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**San Diego's I-15 Congestion Pricing
Project: Preliminary Findings**

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ABSTRACT

This paper presents the preliminary findings from the Phase I evaluation of the Interstate 15 (I-15) Congestion Pricing Project in San Diego. It is a three-year demonstration that allows single occupant vehicles (SOVs) to use the existing I-15 high occupancy vehicle (HOV) lanes for a fee. In Phase I, program participants were charged a monthly fee for unlimited use of the I-15 HOV lanes. The primary objectives of the project are: (1) to maximize use of the HOV lanes; (2) to test whether allowing solo drivers to use the HOV lanes' excess capacity can help relieve congestion on the main lanes; (3) to improve air quality; and (4) to fund new transit and HOV improvements in the I-15 corridor.

San Diego State University (SDSU) is conducting an independent, multi-element evaluation of the project to assess its impacts. The study will consider the project's progress in meeting its primary objectives and provide detailed insight into the affect of congestion pricing on the I-15 corridor. The project has the potential to contribute to the broader understanding of many practical aspects associated with the implementation of congestion pricing in metropolitan areas. It also supplies data for the evaluation of benefits, which is central to the discussion of equity in the context of congestion pricing.

This paper provides an overview of the project status and preliminary findings presented in detail in 22 Phase I technical reports that address a range of topics such as traffic, travel behavior, and institutional issues.

The results from the first year of operations are limited, but indicate the project's relative success. The project appears to be meeting its main objectives. In particular, the total number of vehicles using the HOV lanes increased substantially. The increase is attributed to increased number of carpools as well as project participants. The level of service (LOS) in the HOV lanes has not been adversely affected; LOS C was maintained throughout Phase I. In addition, there was a slight reduction of overall traffic volumes on the main lanes.

Public acceptance of the project was evident in Phase I. The program participants viewed it as a success. However, understanding of the project's overall objectives was low among both the program participants and the public. The majority of I-15 users thought the ExpressPass program was fair to I-15 main lane and HOV lane users. Finally, there was evidence of sensitivity to price increases, although price levels during Phase I were not high enough to deter demand for the program.

INTRODUCTION

This document summarizes the preliminary findings from the Phase I evaluation of the Interstate 15 Congestion Pricing Project, which is a three-year demonstration that allows single occupant vehicles (SOVs) to use the existing I-15 high occupancy vehicle (HOV) lanes for a fee. The project's primary goals are as follows:

- To maximize use of the existing I-15 HOV lanes
- To test whether allowing solo drivers to use the lanes' excess capacity can help relieve congestion on the I-15 main lanes
- To improve air quality
- To fund new transit and HOV improvements in the I-15 corridor

San Diego State University (SDSU) is conducting an independent, multi-element evaluation to assess the project's impacts on the I-15 corridor and the San Diego region. The intent is to study changes in I-15 corridor traffic, travel behavior, and attitudes towards the project over the life of the project. This paper focuses on the pre-project data (collected in Fall 1996) and a portion of Phase I of the project, specifically December 1996 through December 1997.

This paper provides a comprehensive overview of the project status and major findings from Phase I. These findings are presented in detail in 22 Phase I technical reports listed in Appendix A.

PROJECT BACKGROUND

Project Location

The site of the I-15 Congestion Pricing Project is the I-15 corridor, a major north-south freeway in the inland San Diego region of Southern California. The I-15 corridor connects several northern inland residential communities with major employment centers to the south. The main freeway consists of four to five lanes in each direction. The I-15 HOV lanes facility consists of an eight-mile (13-km) stretch of two reversible lanes in the freeway median. The HOV lanes are separated by barriers from the I-15 main lanes. Access to the lanes is available only at the two endpoints of the facility.

The I-15 HOV lanes operate in the southbound direction (inbound commute) from 5:45 a.m. to 9:15 a.m. and in the northbound direction (outbound commute) from 3:00 p.m. to 7:00 p.m. The facility is closed on weekends and holidays. Usage of the facility is limited to carpools and vanpools with two or more occupants, buses, motorcycles, and authorized SOV project participants.

Project History

The I-15 HOV facility opened in 1988. By the early 1990s, the facility was underutilized and had excess capacity, operating at approximately 600 vehicles per hour per lane (LOS A) during the peak commute periods. At the same time, the mixed-flow lanes on I-15 experienced severe congestion. There also was limited transit service in the I-15 corridor.

In 1991, the SANDAG Board member Mayor Jan Goldsmith represented the City of Poway, a community of 46,000, located east of I-15. He was concerned about the relative lack of transit in the I-15 corridor, the congestion on I-15, and the underutilization of the HOV lanes. During earlier informal discussions with Mayor Goldsmith, SANDAG staff had discussed the idea of selling the excess capacity on the I-15 HOV lanes to solo drivers at a market rate. Mayor Goldsmith strongly supported this concept.

At the May 24, 1991 SANDAG Board meeting, a resolution was adopted (No. 91-65) supporting the demonstration project to test the feasibility of pricing the use of the I-15 HOV lanes by SOVs, with revenues allocated to increase transit in the I-15 corridor.

To implement the project, SANDAG sought federal funding under a new program called the Congestion Pricing Pilot Program of the Intermodal Surface Transportation Efficiency Act (ISTEA), adopted by the United States Congress in 1991.

SANDAG's initial funding for the I-15 project was a \$230,000 Federal Transit Administration (FTA) Section 26(b) grant awarded on September 30, 1992. The purpose of the grant was to "...design alternative congestion-pricing mechanisms to authorize and control the use of excess capacity on the I-15 HOV Expressway by single-occupant vehicles." These funds were used in the initial planning phases of the I-15 project.

In January 1995, SANDAG received a \$7.96 million grant from the Federal Highway Administration (FHWA) under the Congestion Pricing Pilot Program. The remaining \$1.99 million of project funding is provided by local, in-kind funding of I-15 transit service.

Special state legislation (Assembly Bill 713), authored and sponsored by Jan Goldsmith, was signed in October 1994 to allow SOVs to use the I-15 HOV facility for a fee. At the time the legislation was being developed, concern was expressed that allowing SOVs to use the HOV lanes could adversely impact HOVs using the facility. Therefore, the state law contains a requirement that the I-15 HOV lanes remain free flowing at all times.

The law requires that LOS B, or the pre-existing level of service on the HOV lanes without SOVs, be maintained on the facility. Unrestricted, free access to the lanes by HOVs shall be available at all times. Before the project implementation, the California Department of Transportation (Caltrans) determined that the pre-existing level of service on the I-15 HOV lanes was LOS C. This level of service must be maintained on the facility under the state law. In addition, the use of revenue is limited to transit and HOV improvements for the I-15 corridor.

