket ride 1
Regional Transit/Yolo Bus 2
Other pass, specify .....7 O
Rather not say.....9
«PASTY »
«O_PASTY »

56: **HHWRK**

Single
min = 1 max = 1 l = 2
2002/10/22 11:45
Including yourself, how many of the <HHSIZ> people in your household are employed full time or part time?
None .....00 => HHRET
One 01
Two.....02
Three 03
Four 04
Five.....05
Six.....06
Seven.....07
Eight 08
Nine 09
Ten or more.....10
Rather not say.....99 => HHRET
«HHWRK »

57: **HHWKD**

Single
min = 1 max = 1 l = 2
2002/10/22 11:45

How many of these <HHWRK> workers in your household work inside the City of Davis, including the UC Davis Campus and the entire City of Davis?
None 00
One 01
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99
«HHWKD »

58: **HHRET**

Single
min = 1 max = 1 l = 2
2002/10/22 11:46
How many of the <HHSIZ> people living in your household are retired?

=> EMPLY
if HHSIZ==HHWRK

None 00
One 01
Two.....02
Three.....03
Four 04
Five 05
Six.....06
Seven 07
Eight 08
Nine 09
Ten or more.....10
Rather not say 99
«HHRET »

59: **EMPLY**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Are you employed...
Full time 1
Part time (less than 30 hours per week) 2
Not employed.....3 => TSAMP
Rather not say .....9 => TSAMP
«EMPLY »

60: **MJOBS**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Are you employed in more than one paying job?
Yes.....1
No .....2 => EMPUC
Rather not say .....9 => EMPUC
«MJOBS »

61: **JOBS**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
How many other jobs do you have?
One 1
Two.....2
Three.....3
Four or more 4
Rather not say 9
«JOBS »

62: **EMPUC**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Is your primary employer UC Davis?
Yes.....1
No .....2 => PNAME
Rather not say .....9 => PNAME
«EMPUC »

63: **BUILD**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
Which building on the UC Davis campus do you work in?
Enter building name .....1 O=> START
Rather not say.....9 => START
«BUILD »
«O_BUILD »

Work Address
{br}{br}
What is the name of your primary employer? @PNAME
{br}
What is your primary work address? @PADDR
{br}
Is there a suite/floor/room number? What is it? @PSUIT
Press the TAB KEY if no apartment/suite/floor/room number.
{br}
What is the name of the closest cross street to where you work? @PXSTR
This cannot be blank, please enter a cross street.
{br}
Which city is this in? @PCITX
{br}
Which county is that in? @PCNTY
{br}
What is the zip code there? @PZIP1
If you aren't sure, please ask someone.

64: **PNAME**

Single
min = 1 max = 1 l = 60
Screen [Template 8] -> PZIP1
2002/10/21 14:38
What is the name of your primary employer?
«PNAME »

65: **PADDR**

Single
min = 1 max = 1 l = 60
2002/10/21 14:38
What is your primary work address? This cannot be blank.
Z**********
«PADDR »

66: **PSUIT**

Single
min = 0 max = 1 l = 20
2002/10/21 14:38

Is there a suite/floor/room number? What is it? Press the TAB key if no apartment/suite/floor/room number, or just scroll to the next field.
«PSUIT »

67: **PXSTR**

Single
min = 1 max = 1 l = 30
2002/10/21 14:38
What is the name of the closest cross street to where you work? This cannot be blank.
Z**********
«PXSTR »

68: **PCITX**

Single, Open-ended
min = 1 max = 1 l = 3
2002/10/29 12:36
Which city is that in?
Berkeley.....001
Citrus Heights.....002
Davis.....003
Dixon.....004
Elk Grove.....005
Fair Oaks.....006
Fairfield.....007
Oakland.....008
.....
Roseville.....009
Sacramento.....010
San Francisco.....011
Vacaville.....012
West Sacramento.....013
Winters.....014
Woodland.....015
Other, specify.....997 O
Rather not say.....999
«PCITX »
«O_PCITX »

69: **PCNTY**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38
Which county is that in?
Alameda.....01
El Dorado.....02
Placer.....03
Sacramento.....04
San Francisco.....05
Solano.....06
Yolo.....07
Yuba.....08
Other, specify.....97 O
Rather not say.....99
«PCNTY »
«O_PCNTY »

70: **PZIP1**

Single
min = 1 max = 1 l = 5
2002/10/21 14:38
What is the zip code there? If you aren't sure, please ask someone.
99999
Rather not say..... 99999
«PZIP1 »

71: **PSTAT**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
WORK STATE
$S CO=CA IN=1>0 ;
California.....CA
«PSTAT »

72: **MPCIT**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE TEXT TO PCITY

```
=> *
if MST(PCITX,PCITY)
```

«MPCIT »

73: **PCITY**

Single
min = 1 max = 1 l = 25
2002/10/21 14:38
CURRENT WORK CITY

```
=> /+1
if 1>0
```

«PCITY »

74: **START**

Single
min = 1 max = 1 l = 1
2002/10/29 12:34
Great. Now we would like to collect the trip information you recorded for <ASSN>. Please remember to record all the trips you made on your travel day. A trip is any time you change address. Be sure to report travel within the UC Davis campus and any change of means of travel as separate trips. Press the NEXT button to continue.
Continue.....1 D
«START »

75: **TSAMP**

Single
min = 1 max = 1 l = 7
2002/10/21 14:38
SAMPLE NUMBER FOR PLACE
9999999

```
=> *
if SAMPN
```

«TSAMP »

76: **TROW**

Single
min = 1 max = 1 l = 3
2002/10/21 14:38
WHAT ROW IS THIS?
$E

```
=> *
if $R
```

«TROW »

77: **PLANO**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38

PLACE NUMBER

=> *
if TROW

«PLANO »

78: **PRON1**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
CONVERSATIONAL PURPOSES

=> *
if IF(($R==1),1,IF(($R==2),2,3))

To start, where were you at 3am on<ASSN>?..1
Where did you go first?.....2
Where did you go next? This includes places within the UC Davis campus. 3
.....

«PRON1 »

79: **PTYPE**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
<PRON1>
Home 1
UC Davis Campus.....2 => UBLDG
Primary workplace (if not UC Davis) 3
Other workplace (if not UC Davis) .....4 => LOCAT
Other place .....5 => LOCAT
Previously entered other place.....6 => LOCAT

«PTYPE »

80: **SKPL1**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP FOR PLACE 1 AT HOME OR WORK

=> CHECK
Else => +1
if PLANO==1 AND (PTYPE=1,3)

«SKPL1 »

81: **SKPLX**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP FOR PLACE > 1 AT HOME OR WORK

=> MODE
Else => +1
if PLANO>1 AND (PTYPE=1,3)

«SKPLX »

82: **UBLDG**

Single
min = 1 max = 1 l = 60
2002/10/21 14:38
PLACE <PLANO>
Which UC Davis building?

«UBLDG »

Place Address
{br}{br}
What is the name of this place? @LOCAT
{br}
Which county is this place in? @PLCTY
@SKPO1
{br}
@SKPOX
Which city is this in? @CITYX
{br}
What is the street address there? @HADDR
{br}
Is there an apartment/suite/floor/room number? What is it? @SUITE
Press the TAB KEY if no apartment/suite/floor/room number.
{br}
Can you tell me the names of the two nearest cross streets? @XSTRT
Format: Street1, Street2
{br}
And the zip code at that location? @PLZIP

83: **LOCAT**

Single
min = 1 max = 1 l = 60
Screen [Template 8] -> PLZIP
2002/10/21 14:38
PLACE <PLANO>
What is the name of this place? This cannot be blank.
Z**********

=> MODE
if PTYPE=1-2

«LOCAT »

84: **PLCTY**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38
PLACE <PLANO>
What county is this place in?

=> +1
if PTYPE=6

Alameda .....01 => CITYX
El Dorado.....02 => CITYX
Placer.....03 => CITYX
Sacramento .....04 => CITYX
San Francisco.....05 => CITYX
Solano.....06 => CITYX
Yolo .....07 => CITYX
Yuba .....08 => CITYX
Other, specify.....97 O
Rather not say.....99

«PLCTY »
«O_PLCTY »

85: **STATE**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38

PLACE <PLANO>
Is this in California?

=> +1
if PTYPE=6

Yes.....1
No.....2
Not sure.....8
Rather not say.....9
«STATE »

86: **CITYX**

Single, Open-ended
min = 1 max = 1 l = 3
2002/10/29 12:36
PLACE <PLANO>
What city is it in?

=> MODE
if STATE>1 OR PTYPE=6

Berkeley.....001
Citrus Heights.....002
Davis.....003
Dixon.....004
Elk Grove.....005
Fair Oaks.....006
Fairfield.....007
Oakland.....008
.....
Roseville.....009
Sacramento.....010
San Francisco.....011
Vacaville.....012
West Sacramento.....013
Winters.....014
Woodland.....015
Other, specify.....997 O
Rather not say.....999
«CITYX »
«O_CITYX »

87: **ADDR**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
What is the street address there?

