I-5 NORTH COAST

MANAGED LANES VALUE PRICING STUDY

FROM LA JOLLA VILLAGE DRIVE TO VANDEGRIFT BOULEVARD

CONCEPT PLAN
VOLUME I

APRIL 2006

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Errata Sheet:
I-5 North Coast Managed Lanes Value Pricing Study (April 2006)

The project description was revised to state that the painted buffer separation between the general purpose lanes and the HOV/Managed Lanes would be up to five (5) feet.

This minor change in the project description is consistent with the analysis contained in this technical study.

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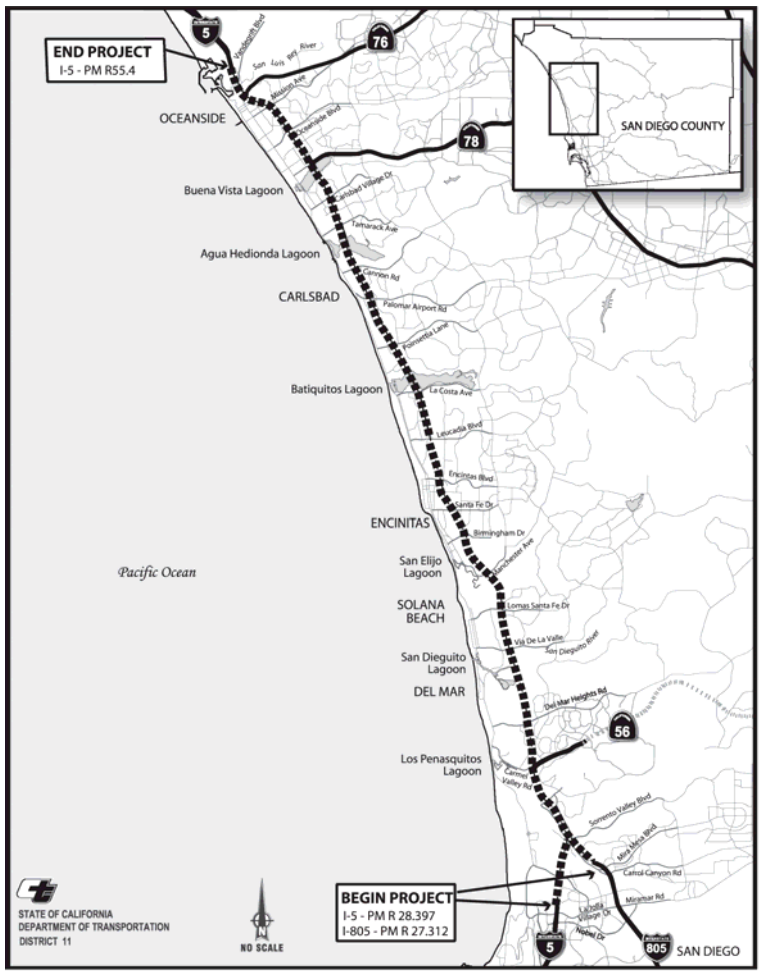
I-5 NORTH COAST MANAGED LANES VALUE PRICING PLANNING STUDY VOLUME I – EXECUTIVE SUMMARY

ES.1 PROJECT DESCRIPTION AND CORRIDOR OBJECTIVES

The I-5 North Coast managed lanes project in San Diego County represents the most extensive national application of managed lanes to date in a new corridor. Four express managed lanes are proposed in several build alternatives to extend 26 miles along the North Coast from La Jolla Village Drive to its northern limit at Vandegrift Boulevard, just south of Camp Pendleton (Figure ES-1). Alternatives being considered in this feasibility review include adding four managed lanes incorporating either four or five adjacent general purpose lanes in each direction, denoted as either an 8+4 alternative or 10+4 alternative. Managed lanes may be separated by barrier or buffer separation as shown in Figure ES-2.

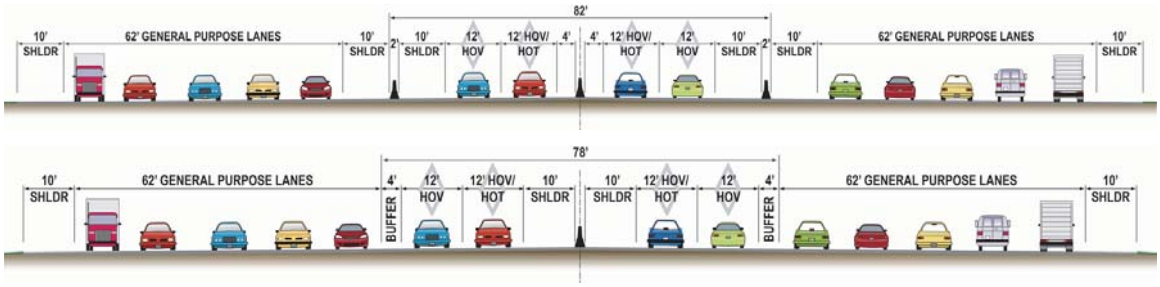
FIGURE ES-1: I-5 STUDY LIMITS



North Coast I-5 Corridor Project Location Map

This planning study is one of various parallel investigations involving an examination of the environmental, design and traffic benefits and impacts associated with the proposed project, which is partially funded under the countywide *TransNet* transportation program. Goals and objectives associated with this project include the ability to manage some of the added roadway capacity along I-5 to ensure that mobility to all stakeholders can be assured. Based on regional and state transportation policies, use of the managed lanes is given highest priority to transit and other high occupancy vehicles (vanpools and carpools) so as to promote more person movement in fewer vehicles. However, much if not all of this project will have available capacity for all potential users, at least during its early years of operation. To accommodate these users, value pricing is being considered as a means of managing demand so as to allow all potential stakeholders to equitability benefit.

FIGURE ES-2: ALTERNATIVE MANAGED LANE CROSS SECTIONS



The primary goal of the proposed I-5 North Coast Managed Lanes (ML) is to maintain mobility of four of the added lanes through roadway demand management. The I-5 Purpose and Need Report prepared as part of corridor NEPA studies identified the following objectives in addressing I-5 corridor mobility:

- Maintain or improve future traffic levels of service in 2030 over the existing levels of service;
- Maintain or improve travel times within the corridor;
- Provide a (roadway) facility that is compatible with future bus rapid transit and modal options; and
- Maintain I-5 as an effective link in the national Strategic Highway Network.

Pricing as a traffic management tool is considered in conjunction with access controls and eligibility to achieve real-time demand management of the ML during varying operating conditions. Access will be restricted to designated locations including openings to adjacent general purpose freeway lanes and direct access ramps (DARs) connecting to transit facilities and local streets. In keeping with regional policy which requires maintenance of a high level of service on HOV and managed lanes in San Diego, there will be a requirement to maintain this high level of service, defined as LOS C or better, at all times. This equates to about 1,650 vehicles per lane per hour, or 1,300 vehicles per hour directionally. Regionally, HOVs carrying two or more persons are allowed free use of managed lanes.

This technical summary provides findings supporting an assessment of value pricing feasibility for the subject I-5 corridor managed lane alternatives.

ES.2 STUDY DESCRIPTION AND CRITERIA

Corridor-wide demand now and in the future will greatly outpace available transportation infrastructure, based on available traffic data and traffic forecasts. Agency and public stakeholders are aware of this situation. The scope of this planning study is determining if pricing as a demand management tool is feasible on the four managed lanes (ML). Pricing is intended to be the primary tool to manage demand which maximizes the number of potential users who can use the I-5 managed lanes, thereby promoting mobility in an equitable manner to the greatest number of users. Pricing can be prescribed according to a preset schedule or applied dynamically to manage demand in real time for all segments of the corridor. Pricing can also generate revenue in support of operations and transit services.

This study examines various factors that influence value pricing feasibility. Study activities include both technical and public outreach investigations, in response to various measures. Evaluations conducted are representative and selective based on differentiating cross sections (i.e.,"10+4" to "8+4") or topic (i.e., buffer vs. barrier separation between general purpose and ML roadways)

These investigations address the following parameters and questions that reflect the various attributes influencing feasibility:

Demand:
- Is sufficient demand, in terms of AM and PM peak hour use, present in various time horizons to justify pricing managed lanes?

Access:
- Can access be provided to the managed lanes with sufficient frequency to adequately meet transit, HOV and priced demand?

Pricing Strategy:
- What is the most appropriate pricing strategy for the I-5 corridor and why?

Impacts to Adjacent Traffic:
- What are the impacts to adjacent traffic caused by managed lanes, and can these impacts be adequately mitigated?

Technology:
- What are the functional and performance monitoring needs to support a pricing strategy?

Revenue:
- What is the potential revenue generated from pricing the I-5 managed lanes?

Public Attitudes:
- Are public, agency and key stakeholder attitudes favorable toward pricing? What issues need to be addressed?

Equity:
- What equity issues, if any, are created by pricing the managed lanes?

The study began in June 2004. Study scope subtasks addressed each of these parameters according to specific subject areas. Table ES-1 provides a summary of the specific subtask reports, or elements within a subtask, that addressed each.

TABLE ES-1: COMPARISON OF FEASIBILITY CRITERIA TO STUDY SUBTASKS REPORTS

Parameter	Measure	Chapter Reference in Concept Plan
Demand	Sufficient demand	Chapter 4-5, (Subtasks 1-1, 1-2)
Access	Sufficient to meet demand	Chapter 4-5, (Subtask 1-2, Subtask 2-3)
Pricing strategy	Appropriate to manage demand	Chapter 2, (Subtask 2-1)
Impacts to adjacent traffic	Merges at access points	Chapter 4-5, (Subtask 1-2)
Technology	Pricing able to be installed and operated	Chapter 7, (Subtask 2-3)
Revenue	Adequate to cover operation	Chapter 6, (Subtask 2-2)
Public attitudes	Supportive of management goals and pricing	Concept Plan Volume 2 of 2,, (Subtask 2-4)
Equity (EJ)	• Pricing strategy • Public outreach feedback	Chapter 2 and Concept Plan Volume 2 of 2, (Subtasks 2-1 and 2-4)

This summary addresses technical investigations conducted, with specific evaluations and findings provided in an accompanying Volume 1 of the I-5 North Coast Managed Lanes Value Pricing Concept Plan. Public outreach activities addressing public perceptions and equity are contained in Volume 2.

ES.3 FINDINGS

ES.3.1. Demand

The existing I-5 corridor in 2002 had an average daily traffic (ADT) volume of 153,000 (north end) to 249,000 (south end). The traffic during peaks was not highly directional varying from 61/39 to 51/49 in the respective peak and off-peak directions. Annual growth rates are 2 to 5 percent, with most growth occurring in off-peak periods. Congestion is experienced in spot locations from 6 a.m. to 6 p.m., consistent with heavy congestion. In comparison to other congested corridors nationwide, a relatively high level of HOV formation already exists, with 16 percent 2-occupant vehicles and two percent 3+ occupant vehicles in the peak traffic streams. Averages nationally are 12 to 15 percent for 2+ HOVs. Truck volumes are moderate with seven percent heavy trucks and 15 percent light duty trucks in the traffic mix.

Forecast conditions for managed lanes were developed using two base pricing schemes--$0.25 per minute saved and $0.50 per minute saved. Both scenarios were calibrated in a “no-build” condition against the I-15 reversible express toll lanes in the SANDAG traffic model. Results showed that forecast volumes on I-5 managed lanes would be overloaded if continuous access was assumed. Successive tests with limited ingress/egress suggested that 4 to 5 mile spacing was needed, and by 2030 some portions of the managed lanes may have to price 2-occupant carpools to manage demand. Policy assumptions established by SANDAG for feasibility testing assumes that 2-occupant HOVs would be given a 50 percent discount for any prevailing HOV pricing rate once capacity is reached.

These findings indicate that the ML facility can be easily oversubscribed in both 2017 (shortly after opening) and 2030 (the design year) based on current values of time associated with I-15 and without applying access restrictions. Accordingly, the demand threshold for justifying pricing demand for I-5 was met for all segments. In a comparison of 8+4 and 10+4 alternatives, the added general purpose lanes on the north end beyond SR 78 distracted from potential demand, indicating that priority phasing this section would not be as critical to meeting current and forecast demand as other sections.

ES.3.2. Access

Results from demand forecast testing indicated that access alone cannot manage demand. Further, applying pricing in conjunction with a fairly restrictive access plan will be required. A restrictive access plan with 4 to 5 mile spacing was applied in conjunction with direct access ramps (DARs) at selected locations as highlighted in Figure ES-3. Arriving at this set of access assumptions was both dictated by NEPA activities involving the analysis of DAR locations and collaborated with Caltrans. A list of DARs were given assumptions. (Further evaluation of specific access locations will continue to be part of the NEPA process.)

Slip ramp access with the I-5 mainlanes showed a peak hour demand that ranged from 100 to 1,600 per hour (both directions). DAR demand varied from 100 to 2,400 per hour, indicating that both access features are needed and will be used. The provision of DARs helps lower demand for slip ramps, and reduces weaving that would otherwise occur across the I-5 mainlanes.

ES.3.3. Pricing Strategy

A wide universe of pricing strategies were identified and evaluated. Most pricing strategies could be applied to any of the I-5 ML alternatives, however, most were more easily applied to a barrier-separated alternative.

FIGURE ES-3: ACCESS ASSUMPTIONS FOR I-5 MANAGED LANES

Table ES-2 provides a brief summary of the various attributes associated with the major types of toll pricing strategies applicable to this corridor. Further investigations focused on comparative pricing benefits of a per-mile toll, segment toll and skewed per-mile toll. Most of the detailed model calibration and development of revenue forecasts were performed using a per-mile toll basis, since this was the best overall approach to managing traffic demand within a variety of variables, including different segment lengths, uneven demand and need for an equitable strategy. Two scenarios were tested for 2030, including SOV pricing and SOV pricing with HOV-2 pricing at a 50 percent discount, due to overloading of lane capacity. The SANDAG model appears to be overly sensitive to HOV-2 pricing, and further model refinement will be necessary to more fully explore HOV-2 pricing when this is needed in the future. Findings suggest that:

- SOV pricing allows for congestion free ML operations in 2015;,
- In 2030, some sections of ML exceed capacity during peak hours with pricing SOV only; and
- SOV/HOV-2 pricing appears to dramatically reduce ML demand.

TABLE ES-2: COMPARABLE ATTRIBUTE MATRIX FOR ALTERNATIVE PRICING STRATEGIES

			Demand Management Attributes			Public Acceptance		
Toll Strategy	Toll Variation	Trips Favored	Overall Effectiveness	Impacts on General Traffic	Revenue Generation	Public Perceptions	Equity	Signing
Flat Toll – Standard	Pre-set Dynamic	Long	Low-Medium Medium-High	High High	Medium Medium	High High	Low Low	Simple Medium
Flat Toll – Max. Trip	Pre-set Dynamic	Long	Low Medium	Medium Medium	Low Low	High High	Medium Medium	Simple Medium
Per Mile w/ Maximum	Pre-set Dynamic	Medium	Medium	Low Low	Low Low	Moderate Moderate	High High	Medium Complex
Per Mile no Maximum	Pre-set Dynamic	Medium	Medium High	Medium Medium	Medium Medium	Moderate Low	Medium Medium	Medium Complex
Per Mile-Skewed w Maximum	Pre-set Dynamic	Long	Medium High	Low Low	Medium Medium	Moderate Low	Medium Medium	Medium Complex
Per Mile-Skewed no Maximum	Pre-set Dynamic	Short	High High	Low Low	High High	Low Low	High High	Medium Medium
Segment Toll-Standard	Pre-set Dynamic	Short	Low Medium	Low Low	Medium Medium	Moderate Low	Medium Medium	Medium Complex
Segment Toll-Skewed	Pre-set Dynamic	Medium	Medium High	Medium Medium	High High	Low Low	Medium Medium	Medium Complex

ES.3.4. Technology and Performance Monitoring

A toll collection system and operation concept was evaluated and developed based on potential tolling strategies. A functional concept was provided since technology will change between now and the year of opening. The target implementation year was assumed to be 2012 to 2015. The concept plan looked at both current and future technology options across a wide array of topics integral to a tolling and traffic operations monitoring system. Key objectives of this plan were interoperability (Title 21) and affordability. Functional requirements were set as standards, with evolving technology decisions over time. Specific recommendations and include:

- Transponders:
  - Transition from Passive RFID toll tags to optical readers.
  - Plan for open road tolling using GPS based readers.
- Communication:
  - Plan for fiber link (hard wiring) along freeway and assume more wireless applications.
  - Dedicated short-range communication spectrum will be available.
  - Consider dynamic signing guidance developed which provides users both the price of the prevailing toll (price per mile) and travel time to a downstream destination to confirm benefits provided for the toll.
- New enforcement options:
  - Video and optical character recognition (OCR) of license tags
  - In-vehicle sensors
  - Front facing optics
- Improve ability for automated traffic management

- Development of a maintenance on-line management system
- Monitoring and evaluation
  - Responsive to corridor and traffic management goals and objectives
  - Supports future capital and operation policy decisions and management practice
  - Affordable and public friendly
- Monitoring and evaluation performance measures :
  - Level of service
  - Changes in speed and delay
  - Changes in average vehicle occupancies
  - Changes in mode splits and travel behavior

ES.3.5. Revenue

Revenue evaluations assumed a toll rate structure based on the I-15 managed lanes for calibration purposes, including variable pricing of managed lanes based on volume-to-capacity ratio. Findings indicated that a per-mile toll and revenues would be higher in the southern portion of the I-5 corridor due to higher demand in this section. In 2030 for the 8+4 alternative, there is no available capacity in the ML for SOV toll users in the southern portion during peak periods. With a 10+4 alternative, the base toll (uncongested) for entire length is $4.00 in 2015 ($0.16 per mile) and $6.00 in 2030 ($0.26 per mile), based on the derived validations from the SR 91 corridor. In 2015 the toll reaches almost $14 during congested conditions based on future year dollar values. In 2030 the toll is over $26 during congested conditions. A summary of forecast revenue is provided in Table ES-3.

ES.3.6. Public Attitudes and Equity

Refer to Public Outreach Executive Summary, Volume 2 of the I-5 Concept Plan.

TABLE ES-3: SUMMARY OF FORECAST REVENUE

I-5 Managed Lanes Estimated Annual Revenue (in millions)		
Location	**2030**	
	8+4	**10+4**
s/o SR 56	$6.656	$4.329
s/o Via de la Valle	$6.274	$3.983
s/o Manchester Ave	$2.076	$1.154
n/o Encinitas Blvd	$2.421	$1.478
s/o Palomar Airport Rd	$1.203	$0.837
n/o Carlsbad Village Dr	$0.882	$0.629
n/o SR 76	$0.227	$0.225
TOTAL	$19.739	$12.636

ES.4 RECOMMENDATIONS

Findings from this study have validated the feasibility of value pricing for the proposed I-5 North Coast managed lanes for both an 8+4 and 10+4 configuration, and for both barrier- and buffer-separated design treatments. Other factors in the ongoing NEPA and related traffic evaluations may result in findings that refute these conclusions and recommendations. The recommendations made below are solely based on evaluations conducted in the 2004-2005 time period for testing value pricing on managed lanes in the configurations indicated, and for the assumptions and variations specified. These findings suggest the following recommendations be considered as the project is further evaluated and implemented:

ES.4.1. Timeline for Value Pricing

The I-5 managed lanes will need value pricing to be applied in order to achieve effective traffic management during congested periods. These congested periods will exist both in the near and long term conditions, and will be prevalent when the added general purpose capacity is opened.

ES.4.2. Access

Access will need to be controlled through designated at-grade slip ramps with the I-5 mainlanes and direct access ramps with local streets and transit facilities. Slip ramps will need to incorporate weave lanes to safety and efficiently handle high volumes of entering and exiting traffic without adversely affecting levels-of-service in either roadway.

ES.4.3. Tolling Strategy

Based on the high level of forecast demand for I-5, likelihood that congestion will exist and grow in both direction and directionality, and similarity these attributes have to analyses conducted on the I-15 corridor, a dynamic, skewed per-mile pricing strategy is recommended for adoption on the I-5 managed lanes. The adoption of dynamic, skewed per mile pricing is feasible and consistent with the adopted pricing strategy on I-15, making marketing and communication of this tolling strategy easier regionally to perform.

Depending on the staged development of both I-15 and I-15 corridors, the recommended pricing strategy may not be needed for early segments of the I-5 corridor that are opened. Flat-based tolling may be possible for the first segments and pre-set, non-skewed per-mile tolling may be possible until such time that specific segments on the south end of the corridor overload. Assuming roadway construction is staged from south to north, these intermediate pricing stages may be appropriate for a number of years to simplify pricing as users become acquainted with the ML roadway and access system. Dynamic signing recommended in the technology chapter could work for this type of phased pricing approach.

ES.4.4. Eligible Users

Current regional, state and federal transportation policies appear to be generally consistent with findings from the value pricing evaluations, insofar as the preference given to potential users. HOVs comprising transit, vanpools, and carpools carrying two or more persons plus motorcycles are considered free according to local policy. Hybrid vehicles, although considered eligible by federal and state legislation, are currently

considered free users of managed lanes in San Diego County. I-5 demand forecasts indicate that 2-occupant HOVs may need to be priced in the future at a rate that represents a 50 percent discount off of the SOV prevailing toll.

ES.4.5. Project Phasing

Managed lanes can provide effective corridor relief and mobility to a variety of freeway users. Value pricing should be applied whenever managed lane capacity is added, whether the project is opened continuously throughout the 26-mile length or opened in phases. The highest demand and need to manage demand will occur on the south end of the project.

ES.4.6. Monitoring and Evaluation

A plan to measure and monitor performance of the managed lanes will be dependent on the need for collection of quality before and after data sets and methods. The following categories of data will be needed:

- Project impact data
- Project utilization and operation data
- Project acceptance data
- Costs and benefits

CHAPTER 1

INTRODUCTION

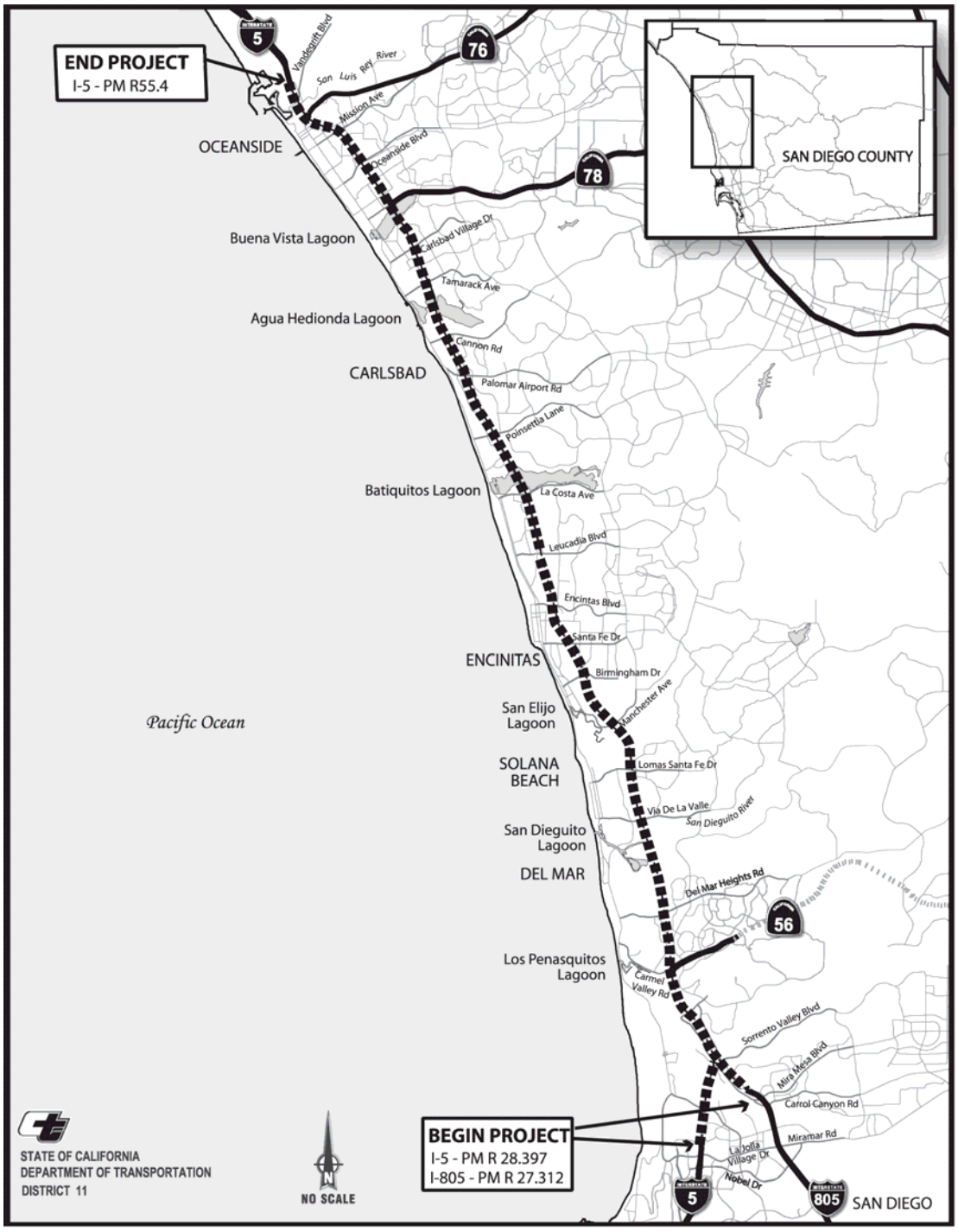
A network of connected and free-flowing HOV and managed lanes throughout the San Diego County region is a key strategy outlined in the 2030 Regional Transportation Plan (RTP), MOBILITY 2030. The I-5 North Coast Managed Lanes project will provide a key component of that network being on a heavily congested corridor providing a key lifeline for trade, commerce, commuting and recreation between the many cities clustered along this corridor from Oceanside to San Diego. The I-5 North Coast Managed Lanes project is part of an overall strategy to improve mobility along the North Coast corridor.

The 26 mile I-5 North Coast Managed Lanes (ML) project will add additional roadway capacity and provide mobility choices for motorists on I-5 in the northern San Diego region. As illustrated in Figure 1-1, the project extends from La Jolla Village Drive to Vandegrift Boulevard along I-5. A key feature of several of the alternatives being considered is four managed lanes—two in each direction—which will be located adjacent the median and operated at a high level of service for bus transit, vanpools, carpools and others regardless of the adjacent roadway traffic conditions. Lane management will depend largely on value pricing, and the purpose of this study is the evaluation of the feasibility of pricing to serve this function.

A study team headed by PB Consult conducted the I-5 North Coast Managed Lanes Value Pricing Planning Study to examine the technical, financial and attitudinal feasibility of HOV/managed lanes on the I-5 corridor. Tasks included an analysis of traffic operations, pricing strategies, electronic toll collection requirements, potential revenue, and performance monitoring requirements, in addition to a significant community outreach surveying program. The I-5 Value Pricing Concept Plan summarizes the results of the tasks of this study, presented in two volumes. Volume 1 addresses technical studies involving value pricing. Volume 2 addresses community outreach survey results and findings.

The next few sections provide a project description, study scope, basis for managed lanes, facility design, parallel studies, and organization of the remainder of this Concept Plan.

FIGURE 1-1: I-5 STUDY LIMITS



North Coast I-5 Corridor Project Location Map

1.1 PROJECT DESCRIPTION

1.1.1 Project Features

A primary feature of the I-5 North Coast Managed Lanes project is development of managed lanes in the median of I-5. The project may be implemented with or without added general purpose lanes. The defined improvements through this report evaluate and compare findings for both a project involving only the implementation of managed lanes, termed "8+4" to reflect the existing 8 lanes plus 4 managed lanes; or "10+4" to denote 10 general purpose lanes (the existing 8 plus 2 more) and 4 managed lanes. Additionally, the managed lanes may be separated from adjacent general purpose lanes by concrete barriers or a designated buffer. Both of these design features were also assessed for selected evaluations involving the application of pricing.

Several access features would support of the managed lanes including:

- Direct HOV-to-HOV connectors at the I-5/I-805 merge,
- Direct Access Ramps (DAR) at key local streets in various communities, and
- Designated slip ramps providing access between the managed lanes and general purpose lanes.

The project would include several additional features to improve general connectivity, capacity, and operating conditions on the project corridor:

- New connectors at SR 56,
- Additional general purpose lanes on I-5 from Del Mar Heights Road to Leucadia Boulevard, and
- Additional auxiliary lanes in heavy weave areas and local freeway interchange modifications added incrementally in key locations to improve traffic flow.

Features to integrate and upgrade the existing roadway facility so that it is compatible with the newly added roadway features, to mitigate environmental concerns, and to improve the final aesthetics of the corridor also will be included in the project. Some examples:

- Replacement of many existing bridges as a result of freeway widening,
- Construction of numerous retaining walls,
- Environmental enhancements (e.g. lagoon restoration) implemented early in the project development process to mitigate corridor highway, transit, and arterial impacts,
- Provision of noise barriers meeting federal requirements, and
- Corridor-wide replacement planting and other aesthetic treatments, termed "betterment" projects, that local communities select.

1.1.2 Project Need and Objectives

The I-5 North Coast corridor experiences recurrent traffic congestion during weekday rush hours and also is heavily traveled on weekends. Congestion on this corridor is a relevant issue because it is the major corridor connecting San Diego County, Los

Angeles County, Orange County, and Baja California, Mexico, regions and it is important for commuter, commercial, and recreational travel.

Without capacity improvements, the increases in traffic in the corridor will result in congestion throughout the entire day. Average daily traffic on I-5 is at 261,000 vehicles (near SR 56) and is projected to increase to 430,000 daily vehicles by the year 2030. Over 10,000 daily truck trips are made on I-5.

Improvements to I-5 are needed since I-5 will carry the burden of trips in the corridor which is also served by commuter and freight rail and arterial roadways. This need persists even with planned expansion of the Coaster commuter rail service. No new major parallel arterial roadways are planned throughout the corridor. Existing arterial roadways parallel to I-5 are segmented and do not provide a continuous north-south alternative route to the freeway

The primary goal of the proposed I-5 Managed Lanes is to maintain mobility of four of the added lanes through roadway demand management. The I-5 Purpose and Need Report prepared as part of corridor NEPA studies identified the following objectives in addressing I-5 corridor mobility among other objectives listed:

- Maintain or improve future traffic levels of service in 2030 over the existing levels of service;
- Maintain or improve travel times within the corridor;
- Provide a (roadway) facility that is compatible with future bus rapid transit and modal options; and
- Maintain I-5 as an effective link in the national Strategic Highway Network.

Pricing as a traffic management tool is considered in conjunction with access controls and eligibility to achieve real-time demand management of the managed lanes during varying operating conditions. Access will be restricted to designated locations including openings to adjacent general purpose freeway lanes and DARs connecting to transit facilities and local streets. In keeping with regional policy which requires maintenance of a high level of service on HOV and managed lanes in San Diego, there will be a requirement to maintain this high level of service (LOS), defined as LOS C or better, at all times. This LOS equates to about 1,650 vehicles per lane per hour, or 1300 vehicles per hour directionally. Regionally, HOVs carrying two or more persons are currently allowed free use of managed lanes unless demand exceeds the above threshold.

Consistent with the high volume of truck traffic existing and projected within the I-5 corridor, the possibility of trucks utilizing the proposed I-5 Managed Lanes has been identified as an issue during this study effort. Although there are traffic operations benefits to separating trucks from the general purpose traffic stream should the opportunity exist, the results of this study show that projected demand for eligible HOV and/or toll users of the proposed I-5 Managed Lanes severely limits the opportunities for trucks to use the lanes when sufficient capacity exists.

Furthermore, current California law prohibits trucks from operating outside of the right-most two lanes of freeways. The design concept for the I-5 Managed Lanes places the lanes toward the median of the freeway necessitating left access from the general purpose lanes at the project termini and intermediate access locations (except at the

DARs which would directly access arterial streets). This configuration would require trucks to weave across all lanes of the freeway to access the I-5 Managed Lanes, particularly at the termini of the facility. Trucks maneuvering in this manner would exacerbate congestion within the corridor and would present a potential collision hazard to the trucks and other freeway users alike. Additional direct access features at the lane termini or reconfiguration of the lanes to accommodate trucks access from the right lanes would be necessary to mitigate this situation. These mitigation measures would add considerable expense to the project for the limited benefit that could be realized by allowing trucks to utilize the lanes during the times of the day when HOV and/or toll user demand (along with general purpose demand) would be lowest.

1.1.3 Other Corridor Projects

The I-5 North Coast Managed Lanes project is one component of the overall strategy to improve mobility along the North Coast corridor. Recent projects include the Del Mar Heights Road northbound freeway auxiliary lane (open to traffic June 2004) and the I-5/I-805 Merge Widening project, currently under construction. Other planned projects in the corridor include:

- Interchange modifications at Genesee Avenue, Sorrento Valley Road, Lomas Santa Fe Avenue, and Manchester Avenue;
- Extending the existing northbound HOV lane to Manchester Avenue and providing a matching southbound HOV lane;
- Constructing the missing freeway-to-freeway connectors at the I-5/SR 78 interchange;
- Double tracking the coastal rail corridor;
- Bus rapid transit (BRT) on the El Camino Real corridor;
- Various arterial street improvement projects.

1.2 SCOPE OF STUDY

The technical work performed in this federal/state funded study was undertaken in two phases. Phase One included the development of the Traffic Operations Plan and the Traffic Forecast Report. Phase Two included development of a functional plan addressing technology, revenue analysis, pricing scenarios and a performance and monitoring plan. Community outreach surveying was conducted throughout the study process.

Phase One of the study produced the Traffic Operations Plan and the Traffic Forecast Report. The Traffic Operations Plan includes a discussion of signing/striping requirements, types and location of all traffic control features, safety issues, AM versus PM operations, peak versus off-peak operations, incident/emergency scenarios, and other issues related to traffic operations specific to the managed lanes. The Traffic Forecast Report provides both existing and projected traffic conditions. Its focus was determining the amount of excess capacity available on the managed lanes and the threshold for value pricing.

Phase Two is comprised of several subtasks including the development of this Concept Plan. As part of Subtask 2.1, Alternative Pricing Strategies, a number of potential alternative pricing strategies were identified and subjected to preliminary screening analysis. After initial review and screening of the pricing options, Subtask 2.2, Traffic

and Revenue Analysis, involved performing a traffic and revenue analysis for the managed lanes using the preferred pricing concepts and testing various toll rates.

Subtask 2.3, Technology and Operations System Concept, related specifically to the development of a draft Concept Plan. It incorporated all the elements of the design process short of the detailed design of the Electronic Toll Collection (ETC) system and access control/enforcement systems. It illustrated how each toll collection and access control scenario would operate. It included general physical descriptions and layouts of the facility including locations of ETC equipment, variable message signs, enforcement strategies, "back office" operating concepts, and customer service center concepts. Only a preliminary definition of the technology to be used was addressed. Preliminary estimates of the capital costs and operating costs were included.

Subtask 2.4 consisted of a community outreach program. Subtask 2.5, Project Monitoring and Evaluation Plan, involved development of the framework for monitoring and evaluating the project when in operation. Subtask 2.6, Presentation of Concept Plan, involved presentation of the draft Concept Plan to SANDAG's Transportation Committee and Board of Directors and incorporation of any revisions into the Final Concept Plan.

1.3 CRITERIA FOR FEASIBILITY

Corridor-wide demand now and in the future will greatly outpace available transportation infrastructure, based on available traffic data and traffic forecasts. Agency and public stakeholders are aware of this situation. Based on the scope of this planning study in determining if pricing as a demand management tool is feasible on the four managed lanes, criteria were established to be assessed in the various technical studies and public surveys. These investigations address the following parameters and questions that reflect the various attributes influencing value pricing feasibility:

- Demand:
  Is sufficient demand, in terms of AM and PM peak hour use, present in various time horizons to justify pricing managed lanes?
- Access:
  Can access be provided to the managed lanes with sufficient frequency to adequately meet transit, HOV and priced demand?
- Pricing Strategy:
  What is the most appropriate pricing strategy for the I-5 corridor and why?
- Impacts to Adjacent Traffic:
  What are the impacts to adjacent traffic caused by managed lanes, and can these impacts be adequately mitigated?
- Technology:
  What are the functional and performance monitoring needs to support a pricing strategy?
- Revenue:
  What is the potential revenue generated from pricing the I-5 managed lanes?
- Public Attitudes:

Are public, agency and key stakeholder attitudes favorable toward pricing? What issues need to be addressed?

- Equity:
  What equity issues, if any, are created by pricing the managed lanes?

The study began in June 2004 and concluded in December 2005. Study scope tasks addressed each of these parameters according to specific subject areas. Table 1-1 provides a reference for the specific subtask reports, or elements within a subtask, that addresses each.

1.4 OUTLINE OF REPORT

Chapter 2 addresses current operating characteristics of I-5. Chapter 3 identifies and evaluates a variety of different pricing strategies, making recommendations on a limited set of strategies to carry forward. Chapters 4 and 5 address traffic forecasts and future operating characteristics based on findings from SANDAG's regional model for 2015 and 2030, and simulations of the corridor, respectively. Chapter 6 provides findings from a revenue analysis using pricing assumptions from Chapter 3. Chapter 7 analyzes and presents findings for a ML toll collection system and operations concept. Chapter 8 provides guidance for a performance monitoring and evaluation program once the lanes open, to measure effectiveness to the project's management objectives. A separate companion volume of the Concept Plan addresses community outreach activities and findings.

TABLE 1-1: COMPARISON OF FEASIBILITY CRITERIA TO STUDY SUBTASK REPORTS

Parameter	Measure	Chapter Reference in Concept Plan
Demand	Sufficient demand	Chapters 4-5, (Subtasks 1-1, 1-2)
Access	Sufficient to meet demand	Chapters 4-5, (Subtask 1-2, 2-3)
Pricing strategy	Appropriate to manage demand	Chapter 2, (Subtask 2-1)
Impacts to adjacent traffic	Merges at access points	Chapters 4-5, (Subtask 1-2)
Technology	Pricing able to be installed and operated	Chapter 7, (Subtask 2-3)
Revenue	Adequate to cover operation	Chapter 6, (Subtask 2-2)
Public attitudes	Supportive of management goals and pricing	Concept Plan Volume 2 of 2,, (Subtask 2-4)
Equity (EJ)	• Pricing strategy • Public outreach feedback	Chapter 2 and Concept Plan Volume 2 of 2, (Subtasks 2-1 and 2-4)

CHAPTER 2

OPERATING PROFILE

This report develops a profile of existing operating conditions along the I-5 corridor as part of the I-5 North Coast Managed Lanes Value Pricing Planning Study. The study corridor's southern limits are at La Jolla Village Drive on I-5 and at Lusk Boulevard on I-805, just south of the I-5/I-805 merge. The study corridor extends 26 miles to its northern limit at Vandegrift Boulevard, just south of Camp Pendleton.

Traffic operating characteristics within the I-5 corridor were identified in terms of the traffic volumes, vehicle classifications, vehicle occupancy profiles, truck volumes, and operating speeds. Traffic data was obtained from SANDAG, Caltrans, and PeMS. The next few sections discuss historical traffic trends, 2002 average weekday and daily traffic, hourly and directional traffic distribution patterns, weekend versus weekday volume trends, northbound HOV lane volume trends, vehicle occupancy distribution, vehicle classification distribution, truck volumes, and current peak hour operating speeds along the I-5 study corridor.

2.1 HISTORICAL TRAFFIC TRENDS

Traffic trends at selected locations along the I-5 Managed Lanes study corridor are presented in terms of annual average daily traffic (AADT) and average weekday daily traffic (AWDT). Data was provided by Caltrans.

Table 2-1 summarizes AADT traffic trends at nine locations along the I-5 corridor for the ten-year period between 1994 and 2003. Also shown are the annual percent change (APC) and the average annual percent change (AAPC) for the ten-year period 1994–2003. It should be noted that year 1994, 1996, and 1998 traffic data were not available for the "I-805 south of Mira Mesa Boulevard" location.

As shown, the I-5 study corridor has experienced an average annual growth rate in the range of 1.88 percent to 3.82 percent between years 1994 and 2003. The highest rate of traffic growth, 3.82 percent, in the corridor has been experienced south of La Costa Avenue. The lowest overall rate of growth, 1.88 percent, has occurred at the southern end of the corridor, south of the I-5/I-805 merge.

TABLE 2-1: 1994-2003 7-DAY ANNUAL ADT VOLUME TRENDS

LOCATION	1994	1995	*APC*	1996	*APC*	1997	*APC*	1998	*APC*	1999	*APC*	2000	*APC*	2001	*APC*	2002	*APC*	2003	*APC*	*10-Year Average APC*
I-805 s/o Mira Mesa Blvd	N/A	134,000	*N/A*	N/A	*N/A*	172,000	*N/A*	N/A	*N/A*	182,000	*N/A*	177,000	*-2.75%*	190,000	*7.34%*	209,000	*10.00%*	200,000	*-4.31%*	***2.06****
I-5 s/o Genesee Ave	127,000	129,000	*1.57%*	131,000	*1.55%*	134,000	*2.29%*	133,000	*-0.75%*	140,000	*5.26%*	145,000	*3.57%*	145,000	*0.00%*	147,000	*1.38%*	150,000	*2.04%*	***1.88%***
I-5 s/o SR-56	210,000	213,000	*1.43%*	216,000	*1.41%*	226,000	*4.63%*	231,000	*2.21%*	245,000	*6.06%*	254,000	*3.67%*	261,000	*2.76%*	262,000	*0.38%*	263,000	*0.38%*	***2.55%***
I-5 s/o Villa de la Valle	192,000	194,000	*1.04%*	200,000	*3.09%*	210,000	*5.00%*	215,000	*2.38%*	227,000	*5.58%*	253,000	*11.45%*	241,000	*-4.74%*	241,000	*0.00%*	241,000	*0.00%*	***2.65%***
I-5 s/o La Costa	158,000	161,000	*1.90%*	166,000	*3.11%*	169,000	*1.81%*	164,000	*-2.96%*	182,000	*10.98%*	192,000	*5.49%*	206,000	*7.29%*	218,000	*5.83%*	220,000	*0.92%*	***3.82%***
I-5 s/o Cannon Rd	156,000	159,000	*1.92%*	163,000	*2.52%*	166,000	*1.84%*	162,000	*-2.41%*	181,000	*11.73%*	190,000	*4.97%*	195,000	*2.63%*	197,000	*1.03%*	199,000	*1.02%*	***2.80%***
I-5 s/o SR-78	162,000	165,000	*1.85%*	171,000	*3.64%*	180,000	*5.26%*	188,000	*4.44%*	192,000	*2.13%*	202,000	*5.21%*	210,000	*3.96%*	205,000	*-2.38%*	209,000	*1.95%*	***2.90%***
I-5 s/o Mission Ave	146,000	148,000	*1.37%*	153,000	*3.38%*	161,000	*5.23%*	183,000	*13.66%*	178,000	*-2.73%*	183,000	*2.81%*	184,000	*0.55%*	184,000	*0.00%*	189,000	*2.72%*	***3.00%***
I-5 s/o Harbor Drive	129,000	125,000	*-3.10%*	134,000	*7.20%*	139,000	*3.73%*	144,000	*3.60%*	147,000	*2.08%*	148,000	*0.68%*	163,000	*10.14%*	173,000	*6.13%*	171,000	*-1.16%*	***3.26%***

APC=Annual Percent Change

**=Average for 1999-2003*

The magnitude of AADT volume growth experienced along the corridor tells a slightly different story to that told by the average annual growth rate. AADT volume growth ranged from 23,000 to 66,000 along the length of the study corridor. The highest and lowest magnitudes, 23,000 and 66,000, both occurred south of the I-5/I-805 merge on the I-5 and I-805, respectively. Please note that because 1994 volumes were not available for the I-805 at this location, the 66,000 volume growth reflects growth between 1995 and 2003, rather than between 1994 and 2003. North of the I-5/I-805 merge, along the I-5, AADT volume growth ranged from 42,000 (south of Harbor Drive) to 62,000 (south of La Costa Avenue).

Table 2-2 summarizes annual weekday traffic trends at four locations along the I-5 corridor for years 2001, 2002, and 2003. The table shows daily volume, as well as AM and PM peak volumes. The AM and PM peaks were defined as the hours with highest combined (northbound plus southbound) volume occurring from midnight to noon (AM), or noon to midnight (PM). Year 2002 data was not available at the Harbor Drive location.

Also shown in Table 2-2 is the directional split (i.e. northbound versus southbound) during each of the three time periods. Several of the AM and PM peak counts show an even direction distribution of volume. For example, at the "I-5 south of Lomas Santa Fe" count location, PM peak volumes were split 51 percent northbound / 49 percent southbound in 2002, and nearly as closely in 2001 and 2003. At the "I-5 south of Leucadia Boulevard" count location AM peak volumes were split 49.1 percent northbound /50.9 percent southbound in 2002 and shifted to 51 percent northbound /49.0 percent southbound in 2003. However, 2001 counts at this location showed a more imbalanced directional split of 39.7 percent northbound /60.3 percent southbound. Similarly, during the AM peak, volumes at the "I-5 southbound Tamarack Avenue" count location were imbalanced in 2001 and 2002, but balanced in 2003 with a directional split of 50.9 percent northbound /49.1 percent southbound.

2.2 2002 AVERAGE DAILY AND WEEKDAY TRAFFIC

Year 2002 average weekday daily traffic (AWDT) and annual average daily traffic (AADT) volumes were obtained from Caltrans to establish baseline traffic conditions in the corridor. They are presented in Table 2-2 and Figure 2-1, respectively.

Figure 2-1 shows AADT to generally increase from north to south up to the I-5/I-805 merge. At the north end of the corridor, between SR 76 and Vandegrift Boulevard, daily traffic averages approximately 151,440 vehicles. At the south end, between Carmel Mountain Road and the I-5/I-805 merge, daily traffic volumes average 272,990 vehicles. In the middle segment, between Mission Avenue and Manchester Avenue, the daily traffic ranges from 191,450 to 211,470 vehicles.

South of the I-5/I-805 merge, on I-5 north of Roselle Street, daily traffic volumes average 129,990 vehicles. South of Roselle Street they average 147,990 vehicles. South of the I-5/I-805 merge, on I-805 north of Mira Mesa Boulevard volumes average 143,000 vehicles. The combined I-5 and I-805 volumes south of the I-5/I-805 merge average 272,990 (129,990 plus 143,000) vehicles.

TABLE 2-2: AVERAGE WEEKDAY DAILY VOLUME DIRECTIONAL SPLIT

	2001			2002			2003		
	NB	SB	TOTAL	NB	SB	TOTAL	NB	SB	TOTAL
I-5 s/o Lomas Santa Fe									
Average Weekday Daily Volume	112,000	112,000	224,000	114,000	115,000	229,000	115,000	116,000	231,000
Percent Split	*50.0%*	*50.0%*	*100.0%*	*49.8%*	*50.2%*	*100.0%*	*49.8%*	*50.2%*	*100.0%*
AM Peak	6,133	7,883	14,016	6,475	7,918	14,393	6,603	7,857	14,460
Percent Split	*43.8%*	*56.2%*	*100.0%*	*45.0%*	*55.0%*	*100.0%*	*45.7%*	*54.3%*	*100.0%*
PM Peak	7811	7286	15097	7719	7415	15134	7664	7320	14984
Percent Split	*51.7%*	*48.3%*	*100.0%*	*51.0%*	*49.0%*	*100.0%*	*51.1%*	*48.9%*	*100.0%*
I-5 s/o Leucadia Boulevard									
Average Weekday Daily Volume	105,000	103,000	208,000	108,000	104,000	212,000	107,000	104,000	211,000
Percent Split	*50.5%*	*49.5%*	*100.0%*	*50.9%*	*49.1%*	*100.0%*	*50.7%*	*49.3%*	*100.0%*
AM Peak	4,911	7,454	12,365	6,044	6,269	12,313	6,371	6,117	12,488
Percent Split	39.7%	60.3%	100.0%	49.1%	50.9%	100.0%	51.0%	49.0%	100.0%
PM Peak	7,665	6,955	14,620	7,645	6,934	14,579	7,591	6,848	14,439
Percent Split	*52.4%*	*47.6%*	*100.0%*	*52.4%*	*47.6%*	*100.0%*	*52.6%*	*47.4%*	*100.0%*
I-5 s/o Tamarack Avenue									
Average Weekday Daily Volume	102,000	103,000	205,000	104,000	105,000	209,000	106,000	107,000	213,000
Percent Split	*49.8%*	*50.2%*	*100.0%*	*49.8%*	*50.2%*	*100.0%*	*49.8%*	*50.2%*	*100.0%*
AM Peak	4,636	7,947	12,583	4,743	7,719	12,462	6,581	6,351	12,932
Percent Split	36.8%	63.2%	100.0%	38.1%	61.9%	100.0%	50.9%	49.1%	100.0%
PM Peak	7,798	6,318	14,116	7,775	6,498	14,273	7,843	6,498	14,341
Percent Split	*55.2%*	*44.8%*	*100.0%*	*54.5%*	*45.5%*	*100.0%*	*54.7%*	*45.3%*	*100.0%*
I-5 s/o Harbor Drive									
Average Weekday Daily Volume	68,000	68,000	136,000	N/A	N/A	N/A	74,000	76,000	150,000
Percent Split	*50.0%*	*50.0%*	*100.0%*	N/A	N/A	N/A	*49.3%*	*50.7%*	*100.0%*
AM Peak	3,837	3,988	7,825	N/A	N/A	N/A	4,799	3,669	8,468
Percent Split	49.0%	51.0%	100.0%	N/A	N/A	N/A	56.7%	43.3%	100.0%
PM Peak	3,937	5,368	9,305	N/A	N/A	N/A	4,160	6,455	10,615
Percent Split	*42.3%*	*57.7%*	*100.0%*	N/A	N/A	N/A	*39.2%*	*60.8%*	*100.0%*

Notes:

- All peak hours are defined as the hours with the highest combined (Northbound + Southbound) volume occurring within the designated period [Midnight-Noon (AM); Noon – Midnight (PM)]; and that for this reason, the directional splits may vary from year to year.
- Average Weekday Daily Volumes are rounded to the nearest thousand.

FIGURE 2-1: 2002 AADT, AM PEAK HOUR TRAFFIC, AND PM PEAK HOUR TRAFFIC

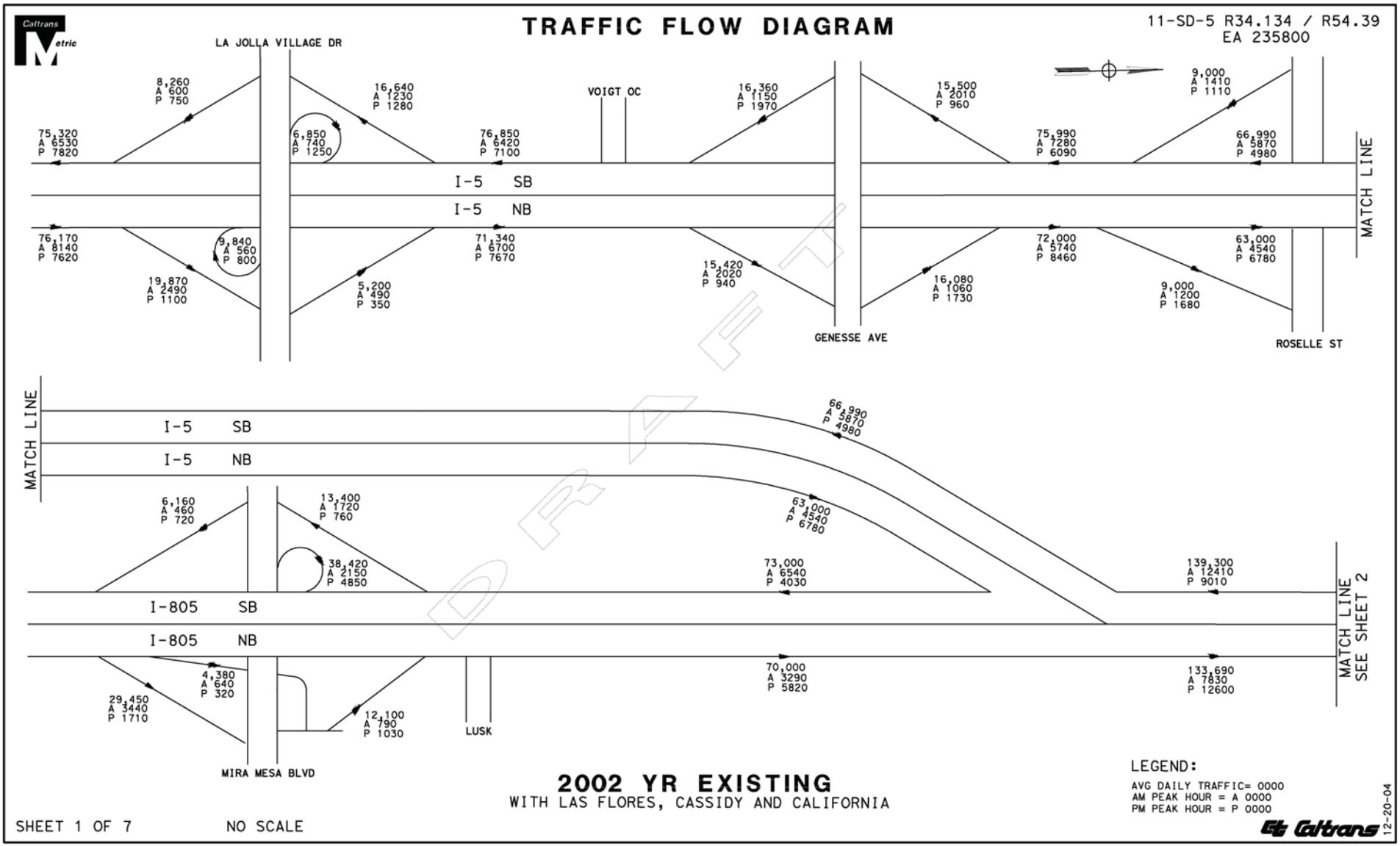


FIGURE 2-1: CONTINUED

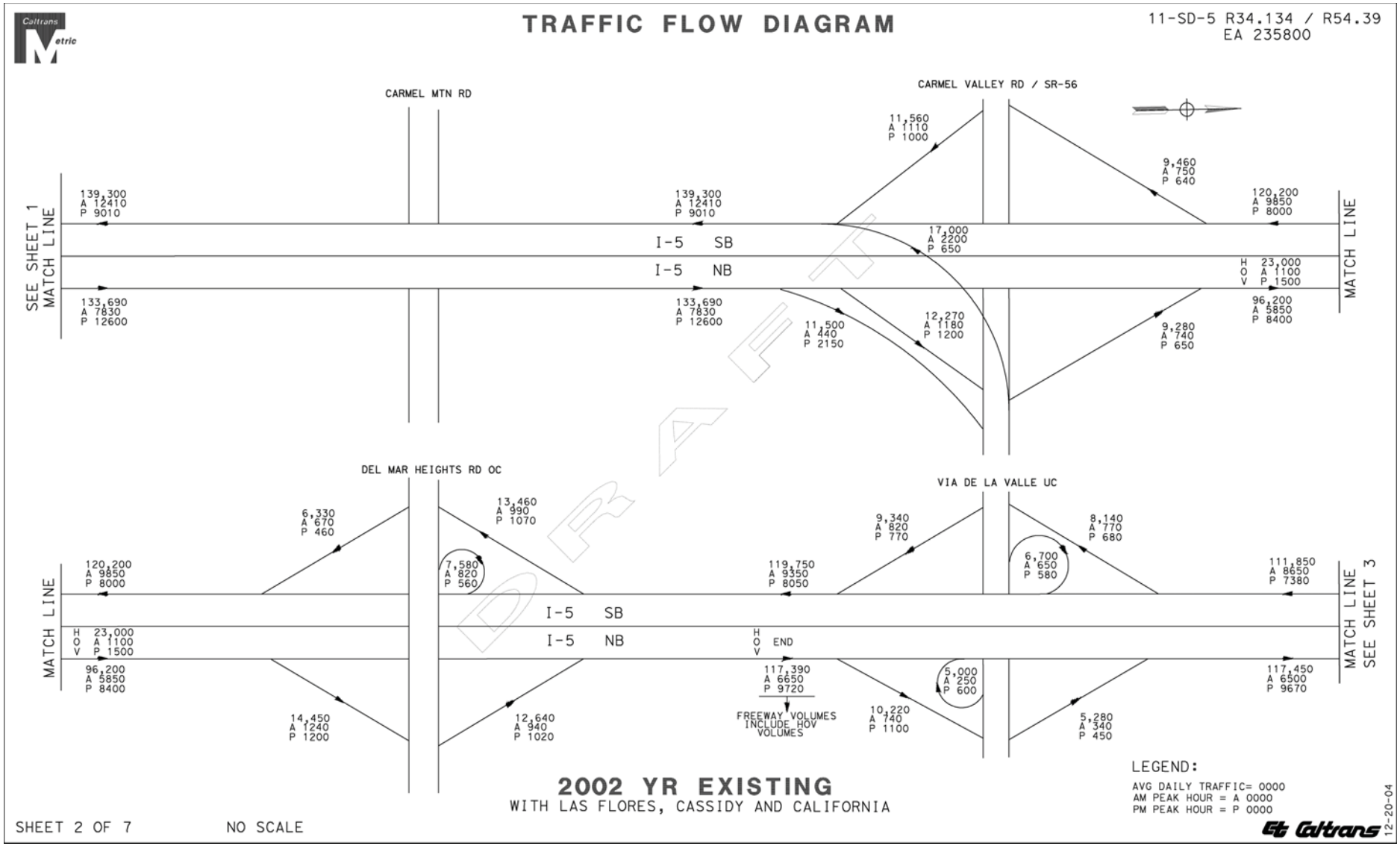


FIGURE 2-1: CONTINUED

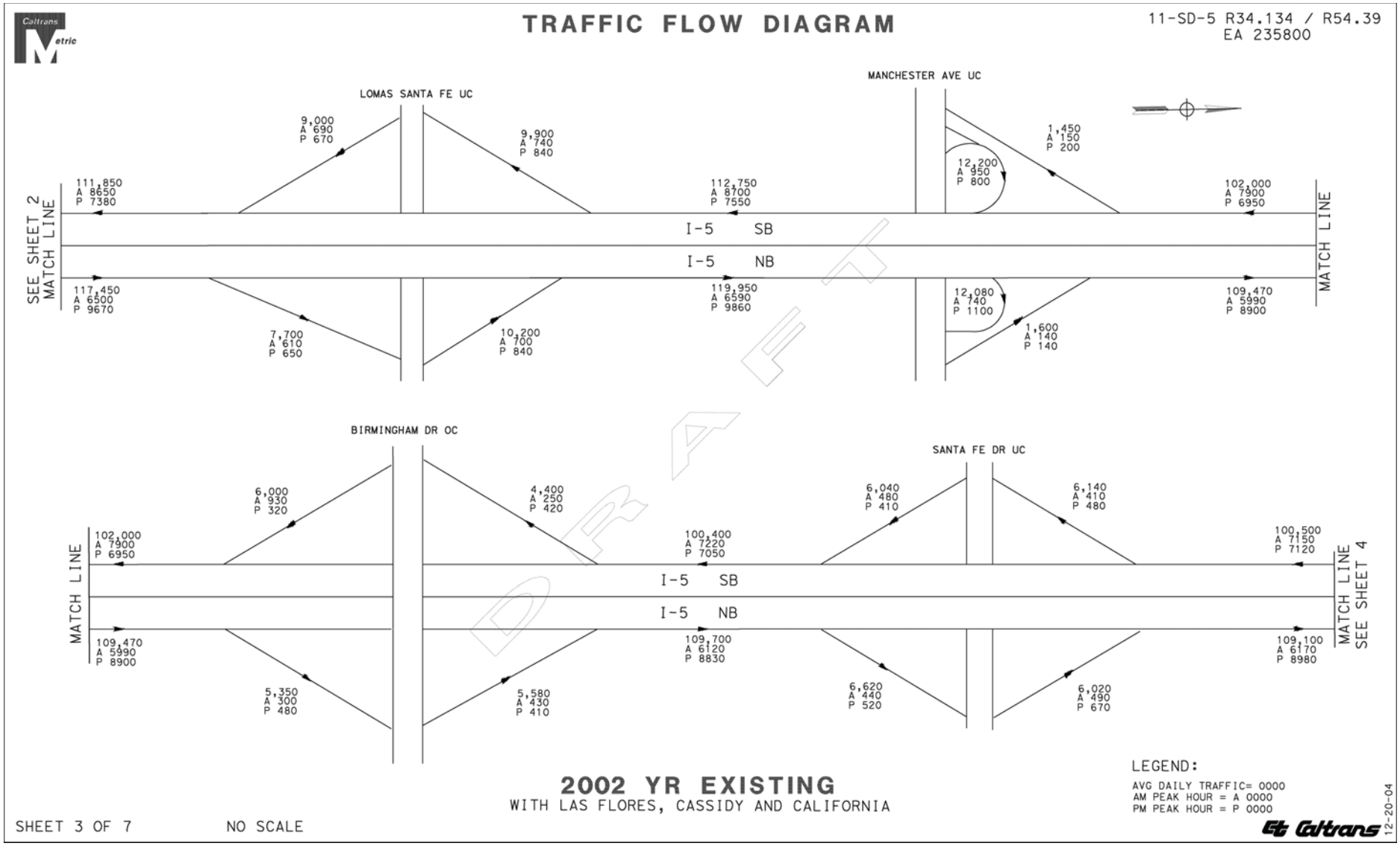


FIGURE 2-1: CONTINUED

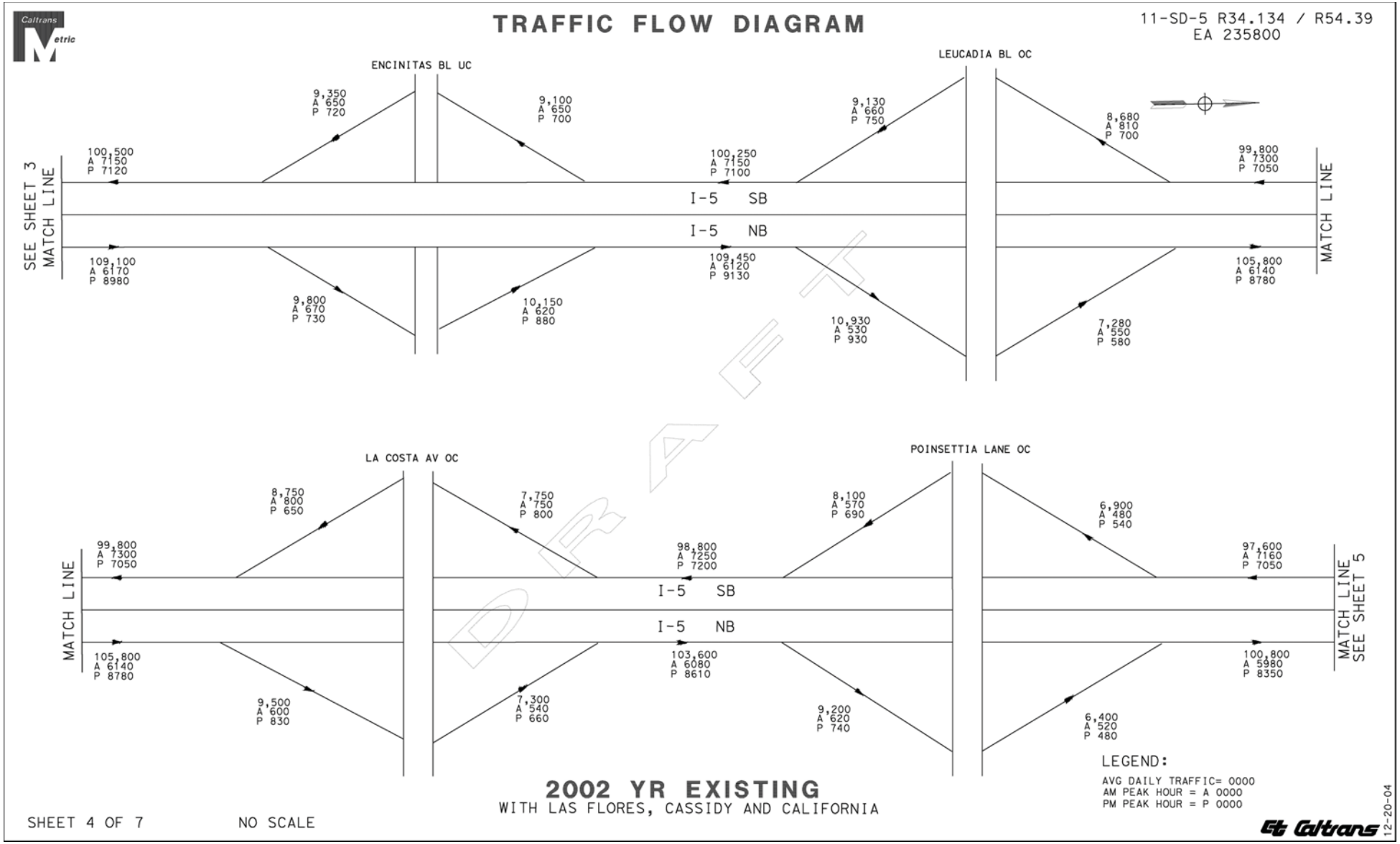


FIGURE 2-1: CONTINUED

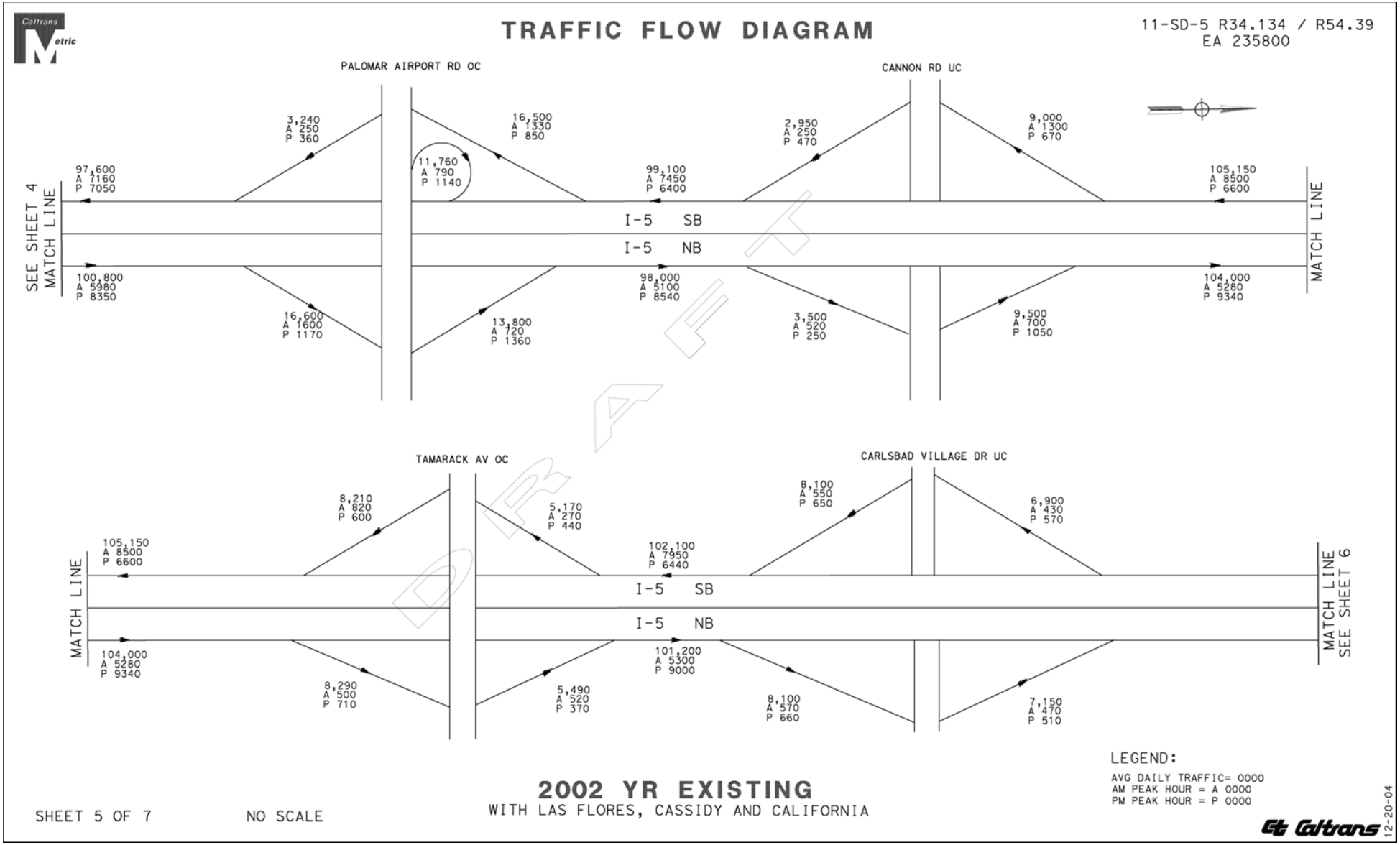


FIGURE 2-1: CONTINUED

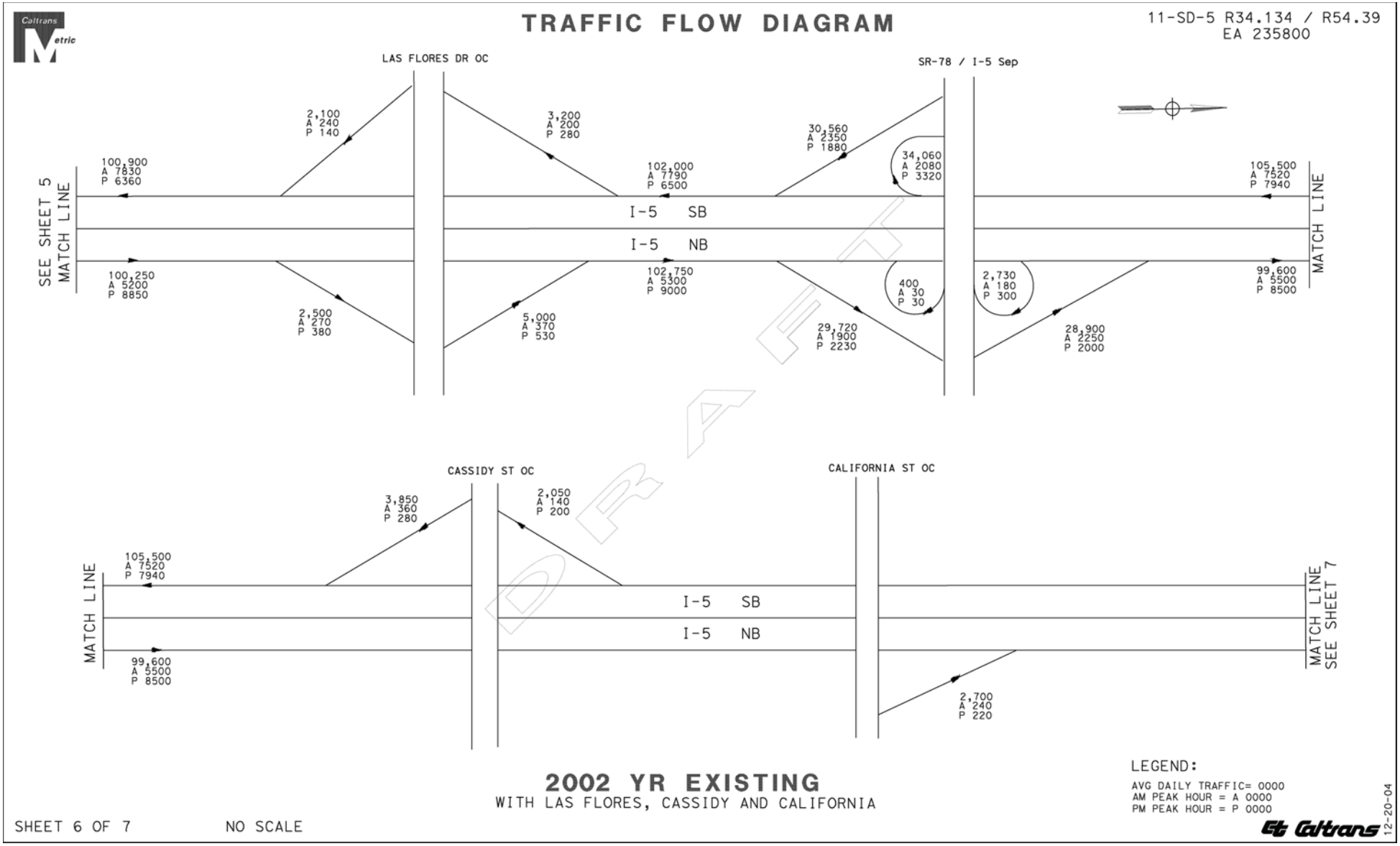
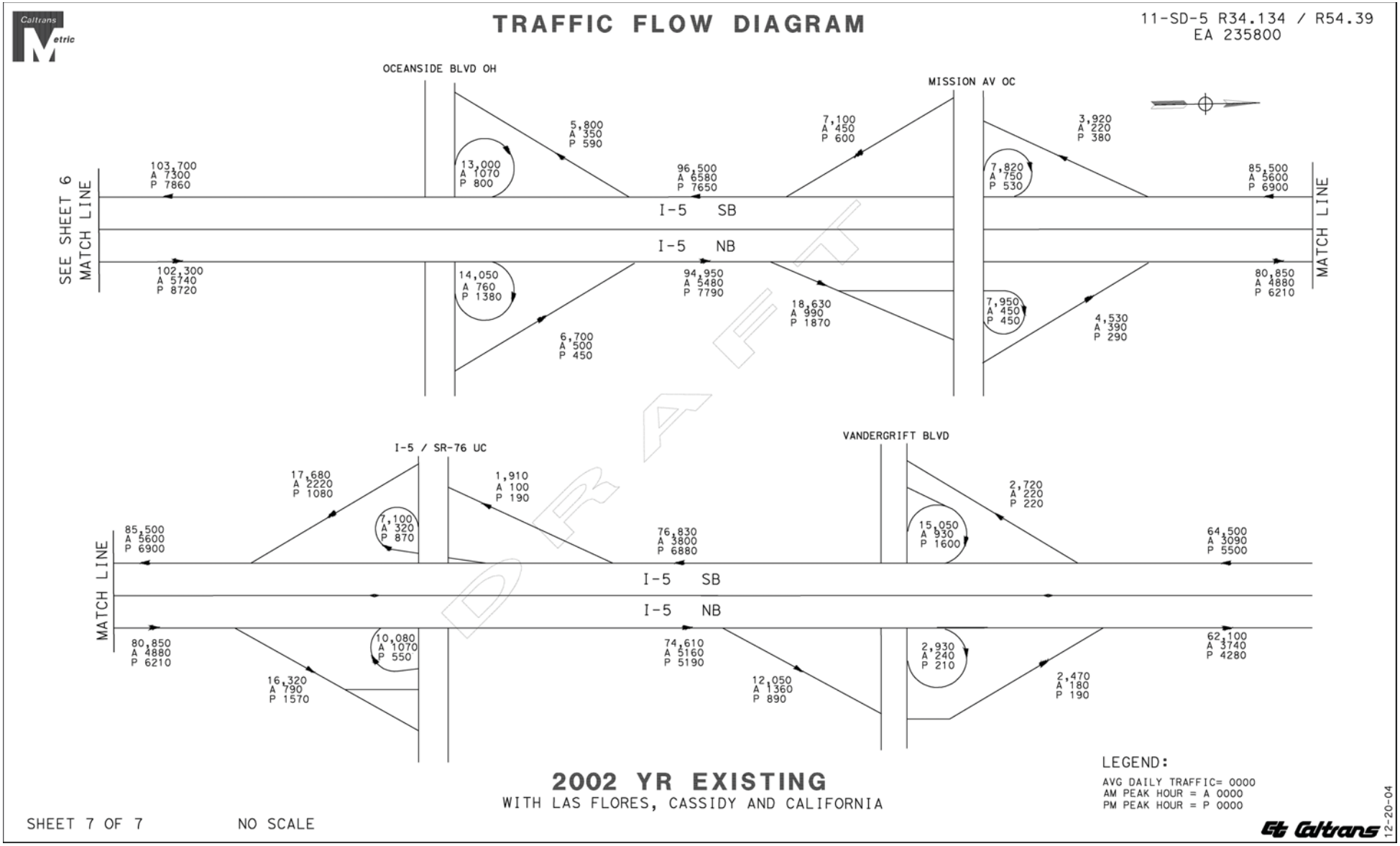


FIGURE 2-1: CONTINUED



2.3 HOURLY TRAFFIC DISTRIBUTION

Figure 2-1 and Table 2-2 present morning and evening peak hour traffic volumes provided by Caltrans. Figure 2-1 displays 2002 volumes on the mainline and ramps along the length of the corridor. Table 2-2 summarizes trends at four locations along the I-5 corridor for years 2001, 2002, and 2003.

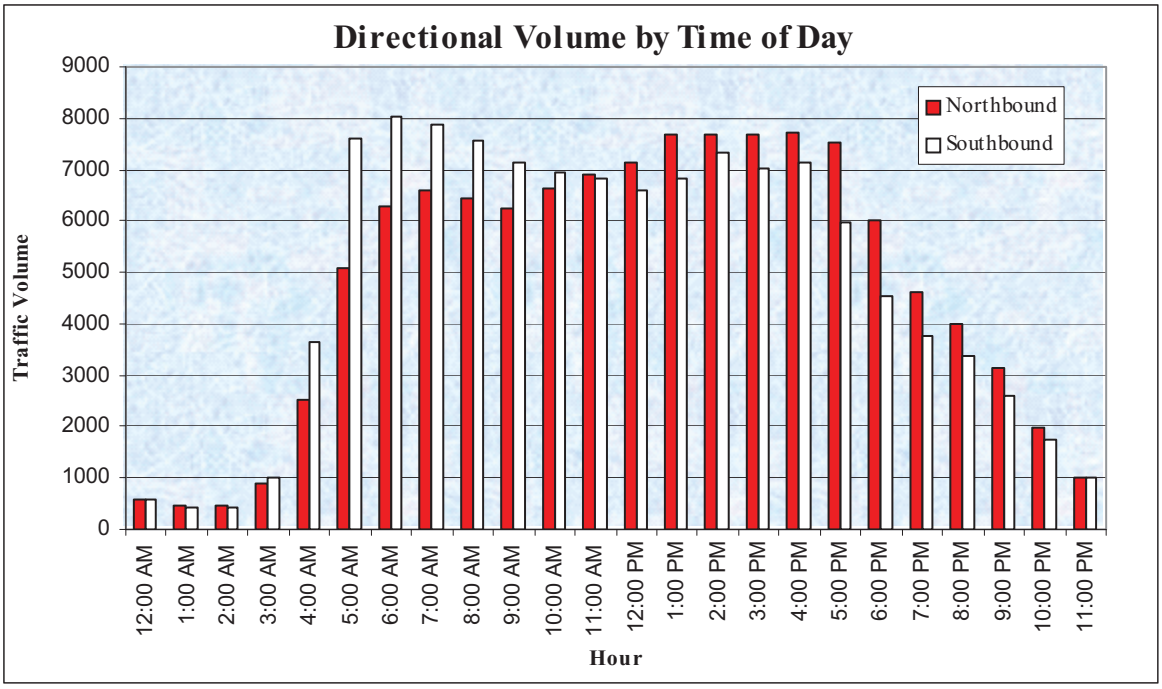
Hourly traffic distributions within the study corridor are graphically displayed in Figures 2-2 through 2-5 for four separate locations along the corridor. The locations from north to south are south of Harbor Drive, south of Tamarack Avenue, south of Encinitas Boulevard, and south of Lomas Santa Fe Drive. Each graphic displays both the directional traffic volume by time of day and the directional distribution, as a percent of the hourly traffic, by time of day.

The hourly distribution of traffic in the I-5 study corridor displays the typical morning and evening periods of increased traffic that are influenced by the work commute. The three southern locations show that the directional distribution of travel in the corridor is heavier southbound in the morning and northbound in the evening, as would be the expected influence of commuters traveling to/from work in the central San Diego area. This is most pronounced during the morning peak when 60 percent or more of the total volume is traveling southbound. The directional split is a more even 55 percent/45 percent during the evening peak.

The hourly distribution of traffic south of Harbor Drive has different characteristics than those exhibited by the other three locations. This location displays morning and evening periods of increased traffic as did the other three, however the periods occur earlier in the morning and evening than at the other three locations and they are less spread. Also, the directional distribution is reversed; there are heavier northbound flows during the morning peak, and heavier southbound flows during the evening peak. These patterns may be due to the generally lower volumes at the northern end of the study corridor, as well as to different work destinations. In particular, the heavy northbound flows occurring in the morning may be due to workers commuting to Camp Pendleton and Orange County, and the heavy southbound flows occurring in the evening may be due to workers returning home from these locations.

FIGURE 2-2: 2003 HOURLY DIRECTIONAL TRAFFIC DISTRIBUTIONS

SOUTH OF LOMAS SANTA FE



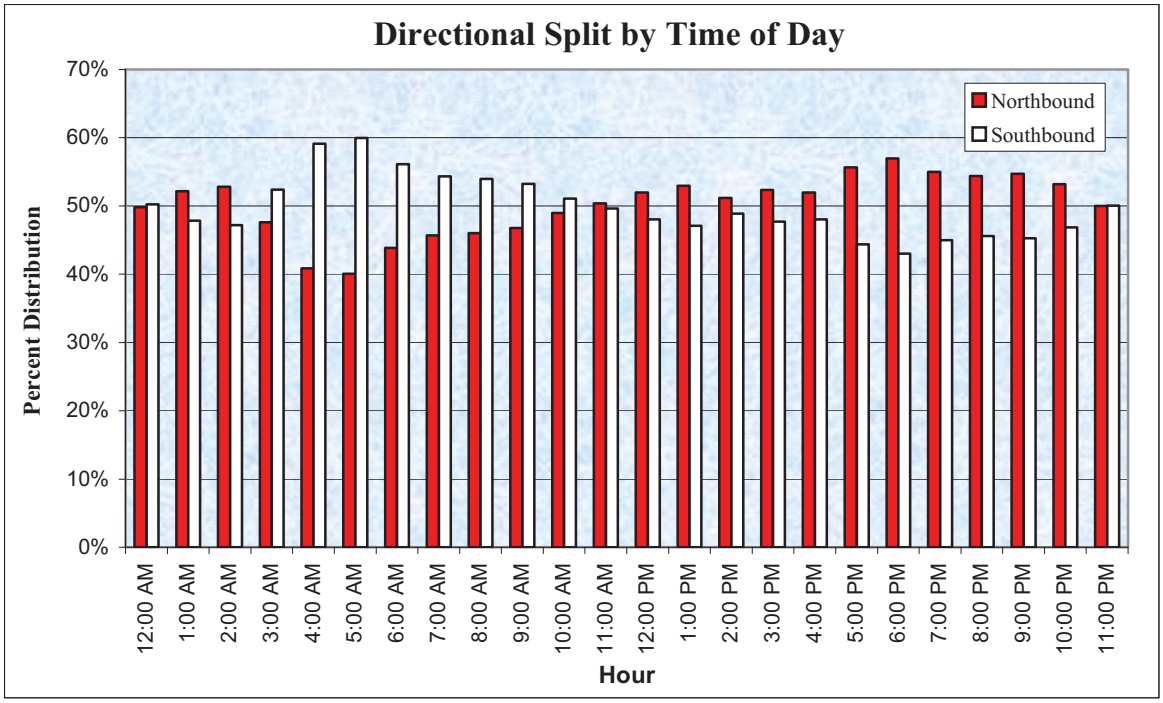
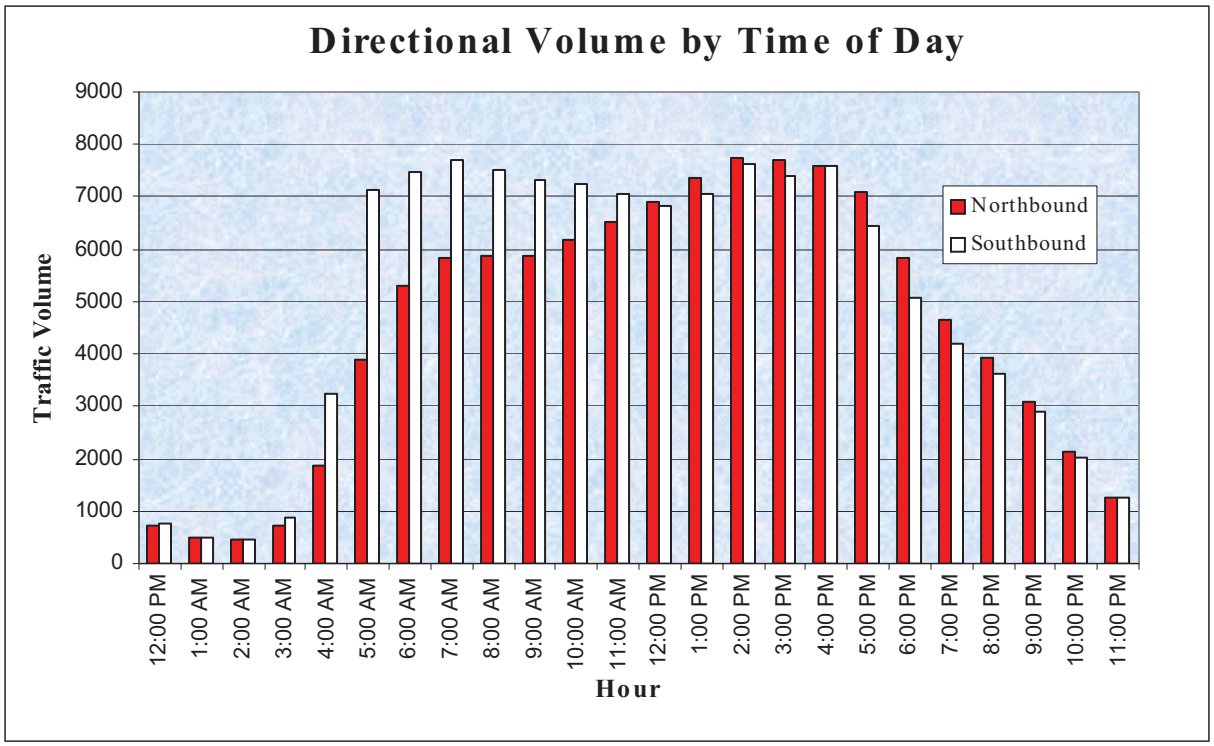


FIGURE 2-3: 2003 HOURLY DIRECTIONAL TRAFFIC DISTRIBUTIONS

SOUTH OF ENCINITAS BOULVARD



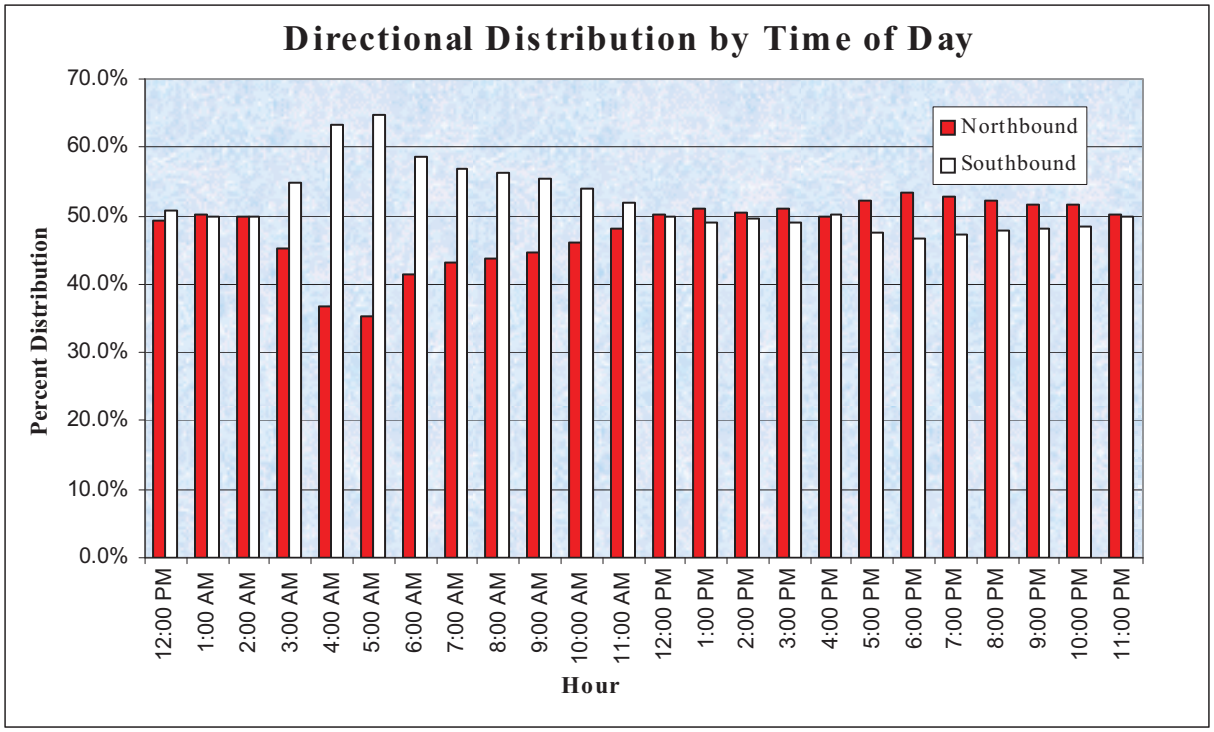
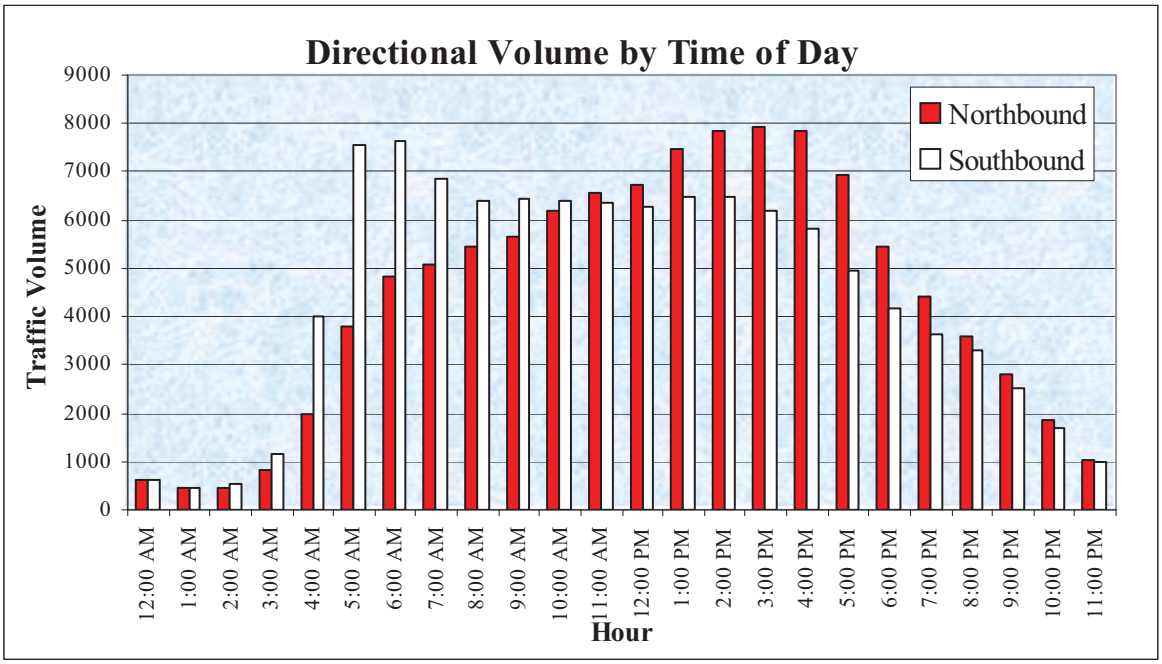


FIGURE 2-4: 2003 HOURLY DIRECTIONAL TRAFFIC DISTRIBUTIONS

SOUTH OF TAMARACK AVENUE



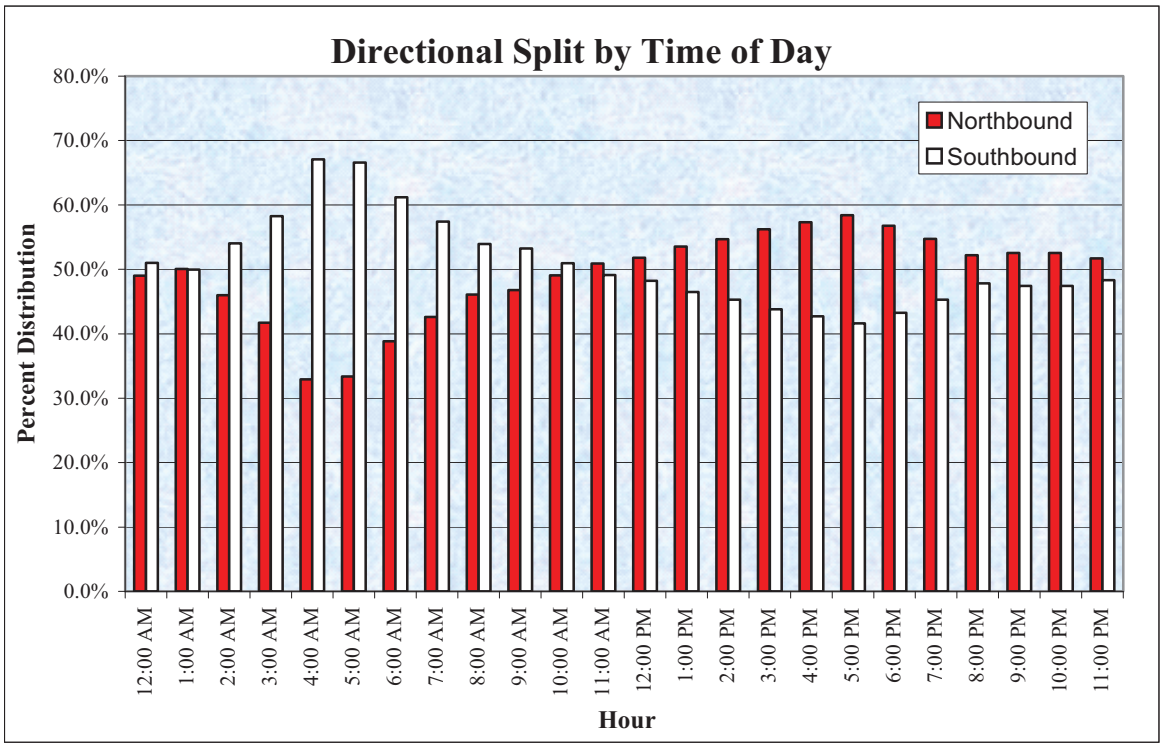
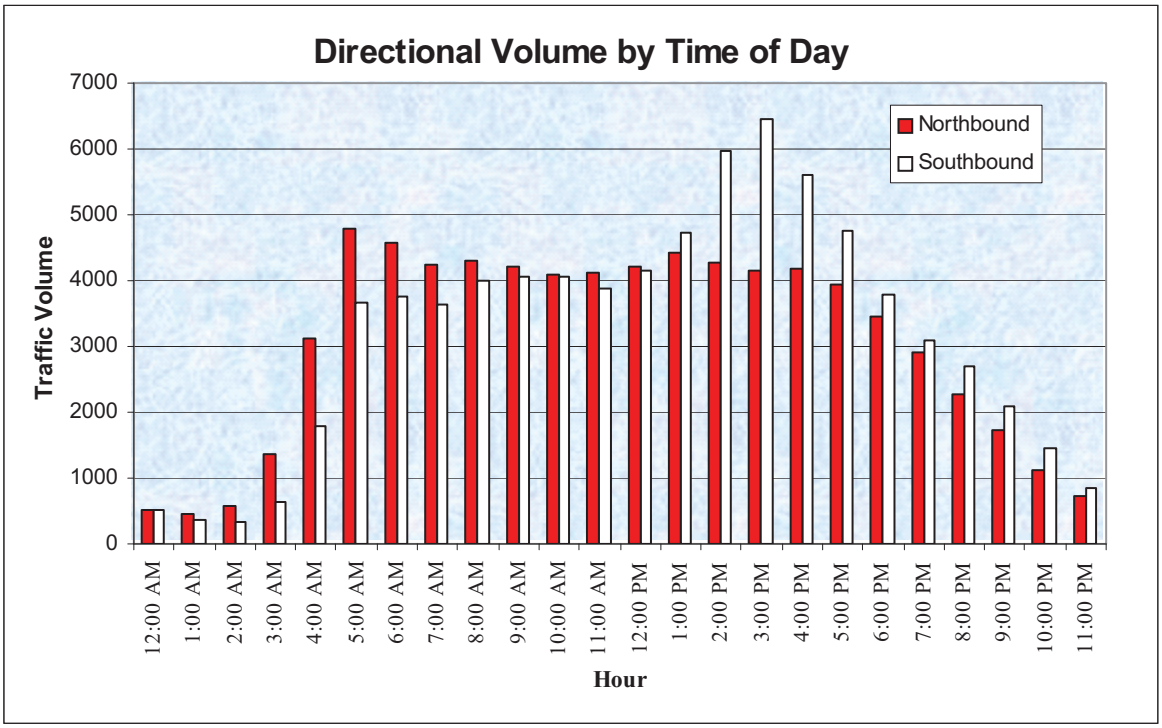
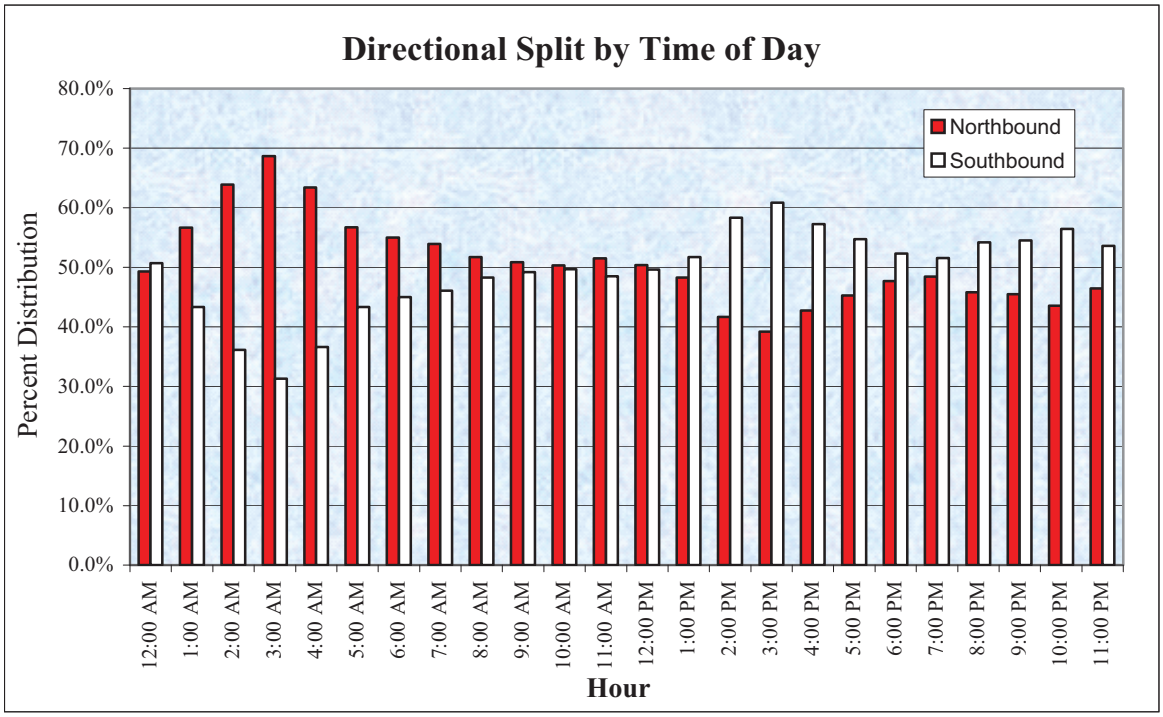


FIGURE 2-5: 2003 HOURLY DIRECTIONAL TRAFFIC DISTRIBUTIONS

SOUTH OF HARBOR DRIVE





2.4 WEEKEND VS WEEKDAY VOLUMES

Mainline and HOV lane I-5 volume data was extracted from PeMS for comparison of weekend and weekday volume trends. PeMS, short for Freeway Performance Measurement System, is a cooperative effort between UC Berkeley, California Partners for Advanced Transit and Highways (PATH), and Caltrans that makes processed data from Caltrans' loop detectors available online, amongst other activities. Daily volumes were extracted for typical spring, summer, and fall weeks in 2003.

Please note that because the data shown is for specific days within 2003, it should not exactly match the annual average volumes contained in this report. Its purpose is to enable a comparison of weekend and weekday volume trends, rather than to establish average annual conditions along the corridor.

Tables 2-3 through 2-5 summarize and compare weekend and weekday volume data for the southbound mainline, northbound mainline, and northbound HOV facilities, respectively. As can be seen in Table 2-3, average weekend volumes on the southbound mainline are one to 15 percent lower than average weekday volumes. The largest difference of 15 percent occurs at the southern end of the study corridor, near La Jolla Village Drive, while the lowest difference of one percent occurs farther north at Cannon Road. Observing each of the weeks individually reveals a broader range of weekend versus weekday volume differences. The smallest difference for an individual week occurs at Cannon Road during the summer when weekend volumes are less than one percent less than weekday volumes. The greatest difference occurs at La Jolla Village Drive during the spring when weekend volumes are 23 percent lower than weekday volumes. In general, weekend volumes more closely match weekday volumes in summer, relative to spring and fall.

Table 2-4 shows similar trends for the northbound mainline, except that weekend volumes on the northbound mainline are higher than weekday volumes in some cases. Average weekend volumes range from one percent higher to 13 percent lower than average weekday volumes. The largest difference of negative 13 percent occurs at the southern end of the study corridor, near La Jolla Village Drive, while the smallest difference of positive 1 percent occurs farther north at Cannon Road. Observing each of the weeks individually reveals a broader range of weekend versus weekday volume differences. The highest difference for an individual week occurs at Cannon Road during the summer when weekend volumes are actually six percent higher than weekday volumes. The lowest difference occurs at Carmel Valley Road during the spring when weekend volumes are 18 percent lower than weekday volumes. In general, weekend volumes more closely match, or even outpace, weekday volumes in summer, relative to spring and fall.

Table 2-5 shows volumes in the northbound HOV lane at one location, Carmel Valley Road. At this location, average weekend volumes are 25 percent lower than average weekday volumes, averaged over the three sample weeks in spring, summer, and fall. As was the case for the mainline volumes, observing the individual weeks reveals a broader range of weekend versus weekday volume differences. The smallest differences occur in spring and summer when weekend volumes are 15 and 14 percent less than weekday volumes, respectively. The largest difference of negative 47 percent occurs in fall.

TABLE 2-3: I-5 SOUTHBOUND MAINLINE – DAILY VOLUMES

	Location Description:		WB LA JOLLA VILLAGE (R28.454)	CARMEL VALLEY (R32.79)	LOMAS SANTA FE (R37.26)	CANNON (R47.834)
SPRING	03/03/2003	Monday	57,846	82,306	99,721	88,136
	03/04/2003	Tuesday	57,313	81,427	98,544	86,891
	03/05/2003	Wednesday	59,445	82,944	100,577	89,472
	03/06/2003	Thursday	62,488	86,032	104,924	93,046
	03/07/2003	Friday	63,891	90,804	112,919	103,455
	03/08/2003	Saturday	51,110	83,587	102,493	96,409
	03/09/2003	Sunday	42,182	70,453	84,405	81,767
	Weekday Average		*60,197*	*84,703*	*103,337*	*92,200*
	Weekend Average		*46,646*	*77,020*	*93,449*	*89,088*
	Percent Difference		*-23%*	*-9%*	*-10%*	*-3%*
SUMMER	07/14/2003	Monday	61,981	89,724	109,547	97,484
	07/15/2003	Tuesday	67,231	91,825	111,785	100,395
	07/16/2003	Wednesday	66,718	92,004	111,563	100,609
	07/17/2003	Thursday	68,636	89,778	114,858	102,938
	07/18/2003	Friday	74,334	98,632	117,516	95,838
	07/19/2003	Saturday	65,158	93,354	110,789	104,399
	07/20/2003	Sunday	53,380	79,989	97,035	94,371
	Weekday Average		*67,780*	*92,393*	*113,054*	*99,453*
	Weekend Average		*59,269*	*86,672*	*103,912*	*99,385*
	Percent Difference		*-13%*	*-6%*	*-8%*	*0%*
FALL	10/20/2003	Monday	59,504	82,718	102,705	91,725
	10/21/2003	Tuesday	60,932	83,232	102,729	91,191
	10/22/2003	Wednesday	61,529	83,593	102,116	92,592
	10/23/2003	Thursday	62,577	86,453	107,120	95,846
	10/24/2003	Friday	66,706	92,963	116,958	107,083
	10/25/2003	Saturday	53,568	84,279	109,034	104,109
	10/26/2003	Sunday	57,545	60,127	81,426	85,107
	Weekday Average		*62,250*	*85,792*	*106,326*	*95,687*
	Weekend Average		*55,557*	*72,203*	*95,230*	*94,608*
	Percent Difference		*-11%*	*-16%*	*-10%*	*-1%*
ALL SEASONS	*Weekday Average*		*63,409*	*87,629*	*107,572*	*95,780*
	Weekend Average		*53,824*	*78,632*	*97,530*	*94,360*
	Percent Difference		*-15%*	*-10%*	*-9%*	*-1%*

TABLE 2-4: I-5 NORTHBOUND MAINLINE – DAILY VOLUMES

	Location Description:		EB LA JOLLA VILLAGE (R28.402)	CARMEL VALLEY (R33.147)	LOMAS SANTA FE (R37.514)	CANNON (R48.138)
SPRING	03/03/2003	Monday	60,076	73,544	101,889	90,728
	03/04/2003	Tuesday	59,805	72,470	98,490	87,731
	03/05/2003	Wednesday	62,808	75,346	103,843	91,981
	03/06/2003	Thursday	63,713	59,618	104,653	92,474
	03/07/2003	Friday	66,552	62,763	109,428	99,827
	03/08/2003	Saturday	53,592	48,504	100,976	94,759
	03/09/2003	Sunday	49,762	63,948	93,230	88,973
	Weekday Average		*62,591*	*68,748*	*103,661*	*92,548*
	Weekend Average		*51,677*	*56,226*	*97,103*	*91,866*
	Percent Difference		*-17%*	*-18%*	*-6%*	*-1%*
SUMMER	07/14/2003	Monday	67,142	87,327	112,547	99,587
	07/15/2003	Tuesday	68,074	60,205	112,481	97,039
	07/16/2003	Wednesday	69,454	68,860	114,260	101,380
	07/17/2003	Thursday	70,863	63,261	116,333	102,487
	07/18/2003	Friday	72,119	53,805	118,617	107,179
	07/19/2003	Saturday	64,817	49,032	115,879	109,420
	07/20/2003	Sunday	62,055	85,062	108,880	104,846
	Weekday Average		*69,530*	*66,692*	*114,848*	*101,534*
	Weekend Average		*63,436*	*67,047*	*112,380*	*107,133*
	Percent Difference		*-9%*	*1%*	*-2%*	*6%*
FALL	10/20/2003	Monday	62,134	83,329	104,816	92,381
	10/21/2003	Tuesday	63,783	54,159	105,437	93,102
	10/22/2003	Wednesday	64,468	48,135	105,882	93,320
	10/23/2003	Thursday	65,407	55,366	107,884	95,378
	10/24/2003	Friday	67,441	49,926	112,363	102,548
	10/25/2003	Saturday	54,666	41,648	105,079	100,051
	10/26/2003	Sunday	57,701	71,115	89,753	89,446
	Weekday Average		*64,647*	*58,183*	*107,276*	*95,346*
	Weekend Average		*56,184*	*56,382*	*97,416*	*94,749*
	Percent Difference		*-13%*	*-3%*	*-9%*	*-1%*
ALL SEASONS	*Weekday Average*		*65,589*	*64,541*	*108,595*	*96,476*
	Weekend Average		*57,099*	*59,885*	*102,300*	*97,916*
	Percent Difference		*-13%*	*-7%*	*-6%*	*1%*

TABLE 2-5: I-5 NORTHBOUND HOV LANE – DAILY VOLUMES

Day	Spring (March 3-9)	Summer (July 14-20)	Fall (Oct. 20-26)
Monday	26,889	28,858	27,224
Tuesday	25,186	27,912	26,743
Wednesday	26,377	27,798	27,331
Thursday	26,708	28,762	27,106
Friday	26,189	29,164	28,110
Saturday	23,521	25,229	11,364
Sunday	21,287	23,776	17,704
Weekday Average	*26,270*	*28,499*	*27,303*
Weekend Average	*22,404*	*24,503*	*14,534*
Percent Difference	*-15%*	*-14%*	*-47%*

AVERAGE OF ALL SEASONS	
Weekday Average	***27,357***
Weekend Average	***20,480***
Percent Difference	***-25%***

2.5 NORTHBOUND HOV LANE VOLUMES

In addition to the daily volumes discussed in the previous section, hourly northbound mainline and HOV lane I-5 volume data was extracted from PeMS for observation of volume trends in the HOV lane. Hourly volumes were extracted for two Wednesdays, one in summer 2003 and one in fall 2003, to represent typical weekday conditions. To represent typical weekend conditions, hourly volumes were extracted for two Saturdays, in the same summer and fall 2003 weeks as the Wednesday data.

Please note that because the data shown is for specific days within 2003, it should not exactly match the annual average volumes contained in this report. Its purpose is to enable analysis of the northbound HOV lane volume trends.

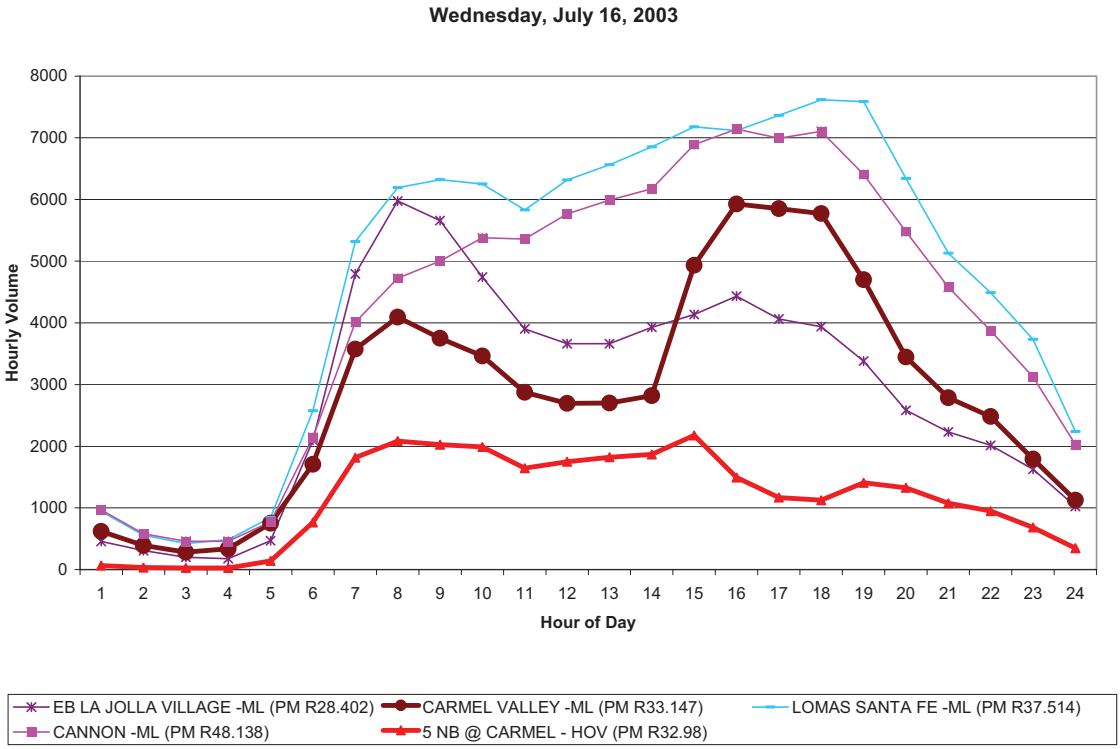
Figures 2-6 and 2-7 exhibit hourly volume data collected for two Wednesdays (July 16 and October 22, 2003) and two Saturdays (July 19 and October 25, 2003), respectively. Each figure shows the hourly volume trend at the same five count locations contained in Tables 2-4 and 2-5. These include one HOV lane count station near Carmel Valley Road, a nearby mainline count station at Carmel Valley Road, and three other mainline count stations.

As can be seen in Figure 2-6, weekday HOV lane volumes begin a steep climb at about 5:00 a.m. to a high of over 2,000 vehicles per hour around 7:00 a.m., remain above 1,500 vehicles per hour throughout the mid-day, and decline suddenly at around 3:00 p.m. Thus, HOV lane volumes are well above the ideal maximum rate of 1,650 vehicles per hour throughout much of the day. It has been determined through the Los Angeles MTA's HOV Performance Study and other HOV studies that single-lane HOV facilities do not function satisfactorily above 1,650 vehicles per hour. In fact, it is likely that the sudden decline in HOV volume which occurs around 3:00 p.m. is due to excessive demand for the HOV lane at this time and a resultant deterioration of conditions in the lane, rather than to diminishing demand.