Project Sponsors

SANDAG is responsible for overall project coordination and management. Caltrans is a primary project partner responsible for overseeing design specifications, physical improvements, and operational changes to the I-15 facility. FHWA is the primary funding agency for the project and is providing oversight and assistance in evaluation design and technical matters. Additional project funding is provided by FTA.

The California Highway Patrol (CHP) provides enforcement services, and the San Diego Metropolitan Development Transit Board (MTDB) assists in the planning and implementation of transit service improvements funded by the project. A Project Management Team (PMT) consisting of SANDAG, Caltrans, FHWA, FTA, CHP, and MTDB staff provides technical review and direction on all aspects of project planning, design, and implementation. Other PMT members include Assembly Member Jan Goldsmith's Office, the City of San Diego, the City of Poway, and the American Automobile Association. PMT meetings are held on a monthly basis.

A consultant team headed by Wilbur Smith Associates (WSA) is assisting SANDAG with the planning phases of the project. San Diego State University (SDSU) Foundation has been retained as an independent consultant to monitor and evaluate the project.

I-15 ExpressPass

Permit Availability and Price

The Phase I ExpressPass program ran from December 1996 through March 1998. In this phase, a limited number of solo drivers paid a flat monthly fee for unlimited use of the I-15 HOV lanes. Initially, 500 monthly ExpressPass permits were made available in December 1996 at a cost of \$50 per month. In February 1997, the total number of available permits was increased to 700. In March 1997, the ExpressPass permit price was increased to \$70 per month, and in April 1997, 200 more permits were made available for a total of 900.

A second price increase from \$70 to \$80 per month was considered by the SANDAG Board of Directors in April 1997. However, this increase was not approved due to customer opposition.

A total of 900 ExpressPass permits costing \$70 each were sold each month from April 1997 through February 1998. In March 1998, the last month of ExpressPass operation, 100 additional permits were made available at \$70 each, for a total of 1,000 permits by the end of Phase I.

Operations

For the first six months of the program (December 1996 through May 1997), ExpressPass customers were provided colored monthly permits to affix to the windshields of their vehicles. For enforcement purposes, the color of the windshield permits was changed each month.

In June 1997, windshield-mounted transponders were distributed to replace the colored permits. An automatic vehicle identification (AVI) system was installed in August 1997 and became operational in September 1997. The AVI system consisted of overhead antennas and readers and vehicle detectors imbedded in the HOV lanes, which jointly determined daily traffic and level of service and provided detailed information about how often and when ExpressPass customers used the I-15 HOV facility. Even with the distribution of transponders, ExpressPass continued as a monthly permit system.

During most of Phase I, the HOV lanes operated in the southbound direction from 6:00 a.m. to 9:00 a.m. and in the northbound direction from 3:00 p.m. to 6:30 p.m. In November 1997, the hours of operation were extended to 5:45 a.m. to 9:15 a.m. southbound and 3:00 p.m. to 7:00 p.m. northbound.

METHODOLOGY OF MONITORING AND EVALUATION

The monitoring and evaluation is a critically important element of any demonstration project. In the case of the I-15 Congestion Pricing Project, it was designed to meet federal requirements for congestion pricing project evaluations, as well as the needs of SANDAG and other project partners.

The SDSU team's goal was to document, assess, and verify all the project's potential impacts on the I-15 corridor. The scope of the monitoring and evaluation is very broad and diversified, since no earlier study was available to judge in advance which issues may or may not be relevant to such a study. Wherever possible, a variety of data and data sources are being used to maximize the reliability of findings. Seventeen individual studies are being conducted.

A wide range of quantitative data on traffic volumes, travel modes, vehicle speeds, HOV violations, and traffic incidents are being monitored and evaluated. Potential changes in air quality and cost of delay also are being evaluated. Another major component is the Attitudinal Panel Study of 1,500 individuals who are surveyed every six months from three groups: (1) current and former ExpressPass users; (2) other I-15 commuters; and (3) I-8 commuters (representing the control corridor).

A business impact component and land use component, public acceptance, media response, community outreach, and marketing also are included in the Phase I evaluation. In addition, the evaluation assesses institutional and technical system issues.

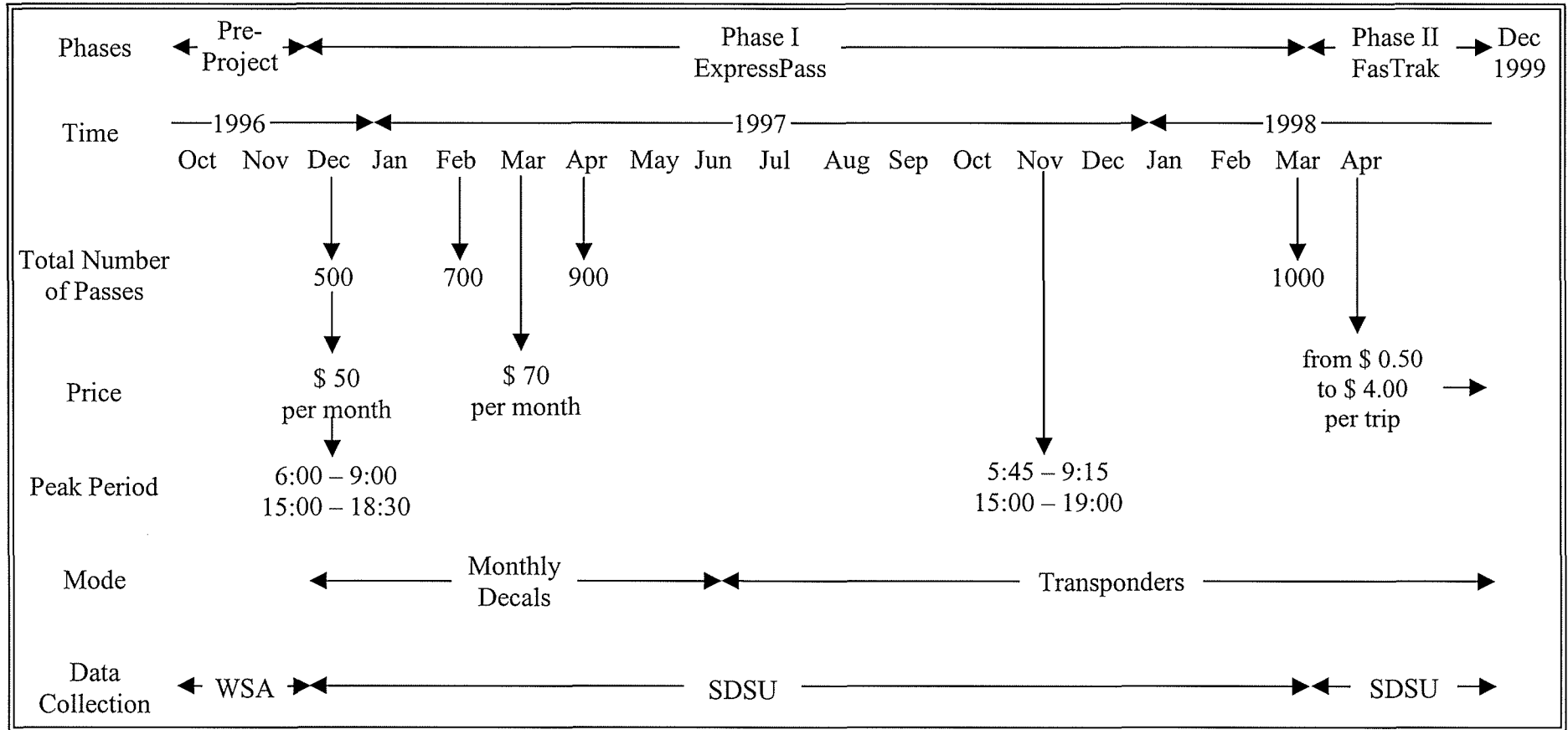
The methodology for the I-15 Congestion Pricing Project evaluation is described in more detail in the SDSU Task 1.4 report entitled *Detailed List of Key Issues*, July 1997. Characteristics of the methodology are summarized below.