=> +1
if PTYPE=6

Enter address.....1 DO
Don't know.....8
«ADDR »
«O_ADDR »

88: **SUITE**

Single
min = 0 max = 1 l = 20
2002/10/21 14:38
PLACE <PLANO>
Is there an apartment/suite/floor/room number? What is it? Press the TAB key if no apartment/suite/floor/room number, or just scroll to the next field.

=> +1
if PTYPE=6

«SUITE »

89: **XSTRT**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
Can you tell me the names of the two nearest cross streets? Format: Street1, Street2

=> +1
if PTYPE=6

Enter cross streets.....1 DO
Don't know.....8
«XSTRT »
«O_XSTRT »

90: **PLZIP**

Single
min = 1 max = 1 l = 5
2002/10/21 14:38
PLACE <PLANO>
And the zip code at that location?
99999

=> +1
if PTYPE=6

Not sure.....99998
Rather not say.....99999
«PLZIP »

91: **MVCTY**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
COPY THE TEXT

=> *
if MST(CITYX,CITY)

«MVCTY »

92: **CITY**

Single
min = 1 max = 1 l = 25
2002/10/21 14:38
CITY TEXT

=> /+1
if 1>0

«CITY »

93: **MODE**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/23 16:04

PLACE <PLANO>
What was your main means of travel to this place?

=> CHECK
if PLANO==1

Walk 01
Bicycle.....02
Drive 03
Passenger in car/truck/van 04
Unitrans Bus 05
YoloBus or Fairfield Transit.....06
MedCenter or other UC Davis campus shuttle 07
Amtrak or Capitol Corridor Train 08
Other, specify.....97 O
Regional Transit LRT 09
Regional Transit Bus.....10
Roseville Transit Bus.....11
El Dorado Transit Bus.....12
Folsom Commuter Bus 13
Taxi/limousine 14
Motorcycle/moped.....15
Rather not say .....99 X
.....

«MODE »
«O_MODE »

94: **OTHTR**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38

PLACE <PLANO>
What was the total number of people traveling with you? Do NOT include yourself. Range: 0 - 10 Note: Only include people that are traveling with you. Do not include other bus, shuttle, or train riders that just happen to be riding at the same time you are.
$E 0 10
None 00
Rather not say 99
«OTHTR »

95: **PRON3**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
BUS STOP OR TRAIN STATION

=> *
if IF((MODE=05-06,10-13),1,IF((MODE=08-09),2,3))

bus stop.....1
train station.....2
shuttle stop 3
«PRON3 »

96: **TIME1**

Single
min = 1 max = 1 l = 4
2002/10/21 14:38
GET PREVIOUS TIME

=> *
if IF(($R==1),0000,RXY($R-1,DEPTM)+RXY($R,TSAMP)-TSAMP)

«TIME1 »

97: **ARRBS**

Single
min = 1 max = 1 l = 4
Screen [Template 8] -> ABSAP
2002/10/21 14:38

PLACE <PLANO>
What time did you arrive at the <PRON3>? Enter hours and minutes. Please use leading zeros. Examples: 0945, 1130, 1045
$H

=> DIDPK
if NOT MODE=05-13

«ARRBS »

98: **ABSAP**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
Was that A.M. or P.M.?
A.M. ..... AM
P.M. .....PM
«ABSAP »

99: **ACCES**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38

PLACE <PLANO>
How did you get to the <PRON3>?
Walked.....01
Drove.....02
Dropped off.....03
Biked.....04
Other, specify.....97 O
Rather not say.....99 X
«ACCES »
«O_ACCES »

100: **PRON4**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
BUS OR TRAIN

=> *
if IF((MODE=05-06,10-13),1,IF((MODE=08-09),2,3))

bus 1
train.....2
shuttle 3
«PRON4 »

101: **GETON**

Single
min = 1 max = 1 l = 4
Screen [Template 8] -> GOBAP
2002/10/21 15:11

PLACE <PLANO>
What time did you board (get on) the <PRON4>? Enter hours and minutes. Please use leading zeros. Examples: 0945, 1130, 1045
$H
«GETON »

102: **GOBAP**

Single
min = 1 max = 1 l = 2
2002/10/21 15:12
Was that A.M. or P.M.?
A.M. ..... AM
P.M. .....PM
«GOBAP »

103: **ROUTE**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38

PLACE <PLANO>

Which <PRON4> routes did you take?
Enter route.....1 DO
Not sure.....8
Rather not say.....9
«ROUTE »
«O_ROUTE »

104: **FARE**

Single
min = 1 max = 1 l = 6
2002/10/21 14:38

PLACE <PLANO>

How much fare did you pay?
Format: 999.99 To enter change less than $1, for example 50 cents, enter ".50" (use the decimal point).
$R.2
Free ride 000000
Used transit pass..... 000001
Not sure 999998
Rather not say 999999
«FARE »

105: **LEVBS**

Single
min = 1 max = 1 l = 4
Screen [Template 8] -> LBSAP
2002/10/22 12:07

PLACE <PLANO>

What time did you arrive at the next <PRON3>? Enter hours and minutes. Please use leading zeros. Examples: 0945, 1130, 1045
$H
«LEVBS »

106: **LBSAP**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38

Was that A.M. or P.M.?
A.M. ..... AM
P.M. .....PM
«LBSAP »

107: **EGRES**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38

PLACE <PLANO>

How did you get from the <PRON3> to your final destination?
Walked 01
Drove 02
Picked up.....03
Biked 04
Other, specify.....97 O
Rather not say .....99 X
«EGRES »
«O_EGRES »

108: **DIDPK**

Single
min = 1 max = 1 l = 1
2002/10/28 11:44

PLACE <PLANO>

Did you park?

=> ARRTM
if (NOT MODE=03-04,15) OR PTYPE=1

Yes.....1
No .....2 => ARRTM
Rather not say .....9 => ARRTM
«DIDPK »

109: **PRON8**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
CONVERSATIONAL PURPOSES

=> *
if IF((PTYPE=2),1,2)

(Please exclude UC Davis parking permits).....1
.....2
«PRON8 »

110: **PAYPK**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38

PLACE <PLANO>

Did you pay for parking? <PRON8>
Yes.....1
No .....2 => WHRPK
Rather not say .....9 => WHRPK
«PAYPK »

111: **PRKCO**

Single
min = 1 max = 1 l = 6
2002/10/21 14:38

PLACE <PLANO>

How much did you pay for parking? Format: 999.99 To enter change less than $1, for example 50 cents, enter .50 (use the decimal point).
$R.2
Not sure .....999998 => WHRPK
Rather not say .....999999 => WHRPK
«PRKCO »

112: **PRKUN**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/29 15:04

PLACE <PLANO>

Is that...
Per hour.....1
Per day.....2
Per week.....3
Per month.....4
Per trip.....5
Other, specify.....7 O
Not sure 8
Rather not say 9
«PRKUN »
«O_PRKUN »

113: **WHRPK**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38

PLACE <PLANO>
Where did you park at UC Davis?

=> ARRTM
if (NOT PTYPE=2)OR(NOT MODE=03,15)

In a UC Davis parking lot 1
On the street 2
Under or near a campus building.....3
Other, specify.....7 O
Rather not say 9
«WHRPK »
«O_WHRPK »

114: **PKLOT**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
What is the number/name of the lot/street/building where you parked?
Enter lot number/street name/building name.....1 O
Rather not say 9
«PKLOT »
«O_PKLOT »

115: **FIND**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
About how long did it take you to find a parking spot?
Less than 5 minutes 1
5 to 10 minutes 2
11 to 20 minutes 3
More than 20 minutes.....4
Not sure 8
Rather not say 9
«FIND »

116: **GETDS**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
How did you get from the parking lot to your final destination?
Walked 1
Biked 2
Other, specify.....7 O
Rather not say 9
«GETDS »
«O_GETDS »

117: **ARRTM**

Single
min = 1 max = 1 l = 4
Screen [Template 8] -> ARTAP
2002/10/21 14:38
PLACE <PLANO>
What time did you arrive at this place? Enter hours and minutes. Please use leading zeros. Examples: 0945, 1130, 1045
$H
«ARRTM »

118: **ARTAP**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
Was that A.M. or P.M.?
A.M. ..... AM
P.M. ..... PM
«ARTAP »

119: **TPUR1**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38
PLACE <PLANO>
And what was your main activity at this destination?
No other activities .....00 N
Personal activities at home 01
Internet use at home 02
Work at home 03
Work (other than at home).....04
Internet use at work 05
Telecommunications at work (tele/video conferencing instead of travel) 06
.....
School (junior college, college/university, vocational school) 07
.....
Shopping-incidental (gas, 1 bag groceries, supplies)09
Shopping-major (clothing, furniture, autos, appliances, etc.) 10
.....
Personal business (bank, post office, haircut, dry cleaning, pay bills, etc.) 11
.....
Medical (doctor visits, survey, physical therapy, dentist, etc) 12
.....
Eat meal outside home 13
Social/recreational (visit, entertainment, exercise, sports, etc) 14
.....
Civic activities (vote, volunteer, community meeting) 15
.....
Pick up/drop off passenger 16
Change mode of transportation 17
Other, specify.....97 O
Rather not say.....99
«TPUR1 »
«O_TPUR1 »

120: **PRON6**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
CONVERSATIONAL PURPOSES

=> *
if IF(($R==1),1,2)

.....1
else.....2
«PRON6 »

121: **CHECK**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
Did you go anywhere <PRON6> that day?
Yes.....1
No.....2 => PRON7
«CHECK »

122: **PRON2**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38

CONVERSATIONAL PURPOSES

=> *
if IF(($R==1),1,2)

first.....1
next.....2
«PRON2 »

123: **DEPTM**

Single
min = 1 max = 1 l = 4
Screen [Template 8] -> DPTAP
2002/10/21 14:38
PLACE <PLANO>
What time did you leave for the <PRON2> place?
Enter hours and minutes. Please use leading zeros. Examples: 0945, 1130, 1045
$H
«DEPTM »

124: **DPTAP**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
Was that A.M. or P.M.?
A.M. ..... AM
P.M. .....PM
«DPTAP »

125: **PRON7**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
CONVERSATIONAL PURPOSES

=> *
if IF(($R==1),1,2)

no.....1
no more.....2
«PRON7 »

126: **MORE**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
So, you made <PRON7> trips, including for work or school?