Counts in the mainline lanes support this theory. As can be seen in Figure 2-6, northbound mainline volumes are highest during the PM peak period, roughly between 3:00 and 7:00 p.m., suggesting that HOV lane demand also likely reaches a high point during this time period. It is especially interesting to observe mainline volumes at Carmel Valley Road, near the HOV lane count station. The two Wednesday counts at this location are extremely different during the PM peak period. The Wednesday in July reaches a daily maximum of about 6,000 during the PM peak period, while volumes on the Wednesday in October begin a slow taper from about 3,000 during the PM peak period. This suggests that travel demand tends to exceed capacity at this location in the mainline, as well as HOV lanes, causing level of service to deteriorate and traffic flow rates to diminish during the PM peak period.

As can be seen in Figure 2-7, the two Saturday volume samples differ significantly in the HOV lane. The Saturday in July reaches a daily high of about 1,800 vehicles per hour, while the Saturday in October reaches a daily high of only about 1,000 vehicles per hour. The HOV lane volume is sustained close to this level throughout the mid-day and early evening, roughly 10:00 a.m. to 6:00 p.m. Mainline volumes also exhibit this sustained mid-day and early evening peaking. The mainline count station at Carmel Valley Road, near the HOV lane count station, shows similarly low volumes in July and October, reaching highs of about 3,000 and 2,700, respectively.

FIGURE 2-6: I-5 NORTHBOUND HOURLY VOLUMES - WEDNESDAY



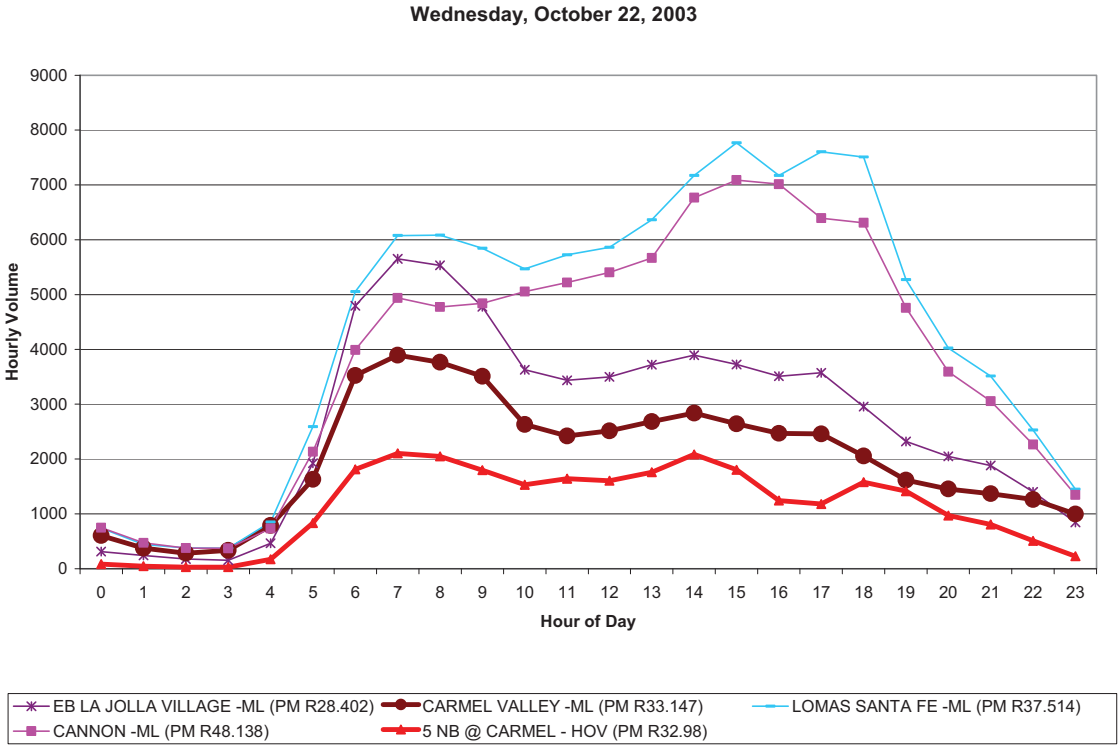
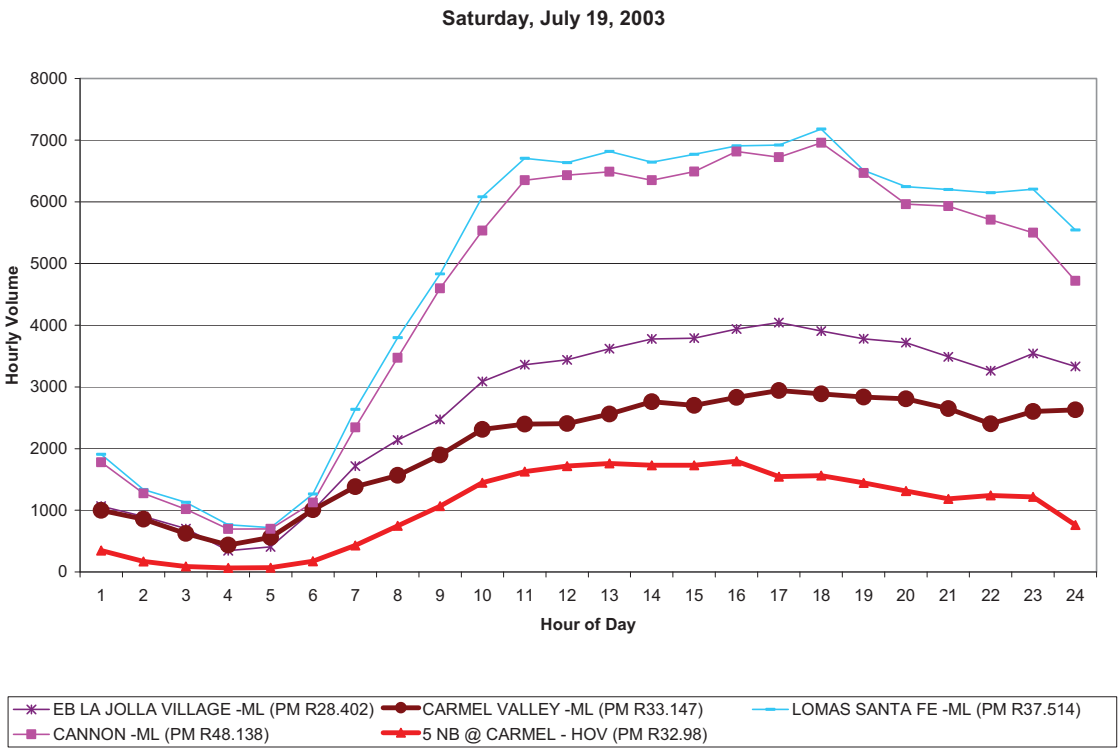
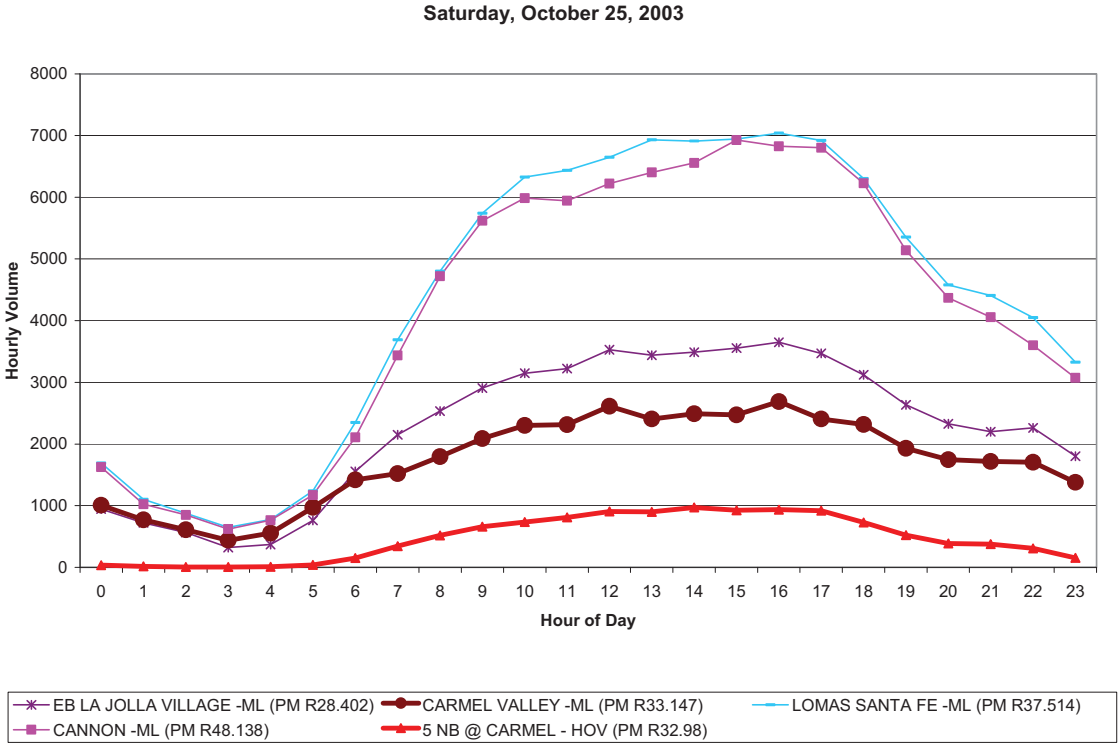


FIGURE 2-7: I-5 NORTHBOUND HOURLY VOLUMES – SATURDAY





2.6 VEHICLE OCCUPANCY DISTRIBUTION

Mainline I-5 vehicle occupancy counts were recorded in 2000 at one location along the study corridor for one direction: southbound I-5 north of Via de la Valle. Please note that these counts are a good source of information on the relative percentage of different vehicle occupancies, but not a good source for vehicle volume information since they were taken several years ago (Year 2000) using a manual counting methodology.

As shown in Table 2-6, at Via de la Valle occupancy counts for the morning peak period from 6:30 to 9:00 a.m. indicate that 87.5 percent of the southbound traffic was comprised of single occupant vehicles (SOV). The remaining southbound, morning peak period traffic consisted of 11.2 percent 2-person carpool vehicles and 1.3 percent 3+ person carpool vehicles. Average vehicle occupancy between 6:30 and 9:00 a.m. was approximately 1.14 persons per vehicle in the southbound direction.

The 7.5 hour traffic totals (6:30 a.m. to 2:00 p.m.) for southbound I-5 north of Via de la Valle indicate that 82.4 percent of traffic was composed of SOV, while 2-person HOV comprised 15.8 percent and 3+ person HOV comprised 1.8 percent. Average vehicle occupancy was approximately 1.19 persons per vehicle on I-5 southbound for the 7.5 hour period.

The percentage of SOV was higher during the morning peak period and lower during the mid-day hours. The lowest percentage of SOV, 77.1 percent, and the highest percentage of 2 and 3+ person carpools, 22.9 percent, occurred from 10 to 11 in the morning. Noon to 1 p.m. had the second lowest percentage of SOV, 77.3 percent. The highest percentage of SOV, 88.1 percent, occurred between 7:30 and 8:00 a.m. in the morning.

2.7 VEHICLE CLASSIFICATION DISTRIBUTION

Vehicle classification counts were conducted on I-5 southbound north of Via de la Valle in 2000. Please note that these counts are a good source of information on the relative percentage of different vehicle classes, but not a good source for vehicle volume information since they were taken several years ago (2000) using a manual counting methodology.

As shown in Table 2-7, autos at Via de la Valle comprised 76.6 percent of vehicular traffic in the southbound direction during the 7.5 hour period (6:30 a.m. to 2:00 p.m.) for which data was collected. Light-duty vehicles, motorcycles, buses, 2-3 axle heavy-duty trucks, and 4+ axle heavy-duty trucks comprised 15.2, 0.2, 0.7, 3.9, and 3.5 percent of the 7.5 hour traffic, respectively.

In the morning peak period (6:30 to 9:00 a.m.), 77.9 percent of southbound traffic at Via de la Valle was composed of autos. Light-duty vehicles, motorcycles, buses, 2-3 axle heavy-duty trucks, and 4+ axle heavy-duty trucks comprised 16.1, 0.2, 0.5, 2.7, and 2.5 percent of the southbound traffic, respectively.

Over the course of the 7.5 hour period counted, the percentage of passenger vehicles roughly followed a skewed bell curve, reaching its minimums in the early morning and mid-day, and reaching its maximum at the end of the morning peak period. The percentage of passenger vehicles peaked from 8:30 to 9 a.m., 82.8 percent. The lowest percentage of passenger vehicles, 73.2 percent occurred from noon to 1 p.m. in the afternoon, while the second lowest, 73.5, occurred from 6:30 to 7 a.m. in the morning.

TABLE 2-6: VEHICLE OCCUPANCY DISTRIBUTION

I-5 n/o Via de la Valle
Thursday (11/9/00)

	VEHICLE OCCUPANCY **Southbound**			
	1	**2**	**3+**	**Total**
6:30 - 7:00 a.m.	2,837	352	38	3,227
Percent	*87.9%*	*10.9%*	*1.2%*	*100.0%*
7:00 - 7:30 a.m.	2,651	332	39	3,022
Percent	*87.7%*	*11.0%*	*1.3%*	*100.0%*
7:30 - 8:00 a.m.	2,581	324	25	2,930
Percent	*88.1%*	*11.1%*	*0.9%*	*100.0%*
8:00 - 8:30 a.m.	2,334	309	42	2,685
Percent	*86.9%*	*11.5%*	*1.6%*	*100.0%*
8:30 - 9:00 a.m.	2,781	373	52	3,206
Percent	*86.7%*	*11.6%*	*1.6%*	*100.0%*
9:00 - 10:00 a.m.	3,736	661	70	4,467
Percent	*83.6%*	*14.8%*	*1.6%*	*100.0%*
10:00 - 11:00 a.m.	3,969	1,024	153	5,146
Percent	*77.1%*	*19.9%*	*3.0%*	*100.0%*
11:00 a.m. - 12:00 p.m.	3,669	924	102	4,695
Percent	*78.1%*	*19.7%*	*2.2%*	*100.0%*
12:00 - 1:00 p.m.	3,187	841	95	4,123
Percent	*77.3%*	*20.4%*	*2.3%*	*100.0%*
1:00 - 2:00 p.m.	3,246	789	62	4,097
Percent	79.2%	19.3%	1.5%	100.0%
TOTAL	***30,991***	***5,929***	***678***	***37,598***
Percent	***82.4%***	***15.8%***	***1.8%***	***100.0%***

Data Source: *2000 Vehicle Occupancy and Classification Study,* SANDAG

TABLE 2-7: VEHICLE CLASSIFICATION DISTRIBUTION

I-5 n/o Via de la Valle
Thursday (11/9/00)

VEHICLE CLASSIFICATION
Southbound

	Passenger Vehicle	Light Duty Vehicles	Motorcycle	Bus	Heavy Duty 2-3 Axle	Heavy Duty 4+ Axle	Total
6:30 - 7:00 a.m.	2,522	705	13	12	68	113	3,433
Percent	*73.5%*	*20.5%*	*0.4%*	*0.3%*	*2.0%*	*3.3%*	*100.0%*
7:00 - 7:30 a.m.	2,444	578	11	15	97	72	3,217
Percent	*76.0%*	*18.0%*	*0.3%*	*0.5%*	*3.0%*	*2.2%*	*100.0%*
7:30 - 8:00 a.m.	2,452	478	6	16	72	72	3,096
Percent	*79.2%*	*15.4%*	*0.2%*	*0.5%*	*2.3%*	*2.3%*	*100.0%*
8:00 - 8:30 a.m.	2,259	426	2	23	110	65	2,885
Percent	*78.3%*	*14.8%*	*0.1%*	*0.8%*	*3.8%*	*2.3%*	*100.0%*
8:30 - 9:00 a.m.	2,810	396	1	22	88	75	3,392
Percent	*82.8%*	*11.7%*	*0.0%*	*0.6%*	*2.6%*	*2.2%*	*100.0%*
9:00 - 10:00 a.m.	3,710	757	7	45	241	187	4,947
Percent	*75.0%*	*15.3%*	*0.1%*	*0.9%*	*4.9%*	*3.8%*	*100.0%*
10:00 - 11:00 a.m	4,448	698	2	49	208	233	5,638
Percent	*78.9%*	*12.4%*	*0.0%*	*0.9%*	*3.7%*	*4.1%*	*100.0%*
11:00 a.m. - 12:00 p.m.	3,973	722	7	23	236	223	5,184
Percent	*76.6%*	*13.9%*	*0.1%*	*0.4%*	*4.6%*	*4.3%*	*100.0%*
12:00 - 1:00 p.m.	3,369	754	5	41	238	197	4,604
Percent	*73.2%*	*16.4%*	*0.1%*	*0.9%*	*5.2%*	*4.3%*	*100.0%*
1:00 - 2:00 p.m.	3,368	729	12	32	223	191	4,555
Percent	*73.9%*	*16.0%*	*0.3%*	*0.7%*	*4.9%*	*4.2%*	*100.0%*
TOTAL	***31,355***	***6,243***	***66***	***278***	***1,581***	***1,428***	***40,951***
Percent	***76.6%***	***15.2%***	***0.2%***	***0.7%***	***3.9%***	***3.5%***	***100.0%***

Data Source: *2000 Vehicle Occupancy and Classification Study* , SANDAG

2.8 TRUCK VOLUMES

Table 2-7, which shows vehicle classification counts from 2000 on Southbound I-5 north of Via de la Valle for a 7.5 hour period, provides a snapshot of fluctuating truck percentages over the course of a day. As can be seen in the table, the percentage of heavy duty trucks (2-3 and 4+ axles) reached a low of 4.6 percent from 7:30 to 8:00 a.m. and a high of 9.5 percent from noon to 1 p.m. The percent of heavy duty trucks was consistently lower during the morning commute period than it was subsequently, from 9:00 a.m. to 2:00 p.m. The percentage of light duty vehicles also varied significantly, but followed a different pattern. The highest observed percentage of light duty trucks, 20.5 percent, occurred from 6:30 to 7:00 a.m. in the morning and the lowest percentage, 11.7 percent, occurred from 8:30 to 9:00 a.m. in the morning.

Truck volume trends along the I-5 study corridor can be seen in the 2002 7-day average daily traffic (ADT) and 2003 weekday (5-day) ADT contained in Table 2-8. The table shows that 7-day truck ADT was consistently lower than weekday truck ADT, at all five locations for which truck data was collected. Although the 7-day data was collected in 2002, and the weekday data was collected in 2003, the magnitude of difference between the two cannot be explained by typical growth rates observed along the corridor (shown in Table 2-1). Weekend truck volumes that are significantly lower than weekday truck volumes are the most likely cause of the consistently lower 7-day truck ADT. A second pattern displayed by the data, is that truck volumes on I-5 decrease from south to north. Both the 7-day and weekday ADT decrease by about nine percent, or 900-1200 trucks, between the southern-most count location and the northern-most one.

TABLE 2-8: CURRENT 7-DAY AND WEEKDAY TRUCK ADT

Location	2002 7-day Truck ADT	2003 Weekday Truck ADT
South of Del Mar Heights Road	10,500	13,700
South of Manchester Avenue	10,300	13,500
South of Palomar Airport Road	10,000	13,050
South of State Route 78	9,800	12,700
North of Oceanside Boulevard	9,600	12,500

Data Source: Caltrans District 11

2.9 CURRENT PEAK HOUR OPERATING SPEEDS

Speed data was extracted from PeMS for observation of weekday and weekend speed trends in the mainline and HOV lanes. The peak hours by direction were identified using the hourly volumes extracted for two Wednesdays and two Saturdays, in summer and fall 2003, described previously under "Northbound HOV Lane Volumes." Speeds were extracted from PeMS for the peak hours identified for the same days as the volume data:

- Wednesday, July 16, 2003
- Saturday, July 19, 2003
- Wednesday, October 22, 2003
- Saturday, October 25, 2003

Speeds at eleven count stations, located at roughly the same locations in the northbound and southbound directions, were tabulated. The eleven count stations are spread across about 20 miles of the 26 mile study corridor, providing reasonably good coverage.

Figures 2-8 and 2-9 illustrate the speed data collected for the southbound I-5 mainline during the weekday and weekend peaks, respectively. It was determined that the weekday peak hour in the southbound direction occurred from 7:00 to 8:00 a.m while the weekend peak hour occurred from 11:00 a.m to 12:00 p.m. based on hourly volume data for the sample days. As can be seen in Figure 2-8, speed reached a minimum of 22 to 24 mph near La Costa Avenue, on both sample weekdays. Slow speeds extended across 2-3 count stations, covering roughly five miles. Speeds of 30 mph or less were observed near Manchester Avenue, Leucadia Boulevard, and La Costa Avenue on the Wednesday in July, and only at Leucadia Boulevard and La Costa Avenue on the Wednesday in October.

As can be seen in Figure 2-9, southbound traffic slows at a similar location during the Saturday peak hour, but not as markedly. A minimum speed of 26 mph was observed at Leucadia Boulevard on the Saturday in July, while a minimum speed of 51 mph was observed at Manchester Avenue on the Saturday in October.

Figures 2-10 and 2-11 illustrate the speed data collected for the northbound I-5 mainline during the weekday and weekend peaks, respectively. It was determined that the weekday peak hour in the northbound direction occurred from 5:00 to 6:00 p.m. , while the weekend peak hour occurred from 4:00 to 5:00 p.m. based on hourly volume data for the sample days. As can be seen in Figure 2-10, during the two sample Wednesdays, northbound mainline speeds reach a minimum at two defined locations. Speeds ranging from 17 to 36 mph were observed at the neighboring stations of Del Mar Heights Road and Via de la Valle. Slow speeds ranging from 24 to 34 mph were also observed further north along the corridor at the adjacent stations at Poinsettia Lane, Palomar Airport Road, and Cannon Road.

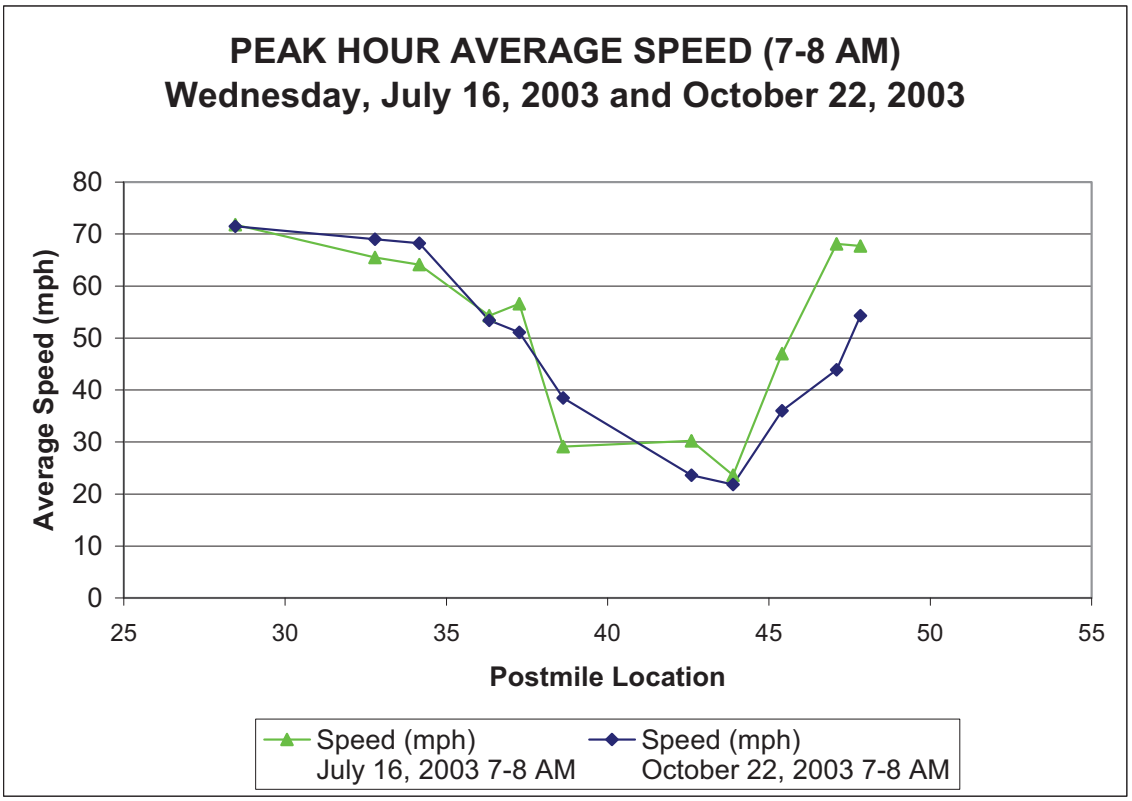
As can be seen in Figure 2-11, slow speeds were only observed in one of the two areas during the sample Saturday peaks. Minimum speeds of 20 and 21 mph were observed at Del Mar Heights Road on the Saturday in July and the Saturday in October, respectively.

Figure 2-12 illustrates speeds in the northbound HOV lane at Carmel Valley Road on the 4 sample days (two Wednesdays and two Saturdays) during their respective peak hours (5:00 to 6:00 p.m. and 4:00 to 5:00 p.m.). As can be seen in the figure, speeds in the

HOV lane range from 11 to 16 mph on the two sample Wednesdays, during the 5:00 to 6:00 p.m. peak hour, suggesting congested conditions. This corresponds with the volume trends observed in the HOV lane discussed previously and illustrated in Figure 2-6.

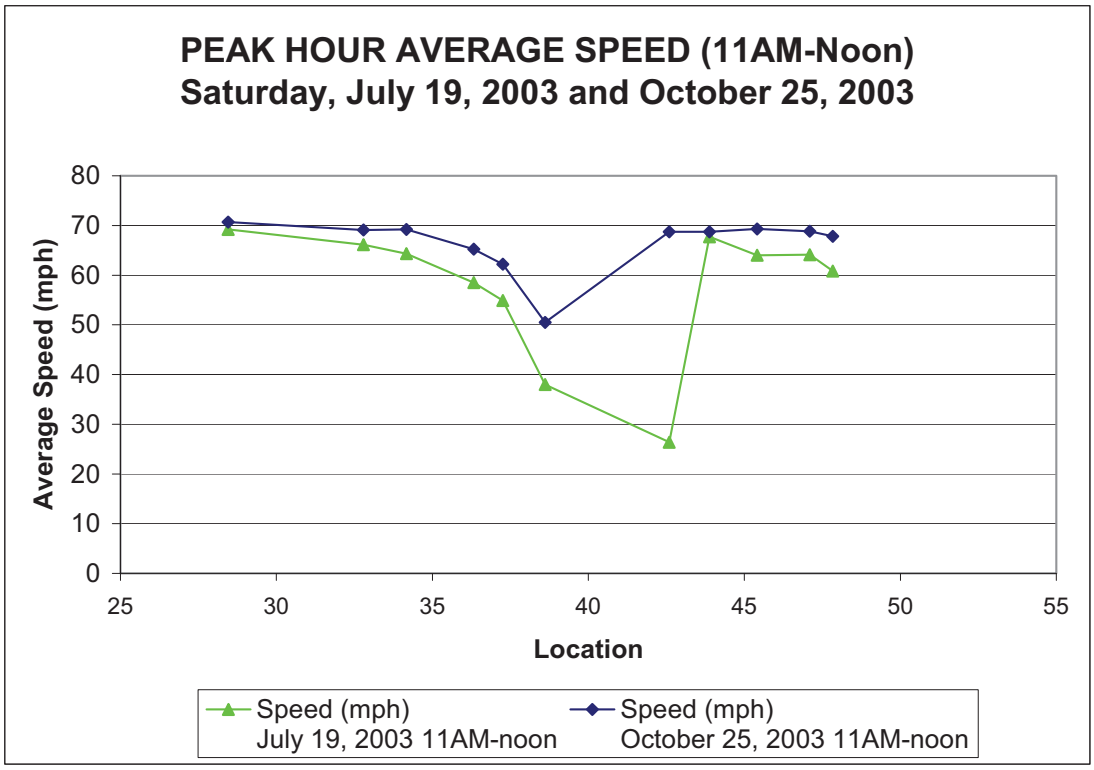
In contrast, Saturday speeds range from a fair 56 mph to a clearly free-flowing 72 mph. Once again, this correlates with the volumes observed in the HOV lane on these same two Saturdays, illustrated in Figure 2-7 and discussed previously. Hourly volumes of approximately 1,800 and 1,550 were observed from 4:00 to 5:00 and 5:00 to 6:00 p.m. on the Saturday in July, respectively, both of which are either above or near the 1,650 vehicle per hour capacity of a single-lane HOV facility. This correlates to the slightly reduced speed of 56 mph observed in the HOV lane from 5:00 to 6:00 p.m. on the Saturday in July. On the other hand, volumes in the HOV lane were well below 1,650 on the Saturday in October, corresponding to the clearly free-flowing speed of 72 mph which was observed.

FIGURE 2-8: I-5 SOUTHBOUND MAINLINE SPEEDS – WEDNESDAY



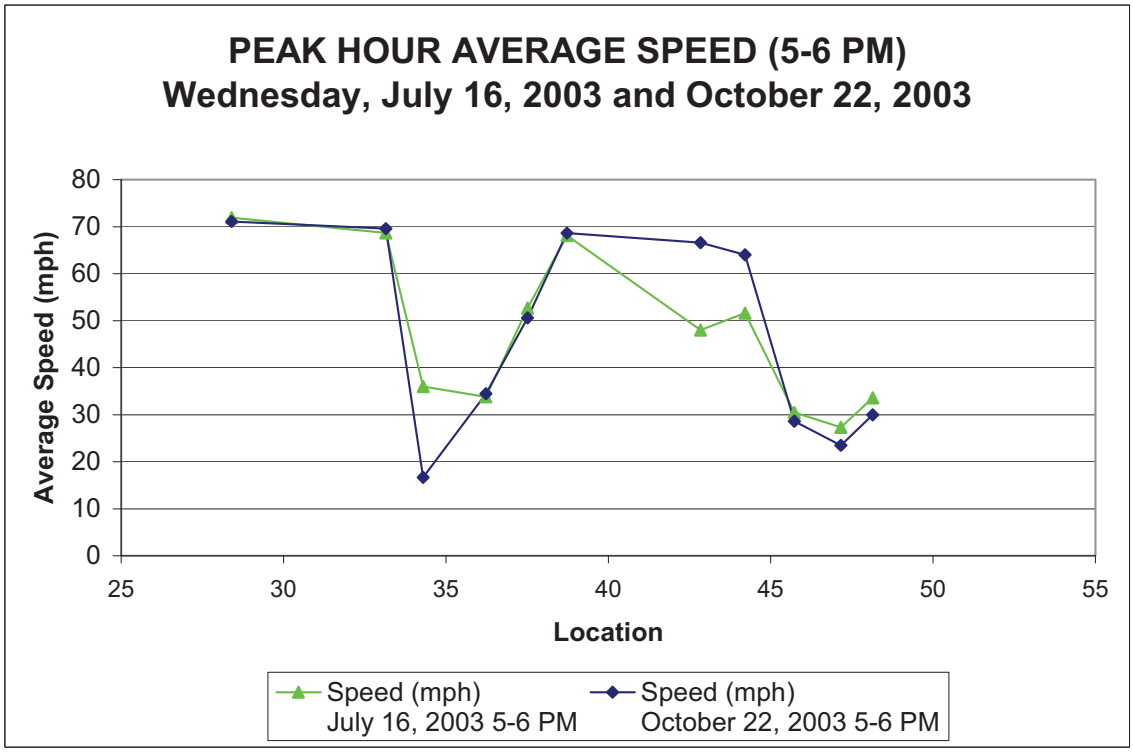
Location Description	CA Postmile	Speed (mph) July 16, 2003 7-8 AM	Speed (mph) October 22, 2003 7-8 AM
WB LA JOLLA VILLAGE	28.454	72	72
CARMEL VALLEY	32.79	66	69
WB DEL MAR HEIGHTS	34.164	64	68
WB VIA DE LA VALLE	36.326	54	53
LOMAS SANTA FE	37.26	57	51
MANCHESTER	38.617	29	39
LEUCADIA	42.591	30	24
LA COSTA	43.885	24	22
POINSETTIA	45.409	47	36
WB PALOMAR AIRPORT	47.097	68	44
CANNON	47.834	68	54

FIGURE 2-9: I-5 SOUTHBOUND MAINLINE SPEEDS – SATURDAY



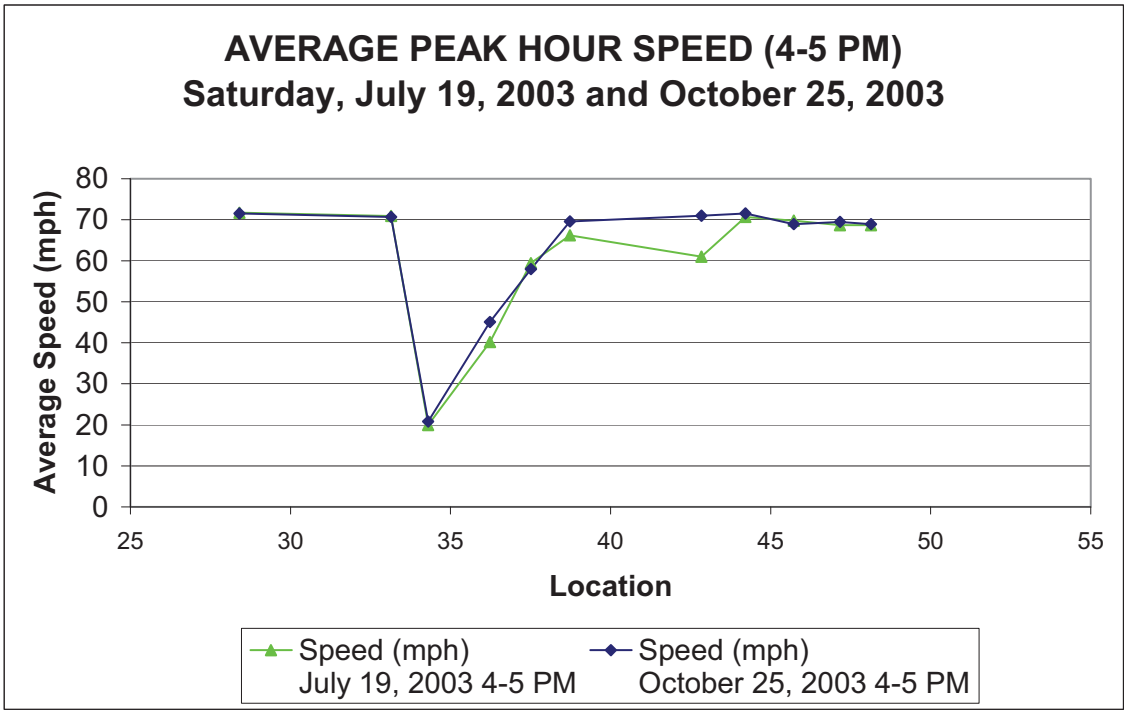
Location Description	CA Postmile	Speed (mph) July 19, 2003 11AM-noon	Speed (mph) October 25, 2003 11AM-noon
WB LA JOLLA VILLAGE	28.454	69	71
CARMEL VALLEY	32.79	66	69
WB DEL MAR HEIGHTS	34.164	64	69
WB VIA DE LA VALLE	36.326	59	65
LOMAS SANTA FE	37.26	55	62
MANCHESTER	38.617	38	51
LEUCADIA	42.591	26	69
LA COSTA	43.885	68	69
POINSETTIA	45.409	64	69
WB PALOMAR AIRPORT	47.097	64	69
CANNON	47.834	61	68

FIGURE 2-10: I-5 NORTHBOUND MAINLINE SPEEDS – WEDNESDAY



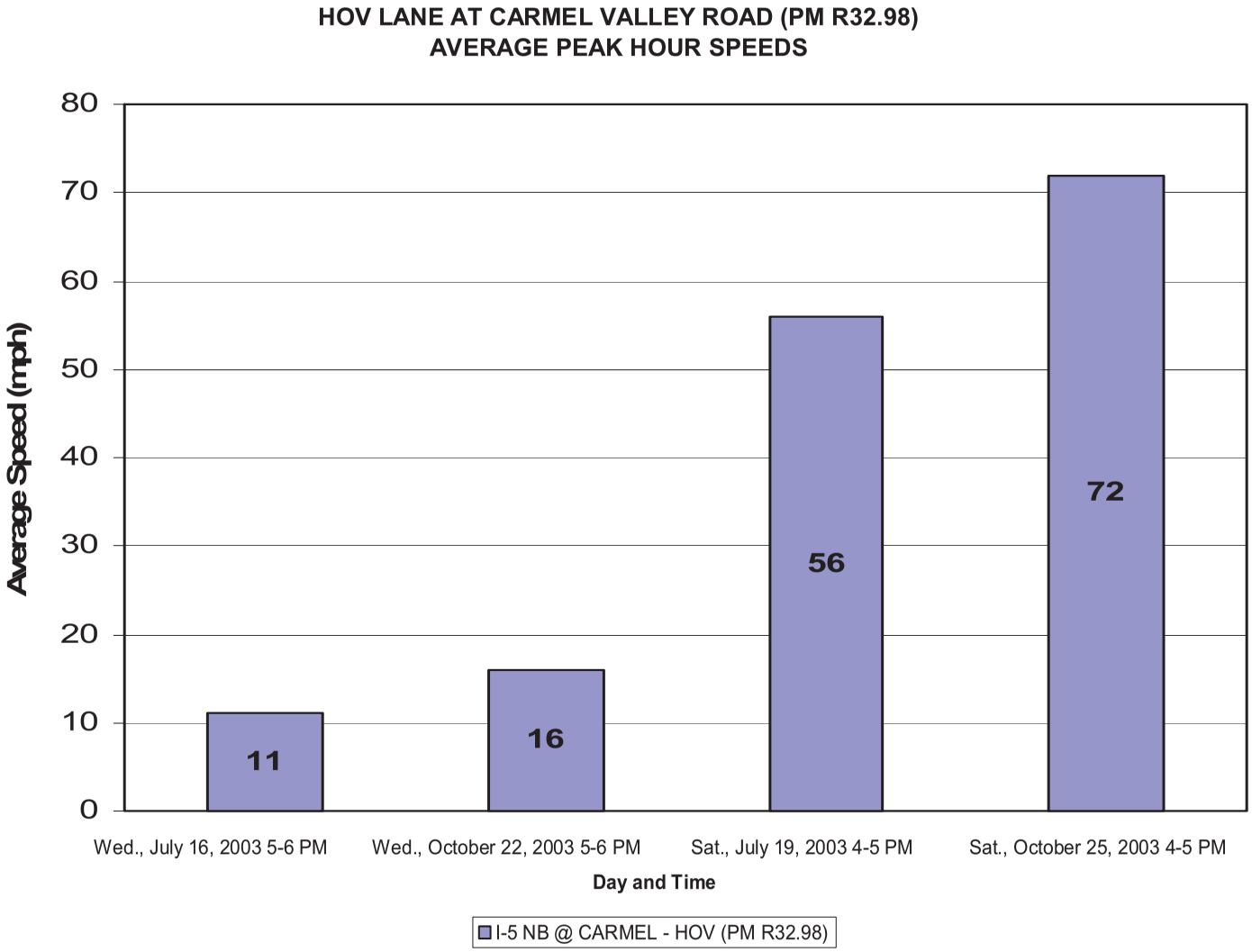
Location Description	CA Postmile	Speed (mph) July 16, 2003 5-6 PM	Speed (mph) October 22, 2003 5-6 PM
EB LA JOLLA VILLAGE	28.402	72	71
CARMEL VALLEY	33.147	69	70
DEL MAR HEIGHTS	34.296	36	17
EB VIA DE LA VALLE	36.23	34	35
LOMAS SANTA FE	37.514	53	51
MANCHESTER	38.728	68	69
LEUCADIA	42.838	48	67
LA COSTA	44.21	52	64
POINSETTIA	45.724	31	29
PALOMAR AIRPORT	47.165	27	24
CANNON	48.138	34	30

FIGURE 2-11: I-5 NORTHBOUND MAINLINE SPEEDS – SATURDAY



Location Description	CA Postmile	Speed (mph) July 19, 2003 4-5 PM	Speed (mph) October 25, 2003 4-5 PM
EB LA JOLLA VILLAGE	28.402	72	72
CARMEL VALLEY	33.147	71	71
DEL MAR HEIGHTS	34.296	20	21
EB VIA DE LA VALLE	36.23	40	45
LOMAS SANTA FE	37.514	59	58
MANCHESTER	38.728	66	70
LEUCADIA	42.838	61	71
LA COSTA	44.21	71	72
POINSETTIA	45.724	70	69
PALOMAR AIRPORT	47.165	69	70
CANNON	48.138	69	69

FIGURE 2-12: I-5 NORTHBOUND HOV SPEEDS



CHAPTER 3
ALTERNATIVE PRICING STRATEGIES

The purpose of this chapter is to identify and review a number of potential pricing strategies suitable to employ on I-5 North Coast Managed Lanes Study. Each pricing strategy details how the tolling mechanism would work, typical potential user fees, and conceptually how the price information would be communicated to the user. It is intended that each of these pricing alternatives be evaluated against feasibility criteria in order to find the one that is best suited for use on the I-5 corridor. The price values listed in each of these alternatives are very preliminary and are only intended for the purposes of the feasibility study. Price values are based on current I-15 toll experience and will be determined at the time of implementation and opening.

3.1 PRICING GOALS AND STRATEGIES

This section discusses pricing goals, toll equity, and targeted trips in an effort to take into consideration the goals and possible issues created by various pricing strategies for the proposed facility.

3.1.1. Project Goals and Objectives

The primary goal of the proposed I-5 North Coast Managed Lanes (ML) is to maintain mobility of four of the added lanes through roadway demand management. This goal is addressed in this section and is reflected in many of the mobility objectives found in the I-5 Purpose and Need report. Specifically, objectives addressing I-5 corridor mobility in this companion report include:

- Maintain or improve future traffic levels of service in 2030 over the existing levels of service;
- Maintain or improve travel times within the corridor;
- Provide a (roadway) facility that is compatible with future bus rapid transit and modal options; and
- Maintain I-5 as an effective link in the national Strategic Highway Network.

The scope of this study is determining if pricing as a demand management tool is feasible on the managed lanes. Pricing needs to be applied in conjunction with access controls and eligibility to achieve real-time demand management of the ML during varying operating conditions. In keeping with regional policy, a high level of service (LOS) on managed lanes in San Diego will need to be maintained.

Pricing can also generate revenue, and various pricing scenarios may optimize revenue generation while managing traffic.

Multiple access points along the roadway in the form of slip ramps with main lanes and direct access ramps (DARs) with major streets and transit facilities make managing traffic through access features a challenge. Users (HOVs or tolled SOVs) may elect to travel only in selected sections of the roadway and create a challenge to lane management. SANDAG and Caltrans also have regional and statewide goals that encourage the use of transit and formation of carpools and vanpools. These modes are

given preference in the form of free use of a managed lane roadway. They may have an adverse impact on mobility if HOV demand exceeds ML capacity. Value pricing may be the only tool to actively manage specific roadway sections, whether this demand is generated from single occupant vehicles (SOVs) or HOVs.

Current commute experience on the I-15 ML facility is based on allowing all traffic to enter at one end and exit at the other. A single toll price is displayed for entering vehicles that can change dynamically. However, multiple access locations make this approach complicated but feasible.

Multiple bottleneck locations within the ML and adjacent lanes may focus demand. Some tolling strategies, such as flat or distance based tolling, may either encourage users to travel a longer portion of the ML while others, e.g., dynamic, may encourage frequent transfers in and out of the ML, causing unnecessary weaving and increased safety and operational hazards. These issues should be recognized in the project's demand management goals and objectives.

Net revenue generated from the ML may be applied to a variety of purposes, including recovery of capital costs or operation costs associated with transit services, as is done on I-15. Toll revenue may become a more important issue on an expansive facility like I-5.

3.1.2. Toll Equity

An equitable toll system is needed since users of the ML will include short trips and long trips, but the possibility of toll rates being adjusted to reflect distance traveled may be needed to manage the ML. This section discusses the advantages and disadvantages of a distance-based system and flat toll system in meeting the management goal.

The traditional views on equity related to tolling rates are designed around mile based pricing plans. To achieve equity in those types of plans, toll rates should be adjusted to reflect the distance traveled. However, the more equitable the toll rates are, the less influence rate adjustments have on demand management. In an optimally managed distance-based system, short trips would have low tolls, which would provide relatively little disincentive to using the ML.

A flat-based toll system charging the same rate to all vehicles regardless of trip length would have low levels of toll equity, but would discourage frequent shifts between ML and general purpose (GP) lanes.

A segmentedly-skewed, time-of-day pricing system would have its equity based in delivering a constant value/cost of time saved. While this measure may be non traditional, it has seen acceptance in the marketplace as a fair way to price accessibility and mobility and it is very much at the heart of the utility derived by the driver.

3.1.3. Targeted Trips

Since different pricing strategies will encourage a variety of trips, it may be appropriate as a regional policy to consider targeting specific trips. For example, longer distance trips may be targeted versus shorter trips, or targeting frequent users who are typically commuters versus discretionary or recreational users who may not be averse to the price of a toll.

3.1.4. User and System Complexity

In selecting the optimum strategy, consideration must be given to complexity of the tolling system and customer interface. Complexity is harder to communicate on roadside signing and harder for users, particularly infrequent users, from making informed decisions. Regional policies and consistency between tolling strategies for I-5 may outweigh other objectives in addressing this need.

3.2 PRICING OPTIONS

A variety of potential pricing options exist. In general, there appear to be three basic options with respect to time variance, including:

- **Fixed Schedule Pricing:** No variability by time of day. Most traditional toll facilities follow this strategy because it is simple to understand and easily applied.
- **Preset Variable Rate Pricing:** Toll rates are varied by time of day or direction of travel, but on a preset fixed schedule. State Route (SR) 91 in Orange/Riverside County operates using this strategy.
- **Dynamic Variable Pricing:** Prices vary based on actual levels of demand or congestion and are not tied to a fixed schedule. This approach is currently applied on I-15.

The ML designs being studied for I-5, including a buffer- or barrier-separated roadway with multiple access points both with the adjacent GP lanes and DARs to arterials and transit facilities, suggest a need for some type of variable toll. Demand management will not be able to be achieved based on a fixed toll schedule. A non-variable toll might be possible for peak periods, but would generate virtually no traffic or revenue in the off-peak periods. Value pricing as defined and applied on the demonstration project on I-15 was based on the premise that toll rates were adjusted in proportion to the "value" motorists receive in traveling the express lanes in terms of time savings and reliability. The price is adjusted to reflect this. However, in off-peak periods when GP lanes operate well, the price is adjusted lower to attract traffic. A fixed rate schedule would neither satisfy demand management nor revenue generation goals.

Preset and dynamic pricing both offer potential for the I-5 ML project. The use of dynamic pricing will increase the ability to manage demand. The trade-offs associated with each relate to the level of complexity assigned. Both of these options are equivalent for any revenue analysis since one can be made to mimic the other in any modeling efforts. This is because modeling assignments for revenue are based on "static" trip tables reflecting regional demand for each period of the day. Ultimately, the decision between preset and dynamic pricing may be a function of the available technology, desire for regional toll policy consistency and ability to address changing conditions on the ML on a more real-time basis.

Within each of these two remaining options, tolling can be prescribed in three more potential strategies:

Flat Tolls: A single rate is charged from a specific entry, regardless of the point of exit. The rate can be different for each entry and different by time of day.

Per-Mile Tolls: A toll rate at any given time is based on the distance traveled, regardless of which entry is used.

Segment Tolls: A specific toll is charged for each segment between each of the major access locations with the GP lanes. For simplicity, DARs would not be considered major access locations, but this possibility also exists.

Each of these strategies can address pricing on lanes in a manner that helps regulate demand. All can vary either by time of day or dynamically based on travel demand. A key factor in determining the effectiveness or appropriateness of each is how the information provided to each user correctly corresponds to the value actually charged. The complexity of the toll design may also discourage use or encourage erratic use among the various access features. Current technology identified in this study limits some of the potential ways such information could be presented to potential users. Sign requirements need to be as simple and as understandable as possible, regardless of whether the signing information is through conventional means or as may be possible in the future, through heads up displays or on board voice over information. A summary of these options is provided in Table 3-1.

TABLE 3-1: OVERVIEW OF I-5 ML PRICING OPTIONS

Basic Options	Description	Optional Strategies	Other Variations
Flat Tolls	Single rate charged from entry regardless of trip length in the ML	• Standard rate at all entries • Rate based on maximum length trips from each entry point	• Time of day
Per Mile Tolls	Toll rate based on distance traveled in the ML	• Standard per mile rates at all entry points • Standard per mile rates depending on entry point	• With and without minimum toll • With minimum and maximum toll • Time of Day
Segment Tolls	Toll charged by segment between each major access point	• Standard rate per segment regardless of entry • Skewed segment rate at different points of entry	• Time of Day

Other variables affect the appropriateness of different toll structures, including the ability to use this toll for differing conditions as demand grows and how the toll policy will affect, or be affected by, pricing on other freeway corridors. Traffic forecasts for I-5 suggest that between 2015 and 2030 HOV demand will exceed the I-5 ML roadway capacity during peak periods. This condition will require tolling some of the HOVs to maintain an acceptable level of service. Variable, dynamic pricing already exists on the I-15 express lanes, and this pricing strategy will have changed to a skewed per mile toll basis by the time the I-5 project opens. These events further complicate potential tolling strategies that may be considered for I-5. Table 3-2 provides a matrix of options that encompasses these other corridor-specific and regional influences. Each of these strategies is then discussed regarding their potential benefits and impacts to forecast I-5 ML use.

TABLE 3-2: PRICING STRATEGY OPTIONS MATRIX

Pricing Strategies Comparison

Pricing Factors								
	Time of Day	Infrequent User	Travel Time	Travel Distance	Maintain LOS C	HOV-2+ free	HOV-3+ free, 2s tolled	Regional Consistency
Strategy								
1. Variable Fixed	X	X			X	X	X	
2. Dynamic	X				X	X	X	X
3. Distance Based		X		X		X	X	
4. Fixed Distance-Based	X	X		X				
5. Fixed by Access Point		X		X				
6. Fixed Time Based	X	X	X					
7. Flat Toll						OPTION	OPTION	
8. Dynamic by Segment						OPTION	OPTION	
9. Time of Day/Segment	X	X		X		OPTION	OPTION	
10. Dynamic, Skewed	X		X	X	X	OPTION	OPTION	X

3.2.1. Strategy 1: Variable Fixed [time of day]

This strategy charges users a variable toll depending on which hour of the day/day of the week they use the managed lanes. The rate schedule might peak in the morning in the southbound direction towards San Diego and in the northbound direction in the late afternoon. However, over time, the price during peaks may be the same for both directions if congestion is evidenced in northbound and southbound directions. Toll charges are independent of distance traveled, and the rate structure is fixed. A distinction could be made between an HOV and SOV as is done on SR 91 to allow HOVs with a certain requisite occupancy free use. A user can expect to pay a maximum toll rate if traveling between peak time of perhaps 7:00 a.m. to 8:00 a.m. and 5:00 to 6:00 p.m.in one or both directions, depending on levels of congestion typically experienced. Lower fees at other times of the day and on the weekend would be in effect. Given the constant change of this user fee throughout the day, a hybrid static-dynamic message sign would be needed to communicate the current price to the user. This sign would be mounted over the roadway at various locations. Assuming all tolled vehicles are equipped with a transponder, a current price schedule could be mailed along with the initial transponder purchase and/or updates mailed and posted to a website to provide the most current price structure (Figure 3-1).

FIGURE 3-1: EXAMPLE COST SCHEDULE FROM SR 91 IN ORANGE COUNTY

SOUTHBOUND

	Sun	M	Tu	W	Th	F	Sat
12:00 AM				$1.00			
1:00 AM				$1.00			
2:00 AM				$1.00			
3:00 AM				$1.00			
4:00 AM				$2.00			
5:00 AM				$3.00			
6:00 AM				$4.00			$1.00
7:00 AM				$5.00			
8:00 AM	$1.00			$4.00			$2.00
9:00 AM				$3.00			
10:00 AM				$2.00			
11:00 AM	$2.00			$2.00			
12:00 PM				$2.00			$3.00
1:00 PM				$2.00			
2:00 PM	$3.00			$2.00			$4.00
3:00 PM	$4.00			$2.00			
4:00 PM	$4.00			$2.00			$3.00
5:00 PM	$3.00			$2.00			
6:00 PM				$2.00			
7:00 PM				$1.00			
8:00 PM	$2.00			$1.00			$2.00
9:00 PM				$1.00			
10:00 PM	$1.00			$1.00			$1.00
11:00 PM				$1.00			

NORTHBOUND

	Sun	M	Tu	W	Th	F	Sat
12:00 AM				$1.00			
1:00 AM				$1.00			
2:00 AM				$1.00			
3:00 AM				$1.00			
4:00 AM				$1.00			
5:00 AM				$1.00			
6:00 AM				$2.00			$1.00
7:00 AM				$2.00			
8:00 AM	$1.00			$2.00			$2.00
9:00 AM				$2.00			
10:00 AM				$2.00			
11:00 AM	$2.00			$2.00			
12:00 PM				$2.00			$3.00
1:00 PM				$2.00			
2:00 PM	$3.00			$2.00			$4.00
3:00 PM	$4.00			$3.00			
4:00 PM	$4.00			$4.00			$3.00
5:00 PM	$3.00			$5.00			
6:00 PM				$4.00			
7:00 PM				$3.00			
8:00 PM	$2.00			$2.00			$2.00
9:00 PM				$1.00			
10:00 PM	$1.00			$1.00			$1.00
11:00 PM				$1.00			

Note: Prices are for illustrative purposes only.

3.2.2. Strategy 2: Dynamic [real time per congestion level]

The rate schedule in Figure 3-1 represents the baseline price structure with actual rates varying (higher or lower) depending on real time traffic volumes and traffic conditions. A distinction could be made between SOV and HOV as is done on the I-15 express lanes to allow HOVs free use. The per-trip fee varies dynamically in response to traffic conditions on the managed lanes and/or general purpose lanes. If calculation of rates involves comparative travel time with the general use lanes, this information would be displayed in advance on dynamic signs. Fees are set to maintain an acceptable LOS C or better assuming 1,650 vehicles/lane/hour as a threshold for this condition. In general, the per-trip fee to use the managed lanes is higher during peak periods when there is more demand and less available capacity. During off-peak periods, the per-trip fee is lower. Traffic volume data, collected from real-time loop detectors in the tolling zone, are used to determine when fees should be changed and to what level. This variable pricing information, again, would be communicated through a hybrid static-changeable message sign (Figure 3-2). This sign would mount over the roadway and be colored differently from the rest of the general purpose signs to indicate the presence of the managed lane(s).

FIGURE 3-2: EXAMPLE SIGN FROM I-15 DYNAMICALLY CHANGING TOLL

3.2.3. Strategy 3: Distance-based with reduced toll for HOV use

This strategy contains various possible scenarios:

- Restrict free access to HOV-3+ vehicles and charge all others
- Restrict free access to HOV-3+ vehicles and charge 2-occupant vehicles a reduced rate that might be a 50 percent discount of the SOV rate.

This strategy allows a certain category of HOVs to use the managed lanes free of charge while all other HOVs pay a toll that is distance based. Given this distinction of vehicles, proper signing and enforcement needs of the managed lanes is made more complex. The first sign a user would see as they approach the facility would be a static sign defining what HOV group is free and which must pay. If SOVs are also allowed, this distinction would also need to be made. As they approach the beginning of the toll zone, an overhead hybrid static-changeable message sign would indicate to the user the current rate for each of the two categories.

3.2.4. Strategy 4: Fixed [distance-based]

This strategy combines elements of distance-based and time-based tolling. Again, a variable toll by schedule is charged depending on the hour of the day/day of the week the facility is used. This variable toll also takes into account the distance traveled during that particular block of time (see previous Figure 3-1). No distinction is made between SOVs and HOVs. The rate schedule peaks in the morning in the southbound direction towards San Diego and in the northbound direction in the late afternoon. Lower rates at other times of the day and on the weekend are indicated. Given the constant change of

this user fee throughout the day, a hybrid static-changeable message sign could be used to communicate the current price to the user. This sign would mount over the roadway and be colored differently from the rest of the general purpose signs to indicate the presence of the managed lane(s). Assuming vehicles equipped with a transponder is a prerequisite for utilizing the facility, a current price schedule could be mailed along with the initial transponder purchase and/or updates posted to a website would provide the most current price structure.

3.2.5. Strategy 5: Access Point Based

This pricing strategy resembles that of certain mass transit lines. Each direct access point along the managed lane facility is treated like a "boarding station" and charges are based on the pairing of entrance points with exit points. The farther the two direct access points are located from each other, the higher the toll. This structure could be maintained at other times using lower point-to-point charges. In addition the point-to-point charges could be modified to account for the variation in distances between access points. For example, instead of charging a constant fee of $0.50 from one access point to the next adjacent one, a $0.30 fee would be charged for those adjacent pairs with a relatively shorter distance and a $0.50 fee would be charged for those pairs with a relatively longer distance. This type of pricing schedule is not conducive for display on overhead signs. Therefore, a price schedule would be mailed along with the initial transponder purchase and updates to the price structure would be posted to a website or mailed to transponder owners with active accounts.

3.2.6. Strategy 6: Fixed [time-based]

This strategy combines two elements of time-based tolling. A variable toll is charged depending on the hour of the day/day of the week the facility is used. This variable toll however also takes into account the number of minutes spent traveling in the facility during that particular block of time. No distinction is made between SOV and HOV. The rate at a particular time would be displayed on a hybrid static-changeable message sign, mounted overhead before the entrance to the facility. Price schedules could also be mailed to transponder owners or posted to a website. A potential drawback to this scenario is that users may have the tendency to speed excessively while in the managed lanes, in order to reduce the fee charged to them.

3.2.7. Strategy 7: Flat Toll

This strategy consists of a flat charge independent of occupancy, travel time, or distance. An option would be to offer a reduced flat rate for either HOV-2+ or HOV-3+. Static signs would be sufficient at entry locations to convey the flat user fee to drivers approaching the facility.

3.2.8. Strategy 8: Dynamic by Segment

This strategy consists of dynamically charging a toll by segment depending on real-time demand for each segment, or time savings generated by each segment if traffic density is obtained from adjacent lanes. In either case, the downstream toll would not be known for an upstream user, and display of toll rates could only be made for no more than the next two or three downstream toll zones. HOVs would be free and not be affected by the SOV toll rates.

3.2.9. Strategy 9: Time of Day, By Segment

This strategy sets a time of day toll by segment, which mirrors the typical traffic conditions experienced in Strategy 8 according to a preset schedule of tolls. Tolls would be able to be known in advance by users, but not necessarily displayed for all downstream segments. Again, signing would be confusing. HOVs would be free and not be affected by the SOV toll rates.

3.2.10. Strategy 10: Dynamic, Skewed Toll

This strategy consists of dynamic toll rate that is set at per mile level within each segment, and skewed or weighted along the corridor to account for demand for specific segments from south to north. The southerly segments would have a higher toll per mile at any time during the peak period than segments further to the north, mirroring demand and congestion characteristics. Some segments would carry the same rate per mile, while others would be higher. A maximum toll rate might be established to discourage users from arbitrarily exiting the ML in the southerly segments.

3.2.11. Comparative Summary among Scenarios

Strategies 1, 2 and 7 propose the same toll for the full length of the ML facility. Travel distance or time is not used as a basis for pricing. While this might work as an interim pricing mechanism for a short initial segment, it would be difficult to justify for the full 26-mile facility and be hard to communicate. With differing levels of congestion along the corridor, a single toll for the entire corridor would not optimize revenue and result in the efficient use of this corridor as noted earlier.

In Strategy 2 if congestion varies widely throughout the corridor, the toll will need to be set to maintain traffic flow in the most congested area. As noted above, this will have negative revenue and efficiency impacts.

In Strategy 3, without time of day or congestion included as pricing factors, the per-mile price would need to be set to handle the peak demand at the peak location. This will reduce revenue and result in inefficient use of the ML facility.

In Strategy 4 adding time of day to Strategy 3 allows for peak period pricing and improves the efficiency of the facility. It does not, however, allow differential pricing along the corridor.

In Strategy 5, this is a variation distance based pricing in Strategy 3. Weekend schedules and peak-period schedules could be added.

In Strategy 6, if free-flow is maintained on the ML, then travel time should be directly proportional to travel distance. As the report notes, speeding could be a problem.

In Strategy 7, a flat toll was included for comparison purposes, but is not practicable as a traffic management tool. This is the simplest of all the strategies and probably the least efficient and effective to meet the ML goals.

Strategies 8, 9 and 10 would divide the corridor into defined segments with each segment having relatively uniform levels of main lane congestion. In Strategy 8 the price, which would reflect the length of the segment, would vary in response to traffic conditions on each ML segment. Strategy 8 is a segmented version of Strategy 2 designed to overcome the problems resulting from differing levels of congestion along the corridor. Strategy 9 is simply a segmented version of Strategy 4. “Management by segment" in Strategy 10 is an approach that appears most appropriate for I-5 because it

allows for the greatest latitude in managing the roadway based on differing traffic conditions. Explaining this tolling scenario would be difficult unless the tolling value is assessed on a "per mile" basis and known at the point of entry. This strategy was also adopted for the I-15 corridor, meaning that its adoption on I-5 would represent regional consistency in how toll rates are applied and understood by the public. The only difference on I-5 is that over time, tolling may eventually have to include pricing the HOV-2 occupant users when they overwhelm the ML capacity. This approach to pricing would also be appropriate for staging the project, where toll rates per mile might start quite low and grow over time.

Minimum and Maximum Tolls

Previous analysis on I-15 raised concerns over the need to apply minimum and maximum tolls to better regulate trip desires and avoid overloading the ML at specific bottlenecks. The parallel analyses conducted on I-5 indicate that recurring ML bottlenecks, focused on the south end of the corridor, will be more likely than randomly occurring along the corridor. Further, the likelihood of weaving in and out of the ML is only related to slip ramp locations with the main lanes, since electing to use a DAR will impose a much greater time penalty of users and eliminate them from being able to quickly traverse the corridor. The spacing of slip ramps is recommended to be quite limited, with up to six intermediate slip ramp sites over the 26-mile project length. Spacing of these access openings will range from under three miles to five miles. Accordingly, the ability for tolled traffic to weave into and out of the ML is very limited. The I-15 toll feasibility recommendations suggested a five-mile minimum trip, and this minimum distance threshold is within the range that would otherwise occur between some successive at-grade slip ramps based on the current I-5 design.

These design characteristics for the I-5 ML suggest that setting a minimum toll may not be required. A minimum toll during rush hours, based on current modeling results using $0.26/mile from I-15 averages, will be above $0.75 per trip and more likely close to $2.00 per trip in the most heavily used sections to the south were costs per mile may be increased to manage demand. Setting a minimum toll would not appear to improve traffic management capability, but may have advantages related to corridor equity when compared to I-15. The complexities of establishing a minimum toll do not appear to merit separate signing and motorist communication.

Setting a maximum toll may be desirable for a variety of reasons. To effectively manage demand during certain hours, tolls will need to be raised to a very high level, based on I-15 and SR 91 experiences. If the same level of per-mile toll applied to I-15 at the current $4.00 for eight miles were needed to manage demand on I-5, at least on the southern sections of the project, this would result in an equivalent through trip toll of at least $12.00. Pricing and behavioral instability could result without the application of some form of maximum toll, since the per mile rates which might be needed to manage demand on certain sections of the project could result in high through trip tolls which are so high as to discourage them. Demand forecasts for I-5 suggest that few users will be through trips for the entire 26 miles. Most enter and exit at various access locations and traverse a portion of the corridor, with a higher demand concentrated in the southern seven miles of the project. Based on this demand profile, there are several rationales that might be applied to establish a policy for a maximum toll. Social equity suggests that the maximum toll be kept rather low, but not so low as to prevent effective lane management. A maximum toll might need to be up to $1.00 per mile based on current

experience. If so, then the maximum toll applied to the section from Manchester south could incur the same value as traveling the entire 26-mile corridor, or a value of about $7.00. Setting a maximum value in this fashion would provide more financial equity to both long and short distance trips and not penalize users who enter at the north and travel through to the south. Typical per mile rates applying a maximum toll are shown in this example in Table 3-3.

TABLE 3-3: TYPICAL PER MILE RATES WITH MAXIMUM TOLLS

Per Mile Rate	Typical Maximum Toll (1)	Through Trip Toll without Maximum (2)
$ 0.20	$ 1.40	$ 5.00
0.40	2.80	10.00
0.60	4.20	15.00
0.80	5.60	20.00
1.00	7.00	25.00

(1) Maximum is based on a 7-mile trip.
(2) Through trip is 26 miles.

3.3 COMPARATIVE ATTRIBUTES

This section provides a comparison among the different scenarios and their effects on system application. Both toll rates and comparative attributes are discussed.

3.3.1. Toll Rates

Different types of trips, which would result from the various pricing options, may result in different toll rates. This section provides a cursory comparison for possible toll rates for sample trips using the different toll scenarios.

TABLE 3-4: COMPARISION OF TOLL RATES FOR VARIOUS TRIP TYPES

(Based on $0.30 per mile equivalents)

Toll Concept	7-Mile Trip South End	5-Mile Trip North End	12-Mile Trip	Through Trip (26 Miles)
Flat Toll –Standard	$ 4.50	$4.50	$4.50	$4.50
Flat Toll –Max. Trip	2.10	1.50	2.10	2.10
Per Mile w/ Maximum	2.10	1.50	2.10	2.10
Per Mile no Maximum	2.10	1.50	3.60	7.50
Per Mile-Skewed w Maximum	4.20	1.50	4.20	4.20
Per Mile-Skewed no Maximum	4.20	1.50	4.20-5.70	9.60
Segment Toll-Standard	2.16	2.16	4.32	7.56
Segment Toll-Skewed	4.32	2.16	4.32-6.48	9.72

- Maximum toll is based on 7-mile trip.
- Standard flat rate is based on a nominal 15-mile trip.
- Average segment length is 3.6 miles.
- For this example, the south two segments are assumed to be more congested than the north segments and assumed for skewed tolling.
- Skewed toll rate multiplier is 2 times the standard toll rate per mile.

3.3.2. Comparative Attributes

This section compares the pricing strategies in regards to the various attributes and evaluation criteria which both reflect the feasibility and on differentiators that help influence selection. Table 3-5 presents a useful comparison for each of the major pricing strategies with respect to a number of attributes and criteria. In each case, the strategy is generally rated for preset versus dynamic pricing. The table suggests that as real-time demand management characteristics are improved, the level of complexity can grow and potentially adversely affect its implementation and acceptability. This level of complexity needs to be weighed against public perceptions of how understandable the tolling strategy is to the end user. Trade-offs are involved in recommending the most appropriate tolling strategy and its acceptance by corridor users and stakeholders.

TABLE 3-5: COMPARATIVE ATTRIBUTE MATRIX – ALTERNATIVE PRICING STRATEGIES

			Demand Management Attributes			Public Acceptance		
Toll Strategy	**Toll Variation**	**Trips Favored**	**Overall Effectiveness**	**Impacts on General Traffic**	**Revenue Generation**	**Public Perceptions**	**Equity**	**Signing/ Communication**
Flat Toll – Standard	Pre-set Dynamic	Long	Low-Medium Medium-High	High High	Medium Medium	High High	Low Low	Simple Medium
Flat Toll –Max. Trip	Pre-set Dynamic	Long	Low Medium	Medium Medium	Low Low	High High	Medium Medium	Simple Medium
Per Mile w/ Maximum	Pre-set Dynamic	Medium	Medium	Low Low	Low Low	Moderate Moderate	High High	Medium Complex
Per Mile no Maximum	Pre-set Dynamic	Medium	Medium High	Medium Medium	Medium Medium	Moderate Low	Medium Medium	Medium Complex
Per Mile-Skewed w Maximum	Pre-set Dynamic	Long	Medium High	Low Low	Medium Medium	Moderate Low	Medium Medium	Medium Complex
Per Mile-Skewed no Maximum	Pre-set Dynamic	Short	High High	Low Low	High High	Low Low	High High	Medium Medium
Segment Toll-Standard	Pre-set Dynamic	Short	Low Medium	Low Low	Medium Medium	Moderate	Medium Medium	Medium Complex
Segment Toll-Skewed	Pre-set Dynamic	Medium	Medium High	Medium Medium	High High	Low	Medium Medium	Medium Complex

Toll equity is best achieved for per mile rates, while flat tolls would have the lowest equity. But flat tolls will encourage longer trips, as would tolls that have maximum caps. The introduction of maximum tolls would moderate some of the potential weaving and discretionary travel that would be less than trip desires require.

As noted in the goals and objectives discussion, managing demand in the ML facility is key to maintaining mobility and acceptable level of service. Table 3-5 provides a ranking for overall effectiveness of each toll strategy, impacts on general traffic (based on the level of weaving likely to occur at specific ingress/egress locations.

3.4 RECOMMENDATION

Based on the high level of forecast demand for I-5, likelihood that congestion will exist and grow in both direction and directionality, and similarity these attributes have to analyses conducted on the I-15 corridor, a dynamic, skewed pricing strategy is recommended for adoption on the I-5 North Coast managed lanes. Additional tolling scenarios such as flat, segment, and per-mile tolls are considered in revenue analysis (Chapter 6). Additional analysis on the toll structure and algorithm will be needed as the project moves into the design phase.

CHAPTER 4

TRAFFIC FORECASTS

4.1 METHODOLOGY

An enhanced version of the SANDAG regional travel model was used to develop traffic estimates and forecasts for the I-5 North Coast corridor. The enhancements involved extending the ability of the model set to appropriately analyze high occupancy (HOV) and high occupancy toll (HOT) demand in the San Diego region. Specifically, the mode choice model has been enhanced to account for the attributes which affect HOV and HOT demand in a more state-of-the-practice manner. The mode choice model enhancements were calibrated to the extent possible against observed data. Existing traffic data is separately presented in Chapter 2.

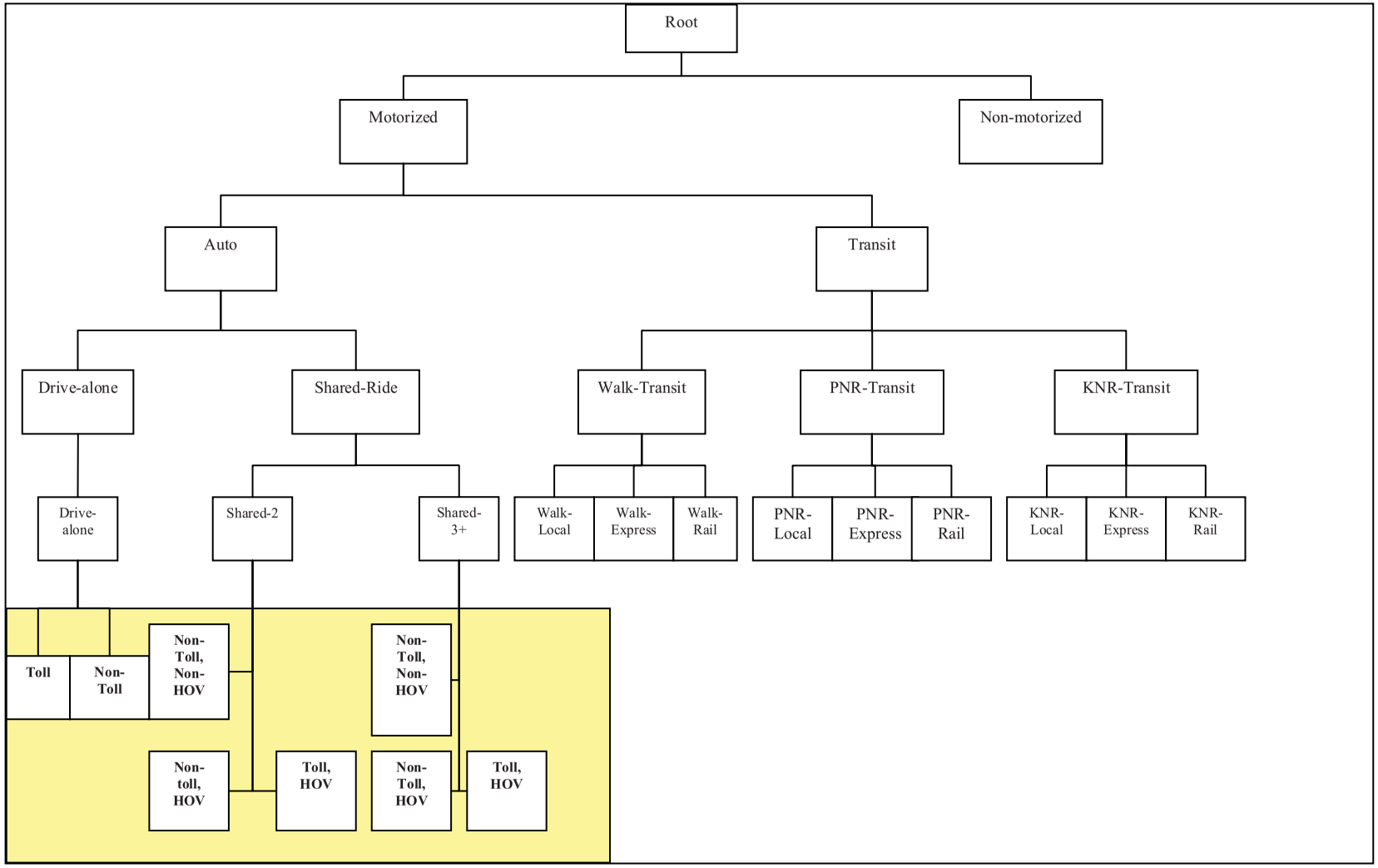
4.1.1. SANDAG Model Enhancement

The SANDAG regional travel demand model was enhanced to allow explicit representation of HOV and toll trips. This enhancement was performed by extending the SANDAG logit mode choice model to consider toll and HOV highway travel separately from general purpose lane highway travel. This is similar to the model's method for differentiating between local, express, and premium transit modes. Figure 4-1 shows the revised model nesting structure. The new modal alternatives for the model, in bold, are nested under the drive-alone, shared-ride (two occupants) and shared-ride (three or more occupant [3+]) auto alternatives. The new modal alternatives for the model are:

- Drive Alone Non-Toll
- Drive Alone Toll
- Shared Ride 2, Non-Toll, Non-HOV
- Shared Ride 2, Non-Toll, HOV
- Shared Ride 2, Toll
- Shared Ride 3+, Non-Toll, Non-HOV
- Shared Ride 3+, Non-Toll, HOV
- Shared Ride 3+, Toll

This structure allows the mode choice model to explicitly trade-off the time and costs associated with each of the highway paths. The model is segmented by household income; thus, low-income travelers are more sensitive to cost, while high-income travelers are less sensitive to cost and therefore more willing to pay to use toll facilities. The model predicts the number of trips that can use each mode. Each mode's trips are then assigned to the highway network, with the appropriate highway links available (for example, drive-alone non-toll trips are prohibited from using toll lanes).

FIGURE 4-1: REVISED SANDAG MODE CHOICE MODEL STRUCTURE



The implementation of this enhancement involved a number of changes to the SANDAG model system:

1) Highway networks applied a specific code identifying whether the link is general purpose or managed lane. The codes are stored in LINK GROUP 3 and have the following values:

LINK GROUP CODE	DESCRIPTION
1	General Purpose Lane
2	HOV-2+ (no toll)
3	HOV-3+ (no toll)
4	General Toll (all occupancies)
5	HOT-1 (DA Pay. HOV-2, 3+ Free)
6	HOT-2 (DA, HOV-2 Pay. HOV-3+ FREE)

2) A set of TRANPLAN procedures were written to build level of service (LOS) matrices (termed "skims") for all highway modes. Each highway mode skim includes time and distance. In addition, HOV and toll lane skims include the time and distance traveled on the managed lane only.

The following table indicates what links are available to each mode for building LOS matrices and for trip table assignment:

	Facility*	General Purpose	HOV-2+ (no toll)	HOV-3+ (no toll)	Toll (all)	HOT-1 (HOV-2, 3+ Free)	HOT-2 (HOV-3+ Free)
	Link Group 3 Code	**1**	**2**	**3**	**4**	**5**	**6**
Modes	Drive-Alone Non-Toll	X					
	Drive-Alone Toll	X			X	X	X
	Shared-Ride 2, Non-Toll, Non-HOV	X					
	Shared-Ride 2, Non-Toll, HOV	X	X			X	
	Shared-Ride 2, Toll (w or wo HOV)	X	X		X	X	X
	Shared-Ride 3+, Non-Toll, Non-HOV	X					
	Shared-Ride 3+, Non-Toll, HOV	X	X	X		X	X
	Shared-Ride 3+, Toll (w or wo HOV)	X	X	X	X	X	X

* X Indicates Availability to Mode

3) The FORTRAN program used to combine AM peak period and PM peak period LOS matrices into peak period level of service matrices for mode choice was revised to process the new highway matrices.

4) The FORTRAN mode choice application program was revised to implement the new nesting structure, as well as restructuring to allow income-specific cost coefficients and peak and off-peak alternative-specific constants by mode. The program was also

modified to produce trip tables in origin-destination format for all of the new highway modes. A number of other changes were implemented as part of this process.

5) A set of TRANPLAN procedures was developed to assign the new trip tables to the highway network using an equilibrium capacity-restraint multi-class assignment algorithm. This functionality is only available in the PC version of TRANPLAN. Therefore, part of the model application process involves porting Unix-based trip tables and highway networks to the PC computer environment, assigning trip tables manually on the PC, and then uploading results back to Unix. Much of this is automated within batch files developed specifically for this study.

4.1.2. Corridor Calibration

The model enhancements were calibrated to observed data collected from users of the existing HOT lanes in the parallel I-15 corridor in San Diego. This project is two reversible managed lanes that parallel the I-15 general purpose lanes for approximately eight miles between State Routes (SR) 56 to the north and SR 163 and SR 52 to the south. The I-15 managed lanes operate in the inbound direction (south to San Diego) in the AM peak period, and outbound in the PM period. It also operates in the off-peak mid-day period, switching between inbound and outbound between 11:00 a.m. and 1:00 p.m. In 2000, the lane operated between 5:30 a.m. and 7:30 p.m., except for the two hours between 11:00 a.m. and 1:00 p.m. Users of the reversible lanes include solo drivers, who pay a variable toll that is determined by traffic density in the reversible lanes, and carpoolers (two or more occupants) can use the roadway for free.

SANDAG provided a summary of number of vehicles observed using the I-15 managed lanes for 2000, broken out by FasTrak™ toll users (drive-alone toll), and HOV users, in one-half hour increments, along with the average toll paid by the FasTrak users for each increment. This data was averaged across the month of October to develop observed target values of number of HOV and toll vehicles on the lane and average toll paid in the peak period (6:00 to 9:00 a.m. and 3:00 to 6:00 p.m.) and the off-peak period. According to the data, the average toll paid in the peak period was $2.00, and the average toll paid in the off-peak period was $0.75.

In addition data were compiled from the I-15 users panel survey conducted by the University of California at Irvine between Fall 1997 and Fall 1999. The data were summarized to determine the number of FasTrak trips by income group and trip purpose, consistent with those used in the travel demand model. These data were used to compute calibration target values for mode choice alternative-specific constants for each of the modes in the enhanced model. The mode choice models were then calibrated to match these values by purpose, period and income group.

I-15 Corridor Validation Results

Validation of model results in the I-15 Corridor focused on two areas. The first tests involved a comparison of model estimated HOV and HOT (or FasTrak) vehicle demand to observed HOV and FasTrak vehicle demand in the I-15 corridor. Although the I-15 corridor is not the subject of the I-5 managed lane study, the presence of managed lanes in the I-15 corridor provides an opportunity to check model performance against locally observed data. If the model is successful in reasonably matching observed HOV/HOT demand in the I-15 corridor, then forecasts of HOV/HOT demand in the I-5 North Coast corridor can be made with increased confidence. Table 4-1 presents a

comparison of observed and model estimated HOV and FasTrak (HOT) demand in the I-15 corridor.

TABLE 4-1: I-15 OBSERVED AND ESTIMATED 2000 HOV AND FASTRAK DEMAND

TIME PERIOD	DIRECTION		HOV	FASTRAK	TOTAL
AM Peak	Inbound	*Observed*	4,094	1,846	5,940
		Model Estimated	2,992	1,799	4,791
PM Peak	Outbound	*Observed*	5,123	1,618	6,741
		Model Estimated	3,960	1,306	5,266
Off Peak	Inbound	*Observed*	1,154	364	1,518
		Model Estimated	2,032	442	2,474
	Outbound	*Observed*	2,623	604	3,226
		Model Estimated	2,046	434	2,480

Source: PB – 10/2004

In addition to a comparison of HOV/HOT modal volumes in the corridor, the model's ability to reasonably replicate observed traffic volumes for all modes is an important aspect of the model validation. Table 4-2 contains a comparison of counted and model assigned volumes at three different locations in the I-15 corridor.

TABLE 4-2 COMPARISON OF 2000 VOLUMES* I-15 MAIN LANES

Count Location	Time Period			
	AM Peak	Off-Peak	PM Peak	Daily
Station 935 - Lake Hodges				
Count	42,505	125,981	48,040	216,526
Assigned	52,507	141,298	62,483	256,288
% difference	24%	12%	30%	18%
Station 980 - Carmel Mountain Road				
Count	47,054	135,064	47,879	229,997
Assigned	44,078	112,805	49,366	206,249
% difference	-6%	-16%	3%	-10%
Station 999 - Carroll Canyon Road				
Count	61,956	168,190	64,383	294,529
Assigned	47,510	137,017	58,001	242,528
% difference	-23%	-19%	-10%	-18%

* unadjusted volumes
Source: PB – October 2004

For all observed count locations and for all times of day, the level of agreement between the counted and assigned traffic volume is within generally accepted error tolerances, particularly those for the time of day periods. The level of agreement in observed and model assigned traffic volumes on a daily basis is, however, at the outer edge of acceptable level of error.

I-5 North Coast Corridor

In addition to validating model performance in the region's existing managed lane corridor, it is important to evaluate model performance in the corridor that is the subject of the managed lane study. Occupancy characteristics of drivers in the I-5 North Coast corridor are a critical element to the level of demand for a managed lane facility in the corridor. Therefore, an appropriate measure of model performance in the I-5 North Coast corridor is a comparison of the model's estimate of trips by occupancy against observed occupancy levels. Table 4-3 contains a comparison of observed and model-estimated traffic volumes by occupancy level at a specific representative location in the I-5 North Coast corridor.

TABLE 4-3 2000 SOUTHBOUND AM PEAK PERIOD OBSERVED VS. MODEL ESTIMATED OCCUPANCY

I-5 @ Via Del Valle				
Mode	Observed Volume	Share	Model-Estimated Volume	Share
Drive-Alone	14,049	87.7%	18,777	88.0%
2-person	1,690	10.5%	1,957	9.2%
3-person	284	1.8%	609	2.8%

Source: PB – October 2004

The model estimated occupancy data compares very favorably with data collected in the I-5 North Coast corridor. Based on this comparison, the model should be expected to reasonably estimate corridor occupancy characteristics and responses by those using the corridor to changes in LOS for the different occupancy modes.

A comparison of total assigned traffic on I-5 to observed traffic counts also provides a means to determine the adequacy of the model's performance in the corridor. Using traffic counts from 2001 through 2003, estimated 2000 traffic counts were developed. These estimated counts are presented in Table 4-4 along with the model assigned daily traffic volumes at five locations in the I-5 North Coast.

The data in Table 4-4 indicates that the model appears to be under-estimating traffic in the corridor other than in the far northern end of the corridor near Camp Pendleton. The traffic assignment results are within generally accepted error margins in the southern and northern ends of the I-5 North Coast corridor. Assignment results appear a bit low in the central portion of the corridor. Further analysis involving screenlines would be necessary to determine whether this is a trip distribution problem or one related to highway assignment.

TABLE 4-4: 2000 MODEL ASSIGNED AND COUNTED VOLUMES COMPARISON ON I-5

	2000						
	Estimate of Counted Weekday Volume			Model Assigned Weekday Volume			% Difference - Assigned vs. Counted
Count Location	NB	SB	TOTAL	NB	SB	TOTAL	TOTAL
I-5 s/o Lomas Santa Fe	109,871	110,499	220,369	96,426	93,708	190,134	-13.7%
I-5 s/o Encinitas Boulevard	104,881	111,806	216,687	79,955	77,115	157,070	-27.5%
I-5 s/o Leucadia Boulevard	104,473	101,903	206,376	81,878	76,276	158,154	-23.4%
I-5 s/o Tamarack Avenue	99,604	100,814	200,418	78,638	79,373	158,011	-21.2%
I-5 n/o Camp Pendleton	64,234	65,046	129,280	78,893	79,593	158,486	22.6%

Source: PB – October 2004

4.2 ANALYSIS YEARS

To evaluate the long term impact of a managed lane facility on the I-5 North Coast corridor as well as the potential near term demand for a managed facility, travel forecasts were developed for a horizon year as well as an intermediate year. The years chosen as the horizon and design year were those for which provided appropriate time frames to evaluate the effect of a managed lane on travel in the I-5 North Coast corridor as well as those for which travel model inputs were readily available. The long term evaluation of the various alternatives was done for the same year as of horizon year for SANDAG's Regional Transportation Plan (RTP) which is currently 2030. The year chosen for intermediate year analysis was 2015 because the current I-5 North Coast project anticipates that most if not all of the project along this corridor will be operational by then.

For both analysis years, data developed and analyzed included daily and peak hour traffic volumes on the managed facility as well as the general purpose lanes. Additionally, peak hour managed lane demand by vehicle occupancy level was developed and reviewed along with level of that demand relative to the assumed LOS policies of the managed lane. An evaluation of the share of I-5 North Coast corridor traffic demand accommodated in the managed lanes both on a daily and peak hour basis was also performed.

4.2.1. Intermediate Year Analysis (2015)

In order to evaluate the performance of the Build alternatives in a near term year prior to the design year, analysis was performed for 2015. This analysis was done to develop data that would provide the opportunity to evaluate phased implementation of the Build alternatives in the context of expected 2015 travel demand and the expected 2015 regional transportation system. Demographic and network assumptions used in this analysis were consistent with SANDAG's RTP phasing. Additional detail regarding demographic and network assumptions are provided in Chapter 5 of this report.

4.2.2. Design Year Analysis (2030)

Analysis of the No Build and Build alternatives was performed for the horizon year of SANDAG's RTP. Analysis of the alternatives in 2030 allowed for evaluation with respect to the expected growth in the region and development of the transportation system over the course of the MTP time frame. The 2030 analysis also was used a mechanism to evaluate an issue related to the configuration of a potential managed facility in the I-5 North Coast corridor. Specifically, 2030 analysis was used to evaluate intermediate access options of the managed facility along the corridor.

4.3 ALTERNATIVES

Along with a No Build alternative, two different Build alternatives were evaluated. The only variation among the two Build alternatives was in the assumed number of general purpose lanes on I-5. Although the operational details of the Build alternatives included options for buffer and barrier-separated managed lanes, the nature of the separation between I-5 general purpose lanes and I-5 managed lanes is such that there would be no difference in the context of regional travel demand analysis. The No Build alternative was analyzed only for 2030 for comparison purposes in the analysis.

The transportation networks used to represent the Build alternatives were based on networks developed by SANDAG and/or Caltrans as a starting point. The proposed I-5 Build alternatives were then added to these networks.

4.3.1. No Build Alternative

The No Build alternative makes use of the same network that was developed by Caltrans for a prior I-5 North Coast corridor modeling effort but with the added feature of braided local general purpose access ramps at Genesee. The No Build network includes an HOV lane in the I-5 North Coast corridor from the I-5/I-805 interchange to Manchester at the northern terminus. The No Build alternative also includes the I-5/SR 78 and I-5/SR 56 freeway-to-freeway connectors.

4.3.2. Build Alternatives

”8+4” Alternative

This includes four managed lanes and eight general purpose lanes (a total of six in each direction) in the I-5 North Coast corridor. For purposes of lane balancing at particular interchanges, short sections include ten general purpose lanes (counting auxiliary lanes). Also included are the I-5/SR 78 and I-5/SR 56 freeway-to-freeway connectors Full direct access (i.e., all movements) to the I-5 managed lanes is assumed via Direct Access Ramps (DARs) at Oceanside, SR 78 HOV, Cannon, Manchester, Voigt and at Lusk on I-805 south of the I-5/I-805 split. This alternative also assumes that ramps to the general purpose lanes at California Street, Cassidy Street, and Las Flores Drive remain open.

For the intermediate year analysis, the DARs were modified, with one exception, to be half-DARs under the logic that demand would such that full-DARs would not be needed in the year 2015. The DARs at Oceanside, Cannon, Manchester are south-facing DARs and provided access for movements to and from I-5 to the south. The DARs at Voigt and Lusk are north-facing and provide access for movements to and from I-5 AND I-805 (in the case of Lusk). The I-5/SR 78 DAR is assumed to all full access DAR

“10+4” Alternative

This alternative is identical to the 8+4 alternative except for the configuration of the general purpose lanes which expands from eight lanes to ten lanes, from the I-5/I-805 split to SR 78 (a total of seven lanes in each direction). Access to and from the managed lanes are identical to those of the 8+4 alternative. This alternative was also used to evaluate intermediate managed lane access through the analysis of an unlimited access scenario as described in Section 4.4 below.

For the intermediate year analysis, the DARs were modified, with one exception, to be half-DARs under the logic that demand would such that full-DARs would not be needed in the year 2015. The DARs at Oceanside, Cannon, Manchester are south-facing DARs and provided access for movements to and from I-5 to the south. The DARs at Voigt and Lusk are north-facing and provide access for movements to and from I-5 AND I-805 (in the case of Lusk). The I-5/SR 78 DAR is assumed to all full access DAR.

4.3.3. Scenario for Increasing HOVs to 3+

At the outset of the modeling effort, it was initially assumed that the pricing policy under which the managed lanes would be operated would charge only drive-alone vehicles

(SOVs). Upon completion of some initial analysis of the Build alternatives for 2030, a desire to understand the impact of a HOV-2+ pricing strategy on managed lane demand came about because this demand was so large in 2030 that it overwhelmed four managed lanes, and in effect, indicated that the lanes could not be effectively managed without raising the occupancy requirements during the peak hours.

For this reason, two tolling scenarios were evaluated for the Build alternatives in the horizon year of 2030. The first scenario involved pricing of SOV vehicles only and no pricing of shared ride vehicles. Under this scenario SOV vehicles were priced on a per mile basis in an amount equivalent to that currently experienced on the I-15 managed lanes – an amount of $0.26 per mile in the peak period and $0.10 per mile in the off-peak period. The second tolling scenario assumed that HOV vehicles with 2 persons would be tolled at half of the rate of SOV vehicles and that 3+ person HOV vehicles would be free.

The purpose for this additional testing was to analyze the level of demand in the managed lane in association of different tolling policies that may be necessitated by excessive HOV demand. The determination of the most appropriate tolling policy given the goals of implementation of the managed lanes is not addressed in this report, but is addressed in the overall study recommendations. Further evaluation of revenue impacts of this same set of scenarios also was conducted in conjunction with the Revenue Analysis (Chapter 6) and is discussed in that respective document.

4.3.4. Intermediate Access Scenarios

Restricting access can both help manage lane demand and also provide for means of collecting and distributing demand at locations where it can best be accommodated with the adjacent mainlanes and local street network through DARs. The Build alternatives include DARs at five selected cross streets along the corridor. Access points along the I-5 North Coast corridor with the adjacent main lanes, referred to in this analysis as intermediate access locations, were the subject of study and evaluation through selected traffic simulations created for the two Build alternatives from forecast demand.

Modeling of both the 8+4 and 10+4 alternatives for 2030 was conducted for a scenario which provided virtually unlimited access between the general purpose lanes and the managed lanes. The unlimited intermediate access scenario was not considered a realistic scenario, but rather was used as a benchmark to evaluate locations where intermediate access might or might not be viable from a demand perspective.

Intermediate HOV/ML access points and the constrained and restricted fatal flaw analyses were developed by Caltrans staff. Decision-making on the final intermediate access points that were carried into modeling for the limited intermediate access scenarios also was driven by operational, environmental, and physical limitations (those areas with “fatal flaws”), as identified in Caltrans separate analysis activities as part of the project’s parallel environmental process.

Unlimited Intermediate Access Scenario

Unlimited intermediate access points, virtually unlimited access between the general purpose lanes and the managed lanes, were tested for Build alternative model runs with DAR locations to determine appropriate access points between the managed lanes and the general purpose lanes. This effort was to assist in decision-making for intermediate access locations, as it was anticipated to determine the sensitivity of demand for managed lanes. The result, further discussed in the Section 6 below, identified no effect

on managed lane volume. For this reason, the decisions on limiting intermediate access locations could be done in accordance with other issues associated with limiting the number of toll zones, minimizing operational conflicts with right-side access locations and environmental constraints.

Limited Intermediate Access Scenario

Based upon the knowledge that travel demand was not influenced in a substantial way by the location of intermediate access locations, the locations were deemed feasible and located based upon other controlling criteria and provided to Caltrans for evaluation in their environmental work. The intermediate access locations are defined in Tables 4-5 and 4-6. The traffic volumes generated from these model runs served as the basis for the analysis and evaluation as presented in the results section.

TABLE 4-5: SOUTHBOUND INTERMEDIATE ACCESS LOCATIONS

Southbound Access Point		
Name	**Entrance from**	**Exit to**
Pendleton	I-5 South	Harbor/Vandegrift, SR 76, Mission
Oceanside	Harbor/Vandegrift, SR 76	Cassidy, Las Flores, Carlsbad Village, Tamarack
Carlsbad	Cassidy, Las Flores, Carlsbad Village, Tamarack	Cannon, Palomar Airport, Poinsettia
Batiquitos	Tamarack, Cannon, Palomar Airport	La Costa, Leucadia, Encinitas
Encinitas	Palomar Airport, Poinsettia, La Costa, Leucadia	Santa Fe, Birmingham, Viewpoint, Manchester, Lomas Santa Fe
Solana Beach	Encinitas, Santa Fe, Birmingham, Manchester	Via de la Valle, Del Mar Heights, SR 56 East, Carmel Mountain, Carmel Valley
Carmel Valley	Lomas Santa Fe, Via de la Valle	I-805 South, I-805/Mira Mesa, Genesee
After the split, along I-805		
Sorrento	Del Mar Heights, Carmel Valley, SR 56 West, Carmel Mountain	I-805 South
After the split, along I-5		
University	Carmel Valley, SR 56 West, Carmel Mountain, Sorrento Valley, Genesee	I-5 South

Source: PB

TABLE 4-6: NORTHBOUND INTERMEDIATE ACCESS LOCATIONS

Northbound Access Point		
Name	**Entrance from**	**Exit to**
Pendleton	California, Oceanside, Mission, SR 76, Harbor/Vandegrift	I-5 North
Oceanside	Cannon, Tamarack, Carlsbad Village, Las Flores, SR 78/Vista, California	Harbor/Vandegrift, SR 76
Carlsbad	La Costa, Poinsettia	Tamarack, Carlsbad Village, Las Flores, Mission
Batiquitos	Santa Fe, Encinitas, Leucadia	Poinsettia, Palomar Airport, Cannon
Encinitas	Santa Fe, Birmingham, Viewpoint, Manchester, Lomas Santa Fe	Encinitas, La Costa, Leucadia
Solana Beach	Via de la Valle, Del Mar Heights, SR 56 West, Carmel Mountain, Carmel Valley	Encinitas, Santa Fe, Birmingham, Manchester
Carmel Valley	I-805 North, I-805/Mira Mesa, Genesee	Lomas Santa Fe, Via de la Valle
After the split, along I-805		
Sorrento	I-805 North, Mira/Mesa Sorrento Valley	Del Mar Heights, Carmel Valley, SR 56 East, Carmel Mountain, Via de la Valle
After the split, along I-5		
University	I-5 North	SR 56 East, Carmel Mountain, Del Mar Heights, Sorrento Valley, Genesee

4.4 ASSUMPTIONS

The following sections detail the basic input assumptions that were used and in some cases varied to create different scenarios among the two Build alternatives. All assumptions used are taken directly from the standard SANDAG model assumptions or were developed in consultation with SANDAG and Caltrans staff.

4.4.1. Background Roadway Network

The Design Year network outside the I-5 North Coast corridor represents SANDAG's MOBILITY 2030 RTP "Reasonably Expected" network. This network is based upon the No Build network, which is the same network developed by Caltrans for a prior I-5 North Coast corridor modeling effort. For this study, the No Build network also included the following: the feature of braided local general purpose access ramps at Genesee; an HOV lane in the I-5 North Coast corridor from the I-5/I-805 interchange to Manchester at

the northern terminus; and the I-5/SR 78 and I-5/SR 56 freeway-to-freeway connectors. This background roadway network also includes both priced and HOV lane facilities in other corridors. There are assumed priced managed lanes on I-805 between I-5 and SR 905, I-15 between SR 78 and SR 163 and SR 52 between SR 125 and I-15 in the background roadway network. The background network includes HOV lanes on I-5 between I-805 and SR 905, I-15 between SR 163 and SR 94, SR 125 between I-8 and SR 54, SR 54 between SR 125 and I-5, SR 94 between SR 125 and I-5, I-8, between El Cajon and SR 125, SR 56 between I-15 and I-5, and SR 78 between I-15 and I-5.

The Intermediate Year network outside the I-5 North Coast corridor assumes all regional freeway, arterial, and transit system improvements anticipated by 2015. This network assumed priced facilities on I-15 between SR 78 and SR 163, on I-805 between I-5 and SR 52 and I-805 between SR 94 and SR 905. The background network assumed HOV lanes on SR 56 between I-15 and I-5, SR 125 between SR 94 and SR 54, SR 54 between SR 125 and I-805, and I-5 between downtown and SR 54.

4.4.2. Land Use and Demographics

The land use and demographic assumptions used in both the Design Year and the Intermediate Year analysis represent the SANDAG's adopted and approved forecasts for the year of analysis.

4.4.3. Managed Lane Configurations

All Build alternatives included direct access ramps (DARs) at the following locations: Oceanside, SR 78 HOV, Cannon, Manchester, Lusk, and Voigt. The evaluation of managed lane demand was performed relative to an assumed LOS C capacity of 1,650 per hour per lane. LOS worse than C (i.e., LOS D, E and F) are characterized by traffic flowing at less than free-flow rates and by stop-and-go traffic conditions. Based on discussions with SANDAG staff, it was assumed that the operational policies of the managed lanes would be such that the lanes would be allowed to operate at no worse than LOS C conditions during the peak periods.

Design Year

In the Design Year (2030) the DARs are assumed to be full DARs providing for all movements at each of the DAR locations.

Intermediate Year

In the Intermediate Year (2015) all DARs are assumed to be are "half-DARs" in this study meaning that they only provide for two respective movements oriented in one direction at the access point. The movements for which direct access is provided vary among the locations. The Oceanside, Cannon, Manchester DARs are south-facing half DARs while the Lusk and Voigt half-DARs are north-facing.

In the initial analysis of the 10+4 alternative, access to the managed lane was virtually continuous between the general purpose lanes and the managed lanes. This scenario was tested to initially identify the locations of highest demand for access to/from the managed lanes. This analysis would allow for the identification of those access points which would be carried forward into the limited access analysis where all movements are designated. Chapter 5 discusses ingress/egress volumes, which contains volumes on the unlimited access scenario analysis.

4.4.4. Tolling

Two alternative tolling assumptions were tested for both of the Build alternatives for the travel demand model. The first and most widely tested among the alternatives was a $0.26 per mile peak period SOV toll and a $0.10 per mile off-peak period SOV toll. Under this set of tolling assumptions, vehicles with two or more occupants are allowed to use the managed lane without being charged a toll. These tolling assumptions were used for the travel demand forecast modeling. The two analyses (demand forecast and revenue forecast) came from different control corridors. The tolling assumptions described above were derived from the I-15 average peak toll cost and distance traveled on the existing I-15 facility. Revenue forecasts assumed a toll based on SR 91, which actually hold lower assumed tolls than currently exist on I-15 in the peak period.

CHAPTER 5

FUTURE OPERATING CHARACTERISTICS

5.1 INTRODUCTION

This chapter summarizes forecast demand for various alternatives and future conditions associated with the I-5 managed lanes. These forecasts served as the basis for evaluating various pricing strategies for the managed lanes and for analyzing revenue associated with pricing the managed lanes. A traffic forecast analysis was performed based on the alternative pricing strategies. This analysis estimated traffic by time period and direction to determine expected use of the I-5 managed lanes. Forecasts were developed for single occupancy vehicles (SOV) use on managed lanes (ML), high occupancy vehicles (HOV), and general purpose traffic demand on I-5. This report also presents an overview of the methodology used in developing these forecasts. Traffic forecasts are included for each alternative for different horizon years.

The traffic volumes developed for this study are for the purposes of evaluating the viability of the HOV/ML as a concept toll facility for the I-5 corridor. Traffic volumes for design, operation analysis, and related environmental studies for the Project Report and Environmental Documentation are still being developed as part of the project development process.

5.2 METHODOLOGY

The enhanced SANDAG model, as described in Chapter 4, was used to develop forecasts for a No Build alternative and two Build alternatives: eight general purpose lanes plus four managed lanes (8+4) and 10 general purpose lanes and four managed lanes (10+4). Among the Build alternatives, two different pricing scenarios were tested using the enhanced SANDAG model. Although many other pricing scenarios are possible and could have been tested, it was felt that modeling of two scenarios offered sufficient information to determine feasibility – which was the primary goal of the study. The model was created by Caltrans staff using networks already developed by Caltrans and modified to be consistent with managed lane configurations and access locations collectively chosen by the project team.

The enhanced model was applied to develop peak period traffic forecasts, including separate forecasts for general purpose lanes and managed lanes. The model application also included development of forecasted traffic volume by occupancy level and toll usage.

The forecast was finalized by post-processing the peak period volumes using standard SANDAG procedures to develop peak hour traffic volumes. The peak hour and peak period forecasts were then later used for revenue analysis and traffic simulation along the project corridor, as described in Chapter 6, Revenue Analysis.

5.3 FORECAST RESULTS

The results of traffic forecasting for both the 8+4 and 10+4 alternatives for both analysis years and each of the access and tolling scenarios are presented in the following

sections. SANDAG's modeling procedures typically include the post-assignment adjustment of volumes to account for variations between model-predicted volumes and traffic counts in the Base Year as well as to account for the effects of future travel demand management programs on peak travel. These adjustments when applied to the forecasted managed lane traffic volumes predicted directly by the models, resulted in illogical relationships among peak hour, peak period and daily traffic forecasts. For this reason, traffic forecasts for the managed lanes were developed both with and without the post-assignment adjustments. The managed lane traffic forecasts used in revenue analysis were not taken through this adjustment process and are presented as "unadjusted" traffic volumes.

So as to adhere to local practice of presenting model forecasted volumes that have been adjusted through the post-assignment process, the mainlane volumes and managed lane share data presented below represent volumes that have been adjusted to account for variations between model-predicted volumes and traffic counts in the Base Year as well as to account for the effects of future travel demand management programs on peak travel. They are, therefore, presented as "adjusted" traffic volumes.

5.3.1. Mainline Volumes

Table 5-1 presents daily traffic volumes at seven different locations along the corridor for the No Build and Build alternatives for 2030. For the Build alternatives, forecasted mainlane volumes are presented for both managed lane pricing scenarios. As would be expected, the 8+4 alternative is forecasted to have lower main lane volumes that the 10+4 alternative. The HOV-2/SOV toll scenarios have higher main lane volumes that the SOV toll scenarios. This is due to the HOT lane being less attractive to HOV vehicles as a result of the tolling of HOV-2, albeit at a lower rate than SOV vehicles. The No Build scenario is forecasted to have higher main lane volumes that the 8+4 scenario under the SOV toll scenario throughout the entire corridor. This result is due to the No Build alternative containing the same number of general purpose lanes as the 8+4 alternative, but a managed facility that allows only HOV-2+ vehicles. Under the No Build alternative, SOV vehicles must use the general purpose lanes of the freeway.

TABLE 5-1: 2030 DAILY MAINLANE VOLUMES

LOCATION	No Build	10+4		8+4	
		SOV Toll	HOV-2 & SOV Toll	SOV Toll	HOV-2 & SOV Toll
North of SR 76	204,800	196,800	208,600	195,300	207,200
North of Carlsbad Village Dr.	237,000	234,500	242,500	224,000	231,500
South of Palomar Airport	227,000	228,500	236,300	216,000	223,800
North of Encinitas Blvd.	241,500	242,500	250,000	228,500	238,300
South of Manchester	272,500	284,500	294,100	269,500	284,200
South of Via De La Valle	292,000	304,000	312,200	292,500	304,500
North of SR 56	310,000	318,000	329,300	314,000	324,500

*adjusted volumes
Source: PB, November 2005

Table 5-2 presents daily traffic volumes for the Build alternatives for 2015 under the SOV toll scenario. As expected, the 10+4 alternative is forecasted to have more traffic in the general purpose lanes than the 8+4 alternative.

TABLE 5-2: 2015 DAILY MAINLANE VOLUMES*

BUILD ALTERNATIVES – SOV TOLL

LOCATION	10+4	8+4
North of SR 76	172,100	172,200
North of Carlsbad Village Dr.	203,000	194,800
South of Palomar Airport	196,900	187,100
North of Encinitas Blvd.	218,600	207,800
South of Manchester	252,500	242,400
South of Via De La Valle	261,400	256,400
North of SR 56	265,200	263,300

* adjusted volumes
Source: PB, November 2005

AM and PM Hour Traffic

Table 5-3 presents AM and PM peak hour traffic volumes for the I-5 main lanes at various points along the corridor for the No Build and Build alternatives for 2030. Data is presented for both tolling scenarios of the Build alternatives. The relationship of the alternatives among the peak hour data resembles very closely that of the daily traffic data. Generally speaking, the PM peak hour volumes are higher than the AM peak hour volumes.

TABLE 5-3: 2030 AM AND PM PEAK HOUR
GENERAL PURPOSE LANE VOLUMES*

	AM PEAK HOUR					PM PEAK HOUR				
		10+4		8+4			10+4		8+4	
LOCATION	No Build	SOV Toll	SOV/HOV-2 Toll	SOV Toll	SOV/HOV-2 Toll	No Build	SOV Toll	SOV/HOV-2 Toll	SOV Toll	SOV/HOV-2 Toll
North of SR 76	13,800	10,400	10,500	10,200	10,200	17,700	14,100	15,300	13,900	15,100
North of Carlsbad Village Dr.	15,100	14,800	14,300	13,500	12,900	14,700	15,100	15,700	12,800	13,700
South of Palomar Airport	14,000	15,000	13,900	12,200	11,900	14,403	14,700	14,900	12,400	12,900
North of Encinitas Blvd.	14,700	14,800	14,500	12,300	12,700	14,675	15,000	15,200	13,200	13,300
South of Manchester	15,470	18,200	17,300	15,400	15,600	16,260	17,500	18,300	15,700	16,900
South of Via De La Valle	17,041	19,700	18,200	17,600	17,000	18,685	19,600	20,200	18,300	19,100
North of SR 56	20,164	21,000	20,600	20,700	20,300	20,560	22,000	22,500	21,000	21,400

* - adjusted volumes

Source: PB, November 2005

Table 5-4 presents AM and PM peak hour mainlane volumes for the two Build alternatives for 2015. The results are from the SOV toll pricing scenario. As with the 2030 data, the 2015 data shows that PM peak hour volumes are higher than AM peak hour volumes and that the 10+4 alternative has higher general purpose lane volumes than the 8+4 alternative.

TABLE 5-4: 2015 AM AND PM PEAK HOUR GENERAL PURPOSE LANE VOLUMES

LOCATION	AM PEAK HOUR		PM PEAK HOUR	
	10+4	8+4	10+4	8+4
North of SR 76	9,100	9,100	13,800	13,900
North of Carlsbad Village Dr.	12,600	11,800	14,800	13,300
South of Palomar Airport	11,800	10,600	14,000	12,000
North of Encinitas Blvd.	13,300	11,900	15,200	13,200
South of Manchester	15,600	14,300	17,000	15,100
South of Via De La Valle	16,000	15,900	17,800	16,400
North of SR 56	16,900	16,700	18,100	17,500

* adjusted volumes

Source: PB, November 2005

5.3.2. Ingress/Egress Volumes

Figure 5-1 and 5-2 present managed lane ingress and egress Design Year AM and PM peak period volumes along the corridor for the 10+4 unlimited access scenario. Based on an analysis of these volumes, candidate intermediate access points between the managed lanes and adjacent general purpose lanes (i.e. non-DAR) were identified corresponding to the highest ingress and egress demand locations. These candidate locations were subsequently reviewed by Caltrans design staff to determine the suitability for intermediate ingress and egress at these locations based on potential design limitations such as limited right-of-way availability, proximity to adjacent interchange locations and sight distance limitations. A refined set of nine intermediate access points were identified and recommended for further evaluation. Figure 5-3 and 5-4 present AM and PM peak period volumes for the 10+4 scenario limited access alternative for the Design Year.

Based on the analysis of the two access scenarios, it was decided that analysis of the two Build alternatives should include only the limited access locations for both the Intermediate and Design Year. All analysis results presented in this document deal with the limited access scenario.

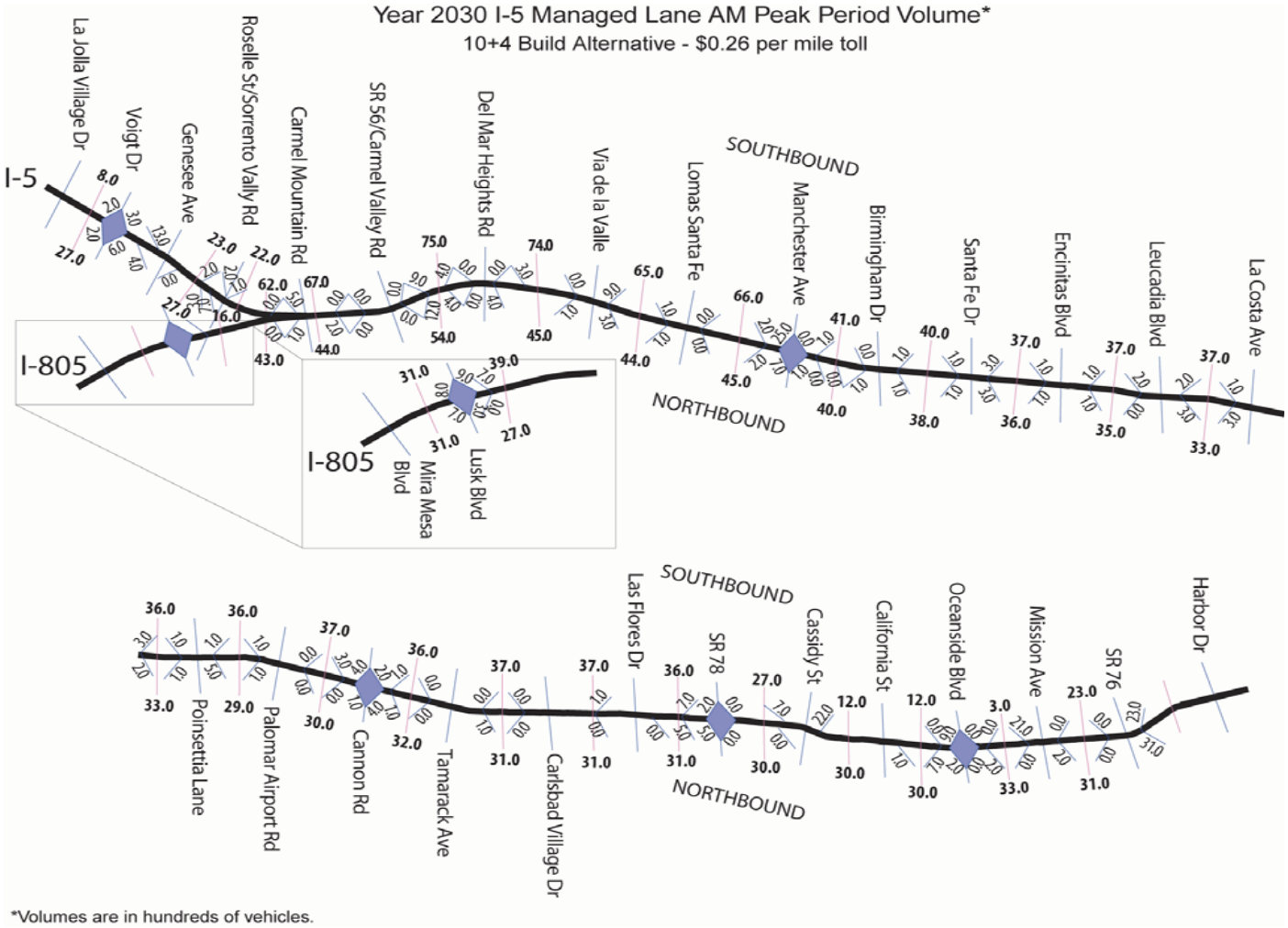
5.3.3. Managed Lane Volumes

Tables 5-5 and 5-6 present 2030 AM and PM peak hour and daily traffic volume summaries for four locations along the I-5 North Coast Managed Lanes under the SOV toll scenario of the two Build alternatives. Table 5-5 presents traffic volume data by occupancy level, total volume and proportion of that peak volume to the peak capacity. Table 5-6 presents similar data for the 8+4 alternative. As would be expected, managed lane traffic volumes increase from north to south and the level of use relative to capacity of the managed lane increases from north to south. These data show that in the southern section of the corridor, the managed lane is operating near or at LOS C in the PM peak hour in the 8+4 alternative and somewhat near capacity in the 10+4 alternative. This level of use was in part the reason behind the decision to test a second tolling scenario among the two Build alternatives for 2030.