Evaluation Waves

The evaluation is being conducted in a series of periodic waves, which generally occur in the Spring and Fall of each year to avoid interference from the typical seasonal changes in traffic patterns. The first wave of data collection was conducted in Fall 1997. Future waves will be conducted in the Spring and Fall of 1998 and 1999. The waves are intended to study the months of April and October throughout the life of the project. Departure from the April/October schedule may be necessary in order to capture important project transitions and changes in operations (e.g., the delay of the Spring 1998 wave in order to allow time for adjustment to the I-15 FasTrak program, which began in April 1998). The pre-project traffic data were gathered in October 1996 by WSA.

The subject of this report is the Fall 1997 wave. It is intended to capture the potential project impacts resulting from Phase I operations. Phase I included major milestones such as the introduction of the ExpressPass program in December 1996, changes in monthly pricing levels and available ExpressPass permits, as well as a change in technical operations from windshield decals to electronic transponders. See Figure 1 Summary of Milestones.

Figure 1
Summary of Milestones



Control Corridor

In order to be able to distinguish changes attributable to the I-15 Congestion Pricing Project itself from external changes occurring in the region, such as changing employment levels, a control corridor is being used. The control corridor selected for the evaluation is Interstate 8 (I-8), which is an east-west commuter route linking residential areas in the east to downtown San Diego to the southwest. Unlike the I-15 study corridor, the I-8 control corridor does not contain an HOV facility. An eight-mile section of I-8, located approximately the same distance from downtown San Diego as the I-15 HOV lanes, was identified as the control site for the evaluation. Both Freeways, I-15 and I-8, are major commuter routes leading toward downtown San Diego. I-15, another major north-south commuter route was not chosen as control corridor because of the very different demographics and economic status of this corridor.

Macroscopic and Microscopic Analysis

Whenever possible, the SDSU evaluation team attempts to gather two types of data for each study wave. These data sets include:

- *Macroscopic*, aggregate data about I-15 and I-8, which consist of traffic data on mode use, time-of-peak distribution, speed and travel time, traffic incidents, violations, and vehicle classification and occupancy; and
- *Microscopic*, disaggregate data about individual traveler behavior, such as an individual's reported mode shifts and changes in time of departure, and traveler perceptions and attitudes, such as perceived changes in congestion, speeds, travel times, and safety of travel.

Gathering both types of data allows the evaluating team to check consistency of findings and provides enhanced understanding of any changes in project impacts observed from wave to wave.

Mix of Longitudinal and Cross-sectional Studies

The evaluation includes both longitudinal and cross-sectional studies. For example, one of the evaluation's main components is the 1,500-person Attitudinal Panel Study. This study is surveying individuals over five waves, in an attempt to collect data on changes in travel behavior, perception of, and attitudes toward the project from the same panel of individuals over the life of the project. This longitudinal data will offer a unique opportunity to study the complex dynamics of how individuals react to changing stimuli over time.

The evaluation also includes cross-sectional studies, such as the Business Impact Study and the Land Use Study, where different businesses and housing developments are being surveyed over three waves. The traffic data collected for the evaluation also are cross-sectional by nature. The SDSU team considers the combination of both longitudinal and cross-sectional data optimal for this evaluation project.

PHASE I STUDIES AND FINDINGS

Phase I studies and major findings from Phase I of the SDSU evaluation are provided below by individual study. It should be noted that the Phase I findings are considered preliminary, as the individual studies will be conducted over the three-year life of the project.

Macroscopic View

To provide a macroscopic view of the I-15 and I-8 corridors, six individual studies about traffic conditions, truck use, bus use, park and ride lot usage, air quality, and cost of delay were conducted by the SDSU team.

Traffic Study

The focus of the Phase I Traffic Study is to detect changes in traffic characteristics from the pre-project period in late 1996 to Phase I of the project in late 1997 in order to evaluate the traffic impacts of the I-15 ExpressPass program.

The Traffic Study summarizes data on traffic volumes, vehicle occupancy and classification, and speed/delay for both I-15 and I-8. This study includes the pre-project traffic volume and vehicle occupancy and classification data collected by WSA, 10 years of historical traffic volumes from Caltrans, and vehicle occupancy and classification data collected by SDSU during Phase I.