=> +1
if CHECK=1

Yes, I made no more trips.....1 => RESTY
No, I did make another trip (You will back up to try again) 2 => CHECK
.....
«MORE »

127: **NEXT**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
PLACE <PLANO>
Trip <PLANO> is complete. Click the NEXT button to record the next trip.
Continue .....1 D
«NEXT »

128: **REND1**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
LOOP TO NEXT ROW AUTOMATICALLY

=> *
if 1

«REND1 »

129: **RESTY**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
Okay, we are almost done. These last few questions help us ensure that the survey is representative of all campus students, faculty, and staff. In keeping with campus protocol, complete confidentiality will be maintained. No one from the study staff will be able to connect you to your answers. Do you live in…
Unattached Single Family Home 1
Townhouse or condo.....2
Duplex.....3
Apartment 4
Mobile home 5
Dormitory.....6
Other, specify.....7 O
Don't know.....8
Rather not say.....9
«RESTY »
«O_RESTY »

130: **OWN**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
Do you own or rent this home?
Own/buying 1
Rent 2
Other, specify.....7 O
Rather not say.....9
«OWN »
«O_OWN »

131: **ALIVE**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
How long have you lived at your current address?
Less than 1 year.....1
1-2 years.....2
More than 2 years 3
Rather not say.....9
«ALIVE »

132: **EQUIP**

Multiple
min = 1 max = 6 l = 1
2002/10/21 14:38
To which of the following services does your household currently subscribe? Select all that apply.
None of these.....0 X
Cable TV 1
Satellite TV 2
On-line services or Internet access.....3
Cellular phone services.....4
Pager services 5
Special subscription information services (stock prices, news services, etc.) 6
.....
Rather not say.....9 X
«EQUIP_01 »
«EQUIP_02 »
«EQUIP_03 »

«EQUIP_04 »
«EQUIP_05 »
«EQUIP_06 »

133: **GEND**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
What is your gender?
Male.....1
Female.....2
Rather not say.....9
«GEND »

134: **AGE**

Single
min = 1 max = 1 l = 2
2002/10/21 14:38
What is your age in years?
$E 15 99
70 years and older.....70
Rather not say.....99
«AGE »

135: **LIC**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
Do you have a valid driver's license?
Yes.....1
No.....2
Rather not say.....9
«LIC »

136: **EDUCA**

Single, Open-ended
min = 1 max = 1 l = 1
2002/10/21 14:38
What is the highest level of education you have attained?
Less than high school.....1
High school graduate.....2
Some college.....3
Vocational/technical degree.....4
Undergraduate/Bachelors degree.....5
Graduate/Post Graduate degree.....6
Other, specify.....7 O
Rather not say.....9
«EDUCA »
«O_EDUCA »

137: **ETHN**

Multiple, Open-ended
min = 1 max = 5 l = 2
2002/10/22 11:49
Please indicate your ethnic identity by checking the appropriate boxes:
African American/Black.....01
American Indian/Alaska Native.....02
Chinese/Chinese American.....03
East Indian/Pakistani.....04
Filipino/Filipino-American.....05
Spanish American/Latino.....06
Pacific Islander.....07
Japanese American/Japanese.....08
Korean-American/Korean.....09
Other Asian.....10
Mexican-American/Mexican/Chicano.....11
Vietnamese/Vietnamese-American.....12
White/Caucasian.....13
Other, specify.....97 O
Rather not say.....99 X
«ETHN_01 »
«ETHN_02 »
«ETHN_03 »
«ETHN_04 »
«ETHN_05 »
«O_ETHN »

138: **HINCM**

Single
min = 1 max = 1 l = 2
2002/10/22 11:49
What was your total household income in 2001 from all sources before taxes, for all members of your household? (Please include grant money)
Less than $10,000.....01
$10,000 to $19,999.....02
$20,000 to $29,999.....03
$30,000 to $39,999.....04
$40,000 to $49,999.....05
$50,000 to $59,999.....06
$60,000 to $74,999.....07
$75,000 to $99,999.....08
$100,000 or more.....09
Not sure.....98
Rather not say.....99
«HINCM »

139: **PINCM**

Single
min = 1 max = 1 l = 2
2002/10/22 11:49
What was your total personal income in 2001 from all sources before taxes? (Please include grant money)
Less than $10,000.....01
$10,000 to $19,999.....02
$20,000 to $29,999.....03
$30,000 to $39,999.....04
$40,000 to $49,999.....05
$50,000 to $59,999.....06
$60,000 to $74,999.....07
$75,000 to $99,999.....08
$100,000 or more.....09
Not sure.....98
Rather not say.....99
«PINCM »

140: **PSAV**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38

Do you use money from your personal savings or student loans to cover living expenses?

=> THANK
if ROLE>3

Yes.....1
No.....2
Rather not say.....9

«PSAV »

141: **GENHE**

Single

min = 1 max = 1 l = 1
2002/10/22 17:33

The last couple of questions ask about your general health and exercise activity. The questions are intended to help examine whether the extensive bicycle and pedestrian facilities in the Davis area contribute to increased health and physical activity. Press the NEXT button to continue.

Continue.....1 D

«GENHE »

142: **HEALT**

Single

min = 1 max = 1 l = 1
2002/10/22 10:46

How would you describe your general health? Is it:

Excellent.....1
Very good.....2
Good.....3
Fair.....4
Poor.....5
Don't know.....8
Rather not say.....9

«HEALT »

143: **PHYSL**

Single

min = 1 max = 1 l = 1
2002/10/22 13:50

How many times in the past week did you participate in physical exercise of at least 20 minutes?

None.....0 => THANK
1-2 times.....1
3-4 times.....2
at least 5 times.....3
Rather not say.....9 => THANK

«PHYSL »

144: **ACTIV**

Multiple, Open-ended

min = 1 max = 2 l = 2
2002/10/22 12:02

What are TWO physical activities in which you participated most in the past week? Select up to two activities.

Walking.....01
Biking.....02
Swimming.....03
Gym workout.....04
Jogging/running.....05
Aerobics/dance class/spin class.....06
Climbing/kayaking.....07
Other, specify.....97 O
Rather not say.....99 X

«ACTIV_01 »
«ACTIV_02 »
«O_ACTIV »

145: **THANK**

Single

min = 1 max = 1 l = 1
2002/10/21 14:38

Completion Question

=> +1
if 1>0

END OF SURVEY.....1 D

«THANK »

146: **TEL01**

Single

min = 1 max = 1 l = 7
2002/10/21 14:38

CHANGES THE PIN NUMBER SO THAT ONCE THE SURVEY IS COMPLETED, IT CAN NOT BE REENTERED.

=> *
if PINNO+2000000

«TEL01 »

147: **INT99**

Single

min = 1 max = 1 l = 2
2002/10/21 14:38

Thank you very much for your participation in the study. Your completed survey has been submitted and you will be entered into a random drawing to receive one of four $250.00 gift certificates on Southwest Airlines. Thank You!
Click on the BNext/B button to submit your responses.CM D => END
.....

«INT99 »

148: **INT**

Single

min = 1 max = 1 l = 2
2002/10/21 14:38

Interrupted questionnaire. You may reenter the survey by using the same URL and Pin Number contained in your e-mail to continue where you left off.
Click on the BNext/B button to quit or the BBack/B button to continue. PC
.....D=> END

Complete.....CM N
Inactivity.....W0 N
Multipe connections.....W1 N
(INT01) Continue.....OK N
(INT01) I refuse to complete the survey.....RF N

«INT »

149: **MOD1**

Single, Open-ended

min = 1 max = 1 l = 2
Procedure 1 -> MDCNF
2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1
if NOT MAKE=01

CL.....01
Integra.....02
MDX.....03
NSX.....04
RL.....05
RSX.....06
TL.....07
Type S.....08
Other, specify.....97 O
Rather not say.....99

«MOD1 »
«O_MOD1 »

150: **MOD2**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=02

A4 01
A4 Avant Quattro 02
A4 Quattro 03
A6 04
A8 05
Allroad Quattro 06
TT 07
Other, specify ..... 97 O
Rather not say 99

«MOD2 »

«O_MOD2 »

151: **MOD3**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:50

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=03

318i 01
325xi 02
328i 03
525i 04
540i 05
740i 06
Other, specify ..... 97 O
M Coupe 07
M3 08
M5 09
X5 10
Z3 11
Rather not say 99
.....