The managed lane volume results for the AM and PM peak hours as well as daily traffic volumes for the second tolling scenario are presented in Tables 5-7 and 5-8. The 2030 data for the 10+4 and 8+4 alternatives, respectively for the tolling scenario under which HOV-2 vehicles were tolled at one-half the rate of SOV vehicles. As would be expected, the effect of this tolling policy was the substantial decrease in the amount of HOV-2 vehicles in the managed lane. The results indicated that the amount of SOV and HOV-3+ vehicles increased somewhat, but not substantially enough to offset the decrease in HOV-2 vehicles. The net result is that the managed lanes were forecasted to have much lower volumes of peak hour and daily traffic, which was, in part, the desired effect. A comparison of the proportion of volume to the LOS C capacity reveals that the managed lanes are operating at levels no higher than 45 percent of capacity in 2030 under this tolling scenario.

Tables 5-9 and 5-10 present 2015 AM and PM peak hour and daily managed lane traffic volumes for the two Build alternatives. Both sets of data are for the SOV toll scenario. Although the levels of managed lane demand are lower than in 2030, as would be expected, it is noteworthy that the managed lane volumes approach 75 percent of LOS C capacity in the southern part of the corridor in the PM peak hour.

FIGURE 5-1: 2030 AM PEAK PERIOD VOLUMES FOR 10+4 ALTERNATIVE, UNLIMITED ACCESS



*Volumes are in hundreds of vehicles.

FIGURE 5-2: 2030 PM PEAK PERIOD VOLUMES FOR 10+4 ALTERNATIVE, UNLIMITED ACCESS

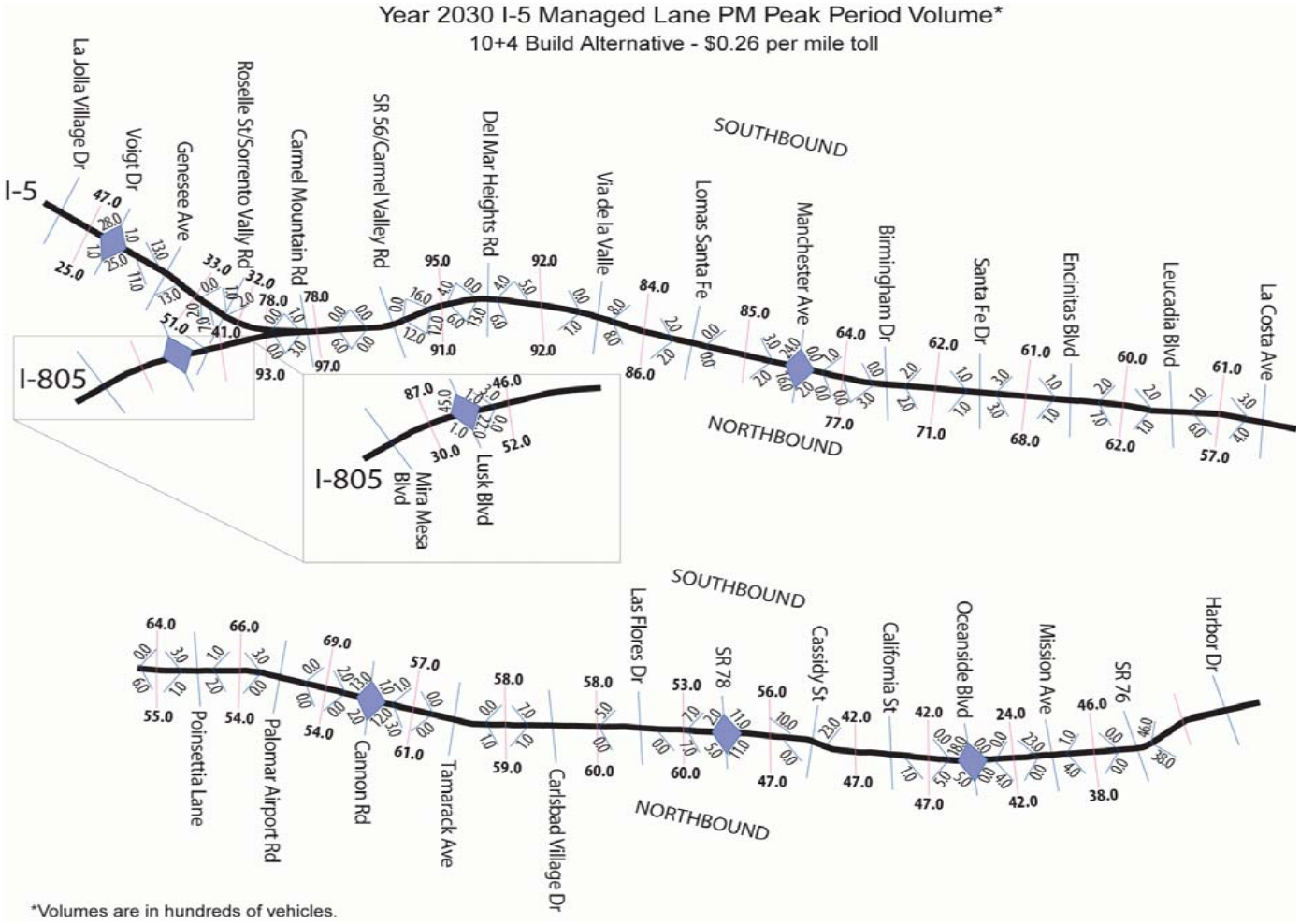


FIGURE 5-3: 2030 AM PEAK PERIOD VOLUMES FOR 10+4 ALTERNATIVE, LIMITED ACCESS

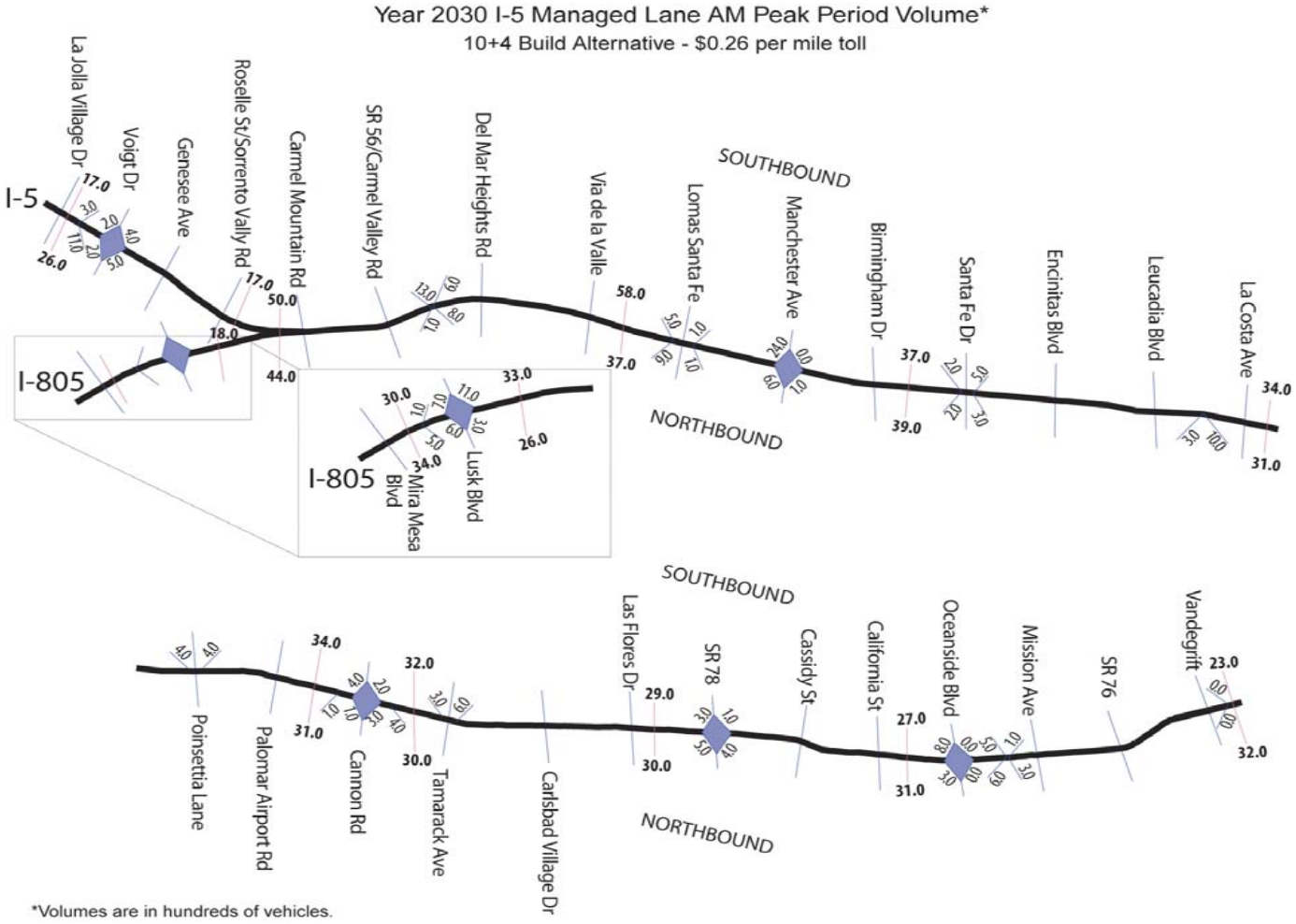


FIGURE 5-4: 2030 PM PEAK PERIOD VOLUMES FOR 10+4 ALTERNATIVE, LIMITED ACCESS

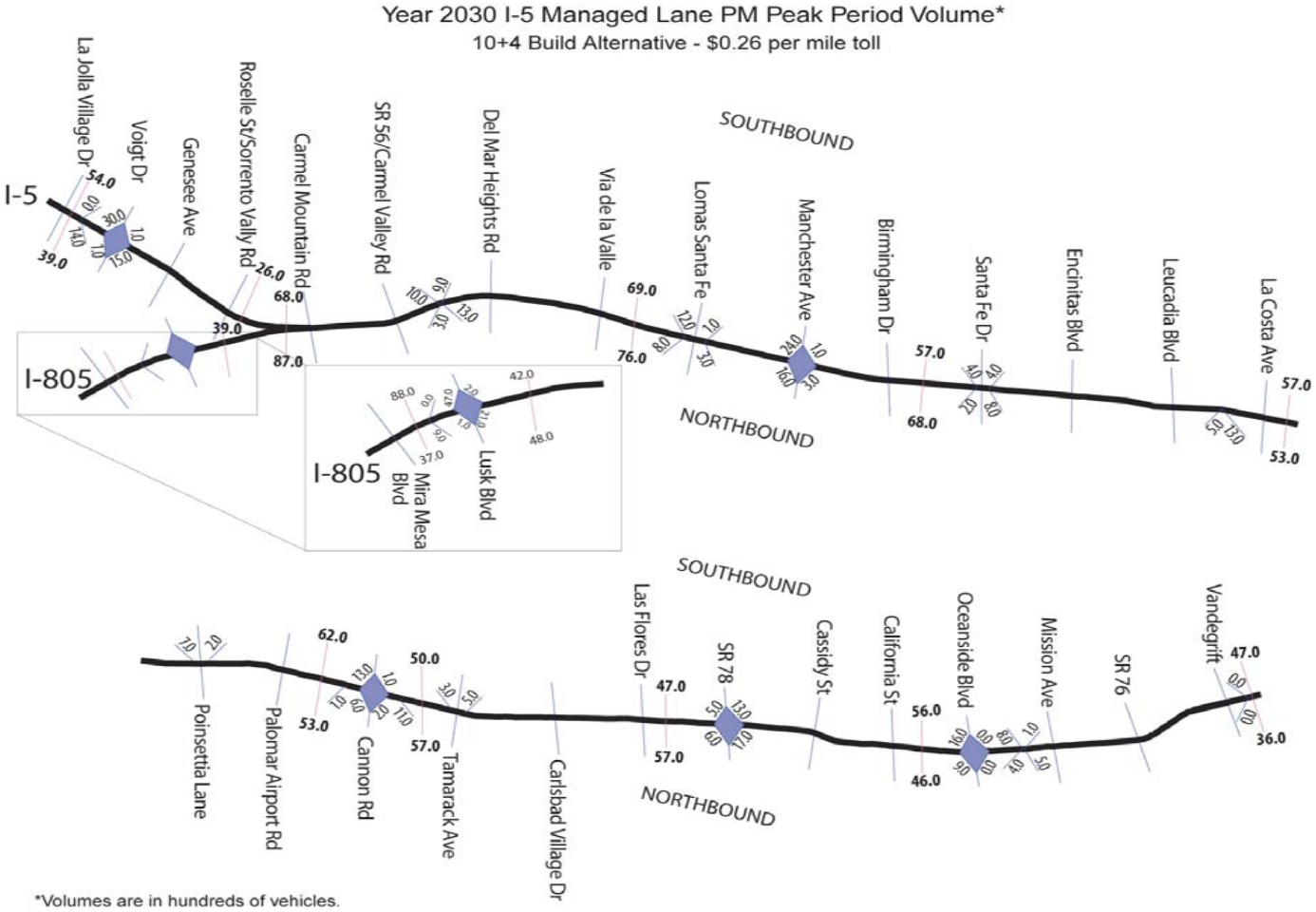
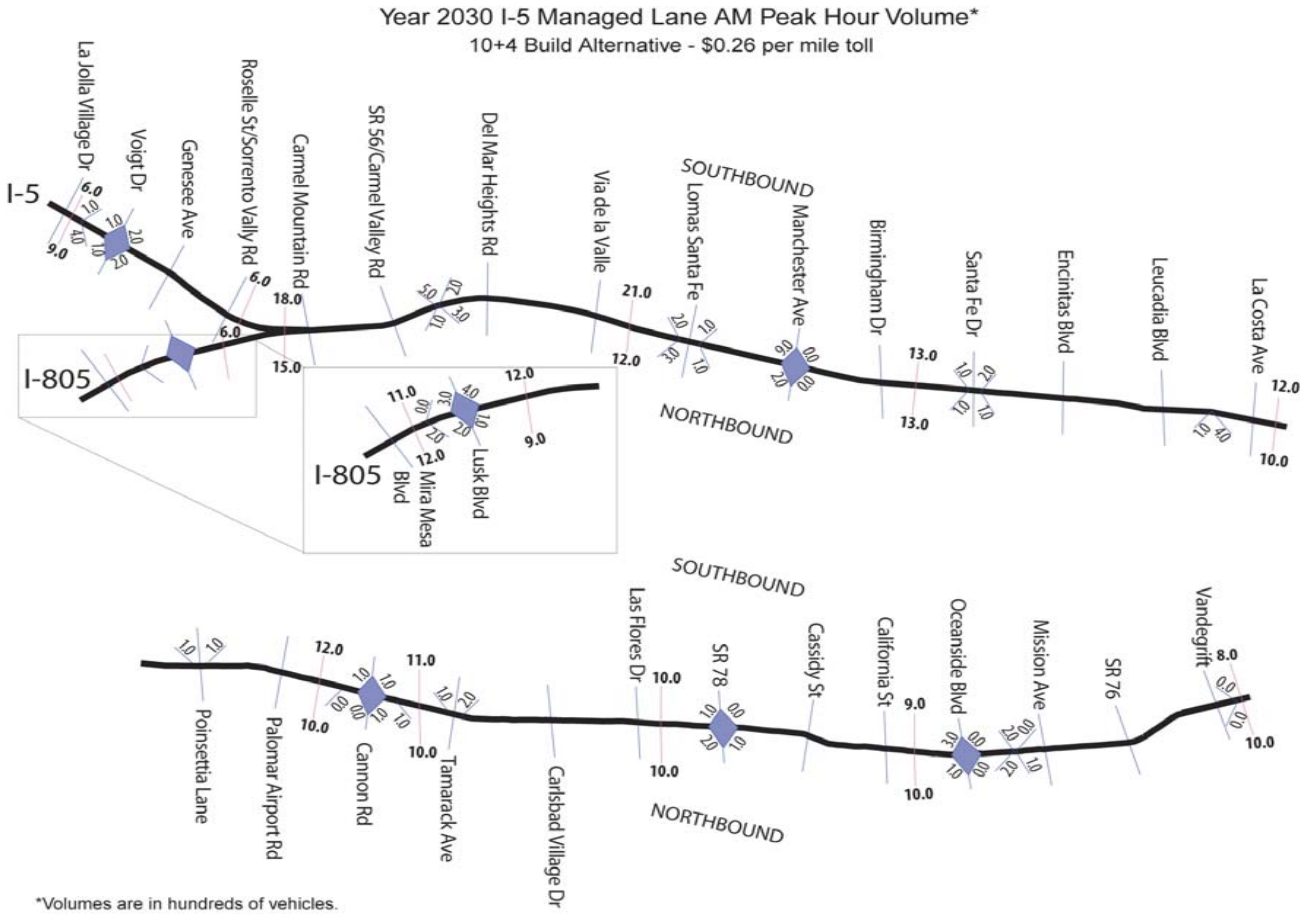
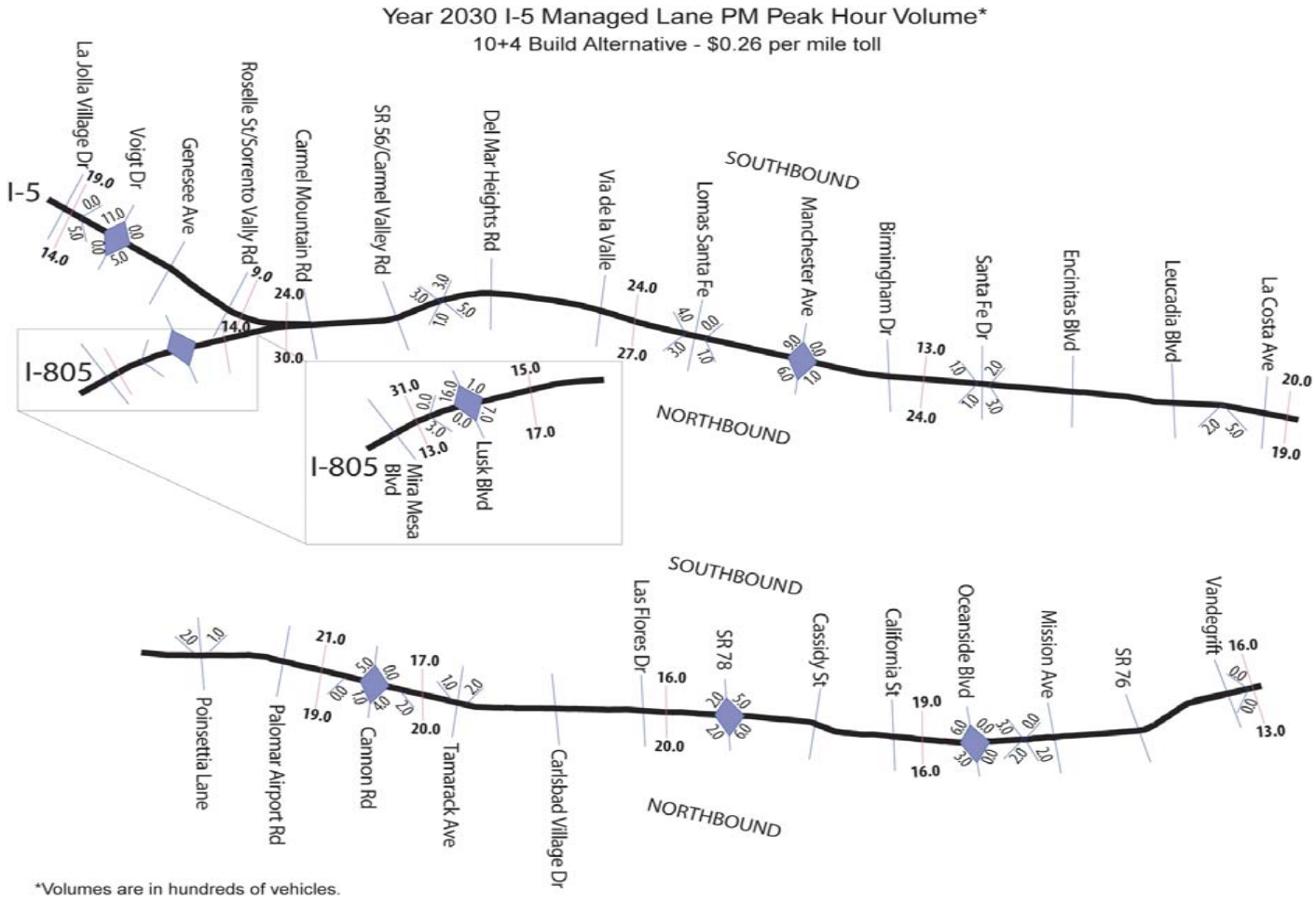


FIGURE 5-5: 2030 AM PEAK HOUR VOLUME FOR 10+4, LIMITED ACCESS**



** Peak Hour data was used for limited access scenario only.

FIGURE 5-6: 2030 PM PEAK HOUR VOLUME FOR 10+4, LIMITED ACCESS**



** Peak Hour data was used for limited access scenario only.

TABLE 5-5: I-5 MANAGED LANE TRAFFIC VOLUMES*

2030 10+4 ALTERNATIVE
SOV TOLL SCENARIO

Location		Drive Alone	Shared Ride - 2 Person	Shared Ride - 3+ Person	Total	Percent of LOS C Capacity
North of SR 76	AM Peak Hour Inbound	100	600	200	**900**	28%
	AM Peak Hour Outbound	100	800	300	**1,200**	38%
	Total AM Peak Hour	200	1,400	500	**2,100**	33%
	PM Peak Hour Inbound	0	1,200	400	**1,600**	50%
	PM Peak Hour Outbound	0	900	300	**1,200**	38%
	Total PM Peak Hour	0	2,100	700	**2,800**	44%
	Daily Inbound	400	7,200	2,400	**10,000**	--
	Daily Outbound	400	6,900	2,300	**9,600**	--
	Total Daily	800	14,100	4,700	**19,600**	--
South of Palomar Airport	AM Peak Hour Inbound	100	900	200	**1,200**	38%
	AM Peak Hour Outbound	100	900	200	**1,200**	38%
	Total AM Peak Hour	200	1,800	400	**2,400**	38%
	PM Peak Hour Inbound	100	1,500	500	**2,100**	66%
	PM Peak Hour Outbound	100	1,300	400	**1,800**	56%
	Total PM Peak Hour	200	2,800	900	**3,900**	61%
	Daily Inbound	800	9,600	3,000	**13,400**	--
	Daily Outbound	700	8,900	2,900	**12,500**	--
	Total Daily	1,500	18,500	5,900	**25,900**	--
South of Manchester	AM Peak Hour Inbound	500	1,400	400	**2,300**	72%
	AM Peak Hour Outbound	100	1,300	300	**1,700**	53%
	Total AM Peak Hour	600	2,700	700	**4,000**	63%
	PM Peak Hour Inbound	100	1,900	600	**2,600**	81%
	PM Peak Hour Outbound	400	1,800	500	**2,700**	84%
	Total PM Peak Hour	500	3,700	1,100	**5,300**	83%
	Daily Inbound	2,200	13,200	4,200	**19,600**	--
	Daily Outbound	2,100	12,300	3,900	**18,300**	--
	Total Daily	4,300	25,500	8,100	**37,900**	--
North of SR 56	AM Peak Hour Inbound	600	1,400	400	**2,400**	75%
	AM Peak Hour Outbound	100	1,400	400	**1,900**	59%
	Total AM Peak Hour	700	2,800	800	**4,300**	67%
	PM Peak Hour Inbound	0	2,200	700	**2,900**	91%
	PM Peak Hour Outbound	500	2,100	600	**3,200**	100%
	Total PM Peak Hour	500	4,300	1,300	**6,100**	95%
	Daily Inbound	2,300	13,900	4,400	**20,600**	--
	Daily Outbound	2,200	13,600	4,400	**20,200**	--
	Total Daily	4,500	27,500	8,800	**40,800**	--

* unadjusted volumes

Source: PB, November 2005

TABLE 5-6: I-5 MANAGED LANE TRAFFIC VOLUMES*

2030 8+4 ALTERNATIVE
SOV TOLL SCENARIO

Location		Drive Alone	Shared Ride - 2 Person	Shared Ride - 3+ Person	Total	Percent of LOS C Capacity
North of SR 76	AM Peak Hour Inbound	100	700	200	**1,000**	31%
	AM Peak Hour Outbound	100	900	300	**1,300**	41%
	Total AM Peak Hour	200	1,600	500	**2,300**	36%
	PM Peak Hour Inbound	0	1,300	400	**1,700**	53%
	PM Peak Hour Outbound	100	1,000	300	**1,400**	44%
	Total PM Peak Hour	100	2,300	700	**3,100**	48%
	Daily Inbound	500	7,800	2,600	**10,900**	--
	Daily Outbound	500	7,500	2,500	**10,500**	--
	Total Daily	1,000	15,300	5,100	**21,400**	--
South of Palomar Airport	AM Peak Hour Inbound	100	1,000	300	**1,400**	44%
	AM Peak Hour Outbound	100	1,000	300	**1,400**	44%
	Total AM Peak Hour	200	2,000	600	**2,800**	44%
	PM Peak Hour Inbound	100	1,600	500	**2,200**	69%
	PM Peak Hour Outbound	100	1,400	500	**2,000**	63%
	Total PM Peak Hour	200	3,000	1,000	**4,200**	66%
	Daily Inbound	1,100	10,500	3,300	**14,900**	--
	Daily Outbound	900	9,800	3,200	**13,900**	--
	Total Daily	2,000	20,300	6,500	**28,800**	--
South of Manchester	AM Peak Hour Inbound	700	1,400	400	**2,500**	78%
	AM Peak Hour Outbound	100	1,300	400	**1,800**	56%
	Total AM Peak Hour	800	2,700	800	**4,300**	67%
	PM Peak Hour Inbound	100	2,200	700	**3,000**	94%
	PM Peak Hour Outbound	500	2,000	600	**3,100**	97%
	Total PM Peak Hour	600	4,200	1,300	**6,100**	95%
	Daily Inbound	2,800	14,200	4,500	**21,500**	--
	Daily Outbound	2,600	13,300	4,300	**20,200**	--
	Total Daily	5,400	27,500	8,800	**41,700**	--
North of SR 56	AM Peak Hour Inbound	700	1,500	500	**2,700**	84%
	AM Peak Hour Outbound	200	1,500	400	**2,100**	66%
	Total AM Peak Hour	900	3,000	900	**4,800**	75%
	PM Peak Hour Inbound	100	2,200	700	**3,000**	94%
	PM Peak Hour Outbound	600	2,200	700	**3,500**	109%
	Total PM Peak Hour	700	4,400	1,400	**6,500**	102%
	Daily Inbound	2,800	14,900	4,800	**22,500**	--
	Daily Outbound	2,700	14,300	4,600	**21,600**	--
	Total Daily	5,500	29,200	9,400	**44,100**	--

* unadjusted volumes

Source: PB, November 2005

TABLE 5-7: I-5 MANAGED LANE TRAFFIC VOLUMES*

2030 10+4 ALTERNATIVE
HOV-2/SOV TOLL SCENARIO

Location		Drive Alone	Shared Ride - 2 Person	Shared Ride - 3+ Person	Total	Percent of LOS C Capacity
North of SR 76	AM Peak Hour Inbound	100	0	200	**300**	9%
	AM Peak Hour Outbound	100	0	300	**400**	13%
	Total AM Peak Hour	200	0	500	**700**	11%
	PM Peak Hour Inbound	100	0	500	**600**	19%
	PM Peak Hour Outbound	0	0	400	**400**	13%
	Total PM Peak Hour	100	0	900	**1,000**	16%
	Daily Inbound	500	100	2,800	**3,400**	--
	Daily Outbound	500	100	2,700	**3,300**	--
	Total Daily	1,000	200	5,500	**6,700**	--
South of Palomar Airport	AM Peak Hour Inbound	100	0	300	**400**	13%
	AM Peak Hour Outbound	100	0	300	**400**	13%
	Total AM Peak Hour	200	0	600	**800**	13%
	PM Peak Hour Inbound	100	0	600	**700**	22%
	PM Peak Hour Outbound	100	0	600	**700**	22%
	Total PM Peak Hour	200	0	1,200	**1,400**	22%
	Daily Inbound	900	200	3,800	**4,900**	--
	Daily Outbound	700	200	3,500	**4,400**	--
	Total Daily	1,600	400	7,300	**9,300**	--
South of Manchester	AM Peak Hour Inbound	600	100	500	**1,200**	38%
	AM Peak Hour Outbound	100	0	400	**500**	16%
	Total AM Peak Hour	700	100	900	**1,700**	27%
	PM Peak Hour Inbound	100	0	800	**900**	28%
	PM Peak Hour Outbound	400	100	800	**1,300**	41%
	Total PM Peak Hour	500	100	1,600	**2,200**	34%
	Daily Inbound	2,400	500	5,100	**8,000**	--
	Daily Outbound	2,200	500	4,800	**7,500**	--
	Total Daily	4,600	1,000	9,900	**15,500**	--
North of SR 56	AM Peak Hour Inbound	700	100	600	**1,400**	44%
	AM Peak Hour Outbound	200	0	500	**700**	22%
	Total AM Peak Hour	900	100	1,100	**2,100**	33%
	PM Peak Hour Inbound	100	0	800	**900**	28%
	PM Peak Hour Outbound	500	100	900	**1,500**	47%
	Total PM Peak Hour	600	100	1,700	**2,400**	38%
	Daily Inbound	2,500	600	5,200	**8,300**	--
	Daily Outbound	2,300	500	5,400	**8,200**	--
	Total Daily	4,800	1,100	10,600	**16,500**	--

* unadjusted volumes

Source: PB, November 2005

TABLE 5-8: I-5 MANAGED LANE TRAFFIC VOLUMES*

2030 8+4 ALTERNATIVE
HOV-2/SOV TOLL SCENARIO

Location		Drive Alone	Shared Ride - 2 Person	Shared Ride - 3+ Person	Total	Percent of LOS C Capacity
North of SR 76	AM Peak Hour Inbound	100	0	300	**400**	13%
	AM Peak Hour Outbound	100	0	300	**400**	13%
	Total AM Peak Hour	200	0	600	**800**	13%
	PM Peak Hour Inbound	100	0	500	**600**	19%
	PM Peak Hour Outbound	100	0	400	**500**	16%
	Total PM Peak Hour	200	0	900	**1,100**	17%
	Daily Inbound	600	100	3,000	**3,700**	--
	Daily Outbound	500	100	2,900	**3,500**	--
	Total Daily	1,100	200	5,900	**7,200**	--
South of Palomar Airport	AM Peak Hour Inbound	200	100	400	**700**	22%
	AM Peak Hour Outbound	100	0	300	**400**	13%
	Total AM Peak Hour	300	100	700	**1,100**	17%
	PM Peak Hour Inbound	100	0	700	**800**	25%
	PM Peak Hour Outbound	100	0	600	**700**	22%
	Total PM Peak Hour	200	0	1,300	**1,500**	23%
	Daily Inbound	1,100	300	4,100	**5,500**	--
	Daily Outbound	900	300	4,000	**5,200**	--
	Total Daily	2,000	600	8,100	**10,700**	--
South of Manchester	AM Peak Hour Inbound	700	200	500	**1,400**	44%
	AM Peak Hour Outbound	100	0	500	**600**	19%
	Total AM Peak Hour	800	200	1,000	**2,000**	31%
	PM Peak Hour Inbound	100	0	900	**1,000**	31%
	PM Peak Hour Outbound	600	100	900	**1,600**	50%
	Total PM Peak Hour	700	100	1,800	**2,600**	41%
	Daily Inbound	3,000	600	5,600	**9,200**	--
	Daily Outbound	2,700	500	5,300	**8,500**	--
	Total Daily	5,700	1,100	10,900	**17,700**	--
North of SR 56	AM Peak Hour Inbound	800	200	600	**1,600**	50%
	AM Peak Hour Outbound	200	0	500	**700**	22%
	Total AM Peak Hour	1,000	200	1,100	**2,300**	36%
	PM Peak Hour Inbound	100	0	900	**1,000**	31%
	PM Peak Hour Outbound	600	100	1,000	**1,700**	53%
	Total PM Peak Hour	700	100	1,900	**2,700**	42%
	Daily Inbound	3,000	600	5,700	**9,300**	--
	Daily Outbound	2,800	600	5,700	**9,100**	--
	Total Daily	5,800	1,200	11,400	**18,400**	--

* unadjusted volumes

Source: PB, November 2005

TABLE 5-9: I-5 MANAGED LANE DAILY TRAFFIC VOLUMES*

2015 10+4 ALTERNATIVE
SOV TOLL SCENARIO

Location		Drive Alone	Shared Ride - 2 Person	Shared Ride - 3+ Person	Total	Percent of LOS C Capacity
North of SR 76	AM Peak Hour Inbound	0	300	100	**400**	13%
	AM Peak Hour Outbound	0	400	100	**500**	16%
	Total AM Peak Hour	0	700	200	**900**	14%
	PM Peak Hour Inbound	0	600	200	**800**	25%
	PM Peak Hour Outbound	0	500	200	**700**	22%
	Total PM Peak Hour	0	1,100	400	**1,500**	23%
	Daily Inbound	200	3,600	1,200	**5,000**	--
	Daily Outbound	300	4,700	1,600	**6,600**	--
	Total Daily	500	8,300	2,800	**11,600**	--
South of Palomar Airport	AM Peak Hour Inbound	100	600	200	**900**	28%
	AM Peak Hour Outbound	0	600	200	**800**	25%
	Total AM Peak Hour	100	1,200	400	**1,700**	27%
	PM Peak Hour Inbound	100	1,100	300	**1,500**	47%
	PM Peak Hour Outbound	0	1,000	300	**1,300**	41%
	Total PM Peak Hour	100	2,100	600	**2,800**	44%
	Daily Inbound	600	6,900	2,300	**9,800**	--
	Daily Outbound	500	6,500	2,200	**9,200**	--
	Total Daily	1,100	13,400	4,500	**19,000**	--
South of Manchester	AM Peak Hour Inbound	700	1,100	300	**2,100**	66%
	AM Peak Hour Outbound	100	800	200	**1,100**	34%
	Total AM Peak Hour	800	1,900	500	**3,200**	50%
	PM Peak Hour Inbound	100	1,400	400	**1,900**	59%
	PM Peak Hour Outbound	500	1,500	400	**2,400**	75%
	Total PM Peak Hour	600	2,900	800	**4,300**	67%
	Daily Inbound	4,100	10,000	3,200	**17,300**	--
	Daily Outbound	900	8,900	3,000	**12,800**	--
	Total Daily	5,000	18,900	6,200	**30,100**	--
North of SR 56	AM Peak Hour Inbound	700	1,100	300	**2,100**	66%
	AM Peak Hour Outbound	0	900	300	**1,200**	38%
	Total AM Peak Hour	700	2,000	600	**3,300**	52%
	PM Peak Hour Inbound	0	1,400	500	**1,900**	59%
	PM Peak Hour Outbound	600	1,700	500	**2,800**	88%
	Total PM Peak Hour	600	3,100	1,000	**4,700**	73%
	Daily Inbound	2,700	9,800	3,200	**15,700**	--
	Daily Outbound	2,400	9,600	3,200	**15,200**	--
	Total Daily	5,100	19,400	6,400	**30,900**	--

* unadjusted volumes

Source: PB, November 2005

TABLE 5-10: I-5 MANAGED LANE DAILY TRAFFIC VOLUMES*

2015 8+4 ALTERNATIVE
SOV TOLL SCENARIO

Location		Drive Alone	Shared Ride - 2 Person	Shared Ride - 3+ Person	Total	Percent of LOS C Capacity
North of SR 76	AM Peak Hour Inbound	0	400	100	**500**	16%
	AM Peak Hour Outbound	0	400	100	**500**	16%
	Total AM Peak Hour	0	800	200	**1,000**	16%
	PM Peak Hour Inbound	0	600	200	**800**	25%
	PM Peak Hour Outbound	0	500	200	**700**	22%
	Total PM Peak Hour	0	1,100	400	**1,500**	23%
	Daily Inbound	200	3,900	1,300	**5,400**	--
	Daily Outbound	200	3,700	1,300	**5,200**	--
	Total Daily	400	7,600	2,600	**10,600**	--
South of Palomar Airport	AM Peak Hour Inbound	100	700	200	**1,000**	31%
	AM Peak Hour Outbound	0	700	200	**900**	28%
	Total AM Peak Hour	100	1,400	400	**1,900**	30%
	PM Peak Hour Inbound	100	1,100	400	**1,600**	50%
	PM Peak Hour Outbound	100	1,000	300	**1,400**	44%
	Total PM Peak Hour	200	2,100	700	**3,000**	47%
	Daily Inbound	700	7,400	2,500	**10,600**	--
	Daily Outbound	500	7,000	2,300	**9,800**	--
	Total Daily	1,200	14,400	4,800	**20,400**	--
South of Manchester	AM Peak Hour Inbound	700	1,100	300	**2,100**	66%
	AM Peak Hour Outbound	100	900	300	**1,300**	41%
	Total AM Peak Hour	800	2,000	600	**3,400**	53%
	PM Peak Hour Inbound	100	1,500	500	**2,100**	66%
	PM Peak Hour Outbound	500	1,600	500	**2,600**	81%
	Total PM Peak Hour	600	3,100	1,000	**4,700**	73%
	Daily Inbound	2,500	10,400	3,400	**16,300**	--
	Daily Outbound	2,200	9,700	3,200	**15,100**	--
	Total Daily	4,700	20,100	6,600	**31,400**	--
North of SR 56	AM Peak Hour Inbound	700	1,200	300	**2,200**	69%
	AM Peak Hour Outbound	0	900	300	**1,200**	38%
	Total AM Peak Hour	700	2,100	600	**3,400**	53%
	PM Peak Hour Inbound	0	1,500	500	**2,000**	63%
	PM Peak Hour Outbound	500	1,600	500	**2,600**	81%
	Total PM Peak Hour	500	3,100	1,000	**4,600**	72%
	Daily Inbound	2,500	10,400	3,400	**16,300**	--
	Daily Outbound	2,200	9,900	3,200	**15,300**	--
	Total Daily	4,700	20,300	6,600	**31,600**	--

* unadjusted volumes

Source: PB, November 2005

The time of day managed lane volumes relationship to LOS C operations varies along the corridor in both 2030 and 2015. The variation is somewhat more dramatic in 2015. These results would provide support to the idea of differential tolling rates in the corridor given the different levels of demand relative to the managed lane's maximum vehicle operational threshold of 1,650 vehicles per lane.

5.3.4. Comparison of Managed Lane Traffic Shares

One method of analyzing the effectiveness of the I-5 managed lanes is to compare the relative amount of traffic volume that is accommodated by the managed lanes in each of the scenarios. Tables 5-11 through 5-14 present this data as shares of the total corridor volume for the 2030 AM and PM peak hours as well as for the entire day at four locations along the I-5 North Coast corridor. Data are presented for both Build alternatives and both tolling scenarios.

These data show that under the SOV tolling scenario of the Build alternatives, the managed lane carries a higher share of corridor traffic and that the 8+4 alternative carries a higher share than the 10+4 alternative. The managed lane share of I-5 North Coast corridor traffic is highest in the middle section of the corridor.

Tables 5-15 and 5-16 present the managed lane share of total corridor traffic in 2015 for the SOV toll scenario of each of the two Build alternatives. Similar to the 2030 data, the 8+4 alternative accommodates a larger share of corridor traffic than the 10+4 alternative.

TABLE 5-11: 2030 10+4 MANAGED LANE SHARES SOV TOLL SCENARIO

Location		Managed Lane Volume	General Purpose Lane Volume	Managed Lane Share of Corridor Volume
North of SR 76	AM Peak Hour Inbound	900	5,300	15%
	AM Peak Hour Outbound	1,200	7,800	13%
	Total AM Peak Hour	2,100	13,100	14%
	PM Peak Hour Inbound	1,600	9,000	15%
	PM Peak Hour Outbound	1,200	6,200	16%
	Total PM Peak Hour	2,800	15,200	16%
	Daily Inbound	10,000	108,900	8%
	Daily Outbound	9,600	103,200	9%
	Total Daily	19,600	212,100	8%
South of Palomar Airport	AM Peak Hour Inbound	1,200	7,900	13%
	AM Peak Hour Outbound	1,200	7,100	14%
	Total AM Peak Hour	2,400	15,000	14%
	PM Peak Hour Inbound	2,100	8,000	21%
	PM Peak Hour Outbound	1,800	7,200	20%
	Total PM Peak Hour	3,900	15,200	20%
	Daily Inbound	13,400	105,700	11%
	Daily Outbound	12,500	101,400	11%
	Total Daily	25,900	207,100	11%
South of Manchester	AM Peak Hour Inbound	2,300	9,500	19%
	AM Peak Hour Outbound	1,700	8,800	16%
	Total AM Peak Hour	4,000	18,300	18%
	PM Peak Hour Inbound	2,600	10,100	20%
	PM Peak Hour Outbound	2,700	9,800	22%
	Total PM Peak Hour	5,300	19,900	21%
	Daily Inbound	19,600	133,900	13%
	Daily Outbound	18,300	133,000	12%
	Total Daily	37,900	266,900	12%
North of SR 56	AM Peak Hour Inbound	2,400	11,500	17%
	AM Peak Hour Outbound	1,900	9,500	17%
	Total AM Peak Hour	4,300	21,000	17%
	PM Peak Hour Inbound	2,900	11,000	21%
	PM Peak Hour Outbound	3,200	11,500	22%
	Total PM Peak Hour	6,100	22,500	21%
	Daily Inbound	20,600	153,100	12%
	Daily Outbound	20,200	147,600	12%
	Total Daily	40,800	300,700	12%

* unadjusted volumes

Source: PB, November 2005

TABLE 5-12: 2030 10+4 MANAGED LANE SHARES SOV/HOV- 2 TOLL SCENARIO

Location		Managed Lane Volume	General Purpose Lane Volume	Managed Lane Share of Corridor Volume
North of SR 76	AM Peak Hour Inbound	300	6,000	5%
	AM Peak Hour Outbound	400	8,700	4%
	Total AM Peak Hour	700	14,700	5%
	PM Peak Hour Inbound	600	10,100	6%
	PM Peak Hour Outbound	400	6,900	5%
	Total PM Peak Hour	1,000	17,000	6%
	Daily Inbound	3,400	115,700	3%
	Daily Outbound	3,300	109,400	3%
	Total Daily	6,700	225,100	3%
South of Palomar Airport	AM Peak Hour Inbound	400	8,200	5%
	AM Peak Hour Outbound	400	7,500	5%
	Total AM Peak Hour	800	15,700	5%
	PM Peak Hour Inbound	700	8,400	8%
	PM Peak Hour Outbound	700	7,400	9%
	Total PM Peak Hour	1,400	15,800	8%
	Daily Inbound	4,900	109,900	4%
	Daily Outbound	4,400	105,000	4%
	Total Daily	9,300	214,900	4%
South of Manchester	AM Peak Hour Inbound	1,200	9,200	12%
	AM Peak Hour Outbound	500	9,300	5%
	Total AM Peak Hour	1,700	18,500	8%
	PM Peak Hour Inbound	900	9,600	9%
	PM Peak Hour Outbound	1,300	9,400	12%
	Total PM Peak Hour	2,200	19,000	10%
	Daily Inbound	8,000	137,800	5%
	Daily Outbound	7,500	138,500	5%
	Total Daily	15,500	276,300	5%
North of SR 56	AM Peak Hour Inbound	1,400	12,300	10%
	AM Peak Hour Outbound	700	10,000	7%
	Total AM Peak Hour	2,100	22,300	9%
	PM Peak Hour Inbound	900	11,200	7%
	PM Peak Hour Outbound	1,500	11,500	12%
	Total PM Peak Hour	2,400	22,700	10%
	Daily Inbound	8,300	160,100	5%
	Daily Outbound	8,200	151,400	5%
	Total Daily	16,500	311,500	5%

* unadjusted volumes

Source: PB, November 2005

TABLE 5-13: 2030 8+4 MANAGED LANE SHARES SOV TOLL SCENARIO

Location		Managed Lane Volume	General Purpose Lane Volume	Managed Lane Share of Corridor Volume
North of SR 76	AM Peak Hour Inbound	1,000	5,300	16%
	AM Peak Hour Outbound	1,300	7,800	14%
	Total AM Peak Hour	2,300	13,100	15%
	PM Peak Hour Inbound	1,700	8,900	16%
	PM Peak Hour Outbound	1,400	6,100	19%
	Total PM Peak Hour	3,100	15,000	17%
	Daily Inbound	10,900	108,000	9%
	Daily Outbound	10,500	102,200	9%
	Total Daily	21,400	210,200	9%
South of Palomar Airport	AM Peak Hour Inbound	1,400	6,800	17%
	AM Peak Hour Outbound	1,400	6,500	18%
	Total AM Peak Hour	2,800	13,300	17%
	PM Peak Hour Inbound	2,200	6,900	24%
	PM Peak Hour Outbound	2,000	6,000	25%
	Total PM Peak Hour	4,200	12,900	25%
	Daily Inbound	14,900	99,400	13%
	Daily Outbound	13,900	95,500	13%
	Total Daily	28,800	194,900	13%
South of Manchester	AM Peak Hour Inbound	2,500	7,900	24%
	AM Peak Hour Outbound	1,800	7,600	19%
	Total AM Peak Hour	4,300	15,500	22%
	PM Peak Hour Inbound	3,000	8,000	27%
	PM Peak Hour Outbound	3,100	8,000	28%
	Total PM Peak Hour	6,100	16,000	28%
	Daily Inbound	21,500	126,300	15%
	Daily Outbound	20,200	125,800	14%
	Total Daily	41,700	252,100	14%
North of SR 56	AM Peak Hour Inbound	2,700	12,200	18%
	AM Peak Hour Outbound	2,100	8,700	19%
	Total AM Peak Hour	4,800	20,900	19%
	PM Peak Hour Inbound	3,000	10,400	22%
	PM Peak Hour Outbound	3,500	10,900	24%
	Total PM Peak Hour	6,500	21,300	23%
	Daily Inbound	22,500	153,500	13%
	Daily Outbound	21,600	143,000	13%
	Total Daily	44,100	296,500	13%

* unadjusted volumes

Source: PB, November 2005

TABLE 5-14: 2030 8+4 MANAGED LANE SHARES SOV/HOV-2 TOLL SCENARIO

Location		Managed Lane Volume	General Purpose Lane Volume	Managed Lane Share of Corridor Volume
North of SR 76	AM Peak Hour Inbound	400	5,900	6%
	AM Peak Hour Outbound	400	8,500	4%
	Total AM Peak Hour	800	14,400	5%
	PM Peak Hour Inbound	600	10,000	6%
	PM Peak Hour Outbound	500	6,800	7%
	Total PM Peak Hour	1,100	16,800	6%
	Daily Inbound	3,700	115,000	3%
	Daily Outbound	3,500	108,700	3%
	Total Daily	7,200	223,700	3%
South of Palomar Airport	AM Peak Hour Inbound	700	7,100	9%
	AM Peak Hour Outbound	400	6,600	6%
	Total AM Peak Hour	1,100	13,700	7%
	PM Peak Hour Inbound	800	7,300	10%
	PM Peak Hour Outbound	700	6,300	10%
	Total PM Peak Hour	1,500	13,600	10%
	Daily Inbound	5,500	103,300	5%
	Daily Outbound	5,200	98,800	5%
	Total Daily	10,700	202,100	5%
South of Manchester	AM Peak Hour Inbound	1,400	8,700	14%
	AM Peak Hour Outbound	600	8,000	7%
	Total AM Peak Hour	2,000	16,700	11%
	PM Peak Hour Inbound	1,000	7,300	12%
	PM Peak Hour Outbound	1,600	6,300	20%
	Total PM Peak Hour	2,600	17,600	13%
	Daily Inbound	9,200	133,500	6%
	Daily Outbound	8,500	133,000	6%
	Total Daily	17,700	266,500	6%
North of SR 56	AM Peak Hour Inbound	1,600	12,700	11%
	AM Peak Hour Outbound	700	9,200	7%
	Total AM Peak Hour	2,300	21,900	10%
	PM Peak Hour Inbound	1,000	11,100	8%
	PM Peak Hour Outbound	1,700	11,100	13%
	Total PM Peak Hour	2,700	22,200	11%
	Daily Inbound	9,300	159,300	6%
	Daily Outbound	9,100	147,400	6%
	Total Daily	18,400	306,700	6%

* unadjusted volumes

Source: PB, November 2005

TABLE 5-15: 2015 10+4 MANAGED LANE SHARES SOV TOLL SCENARIO

Location		Managed Lane Volume	General Purpose Lane Volume	Managed Lane Share of Corridor Volume
North of SR 76	AM Peak Hour Inbound	400	4,700	8%
	AM Peak Hour Outbound	500	7,500	6%
	Total AM Peak Hour	900	12,200	7%
	PM Peak Hour Inbound	800	9,600	8%
	PM Peak Hour Outbound	700	5,400	11%
	Total PM Peak Hour	1,500	15,000	9%
	Daily Inbound	5,000	98,500	5%
	Daily Outbound	6,600	89,400	7%
	Total Daily	11,600	187,900	6%
South of Palomar Airport	AM Peak Hour Inbound	900	6,400	12%
	AM Peak Hour Outbound	800	6,600	11%
	Total AM Peak Hour	1,700	13,000	12%
	PM Peak Hour Inbound	1,500	7,400	17%
	PM Peak Hour Outbound	1,300	7,100	15%
	Total PM Peak Hour	2,800	14,500	16%
	Daily Inbound	9,800	87,200	10%
	Daily Outbound	9,200	89,400	9%
	Total Daily	19,000	176,600	10%
South of Manchester	AM Peak Hour Inbound	2,100	8,300	20%
	AM Peak Hour Outbound	1,100	7,400	13%
	Total AM Peak Hour	3,200	15,700	17%
	PM Peak Hour Inbound	1,900	8,200	19%
	PM Peak Hour Outbound	2,400	9,000	21%
	Total PM Peak Hour	4,300	17,200	20%
	Daily Inbound	17,300	116,600	13%
	Daily Outbound	12,800	118,600	10%
	Total Daily	30,100	235,200	11%
North of SR 56	AM Peak Hour Inbound	2,100	9,700	18%
	AM Peak Hour Outbound	1,200	7,400	14%
	Total AM Peak Hour	3,300	17,100	16%
	PM Peak Hour Inbound	1,900	8,300	19%
	PM Peak Hour Outbound	2,800	10,100	22%
	Total PM Peak Hour	4,700	18,400	20%
	Daily Inbound	15,700	124,700	11%
	Daily Outbound	15,200	123,900	11%
	Total Daily	30,900	248,600	11%

* unadjusted volumes

Source: PB, November 2005

TABLE 5-16: 2015 8+4 MANAGED LANE SHARES SOV TOLL SCENARIO

Location		Managed Lane Volume	General Purpose Lane Volume	Managed Lane Share of Corridor Volume
North of SR 76	AM Peak Hour Inbound	500	4,600	10%
	AM Peak Hour Outbound	500	7,000	7%
	Total AM Peak Hour	1,000	11,600	8%
	PM Peak Hour Inbound	800	8,900	8%
	PM Peak Hour Outbound	700	5,400	11%
	Total PM Peak Hour	1,500	14,300	9%
	Daily Inbound	5,400	98,600	5%
	Daily Outbound	5,200	89,700	5%
	Total Daily	10,600	188,300	5%
South of Palomar Airport	AM Peak Hour Inbound	1,000	5,600	15%
	AM Peak Hour Outbound	900	5,600	14%
	Total AM Peak Hour	1,900	11,200	15%
	PM Peak Hour Inbound	1,600	6,300	20%
	PM Peak Hour Outbound	1,400	5,800	19%
	Total PM Peak Hour	3,000	12,100	20%
	Daily Inbound	10,600	82,300	11%
	Daily Outbound	9,800	84,500	10%
	Total Daily	20,400	166,800	11%
South of Manchester	AM Peak Hour Inbound	2,100	7,100	23%
	AM Peak Hour Outbound	1,300	6,200	17%
	Total AM Peak Hour	3,400	13,300	20%
	PM Peak Hour Inbound	2,100	6,900	23%
	PM Peak Hour Outbound	2,600	7,800	25%
	Total PM Peak Hour	4,700	14,700	24%
	Daily Inbound	16,300	110,800	13%
	Daily Outbound	15,100	114,400	12%
	Total Daily	31,400	225,200	12%
North of SR 56	AM Peak Hour Inbound	2,200	9,300	19%
	AM Peak Hour Outbound	1,200	6,100	16%
	Total AM Peak Hour	3,400	15,400	18%
	PM Peak Hour Inbound	2,000	6,900	22%
	PM Peak Hour Outbound	2,600	9,600	21%
	Total PM Peak Hour	4,600	16,500	22%
	Daily Inbound	16,300	122,400	12%
	Daily Outbound	15,300	123,700	11%
	Total Daily	31,600	246,100	11%

* unadjusted volumes

Source: PB, November 2005

5.4 RESULTS AND RECOMMENDATIONS

Traffic analyses conducted on the I-5 North Coast corridor validated feasibility of value pricing for both of the Build alternatives assuming either a buffer or barrier separation.

As shown in the data above, the proposed managed lanes, when operated as a priced facility, carry a substantial amount of traffic and do seem to reduce traffic levels on the I-5 general purpose lanes as compared to a scenario in which no managed lane exists. In terms of traffic on the general purpose lanes, the most direct comparison is between the No Build and the 8+4 alternative. In the 2030, the general purpose lane volumes of the 8+4 alternative under the SOV toll scenario are forecasted to be somewhat lower than volumes for the No Build alternative. The same is true with respect to general purpose volumes in the AM and PM peak hours. General purpose lane volumes for the 10+4 alternative in 2030 are higher than those of the No Build alternative, but this is most likely due to the increased general purpose lane capacity. Despite the higher volumes of the general purpose lanes of the Build alternatives, performance of the corridor is improved over the No Build condition.

In terms of level of use, the managed lanes are forecasted in 2030 under the SOV toll scenario to operate near or above 90 percent of the desired operation threshold (1,650 vph/lane) in the peak hours, with certain sections in the south approaching full use. With the more robust HOV-2/SOV tolling policy, demand levels drop by more than half. These results suggest that the HOV-2/SOV tolling policy might be more aggressive than necessary, and the SOV toll policy not aggressive enough. A variable tolling policy is probably the most feasible. In 2015, levels of managed lane uses approach 75 percent of maximum desired levels, demonstrating that there is a market for managed lanes in the corridor in the near term. The nature of demand by occupancy level in 2015 is different than that in 2030. The 2015 managed lane demand has a higher proportion of SOV vehicles than does 2030 managed lane demand. This is probably due to higher levels of corridor congestion in 2030 which encourage higher levels of carpooling in the corridor.

A review of the managed lane share of corridor traffic among the Build alternatives demonstrates that the managed lanes carry the highest percentage of corridor vehicle traffic when adjacent lanes are most congested. The 8+4 alternative is the most congested alternative in both analysis years, and correspondingly, has the highest managed lane share of traffic. This data demonstrate that the share of traffic carried on the managed lanes drops off dramatically under the HOV-2/SOV tolling policy as compared to the SOV tolling policy.

A summary of findings are highlighted below:

- Using calibration to experiences on I-15, the I-5 managed lanes will generate significant demand based on toll rate currently applied. The rates applied were $0.26 per mile during the peak period and $0.10 per mile in the off-peak.
- Results from the forecast traffic conditions indicate that the 8+4 alternative carries a proportionately higher share of overall corridor traffic than when compared to the 10+4 alternative. In the southern portion of the I-5 corridor, both alternatives operate at or near LOS C capacity in the design year. This would suggest that more restrictive occupancy requirements than a HOV-2+ will eventually be necessary.

- Peak travel time savings for managed lane trips traversing the I-5 North Coast corridor between SR 76 and the I-5/I-805 split is at least 12 minutes for the 8+4 alternative and at least eight minutes for the 10+4 alternative in 2030. These figures suggest a travel time savings rate approaching a minimum of one-half minute per mile, a value which represents substantial time savings. In 2015, as would be expected, these travel time savings figures decrease to a minimum of seven minutes for the 8+4 alternative and at least five minutes for the 10+4 alternative. This is shown in Table 5-19.

TABLE 5-17: PEAK TRAVEL TIME SAVINGS FROM SR 76 TO I-5/I-805 SPLIT*

	2015	2030
8+4 Alternative	12 minutes	7 minutes
10+4 Alternative	8 minutes	5 minutes

*Minimum travel time savings.

- Designated intermediate access locations with the I-5 general purpose lanes are feasible in the locations selected and minimize the number of toll zones required to effectively manage lanes.

CHAPTER 6

REVENUE ANALYSIS

6.1 POTENTIAL PRICING CONCEPTS

In Chapter 3, a wide variety of toll pricing scenarios were identified and reviewed for the purpose of managing traffic in the I-5 North Coast managed lanes. Findings suggested that flat pricing was not as practicable for lane management, and dynamic pricing had the greatest potential for flexibly addressing pricing needs based on real-time changes in roadway operating conditions. Per mile and segment tolls had greater potential for pricing, and skewed has perhaps the greatest potential because not all sections of the I-5 managed lanes have the same levels of forecast demand. Three pricing strategies were considered for further comparative study—flat rate tolls, segment tolls, and per mile tolls with focus on skewed rates where demand is heaviest. This chapter briefly analyzes these shortlisted strategies, with an in-depth analysis of revenue for one specific strategy.

6.1.1. Qualitative Forecasts of Traffic

The process of selecting pricing policies to forecast diversions to tolled facilities is difficult even when one has undertaken detailed computer simulations. In situations where qualitative estimates of future tolled travel are needed, one must bear in mind that many variables are involved that influence outcomes.

However, in order to support discussions of policies related to facility feasibility the study team has prepared just such qualitatively estimated impacts/adjustments to the base forecast for three other pricing strategies. Of necessity, the rigor supporting these estimates will be far lower that that of the scenarios that were actually modeled on computers.

The three pricing strategies to be evaluated are;

- Flat rate
- Segment rates
- Skewed toll per mile

To inform this estimation process, it is useful to look at the results of the base line forecast. Traffic levels in the northern areas of the ML facility as shown in Table 5-6, Chapter 5, indicate that in 2030 there is considerable room for added toll paying traffic that is not utilized due to the toll rate being too high. The percent of capacity within the LOS C volume level only reaches 66 percent in the peak direction of the peak hour in 2030. This not only reduces income, but also sub-optimizes performance of the ML facility on the basis of objectives established at the outset for maximizing vehicle trips through the corridor and on the managed lanes.

Even in the highly traveled sections in the southern portions in the non-peak direction, traffic levels are not forecast to exceed 75 percent of the LOS C levels. This clearly

demonstrates that even under a very simplistic tolling/pricing strategy that was structured around the performance of I-15; there is room for improving the management of the system to achieve the objectives established for maximizing throughput at the outset.

This is a natural outcome for traffic and revenue forecasting and price setting that serves as the basis of this assessment, (i.e., it was not meant to be an investment grade forecasting process, and one should not/can not usefully apply those performance standards post hoc). However, this assessment of the forecast was made to inform the process of making the qualitative estimation effort and not made as a post hoc critique of the forecasts that have been prepared within the understood constraints.

Another dimension of the operational performance of the ML facility shown in Table 5-6 also is informative to this effort to make the qualitative forecasts enumerated above, and that is the percent of toll-paying vehicles as compared to the non-toll-paying fraction of HOV vehicles. On a daily basis in the northern reaches of the ML facility, one realizes that only five to seven percent toll paying utilization of the MLs in 2030, while in the more highly traveled southern section toll payers do not even comprise 15 percent of the traffic.

While there is little room in 2030 in the peak direction to add toll payers under the base forecast, there is anywhere from 25 to 35 percent of the capacity that is unused in the non-peak direction during the peak period that could be utilized if tolls were lower.

Taking this information and applying it to the three tolling scenarios shown above, the following conclusions can be made:

- A flat rate toll/pricing plan would only exacerbate the under-utilization identified above. It would surely reduce off-peak use, if not eliminate it entirely. If one tried to secure a portion of that traffic by reducing the flat rate from the base line forecast's peak price level, by 2030, it would come at the expense of creating significant delays in the southern portion of the ML facility since the demand would surely exceed that which would be compatible with LOS C volumes in peak direction peak periods.
- Segment rates, meaning two segments: northern and southern segments, would increase traffic volumes and revenues since use of the currently under-utilized capacity could be optimized. If one further refined the notion of segment rate pricing to be directionally differentiated as well segmentally differentiated, one could further improve performance in terms of increased vehicle traffic and increase revenues
- Skewed per-mile rates, meaning rates that were differentiated for each tolled segment, would further improve upon the performance of the "segment rate" strategy. Of course, if one further differentiated rates by direction, one would see even further improvements.

The HOV percentages of vehicle composition in Table 5-6, one is presented with a policy and income-based issues if one chooses to pursue higher toll paying objectives:

- Financial returns from tolling could be improved by increasing the free HOV requirement to HOV-3+ at some point in the forecast period.

- This transition comes at the expense of person-trip accommodation on the ML facility insofar that for every SOV vehicle that replaces an HOV-2 vehicle, one is reducing the average person carrying capacity.
- One also would incur a reduction in market demand to support joint development revenue planning/real estate ventures from this impact. This could result in some economic/financial reduction/impacts. Bus rapid transit (BRT) are the main sources of demand for joint development strategies, and they would not be affected by moving up to an HOV-3+ free policy with potential discounts to lower occupancy carpools.

Tables 5-3 and 5-4 in Chapter 5 show that growth in travel is low in the north and comparatively higher in the south. Demand on the southern portions of the corridor challenges the view that the facility may have more than enough capacity to meet needs over the forecast period.

Regarding the spatial dimensions of the travel scenario that was used in the baseline forecast in this report and its impact on the three qualitative forecasts being described in this section, the traffic levels should be impacted as shown below:

- Assuming reasonable rate levels chosen to attempt to optimize traffic and revenues, the flat rate toll pricing plan would see congestion at higher levels in the southern sections than that of the base line forecasts. Depending on the toll levels chosen, congestion could occur earlier in the forecasts as well.
- Segmented tolling as described above would be designed to accommodate this spatial distinction, so no other impacts would be seen.
- Skewed per-mile tolling as described above would be designed to accommodate this spatial distinction, so no other impacts would be seen.

6.1.2 Incorporating Risk in the Policy and Enterprise Strategy Development Process

It is important to remember when looking at these forecasts as well as that of the baseline forecast that one is looking at events that are over 10 to 20 years into the future, and many factors will affect their realization which are not imbedded into the forecasts. Aside from growth rate fluctuations, variables like recessions, inflation, a fall in real wage rates, oil price rises and the like could occur, and all have the potential to reduce traffic on the toll road or in the corridor.

A reduction in traffic has implications for many other dimensions of public and private life as well as the success and performance of the ML facility. It may be that the results of a detailed risk based assessment may be more informative than a computer-based assessment of a traditional normative forecast.

For example, a price rise in fuel costs would likely pressure motorists to choose transit modes if they were available and if they serviced the destinations that motorists desired. By making this choice available, one is enabling the public and the regional economy to better manage the economic and financial impacts of such a price rise. One does not need a forecast to accommodate this highly probable event; one needs a management strategy based on a financially weighted risk assessment.

A managed lane facility can have the ability to incorporate not only transit modes to enable the choice by motorists to make more readily in times when modal competitiveness is shifting, it can also incorporate development activities on parcels adjoining the transit stations which could be influenced by BRT services. This will have the effect of enabling the region's policy makers and the public to better manage changes in its competitive production capabilities. A risk analysis can also enable the ML facility to be phased in response to a better understanding of these variables.

For purposes of more detailed revenue forecast investigations, the study team recommended a focused application of per-mile tolling, using I-15 for calibration purposes. In obtaining a conservative "ballpark" estimate of revenue, no other aspects of risk or variables related to value capture for access locations or adjoining land parcels were applied in this feasibility study. Such a study may be warranted in the future. The remainder of this chapter addresses a revenue comparison assuming per-mile tolling for the different 8+4 and 10+4 roadway configurations for 2015 and 2030.

6.2 METHODOLOGY

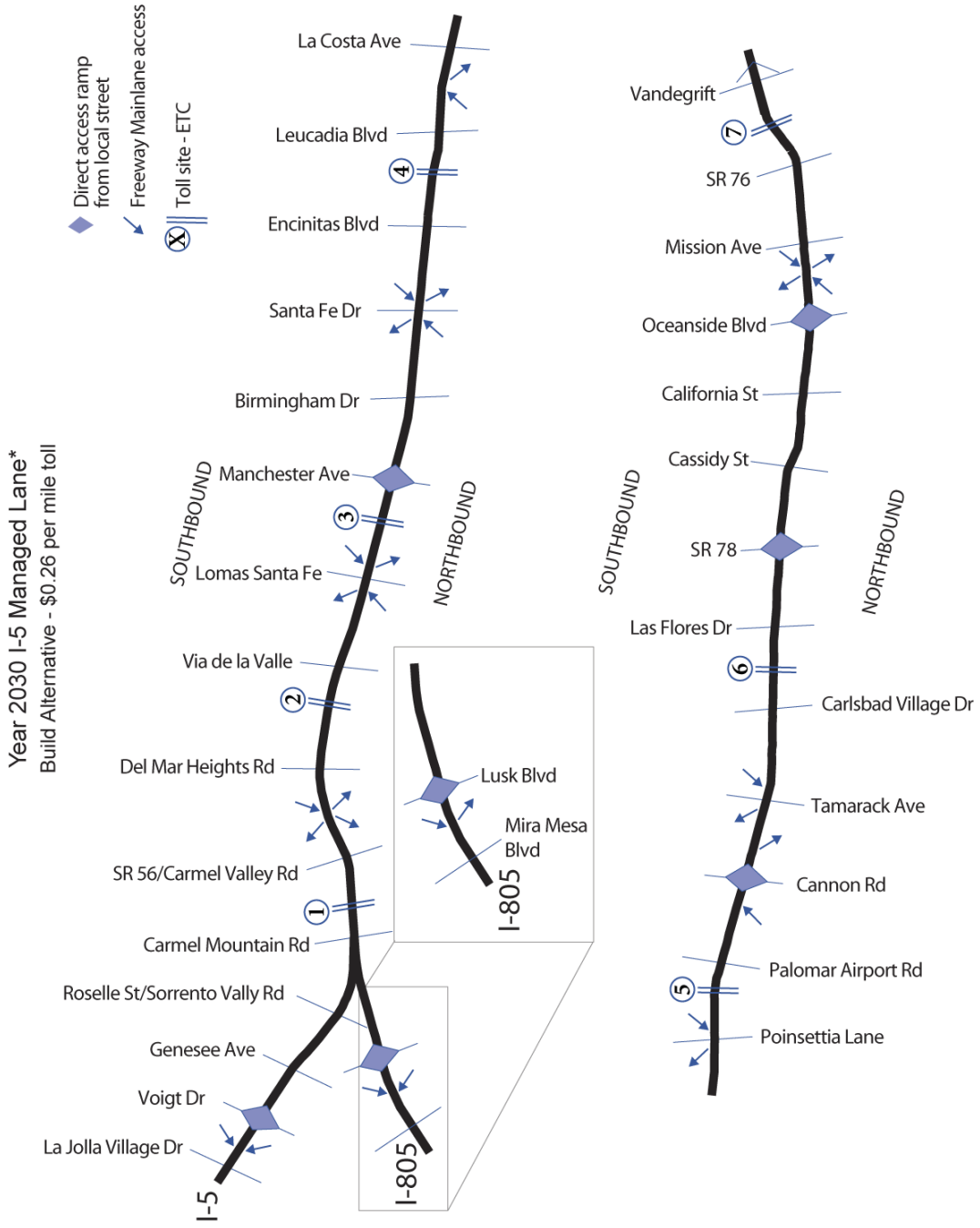
The revenue analysis for the I-5 North Coast Managed Lanes was performed using unadjusted output from the SANDAG regional model at seven mainline tolling locations along the study corridor. The model output provided peak, off-peak and daily traffic volumes segmented into general purpose lane and managed lane trips by vehicle occupancy. These volumes were then broken down into hourly volumes, and hourly toll rates were estimated based on the volume/capacity ratio in the managed lanes based on a throughput goal of no more than 1,650 vehicles/hour/lane. The toll rate structure was based on the structure used on the I-15 Express Lanes in San Diego. Finally, the estimated revenues for each of the seven locations were summed to provide annual revenue estimates for 2015 and 2030 scenarios with "8+4" and "10+4" lane configurations. It is important to note that in the "8+4" configuration, there are three of the seven tolling locations where there are more than eight general purpose lanes (auxiliary lanes have been excluded for this analysis); North of SR 76, I-5 is proposed to have 10 general purpose lanes; south of Via de la Valle I-5 is proposed to have nine general purpose lanes (5SB/4NB); and south of SR 56 I-5 is proposed to have 10 general purpose lanes.

6.2.1. Model Output

The regional model output was used without any adjustments in order to determine the split between managed lane and general purpose lane use. The tolling location and managed lane access points assumed are shown in Figure 6-1. The model assumed a toll cost of $0.10 per mile during off-peak periods and up $0.24 per mile during peak periods (all costs are valued in the base year of 2000).[1] Figure 6-2 is a sample of the model output that was used in the revenue analysis. Model output for the 10+4 and 8+4 configurations was used for 2015 and 2030 at each of the seven tolling locations. A complete set of model outputs can be found in the appendix.

[1] The demand forecast model used tolling assumptions of $0.26 per mile; however, the revenue analysis assumed a toll rate of $0.24 per mile for the 2030 Build Alternative, based on SR 91 validations.

FIGURE 6-1: STUDY AREA AND TOLLING LOCATIONS[2]



[2] The demand forecast model used tolling assumptions of $0.26 per mile; however, the revenue analysis assumed a toll rate of $0.24 per mile.

FIGURE 6-2: SAMPLE REGIONAL MODEL OUTPUT

	Drive Alone		Shared Ride - 2 Person		Shared Ride - 3+ Person			V/C*	Percent of
	Non-Toll	Toll	Non-Toll, Non-HOV	Non-Toll, HOV	Non-Toll, Non-HOV	Non-Toll, HOV	Total	Ratio	LOS C Capacity
AM Peak Period Inbound									
General Purpose Lanes	*30,700*	*200*	*700*	*600*	*200*	*200*	***32,600***	***0.97***	*n/a*
Managed Lanes	*0*	*1,400*	*0*	*3,400*	*0*	*900*	***5,700***	***0.48***	*n/a*
Total Demand of Managed Lane Modes	*--*	*1,600*	*--*	*4,000*	*--*	*1,100*	***6,700***		70%
AM Peak Period Outbound									
General Purpose Lanes	*23,500*	*200*	*800*	*1,000*	*300*	*300*	***26,100***	***0.70***	*n/a*
Managed Lane	*0*	*100*	*0*	*2,800*	*0*	*800*	***3,700***	***0.31***	*n/a*
Total Demand of Managed Lane Modes	*--*	*300*	*--*	*3,800*	*--*	*1,100*	***5,200***		54%
Total AM Peak Period									
General Purpose Lanes	*54,200*	*400*	*1,500*	*1,600*	*500*	*500*	***58,700***	***0.83***	*n/a*
Managed Lanes	*0*	*1,500*	*0*	*6,200*	*0*	*1,700*	***9,400***	***0.39***	*n/a*
Total Demand of Managed Lane Modes	*--*	*1,900*	*--*	*7,800*	*--*	*2,200*	***11,900***		62%

* - modeling capacity

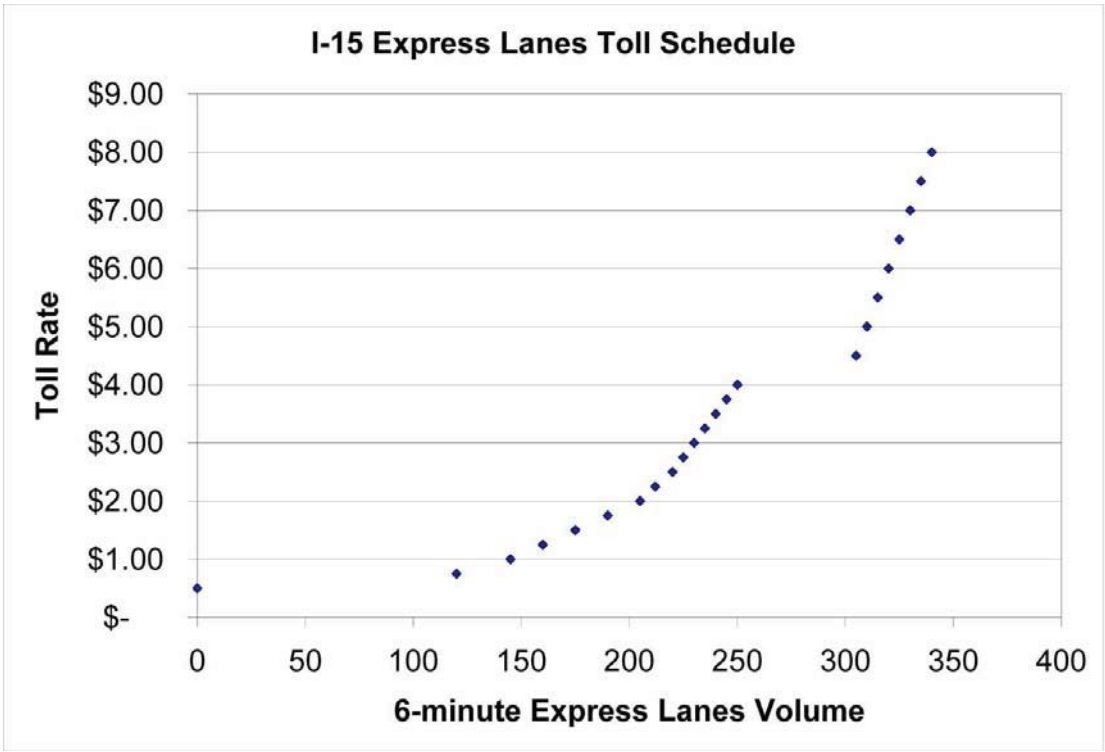
	Drive Alone		Shared Ride - 2 Person		Shared Ride - 3+ Person			V/C*	Percent of
	Non-Toll	Toll	Non-Toll, Non-HOV	Non-Toll, HOV	Non-Toll, Non-HOV	Non-Toll, HOV	Total	Ratio	LOS C Capacity
AM Peak Period Inbound									
General Purpose Lanes	*32,500*	*200*	*800*	*700*	*300*	*200*	***34,700***	***1.03***	*n/a*
Managed Lanes	*0*	*1,800*	*0*	*3,700*	*0*	*1,000*	***6,500***	***0.54***	*n/a*
Total Demand of Managed Lane Modes	*--*	*2,000*	*--*	*4,400*	*--*	*1,200*	***7,600***		79%
AM Peak Period Outbound									
General Purpose Lanes	*21,600*	*200*	*700*	*1,000*	*200*	*300*	***24,000***	***0.65***	*n/a*
Managed Lane	*0*	*100*	*0*	*2,900*	*0*	*900*	***3,900***	***0.33***	*n/a*
Total Demand of Managed Lane Modes	*--*	*300*	*--*	*3,900*	*--*	*1,200*	***5,400***		56%
Total AM Peak Period									
General Purpose Lanes	*54,100*	*400*	*1,500*	*1,700*	*500*	*500*	***58,700***	***0.83***	*n/a*
Managed Lanes	*0*	*1,900*	*0*	*6,600*	*0*	*1,900*	***10,400***	***0.43***	*n/a*
Total Demand of Managed Lane Modes	*--*	*2,300*	*--*	*8,300*	*--*	*2,400*	***13,000***		68%

* - modeling capacity

6.2.2. Tolling Rates

The I-15 Express Lanes in San Diego were used as a basis for generating the tolling curves and the toll rate relationships factored to percent capacity on the toll facility. The I-15 Express Lanes toll rates are monitored based on the volume over capacity (v/c) ratio in the lanes. Figure 6-3 shows the relationship between six-minute average volumes on the I-15 Express Lanes and the toll rates that are charged to single occupancy vehicles (SOV).

FIGURE 6-3: OBSERVED I-15 DATA POINTS



This relationship between managed lane v/c rates and toll rates were then translated to apply to the I-5 North Coast managed lanes assuming variable pricing of these lanes. Base (off-peak) tolls were calculated based on the distance between tolling locations using the $0.10 per mile rate assumed in the model. The following figure shows the off-peak SOV toll rates for 2000, 2015, and 2030, rounding tolls to the nearest 25-cent increment and assuming a three percent annual inflation rate.

FIGURE 6-4: OFF-PEAK BASE TOLL RATES

Location	**Mileage** (miles)	**2000** 10¢/mile	**2015** 16¢/mile	**2030** 24¢/mile
s/o SR 56	4.5	$0.50	$0.75	$1.00
s/o Via de la Valle	3.9	$0.50	$0.50	$1.00
s/o Manchester Ave	1.2	$0.25	$0.25	$0.25
n/o Encinitas Blvd	5.5	$0.50	$1.00	$1.25
s/o Palomar Airport Rd	3.9	$0.50	$0.50	$1.00
n/o Carlsbad Village Dr	3.8	$0.50	$0.50	$1.00
n/o SR 76	2.6	$0.25	$0.50	$0.50
TOTAL	25.4	$3.00	$4.00	$6.00

These base toll rates were used during times of very low use on the managed lanes (corresponding to 0-100 vehicles per hour using Figure 6-3). As volumes in the corridor increase, the managed lane volumes also increase, and the toll rates are adjusted upward based on the relationship shown in Figure 6-3. Figure 6-5 shows the resulting average hourly toll rates that were used during the peak hour (northbound) in 2015 (10+4 and 8+4 configurations). Each hour's toll rate structure varies based on the level of congestion in the managed lanes. Portions of the project with higher congestion, such as the southern section near SR 56, have a higher toll rate per mile. These rates are only charged to customers who are driving alone; all vehicles carrying two or more people travel in the managed lanes for free based on current occupancy policies.

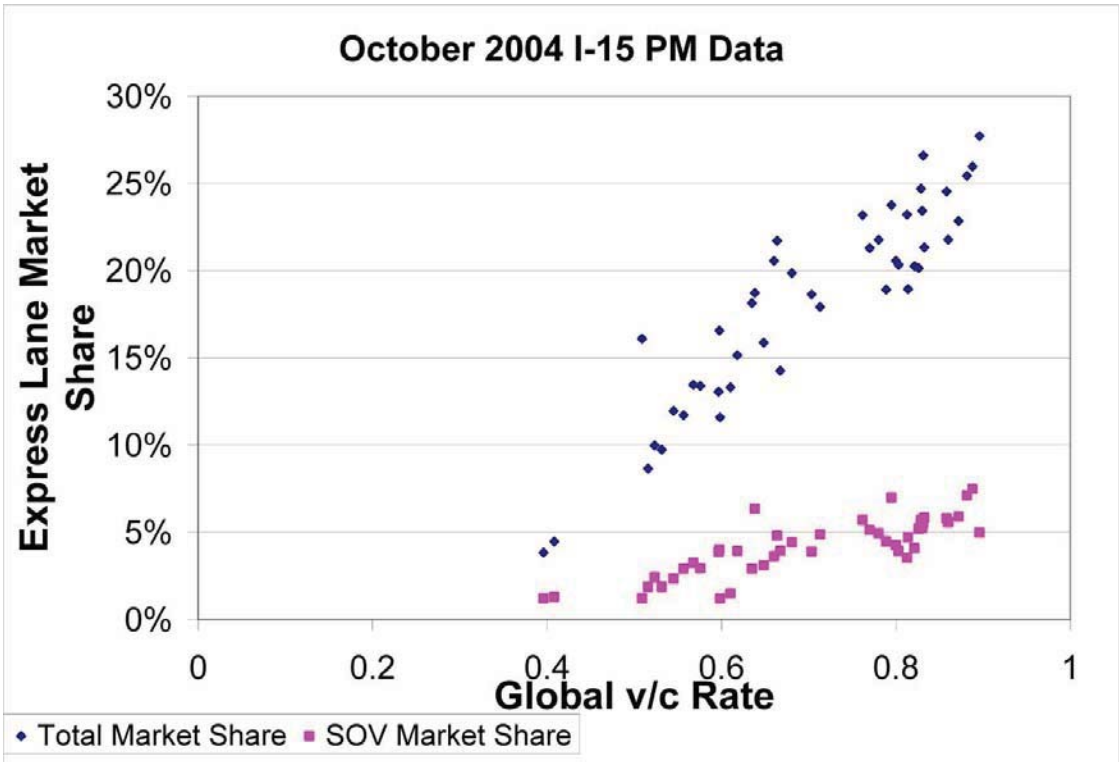
FIGURE 6-5: 2015 10+4 AND 8+4 CONFIGURATION TOLL RATES

	10+4		**8+4**	
	2015		**2015**	
Location	Off-peak	NB Peak	Off-peak	NB Peak
s/o SR 56	$0.75	$4.90	$0.75	$5.50
s/o Via de la Valle	$0.50	$3.25	$0.50	$3.25
s/o Manchester Ave	$0.25	$1.50	$0.25	$2.00
n/o Encinitas Blvd	$1.00	$2.50	$1.00	$2.50
s/o Palomar Airport Rd	$0.50	$0.75	$0.50	$0.75
n/o Carlsbad Village Dr	$0.50	$0.50	$0.50	$0.50
n/o SR 76	$0.50	$0.50	$0.50	$0.50
TOTAL	$4.00	$13.90	$4.00	$15.00

6.2.3. Tolling Curves

The volume of traffic using the managed lanes is determined by using the regional model output. However, since the revenue model requires hourly volume input (rather than by period), tolling curves must be generated to develop a relationship between total corridor v/c rates and the use of the managed lanes by both SOV and HOV trips. The basis of these curves is application of observed market share rates and global v/c data from the I-15 Express Lanes, as shown in Figure 6-6. As the overall (global) volume in the corridor increases, the share of total traffic using the managed lanes increases. Since managed lanes are intended to benefit carpools, the majority of the users will be HOVs, and a smaller share will pay the toll to use as an SOV.

FIGURE 6-6: I-15 EXPRESS LANE MARKET SHARE CURVE



The basic shape of total market share, as shown below in Figure 6-7, was applied to each of the tolling locations on the I-5 corridor. The total market share curve for each location is slightly different, depending on the mix of HOV and SOV managed lane use that was projected by the regional model. Figure 6-7 shows a generic total market share curve, and the curves in Figures 6-8 and 6-9 show the varying curve types by time of day and location for FasTrak™ (paying) customers, HOV, and total market share. While each year and configuration have similar curves, each are unique in order to match the regional model output.

FIGURE 6-7: SAMPLE MANAGED LANE MARKET SHARE CURVE

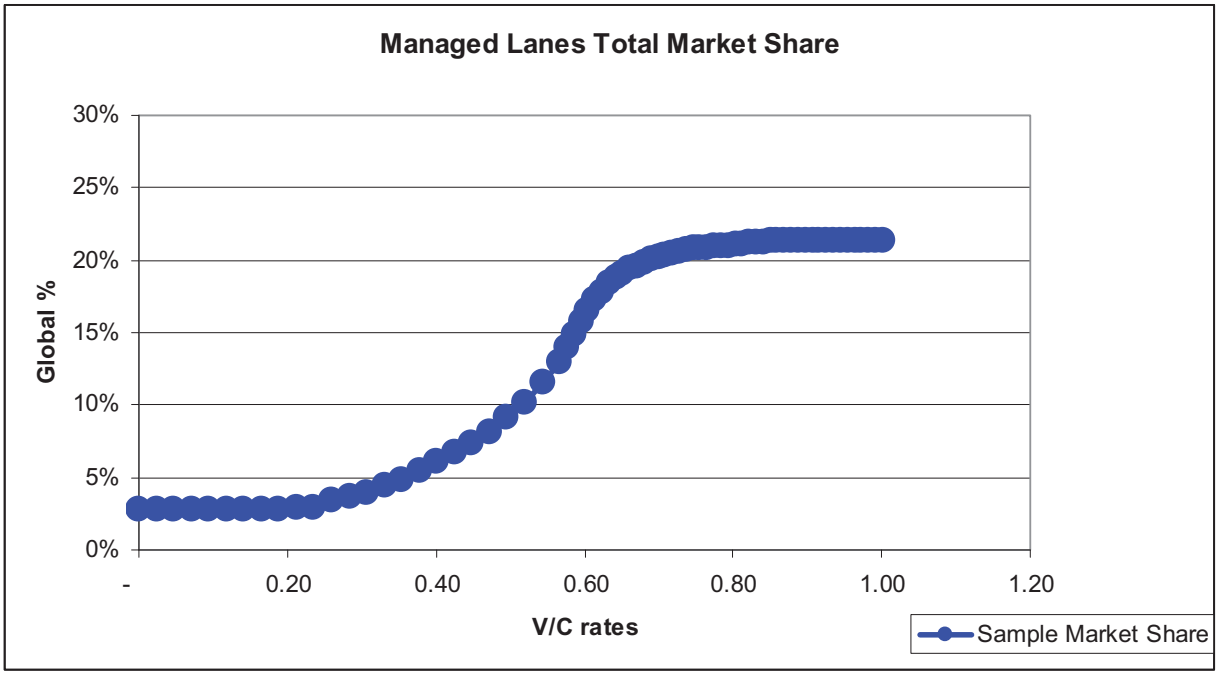
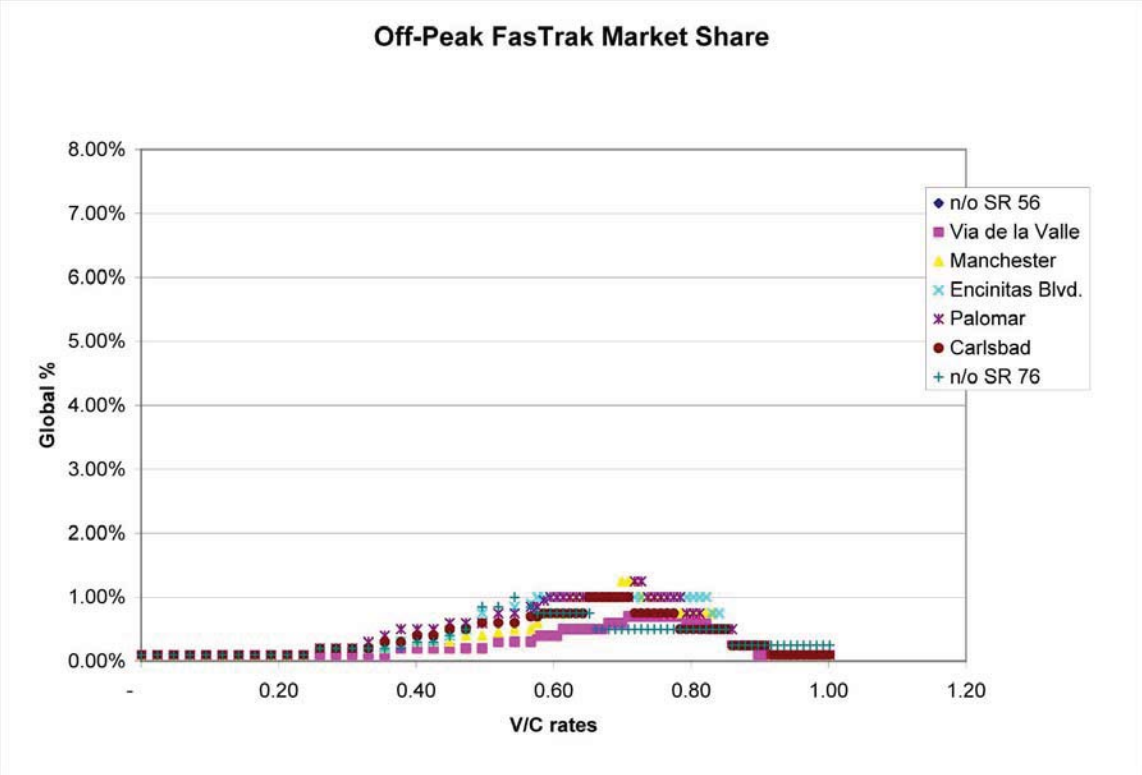
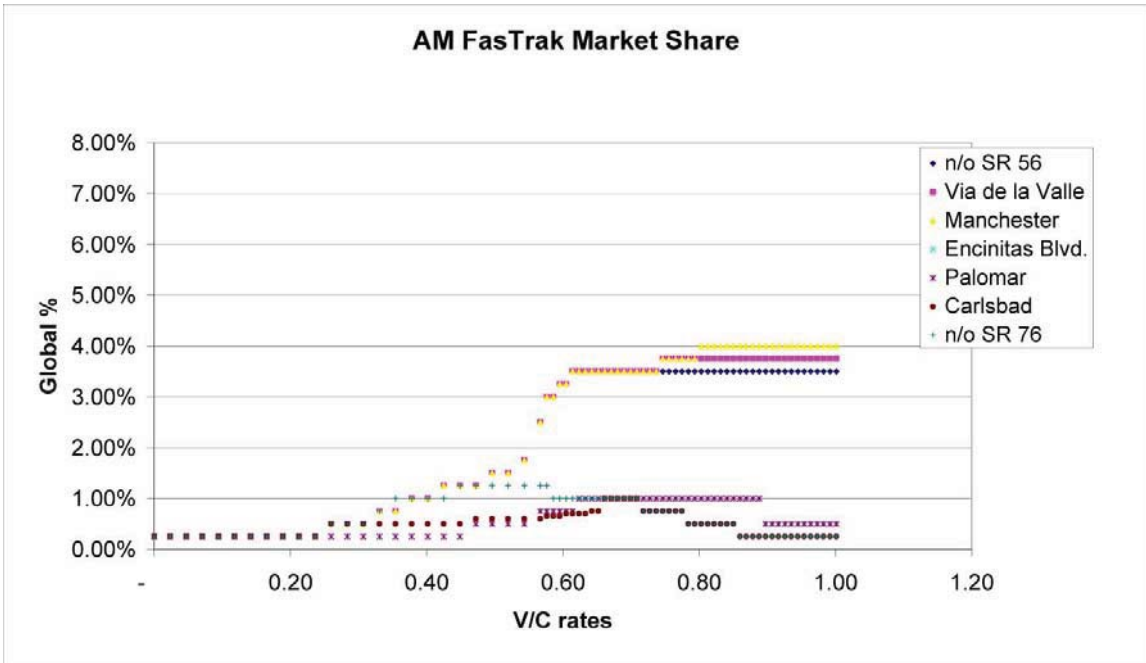
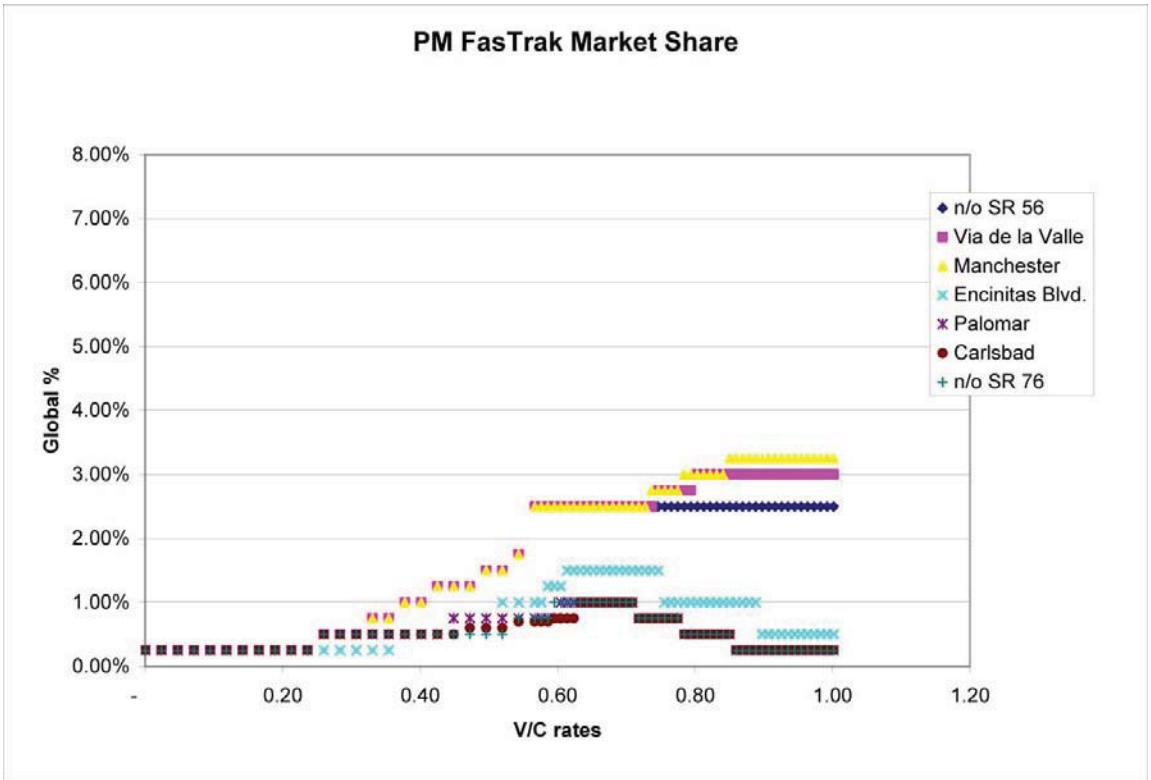
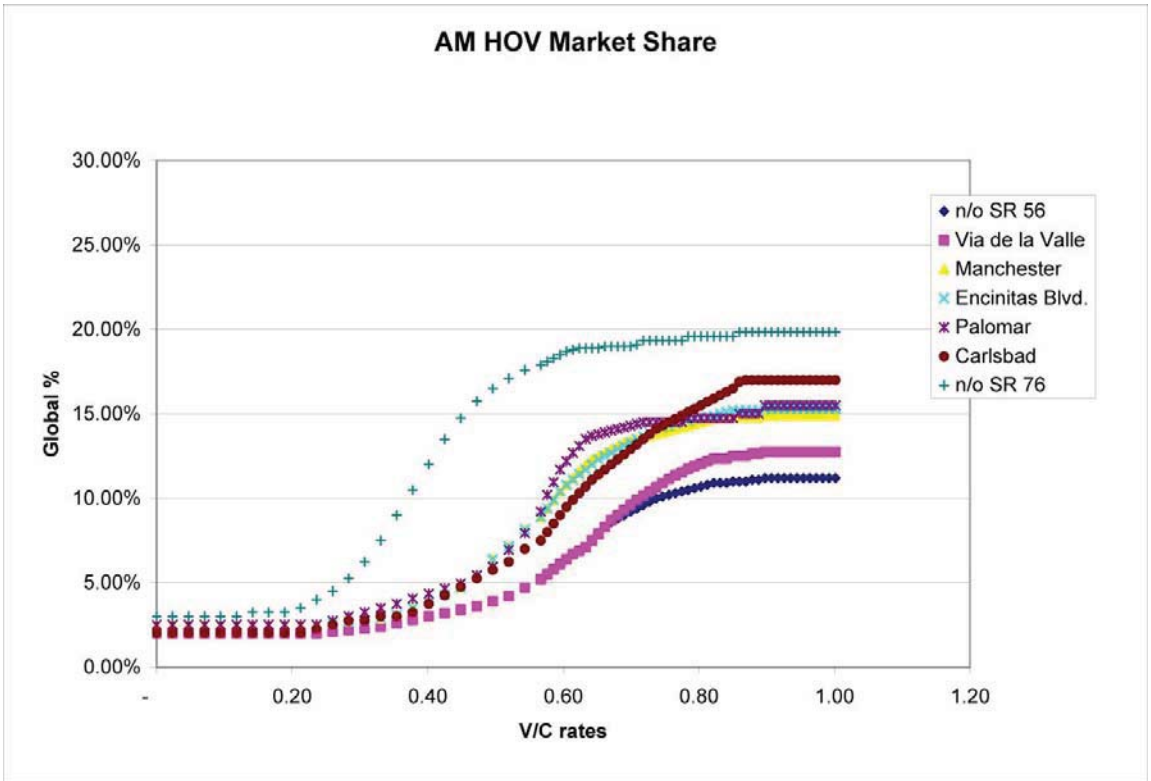


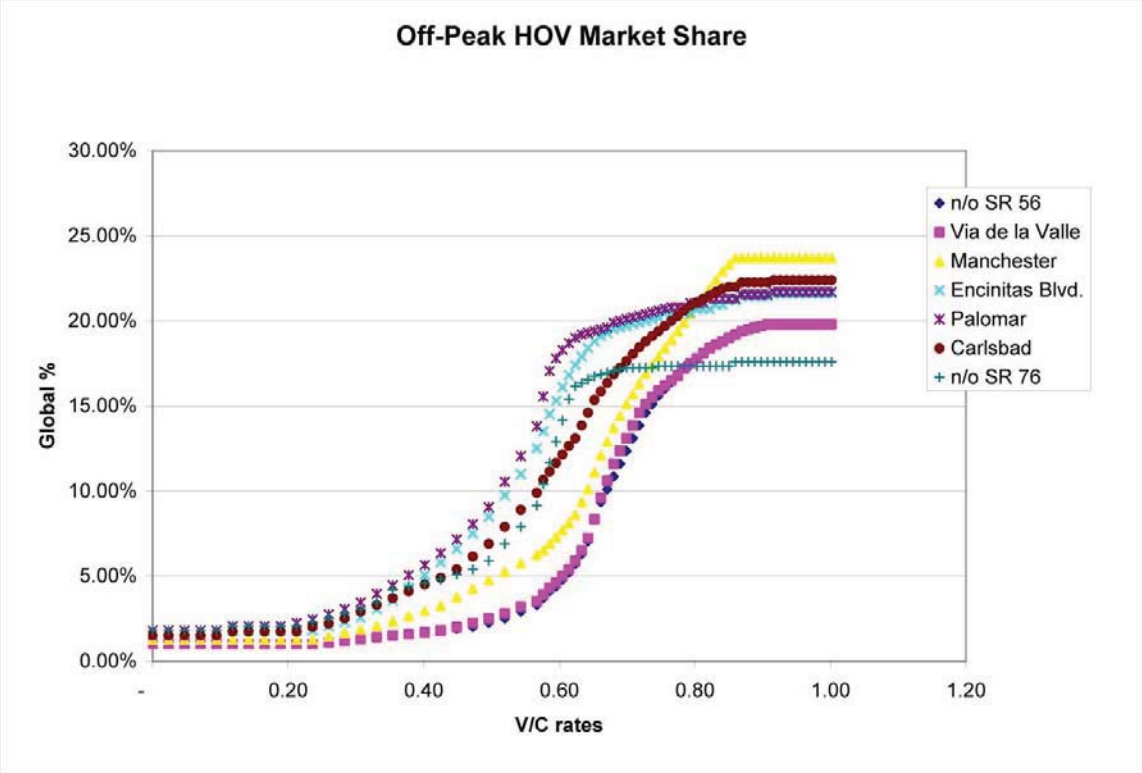
FIGURE 6-8: 2030 10+4 FASTRAK, HOV, AND TOTAL MARKET SHARE CURVES BY LOCATION

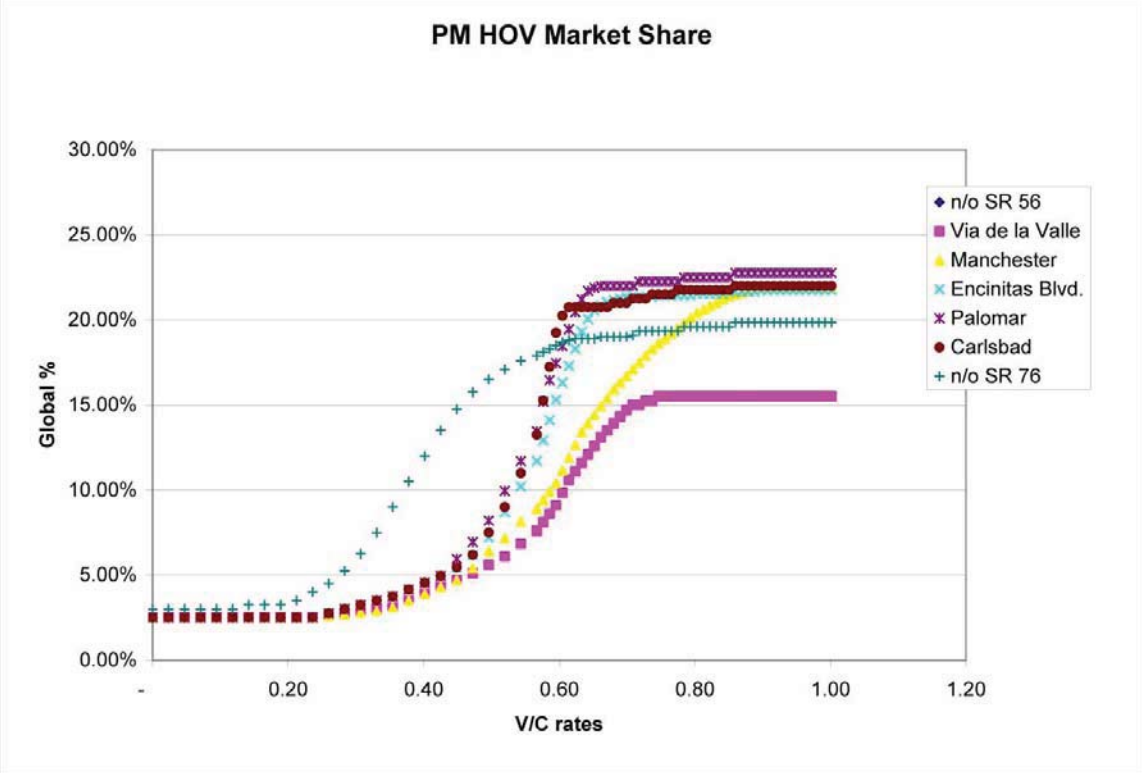


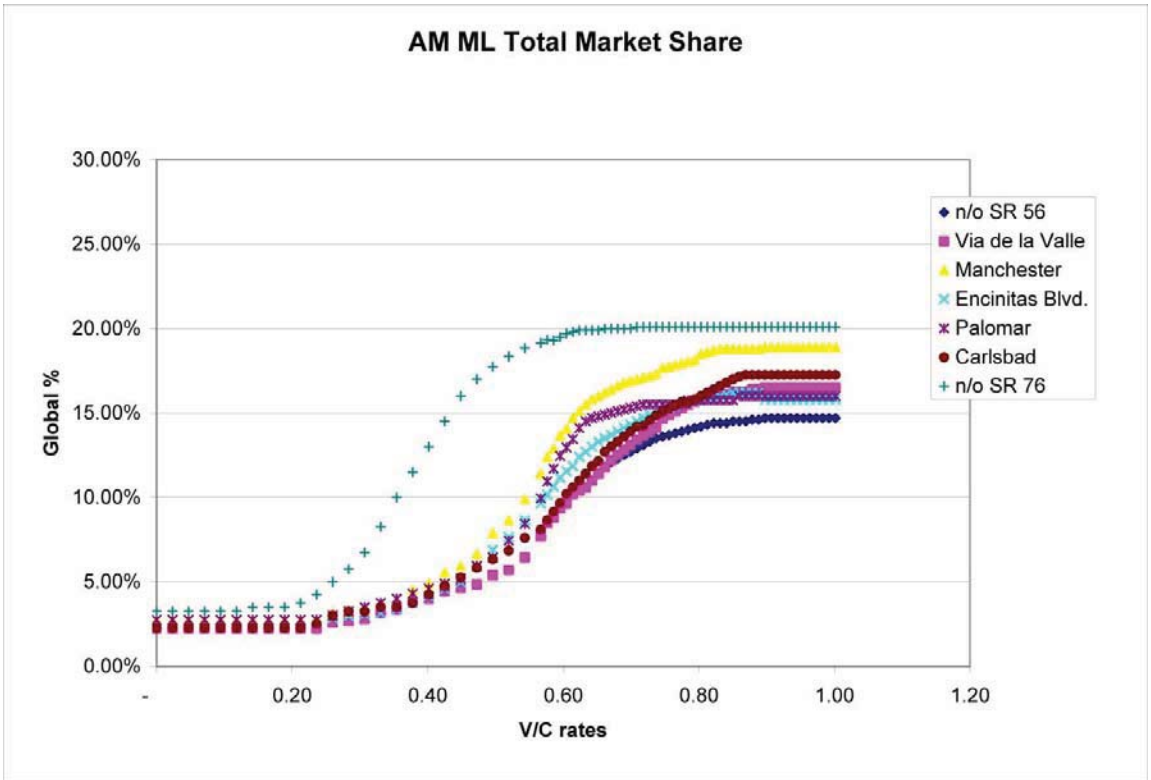


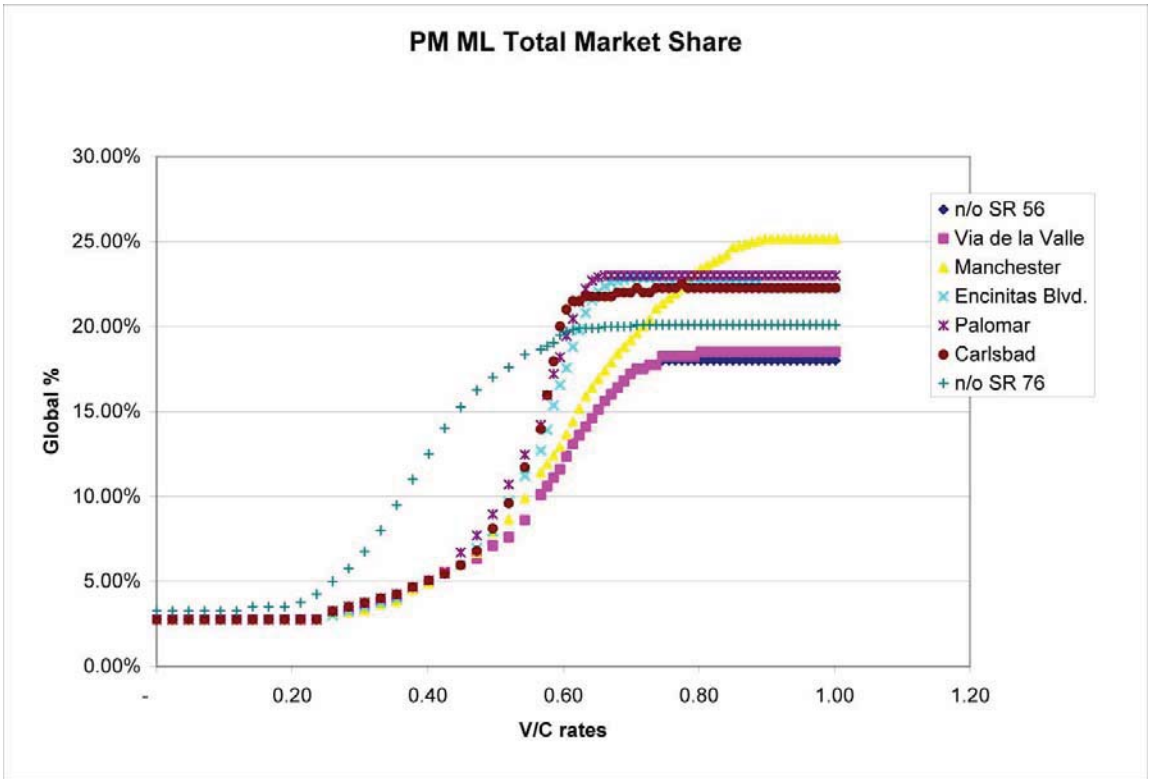

PM FasTrak Market Share
8.00%
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