- **Traffic volumes in the I-15 HOV lanes** increased substantially between Fall 1996 and Fall 1997, based on Caltrans loop counts at Carroll Canyon Road. Total number of vehicles increased by 20 percent in the a.m. peak period and by 12 percent in the p.m. peak period. The increase in volumes in the HOV lanes also is substantiated by WSA and AVI data collected before and during Phase I. These data indicate a 10 percent increase in the a.m. peak period volumes and a 20 percent increase in the p.m. peak period volumes on the I-15 HOV lanes. All changes are statistically significant.
- **Traffic volumes on the I-15 main lanes** decreased slightly between Fall 1996 and Fall 1997. Total I-15 main lane volumes decreased by two percent in the a.m. peak period and three percent in the p.m. peak period. These volume changes are small and thus it is unlikely that the changes were perceptible to travelers who used the main lanes during the peak periods.
- **Traffic volumes in the entire I-15 corridor** (combined main lane and HOV lane volumes) changed only slightly between Fall 1996 and Fall 1997. Based on Caltrans loop counts at Carroll Canyon Road, average traffic volumes for the I-15 corridor increased by less than one percent in the a.m. peak period and decreased by slightly more than one percent in the p.m. peak period. These changes were not likely to be noticed by peak period I-15 commuters.
- **Traffic volumes on I-8**, based on Caltrans loop counts at West Main Street, have increased substantially from Fall 1996 to Fall 1997. There was an eight-percent average increase in traffic in both the a.m. and p.m. peak periods. This increase in average traffic volumes is statistically significant and would represent noticeable changes to travelers using I-8 during peak commute periods.
- **Carpool volumes on I-15 HOV lanes** have increased substantially since the program started in December 1996. Based on WSA data, total carpools increased from 8,572 per day in

January 1997 to 9,971 per day in December 1997 – statistically significant increases of 10 percent for the a.m. and 21 percent for the p.m. peak period. Another data source (Caltrans data combined with WSA data) substantiates the increase in carpools, showing an increase of 23 percent for the a.m. peak period and a 14 percent increase for the p.m. peak period. Both changes are statistically significant. The conversion of I-15 express bus riders to carpoolers might be part of the increase in carpool volumes, since the ridership of buses using the HOV lanes decreased by three percent, but there is no evidence to support this hypothesis at this stage of the project.

- **SOV violation rates on the HOV lanes** have dropped from about 15 percent of total number of vehicles using the lanes in October 1996 to about two percent in October 1997, based on WSA data – a statistically significant change.
- **Total SOVs in the I-15 corridor**, as measured at Carroll Canyon Road, remained virtually unchanged at about 26,000 vehicles during the a.m. peak period over the last 10 years. From 1988 to 1997, total vehicle volumes in the I-15 corridor increased by 19 percent to 34,278 total vehicles in Fall 1997. However, this increase in total vehicle volume is primarily the result of a near doubling of HOVs between 1988 and 1997. (HOVs in the a.m. peak period increased by 98 percent between 1988 and 1997).
- **The total number of persons traveling on I-15** during the a.m. peak period has increased from 32,860 in 1988 to 42,977 in 1997 - a 31 percent increase. This increase in persons carried through the I-15 corridor is due to the significant increase in the HOV population in the corridor, as well as improved utilization of the I-15 HOV lanes.
- **The increase in HOVs and the addition of ExpressPass vehicles in the I-15 HOV lanes** resulted in an increase in total vehicle volumes during peak periods between Fall 1996 and Fall 1997. The peak period utilization factor (PPUF) increased by a statistically significant eight percent for the a.m. peak period and by 27 percent for the p.m. peak period. (The PPUF is defined as a ratio of volume during peak period to the maximum peak period volume assuring LOS C).
- **Although utilization of the I-15 HOV lanes increased** there was no ‘flattening’ of the peak period. The peak period distribution factor (PPDF) decreased by eight percent during the a.m. peak period and increased by only one percent in the p.m. peak period. (The PPDF is defined as a ratio of volume during peak period to the overall peak volume based on the highest 15-minute volume.) This is because the I-15 ExpressPass program did not provide any pricing incentive for ExpressPass users to avoid travel on the I-15 HOV lanes during the middle of the peak period. Both PPUF and PPDF need to be carefully examined throughout the life of the project.
- **Speed/delay studies** performed in Fall 1996 and 1997 using the “floating car” technique indicate that there has been a reduction in travel time on the I-15 main lane segments located adjacent to the I-15 HOV facility. This reduction is on average slightly less than two minutes during the morning peak period and slightly more than 2 minutes during the afternoon peak period. Thus, travel time was reduced by 19 percent during the a.m. peak period and by 23 percent during the p.m. peak period. Both changes are statistically significant.
- **I-8 is less congested** than I-15. Delays on I-8 are less than on I-15 for both the a.m. and p.m. peak periods. Communities along I-15 and I-8 are both growing quickly. However, growth of traffic on I-15 seems to be smaller than on I-8 because the increase in carpool population on I-15 allows more people to travel by fewer cars.

Cost of Delay Study

The intent of this study is to examine changes in cost of delay as traffic and pricing policies change over time. The Cost of Delay Study estimates the value of time lost by commuters as a result of traffic delays during peak periods along the I-15 main lane segment, which corresponds to the I-15 HOV lanes. The cost of delay is also estimated for a section of I-8, the control corridor.

Delay costs are calculated using two factors. The first factor is the total amount of delay on roadways as compared to a free-flow situation using vehicle speed data from Fall 1996, the pre-project period, and Fall 1997, the project period. The second factor is the value of time, which is defined as an individual's willingness to pay to avoid delays, using percentage of average gross wages that were derived from the Fall 1997 Attitudinal Panel Survey.

- **For the I-15 corridor**, annual cost of delay during Fall 1997 is estimated to be \$4.27 million per year - an 18 percent decrease from Fall 1996.
- **For the I-8 corridor**, annual cost of delay during Fall 1997 is estimated to be \$1.39 million per year - a 14 percent increase from Fall 1996.
- **Costs of delay are significantly higher along I-15** primarily because traffic volume is higher than along I-8. Additionally, commuters along I-15 have higher average hourly wages and therefore higher values of time. The overall decrease on cost of delay on I-15 is caused by the slight reduction in volumes on the main lanes and by an increase in average speed traveled. Increase in cost of delay on I-8 is caused by the increased volumes along I-8. No speed/delay study was performed in 1996, because at that time, I-8 had not been designated as the control corridor. However, average speeds in Fall 1996 were assumed to be the same as the speeds observed in Fall 1997 – a conservative assumption given the substantial increase in traffic volumes over the same period.

Air Quality Study

The Air Quality Study estimates total emissions of four main pollutants along I-15 and I-8: hydrocarbons (HC), nitrogen oxides (NO_x), particulate matter (PM), and carbon monoxide (CO). Total emissions of each pollutant depend upon four main factors: (1) emission factors in grams per mile; (2) average vehicle speeds; (3) total vehicles; and (4) the length of the roadway. Emission factors vary depending on vehicle type and speed and are based upon California Air Resources Board's EMFAC7G model. Average speed data, vehicle classification data, and vehicle volumes are the same data as those that were used for the Phase I Traffic Study.