«MOD3 »

«O_MOD3 »

152: **MOD4**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=04

Century 01
LeSabre 02
Park Avenue 03
Regal 04
Rendezvous 05
Riviera 06
Roadmaster 07
Other, specify ..... 97 O
Rather not say 99

«MOD4 »

«O_MOD4 »

153: **MOD5**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=05

Catera 01
CTS 02
DeVille 03
El Dorado 04
Escalade 05
Seville 06
Other, specify ..... 97 O
Rather not say 99

«MOD5 »

«O_MOD5 »

154: **MOD6**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:50

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=06

1500 Pick Up 01
Astro 02
Avalanche 03
Blazer 04
Camaro 05
Caprice 06
Cavalier 07
Corsica 08
Corvette 09
Express 10
Impala 11
Lumina 12
Malibu 13
Other, specify ..... 97 O
Metro 14
Monte Carlo 15
Prizm 16
S-10 Blazer 17
S-10 Pick Up 18
Silverado 19
Sport Van 20
SSR 21
Suburban 22
Tahoe 23
Tracker 24
Trail Blazer 25
Venture 26
Rather not say 99

«MOD6 »

«O_MOD6 »

155: **MOD7**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:50

<*VEHNO* >
What is the model?

=> +1
if NOT MAKE=07

300M 01
Cirrus 02
Concorde 03
LeBaron 04
LHS 05
Other, specify .....97 O
Prowler 06
PT Cruiser 07
Sebring 08
Town & Country 09
Voyager 10
Rather not say 99

«MOD7 »
«O_MOD7 »

156: **MOD8**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/22 11:50

<*VEHNO* >
What is the model?

=> +1
if NOT MAKE=08

Caravan 01
Dakota 02
Durango 03
Intrepid 04
Neon 05
Other, specify .....97 O
Ram Pick Up 06
Ram Van 07
Stratus 08
Viper 09
Rather not say 99
.....

«MOD8 »
«O_MOD8 »

157: **MOD9**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/22 11:50

<*VEHNO* >
What is the model?

=> +1
if NOT MAKE=09

Cobra Coupe 01
Crown Victoria 02
Econoline 03
Escape 04
Excursion 05
Expedition 06
Explorer 07
Explorer Sport 08
F-150 09
F-250 10
F-350 11
Focus 12
Other, specify .....97 O
Focus SE Wagon 13
Mustang 14
Ranger 15
SVT F-150 Lightening 16
SVT Mustang 17
SVT Mustang Cobra 18
Taurus 19
Taurus Wagon 20
Thunderbird 21
Windstar 22
ZX2 23
Rather not say 99
.....

«MOD9 »
«O_MOD9 »

158: **MOD10**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38

<*VEHNO* >
What is the model?

=> +1
if NOT MAKE=10

Metro 01
Prism 02
Storm 03
Other, specify .....97 O
Rather not say 99

«MOD10 »
«O_MOD10 »

159: **MOD11**

Single, Open-ended
min = 1 max = 1 l = 2
2002/10/21 14:38

<*VEHNO* >
What is the model?

=> +1
if NOT MAKE=11

Envoy 01
Jimmy 02
Safari 03
Savana 04
Sierra 05
Sonoma 06
Yukon/Yukon XL 07
Yukon Denali 08
Other, specify .....97 O
Rather not say 99

«MOD11 »
«O_MOD11 »

160: **MOD13**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=13

Accord 01
Civic 02
CR-V 03
Insight 04
Odyssey 05
Passport 06
Prelude 07
S2000 08
Other, specify ..... 97 O
Rather not say 99

«MOD13 »

«O_MOD13 »

161: **MOD14**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:51

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=14

Accent 01
Atos 02
Centennial 03
Coupe 04
Elantra 05
Galloper 06
H-1 07
Other, specify ..... 97 O
Matrix 08
Santa Fe 09
Sonata 10
Terracan 11
Trajet 12
XG 13
Rather not say 99

«MOD14 »

«O_MOD14 »

162: **MOD15**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=15

Q45 01
135 02
G20 03
QX4 04
Other, specify ..... 97 O
Rather not say 99

«MOD15 »

«O_MOD15 »

163: **MOD16**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=16

Axiom 01
Rodeo 02
Rodeo Sport 03
Trooper 04
Other, specify ..... 97 O
Rather not say 99

«MOD16 »

«O_MOD16 »

164: **MOD17**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=17

XTYPE 01
XK8 Coupe 02
XK8 Convertible 03
S Type 04
XJ Sedan 05
Other, specify ..... 97 O
Rather not say 99

«MOD17 »

«O_MOD17 »

165: **MOD18**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=18

Grand Cherokee 01
Liberty 02
Wrangler 03
Other, specify ..... 97 O
Rather not say 99

«MOD18 »

«O_MOD18 »

166: **MOD19**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<***VEHNO*** >

What is the model?

=> +1

if NOT MAKE=19

ATV 01
Motorcycle 02
Utility Vehicle 03
Water Craft 04
Other, specify ..... 97 O
Rather not say 99

«MOD19 »

«O_MOD19 »

167: **MOD21**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=21

ES 01
GS 02
IS 03
LS 04
LX 05
RX 06
SC 07
Other, specify ..... 97 O
Rather not say 99

«MOD21 »

«O_MOD21 »

168: **MOD22**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=22

Blackwood 01
Continental 02
LS 03
Navigator 04
Town Car 05
Other, specify ..... 97 O
Rather not say 99

«MOD22 »

«O_MOD22 »

169: **MOD23**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:51

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=23

323 01
626 02
929 03
Miata 04
Millenia 05
Other, specify ..... 97 O
MPV 06
Pick Up 07
Protege 08
Protege 5 09
Tribute 10
Rather not say 99

«MOD23 »

«O_MOD23 »

170: **MOD24**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=24

Cougar 01
Grand Marquis 02
Mountaineer 03
Sable 04
Villager 05
Other,specify ..... 97 O
Rather not say 99

«MOD24 »

«O_MOD24 »

171: **MOD26**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:51

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=26

Airtrek SUV 01
Aspire Sedan 02
Cedia Wagon 03
Delica Space Gear Minivan 04
Diamante Sedan 05
Diamante Wagon 06
Dion Minivan 07
Eclipse 08
Galant 09
Other, speecify ..... 97 O
Grandis Minivan 10
Lancer 11
Legnum 12
Minica Mini-Hitchback 13
Mirage Dingo Minivan 14
Pajero 15
RVR Minivan 16
Toppo BJ 17
Town Box Mini-Minivan 18
Rather not say 99

«MOD26 »

«O_MOD26 »

172: **MOD27**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:51

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=27

350Z 01
Altima 02
Frontier 03
Maxima 04
Pathfinder 05
Other, specify ..... 97 O
Quest 06
Sentra 07
SE-R 08
Stanza 09
Xterra 10
Rather not say 99

«MOD27 »

«O_MOD27 »

173: **MOD28**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=28

Alero 01
Aurora 02
Bravado 03
Intrigue 04
Silhouette 05
Other, specify ..... 97 O
Rather not say 99

«MOD28 »

«O_MOD28 »

174: **MOD30**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=30

Aztek 01
Bonneville 02
Firebird 03
Grand Am 04
Grand Prix 05
Montana 06
Sunfire 07
Vibe 08
Other, specify ..... 97 O
Rather not say 99

«MOD30 »

«O_MOD30 »

175: **MOD31**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=31

911 Series 01
Boster 02
Classic 03
Other, specify ..... 97 O
Rather not say 99

«MOD31 »

«O_MOD31 »

176: **MOD33**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=33

9-5 Sedan 01
9-5 Sport Wagon 02
9-3 Saab 03
9-3 Convertible 04
Other, specify ..... 97 O
Rather not say 99

«MOD33 »

«O_MOD33 »

177: **MOD34**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=34

Coupe 01
Sedan - L Series, S Series 02
Vue 03
Wagon 04
Other, specify ..... 97 O
Rather not say 99

«MOD34 »

«O_MOD34 »

178: **MOD35**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=35

Forester 01
Impreza 02
Legacy 03
Outback 04
Other, specify ..... 97 O
Rather not say 99

«MOD35 »

«O_MOD35 »

179: **MOD36**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=36

Aerio Sedan 01
Aerio SX 02
Esteem 03
Grand Vitara 04
Vitara 05
XL-7 06
Other, specify ..... 97 O
Rather not say 99

«MOD36 »

«O_MOD36 »

180: **MOD37**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:51

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=37

4Runner....01
Avalon....02
Camry....03
Celica....04
Corolla....05
Echo....06
Highlander....07
Land Cruiser....08
MR2 Spyder....09
Paseo Convertible....10
Prerunner....11
Other, specify....97 O
Previa....12
PRIUS....13
Rav 4....14
Sequoia....15
Sienna....16
Solara....17
Supra....18
T100....19
Tacoma....20
Tercel....21
Tundra....22
Rather not say....99

«MOD37 »

«O_MOD37 »

181: **MOD38**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=38

Cabrio....01
Eurovan....02
Golf....03
GTI....04
Jetta....05
Beetle....06
Passat....07
Other, specify....97 O
Rather not say....99

«MOD38 »

«O_MOD38 »

182: **MOD39**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/22 11:52

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=39

850....01
960....02
C70 Convertible....03
C70 Coupe....04
Cross Country....05
S40....06
Other, specify....97 O
S60....07
S80....08
V40....09
V70....10
XC....11
Rather not say....99

«MOD39 »

«O_MOD39 »

183: **MOD40**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=40

ATV....01
Golf Car....02
Motorcycle....03
Other, specify....97 O
Rather not say....99

«MOD40 »

«O_MOD40 »

184: **MOD41**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >

What is the model?