AM HOV Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


Off-Peak HOV Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


PM HOV Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


AM ML Total Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


PM ML Total Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76

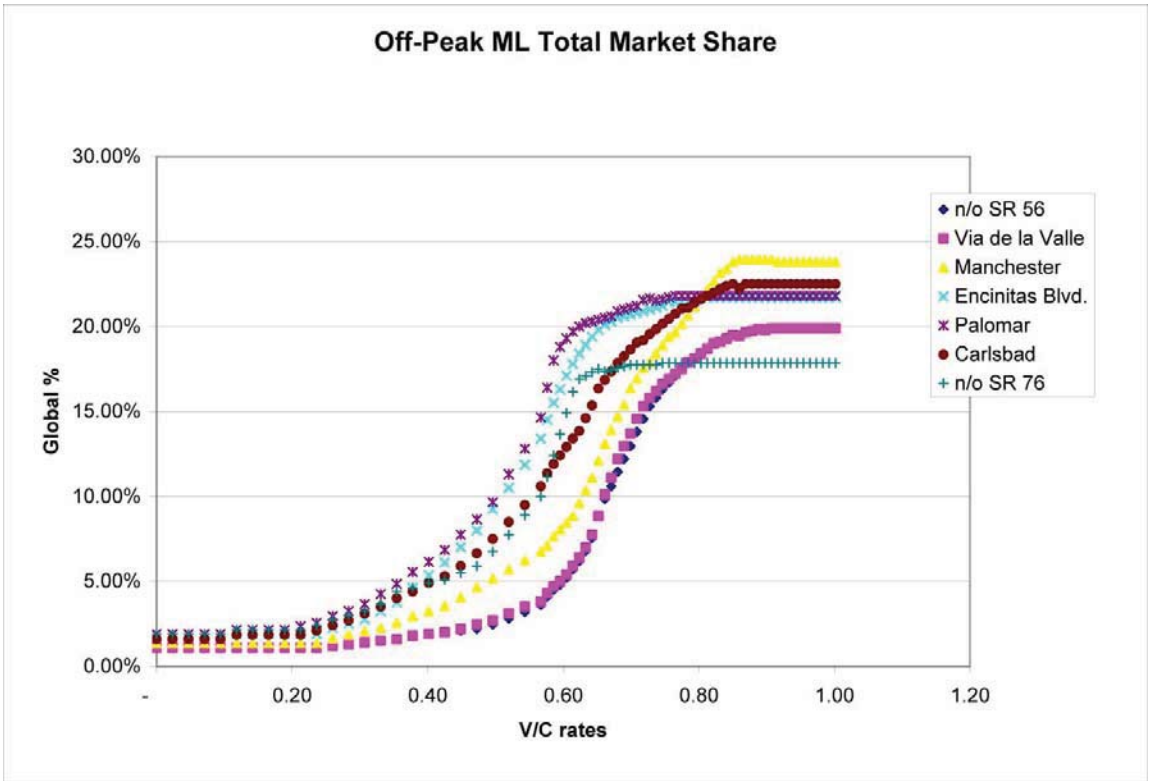
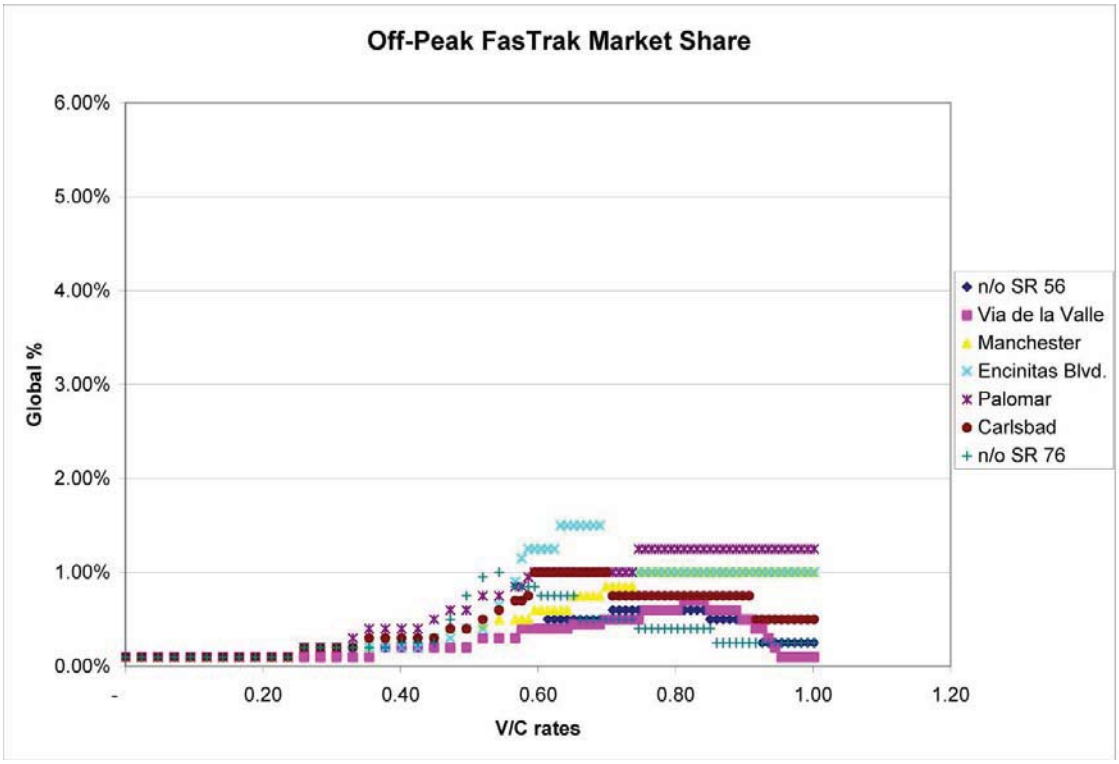
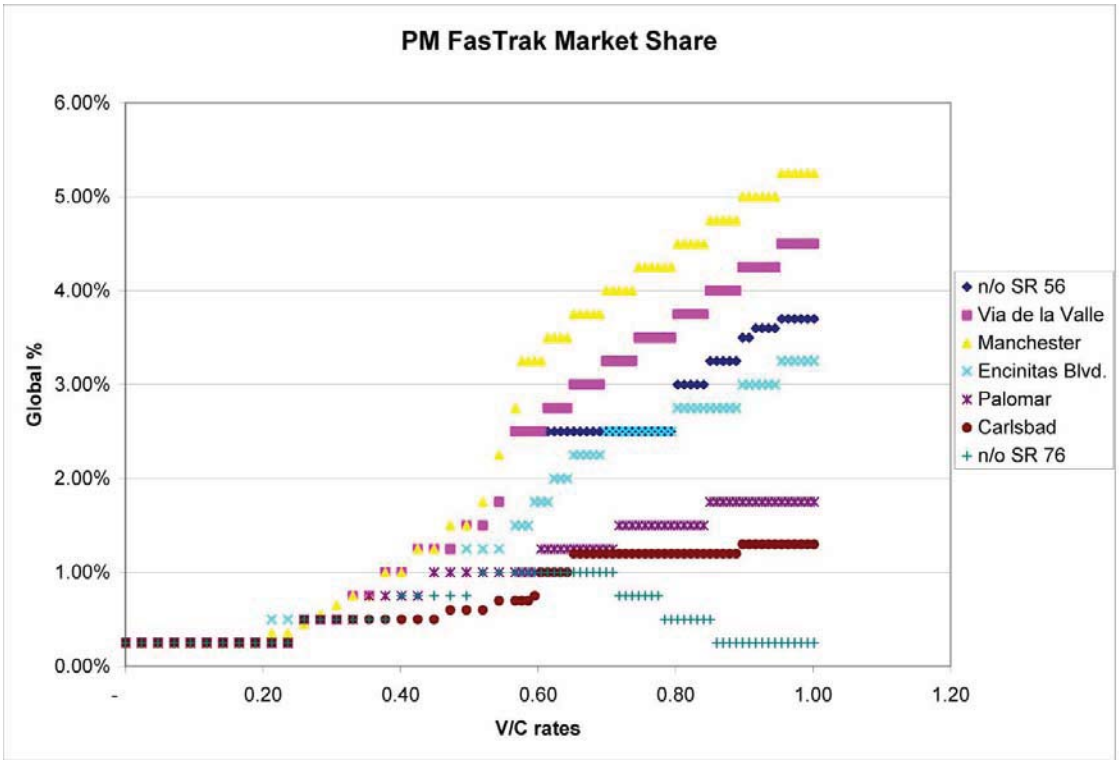
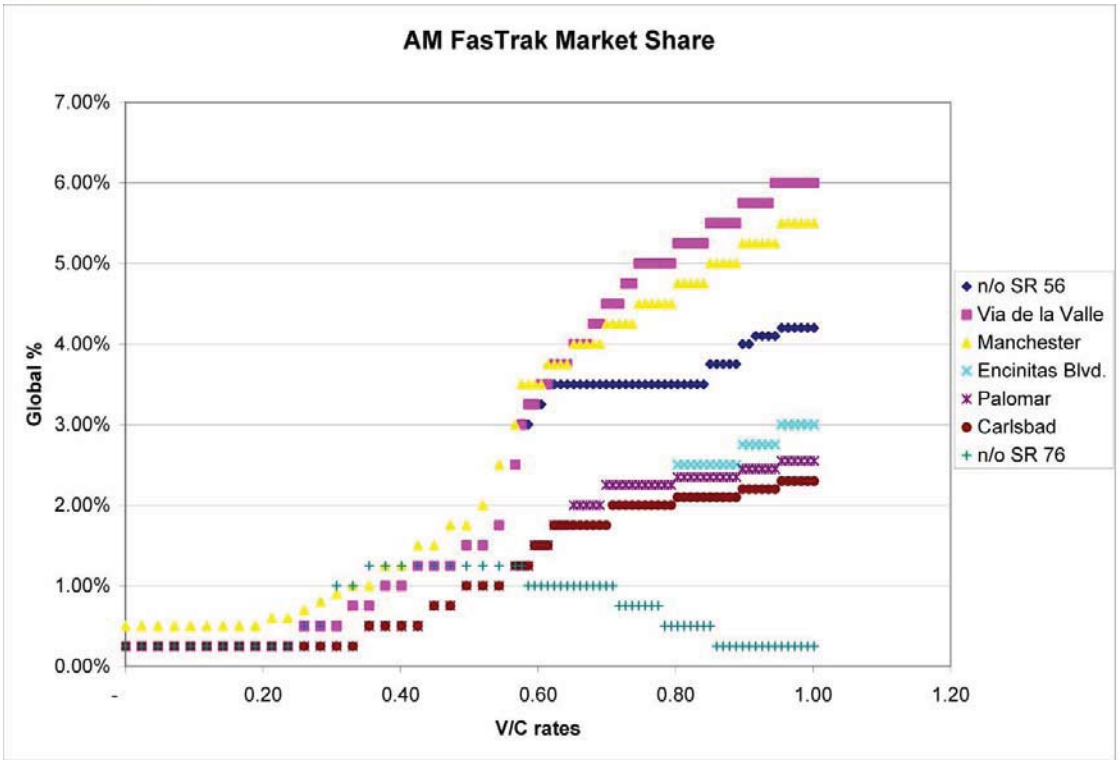
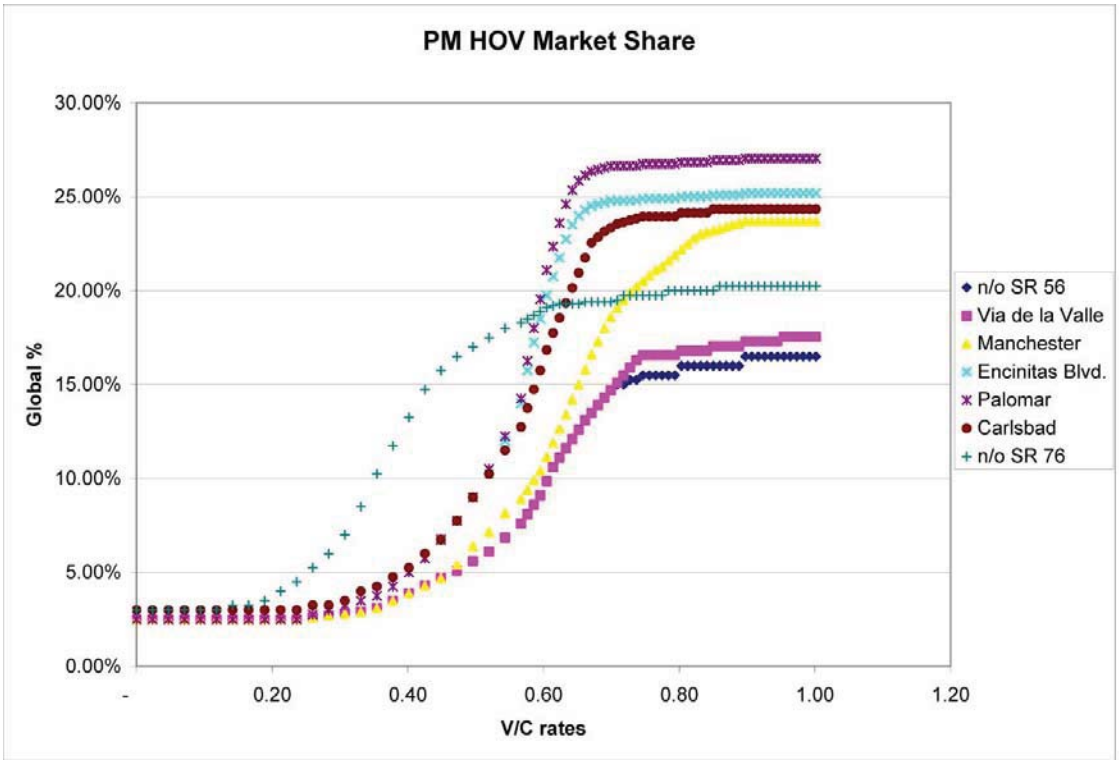

Off-Peak ML Total Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76

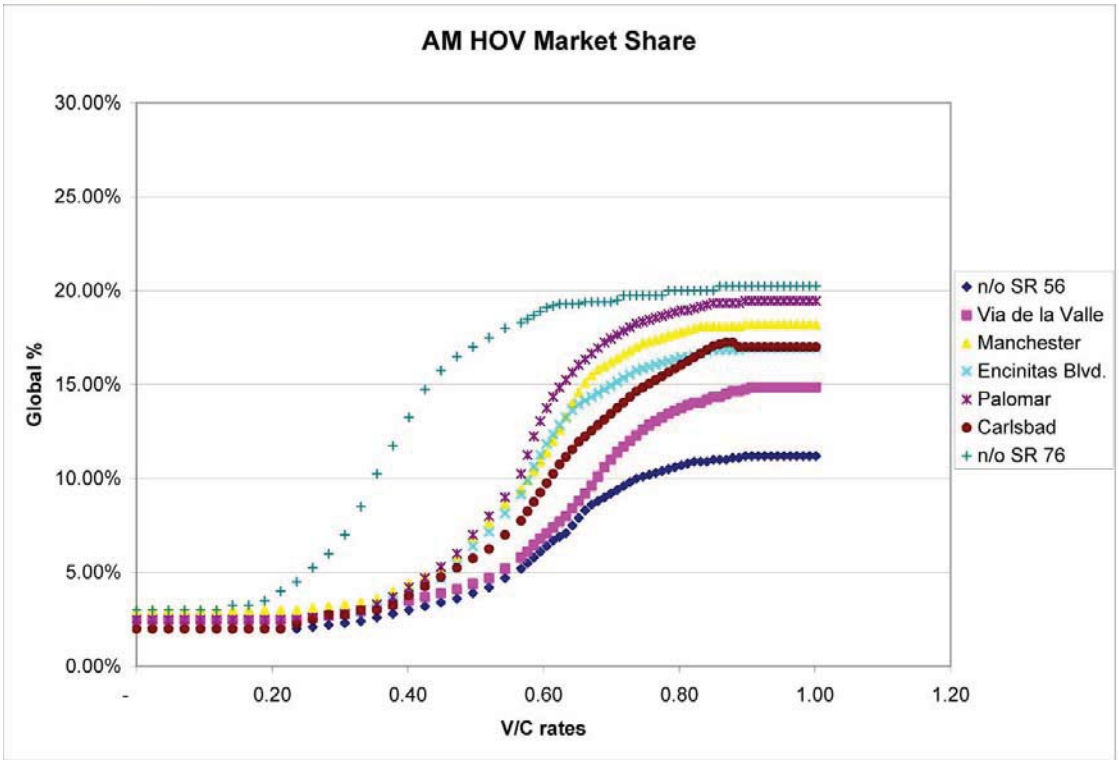
FIGURE 6-9: 2030 8+4 FASTRAK, HOV, AND TOTAL MARKET SHARE CURVES BY LOCATION

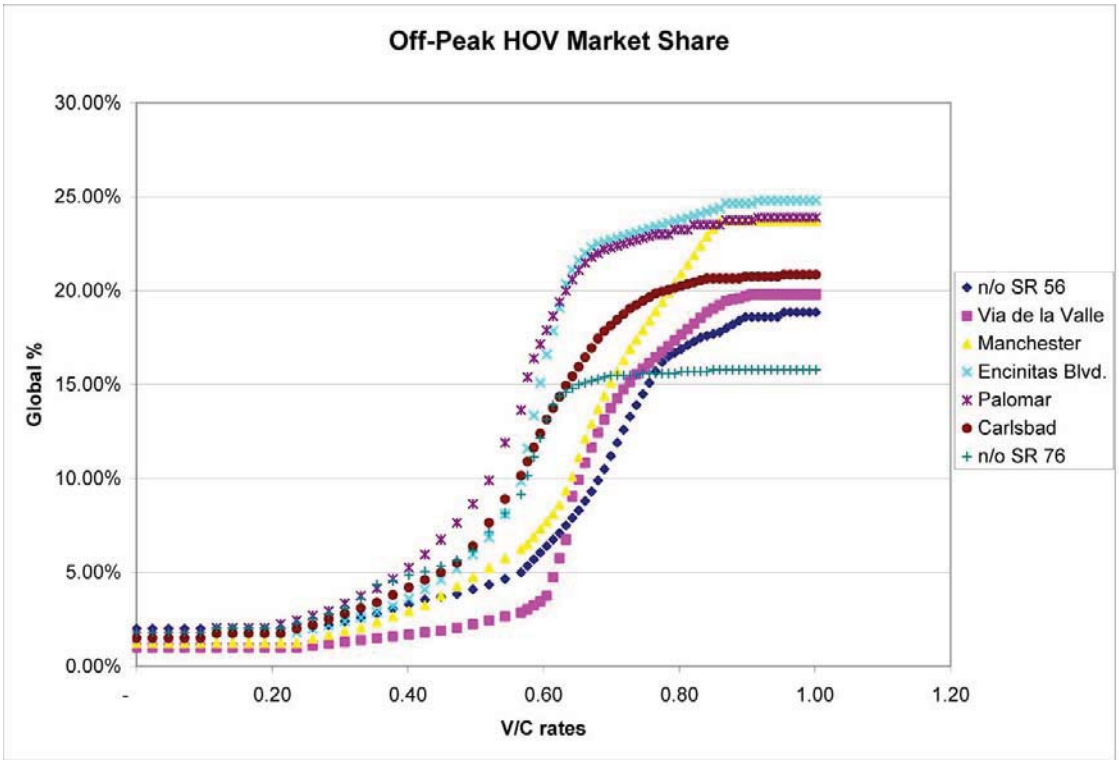


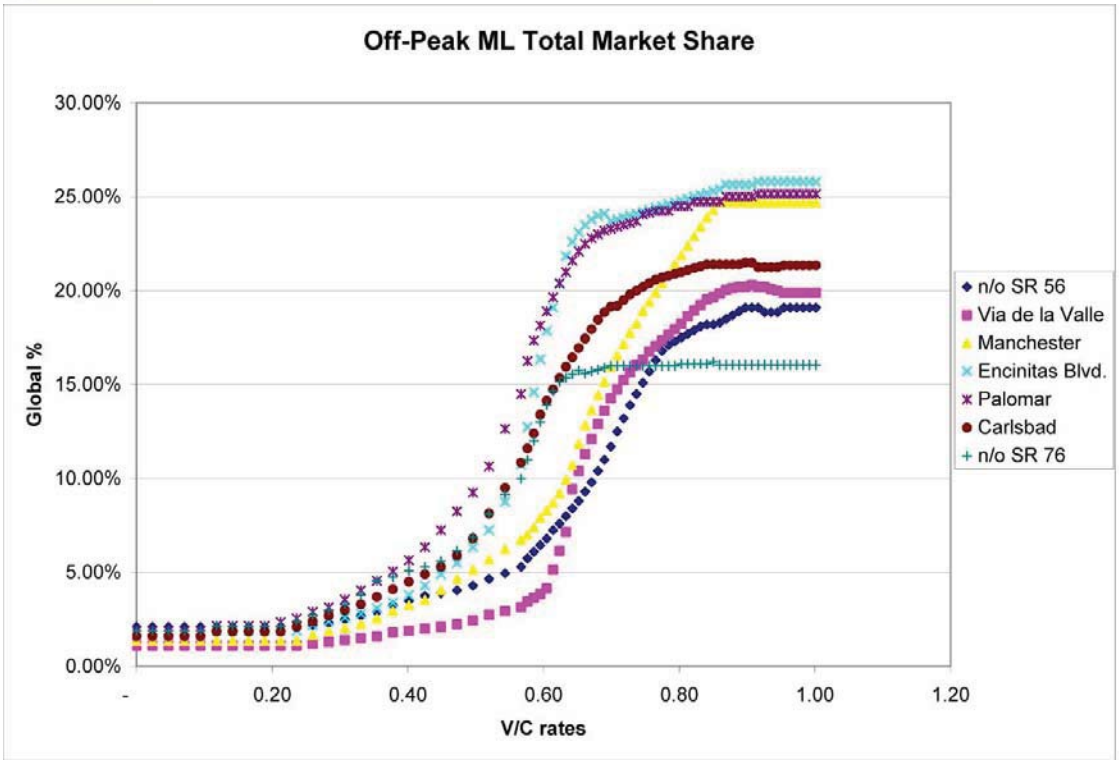


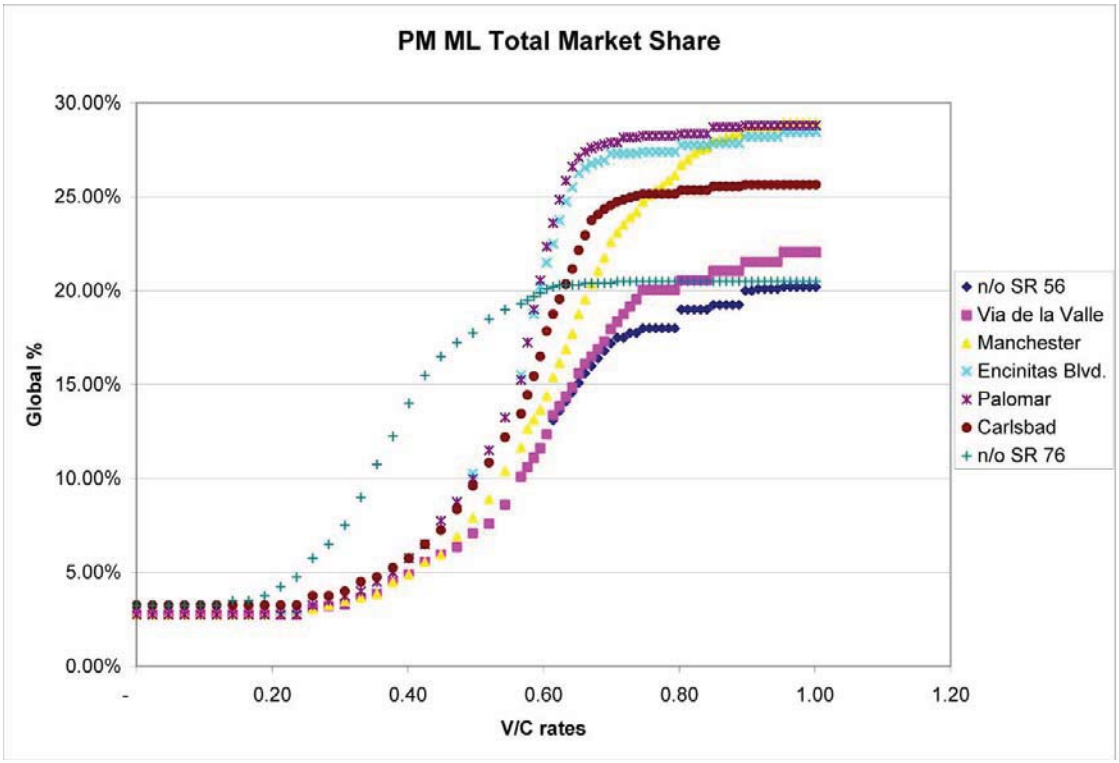

AM FasTrak Market Share
7.00%
6.00%
5.00%
4.00%
3.00%
2.00%
1.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76

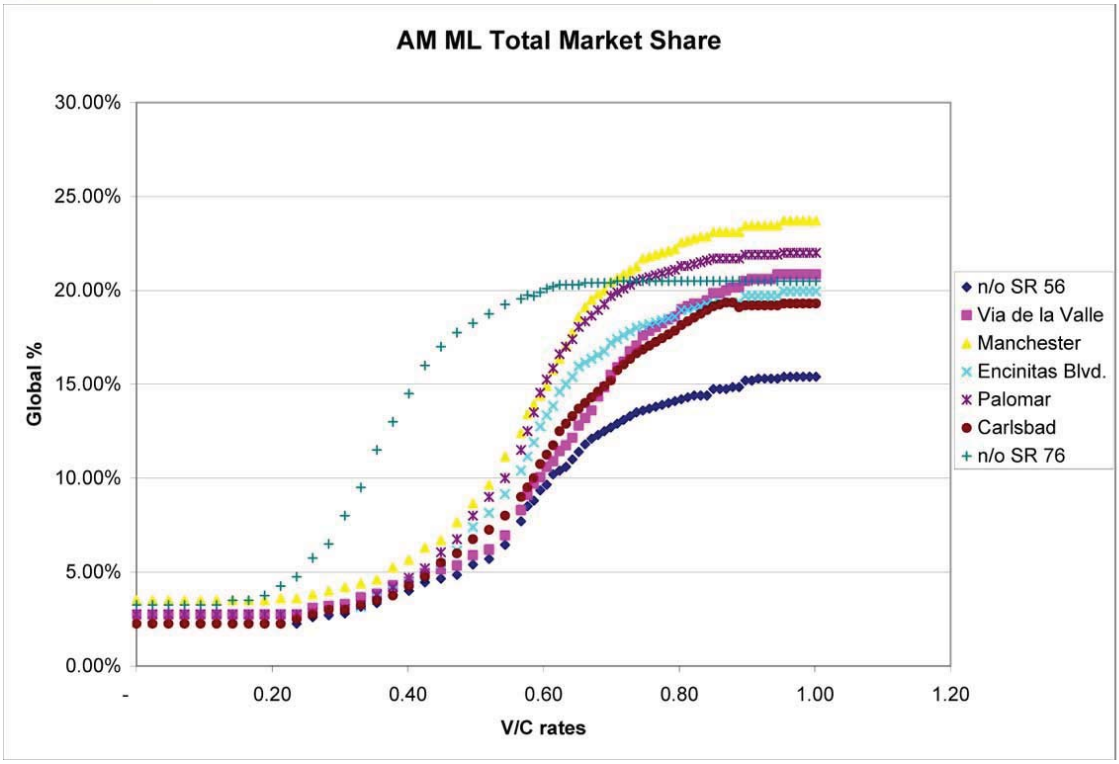

PM HOV Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


AM HOV Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


Off-Peak HOV Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


Off-Peak ML Total Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


PM ML Total Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76


AM ML Total Market Share
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Global %
-
0.20
0.40
0.60
0.80
1.00
1.20
V/C rates
n/o SR 56
Via de la Valle
Manchester
Encinitas Blvd.
Palomar
Carlsbad
n/o SR 76

6.3 ASSUMPTIONS

The regional model was assumed to effectively distribute the SOV and HOV trips between the managed lanes and the general purpose lanes. These volumes were used in the revenue analysis without adjustment. The HOV definition included vehicles with two or more people, unless discussed otherwise.

A key assumption that should be noted is that all SOVs who are required to have a transponder to pay the toll were equipped with a transponder. In a corridor such as I-5, there are many through trips that do not regularly travel the road and will not know the tolling system. There was no reduction taken for vehicles without transponders or valid accounts for payment. In addition, it was assumed that HOVs did *not* require a registered transponder to use the managed lanes facility. On facilities such as the 91 Express Lanes in Orange/Riverside County, California, all vehicles who travel on the Express Lanes are required to have a valid transponder in their vehicle to use the facility; even HOVs who use the facility for free during most times of the day.

6.4 FORECASTED TOLL REVENUE

Revenue forecasts were created for four build scenarios

- 2015 8+4
- 2015 10+4
- 2030 8+4, and
- 2030 10+4

Unadjusted model output for each of the scenarios was used to develop SOV and HOV market share curves, to simulate the hourly traffic conditions. Daily and annual revenues were then generated based on these hourly distributions. Revenues are presented in year of expenditure dollars unless stated otherwise.

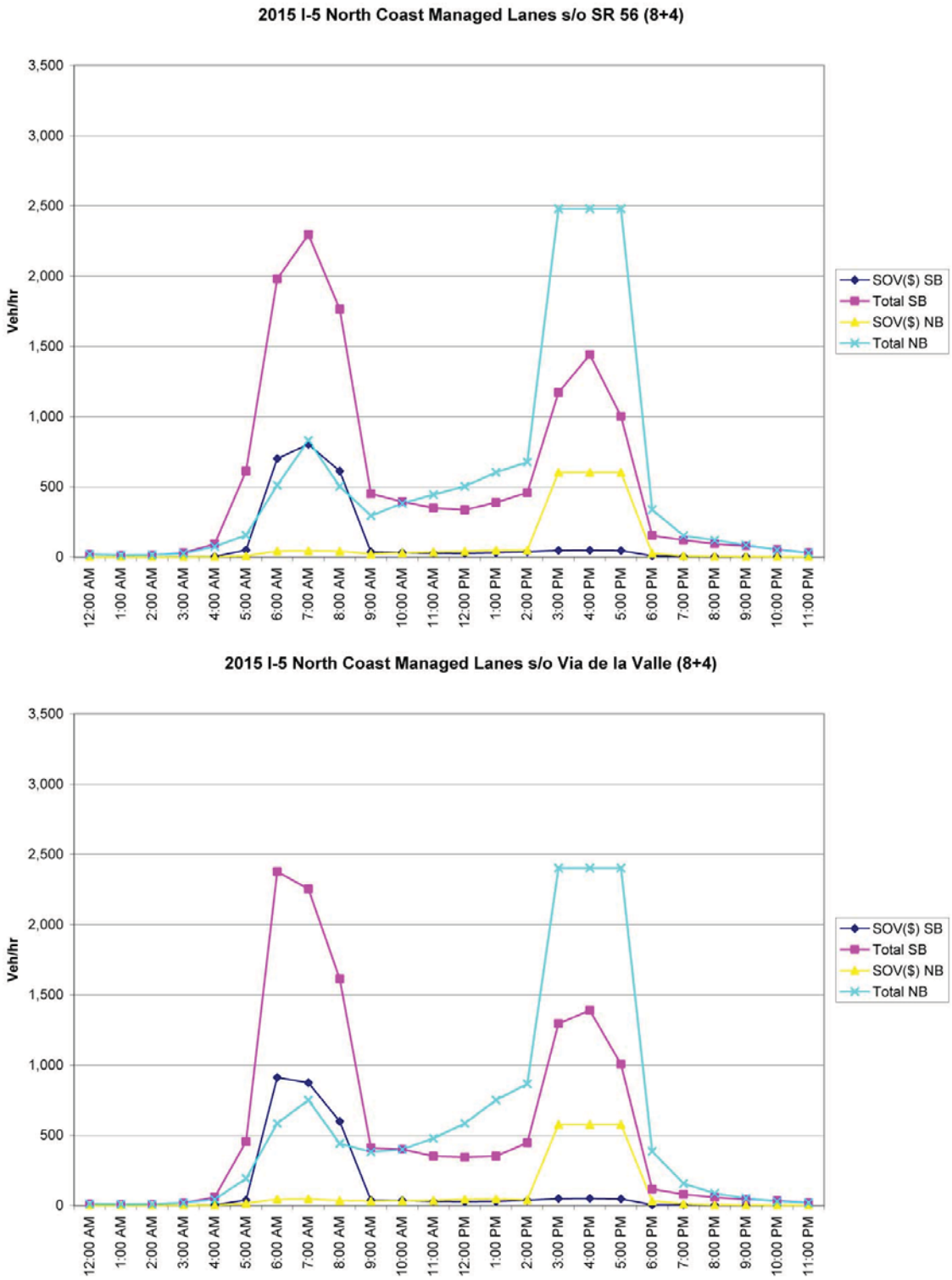
6.4.1. Intermediate Year 2015

Volume by Segment

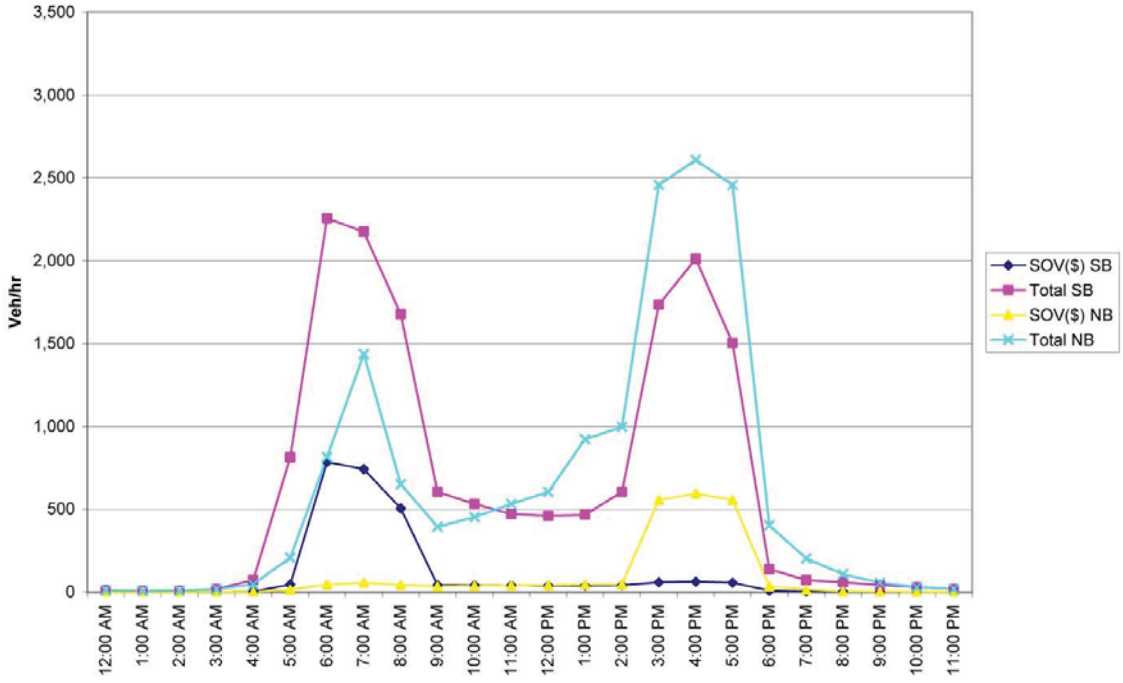
The following graphs show the hourly volumes at each of the tolling locations for 2015 for the “8+4” configuration with eight general purpose lanes and four managed lanes (Figure 6-10) (Modifications in lane configurations are discussed in the Methodology section in this chapter.); and for the “10+4” configuration with ten general purpose lanes and four managed lanes (Figure 6-11).

Volumes in the southern portion of the study area have higher corridor volumes, which are shown by the greater use of the managed lanes. As the volumes decrease further to the north, the managed lane use decreases.

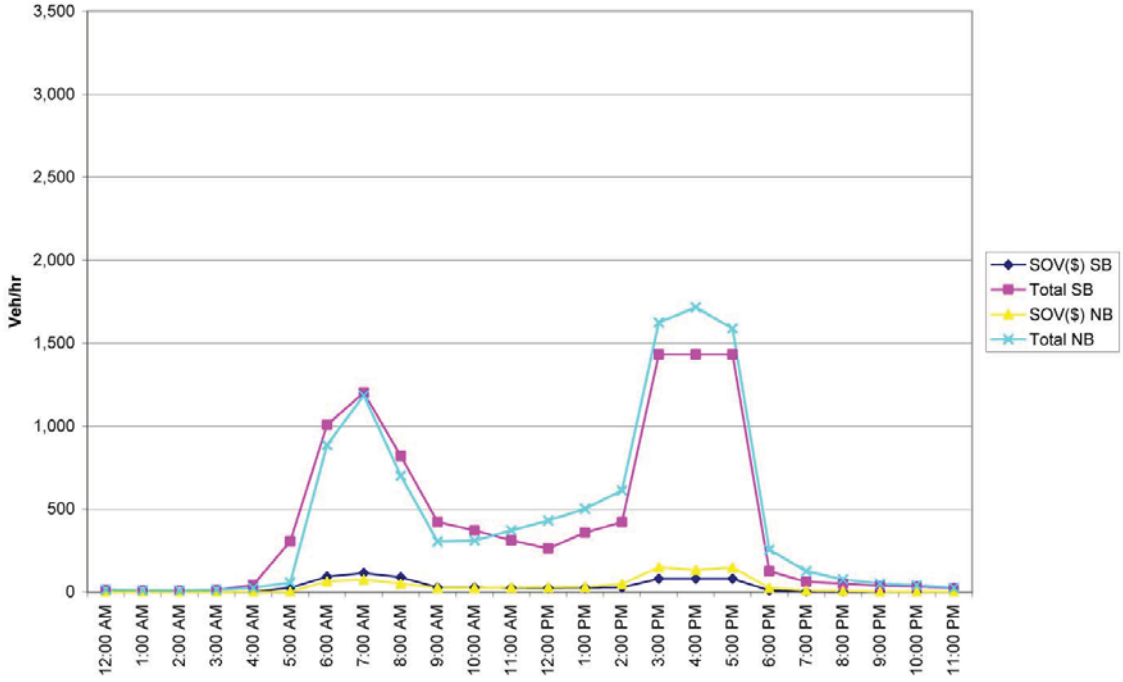
FIGURE 6-10: 2015 MANAGED LANES HOURLY TRAFFIC VOLUMES (8+4 CONFIGURATION)



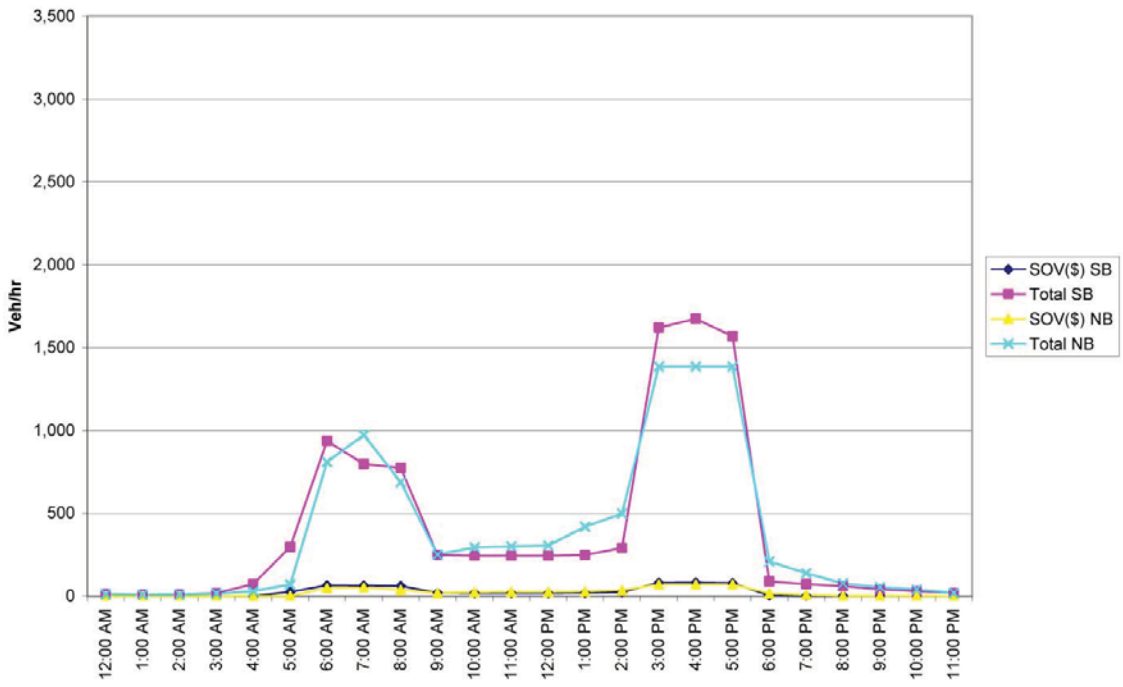
2015 I-5 North Coast Managed Lanes s/o Manchester Ave (8+4)



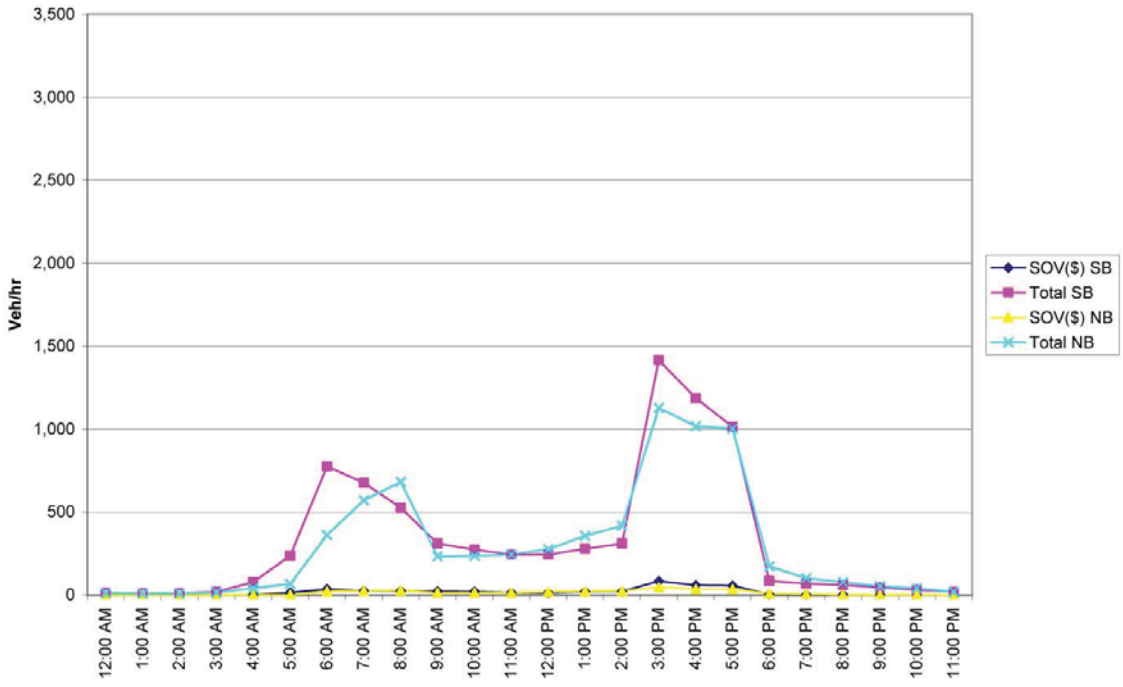
2015 I-5 North Coast Managed Lanes n/o Encinitas Blvd. (8+4)



2015 I-5 North Coast Managed Lanes s/o Palomar Airport Rd (8+4)



2015 I-5 North Coast Managed Lanes n/o Carlsbad Village Dr (8+4)



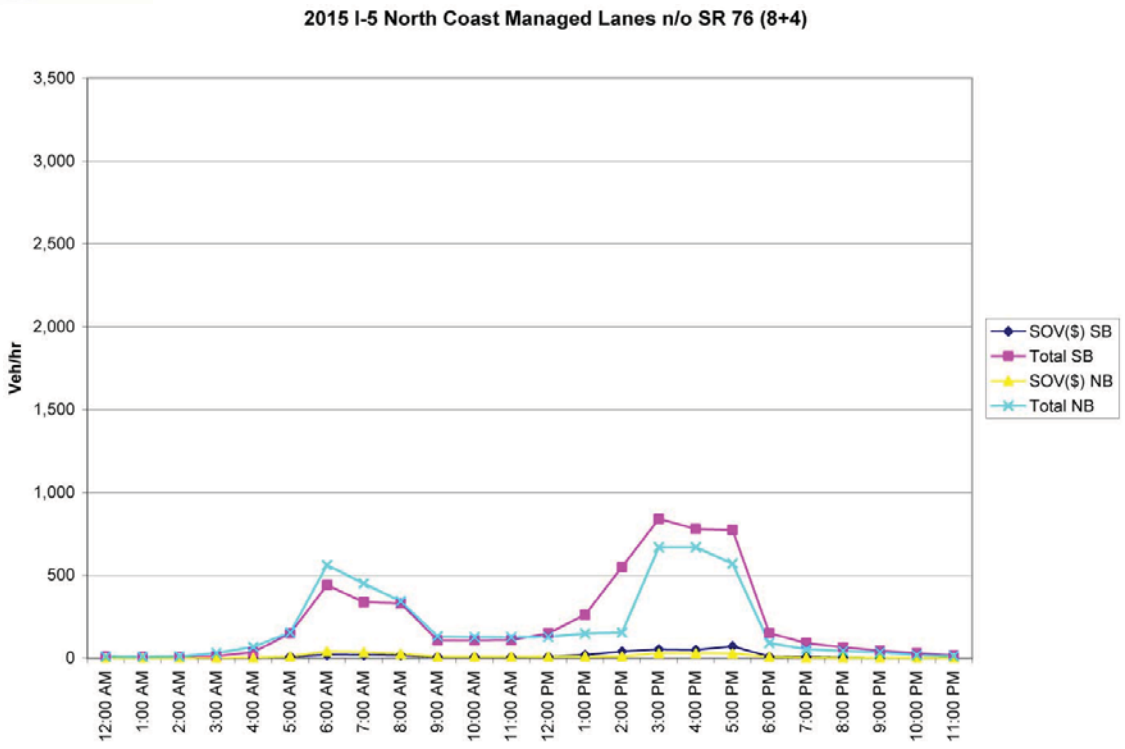
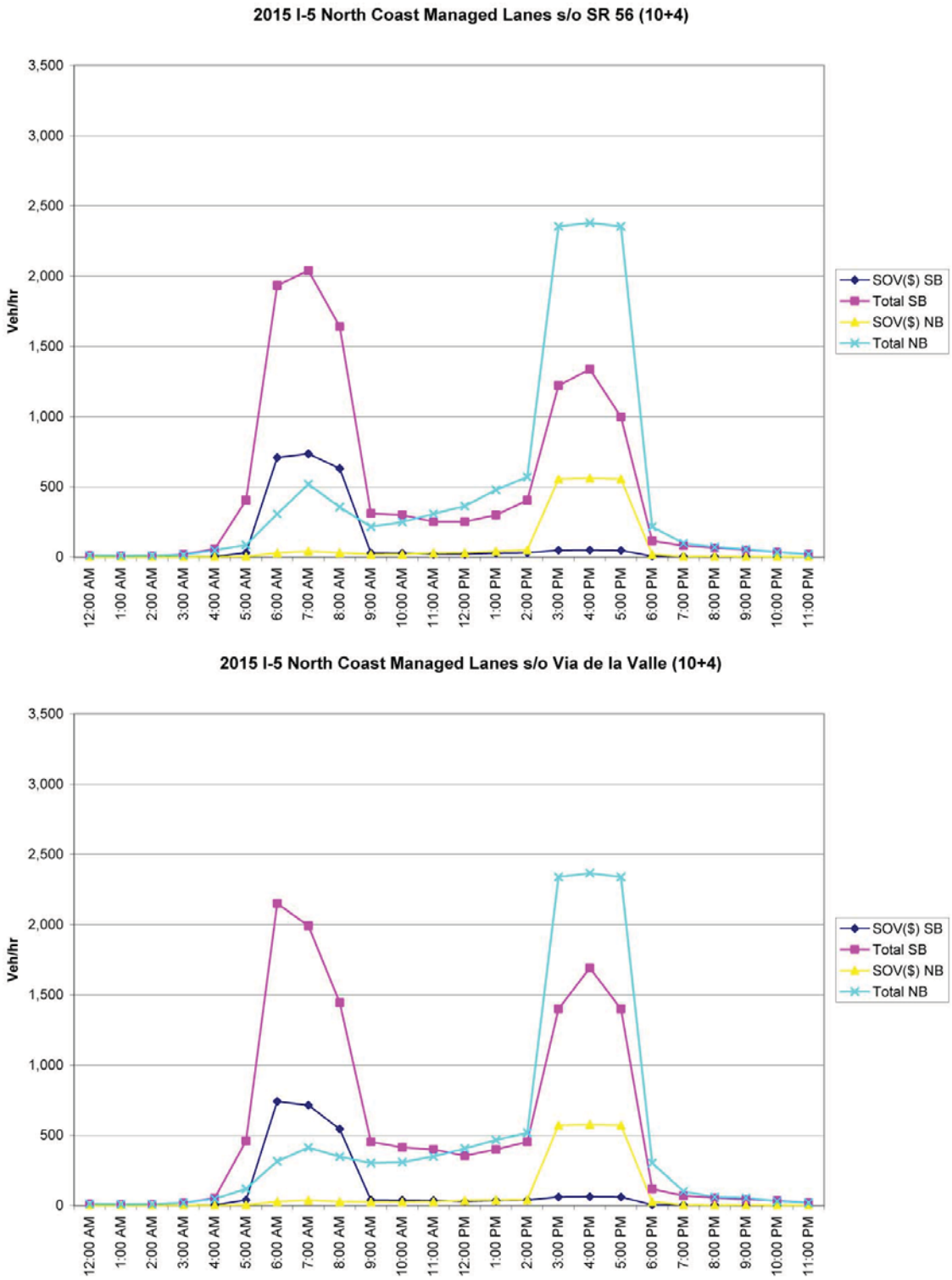
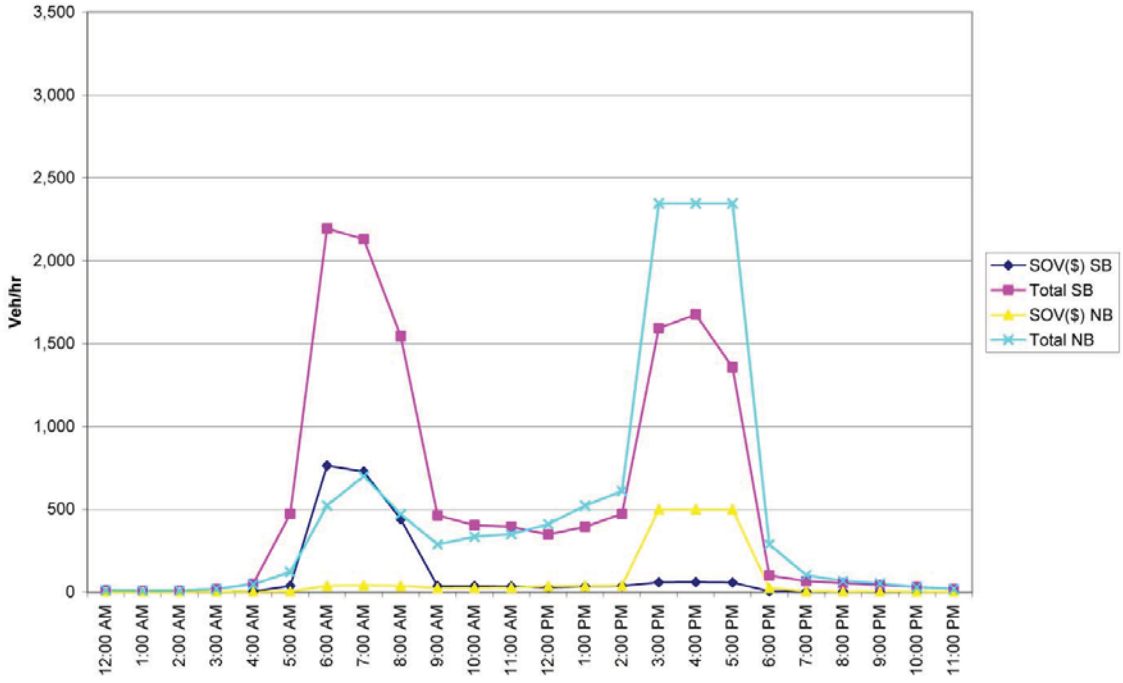

2015 I-5 North Coast Managed Lanes n/o SR 76 (8+4)
Veh/hr
3,500
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
SOV($) SB
Total SB
SOV($) NB
Total NB

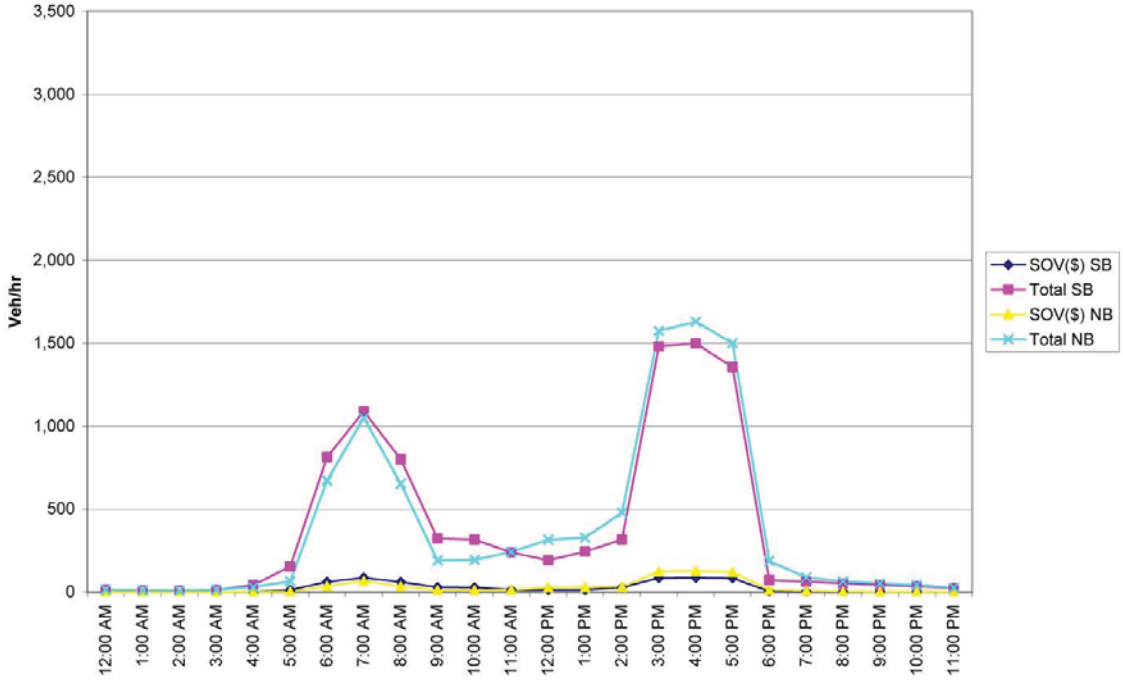
FIGURE 6-11: 2015 MANAGED LANES HOURLY TRAFFIC VOLUMES (10+4 CONFIGURATION)



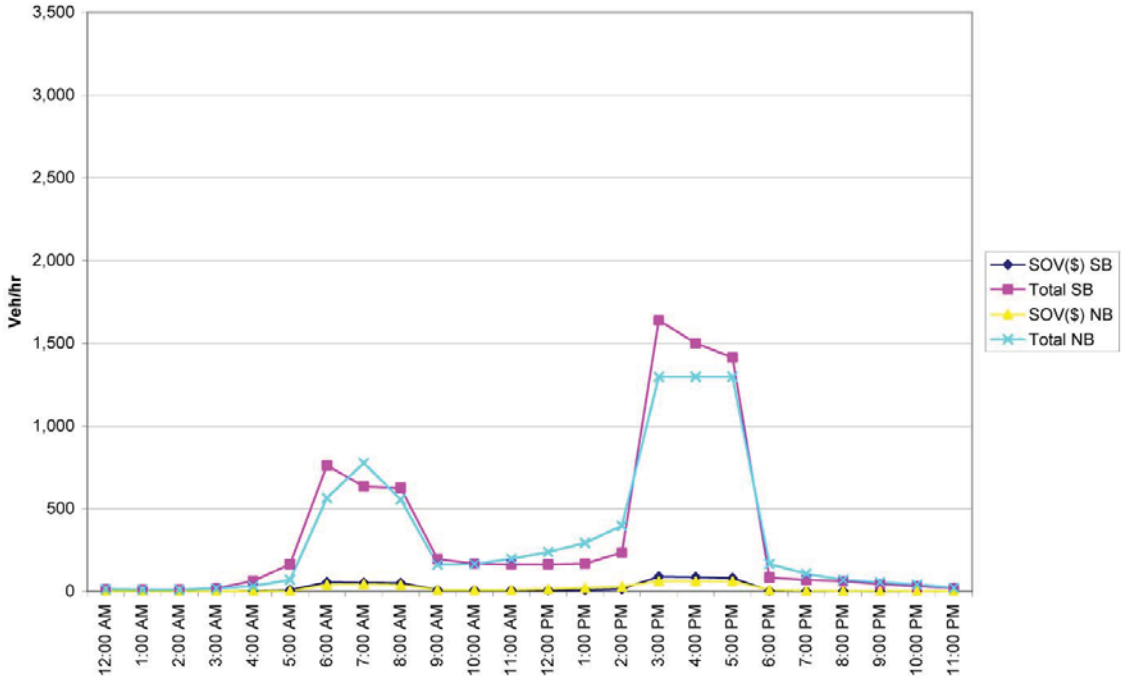
2015 I-5 North Coast Managed Lanes s/o Manchester Ave (10+4)



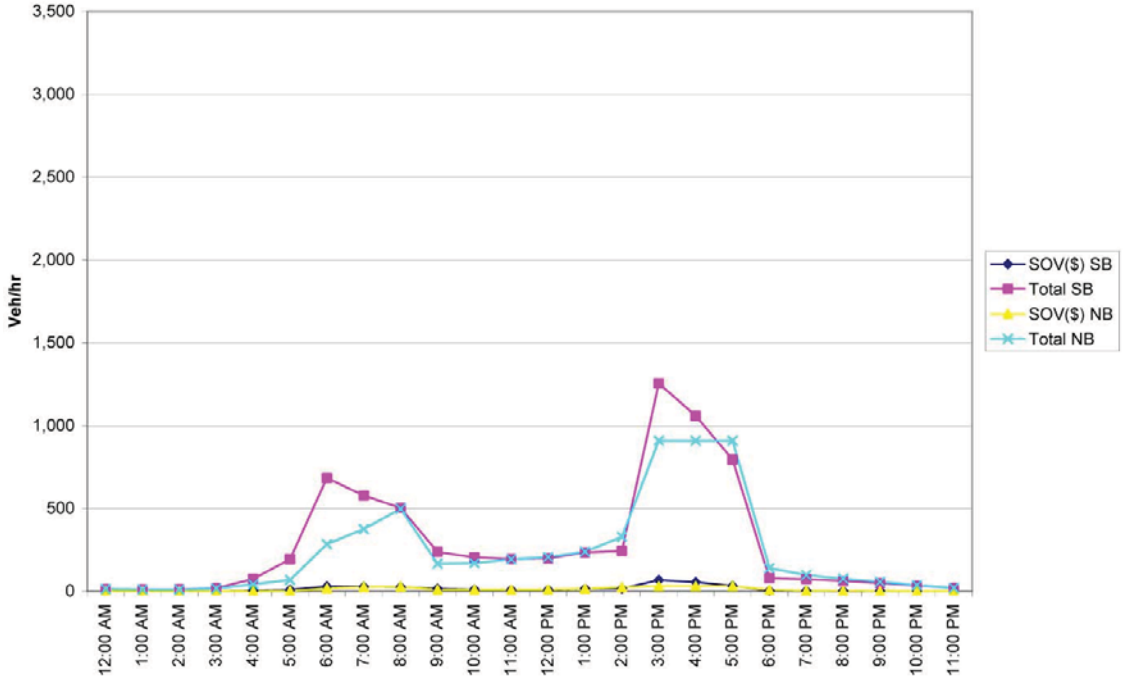
2015 I-5 North Coast Managed Lanes n/o Encinitas Blvd. (10+4)

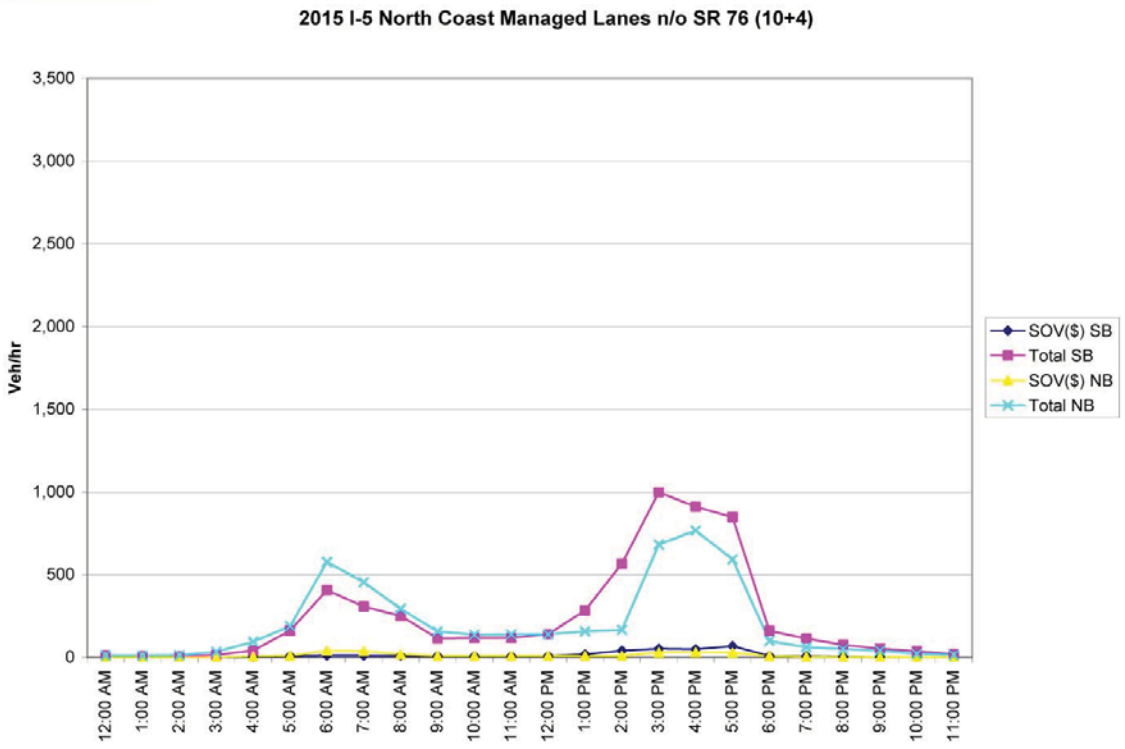


2015 I-5 North Coast Managed Lanes s/o Palomar Airport Rd (10+4)



2015 I-5 North Coast Managed Lanes n/o Carlsbad Village Dr (10+4)




2015 I-5 North Coast Managed Lanes n/o SR 76 (10+4)
Veh/hr
3,500
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
SOV($) SB
Total SB
SOV($) NB
Total NB

Revenues by Segment

As discussed earlier, the base (uncongested) toll cost per mile in 2015 is $0.16 per mile. During peak times when the volume on the managed lanes is projected to be at its highest, these rates adjust to between approximately $4.90 (10+4) to $5.50 (8+4) during the northbound peak at the highest tolling location. Estimated annual revenues, broken down by location, are shown below in Figure 6-12.

FIGURE 6-12: 2015 MANAGED LANES ANNUAL REVENUE

Location	**2015**	
	8+4	**10+4**
s/o SR 56*	$5.555 million	$4.248 million
s/o Via de la Valle*	$3.904	$2.918
s/o Manchester Ave	$1.794	$1.376
n/o Encinitas Blvd	$0.759	$0.628
s/o Palomar Airport Rd	$0.254	$0.210
n/o Carlsbad Village Dr	$0.132	$0.108
n/o SR 76*	$0.108	$0.104
TOTAL	$12.506	$9.592

*Note: s/o SR 56 and n/o SR 76 have 10 GP lanes, and s/o Via de la Valle has 9 GP lanes in the 8+4 configuration.

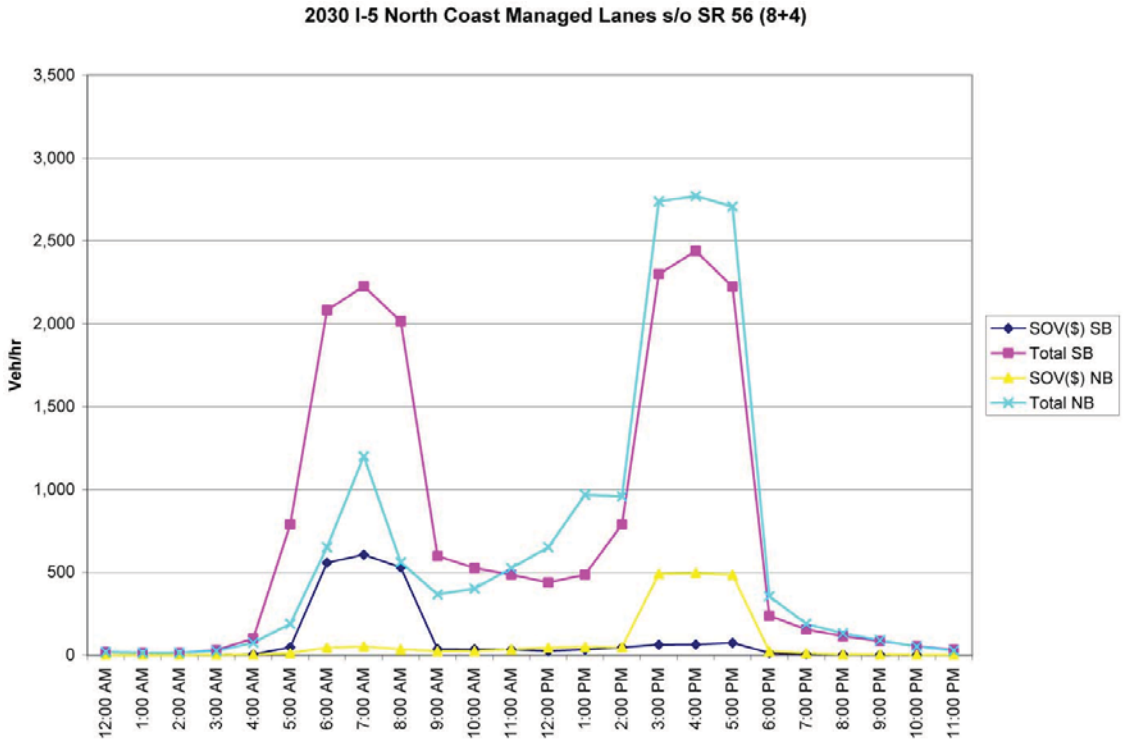
6.4.2. Design Year 2030

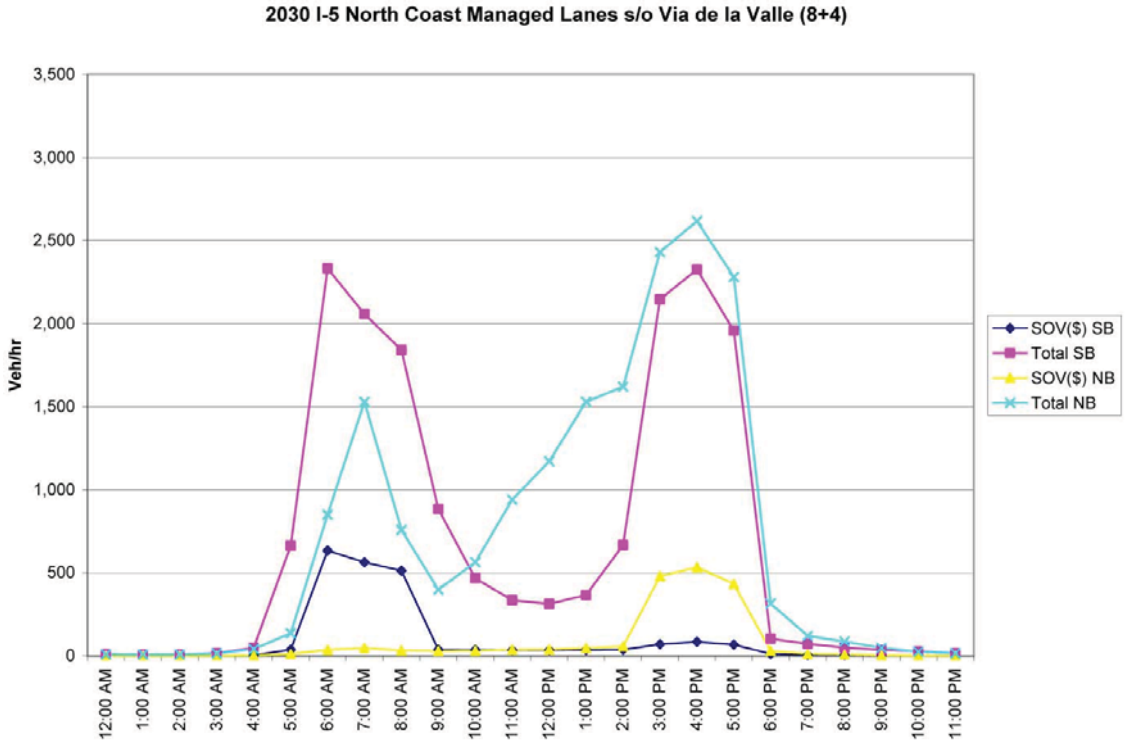
Volume by Segment

The following graphs show the hourly volumes at each of the tolling locations in 2030 with eight general purpose lanes and four managed lanes (Figure 6-13) and ten general purpose lanes and four managed lanes (Figure 6-14).

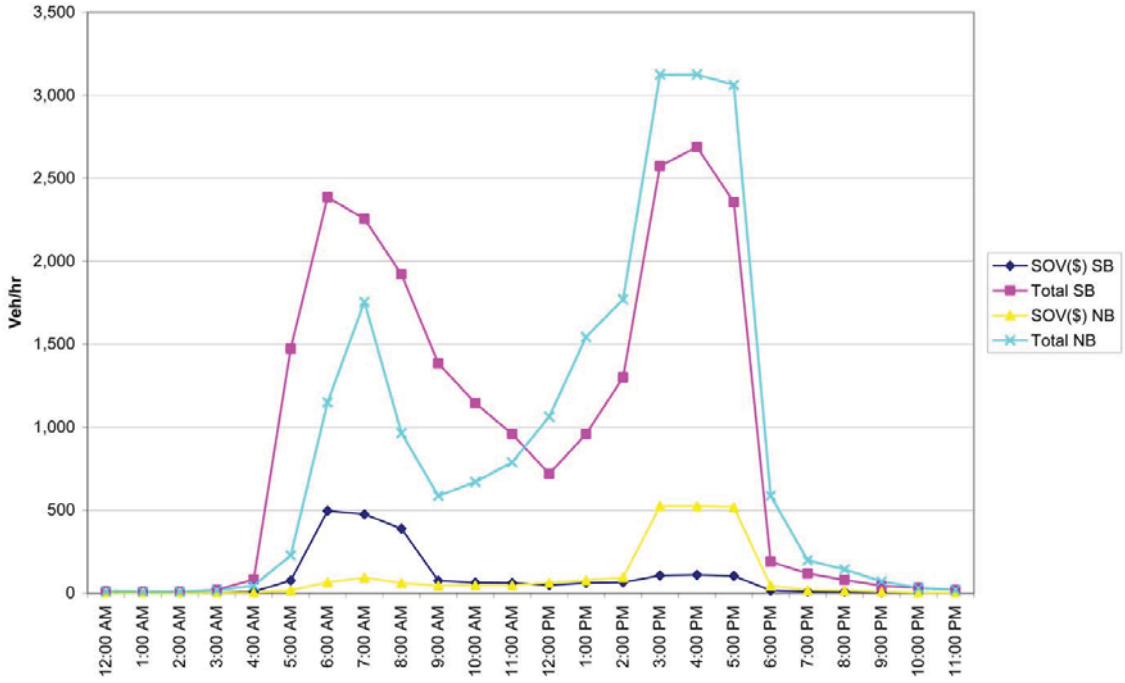
Conditions on the roadway in 2030 with the 8+4 configuration deteriorate and there is not available capacity during peak periods to allow SOVs to use the managed lanes. For this reason, the analysis for this configuration tends to break down, the data should be used carefully.

FIGURE 6-13: 2030 MANAGED LANES HOURLY TRAFFIC VOLUMES (8+4 CONFIGURATION)

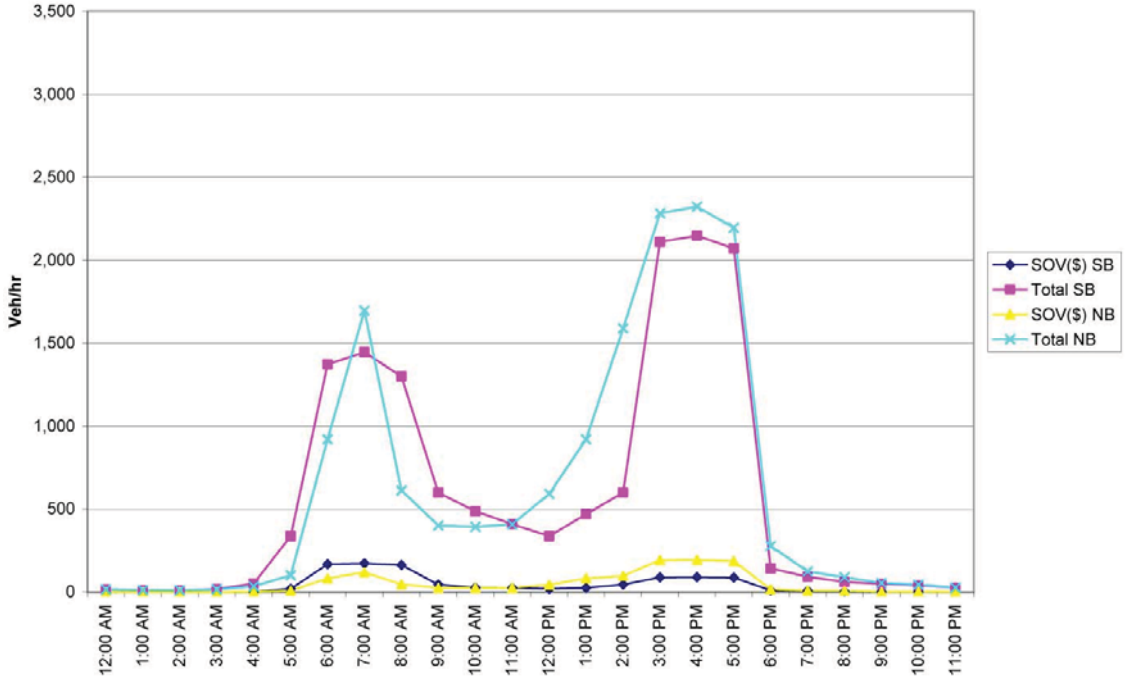




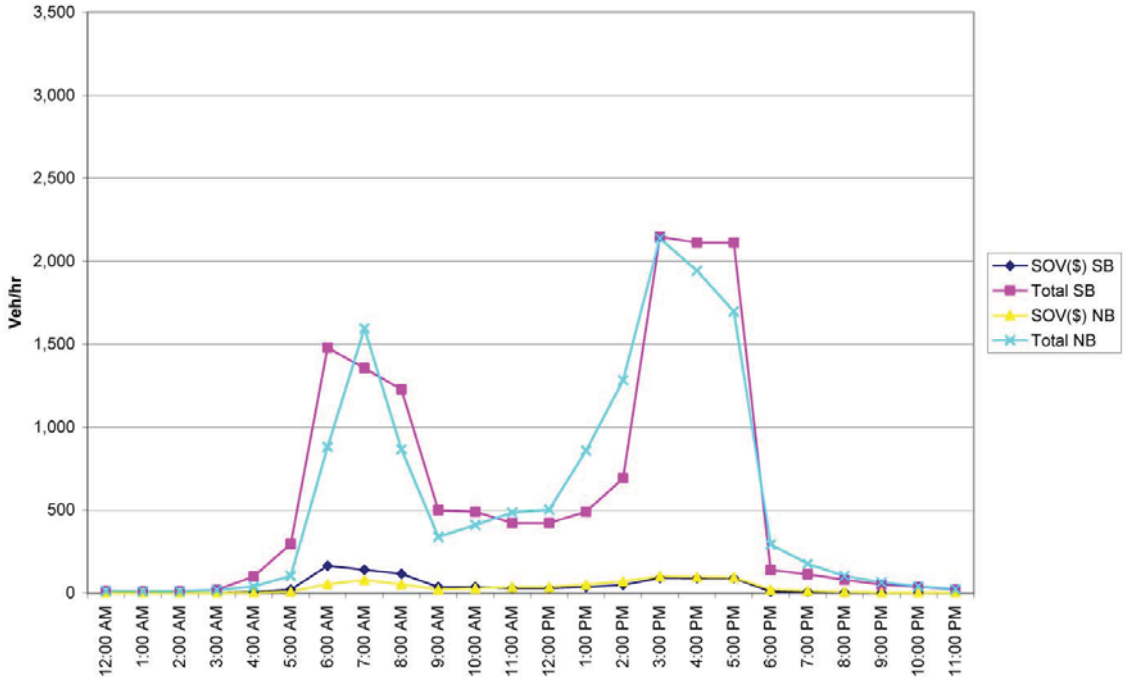
2030 I-5 North Coast Managed Lanes s/o Manchester Ave (8+4)



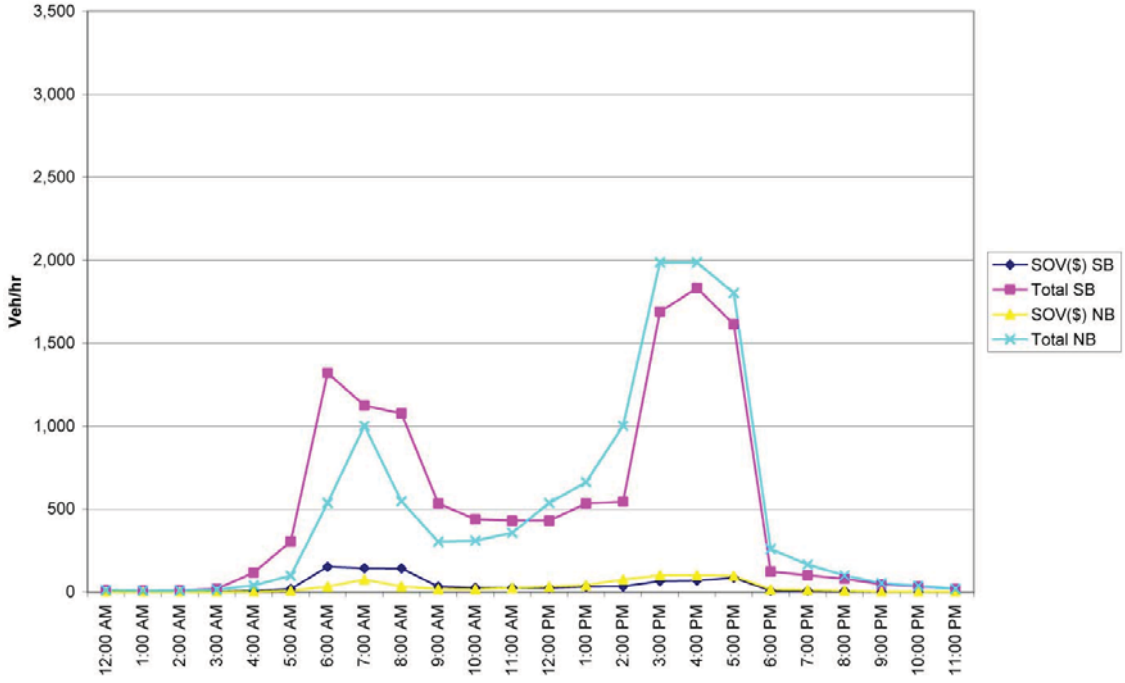
2030 I-5 North Coast Managed Lanes n/o Encinitas Blvd. (8+4)



2030 I-5 North Coast Managed Lanes s/o Palomar Airport Rd (8+4)



2030 I-5 North Coast Managed Lanes n/o Carlsbad Village Dr (8+4)



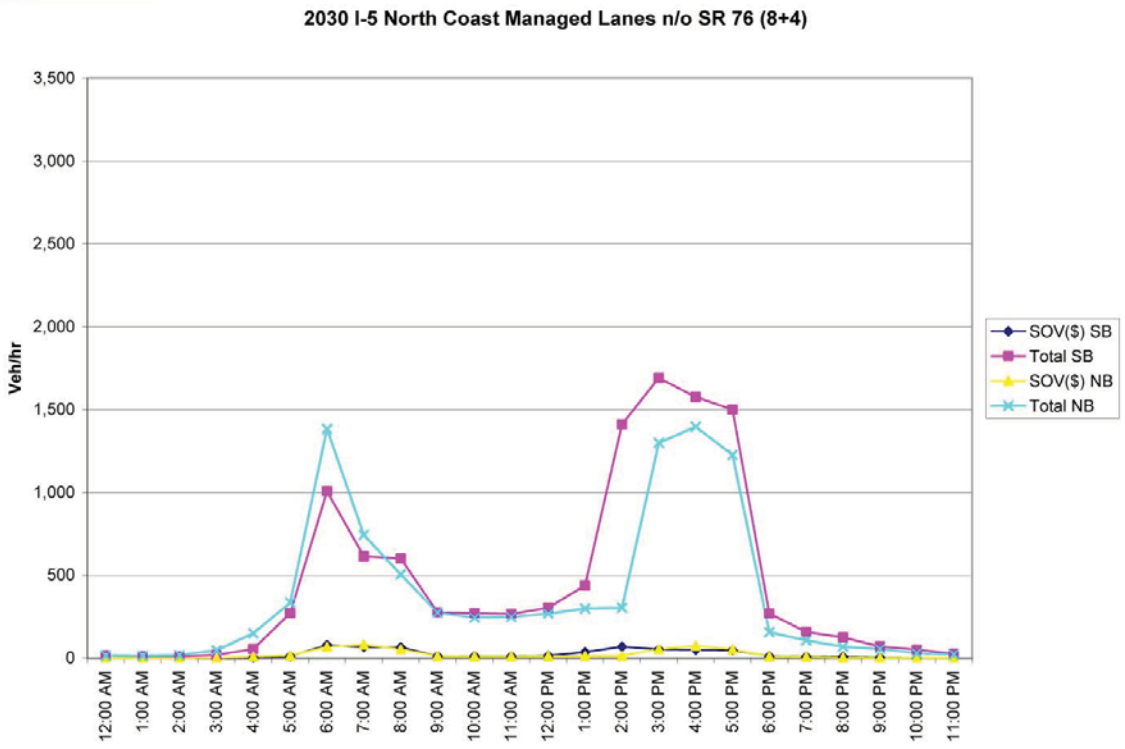
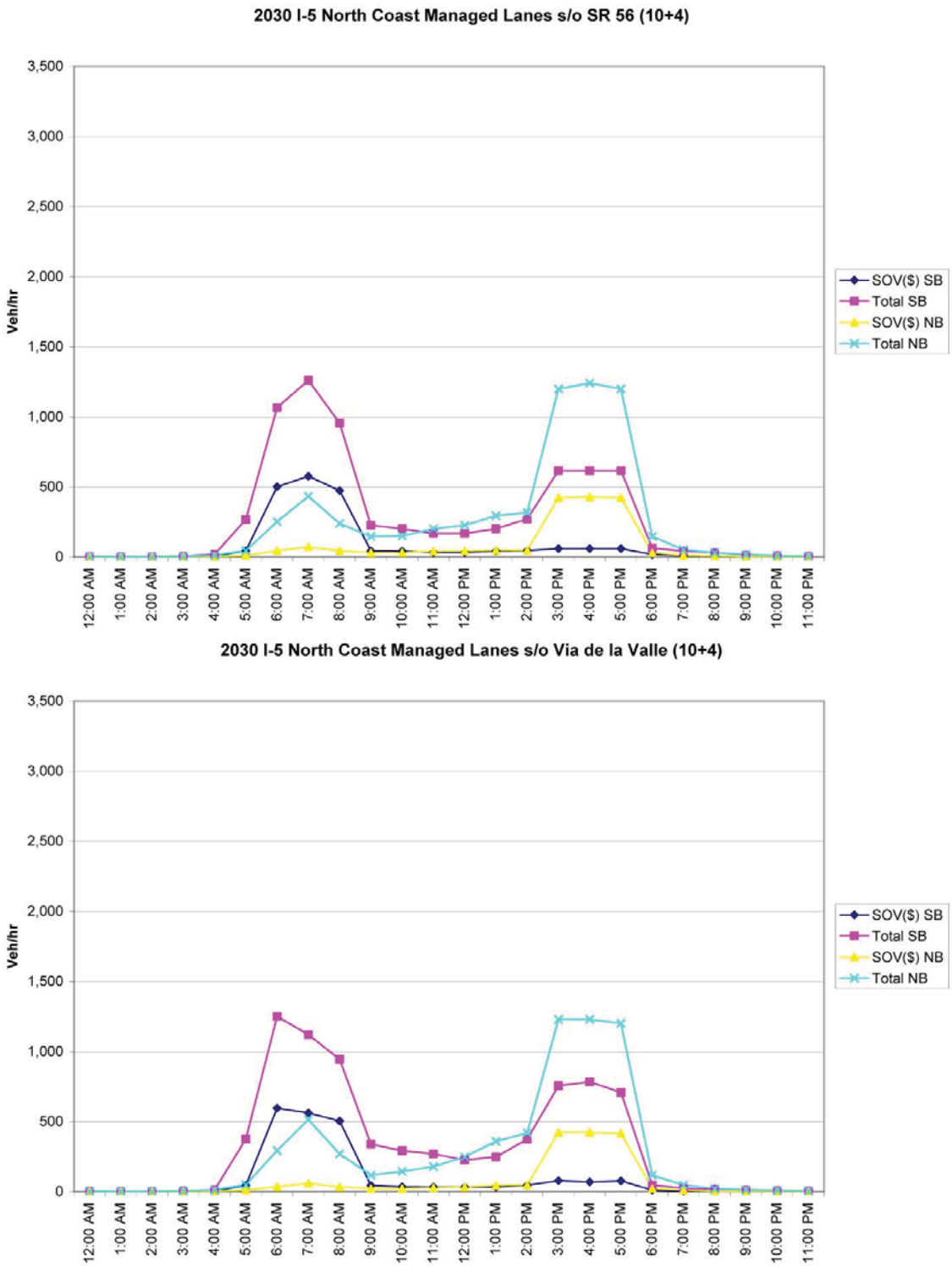
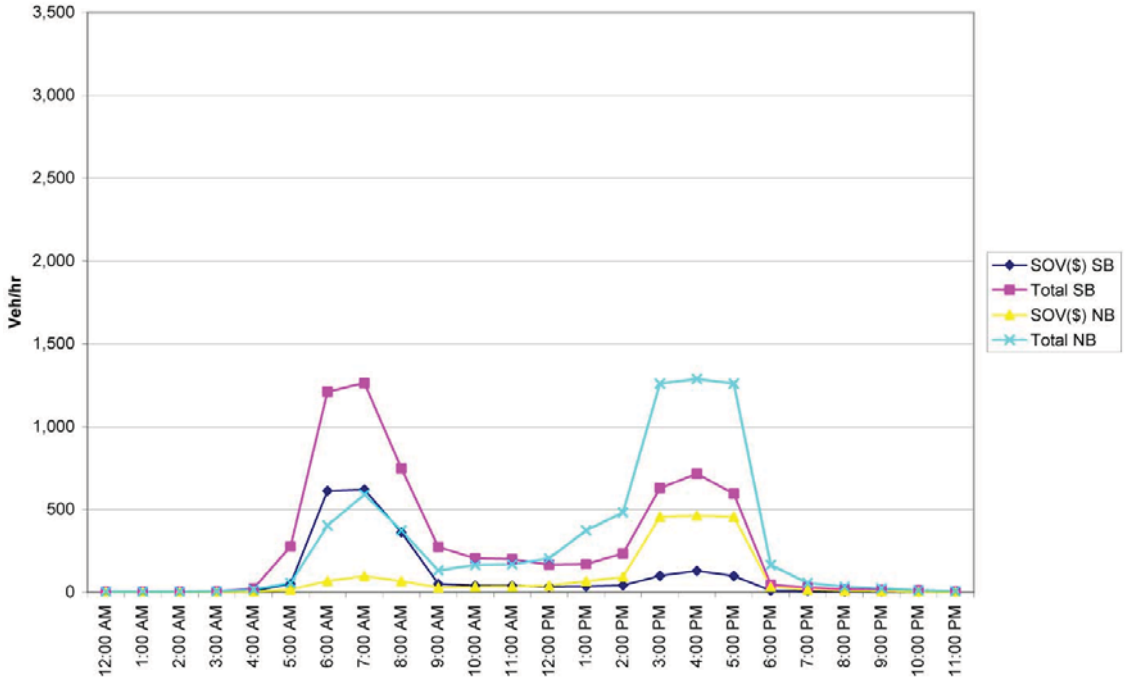

2030 I-5 North Coast Managed Lanes n/o SR 76 (8+4)
Veh/hr
3,500
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
SOV($) SB
Total SB
SOV($) NB
Total NB

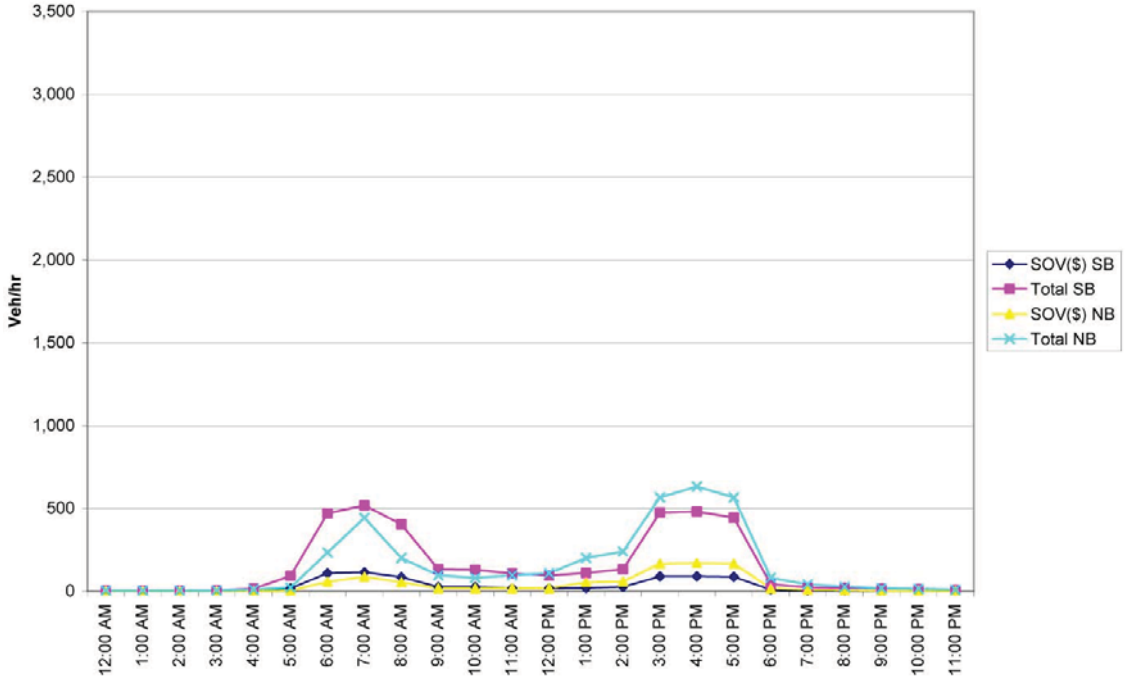
FIGURE 6-14: 2030 MANAGED LANES HOURLY TRAFFIC VOLUMES (10+4 CONFIGURATION)



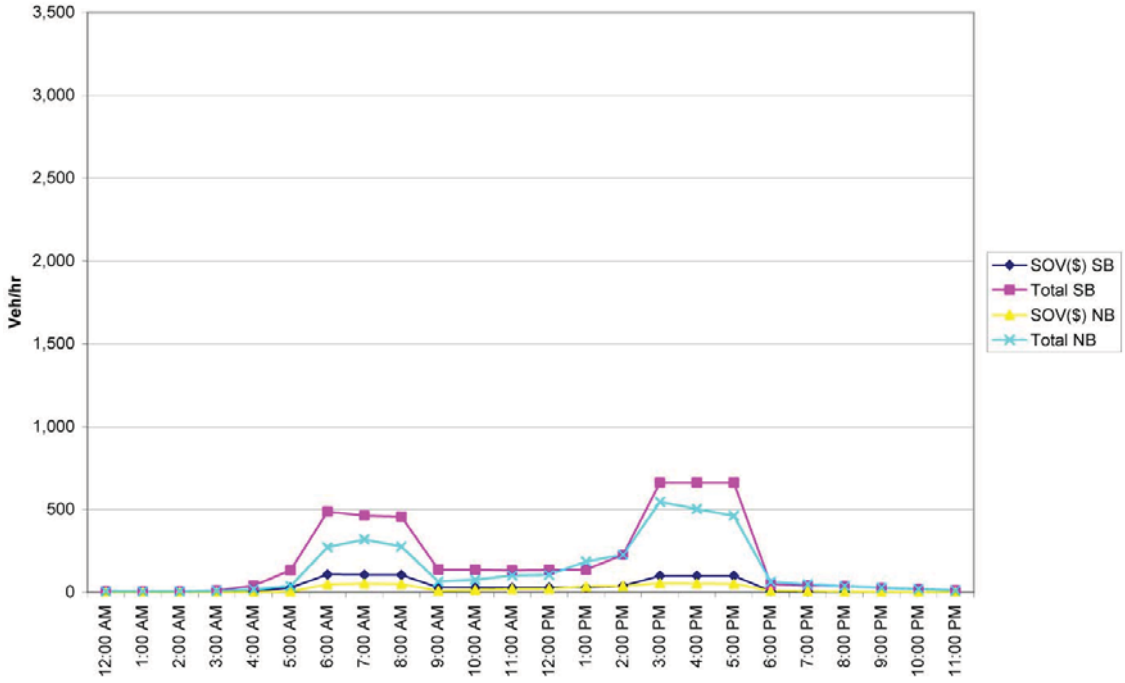
2030 I-5 North Coast Managed Lanes s/o Manchester Ave (10+4)



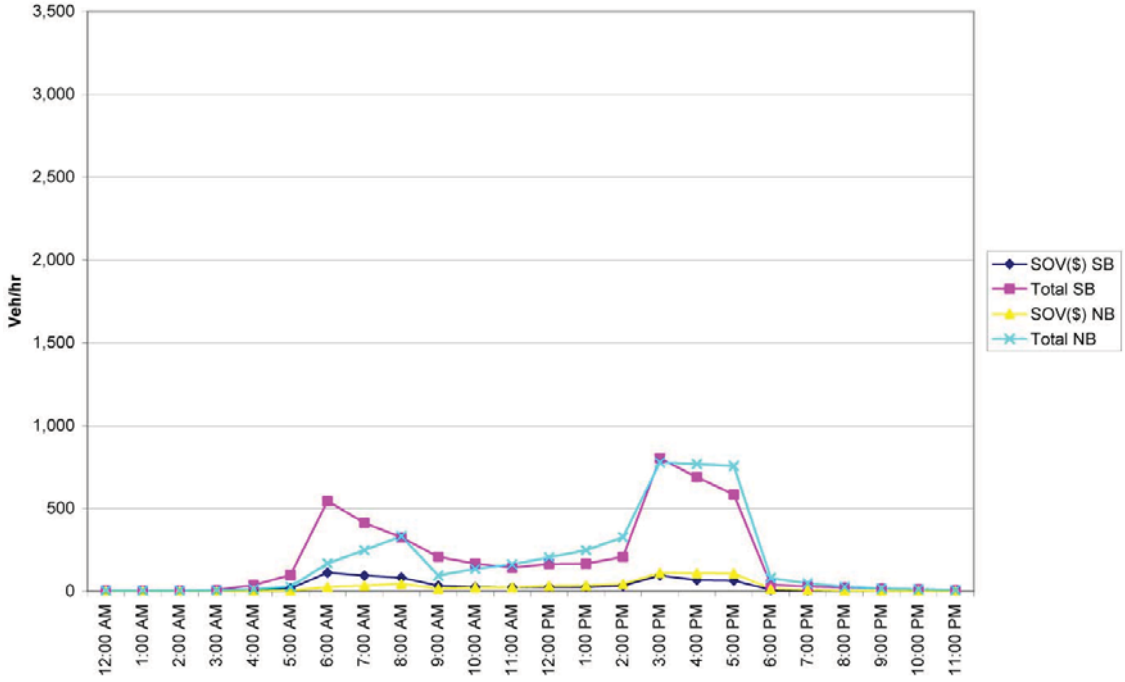
2030 I-5 North Coast Managed Lanes n/o Encinitas Blvd. (10+4)

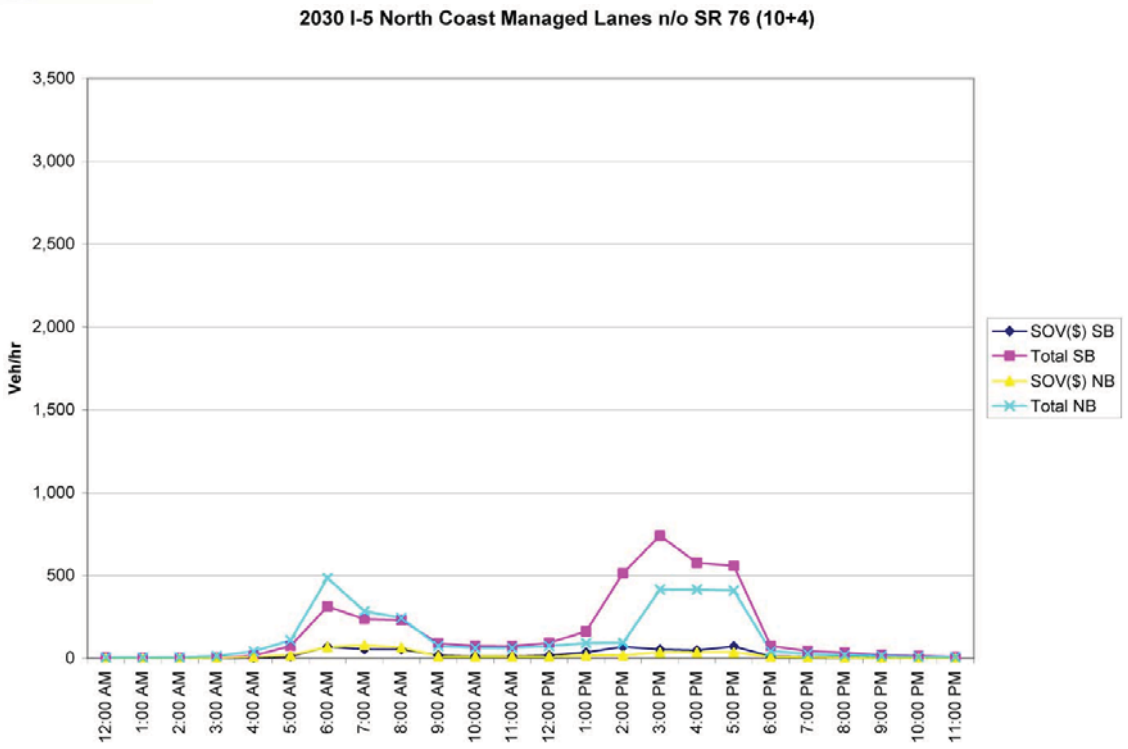


2030 I-5 North Coast Managed Lanes s/o Palomar Airport Rd (10+4)



2030 I-5 North Coast Managed Lanes n/o Carlsbad Village Dr (10+4)




2030 I-5 North Coast Managed Lanes n/o SR 76 (10+4)
Veh/hr
3,500
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
SOV($) SB
Total SB
SOV($) NB
Total NB

Revenues by Segment

As discussed previously, the base (uncongested) toll cost per mile in 2030 is $0.24 per mile. During peak times when the volume on the managed lanes is projected to be at it's highest, these rates adjust to approximately $8.00 in both the 10+4 and the 8+4 configurations for the most congested segments. Estimated annual revenues, broken down by location, are shown below in Figure 6-15. As noted, the conditions in the 8+4 configuration in 2030 are very congested, and there is not available much available capacity for SOVs during the peak periods. Resulting revenues may not accurately reflect these conditions.

FIGURE 6-15: 2030 MANAGED LANES ANNUAL REVENUE

Location	**2030**	
	8+4*	**10+4**
s/o SR 56	$6.656 million	$4.329 million
s/o Via de la Valle	$6.274	$3.983
s/o Manchester Ave	$2.076	$1.154
n/o Encinitas Blvd	$2.421	$1.478
s/o Palomar Airport Rd	$1.203	$0.837
n/o Carlsbad Village Dr	$0.882	$0.629
n/o SR 76	$0.227	$0.225
TOTAL	$19.739	$12.636

*Note: Model output for peak periods provide SOVs using the managed lanes during at-or over-capacity conditions. This policy and model output should be re-evaluated.

6.5 FORECAST OF 2+ / 3+ HOV POLICY

Model output was reviewed that analyzed the option of tolling the SOVs at full price and the HOV-2 at 50percent of the SOV price due to the managed lanes being oversubscribed by 2030. This alternative tolling policy would allow the HOV-3+ to travel in the managed lanes for free. The revenue model was modified for this tolling adjustment and the market share curves were changed to match the unadjusted SANDAG model output. The SANDAG model results, a sample shown in Figure 6-16 below, show a significantly lower managed lane use when HOV-2 are tolled at 50 percent of the SOV price.

FIGURE 6-16: 2030 10+4 HOV-2+/3+ MODEL OUTPUT

Managed Lane Daily Volumes (SANDAG Model Output)					
Location		**SOV**	**HOV-2**	**HOV-3+**	**Total**
s/o SR 56	3+ Free	3,800	900	8,600	10,300
	2+ Free	3,500	21,900	7,000	32,400
s/o Palomar	3+ Free	1,400	400	6,900	8,700
	2+ Free	1,300	17,500	5,600	24,400
n/o SR 76	3+ Free	1,000	200	5,400	6,600
	2+ Free	800	13,800	4,600	19,200

The resulting managed lanes market shares are very low, and since the managed lanes toll price is directly tied to managed lanes volume, the toll rates do not rise above $1.50, which is very close to the base uncongested toll in 2030. The resulting revenue that is generated using the HOV-3+ free model output is $6.0 million in 2030, compared to $12.6 million generated when HOV-2+ is free.

It is our opinion that this model output is problematic and should not be used to evaluate the impact of charging HOV-2 vehicles in this analysis. Because of the problems with the model output, the study team has not performed a similar analysis using the 2030 8+4 model output.

6.6 SUMMARY

Pricing can be seen as a means to create adaptive management capabilities/frameworks that extend the performance of investments/expenditures in transport facilities and their ability to meet their objectives. Pricing can permit expanded flexibility and adaptiveness and thereby support expanded options and extend timelines and life cycles.

By designing to financial parameters, one can also extend the ability of a given budget to meet a region's travel needs. If one begins to take advantage, where it is compatible with one's own context, of the business decision making models that those who operate toll roads as purely business ventures use, one can build to market/demand based budgets and rebuild on schedules compatible with demand changes/shifts. The marketplace supports this very kind of adaptive decision making and that can be an advantage in some dimensions of the public sector arena.

This approach, where compatible with institutional contexts, depends less on forecasts being pressed into service as predictions, and it can enable the use of more robust decision making via risk based models

The revenue analysis for the I-5 North Coast Managed Lanes was performed using the unadjusted output from the SANDAG regional model. Two different lane configurations were studied; the 8+4 configuration which provided eight general purpose lanes and

four managed lanes throughout most of the corridor (some locations did have either nine or ten general purpose lanes), and the 10+4 configuration which provided ten general purpose lanes and four managed lanes throughout the corridor.

The revenue analysis assumed a toll rate structure that was based on the structure used on the I-15 Managed Lanes in San Diego. It was assumed that there would be variable pricing on the lanes, and the pricing would be determined based on the volume over capacity (v/c) ratio in the lanes.

The following bullet points summarize the major findings and conclusions made from the revenue analysis for this study:

- The SANDAG model output projected that there would be significantly greater use of the managed lanes in the southern portion of the facility, and as a result, the per mile toll in the managed lanes is higher in the southern segments. In addition, the AM and PM peak SOV paying customers will be higher in the southern portion of the facility.
- Conditions on the 2030 network with the 8+4 configuration deteriorate and there is no available capacity during peak periods to allow SOVs to use the managed lanes. The SANDAG model output for peak periods allows SOVs to use the managed lanes during the at-or over capacity conditions. This policy should be re-evaluated, and refinements are needed to the SANDAG model to properly evaluate these conditions.
- Base (uncongested) toll rates for using the length of the facility total $4.00 in 2015 ($0.16/mile) and $6.00 in 2030 ($0.24/mile)
- 2015 toll rates for using the length of the facility totals $4.00 in uncongested conditions and are estimated to reach up to approximately $13.90 during peak conditions, assuming the 10+4 configuration.
- In 2015, estimated managed lanes annual revenue is $12.5 million for the 8+4 configuration and $9.6 million for the 10+4 configuration
- In 2030, estimated managed lanes annual revenue is $19.7 million for the 8+4 configuration and $12.6 million for the 10+4 configuration.
- Refinements are needed to the SANDAG model to estimate the impact of changing the HOV policy from HOV-2+ free to HOV-3+ free (in which HOV-2 would pay 50percent of the SOV toll). This scenario was evaluated using the current SANDAG model, and the sensitivities to the HOV-2 toll were too great and proved to be problematic in evaluating this alternative.

CHAPTER 7

TECHNOLOGY AND SYSTEM OPERATIONS CONCEPT

7.1 INTRODUCTION

The scope of this chapter addresses electronic toll collection (ETC) technology in the context of opening managed lanes between the years 2010-2020. Technology will advance considerably between now and then, so this discussion focuses on current conditions related to value pricing within a 5 to 15-year timeframe, and within the context of technology infrastructure, violation enforcement systems (VES), automated traffic management and control systems, and freeway incident/response systems. This chapter addresses a concept of operations that covers in-lane maintenance, traffic management, customer service, violations processing, and staffing needs for front and back-end office operations of a value pricing system on the I-5 North Coast Managed Lanes. Requirements for evaluation and continuous improvements also are addressed. Finally, a preliminary cost estimate for a completely integrated electronic toll and traffic monitoring (ETTM) system, including VES that is based on current market-ready technology is provided. This estimate may need to be adjusted for inflation and changes in technology depending upon the year of investment.

7.2 FACILITY DESIGN

The following facility design assumptions and variables were considered in the technology assessment:

7.2.1. Managed Lane Configurations

The four configuration scenarios considered for the I-5 North Coast Managed Lane project include 8+4 barrier-separation, 8+4 buffer-separation, 10+4 barrier-separation, and 10+4 buffer-separation. Any are potential alternatives that may become the locally preferred alternative. More detailed definitions for each are provided below.

Barrier-separation – Use of concrete barrier separating concurrent general purpose and managed lane traffic flows, which may include emergency breakdown shoulders for each roadway.

Buffer-separation – Use of painted buffer areas between general purpose and managed lane concurrent traffic flows, which may include emergency breakdown shoulders for each roadway.

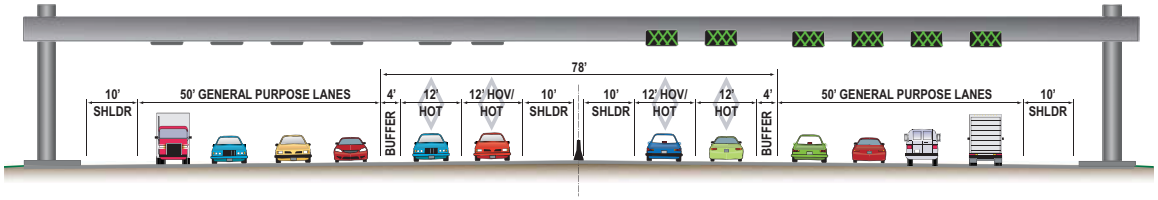
8+4 Configuration - 8 lanes for general purpose traffic (4 in each direction) and 4 lanes for managed traffic in the median (2 in each direction).

10+4 Configuration - 10 lanes for general purpose traffic (5 in each direction) and 4 lanes for managed traffic in the median (2 in each direction).

So, the possible configurations include:

- 8+4 Barrier-separated alternative;
- 10+4 Barrier-separated alternative;
- 8+4 Buffer-separated alternative (See Figure 7-1 as an example); or
- 10+4 Buffer-separated alternative.

FIGURE 7-1: 8+4 BUFFER SEPARATED ALTERNATIVE



From a technology perspective the difference between the 8+4 and 10+4 alternative will be the number of devices installed in the general purpose lanes and the size and type of the sign and gantries. The choice of barrier or buffer separation does play a role in choosing the type of ETC and VEStechnologies. With a buffer-separated facility, global positioning satellite (GPS)-based or open road tolling makes more sense as vehicles move freely between general purpose and managed lanes. Until such technology is adopted, wider use of toll readers augmented by Video Imaging Video Detection (VIVD) may be needed in support of the VES.

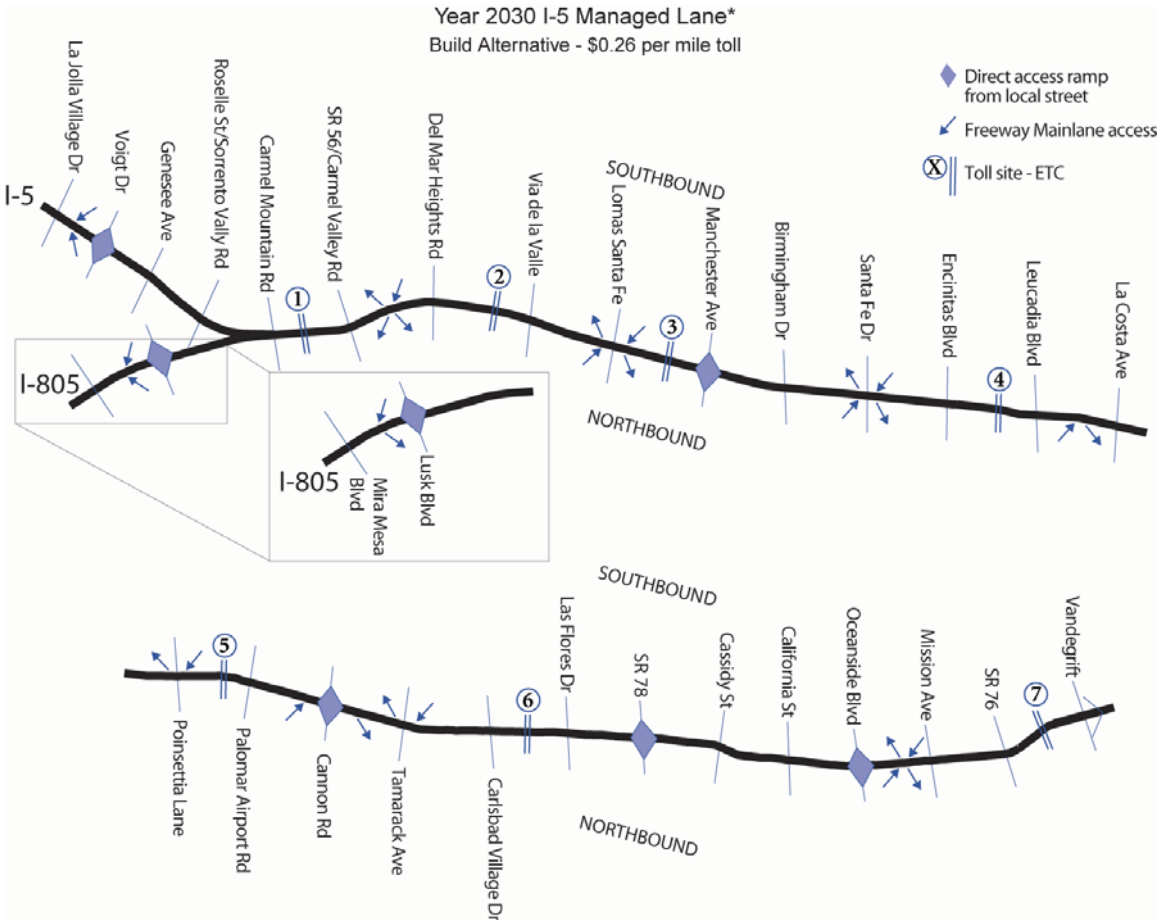
More traditional tolling methods like the transponders and toll tag readers used today can be sued in a buffer- or barrier-separated facility. The design is less complex when traditional tolling methods are paired with barrier-separated facilities.

Differences in technology, application of technology and operational concepts between a buffer-separated arrangement and a barrier-separated arrangement are noted within the specific section where differences occur. If not noted, the technology, application of the technology or operational concepts should apply to either roadway alternative.

7.2.2. Managed Lane Entry/Exit Access Points and Toll Zones

The managed lanes are assumed to have access restrictions except at designated ingress/egress treatments. Access treatments will take the form of Direct Access Ramps (DARs) with other freeways and streets and intermediate, high-speed slip ramps with the general purpose lanes. Figure 7-2 (next page) illustrates these assumptions for both of the above two lane configurations.

FIGURE 7-2: LANE CONFIGURATION



Design Vehicle Group Assumptions

For the purpose of technology assessment, the design vehicle assumptions include the following:

- Single occupancy vehicles (SOVs) have one occupant.
- High Occupancy Vehicles (HOVs) have more than one occupant. They can be classified as "2+" (two or more occupants in a vehicle); "3+" (three or more occupants in a vehicle); or as a "vanpool or transit bus".
- Motorcycles are allowed.
- Hybrid vehicles are considered eligible based on current state and federal legislation, but will probably not be eligible by the opening year due to the likely high percentage of hybrid and alternative fuel vehicles in the overall traffic stream.
- No large commercial trucks will be allowed to use the HOV lanes per Caltrans truck restriction policy on inside lanes.

- Automobiles and motorcycles will be able to use the managed lanes for a fee. SOVs will pay the full toll. HOVs with two or more occupants will not pay a toll until such time that their volumes regularly exceed the operational threshold of the lanes. At that time vehicles with two occupants may be levied a discounted toll.
- Deadheading transit vehicles and emergency vehicles will be considered eligible and will pay no toll

In order to improve travel time for HOVs and FasTrak users will have access to the managed lanes through DARs and:

- Transit signal prioritization – where priority is given to transit buses at signalized intersections or ramp meters.
- Queue jumps – facilities that can be used to bypass points on the transportation network where congestion is particularly severe and occurs in a predictable pattern.

Forecasted Volumes and Revenue Implications

The forecast traffic volumes on the Managed Lanes for 2015 and 2030 (considered the intermediate or opening year condition) are provided in the Chapter 5. Traffic demand will essentially fill the managed lanes to their operational threshold in selected segments for both 2015 and 2030. In earlier years this mix will include more SOVs than HOVs, and over time HOVs will comprise the largest number of users. Demand is not forecast to be uniform throughout the corridor. The southern two-thirds of the corridor will experience greater demand and the portion further north, and the portion between I-805 and SR 56 will experience congestion on a recurring basis for all planning horizons. These conditions suggest a dynamic operational setting in some parts of the corridor in which real-time traffic management will be needed shortly after the managed lanes open. Not all segments of the corridor will need this active management.

7.3 TECHNOLOGY INFRASTRUCTURE

7.3.1. Standards

Standards ensure interoperability and long-term affordability of technology. This means that multiple manufacturers' devices will work together to complete a system. With standards, a public agency can competitively bid its projects so that the best qualified, lowest cost solution can be employed; instead of being locked into purchasing products/devices from a single vendor or manufacturer.

Standards can also be applied to data formats, so that a uniform, known data format can be easily imported into or exported from one manufacturer's system to another.

The majority of products and devices move from their initial proprietary model to a standards-based model, as a wider base of customers demand an open, standards-based solution. California has developed and employed a standard for "traditional" ETC systems. It is expected that any improvements in ETC technology will begin with that standard or migrate to a standard.

Current Standard- California Title 21

Title 21 is an open standard developed by the California Department of Transportation (Caltrans) and adopted by California and Colorado. Therefore, transponders and readers within California must be interoperable (i.e., able to be applied and used by any agency or toll road operator) within the State. The statewide interoperable toll system is branded "FasTrak™," a registered trademark of the Transportation Corridor Agencies (TCA) of Orange County. Today, there are four active FasTrak agencies including: the Bay Area Toll Authority (BATA), who oversees electronic toll collections (ETC) operations on eight bridges (seven owned by Caltrans and one owned by the Golden Gate Bridge Highway and Transportation District); the TCA, who operates the San Joaquin Hills (SR 73), Foothills (SR 133), and Eastern (SR 241 and SR 261) Toll Roads; the Orange County Transportation Authority (OCTA), who operates the 91 Express Lanes; and SANDAG, who operates an existing 8-mile HOT lane on I-15 in San Diego County. Interstate 15 is being expanded into a 20-mile managed lane facility, and a fifth agency – the California Transportation Ventures (CTV) – is set to begin toll operations on the South Bay Expressway (SR 125) in San Diego County in 2006.

Title 21, Division 2, Chapter 16 presents the compatibility specifications for automatic vehicle identification equipment. The compatibility specifications were developed for the reader and the transponder in order to:

- Trigger or activate a transponder
- Poll the transponder for specific information
- Provide an acknowledge message to the transponder after a valid response to the polling message is received

The reader standards specify:

- Reader trigger signal length
- Reader send mode (downlink)
- Carrier frequency
- Carrier modulation
- Data bit rate
- Number of data bits
- Field strength

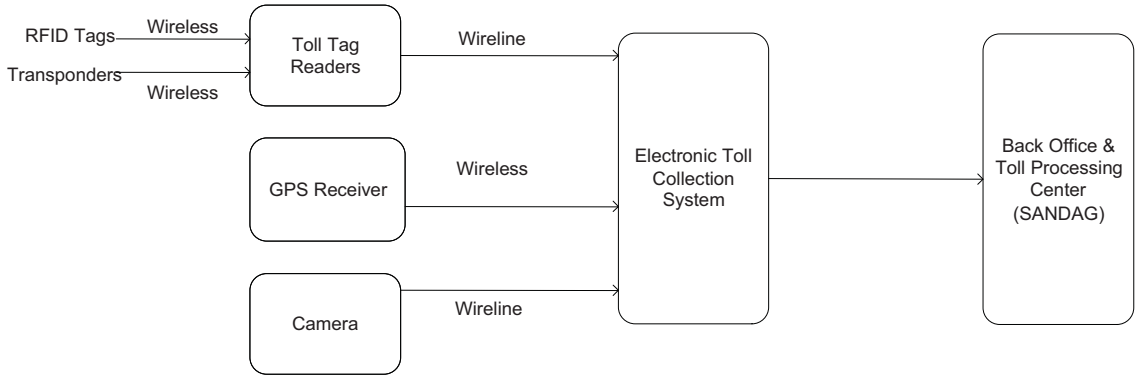
The transponder standards specify:

- Technology type
- Transponder antenna polarization
- Field of view
- Location
- Transponder send mode (uplink)
- Carrier frequency
- Carrier modulation
- Sub-carrier modulation

- Sub-carrier frequencies
- Data bit rate
- Number of data bits
- Receiver field strength
- Threshold

Further, the standard specifies communications protocol and a set of data records. The ETC functional system is illustrated in Figure 7-3.