- **For the I-15 main lanes**, emission levels for the four pollutants studied have been stable between Fall 1996 and Fall 1997 for the a.m. peak period. They have increased by up to seven percent for the p.m. peak period (except for PM emissions that have decreased slightly over the same time). This increase of emission levels was caused primarily by increased average speeds.
- **On the I-15 HOV lanes**, total emissions increased by 25 percent for the a.m. peak period and by six percent for the p.m. peak period from Fall 1996 to Fall 1997. This increase in total emissions was caused by increased traffic volumes and vehicle speeds on the HOV lanes.

- **For the entire I-15 corridor**, the overall increase in emissions for all four pollutants ranged from one to seven percent over the same time. This increase in total emissions in the I-15 corridor was primarily caused by an increase in average vehicle speeds between October 1996 and October 1997.
- **For I-8**, no speed was data available on I-8 for 1996. Thus, the conservative assumption was made to keep speed unchanged between Fall 1996 and 1997. With this assumption, total emissions in the I-8 corridor are estimated to have increased by 18 percent for the a.m. peak period and by 12 percent for the p.m. peak period. These increases are caused primarily by increased average daily traffic volumes.

Park and Ride Study

The Park and Ride Study monitors usage of park and ride lots in the I-15 and I-8 corridors. Twenty-one park and ride lots along I-15 and 11 park and ride lots along I-8 were monitored by the SDSU team in Fall 1997 for two consecutive days. SDSU's observations were supplemented by the historical park and ride counts of the same lots from Caltrans in the Spring of 1996 and 1997.

- Observed usage rates varied substantially among park and ride lots in both the I-15 and I-8 corridors. There were no statistically significant differences in usage rates between the two days observed for either corridor in Fall 1997.
- Evaluation of historical park and ride lot data from Caltrans reveals a stable 40 percent average usage rate for lots along I-15. At the same time, the I-8 park and ride lots experienced a substantial and statistically significant decline in average usage rate from 30 percent in Spring 1996 to 16 percent in Fall 1997.

Truck Use Study

The Truck Use Study monitors truck use along both the I-15 and I-8 corridors. Vehicle classification data collected for the I-15 corridor by WSA during the pre-project period (Fall 1996) and collected for both I-15 and I-8 by SDSU in Fall 1997 are analyzed.

- In both the I-15 and I-8 corridors, heavy trucks represent less than three percent of total vehicles.

Bus Study

The Bus Study monitors changes in ridership on bus routes serving I-15 and compares those changes with transit ridership levels for the San Diego region. Ridership data for the I-15 bus routes and regional ridership data were collected from MTDB and San Diego County Transit System (CTS).

Eight bus routes serving the I-15 corridor were included in this analysis. These routes were categorized as either express service routes or local service routes. The study also distinguished between I-15 routes using the I-15 HOV lanes, and I-15 routes not using the HOV lanes. In this study, regional transit ridership levels, rather than I-8 transit ridership levels, were used as the control because of limited transit service in the I-8 corridor.

- **Bus ridership in the I-15 corridor** increased from Fall 1996 to Fall 1997 by six percent. However, the individual routes using the I-15 HOV lanes recorded a slight decline (three percent) in ridership between Fall 1996 and 1997.
- **Bus ridership in the San Diego region** increased between Fall 1996 and Fall 1997 by six percent.

Revenues from the project were used to establish a new express bus service in the I-15 corridor marketed as the "Inland Breeze." Patronage of this service will be studied in detail in Phase II of the project.

Microscopic View

The microscopic view is provided by various studies which monitor and assess attitudes, perceptions, and travel behavior of individuals and groups affected by the I-15 Congestion Pricing Project. This group of studies includes the Attitudinal Panel Study, Business Impact Study and Land Use Study.

Attitudinal Panel Study

The Attitudinal Panel Study is designed around the principle of interviewing the same respondents at regular intervals, or waves, throughout the life of the project. Five panel waves will be conducted. As of November 1998, three waves were completed.

The intent of this study is to measure characteristics of travel behavior, attitudes, and perceptions during each wave. Each panel will consist of a total of 1,500 respondents from three sub-samples of (1) I-15 ExpressPass program participants; (2) other I-15 commuters; and (3) I-8 commuters. In addition, because of the importance of monitoring carpooling effects, these commuters were over-sampled in the first wave to insure adequate representation in later surveys.

The findings presented below are based only on the analysis of the first wave (Fall 1997).

Mode Choice

- I-15 ExpressPass users were found to be regular solo drivers. Ninety-seven percent drove alone on their last trip, and of these, 95 percent had driven alone for all trips in the previous five-day week.
- In comparison, other I-15 users switched modes often. Of the 23 percent of I-15 carpoolers who carpoled for their most recent trip, 62 percent had carpoled for all of their trips in the previous five-day workweek. I-8 users exhibited similar patterns of mode choice as other I-15 users.
- Work or work-related travel was the main trip purpose for the most recent weekday trip among almost all I-15 and I-8 users. A total of 99 percent of ExpressPass users, 93 percent of former ExpressPass users, 81 percent of other I-15 users, and 77 percent of I-8 users had work or a work-related purpose for their most recent weekday trip.
- ExpressPass users were satisfied with traffic conditions during their commute. Eighty percent of ExpressPass users were very or somewhat satisfied with traffic conditions on their most

recent trip, compared with 72 percent of I-15 carpoolers, 34 percent of I-15 solo drivers, and 66 percent of all I-8 users.

- Both current ExpressPass users and I-15 carpoolers shared negative perceptions of traffic conditions in the I-15 main lanes. However, I-15 solo drivers using the I-15 main lanes viewed traffic conditions on the lanes more positively.

Characteristics of Current and Former ExpressPass users

Current ExpressPass users emerged as a group with distinct personal and household characteristics. They

- were predominantly 35-54 years old;
- were predominantly male;
- had an educational level of a bachelor's degree or higher;
- generally had household incomes of more than \$100,000;
- were solo drivers who used the I-15 HOV lanes for work or work-related purposes eight to ten times per week;
- held negative perceptions of traffic congestion on the I-15 main lanes;
- were solo drivers who used the I-15 main lanes prior to joining the ExpressPass program;
- cited significant time saving using HOV lanes, which are much higher than actual time savings; and
- paid for the \$70 monthly fee by themselves.