=> +1

if NOT MAKE=41

Korando....01
Lanos....02
Leganza....03
Matiz....04
Musso....05
Nubira....06
Tacuma....07
Other, specify....97 O
Rather not say....99

«MOD41 »

«O_MOD41 »

185: **OMODL**

Single, Open-ended

min = 1 max = 1 l = 2

2002/10/21 14:38

<*VEHNO* >
What is the model?

=> +1
if NOT MAKE=12,20,25,29,32,97

Enter model name.....01 DO
Rather not say.....99

«OMODL »
«O_OMODL »

186: **SKM1**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD1=WR

«SKM1 »

187: **MVM1**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

=> *
if MST(MOD1,MDFIN)

«MVM1 »

188: **SKM2**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD2=WR

«SKM2 »

189: **MVM2**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

=> *
if MST(MOD2,MDFIN)

«MVM2 »

190: **SKM3**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD3=WR

«SKM3 »

191: **MVM3**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

=> *
if MST(MOD3,MDFIN)

«MVM3 »

192: **SKM4**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD4=WR

«SKM4 »

193: **MVD4**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

=> *
if MST(MOD4,MDFIN)

«MVD4 »

194: **SKM5**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP ID MODEL IS BLANK

=> +1
Else => +2
if NOT MOD5=WR

«SKM5 »

195: **MVM5**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

=> *
if MST(MOD5,MDFIN)

«MVM5 »

196: **SKM6**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD6=WR

«SKM6 »

197: **MVM6**

Single
min = 1 max = 1 l = 1

2002/10/21 14:38
MOVE MODEL TEXT

```
=> *
if MST(MOD6,MDFIN)
```

«MVM6 »

198: **SKM7**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD7=WR
```

«SKM7 »

199: **MVM7**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

```
=> *
if MST(MOD7,MDFIN)
```

«MVM7 »

200: **SKM8**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD8=WR
```

«SKM8 »

201: **MVM8**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

```
=> *
if MST(MOD8,MDFIN)
```

«MVM8 »

202: **SKM9**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD9=WR
```

«SKM9 »

203: **MVM9**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

```
=> *
if MST(MOD9,MDFIN)
```

«MVM9 »

204: **SKM10**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD10=WR
```

«SKM10 »

205: **MVM10**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

```
=> *
if MST(MOD10,MDFIN)
```

«MVM10 »

206: **SKM11**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD11=WR
```

«SKM11 »

207: **MVM11**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
MOVE MODEL TEXT

```
=> *
if MST(MOD11,MDFIN)
```

«MVM11 »

208: **SKM13**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38
SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD13=WR
```

«SKM13 »

209: **MVM13**

Single
min = 1 max = 1 l = 1
2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD13,MDFIN)
```

«MVM13 »

210: **SKM14**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD14=WR
```

«SKM14 »

211: **MVM14**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD14,MDFIN)
```

«MVM14 »

212: **SKM15**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD15=WR
```

«SKM15 »

213: **MVM15**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD15,MDFIN)
```

«MVM15 »

214: **SKM16**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD16=WR
```

«SKM16 »

215: **MVM16**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD16,MDFIN)
```

«MVM16 »

216: **SKM17**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD17=WR
```

«SKM17 »

217: **MVM17**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD17,MDFIN)
```

«MVM17 »

218: **SKM18**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD18=WR
```

«SKM18 »

219: **MVM18**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD18,MDFIN)
```

«MVM18 »

220: **SKM19**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD19=WR
```

«SKM19 »

221: **MVM19**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD19,MDFIN)
```

«MVM19 »

222: **SKM21**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD21=WR
```

«SKM21 »

223: **MVM21**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD21,MDFIN)
```

«MVM21 »

224: **SKM22**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD22=WR
```

«SKM22 »

225: **MVM22**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD22,MDFIN)
```

«MVM22 »

226: **SKM23**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD23=WR
```

«SKM23 »

227: **MVM23**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD23,MDFIN)
```

«MVM23 »

228: **SKM24**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD24=WR
```

«SKM24 »

229: **MVM24**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD24,MDFIN)
```

«MVM24 »

230: **SKM26**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD26=WR
```

«SKM26 »

231: **MVM26**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD26,MDFIN)
```

«MVM26 »

232: **SKM27**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD27=WR
```

«SKM27 »

233: **MVM27**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD27,MDFIN)
```

«MVM27 »

234: **SKM28**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD28=WR
```

«SKM28 »

235: **MVM28**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD28,MDFIN)
```

«MVM28 »

236: **SKM30**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD30=WR
```

«SKM30 »

237: **MVM30**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD30,MDFIN)
```

«MVM30 »

238: **SKM31**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD31=WR
```

«SKM31 »

239: **MVM31**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD31,MDFIN)
```

«MVM31 »

240: **SKM33**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD33=WR
```

«SKM33 »

241: **MVM33**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

MOVE MODEL TEXT

```
=> *
if MST(MOD33,MDFIN)
```

«MVM33 »

242: **SKM34**

Single

min = 1 max = 1 l = 1

2002/10/21 14:38

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD34=WR
```

«SKM34 »

243: **MVM34**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

MOVE MODEL TEXT

```
=> *
if MST(MOD34,MDFIN)
```

«MVM34 »

244: **SKM35**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT MOD35=WR
```

«SKM35 »

245: **MVM35**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

MOVE MODEL TEXT

=> *
if MST(MOD35,MDFIN)

«MVM35 »

246: **SKM36**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD36=WR

«SKM36 »

247: **MVM36**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

MOVE MODEL TEXT

=> *
if MST(MOD36,MDFIN)

«MVM36 »

248: **SKM37**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD37=WR

«SKM37 »

249: **MVM37**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

MOVE MODEL TEXT

=> *
if MST(MOD37,MDFIN)

«MVM37 »

250: **SKM38**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD38=WR

«SKM38 »

251: **MVM38**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

MOVE MODEL TEXT

=> *
if MST(MOD38,MDFIN)

«MVM38 »

252: **SKM39**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD39=WR

«SKM39 »

253: **MVM39**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

MOVE MODEL TEXT

=> *
if MST(MOD39,MDFIN)

«MVM39 »

254: **SKM40**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD40=WR

«SKM40 »

255: **MVM40**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

MOVE MODEL TEXT

=> *
if MST(MOD40,MDFIN)

«MVM40 »

256: **SKM41**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

SKIP IF MODEL IS BLANK

=> +1
Else => +2
if NOT MOD41=WR

«SKM41 »

257: **MVM41**

Single
min = 1 max = 1 l = 1
2002/10/21 14:39

MOVE MODEL TEXT

```
=> *
if MST(MOD41,MDFIN)
```

«MVM41 »

258: **SKMOT**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

SKIP IF MODEL IS BLANK

```
=> +1
Else => +2
if NOT OMODL=WR
```

«SKMOT »

259: **MVMOT**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

MOVE MODEL TEXT

```
=> *
if MST(OMODL,MDFIN)
```

«MVMOT »

260: **MDFIN**

Single

min = 1 max = 1 l = 30

2002/10/21 14:39

FINAL MODEL

```
=> /+1
if 1>0
```

«MDFIN »

261: **MDCNF**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

<***VEHNO*** >

For confirmation, that's a <YEAR> <MAKE> <MDFIN>?

Yes.....1 => MODEL

No, try again .....2 => MAKE

«MDCNF »

262: **HOLD**

Single

min = 1 max = 1 l = 1

2002/10/21 14:39

PLACE HOLDER FOR END OF PROCEDURE

```
=> +1
if 1>0
```

«HOLD »

APPENDIX G

ANALYSIS OF THE UC DAVIS TRAVEL SURVEY

I. Introduction

A web-based survey was conduced with 1,024 students, faculty, and staff members of the UC Davis campus in the fall of 2002. The survey was conducted to:

- Assess the travel patterns and transportation needs of the UC Davis community;
- Assist with the LRDP process currently on-going at UC Davis;
- Develop data that could be used in a local forecasting model; and
- Assist with the needs assessment and scenario evaluation of innovative transportation alternatives for the campus.

The survey consisted of a travel diary on which travel activities were recorded by respondents and questionnaires that included demographic, transportation, health, and exercise questions. Respondents were selected to record travel activities on weekdays and weekends. The survey process began with a recruitment email, followed by the survey, two reminder emails (if the survey had not been completed), and finally a thank-you email (once the survey had been submitted).