FIGURE 7-3: ELECTRIC TOLL COLLECTION (ETC) SYSTEM



15-Year Outlook - Standardization

Interoperability will work best as the transportation agencies compel vendors to move from their proprietary solutions to an open standard, and this will happen as more projects and products surface. Standardization can be a time-consuming process. New standards, such as the dedicated short range communications (DSRC) protocol, or 5.9 GHz bandwidth, are being planned for now, but this effort involves a number of major participants to be successful, including toll industry partners and the big five automakers, and a workable solution is not anticipated until 2015 or beyond.

The I-5 toll system should be compatible with other transportation related functions, such as automated parking systems and non-transportation related functions such as purchasing goods. Systems must also include specific HOV requirements. The system must be able to incorporate the various tolling requirements of HOV's and SOV's. For example, HOV users may be allowed on the lane free of charge during certain periods of the day. However, there could be times when the HOV'er is a SOV that day and doesn't meet the HOV restrictions. In this case, the user would be charged the SOV toll rate. This transaction must occur with minimal or no effort required of the driver. Current tag technology doesn't incorporate this HOV requirement in a single tag solution.

The system design must maintain the fundamental functional characteristics, independent of a specific technology. This philosophy will enable technologies to integrate into the system. The key considerations when choosing a technology are operating function, capital and operating costs, security, product maturity, compliance with standards, maintainability and ease of use. Issues influencing the design include pricing schemes (fixed, variable, dynamic), access management (entry/exit restrictions,

lane-use eligibility requirements), enforcement (deterrent, aggressive) and technology (proprietary, open-architecture).

15-Year Outlook - Agreements between Neighboring Authorities

In addition to open protocols and standards, interoperability agreements between neighboring agencies and neighboring states will enable toll operators to share information regarding vehicles and their owners. This information will need to be in a format that each agency can use.

Regional and ultimately, national, multi-use systems have already begun to emerge, such as the EZ Pass system operated by the Interagency Group (IAG) affiliates in the northeast, and FasTrak in California and Colorado. As appropriate standards develop, SmartCards, which may replace transponders and readers, can be shared across supportive transportation programs (for multimodal fare payment), and between multiple transportation agencies. This evolution may lead to sharing transaction processing costs and ultimately driving down operational costs and increasing automation.

Developing these institutional partnerships and common data formats, while being time consuming in the short term, will lead to cost savings by reducing the transaction and violation processing time and reducing staffing requirements.

7.3.2. Electronic Toll Collection (ETC) System

ETC systems currently use devices such as radio frequency identification (RFID) transponders, readers, and communications systems. In the future, widespread adoption of RFID tolling, including open road tolling, is expected. However, alternative technologies may replace today's RFID standards, such as video camera detection with and optical character recognition (OCR), GPS tolling, and DSRC systems. Assuredly, these competing technologies will help drive the industry to accomplish ETC functions more efficiently and more cost effectively.

RFID Transponders (a.k.a. "Toll Tags")

Currently, passive and active transponders are installed in vehicles (after market) for ETC. In the future, the RFID technology that makes transponders work will probably be built into vehicles initially as options (like *On-Star*™ vehicle tracking) and ultimately will be required by statute as standard equipment on all new vehicles.

Current - Passive Transponders – RFID Toll Tags

The most common type of toll collection system operates using RFID technology. The RFID toll tag transponder is typically mounted on the inside of the vehicle's front windshield, directly beneath the rear view mirror. An overhead transceiver antenna (i.e., "RFID Reader") is mounted above the traffic lane, affixed to the underside of bridges or gantries. Today, most RFID readers transmit in the 900 MHz frequency range, and the readers are designed to cover a small footprint. When the vehicle crosses the zone of the transmitter footprint, a small portion of the radio energy from the transmitter is reflected from the toll tag back to the receiver. Within this reflected energy, the unique identification number of the tag is also transmitted back to the receiver. This type of tag is often referred to as a passive tag because it receives its energy from the incoming signal and its function is limited. A passive transponder has no battery to replace and the electronics are quite simple. Therefore, the passive toll tag is inexpensive and reliable. System management software adds date and time information to the received

information. Then, by cross-referencing the reflected ID number with the database of registered users, the toll is charged to the customer's account.

Since the system is dependent on reflective radio energy, the power is low, and limits the transmitter range to only about 30 feet. For this reason, antennae must be mounted over each lane. The low power tends to limit the amount of data that can be transmitted.

Current - Active Transponders - RFID Toll Tags

Active type toll tags are equipped with a battery, antenna, receiver, and transmitter. The battery operated tags usually result in a higher cost of ownership for the user. Battery life is dependent on basic capacity of the battery and the long-term power drain. Typical toll tag batteries last about five years. When the battery power is lost, the driver begins to be regularly recorded as a violator, and the tolling authority sends a violation notice to the user.

Active tags have a greater transmit range so it is more difficult to associate the vehicle with a specific lane. The tag is always in a low power dormant receiving mode using the same technology as found in a pager. When the driver passes under the toll authority antenna with the matching frequency, the tag goes from dormant mode to active mode and responds by transmitting the serial number of the tag. The serial number is cross-referenced with the registered users and the user's account is charged with the toll.

15-Year Outlook –Toll Tags

Once toll tags move to a universally standardized format, they will become optional and eventually standard equipment on all new vehicles. Until that time, toll tags may still be built into a vehicle and have a firmware update that will bring the toll tag in compliance with a proprietary operating system. The built in toll tags may eventually be embedded into windshields.

Additionally, toll tags will move from using the 900 MHz spectrum to the 5.9 GHz (DSRC) spectrum to transmit information between the toll tag and the reader.

RFID Readers (Antenna/Transmitter/Receiver)

Currently readers are used to receive the ETC signals from the transponder in the vehicle. They transmit the ETC information to the ETC processing center. In the future, open road tolling using RFID, video cameras with OCR back-end processing capability, or GPS-based tolling, and eventually DSRC, may augment or altogether replace today's RFID readers.

Current – RFID Readers

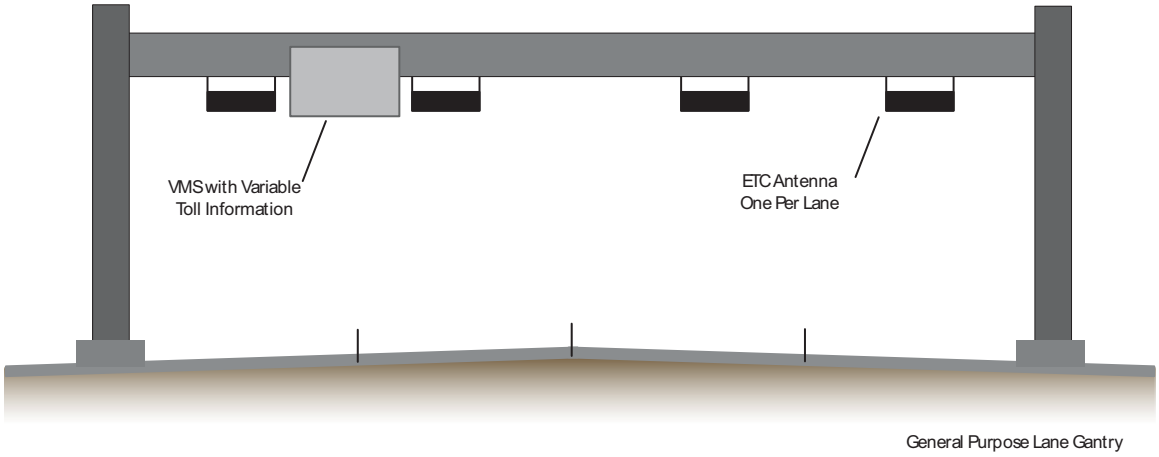
RFID readers receive the information from transponders in vehicles, add a date, time, and location stamp, and send it to the ETC processing center. The readers track a vehicle's speed, location, and travel time along a roadway. Readers play a role in deducting the appropriate toll from a user's account.

Readers consist of a computer designed to be used outdoors, a radio transceiver and an antenna. The reader is connected to the ETC processing center via a wireline or wireless connection. The majority of these connections currently use an optical fiber backbone. This communications backbone is required to provide transaction information, vehicle license plate and video images, field device status information, and lists of valid or invalid transponders. While wireless communications are being used to

connect more and more endpoints, it is not likely that RFID readers will be wirelessly connected to ETC processing centers as the distances will be too great.

Figure 7-4 depicts a general purpose lane gantry with RFID readers and a variable message sign.

FIGURE 7-4: GENERAL PURPOSE LANE GANTRY



15-Year Outlook – Open Road Tolling

Open road tolling is most often defined as a pay facility in which customers do not have to pass through a toll plaza, and customers do not have to slow down. Facilities that use toll plazas process only 400 to 700 transactions per hour per lane while open road tolling has the operational advantage of being able to process up to 1,800 vehicles per hour. Open road tolling has other cost effective benefits because there are no toll collector salaries and personnel overhead benefit costs to absorb. Also, there are no coins or cash machines to maintain.

Open road tolling looks attractive because it may reduce the installed infrastructure required to accomplish ETC. The infrastructure typically consists of lighter weight gantries that can span the roadway to support RFID reader, or similar toll systems. Open road tolling has just started being deployed. If such open road toll systems show to be reliable, they may replace the traditional toll plaza structures.

Video Capture and GPS Tolling Applications

Current – Paid-by-License Plate - Video Capture Systems and Optical Character Recognition (OCR) Image Processing

Video cameras capturing optical images of license plates, combined with highly-automated OCR systems, can be used to augment and potentially replace RFID tolling. The state issued license plate offers a unique way for each vehicle to be identified. When a vehicle comes into the tolling surveillance zone, a video image of the rear license plate is captured. Some systems are set up so that the camera captures not only a close-up image of the license plate but others catch an image of the car and driver as well.

The license plate image is transmitted to the OCR software that analyzes the image and determines the license plate characters. First, the toll agency client database is searched, and if no positive match is found, the system proceeds to search the state database of license plates until there is a match. In most cases, the patron whose account is linked to the license plate, or if a non-patron, the person that was issued the license plate by the DMV, is charged the toll fee and any applicable surcharge.

Video cameras equipped with OCR processing back-ends are most often used today for redundancy and violation enforcement, rather than as the primary toll charging system. On Toronto, Ontario's Express Toll Road (407), OCR has been used as an option available for infrequent toll road users who do not want to lease a toll transponder. The operators of the 407 chose this method of tolling because they realized that not all traffic within the province is local; therefore, those visitors may not have a transponder or an account. A small surcharge is added to the toll to cover the cost of the additional system processing.

For "paid-by-plate" video capture systems, the footprint of the camera mounting equipment is rather small. A stable platform must be provided for the camera. The camera can be mounted to a gantry or an overhead sign bridge. A camera setup is necessary for each lane of traffic.

A strobe flash unit is often used to enhance that image quality. The image quality can be further improved by adding controls for flash and camera shutter durations or adding infrared technology.

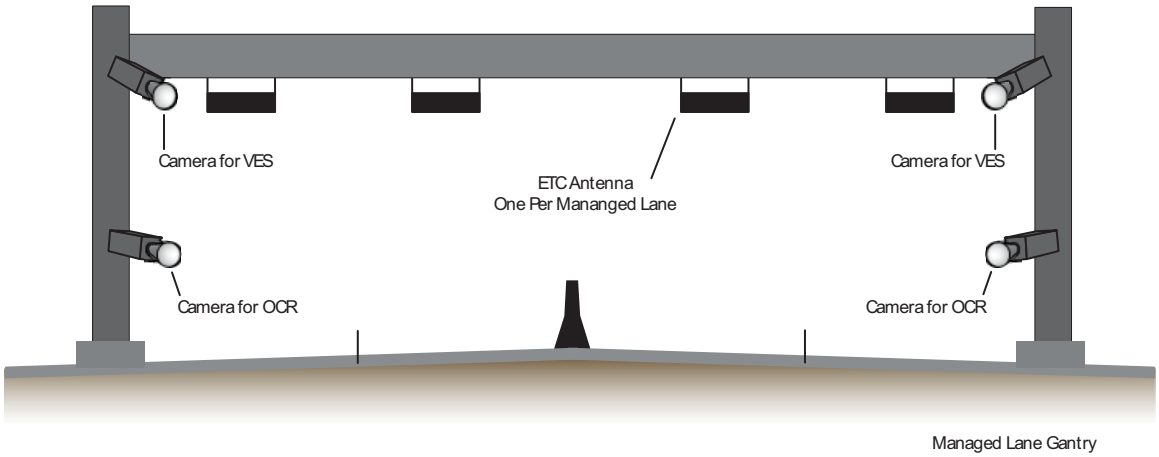
Reflective glare, heavy rain, fog, and dirt can make reading the plate more difficult. If a roadway is oriented east-west, the glare from the morning or evening sun will often cause a problem; and, when this happens it often coincides with the AM and PM peak traffic periods resulting in a loss of revenue.

The general practice has been to place cameras so they capture the rear license plate image as the vehicle leaves the toll zone. Currently, Caltrans does not allow trucks in managed lanes located within the center-median of the freeway. Should SANDAG decide to permit trucks to use the managed lanes, the viability of using video cameras to capture images of license plates may be negatively impacted. Whenever a tractor-trailer truck passes the toll zone, the rear license plate image is useless. The trailers are rented and are often transferred to another tractor after being hauled. Permitting trucks to use the managed lanes would result in a unique and difficult enforcement problem, as it is difficult to track down the truck cab or violator. One possible mitigation would be to use an additional camera to capture the front license plate if there is a significant amount of truck traffic that results in lost revenue.

Depending on license plate imaging for toll revenue introduces the opportunity for some drivers to escape the toll by using fraudulent practices. Currently, there are license plate spray coatings available for purchase that obscures the license plate when a flash is used in the photography process. The spray contains material with reflective properties that provide a glare under the bright flash conditions. The resulting photograph shows a bright white area that obscures the license plate text and the image is not readable. Some drivers could also resort to stealing license plates from other vehicles so that the owner of the plate is charged to the toll, and not the driver using the toll facility.

Figure 7-5 provides an example of where the VES and OCR cameras would be placed on a gantry.

FIGURE 7-5: MANAGED LANE GANTRY



DMV Relational Database Lookups

Using license plates as the primary toll identification technique can require a more complicated computer processing system. California's records database can contain millions of entries to be queried. The Department of Motor Vehicles (DMV) controls and updates the database of information associated with the license plates. The toll authority must rely on the accuracy of the information provided. When vehicles are sold new, transferred to new owners, or if the license plates are used fraudulently, it may take some time for the DMV to update the records. During that time, the toll charges are not assessed correctly.

15-Year Outlook - Video Capture Systems and Optical Character Recognition (OCR) Image Processing

Advancements in wireless electronic toll systems and improvements in securing those transmissions will help fuel ETC as the preferred method for collecting tolls. The video capture and OCR image processing is expected to continue its role as an enforcement technology that will be used to document violators. It is also expect that the video capture and OCR image processing systems will decrease in price and improve their accuracy to move from a secondary to primary enforcement tool.

Current – Global Positioning Satellites (GPS) Tolling

GPS tolling utilizes the technology associated with the constellation of satellites to determine the approximate location of a vehicle, expressed in terms of a set of latitude, longitude, and altitude (elevation) coordinates. This is the same satellite positioning system used by the military, airlines, and hikers. With recent advances automatic vehicle location (AVL) using GPS is typically accurate within 10 meters, and often better. An on board unit (OBU), also sometimes referred to as an integrated vehicle logic unit (IVLU) contains the required electronics and software necessary to complete the system for AVL applications. The OBU/IVLU is small enough to mount on top of the dashboard or conceal beneath/behind the seats to prevent interference with visibility.

The advantage of GPS-enabled toll systems can significantly improve cost effectiveness of the system's installation by eliminating installation of traditional ETC infrastructure. A virtual map of the toll road is digitally stored in the OBU/IVLU. The digital map highlights the roadway and the tolling limits of the roadway. The GPS system calculates when the vehicle location is within the tolled roadway limits. As the vehicle travels along, the GPS

unit continuously updates the vehicle position and a charge per mile for the affected segment is assessed to the user's account. An indication is given to the driver when a toll section is upcoming and when the vehicle is within the toll zone. The data is stored on board until the user information is downloaded to the ETC processing system. The download of toll distances and related charges can occur via a DSRC link along the roadway, or via a mobile phone link.

The on board GPS system data is linked to the back office system in order to calculate the toll and total account charge for the trip. This can be set up to occur at regularly scheduled times, not necessarily when the user is on the toll facility. This process can result in a complex operation. The tolling system must calculate vehicle locations using longitude and latitude coordinate data and compare it to a predetermined set of toll zone coordinates.

At present the GPS satellites do not send out a strong signal, and occasionally data can be lost if contact with the satellites is lost. When this happens, the system must be reset. This could result in lost toll revenues or billing errors. Enforcement of a GPS based toll system could be difficult because police would not readily be able to tell if a driver has the system turned on, turned off, or if it is disabled. Further development and testing of this technology is needed before GPS-enabled tolling is embraced as a viable solution for ETC.

Germany, Switzerland, and Austria started prototype testing of a GPS toll system for trucks in 1995. The development is continuing as improvements have been made to the antenna location. OBUs and suppression of engine electronic static have interfered with GPS operation.

Additionally, a GPS-based tolling system cannot determine the number of occupants in the vehicle. In-vehicle sensors, cameras, and police officers will provide the necessary passenger information so that the appropriate toll will be charged to that vehicle.

Further development and testing of this technology is needed before GPS-enabled tolling is embraced as a viable solution for ETC.

15-Year Outlook – Global Positioning Satellites (GPS) Tolling

As the technology improves, there may be more commercial vehicle GPS tolling used in Europe and Asia. The initial cost of the equipment is more likely offset by the higher roadway taxes that heavy commercial vehicles must pay. For passenger vehicle tolling, many industry experts believe that DSRC provides a better solution for ETC.

Communications Systems

Current Communications Systems – Fiber Optics

To support the various ETC field devices, such as readers, variable message signs, cameras, ramp meters, and detection systems, a transmission medium is needed to connect all field equipment. The most common method of connecting these ETC field devices is an optical fiber line placed alongside the roadway. During construction of the roadway, several four-inch conduits with inner- ducts are installed in a trench. Additionally, pull boxes are installed in the ductbank at anticipated field device locations. The optical fiber can be pulled into the conduits as needed.

While wireless technology is becoming more prevalent and more useful (with larger bandwidths and increased throughput), there will still be a need for large bandwidth, wireline communications, such as optical fiber. Therefore, four-inch conduits with

innerduct should be installed for any near term projects, including I-5, particularly when such installations can be included as part of more invasive widening construction where cost economies of trenching as part of an overall project and need are insignificant. Other communication and metering devices along the freeway will probably need to use optical fiber in this conduit as well.

15-Year Outlook - DSRC – Dedicated Short-Range Communications

DSRC is the name given to the 5.9 GHz spectrum. This spectrum was established by the Federal Communications Commission (FCC) to be used by intelligent transportation systems for the purpose of establishing nationwide interoperability of short range wireless communications between vehicles traveling at highway speeds and roadside devices. The wireless link is expected to enable the operation of multiple public safety and private DSRC services that will improve traveler safety, increase highway and transit efficiency, decrease traffic congestion, and reduce air pollution.

There are four classes of DSRC planned. Each class will be defined by its maximum authorized transmitter power, which will also define the typical maximum transmission range. It is expected that toll road applications would use either Class 1 with a range of 15 meters, or Class 2 with a range of 100 meters.

The data transmission rate for DSRC is expected to operate at speeds up to 25 megabits per second (Mbps). This will allow for near instant access and will be well adapted for a high-speed mobile environment.

The amount of data that a DSRC system can handle is quite large. For this reason, numerous public safety and vehicular safety applications are planned. A version of open road tolling, to reduce the expense of roadway infrastructure is expected to coincide with DSRC operation.

There is international cooperation between communications providers and the automobile industry so that the system will be able to operate in any country. The first systems may be optional or stand alone OBUs. At some point, DSRC units are expected to become a standard feature on all vehicles, probably beginning in the 2015 model production year.

7.3.3. ETC Violation Enforcement System (VES)

Enforcement goals include motorist and officer safety, reliability, and motorist adherence. There are two types of ETC violations, namely, occupancy and toll. Technology and officers are both used to catch violators. Better violation enforcement is obtained when officers and technology collaborate, and ultimately the managed lanes will experience lower violation rates.

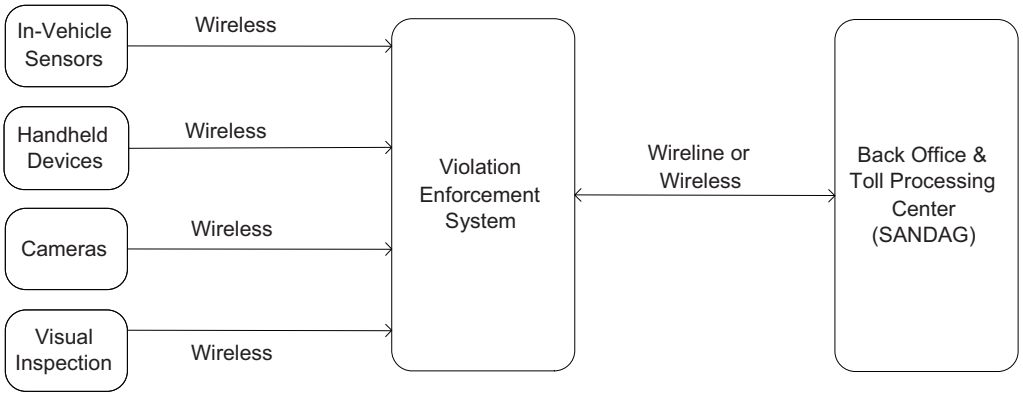
If motorists get the impression there is a lack of enforcement, they are tempted to violate the occupancy and/or toll requirement because the risk of being fined, regardless of the fine structure, is minimal. Although enforcement is essential, the level of enforcement required must be balanced with the amount of funding and police resources available. Enforcement should be conducted in a manner that does not adversely impact traffic operations, and the presence of patrol officers, while improving compliance, may also adversely affect traffic performance.

Penalties for violations must be adequate to discourage the willful violator such that reliance on dedicated enforcement officers can be minimized. The minimum fine for an HOV violation is $351 for the first offense. After the third offense, that same violation will

escalate to over $1000 inclusive of court costs. It should be noted, very little of the citation revenue feeds back into the toll system, and this policy should be changed in the future if technology and court requirements continue to rely on on-site police presence for some infractions, including meeting minimum occupancy requirements.

A violation enforcement system has already been automated for toll compliance in both San Diego and elsewhere, and statutes exist to allow for this process. Numerous projects throughout California allow for issuing a vehicle a violation notice by mail if the vehicle does not pay the requisite toll on a tolled facility. Figure 7-6 illustrates this enforcement system as is applied in a number of locations.

FIGURE 7-6: VIOLATION ENFORCEMENT SYSTEM OVERVIEW



Occupancy enforcement is more complicated and requires on-site presence, and this function has been problematic for all HOV and managed lane projects worldwide. Separating tolled versus free users creates many headaches for enforcement personnel. Originally, the I-15 Express Lanes employed a single tolling location with an observation booth and separate lane to segregate free from tolled users. Currently, both HOV and tolled users travel through the same lanes. The number of tolling zones on I-5, limited right-of-way and multiple ingress/egress locations make this approach impracticable for police enforcement alone.

Several occupancy detection advancements, including a portable verification reader carried by police, can make monitoring more efficient. But on-site presence is still a requirement by the respective traffic courts and current state statutes. A tiered pricing structure, particularly when the managed lanes overload at the HOV-2+ restricted level, will also be problematic for police. The following sections describe current and future options to address both toll evasion violations and occupancy infractions.

Current – Enforcement Area Design

Enforcement of occupancy infractions is improved by the presence of on-site law enforcement officers. Caltrans has pioneered the practice of providing designated enforcement areas where offsets in the median barrier are provided adjacent extraordinarily wide shoulders. Enforcement area design involves spacing areas periodically along facilities, particularly along roadways that do not incorporate wide median shoulders that are 14 feet or more. These areas are designed for safely monitoring traffic and apprehending violators. Provisions for enforcement areas are

included in the Caltrans HOV Guidelines. The following design features are considered for developing the enforcement area:

- If intended for monitoring and apprehension, includes a preferable length of 1300 feet
- Should be at least 14-15 feet in width
- Should have an approach taper of 115:1 and a departure taper of 80:1 or greater, or it may be controlled by general freeway criteria as required to fit in the design for proper acceleration to the design speed
- Should ideally be provided at a minimum interval of two to three miles along the managed lane facility. Some DAR sites may supplement this interval spacing, particularly if wide shoulders are provided

The managed lanes on I-5 will contain full standard width inside shoulders that can be used for continuous enforcement along the managed lanes. The location of inside shoulders may be left or right side oriented, depending on whether the lanes are buffer or barrier-separated, and whether full shoulders are provided on one or both sides of a barrier-separated configuration. In either case, the function of enforcement will allow for the ability of any officer to perform a simultaneous occupancy and toll evasion check by the use of a portable toll tag reader in the patrol vehicle while the officer is either in a roving or stationary position. This approach should alleviate the need for designated enforcement areas, other than as convenient places to perform stationary monitoring while being somewhat better protected. Unlike the current I-15 operation, this report does not recommend dedicated enforcement areas as a function of the adopted enforcement protocols or strategies. If enforcement areas are justified, the respective police may desire periodic median installations to more flexibly change directions through the median opening and observe traffic flow with some protection. The pursuit and apprehension of any motorist found without the requisite number of occupants and not having their toll tag read can be performed in the full width shoulders that will be a standard feature of the roadway's typical section.

Current Practice - Vehicle Occupancy Verification

Vehicle occupants cannot be easily verified by video images within the vehicle compartments and matched with an image of the license plate. This shortcoming, documented in numerous studies and technology demonstrations dating back more than 20 years in California, has been a major obstacle toward automating occupancy compliance. Such a technology must be "foolproof" in determining occupancy, and traffic courts must be willing to accept documentation of a violation. The prevalence of tinted windows, limited lighting conditions and children or pets riding in vehicles make the requirement of a foolproof reading difficult to distinguish between an HOV and SOV. Cameras are not yet at an advanced enough stage where they can accurately detect the number of passengers in a vehicle, and therefore, cannot be currently considered viable to address this need. Cameras can be used in concert with monitoring tools to address other forms of operational infractions, including buffer crossing and speeding. It is possible that front-facing cameras detecting occupancy in the front two seats with considerable accuracy teamed with a change in business rules that would define HOVs differently to mean two or more adult occupants driving in the front two seats could go a long way toward solving this problem in the short term. However, other concerns related

to privacy laws may prevent use of such images for the purpose of occupancy enforcement.

This matter has hampered operation of HOV lanes for more than 30 years, and throughout this period it was felt technology would eventually be adopted to address occupancy infractions. Such will happen, but there is no current evidence that the I-5 lanes can rely on a technology fix. To address this difficulty, some HOT lane operation plans are considering only allowing free use to highly visible HOVs, including vanpools and buses, and forcing all others to pay a toll at the same rate. Recommendations from this assessment must continue to focus on a VES that makes the best use of limited on-site police enforcement through the use of in-vehicle detection systems for confirming toll payment so as to separate those who have paid from those with the requisite number of vehicles. Applying a portion of the fines collected back into enforcement, can help ensure that staffing presence is always available to serve this need.

Current – Routine Law Enforcement

Routine enforcement based on accident history is a popular method to deploy personnel and focus not only on toll and occupancy violations, but other infractions and traffic management needs as well. Special enforcement assigns additional personnel and equipment during periods of need on the facility. Selective enforcement may involve the use of fixed observers, unmarked vehicles or roving spotters to enhance enforcement effectiveness. In most cases, both routine and special enforcement activities have been unscheduled, thereby not allowing motorists to predict when enforcement will occur. A more detailed discussion of the different enforcement strategies and techniques can be found in a variety of other references, including the National Cooperative Highway Research Program (NCHRP) #414, HOV Systems Manual (1998) and American Association of State Highway and Transportation Officials (AASHTO) Guide for High Occupancy Vehicle Facilities (2004).

To segregate paid from free users, most ETC reader sites in California currently employ overhead mounted indicator lights which are visible to enforcement patrols who are instructed to park downstream of the tolling installation. The overhead indicator lights alert the officer if a violation has occurred. The light is intentionally concealed from passing motorists. A combination of automatic enforcement from cameras, and observation by officers, increases the rate of violator apprehensions.

It is not possible for a police officer to issue citations or apprehend all the “free” violators in such a labor-intensive system. There also are inherent dangers associated with chasing a violator along a highway and stopping on the shoulder to issue citations.

Current Strategies– Lane Segregation

Channelizers

When managed lanes are designed and operated into the freeway cross section, a means to differentiate these lanes from the general purpose lanes is needed to maintain the integrity of tolling, promote a more reliable operation and regulate ingress and egress. The alternatives being studied in the NEPA process include buffer separation and barrier separation. Both approaches are considered in this functional plan. Barriers provide for adequate facility differentiation based on current technologies as outlined in other sections. Buffer separation poses more challenges because it relies upon pavement markings to outline or highlight the separation zone. There are typically a

series of signs that remind drivers not to cross the pavement marking stripes. If no physical separation in the buffer area is provided, the integrity of the managed lane operation may be compromised.

If some form of soft separation is applied, such as ground-mounted channelizers in the buffer area, they can help reduce access violations. Channelizers are typically posts that are made of high-impact plastic that can be anchored into the pavement or glued in place with a high strength epoxy. These posts come in a variety of shapes and sizes and have reflectorized surfaces. The base of the channelizer is often constructed with a spring-like device so that when hit, it will return to the vertical position. The plastic is of low mass so that damage to vehicles is minimized. However, channelizers have been criticized in some locales as presenting a safety hazard when they are dislodged and become projectiles, and maintenance costs to replace them can be rather high. In San Diego, Caltrans does not support the implementation of channelizers. The 15-year outlook suggests that the capital costs of toll tag reading installations, coupled with transaction costs, will become lower and allows for consideration of barrier-free alternatives to be operated. For this reason, both barrier and buffer-separated alternatives can be feasible and practical. The main issue seems to be agency preferences and likely implementation horizon for multiple toll zones along the corridor.

5-Year Outlook – Portable RFID Hand Held Devices

For occupancy and toll evasion monitoring, an enforcement officer can use a hand-held reader for two primary purposes: to determine if a toll tag is operational, and to check if the tag serial number matches the information in the database for the listed toll user. When the enforcement officer aims the reader at the toll tag, the tag reacts by transmitting the same information as when it passes through the tolling zone. The officer is able to determine if the tag is in the possession of the authorized user if the tag serial number matches the information listed in the toll road authority database, and whether or not a transaction has just occurred. The database will typically list the owner's name, license plate, and the vehicle type. The officer is then able to verify the information during a traffic stop.

The experience of some enforcement officers shows that the hand-held readers do not usually work when a vehicle is at operating speed. In general, the vehicle must be stopped, or nearly stopped, in order for the hand-held reader to operate. The reader must be at a close range to the toll tag. This often requires that the officer must lean over the hood of the vehicle before the tag responds with the transmitted user data. This shortcoming will hopefully be addressed in the not too distant future so that tags can be read more quickly and efficiently by enforcement personnel in the field.

5-Year Outlook – Smart Card/Transponder Validation

Occupancy verification could be conducted by utilizing the latest generation of SmartCards that have an RFID chip imbedded within it. The system could work in much the same way a passive transponder works to identify toll vehicles. However, in this case, a credit card sized SmartCard is carried by each occupant. Each SmartCard would transmit a signal to the receiver. If the receiver picks up the correct number of SmartCards within the vehicle it is assumed that the correct number of passengers are within the vehicle. Periodic visual enforcement would be necessary with this technology to discourage drivers from carrying extra SmartCards.

15-Year Outlook – In-vehicle Monitoring

There will likely be a shift from roadside visual monitoring to in-vehicle monitoring; thereby shifting more of the system costs from transportation agencies to individuals. Certainly it is possible that intelligent, sensing equipment will be installed directly into vehicles, and therefore, the consumer will pay the price for the devices. Examples of this sensing equipment include:

In-vehicle sensors

- Mechanical systems, such as a seatbelt. A supplementary system could monitor belt pay out, i.e. how far the seatbelt releases or retracts, or seat belt movement to determine if a person (adult or child) is in the seat. This technology has been employed in Europe for more than five years.
- Photography – inside the vehicle. Could be used in conjunction with the airbag sensors to determine occupant position sensing for a smart airbag deployment. Video for occupant counting would be far less complicated than video for smart airbag uses.
- LED imaging – inside the vehicle to produce contour images and compares that to a contour image of an empty vehicle. Difficulties arise with rear facing car seats.
- Infrared sensors could use a passive or active system. The passive system would compare body heat images to empty car images. An active system would scan the passenger compartment and develop a three dimensional model. Clothing, hot objects, or red-colored material can distort infrared images.
- Thermal imaging would be similar to infrared sensors and have the advantage of not easily identifying who the occupant is. It can verify that an occupant is present, however.
- Weight/heat sensors within the vehicle under each seat.
- Medical application sensors (heartbeat, breathing monitors). Volvo has developed a concept car that employs a heartbeat sensor. It will inform you if a person or animal has been locked in the car. It may be possible to adapt this technology to determine the number of people in a vehicle.
- Biometric recognition – makes sense for the driver, but not as much sense for passengers.
- SmartCards – again, makes sense for the driver, but not as much sense for passengers.

15-Year Outlook – Front-facing Optics

Front facing optics consist of a camera mounted so that a photographic view into the windshield of the approaching vehicle is captured. The driver and front seat passenger are usually visible, but those in the back seat can be obscured by the low light level or by the headrests. Children are usually below the level of the seatback and often do not show up in the photo. Reflection off the windshield also presents a problem. The violators often claim that the photographs are inaccurate for these reasons making reliability of enforcement difficult.

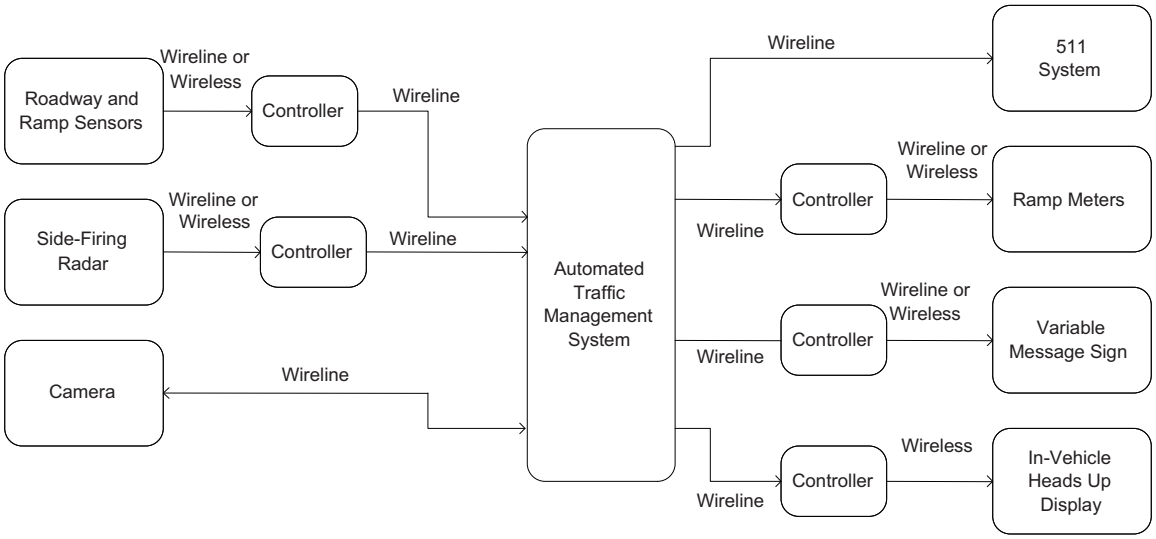
15-Year Outlook – National Identification Card

The READ ID act became law in 2005. By 2008, a national identification card will be required for an individual to use any government service, to travel on airplanes, or to open a bank account. Most likely, state-issued driver's licenses will become the national identification card. In order to get this national identification card, an individual must provide a photo identity card, document birth date and address, and show Social Security card (or valid Visa). With a few modifications, the passive ETC system could read the national identification cards of all vehicle occupants to determine the correct number of occupants and feed that information to the toll processing system to charge the correct toll based on the number of occupants in the vehicle.

7.3.4. Traffic Management and Control Systems

Traffic management systems also are an integral component to a successful managed lane system. Current traffic management systems for managed lanes also perform various functions for the adjacent lanes as well. This concept applies to the I-15 corridor and will likely be applied to the I-5 North Coast Managed Lanes corridor as well. Components include ramp metering, regulatory signing, detection systems, variable message signs (VMSs), closed circuit television (CCTV) monitors, and maintenance online management systems (MOMS). Refer to Figure 7-7 below.

FIGURE 7-7: AUTOMATED TRAFFIC MANAGEMENT SYSTEM DIAGRAM



More globally, information from the I-5 North Coast Managed Lane project should be fed into the local and regional traveler information systems and the 511 systems to inform travelers of travel times and current tolls. The information must be in a common format or re-formatted to fit the needs of the traveler information and 511 systems.

Current – Ramp Metering

Ramp metering is a freeway management tool in which a traffic signal is installed at the entry ramp with the intent of controlling the number of vehicles accessing the freeway. Loop detectors are placed upstream of the ramp to measure the speed and number of

vehicles per lane per hour on the freeway. The detector data is analyzed using freeway algorithms and when freeway conditions are too congested, the ramp meter begins operation. When the ramp meter is operating, the red traffic signal is displayed to stop vehicles from entering the freeway in queues that further degrade traffic flow. During times of high traffic congestion, the green signal is displayed for a short period of time allowing only one or two vehicles to enter the freeway at a time. When the congestion is not as severe, the ramp meter green timing is extended to allow more vehicles to enter. At times when the freeway is operating normally, the ramp meters are turned off. Ramp meters are typically operated during the AM and PM peak periods.

There are multiple algorithms to control the rate at which traffic is signaled to enter the roadway. The major categories of ramp metering include isolated, cooperative, competitive, and integral. Isolated ramp metering determines the meter rate for an individual on-ramp based on its local traffic conditions (e.g. flow, occupancy, travel speed, and queue overflow).

Cooperative ramp metering algorithms calculate an isolated meter rate and then calculate a system flow rate in order to minimize congestion at the bottleneck and spillback at critical ramps. Cooperative ramp metering reacts to critical traffic conditions and responds after the fact.

Competitive ramp metering algorithms compute a local and global traffic flow rate and choose the more restrictive rate to control the flow.

Integral ramp metering algorithms use control objectives, such as travel time or throughput, to control entrance to the facility.

Dynamic ramp metering is a subset of integral ramp metering and it takes into account the traffic congestion upstream of the meter and dynamically changes the rate at which traffic is signaled to enter the roadway. A dynamic ramp metering algorithm is the most complex and comprehensive as it combines system-wide, adaptive and predictive controls.

15-Year Outlook

Ramp metering will continue to be used in the future. The detectors may become roadway surface installed devices that transmit their information wirelessly to a reader. That detector information will be transmitted, probably via wireline, to a location for processing by an algorithm to determine the correct vehicle entry rate. The “meter” information may be transmitted to the vehicle wirelessly in a heads-up display. The processing algorithms will continue to improve and become more appropriate for a specific facility. The concepts used in ramp metering, however, will remain the same. There will be detectors, information flow, algorithms to process information, vehicle entry rate determination, and information dissemination.

Current – Pavement Markings and Signing

Pavement Markings

Pavement markings for either a buffer- or barrier-separated roadway will follow the standard MUTCD and Caltrans requirements associated with freeway applications. Buffer-separated lanes provide both white and yellow striping in accordance to the Caltrans HOV Guidelines in the buffer area, with a yellow left edge stripe. Barrier-

separated roadways carry a left solid yellow edge stripe and right solid white edge stripe. The left solid edge stripe for the general purpose lanes would be white.

Guide Signing

Guide signing is essential to direct road users along highways. The new Manual on Uniform Traffic Control Devices (MUTCD) and Caltrans HOV Guide provide guide signing examples that are appropriate for the I-5 managed lanes, and this report provides illustrative examples as recommendations for typical guide signing applications (Figures 7-8 through 7-13). New HOV signing requirements in the 2003 MUTCD include more emphasis on overhead mounted signs, particularly at lane approaches. Color and sign formatting requirements are also specified. Additional revisions to the MUTCD are likely in the next two editions, in which more emphasis will be given to the application of pricing information and sign color through ongoing research. Accordingly, guidance on signing may change before the I-5 project is finalized and constructed.

Regulatory Signing

Regulatory signs provide the critical link to the public that informs drivers of the operational and legal enforcement parameters of a managed lane. These signs must conform to state and federal specifications pertaining to shape, size, and color. Regulatory signs are typically of rectangular shape and consist of black letters against a white background.

Managed lane regulatory signs typically refer to the physical limits of the lane, the hours of operation, the occupancy requirements, and the applicable tolls. This is a relatively large amount of data that the driver must comprehend when approaching a managed lane at freeway speeds. For that reason, the information is often distributed over several signs and with adequate spacing between signs so that the driver has enough time to understand the sign and maneuver the vehicle in anticipation of the final decision points.

The design of regulatory signs requires careful consideration of the information so that the driver most readily understands it. If the signs have too much information or are confusing, it can often lead to an enforcement problem. The signs are typically mounted on overhead structures or as large ground mounts. When a managed lane is integrated into a freeway cross-section, additional consideration must be given to sign placement so that signs intended for drivers on the managed lane are not interpreted as intended for drivers traveling on the adjacent main lanes.

Locations

Overhead minimum occupancy signs shall be located at least 800m (0.5 mile) before the beginning or entry point to the managed lanes.

Ground-mounted preferential only lane signs shall be installed at the beginning, initial entry point, intermediate access ramps, and direct access ramps to all types of preferential only lanes. An overhead preferential only lane operational sign shall be installed only at the beginning or initial entry point to all types of preferential only lanes. Ground mounted preferential only lane ends signs shall be installed at least 800m (0.5 mile) in advance of the termination of the managed lane.

Examples

Figures 7-8 through 7-13 offer examples of typical sign language and placement based on access requirements associated with a buffer- or barrier-separated managed lane orientation.

FIGURE 7-8: MANAGED LANE ENTRY SIGNING

Example Managed Lane Entry Signing

Located in advance and at each entrance. Black elements are dynamic.

NOT TO SCALE

FIGURE 7-9: MANAGED LANE EXIT SIGNING

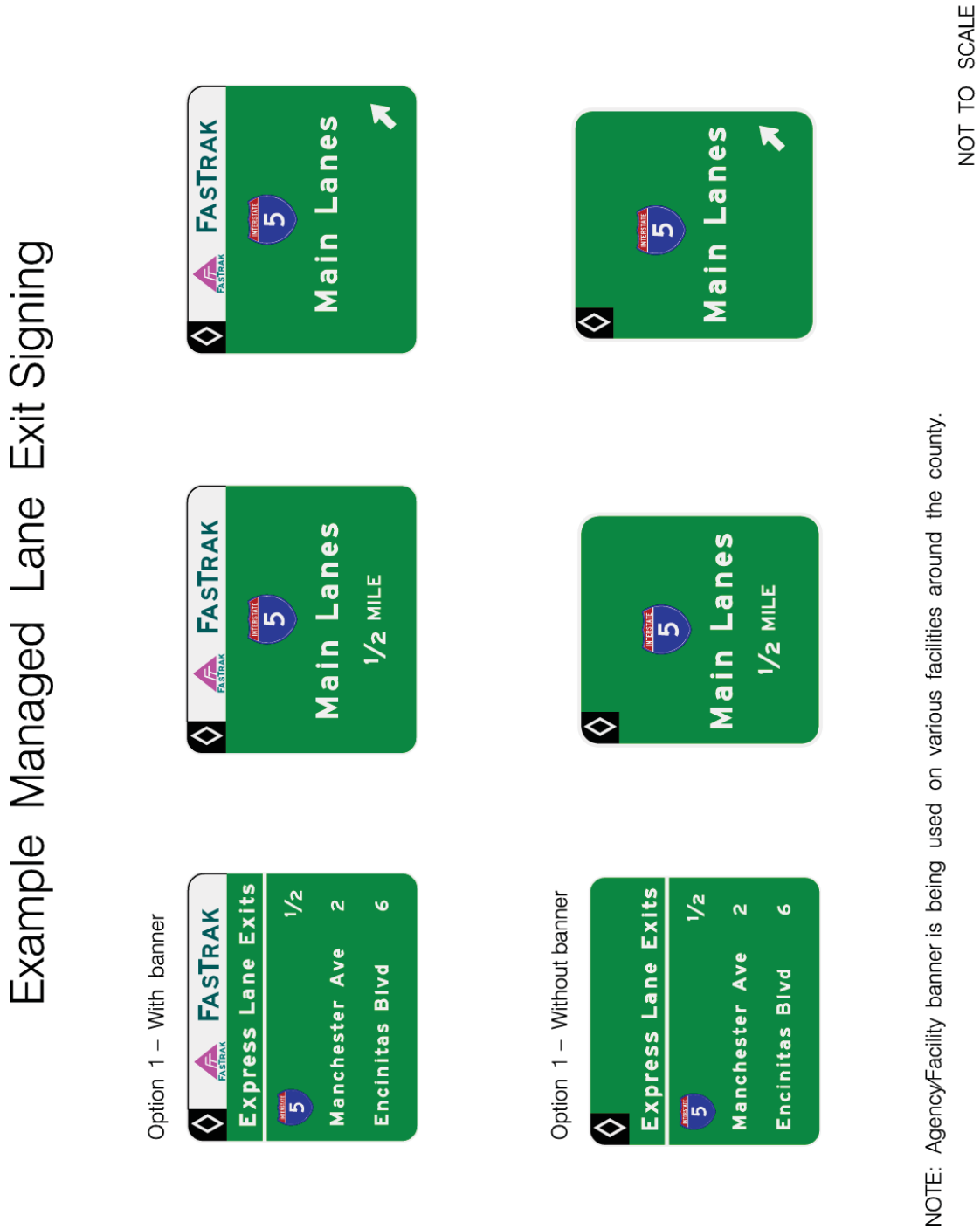


FIGURE 7-10: EXAMPLE LAYOUT ENTRANCE SIGNING

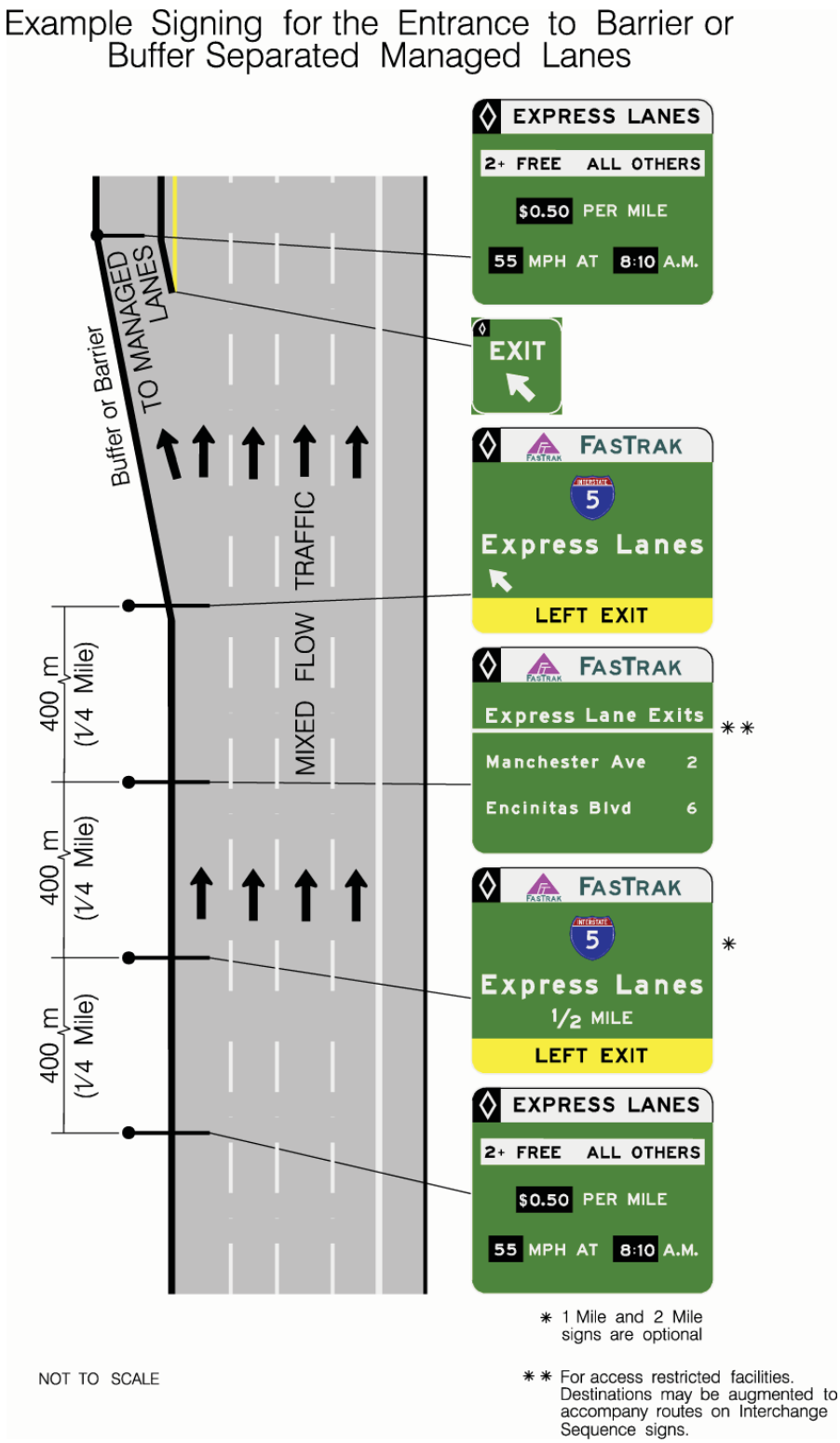


FIGURE 7-11: EXAMPLE LAYOUT EXIT SIGNING

Example Signing for the Exit from Barrier or Buffer Separated Managed Lanes

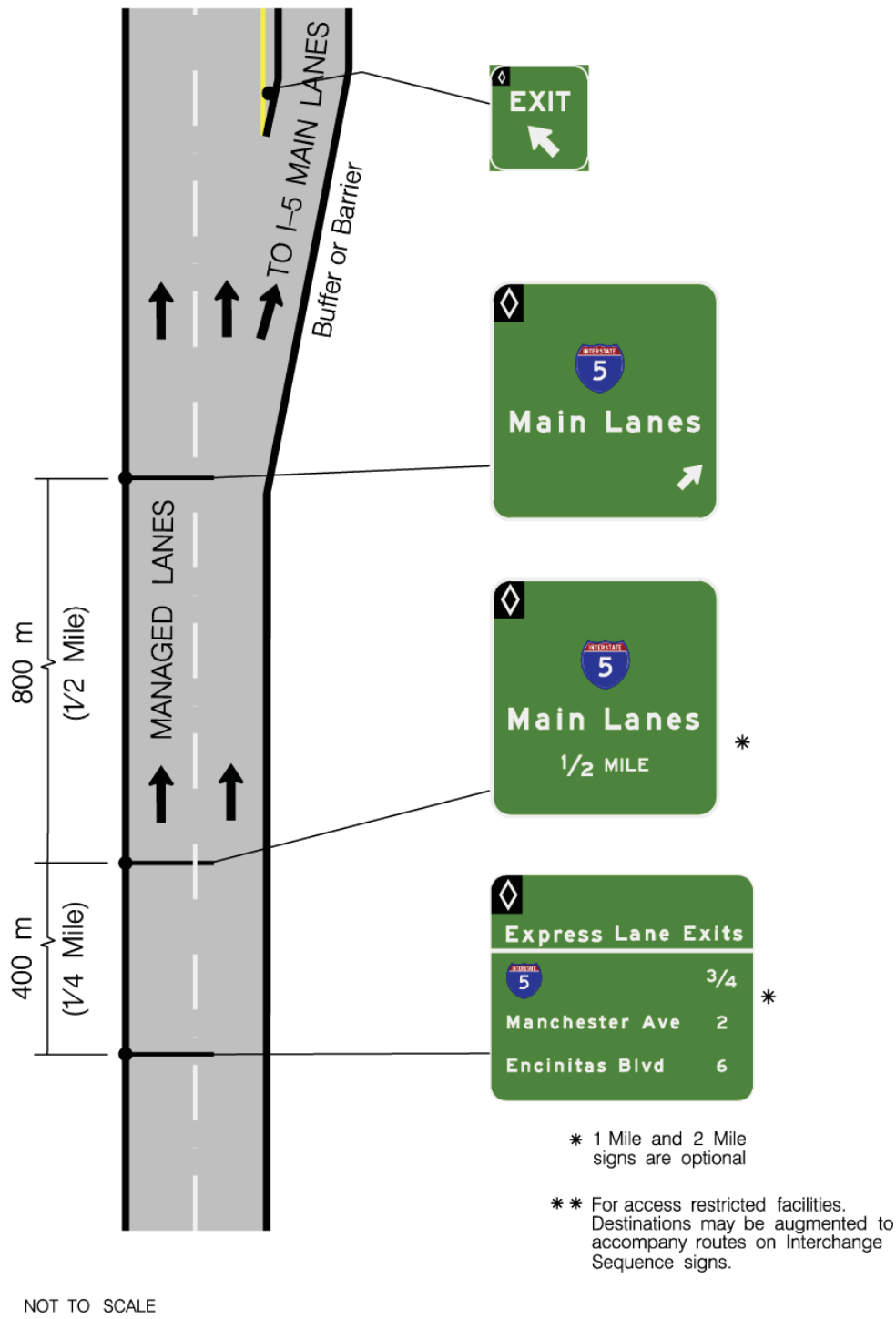


FIGURE 7-12: EXAMPLE SIGNING FOR DIRECT ACCESS FROM A PARK & RIDE FACILITY

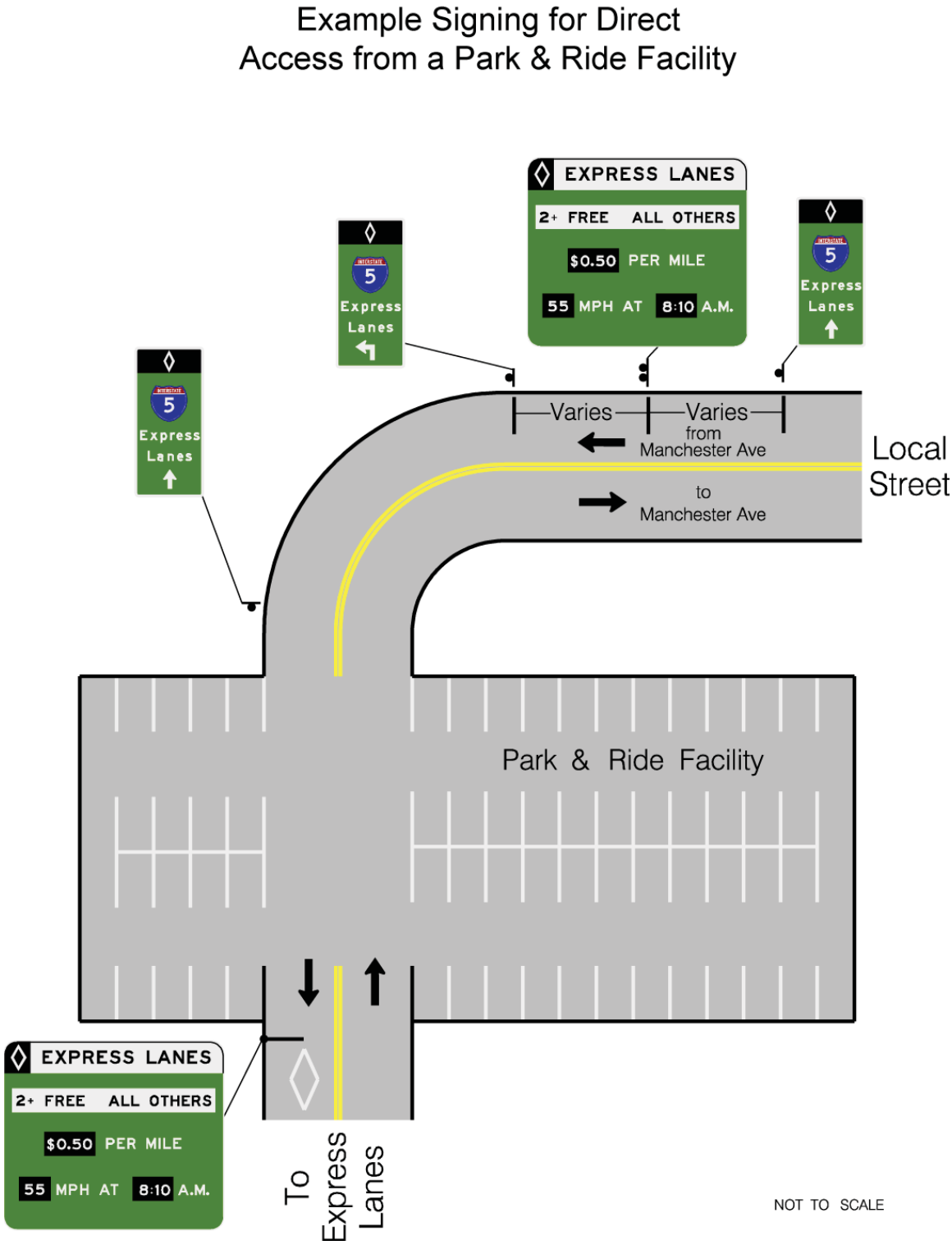
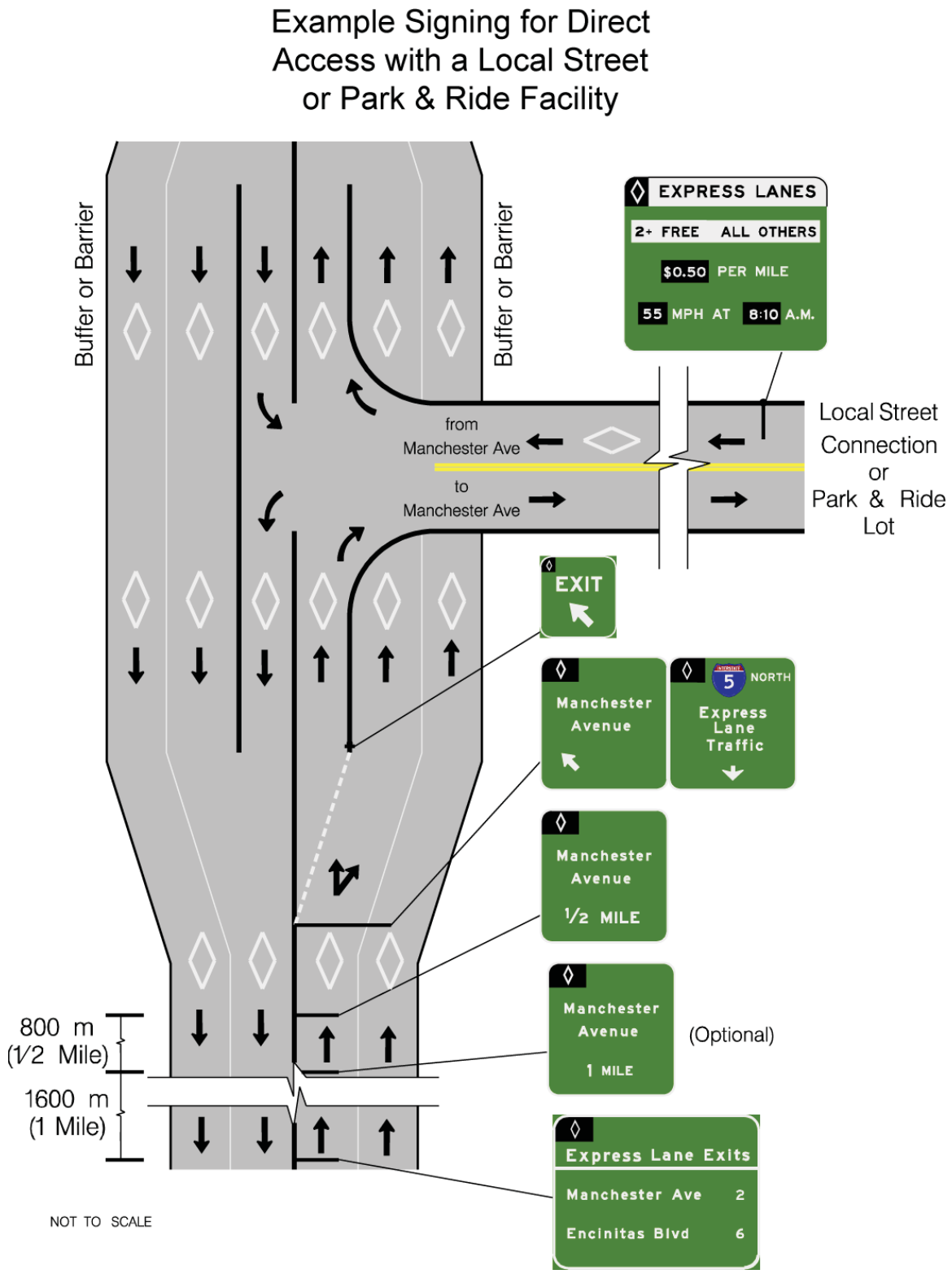


FIGURE 7-13: EXAMPLE SIGNING FOR DIRECT ACCESS WITH A LOCAL STREET OR A PARK & RIDE FACILITY



Vehicle Detection Systems: Determining Traffic Flow

Detectors and sensors will be placed in both the managed and general purpose lanes to determine the current flow in both of those lanes. The information will be used for two systems, namely, the ramp metering system and the toll rate processing systems. The detector information will be used to determine the appropriate ramp meter timing to reach the desired traffic flow. The detector information will also be used to calculate the toll charges for SOVs and HOV-2+s within the managed lanes.

The information will be collected from the detectors and sensors at the controllers and sent back to the traffic management center for ramp meter timing processing and the ETC processing center for toll calculation.

Finally, the detectors may also be used to feed the traffic management center's travel time calculation. The travel time will also be shown on the variable message signs (VMSs) to help motorists determine if they want to use the general purpose or managed lanes. The travel time for the entire I-5 North Coast Managed Lane corridor or discrete sections of the corridor may be calculated. As discrete tolls will be calculated between the seven toll zones, it will be possible to detail the travel time between those zones (and show that information on the VMSs). Therefore, travel time for the downstream toll zones will be calculated before the next VMS.

Current - In-pavement Loop Detection and Treadles

Treadles and loop detectors are currently used field devices that detect traffic flow. Additionally, software (algorithms) is required to take that count information and turn it into a useful statistic.

Treadles can be electromechanical, resistive rubber, optical or piezoelectric. They are used to determine the number of axles, number of wheels and direction a vehicle is crossing the treadle.

While mechanical treadles are well known to the industry, they have significant limitations including, mechanical problems subject to weather conditions, exacting installation, and careful maintenance. Additionally, mechanical treadles don't always register motorcycles. There is a move from mechanical to piezoelectric and fiber optic treadles.

In pavement loop detectors sense the presence of vehicles in order to measure vehicle flow, density and speed as part of the vehicle classification process. Some loops can also classify a vehicle by its speed, length, and axles. Loop detectors have a low cost and are well understood by the industry. On the downside, the need to be cut into the pavement and maintenance can be an issue when the road deteriorates. Additionally, re-bar must be protected from damage during loop detector installation to minimize future maintenance costs of the facility.

No matter which detection device is used, the vehicle presence, number of axles, number of wheels and direction data is sent via wireline to the traffic management center and the electronic toll and traffic management (ETTM) center.

Current – Video Imaging Video Detection (VIVD)

Video Imaging Video Detection (VIVD) is comprised of a camera, an image processor, and an interface capable of algorithm processing. The system is operated by placing a video camera above the freeway. The background image, with no vehicles in the field of

view is considered the natural background. When the system is operational, a new video image is loaded to the processors. The natural background is subtracted digitally from the entire video image. The remaining digital image is that of vehicles that were caught in the view of the camera. The image pattern of vehicles is fairly typical and a pattern match indicates that a vehicle is present and will be counted.

The processor uses another algorithm for pattern matching which allows the vehicle to be tracked across the field of view. The distance tracked, combined with the camera shutter speed, allows a speed for the vehicle to be calculated.

The VIVD system has been most often deployed at intersections where image zones are used to detect when a vehicle is waiting in a traffic queue. The stopped vehicles provide for a more accurate result as compared to a freeway installation.

Some systems are said to have 96 percent accuracy. However, the accuracy of detection can be reduced due to darkness, abrupt changes in lighting conditions, rain, headlights reflecting off of wet roadway surfaces, or long shadows of vehicles cast during sunrise and sunset.

5 -Year Outlook – Side-firing Radar Detection

Side-firing radar typically operates in the microwave range, allowing it to operate unaffected in such adverse weather conditions such as rain, snow, or hail. When mounted at right angles to the traffic lane, in side-firing operation, the radar footprint can detect up to eight individual lanes of traffic. The imaging and signal processing allows vehicle detection for volume, occupancy, and average speed. The ability to detect volume and average speed make side-firing radar very suitable for Advanced Traffic Management System (ATMS) operations requiring input data for traffic volumes and incident detection. The installation of the radar unit is easier than installing pavement loops. The maintenance requirements are typically less than that required for in-pavement loops.

Side-firing radar has been gaining in popularity because of the ease of installation, price, accuracy, and reliability. It is not affected by weather and even has the ability to detect vehicles that are partially hidden behind a larger passing vehicle such as a truck. The trend in popularity is expected to continue for these reasons.

5 to 10-Year Outlook – Wireless Sensors

Loop detectors often fail before they reach their 10-year design life. Sawing open the road to replace failed loop detectors is time consuming and costly. Wireless sensors are being developed to replace loop detectors. These wireless sensors can be glued onto the road surface much like reflectors. The sensors would be battery powered so wires are no longer embedded in the roadway to support a sensor. Small base stations are installed along the roadside to wirelessly collect the data. The data then could be transmitted via wireless or wireline method to the management/processing center. These devices are new and have not been tested in real world conditions for any considerable length of time. More time is needed to know if these sensors are ready for full-scale deployment.

Direct Signage Messaging: Changeable/Variable Message Signs (CMS/VMS)

CMS and VMS (used interchangeably) systems are currently the most popular technology used to convey information to drivers. The signs are quite reliable and easy to operate. When planning the location for a VMS installation, the engineer will need to

understand the impact to the visibility of the sign due to horizontal and vertical curvature, lighting conditions, and sun position.

The key to implementing dynamic pricing is installing VMSs prior to each entrance point to the managed lanes. VMSs will advise motorists of the current toll rates for SOVs and HOV-2. The toll rate displayed on the VMS must remain constant while the motorist travels the segment.

VMSs should not be used to display static information (such as occupancy requirement), but could be used to display variable information, such as:

- Current managed lane tolling prices
- Real-time traveler information
  - Segment information – "15 minutes until next interchange"
  - Corridor information – "Managed lanes travel time vs. general purpose lane travel times vs. current toll – cost/benefit ratio"

Current - VMSs to Broadcast of Current Toll Rates

The field devices such as treadles, loops, and side-firing radar will transmit their information to lane controllers and ultimately the ETC processing center in order to calculate the traffic flow and appropriate toll rate. The toll rate will be calculated to manage the traffic in the general purpose lanes and managed lanes. Once the appropriate toll rate is calculated, the toll will be displayed on the VMSs. The entire process from the detection system to the VMS message takes a few seconds.

Current – VMSs to Broadcast Travel Conditions/Incident Information

Incident notification usually consists of broadcasting the fact that there is an incident ahead, the location of the incident, and an advisory for action that could be taken by the driver. This information allows a driver to decide whether to continue on the freeway or exit to an alternate route. The VMS sign messages should use a minimal amount of text and conform to a standard format for the message layout. A standard format allows the drivers to become familiar with the layout and thereby they understand the message more quickly.

Example VMS characteristics include:

- Letter size of 18" (desirable) to 10.6" (acceptable)
- Maximum of three lines with no more than 20 characters per line
- Maximum of two displays used within any message cycle
- Readable at least twice by drivers traveling at the posted speed, the off-peak 85th percentile speed or the operating speed
- Messages centered within each line

15-Year Outlook – In-Vehicle Heads Up Display

Within the next 15 years, advances will occur in automobile technology that will bring operating agencies closer to having real time traffic, toll rates, and construction information displayed in vehicles. Instead of Caltrans or SANDAG purchasing and installing VMSs and the infrastructure to support them, a vehicle would likely have a DSRC receiver and a mechanism to display real-time information. Public agencies

(Caltrans and SANDAG) would still be responsible for installing and operating the system that detects traffic, calculates the appropriate toll rate, and transmits that information to vehicles.

Traffic Monitoring and System Alarms

Current – Closed Circuit Television Cameras and Monitors

Closed circuit television (CCTV) cameras will likely be used for both enforcement and traffic management. For the traffic management purposes, CCTV cameras should be installed along the facility at regular intervals to provide monitoring and verification capabilities of traffic conditions. Where known backups or slowdowns exist, additional cameras may be installed. A managed lane facility requires more than the usual number of cameras as managing the traffic flow requires both active and passive management and response to incidents so that the maximum operating efficiency can be gained from both parallel roadway systems.

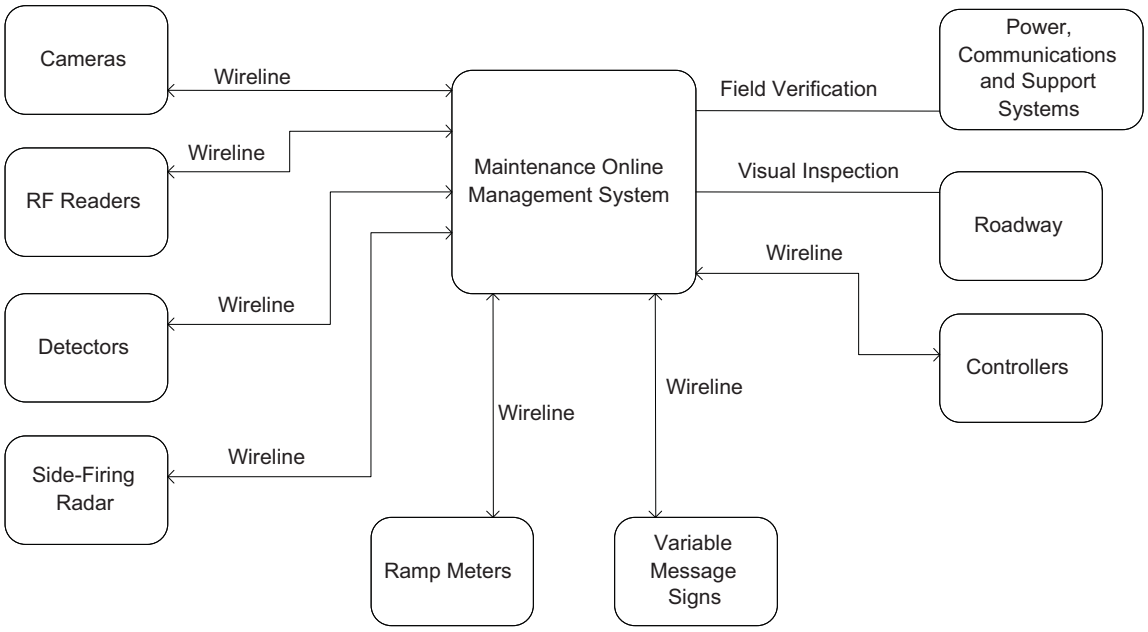
Caltrans and SANDAG may want to consider how ETC management and traffic management facilities are performed as they could share a significant amount of information, and each function impacts the other's decisions and outcomes. Therefore, the traffic management center function should be discussed with respect to how each agency will use and share potentially similar information for different end user needs.

It may make sense for SANDAG and Caltrans to consider co-locating the ETC management and/or traffic management facilities to facilitate sharing each other's information. This may reduce operating costs for each operator.

Current - Maintenance Online Management System (MOMS)

A maintenance online management system is an electronic method of supporting electronic toll collection system hardware and software elements in the field. Refer to Figure 7-14 for an overview of the MOMS components. The MOMS method is built upon a series of user-definable modules attached to the various field elements (e.g., VMS signs, loops, readers, etc.) which can provide real-time monitoring and reporting on system up-time and maintenance needs. The use of a MOMS can streamline the maintenance support required for efficient operation of the ETC system.

FIGURE 7-14: MAINTENANCE ONLINE MANAGEMENT SYSTEMS (MOMS)



Typical modules within a MOMS include:

- Lane events – which track the normal changes in the operational state of a lane.
- Diagnostic events – which verify the current operating state of the lane devices, loop detectors, cameras, etc.
- Unusual occurrences – this module requires definition and customization.
- Paging/Alarms – which notify the appropriate maintenance technician when a system failure has occurred, and ensures fast response time to repair.
- Performance history – which tracks the mean time between failure (MTBF) and mean time to repair (MTTR) for field devices and components.
- Work orders – automatically generates work orders based on diagnostic event messages.
- Part requisition – identifies and locates necessary parts and components by serial number to fulfill the work order.
- Suppliers – manages the contact information for suppliers.
- Equipment inventory – manages parts and components for the entire ETC system. Consumable items (without serial numbers), such as receipt printer paper and traffic light bulbs, can be managed through this inventor module.

15-Year Outlook – Automated Traffic Management and Control Systems

The 15-year outlook for automated traffic management and control systems includes a further deployment of technology along the roadside, in the pavement, in vehicles and in the sky. The trend will be to put the cost of ownership and maintenance on vehicle owners by using telematics, in-vehicle devices, and GPS satellites. Through this

process, SANDAG will probably not be able to completely eliminate their portion of the cost of ownership and maintenance.

7.3.5. Freeway Incident Response Provisions

Any impedance to ingress and egress locations, and blocked (managed) lanes may discourage motorists from using them. SANDAG loses toll revenue if the managed lanes are blocked and travel times do not match what was advertised on the variable message signs. Additionally, the lanes do not provide a reliable travel time for HOVs and transit. Traditional means -- road patrols and circulating tow trucks will not address the issue quickly enough. Real-time information provided by cameras and a monitored traffic management center (TMC) can more quickly identify blockages and initiate the appropriate personnel response (emergency, law enforcement, and tow trucks).

The I-5 HOT managed lane project will require more monitoring and response personnel (i.e.,freeway service patrol/customer assistance patrol) than simply a general purpose lane project. There would need to be enough staffing to meet the throughput and travel time goals of the managed lane facility and the staffing should be dedicated to serving the managed lane system. It will take SANDAG time to determine exactly how many additional staff that will be required. At a minimum, the traffic management center and freeway response systems should be fully staffed during peak demand times. The managed lane project may require this staffing for extended hours longer than peak demand periods.

Current - Incident Management Planning

Incident management is an important part of managed lane operations, just as it is important to overall freeway operations. Incidents result in delays to travelers that cost the public money. One rule of thumb is that for every minute a lane is blocked, it causes five minutes of congestion. The preparation of an incident management plan combined with training of the responders will result in a managed lane facility that is more efficient and ultimately more cost effective to operate. However, with dual roadways, the means to circumvent many incidents can be enhanced, but only if there is a means of communicating such information to motorists in a timely fashion. This means that the managed lane system will need to be able to accept large numbers of entering and exiting vehicles at the slip ramps in the event of an incident, and such information will need to be communicated to the driver. This communication medium may start with CMS displays in advance of each entrance or exit from each respective roadway, but eventually may be augmented through in-vehicle notification systems.

Current – Freeway Service Patrols

Freeway or Customer Assistance Service Patrols are extremely popular with the motoring public and are in many areas the most commonly cited service motorists could on when they need help. They are popular in the San Diego area. The provision of this service becomes more critical for managed lanes because there is no safe way for motorists who break down in these inner roadway barrels to seek help without attempting to cross busy mainlanes. Few opportunities will exist near median direct access ramps where a motorist could walk out of the managed lanes and seek assistance. Accordingly, the need for dedicated freeway service patrols, linked with rapid response telecommunications with the TMC, will be needed for both peak and off-peak operating periods. Barrier or buffer-separation for managed lanes will pose the same service assistance need. Several approaches to consider in augmenting

communications with stranded motorists will include posting emergency phone access numbers along the managed lanes for cell phone users and accessing through telecommunication links increasing use of in-vehicle emergency help requests.

7.4 CONCEPT OF OPERATIONS

The managed lanes should be operational 24 hours a day, seven days a week, and will not typically revert to free use unless in the event of a major incident. These inside lanes will be managed at an operational threshold of not more than approximately 1,650 vehicles directionally per lane per hour, depending on level of service (LOS) being experienced at key access locations based on this operational threshold.

7.4.1. System Overview

Figure 7-15 depicts the systems necessary for the I-5 North Coast Managed Lane electronic traffic and toll management (ETTM) system.

Automated traffic management and control systems will determine the traffic flow in the general purpose lanes and the managed lanes. In order to determine the pricing for the managed lanes the traffic flow must be known in the general purpose lanes and the managed lanes. Sensors will be embedded in and along the roadway of the general purpose lanes, managed lanes and ramps to determine speed of traffic and number of vehicles per hour.

In order to provide a benefit to the driver, the managed lanes must maintain a level of service (LOS) better than the general purpose lanes. To compare LOS between the ML and the GP lanes, both the GP and the ML must be instrumented with vehicle detection equipment to obtain travel time, speed and/or occupancy data. Obtaining ML and GP lane traffic data provides the most flexibility in the tolling schemes.

The ability to change the toll rate is dependent on the congestion state of the entire (GP and ML) facility. Table 7-1 provides four alternative states for the facility and the suggested toll level for that alternative.

FIGURE 7-15: I-5 NORTH COAST ETTM SYSTEM OVERVIEW

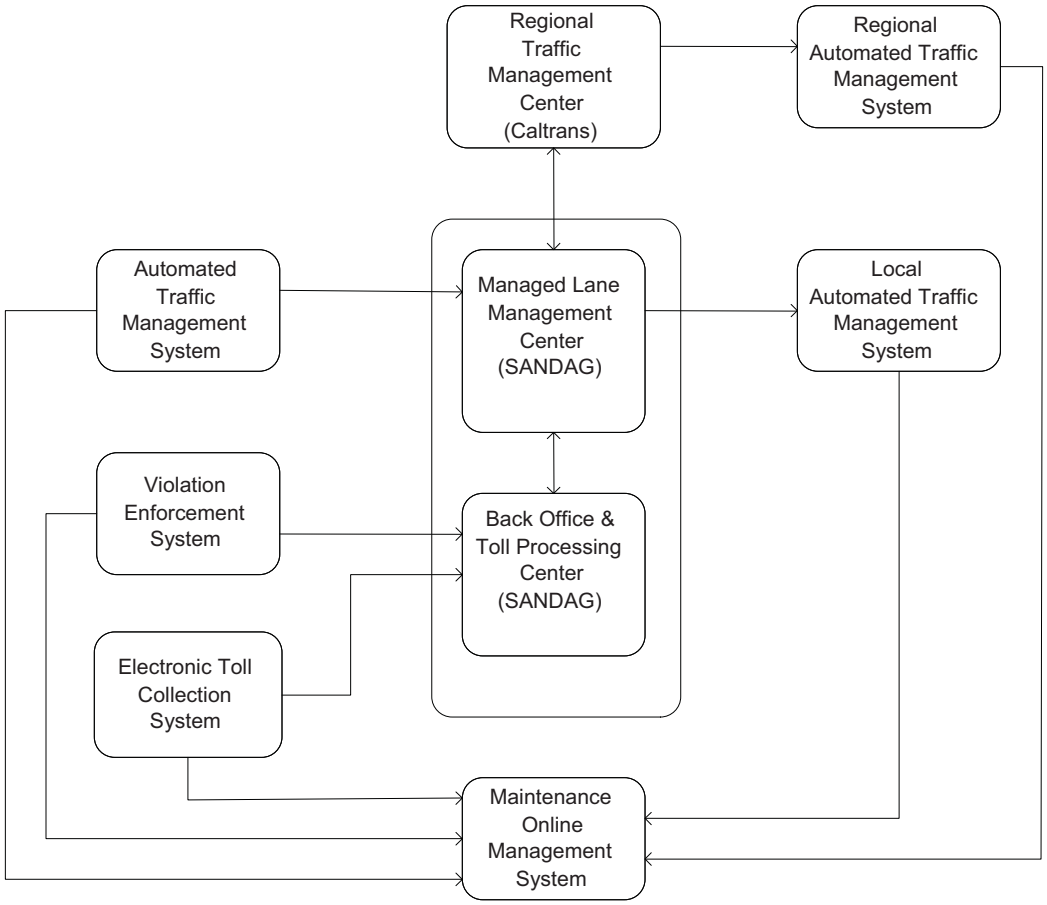


TABLE 7-1: FACILITY CONGESTION TOLL LEVELS

Managed Lanes	General Purpose Lanes	Toll Level	Reason for Toll Level
Not Congested	Not Congested	Low	No incentive to pa toll given high LOS of GP lanes.
Not Congested	Congested	High	Demand for high LOS exists on the managed lanes
Congested	Not Congested	High	Demand on ML must be reduced to regain high LOS
Congested	Congested	High	Demand on ML must be reduced to regain high LOS

The traffic flow information will be fed into the toll rate algorithm in order to determine the appropriate toll rates for SOVs and HOV-2+ (or possibly HOV-3+ at a later time). The system should be made flexible, user-defined, and table-driven to allow for periodic adjustment over time. Higher tolls will be charged during periods of peak demand. Multiple toll zones will exist in each direction; the entire corridor may not have the same

pricing basis. Each individual zone's toll rate will be calculated. Factors considered in that calculation are the number of vehicles in the general purpose and managed lanes within the zone and travel time within the zone. Toll rates for each zone will be communicated to motorists on signs in advance at access points via dynamic message signs (DMS), through the region's automated 511 traveler information system, and ultimately by way of in-dash heads up displays.

Traffic flow data is only one element to the toll rate algorithm. Levels of Service and toll rate increments are two other inputs into the algorithm. A benefit to traveling on the ML is the speed and reliability to traverse the lane within a valued time period. Therefore, the ML LOS must be better than the GP LOS and that increased LOS must be consistent from day to day. Local agencies must agree to the expected ML LOS, and the current statewide application of 1,650 vehicles/lane/hour is a realistic operational threshold.

Maintaining a high and consistent LOS comes at a price. The toll rate must be adjusted to maintain the balance between demand and access. "At what rate should the toll increase to maintain an acceptable and reliable LOS?" is another question that can only be answered at the local level. The toll increments must be consistent with other toll facilities in the area.

An entire system of electronic toll collection devices will be installed along the facility in order to collect the appropriate tolls electronically, and potentially to sample travel speeds and travel times through the managed lane segments for feedback to 511.

A combined approach to enforcement will incorporate both technology-based automated violation enforcement systems (VES) and personnel-based routine patrol enforcement provided by the CHP. The dual approach is recommended to ensure that vehicle occupancy and carpool requirements are met and that toll evasion is kept to a minimum.

A front-end (in-lane) communications server is required to communicate with the field equipment. This server may process the LOS computations and output dynamically varying toll charges, if such capability is optioned for. The front-end communications server should host the tolling algorithm and shall be fail-safe including such measures as redundant configuration and processors, uninterrupted power supply (UPS), et cetera, to lessen the possibility of system downtime.

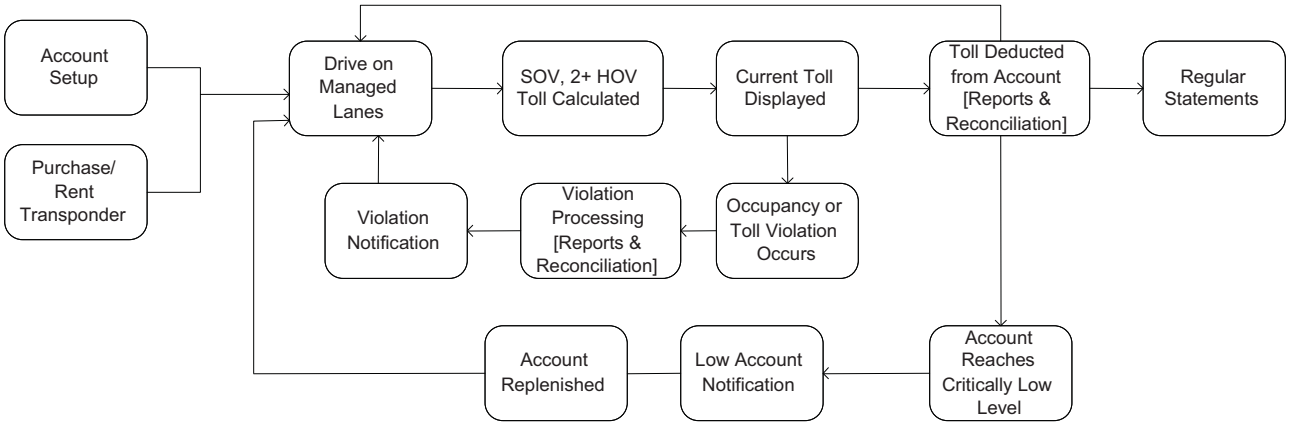
A back-end system is also required to process tolls, set up accounts, process violations, interface with neighboring agency systems, and interface with the public, and will serve as the managed lane toll system account management and revenue collection system/clearinghouse. This back office server can be independent but is more likely to be combined with the expanded I-15 back office system/server that will already be operational for the I-15 managed lane toll operation. Therefore, the back-end system/server solution should be scalable and allow for ease of interface to other back-end applications. These may include the regional transit fare collection system, electronic parking meters, or other related applications as well as the regional managed lane/tolling system(s). Each back-end system will have a process to accurately and efficiently complete its portion of electronic toll collection.

Staff augmentation will be necessary in the back office to perform a variety of I-5 managed lane functions, including management, maintenance, marketing, and traffic management specific to this corridor. Additionally, high-quality customer service for I-5

patrons should be ensured through a combination of front office customer service options, including email/web access, telephone and walk-in, The customer service front-end responsibilities will require physical space as well, to host the walk-in and account fulfillment centers. SANDAG and Caltrans may want to co-locate some of those customer service functions to save space, minimize staff requirements, share data, and reduce overhead.

Figure 7-16 depicts the process overview for account setup, toll calculation, display and deduction, violation processing, and account replenishment.

FIGURE 7-16: ACCOUNT PROCESS OVERVIEW



7.4.2. Development of Standards

Caltrans developed a Technical Specification for Automatic Vehicle Identification (AVI) and tolling in California that is codified in administrative law under Title 21 of the California Code of Regulations, Division 2, Chapter 16. With many advances in AVI and electronic payment methods since that time, there is pressure now to update the Title 21 specification to include more flexibility in technology applications, such as use of battery-less toll tags, SmartCard-enabled tags, and/or elements envisioned as part of the Federal DSRC specification. At some point, Title 21 may become totally obsolete and give way to the DSRC specification, or perhaps it will mirror the DSRC standard. Until that time, Caltrans should be concerned with modifying parameters, although not an exhaustive list, such as:

- Accuracy;
- vehicle speed;
- number of transactions per hour;
- radio frequency (RF) radiation levels;
- security measures;
- data format/content;
- power density;
- read/write capability;
- 100 mph read speed;
- compliance with existing national/International standards (like ANSI, FCC, IEEE);

- ability to use tags on vehicles with metallized windshields;
- communications protocols;
- message content;
- vehicle occupancy;
- cost of transponders; and
- interoperability with other related fare collection systems (e.g., SmartCards) deployed throughout the state.

For the I-15 and I-5 North Coast Managed Lanes toll collection and back-end processing, SANDAG should consider leveraging existing investments into automated fare collection systems and processes, such as the regional transit SmartCard, to determine what economies of scale, if any, exist; whether a consolidation of standards is possible; and what potential such consolidation has to increase ease of travel/mode crossover for regional commuters.

7.4.3. Traffic Management: Assumed Operational Parameters

Pricing is the primary management technique that will be employed to moderate demand. "The concept of value pricing within the highway sector involves the introduction of road user charges that vary with the level of congestion and/or time of day, providing incentives for motorists to shift some trips to off peak times, less congested routes, or alternate modes. Higher prices may also encourage motorists to combine lower-valued trips with other journeys or eliminate them entirely."[1] Managed lanes are designed to assess a road user fee that is in line with the value of reliable travel time to an SOV who is buying-in. Reliable travel time may be measured in how often is the calculated travel time is correct, or how effectively using the managed lanes gets commuters where they need to go more quickly.

For managed lane installations, variable pricing can also be set in real-time by the prevailing traffic conditions, an option known as dynamic variable pricing. It is recommended that the toll calculation algorithm consider several factors such as the number of vehicles in the managed and general purpose lanes, speed, number of vehicles per hour, and time of day to determine the appropriate toll for that moment in time. The toll calculation algorithm will re-calculate the toll within a set time period, or under a more complex system, whenever necessary to keep the flow at an acceptable rate.

Dynamic Variable Pricing Technique

The benefit of using the managed lanes over the general purpose lanes is reduced trip time and reliability. To maintain these benefits, traffic flow data must be collected on the entire facility, managed lanes and general purpose lanes. To maintain the trip time and reliability advantage, the level of service on the managed lanes must be controlled to maintain a LOS satisfactory to the users. This LOS is typically LOS equal to C.

[1] A Guide for HOT Lane Development, FHWA-OP-03-009, Federal Highway Administration, Washington, D.C., March 2003, page 3.

Level of service of a roadway is determined by assessing the current volume on the roadway against the capacity of the roadway. Capacity volumes vary by geometrics and operational characteristics. Typical general purpose lane capacities range between 2,000 and 2,100 vehicles per hour per lane (vphpl). Managed lane capacities range between 1,650 and 2,000 vphpl. The lower capacity is due to the lane characteristics, including whether the managed lane is separated from the general purpose lanes by a buffer or a more positive barrier.

Buffer separated managed lanes typically have lane capacities near 1,650 vphpl due to the uncontrolled interaction between managed lane traffic and general purpose lane traffic. Traffic separated only by pavement markings influence conditions of the adjacent facility. Buffers are generally less than four feet. This distance does not provide enough comfort for the driver if congestion were to occur on the adjacent lane.

In order to maintain a minimum LOS "C" (85th percentile) condition on the managed lanes, the volume-to-capacity threshold for the maximum number of vehicles per lane per hour (VPLPH) is 1,650. In most open road environments, instability occurs when the number of vehicles per lane per hour exceeds 2,000-2,100 VPLPH. The Highway Capacity Manual suggests that acceptable speeds for LOS “C” fall in the range of 35-50 mph. However, experience has demonstrated that the posted speed is the optimal rush hour speed; in the case of the I-5 North Coast Managed Lanes the posted speed is 65 mph.

7.4.4. Back-End Office Operations

Back-end office operations include toll posting; transaction auditing; recurring payment, billing and payment processing; statements and account notices; customer information/annotations; violation processing; DMV interfaces; OBU tracking and order fulfillment; interoperable interfaces; reporting; Internet hosting; marketing interfaces; communications interfaces and telephony; front end user interface, and security.

Toll Posting

An ETC system must maintain an accurate posting of all toll transactions with unique records associated with the appropriate account. Each financial record must be reconciled and closed. A transactional record should be associated with the debit/credit account system. Daily, weekly, and monthly posting reports are required for reconciliation and auditing.

While proprietary toll posting systems exist, it will be possible to find an open architecture using commercial off the shelf (COTS) hardware and Internet protocols. Since the I-5 North Coast managed lane toll system integration will follow the I-15 managed lane system design and integration, it is possible that the existing I-15 system will be expanded to handle the I-5 account and transactional data under a separate subdivision within the overall clearinghouse functionality. Therefore, it is important for SANDAG to consider scalability, expandability, ease-of-use, and maintainability.

Transaction Auditing

The tolling system integrity must be guaranteed. Therefore, independent periodic tests should be planned that test the lane and host systems to verify the accuracy of the counters, transactions, and postings.

Recurring Payment, Billing and Payment Processing

Pre-paid accounts should permit payment by credit cards, debit cards, automatic clearing house (ACH) authorizations, electronic checks, gift cards, cash and/or check deposits, and the back-end toll posting system should be configured to accept payment from third party transfers (such as a reciprocal FasTrak agency's clearing house). The back-end system will therefore require automated interfaces with credit card processors, bank processors, and check processors.

Patron Account Statements

Statements provide the account holder with a record of toll system transactions, beginning and ending balances. The system should be capable of generating statements for any interval, primarily monthly or quarterly, and should be delivered periodically to the account holder via one or more of the following means: U.S. mail, electronically (in portable document format) by email, by facsimile (FAX), or over the counter. Fees for statements could be charged if requested by U.S. mail or FAX, or if desired monthly rather than quarterly.

Customer Information/Annotations

In order to differentiate account holders, a database of customer information, such as name, address, telephone number, email address, account number, vehicle description and license plate numbers, and transponder numbers assigned to each account, should be maintained. Each account should be password-protected by a user-definable personal identification number (PIN). Furthermore, the back-end toll posting system should be designed to meet or exceed then-current payment card industry (PCI) standards for security, data encryption, and privacy protection.

Space for frequent annotations, such as statement and notice delivery dates, replenishment histories, historical changes to account information, and customer communications notes, should be provided for in the toll-posting system account database, which will greatly facilitate high-quality customer service. The system could be linked directly to the front office interactive voice response (IVR) telephone system.

Violation Processing

Through the I-15 project, SANDAG has already developed many of the internal and external processes necessary for an ETC/violation processing system. Those processes include:

- Toll amounts and occupancy requirements;
- Dispute resolution;
- Payment forms and timeline;
- Information sharing/notification between sister tolling authorities;
- DMV involvement;
- Information sharing between VES devices and violation processing; and
- Priorities and penalties.

These current procedures and processes are relevant for the I-5 North Coast Managed Lanes project as the same types of violations will be prevalent. Typical violations will involve toll evasion, occupancy infractions and if a buffer-separated project is applied without any form of soft barrier, buffer crossing could become prevalent. The VES role

will primarily reside with the operator of the managed lanes, which will include SANDAG as the tolling operator (or their contracted agent), Caltrans for operational monitoring of all roadway facilities through their traffic operation center, and the California Highway Patrol, likely under contract to provide enforcement services needed for the VES. The VES functional roles will reside with SANDAG and CHP, under contract to provide these services on a dedicated basis.

DMV Interface

SANDAG should develop interfaces to the DMV and possibly an interstate DMV consortium in order to share information related to violations processing. The interfaces would include common data standards in a format that is accessible (in order to share information between the toll posting system and the DMV, and process away-from-home transactions) and agreed-upon policies and procedures. The back-end violations processing office should be capable of transmitting and receiving the data so that registered owner/vehicle registration information, and vehicle color, make, model, year, and license plate information can be quickly queried to expedite and validate violations processing.

Transponder/OBU Tracking and Order Fulfillment

This system tracks the inventory levels of transponders or on board units (OBUs) (collectively, "tags"); including their internal ID and facility code, and assignment status. This module should be capable of documenting order placement, order fulfillment, tag assignment, tag issuance, tag return/recall, tag test/status, and warranty of tags, at any given time.

Interoperability and Reciprocity

The back-end system shall be capable of identifying, validating, accepting, and reporting transactions for both home-agency and away-agency transactions. This is accomplished by a series of interoperable interfaces between California FasTrak™ toll agencies. The guidelines for how the agencies interact is defined in a series of agency-to-agency cooperative user fee agreements, and its parameters specified in the California Toll Operator's Committee (CTOC) technical document entitled *Technical Specification for Interagency Electronic Data Interchange,* current revision G.4 (or later).

A separate example of how interoperability with the toll-posting system might be desirable is an interface with the regional SmartCard transit fare collection system.

The back-end system must be able to separately identify, validate, accept, and report tag- or image-based transactions for all interoperable applications and reciprocal accounts. The back-end system must also reconcile the tag- and image-based transactions on a routine basis, for the purpose of creating billing and settlement files. All tag- and image-based transactional and account data should be backed up regularly using redundant arrays of inexpensive disks (RAID) architecture, and the full toll-posting system and account database archived periodically on a routine basis.

Reporting

The back-end system shall be capable of generating a number of canned and customized reports. The following types of reports are necessary at minimum: financial, audit, exception, asset/inventory, warranty, local transactional, reciprocal transactional, violations, collections, MOMS (system uptime/status and system maintenance/repair

reports), and account/patron activity reports and statements. Additionally, a series of customized management, marketing, accounting, operational, and service-related reports should be easily designed, implemented, and made accessible from the main software interface.

It should be possible to generate and review those reports remotely from desktops using a secure virtual private network (VPN) connection.

Internet Hosting and Web-Enabled Account Management Tools

Prospective patrons, account holders, and others should be able to obtain general information concerning the I-5 North Coast and affiliated managed lanes toll facilities, download standard forms (e.g., new account application, account change forms), and reach a SANDAG managed lanes customer service representative via e-mail and/or web-form from a non-secure informational Website.

Just as important, patrons and violators should be able to log-in to a secure Website from the Homepage that allows them to review confidential account information, make payments, apply for additional transponders, download statements, etc. SANDAG shall provide for the development and on-going content/maintenance of both the secure and non-secure sections of the managed lanes toll facilities website. Most of the available off-the-shelf toll system software applications today include both secure and non-secure web capability.

Marketing Interfaces

To successfully operate a managed lanes facility or network as complex as the planned I-15 and I-5 North Coast Managed Lanes, an integrated and flexible marketing program is necessary. The back-end system should include a feature that is capable of tracking various marketing promotions and must enable routine measurement of these special programs and the application of the promotion/program to the account base and it should include the capability to report on the productivity of such efforts to gauge their success or failure.

Communications Interfaces and Telephony

The back-end plan must accommodate multiple remote accesses to the system, call center functions with call routing, interactive voice response (IVR), predictive dialer ability, call monitoring, and establishment of multiple call banks. This system should provide monitoring and performance reports. SANDAG's 511 IVR system will be the portal for customer telephone access to the front office.

Front End User Interface

The front end of the toll system account database should have a search engine that allows for searches based on patron information, account and transponder numbers, violation and transaction numbers, replenishment methods, et cetera.

The toll system shall be secure and must require any person logging on to provide his/her discrete user name and password, and shall track all account maintenance or database changes to the user, including the recording of a date/time stamp.

Once secure-access is granted, the front-end system should allow for authorized personnel to make updates, modifications, and/or authorize payments to be applied to an account.

Security

The back-end toll system must be secure, behind a firewall, hosted offline, and failsafe in its ability to prevent hackers from accessing account information or modifying the database in any way.

Additionally, the signal between a toll tag and reader should be encrypted, in accordance with Title 21 or more current standards; and only the account number, and not the account balance, should be stored on the tag, to prevent security breach.

7.4.5. Staffing

An electronic toll system requires more than technology to work. Administrative, customer service, marketing, accounting, violations processing, maintenance, and technical support staff are required for a successful operation. Currently SANDAG's toll business model for the existing I-15 HOT lanes is primarily outsourced operations, including customer service, maintenance, and back-end processing, with limited internal staff overseeing the effort. SANDAG should conduct an analysis of their existing and planned I-15 managed lane operation to evaluate what the potential savings or service improvements might be if they in-sourced a portion of those tasks. If proven effective, SANDAG should expand upon these findings and increase their staff involvement for the opening of the I-5 North Coast Managed Lanes to directly operate all or a portion of the critical managed lanes responsibilities, including front office (customer service), back office (clearing house and violations processing), lane level (technical and maintenance), and support (accounting, marketing, et cetera) roles. Any in-sourcing will require SANDAG to hire and train new staff and should be planned for accordingly.

Customer Service

Account Representatives

SANDAG will operate a front office customer service center (CSC) staffed with customer service representatives (CSRs). The CSC will handle frontline communication with the account base and ensure a responsive account management and order fulfillment process. All CSRs shall be capable of accepting and recording account and violation payments.

Like the current practice on I-15, it is recommended that SANDAG continue a pre-paid balance accounting policy. A pre-paid balance accounting policy offers the highest assurance of timely toll transaction payments, requiring the patron(s) to deposit the funds or pre-authorize payments through a credit card, debit card, or ACH in advance of their use of the lanes. Accounts are set-up like debit accounts, and paper or electronic statements are periodically forwarded to the account base in order that they may monitor their transaction activity and balance.

The CSC will also be the channel through which transponders/OBUs are distributed to account holders. Therefore, all CSRs must be trained in the fulfillment of transponder distribution and collection, and a select number of CSRs should specifically be assigned to handle inventory, warranty processing, and procurement/receiving of transponder shipments.

SANDAG's current operational policies (or "Business Rules") for handling low balances, expired credit cards, failed AVI transactions, deactivation of accounts, and collection of

negative balances should be reviewed for currency and applicability to this facility. If necessary, those policies may be updated.

Point of Sale

For the near term, it is envisioned that SANDAG will continue to purchase and in turn lease the use of toll tags (transponders or OBUs) to patron accounts through its CSC. The CSC policies should ensure a simple transaction for prospective patrons to obtain those items. The more automated the system, the less expensive it will be for SANDAG to administer, so there is a motivation to shift a large portion of these transactions to the e-commerce (Internet) site. Additionally, SANDAG should consider making available a limited number of its transponder inventory from nearby convenience stores, government outlets, or even possibly custom-fabricated transponder vending machines.

Marketing

Marketing involves two components, namely, public education and sales. Many of the current and future lessons being learned from the I-15 managed lanes project will be known and able to be applied to the I-5 corridor before it opens. So many of the fundamentals presented here are assumed to be baseline needs that will already have practices and policies in place prior to initiating operations.

Public Education

The public wants to know:

- What are the travel benefits and travel impacts
- What is the public funding benefit
- What are the users fees
- How will the project address social and geopolitical equity issues
- Where will the toll money go
- Address technology concerns, such as privacy
- Address environmental issues

A clear, concise message must be developed in order to address the list of concerns. Once the message is developed, public meetings, focus groups, newsletters, websites and formal hearings will help educate the public.

Sales

Before sales can begin, a marketing campaign should be launched using media events, press/news releases using media (websites, television, radio, print) advertisements, telephone and paper surveys, and direct mailings. It is crucial that the information provided be balanced, timely, and accurate. SANDAG must be careful to craft an information-based (not opinion-based) message.

Violations

Regardless of site conditions, a combination of routine (manual) and automated violation enforcement is recommended to ensure success in operation of the I-5 North Coast Managed Lanes.

Routine Enforcement with California Highway Patrol (CHP) Officers

The strategy for the initial six (6) months of operation should be to implement a routine enforcement campaign based on a high degree of law enforcement presence. This will help ensure operational integrity during this critical introductory period as well as set the tone for future operations. The precise level of medium- and long-term CHP enforcement presence needed will be determined based on experimentation, continuous monitoring, and from first-hand Officer/operational experience. The enforcement hours and mix of motorcycle versus patrol car units assigned should be adjusted through these periodic evaluations.

Automated Violation Enforcement System (VES)

Automated VES will include components such as cameras, video capture, optical character recognition image processing, hand held readers, and in-vehicle sensors. These devices would send their signals to a system for processing to determine if an occupancy or toll violation has occurred. A warning letter and ultimately a ticket would be generated from the evidence collected.

With the dynamic pricing and occupancy requirements for this managed lane facility, automated VES is not ready to replace routine enforcement. For now, enforcement will be improved when routine and automated procedures are used together. As technology improves, there may come a time when routine enforcement can be minimized or eliminated.

Back-end Violations Processing and Dispute Resolution

While much of the violation process will occur electronically, all of the commercial VES applications require a degree of manual review and an on-going quality assurance program. Additionally, the generation of paper violation statements and resolution of violations through payment or dispute require a staff presence. Significant mail handling costs can be attributed to the processing of violations and a dispute process should be available to patrons who receive a violation notice but whose accounts are otherwise in good standing. The underlying motivation of the violation policy should be to convert violators to good customers.

Maintenance and Support

In-Lane Maintenance

A comprehensive maintenance program, including preventive maintenance, diagnostic maintenance, and repair, is required for all toll system field elements/infrastructure. This includes, but is not limited to:

- RFID (or other ETC device) system elements (readers, antenna, transceivers)
- Changeable/variable message signs (CMSs/VMSs)
- Closed-circuit television (CCTV) surveillance cameras
- Video-camera detection systems for VES (cameras, arms, etc.)
- Communications infrastructure (wireless modems, antenna, and fiber/hardwired communications cabling)

- Electrical infrastructure (wires, cables, connectors, pull/junction boxes, etc.)
- Vehicle sensor equipment (loops, side-firing radar detectors, treadles, etc.)

The toll system application shall incorporate a maintenance online management system (MOMS) which shall help identify and track preventative maintenance plans and actual maintenance conducted; shall allow for notes to be recorded about various field elements; shall permit equipment to be accurately managed, including a spare parts inventory; and shall automatically monitor and generate timely notification alarms to maintenance staff who are responsible for testing, maintaining, and responding to ad-hoc system interruptions or device failures. The MOMS shall be capable of automatically paging a maintenance technician remotely, and it is the technician's responsibility to assess, troubleshoot, and repair system failures identified by the MOMS.

Routine maintenance reporting will be an important aspect of the toll system reporting feature, and the system should be capable of producing a total system uptime report that calculates a percentage failure rate for all parts, and for the system at large.

Software Maintenance

Software maintenance is important to the long-term success of the managed lanes project. SANDAG's Information Technology (IT) staff and system operators will be trained how to use and update the integrated ETC software system. However, the trend in software is to outsource the software's maintenance to a vendor (the company that provided the software or a third-party vendor). It is unlikely that SANDAG's staff currently has an individual who will understand all of the areas required making the system work well. Additionally, the software should not require a full time employee for maintenance.

Software Management

Skilled personnel will be required to update and operate the software. SANDAG will have to expand their technology staff (in number and/or job responsibilities) to manage the databases and Internet aspects associated with the integrated software system. SANDAG will also require database entry personnel to enter new and update existing accounts.

While not recommended, it is also possible to outsource all of the software management functions. SANDAG should carefully weigh the short and long-term benefits and risks of outsourcing software management.

Network Maintenance

While the end devices are different than a typical local area network (LAN) or wide area network (WAN), the concept of LAN/WAN applies to the managed lanes ETTM system. Just as a LAN or WAN needs network support, so will the I-5 North Coast Managed Lane ETTM network. Both the network and end devices will need to be monitored for proper operation and replacement when they are not functioning properly.

Appropriate systems support for data archival, redundant power and communications, proper hardware and software for data storage and processing, proper environmental conditions for server placement and appropriate security for safeguarding of the central computers are all important considerations to the managed lanes information technology network. Adequate assurances of the stability of the managed lanes network are thus an

important area of emphasis. The administration of the network will require some level of dedicated staffing.

System Auditors

A plan of regular, independent periodic tests of the hardware, software, and network systems should be planned that test the lane and host systems continuity, accuracy, adherence to procedure, and to vouch for the integrity of the transaction postings. The system audit should be easily reconciled to the financial system transactional audits. If travelers feel that their ETC account is being mismanaged, they are unlikely to consider using the managed lanes.

Traffic Management

Incident Management

In incident response team and procedures must be established to coordinate multiple agencies and various types of events including accidents, breakdowns, rain/mudslide control, routine maintenance, and ad-hoc occurrences, such as an evacuation or special event. The I-5 North Coast Managed Lanes incident management plan should be specific enough to deal with nuances of the corridor, but integrated into a larger regional approach to freeway and managed lanes emergency response.

FSP or Customer Assistance Patrol

The regional freeway service patrol (FSP) fleet that SANDAG operates already provides service to the I-5 North Coast corridor; however, there may be a need to augment existing or planned FSP levels with a more frequent or dedicated fleet of early responders, including tow trucks. Other managed/HOT lanes such as the 91 Express Lanes in Orange County augment their FSP with a “customer assistance patrol” (CAP) that raises the bar in rapid incident detection and clearance on the managed lanes. Physical space to park and stage FSP/CAP vehicles should be considered during final design of the managed lanes facility.

Traffic Operations Center and Traffic Management Center (TMC) Coordination

SANDAG does not operate a traffic operations center (TOC) today. SANDAG coordinates with Caltrans through its jurisdiction and operation of a Regional Traffic Management Center (TMC). Because so many of the traffic management and toll processing functions of the I-5 North Coast Managed Lanes will require timely response and rapid dissemination of information, it may make sense for SANDAG to physically occupy one or more corridor-specific TOCs or a consolidated TOC hub for all of its managed lanes operations. Otherwise, SANDAG should continue to work closely with Caltrans to exchange information and respond to operational events. If SANDAG does develop its own TOC(s), it may consider also to co-locate those TOC(s) within or nearby Caltrans’ existing TMC; and/or to establish dedicated communications interfaces to transmit data and voice communications in real- or near-real-time.

7.5 EVALUATION AND CONTINUOUS IMPROVEMENT PROCESS

7.5.1. Performance measures

Managed Lanes capacity

"There is a trade off between maximum capacity and managed capacity. As volume increases, speed generally decreases until reaching a point of instability typically between 2,000 and 2,100 vehicles per lane per hour. When throughput degrades beyond maximum capacity, speeds decline to levels around 15 miles per hour and flows drop as low as 1,300 vehicles per lane per hour.

When lanes are managed to promote "free flow" conditions, throughput must be contained to a level below maximum capacity. This regulated threshold, or managed capacity, is simply a management benchmark that ensures premium traffic service for HOT lane users."[2]

The operational threshold of 1,650 vehicles per lane per hour is the guideline from which a variety of operational management strategies and future policy decisions are based in order to adjust these as demand changes. Once the facility is built and operational, it is clear that SANDAG will need to monitor the traffic flow and choose the correct balance between maximum capacity and managed capacity.

User accounts

Performance measures for user accounts include accuracy of user and accounting information. There will be a correlation between user account/accounting accuracy and customer service calls.

Violations/enforcement

Performance measures for violations/enforcement include:

- Percentage of correct/incorrect violation events. (Can faulty violation events be traced back to faulty equipment or insufficient training?)
- Percentage of violation events becoming violation notices (and payments)

Customer service/call handling

Performance measures for customer service/call handling include:

- Percentage of complaints versus number of calls
- Response time to handle a customer inquiry/complaint
- Retention rate of customer service agents. If agents are not given proper training or do not have the skills to deal with stress, there will be an unusually high turnover rate.

System performance

Performance measures for system performance include uptime for field devices, system infrastructure (such as power and communications), and ETC sub-systems. Mean time between failure (MTFB) should be compared to expected value. The time of day the

[2] FHWA, "A Guide for HOT Lane Development", Publication Number: FHWA-OP-03-009, pg. 64.

failure occurs should be watched for trends. For example, failure at 4:00 a.m.has less of an impact than failure at 4:00 p.m..

7.5.2. Monitoring program

Monitoring will occur in several areas and the combination of this monitoring will quantify the successfulness of the program. A regular program of data collection, analysis, device inspection/testing, and review must be established as part of the ETTM operational plan to ensure proper operation of the managed lanes.

ETTM field devices

- Are all of the devices functional?
- Are the loops, treadles, beam sensors and side-firing radar detecting the appropriate number of vehicles and speed of vehicles?
- Are the toll tag readers reading the correct number of transponders?
- Are the VMSs displaying the correct message?
- Are the devices living up to (or beyond) their life expectancies?

Should SANDAG choose to employ any aspect of GPS-based tolling, additional considerations might include:

- Is the system calculating correctly the number of miles traveled?

[Note: It will be difficult to test the accuracy of in-vehicle sensors without the approval of individual vehicle owners.]

Communications systems

Serving as the backbone of the information network for the managed lanes, communications systems must also be checked for proper operation.

- Does the information from the automated traffic control system reach the traffic management system in the correct amount of time?
- What is the error rate?
- Does the VMS message (with the current toll information) display in the proper amount of time?
- Is the optical fiber performing as specified?

The central processing system

- Are transponder reads being associated with the correct account?
- Are the correct toll rates being computed?
- Is the appropriate amount of money being debited from the correct account?
- Is the MOMS system correctly determining, scheduling, and replacing broken items of the system?

The customer service system

- How long is it taking to process a new order and send out a transponder?
- Is the transponder arriving at the account holder's residence in a reasonable amount of time?

- How long does it take to resolve billing or violation issues?

The enforcement system

The following enforcement monitoring data would be of great benefit for future planning and identification of resource requirements for ongoing enforcement activities:

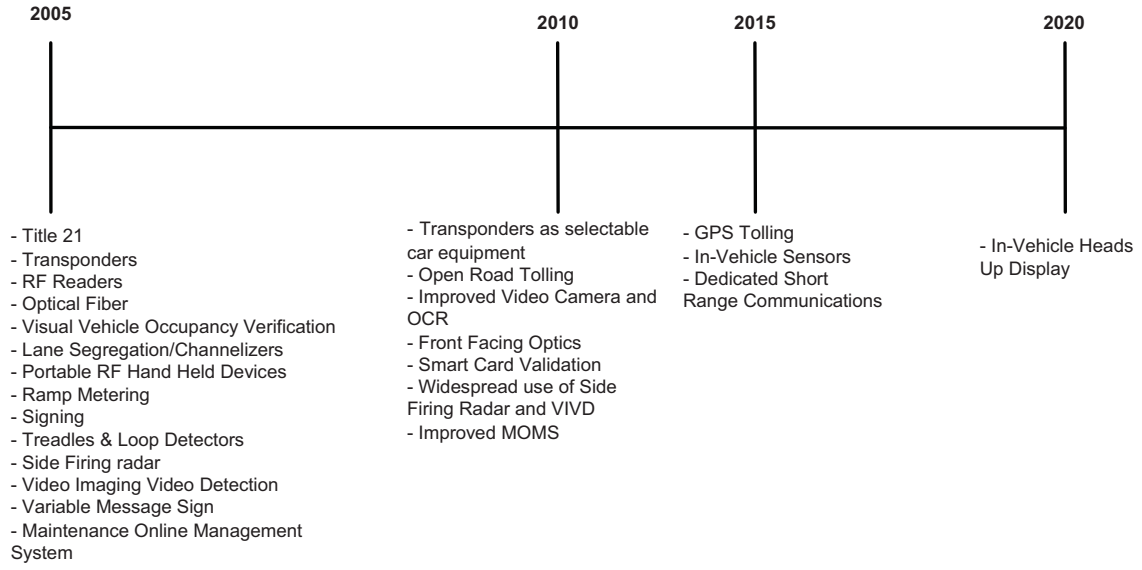
- The method of enforcement (officer, officer with video, etc.)
- The time the enforcement began and ended
- The location where enforcement took place (direction and location)
- The number of police personnel on duty (officers supplied, person hours used)
- A summary of violations issued (warnings, violation tickets)
- General notes regarding typical response of motoring public and challenges faced in carrying out this type of enforcement
- The results from any court actions regarding disputes of HOT/HOV violations.