Former ExpressPass users (i.e., those who dropped out of the program as the price was increased) differed from current users as follows. They

- were predominantly female;
- were less likely to be college graduates;
- generally had lower household incomes;
- had less negative views of traffic congestion on I-15 main lanes; and
- held views that were more similar to other I-15 solo drivers.

Awareness and Attitudes toward the ExpressPass Program

Current ExpressPass users thought that the ExpressPass program was a success, but fewer former ExpressPass users and fewer other I-15 users considered the program a success. Close to 40 percent of both I-15 solo drivers and I-15 carpoolers were unaware of the ExpressPass or had no opinion about the program.

The majority of respondents thought that the ExpressPass program was fair to both travelers using the I-15 main lanes and the I-15 HOV lanes.

The majority of I-15 users agreed with allowing solo drivers to use the HOV lanes for a fee.

Program Impacts

Non-ExpressPass I-15 users did not believe the ExpressPass program had affected their travel time. This is expected given that during Phase I only between 500 and 1000 SOV participants were allowed to use the HOV lanes each month. Importantly, carpoolers did not feel adversely impacted by the ExpressPass program. This perception coincides with the Traffic Study finding that LOS C in the HOV lanes was maintained.

The majority of ExpressPass users believed that the ExpressPass program has resulted in significant shortening of their travel time (between 13 and 22 minutes). The perceived time saved for the inbound trip (19-minute average, 15-minute median) was much greater than actual time saved. The actual time saved, based on five-day speed/delay study ranged from zero to nine minutes maximum using the I-15 HOV lanes.

This discrepancy may be due to the ExpressPass user's perceived increase in the reliability of on-time arrival at his/her destination. For some travelers, use of ExpressPass caused substantial time reduction on the on-ramps, also contributing to this perceived travel time reduction.

The majority of ExpressPass users adjusted their inbound departure time, reporting that they left later. This finding is consistent with the Traffic Study finding of an increase in utilization during the middle of the peak.

The majority of I-15 users considered the I-15 HOV lanes to be safer than the I-15 main lanes. The users of the HOV lanes, including both carpoolers and ExpressPass users, most strongly perceived this difference in safety.

Price Sensitivity

The majority of current and former ExpressPass users thought the \$70 monthly fee was too high, and held more positive views of the \$50 monthly fee.

The majority of all I-15 respondents thought that the price of the ExpressPass program should increase if the HOV lanes became too congested. This solution was favored over raising the vehicle occupancy requirement from two to three persons. This finding is an indication of support for the principal of pricing SOVs to use the HOV facility.

Use of Revenue

Although using ExpressPass revenue to improve I-15 transit service is one of the objectives of the project, very few respondents (two percent of all respondents and three percent of I-15 respondents) thought that the program revenue should be used to enhance I-15 express bus

service. I-15 carpoolers and program participants were in favor of using the ExpressPass revenues to extend the HOV lanes while I-15 solo drivers favored improvements to the main lanes.

Business Impact Study

Three waves of the Business Impact Study were or will be conducted during Fall 1997, 1998, and 1999. The findings presented below are based upon the first wave (Fall 1997). A total of 138 businesses completed the brief telephone survey for the Fall 1997 wave. Businesses were selected by random sampling methods from the *Pacific Bell Yellow Pages*. The survey sample included businesses located in three general areas of the San Diego region: (1) along the I-15 corridor; (2) along the I-8 control corridor; and (3) in downtown San Diego (served by the I-15 and I-8 corridors).

- A sample of 138 respondents is larger than the 120 originally targeted responses for this study. However, the majority of respondents either did not know whether the ExpressPass program would have an impact or thought the program would have no impact on their business. Thus, only a small fraction of answers could be used for analysis. A larger sample was planned for the Fall 1998 business survey.
- There appeared to be no statistically significant differences between businesses that depend primarily on I-15 and those that depend primarily on I-8 with a single exception: awareness of the ExpressPass program. These preliminary findings are affected by small samples available for statistical analysis.
- Awareness of the I-15 ExpressPass program among the local business community was low.
- Local businesses did not consider the ExpressPass program to be of significance to their own employees, their customers, or to their business operations.
- Not surprisingly, the delivery-based businesses were more concerned about the importance of employees, goods, and services traveling in both the I-15 and I-8 corridors than site-based businesses.

Land Use Study

A survey of new owners in residential developments along the I-15 study corridor and the I-8 control corridor was or will be conducted in the Spring of 1998 and 1999. Potential land use impacts will also be identified in future waves of the Attitudinal Panel Study, which contains questions about housing location and the factors that influence housing location decisions.

Other Aspects

The third major group of studies comprises a variety of supplemental studies on a variety of topics. This group includes eight separate studies, which are described below:

Implementation Procedures, Policies, Agreements and Barriers

This study reviews the multi-party agreements for Phase I and describes the decision-making required to implement the project. In addition, interviews with key stakeholders are performed periodically to monitor their assessment of the project.

- One significant factor in the implementation of the I-15 Congestion Pricing Program was the role played by a local political champion – Jan Goldsmith. The project required special state legislation to allow SOVs to use the HOV facility for a fee. The local representative shepherded the legislation and was responsive to concerns that such a policy should not be allowed to undermine the position of carpoolers. Current project stakeholders acknowledge the role of the political champion in promoting and supporting the project in its early stages. This is thought to explain in part why the I-15 project was implemented, while similar efforts around the U.S. were not.
- The current project partners and stakeholders view the project as a success for inter-agency cooperation. They felt that the role of the PMT was key to successful implementation and would serve to strengthen long term relationship between agencies.
- At the end of Phase I, stakeholders representing project partners widely perceived the project as successful in meeting its objectives. However, different stakeholders perceived different objectives. They believed that the I-15 HOV lanes' capacity was being more efficiently utilized and that pricing was successfully being implemented by selling monthly ExpressPass permits at varying prices.
- Stakeholders noted that planned fee increases for the program could not be approved by the SANDAG Board because of strong customer opposition. It was felt, however, that the ultimate goal of variable pricing would not be jeopardized by this decision. Indeed, that turned out to be the case.

Enforcement Effectiveness and Violation Assessment

This study assessed violation data collected by WSA during the I-15 ExpressPass phase as well as citation data and interviews from the CHP.