A stratified random sampling method was applied to UC Davis emails, which are classified by faculty, students, and staff. The sample was stratified to represent the actual distribution of those campus roles. The retrieval goal of 1000 completed surveys was met; however, students were under-represented in the sample and staff and faculty were over represented. Weights were developed and applied to the sample to replicate the actual distribution of faculty, staff, and students. The weighted sample is analyzed in this report.

The emails could not be stratified by any variable other than faculty, staff, and student because no other information was attached to emails. In the analysis of the sample, it was discovered that those who live outside the City of Davis were represented disproportionately in the sample. It may be that these individuals face greater transportation challenges and thus had a greater interest in filling out the survey.

For a more detailed description of the survey methods and implementation process see Appendix G for the survey instrument and Appendix H for NuStat's Methodology Report.

II. Key Demographic Variables

The demographic characteristics of the survey sample are described in this section. Persons in the survey are categorized by their UC Davis roles, including undergraduate student, graduate/professional student, faculty, staff, post-graduate researcher, and other. Key demographic variables for the sample are presented in Table 1.

- Undergraduate students comprise the largest portion of the sample (37.1%), followed by staff (22.2%), graduate/professional students (16.3%), post-graduate researchers (15.6%), and, finally, faculty (6.9%).

- The average age of the sample is 30.1 years. The average undergraduate age is 19.4 years, the average graduate/professional student age is 28.7 years, the average faculty age is 46.8 years, the average staff age is 41.7 years, and the average post-graduate researcher age is 34.

- The average household size of persons in the sample (3.1 persons) is generally larger than the Sacramento regional average in the year 2000 (2.6 persons) (SACOG, 2001). Undergraduates have the largest household size (3.9 persons), which reflects shared living arrangements with friends or other non-relatives. This may explain the relatively large sample household size. Post-graduate researchers have the next largest household size with 2.8 persons. Faculty and staff both have an average household size of 2.7 persons, and graduate students have the smallest average household size of 2.4 persons.

- The average number of vehicles per household in the sample (2.3) is also larger than the Sacramento region average in the year 2000 (2.1). This may also be explained by the larger average household size. The average number of vehicles per household ranges from a low of 1.6 for post-graduate researchers to a high of 2.8 for undergraduates.

- The modal number of vehicles per household across roles is 2 (i.e., student, staff, faculty). This is consistent with modal vehicle ownership in the region (SACOG, 2001).

- Only 5.7% of the households in the sample have no vehicle. This figure is higher than the 3% figure for the region in 2000 (SACOG, 2001). Undergraduates make up approximately 58% of the 5.7% figure, graduate students make up 18%, and post-graduate researchers make up 22%.

- The average number of bicycles per household in the sample is 2.3. The average number of bicycles per household ranges from a low of 1.9 for graduate/professional students to a high of 2.7 for undergraduate students. Only 10% of respondents belong to the households without a bicycle. The modal number of bicycles per household across roles is 2 (i.e., students, staff, and faculty).

- The median income for the sample is between $30,000 and $40,000. This is lower than the median income for the Sacramento region, which was $45,000 to $49,999 in the year 2000 (SACOG, 2001). Students have the lowest household incomes (less than $10,000 for undergraduate student and between $10,000 and $20,000 for graduate students). The large number of students in the population explains the lower than average income estimates. Faculty have the highest household income (greater than $100,000), followed by staff (between $60,000 and $70,000), and, finally, post-graduate researchers (between $30,000 and $40,000).

Table 1. Key Demographic Variables by UC Davis Role

UC Davis Role	% Total	Mean Age	Mean HH Size	Vehicles/HH	Bike/HH	Median HH Income
Undergraduate student	37.1%	19.4	3.9	2.8	2.7	< $10,000
Graduate/professional student	16.3%	28.7	2.4	1.8	1.9	$10,000-$20,000
Faculty	6.9%	46.8	2.7	2.1	2.5	> $100,000
Staff	22.2%	41.7	2.7	2.3	2.1	$60,000-$70,000
Post-Graduate Researcher	15.6%	34.0	2.8	1.6	2.2	$30,000-$40,000
Other	1.9%	23.9	2.7	2.0	2.1	$30,000-$40,000
Total	100	30.1	3.1	2.3	2.3	$30,000-$40,000

HH=households

Housing types by UC Davis role for the sample are presented in Table 2.

- Detached single family homes (38.1%) and apartments (33.6%) are the most common housing types for the total sample.
- Housing types for graduate/professional students and post-graduate researchers are generally consistent with the total sample.
- For undergraduates, however, apartments (45.3%) and dormitories (29.7%) are the most common housing type.
- The detached single family home is the most popular housing type for both faculty (85.8%) and staff (76.5%).

Table 2. Distribution of Housing Types by UC Davis Role

	Apartment	Detached SF Home	Dormitory	Duplex	Mobile Home	Other	Townhouse or Condo.
Undergraduate student	45.3%	6.1%	29.7%	4.1%	0.7%	2.0%	12.2%
Graduate/professional student	46.0%	39.7%	0.0%	7.9%	0.0%	3.2%	3.2%
Faculty	6.4%	85.8%	0.0%	2.3%	0.0%	0.0%	5.5%
Staff	10.8%	76.5%	0.0%	5.4%	0.3%	1.6%	5.4%
Post-Graduate Researcher	36.1%	37.7%	0.0%	9.8%	1.6%	1.6%	13.1%
Other	41.4%	41.4%	0.0%	0.0%	0.0%	0.0%	17.1%
Total	33.6%	38.1%	11.2%	5.7%	0.6%	1.9%	9.0%

Services subscribed to by respondents' households are presented in Table 3.

- The most popular services subscribed to by the total sample households are online or internet access (71.2%), cellular phone (66.4%), cable TV (58.5%), and satellite TV (19.5).

- Undergraduate households have the highest rates of online (87.1%), cellular phone (75.7%), and cable TV (67.9%) services.

- Households of post-graduate researchers have the lowest rates of online (55.0%), cellular phone (47.5%), and cable TV (41.4%) services.

- Rates for faculty, staff, and graduate/professional students range from 59.2% to 66.7% for cable TV, 57.1% to 70.5% for cellular phones, and 51.2% to 58.3% for cable TV.

Table 3. Distribution of Services by UC Davis Role

	Cable TV	Satellite TV	Online or Internet Access	Cellular Phone
Undergraduate student	67.9%	13.2%	87.1%	75.7%
Graduate/professional student	58.3%	10.7%	66.7%	57.1%
Faculty	51.2%	32.4%	59.2%	64.4%
Staff	55.3%	39.2%	65.3%	70.5%
Post Graduate Researcher	46.7%	9.1%	55.0%	47.5%
Other	41.4%	5.7%	44.8%	72.4%
Total	58.5%	19.5%	71.2%	66.4%

III. Travel Behavior

The travel behavior described comprises person travel from one location to another in order to accomplish some activity. More specifically, the elements of travel presented in this chapter include the following:

- Frequency of travel or the number of trips

- Purpose of travel or the activity accomplished through travel

- Mode of travel (e.g., drive, carpool, transit, walk, or bicycle)

- Time of travel or when the trip occurred

- Duration of travel or how long it took to complete the trip.

A. Frequency of Travel

Trips by origin location by UC Davis role for the sample are presented in Table 4. Trips occur over the course of a day. This table includes both weekday and weekend travel.

- A total of 3,847 trips are included in the total surveyed sample. Of the 3,847 trips, 418 originate in the city of Davis, and 3,429 originate outside of Davis. The greater frequency of travel outside of Davis reflects the disproportionate

representation of persons who live outside of Davis in the survey sample (see discussion above).

- The frequency of travel by UC Davis role is consistent with their distribution in the sample and population.

- The average number of trips per person for the total sample is 4. By UC Davis role, trips per person range from 3.6 to 4.3. Staff makes the most trips and post-graduate researchers make the fewest trips. The average number of trips per person for the Sacramento region was 3.6 in the year 2000 (SACOG, 2001).

Table 4. Distribution of Trips by Origin Location and By UC Davis Role

	Davis	Outside of Davis	Total	Total trips per person
Undergraduate student	99	1316	1415	4.0
Graduate/professional student	42	598	640	4.1
Faculty	34	219	253	3.8
Staff	140	784	924	4.3
Post-Graduate Researcher	84	455	539	3.6
Other	20	57	76	4.2
Total	418	3429	3847	4.0

B. Trips by Purpose

The frequency of trips varies widely by purpose and by UC Davis role. Table 5 presents the distribution of weekday trips by purpose according to UC Davis role.

- For the sample trips, work trips account for 22.6% of the total, education trips for 17.1%, personal business/other trips for 13%, shopping trips for 6.1%, visit/recreation trips for 31.6%, meal trips for 4.0%, and serve-passenger trips for 5.6%.

- The distribution of trips by purpose and UC Davis role varies in expected ways. University employees (i.e., faculty, staff, and post-graduate researchers) make very few education trips (ranging from none to 0.7%) and the greatest number of work trips (ranging from 33.0% to 39.7%). Undergraduate students make the largest number of education trips (37.6%), followed by graduate/professionals students (18%).

- In general, the respondents, across all UC roles, tend to make a relatively large number of trips for visiting and recreation purposes.

- Meal and shopping trips are least frequent across all UC roles.