7.6 POTENTIAL TIMELINE FOR TECHNOLOGY ADOPTION

This report has focused on current and future technology options for implementing an I-5 North Coast Managed Lanes Value Pricing project.

Figure 7-17 lays out the timeline for projected project development and implementation between now and 2015-2020. It should be noted that the future technology options are not cast in stone and represent the best informed estimate for the availability of those technologies at the present time. They do not correspond in any way to the adopted project schedule associated with construction I-5.

FIGURE 7-17: TIMELINE FOR TECHNOLOGY ADOPTION



7.7 PRELIMINARY COST ESTIMATE OF CURRENT TECHNOLOGY

7.7.1. Assumptions for Estimate

ITS installations for the corridor are provided in Table 7-2. ETC and related equipment estimates are provided in Table 7-3. Both estimates are based on current year dollars (2005). Estimate assumptions include the following:

- 8+4 lane configuration assumed to be the same for 10+4 for purposes of this analysis.
- Four-inch mainline conduit with 48 strands of single mode optical fiber installation for 26 miles.
- Lateral conduit as (2) two-inch conduits with six strands of single mode optical fiber and (3) #8 THW (copper stranded, insulated wire) for power.
- Optical fiber splicing to be done in manholes only.
- VMS (arterial) signs to be installed prior to entrance to all on-ramps on the managed lanes.
- VMS (managed lanes) signs to be installed on the managed lanes in advance of the toll collection site.
- VMS (general purpose lanes) signs are to be installed on the main freeway at one-mile advance and at the entrance to the managed lanes.
- This estimate does not include fixed message signs required for static messages.

7.7.2. Annual Operating Expenditures

Operating costs likely to be incurred by SANDAG and affiliated agencies for the I-5 North Coast Managed Lanes are divided into three categories: operations, maintenance and violation processing. Each category includes functional areas for the provision of services associated with the tolling operation.

Operation costs involve administration, finance and accounting, customer service, and support staff at the tolling center. Operating expenses can include facility costs, office equipment costs, supplies and other direct costs associated with account management and revenue handling. In an established operation, the operating costs/expenses can be estimated to increase somewhere between $0.20-$0.50/transaction processed.

Maintenance costs involve preventative and corrective maintenance activities of the roadside tolling equipment and collection locations and central computer systems and application software. Maintenance expenses include facility and vehicle costs, technical support type contracts, and consumables. Maintenance services will generally approximate $100,000 to $500,000 annually.

Violation processing costs for toll evasion involve violations image review, finance and accounting, customer service, and appeals and hearing support. Additionally the cost of on-site enforcement activities and judicial or other adjudication proceedings must be included. Violation processing expenses include facility costs, office equipment, lookup fees, supplies and other direct costs associated with revenues handling. Excluding fixed

costs for facilities and computer assets, the operating expenses can be estimated to be between $1and $5 per violation processed.

Additionally, enforcement presence likely to be needed on site for occupancy enforcement may vary from as low as $120,000 annually to $300,000 annually depending on the level of presence that may be needed for different parts of the corridor and level of enforcement visibility that may be required. There is no viable alternative in the near, and perhaps long-term future that will replace this function through technology due to court and institutional concerns over this issue, and the cost to advance this technology in each affected vehicle may be considerably more than the added enforcement presence.

Buffer-separation in this analysis assumes soft barriers (pylons), thus negating the need for more instrumented roadway treatment to monitor and remotely catch access violations. The cost for this approach is not considered feasible given the length of the corridor, but the cost of pylon maintenance is a factor to consider for buffer-separation.

Operating costs can be significantly reduced if the operations activities are supported by web-based applications. On-line account management and payment, including for violation fines and fees, on-line account statements, and other e-services dramatically reduce the cost of service center operations. Depending on how many processes are automated and web-based, an agency could reduce its annual operating expenses by 10 to 25 percent.

Estimated capital and operation costs for managed lanes under the two configuration scenarios are summarized below:

Barrier-separated Configuration

ETC installations	$1.7 million
Enforcement (CHP)	$120,000-$200,000/year
Maintenance of ETC system:	$300,000/year

Buffer-separated Configuration

ETC installations	$1.7 million
Enforcement (CHP)	$200,000 - $300,000/year
Maintenance of ETC system:	$300,000/year
Pylon Maintenance:	$500,000 - $800,000/year

TABLE 7-2: PRELIMINARY COST ESTIMATE FOR GENERAL PURPOSE LANES

Description	Unit	Quant.	Unit Cost	Mtl. Cost	Hr/Unit	Labor Cost	Total Cost
Antenna	EA	140	$2,500	$350,000	6	$42,400	$78,400
ETC reader	EA	28	$1,300	$36,400	4	$5,600	$21,000
ETC reader/controller	EA	28	$7,300	$204,400	4	$5,600	$105,000
CCTV Controller+Cabinet	EA.	30	$6,000	$180,000	16	$24,000	$204,000
Loop Detection Controller+CCTV Controller + Cabinet	EA.	12	$10,000	$120,000	16	$9,600	$129,600
VMS Controller+Cabinet	EA	39	$6,000	$234,000	16	$31,200	$265,200
Controller Cabinet Foundation	EA	81	$2,672	$216,432	16	$64,800	$281,232
TMS Manhole	EA	60	$3,500	$210,000	8	$24,000	$234,000
Splices	EA.	240	$20	$4,800	0.5	$6,000	$10,800
SM splice case	EA.	60	$600	$36,000	4	$12,000	$48,000
NEMA 4x Box	EA.	60	$65	$3,900	1	$3,000	$6,900
4"conduit (PVC) with quad innerduct*	LF	132000	$12.00	$1,584,000	0.32	$2,112,000	$3,696,000
6 SM Fiber	LF	12500	$2.00	$25,000	0.01	$6,250	$31,250
48 SM Fiber	LF	132500	$4.50	$596,250	0.02	$132,500	$728,750
Optic Transceiver	EA	60	$7,000	$420,000	1	$3,000	$423,000
Video Optic Transceiver	EA.	40	$3,000	$120,000	1	$2,000	$122,000
Test Fiber Optic Cable*	LS	1	$10,000	$10,000	0	$0	$10,000
#8 THW or USE Power	LF	37500	$0.28	$10,388	0.005	$9,375	$19,763
2"conduit (PVC)	LF	25000	$4.55	$113,750	0.16	$200,000	$313,750
Electrical Connection & Transformer	EA.	60	$3,000	$180,000	2	$6,000	$186,000
VMS (Arterial)*	EA	12	$10,000	$120,000	12	$7,200	$127,200
VMS Foundation (Arterial)	EA.	12	$1,500	$18,000	8	$4,800	$22,800
VMS (Managed Lane)*	EA	15	$30,000	$450,000	12	$9,000	$459,000
VMS Foundation (Managed Lane))	EA.	15	$3,500	$52,500	8	$6,000	$58,500
VMS (Freeway)*	EA	12	$100,000	$1,200,000	24	$14,400	$1,214,400
VMS Foundation (Freeway)	EA	12	$7,000	$84,000	8	$4,800	$88,800
CCTV Camera	EA.	30	$5,200	$156,000	4	$6,000	$162,000
CCTV Pole Foundation	EA.	30	$1,500	$45,000	12	$18,000	$63,000
Detection Loops	EA.	160	$75	$12,000	2	$16,000	$28,000
Sub Total							$9,373,945
30% Contingencies							$2,812,183
Total							**$12,186,128**

TABLE 7-3: PRELIMINARY COST ESTIMATE FOR MANAGED LANES

					LABOR COST =	$50.00	Per HR
Description	**Unit**	**Quant.**	**Unit Cost**	**Mtl. Cost**	**Hr/Unit**	**Labor Cost**	**Total Cost**
Antenna	EA	28	$2,500	$70,000	6	$8,400	$78,400
ETC reader	EA	14	$1,300	$18,200	4	$2,800	$21,000
ETC reader/controller	EA	14	$7,300	$102,200	4	$2,800	$105,000
CCTV violation cameras	EA	28	$5,200	$145,600	8	$11,200	$156,800
Power	LS	7					$2,500
Lane controller	EA	14	$11,400	$159,600	16	$11,200	$170,800
Support Structure	EA.	14	$45,000	$630,000	24	$16,800	$646,800
Support Foundation	EA.	14	$7,000	$98,000	24	$16,800	$114,800
Communications interface	LS	1					$5,000
Local Field processing Equipment+Software	LS	1					$100,000
Integration & Toll Tag Tracking	LS	1					$300,000
Detection Loops	EA.	64	$75	$4,800	2	$6,400	$11,200
Sub Total							$1,307,300
30% Contingencies							$392,190
Total							**$1,699,490**

CHAPTER 8

MONITORING AND EVALUATION PLAN

8.1 PURPOSE OF THE MONITORING AND EVALUATION PLAN

This Monitoring and Evaluation Plan (MEP) is intended to provide SANDAG and Caltrans with the fundamental information necessary to prepare a detailed work scope for the future monitoring and evaluation of the I-5 North Coast Managed Lanes. The cooperative relationship between Caltrans and SANDAG for the ownership and operation of the proposed managed lanes similarly requires a cooperative approach to monitoring and evaluation of the lanes.

Traditionally throughout California, Caltrans has lead efforts to monitor and evaluate the performance of freeway facilities and in particular high occupancy vehicle lanes. In areas with extensive HOV systems exist (such as Los Angeles County, Orange County, the Inland Empire, and the San Francisco Bay Area), Caltrans conducts comprehensive monitoring of HOV lanes and publishes annual reports documenting evaluation results. Where HOV lane operations are actively managed using value pricing by local transportation agencies (i.e. OCTA on SR 91 Express Lanes and SANDAG on I-15 Managed Lanes), Caltrans monitoring efforts are typically enhanced and expanded by the local transportation agency consistent with the operation of the managed lanes to provide more robust evaluation results. It is anticipated that a similar cooperative approach between Caltrans and SANDAG will be necessary for monitoring and evaluating the performance of the I-5 North Coast Managed Lanes (and the adjacent general purpose lanes).

This plan provides guidance for the data collection, performance measures and evaluation necessary to assess the overall performance of the I-5 North Coast Managed Lanes and related Value Pricing project. As such, the MEP includes the following elements:

- Evaluation Objectives
- Overview of Evaluation Approach
- Key Performance Measures
- Recommended ‘Before’ Data Set
- Recommended ‘After’ Data Set
- Ongoing Monitoring Activities
- Schedule and Budget
- Continuing Improvement Process

The inclusion of a recommended ‘before’ data set is a critical part of the MEP establishing the baseline to evaluate the effectiveness of the I-5 North Coast Managed Lanes. The existing traffic operating characteristics within the I-5 North Coast study corridor were generally identified in terms of traffic volumes, vehicle classifications,

vehicle occupancy profiles, truck volumes, and operating speeds as part of Chapter 2. A more comprehensive before data set is recommended as part of the MEP in order to allow SANDAG and Caltrans to have adequate time to plan, coordinate and execute the collection of baseline data for future detailed evaluation and monitoring of performance on I-5 within the study corridor.

This MEP follows closely the I-15 Managed Lanes Value Pricing Project Planning Study Monitoring and Evaluation Plan that was prepared by Wilbur Smith Associates in 2002 to ensure compatibility with previous SANDAG evaluation efforts for other similar managed lanes performance monitoring and evaluation efforts. Similar data sets will be assembled, performance measures identified and compatible analyses applied to enable comparisons between earlier study efforts and related corridors (e.g., I-15 ML). However, the desire to be consistent with previous or similar study efforts did not preclude the consideration of monitoring and evaluation needs that are unique to the I-5 North Coast Managed Lanes. Consideration of differing demographics and inter-regional travel needs within the study corridor, the presence of land uses with unique trip generation characteristics within the study corridor (such as the University of California at San Diego, the Del Mar Racetrack and Fairgrounds, and Legoland), the use of multiple access locations (including the use of both general purpose lane ingress/egress and direct access ramps), the requirement to manage demand on a fixed number of managed lanes in each direction, and the impact on parallel fixed rail transit services all contrast with the I-15 ML thereby requiring customized monitoring data, performance measures and evaluation methods described herein.

8.2 EVALUATION OBJECTIVES

This chapter identifies objectives relating to the I-5 North Coast Managed Lanes project and in particular to the application of eligibility limitations and value pricing as a mechanism to manage demand on the proposed managed lanes facility. Modeled after the existing I-15 Express Lanes, the I-5 North Coast Managed Lanes project represents a key component of the SANDAG 2030 Regional Transportation Plan strategy to “deploy a network of connected and free flowing managed lanes throughout the San Diego region.” This chapter outlines the project need and objectives identified through the project development process by the various I-5 North Coast stakeholders, including federal, state and regional implementing partner agencies.

8.2.1. Project Need

Caltrans has stated the following purpose for the I-5 North Coast Managed Lanes project:

> “The purpose of the project is to reduce current and future congestion and improve safety and operations on Interstate 5.”

Building upon the Caltrans purpose statement, SANDAG has stated the following need for the I-5 North Coast Managed Lanes project:

> “The I-5 North Coast corridor experiences recurrent traffic congestion during weekday rush hours and also is heavily traveled on weekends. Interstate 5 is a major corridor connecting San Diego, Los Angeles, Orange County, and Baja California, Mexico regions.

- Average daily traffic on I-5 is at 261,000 vehicles (near SR 56) and is projected to increase to 430,000 daily vehicles by the year 2030. Over 10,000 daily truck trips are made on I-5.
- Interstate 5 is important for commuter, commercial, and recreational travel. Without capacity improvements, the increases in traffic in the corridor will result in congestion throughout the entire day.
- The arterial roadways parallel to I-5 are segmented and do not provide a continuous north-south alternative route to the freeway. No new parallel arterial roadways are planned. The Coaster commuter rail service is being expanded; however, I-5 will carry the burden of trips in the corridor."

8.2.2. Project Objectives

To meet the purpose of the I-5 North Coast Managed Lanes project, Caltrans has identified the following five project objectives:

- Adding capacity to the highway system to aid in the movement of goods
- Provide free-flow carpool lanes
- Improving the efficiency of the existing facility by managing the congestion
- Provide efficient public transportation
- Add double tracking the rail corridor

Similarly, SANDAG has identified a number of specific objectives relating to the proposed I-5 North Coast Managed Lanes. Reiterating capacity limitations and congestion within the corridor as the principle project need, the project objectives emphasize mobility options, traffic flow and minimizing impacts. The project objectives as defined by SANDAG are as follows:

- Maximize mobility for all modal choices, including passenger rail, bus, vanpool, carpool, FasTrak, bicycle and pedestrian, single occupant vehicles, and trucks.
- Maintain free flow conditions in the Managed Lanes.
- Employ the use of value pricing techniques and other technology to improve operation of the HOV/Managed Lanes.
- Minimize impacts to aesthetic, historic and environmental resources.
- Minimize private property takes.

The I-5 North Coast project is intended to improve mobility in the region for both daily commuters and commercial traffic. The addition of managed lanes is intended to provide high occupancy vehicles, transit and value pricing customers with an option that ensures improved traffic flow, trip reliability and travel time savings as an incentive to carpool, vanpool, ride transit or pay a toll. The I-5 North Coast corridor objectives relating to mobility choices, traffic flow and utilization of value pricing and technology to manage demand are most applicable for consideration in the context of performance monitoring and evaluation.

8.3 EVALUATION APPROACH

To assess the effectiveness of the I-5 North Coast Managed Lanes project to fulfill the previously stated objectives, a four-tiered evaluation approach is recommended. This approach is consistent with the evaluation approach proposed for the I-15 Managed Lanes Value Pricing project. Each of the following four-tiers of the recommended evaluation approach is described below:

- Measurement of Project Impact
- Measurement of Project Utilization
- Measurement of Project Acceptance
- Assessment of Project Operations

8.3.1. Measurement of Project Impact

The measurement of project impact will be based primarily on the comparison of before and after conditions within the I-5 North Coast corridor to assess apparent changes. In particular, changes in average vehicle occupancy (AVO) or mode split are indicative of the effectiveness of managed lanes to encourage carpooling or transit usage. Similarly, the assessment of lane volumes and average travel speeds/times reflect the effectiveness of improvements within the corridor to provide additional capacity and relief from congestion. A comparison of public opinions will indicate changes in the level of public acceptance and overall satisfaction with the investment in the corridor and subsequent refinements to operating design and policy.

To facilitate the measurement of project impacts, a 'before' data set is recommended to establish the baseline of traffic conditions and public opinions for subsequent comparison. An 'after' data set is recommended to be collected at regular intervals on an ongoing basis. The collection of time series data will allow for the analysis of before and after conditions, and the analysis of continuing changes over time during project implementation.

8.3.2. Measurement of Project Utilization

Utilization of the managed lanes facility can be determined by the combination of lane volumes and AVO to determine the total number of person trips. Person trips in the managed lanes can subsequently be compared to those in the adjacent general purpose lanes to determine the effectiveness of the I-5 North Coast project to encourage carpooling and transit utilization. In the I-5 North Coast corridor, it also is appropriate to monitor patronage on the Coaster (which runs parallel to the freeway) to determine any change in rail patronage resulting from diversion to carpools or bus transit.

Utilization of the value pricing system can be assessed by reviewing the level and frequency of toll use. Information on toll usage can be collected from a combination of account information and lane volumes to determine the effectiveness of various tolling levels to manage demand. Supplemental information on toll user characteristics can also be collected through surveys of toll users and can be compared to results to the I-15 corridor to assess public acceptance of then current and proposed future toll levels.

8.3.3. Measurement of Project Acceptance

This I-5 North Coast Managed Lanes Value Pricing Study includes market research elements to complete an initial assessment of public and stakeholder attitudes regarding managed lanes on I-5 and the concept of value pricing. A continued understanding of

attitudes toward the managed lanes, toll levels and toll systems will be important to understand the impact of changes in operational policy. The attitudes of Managed lanes users, I-5 users that do not us the managed lanes, residents of the I-5 corridor and project stakeholders (technical staff, elected officials, etc.) will be assessed at regular intervals to evaluate issues related to value pricing acceptance, equity and perceptions of project success. The results of the measurement of project acceptance for I-5 will be compared over time to track changes in attitudes and will be compared to results obtained for I-15 and other similar facilities to help understand any unique attitudes or perceptions regarding I-5.

8.3.4. Assessment of Project Operations

This tier of the evaluation approach encompasses the traditional elements of performance monitoring and evaluation. For the assessment of project operations, the performance of the managed lanes and the adjacent freeway lanes will be evaluated in terms of lane utilization (including traffic volume and person trips), travel speeds and trip reliability, user perceptions, costs (including capital infrastructure costs, operations and maintenance, enforcement, marketing, monitoring, etc.) and revenues. The assessment of project operations will draw largely from the data gathered to support the preceding three tiers and represents the consolidation of the individual analyses into an overall assessment for the project performance. Key pieces of the information used to support the assessment of project operations will also provide the basis for determining demand management needs as they relate to value pricing of the managed lanes. This highlights the close relationship between performance monitoring/evaluation and tolling systems/value pricing operations.

8.3.5. Summary of Evaluation Approach

The recommended evaluation approach can be summarized in two parts:

- A before and after analysis to measure the impact of adding managed lanes to the I-5 North Coast corridor and to measure the effectiveness of using value pricing to manage demand.
- Ongoing evaluation of system performance to measure the impact of changing travel behavior and changes in operational policy for the I-5 North Coast Managed lanes.

The evaluation will focus on addressing the specific objectives of the I-5 North Coast project. In particular, the evaluation effort will assess the effectiveness of the I-5 North Coast Managed Lanes and value pricing at providing (and encouraging) alternative mobility choices, improving traffic flow, improving travel reliability and managing demand.

8.4 KEY PERFORMANCE MEASURES

To accomplish the evaluation of performance and to address the specific measurements of performance described in the evaluation approach, it is necessary to define appropriate measures of effectiveness (MOEs) or performance indicators. The following MOEs are recommended to support the evaluation of the I-5 North Coast project. Generally the MOEs are consistent with those previously recommended for the I-15 Managed Lanes Value Pricing Project.

- Level of service
- Changes in travel speed, travel time and delay
- Changes in vehicle occupancy
- Changes in mode split
- Change in vehicle classification
- Changes in travel behavior
- Toll utilization
- Park and ride utilization
- Rate of toll evasion violations

The following sections provide a more detailed description of each MOE.

8.4.1. Level of Service

It is anticipated that a maximum level of service (LOS) threshold will be established as a policy standard to preserve mobility within the Managed lanes. LOS, defined as the ratio of volume to capacity, will be monitored to determine the effectiveness of eligibility and value pricing policy at managing demand in the Managed lanes. Volume data (as the basis for determining LOS) can be collected automatically using inductive loops, side-firing radar, video/optics, or other similar fixed traffic count devices. Eligibility limitations (i.e. high occupancy vehicle [HOV] minimum occupancy thresholds) and toll pricing will be used to maximize the number of people and vehicles using the lanes while still maintaining desirable traffic flow.

In the original I-15 Congestion Pricing demonstration project, the LOS threshold was established at LOS C. Maintaining LOS C met the primary purpose of the I-15 managed lanes by providing free flow conditions to transit, HOV, and toll paying SOV users. By striving to ensure LOS C is maintained, travel time savings afforded to I-15 managed lane users provides an incentive for commuters to use transit or to carpool.

Caltrans utilizes an alternative approach for evaluating LOS in HOV lanes. The Caltrans approach establishes a maximum optimal operating capacity of 1,650 vehicles per hour per lane (vphpl) for HOV facilities. Caltrans considers an HOV lane to have exceeded its optimal operating capacity when the 1,650 vphpl threshold is exceeded in 80 percent of the peak hours. A similar threshold may be appropriate for the purposes of monitoring and evaluating the I-5 North Coast Managed Lanes to ensure free flow traffic conditions are maintained.

LOS will need to be measured by time of day, day of week and month of the year to assess the ability of eligibility limitations and value pricing to maintain the LOS threshold. Furthermore, LOS will need to be monitored in each operating segment of the freeway to

reflect changes in freeway operations between major interchange locations. The preliminary pricing plan designates multiple tolling zones, each of which will require independent monitoring to maintain LOS. In addition to time of day, day of week and monthly LOS monitoring as described previously to track LOS over time, real-time monitoring of LOS in both the managed lanes and the adjacent general purpose lanes will be desirable to determine appropriate toll levels for true real-time value pricing and demand management.

8.4.2. Changes in Travel Speed, Travel Time and Delay

Related to LOS in the managed lanes is change in travel speed, travel time and delay. As indicated previously, travel time savings is the primary motivation for people to use managed lanes for transit, carpool or for a toll. Observing travel speed and/or travel time in the managed lanes and adjacent general purpose lanes will provide an indication of the relative time savings in the managed lanes. The relative time savings is a critical piece of information to potential managed lanes users, particularly those paying a toll. Findings from the market research activities associated with this study highlight the importance of developing and disseminating this information for each toll segment on a real-time basis. Monitoring changes in travel speed, travel time and delay over time will provide an important indication of the performance of the managed lanes and any impact of the managed lanes on the adjacent general purpose lanes. Evaluating changes in travel speed, travel time and delay over time also will provide important information to allow project stakeholders to establish and modify operating policy to better meet project objectives.

Travel speeds can be estimated automatically using induction loops, video or other similar traffic counting technologies. These methods are used extensively for traffic congestion monitoring in the San Diego area. Manual observations using radar or laser devices can validate travel speeds at a given location while floating car travel time runs can validate travel times between given points. Travel times can also be monitored automatically using in-vehicle toll transponders by tracking the progress of a vehicle from observation point to observation point. A combination of methods may be most appropriate to monitor travel speed, travel time and delay in both the managed lanes and general purpose lanes on I-5 North Coast.

8.4.3. Changes in Vehicle Occupancy

Evaluating changes in vehicle occupancy provides a measure of effectiveness related to mode split. Monitoring changes in vehicle occupancy generally reflects the effectiveness of managed lanes at encouraging new carpool users or transit riders. AVO is generally measured using manual observation of the number of passengers in vehicles passing a given point, although new technologies offer the prospect of automated AVO counting with certain limitations.

8.4.4. Changes in Mode Split

Building on the observation of changes in vehicle occupancy, changes in mode split can also highlight the effectiveness of managed lanes to attract new bus or rail transit riders, and lead to the formation of new vanpools or carpools. Evaluating changes in mode split in addition to vehicle occupancy can provide important insight into the choice of commuters to switch from driving alone to other higher occupancy travel modes utilizing the managed lanes.

Changes in mode split are typically measured using a combination of transit passenger boardings for routes operating in the corridor, visual observations of carpools and/or by obtaining data related to the formation of vanpools (associated with the previous MOE) from the local rideshare organization (in this case, SANDAG also oversees the region's RideLink ridesharing program), and from direct surveys of transit and HOV users. The key evaluation of changes in mode split involves a before and after comparison for the corridor although the ongoing monitoring of mode share in the corridor can highlight the impact of changes in operating policy (e.g., changing HOV occupancy thresholds or toll levels) or changes in commuter behavior (e.g., shift to alternate modes to avoid congestion or higher gas prices). In the case of the I-5 North Coast corridor, it will also be important to monitor ridership on the Coaster service to determine any impact of the managed lanes on commuter rail share.

8.4.5. Change in Vehicle Classification

The influence of truck traffic in the I-5 North Coast corridor has been highlighted in the project need and is reflected in regional policy goals. While the I-5 North Coast Managed Lanes do not directly address goods movement in the current proposed form, the impact of the project on goods movement can be evaluated by monitoring changes in the number of vehicles of different vehicle classifications over time. At present, trucks with three or more axles are prohibited from traveling in the inside lanes, which includes existing I-15 Express Lanes (California Vehicle Code (CVC) 21655(b)) and would conceivably restrict truck traffic on the I-5 North Coast Managed Lanes. Automatic vehicle classification data can be collected automatically using loop detection or video traffic count equipment on the adjacent I-5 general purpose lanes to assess total truck traffic demand. Due to the nature of goods movement in the corridor, a limited number of observation points tracked over time would be sufficient to highlight any noticeable changes in truck traffic patterns over time.

Additionally, it will be necessary to monitor the use of alternative fuel vehicles over time to determine any impact on managed lanes performance. In addition to inherently low emission vehicles (ILEVs) authorized previously, recently enacted federal legislation (SAFETEA-LU) also provides states the discretion to permit certain high mileage gas/electric hybrid vehicles to operate in HOV lanes with only one occupant. In anticipation of SAFETEA-LU, California passed legislation to permit high mileage gas/electric hybrid automobiles to utilize HOV lanes with a single occupant (CVC 5205.5 and 21655.9). The California legislation (currently authorized only through January 1, 2008) specifically requires Caltrans to monitor and evaluate HOV lane performance to determine if permitting single occupant hybrid vehicles to use HOV lanes leads to significant congestion or breakdown of the lanes (CVC 5205.5 (d) and (g)). Consistent with the state statute, it will be necessary to monitor the level of utilization of the lanes by the alternate vehicle types to determine the relative impact on project performance.

8.4.6. Changes in Travel Behavior

In addition to the changes in travel behavior described previously under changes in mode shift, likely changes in travel behavior may also include changes in the time of day of travel, frequency of travel, length of trips and route of travel. Monitoring changes in travel behavior will help to understand the impact of traffic congestion within the corridor and any benefit of the proposed project.

Changes in travel behavior should be monitored for managed lane users (including bus and rail transit users, HOV users and toll users) and freeway users that do not use the

managed lanes. The primary instruments for collecting this information include telephone or direct mail surveys and/or administration of travel diaries with a focus on before and after project changes in addition to ongoing changes as drivers in the corridor respond to continued traffic growth.

8.4.7. Toll Utilization

The volume of toll usage will be monitored to assess the effectiveness of value pricing to maximize the efficiency of the managed lanes. Monitoring toll utilization over time will validate toll operating policy and toll calculation assumptions by determining the elasticity of toll pricing and the ability to vary toll levels to best regulate demand. This approach is fundamental to the success of the value pricing initiative by ensuring the maximum number of toll users can utilize the managed lanes without compromising the maximum LOS threshold described previously.

Toll utilization is collected routinely as part of the automatic toll collection and account process. Comparing toll utilization to LOS, in addition to comparing toll utilization to differing toll rates charged, will provide an assessment of the effectiveness of various toll levels at managing demand under differing traffic flow conditions.

8.4.8. Park and Ride Utilization

The provision of park and ride facilities is integral to the effectiveness of a managed lanes facility to attract and service transit and HOV users. Monitoring the utilization of park and ride facilities can provide an additional measure of the ability of the managed lanes project to encourage carpooling or transit usage. Park and ride lot utilization can be tracked automatically by monitoring ingress and egress to the park and ride lot using automated traffic counting equipment. It can also be collected manually through visual observation.

8.4.9. Rate of Toll Evasion Violations

The number of toll evasion violations and/or citations issued will be monitored to assess public acceptance of value pricing rates and lane demand management, and the effectiveness of toll collection systems and lane segregation. Like toll utilization, monitoring toll violations over time will validate toll operating policy by determining public acceptance of toll pricing and the ability best regulate demand. The review of toll evasion violators will also be critical for assessing the effectiveness of lane delineation and segregation from general purpose lanes, particularly if buffer separation is selected over barrier separation. In the case of buffer separation, high levels of toll evasion by crossing the buffer may necessitate a review of toll collection systems and enforcement to help minimize violations and loss of revenue.

8.5 RECOMMENDED 'BEFORE' DATA SET

A critical element of the monitoring and evaluation plan is to establish a comprehensive and robust 'before' project data set as the basis for all subsequent evaluation of the performance of the managed lanes. Consistent with the Evaluation Approach described previously, the before data set can be categorized in the context of the four-tier system with a principal focus on the Measurement of Project Impact.

The traffic data collected as part of the initial review of operating characteristics provides an overview of historic data for before analysis purposes. However, a more comprehensive and robust data set must be developed at least one year prior to the commencement of significant project construction and monitored, as possible, through construction to serve as the basis for subsequent detailed 'after' project comparison.

The before data set should be designed and collected to be consistent with the ultimate plan for monitoring the project. It should be based on the design of the facility to ensure appropriate comparative data is developed. Specifically, data should be developed for each functional operational segment of the toll facility and adjacent freeway to reflect the selected toll collection system and operating plan. Furthermore, baseline public attitude data should be developed prior to the disruption of project construction as a point of reference for future comparisons to after project conditions.

8.5.1. Project Impact Data

As described previously, the measurement of project impact is based primarily on the comparison of before and after conditions and as such will rely heavily on the development of a robust before data set. The evaluation of system impact will involve an assessment of changes in volumes, travel speeds, vehicle occupancy and mode split as indications of the effectiveness of the managed lanes.

System impact data includes four primary data items:

- Traffic counts (volumes, speeds and classification)
- Vehicle occupancy
- Mode split
- Transit ridership and route on-time performance

Traffic Counts

Traffic volumes, speeds, classification and LOS can all be derived from automated traffic count equipment. Automated traffic count stations are typically established at a permanent fixed location and most commonly use inductive loops. For the purposes of the I-5 North Coast corridor, permanent count stations capable of detecting lane volume and speed should be established in both the general purpose lanes and future managed lanes for each of the proposed toll operating segments. It would be desirable to locate these stations nearest the future point of ingress to the managed lanes toll segment in order for these stations to ultimately be used to monitor changing demand for the managed lanes in conjunction with calculating the real-time toll (should real-time value pricing be utilized). In addition, it is recommended that count stations be located nearest the future points of egress for each managed lanes toll segment to effectively monitor potential queuing impacts downstream. Traffic count data should be summarized by location, direction, lane (if applicable), time of day, day of week, and month of year.

HOV lane volume data for the existing northbound HOV lane in the vicinity of the I-805 interchange will also provide important insight into HOV lane utilization in this segment of the study corridor. The comparison of before HOV lane volumes to HOV volumes after managed lanes will help in understanding the number of new carpools being created as a result of the managed lanes.

Automatically collected traffic speeds should be compared with sample floating travel time runs in the corridor to validate the use of automatically collected, fixed location speeds as the basis for calculating corridor travel times. In the before case, investment in fixed count locations capable of detecting speeds may not be possible due to the imminent nature of construction and the associated 'throw-away' cost of installing the counters. In this circumstance, the use of floating car travel time runs may serve as a suitable alternative as the basis for future analysis using fixed locations.

Vehicle classification data can also be obtained from fixed traffic count stations and can be utilized to determine the impact of managed lanes on the overall mix of traffic. Due to the nature of heavy truck traffic movements within the I-5 North Coast corridor, it would be appropriate to collect vehicle classification data at a minimum of two (2) locations to provide a sample of the traffic mix. It is recommended that the classification data stations be located near each end of the corridor to assess the mix and volume of differing vehicle types at these locations.

Like volume and speed data, establishing permanent vehicle classification count stations in the before case may not be practical due to the potential for equipment to be removed during construction. Alternatively, manual classification counts at the proposed count stations would be appropriate to establish the baseline classification data. Similarly, manual classification counts should be conducted periodically in conjunction with automated count stations to ensure data validity.

Vehicle Occupancy

At present, direct observation is recommended as the most effective way of obtaining vehicle occupancy data. Conducting manual occupancy counts at appropriate overhead vantage points will allow visual observation of the number of persons within each vehicle as the basis for estimating vehicle occupancy. Although it is not essential to have occupancy counts completed for each volume count location in order to assess person movement within the corridor, this level of data collection would be desirable.

AVO collected from visual observation can then be combined with vehicle volume information to determine total person movement within the corridor. Vehicle occupancy data can also be utilized to help determine changes in mode split by reviewing changes in the number of vehicles carrying more than one person.

Mode Split

In addition to the review of vehicle occupancy data described previously, user surveys should be conducted as the basis for evaluating mode split and mode choice. Surveys should be designed to gather sufficient data to measure baseline mode split on I-5 for comparison to the mode split after the opening of the managed lanes. Sufficient sample size should be obtained within the survey to include SOV, HOV, and transit users (and additionally toll users and non managed lane users for after project evaluation).

Transit Ridership and Route On-Time Performance

Provisions for improved transit service and operations are a critical element of the I-5 North Coast project and therefore the evaluation of the impact of the project on transit

ridership and service performance will be important. For this reason, collection of before project transit ridership and route on-time performance data is recommended. Counts of passenger boardings for transit routes operating within the I-5 corridor should be assembled from operator collected data or gathered using visual observation. Similarly, route on-time performance and travel time data should also be collected as a basis for after project comparison.

Monitoring ridership on the Coaster commuter rail (which operates parallel to I-5) as well as express bus service which operates in the I-5 North Coast corridor will be an important determinant of impacts from the managed lanes on commute transit patronage. Both bus transit passenger boardings and alightings, and Coaster rail passenger boardings and alightings data should be gathered from the service operators or from visual observation for subsequent after project comparison. A variety of manual observation and automated techniques are available for this purpose.

8.5.2. Project Utilization Data

Project utilization data focuses on counts of various user groups to support ongoing long term monitoring and evaluation of project performance. As such, most of the data items required for monitoring and evaluating project utilization are duplicative of components of the impact data in the before data set. Utilization data tends to place a stronger focus on the delineation of specific user groups, particularly once the project is operational.

For the purposes of the I-5 North Coast corridor, before utilization data will encompass the following three data types:

- Carpools and vanpools
- Transit ridership
- Park and Ride lot utilization

Carpools and Vanpools

Building on the vehicle occupancy and mode split data collected as part of the project impact before data set, information on the frequency of HOV use, origin and destination (O/D), HOV participation (how long they have participated in a carpool or vanpool), and mode to access the HOV arrangement can provide an understanding of changes in travel behavior as a result of providing the managed lanes. The previously described I-5 user survey will provide the opportunity to collect data as it specifically relates to those that participate in carpools or vanpools.

Transit Ridership

Again building on the passenger boarding and alighting data collected as part of the project impact before data set, information on socio-economic characteristics, O/D and mode to/from transit (trip ends) for transit riders will provide fundamental information to evaluate changes in transit rider behavior and characteristics as a result of completing the project. Information derived from the user survey will serve as the basis for developing this before data set.

Park and Ride Lot Utilization

Counts of vehicles within existing park and ride lots within the I-5 North Coast corridor should be conducted prior to the start of construction of the managed lanes to allow for the assessment of park and ride lot utilization. Additional park and ride lots associated with the managed lanes represent an integral part of the overall project. Understanding

current park and ride lot utilization will allow evaluation of the effectiveness of the managed lanes (and additional park and ride lots) at attracting new park and ride participants in carpools, vanpools or transit service.

8.5.3. Project Acceptance Data

The use of surveys to gather information as the basis for monitoring and evaluating project performance has been described previously as it relates to a number of specific performance measures and data needs. The evaluation of project acceptance will rely exclusively on data collected through surveys taken directly of I-5 users and affected stakeholders. Surveys that specifically target and distinguish between managed lane users and non-users should be administered during the after data collection effort and subsequently compared to the before data. In a previous task of the current study (I-5 North Coast Managed Lanes Value Pricing Study), the study team conducted preliminary market research to develop an initial understanding of attitudes and opinions regarding the proposed project. It is recommended that subsequent surveys be conducted to further develop the understanding of perceptions relating to the I-5 North Coast Managed Lanes project.

Project acceptance data for the before data set encompasses two data types:

- User perceptions
- Stakeholder perceptions

User Perceptions

For the purposes of before data gathering, surveys of I-5 users should be undertaken to determine their attitudes and opinions toward the proposed project. Specific questions to be addressed may include perceived advantages/disadvantages of the managed lanes system, acceptance of the value pricing concept, likelihood of utilizing the managed lanes, awareness of the project, and perceived inequity of pricing the managed lanes. Surveys should include sufficient samples of HOV and transit users to address specific data needs described previously.

Many of these questions are addressed in surveys conducted as part of the I-15 managed lanes project development and therefore provides a basis for comparison to this project. Unlike I-15, the I-5 corridor does not presently contain managed lanes incorporating value pricing. For this reason, after surveys of user perceptions will require delineation between users of the managed lanes (including HOV, transit, and toll users) and users of I-5 that do not use the managed lanes.

Stakeholder Perceptions

The perceptions of technical staff, decision-makers, elected officials and community leaders can be useful in assessing attitudes towards managed lanes and value pricing. These results also can provide an interesting contrast between the opinions of those who are responsible for developing the managed lanes and value pricing project and the ‘customers’ that will ultimately use the facility.

Stakeholder interviews were conducted during a previous phase of this study in order to assess stakeholder opinions. Additional stakeholder interviews would be appropriate as part of establishing the before data set, particularly as it relates to stakeholder perceptions of likely outcomes of the project and resultant benefits and impacts to I-5 users.

8.5.4. Project Operational Data

Further building on data developed to evaluate project impacts, project utilization, and project acceptance, project operational analysis encompasses the traditional elements of performance monitoring and evaluation. The assessment of project operations will consolidate data developed for the preceding data sets to support the overall assessment for the project performance.

To support the assessment of project operations, lane utilization data (including traffic volumes and person trips), travel speed data and user perception data will be combined with the following additional data elements:

- Reliability
- Costs and revenues
- Safety and violations

Reliability

As indicated for other data types, before and after trip reliability data should be comparable. The use of previously described level of service and travel speed data to estimate trip reliability should enable this compatibility. In particular, travel speed in terms of average delay and LOS in terms of percentage of time exceeding a given LOS threshold provide trip reliability estimates.

Costs and Revenues

Costs to be considered for evaluating the managed lanes project could include capital infrastructure, operations, maintenance, enforcement, marketing and monitoring costs. Potential revenues for the project could include revenues from toll generation or violation fines.

In the context of the before data set, cost and revenue data gathered will be limited by the nature of the facility. Typically, operations, maintenance, enforcement, and monitoring costs would be incurred as would fine revenues. However, this data may not be available specifically for the study corridor. To the extent possible, cost and revenue data should be assembled for the I-5 North Coast corridor to support subsequent after project evaluation.

Safety and Violations

Safety data including accident rates, frequency of occurrence by location, contributing factors, as well as number of injuries and fatalities should be assembled for the study corridor. Accident data is typically available through accident reporting conducted by the California Highway Patrol and assembled by Caltrans. Assembling this information for the before data set will allow the project to be evaluated in terms of changes in accident rates and locations.

Violations of HOV eligibility requirements can provide an indication of the effectiveness of lane operations. In particular, high violation rates can indicate poor performance of a managed lanes facility with capacity being ‘stolen’ by ineligible users. Data relating to violations on the existing northbound HOV lane will provide a limited basis for before-after comparison. Comparison to data collected on the existing I-15 Express Lanes may provide a more useful comparison.

Violation data can generally be collected by one of two means. The first involves the review of vehicle occupancy data to determine the proportion of HOV lane users that do

not meet minimum eligibility requirements. Where value pricing is utilized for managed lanes, vehicle occupancy observation also would require confirmation of a valid toll collection to determine a violation. The second method would involve the review of actual citations issued by law enforcement officials or through the automated monitoring of lane compliance (typically video or photographic monitoring and enforcement of toll collections).

8.5.5. Summary of Before Data Set

Table 8.1 below summarizes the data elements comprising the before data set.

TABLE 8-1: SUMMARY OF BEFORE DATA SET

DATA ELEMENT	PRIMARY METHOD (S)	VALIDATION METHOD (S)
Project Impact Data		
Volumes	Automated, fixed location count stations	None
Speeds	Automated, fixed location count stations	Floating travel time runs (also an alternate primary method)
Vehicle Classification Counts	Automated, fixed location count stations	Manual classification counts (also an alternate primary method)
Vehicle Occupancy	Manual occupancy counts at overhead vantage points	None
Mode Split	1. Manual occupancy counts 2. User surveys	None
Transit Ridership	Boarding counts as available from operator or manual	None
Transit Performance	On-time performance data from operator or manual	None
Project Utilization Data		
Carpool and Vanpool Data	1. Manual occupancy counts 2. User surveys	None
Transit Ridership	1. Boarding counts 2. User surveys	None
Park and Ride Lot Utilization	Counts of vehicles in lots	None
Project Acceptance Data		
User Perceptions	User surveys	None
Stakeholder Perceptions	Surveys of stakeholders	None
Project Operational Data		
Volumes, person trips, speeds, user perceptions	As indicated above	As indicated above
Reliability (based on speed and LOS)	See speed and volumes above.	See speed and volumes above.
Costs and Revenues	As available	None
Safety and Violations	1. CHP/Caltrans accident and citation records 2. Manual occupancy counts	None

8.6 RECOMMENDED 'AFTER' DATA SET

Much of the 'after' data set replicates the before data set to allow direct comparison of the various key performance measures. After data should be collected to be consistent with the before data in terms of collection times (time of day, day of week, month), physical locations and data collection methodology. In addition, several specific analyses based on the evaluation of before and after data have been identified. These analyses include cost of delay, institutional assessment and technical assessment.

The after data set can be categorized using the same four-tiered system described in the Evaluation Approach. For each of the four project data categories, before and after data will be evaluated by comparing specific performance measures. Appropriate statistical evaluation should then be conducted to determine whether any observed changes in behavior between before project and after project, and between different user groups are statistically significant. This statistical evaluation may include difference of means (averages) and data variance around the means.

8.6.1. Project Impact Data

As described in the before data section, project impact data includes the following four data elements:

- Traffic counts (volumes, speeds and classification)
- Vehicle occupancy
- Mode split
- Transit ridership and route on-time performance

The following additional data element is recommended to be added to the after data set to better understand the performance of the managed lanes:

- Cost of delay

Traffic Counts

Traffic volumes, speeds, classification and LOS data were recommended to be assembled as part of the before data set covering various time periods and locations within the existing I-5 freeway. Under the after condition, similar data should be collected during corresponding times and at corresponding locations in both the general purpose lanes and the newly added managed lanes. Traffic count data should be collected automatically and regularly from the appropriate stations and summarized by location, direction, lane (if applicable), time of day, day of week and month to be consistent with the before data set.

As part of the construction of the managed lanes and the reconstruction of the existing freeway, automated traffic count equipment should be installed at permanent fixed locations along the corridor to support performance monitoring efforts. This equipment also will be necessary to support value pricing and in particular, the monitoring of LOS to determine appropriate tolling levels. As part of the before data set, it was recommended that at least one count location (for volume and speed data) be established within each of the tolling zones. With the completion of the facility, additional traffic count stations should be implemented at regular intervals to supplement the primary toll segment locations and to provide redundancy in the event of a primary counter failure.

Automatically collected traffic speeds should again be compared with sample floating travel time runs in the corridor to validate fixed location speeds as the basis for calculating corridor travel times. However, in the after case, the primary source of speed and travel time data should be fixed count locations capable of detecting speeds to help reduce the long term labor cost of generating this information.

The introduction of electronic tolling in the corridor will provide the opportunity to monitor speed and travel time data automatically, and on a continuous basis, by tracking vehicle progress through the corridor using in-vehicle toll collection technology. Toll transponders, global positioning systems, license plate matching, and other similar technologies each have the potential to enable real-time tracking of vehicle progress from observation point to observation point through the corridor to determine average travel speeds and times.

Vehicle classification data should also now be obtained from fixed traffic count stations at the northern and southern ends of the corridor. Manual classification counts at the permanent counts stations would be appropriate to validate automatically collected data, but again, to the extent feasible, data should be derived from automated sources to reduce labor costs.

Vehicle Occupancy

In the absence of a reliable automated vehicle occupancy detection method, direct observation is again recommended as the most effective way of obtaining vehicle occupancy data for the after data set. Visual observation of the number of persons within each vehicle should be conducted again from the same vantage points utilized in the before data collection to ensure consistency. Separate observations and estimations of AVO should be developed for the managed lanes and the general purpose lanes for comparison to the before data set and for after project comparison between lane types.

Mode Split

Consistent with the before data collection methodology, mode split data should again be developed in the after case by reviewing the vehicle occupancy data described previously (to determine the overall percentage of carpools) and through user surveys. Surveys of the users of the managed lanes and the adjacent general purpose lanes will yield the most detailed information regarding mode split and mode choice. Surveys should be designed to mimic the before data survey, and should gather sufficient sample size to include SOV, HOV users, transit users, and toll users for both managed lanes users and those that do not utilize the managed lanes. .

Transit Ridership and Performance

The completion of the managed lanes and associated support facilities will provide the opportunity for improved transit service and operations. Counts of passenger boardings for transit routes operating within the I-5 North Coast corridor (both in the managed lanes and outside of the managed lanes) should be assembled from operator collected data or gathered using visual observation. Similarly, route on-time performance and travel time data should also be collected as a basis for comparison to the before project data set.

As indicated previously, monitoring the ridership on the Coaster also will be important to understand any impact the completion of the managed lanes and the provision of improved bus service may have on commuter rail patronage. Like bus transit passenger

boardings, Coaster passenger boardings data should be gathered from the service operator or from visual observation for comparison to the before project data.

Cost of Delay

The impact of changes in delay within the overall corridor can be quantified and evaluated in terms of the dollar cost to freeway users for lost time, productivity and resources. An assessment of the overall cost of delay will reflect the value of any time savings realized by the managed lanes. These cost savings can be calculated by determining the time loss caused by system delay and applying standard factors to reflect the monetary value of the time lost.

8.6.2. Project Utilization Data

With the completion of the managed lanes, project utilization data will encompass the three data types described in the before data set, but will also now include toll user data reflecting a new user group of the I-5 North Coast corridor. Therefore, after project utilization data will encompass the following four data types:

- Toll users
- Carpools and vanpools
- Transit ridership
- Park and Ride lot utilization

Toll Users

Toll user data can be developed primarily through a review of toll user accounts and activity on those accounts. Toll utilization data can include monitoring of the number of active user accounts, the number of transponders distributed to accounts, frequency of use on the accounts/transponders, average distance of toll use, and value of tolls paid. Additionally, socio-economic data relating to toll users could be developed through surveys of registered toll account holders.

Carpools and Vanpools

Consistent with the data developed for the before data set, information on the frequency of HOV use, O/D, HOV participation, and mode to access the HOV arrangement should again be collected through user surveys to assess the impact of the project. With the inclusion of the new managed lanes, sufficient survey samples should be obtained to also allow comparison between the managed lane users and users of the freeway that do not use the managed lanes in order to identify any notable differences between these user groups.

Transit Ridership

Surveys of transit patrons will allow further comparison of socio-economic characteristics, O/D and mode of access to/from transit (trip ends) for after project transit riders. Building on the transit ridership data described previously, the after project transit rider survey data will allow comparison to before data to determine changes in rider behavior as a result of completing the project. Like previously described data types, sufficient survey sample sizes should be obtained to differentiate between those using transit service operating within the managed lanes and those using service on the freeway that operates outside the managed lanes (if applicable).

Park and Ride Lot Utilization

Utilization of park and ride lots along the I-5 North Coast corridor should be collected to assess changes in total park and ride usage and, in particular, increased usage at existing and new lots following implementation of the managed lanes. Counts of vehicles within previously existing and new park and ride lots in the corridor should be compared to before data to determine the impact of the managed lanes and the related improvement in HOV and transit service. Park and ride lot utilization should also be compared to mode share data and tracked over time to evaluate the effectiveness of the managed lanes and new park and ride lots to attract new participants in carpools, vanpools or transit service.

8.6.3. Project Acceptance Data

Survey data will again provide the basis for the evaluation of project acceptance. Comparison of I-5 users and stakeholders after project survey results with before project data will enable an evaluation of changing attitudes and perceptions after the opening of the managed lanes and as the project matures. Project acceptance data for the after data set will again encompass the two data types detailed in the before data set:

- User perceptions
- Stakeholder perceptions

The after data evaluation of project acceptance also is recommended to incorporate an additional data type:

- Institutional assessment

User Perceptions

Specific questions to determine after project user perceptions of the I-5 North Coast project should reflect those questions originally asked before project implementation. Like the before project scenario, surveys should include sufficient samples of HOV and transit users in addition to toll users to address specific data needs between these groups. Similarly, with the completion of the managed lanes, it will be important to gauge the attitudes and perceptions between the following two distinct sub-groups of I-5 users:

- Managed lanes users
- Freeway users that do not use the managed lanes

Although the data collected for these two sub-groups will address the same fundamental questions, the comparison of the two sub-groups will be important to understanding the overall perception of the managed lanes investment. In particular, this comparison will provide useful information regarding perceptions of inequity and fairness of the managed lanes for the different user sub-groups.

Stakeholder Perceptions

Additional stakeholder interviews should be conducted after project implementation to assess any changes in the perceptions of technical staff, decision-makers, elected officials and community leaders towards the managed lanes and value pricing. In particular, the after project stakeholder interviews can address the perceived benefits and impacts of the project, key implementation and operational issues, and the fulfillment of project objectives.

Institutional Assessment

Similar in approach to the stakeholder interviews, an institutional assessment of the I-5 North Coast project should be conducted after project completion to assess issues and outcomes relating to the project, and the overall project development process and experience. Debrief interviews or 'focus group' panels with key project staff should be conducted to discuss lessons learned relating to project implementation and initial operations, why certain project outcomes were realized and why certain project objectives were fulfilled or remain unfulfilled. This information could be utilized to further enhance the I-5 North Coast project or could be applied to improve the potential for success on other similar projects.

8.6.4. Project Operational Data

The evaluation of project operations becomes more critical following the completion of the I-5 North Coast project. The assessment of project operations will again consolidate data developed for the preceding data sets to support the overall assessment of the project performance. Lane utilization data (including traffic volumes and person trips), travel speed and travel time data, and user perception data will be combined with the following data elements described in the before data set to evaluate project operations:

- Reliability
- Costs and revenues
- Safety and violations

Additionally, with the completion of the project and the utilization of technological elements for tolling and project monitoring, a technical assessment will be applicable as part of the assessment of after project operations.

Reliability

In accordance with project objectives, the operation of the managed lanes places increasing importance on trip reliability. The analysis of LOS and travel speed data for both the managed lanes and the general purpose lanes will enable a comparison of trip reliability between the two options. Similarly, a comparison to before data will reflect changes in trip reliability in the corridor overall as a result of the completion of the project.

Costs and Revenues

Following the implementation of the I-5 North Coast project, it will be possible to more accurately evaluate project costs including capital infrastructure costs, operations and maintenance costs (including the costs of operating and maintaining the tolling systems), enforcement costs, marketing costs and monitoring costs. This information can be compared to actual revenues derived from the project, including revenues from toll generation or violation fines to complete an assessment of the ratio of costs to revenues.

Safety and Violations

Safety data including accident rates, frequency of occurrence by location, contributing factors and number of injuries and fatalities were recommended to be assembled for the before condition on the I-5 North Coast corridor. Comparison of this data with corresponding after project data will provide an understanding of the impact of the project on safety in the corridor.

Violations of HOV eligibility requirements and levels of toll evasion can provide an indication of the effectiveness and acceptance of the managed lane operations. Data relating to violations for the managed lanes should be compared to both before data collected for the existing northbound I-5 HOV lane, and similar data for other managed lane facilities.

Technical Assessment

The implementation of automated data collection, tolling and enforcement systems makes it appropriate to review and evaluate the performance and reliability of these systems in the context of overall project success. Assessment of technical systems should be conducted to evaluate failures of technical systems and any associated monetary cost (including losses in toll revenues). Understanding the failures of technical systems will allow these systems to be further refined or superceded to improve overall reliability and cost effectiveness. This information will also be useful for understanding the limitations of other data that may be affected by technical systems failure.

8.6.5. Summary of After Data Set

Table 8-2 summarizes the data elements comprising the after data set. They are largely similar to the before data set, although some additional data elements are included and data collection methods have changed in some cases. The additional data elements are as follows:

- Cost of delay
- Toll user data
- Institutional Assessment
- Technical Assessment

TABLE 8-2: SUMMARY OF AFTER DATA SET

DATA ELEMENT	PRIMARY METHOD (S)	VALIDATION METHOD (S)
Project Impact Data		
Volumes	Automated, fixed location count stations	None
Speeds	1. Automated, fixed location count stations 2. Tracking vehicle progress using tolling devices	Floating travel time runs
Vehicle Classification Counts	Automated, fixed location count stations	Manual classification counts
Vehicle Occupancy	Manual occupancy counts at overhead vantage points	None
Mode Split	1. Manual occupancy counts 2. User surveys	None
Transit Ridership	Boarding counts as available from operator or manual	None
Transit Performance	On-time performance data from operator or manual	None
Cost of Delay	Automated count stations and available value-of-time estimates	None
Project Utilization Data		
Toll User Data	1. Toll user account data 2. Surveys of toll account holders	None
Carpool and Vanpool Data	1. Manual occupancy counts 2. User surveys	None
Transit Ridership	1. Boarding counts 2. User surveys	None
Park and Ride Lot Utilization	Counts of vehicles in lots	None
Project Acceptance Data		
User Perceptions	User surveys	None
Stakeholder Perceptions	Surveys of stakeholders	None
Institutional Assessment	Interviews of individuals or focus group panels	None
Project Operational Data		
Volumes, person trips, speeds, user perceptions	As indicated above	As indicated above
Reliability (based on speed and LOS)	See speed and volumes above.	See speed and volumes above.
Costs and Revenues	As available	None
Safety and Violations	1. CHP/Caltrans accident and citation records 2. Manual occupancy counts and toll records	None
Technical Assessment	Evaluate performance, reliability, and failures of technical systems and associated monetary costs	None

8.7 ONGOING MONITORING ACTIVITIES

The data elements described in the before and after data sets provide the basis for establishing an ongoing monitoring and evaluation framework for the I-5 North Coast corridor following the implementation of the managed lanes project and associated value pricing element. While the comparison of before and after conditions can provide a comprehensive and immediate understanding of the impacts of the project, continuous project monitoring and benchmarking over time can provide an equally important insight into changing trends in travel behavior and operational needs.

As development continues in the I-5 North Coast corridor, traffic conditions will likely change causing users of the corridor to respond by modifying their travel behavior. Ongoing monitoring of traffic conditions and travel behavior in the corridor will provide useful information to allow responsible agencies to better address these changes and to refine the operation of the managed lanes to better meet the needs of I-5 users.

Table 8-3 summarizes the various data elements previously described in the before and after data set descriptions, and recommends desirable frequencies for ongoing data collection and performance monitoring and evaluation. The frequency of evaluation is intended to achieve a balance between the need to monitor meaningful changes in travel behavior and the relative cost of collecting and analyzing the required data.

TABLE 8-3: SUMMARY OF ONGOING MONITORING ACTIVITIES

DATA ELEMENT	METHOD (S)	MINIMUM FREQUENCY
Project Impact Data		
Volumes	Automated, fixed location count stations	Quarterly by season [3]
Speeds	1. Automated, fixed location count stations 2. Track vehicle progress using transponder data 3. Floating travel time runs for validation [1]	Quarterly by season [3]; validation as needed [1]
Vehicle Classification Counts	1. Automated, fixed location count stations 2. Manual classification counts for validation [2]	Quarterly by season [3]; validation as needed [2]
Vehicle Occupancy	Manual occupancy counts at overhead vantage points	Annual (quarterly by season if available)
Mode Split	1. Manual occupancy counts 2. User surveys [4]	Annual counts (quarterly by season if available); Biennial surveys
Transit Ridership	Boarding counts as available from operator or manual	Annual (bi-annual if available)
Transit Performance	On-time performance data from operator or manual	Annual (bi-annual if available)
Project Utilization Data		
Toll User Data	Transponder and toll user account data	Quarterly by season
Carpool and Vanpool Data	1. Manual occupancy counts 2. User surveys [4]	Annual counts (quarterly by season if available); Biennial surveys
Transit Ridership	1. Boarding counts 2. User surveys	Annual counts (bi-annual if available); Biennial surveys
Park and Ride Lot Utilization	Counts of vehicles in lots	Annual (bi-annual if available)
Project Acceptance Data		
User Perceptions	User surveys [4]	Biennial
Stakeholder Perceptions	Surveys of stakeholders	Biennial
Volumes, person trips, speeds, user perceptions	As indicated above	As indicated above

TABLE 8-3: SUMMARY OF ONGOING MONITORING ACTIVITIES (Continued)

DATA ELEMENT	METHOD (S)	MINIMUM FREQUENCY
Project Operational Data		
Reliability (based on speed and LOS)	See speed and volumes above.	See speeds & volumes above
Costs and Revenues	As available	Annual
Safety and Violations	1. CHP/Caltrans accident and citation records 2. Manual occupancy counts and toll records	Annual CHP/ Caltrans records; Annual counts (quarterly if available)

Notes:

[1] Floating travel time runs to be used to validate automated speed and travel time data on an as needed basis.

[2] Manual classification counts to be used to validate automated counts on an as needed basis.

[3] Real time monitoring of volumes, speeds and travel times may be necessary for toll operations.

[4] Three types of user surveys to be conducted biennially: license plate, transit rider, and phone.

8.8 SCHEDULE AND BUDGET

This section discusses the proposed schedule and estimated budget for conducting the MEP described herein and summarized by Tables 8-1, 8-2, and 8-3. These tables list the data elements comprising the before, after, and ongoing data sets, respectively.

It is recommended that a "third party" that is neither the implementing agency (e.g., SANDAG or Caltrans), nor the funding agency [Federal Highway Administration (FHWA)], be involved in reviewing the evaluation. Periodic "third party" reviews could help ensure the evaluation is objective and addresses the breadth of issues relevant at any given time.

8.8.1. Schedule

Since the projected implementation date for the I-5 North Coast Managed Lanes and Value Pricing project has not been determined, specific evaluation dates cannot be recommended. However, when the implementation date is determined, the evaluation activities should be scheduled with the following considerations.

Before Data Set Schedule:

- It is suggested that evaluation activities be initiated no less than one year prior to project implementation to allow for data to be collected at a time that reflects baseline conditions and accepted travel patterns.
- The evaluation contractor should be retained at about the same time as the consultant for the value pricing planning and pre-implementation services. This would enable the evaluation to be integrated into planning and pre-implementation activities.
- Depending on the project implementation date, data collected as part of this study will likely be too historic to be used in the before data set.

After Data Set Schedule:

- It is suggested that evaluation activities be initiated following project opening. Data should be collected at a time when travel behavior has reasonably adjusted and stabilized in response to the project opening.
- Data collection for the after evaluation should duplicate, to the extent feasible, the times of the year (e.g., spring and fall) and other parameters defining the before data collection effort.

Ongoing Data Set Schedule:

- Table 8-3 indicates the suggested minimum frequency per data element in the ongoing data set. Frequencies range from quarterly to biennial.
- Data elements collected more that once a year (e.g., quarterly) should be collected at approximately the same time each year to facilitate comparisons between years.

A general rule of thumb which applies to scheduling all three data collection efforts (before, after, and ongoing) is that it is desirable to collect data for "typical" travel conditions. Some common circumstances that often lead to atypical travel conditions include:

- Heavy rain that could affect speeds and travel patterns

- Commonly observed holidays that could affect travel patterns
- Severe accidents or incidents that could cause abnormally long delay or result in full re-routing of traffic to alternate facilities.

In order to avoid such atypical conditions, it may not always be desirable to collect data on precisely the same days from year to year, but rather to collect data at approximately the same times of the year.

8.8.2. Budget

The budget necessary for implementing the MEP was estimated based on the cost of HOV monitoring programs around the country, the San Diego region's I-15 Managed Lanes Value Pricing Project MEP, the San Diego region's I-15 FasTrak Program, the length of the project corridor, and the data elements included in the program. It is estimated that implementation of the MEP would cost approximately $300,000 annually in the first several years of implementation. It is further estimated that the cost could decrease to approximately $200,000 annually in subsequent years due to increased automation, tailoring of the data set, and possible economy of scale effects from the expansion of the managed lane network in the San Diego region.

While the MEP has been substantially defined herein, the finalization of several data parameters and other program characteristics will affect the cost of implementing the MEP. These parameters and characteristics are as follows:

- Frequency of Data Collection: The estimated budget does not include data collection, but rather assumes data collected by local agencies or the toll operator for other needs could also be utilized for the MEP.
- Frequency of Data Analysis: Minimum frequencies for ongoing data analysis have been identified, however greater frequencies for several data elements would be useful if budget should permit.
- Number of Analysis Locations: A minimum number of data collection locations have been recommended, however a higher density of analysis locations along the corridor would be beneficial for several data elements if budget permits.
- Frequency of Validation Activities: Validation activities have been identified for several data elements, to be conducted on an as needed basis.
- Which Costs are Included: The estimated budget does not include data collection. It assumes that the MEP will be able to make use of data collected by Caltrans, SANDAG, Metropolitan Transit System (MTS), the North County Transit District (NCTD), or other local agencies. The budget does, however, include a portion of data processing, user and stakeholder surveys, all data analysis, and all report development activities. These various budget components and their inclusion in the budget estimate are further explained below:
    - Automated Data Collection: Equipment, installation, and maintenance costs (not included)
    - Manual Data Collection: Administrative and logistical planning, staffing, and equipment such as vehicles for travel time runs (not included)

- Data Processing: Selection of suitable analysis dates based on weather, accidents, holidays, and the availability of data resources. Requesting and obtaining data from Caltrans, SANDAG, MTS, NCTD, or the toll operator. Inputting data only available in hard-copy format into the computer. Reformatting electronic data in preparation for analysis (partially included)
- User and Stakeholder Surveys (included)
- Data Analysis: Calculation of performance measures. Analysis of current period performance and year-to-year performance trends (included)
- Monitoring Reports: Development of charts, graphs and summary text (included).

8.9 CONTINUING IMPROVEMENT PROCESS

It is expected that the MEP defined herein will continually improve and adapt as opportunities or necessities to do so materialize. For example, changing regional goals or changes in corridor-specific goals might lead to changes in the measures of effectiveness or data elements comprising the MEP.

Technological advances may provide improved data collection possibilities worth incorporating into the MEP. They may enable more meaningful measures of effectiveness to be calculated, higher quality data, lower costs due to automation of manual data collection items, or more frequent analysis due to data collection automation. For example, a Global Positioning System (GPS) rather than transponder based toll collection method might offer improved speed and travel time data. Similarly, more widespread use of GPS and automated fare collection in bus and rail systems would improve the range and frequency of transit data available.

It is foreseen that the MEP will rely heavily on data collected by local agencies and toll operators for other purposes. As local agencies and toll operators adopt new technologies, such investments should be utilized to improve the quality of the MEP in order to maximize their cost-effectiveness. For instance, investments in equipment supporting toll collection and value pricing for operations of the managed lanes could also be useful to the MEP. Similarly, investments in improved bus and rail technology for operation of the integrated bus and rail transit system may also offer new data opportunities for the MEP.

8.10 SUMMARY OF RECOMMENDED PLAN

In conclusion, the recommended Monitoring and Evaluation Plan consists of three components:

- Before: Monitoring and evaluation of conditions before project implementation,
- After: Monitoring and evaluation of conditions after project opening, and
- Ongoing: Annual monitoring and evaluation of conditions thereafter.

The before, after, and ongoing components each adopt a four-tiered approach to assess the effectiveness of the I-5 North Coast Managed lanes project to fulfill the previously stated objectives. This approach is consistent with the evaluation approach proposed for the I-15 Managed Lanes Value Pricing project.

- Measurement of Project Impact
- Measurement of Project Utilization
- Measurement of Project Acceptance
- Assessment of Project Operations

Specific data elements included in the before, after, and ongoing components are summarized in Tables 8-1, 8-2, and 8-3, respectively.

I-5 NORTH COAST

MANAGED LANES VALUE PRICING STUDY

FROM LA JOLLA VILLAGE DRIVE TO VANDEGRIFT BOULEVARD

CONCEPT PLAN
VOLUME II

APRIL 2006

Submitted to:

Submitted by:

Errata Sheet:
I-5 North Coast Managed Lanes Value Pricing Study (April 2006)

The project description was revised to state that the painted buffer separation between the general purpose lanes and the HOV/Managed Lanes would be up to five (5) feet.

This minor change in the project description is consistent with the analysis contained in this technical study.

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I-5 NORTH COAST MANAGED LANES VALUE PRICING PLANNING STUDY

VOLUME II - EXECUTIVE SUMMARY

ES.1 COMMUNITY OUTREACH OVERVIEW

ES.1.1. Purpose

The goal from the I-5 North Coast Managed Lanes Value Pricing Study Community Outreach Program was to accurately gauge public reactions to and support for a variety of value pricing and lane management options under consideration on I-5 north of San Diego. The importance of understanding early in the planning process what design, pricing and operations elements were favorably – and unfavorably – received by a variety of publics ultimately helped to shape the final recommendation of the study.

ES.1.2. Methodology

Four distinct methods for gathering and gauging public opinion were utilized as a part of this study and were as follows:

Stakeholder Interviews

Date Fielded: November/December, 2004
Number of Participants: 24

Focus Groups

Set #1 (comprised of two focus groups)
Date Hosted: November 16th, 2004
Number of Participants: 16

Set #2 (comprised of two focus groups)
Date Hosted: May 5th, 2005
Number of Participants: 17

Intercept Interviews

Date Fielded: February 2005
Number of Participants: 353

Telephone Survey

Date Fielded: January/February, 2005
Number of Participants: 804

ES.2 STAKEHOLDER INTERVIEWS

Documenting key leader attitudes and opinions about the value-pricing component of the proposed Interstate 5 (I-5) managed lanes in North San Diego County was

undertaken in November and December 2004. A total of twenty-four stakeholders participated in in-person one-hour interviews. Stakeholders participating in the interview process included:

Elected Officials

- Leon Williams, Chair, Metropolitan Transportation System
- Hon. Judy Ritter, Councilmember; City of Vista

Operation Stakeholders

- Mark Baza, Caltrans District 11
- Lt. Richie Rennie and Capt. David Webb; California Highway Patrol N. San Diego County
- Mr. Gonzalo Lopez, Director for Marketing & Community Relations, Metropolitan Transit Service
- Robert Leiter, Department Director of Land Use and Transportation Planning, SANDAG

Community Groups & Interest Groups

- Louis Martinez, Treasurer, Hispano-Americans for Progress, (also City of Vista Traffic Commissioner)
- Reginald Owens, First VP; Warner Davis, Second VP; North San Diego County Branch of National Association for Advancement of Colored People (NAACP)
- Grace Roos, Transportation Director; San Diego League of Women Voters
- Lisa Briggs, Executive Director; San Diego Taxpayers Association

Environmental Groups

- Ron Wootton, Executive Director; Buena Vista Lagoon Foundation
- Doug Gibson, Executive Director; San Elijo Lagoon Conservancy

Military Groups

- Larry Rannals, Community Plans & Liaison Officer; Marine Corps Base, Camp Pendleton
- Pete Magana, Secretary; American G.I. Forum, Oceanside Chapter

Business, Community and Regional Attractors

- Ceci Cazares, Chair, Legislative Committee; San Diego County Hispanic Chamber of Commerce
- Tim Read, Director of Operations; Del Mar Thoroughbred Club
- Milton Phegley, Campus Community Planner, Government and Community Relations; University of California, San Diego

Special Roadway Users

- Armando Freire, President; Dimex Trucking
- Yolanda Jimenez, President; Lucar Trucking
- Ron Popham, Director, Maritime Services; Stuart Farnsworth, Maritime Program Manager; Port of San Diego
- Dan Beal, Managing Director, Public Policy; Automobile Club of Southern California

Interregional Stakeholders

- Hasan Ikhrata; Southern California Association of Governments

Topics covered in the interviews included:

- Current traffic conditions on I-5
- Experience with and attitudes toward I-15 Express Lanes

- Operational issues associated with managed lanes on the I-5 Corridor
- Willingness to pay for managed lanes
- Use of toll revenues
- Pros and cons regarding pricing strategies proposed for I-5
- Environmental and fairness concerns
- Ideas for other public outreach and market research

ES.2.1. KEY FINDINGS

ES.2.1.1. People Are Desperate for Mobility Solution on I-5

The daily stress of congested commuting is reaching the breaking point for many, and stakeholders said that managed lanes will be welcomed, for the most part, as one among many needed tools to solve existing and projected traffic problems on I-5. Stakeholders generally saw this additional travel choice as a good thing.

ES.2.1.2. No Equity Deal-Breakers for Value Pricing on Managed Lanes

Though many stakeholders are sensitive to the plight of low-income families and motorists, the managed lanes were seen to be fair because the decision to pay as a solo driver is entirely optional. As long as carpools and transit riders continue to ride free and enjoy free-flow conditions, most stakeholders saw no "real" equity issue. Further, the idea of requiring people to pay for a scarce resource—free-flow peak travel—was viewed as fair in the context of our market economy. However, issues of affordability and perception of equity were still identified as problematic. To some extent, these issues can be mitigated through directing revenues to new, high-quality transit service along the corridor.

ES.2.1.3. Goods Movement is Important, But Keep Trucks Off Managed Lanes

Most stakeholders—including the trucking firms interviewed—did not want to see trucks on the managed lanes, due to a variety of operational concerns about truck/passenger car conflicts, both within the lanes and getting to the lanes. Trucking representatives prefer to stay on the outside lanes, and most do not have enough operating margin to pay tolls, even to obtain a time advantage. Other systemic issues would militate against any advantage gained, in the view of some.

ES.2.1.4. Use Revenues for New Transit or Corridor-Specific Transportation Purposes

Suggestions for use of toll revenues was strongest for new transit, and TDM program support, and secondarily for any highway purpose within the I-5 Corridor. Some flexibility for transportation-related expenditures outside the corridor was mentioned, as well as mitigations for freeway impacts to the environment.

ES.2.1.5. Will Managed Lanes Discourage HOV Use in the Long Run?

The most serious and consistent argument against using value pricing on managed lanes was the concern of approximately 25 percent of stakeholders that allowing solo drivers to purchase their way out of congestion, rather than behaving their way out of it, can only serve to undermine regional support for transit and carpooling. This group sees transit as the only real mobility solution in the long term, and value pricing may have the effect of delaying needed social investment to ensure that transit infrastructure is in place when it is needed.

ES.2.1.6. Project Benefits

Most frequently identified benefits of the project are listed below:

- Managed lanes with value pricing provide an effective new alternative for moving people in the I-5 Corridor, and decrease travel time for transit and HOV users. (7)
- New capacity eases burdens on the main lanes, including trucks which may be excluded from the lanes themselves (4)
- Project will marginally reduce air pollution (4)
- The lanes will preserve right-of-way for future high-capacity transit (3)
- Project will improve quality of life by providing people with dependable trip times (3)
- The lanes maximize corridor capacity (3)

ES.2.1.7. Let Caltrans Determine Best Design for Mobility and Safety

Most stakeholders prefer a physical barrier to a painted barrier, but in most other respects are content to allow Caltrans planners and engineers make design decisions based on moving people effectively and safely.

ES.2.1.8. The Jury is Still Out

Responses to a number of questions illustrate the need for additional study of the effectiveness of managed lanes in achieving agreed-upon regional transportation goals. Some reluctant or limited support for another value pricing application in San Diego County would be strengthened if monitoring and reporting results demonstrated real and quantifiable travel and quality of life benefits.

ES.2.1.9. Need for Ongoing Marketing, Public Education and Better Facility Signage

The following comments point to a need for a targeted and continuous public information program and more sophisticated and clear signage solutions:

- I-5 is more complex configuration than I-15
- People need to know what revenues are used for
- Better explanation of how to use the lanes, access points
- Better explanation of project benefits to different road user groups
- Better transit and carpool/vanpool information
- International/bi-lingual signage needed

ES.3 FOCUS GROUPS

ES.3.1. First Round (Focus Groups #1 and #2)

Two focus groups were conducted for SANDAG on November 16, 2004 with regular users of Interstate 5 (I-5) between Oceanside and the I-5/I-805 split. Respondents were recruited and were screened for using I-5 between Oceanside and the I-5/I-805 split at least three days per week, and balanced by gender, age, and employment status. The first focus group had seven participants, while the second had nine participants.

The main objective of this set of two focus groups was to understand the reactions of I-5 users to a proposed expansion of that freeway to add one additional general use lane and two managed lanes to each direction of the freeway. The focus groups were also used to develop appropriate language for use in the subsequent quantitative research that was conducted by telephone.

The primary purpose of the focus groups were to understand participants' perceptions of and reactions to:

- Current traffic on I-5
- Other managed lane facilities in Southern California
- Proposed expansion of I-5
- Types of managed lanes
- Willingness to pay for managed lanes
- Environmental and fairness concerns

ES.3.1.1. SUMMARY OF FINDINGS

- Focus group participants were generally familiar with Southern California toll roads and understand how they operate. Usage was mixed, but several had used one of the toll roads in the past.
- Participants provided mixed to positive comments on existing toll facilities, noting that there are potential problems if accidents occur in the lanes, and at the egress points where merging with the other lanes is problematic.
- Participants are moderately positive to the idea of improvements on I-5, although enthusiasm for the project depends on the level of use, with those who have longer trips being somewhat more supportive.
- Both groups felt that continued population growth will have a large impact on freeway conditions, and it is unlikely that the suggested improvements will be able to 'solve' congestion problems.
- Participants voiced concerns about construction-related congestion and how long it will take to complete the improvements.
- There were also some concerns voiced about environmental impacts including noise, visual impact, and the effect on wildlife.
- Preference for a barrier type between managed and general purpose lanes was mixed, with concern about accidents being an important factor in the first group's preference for painted lines. The second group preferred some type of soft barrier (pylons) that would enable drivers to enter/exit the managed lanes in case of an accident, but deter people from entering and exiting illegally. Most do not like hard barriers because of the inability to get in and out in case of an accident.
- Both groups are in agreement with access/egress points being three to five miles apart. Concern about merging safety is an important consideration in preferring that they be no more frequent than every three miles, and concern about construction cost and the ability to get into the system play a role in the maximum distance of five miles.
- In general, participants are not interested in a freeway expansion that does not include at least one additional general purpose lane.

- A majority of the first group, but only a third of the first group indicated that they would be willing to pay anything to use the managed lanes, and very few were willing to pay $5 or more per trip.
- Three people from each group feel that the improvements would reduce congestion, and a combined five respondents from both groups feel they would provide a more predictable travel time. However, most said the improvements would not change their travel behavior.

ES.3.2. Second Round (Focus Groups #3 and #4)

Two focus groups were conducted for SANDAG on May 5, 2005 with regular users of I-5 between Oceanside and the I-5/I-805 split. Respondents were recruited and were screened for using I-5 between Oceanside and the I-5/I-805 split at least three days per week, and balanced by gender, age, and employment status. Potential participants were screened and separated into two groups – one group consisted of those who traveled less than 10 miles per day and the other group consisted of those who travel 10 or more miles per day on the section of I-5 that will have the managed lane facility. The first focus group (#3) had eight participants, while the second (#4) had nine participants.

This second set of focus groups focused on expanding on the results of the telephone survey. Specific questions raised as a result of the telephone survey and explored in the focus group included:

- Why the target audience appears to have a preference for fixed tolls over variable tolling, and
- Why the target audience does not appear to be especially concerned about maintaining a high level of performance in the managed lanes.

ES.3.2.1. SUMMARY OF FINDINGS

- Initial reactions to the project were mixed in both groups. Some felt that the addition of managed lanes to the I-5 was a positive proposal, while others felt the project was not fair or the best use of space or funds.
- There was no clear preference voiced by either group for direct access ramps or slip access and egress points. A wide range of perspectives were provided, but it appears that in general, focus group participants currently do not have enough information to have a strong preference for either one. Some think that direct access ramps are safer and easier because they don't require crossing lanes. Others think that slip access ramps are safer and easier because they could be more frequent, and there is less of an issue about getting up to speed to enter the managed lanes. Participants generally felt that direct access ramps did not justify traveling further or paying a higher toll. The results from this discussion favor providing direct access ramps at the heaviest volume intersections and slip access in-between at lower volume access/egress points.
- For shorter distance travelers there was no clear preference for fixed or variable tolls. However, a majority of the longer distance travelers in the second group preferred variable tolling, and appeared to be more in touch with the concept of using tolls to maintain free flow conditions in the managed lanes.
- Both groups agreed that the toll price and method of calculation must be clear enough for travelers to easily understand it for people to feel comfortable using

the lanes. Participants also recommended posting the time savings that would be achieved if they used the managed lanes.

- The groups generally agreed that free or drastically reduced tolls are necessary to effectively motivate the formation of carpools and vanpools. Focus group participants generally are against raising the number of carpool occupants from two to three, saying that establishing a carpool is already difficult.
- Participants in both focus groups mentioned concerns about fairness and affordability of the toll lanes to all freeway users. The project is more likely to be positively received if it is presented as HOV lanes that will be available to single occupancy vehicles that are willing to pay, so that the new lanes will be used to maximize capacity while maintaining free flow conditions.
- The way the toll is communicated also could be presented as being reduced when lanes are not at full capacity, rather than increased as needed to maintain free flow conditions. This focuses on the positive aspect of reducing costs when possible, rather than the negative aspect of increasing costs to reduce demand for the managed lanes.
- The participants that are long distance travelers appear to better understand and support the concept of congestion-based variable tolling. They are likely to both support and be heavier users of the system. The short distance travelers (which appear to be at least half of all I-5 users) are not as likely to see a clear benefit for the new facility. Clear communications that show how the facility is designed to encourage car/vanpooling (and even Coaster and express bus service), and to pull as much traffic as possible off of the general purpose lanes will generate a more positive perspective among this large constituency.

ES.4 INTERCEPT SURVEYS

To assess the opinions of non-SOV commuters, surveys were distributed on February 7, 2005 on an express bus, the Coaster, and in an Oceanside park and ride lot at the intersection of I-5 and SR 78. Approximately 400 surveys were distributed to yield a total of 353 completed surveys.

ES.4.1. Potential I-5 Improvements

- Eighty-two percent of respondent non-SOV corridor users think that I-5 needs to be expanded.
- Sixty percent of respondents support the proposed idea of one general purpose and two toll express lanes.
- Car/vanpoolers are the most supportive with 90 percent saying the I-5 needs to be expanded and 76 percent supporting the proposed express lane project.

ES.4.2. Tolling

- Thirty four percent of intercept survey respondents believe that a fee schedule set by time of day will encourage carpooling, while only 26 percent believe varying fees by traffic conditions will encourage carpooling.

- Thirty-nine percent of respondents felt that a fee schedule set by time of day will encourage transit usage, while 26 percent of respondents believe fees that vary with traffic conditions will encourage transit usage.

ES.4.3. Proposed Project Opinions

- Alternative mode (non-SOV) corridor users agree that the toll express lane project will make the I-5 safer, that express lanes with reduced or free tolls for carpools will increase carpooling, and that toll lanes are a good way to help pay for freeway expansion.
- More than half of bus and train riders support spending more money on train and bus services, while a majority of car/vanpoolers disagree.
- In contrast, general I-5 corridor users contacted via telephone survey do not feel that money should be invested in buses and trains instead of freeways, and disagree that toll lanes with free or reduced fares for carpools would increase carpooling.

ES.5 TELEPHONE SURVEYS

Random households in zip codes surrounding the I-5 freeway between Oceanside and the I-5/805 split were contacted by telephone during the months of January and February 2005 and asked to participate in the I-5 North Coast Managed Lanes Value Pricing Study Telephone Survey. More than 1,300 households were contacted to yield 804 complete surveys. The following outlines the findings from this survey effort.

ES.5.1. I-5 Usage

- Seventy percent of respondents use the I-5 at least five days per week, with a mean of 4.4 days per week.
- Seventy-six percent are traveling south on the I-5 when leaving from home and travel a mean of 17.5 miles one-way on the I-5. The portion of the trip on the I-5 takes less than 30 minutes for 65 percent of respondents.

ES.5.2. Potential I-5 Improvements

- Forty-six percent of respondents had heard something about potential improvements to the I-5 freeway north of the 805 split. Eighty-one percent recalled the potential improvements as adding lanes to the freeway.
- Sixty-two percent support construction of one new general use lane and two express toll lanes.
- Sixty-one percent felt that the most important benefit of this potential project would be reduced congestion. Thirty percent mentioned reduced commute times.
- The most commonly stated concern (23 percent) with the proposed improvements was that the project would take too long to complete.

ES.5.3. Tolling

- Respondents prefer raised tolls to closed entrances to control congestion and prefer fixed tolls to variable tolls.

- Fifty-two percent felt that variable tolling is not an equitable way to control congestion. However, 56 percent of respondents felt that fixed tolls were fair and equitable.

ES.5.4. Proposed Project Opinions

- Corridor users feel that additional lanes should be built, and they indicate a preference for managed lanes. Respondents also agree that managed lanes can be used to help defray the costs of freeway expansion.

- Although I-5 users believe managed lane expansion will reduce congestion, they are not optimistic about other potential benefits of these lanes such as increased carpooling, improved traffic flow with raised tolls, safer driving, or reduced pollution.

CHAPTER 1

I-5 STAKEHOLDER INTERVIEWS

1.1 EXECUTIVE SUMMARY

This report summarizes 24 stakeholder interviews conducted in November and December 2004 on behalf of the San Diego Association of Governments (SANDAG). Twenty-five individuals were identified as stakeholders whose views were sought on a variety of issues related to the value pricing component of the proposed Interstate 5 (I-5) Managed Lanes in North San Diego County.

The purpose of the stakeholder interviews was to obtain timely public input into a range of policy and operational issues associated with a pricing strategy under consideration for the proposed 26-mile facility configured as two north-bound and two south-bound managed lanes extending from Camp Pendleton in the north to just south of the Interstate 805/Interstate 5 merge in the south. Described to stakeholders as free to carpoolers (HOV-2+) and transit buses, the lanes would permit solo drivers to enjoy uncongested peak period travel for a toll designed to keep the lanes free flowing by managing demand.

Stakeholders were chosen to provide SANDAG with a variety of opinions from key segments of the I-5 Corridor residents and freeway users, including:

- Elected Officials
- Operational Stakeholders
- Community Groups and Interest Groups
- Environmental Groups
- Military Community
- Business and Regional Attractors
- Roadway User Groups
- Interregional Stakeholders

An effort was made to reach stakeholders who might not otherwise be heard from, but who would have a distinct viewpoint regarding the value pricing aspect of the managed lanes. The stakeholder participants also were selected to address potential equity issues associated with designed develop appropriate language for use in the subsequent quantitative research that will be conducted by telephone.

Stakeholders were interviewed in person, and in a one-hour discussion were asked for their views on the following topics:

- Current traffic conditions on I-5
- Experience with and attitudes toward I-15 Express Lanes
- Operational issues associated with managed lanes on the I-5 North Coast Corridor

- Willingness to pay for managed lanes
- Use of toll revenues
- Pros and cons regarding pricing strategies proposed for I-5
- Environmental and equity concerns
- Ideas for other public outreach and market research

1.1.1. Key Findings

People Are Desperate for Mobility Solution on I-5

The daily stress of congested commuting is reaching the breaking point for many, and stakeholders said that managed lanes will be welcomed, for the most part, as one among many needed tools to solve existing and projected traffic problems on I-5. This additional travel choice was generally seen as a good thing by stakeholders.

No Equity Deal-Breakers for Value Pricing on Managed Lanes

Though many stakeholders are sensitive to the plight of low income families and motorists, the managed lanes were seen to be fair because the decision to pay as a solo driver is entirely optional. As long as carpools and transit riders continue to ride free and enjoy free-flow conditions, most stakeholders saw no "real" equity issue. Further, the idea of requiring people to pay for a scarce resource—free-flow peak travel—was viewed as fair in the context of our market economy. However, issues of affordability and perception of equity were still identified as problematic. To some extent, these issues can be mitigated through directing revenues to new, high-quality transit service along the corridor.

Use Revenues for New Transit or Corridor Specific Transportation Improvements

Suggestions for use of toll revenues was strongest for new transit and Transportation Demand Management (TDM) program support, and secondarily for any highway improvements within the I-5 Corridor. Some flexibility for transportation-related expenditures outside the corridor was mentioned, as well as mitigations for freeway impacts to the environment.

Will Managed Lanes Discourage HOV Use in the Long Run?

The most serious and consistent argument against using value pricing on managed lanes was the concern of approximately 25 percent of stakeholders that allowing solo drivers to purchase their way out of congestion, rather than behaving their way out of it, can only serve to undermine regional support for transit and carpooling. This group sees transit as the only real mobility solution in the long term, and value pricing may have the effect of delaying needed social investment to ensure that transit infrastructure is in place when it is needed.

Project Benefits

Most frequently identified benefits of the project are listed below:

- Managed lanes with value pricing provide an effective new alternative for moving people in the I-5 Corridor, and decrease travel time for transit and HOV users. (7)

- New capacity eases burdens on the main lanes, including trucks which may be excluded from the lanes themselves (4)
- Project will marginally reduce air pollution (4)
- The lanes will preserve right-of-way for future high-capacity transit (3)
- Project will improve quality of life by providing people with dependable trip times (3)
- The lanes maximize corridor capacity (3)

Let Caltrans Determine Best Design for Mobility and Safety

Most stakeholders prefer a physical barrier to a painted barrier, but in most other respects are content to allow Caltrans planners and engineers make design decisions based on moving people effectively and safely.

The Jury is Still Out

Responses to a number of questions illustrate the need for additional study of the effectiveness of managed lanes in achieving agreed upon regional transportation goals. Some reluctant or limited support for another value pricing application in San Diego County would be strengthened if monitoring and reporting results demonstrated real and quantifiable travel and quality of life benefits.

Need for Ongoing Marketing, Public Education and Better Facility Signage

The following comments point to a need for a targeted and continuous public information program and more sophisticated and clear signage solutions:

- I-5 is more complex configuration than I-15
- People need to know what revenues are used for
- Better explanation of how to use the lanes and access points
- Better explanation of project benefits to different road user groups
- Better transit and carpool/vanpool information
- International/bi-lingual signage needed

1.2 STAKEHOLDER INTERVIEW PARTICIPANTS

Stakeholder participants are identified in Table 1-1. Shading indicates stakeholders who have particular significance for environmental justice concerns.

TABLE 1-1

STAKEHOLDER PARTICIPANTS

(ORGANIZATION AND INDIVIDUAL STAKEHOLDER CATEGORY)

Category	Organization (Shading indicates Environmental Justice stakeholders)	Representative
ELECTED OFFICIALS	Metropolitan Transportation System	Mr. Leon Williams, Chairperson
	City of Vista	Hon. Judy Ritter, Councilmember (Also SANDAG Board Member and Chair, North San Diego County Transit Development Board)
OPERATIONAL STAKEHOLDERS	Caltrans District 11	Mark Baza, Chief, District 11 Planning
	CHP North San Diego County	Lt. Rich Rennie Captain David Webb
	Metropolitan Transit Service	Mr. Gonzalo Lopez, Director for Marketing & Community Relations
	San Diego Association of Governments	Robert Leiter, AICP, Department Director of Land Use and Transportation Planning
COMMUNITY GROUPS AND INTEREST GROUPS	Hispano-Americans for Progress	Louis Martinez, Treasurer (Also City of Vista Traffic Commissioner)
	North San Diego County Branch of National Association for Advancement of Colored People (NAACP)	Reginald Owens, First VP Warner Davis, Second VP
	San Diego League of Women Voters	Grace Roos, Transportation Director
	San Diego Taxpayers Association	Lisa Briggs, Executive Director
ENVIRONMENTAL GROUPS	Buena Vista Lagoon Foundation	Ron Wootton, Executive Director
	San Elijo Lagoon Conservancy	Doug Gibson, Executive Director
MILITARY COMMUNITY	Marine Corps Base, Camp Pendleton	Larry Rannals, Community Plans & Liaison Officer
	American G.I. Forum, Oceanside Chapter	Pete Magana, Secretary

BUSINESS COMMUNITY AND REGIONAL ATTRACTORS	Downtown Encinitas MainStreet Association	Peter Norby, Executive Director
	San Diego Economic Development Corporation	Erik Bruvold, Vice President and Director, Infrastructure Issues
	San Diego County Hispanic Chamber of Commerce	Ceci Cazares, Chair, Legislative Committee
	Del Mar Thoroughbred Club	Tim Read, Director of Operations
	University of California, San Diego	Milton Phegley, Campus Community Planner, Government and Community Relations
SPECIAL ROADWAY USERS	Dimex Trucking	Armando Freire, President
	Lucar Trucking	Yolanda Jimenez, President
	Port of San Diego	Ron Popham, Director, Maritime Services Stuart Farnsworth, Maritime Program Manager
	Automobile Club of Southern California	Dan Beal, Managing Director, Public Policy
INTERREGIONAL STAKEHOLDERS	Southern California Association of Governments	Hasan Ikhrata, Director of Planning

1.3 INTERVIEW METHODOLOGY

A stakeholder interview guide was developed by the consultant team and approved by SANDAG and is included in Appendix A of this report. SANDAG mailed invitations to each identified stakeholder and the consultant team followed up via e-mail and telephone to schedule an interview at a time and place of the stakeholders' choosing.

Each stakeholder was interviewed in person, and interviews were designed to take between 45 minutes and one hour, though a number of interviews lasted longer than one hour, with permission of respective stakeholders. The interviewer provided basic information on project design scenarios available at the time. Notes from the interviews formed the basis for individual summaries of stakeholder comments. These were subsequently provided for review by each participant. Stakeholders were given two weeks to make any desired changes or additions to the written summaries. The approved summaries are included in Appendix B of this report.

1.4 STAKEHOLDER RESPONSES

1.4.1. STAKEHOLDER ROLE IN PROJECT PLANNING OR IMPLEMENTATION

Table 1-2 shows how the 24 stakeholder organizations view their respective roles in relation to the project.

TABLE 1-2

PROJECT PLANING OR IMPLEMENTATION ROLE,

BY STAKEHOLDER CATEGORY

Lead Agency or Other Significant Role in Project	**Advisory Role** (Project Support, Long Range Planning or Operational Involvement on Completed Project)	**Limited or No Role Beyond Stakeholder Interview Process**
• SANDAG • Caltrans - District 11	• Metropolitan Transit System • North San Diego County Transit Development Board • California Highway Patrol • San Diego County Taxpayers Association • SCAG • Automobile Club of Southern California • Port of San Diego • Buena Vista Lagoon Foundation • San Elijo Lagoon Conservancy • San Diego Economic Development Corporation • San Diego County Hispanic Chamber of Commerce • UCSD • Marine Corps Base	• NAACP • Dimex Trucking • Lucar Trucking • American G.I. Forum, Oceanside Chapter • Hispano-Americans for Progress • League of Women Voters • Downtown Encinitas MainStreet Association • Del Mar Thoroughbred Club

1.4.2. CONDITIONS ON INTERSTATE 5

Perception of Existing Conditions

Stakeholders' assessment of existing conditions on I-5 were unanimous and emphatic: congestion is horrible, has deteriorated over the past five to 10 years, and will only get worse in the future.

Typical comments include:

> "It gives me a headache."
> "It's catastrophic."
> "Horrendous. Something to be avoided. Almost constant overflow."

In addition to simple over-capacity, current stop-and-go conditions are ascribed to bottlenecks at transitions, lane drops, highway construction, and accidents.

Likely Future Conditions

Stakeholders are not optimistic about the region's ability to solve future projected transportation problems and do not see easy solutions. A number of stakeholders echoed the observation that "By time the engineers build a solution, the demand has surpassed the designed capacity." For about a quarter of stakeholders, this means that land use and transit or truly high occupancy solutions will be needed to meet future mobility needs.

Importance of Providing Mode Choice on Interstate 5

All stakeholders expressed support for modal choice along the I-5 Corridor. The differences among stakeholders related to the strength of that support—ranging from a belief in the general benefits of "more choice" in the mobility marketplace to a strong commitment to multi-modal transportation and significant investment in transit.

1.4.3. I-15 EXPRESS LANES: FAMILIARITY AND ATTITUDES

Familiarity

The proposed expansion of the existing I-5 freeway would add two additional express lanes and one general use lane to the highway that is generally four lanes wide. This was explained to participants with the use of photo images and artistic renderings to give them a feel for the project.

Most stakeholders were familiar with the existing I-15 Express Lanes, but only a handful had used them as toll-paying customers. This small group felt the tolls provided value, but most agreed the facility was too short, and that merging back into main lanes was a problem until recent Caltrans improvements were completed.

Another set of stakeholders used the lanes as a member of a carpool on a regular or occasional basis. Some don't use the lanes because the limited access precludes it. Approximately half the stakeholders had not used them at all, but were generally familiar with them. Of this latter group, many felt that signage and marketing of the lanes was inadequate, and that information on how to use the lanes as a carpool or transit rider was similarly lacking. A few stakeholders expressed confusion about how and where to enter the lanes, and felt the I-15 facility did not compare well with the Orange County toll roads in terms of user-friendliness. Also of note is that people believe the tolls vary in relation to main lane congestion, rather than express lane volumes. Nor do they know what the toll revenues are used for.

Are the I-15 Express Lanes Fair?

Fifteen stakeholders, three-fifths of those interviewed, believe that managed lanes are fair. When asked what fairness means to them, they responded as follows:

- It's an option to pay for premium service and speeds are maintained for HOV and transit, who still ride free.
- Everyone, even moderate income families, will find them worthwhile sometime
- Solo drivers help pay, and carpoolers enjoy free-flow conditions
- It encourages carpoolers, and the more carpoolers, the tolls rise and reduce solo drivers
- It's fair to charge for a scarce resource, i.e., free-flow peak period mobility—we can't build a lot more lanes
- The toll is worth the value provided
- Fair as a demand management tool
- Unfairness would not necessarily be a reason not to utilize tolls as a tool

Five stakeholders gave a qualified "Yes, but…" and noted the following reservations with respect to the fairness of the I-15 managed lanes:

- They're fair, but the tolls are a burden on low income motorists
- Fair in terms of value received, but not social equity, or possible perceptions of inequity

Three stakeholders said flatly that the lanes are not fair, and offered the following comments as explanation:

- It's not fair for those who can afford to, to pay and avoid congestion without having to change travel behavior
- Don't reward an undesirable behavior just because a person can afford it
- Wasted space is not fair to anyone

Do Managed Lanes Provide an Efficient Mobility Option?

Thirteen stakeholders believe the I-15 Express Lanes provide an efficient mobility option for corridor travelers because:

- They maximize existing capacity
- More choice is good
- They save time

One stakeholder noted that the lanes are not as effective as they should be, however, because the pricing is sometimes badly applied, and there are reports of faulty transponders that compromise revenue collection as well as demand management effectiveness.

Four stakeholders said the I-15 Express Lanes are not effective, noting that:

- In the long run, they will or may diminish support for and utilization of HOV lanes/transit
- They encourage sprawl by reducing trip times for those willing to pay
- Better to create three general purpose lanes, using the two HOV lanes plus the wasted space used by barriers
- They don't reduce congestion in adjacent general purpose lanes
- They create as much congestion as they reduce (at transitions)

Four stakeholders were neutral on the subject. Their comments were as follows:

- "Theoretically they save time—but you lose it merging back into main lanes
- Better to have general purpose lanes
- Possibly efficient—but probably don't encourage new carpool formation
- More study needed

Applicability to I-5

Twelve stakeholders would like to see value pricing on I-5 managed lanes, but several would approve only with conditions:

- As long as there are alternatives
- As long as it keeps traffic moving
- As long as lanes are added, and no general purpose lanes are taken
- As long as transponders are interoperable on all California toll roads

Six more stakeholders give reluctant approval to an I-5 pricing strategy, noting the following:

- As long as HOV lanes are going to be built, they should be managed lanes
- Depending on what revenues would be used for
- As long as it was proven that the lanes don't discourage carpooling
- Future congestion may make HOVs and transit so desirable that value pricing is not necessary
- As demonstration project only, with sufficient monitoring and reporting to verify results

Four stakeholders do not want pricing on I-5 at all. One suggested that SANDAG either add general purpose lanes or use the space for light rail.

1.4.4. STAKEHOLDER CONSTITUENT ISSUES

Stakeholders were asked about the concerns of their organization's membership or constituency. Although Table 1-3 illustrates a range of concerns that reflect specific organizational purposes, the following issues were among those most often mentioned by stakeholders:

- Need to provide mobility options now
- Ensure current decisions meet future demand
- Maintain regional economic competitiveness
- Prioritize transportation investment for HOV—to move people, not vehicles

TABLE 1-3

COMMUNITY CONCERNS BY STAKEHOLDER CATEGORY

Category	Identified Concerns
Elected Officials	• Need to provide transit alternatives • Need to give citizens options • Need to provide solutions to mobility needs now and plan for future
Operational Stakeholders	• Options to fund and to serve transportation needs • Getting people to work • Moving people, not vehicles • More congestion = more frustration = more accidents • Safe law enforcement activity for officers and motorists—more difficult with more congestion • Goods movement
Community & Interest Groups	• Congestion and mobility • Ability of transportation system to keep up with residential growth • Ensure project costs are reasonable • Appropriate use of toll revenue • Support for widening the freeway • Affordability of tolls • Truck/car conflicts • Priority for high occupancy vehicles
Environmental Groups	• Footprint intrusion into wetlands Economy/transportation nexus • Air quality
Military Community	• Mobility needs of low income Marines • Needs of no- or one-car households on the base
Business & Regional Attractors	• Regional congestion reducing competitiveness • Priority for high-occupancy vehicles • Congestion on and near freeway on-ramps and off-ramps, and long queuing to access the freeway • Arterial congestion related to freeway • Housing availability and affordability • Paying for transportation infrastructure
Roadway User Groups	• Traffic congestion—cost in time and money • Mobility and quality of life • Price of fuel • Goods movement • Stress on truck drivers • Proposition 42 "rip-off"
Interregional Stakeholders	• Interregional connectivity and transportation system continuity • Performance of solutions chosen • Environmental Justice

1.4.5. MANAGING DEMAND

Limiting Physical Access vs. Using Tolls to Manage Demand

Seven stakeholders thought it best to use a combination of physical access control and tolls:

- But use physical closures only in emergency
- Offers most flexibility
- Ameliorates impact on low income motorists
- Requires good signage and solution to re-route people whose normal pathway is closed

A "tolls only, or primarily" solution was favored by six stakeholders:

- Otherwise geographic inequities could arise; also safety problems
- Closing access normally open would result in irate drivers—disrupting their expectations
- Closing physical access will erode support for the project and compromise operation of the system
- If people go to the trouble of carpooling, they shouldn't be denied access physically.

One stakeholder favored physical access primarily or only. Four stakeholders were willing to let Caltrans decide based on safety and performance. Five had no opinion or were not sure. Ambivalence stemmed from the recognition that, though physical access provides equal, but limited, opportunity to use the lanes; tolling is more convenient. However, tolling has inherent equity problems, at least in terms of perception of fairness, say some stakeholders.

Impact of Managed Lanes on Travel Behavior

Half of the stakeholders felt that strong ridership on and demand for Coaster services indicated a good potential to increase freeway based transit ridership on the managed lanes with bus rapid transit (BRT). Several thought that ridesharing participation would get a boost because the facility would provide trip time benefits for those modes. However, others felt that this was a minimal possibility, and would not, in any event, have a significant impact on overall congestion. Several stakeholders referred to the overriding issues of sprawl and lack of close-in housing that is affordable. These contributions to freeway demand swamp any efforts to ameliorate congestion through transit and carpooling. Finally, several referred to Californians' love for their cars, and the relative lack of investment in high-quality transit service that can effectively compete in the mobility marketplace.

Will managed lanes encourage transit and ridesharing compared to driving alone? Approximately one third of stakeholders expressed great concern that value pricing on the managed lanes would severely undermine current and proposed transit and HOV plans. By allowing solo drivers to pay to avoid congestion, without going to the trouble of carpooling or taking the bus, society is sending the message that HOV modes are "second-best" say some stakeholders. This segment of stakeholders believes we should adopt a consistent and strong position of support for the *only* strategy that will accommodate future demand: high occupancy vehicle modes, with an emphasis on

premium transit and convenient feeder and local circulation networks designed to severely reduce the need for and attractiveness of solo driving.

Other stakeholders support new solo driving options that can provide reliable trip times on congested corridors as a matter of personal choice, and admitted that this means more solo driving on HOV lanes. For residents of communities located between I-15 and I-5 such as Vista, managed lanes on I-5 means they will have a new route choice available to them, especially for trips to San Diego.

Managed Lanes' Effectiveness in Moving People

Stakeholders were asked whether they thought managed lanes with value pricing were more or less effective, lane for lane, at moving people than regular HOV lanes or main lanes. Responses are summarized in Table 1-4.

Those who thought they were more effective attributed that result to managed lanes' ability to more efficiently use all available capacity, coupled with the free-flow conditions lacking on main lanes during peak periods. Several critics of value pricing felt that the only reason value pricing might increase people-moving capacity of lanes was due to lack of commitment to high quality public transit networks within the region, and the absence of local feeders to collect and distribute people to and from major transit routes.

TABLE 1-4

HOW WELL DO MANAGED LANES MOVE PEOPLE?

More Effective than Regular HOV Lanes?	Number of Responses
YES	10
NO	5
DON'T KNOW	6
More Effective than Main Lanes?	**Number of Responses**
YES	11
NO	3
DON'T KNOW	5

1.4.6. ACCESS AND EGRESS

Number of Access Points

Stakeholders recognize the tradeoff between access and operational complications due to merging and weaving. In general, four- to seven-mile spacing for DARs seemed appropriate to stakeholders. Suggestions for specific access points included:

- Locate access to prioritize through-traffic and longer trips
- Limit access (the definition of express lanes) but provide good directions to major destinations
- Spacing isn't the issue—just respond to the need
- DAR at Palomar Airport Rd. or Poinsettia
- Remove either Santa Fe or Birmingham, or combine them if there is enough room; freeway is already very narrow at that location
- Fewer access points means less merging and weaving
- Put slip ramps where needed, but don't cause congestion
- Base access on hard throughput data, not political influence
- Design access to accommodate new and proposed future development
- DAR at SR 56 is needed
- The more open the facility can be, the better
- Concern about the Del Mar area—Caltrans needs to examine origins/destinations carefully
- Get community input on this issue
- Choose safety over convenience
- Respond to local travel patterns and needs

Ingress/Egress Priority

Most stakeholders felt that anybody eligible to drive in the managed lanes should be able to access them at any point. Though some exceptions could be made for direct access ramps, anything else seemed too complicated to explain and difficult to manage physically.

Stakeholders had more support for prioritized egress, however. Transit and to a lesser extent carpools and vanpools got the nod for priority treatment in merging back into main lanes. Some stakeholders mentioned the operational advantage of dispersing merging-related weaving over a longer physical distance.

Painted vs. Physical Barriers

When asked whether they preferred physical barriers or painted buffer to separate the main lanes from the managed lanes, most stakeholders chose physical barriers (12 responses). However, if physical barriers are chosen, there should be adequate shoulders on each side of the managed lanes so vehicles aren't too close to the concrete, and periodic breaks for enforcement activities and emergency vehicles must be provided. Nine stakeholders either had no opinion or thought Caltrans should make the determination. Four stakeholders preferred painted lane separators. One stakeholder suggested that a mix of barriers could be used, as appropriate to the physical constraints and traffic volumes for each segment.

The reasons provided for their choices are listed below.

Physical is better:

- Painted barrier creates temptations to cheat, and is unsafe because of that
- Painted barrier is "not a starter" for Caltrans in all likelihood
- Physical barrier can carry embedded Intelligent Transportation Systems (ITS) equipment in the future for electronic vehicle guidance
- Truckers would rather run into a concrete barrier than a vehicle, if they fall asleep

Painted is better:

- Offers flexibility in case of emergency
- Allows for changes in access points based on changing demand over time
- Better to start with painted barriers, then move to physical barriers if necessary
- Physical barriers can cause more accidents than they prevent
- Visual impacts of physical barriers can be a reason to oppose the project

Let Caltrans Decide/No Opinion:

- Choose the option that minimizes lane violations and improves mobility
- Make choices clear to drivers
- Base decision on safety factors
- Use whatever allows for better demand management

1.4.7. SIGNAGE AND TOLL INFORMATION

Although most stakeholders had high praise for Caltrans signage in general, they were split on the issue of how well signed I-15 Express Lanes are. Stakeholders noted that I-5 is a more complex system than the Express Lanes on I-15. Concern about I-5 signage stems from the need to alert people in sufficient time about upcoming choices. Several

have hopes for information technology and global positioning system (GPS) solutions by time the facility opens in 2014.

1.4.8. TOLLS

Willingness to Pay

Stakeholders were asked for their reaction to a toll level of $6 during the peak, to save 24 minutes traveling the 26-mile length of the proposed managed lane facility. Seven stakeholders would leap to grab such a bargain. A group of nine other stakeholders felt that the $6 toll was fair for the benefit described, and that most people would find it worthwhile under some circumstances. Three stakeholders were concerned that, while the fee might be worth it to a few, the toll would not be affordable for many corridor travelers. One person thought it would encourage carpooling among the less affluent. And while one stakeholder acknowledged that the toll needed to be high enough to represent a real premium for a valuable benefit, another expressed complete disagreement with the tolling concept, and said the $6 was simply too high.

How Should Toll Revenues be Spent?

Stakeholders were asked how they would like to see net toll revenues spent. This information is summarized in Table 1-5. Note that many stakeholders identified more than one appropriate target for revenues, and some expressed no preference.

Transit service was the overwhelming favorite use for these revenues and half of stakeholders were strong advocates of transit as the *only* use of toll revenues. Further, these advocates want to make sure that the service is high-quality transit service that can compete effectively against the advantages of driving alone.

All but one stakeholder thought monies should be spent in the corridor from which they were generated. No one thought they should go to “any social purpose,” although a handful believed that general mitigation of freeway impacts was a legitimate use of toll revenues, and that corridor cities could therefore qualify as legitimate recipients of those revenues. One suggestion for a flexible approach was that each corridor be granted some autonomy in determining use of toll revenue. A few mentioned that the amount of net revenue involved is not likely to be significant.

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TABLE 1-5

STAKEHOLDER PREFERENCES FOR USE OF TOLL REVENUES

Preferred Toll Revenue Use	Number of Responses
• New transit service on I-5 North Coast (BRT and premium transit service)	10
• Any transportation-related improvement along I-5 Corridor (extend managed lanes, improve arterial feeders to freeways, improving ramps, and improve the driving experience)	7
• Carpool/vanpool program support and transportation demand management (TDM)	5
• Any transportation-related improvement in San Diego County, including goods movement	4
• Environmental and environmental justice purposes (e.g., mitigate planting of invasive species, improving parks and wetlands, improving water quality to mitigate runoff impacts, and mitigating social impacts)	4
• Pay for managed lanes facility itself, including ongoing maintenance	2
• Information and marketing	1

1.4.9. SAFETY, ENFORCEMENT, AND RELATED OPERATIONAL ISSUES

Issues identified by stakeholders are listed below, in descending order of frequency:

- Let Caltrans decide these issues based on safe and efficient operation of the freeways (5)
- Use physical barriers/concerns about merging and weaving associated with painted lane separators (4)
- Concern about enforcement areas/suggestion to locate enforcement and breakdown areas to the left of the managed lanes. (4)
- Caltrans might want to consider photo enforcement (2)
- Need for better signage (1)
- CHP notes difference in approach to design between CHP (safety focused) vs. SANDAG and Caltrans who have a mobility and engineering perspective (1)
- Keep emergency vehicle turnaround areas at Federal Highway Administration (FHWA) standards (1)
- Keep the rules and design simple in order to help people obey the laws (1)
- Exclude trucks from the managed lanes (1)
- Concern about blinding headlights from opposing traffic (1)

Stakeholder views on treatment of managed lanes scofflaws are as follows:

- Violators should get a regular CHP traffic ticket (2)

- It's ok to apply both a toll-related fine and HOV lane violation (1)
- Get HOV violation mailed to them ($341) (1)
- Toll based penalty is preferable (1)
- Not sure about violations (1)
- Apply either toll-related fines or HOV lane violation citations, but not both (1)

1.4.10. ENVIRONMENTAL ISSUES

Environmental impacts identified by stakeholders are summarized in Table 1-6. Several stakeholders pointed out that toll revenues could be used to offset environmental impacts of the freeway widening itself. Four stakeholders did not anticipate any environmental impacts associated with value pricing, six declined to respond, and one thought it was too difficult to quantify such impacts. Of those identifying impacts, it is important to note that positive environmental impacts were associated with value pricing on HOV lanes, due to anticipated reductions in vehicle emissions. The two lagoon conservancy organizations hoped for improvements in water quality of the lagoons due to negotiations with Caltrans designed to reduce current impacts of structures crossing the lagoons. However, both these organizations equated any additional freeway surface with additional environmental impacts.

TABLE 1-6

POTENTIAL ENVIRONMENTAL IMPACTS

Negative Environmental Impact Identified	Number of Responses
• Property takes	4
• Noise	3
• Air quality	3
• View shed impacts	2
• Water quality	1
• Lagoon crossing impacts	1
• Planting non-native species	1
Positive Environmental Impact Identified	**Number of Responses**
• Reduction of vehicle emissions (improved traffic flow and/or encouragement of clean air vehicles and higher-occupancy of vehicles)	6
• Lagoon overcrossings improved	2
• Potential to locate transit-oriented design and bus rapid transit stations at direct access ramps	2

1.4.11. PROJECT BENEFITS

Although many stakeholders did not articulate specific project benefits, it was clear from their responses to other questions that they saw value in having a congestion-free travel alternative during peak periods. Explicit stakeholder descriptions of project benefits are listed below, in descending order of response frequency (noted in parentheses).

- Managed lanes with value pricing provide an effective new alternative for moving people in the I-5 Corridor, and decrease travel time for transit and HOV users. (7)
- New capacity eases burdens on the main lanes, including trucks which may be excluded from the lanes themselves (4)
- Project will marginally reduce air pollution (4)
- The lanes will preserve right-of-way for future high-capacity transit (3)
- Project will improve quality of life by providing people with dependable trip times (3)
- The lanes maximize corridor capacity (3)
- The lanes manage demand effectively (2)
- Can serve as emergency evacuation lanes (1)
- Preserves right-of-way for any future purpose (main lanes, transit or truck lanes) (1)
- Facility is free to transit riders and those who rideshare (1)
- Tolling helps pay for new infrastructure (1)

1.4.12. PROJECT CONCERNS AND CHALLENGES

Operational Issues

- On-ramp queuing backing up onto arterials, especially at major regional destinations (2)
- Are managed lanes the best use of the pavement? Opposed to 400-space park-and-ride lot at Manchester (1)
- Twenty mile bottleneck will be created when the lanes end at Vandegrift Rd. and pick up again in Orange County will create congestion and air quality impacts for Camp Pendleton (1)
- Challenge of providing safe and effective enforcement (1)
- Ensure that buses can travel uninterrupted, giving people a real time-saving, money-saving and convenient alternative to solo driving (1)
- Need to integrate transit plans into I-5 widening plans (1)
- Plans to use shoulders for transit takes away from breakdown and enforcement areas (1)

Construction Issues

- Should this be a 10+4 or an 8+4 facility? (1)
- Sheer physical problem of constructing the lanes—the staging—is daunting (2)
- Length of construction time, especially for structures (2)
- Ensuring good benefit to cost ratio and keeping costs reasonable (1)
- Keep the pavement footprint as small as possible to reduce lagoon impacts (1)

Pricing Issues

- Will the pricing be designed to accommodate through-trips or shorter, local and regional trips? (1)
- Preserving mobility for low- and moderate income people (1)

- Maintaining free access for carpools (1)
- Lanes might discourage carpool formation or investment in transit (4)
- Toll affordability (2)

Marketing and Public Information Issues

- Caltrans needs to educate the public about how and why they build certain segments of the facility first (1)
- Public expectations (and misconceptions) that an extra lane will cure all problems (1)
- Educational challenge to avoid potential public confusion about the lanes (1)
- Educational challenge to dispel misconceptions about fairness and inform people of project benefits (2)

1.4.13. OPERATIONAL SUGGESTIONS

Although stakeholders have great confidence in Caltrans District 11 to "figure it out," the following list of suggestions reflects some specific concerns about the facility.