- In Fall 1996, SANDAG and CHP established an enforcement plan that specified varying levels of patrol vehicle and motorcycle enforcement, corresponding to project milestones (such as planned price changes and the switch from decals to transponders).
- SOV violations decreased from 15 percent of total traffic in the I-15 HOV lanes to an average of two percent of total traffic in 1997.
- The reduction in SOV violators was not due to increased citations, but attributable to increased CHP enforcement on the HOV lanes, as well as the likely conversion of some SOV violators to legitimate ExpressPass solo drivers. Although the level of enforcement was less than planned (due to the voluntary nature of the duty), enforcement seemed to be adequate and compliance quite high.

Safety-Related Issues

Accident data for I-15 and I-8 compiled for the period 1988 through 1996 from CHP traffic accident reports were used in the study.

- The rarity of accidents proved difficult to establish any relationship between the I-15 Congestion Pricing Project and accident levels on the relevant segments of I-15.

Marketing and Promotional Efforts

The marketing efforts evaluated include the work completed by Frank Wilson & Associates (FWA), the marketing subcontractor for the project, and SANDAG, which also promotes the project and provides communications to the public and local media.

- Initial marketing efforts were successful in achieving the goal of promoting early sign-up and usage of the ExpressPass program. The initial 500 ExpressPass permits sold within 24 hours on the first day they were offered, and a large waiting list was established. The available supply of permits each month was sold relatively easily throughout Phase I.
- Following the initial kickoff of the ExpressPass program in December 1996, marketing efforts were scaled back substantially to avoid “overselling” the program, since only a limited number of permits were available during Phase I.

Community Outreach and Impacts

The Community Outreach and Impacts Study describes the outreach efforts conducted by SANDAG among community groups in Spring 1996 (prior to the project) and in Spring 1997 (during Phase I of the project) in compliance with the federal Environmental Justice requirements (Executive Order 12898).

- The first set of outreach activities conducted by SANDAG was developed around the concept of public workshops and mailed postcards that would give the public an opportunity to express its views about the project. The participation in public workshops was very low, as was the written response rate.
- The second set of SANDAG activities in Spring 1997 used multiple media to introduce the project to the public and to seek public reaction to it. As before, public reaction and interest were very low.
- Lack of substantial public attention and participation indicates that the ExpressPass program was not viewed by the I-15 public as a controversial issue during Phase I of the project.

Media Relations and Coverage

Print articles and electronic news coverage are being closely monitored throughout the life of the project and are classified as informational or opinion pieces to assess the general tone of the media coverage.

- During Phase I, media coverage was generally informative, balanced, timely, and accurate.
- The media information about the project during Phase I focused on a general description of the project, the use of project revenue to fund I-15 transit, and price-related issues.
- The media was supportive of the use of project revenue for transit service improvements and has acknowledged ExpressPass users’ satisfaction with the program.

- Not unexpectedly, there have been some negative opinion pieces and concerns about the elitist character of the project and price, particularly when fees were raised. However, Phase I has not been attacked and criticized in a consistent manner.
- Awareness of the project among individuals and businesses appears to be low. The explanation may lie in the relatively small scale of the project (only 1,000 passes during Phase I) and the absence of negative impacts. The ExpressPass program was not viewed by the I-15 public as a controversial issue during Phase I of the project.

Acceptance of the Project and the Pricing Concept

This study examines public response to the I-15 Congestion Pricing Project, as expressed in public correspondence to SANDAG, focus group research, and attitudes expressed by respondents in the Attitudinal Panel Study.

- ExpressPass users exhibited continuing enthusiasm for the project. Only former users expressed the view that the program was not a success, most likely because of feeling “priced out” of the program. However, price sensitivity was evident from results of the Attitudinal Panel Study and focus group research.
- At the end of Phase I, there were no indications of widespread dissatisfaction with the I-15 ExpressPass program. Forty-seven percent of I-15 commuters questioned in the Attitudinal Panel survey thought the program was a success, 27 percent did not think the program successful, and 26 percent were unaware of or did not have an opinion about the program.
- Evidence from Fall 1997 Attitudinal Panel Study showed support for automated, per-trip pricing among those who understood the project. This is in contrast with the negative reactions about per-trip pricing from the July 1997 focus groups.

Technical Assessment of the Congestion Pricing System

The Interim Electronic Toll Collection (ETC) System, which became operational on September 1, 1997, generally performed well during the remainder of Phase I of the project. From August 25, 1997 to December 31, 1997, there were four times when the Interim ETC System was down. Out of 754 hours of scheduled operations, the Interim ETC System was inactive for approximately 94 hours, or 12 percent of total scheduled operation. During the four down times, the I-15 HOV lanes data were not recorded for 77 hours, or about 10 percent of total scheduled operation. During one of the failures, the system was down because of a power outage, and the three other down times were caused by communications failures.

CONCLUSIONS

- Phase I of the I-15 Congestion Pricing Project was marked with relative success. The project appears to meeting its primary objectives. Total vehicles using the I-15 HOV lanes increased substantially over Phase I, resulting in better utilization of the I-15 HOV facility. There was a slight reduction in overall traffic volumes on the I-15 main lanes.
- Perhaps one of the most important impacts during Phase I was a significant increase in HOVs using the I-15 HOV lanes. These additional vehicles, combined with a gradual increase in

ExpressPass vehicles, resulted in better utilization of the I-15 HOV lanes. Even with the increase in HOVs and ExpressPass vehicles using the HOV lanes, LOS C was maintained during Phase I. Carpoolers did not face deteriorating traffic conditions because of the ExpressPass program.