Table 5. Distribution of Weekday Trips By Purpose and By UC Davis Role

	Undergraduate student	Graduate/ professional student	Faculty	Staff	Post-Graduate Researcher	Other	Total
Work	4.5%	24.7%	39.7%	33.0%	39.2%	32.4%	22.6%
Education	37.6%	18.0%	0.7%	0.6%	0.0%	15.1%	17.1%
Personal Business/Other	12.5%	11.4%	16.3%	15.2%	11.2%	12.2%	13.0%
Shopping	4.1%	6.7%	4.4%	8.7%	7.8%	1.4%	6.1%
Visit/Recreation	33.8%	31.0%	28.0%	31.6%	28.9%	26.6%	31.6%
Meal	6.2%	2.4%	3.7%	3.3%	2.2%	0.7%	4.0%
Serve Passenger	1.4%	5.9%	7.2%	7.5%	10.8%	11.5%	5.6%

The distribution of weekend trips by purpose according to UC Davis role is presented in Table 6.

- For the sample trips, work trips account for 14.2% of the total, education trips for 4.4%, personal business/other trips for 9.9%, shopping trips for 22.7%, visit/recreation trips for 29.6%, meal trips for 4.4%, and serve-passenger trips for 14.8%.

- Interestingly, relatively large shares of trips are made for work purposes on the weekends across all UC Davis roles. Undergraduates make more work trips on the weekends than weekdays. In general, the other UC Davis roles make just over half of their weekday work trip share on the weekend.

- The largest shares of trips over the weekend are for visiting/recreation purposes across all UC Davis roles, with the exception of graduate/professional students.

- Shopping trips increase significantly on the weekends for all roles. There is also an increase in serve passenger trips and meal trips.

- Undergraduate students tend to make more personal business/other trips on the weekend than the other UC Davis roles

Table 6. Distribution of Weekend Trips By Purpose By UC Davis Role

	Undergraduate student	Graduate/ professional student	Faculty	Staff	Post-Graduate Researcher	Other	Total
Work	9.4%	14.3%	22.3%	17.5%	13.3%	0.0%	14.2%
Education	5.9%	12.2%	2.4%	1.2%	0.0%	0.0%	4.4%
Personal Business/Other	20.0%	4.1%	7.8%	7.6%	2.2%	0.0%	9.9%
Shopping	18.8%	30.6%	18.7%	23.1%	22.2%	0.0%	22.7%
Visit/Recreation	31.8%	18.4%	30.1%	29.5%	37.8%	0.0%	29.6%
Meal	4.7%	4.1%	7.8%	3.5%	4.4%	0.0%	4.4%
Serve Passenger	9.4%	16.3%	10.8%	17.5%	20.0%	0.0%	14.8%

C. Mode of Travel

The share for the typical mode of travel to UC Davis by role is provided in Table 7.

- In general, bicycle and transit mode shares for the sample are relatively large, and the drive mode share is relatively small. The mode shares for the total sample are 39.9% for drive, 1.7% for carpool/vanpool, 17.1% for transit, 3.1% for walk, and 38.3% for bicycle. The bicycle mode share is almost as large as the drive mode share, and the transit mode share is significant. By comparison, the work mode shares for the Sacramento region are 80.9% for drive, 9.7% for carpool, 3.4% for transit, 2.6% for walk, and 3.3% for bicycle travel.

- Undergraduate students have the lowest drive (18.1%) and the highest bicycle (43.1%) and transit (35.0%) mode shares.

- Staff has the highest drive (73.9%) and the lowest transit (5.2%) and bicycle mode shares (16.1%).

- For the faculty, post-graduate researchers, and graduate/professionals students, mode shares for driving range from 33.8% to 53.8%, mode shares for bicycling range from 36.8% to 49.2%, and mode shares for transit range from 4.0% to 9.2%.

Table 7. Shares for Typical Travel Mode to UC Davis By Role

	Undergraduate student	Graduate/ professional student	Faculty	Staff	Post-Graduate Researcher	Other	Total
Drive	18.1%	43.5%	53.8%	73.9%	33.8%	86.2%	39.9%
Carpool/Vanpool	1.3%	0.0%	2.4%	3.6%	1.5%	0.0%	1.7%
Transit	35.0%	4.3%	4.0%	5.4%	9.2%	0.0%	17.1%
Walk	2.5%	4.3%	2.8%	1.0%	6.2%	0.0%	3.1%
Bicycle	43.1%	47.8%	36.8%	16.1%	49.2%	13.8%	38.3%

The mode shares for *all* weekday trips by UC Davis role is presented in Table 8.

- When *all* work/school trips are evaluated, mode shares are higher for walking, lower for bicycling (with the exception of students), lower for transit, and lower for driving (with the exception of post-graduate researchers) compared to the typical mode of travel to UC Davis campus.

- When *all* other and total trips are evaluated, the mode shares for driving and carpooling tend to be higher, and for transit, walk, and bike are lower than the typical mode of travel to UC Davis campus and for all work/school trips. However, transit, walk, and bike mode shares and drive modes still tend to be lower that the average for the region.

- It appears that the transit, bicycle, and walk accessibility provided to UC Davis is effective with respect to reduced driving to campus. This is particularly true for undergraduate students and less so for staff.

Table 8. Mode Share for All Weekday Trips By UC Davis Role

	Drive	Carpool/ Vanpool	Transit	Walk	Bicycle
Undergraduate student					
Work/School	14.7%	1.2%	17.6%	22.9%	43.7%
Other	28.4%	6.9%	15.0%	20.4%	29.3%
Total	22.6%	4.5%	16.1%	21.4%	35.4%
Graduate/professional student					
Work/School	37.6%	0.9%	1.8%	22.9%	36.7%
Other	63.7%	4.8%	1.4%	9.6%	20.5%
Total	52.5%	3.1%	1.6%	15.3%	27.5%
Faculty					
Work/School	46.8%	3.9%	1.4%	22.0%	25.9%
Other	62.4%	6.2%	0.9%	7.2%	23.3%
Total	56.1%	5.3%	1.1%	13.2%	24.3%
Staff					
Work/School	66.7%	4.8%	2.9%	14.7%	10.9%
Other	78.2%	4.8%	2.0%	8.6%	6.5%
Total	74.3%	4.8%	2.3%	10.7%	7.9%
Post-Graduate Researcher					
Work/School	38.9%	4.4%	3.3%	22.2%	31.1%
Other	66.7%	3.5%	3.5%	9.2%	17.0%
Total	55.8%	3.9%	3.5%	14.3%	22.5%
Other					
Work/School	75.7%	6.1%	0.0%	6.1%	12.1%
Other	100.0%	0.0%	0.0%	0.0%	0.0%

Total	88.5%	2.9%	0.0%	2.9%	5.8%
Total					
Work/School	36.5%	2.7%	8.3%	20.6%	31.9%
Other	56.4%	5.3%	6.5%	12.7%	19.1%
Total	48.5%	4.3%	7.2%	15.8%	24.2%

The weekend mode of travel by origin location according to UC Davis role is presented in Table 9.

- In general, the weekend mode of travel for all trips is higher for driving and lower for transit, walking, and bicycling compared to the results for all weekday trips.

- When the origin of the weekend trip is outside of the city of Davis, then drive mode shares are higher and walk and bicycle mode shares are lower than when the origin of the trips is inside Davis.

- Transit use is minimal on the weekend, particularly when the origin of the trip is inside the city of Davis.

- Undergraduate students tend to carpool and vanpool quite a bit on the weekend.

Table 9. Mode Share for All Weekend Trips By Origin Location and UC Davis Role

Trip Origin Location	Undergraduate student	Graduate/ professional student	Faculty	Staff	Post-Graduate Researcher	Total
All						
Drive	45.6%	66.7%	56.9%	77.2%	69.2%	60.2%
Carpool/Vanpool	19.3%	0.0%	9.7%	6.5%	0.0%	9.5%
Transit	5.3%	0.0%	0.0%	0.0%	7.7%	2.8%
Walk	19.3%	11.1%	20.8%	4.1%	7.7%	13.2%
Bicycle	10.5%	22.2%	12.5%	12.2%	15.4%	14.3%
Davis						
Drive	33.3%	50.0%	46.7%	60.0%	50.0%	44.2%
Carpool/Vanpool	16.7%	0.0%	0.0%	0.0%	0.0%	7.1%
Transit	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Walk	33.3%	0.0%	33.3%	0.0%	0.0%	18.3%
Bicycle	16.7%	50.0%	20.0%	40.0%	50.0%	30.4%
Outside of Davis						
Drive	47.1%	67.6%	59.6%	78.8%	72.7%	61.9%
Carpool/Vanpool	19.6%	0.0%	12.3%	7.1%	0.0%	9.8%
Transit	5.9%	0.0%	0.0%	0.0%	9.1%	3.1%
Walk	17.6%	11.8%	17.5%	4.4%	9.1%	12.6%
Bicycle	9.8%	20.6%	10.5%	9.7%	9.1%	12.6%

D. Time of Travel

The distribution of weekday and weekend travel by time of day according to UC Davis role is presented in Table 10.

- For weekdays, approximately half of the travel occurs during the peak periods and about a third of travel occurs during the midday; 25.4% of trips occur during the AM peak, 27.9% of the trips occur during the PM peak, 29.9% of trips occur during the midday period, and 16.7% of trips occur during the evening period.