- Must be a direct connection at SR 76 (3)
- Provide dedicated on-ramps/off-ramps (2)
- Better signage needed at SR 56 to help drivers get into the desired lane without having to make dangerous last minute merging (1)
- Design well-located parking structures connected to good community shuttle service to resolve congestion problem at Genesee Avenue and Campus Point near UCSD (1)
- Get better origin/destination information to plan overall transportation network (1)
- Make the lanes general purpose (1)
- Extend the lanes farther south (1)
- Carry the lanes north to connect to Orange County freeway improvements (1)
- A critical piece for Port of San Diego is the I-805 traffic after completed SR 56, as well as interchanges along the "S" curve that are overloading I-5, making it difficult for trucks leaving the Port (1)
- BRT and DARs need to be located in order to serve major attractors and employment patterns (1)
- Take advantage of great opportunity for joint development and transit-oriented design at the DARs (2)
- Develop high-quality transit feeder service needs to serve both the DARs and the destinations (1)
- The region should plan on giving more and more lane capacity to buses as congestion increases over time. Since interregional travelers may also be attracted to BRT the region needs to preserve capacity for that (1)
- Build barrier separated outside auxiliary lanes that would facilitate shorter trips and keep people off the main freeway lanes. (1)

1.4.14. ENVIRONMENTAL JUSTICE

Equity

Responses to a question asking stakeholders for their views regarding the equity of value pricing on managed lanes are summarized according to stakeholder category in Table 1-7 (Response frequency is in parentheses). For nearly all stakeholders, toll non-

affordability for low income travelers is troubling, but because use of the lanes is optional, and transit and HOV users retain free access to a new facility, equity problems are minimized to non-existent. And stakeholders recognize that for everyone, time will be valuable enough at some point to make the availability of a reliable and quick trip a worthwhile project benefit.

TABLE 1-7

DOES VALUE PRICING ON MANAGED LANES POSE AN EQUITY PROBLEM?

Stakeholder Category	Equity Concerns (Number of Responses)
Elected Officials	• Not an issue because tolls are a choice and HOV is free (1) • Equity is an issue and can be somewhat mitigated with premium transit (1)
Operational Stakeholders	• Address equity concerns through community involvement process (1) • Not an issue because tolls are optional and HOV is free (1) • Unfairness of income differential recognized (1) • Address income inequity through other means (e.g., vouchers) (1) • Market mechanism and transit service will promote transit ridership, so not "unfair" (1)
Community & Interest Groups	• Not an issue because tolls are a choice and HOV is free (3) • Equity issues are income-related, not ethnicity related, though there is an overlap (1) • Equity (affordability) is a problem, but transit subsidies could help mitigate (1) • Equal access to managed lanes for all communities is an equity issue (1)
Environmental Groups	• No opinion (1) • Unfairness could be mitigated with appropriate use of toll revenues (1)
Military Community	• Equity issues are income related, not ethnicity related, though there is an overlap (1) • Ethnic communities along alignment might object to impacts of freeway widening, but not value pricing (1) • Not an issue because tolls are a choice and HOV is free (1)
Business & Regional Attractors	• Only a pure toll road is supportable—everyone pays for the road itself (1) • The only equity issue relates to maximizing access to the lanes for all communities (1) • Rebate to low income people and free HOV access will help mitigate equity impacts (2) • If managed lanes help workers get to better jobs, that's a built-in mitigation of the lanes (1)
Roadway User Groups	• Not an issue because tolls are a choice and HOV is free (2) • Society charges for all goods and the benefits help mitigate those costs (1) • More a perception issue than a real issue, since everyone's time is valuable (1)
Interregional Stakeholders	• Both costs and benefits in public and private sector need to be weighed and balanced against each other; equity impacts are mitigated by transit/HOV free access and possible alleviation of congestion on main lanes

Stakeholders' Assessment of Public Perception of Project Fairness

Although several stakeholders recognized the statistical overlap between some ethnic groups (primarily Black and Hispanic), they agreed that the primary impact is that the lanes are not affordable—at least on more than an emergency or occasional basis—to low income individuals. Most stakeholders thought those who use transit or rideshare would be very happy with the managed lanes facility on I-5, but that some resentment might arise from main lane motorists who chose not to pay or use HOV modes. Stakeholders (including trucking industry representatives) felt that truck drivers would be relieved by any strategy that helped reduce traffic in the main lanes.

1.4.15. UNDERREPRESENTED GROUPS

Many stakeholders did not feel sufficiently familiar with the corridor communities to identify specific underrepresented groups. One stakeholder stated that highway advocates tend to be *over*-represented in transportation decisions. And a few noted that the I-5 Corridor is generally affluent, heterogeneous, fairly well educated, sophisticated about travel, and very vocal. However a few stakeholders thought that the following groups tended to be underrepresented in regional transportation decision making processes:

- Transit riders
- Southern part of the county (strong *TransNet* supporters) vs. North (*TransNet* beneficiaries)
- Less affluent
- Regular freeway users and the public at large
- Service unions
- Mexican-Americans
- Samoan population
- Native Americans (inland)
- Chambers of Commerce, Auto Club, and Endangered Habitat Group
- Seniors
- High school students
- Farm workers and domestic workers
- Residential communities adjacent to facility (at least they *feel* underrepresented)
- Goods movement community ("Freight doesn't vote.")

1.4.16. LIKELY SOURCES OF PROJECT SUPPORT AND OPPOSITION

Many stakeholders declined to guess where support or opposition for an I-5 managed lane facility would come from. Those who did respond tended to think that most corridor travelers, including weekday commuters and weekend recreational travelers, would be supportive. Opposition would likely come from two extremes: people who think that all lanes should be general purpose lanes, and those who think that any new capacity is sprawl-inducing and leads to environmental problems rather than better mobility.

1.4.17. PROPOSED SURVEY QUESTIONS

Stakeholders were informed that an 800-household random digit dial telephone survey of I-5 Corridor households would be conducted in 2005, as part of the study's public outreach program. They provided the following suggestions for survey questions:

Transit and Vanpooling/Carpooling vs. Pricing on the Managed Lanes

"Would you be more likely to use bus rapid transit that used this corridor if you lived within walking distance to a station? What is the likelihood that you would also be willing to drive to a park and ride lot at one of the new direct access ramps, or join a carpool to reduce 24 minutes for a peak hour trip?"

"Why are you opposed to carpooling?"

"Would the value pricing component of this project encourage you to carpool, vanpool or take transit?"

We don't need to ask people if congestion is a problem. Instead, ask, "Would you use the managed lanes? Would you be more or less likely to join a carpool if the lanes were restricted to carpools? Would you use bus rapid transit? Where do you need to get? (What are your origins and destinations?)"

"Do you want these lanes to be limited to high-occupancy vehicles, or do you want to include value pricing on them to permit solo drivers to buy their way onto the lanes?"

"If you could get to point A to point B without a car, what do you need your car for? What would it take to get you out of your single occupancy vehicle?"

Ability and/or Willingness to Pay

"Would you be able to afford this? Are willing to pay x dollars for x benefit?"

"At what price would you *not* use the lanes?"

Use of Revenues

"Would you support directing some portion of net toll revenue to community enhancement and environmental protection projects along the I-5 corridor?"

Solving the Mobility Problem

"If you accept that we don't have enough resources, would you rather pay a toll, pay through property tax, sales tax, or gas tax? If you don't like this, what do you like?"

"Do you think it is reasonable to expect a long term solution to I-5 corridor mobility problems by catering to the automobile only? If not, how would you rate the importance of adding serious transit solutions into the mix?"

Process Issues

"Would creation of a Citizen's Oversight Committee increase your support for the managed lanes?"

"Agencies can maximize either the amount of community outreach and consensus building, to meet the concerns of neighbors immediately along the freeway, or build the project as soon as possible? On a scale of one to five, should we take time to develop consensus, or should we build the project as soon as possible, with as much fairness as possible [reimbursing people for property impacts in accordance with state law]?"

Goods Movement

"How important is it to you that your daily goods arrive at the store? If you knew that there would be fewer trucks on the roads during the peak period and that your stores would be more efficiently stocked? Would you be willing to allow ***exclusive*** use of the managed lanes by trucks during off-peak hour? One lane? Would you be willing to allow them at off-peak with no toll? Or a toll that would be reimbursed through federal gas tax rebate?"

CHAPTER 2

I-5 FOCUS GROUPS

2.1 FIRST ROUND (FOCUS GROUPS #1 AND #2)

2.1.1. Key Findings

- Focus group participants were generally familiar with Southern California toll roads and understand how they operate. Usage was mixed, but several had used one of the toll roads in the past.
- Participants provided mixed to positive comments on existing toll facilities, noting that there are potential problems if accidents occur in the lanes, and at the egress points where merging with the other lanes is problematic.
- Participants are moderately positive to the idea of improvements on I-5, although enthusiasm for the project depends on the level of use, with those who have longer trips being somewhat more supportive.
- Both groups felt that continued population growth will have a large impact on freeway conditions, and it is unlikely that the suggested improvements will be able to 'solve' congestion problems.
- Participants voiced concerns about construction-related congestion and how long it will take to complete the improvements.
- There were also some concerns voiced about environmental impacts including noise, visual impact, and the effect on wildlife.
- Preference for a barrier type between managed and general purpose lanes was mixed, with concern about accidents being an important factor in the first group's preference for painted lines. The second group preferred some type of soft barrier (pylons) that would enable drivers to enter/exit the managed lanes in case of an accident, but deter people from entering and exiting illegally. Most do not like hard barriers because of the inability to get in and out in case of an accident.
- Both groups are in agreement with access/egress points being three to five miles apart. Concern about merging safety is an important consideration in preferring that they be no more frequent than every three miles, and concern about construction cost and the ability to get into the system play a role in the maximum distance of five miles.
- In general, participants are not interested in a freeway expansion that does not include at least one additional general purpose lane.
- A majority of the first group, but only a third of the first group indicated that they would be willing to pay anything to use the managed lanes, and very few were willing to pay $5 or more.
- Three people from each group feel that the improvements would reduce congestion, and a combined five respondents from both groups feel they would provide a more predictable travel time. However, most said the improvements would not change their travel behavior.

2.1.2. Background

Two focus groups were conducted for SANDAG on November 16th, 2004 with regular users of Interstate 5 (I-5) between Oceanside and the I-5/I-805 split.

The groups were conducted at a focus group facility in Northern San Diego near the I-5/I-805 split. Respondents were recruited by telephone by Strategic Consulting & Research. Participants were screened for using I-5 between Oceanside and the I-5/I-805 split at least three days per week, and balanced by gender, age, and employment status. The first focus group had seven participants, while the second had nine participants. Please see Appendix C for more information on these participants.

The main objective of the focus groups was to understand the reactions of I-5 users to a proposed expansion of that freeway to add one additional general purpose lane and two managed lanes to each direction of the freeway. The focus group also was used to develop appropriate language for use in the subsequent quantitative research that will be conducted by telephone.

The primary purpose of the focus groups was to understand participants' perceptions of and reactions to:

- Current traffic on I-5
- Other managed lane facilities in Southern California
- Proposed expansion of I-5
- Types of managed lanes
- Willingness to pay for managed lanes
- Environmental and fairness concerns

2.1.3. Focus Group Participants

While focus group participants were recruited to balance age, gender and employment levels, and screened for those who used I-5 three or more days per week, the first group of participants appeared to be more likely to commute longer distances to work on a daily basis. The second group had a higher proportion of participants that worked at home or close to their home, and used the freeway for shorter distance trips. The difference in group composition may have been a factor in the in the differences in discussion between the two groups.

2.1.4. Responses to Topic Presented

Toll Roads In Southern California

Focus group discussion began with the participants introducing themselves and explaining their use of I-5. This information is summarized in Appendix C and D.

Discussion then proceeded to the participant's familiarity with and usage of the toll managed lanes in Southern California, such as the I-15, State Route (SR) 91 between Orange and Riverside counties, and SR 73 in Orange County.

Focus Group 1

- The first group of participants appeared to be more familiar with the toll roads, both in usage and understanding how they functioned.

- Perceptions of the effectiveness of toll roads varied, depending primarily on the road discussed.
- Three participants in the first group had used the express lanes on I-15 and felt that the general purpose lanes tend to move faster than the carpool lanes.
- Some cited concern that the managed lanes seem to exit at very congested areas of the freeway, which eliminates the benefit of using them.
- Participants understood that payment was made using a fast track pass, and also noted the use of reversible lanes on this highway.
- Skepticism about the value of the lane given its short length was also expressed.
- Two participants mentioned SR 91 and noted that it also is very congested. The point was made that if there is an accident in the express lanes, then traffic is stuck.
- One participant in the first focus group recalled using the SR 73 and having a great experience as there is little traffic.

Focus Group 2

- The second focus group was familiar with the toll roads of southern California, but only a few participants had used them.
- Two participants recalled using the I-15 Express Lanes.
- Two participants had used SR 91.
- One participant was amazed and delighted by how fast traffic went when she used it. However, this user got on the express lanes by accident and did not realize that it was a toll road.
- Two participants explained that a toll road should have the fewest number of exits possible because it discourages use by people who have shorter trips.
- Another participant liked the idea of reversible lanes that change depending on how heavy traffic is.

Proposed Changes To The I-5 North Coast Facility

The proposed expansion of the existing I-5 freeway would add two additional express lanes and one general use lane to the highway that is generally four lanes wide. This was explained to participants with the use of photo images and artistic renderings to give them a feel for the project.

Initial Reactions

Initial reaction to the proposed changes was tepid for both groups. Many expressed that the additional lanes would quickly fill with traffic, and others expressed fairness or environmental concerns. Those who were more positive about the proposal suggested flexible reversible lanes and suggested free or reduced fees for alternative fuel vehicles and carpools. Many participants in both groups were resigned that there aren't any improvements that could solve traffic problems due to increases in population and the lack of alternatives to driving.

One participant in each group stated that they would prefer a high-speed train.

Focus Group 1

- Several participants in the first focus group expressed concern that additional lanes would simply fill with vehicles and the problem would not be solved.
- Participants made points about the length of time and amount of money a project like this would take, and congestion effects of construction.
- Others commented on the issue of fairness in regard to payment, and expressed concern that only people who can afford it would be able to use the lanes. This group roundly agreed that they did not wish to pay for these lanes as they already pay taxes.
- Although this group had concerns, they also commented that flexible and reversible lanes (i.e., ability to move the center median barrier to allow for more lanes in the direction of peak travel flows) were an important aspect of this proposed expansion.
- One participant wanted flexible carpool lanes to use in non-peak times in case of road construction or accidents.
- Although some doubted that the expansion would alleviate congestion, one participant stated that he would be willing to pay a fee for free flowing traffic.

Focus Group 2

- The second group also reacted with concerns about the proposal. However, this group focused on the environmental effects. One participant commented about sound barriers and the communities that might be affected. Several commented on the potential for damage to the views, hillsides, and wildlife.
- This group also explained that with population growth in the area, the proposed expansion would not solve the problem of more traffic on the freeway.
- Three participants suggested six or seven unrestricted lanes be built rather than managed lanes. One person thought that it sounded like a fast freeway for the rich and a slow freeway for the poor, while another did not like the idea of two lanes zipping along and five lanes sitting still.
- One participant had an initial positive reaction, citing the benefits of carpool lanes and other incentives to reduce traffic. This participant felt that these were important aspects of the project and that the freeway should not simply be widened. The participant commented that the express lanes should be free for carpool or alternative fuel vehicles.
- Those participants who use the freeway for longer commutes on a regular basis felt more positive about the proposal. They stated that this was an alternative to control the flow of traffic for those who must commute. One participant commented that improved travel times would be worth paying for, as it gives people the one thing they can't buy; 'time.'
- There was some disagreement in this group regarding reversible lanes. One person felt that traffic was usually congested in both directions making reversible lanes useless, while another thought that reversible lanes were a good idea for emergency vehicles.

Who Would Benefit From These Lanes?

Participants were asked who they felt would benefit the most from these lanes. Some comments were as follows:

- People who are willing to pay
- Developers of this project
- Working man who would have more reliable estimated trip time
- The person who travels the farthest
- Government making money from this and taxes
- Long commuters
- Concrete manufacturers
- Carpools, buses and people who travel far
- People stuck on freeway without alternative routes
- No one
- Those with a lot of money

Types Of Barriers

Participants were asked to describe the type of barriers between regular lanes and express lanes they would prefer. Interestingly, the groups were very different in their responses between groups, but mostly in consensus within each group.

Focus Group 1

- The first group preferred painted lines as barriers between the managed lanes and regular traffic lanes. Some suggested colored lights as well.
- A primary concern about hard barriers was that if an accident occurred, drivers would be stuck in the express lane for a long period of time. Their objection to pylons as a soft barrier appeared to be more about esthetics than functionality.
- Several people in this group mentioned flexible or reversible lanes as well.

Focus Group 2

- Participants in the second group preferred a soft barrier of pylons and gave several reasons for this choice:
    - a barrier deters cheating, as well as cutting in and out of lanes,
    - pylons, as opposed to concrete, allow emergency vehicles to drive over the barrier and into the lanes,
    - painted lines are unsafe because people (the participant included herself) cut across the lines.
- Two people mentioned concrete barriers – one to say that they are ugly, and the other to suggest that they are the most effective deterrent to cheating.

Access And Egress

Across both focus groups, participants felt that entrances should be three to five miles apart. Comments about access/egress points are listed below.

- Participants explained that exits less that three miles apart would create too much traffic congestion due to merging vehicles.
- Participants also expressed a concern that exits too far apart would create more traffic on surface streets, and would not be fair or convenient to some people.
- One participant expressed concerns about the number of new exits and entrances due to the costs of building them.

- Another person felt that entrances and exits should be widened.
- One participant pointed out that the need for more exits and entrances if there is only one express lane, because it is only possible for traffic to pass a slower vehicle or an accident when there are two express lanes.

Entire Project vs. Hot Spots

Those in the second focus group were asked if there were certain areas of the freeway that were most in need of additional lanes, or if the entire project should be built at one time.

- Three participants in this group felt that the whole project should be built at once or bottlenecks would be created.
- Another three people felt that additions should be built first in hot spots.
- One participant made the following hotspot suggestions:
    - Poinsettia to Villa de la Valle
    - I-5/I805 split
    - Del Mar dip

Tolls

Both groups were asked about what types of tolls they would prefer.

- Regular commuters seem to prefer a monthly pass.
- One participant suggested a flat fee to encourage regular commuters to buy a pass and use it.
- Most participants preferred the option to pay as you go, so that more people are able to use the lanes depending on traffic conditions, length of trip, and their own schedules.
    - one participant explained that he would use it on his way home from work, but not on his way to work.
    - another participant said that he might be willing to pay if he had an important meeting to get to
    - a third said he would only pay in special circumstances.
- Some participants also explained that they want to know how much the fee will be at any given time and were not very receptive to variable pricing based on the current congestion level.
    - one person said that the higher the price was, the more congested he knew the express lane would be.
    - others suggested that the fee should vary depending on how many exits the driver is going.
- One person explained that all options should be available so that more people will use it depending upon their circumstances.

The discussion of fees in the first focus group led to a conversation about carpools and fee reductions for certain users.

- One person, a regular carpooler, thought that the carpool lane should be restricted to those with three or more people per vehicle.
- Others disagreed, saying it was already difficult to coordinate with only one other person and that most people do not carpool as it is.

- Another suggested that the criteria for counting individuals in a carpool vehicle should be that only those over the age of 16 should be counted as this would be more likely to reduce vehicle trips.
- Some also felt that those with lower incomes and the disabled should be provided with discount rates or free fares for the managed lanes.

Willingness To Pay

Participants were asked for a show of hands for their willingness to pay a fare to use the managed lane at different price levels.

Focus Group 1:

- $2/trip: 5 were willing to pay
- $5/trip: 3 were willing to pay
- $7/trip: 2 were willing to pay

Focus Group 2:

- $2/trip: 3 were willing to pay
- $3.50/trip: 3 were willing to pay
- $5-$7/trip: 1 was willing to pay

Some participants were not willing to pay any fee. Following are some comments:

- I would prefer to suffer
- It might cause me to consider the train
- I would consider buying a hybrid car

How Should Revenues Be Used?

When asked how revenues from the managed lanes should be used, participants, especially in the second focus group, seemed doubtful that revenues would be earned. The suggestions that were provided follow below.

- Some suggested more roads and alternative transportation. The suggestions for alternative transportation included:
  - mass transit (such as the Coaster) improvements and expansion, and
  - promoting alternative fuel vehicles.
- A few participants also suggested that the funds should stay within transportation and that there should be transparency for how the money is used.

Facility Without General Purpose Lane

Participants were asked for their reactions to the proposed expansion without an additional general public lane. The reaction was negative for the most part in the first group, and more balanced in the second.

- Most in the first focus group said that they would prefer a plan with one additional regular lane and one managed lane.
- One participant believed that the shoulders should be eliminated.

- In the second group two participants felt that the addition of two managed lanes without an additional general public lane would be attractive because of improved potential carpooling and alternative fuel vehicles.
- One participant said that a plan without the general public lane would only make traffic worse.

Changes Due To Proposed Facility

Participants were asked if the proposed facility would cause them to make any travel behavior changes.

- One participant commented that everyone who is currently avoiding traffic will change their schedule which will cause more congestion.
- Another said that she would go to Orange County whenever she wanted.
- Two other participants thought that people would not make changes to their travel behavior, as people are on a fixed schedule.

When asked if the proposed facility would reduce congestion, three people from each group agreed. Four people from the first focus group and one person from the second felt that the proposed facility could reduce travel time.

Those in the second group were asked if the facility would improve safety.

- Two participants felt that it would reduce the number of people swerving between lanes to find the lane that is moving the fastest.
- One person felt that it would not improve safety because cars would be traveling at higher speeds.

When asked if this facility would improve reliability or predictability of travel times, four people in the second focus group agreed with one participant commenting that if you need to get somewhere, you can pay to travel faster.

What Would You Call These Managed Lanes?

Participants were asked what they would call these pay lanes. Some responses included:

- Toll lanes
- Toll road
- FasTrak™
- Express way
- Reversible lanes
- Carpool lane
- Express lanes
- Can pay to drive if not carpool

How Would You Describe The Project?

Participants were asked how they would describe the project they had just discussed. Some responses included:

- Extension of I-5
- Two lanes you have to pay for
- Widen I-5

- Temporary solution to much larger problem that will make people mad
- Will have the same problems
- Changes/improvements to highway
- HOV lanes
- Exploring options for alleviating traffic
- Hybrid toll way
- Pay lanes
- Paid lanes
- Way to get rid of congestion on I-5 modeled after SR 91's success
- Idea of adding more lanes to create toll road

2.2 SECOND ROUND (FOCUS GROUPS #3 AND #4)

2.2.1. Key Findings

- Initial reactions to the project were mixed in both groups. Some felt that the addition of managed lanes to the I-5 was a positive proposal, while others felt the project was not fair or the best use of space or funds.
- There was no clear preference voiced by either group for direct access ramps or slip access and egress points. A wide range of perspectives were provided, but it appears that in general, travelers are not sufficiently familiar with the salient points of the two alternatives to generate a strong preference for either one. Some think that direct access ramps are safer and easier because they don't require crossing lanes. Others think that slip access ramps are safer and easier because they could be more frequent, and there is less of an issue about getting up to speed to enter the managed lanes. Participants generally felt that direct access ramps did not justify traveling further or paying a higher toll. The results from this discussion favor providing direct access ramps at the heaviest volume intersections and slip access in-between at lower volume access/egress points.
- For shorter distance travelers there was no clear preference for fixed or variable tolls. However, a majority of the longer distance travelers in the second group preferred variable tolling, and appeared to be more in touch with the concept of using tolls to maintain free-flow conditions in the managed lanes.
- Both groups agreed that the toll price and method of calculation must be clear enough for travelers to easily understand it for people to feel comfortable using the lanes. Participants also recommended posting the time savings that would be achieved if they used the managed lanes.
- The groups generally agreed that free or drastically reduced tolls are necessary to effectively motivate the formation of carpools and vanpools. Focus group participants generally are against raising the number of carpool occupants from two to three, saying that establishing a carpool is already difficult.
- Participants of both groups were asked to explain the benefits and give a summary of the proposed I-5 project. Most explained that the project consisted of toll lanes for those willing and able to pay.

- Participants in both focus groups mentioned concerns about fairness and affordability of the toll lanes to all freeway users. The project is more likely to be positively received if it is presented as HOV lanes that will be available to single occupancy vehicles that are willing to pay, so that the new lanes will be used to capacity while maintaining free-flow conditions.
- The way the toll is communicated could also be presented as being reduced when lanes are not at full capacity, rather than increased as needed to maintain free-flow conditions. This accentuates the positive stating the toll level more as a reward than a punishment.
- The participants that are long distance travelers appear to better understand and support the concept of congestion-based variable tolling. They are likely to both support and be heavier users of the system. The short distance travelers (which appear to be at least half of all I-5 users) are not as likely to see a clear benefit for the new facility. Clear communications that show how the facility is designed to encourage car/vanpooling (and even Coaster and express bus service), and to pull as much traffic as possible off of the general-purpose lanes will generate a more positive perspective among this large constituency.

2.2.2. Background

Random households in zip codes surrounding Interstate 5 (I-5) between Oceanside and the I-5/I-805 split were contacted by telephone during the months of April and May 2005 and asked to participate in the two I-5 Focus Groups, held May 5 in San Diego. Potential participants were screened for traveling on I-5 between Oceanside and the I-5/I-805 split, and separated into groups of those who travel less than 10 miles per day and those who travel 10 or more miles per day on the section of I-5 that will have the managed lane facility.

This second set of focus groups focused on expanding on the results of the telephone survey; exploring why the target audience appears to have a preference for fixed tolls over variable tolling, and does not appear to be especially concerned about maintaining a high level of performance in the managed lanes. Please see Appendix D for more information on these participants.

2.2.3. Focus Group Participants

In order to provide a representative sample of I-5 North Coast users, potential focus group participants were contacted using a random digit dialing (RDD) list to avoid the bias that would occur with a listed sample. The RDD list was developed using a list of zip codes that were likely to contain I-5 freeway users in the targeted area. Potential participants were contacted and screened to ensure that they were at least 18 years of age, live within the targeted list of zip codes, and travel on I-5 a minimum of three days per week. Focus group participants were recruited to balance age, gender and employment levels.

The focus group discussion guide was developed using previous research including prior focus groups with I-5 users, executive interviews conducted with a variety of community leaders, telephone surveys of I-5 drivers, and field surveys with alternative mode commuters.

2.2.4. Responses to Topics Presented

Reactions to Potential I-5 Improvements

A detailed explanation of the proposed project was given to the participants by the moderator, and discussion ensued about initial reactions to the project.

Focus Group 3

The first group of participants, those who travel less than 10 miles each way on their regular trip on the I-5 corridor between Oceanside and the I-5/I-805 split, had a range of initial reactions to the proposed project. One person believed that the toll lanes would be best used by those who wish to travel long distances through the corridor. One participant voiced concerns about costs, while another was more interested in restricting access of large trucks.

Focus Group 4

Initial reactions to the proposed project of the second group were more intense. These participants, who use the I-5 corridor for 10 miles or longer on their regular trip, all have had prior experience with toll lanes.

One participant mentioned that it did not seem feasible to fit seven lanes on each side of the freeway through the corridor. Two people voiced concerns that tolls might not be fair to those who cannot afford to pay for them, and that the toll idea would be 'elitist.' Another participant countered that if someone could afford to pay, then why not have toll lanes? One person said he thought the toll lanes were a good idea because they would bring money to the city, and he felt that tourists from Los Angeles would use them. He also stated that he would be likely to use them.

Two participants indicated a preference for general purpose lanes over managed lanes.

Access/Egress

Focus group members were then asked to give their input about access and egress points to the managed lanes. Slip access and direct access ramps were also explained and discussed.

Focus Group 3

The group was divided about the number or frequency of access points to the managed lanes. Some participants felt that more frequent access points would enable short trips to utilize the lanes and make it easier to access the lanes. Others said that less frequent access would be safer due to less traffic weaving across the freeway to get into the lanes.

In the first group of participants, about half preferred direct access ramps and half preferred slip access. Some said frequent slip access would allow easier use of lanes, while others wanted direct access ramps because getting into the lanes would be faster and safer.

When asked if they would pay more to use the direct access lanes, the majority said they would not.

Focus Group 4

The second group of participants was also divided regarding the frequency of access points and preference for direct access ramps or slip access. One participant explained that fewer access points would be a good method of keeping the lanes free flowing, and another thought that if the managed lanes were meant for longer trips, then there should be fewer access points. Several people said that if they could not get on or off where they wanted to, then they would not use the lanes; therefore, more frequent access points would be needed. One participant suggested that access points might be varied by time of day.

The majority of people in the second focus group said that they would prefer direct access ramps to slip access for ease of use and safety reasons. One participant explained that if he could use the direct access lane and not need to weave across traffic, he would know why he was paying to use the lanes. Two people expressed concerns about the acceleration of cars entering the ramp slowing down the traffic in the lanes.

When asked if they would use the direct access ramp if they had to drive about two miles further to reach it, the majority said they would use the closer, slip access. Participants were also asked if they would pay more to use the direct access lanes, only a few said they would pay more depending on congestion and time of day.

Safety

Respondents were asked about how managed lane access and egress would be safest.

Focus Group 3

A participant in the first focus group felt that fewer managed lane access points would make the freeway safer, as it would reduce weaving in and out of traffic. In contrast, another participant explained the difficulty of urgently getting over to infrequent entrances, and believed that there should be more access points to minimize this problem. Another person said that clear signage to let newcomers where the access points are would make the freeway safer, as they would be able to get to the lanes in time, as well as look out for others merging in and out of the lanes. One participant also felt that the use of direct access ramps would make the managed and general purpose lanes safer.

Focus Group 4

Those in the second focus group felt that fewer access points would make the managed lanes safer as well as the general purpose lanes, as it would reduce weaving in and out of lanes.

Both focus groups mentioned the use of barriers other than painted lines to keep people from “cheating” on the system, and from causing a hazard by weaving in and out of lanes over a painted barrier.

Tolling

The focus group moderator explained the two types of tolling to participants, fixed and variable, and then gave details about variations on variable tolling. Group members were then asked for their preferences and opinions.

Focus Group 3

The group was relatively evenly divided between fixed and variable tolls. Of the eight participants in the first focus group, four prefer fixed tolling, while one prefers dynamic variable tolling based on congestion, and one prefers variable tolling based on time of day. Two participants said that because of the tolls, they would never use the managed lanes, and therefore did not prefer fixed or variable tolling.

Comments made about fixed tolls:

- Consistency in price, even if free-flow conditions are not guaranteed
- Certainty in price, no surprises when the bill arrives
- Traffic is too dynamic to be able to price variable tolls accurately
- Always know how much it is going to cost
- Prefer fixed tolls because I know how much it is going to cost if I leave home late. I have incentive to leave on time to avoid traffic and therefore paying the toll.

Participants also made the following comments about variable tolls, and seemed to prefer tolls that vary by congestion rather than by time of day:

- Tolls variable by congestion scientifically solves traffic problems
- Reflects supply and demand when tolls vary with congestion
- Variable tolls cause uncertainty and customers have difficulty monitoring billing
- Prefer variable but don't believe traffic will always be free flow due to possible accidents in managed lanes
- Signs should be on entrance ramp to show what tolls would be in advance
- Signs with tolls should show the price and time savings if managed lanes selected

It is interesting to note that although the variable tolling was clearly explained to be based on maintaining free-flow conditions in the managed lanes, most participants appeared to interpret this as increasing the tolls as congestion in the general-purpose lanes increase, rather than based on congestion in the managed lanes.

Focus Group 4

The majority of participants in the second focus group preferred variable tolling over fixed. Of the nine participants in the second focus group, one prefers fixed tolling, while six prefer dynamic variable tolling based on congestion, and two prefer variable tolling based on time of day. The following are some of the comments made regarding fixed tolls:

- Fixed pricing won't work, no one will use toll lanes if there is no traffic
- Prefer fixed, but lanes should be closed or free to all during off-peak hours
- Fixed does not utilize lanes properly
- Prefer fixed tolls because they are easier for users to understand than tolls that change all the time

Tolling that varies by congestion is also the preferred choice for the second focus group. Below are some of the comments members of this group made regarding variable tolls:

- Tolling based on congestion is fair

- Variable pricing by congestion is better because no one will use managed lanes if traffic is lighter unless the lanes are lower priced, and managed lanes should be generating revenue at all times
- Variable tolls based on congestion is preferred because motorists can use the price as a barometer to tell whether traffic is bad or not
- Prefer variable pricing by congestion because I use the traffic during rush hour
- Prefer variable pricing by time of day because dynamic pricing is unpredictable
- Want to know how much I am paying so variable pricing by time of day
- Prefer variable pricing by congestion because accidents can happen any time of day and time of day pricing is not equipped to respond to them

Participants in the second focus group were also asked about the pricing of the toll in order to keep the traffic lanes free flowing. The group generally agreed that the price would need to be more than $3.50 and less than $10.00 for the whole corridor, and would be optimal in the $5.00-$6.00 range. One participant mentioned that for an every day commuter, $10 a day was simply too much, especially one-way. Participants also agreed that the toll needed to be more than the Coaster price of about $4.00, and that it might encourage Coaster usage.

One interesting idea that surfaced in both groups was the notion that if people do not understand the tolling system, and are afraid their bill will be higher than expected, they will not use the lanes, much like cell-phone billing. Therefore, whatever pricing is in place, it must be easy to understand and clearly marked in advance of the access points.

Another idea that was brought up in both groups was the use of dynamic signs that would display the pricing, the travel time difference between the managed lanes and regular lanes, which would enable approaching motorists to calculate a benefit-cost for the trip (i.e., the user knows what he/she is getting for their investment). Participants in the focus group felt this added feature would help motivate drivers to use the managed lanes.

Carpooling

The groups then discussed issues surrounding carpools and the managed lanes, such as whether free or reduced tolls would encourage carpooling and whether the number of people needed in a vehicle to create a carpool should be increased from two to three or more.

Focus Group 3

Several members of the first focus group had the position that carpools are often impractical no matter what the encouragement. However, the group agreed that to incentivize carpooling, the toll should be free or dramatically reduced (by at least 75 percent). One person in this group mentioned that she would more aggressively look for people to carpool with if she knew that she could then use this managed lane to avoid congestion.

As this group felt carpools were often impractical, they did not like the idea of increasing the number of riders in a carpool from two to three or more.

Focus Group 4

Participants in the second focus group also believed that reduced tolls would not encourage carpooling but conversely felt that carpools should not need to pay tolls. This group also pointed out that for a carpool, the tolls per person would already be reduced from the regular rate just by riding in the same car and splitting the regular toll.

Another participant in the second group felt that increasing the number of people needed to make up a carpool to three or more would encourage people to look for more members for a carpool group. However, a different participant responded that raising the carpool formation requirement would make using the managed lanes as a carpool more difficult.

Benefits and Project Summary

As a summary of the discussion, participants from both groups were asked to explain how they would describe benefits of the proposed project and to provide a summary of the proposed I-5 project as they understood it.

Focus Group 3

Following are many of the comments that participants in the first group gave as a summary and to describe the benefits of the proposed project:

- Mission for SANDAG is to provide services for everyone, people need to know how this project will impact the general traffic flow
- Focus on the reduced rate for carpools
- If you want a faster commute, you can pay a toll
- If the managed lane operator is a private company then they are just looking to make money and not thinking about what is best for commuters
- Approach to managed lanes operation is based on simple supply and demand
- Private company could manage it better, government is less efficient

Focus Group 4

Participants in the second focus group made the following comments to describe the benefits of the proposed project:

- A new system where rich travel faster
- Adding toll lanes to free up traffic, designed to ease congestion; goal is to make lane free flowing
- I am a little confused about variable tolls; how they are calculated and how I'll be able to predict what the fees would be
- Providing extra lanes so when there is traffic you have the option to pay to use them for a faster trip
- The goal of managed lanes is to provide free flow travel and manage the lanes by tolling. Managed lanes provide options where travelers can make choices about using them
- Idealistic but not feasible to add additional lanes in the I-5 North Coast corridor
- Toll lanes that provide free flow traffic are successful (e.g. SR 73 in Orange County); believes a private company is more efficient

Fairness and Environmental Justice

Participants in both focus groups mentioned concerns about fairness and affordability of the toll lanes to all freeway users. The words "elite" and "for the rich" were mentioned at some point in both groups.

Focus Group 3

One or two participants in the first group said at some point in the discussion that the toll lanes might be unfair to people who cannot afford to pay. Others made comments about how the toll lanes were for the rich, but did not necessarily seem to be concerned about it. The people who could afford it were seen as both "Hummer drivers" and people whose time is important to them.

Other parts of the discussion returned to what participants felt about how the tolls should be used, and what money should pay for the roads. One participant in the first group said that money should not go to a private company. Another felt that if taxes pay for the construction, then it is a "social service" and the people should not have to pay a toll. A participant also mentioned that any profits should go toward San Diego transportation.

Focus Group 4

Participants in the second focus group also made comments about the fairness of tolls and about how the toll revenues should be used. One participant's initial reaction to the plan was that only rich people could use the toll lanes, and that this might not be fair to others who cannot use them.

Most participants in the second focus group felt that a private company would be preferable to manage the toll lanes, as they would be more efficient and responsive.

The second focus group felt that excess toll revenues from the managed lanes should go to fund:

- Schools
- Mass transportation such as bus and train
- Movable zipper lane
- Expanded general purpose lanes

This group also was asked to comment on how the tolls could be made fairer for low and moderate income populations. Several participants mentioned some method of providing reduced tolls or assistance for lower income people, such as students and seniors. Other participants described a system where more frequent users would get a discount, something like a bulk discount or monthly pass in the range of $200.

2.2.5. Recommendations

Following are some suggestions on how to present the managed lanes to help minimize the 'elitist' image.

- Present the managed lanes as HOV lanes rather than HOT lanes. HOVs go free or pay a significantly reduced fare to use the lanes, while others can pay more to ride if they choose as long as it doesn't hinder free flow conditions on the managed lanes.

- Accentuate the positive. State the objective of the project as "maximizing traffic flow on the managed lanes while maintaining free flow conditions" rather than focusing only on free flow conditions.

- Consider the possibility of providing discounted toll prices for seniors, students, and lower incomer families that require assistance. It should be noted that this might prove difficult to implement since once a transponder has been issued, it could given by the transponder owner to anyone to use.

Findings from the focus groups lead to recommendations for further study and ways to present the benefits of the project from a positive perspective.

CHAPTER 3

I-5 INTERCEPT SURVEYS

As part of the SANDAG I-5 North Coast Managed Lanes Study that includes focus groups, stakeholder interviews, telephone surveys, and intercept surveys were performed by Strategic Consulting & Research.

3.1 KEY FINDINGS

To assess the opinions of non-single occupant vehicles (SOV) commuters, surveys were distributed on February 7, 2005 on an express bus, the Coaster, and in an Oceanside park and ride lot at the intersection of I-5 and SR 78. Approximately 400 surveys were distributed to yield a total of 353 completed surveys.

3.1.1. Purpose

This survey was conducted as part of an overall outreach effort to fully understand the awareness, knowledge, concerns and attitudes about the I-5 North Coast Managed Lanes among the various impacted stakeholders. The specific purpose of the intercept surveys was to capture input from alternative mode commuters that due to their low incidence in the general public, would not be captured in sufficient quantity in an RDD telephone survey in order to provide quantitative results. The results from the intercept surveys will be combined with the results from other research efforts to develop recommendations for successful execution of the project.

3.1.2. Methodology

In order to capture alternative mode commuters in sufficient numbers for quantitative reporting, intercept surveys were conducted onboard the Coaster, express bus service, and at a park and ride lot. A draft survey instrument was developed using the results of the previous focus groups and executive interviews conducted with community leaders. The draft survey instrument was submitted to SANDAG and the Technical Advisory Committee for review, and recommended changes were incorporated into the final survey instrument.

Surveying was conducted between 6:00 a.m. and 9:00 a.m. to capture alternative mode commuters utilizing park and ride lot # 44 at the intersection of I-5 and SR 78, onboard Coaster trains from Oceanside to Sand Diego departing Oceanside at 6:06 and 6:44 AM (and boarding between Oceanside and Solano Beach), and onboard express bus # 310 between the Oceanside transit center and UTC Mall. The one page survey was available in both English and Spanish.

3.1.3. Alternative Modes of Travel

- Coaster and express bus users utilize public transit 4.5 and 4.4 days per week respectively while car/vanpoolers say they do not use public transit on I-5 at all.

- Express bus riders say they also carpool on I-5 a mean of 0.4 days per week, compared to 0.2 days per week for Coaster riders.
- Park and ride lot respondents are most likely to also drive alone at 1.3 days per week while both Coaster and express bus riders drive alone less than half a day per week

3.1.4. Potential I-5 Improvements

- Eighty-two percent of these non-SOV corridor users think that I-5 needs to be expanded.
- Sixty percent of respondents support the proposed idea of one general purpose and two toll express lanes in each direction.
- High occupancy vehicles (HOV)/vanpoolers are the most supportive with 90 percent saying I-5 needs to be expanded and 76 percent supporting the proposed managed lane project.

3.1.5. Tolling

- Thirty four percent believe that a fee schedule set by time of day will encourage carpooling, while only 26 percent believe varying fees by traffic conditions will encourage carpooling.
- Thirty-nine percent of respondents felt that a fee schedule set by time of day will encourage transit usage, while 26 percent of respondents believe fees that vary with traffic conditions will encourage transit usage.

3.1.6. Proposed Project Opinions

- Alternative mode users agree that the toll express lane project will make the I-5 safer, that express lanes with reduced or free tolls for carpools will increase carpooling, and that toll lanes are a good way to help pay for freeway expansion.
- More than half of bus and train riders support spending more money on public transit services, while a majority of HOVs and vanpoolers disagree.
- In contrast, general I-5 users contacted via telephone survey do not feel that money should be invested in public transit instead of freeways, and disagree that managed lanes with free or reduced fares for HOVs would increase carpooling.

3.2 INTRODUCTION

Surveys were distributed on February 7, 2005 on an express bus, the Coaster, and at park and ride lot #44 in Oceanside at the intersection of SR 78 and the I-5. Surveying was conducted between the hours of 5:45 and 10:00 a.m.. Surveys were a single page in length and were available in English and Spanish at the preference of each respondent.

Although surveys were offered in both English and Spanish, only one complete Spanish-language survey was received.

Approximately 400 surveys were distributed to yield a total of 353 complete surveys.

Of the 353 complete surveys, 78 percent (276) were from the Coaster, five percent (17) were from the express bus, and 17 percent (60) from the park and ride lot.

Surveys were conducted on an intercept basis for these alternative mode commuters because their incidence in the general public would result in only a handful of respondents in the random digit dialing telephone survey. Completing 350 surveys with alternative mode commuters provides unique insights from these commuters, and also enables comparisons between SOV and alternative mode commuters for selected questions.

Only those Coaster riders that boarded the southbound train between Oceanside and the Solano Beach station were given surveys. The express bus service traveled between the Oceanside Transit Center and UTC Mall, and riders in both directions were surveyed. Park and ride users were given surveys if their carpool or vanpool was going to travel southbound on I-5, or to pool participants that were going northbound but commuted to the park and ride lot from a point further south via I-5.

3.3 PURPOSE

This survey was conducted as part of an overall outreach effort to fully understand the awareness, knowledge, concerns and attitudes about the I-5 North Coast Managed Lanes among the various impacted stakeholders. The specific purpose of the intercept surveys was to capture input from alternative mode commuters that due to their low incidence in the general public, would not be captured in sufficient quantity in an RDD telephone survey to provide quantitative results. The results from the intercept surveys will be combined with the results from other research efforts to develop recommendations for successful execution of the project.

3.4 METHODOLOGY

A draft survey instrument for the intercept surveys was developed using the results of previous focus groups and executive interviews conducted with community leaders. The draft survey instrument was submitted to the Technical Advisory Committee for review, and recommended changes were incorporated into the final survey instrument. The goal of the survey was to provide as much information as possible in the same format at the telephone survey so that results between the two groups could be compared.

In order to capture alternative mode commuters in sufficient numbers to provide quantitative results, a sampling plan was developed to reach respondents during their commute. Coaster riders were interviewed onboard the Coaster, express bus riders were interviewed onboard the express bus, and car/vanpoolers were interviewed at a park and ride lot.

The total established sample size for alternative mode commuters in the project plan was 75 respondents, the minimum amount necessary to provide rough quantitative measurement of alternative users' opinions, so that they could be compared to respondents to the telephone survey. However, given the amount of resources required to provide a representative sample across the three different modes (commuter rail, express bus and car/vanpooling), enough surveying resources were utilized to expand the total number of completed surveys to 353.

To capture Coaster riders, two surveyors distributed surveys on each of two trains departing Oceanside to San Diego at 6:06 and 6:44 a.m. Self-administered surveys were available in both English and Spanish and were distributed to riders who boarded between the Oceanside and Solano Beach stations. A total of 276 completed surveys were collected onboard the Coaster.

To capture car and vanpoolers, interviewing was conducted at park and ride lot #44 near the intersection of I-5 and SR 78. Surveys were distributed in both English and Spanish to all qualified car/vanpoolers. Qualified car/vanpoolers included all pools heading southbound on I-5, and those individuals who were going north on I-5, but arrived at the park and ride lot by driving north on I-5. A limited number of additional surveys were

also provided to pools that were picking up additional riders at different locations that then continued southbound on I-5.

Most of the surveys were completed on-site at the park and ride lot and returned in person to the interviewers. However, there were some potential respondents that did not have time to complete the survey before departing. These potential respondents were given postage-free business-reply envelopes so that they could complete the survey later in the day and return it at no cost via the mail. Approximately 20 of the 60 total park and ride lot surveys were completed via business reply mail.

The only express bus service currently using the North Coast portion of I-5 is bus #310 that travels between the Oceanside Transit Center and UTC Mall. This bus was surveyed in both directions and surveys were completed with 17 of the 21 riders.

Upon completion of data collection, cross-tabulations of results were produced using commute mode and demographic variables as banner points. The cross-tabulations were used in data analysis, and a draft report was produced. The draft report was submitted for SANDAG for comments and recommendations. These comments and recommendations were incorporated into the draft to produce the final report.

3.5 ALTERNATIVE MODES OF TRAVEL

Figure 1 shows the mean number of days per week participants reported using various alternative modes of travel. This is displayed in total and by survey location.

As shown, bus and Coaster users are likely to use these modes a mean of 4.4 and 4.5 days per week respectively, while those surveyed at the park and ride lot do not use the bus or Coaster at all.

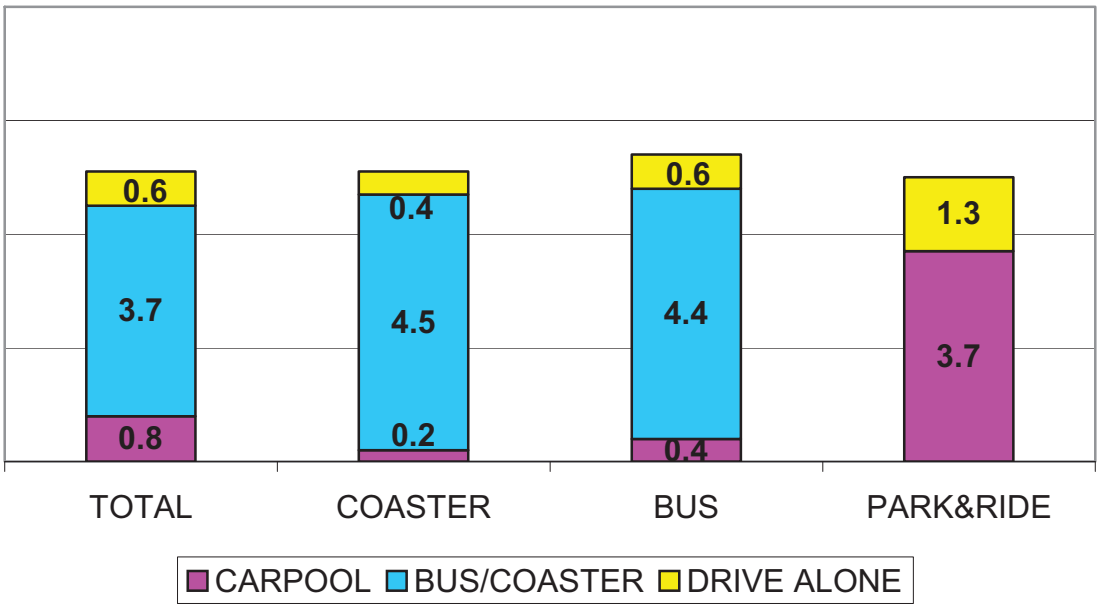
Carpooling was selected as a mode choice across survey locations, with Park and Ride users carpooling a mean of 3.7 days per week. Bus users followed, carpooling 0.4 days per week and Coaster users carpool 0.2 days per week.

Park and Ride users also drive alone a mean of 1.3 days per week, with bus and Coaster riders following at 0.6 and 0.4 days per week respectively.

FIGURE 3-1

ALTERNATIVE MODES USAGE BY SURVEY LOCATION

TRANSIT MODE: MEAN DAYS PER WEEK BY SURVEY LOCATION



Respondents were asked if they felt that I-5 should be expanded and whether they support the proposed one general purpose and two toll lanes in each direction.

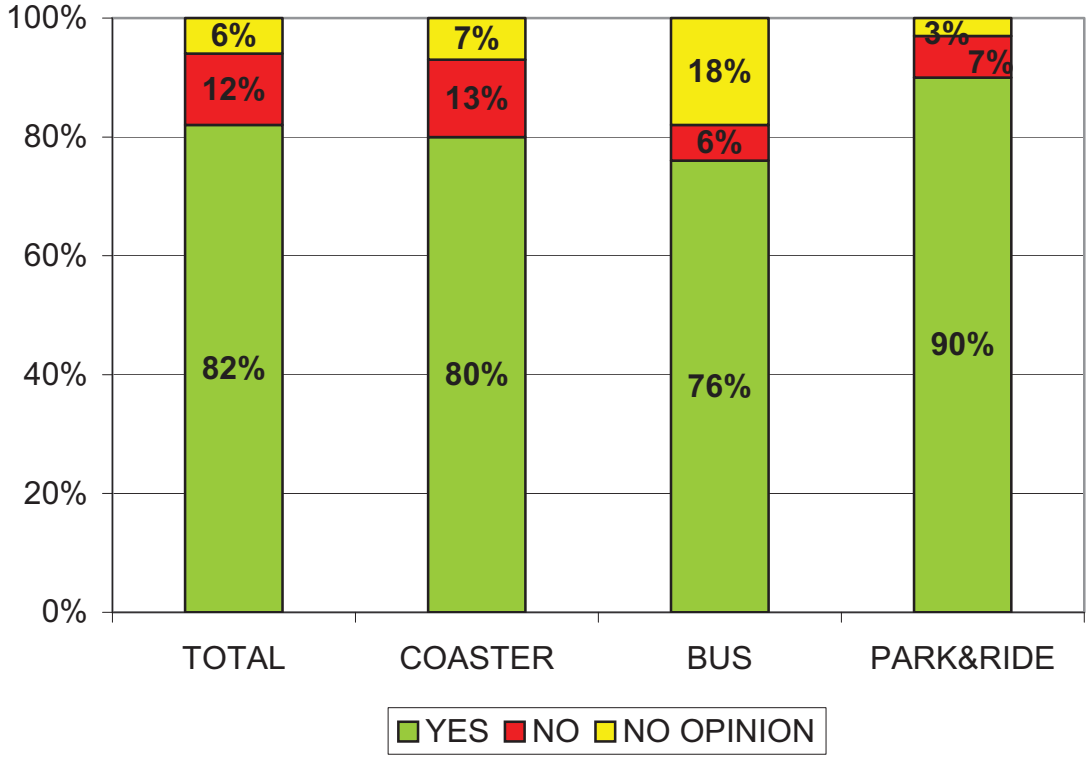
3.6 POTENTIAL I-5 IMPROVEMENTS

The vast majority of alternative mode commuters think that I-5 needs to be expanded, at 82 percent overall. Park and ride participants are most strongly in favor of expansion, at 90 percent, while bus users are less enthusiastic at 76 percent.

FIGURE 3-2

I-5 EXPANSION

DO YOU THINK I-5 NEEDS TO BE EXPANDED?



This finding is consistent with those from the telephone survey of commuters, which found that 82 percent support improvements to I-5.

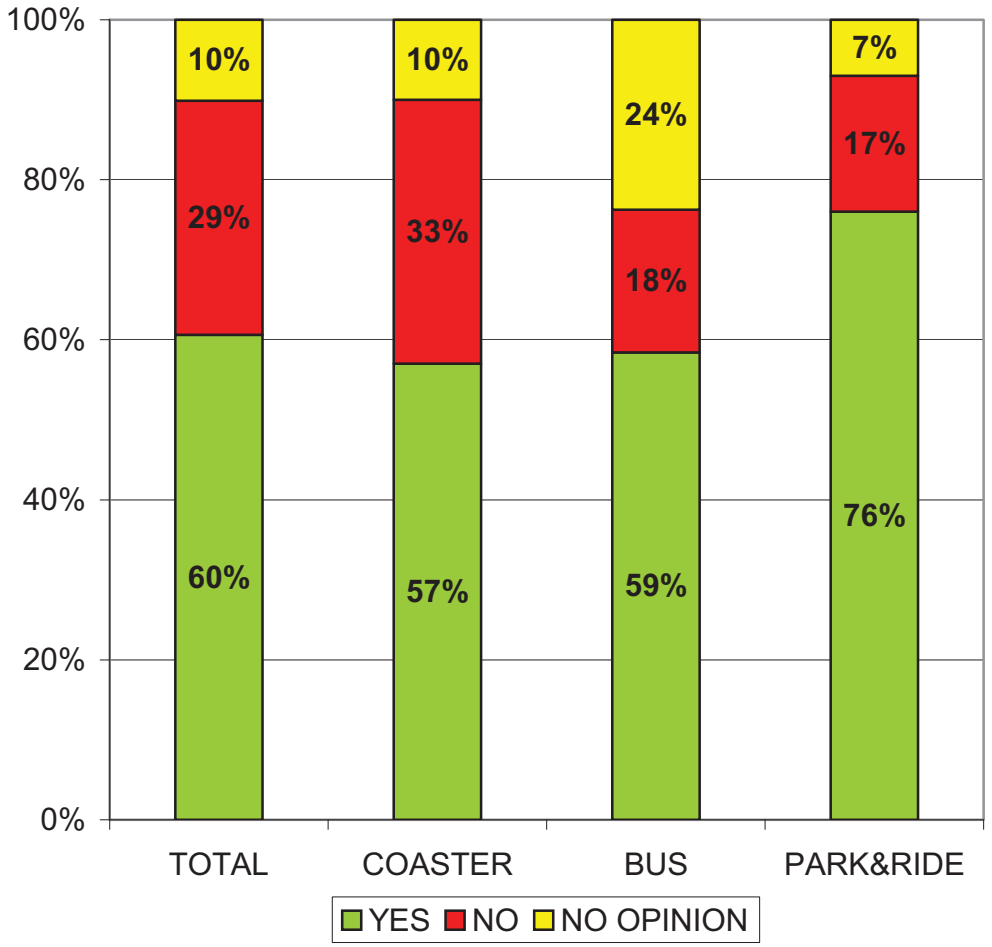
Overall, 60 percent of alternative mode commuters support the proposed idea of one general purpose and two toll express lanes. This level of support is consistent with both Coaster and bus passengers. The park and ride users are more strongly in support of this proposed expansion of I-5.

Of all groups, Coaster riders are most against the addition of one general purpose lane and two toll lanes in each direction, with 33 percent not in favor.

FIGURE 3-3

SUPPORT PROPOSED IMPROVEMENTS

DO YOU SUPPORT CONSTRUCTION OF ONE GENERAL PURPOSE AND TWO TOLL LANES IN EACH DIRECTION?



Support of the proposed package of two tolled express lanes and one general purpose lane in each direction received similar support from the general corridor user survey at 62 percent, as by the alternative mode commuters at 60 percent. As noted above, only the HOVs/vanpoolers varied significantly with 76 percent supporting the concept.

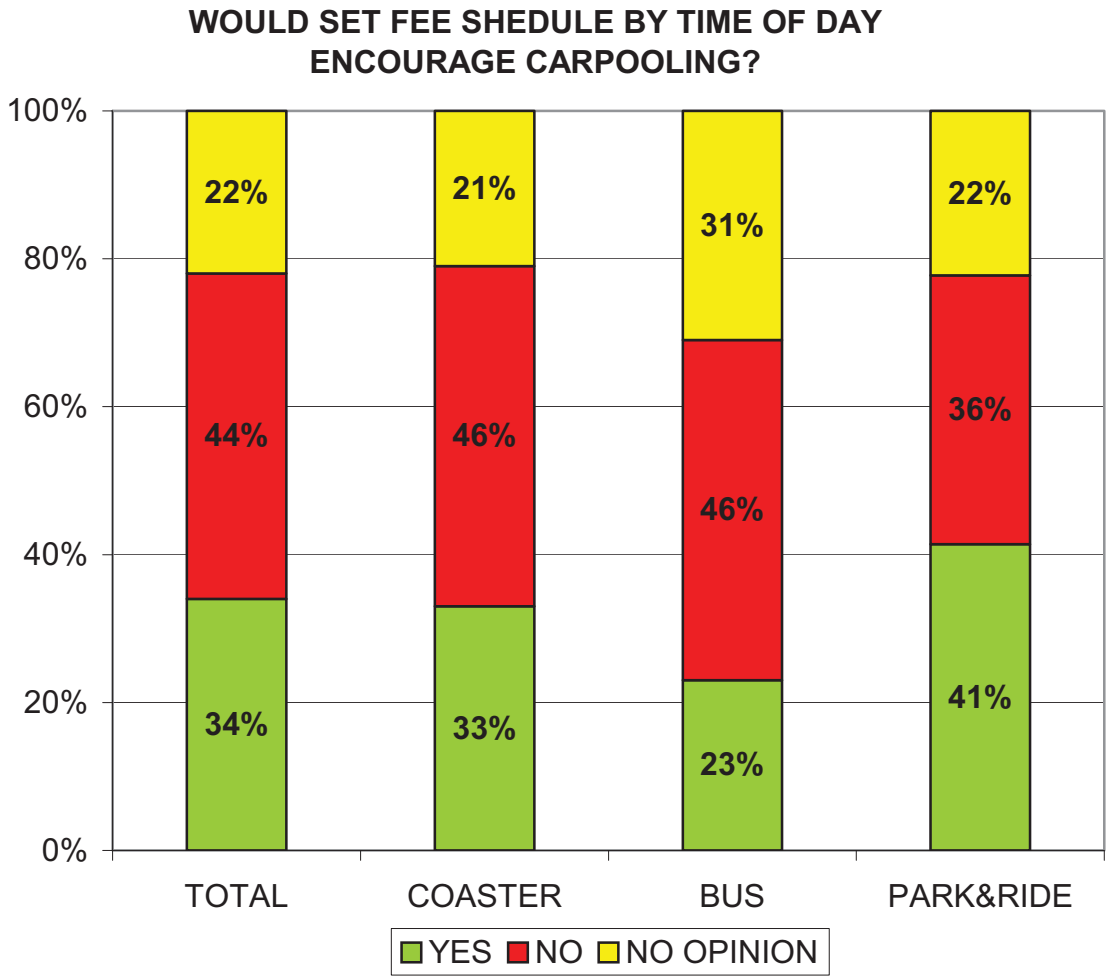
Survey participants were questioned regarding toll usage, and its effects on mode choice. Results are comparable with the telephone survey of commuters who prefer fixed tolls (40 percent) to variable tolls (30 percent).

3.7 TOLLING

Thirty-four percent believe that a fee schedule set by time of day will encourage carpooling. Those surveyed at the park and ride lots are most strongly in agreement among the three groups at 41 percent.

FIGURE 3-4

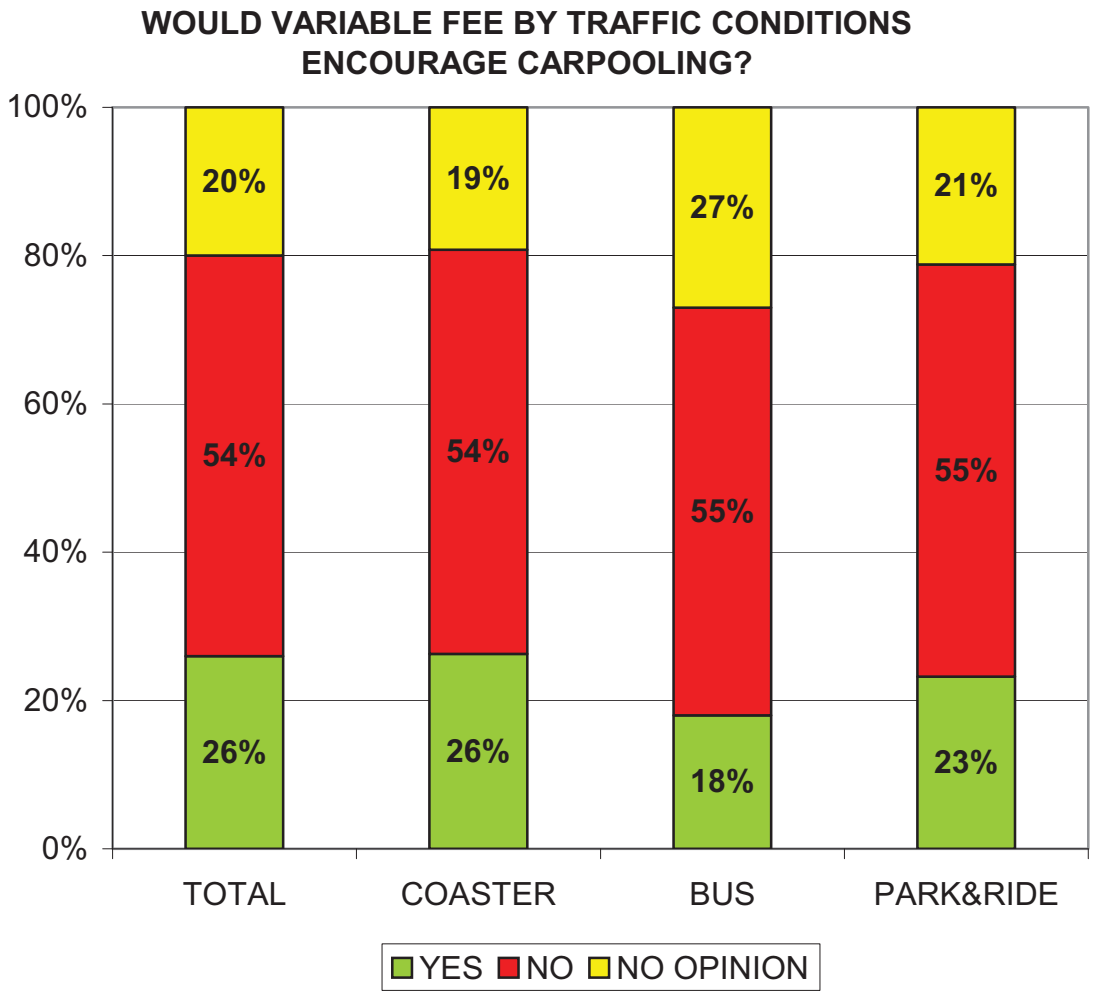
ENCOURAGE CARPOOLING: SET FEE SCHEDULE



Respondents are less likely to believe that varying fees by traffic conditions will encourage carpooling, with 26 percent in agreement. Bus riders are least in agreement at only 18 percent.

FIGURE 3-5

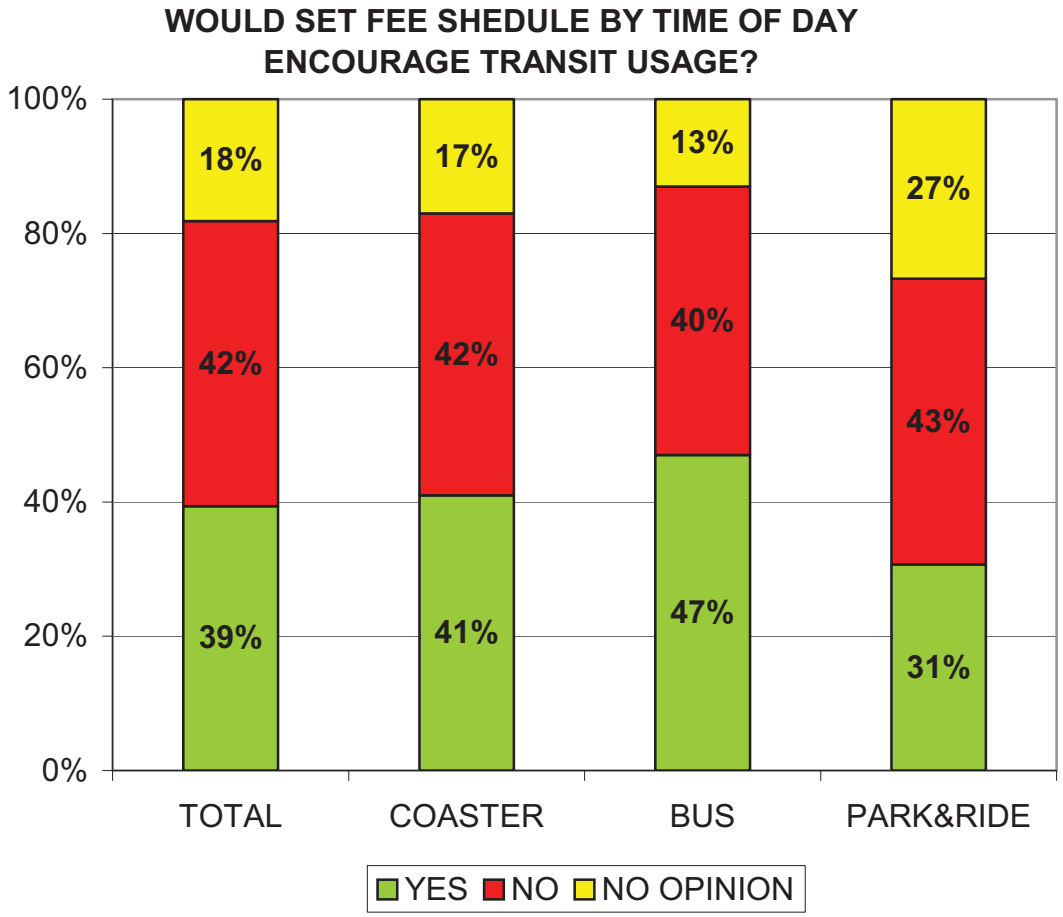
ENCOURAGE CARPOOLING: VARIABLE FEE



Thirty-nine percent of respondents feel that a fee schedule set by time of day will encourage transit usage. Bus riders are most positive about this toll type with 47 percent believing that a fee schedule would encourage transit use.

FIGURE 3-6

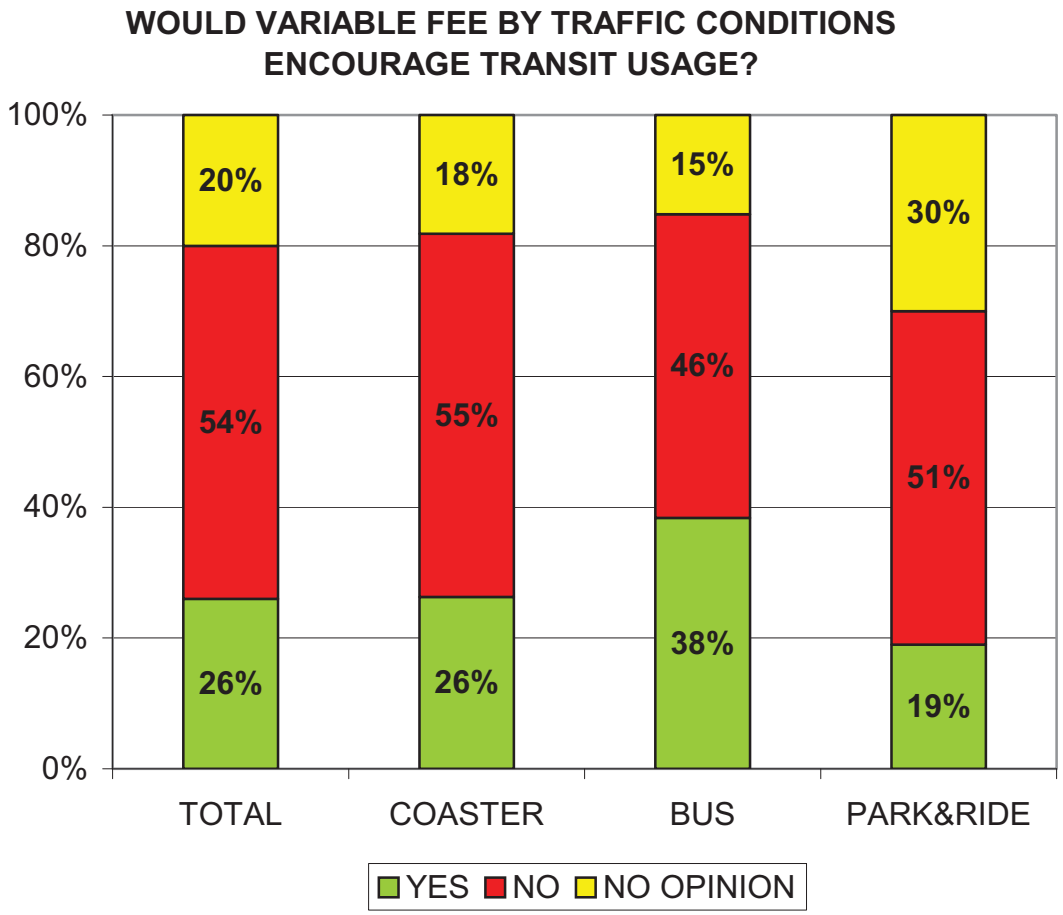
ENCOURAGE TRANSIT USE: SET FEE SCHEDULE



Twenty-six percent of respondents think that a fee that varies with traffic conditions would encourage transit usage. Again, bus users are most likely to feel that a variable fee would encourage transit use while park and ride users are least likely to agree that fees that vary with traffic congestion would increase usage of transit.

FIGURE 3-7

ENCOURAGE TRANSIT USE: VARIABLE FEE

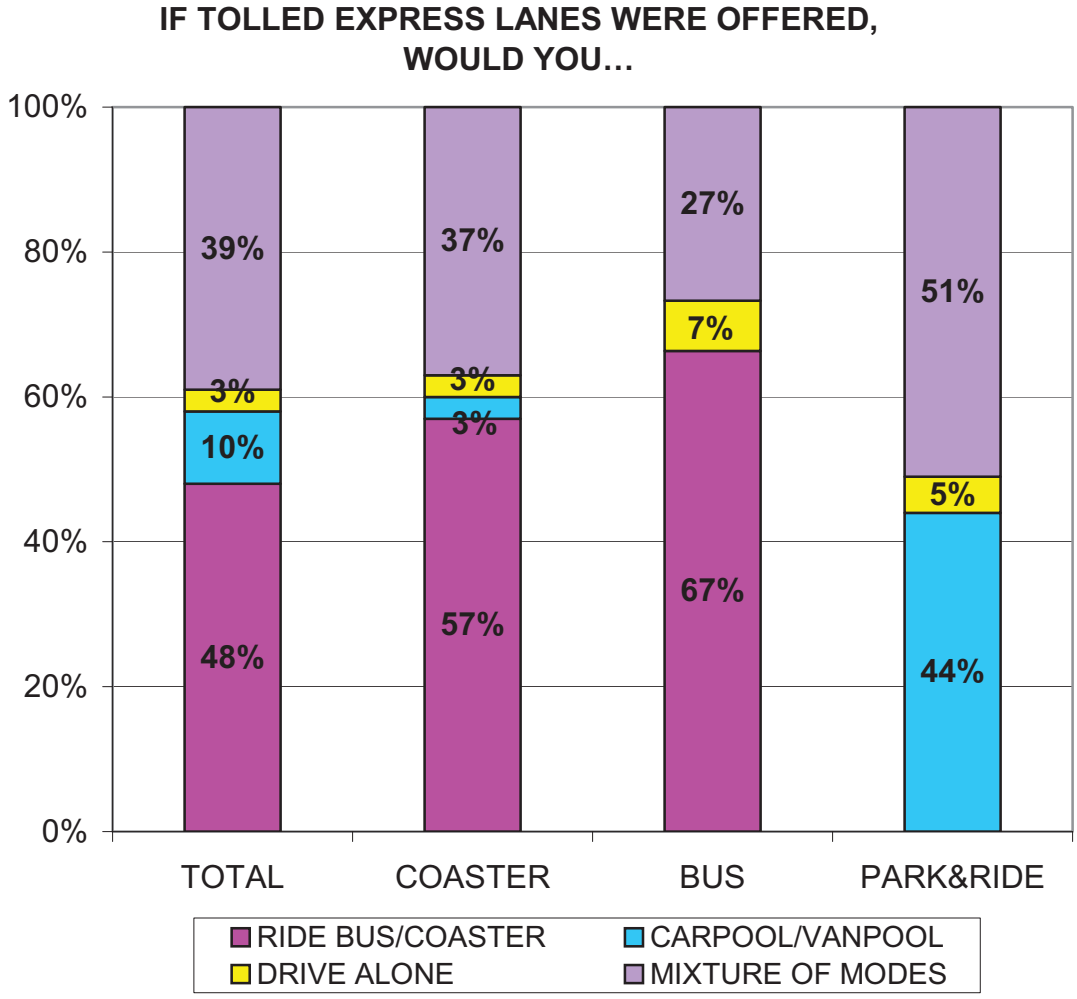


Respondents were asked what transit mode they would choose if express toll lanes were offered. Overall, only three percent indicate that they would drive alone exclusively.

Those surveyed on the express bus and Coaster say they would continue to use these modes for the bulk of users, at 67 and 57 percent respectively. Park and ride respondents would use a mix of modes (51 percent) and continue to carpool or vanpool at 44 percent.

FIGURE 3-8

MODE CHOICE WITH TOLL LANES



Survey participants were asked whether they agreed or disagreed with statements that apply to potential I-5 improvements.

3.8 PROPOSED PROJECT OPINIONS

Respondents were asked several opinion questions about the proposed project, and were asked to respond on a four point scale from “Strongly Disagree = 1” to “Strongly Agree = 4”.

The following table details these scale questions and the percent of respondents in each category, along with the mean rating.

Overall, corridor users agree that the toll express lane project will make the I-5 safer, that managed lanes with reduced or free tolls for carpools will increase carpooling, and that toll lanes are a good way to help pay for freeway expansion.

However, some respondents do not think that the project will reduce air pollution, and think that the money should be invested in buses and trains instead. Coaster respondents do not feel that the expansion project would reduce air pollution and bus riders were the only group that feels that noise would increase in neighborhoods because of the project. Coaster and express bus riders agree that money should be invested in more public transit instead of freeways, while the majority of HOVs/vanpoolers disagree.

Respondents contacted via telephone survey differed from the alternative mode commuters in the intercept survey in their agreement with the opinion questions in the following instances:

- Contrary to the alternative mode commuters they do not feel that money should be invested in public transit instead of freeways.
- General commuter respondents disagree that toll lanes with free or reduced fares for carpools would increase carpooling.
- General commuters feel that the proposed expansion would not make I-5 safer.

The average response scores for the total alternative mode survey, the individual alternative modes, and the general telephone survey results are detailed in Table 1 on the following page.

TABLE 3-1

PROPOSED PROJECT OPINIONS

QUESTIONS:	RATING					OVERALL
	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	NO OPINION	
DIVIDER BETWEEN EXPRESS AND REGULAR LANES SHOULD BE MORE THAN PAINTED LINES	6%	23%	30%	30%	9%	AGREE
COASTER						AGREE
BUS						AGREE
PARK AND RIDE						AGREE
TELEPHONE SURVEY RESPONDENTS						AGREE
MONEY SHOULD BE INVESTED IN BUSES / TRAINS INSTEAD OF FREEWAYS	9%	25%	26%	32%	9%	AGREE
COASTER						AGREE
BUS						AGREE
PARK AND RIDE						DISAGREE
TELEPHONE SURVEY RESPONDENTS						DISAGREE
HAVING TOLL EXPRESS LANES WITH FREE OR REDUCED TOLLS WILL INCREASE CARPOOLING	8%	24%	38%	22%	7%	AGREE
COASTER						AGREE
BUS						AGREE
PARK AND RIDE						AGREE
TELEPHONE SURVEY RESPONDENTS						AGREE
HAVING TOLL EXPRESS LANES IS A GOOD WAY TO HELP PAY FOR THE FREEWAY EXPANSION	11%	23%	40%	19%	7%	AGREE
COASTER						AGREE
BUS						AGREE
PARK AND RIDE						AGREE
TELEPHONE SURVEY RESPONDENTS						AGREE
TOLL EXPRESS LANE PROJECT WILL MAKE THE I-5 SAFER	6%	28%	37%	12%	18%	AGREE
COASTER						AGREE
BUS						AGREE
PARK AND RIDE						AGREE
TELEPHONE SURVEY RESPONDENTS						AGREE
TOLL EXPRESS LANE PROJECT WILL REDUCE AIR POLLUTION	12%	36%	25%	11%	16%	DISAGREE
COASTER						DISAGREE
BUS						AGREE
PARK AND RIDE						AGREE
TELEPHONE SURVEY RESPONDENTS						DISAGREE
EXPRESS LANES WILL INCREASE THE NOISE LEVEL IN NEIGHBORHOODS	10%	37%	26%	8%	19%	DISAGREE
COASTER						DISAGREE
BUS						AGREE
PARK AND RIDE						DISAGREE
TELEPHONE SURVEY RESPONDENTS						DISAGREE

CHAPTER 4

I-5 TELEPHONE SURVEYS

As part of the SANDAG I-5 Expansion Research Project that includes focus groups and intercept surveys, telephone surveys were performed by Strategic Consulting & Research.

4.1 KEY FINDINGS

Random households in zip codes surrounding the I-5 freeway between Oceanside and the I-5/I-805 split were contacted by telephone during the months of January and February 2005 and asked to participate in the I-5 North Coast Telephone Survey. More than 1,300 households were contacted to yield 804 complete surveys.

4.1.1. I-5 Usage

- Seventy percent of respondents use I-5 at least five days per week, with a mean of 4.4 days per week.
- Seventy-six percent are traveling south on I-5 when leaving from home and travel a mean of 17.5 miles one-way on I-5. The portion of the trip on I-5 takes less than 30 minutes for 65 percent of respondents.

4.1.2. Potential I-5 Improvements

- Forty-six percent of respondents had heard something about potential improvements to I-5 freeway north of the I-5/I-805 split. Eighty-one percent recall the potential improvements as adding lanes to the freeway.
- Sixty-two percent support construction of one new general purpose lane and two express toll lanes.
- Sixty-one percent feel that the most important benefit of this potential project would be reduced congestion. Thirty percent mentioned reduced commute times.
- The most commonly stated concern (23%) with the proposed improvements was that the project would take too long to complete.

4.1.3. Tolling

- Respondents prefer raised tolls to closed entrances to control congestion and prefer fixed tolls to variable tolls.
- Fifty-two percent feel that variable tolling is not an equitable way to control congestion. However, 56 percent of respondents feel that fixed tolls are fair and equitable.

4.1.4. Proposed Project Opinions

- Corridor users feel that additional lanes should be built, and they indicate a preference for managed lanes. Respondents also agree that toll lanes can be used to help defray the costs of freeway expansion.
- Although I-5 users believe the toll lane expansion will reduce congestion, they are not optimistic about other potential benefits of toll lanes such as increased carpooling, improved traffic flow with raised tolls, safer driving, or reduced pollution.

4.1.5. Environmental Justice

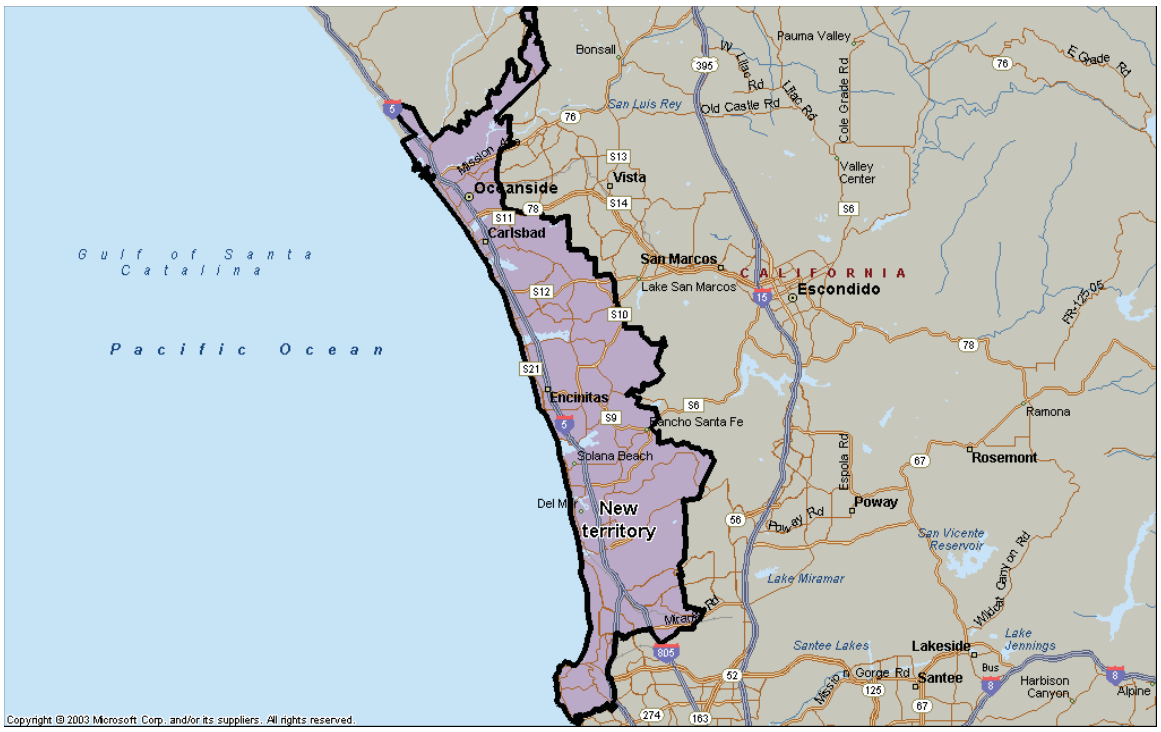
- While there are not significant differences between lower income or non-Caucasian I-5 users and the general user, some variation can be seen.
- Non-Caucasians are more likely to support the proposed project and more in support of a fixed versus variable toll than the average.
- Although low-income respondents are somewhat more likely than general users to support the express lane project, they are more supportive of using closures rather than raising tolls to control flow. They are also more likely to say only general purpose lanes should be built.

4.2 INTRODUCTION

4.2.1. Purpose

The telephone survey is one component of the I-5 North Coast Managed Lanes Value Pricing Study Community Outreach Program. The goal of the outreach program is to accurately gauge public reactions to, and support for a variety of value pricing and lane management options under consideration on I-5 north of San Diego. The importance of understanding early in the planning process what design, pricing and operations elements were favorably – and unfavorably – received by a variety of publics ultimately helped to shape the final recommendation of the study.

FIGURE 4-1 MAP OF TARGET CORRIDOR



Random households in zip codes surrounding the I-5 freeway between Oceanside and the I-5/I-805 split (see Figure 1) were contacted by telephone during the months of January and February 2005 and asked to participate in the survey.

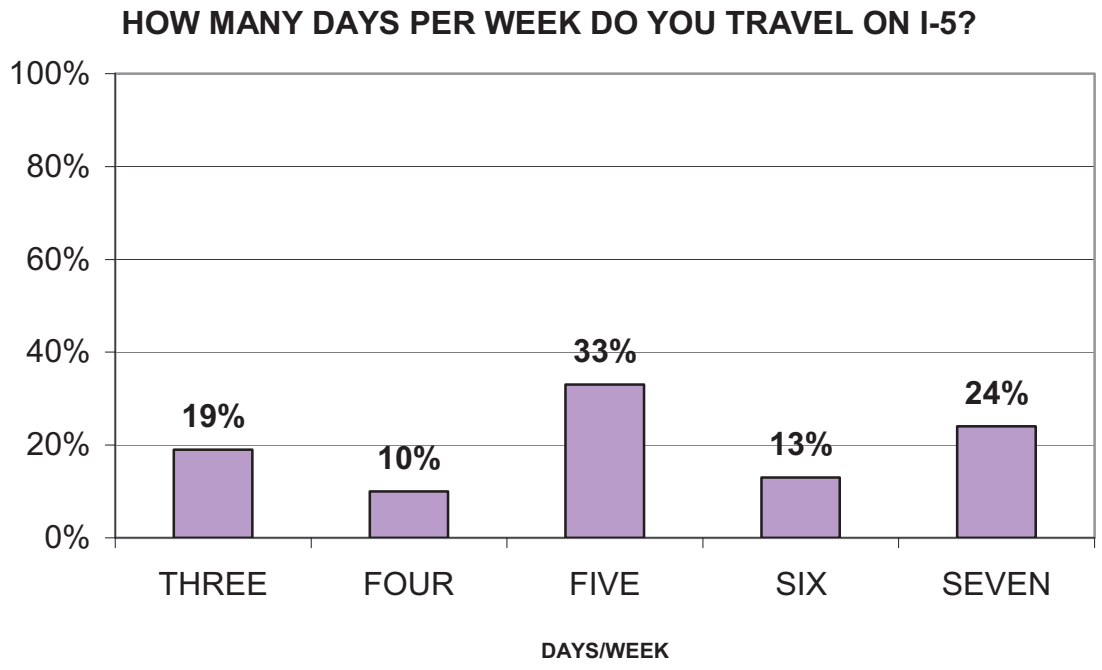
Surveys were conducted between the hours of 5:00 and 9:00 p.m. weekdays and between the hours of 9:00 a.m. to 9:00 p.m. Saturday and Sunday to reach people 18 years of age and older who use at least some portion of the I-5 between Oceanside and the I-5/I-805 split at least three days per week. More than 1,300 households were contacted to yield 804 complete surveys. The telephone survey provides quantitative and representative results for the target audience with statistical accuracy of ± 2.1-3.5% at a 95% confidence level.

Survey participants were asked questions about their commute patterns and usage of the I-5 freeway.

4.3 I-5 USAGE CHARACTERISTICS

Seventy percent of respondents use the I-5 at least five days per week. To qualify for the survey, respondents had to use the I-5 at least 3 days per week.

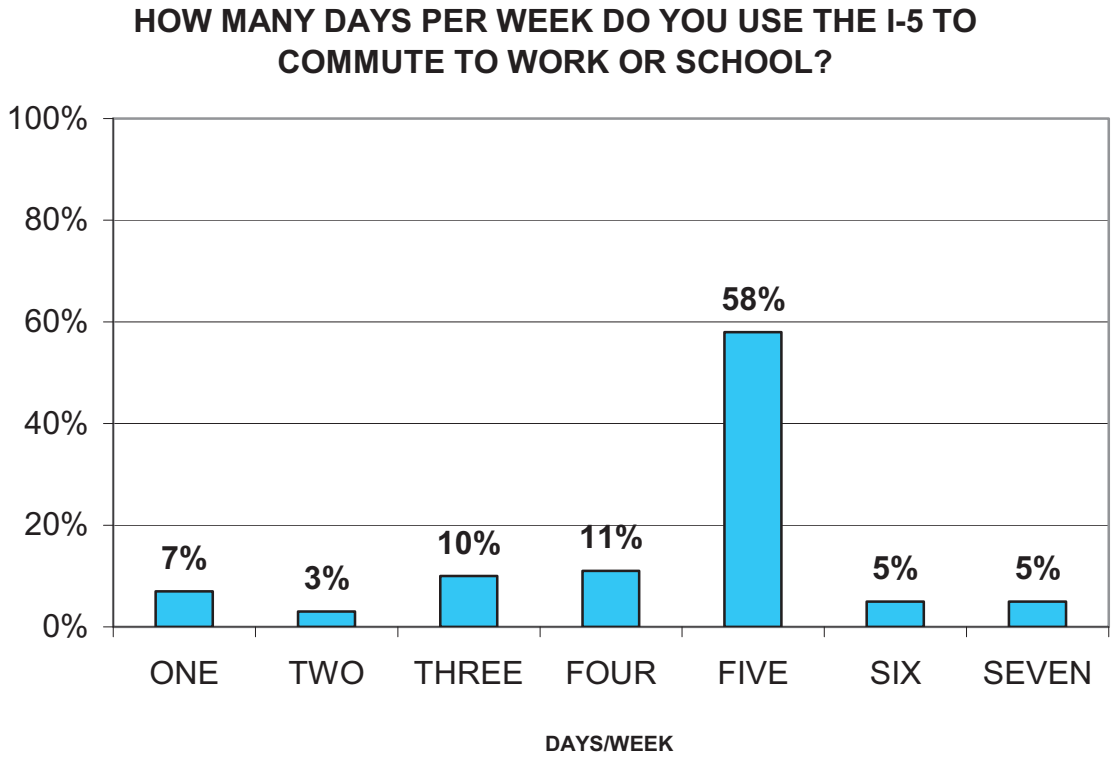
FIGURE 4-2 I-5 USAGE DAYS PER WEEK



Sixty-eight percent of those who commute to work or school use the I-5 for this commute at least five days per week. Respondents use the I-5 a mean 4.4 days per week.

Those in the lowest income bracket of less that $34,000 annual household income and Hispanics tend to use the I-5 for work or school commute most often, with means of 4.8 and 4.7 days per week respectively.

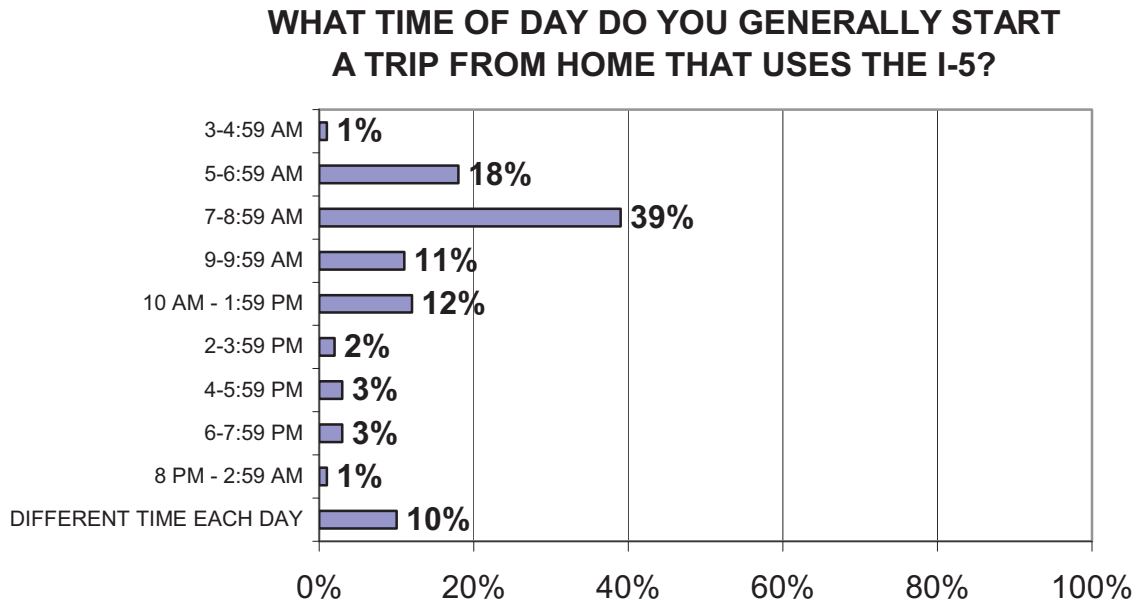
FIGURE 4-3 I-5 COMMUTE DAYS PER WEEK



When leaving from home to start a trip on I-5, the top two most commonly used entrances are SR 78 at 12 percent and Del Mar Heights Road at ten percent. Most respondents (76%) are traveling south on I-5 when leaving from home.

Fifty-eight percent leave their home before 9:00 a.m. to start their trip on I-5.

FIGURE 4-4 TIME OF DAY TO START TRIP



Sixty-two percent travel less than 20 miles one-way on I-5 with a mean distance of 17.5 miles traveled. Hispanics and African Americans tend to travel slightly farther on the I-5 than other ethnicities, with a mean of 21.8 miles for Hispanics and 23.7 miles for African Americans. Those in the $75,000 to $99,000 household income bracket also tend to travel farther, with a mean of 21.3 miles.

The portion of the trip on I-5 takes less than 30 minutes for 65 percent of respondents.

TABLE 4-1 DISTANCE OF I-5 TRIP

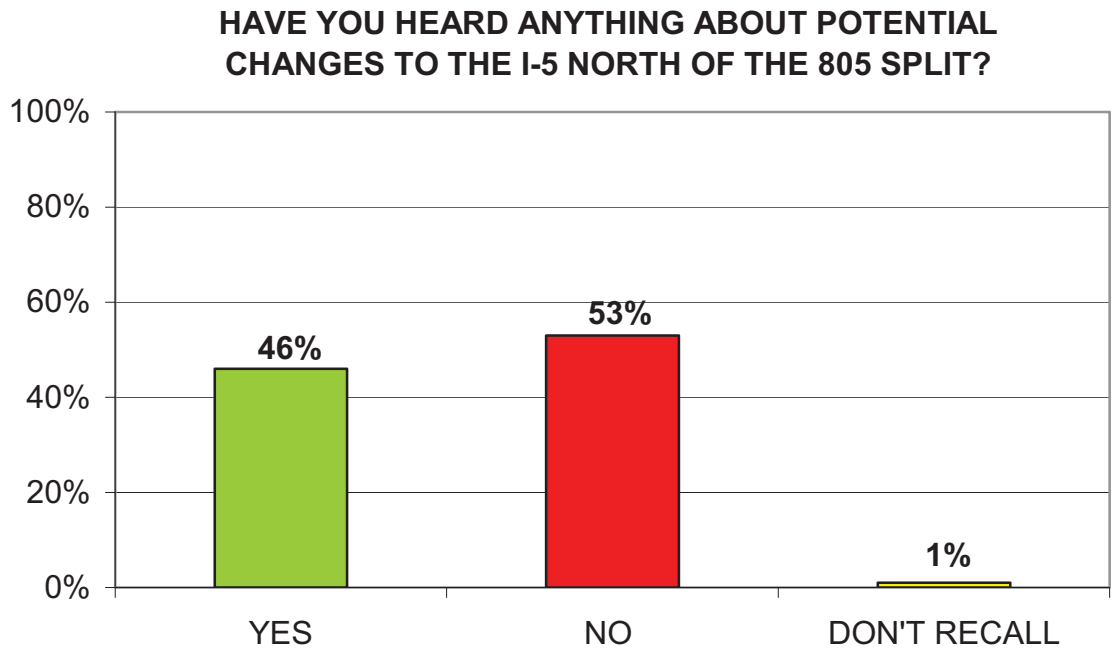
APPROXIMATELY HOW LONG IS THE PART OF THE TRIP ON THE I-5?	
	MEAN MILES
HISPANIC	21.8
WHITE	17.0
AFRICAN AMERICAN	23.7
ASIAN/PAC ISLAND	16.5
<$34,000	13.9
$35-49,000	19.5
$50-74,000	18.3
$75-99,000	21.3
$100,000 +	16.3
ALL RESPONDENTS	17.5

Respondents were asked if they had heard anything about potential improvements to the I-5 freeway and their opinions about possible improvement projects.

4.4 POTENTIAL I-5 IMPROVEMENTS

Forty-six percent of respondents had heard something about potential improvements to the I-5 freeway north of the I-805 split. Respondents 40 years of age and older were more likely than younger respondents to be aware of possible freeway improvements. Those with higher household incomes in the $75,000 and up range were also more likely to have heard something about the potential project than those in the lower income ranges.

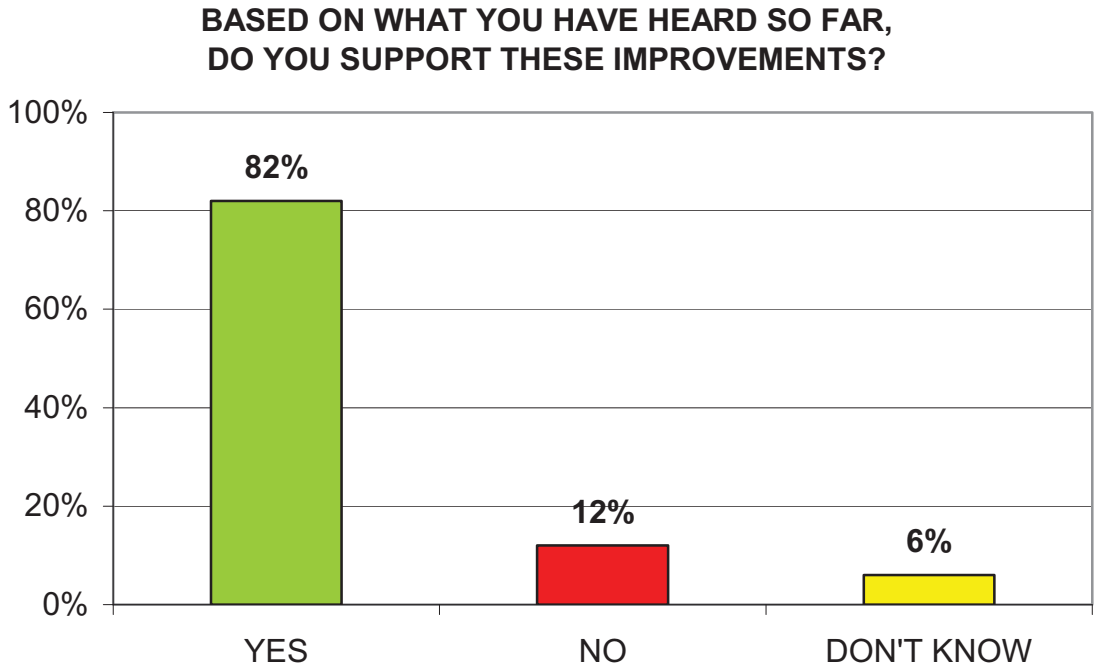
FIGURE 4-5 AWARE OF POTENTIAL I-5 PROJECT



Of those who had heard of the improvements, most believed that they had heard about it from the newspaper (46%). Respondents under 29 years of age and Hispanics were more likely to recall seeing the information on television (both at 41%).

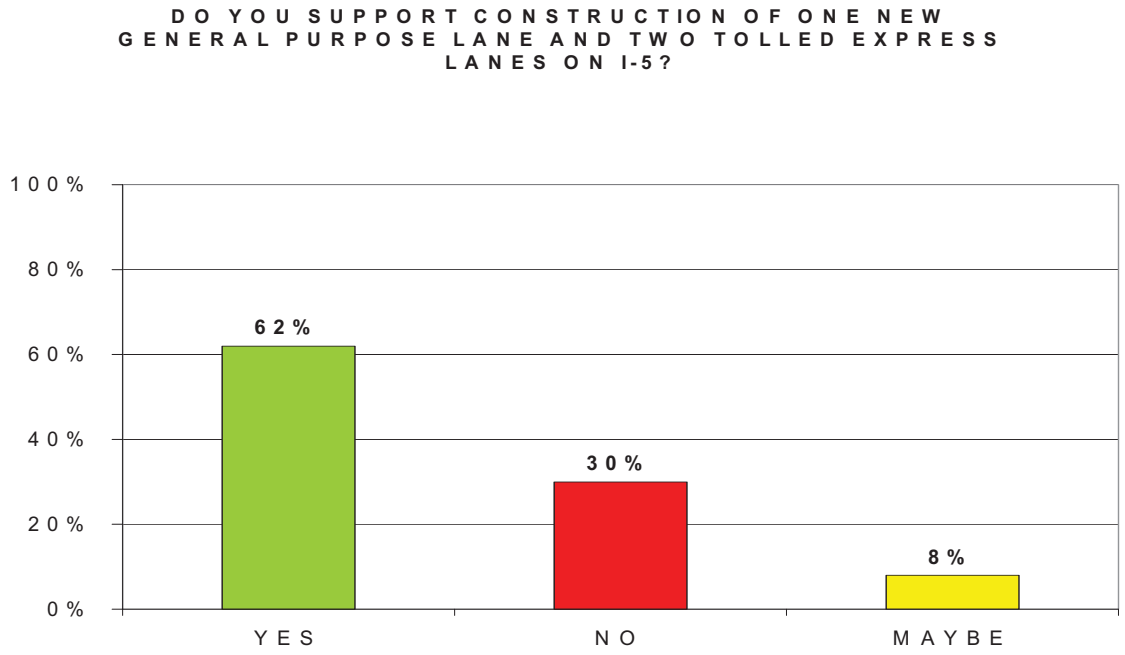
Eighty-one percent recall the potential improvements as adding lanes to the freeway, and 82 percent support proposed improvements. Support is above 70 percent across all demographic groups, with the exception of those in the lowest household income bracket of less than $34,000 annually (67%).

FIGURE 4-6 SUPPORT IMPROVEMENTS



When asked if they support construction of one new general purpose lane and two express toll lanes, 62 percent of respondents agreed.

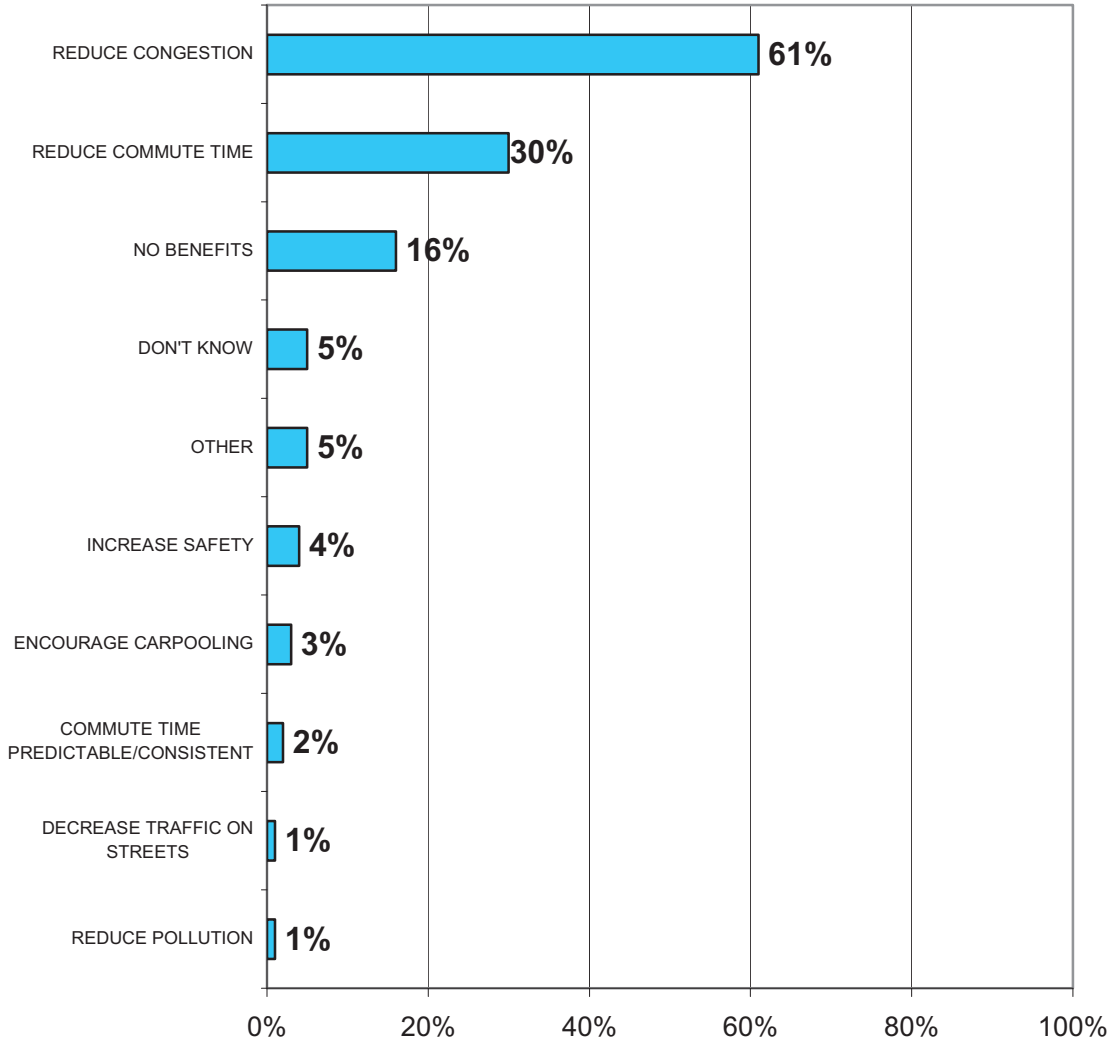
FIGURE 4-7 SUPPORT GENERAL PURPOSE AND TOLL LANES



The majority feel that the most important benefit of this potential project would be reduced congestion, with 61 percent citing this advantage. Thirty percent mentioned reduced commute times.

FIGURE 4-8 MOST IMPORTANT BENEFIT

WHAT DO YOU SEE AS THE MOST IMPORTANT BENEFITS OF THIS PROJECT?



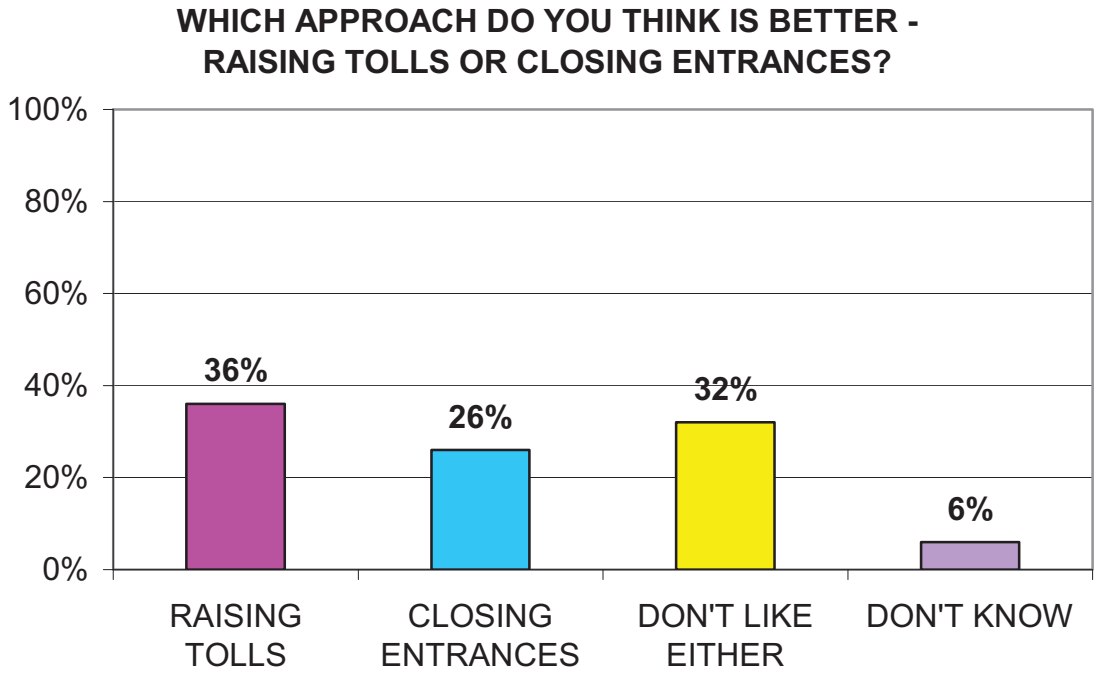
The most commonly stated concern with the proposed improvements is that the project would take too long to complete, with 23 percent citing this concern. Following this issue are worries about another tax to commuters at 14 percent, and concerns that the project would not decrease congestion or would create construction congestion at 12 percent each.

Survey participants were questioned regarding tolling usage, fairness and preferences..

4.5 TOLLING

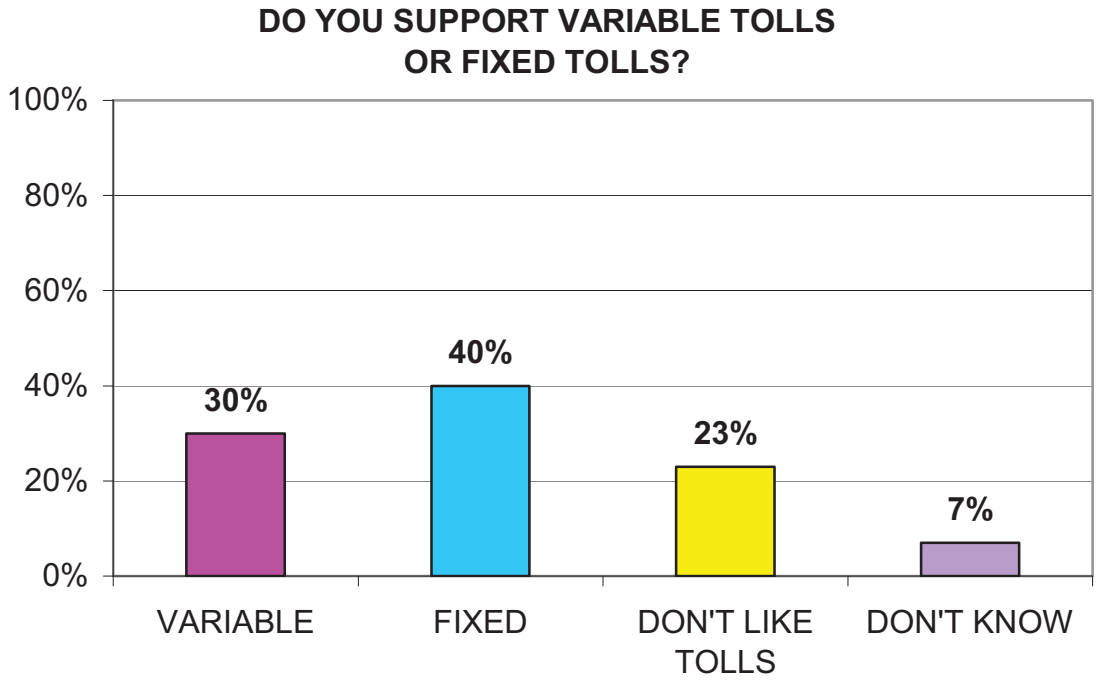
Respondents are divided on the question of whether closing entrances or raising tolls is a better approach to controlling congestion, with more preferring the method of raised tolls. Thirty-two percent indicated that they do not like either option.

FIGURE 4-9 RAISING TOLLS VERSUS CLOSING ENTRANCES



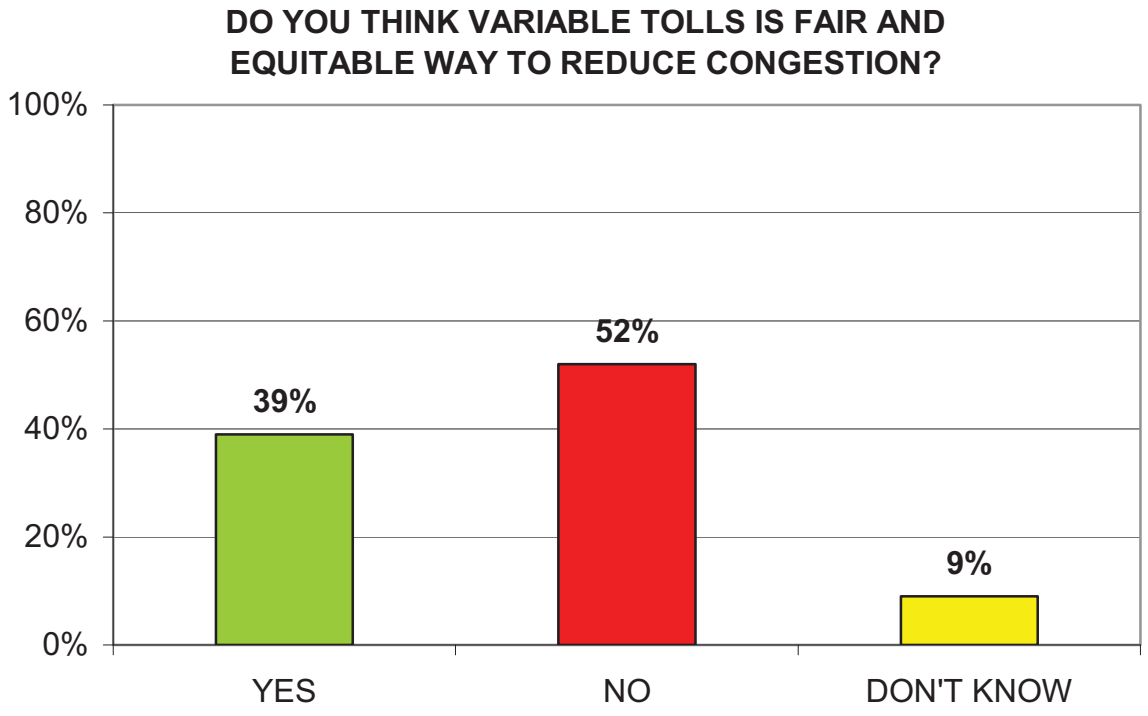
Respondents also are divided on preference for variable or fixed tolling, with more preferring fixed tolls at 40 percent. Twenty-three percent said that they do not like any tolls.