- In addition, the revenue raised by the ExpressPass program allowed the start of a new I-15 express bus called the Inland Breeze (Route 990) in November 1997.
- There also was a significant reduction in SOV violators using the HOV lanes. The reduction in SOV violators is attributable to the increased CHP enforcement of the HOV lanes, as well as the likely conversion of some SOV violators to legitimate ExpressPass solo drivers.
- Other traffic and traffic-related benefits were recorded in Phase I along the I-15 corridor. A relatively high level of I-15 park and ride lot utilization was observed, while lot usage along I-8 was lower and showed a decline over the same period.
- The panel surveys are producing a wealth of information about travel behavior and attitudes of the survey participants. Those who were aware of the program in the first wave were generally supportive of allowing solo drivers to use the Express Lanes for a fee. It is also significant that the majority of I-15 users believed that it would be acceptable to raise the price of the ExpressPass to prevent the HOV lanes from becoming too congested. This first survey wave uncovered no widespread dissatisfaction with the program. ExpressPass users cited several program benefits. Users expressed satisfaction with the reduction in their travel time, the reliability of on-time arrival at their destinations, and the perception of improved safety of the I-15 HOV lanes. Therefore, they viewed the program as a success. Those who dropped out of the program cited cost as the reason. Other I-15 users were evenly divided in opinion about the success of the project.
- Although general response to the I-15 Congestion Pricing Project was positive during Phase I, two potentially problematic issues arose. The first issue is sensitivity to increases in price among some users, particularly former users. Customer opposition is thought to have been the primary reason that the second ExpressPass price increase from \$70 to \$80 was not passed by the SANDAG Board in April 1997. The second potentially contentious issue is the lack of awareness and support among ExpressPass users and other I-15 users for using the revenue from the program for transit improvements in the I-15 corridor. This funding objective of the project did not appear to have broad support.
- The project partners involved in implementation activities viewed the ExpressPass program in a positive light. The representatives of the various project partner agencies believed the project to be well managed and successful in meeting its intended objectives.
- Awareness of the ExpressPass program and its specific objectives was relatively low among individual I-15 commuters and businesses located along I-15 during Phase I. This may have been a result of the limited marketing and promotional efforts and the small scale of the project.
- Outreach efforts conducted by SANDAG to comply with federal Environmental Justice requirements did not attract substantial public attention and participation. It appeared that the ExpressPass program was not viewed by the I-15 public as a controversial issue during Phase I.
- Media coverage of the project was fair, timely, and generally objective, confined primarily to providing information about the I-15 Congestion Pricing Project. However, in late 1997, media attention shifted towards overall traffic problems facing the growing I-15 corridor, and some negative opinions and misconceptions about the pricing project began to emerge.

It is too soon to declare the project a success in achieving its primary goals. However, if traffic trends are maintained or even improved during the life of the project, there are indications of potential benefits for all travelers in the I-15 corridor.

I-15 CONGESTION PRICING PROJECT: A BROADER CONTEXT

In this section, an attempt is made to assess the results of Phase I of the San Diego I-15 Congestion Pricing Project from a somewhat broader perspective. This would allow examination of the extent that this particular project did or did not confirm 'conventional wisdom' about congestion pricing in general.

Concerning both the aggregate system-wide traffic data and the disaggregate travel behavior data, monitoring and evaluation of Phase I of the project do not yet allow a complete interpretation of all the project impacts and differences between the study corridor I-15 and the control corridor I-8 that were observed so far. However, statistical analyses show that differences between I-15 and I-8 do exist, and most of them are significant. They will be carefully monitored throughout the life of the project. It should be emphasized that aggregate and disaggregate data are completely compatible and consistently lead to some broader conclusions. These conclusions are preliminary and limited to the specific version of congestion pricing that utilizes separate HOV lanes on an urban freeway.

So far, Phase I of the I-15 project has proven that:

- 1) Congestion pricing can be successfully implemented on a major urban freeway.
- 2) Congestion pricing is able to generate measurable and significant system-wide traffic impacts within the effected corridor.
- 3) Congestion pricing is able to cause measurable and significant changes in travel behavior, at least among the program participants.
- 4) Congestion pricing creates an identifiable new travel option, which is highly valued by the participants.
- 5) Congestion pricing does not appear to be a policy that 'harms' carpool use of the corridor; on the contrary, it may have a potential to actually increase travelers' interest in carpooling, if it remains a non-fee travel option.
- 6) Congestion pricing can be designed in a way that protects the interest of carpoolers and keeps them satisfied.
- 7) Congestion pricing can be an effective tool to better utilize the HOV lanes.
- 8) Congestion pricing of the fixed-fee and time-insensitive kind does not contribute toward spreading traffic throughout the peak; on the contrary, it encourages delayed morning departures for work and increases trip concentration in the middle of the peak period.
- 9) There is a strong sensitivity to fee levels; program participants express their disapproval of a monthly fee that is perceived as too high.
- 10) Potential public concerns about effectiveness and fairness of a congestion pricing project need not necessarily arise.

FUTURE ISSUES

Phase II of the I-15 Congestion Pricing Project, marketed under the term I-15 FasTrak, began in April 1998 and will continue through December 1999. In this phase, the number of customers is not limited and the mode of pricing changed from charging monthly fees to charging per-trip fees. The per-trip fee ranges from \$0.50 to \$4.00 and varies by time of day and by real-time traffic levels in the HOV lanes. Tolls are collected electronically. Fees are adjusted as frequently as every six minutes to control SOV demand for the HOV lanes and maintain free-flow traffic conditions on the facility.

This changes the basis for decision making to use the HOV lanes. Whereas during Phase I commuters had to choose on a monthly basis whether to use the HOV lanes or not to use them, during Phase II, they have this option twice a day. It is anticipated that some potential customers may change their departure times in order to avoid the highest peak prices in the most congested periods. Others may alternate between HOV lane and main lane usage. It remains to be seen whether this new pricing policy increases or decreases support for the project and or the potential community benefits.

Support for the project and acceptance of the associated transit funding policy will be monitored closely over the life of the project. In Phase II, the constituency of solo drivers is much larger than in Phase I, since there are no limitations on the customer base as there were at the early stage of the project. Therefore, awareness of the project and its potential impacts are likely to increase during Phase II.

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APPENDIX A
List of Available Reports

Task(s)	Description
1.1	Worldwide Experience With Congestion Pricing
1.2	Up-To-Date Results of the SR-91 Congestion Pricing Experiment
1.3	Background Information on I-15 Corridor based on HOV Assessment Study
1.4-1.5	Detailed List of Key Issues and Study Design and Schedule
2.1-2.4	Control Factors
3.1.1 - 3.1.6	Phase I Traffic Study
3.1.8	Phase I Truck Use Study
3.1.9	Phase I Bus Study
3.1.10	Phase I Park and Ride Study
3.1.11	Phase I Land Use Study Methodology
3.1.12	Phase I Cost of Delay Study
3.1.13	Phase I Air Quality Study
3.2.1 - 3.2.3	Phase I Attitudinal Panel Study
3.2.4	Phase I Business Impact Study
3.3.1	Phase I Implementation Procedures, Policies, Agreements and Barriers
3.3.2	Phase I Enforcement Effectiveness and Violation Assessment
3.3.3	Phase I Safety-Related Issues
3.3.4	Phase I Marketing and Promotional Efforts
3.3.5	Phase I Community Outreach and Impacts
3.3.6	Phase I Media Relations and Coverage
3.3.7	Phase I Acceptance of the Project and the Pricing Concept
3.3.8	Phase I Technical Assessment of the Congestion Pricing System