- These results are relatively consistent with those obtained for the Sacramento region in the year 2000 in which 20.3% of trips were during the AM peak, 27% of the trips were during the PM peak, 28.7% of trips were during the midday period, and 23.9% of trips were during the evening period

- For weekends, almost 40% of travel occur during the midday and less than half occur during the peak periods; 15.8% of trips occur during the AM peak, 27.5% of the trips occur during the PM peak, 39.4% of trips occur during the midday period, and 17.3% of trips occur during the evening period.

- With the exception of undergraduate students and post-graduate researchers, all roles tend to have distributions of travel by time of day that are relatively consistent. The small sample size for weekend trips for the post-graduate researchers may have skewed the results for this role. Undergraduate students tend to have significantly lower AM peak hour travel compared to the other UC Davis roles. Class times and late nights studying may explain these results.

Table 10. Distribution of Weekday And Weekend Travel By Time of Day and UC Davis Role

	WEEKDAY				WEEKEND			
	AM Peak	Evening	Midday	PM Peak	AM Peak	Evening	Midday	PM Peak
Undergraduate student	19.6%	16.0%	40.1%	24.4%	6.7%	16.7%	41.7%	35.0%
Graduate/professional student	25.9%	18.0%	32.5%	23.5%	16.7%	25.0%	33.3%	25.0%
Faculty	29.6%	14.8%	26.4%	29.2%	19.4%	13.9%	43.1%	23.6%
Staff	29.5%	17.6%	19.9%	32.9%	15.4%	17.9%	44.7%	22.0%
Post-graduate researcher	30.6%	17.2%	20.7%	31.5%	53.8%	0.0%	30.8%	15.4%
Other	26.6%	13.6%	23.8%	36.0%	0.0%	0.0%	0.0%	0.0%
Total	25.4%	16.7%	29.9%	27.9%	15.8%	17.3%	39.4%	27.5%

E. Duration of Travel

The duration of travel by mode, purpose, and trip origin location is presented in Table 11.

- In general, trips that originate outside of the city of Davis tend to be longer. Greater accessibility to work, school, and other amenities (e.g., restaurants and

shopping) on the UC Davis campus and the City of Davis (relative to locations outside Davis) may contribute to the shorter duration of trips that originate inside Davis.

- Shopping and meal trips tend to be of longer duration across modes and origin locations.

- Driving and bicycle trips tend to be of longer duration across trip purposes and origin locations.

Table 11. Duration of Travel By Mode, Purpose, and Trip Origin Location (Hours)

	Work	Education	Personal Business/ Other	Shopping	Visit/ Recreation	Meal	Serve Passenger
Davis							
Drive	0.18	0.33	0.58	0.12	0.24	0.15	0.12
Carpool/Vanpool	0.17	0.00	0.37	0.07	0.08	0.00	0.07
Transit	0.00	0.92	NA	0.00	0.64	0.00	0.00
Walk	0.21	0.00	0.12	0.00	0.15	0.10	0.00
Bicycle	0.42	0.52	0.18	0.09	0.28	0.18	0.09
Outside of Davis							
Drive	0.35	1.36	0.58	0.25	0.57	0.42	0.30
Carpool/Vanpool	0.36	NA	0.41	0.08	0.73	0.49	0.57
Transit	0.66	2.44	0.70	0.00	NA	NA	0.00
Walk	0.15	0.78	0.18	0.22	0.60	0.22	0.13
Bicycle	0.49	0.96	0.27	0.29	0.57	0.35	0.12

NA=not available from data.

F. Other Travel Issues

The survey addresses a number of other travel issues including those related to parking permits, transit, and health.

The percentage of those who drive to the UC Davis campus and purchase parking permits is presented in Table 12, and the type of permit purchased is presented in Table 13.

- A relatively large number of respondents in the sample purchase parking permits (43%).

- Faculty, staff, and other UC Davis roles are the most frequent purchasers (64.7%, 69.1, and 87.9%, respectively).

- The C permit is the most popular permit among the survey sample.

Table 12. Percentage of Those Who Drive to UC Davis and Purchase A Parking Permit

Undergraduate student	23.1%
Graduate/professional student	43.7%
Faculty	64.7%
Staff	69.1%
Post-Graduate Researcher	37.3%
Other	87.9%
Total	43.0%

Table 13. Distribution of The Type of Parking Permit Purchased

	Undergraduate student	Graduate/ professional student	Faculty	Staff	Post-Graduate Researcher	Other	Total
A Permit	0.0%	15.4%	76.5%	57.1%	31.8%	13.8%	34.7%
C Permit	87.9%	65.4%	17.4%	36.6%	40.9%	86.2%	53.0%
R Permit	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%	0.1%
Visitor Permit	12.1%	19.2%	5.3%	6.3%	27.3%	0.0%	12.2%

The percentage of those who take transit to UC Davis and who purchase a transit pass is presented in Table 14.

- Only about 4.4% of survey respondents purchase transit passes.
- The percentage of purchase rates ranges from 5.2% for undergraduate students to 10.4% for post-graduate researchers.
- The small transit pass ownership levels may be explained by the over-representation people who live outside of Davis in the survey.

Table 14. Percentage of Those Who Take Transit to UC Davis and Purchase A Transit Pass

Undergraduate student	5.2%
Graduate/professional student	7.1%
Faculty	3.6%
Staff	5.3%
Post-Graduate Researcher	10.4%
Other	0.0%
Total	4.4%

Health ratings and exercise frequency of survey respondents are presented in Tables 15 and 16.

- Most of the respondents rate their health as very good. An interesting exception is faculty. Most of the faculty surveyed rate their health as excellent, despite the fact that as a group they have the oldest average age of the UC Davis roles. On the other hand, students, who have the youngest average age, rate their health as fair more frequently than any other UC Davis role. In general, students and post-graduate researchers are least likely to rate their heath as excellent and most likely to rate their health as fair.

- Health ratings do appear to be correlated with exercise frequency. Most of the respondents exercise between three and four times a week, which is the second highest exercise frequency provided in the survey. Faculty and staff are the most likely to exercise more than fives times a week (26.5%), and students and post-graduate researchers are the least likely to exercise more than five times a week and the most likely not to exercise at all. Again, exercise frequency tends to be inversely correlated with average age of a UC Davis role.

Table 15. Distribution of Health Ratings By UC Davis Role

	Excellent	Very Good	Good	Fair	Poor	Don't know/Rather not say
Undergraduate student	16.3%	35.0%	33.8%	13.1%	0.6%	1.3%
Graduate/professional student	25.4%	42.3%	31.0%	1.4%	0.0%	0.0%
Faculty	43.6%	38.7%	12.7%	1.1%	0.0%	3.9%
Staff	29.4%	39.7%	24.8%	4.8%	0.6%	0.6%
Post-Graduate Researcher	18.5%	43.1%	29.2%	6.2%	0.0%	3.1%
Other	27.6%	41.4%	27.6%	3.3%	0.0%	0.0%
Total	20.0%	37.9%	30.5%	9.5%	0.5%	1.5%

Table 16. Distribution of Exercise Frequency Per Week By UC Davis Role

	At least 5 times	3-4 times	1-2 times	None	Rather not say
Undergraduate student	18.1%	28.1%	33.8%	18.8%	1.3%
Graduate/professional student	16.9%	39.4%	25.4%	18.3%	0.0%
Faculty	26.5%	39.2%	21.0%	9.4%	3.9%
Staff	26.5%	33.5%	27.4%	11.3%	1.3%
Post-graduate researcher	16.9%	21.5%	35.4%	26.2%	0.0%
Other	13.8%	41.4%	41.4%	3.3%	0.0%
Total	19.9%	28.0%	32.5%	18.5%	1.0%

IV. Conclusions

Some of the more interesting findings from the survey of the UC Davis campus for the purposes of this study include:

- The relative high level of bicycle ownership among those in the UC Davis community. The average number of bicycles per household was 2.3 and only 10% of respondents belonged to households without a bicycle.

- Only 5.7% of the households had no vehicle. This figure is almost double that of the regional average.

- A relatively high rate of technology subscription services among the campus community. The most popular services were online or internet access (71.2%) and cellular phones (66.4%).

- Bicycle and transit mode shares were relatively large, and the drive mode share was relatively small. The mode shares for the total sample were 39.9% for drive, 1.7% for carpool/vanpool, 17.1% for transit, 3.1% for walk, and 38.3% for bicycle. The bicycle mode share was almost as large as the drive mode share, and the transit mode share was significant. By comparison, the work mode shares for the Sacramento region were 80.9% for drive, 9.7% for carpool, 3.4% for transit, 2.6% for walk, and 3.3% for bicycle travel.

It appears that the provision of a relatively comprehensive network of bicycle paths and transit in the City of Davis to the UC Davis Campus has encouraged higher bicycle ownership, allowed for more households to exist without autos, and significantly increased the rate of bicycle and transit use and discouraged the rate of driving (relative to the regional average).

Reference:

Sacramento Area Council of Governments (SACOG) (2001). *Pre-Census Travel Behavior Report Analysis of the 2000 SACOG Household Travel Survey.* DKS Associates and Mark Bradley Research & Consulting. July.