FIGURE 4-10 VARIABLE TOLLS VERSUS FIXED TOLLS



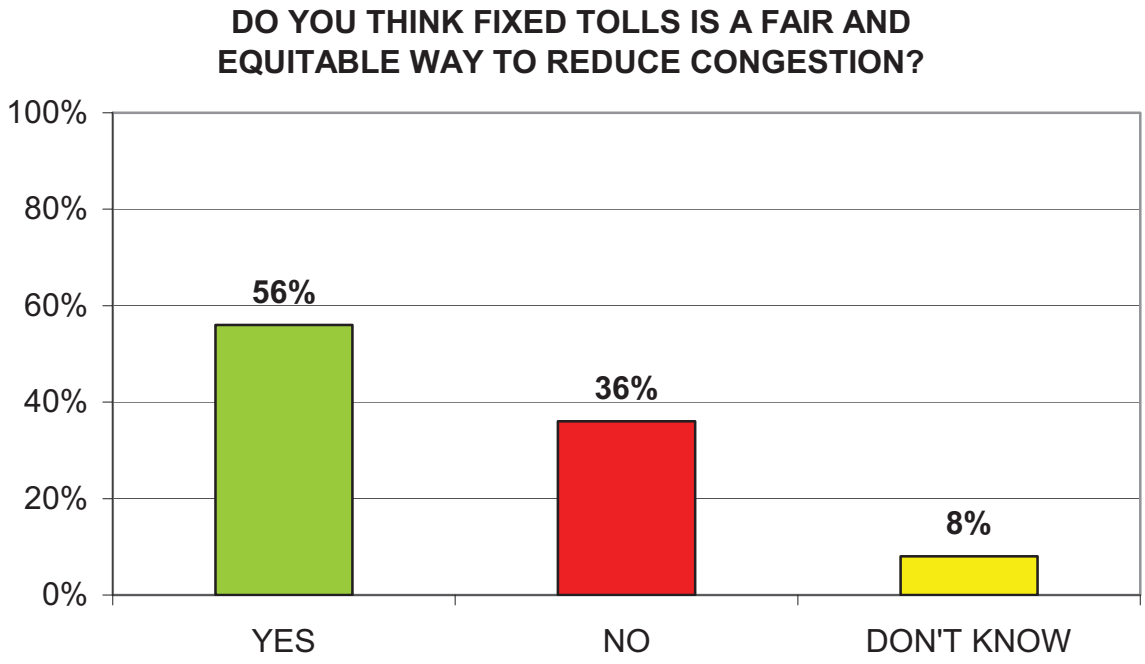
When asked if they feel that variable tolling is an equitable way to control congestion, 52 percent replied that they do not. African Americans are most strongly opposed to variable tolls with 65 percent stating that variable tolls are not fair and equitable. Those in the 18 to 29 age group are most likely to be in favor of this option, with 51 percent responding that variable tolls were fair.

FIGURE 4-11 VARIABLE TOLLS, FAIR AND EQUITABLE



Fifty-six percent of respondents feel that fixed tolls are fair and equitable. Those 55 and older and those in the $75,000 to $99,000 household income bracket are the groups that feel most strongly that fixed tolls are unfair, at 43 and 44 percent respectively.

FIGURE 4-12 FIXED TOLLS, FAIR AND EQUITABLE



In the final section of the survey before collecting demographic information, survey participants were asked whether they agreed or disagreed with statements that apply to potential I-5 improvements.

4.6 PROPOSED PROJECT OPINIONS

Respondents were asked several opinion questions about the proposed project, and were asked to respond on a four point scale from “Strongly Disagree = 1” to “Strongly Agree = 4”.

The following table details these scale questions and the percent of respondents in each category, along with the mean rating.

Overall, corridor users feel that additional lanes should be built, and they indicate a slight preference for managed lanes (supported by 53 percent). Respondents also agree that toll lanes can be used to help defray the costs of freeway expansion. The preferred method of division between toll and general purpose lanes is something other than a painted line.

Although I-5 users believe the toll lanes expansion will reduce congestion, they are not optimistic about the other benefits of toll lanes such as increased carpooling, improved traffic flow with raised tolls, safer driving, or reduced pollution. However, respondents did not feel that the project would increase noise in neighborhoods either.

TABLE 4-2 PROPOSED PROJECT OPINIONS

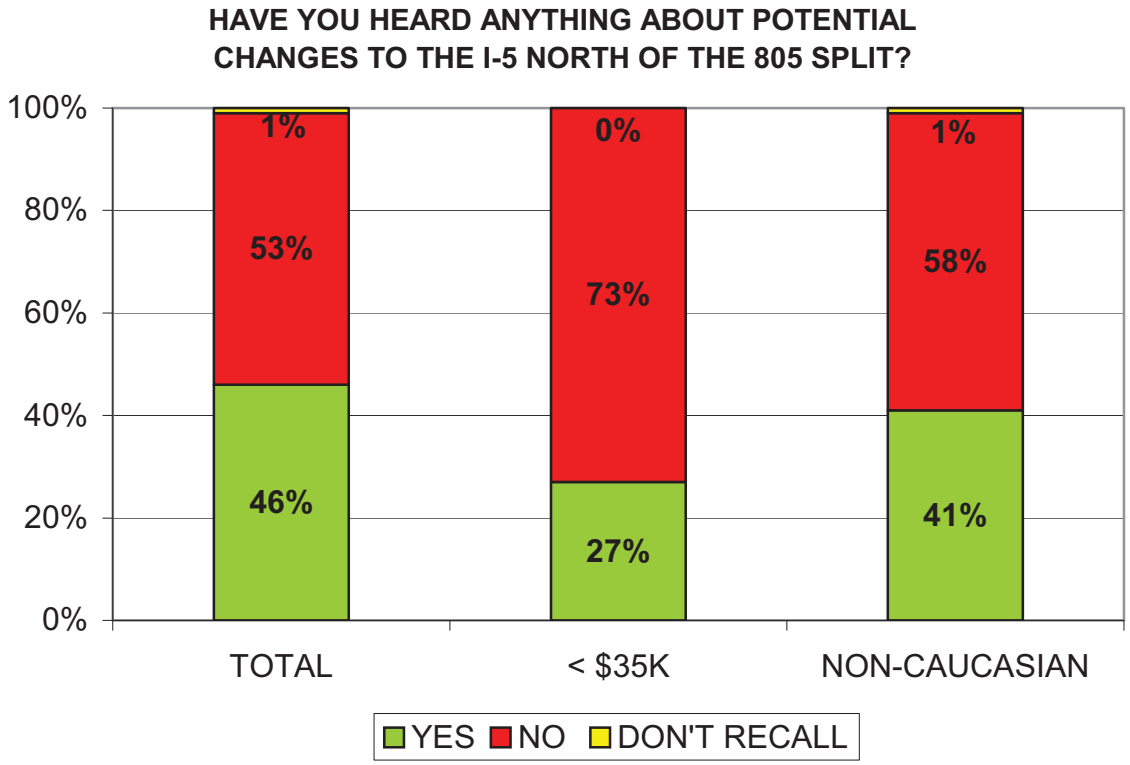
QUESTIONS:	RATING					MEAN
	STRONGLY DISAGREE	DISAGREE	AGREE	STRONGLY AGREE	DON'T KNOW	
HAVING TOLL EXPRESS LANES IS A GOOD WAY TO HELP PAY FOR THE FREEWAY EXPANSION	8%	15%	65%	9%	3%	2.78 AGREE
TOLL EXPRESS LANE PROJECT WILL HELP REDUCE CONGESTION	7%	20%	58%	10%	5%	2.75 AGREE
DIVIDER BETWEEN EXPRESS AND REGULAR LANES SHOULD BE MORE THAN PAINTED LINES	6%	32%	45%	12%	5%	2.66 AGREE
ONLY GENERAL PURPOSE LANES SHOULD BE BUILT ON I-5	6%	47%	28%	14%	5%	2.52 DISAGREE
HAVING TOLL EXPRESS LANES WITH FREE OR REDUCED TOLLS WILL INCREASE CARPOOLING	9%	36%	47%	4%	4%	2.49 AGREE
TOLL EXPRESS LANE PROJECT WILL MAKE THE I-5 SAFER	7%	35%	41%	4%	12%	2.48 AGREE
TOLL EXPRESS LANE PROJECT WILL INCREASE THE NOISE LEVEL IN NEIGHBORHOODS	4%	50%	30%	7%	9%	2.44 DISAGREE
HAVING TOLL EXPRESS LANES IS A BETTER WAY TO IMPROVE TRAFFIC FLOW THAN ADDING REGULAR LANES	13%	35%	38%	6%	8%	2.40 DISAGREE
MONEY SHOULD BE INVESTED IN BUSES / TRAINS INSTEAD OF FREEWAYS	12%	47%	23%	11%	6%	2.37 DISAGREE
RAISING TOLLS IS AN EFFECTIVE WAY TO CONTROL CONGESTION	13%	38%	39%	3%	6%	2.35 DISAGREE
CLOSING TOLL EXPRESS LANE ENTRANCES IS A FAIR WAY TO CONTROL CONGESTION ON THOSE LANES	13%	43%	36%	2%	7%	2.28 DISAGREE
TOLL EXPRESS LANE PROJECT WILL REDUCE POLLUTION	11%	52%	23%	3%	11%	2.20 DISAGREE
NO NEW FREEWAY LANES SHOULD BE BUILT	32%	54%	9%	3%	2%	1.82 DISAGREE

In order to be certain that all segments of the population have been surveyed and are accounted for in the decision making process, following is a break down of opinions by non-Caucasian and lower income (less than $35,000 annual household income[1]) users of the I-5 freeway.

4.7 ENVIRONMENTAL JUSTICE

Those at lower income levels are less likely than the average commuter to have heard about potential I-5 improvements, while non-Caucasian users are only slightly less aware of possible changes.

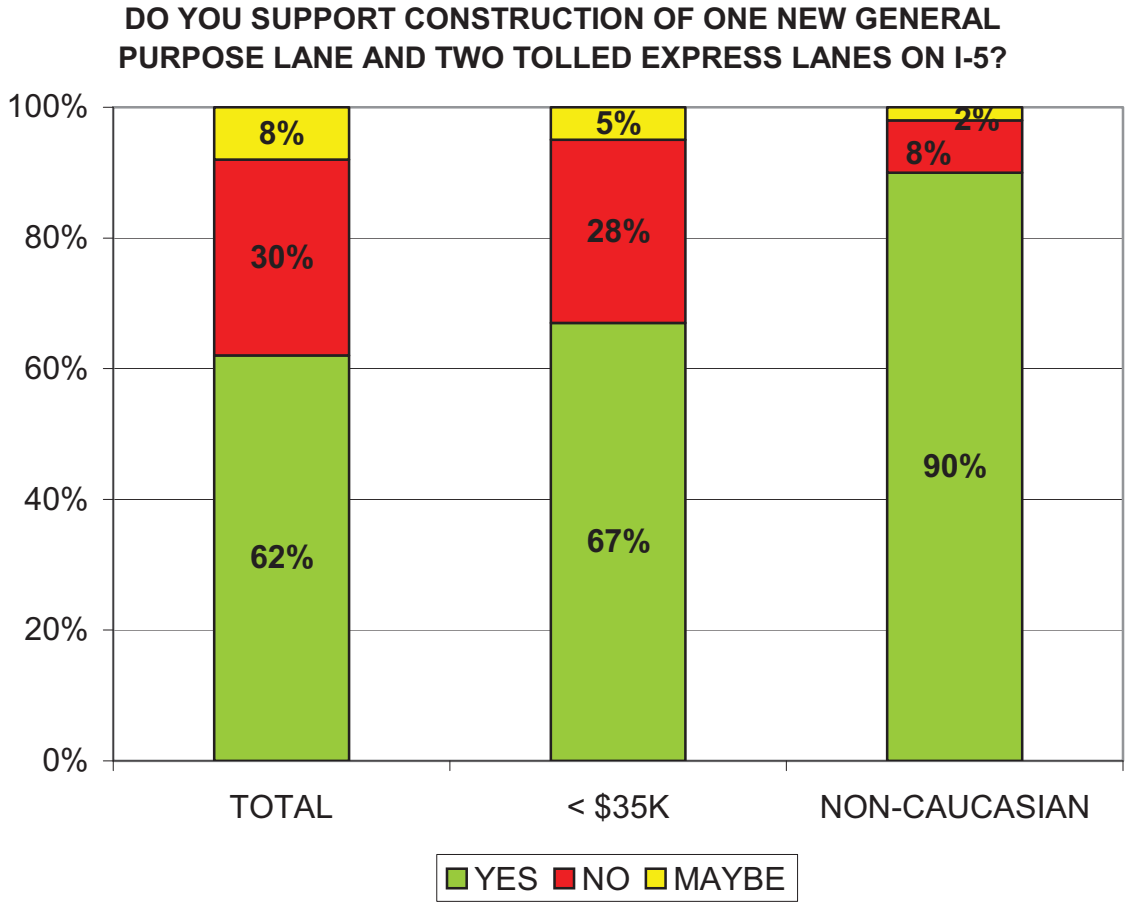
FIGURE 4-13 AWARE OF POTENTIAL I-5 PROJECT



[1] Since household size was not collected in this survey, $35,000 was selected as the best overall cut point to define low income households.

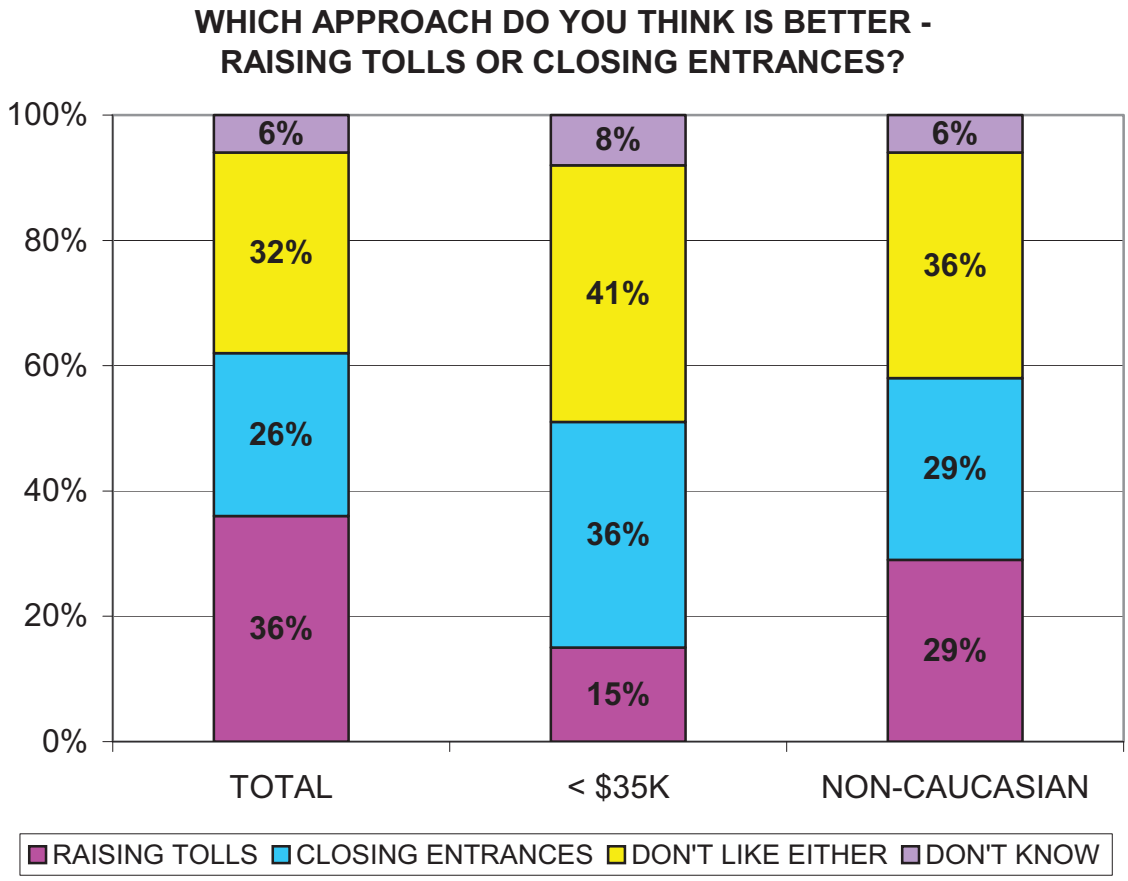
Non-Caucasian users are much more supportive than the average user of the proposal to add one additional general purpose lane and two loll lanes.

FIGURE 4-14 SUPPORT GENERAL PURPOSE AND TOLL LANES



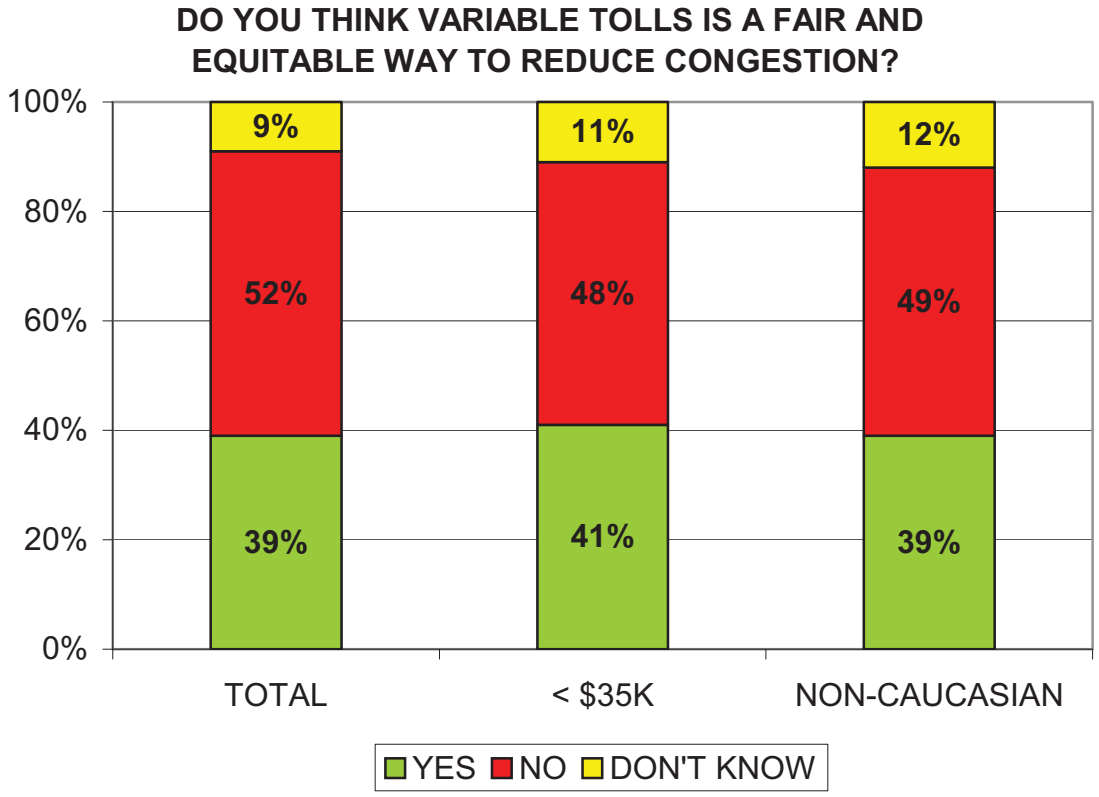
Both lower income and non-Caucasian respondents are less in favor of raising tolls and more in favor of closing entrances to control congestion than respondents overall. However, the lower income and non-Caucasian groups are also more likely to say that they are not in favor of either option than the average. As shown in the chart below, those at the lower income level differed more from the average than the non-Caucasian group.

FIGURE 4-15 RAISING TOLLS VERSUS CLOSING ENTRANCES



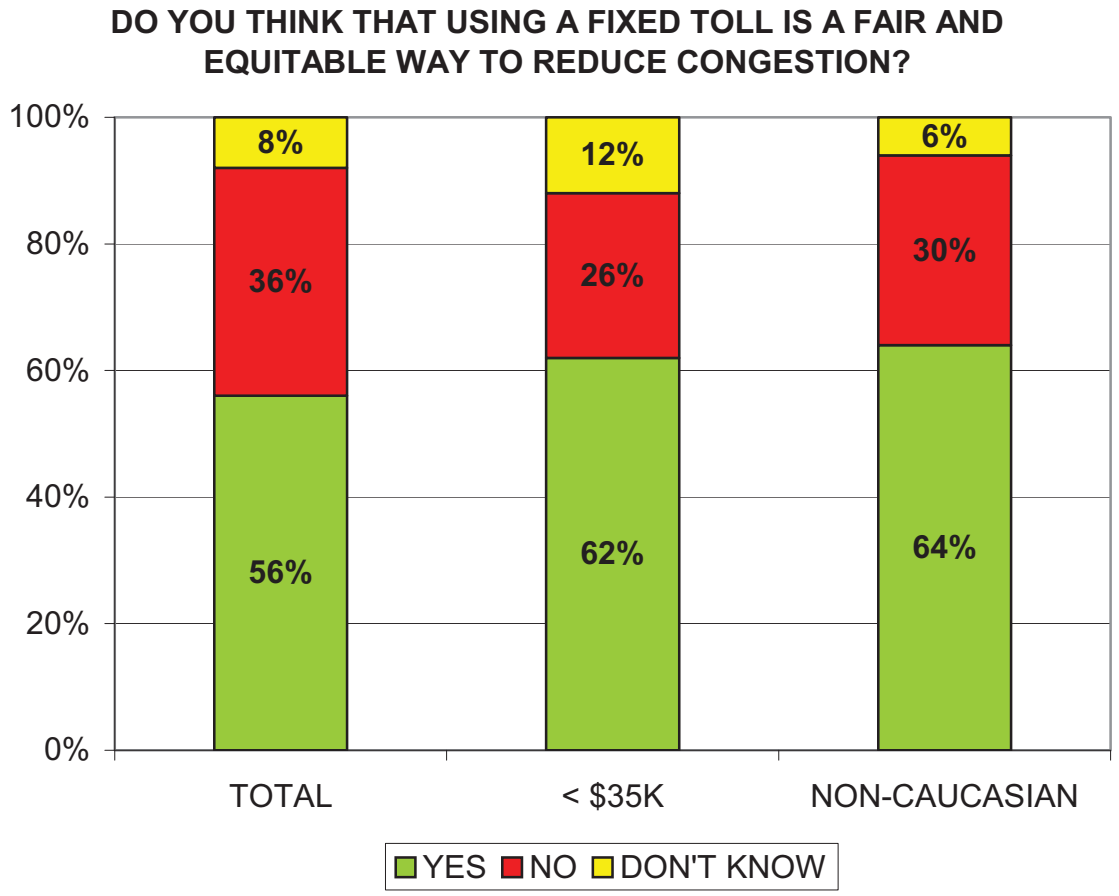
Non-Caucasian and lower income commuters are consistent with the average corridor user in regard to the fairness of variable tolls.

FIGURE 4-16 VARIABLE TOLLS, FAIR AND EQUITABLE



Lower income and non-Caucasian respondents are more likely than the average user to believe that fixed tolls are fair and equitable.

FIGURE 4-17 FIXED TOLLS, FAIR AND EQUITABLE



Respondents were asked several opinion questions about the proposed project, and were asked to respond on a four point scale from “Strongly Disagree = 1” to “Strongly Agree = 4”. In general, both non-Caucasian and lower household income respondents are generally consistent with the total population, but are slightly more likely to agree with the positive opinion statements.

Both lower income and non-Caucasian respondents are more likely than average to agree that tolls lanes with free or reduced tolls for multiple passengers will increase carpooling, that the express lane project will make I-5 safer, and that toll express lanes are a good way to pay for freeway expansion. However, both groups are more likely to say that only general purpose lanes should be built.

TABLE 4-3 PROPOSED PROJECT OPINIONS, ENVIRONMENTAL JUSTICE

QUESTIONS:	<$35,000 HOUSEHOLD INCOME MEAN	NON-CAUCASIAN MEAN	TOTAL MEAN
HAVING TOLL EXPRESS LANES IS A GOOD WAY TO HELP PAY FOR THE FREEWAY EXPANSION	2.85 AGREE	2.88 AGREE	2.78 AGREE
TOLL EXPRESS LANE PROJECT WILL HELP REDUCE CONGESTION	2.78 AGREE	2.92 AGREE	2.75 AGREE
DIVIDER BETWEEN EXPRESS AND REGULAR LANES SHOULD BE MORE THAN PAINTED LINES	2.83 AGREE	2.70 AGREE	2.66 AGREE
ONLY GENERAL PURPOSE LANES SHOULD BE BUILT ON I-5	2.62 AGREE	2.65 AGREE	2.52 DISAGREE
HAVING TOLL EXPRESS LANES WITH FREE OR REDUCED TOLLS WILL INCREASE CARPOOLING	2.58 AGREE	2.63 AGREE	2.49 AGREE
TOLL EXPRESS LANE PROJECT WILL MAKE THE I-5 SAFER	2.58 AGREE	2.63 AGREE	2.48 AGREE
TOLL EXPRESS LANE PROJECT WILL INCREASE THE NOISE LEVEL IN NEIGHBORHOODS	2.53 AGREE	2.34 DISAGREE	2.44 DISAGREE
HAVING TOLL EXPRESS LANES IS A BETTER WAY TO IMPROVE TRAFFIC FLOW THAN ADDING REGULAR LANES	2.46 DISAGREE	2.56 AGREE	2.40 DISAGREE
MONEY SHOULD BE INVESTED IN BUSES / TRAINS INSTEAD OF FREEWAYS	2.39 DISAGREE	2.30 DISAGREE	2.37 DISAGREE
RAISING TOLLS IS AN EFFECTIVE WAY TO CONTROL CONGESTION	2.35 DISAGREE	2.49 DISAGREE	2.35 DISAGREE
CLOSING TOLL EXPRESS LANE ENTRANCES IS A FAIR WAY TO CONTROL CONGESTION ON THOSE LANES	2.41 DISAGREE	2.38 DISAGREE	2.28 DISAGREE
TOLL EXPRESS LANE PROJECT WILL REDUCE POLLUTION	2.30 DISAGREE	2.29 DISAGREE	2.20 DISAGREE
NO NEW FREEWAY LANES SHOULD BE BUILT	1.98 DISAGREE	1.85 DISAGREE	1.82 DISAGREE

Lower income users are also more likely to agree that the noise level in neighborhoods might increase because of the express lane project. Non-Caucasian respondents are more likely to agree that having toll lanes is a better way to improve traffic flow than simply adding regular lanes, and are come closer to agreeing that raising tolls is an effective way to control congestion.

APPENDIX A

I-5 NORTH COAST MANAGED LANES

STAKEHOLDER INTERVIEW GUIDE

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:_____

Interview conducted/attended by:_____

Interview date:_____

1. *Introduction (3 min)*

- **Explain Purpose of Interviews**
  - Document perceptions of transportation conditions on I-5 travel, their needs regarding trips to work, school, shopping, and other essential local, regional, and intrastate destinations.
  - Gather initial feedback on pricing and traffic management options being considered for I-5, with focus on managed lanes in the median. That is, we are not seeking to duplicate Caltrans' efforts to obtain feedback on the overall I-5 widening, nor impacts or benefits associated with that. However, we do want to know if, or how, stakeholders perceive variants of the managed lanes component under study as they affect the I-5, including the question of whether they make the widening project more or less appealing.
  - Gather attitudes and expectations of the project, with focus on pricing.
  - Document suggested project modifications to address stakeholder concerns.
- **Describe Follow-up to Interview Process**
  - Interview participant will be sent a written summary of the interview for review and approval, allowing for a two week review period.
  - Approved summary will become part of the study report summarizing stakeholder interviews
  - Summary and analysis grouped by type.

- **Review Study Purpose, Process, and Timeline**
  - Traffic Operation Plan: July-Nov 1, 2004
  - Traffic Forecast Report: July-Nov 15, 2004
  - Alternative Pricing Strategies: July-September 30, 2004
  - Traffic and Revenue Analysis: July 04-Feb 2005
  - Technical/Operations System Analysis: July 04-Jan 25, 2005
  - Other Community Outreach Tasks:
    - Round 1 Focus Groups (2 groups) November 16, 2004
    - Round 2 Focus Groups (3 groups) March 3, 2005
    - 800-Household Telephone Survey: January/February 2005
    - Intercept Surveys: February 2005
  - Final Presentation to SANDAG Transportation Committee: June 2005
  - Recommendations to SANDAG Board: July 2005

2. Perception of Existing and Future Corridor Mobility Conditions (2min)

QUESTIONS:

- How would you describe the current traffic/transportation conditions on I-5?
- What are the transportation issues or concerns shared by members of the group you represent (if applicable)?

3. Awareness of and Existing Attitudes about Managed Lanes (3 min)

QUESTIONS:

- Are you familiar with the current I-15 Express Lanes?
- Do you think they provide an efficient mobility option for travelers?
- Do you think they're fair? What does fairness mean to you in this context?
- Are you generally in favor of applying a pricing strategy to the I-5 corridor? [Inform interviewee that the pricing strategies that prove to be effective on I-5 may differ from those now used on I-15.]
  - Why/why not?

4. DESCRIBE Managed Lane Options (10-13 Min)

Describe project, review map or other visual aids

- ***Context***
  - *Traffic statistics: average daily traffic at Del Mar Heights Rd. – busiest point—is now 224,000 vehicles; will be 345,000 by 2030, per Caltrans;*
- ***Concept***
  - Like the I-15 ML, but two lanes in each direction that would operate 24 hours a day, seven days a week with periodic access from the freeway mainlines and from dedicated ramps connected to major overcrossing/undercrossing streets (not reversible/no movable barriers)
  - May or may not be barrier separated
  - 26 miles long
  - Goal to move more people, not more vehicles, by providing at least four free flowing lanes for carpoolers, transit buses, and others willing to pay to better manage demand by time of day. Depending on the time of day, paying others might include lower occupancy HOVs, trucks or solo drivers (like on I-15)
  - Cutting 2030 Oceanside to San Diego drive time from 66 to 49 minutes based on 2030 Regional Transportation Plan
- ***Physical Options***
  - Option A (10+4 painted buffer with designated access)
  - Option B (10+4 physical barrier with designated access)
  - Option C (8+4 physical barrier with designated access)
  - Option D (8+4 painted buffer with designated access)
- ***Range of alternative pricing scenarios under consideration***
  - **Tolls**

        - Fixed vs. variable
        - Zoned or flat (one segment higher than another)
        - Time of day (congestion pricing perhaps only during peak commute periods)
        - Predetermined amount or whatever it takes to maintain free-flow
    - **Access vs. Tolls**
        - Different options to manage demand and preserve speed advantages
- ***Range of toll levels to be considered and likely impacts***
    - NOTE: Toll testing will not be complete before stakeholder interviews are underway, but we will develop some reasonable scenarios, based more or less on the I-15 toll levels that now keep the managed lanes congestion-free. For example:

        - A typical peak period toll (one-way) of $6 was developed using the cost of a minute of time saved on the I-15 lane. The average peak period toll paid in 2000 on I-15 was $2.00, and the average time saved was 8 minutes, for a cost of about $0.25/minute of time saved. Let's assume that the entire toll lane will operate at 55 mph in 2025, and assume the general purpose lane will operate at 30 mph average. Then the time savings assuming one used the entire facility would be:

            <u>Time Costs/Time Savings for Entire 26-Mile Facility:</u>

            General purpose lane time: 26/30*60=52 minutes
            Toll lane time: 26/55*60=28 minutes

            Savings=24 minutes = a toll of $6 would be equivalent for the time savings.
    - Remind stakeholders that a higher toll may apply only to short periods of time, or shorter segments (not the entire 26-mile facility.)
- ***Access/Ingress/Egress (Show Concept)***
- ***Transit and rideshare alternatives, treatment of HOVs***
    - *PB modeling threshold changes based on Caltrans standard of 1650 vph/lane or 3300 vph for two lanes. Design horizons are 2015 and 2030.*
- ***Use of toll revenue***
- ***Enforcement (similar to Managed Lanes)***
- ***Hours of operation (perhaps only during peak)***
- ***Technology (FasTrak™ technology, or future GPS technology)***
- ***Financing* –combination of traditional Caltrans sources and *TransNet* sales tax**
- **Possible *access to lanes by different vehicle types***

5. QUESTIONS: Project Concept/Operations Pros and Cons (20 min)

- What, if any, will your (your agency or organization's) role be in planning and/or implementing the new project?
- What current community issues could affect the outcome of the proposed project, or be affected by the project? How?
- What are your (or your organization's) concerns or problems with this approach?
    - What do you see as the project's biggest challenge?
- Understanding that physical access to the lanes can be combined with toll management of lane volumes, what are your priorities for use of the managed lanes?
    - Encourage buses/transit vehicles
    - Encourage vanpools
    - Encourage carpools
    - Increase options for solo drivers to buy-in
    - Allow trucks to use the lanes at appropriate periods during the day
    - Allow emergency vehicles at no toll
    - Allow clean air vehicles at no toll
    - Other
- Which is preferable to avoid congestion on the managed lanes---limiting access, increasing tolls, or combination?
- Access/Ingress/Egress
    - How open or closed should the facility be?
    - Should all access points be open to all users or should some be limited to transit (i.e., park and ride lots)?
    - What conditions should be taken when lanes overload—should access be able to be closed at a specific location?
    - Could a pricing penalty be used if somebody violated a closed access?
    - Physical barrier vs. painted barrier—your views?
    - Frequency of access points – speed & safety vs. access—your views?
    - What would you recommend if time is saved along the project, but traffic has to merge back into same number of lanes downstream? That is, what approach would you use to give merging priority to some, but not all users?
- Do any of the project options present safety and/or enforcement concerns for you?
- Signage and toll information
    - If you've traveled the I-15 Express Lanes, do you think the signing is effective?
    - What concerns about signage and toll information do you have on the I-5 corridor?
- What is your reaction to a peak-period toll of $6 (for the entire 26 mile facility) that would save you at least 24 minutes of travel time?
- How would you like to see toll revenues from this project spent? For example,
    - To support new transit in I-5 Corridor
    - Subsidize carpooling programs
    - Any highway purpose within I-5 Corridor
    - Other?
- What is the importance of providing modal choice in how you view I-5 corridor operations?

- What do you suppose would be the impact on travel behavior of implementing a pricing strategy?
    - Impact on your own personal travel patterns, mode, time
    - What is the potential in this corridor for transit and carpooling?
    - Impact on travel behavior for corridor commuters overall
    - Impact on your organization's members
- Perceived effectiveness—do you think the Managed Lanes will move more people than regular carpool lanes? Than main lanes?
- What are your (or your organization's) views on potential environmental benefits/concerns (e,g., noise, pollution, impact on lagoons)?
- Do you have any suggestions for improving the concept or design?
    - What steps do you think could/should be taken with regard to any issues that could affect the project?

6. QUESTIONS: Environmental Justice Issues (10 Min)

- How do you see the issue of equity relative to this project?
- How could any identified impacts or problems be mitigated with modifications to the project?
- What do you suppose would be the perception of fairness on the part of other groups?
    - Low income populations
    - Members of ethnic minorities
    - User groups
        - I-5 main lane users
        - HOV lane users
        - Transit riders
        - San Diego commuters vs. interregional travelers
        - Truckers
- What areas of the community, or what specific groups do you think have a special interest in the project? How do you think we should involve them?
- What areas of the community, especially along the corridor tend to be underrepresented in community discussions? How do you think we might involve these communities more effectively?

7. QUESTIONS: Other Public Input (5 Min)

- Thinking about I-5, and for a moment separating the larger freeway widening project from the managed lanes options we've been discussion, where do you see support/opposition coming from with respect solely to I-5 North Coast managed lanes? What would be the basis for support/opposition? Which project variations would, in your view, receive more support?
- Would it surprise you to learn that
- SANDAG will be conducting an 800-household telephone survey addressing value pricing feasibility on the Managed Lanes project. What would you like to learn from that effort?

8. Wrap-Up (1 Min)

- Reminder that stakeholders will receive copies of their statements (via e-mail) and given two weeks to check for accuracy.
- How would you like to be kept apprised of new developments as this project planning study goes forward?
- Thank you!

APPENDIX B

I-5 NORTH COAST MANAGED LANES

STAKEHOLDER INTERVIEW SUMMARIES

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Mr. Leon Williams, Chairperson Metropolitan Transit System (MTS)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 19, 2004**

MTS's Role in Project Planning or Implementation

MTS does not have much of a role; it's really a SANDAG function.

Perception of Existing and Future Corridor Mobility Conditions

Conditions on I-5 are very undesirable. There is severe congestion and there are no alternatives for through traffic. If you're on it, you're simply stuck and you have no recourse.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Williams is familiar with I-15 FasTrak, but does not use them.

Efficiency

Mr. Williams does not think they really offer an efficient mobility option because in the long run, they diminish the effectiveness of HOV lanes, allowing people with means to avoid congestion without changing their behavior. It would be better to promote the utilization of HOV lanes. Nor do the lanes have much a positive impact on the adjacent general purpose lanes.

Fairness

Mr. Williams doesn't think they're fair, in the sense that if someone has means, whether that's due to a smaller family or larger disposable income, they can use the lanes. And it's not reducing crowding on the freeway.

Applicability to I-5 Corridor

Mr. Williams is not in favor of pricing on the I-5 Corridor. Instead, he thinks the region should make a big splash in favor of HOV use and put vehicles and buses on those lanes that really work.

Project Concept & Operations Pros and Cons

Current Community Issues

One problem is that of vehicle queuing onto surface streets and into communities at metered ramps.

Priorities for Use of Managed Lanes

Use of the lanes should be prioritized according to vehicle capacity and occupancy, in descending order. Whatever else, the lanes must be clear for high occupancy vehicles. Trucks could be permitted if they don't interfere with operations, but if trucks use it regularly, no one else will want to. Emergency vehicles should be allowed, but not to the extent that they impede the major purpose of the lanes—HOV. Clean air vehicles should not be allowed to use the lanes for free as solo-occupancy vehicles.

Managing Demand: Access vs. Tolls

Mr. Williams does not agree with the value pricing concept for managed lanes, but would leave this issue to Caltrans to implement whatever works to move more people (not vehicles).

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Choose the strategy that minimizes violations.

Number of Access Points

Mr. Williams thinks freeways should serve through-traffic, and not be used for local traffic, and that fewer access points would therefore be preferable. He suggests that more attention be focused on developing local community circulation, including public transportation within and between communities.

Operating the Lanes: Ingress/Egress Priority

Always prefer HOV—carpoolers already endure an inconvenience, so anything that can be done to make that up is desirable.

Signage and Toll Information

Mr. Williams notes that he has missed the I-15 FasTrak entrance a few times because the signs were not clear. There's no indication that a motorist should veer into the left lane to access the Express Lanes. Caltrans should improve on that for the I-5 Corridor.

Importance of Modal Choice on the I-5 Corridor

It's very important to give people choices.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

The toll should be high enough to represent a real premium price.

Use of Toll Revenue

Premium transit service should be the only target for toll revenue.

Managed Lanes' Likely Impact on Travel Behavior

People would carpool less—they'll choose to have their music and their sport utility vehicle (SUV), if they have the choice to pay to drive alone.

Effectiveness in Moving People

The lanes would move fewer people than regular carpool lanes because they allow lower occupancy vehicles for a fee, but more than main lanes because they operate at free-flow during peak periods.

Environmental Issues

Although the freeway widening itself has environmental impacts, it would be hard to quantify impacts that relate specifically and solely to the value pricing component of the managed lanes. However, the ability to buy your way out of congestion as a solo driver could encourage commuters to reside farther from their workplace and therefore induce sprawl.

Safety, Enforcement, and Related Operational Issues

In general, these issues are best left to Caltrans engineers and planners. CHP especially will close down freeways much longer than they need to when there's an incident. Quicker response could minimize this type of non-recurrent congestion. Perhaps some technology could be developed to obtain whatever legal documentation of incidents is required in a quicker fashion. Perhaps some protective legislation should be developed to shield them from frivolous lawsuits attacking accident information collection techniques.

Operational Suggestions

An issue that should be explored is whether buses should possibly be allowed to drive on the shoulders.

Pros

The lanes preserve right of way for future transit solutions that will be needed.

Project Concerns and Challenges

MTS is concerned that the managed lanes, with pricing, will undermine HOV use and fuel the anti-transit sentiment of some. Mr. Williams also is concerned about equity and fairness issues.

MTS believes that high-quality transit is the only solution that will be able to move people in the future, so why make that inevitable choice more difficult by promoting the SOV? Further, sprawl will continue in the absence of a strong transit direction, making future populations more difficult to serve even with improved transit networks.

Environmental Justice Issues

Equity

There is an income-related fairness issue. This could be somewhat mitigated by providing high-quality bus alternatives.

Perceptions of Fairness

Low income groups would not perceive the managed lanes as fair. Although the equity issue is income-related, ethnicity also is income related, unfortunately, for some groups.

I-5 main lane users might be upset if they were in those lanes only because they didn't have enough money to use the managed lanes. If carpoolers and vanpoolers would not be delayed on the HOV lanes, they would probably be pleased with the project. If transit riders received real priority—access, ingress and egress priorities, and good connecting service, they would support the project. Mr. Williams notes that those who are less familiar with the lanes (for example, interregional travelers) may judge the lanes differently than those who live in the region and "own" the facility—the latter might be more critical.

Other Public Input

Underrepresented Groups

Many who ride buses never get asked to the table. A large portion of *TransNet* support came from the southern part of the County, but North County appears to receive more benefits.

Likely Sources of Project Support and Opposition

Mr. Williams is not aware of where a lot of opposition would come from. It depends on leadership—how you paint the picture determines the support or opposition you get.

Proposed Survey Question:

"Do you think it is reasonable to expect a long term solution to I-5 corridor mobility problems by catering to the automobile only? If not, how would you rate the importance of adding serious transit solutions into the mix?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Hon. Judy Ritter, Councilmember City of Vista; Chair, North San Diego County Transit Development Board (NCTD)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 17, 2004**

NCTD's Role in Project Planning or Implementation

NCTD will support adding more lanes, especially HOV lanes that the buses can use to increase on-time performance. This helps the whole system. NCTD will be working with SANDAG, MTS, and Caltrans to coordinate the regional network and develop the bus rapid transit (BRT). The common goal is to move more people.

Perception of Existing and Future Corridor Mobility Conditions

Congestion is bad and growing worse, and causes problems for the Councilmember's constituents.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Councilmember Ritter is very familiar with the I-15 FasTrak facility.

Efficiency

By using all available capacity, the FasTrak Program does provide an efficient mobility option.

Fairness

As long as carpoolers and transit riders still ride free, and their speeds are maintained, it's fair. It's simply a premium service.

Applicability to I-5 Corridor

Many people along the I-15 Corridor are asking when the FasTrak will be expanded. It makes sense to look at a similar concept for the I-5 Corridor.

Project Concept & Operations Pros and Cons

Current Community Issues

Councilmember Ritter discussed value pricing and Proposition A at a recent Chamber retreat, and she guesses that the one person who thought the lanes weren't fair was not

familiar or experienced with it. Although some of the general public might feel the managed lanes concept isn't fair, Councilmember Ritter does not hear objections about the I-15 FasTrak, and in fact, people want the facility extended more quickly than planned.

Priorities for Use of Managed Lanes

None identified.

Managing Demand: Access vs. Tolls

It is better to manage demand through using tolls. Otherwise, certain geographic areas along the alignment are likely to be unable to access the lanes during congested periods.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Caltrans will have to make this decision based on safety and operational parameters. The problem with a physical barrier would be how to allow as much access as possible to all those along the alignment. However, with the toll option, a painted barrier creates temptations for cheating which are dangerous to all.

Number of Access Points

Councilmember Ritter recommends that some of the proposed (preliminary) access points be combined, to reduce the total number. For example, there could be one access point for Solana Beach and Birmingham. Yet there's a long span between Tamarack and La Costa—there could possibly be an additional access point there, depending on traffic demand. Whatever Caltrans has to do to make the lanes work, people will come to learn where to access the lanes.

Operating the Lanes: Ingress/Egress Priority

All ingress points to the facility should be open to any eligible vehicle. As far as merging back into the main lanes, Councilmember Ritter points to the new southern terminus of the I-15 facility as a good model.

Signage and Toll Information

Councilmember Ritter believes that the I-15 Managed Lanes are effectively signed. A concern on the I-5 Corridor would be how to alert potential HOV users when the lanes are congested. She suggests more changeable message signs offering alternate route information to travelers.

Importance of Modal Choice on the I-5 Corridor

Modal choice is extremely important, it is the basis of North County Transit District's mission.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Councilmember Ritter thinks that perhaps $6 to save half an hour is fair, but it is difficult to imagine the reaction in 2014.

Use of Toll Revenue

Revenues should be used for some transportation-related improvement, along the I-5 Corridor. One suggestion is BRT subsidies. Councilmember Ritter suggests that each corridor should be independent, in its use of revenues.

Managed Lanes' Likely Impact on Travel Behavior

Vista is halfway between the I-5 and I-15 corridors, and if a value-priced managed lane were implemented on I-5, Vista residents would have a new choice. Councilmember Ritter herself would, like many others, still listen to the news before making a travel decision, but an I-5 facility would definitely increase the options for travel to San Diego. Councilmember Ritter also thinks that the recent increases on the Coaster bode well for the potential for increasing transit ridership within the corridor.

Effectiveness in Moving People

Because the managed lanes use all available capacity, they will move more people than regular carpool lanes. They will also move more people than main lanes.

Environmental Issues

Councilmember Ritter does not see any environmental issues associated with value pricing on the managed lanes.

Safety, Enforcement, and Related Operational Issues

Caltrans will have to focus on safety at the access points. In that regard, good signage becomes a necessity to alert people which lanes to move into to reach their destinations. Duplicate signage is needed to allow for the fact that trucks frequently block the view of signs for passenger cars near them.

Lane violators should receive a regular CHP traffic ticket.

Operational Suggestions

Make sure that transponders are interoperable between all California regions. If it's a choice between property takes and adding median landscaping, Councilmember Ritter suggests eliminating the landscaping.

Pros

The managed lanes with value pricing provide an effective new alternative for people in the I-5 Corridor, and decrease travel time for transit and HOV users.

Project Concerns and Challenges

Councilmember Ritter believes policy-makers will have to decide whether pricing should be designed for distance travel, or whether it should have more access points and accommodate local and regional mobility patterns. She believes that there will have to be a connection to SR 76 when it is completed, because people from Temecula will use that and take some pressure off SR 78.

Environmental Justice Issues

Equity

There is not really an equity issue, since the managed lanes will free up main lanes for those who can't afford or choose not to use the lanes as toll-payers. Councilmember Ritter notes that everyone has some use for a quicker ride at some time.

Perceptions of Fairness

Councilmember Ritter hopes main lane users will understand that the managed lanes relieve traffic for them. Both carpooler/vanpoolers and transit riders should be happy with a new two-lane facility in each direction that is free to them. There will likely be no difference in perception of equity between interregional and intraregional travelers.

Other Public Input

Underrepresented Groups

None identified.

Likely Sources of Project Support and Opposition

Strong support is likely to come from weekday business travelers and weekend recreational travelers. It's uncertain where opposition would come from.

Proposed Survey Question

Pass.

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Mark Baza, Planning Department** **Caltrans District 11**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**December 6, 2004**

Caltrans District 11's Role in Project Planning or Implementation

Caltrans' primary role is as operator of the system, tasked with doing due diligence in developing the analysis. The whole region will make the decision, ultimately. With regard to the value pricing component of the managed lanes project, Caltrans has been charged to look at pricing possibilities, to look at all options to fund and to serve transportation needs.

Perception of Existing and Future Corridor Mobility Conditions

Mr. Baza describes the I-5 as "Congested, in a nutshell."

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Baza has used the I-15 Express Lanes as a carpooler.

Efficiency

The lanes are efficient in that they maximize both existing and new capacity.

Fairness

The I-15 managed lanes are fair, in the sense that the tolls are reasonable for the premium service people get.

Applicability to I-5 Corridor

Personally, Mr. Baza favors implementation of a pricing strategy on I-5. However, Caltrans 11 does not have a technical or policy position that he is aware of. .

Project Concept & Operations Pros and Cons

Current Community Issues

Not applicable.

Priorities for Use of Managed Lanes

The highest priority would be for HOV because they move more people. Although SOV isn't a high priority, they must be considered, and the revenue aspect must be taken into account. From an operational standpoint, Mr. Baza doesn't think permitting trucks on I-5 managed lanes is the best approach. Based on SCAG's SR 60 Corridor Study, it may not even be legal to permit trucks, and it may require too much of a weave. Putting trucks on managed lanes is probably not a feasible option. Emergency vehicles should be allowed at no toll. Mr. Baza has no opinion on whether that privilege should also be extended to clean air vehicles.

Managing Demand: Access vs. Tolls

A combination of tools is best because what works in one area might not work in another. Flexibility will help in implementation. From an operational standpoint, Caltrans would only want to close off normal ingress points in case of extraordinary emergency.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Caltrans will likely use a physical barrier, whether it's movable or stationary because of safety, and to prevent weaving in a condition of great speed differentials between lanes. In fact, painted barriers are probably "not a starter" for Caltrans, given the high corridor volumes.

Number of Access Points

The technical work will have to be completed to determine the best spacing of direct access ramps (DARs). If DARS have a purpose for large attractors, or large volumes, then spacing isn't an issue. Access must be designed to serve the volumes that exist now and will exist in the future.

Operating the Lanes: Ingress/Egress Priority

There will need to be some distinctions made between vehicle or user types at some access points, but only at DARs, not slip ramps. It may not be desirable to mix carpoolers with transit at some locations, for example. The feasibility and desirability of prioritizing traffic by type back into main lanes would have to be determined on a case-by-case basis.

Signage and Toll Information

Mr. Baza thinks the signage on the I-15 managed lanes is effective for daily users, but doesn't provide enough information for newcomers or people unfamiliar with the lanes. Signage on the I-5 facility must be clear, and continuous throughout the corridor. It's a long stretch of highway, and especially if there are going to be variations in the facility, there must not only be adequate signage, but early and ongoing marketing efforts as well.

Importance of Modal Choice on the I-5 Corridor

Modal options for people are very important, and necessary from Caltrans' perspective in order to manage the system better. Caltrans is no longer in the business of just taking care of SOVs.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Baza thinks that is a reasonable toll, and in the middle of the peak, he'd use the lanes at $6.00 per trip.

Use of Toll Revenue

Although the toll revenues won't be significant, Mr. Baza would like to see them directed to new transit, carpooling and other highway purposes along the I-5 Corridor, only.

Managed Lanes' Likely Impact on Travel Behavior

Mr. Baza believes the existence of managed lanes will encourage people to pay to drive alone. "The corridor is ripe for pay-to-go."

Effectiveness in Moving People

Managed lanes are "not necessarily" better at moving people than regular carpool lanes, but they are more effective than general purpose lanes.

Environmental Issues

There are issues with the lagoon crossings. Caltrans also will be looking at more sensitive landscaping and moving away from oleanders and non-native invasive species, which are maintenance headaches anyway. Other environmental issues will be noise and view shed impacts.

Safety, Enforcement, and Related Operational Issues

Mr. Baza believes that while some kind of traffic violation should certainly apply to managed lane violators, he's not sure whether an additional pricing penalty also should be applied.

Operational Suggestions

BRT and DARs need to be located in order to serve major attractors and employment patterns. There also is a great opportunity for joint development and transit-oriented design at the DARs. Finally, transit feeder service needs to serve both the DARs and the destinations.

Pros

None identified.

Project Concerns and Challenges

The biggest planning concern for Caltrans District 11 is that they must decide whether to build a 10+4 or 8+4 (main lane + HOV lane) facility. Right-of-way constraints are an issue, and even with the smaller footprint, there may be some new property takes required.

From a project development standpoint, Caltans' biggest challenge is the staging. The sheer physical problem of constructing the lanes is daunting. Where possible, Caltrans must look at stand-alone auxiliary lane projects and pursue those, because every inch of capacity will be needed to manage the traffic during construction. Once the I-5/I-805 interchange is completed, there will be new bottlenecks, and all operational improvements or capacity enhancements will have to be explored while the region undergoes the long planning and environmental process. Caltrans has to look at defining logical segments, and educating the public about its decisions, to show the public that Caltrans is going the extra mile to accomplish the corridor improvements as fast and cost-effectively as possible.

Environmental Justice Issues

Equity

Mr. Baza is a firm believer that Caltrans and other stakeholder agencies need to get out into the community and get input. Certain communities are good at getting heard, but Caltrans needs to hear from all of them.

Perceptions of Fairness

The issue is primarily affordability, which is related most strongly to income. The main lane users are likely to have some resentment, and perceive the managed lanes as "Lexus Lanes" for the rich folks, but the corridor has a lot of educated people who realize that capacity is freed up for the general purpose lanes. HOV lane users will be fine with the lanes as long as the facility moves; if it every shuts down, they'll resent it. Transit riders will like the BRT. Truckers will probably not want to use the lanes. Interregional and San Diego commuters will probably split along the same lines as main lane users in general—some will see that the capacity helps the main lanes.

Other Public Input

Underrepresented Groups

Mr. Baza is not familiar enough with the corridor to identify specific groups, but in general, the less affluent have a harder time getting heard.

Likely Sources of Project Support and Opposition

Not sure.

Proposed Survey Question

Any information is good.

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Gonzalo Lopez, Director of Marketing and Community Relations, Metropolitan Transit System (MTS)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**December 3, 2004**

MTS's Role in Project Planning or Implementation

MTS doesn't have an official role, but will participate in an advisory capacity, with SANDAG serving as the long-range planning lead agency.

Perception of Existing and Future Corridor Mobility Conditions

Mr. Lopez describes traffic as catastrophic, and notes that it gives him a headache. People get stressed when they are trapped—they become desperate in the peak hours, from 2:00 p.m. on, especially from La Jolla to Chula Vista in the south.

Mr. Lopez works with the Hispanic Chamber of Commerce, in his position at MTS, and he hears that people want more access, and more frequent bus service. Getting to work is very important, and people support transportation, as is apparent by recent public support for *TransNet*. Both anecdotal evidence and research shows that people don't mind some tax increase if social services and transit service increase as well.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Lopez knows about the I-15 FasTrak lanes, but has not used them frequently.

Efficiency

The official MTS position is that the lanes do provide an efficient mobility option. Mr. Lopez feels neutral about it, personally, and needs more information. He observes that people's actual experience with the lanes is sometimes problematic, and they are expensive.

Fairness

It's somewhat pricey for many, says Mr. Lopez, and while it's easy for a middle class person to say that's all right, it's a bigger burden on lower income people. Market pricing excludes a lot of people.

Applicability to I-5 Corridor

Mr. Lopez agrees with pricing as a rational mechanism, and thinks it's fair as long as there are alternatives.

Project Concept & Operations Pros and Cons

Current Community Issues

There is some community concern about the location of stations and ingress/egress. Mr. Lopez understands that there has been a lot of public input into those decisions. What people want is a predictable and trustworthy transportation network.

Priorities for Use of Managed Lanes

Vehicles should be accorded priority based on occupancy, from highest to lowest. Trucks could possibly use the lanes off-peak. Emergency vehicles should be allowed at no toll, but not hybrids. Mr. Lopez feels hybrids are expensive and giving them priority would be elitist.

Managing Demand: Access vs. Tolls

Mr. Lopez thinks a combination of physical access and tolls makes sense. It is easily managed and gives people more options. If people need to get on, they can pay, if not, they can wait five minutes for the lanes to open at a lower cost, or no cost. Good signage would be necessary if physical access were to be opened and closed to manage demand.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers
Enforcement problems occur with painted barriers. Concrete barriers are preferable for safety reasons, as well.

Number of Access Points
If the lanes are to operate as express lanes, then by definition the fewer entrances the better. But there should be good directions on how to get to major destinations. And with fewer access points, they might themselves become congested or create merge-related bottlenecks. There's a technical tradeoff between dispersing access over more entrances/exits and maintaining the flow of both managed lanes and main lanes.

Operating the Lanes: Ingress/Egress Priority
Mr. Lopez favors providing ingress and egress (merge) priority to public transit, to help it be more competitive. Every possible operational feature that can give preference to the bus should be included in the facility design.

Signage and Toll Information

People need enough advance warning, and that can't be done "on the cheap." It also requires good customer information and adequate radio and web information as well.

Importance of Modal Choice on the I-5 Corridor

It is important to have choice, because that's the way to attract people. Our culture demands that people have choices.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Lopez says that, though $6 a ride may be worth it to him, that's $120 per month on a daily basis. So, if there were a public transportation alternative, he'd use that. He imagines that this is a rational decision many people would make.

Use of Toll Revenue

Transit would be a priority for MTS, along with transportation improvements, better information within that corridor, or even environmental purposes.

Managed Lanes' Likely Impact on Travel Behavior

People might choose to remain as solo drivers, and pay a fee. If so, the public transit system has to be very competitive with solo driving. People value relaxation, so that angle of public transit could be promoted.

Effectiveness in Moving People

Mr. Lopez believes that the managed lanes will move more people than either regular HOV lanes or main lanes.

Environmental Issues

Emissions might be reduced with managed lanes, and quality of life might improve. Environmental mitigations of the freeway widening could be undertaken using toll revenue.

Safety, Enforcement, and Related Operational Issues

Mr. Lopez advises facility planners to remember that people make mistakes when rules are complicated, so it's necessary to simplify the message.

Operational Suggestions

None identified.

Pros

It provides a new option, and another potential solution for a crowded corridor.

Project Concerns and Challenges

MTS wants to make sure that buses can travel uninterrupted, so that gives people a real alternative, saving both time and money over driving solo.

Environmental Justice Issues

Equity

The market serves a purpose in many ways, so the price will have to be enough to be an effective rationing mechanism, but not so high as to exclude people altogether. If it's expensive enough to drive solo, and quality transit is available as an alternative, people will use it, and that's a mitigation.

Perceptions of Fairness

People do what they need to do. Lower income people will mostly avoid using the lanes—especially because low income people in this area is really low income: $20 thousand for a family of four. The only major ethnic group in the project area that's significant in size is Hispanic. Income, not ethnicity, is what impacts them.

If I-5 main lane users feel they can pay to access the lanes, but simply choose not to, they will feel they have control over the decision. HOV users should be fine with managed lanes as long as their speeds are maintained. And if transit riders have a good BRT system, they will have more than they have now. However, BRT poses its own set of equity implications. Truckers should enjoy fewer cars on the lanes they use. Local San Diegans can find alternatives to the freeway entirely.

Other Public Input

Underrepresented Groups

None identified.

Likely Sources of Project Support and Opposition

People likely to use BRT will probably support the lanes. There will probably be more support than opposition, since people want solutions right now.

Proposed Survey Question

"How would this improve your life? Do you want this, and why?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Captain David Webb** **Lt. Rich Rennie** **California Highway Patrol (CHP, Oceanside Area)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 12, 2004**

CHP's Role in Project Planning or Implementation

The CHP will play an enforcement role in the project when it's implemented. CHP also works with Caltrans during planning and construction phases on issues including safety, pullout areas and enforcement areas. The CHP has a minimum of annual meetings with Caltrans, and has a number of avenues of communication through which it makes freeway-related concerns known.

Perception of Existing and Future Corridor Mobility Conditions

Congestion is a daily occurrence, during morning and evening commute periods, and also throughout the weekend. Traffic has deteriorated noticeably over the past five years, and by noon, it's stop-and-go from Oceanside south. On the weekend, southbound lanes are severely congested. This means more frustrated drivers and more accidents. The CHP needs visibility to helps its enforcement mission, but congestion means the CHP vehicles have difficulty covering territory. In addition, it becomes more difficult to pull people over for violations when congestion is already bad, and will become worse as people slow down for the enforcement activity on the shoulder.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Both Lt. Rennie and Captain Webb are familiar with the I-15 FasTrak managed lanes, and Captain Webb has used them a few times, as a carpooler.

Efficiency

Both officers feel the lanes are obviously more efficient than the main lanes.

Fairness

Lt. Rennie believes the FasTrak lanes are fair, in the sense that they give people an option they can pay for to get the additional convenience.

Applicability to I-5 Corridor

The CHP is neutral on this issue, and leaves it as a technical issue in the realm of Caltrans engineers and SANDAG.

Project Concept & Operations Pros and Cons

Current Community Issues

The main issue identified by CHP related to the low income military families at and near Camp Pendleton.

Priorities for Use of Managed Lanes

Highest priority should go to high-occupancy vehicles—transit buses, vanpoolers, and carpoolers. Only two-axle trucks should be allowed. Clean air vehicles should be a higher priority than solo-drivers. Emergency vehicles should be permitted at no toll.

Managing Demand: Access vs. Tolls

Lt. Rennie suggests that physically limiting access is better than using tolls to keep the managed lanes uncongested, because it avoids the equity issue. However, it complicates enforcement and may result in a confusing array of choices for people as they're driving. People get confused very easily. If a physical approach to lane management is taken, Caltrans will have to give plenty of warning to people, for example, "Managed Lanes closed 8 miles ahead."

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

There are few long stretches on the alignment, and with soft barriers, Caltrans will need to post where people can get in and out. An advantage to having soft barrier is that sometimes you're in stopped traffic and people next to you are moving faster, so you would want the most flexibility. However, the flexibility is a tradeoff against safety. Additionally, replacing the attenuators is expensive. One solution could be creating several breaks in hard barriers to clear accidents. CHP warns that if the lanes are configured with hard barriers on each side, then a center shoulder will be absolutely essential.

Number of Access Points

Access about every four to seven miles seems adequate.

Operating the Lanes: Ingress/Egress Priority

CHP officers suggest that anyone entitled to use the managed lanes should be able to access the lanes at all points. Allowing priority to some users for merging back into the main lanes might be confusing, and the officers don't see how it could be accomplished.

Signage and Toll Information

The I-15 FasTrak lanes seem to be well-signed. Since the I-5 Corridor will offer drivers more ingress/egress options, Caltrans will have to pay special attention to giving people clear and sufficient notice. Additionally, and educational campaign will be required.

Importance of Modal Choice on the I-5 Corridor

Though pricing of the carpool lanes somehow is in some ways objectionable, the option should be available. More frequent and convenient transit also is needed on this corridor.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Both officers believe that the toll would be "well worth it." Some would be able to afford this more often than others, however.

Use of Toll Revenue

CHP will receive additional Caltrans monies to pay for extra enforcement associated with the managed lanes. The officers suggest that toll revenues be used for highway maintenance within the I-5 Corridor.

Managed Lanes' Likely Impact on Travel Behavior

Lt. Rennie admits that, though he has reservations about the lanes, he would probably use them (as a civilian motorist) when the freeway was congested. The CHP officers believe there is high potential for increasing transit and carpooling on the I-5 Corridor, because congestion is so bad. But some drivers will not be able to carpool, or will choose not to, and will opt to avail themselves of the pricing option.

Effectiveness in Moving People

The officers believe that the managed lanes will be more effective in moving people than both regular HOV lanes and general purpose lanes.

Environmental Issues

This is not an issue for CHP.

Safety, Enforcement, and Related Operational Issues

CHP recommends that enforcement and breakdown areas be located to the left of the managed lanes. Caltrans might also want to look at photo enforcement.

With respect to how to penalize scofflaws in the managed lanes, CHP doesn't want to "double-ding" people for violations of the lanes, and so either toll-related fines or traffic tickets (HOV lane violations) should apply, but not both.

Operational Suggestions

There should be a direct access ramp onto the managed lanes at SR 78. For other operational suggestions, see answers to Safety, Enforcement, and Related Operational Issues and Signage and Toll Information.

Pros

The lanes can manage demand effectively.

Project Concerns and Challenges

One of the problems is that the general public believes that an extra lane would cure all the problems, though it wouldn't. Other concerns relate to the overall problems of how to enforce the lanes safely and effectively. CHP sees a big educational need, to avoid potential public confusion about the lanes.

Environmental Justice Issues

Equity

Although everyone's time is valuable to them, certain segments of the population will not be able to afford the tolls, or will not be able to use them often. Mitigating this, however, is the fact that mobility management reduces pollution. So, if the goal is efficient demand management, then Caltrans has to opt to permit the buy-in.

Perceptions of Fairness

The CHP officers believe that equity issues will be perceived by people as an income-related, rather than an ethnicity-related issue, though there is a relationship between ethnicity and income in the U.S.

I-5 main lane users will include some percentage of people who will be vocal in opposition to the lanes. These are folks who feel they pay their gas tax, and so shouldn't have to pay to use any road. Most people will see that the managed lanes offer a choice similar to flying tourist vs. first class. Though some HOV lane users some will resent that the toll-payers are not taking the time and effort to carpool, their resentment should be allayed by the fact that they don't have to pay. A similar reaction might come from transit riders.

Some differences in perception of equity might come from differences in familiarity with the concept or operation of managed lanes. Thus, Orange County travelers who are very familiar with value pricing, will understand the lanes and have no problem with them. Others less familiar with how they work may have more objections. These could include tourists, and even truckers traveling to or from the San Diego port area. Truckers should generally be happy to get more four-wheelers out of their way. Their biggest concern will be the numbers of weaving points. They already tend to drive in the number three lane rather than the number four lane, to avoid merging traffic.

Other Public Input

Underrepresented Groups

CHP recommended including the Coastal Commission, the lagoon conservancy organizations, and the Surfriders' Foundation.

Likely Sources of Project Support and Opposition

Support will likely come from the chambers of commerce, tourism interests, city councils, the Southern California Auto Club, and "big-time users" of the freeway. Support will also come from the general public, and those who are happy with HOV lanes.

I-5 North Coast Managed Lanes Value Pricing Planning Study

Interview participant:	**Robert A. Leiter, AICP, Department Director of Land Use and Transportation Planning San Diego Association of Governments (SANDAG)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 19, 2004**

SANDAG's Role in Project Planning or Implementation

SANDAG is the lead planning agency involved in planning the I-5 managed lanes, as well as the larger corridor widening project. Mr. Leiter's department is focused solely on the value pricing study.

Perception of Existing and Future Corridor Mobility Conditions

Although Mr. Leiter lives along the I-15 Corridor, he is aware of heavy congestion on the I-5 Corridor. SANDAG is concerned about the ability to reach destinations without a lot of congestion delays. Goods movement is another important aspect of the mobility issues on I-5.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Leiter uses the I-15 managed lanes with a transponder on an occasional basis. He lives one interchange south of the north end of the facility, and the only time he uses them is if the main lanes are severely congested, or if he's going to Escondido, and not home, first (in the evening peak). Also, on a Friday evening, he might pay the "kind of expensive" toll of four or five dollars for eight miles.

Efficiency

Mr. Leiter does not think the lanes are as efficient as they could be, but they still provide a good mobility option. His concern is that the pricing sometimes appears to be badly applied. For example, the tolls are only two or three dollars when the managed lanes are already backing up. Also, there have been issues with faulty transponders and slip ramp construction impacts.

Fairness

If fairness means that people pay a price based on managing the lanes—not social equity, but for the value received, then managed lanes are fair. The whole concept is to use tolls to maintain flow, and then to allocate the net toll revenue to provide transit.

Applicability to I-5 Corridor

Mr. Leiter supports a value pricing application on I-5

Project Concept & Operations Pros and Cons

Current Community Issues

Mr. Leiter is not aware of any special issues that might affect the project.

Priorities for Use of Managed Lanes

Priority should start with the highest-occupancy vehicles and move down to SOVs. Off-peak truck utilization of the lanes should be considered. Mr. Leiter does not support allowing clean air vehicles to use the lanes at no fee, though emergency vehicles certainly should be permitted. It is also worth considering priority for disabled people.

Managing Demand: Access vs. Tolls

Demand should be managed primarily, if not solely, though the variation in tolls. This should suffice.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Mr. Leiter likes physical barriers to control access to the lanes. Also, with potential electronic guidance systems that BRT may use in the future, it's not a good idea to have people ducking in and out of the managed lanes.

Number of Access Points

Although this is in the project planning and engineering arena, Mr. Leiter thinks direct access ramps (DARs) should be located about every three miles, as studies suggest, and slip ramps located where they make sense, and don't create congestion. He is concerned that planners are counting on using El Camino Real for bus rapid transit, but that the North County cities have not approved the configurations necessary to make that alternative effective. Thus, he wants to ensure that the design doesn't preclude the possibility of using managed lanes north of Manchester for bus rapid transit, because it might not be possible to use El Camino Real effectively for that purpose.

Operating the Lanes: Ingress/Egress Priority

Mr. Leiter does not see the need for prioritizing access by user type. If the value pricing can't keep the lanes clear at high tolls, then the carpool eligibility for carpools will have to be raised to three people per vehicle. This is preferable to closing access physically.

If possible, merging back into the main lanes should give priority to buses first, then HOV, then SOV. It may not be necessary to separate them, though, and it might be harder for enforcement if they were separated. On I-15 there's no choice at the merge, and that works well.

Signage and Toll Information

I-15 signage seems to be effective. The point is to give people sufficient warning and some public education. The Orange County toll roads seem to be a little more user-friendly—they provide more information that is somewhat better explained.

Importance of Modal Choice on the I-5 Corridor

It's important to give people choices that help them choose transit or other HOV modes.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Under the right circumstances, Mr. Leiter would pay this amount.

Use of Toll Revenue

Toll revenue should support new transit in the I-5 Corridor, or possibly vanpool or carpool transportation demand management support programs.

Managed Lanes' Likely Impact on Travel Behavior

Mr. Leiter thinks transit ridership could improve because the managed lanes facility will provide opportunities for shorter trip times using transit. If transit can give people a travel experience that compares favorably to driving alone, people will choose transit. The improvement of the HOV system under the proposal will also encourage carpools.

Effectiveness in Moving People

Managed lanes with value pricing would move more people than either regular carpool lanes or general purpose lanes.

Environmental Issues

SANDAG can have a positive environmental effect by encouraging smart growth at BRT/DAR locations. The agency has a plan for shuttle networks, and possibly arterial BRT that brings people into the system and provides door-to-door service—better than light rail. Places like Eastern Chula Vista would have been harder to serve by light rail, for example.

Safety, Enforcement, and Related Operational Issues

Violators should receive a traffic ticket, not a pricing penalty.

Operational Suggestions

Mr. Leiter is confident that agency staff will develop a safe and effective facility.

He also notes, however, that the Regional Comprehensive Plan (RCP) is designed to connect land use plans to transportation plans, and the region is putting a lot of emphasis on smart growth. Thus, instead of closing access to manage demand, the region should plan on giving more and more lane capacity to buses as congestion increases over time. Since interregional travelers may also be attracted to BRT the region needs to preserve capacity for that. Coming technological advances could likely improve BRT's advantages over SOVs in the future.

Pros

Managed lanes will provide an effective means of adding transportation capacity and maximizing the use of transportation facilities.

Project Concerns and Challenges

The largest concern is that because people don't understand how the lanes work, or what their purpose is, they perceive them to be unfair. This implies an education and outreach challenge for SANDAG.

Environmental Justice Issues

Equity

The issue of equity must be evaluated and understood. But Mr. Leiter suggests that when trying to make a transportation system work efficiently, and in considering a number of community goals, such as air quality and addressing low income mobility needs, overloading the transportation system and disrupting the market you are trying to create to manage demand might be self-defeating. Social equity might better be addressed through other programs, such as emergency vouchers.

Perceptions of Fairness

Mr. Leiter referred to a low income participant in a recent focus group on the I-5 managed lanes, a man who had said he'd use the lanes as a carpooler. Mr. Leiter feels that as long as people know they can use the system, and the equity issues are being dealt with, they'll be okay with the concept. That makes another education and outreach issues.

I-5 main lane users may be pleased if other drivers leave the main lanes less congested by using the managed lanes. HOV and transit riders will be happy with better operations along the corridor. Interregional travelers from Orange County and Mexico will understand the operation of the lanes, because they are familiar with tolling, and so probably won't object to them. To the extent that the managed lanes improve system flow, they wouldn't have a problem with them, and it's possible they might enjoy off-peak access to the lanes, though Mr. Leiter is not sure this is accurate.

Other Public Input

Underrepresented Groups

No groups identified. Mr. Leiter observes that I-5 travelers are fairly heterogeneous and very vocal.

Likely Sources of Project Support and Opposition

Support will come from educated commuters and users who would understand and like the managed lanes facility. Conservative people who think they should be able to drive anywhere at any time, at any speed, may object to managed lanes. In general, people on the I-5 Corridor are probably more sophisticated and willing to consider new ways of doing things, and the lanes probably have a greater chance of support there.

Proposed Survey Question

"Would you be more likely to use Bus Rapid Transit along this corridor if you lived within walking distance to a station? What is the likelihood that you would also be willing to drive to a park and ride lot at one of the new direct access ramps, or join a carpool, to reduce 24 minutes for a peak hour trip?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Louis Martinez, Treasurer Hispano-Americans for Progress (HAP), and Traffic Commissioner, City of Vista**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 22, 2004**

HAP's Role in Project Planning or Implementation

Mr. Martinez has been in a leadership school sponsored by SANDAG, and has attended North County Transit District (NCTD) meetings and has been asked to participate in an organization involved in promoting NCTD. He is familiar with SANDAG and its structure.

Perception of Existing and Future Corridor Mobility Conditions

Traffic is "horrendous. Something to be avoided." Mr. Martinez says I-5 is in almost constant overflow, and that he personally avoids going to San Diego as much as possible. When he does, he tries to travel after 9:30 a.m. and return to Vista before 3:00 p.m.

The issues of concern for HAP members include the ability of working people to access downtown, parking costs, and access to work locations that are not downtown-focused.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Martinez is familiar with the I-15 Express Lanes, and before his recent retirement, he traveled on the main lanes three to four times per week, and looked with some amount of envy at those on the managed lanes. Now, he is able to use the lanes as a carpooler when traveling with his wife.

Efficiency

Mr. Martinez thinks the I-15 managed lanes are efficient, and he would have used them if he could have.

Fairness

The lanes are fair because there's no overcrowding, and they ensure that it works for the carpoolers while getting solo drivers to help pay for the roads.

Applicability to I-5 Corridor

Mr. Martinez would support applying an I-15 managed lane concept to the I-5 Corridor.

Project Concept & Operations Pros and Cons

Current Community Issues

The community is basically interested in widening the freeway.

Priorities for Use of Managed Lanes

Priority should be accorded to users based on highest occupancy of the vehicle to lowest. Mr. Martinez would need to see how truck use of the lanes would work. "Trucks are heavy, though they do pay taxes," he observes. Emergency vehicles should be allowed to use the lanes at no toll, but Mr. Martinez is less sure about permitting clean air vehicles the same privilege.

Managing Demand: Access vs. Tolls

Closed access would result in some irate citizens, says Mr. Martinez. It is preferable to let the market do the job.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Mr. Martinez would rather have some sort of physical barrier—even if it were just k-rail.

Number of Access Points

Access should not be available at every on-ramp. A four to seven mile interval is adequate.

Operating the Lanes: Ingress/Egress Priority

On-ramps should be open to all eligible facility users. He would support providing a longer merge back into main lanes for transit buses.

Signage and Toll Information

Signage on the I-15 FasTrak is very effective—Caltrans does a good job with signage in general.

Importance of Modal Choice on the I-5 Corridor

It's very important to provide choice for people.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Martinez would be willing to pay $6 to save 24 minutes, rather than being stuck for 20 minutes in 12 mile per hour traffic. His time is valuable, and managed lanes are less stressful travel option. He believes other Hispanic-Americans would feel that way as well.

Use of Toll Revenue

Toll revenue should go to support new transit in the I-5 Corridor, and for highway maintenance within San Diego County.

Managed Lanes' Likely Impact on Travel Behavior

Mr. Martinez believes both carpools and solo drivers who can afford it will use the proposed managed lanes. "Just open them—they will be used!"

Effectiveness in Moving People

Managed lanes will not move as many people as regular carpool lanes, but will move more people than main lanes.

Environmental Issues

HAP would have no environmental concerns, beyond those impacts related to the addition of new concrete that is part of the expanded footprint of the roadbed.

Safety, Enforcement, and Related Operational Issues

Leave these issues to Caltrans engineers.

Operational Suggestions

Mr. Martinez would like Caltrans to provide connections at SR 78 and Palomar Road onto the managed lanes. He notes a 5000-unit residential development near Palomar Road, known as Leo Carrillo Ranch, which will generate a lot of trips.

Pros

The managed lanes will offer people in Vista another way to get downtown.

Project Concerns and Challenges

None identified.

Environmental Justice Issues

Equity

No equity issues, as long as it's an additional option to pay tolls, and carpools/transit remain free.

Perceptions of Fairness

Mr. Martinez thinks all groups will adjust quickly to the managed lanes if they were built.

Other Public Input

Underrepresented Groups

Mr. Martinez notes that everyone in Vista gets heard, since it's such a small town with plenty of access to elected officials.

Likely Sources of Project Support and Opposition

Some people are simply opposed to mass transit. Everyone would support the managed lanes as long as they don't take private property or beach property.

Proposed Survey Question

"Would creation of a Citizen's Oversight Committee increase your support for the managed lanes?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Mr. Reginald Owens, First Vice President** **Mr. Warner Davis, Second Vice President** **North San Diego County Branch, National Association for the Advancement of Colored People (NAACP)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 15, 2004**

NAACP's Role in Project Planning or Implementation

The North San Diego Branch of the NAACP is not involved with Caltrans—not because its members are not concerned with transportation issues, but because they're primarily a civil rights organization. The members are concerned about affordability and who will be able to benefit from the lanes.

Perception of Existing and Future Corridor Mobility Conditions

Both Mr. Owens and Mr. Davis noted that congestion going south is, indeed "going south: from bad to horrible." They note that the I-5 used to get more congested farther south of Oceanside, near Via de la Valle. Now the backup starts as far north as Carlsbad and is progressively getting worse. Nor does time of day seem to matter too much. Even northbound traffic is congested.

NAACP members are concerned about accessibility to and from the freeways and the travel delays and traffic on the freeways. Surface streets are often no better, however. A six-mile trip from Carlsbad to Oceanside on El Camino Real can take 45 minutes. Mr. Owens thinks public transportation, though it exists, is not convenient. The train is adequate, and Mr. Warner uses the train almost exclusively to go to downtown San Diego.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Warner is not familiar with the lanes, though Mr. Owens is somewhat familiar with them. Neither has used them, and don't have transponders.

Efficiency

Theoretically, the lanes are efficient, but, again, neither Mr. Owens nor Mr. Davis has direct experience to that effect. They express concern that the lanes simply dump vehicles back into clogged lanes, and they ask, "How much time do you really save?"

Fairness

Mr. Owens and Davis believe the lanes are fair, because they provide an additional option, and carpoolers, vanpoolers, and transit riders still use the managed lanes at no cost.

Applicability to I-5 Corridor

Because even the HOV lanes can become congested, the NAACP representatives would favor a pricing approach if it kept traffic moving.

Project Concept & Operations Pros and Cons

Current Community Issues

The travel-inducing aspect of the managed lanes (as well as the widening itself) could impact corridor cities' attempts to retain "small town" quality of life and image.

Priorities for Use of Managed Lanes

Generally, higher occupancy vehicles should receive priority. Trucks are dangerous—leave them on the outside lanes of the main freeway, where they travel at safer speeds. They also have to be weighed, and they're subject to some restrictions that smaller vehicles aren't. While emergency vehicles should absolutely be allowed to use the lanes at no toll, there is no logic in allowing clean air vehicles to do so: people are already buying them in ever greater numbers, and it's a confusing policy for people to understand.

Managing Demand: Access vs. Tolls

Although using tolls to control demand has advantages, the first option should be to use physical access strategies, as long as there is adequate signage. A combination of these tools, depending on the flow of traffic, should be used.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

A physical barrier is preferable. If people are given an option to take advantage of the lanes, they will. Movable barriers might make more sense in terms of long-range strategic transportation planning.

Number of Access Points

Add slip ramps at those points where congestion occurs on a regular basis, as long as the merge and weave movements don't make congestion worse.

Operating the Lanes: Ingress/Egress Priority

All access points should be available to all eligible users of the managed lanes.

Signage and Toll Information

Mr. Owens and Mr. Davis both would like to see better signage on the I-15 FasTrak. The existing signage is confusing, and they guess that many people would fear getting

on the lanes accidentally, unaware of the current toll. They would like to see SANDAG or Caltrans do better marketing for the existing as well as any future lanes planned for the I-5 Corridor. If a combination of physical access restrictions and tolling is used to manage demand, good signage becomes even more important.

Importance of Modal Choice on the I-5 Corridor

On a scale of one to ten, modal choice is a "ten." The region must develop a range of options that accommodate the range of incomes of the population along the corridor, and those using the corridor.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

People would use the lanes at this price, especially those who had a special need on a given day.

Use of Toll Revenue

Don't send the revenues to the general fund! Net revenues should be dedicated to the upgrading of the transportation system in the I-5 Corridor first, but if the need is not there, some flexibility should be permitted so that adjacent areas could receive the funds. Revenues could also be used to expand or extend the managed lanes, if they prove to be effective.

Managed Lanes' Likely Impact on Travel Behavior

Both Mr. Owens and Mr. Davis agree that they would use the managed lanes. Mr. Davis, speaking as a senior citizen, favors public transportation, and believes greater use of transit would reduce accidents and congestion. But he doesn't think the pricing would encourage transit due to the lack of connections at origins and destinations. Further, carpooling might not be increased because people tend to value the time alone in their cars, and if they can pay to travel faster, they'll take that option.

Effectiveness in Moving People

Mr. Owens and Mr. Davis believe that managed lanes will move more people, lane for lane, then either carpool or general purpose lanes.

Environmental Issues

The NAACP is concerned about such issues as locating waste dumps near poor populations, which doesn't really apply to the managed lanes concept. However, the organization would support development of the lanes in harmony with environmentally sound principals.

Safety, Enforcement, and Related Operational Issues

A painted barrier scenario results in enforcement problems. Mr. Owens notes that he has seen solo drivers swerve into the HOV lanes and get away with it. Merging traffic, weaving and the bottlenecks created represent another set of problems that are of concern.

Operational Suggestions

Caltrans should consider direct connecters with SR 78 and SR 76.

Improving the HOV and transit network, facilities and services is essential if people are really going to start using these alternatives.

Caltrans needs to keep in mind the problems that are beyond the I-5 Corridor that nonetheless affect operations within the I-5 project area.

Pros

The fact that the managed lanes may preserve a future transit corridor is one advantage of the project. The benefits of managed lanes, as opposed to a "no project" alternative seem to outweigh the disadvantages. The new capacity would also lessen the burden on the main lanes.

Project Concerns and Challenges

The approach should be to look at who's going to use it, and of course if we're talking about moving people vs. vehicles, that population that will be middle- to low income. To preserve their mobility through maintaining free carpool access is a priority.

Environmental Justice Issues

Equity

Both Mr. Davis and Mr. Owens view the equity issue as a matter of income, or class, rather than ethnicity. Affordability is the issue, although the logic of charging to keep the lanes free-flowing makes sense. If the lanes are still free to high-occupancy vehicles, then charging for solo drivers is not a problem.

Perceptions of Fairness

It us unlikely that perceptions of low income groups will be any different than those main lane users who look over at the HOV lanes. If it saves people time, then even if you're poor, it just costs you some planning to be able to use the lanes as a carpooler. Carpoolers and transit riders should be pleased with the managed lanes.

Other Public Input

Underrepresented Groups

The fastest-growing population is the Mexican-American population, so they need to be approached. The Samoan population and the inland Native American populations should also be considered.

Likely Sources of Project Support and Opposition

Opposition might come from taxpayers if SANDAG has to pass a bond. The pricing concept has to be the focus of more outreach and education in order to familiarize a variety of populations about it before it gets off the ground.

Proposed Survey Question

"Why are you opposed to carpooling?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Grace Roos,** **League of Women Voters**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**December 14, 2004**

League of Women Voters' Role in Project Planning or Implementation

No comment provided.

Perception of Existing and Future Corridor Mobility Conditions

Ms. Roos describes I-5 conditions during commute time, as "very, very bad." One of the League of Women Voters (League) concerns is overloaded trucks, causing cars to constantly swerve in and out of lanes. Another concern is that when Caltrans establishes temporary construction lanes, the entrance and exit angles are too sharp for vehicles to negotiate safely.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Ms. Roos is very familiar with I-15 FasTrak, but doesn't use them because of the limited access.

Efficiency

Ms. Roos does think that the FasTrak lanes provide an efficient mobility option for travelers.

Fairness

Ms. Roos believes the managed lanes on I-15 are fair because as more carpoolers use the lanes, the tolls serve to cut back the numbers on solo-driving toll payers. For Ms. Roos, fairness "means that those people who are willing to carpool, it encourages them.

Applicability to I-5 Corridor

Ms. Roos gives only "reluctant support" to a pricing application along the I-5 corridor. The League's position strongly supports carpooling as a method of reducing congestion. The League's hesitant support comes only if the same priority for HOVs are set in place along the I-5 as exists on the I-15.

Project Concept & Operations Pros and Cons

Current Community Issues

The main concerns that the League sees are the wider range of environmental problems associated with the expansion of the roadway, rather than the pricing per se.

Priorities for Use of Managed Lanes

The League would place priority on the highest occupancy vehicles first, and allow solo drivers to buy into the lanes only if there were excess capacity. Trucks should not be allowed. Ms. Roos favors allowing toll-free access for both emergency and clean air vehicles.

Managing Demand: Access vs. Tolls

Ms. Roos favors a combination of limiting physical access and tolls to manage demand on the managed lane facility.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Ms. Roos is concerned that the physical barrier may be necessary for a priced facility, but that a pure HOV lane would be more accessible with painted barriers. This easier access would also allow for more dispersed merging areas, says Ms. Roos. But, with a tolled facility, Mr. Roos believes a concrete barrier is needed because, she says, “There are some people who would innocently sneak into the HOV lanes if they unconsciously see space. This is a problem only with pricing. With no pricing a painted barrier is preferable.”

Number of Access Points

Since it’s a managed lane, rather than a pure HOV lane, Ms. Roos sees the need to have controlled access. She would like to see a combination of slip lanes and direct access ramps to accommodate new growth. Caltrans and SANDAG should know where current need exists, or where proposed new development is planned.

Operating the Lanes: Ingress/Egress Priority

Mr. Roos doesn’t see how access could be very easily limited to allow only certain users (e.g., giving transit buses access, but forbidding others). Given that it’s a managed lane, she prefers using the toll to control access.

To keep the lanes free-flowing, Ms. Roos would rather have pricing go up than close the lanes because the goal is to permit as many HOVs on the lanes as possible. However, if the managed lanes overload even at the highest toll permitted, Ms. Roos believes Caltrans could provide adequate signage to exclude SOVs until the lanes are uncongested.

Ms. Roos suggests a metered off-ramp approach to give preferential treatment to transit and HOVs as they merge back into the main lanes. The concept would be similar to Caltrans’ treatment of metered on-ramps, which give priority to HOVs.

Signage and Toll Information

As Ms. Roos travels on the I-15 main lanes and observes the I-15 toll information, it seems adequate to her, and would seem to be a model of efficient signing that Caltrans should imitate on I-5. The goal is to provide drivers with sufficient warning to make their travel decision.

Importance of Modal Choice on the I-5 Corridor

People have to have options. There are people who because of age or disability cannot drive, and they need transit.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Ms. Roos believes the toll discriminates against middle- and low income solo drivers. However, it may encourage carpooling among those groups. Ms. Roos warns that it doesn't encourage carpooling among high-wage earners.

Use of Toll Revenue

According to the League, support for *new* transit in the I-5 corridor is the only supportable use of toll revenue. A slight exception might be made for a small amount of *additional* carpool program support (i.e., not replacement of existing funding).

Managed Lanes' Likely Impact on Travel Behavior

If Ms. Roos traveled the I-5 corridor, she would use the managed lanes as a carpooler. Although Ms. Roos recognizes that the habits of commuters are not easily changed, she believes many other corridor users will make that decision, as well, based on the popularity of the Coaster. She notes that when League members from Carlsbad and Oceanside come south for a meeting, they use the Coaster whenever possible. People are looking for convenient alternatives to the solo-occupancy vehicle.

Effectiveness in Moving People

Perceived effectiveness—do you think the Managed Lanes will move more people than regular carpool lanes? Ms. Roos is not sure whether, in the absence of tolled SOVs, the capacity would be filled with more carpoolers. However, the managed lanes will move more people than main lanes.

Environmental Issues

None identified with the managed lanes themselves.

Safety, Enforcement, and Related Operational Issues

Mr. Roos is not concerned about a possible "double-dinging" of solo-driver scofflaws who violate the rules of the managed lanes—that is, they could receive both a toll penalty and a traffic ticket.

She does see some potential safety and enforcement problems associated with a painted barrier scenario.

Operational Suggestions

The League would support having barrier-separated outside auxiliary lanes that would facilitate shorter trips and keep people off the main freeway lanes.

Pros

None identified.

Project Concerns and Challenges

The League's main concern is that the pricing component could discourage carpooling.

Environmental Justice Issues

Equity

Ms. Roos is somewhat ambivalent about the equity issue. The tolls obviously give preference to those who can afford it easily, so equity is a problem. She would like to see more people using transit anyway, so providing a subsidy to transit riders in that corridor could mitigate equity concerns.

Perceptions of Fairness

Ms. Roos believes that low income people have so many larger problems facing them that they may not register the managed lanes as an additional equity concern. And, she adds, they do have the option of carpooling or taking a bus. She believes the equity issue is related more to income than ethnicity, and notes that some ethnic minorities are relatively affluent.

User groups will experience the lanes differently. Ms. Roos states that, "I-15 main lane users' letters to the editor indicate that they feel that there's space there, and that even HOV lanes should be converted to general purpose lanes." She doesn't think carpoolers would object, as long as their use of the lanes is protected. Transit riders would experience no impact, says Ms. Roos. Interregional users may not have transponders, so they may feel that's inconvenient. Although truckers' time is very important, Ms. Roos doesn't want to see large trucks on the lanes, because they are often overloaded and subject to breakdowns.

Other Public Input

Underrepresented Groups

Ms. Roos notes that the I-5 corridor is largely affluent, but that people to the east and south are often underrepresented. Indian tribes might be interested in the project. Other especially interested groups would be the Auto Club, chambers of commerce, and environmental groups, including the Endangered Habitat Group that was working in support of Proposition A might also be interested.

Likely Sources of Project Support and Opposition

Obvious strong supporters would be the Chamber of Commerce and the Auto Club, says Ms. Roos. The League is neutral or possibly a very weak project supporter, because they strongly support carpooling and public transit use.

Proposed Survey Question

"Would the value pricing encourage you to carpool?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Lisa Briggs, Executive Director San Diego County Taxpayers Association (SDCTA)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 19, 2004**

SDCTA's Role in Project Planning or Implementation

SDCTA has been working with the oversight committee that was approved through Proposition A. Ms. Briggs and/or volunteers have also been part of SANDAG's Regional Transportation Plan (RTP) process, as a watchdog, making sure that costs are reasonable, and that there are not a lot of cost overruns, and that revenue is used well. SDCTA is pushing SANDAG to come up with some meaningful performance measures for traffic flow—not just cost, but also effectiveness. For example, they want to look at people throughput and commute times. It is important to know how well the transportation system is keeping up with residential growth.

Perception of Existing and Future Corridor Mobility Conditions

Conditions are congested from the I-805/I-5 merge up to La Costa. Congestion breaks up a bit toward Oceanside. During weekday rush hours, the merge is very bad, but increasingly, even weekends are congested. Ms. Briggs has been aware of this worsening trend for at least seven years. SDCTA is concerned about congestion itself, as well as its impacts on the regional economy and quality of life.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Ms. Briggs is intimately familiar with the I-15 Express Lanes (FasTrak). In fact, they are the only reason she is still willing to live in Rancho Pensasquitos and commute to downtown San Diego. She notes significant growth along the corridor.

Ms. Briggs also observes that many people think FasTrak pricing is based on rush hour, rather than flow on the managed lanes themselves, and are unaware that it's an inverse relationship. In fact, Ms. Briggs herself used the lanes for at least a year and a half before she understood this—and that was partly because she began working with SANDAG. This speaks to a need for better marketing and public information for the new lanes on I-5.

Efficiency

The lanes are an efficient option for people, but Ms. Briggs thinks they need to be extended past Escondido, past the Hodges Bridge bottleneck.

Fairness

Ms. Briggs thinks they're fair. Based on her own use, and she is not "especially affluent" she can see that people who place value on being able to get to and from home to work and childcare in an efficient way will find the lanes worthwhile. And because transit and carpool users are free, there is something for everyone. It's a personal choice. On some days, when the traffic is not so bad, Ms. Briggs chooses not to pay the toll, and use the main lanes.

Applicability to I-5 Corridor

Although value pricing seems to be working on the I-15 Corridor, Ms. Briggs would like to see studies that document real benefits before a decision is made to apply the concept to the I-5 Corridor.

Project Concept & Operations Pros and Cons

Current Community Issues

[See Likely Sources of Project Support and Opposition, below]

Priorities for Use of Managed Lanes

Ms. Briggs places the first level of priority on high-occupancy vehicles, including transit buses, vanpools and carpools. She suggests that a tradeoff between slightly lower speeds and more options to solo drivers to buy in might be wise, because it would help alleviate main lane congestion and generate more revenues. Although allowing emergency vehicles in at no toll is a "no brainer," Ms. Briggs thinks the case for clean air vehicles is more difficult. Because the lanes are designed for mobility and congestion relief—not clean air, she suggests that until that goal is achieved, they not be given priority. She is not in favor of allowing trucks on the lanes.

Managing Demand: Access vs. Tolls

Ms. Briggs believes that physically limiting lane access could be added to tolls to manage demand. The essential thing is to make people understand that the toll rises because the lanes are full. People don't get it.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

The type of barrier and whether locations can be closed if congestion occurs even with the tolls at their highest rate is an engineering design issue, and should be based on mobility improvement. Whatever the decision, the options need to be clear to drivers.

Number of Access Points

The lanes need to be safe and flowing. The location and number of access points must be based on hard throughput data, and not political influence.

Operating the Lanes: Ingress/Egress Priority

Caltrans decision based on moving more people.

Signage and Toll Information

The I-15 FasTrak signing is reasonably effective. People can't always see what's up ahead on either the freeway main lanes or the managed lanes. Perhaps a sign comparing the lanes visually or with some easily understood market would allow better consumer choice information.

Importance of Modal Choice on the I-5 Corridor

It's very important to provide people with choices.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

It's a good deal.

Use of Toll Revenue

Members do not want to see money going to growth of bureaucracies, but to improve the transportation system, and improving quality of life. Some revenue could even go to water supply and treatment, or storm water runoff, because the freeway expansion means more runoff, as well as other impacts.

Managed Lanes' Likely Impact on Travel Behavior

If a pricing strategy were implemented, Ms. Briggs believes people may carpool, and based on the success of the Coaster, others may choose transit. However, some may use them as toll-payers, knowing they can still make a meeting and not have to leave 90 minutes early.

Effectiveness in Moving People

Ms. Briggs believes the managed lanes will move more people than regular HOV lanes, but would need proof to believe they moved more people than main lanes.

Environmental Issues

Not an issue.

Safety, Enforcement, and Related Operational Issues

These are Caltrans decisions, based on safety and efficient operation of the system.

Operational Suggestions

Leave it to Caltrans.

Pros

Provides an additional mobility option in a corridor that needs more options to increase people-moving capacity.

Project Concerns and Challenges

SDCTA's biggest concern is cost/benefit of the project, including the reasonableness of the costs, where the money is going.

The biggest challenges to any project are the NIMBYs (Not In My Back Yard). Assuming that Caltrans has right-of-way required, the environmental process will burn up a lot of time and money, as well.

Environmental Justice Issues

Equity

Because it's a choice, and not a mandate, and carpoolers, vanpoolers and transit riders can still use the lanes for free, there really isn't an equity question.

Perceptions of Fairness

There may be some people that are upset, and just want to open the lanes up to everyone, but carpoolers and transit riders should be happy. The transit riders enjoy the moral high ground on this.

People coming from Orange County, where tolling exists, will understand what San Diego County is doing. Others, including those from non-congested areas, may wonder what's going on. It's hard to say how truckers will react to the lanes.

Other Public Input

Underrepresented Groups

The heads of service unions are included in various SANDAG committees. But the regular users need to be included in the discussion.

Likely Sources of Project Support and Opposition

Ms. Briggs thinks there will be some people who will be concerned about the proposed value pricing on I-5, and these may be consumer advocates or those who advocate for low income populations. Possibly students and employers with lower-wage employees might also have issues that should be addressed. Environmental pushback due to the potential growth-inducing effect of facilitating longer commutes might occur, and, on the other side, anti-carpool sentiments might also make themselves known.

Proposed Survey Question

Ms. Briggs doesn't see the need to ask people if congestion is a problem. Instead, ask, "Would you use the managed lanes? Would you be more or less likely to join a carpool if the lanes were restricted to carpools? Would you use bus rapid transit? Where do you need to get on and off? (What are your origins and destinations?)"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Ron Wootton, Executive Director** **Buena Vista Lagoon Foundation (BVLF)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 15, 2004**

Buena Vista Lagoon Foundation's Role in Project Planning or Implementation

BLVF has invited Fish and Game, various city government representatives, the US Army Corps of Engineers, transit operators and Caltrans to a number of BLVF's meetings, to discuss how the I-5 widening would affect the lagoon. In addition, the BVLF has already been playing a role in inviting, including and considering the project stakeholder agencies in the Lagoon Restoration Feasibility Analysis. The BVLF is still looking for alternatives for the lagoon, and would like to see agencies work together toward feasible solutions.

Perception of Existing and Future Corridor Mobility Conditions

Mr. Wootton observes that conditions on I-5 are highly variable, with obvious increases in traffic volumes, leading to an increased problem at transitions.

Members of the BVLF are focused on issues related to physical impacts of proposed freeway changes on the lagoon. Members ask, "How many cars will be sending out fumes into the air? What will the be the future footprint intrusion into the wetlands?"

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Wootton is familiar with the I-15 FasTrak lanes, and has used it upon occasion when he's riding with an employee, as a carpooler. He has not used the lanes as a toll-payer.

Efficiency

Mr. Wootton does not believe the I-15 FasTrak facility is efficient, because, in his view, they create as much congestion as they relieve, at the transitions. He believes that more general purpose lanes would be better, because they would have no congestion-causing transitions.

Fairness

Mr. Wootton does not see a fairness problem, to the extent that Caltrans is getting two people into a car, or allowing people to pay to get around congestion. In fact, he says, "More power to them."

Applicability to I-5 Corridor

As long as HOV lanes are already a part of the project, Mr. Wootton would be in favor of applying an I-15 FasTrak approach to them

Project Concept & Operations Pros and Cons

Current Community Issues

The main issues of concern for the BVLF relate to the current decision-making process that will follow completion of the Lagoon Restoration Feasibility Study. Should the Lagoon be enhanced in its current state as a freshwater lagoon, which is unusual? Or should it be mixed with some tidal interaction? Or should it be open entirely to tidal interaction? Or should it just be left alone? Different constituencies within and without the BVLF are on different sides. The Foundation has had some interest from agencies willing to fund various scenarios, and the preservation of the BLV is a popular project with a lot of local high-profile support. The BVLF's concerns related to the proposed managed lanes would be only those that would impact one of these scenarios.

Priorities for Use of Managed Lanes

No Opinion/Not Applicable

Managing Demand: Access vs. Tolls

No Opinion/Not Applicable

Access/Ingress/Egress

No Opinion/Not Applicable

Signage and Toll Information

No Opinion/Not Applicable

Importance of Modal Choice on the I-5 Corridor

Mr. Wootton stresses that decision-makers consider the rail and roadway scenarios as one package, because they both cross the lagoon, and unless they are mutually exclusive options, their impacts will be cumulative.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

No Opinion/Not Applicable

Use of Toll Revenue

No Opinion/Not Applicable

Managed Lanes' Likely Impact on Travel Behavior

Although Mr. Wootton agrees it's important to give people choices, he doesn't think they will take the bus, because connecting service (first mile/last mile segments of total trips) is inadequate or non-existent. Nor does he think the value pricing will encourage more

carpoolers. People are already encouraged to carpool at the workplace. Housing and job location are more important factors than the pricing.

Effectiveness in Moving People

Mr. Wootton does not believe the lanes carry more people than regular carpool lanes, and he points out that this is inherent in their concept. "If you could carry more people without charging the fee, you wouldn't charge the fee." Nor does he think managed lanes carry more people than general purpose lanes.

Environmental Issues

BVLF is primarily concerned about the size of the physical footprint, which does not seem to be significantly impacted by the value pricing project. Air quality, another major concern, might be marginally improved. Mr. Wootton notes that the net impacts of the freeway widening itself may even be beneficial, because project-related changes to the over-crossing could also include deepening the lagoon shoreline around the edge, and that could be a benefit.

Safety, Enforcement, and Related Operational Issues

No Opinion/Not Applicable

Operational Suggestions

Mr. Wootton is concerned that decision-makers and Caltrans are worrying about through traffic without attending sufficiently to the I-5/SR 78 transition. He warns that for every small increment in congestion on I-5, there's a much larger increase in congestion at the transition.

Pros

No Opinion/Not Applicable

Project Concerns and Challenges

The BVLF is only concerned about the issues of the footprint of the roadway and local air quality impacts on the lagoon. Understanding that physical access to the lanes can be combined with toll management of lane volumes, what are your priorities for use of the managed lanes?

The main focus of BVLF on project scenarios is physical footprint-related. BVLF would therefore advocate any project variation that would reduce the physical footprint (and impacts) of the project. For example, a toll booth or enforcement area that required more pavement would be less desirable from the standpoint of BVLF.

Environmental Justice Issues

No Opinion/Not Applicable

Other Public Input

No Opinion/Not Applicable

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Doug Gibson, Executive Director San Elijo Lagoon Conservancy (SELC)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 15, 2004**

SELC's Role in Project Planning or Implementation

SELC will be involved in working with agencies on any potential impacts that may happen within the corridor, plus they'll work on mitigation strategies. SELC is focused on the area from the top of Manchester to the top of Lomas Santa Fe Drive, and is involved as much as possible in the Manchester interchange project.

Mr. Gibson also is co-chair of the Southern California Wetlands Recovery Project, San Diego Task Force, and has inter-agency contact in that forum, as well.

Perception of Existing and Future Corridor Mobility Conditions

The I-5 Corridor does not support the mobility needs of the population.

SELC membership is concerned about transportation-related impacts to wetlands and long term air pollution problems that affect both the lagoon and the coast line.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Gibson is familiar with the current I-15 Express Lanes, but he does not use them. He does make use of the SR 73 toll road in Orange County.

Efficiency

Mr. Gibson knows people who do use the I-15 FasTrak and they like it. Generally, it is beneficial to give people more options.

Fairness

Mr. Gibson recognizes that the lanes require people to pay a premium for time. The concept is "fair" in that there isn't enough space left to develop the infrastructure to save time for everyone—so it's reasonable to charge for a scarce resource.

Applicability to I-5 Corridor

Whether Mr. Gibson would support applying a pricing strategy to the I-5 Corridor depends on what the revenues would be used for.

Project Concept & Operations Pros and Cons

Current Community Issues

Issues of concern to SELC and the community on the north side of the San Elijo Lagoon include sound wall design, noise attenuation, and how that will work. For people on the southern side of the lagoon, there are going to be property takes that are active and ongoing concerns.

Priorities for Use of Managed Lanes

Mr. Gibson favors giving priority to high-occupancy vehicles first, in descending order of capacity. To generate revenues, there must be opportunities for buy-in, but at a premium price. Trucks should not be permitted—"trucks and carpool lanes don't get along." Mr. Gibson cites tough ingress/egress, queuing problems and numerous grades that create additional truck/auto conflicts. Emergency vehicles should be permitted at no toll, but Mr. Gibson reserves highest priority for clean air vehicles, reflecting SELC's concerns about air quality and its impact on the health of the lagoon.

Managing Demand: Access vs. Tolls

Mr. Gibson thinks a combination of controls on physical access and tolls will have to be used, in a dynamic and responsive manner to existing conditions to manage demand fluctuations. However, access will have to be maintained for emergency vehicles, and the public will need good signage to understand that a frequently used entrance is temporarily closed.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

This is a Caltrans issue.

Number of Access Points

There should be direct access at SR 56. Otherwise, leave it to Caltrans.

Operating the Lanes: Ingress/Egress Priority

Mr. Gibson proposes that all lanes be merged together. Not only is Mr. Gibson opposed to providing priority access to freeway based transit, he is against development of BRT on the managed lanes, and supports, instead, double tracking the Coaster, rebuilding the trestle and improving service on that rail alignment.

Signage and Toll Information

SELC does not have a position or opinion on this.

Importance of Modal Choice on the I-5 Corridor

Choice is good.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Gibson doesn't think the toll level is a problem, and that at any given level you'll find people who are willing to pay it.

Use of Toll Revenue

From the pricing standpoint, and given that the project will be paid for by *TransNet*, one of the most important issues for SELC is what the funding will be used for. SELC would not want the fees to support new transit in the corridor, nor is carpooling support on SELC's list. Mr. Gibson hopes to see the revenues go to offset the impacts of invasive species planted in the freeway median by Caltrans. He thinks that at least some portion of the revenues should go to the corridor cities for coastal parks. All cities along the I-5 are impacted by the widening project, and by the freeways generally. Directing toll revenues to mitigate those impacts through improving parks and wetlands would be fair.

Managed Lanes' Likely Impact on Travel Behavior

Mr. Gibson would use the lanes himself. He believes the increasing severity and extent of "peak period" traffic will move people into transit, but hopes to keep transit off the freeways—especially for short hops—and instead, to integrate feeder bus service with an improved Coaster service. Carpooling continues to be a hard sell, because of peoples' diverse travel patterns and the north/south nature of the main roads and freeways. The managed lanes should be reserved for three-person carpools and up.

Effectiveness in Moving People

Although Mr. Gibson thinks managed lanes will NOT move more people than carpool lanes, he's not sure whether they'll move more people than main lanes (lane for lane.)

Environmental Issues

In addition to SELC mission-related interest in noise, air and water quality impacts, SELC has members who may lose property and who will face more freeway noise.

Safety, Enforcement, and Related Operational Issues

These are Caltrans and CHP issues.

Operational Suggestions

None identified.

Pros

Managed lanes could marginally reduce air pollution.

Project Concerns and Challenges

SELC is "adamantly opposed" to the proposal to locate a 400-space park-and-ride lot at Manchester, without significant project modifications. (It must be smaller, more condensed, packed into one side of the strawberry field, and the remainder of the field needs to be re-vegetated with native species.)

Environmental Justice Issues

Equity

Mr. Gibson does not think there is a significant equity problem with implementing value pricing on the managed lanes. Whether it's fair or unfair, you find your median balance of what's fair. People would be willing to pay more if it's they knew what it was going for, and that it benefited their community.

Perceptions of Fairness

It is likely that charging a fee will cause some hard feelings, particularly in low income groups, which then might show itself along ethnic lines. Main lane users should not object, since the managed lanes represent a new option, on new lanes. HOV users and transit riders will be similarly pleased with a quicker travel option. Mr. Gibson thinks that both San Diego and interregional travelers should be happy with the managed lanes.

Other Public Input

Underrepresented Groups

None identified.

Likely Sources of Project Support and Opposition

Support and opposition depend, in Mr. Gibson's view, largely on what the toll revenue is used for. "You could get every city and environmental group on board if the funding is directed toward them. And, in opposition, you'll have the typical people out there suing for anything.

Proposed Survey Question

"Would you support some portion of net revenue going to community enhancement and environmental protection?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Larry Rannals, Community Plans & Liaison Officer** **Marine Corps Base, Camp Pendleton**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**December 3, 2004**

Camp Pendleton's Role in Project Planning or Implementation

About six years ago, SANDAG prepared a plan to widen the I-5, and they asked the Department of Defense to provide representation to the TAC (Technical Advisory Committee). The Navy represented the south, and Camp Pendleton was asked to provide representation for the northern part of the corridor.

Perception of Existing and Future Corridor Mobility Conditions

The I-5 in North County is not uncongested any more. From Orange County southward, it's congested much more severely and more often than ten years ago, and it's going to continue to get worse. The southbound lanes from Carlsbad south are especially bad.

At Camp Pendleton, there are a lot of younger Marines, at lower grade and pay levels, and they perhaps can't afford two cars. This creates problems with spouses stranded at home with no alternatives. North County Transit District does serve the base, but even though they provide more service than is warranted by the absolute volume of ridership, the frequency (60 minute headways) is still too low to accommodate the needs of those Marine spouses who are transit dependent. And not all parts of the base are served by NCTD. An additional problem is that the needs of those on the base don't always gel with the bus schedule.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Though Mr. Rannals has never used the I-15 Express Lanes, he is familiar with them through reading SANDAG literature.

Efficiency

Mr. Rannals believes that the lanes are well received by the public, and are perceived as effective mobility options. He would like to see the facility extended. His personal opinion, however, is that HOV lanes don't fix the congestion problem, and he prefers making all lanes general purpose lanes.

Fairness

Mr. Rannals believes that the structure of the pricing (paying more during peak than off-peak) is fair, based on what he knows about it. It would be expensive to use the lanes regularly, but if someone can afford it, it's worth it.

Applicability to I-5 Corridor

Mr. Rannals is generally in favor of an I-5 pricing solution, as long as lanes are added, and no general purpose lanes are taken.

Project Concept & Operations Pros and Cons

Current Community Issues

None identified.

Priorities for Use of Managed Lanes

Prioritization of the lanes should be based on vehicle occupancy, and go from highest to lowest. From Camp Pendleton's perspective, Mr. Rannals would favor truck use of the lanes off-peak. Emergency vehicles should certainly be allowed on the lanes at no toll, and possibly clean air vehicles. Mr. Rannals suggests that active duty Marines be allowed to use the managed lanes as well, at no cost to them.

Managing Demand: Access vs. Tolls

Let the experts determine whether physical access, tolls or a combination of the two should be used to manage demand.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

This is a design question that should be decided on the basis of safety.

Number of Access Points

The more open the facility, the better.

Operating the Lanes: Ingress/Egress Priority

Access should be open to everyone who's qualified to use the lanes. Merging priority should be based on what makes sense—leave it to Caltrans engineers.

Signage and Toll Information

Just make the signage adequate to keep people informed of what's going on, and what's ahead.

Importance of Modal Choice on the I-5 Corridor

Providing choices is very important. The Coaster has excellent ridership, but it hasn't taken a lot of volume off the I-5.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Rannals thinks the sample toll is reasonable based on other toll roads of which he is aware, but says each individual will react based on his or her own personal situation.

Use of Toll Revenue

Toll revenue should be spent within the corridor that generated it, and be spent on some transportation purpose, including freeways and arterial feeders to the freeway.

Managed Lanes' Likely Impact on Travel Behavior

If the lanes were built, Mr. Rannals might use them as a toll payer, depending on the value of any given trip. He would not become a regular user, however.

He is not sure if would encourage carpooling, and he suspects the lanes would not encourage transit as much as SANDAG would like. Marines at the base would probably use the lanes as carpoolers. However, as a whole, they tend to be corporals and below, and these are not high-income positions. Certainly, some people would choose to use the lanes, at some times, regardless of income.

Effectiveness in Moving People

Mr. Rannals doesn't believe the managed lanes will carry more people than either the same number of regular HOV lanes or main lanes.

Environmental Issues

Camp Pendleton might have air quality concerns—especially if the base residents must live and work along a 20-mile bottleneck where the emissions are unfairly concentrated.

Safety, Enforcement, and Related Operational Issues

None identified. Mr. Rannals favors a toll-based penalty for lane violators, rather than a moving violation citation.

Operational Suggestions

Carry the lanes all the way to connect to Orange County freeway improvements. And place some attention on the contra flow traffic. The freeway in the north end of the County is carrying increasingly heavy volumes.

Pros

None identified.

Project Concerns and Challenges

As currently planned, the SR 241 toll road will be constructed in southern Orange County and will end at the Orange/San Diego County line where it merges with I-5. As currently envisioned, SANDAG's I-5 managed lanes project is being planned to end at Vandegrift Blvd. in the City of Oceanside, thus leaving an approximate 20-mile stretch of I-5 through Camp Pendleton with no planned traffic flow improvements of any kind being contemplated. Mr. Rannals points out that just because there aren't a lot of residential areas along the freeway alignment adjacent to Camp Pendleton, that doesn't mean the

through-traffic isn't significant from Oceanside to Orange County. If the I-5 managed lanes stop at Oceanside, there will be a bottleneck for miles along the military base. "At some point, someone needs to start thinking about this," states Mr. Rannals.

Environmental Justice Issues

Equity

Some low income groups might think value pricing is fair because it reduces traffic on the general purpose lanes; others might think it's unfair because some can afford it and not others. Mr. Rannals believes equity is related more closely to income than ethnicity, but members of ethnic groups may feel otherwise.

Perceptions of Fairness

Different road users might be pleased with the lanes for different reasons. I-5 main lane users will be happy that people are getting off the main lanes. HOV lane users get a two lane HOV facility, and transit riders will enjoy quicker travel time if their buses can use the lanes. For those already familiar with managed lanes, and especially those who already use them, the appearance of more such lanes will be welcomed. Truckers will just be glad to get passenger vehicles out of their way.

Other Public Input

Underrepresented Groups

None identified.

Likely Sources of Project Support and Opposition

Low income groups might object. Strong support will come from any transportation enthusiast who thinks managed lanes are the way to go.

Proposed Survey Question

"SANDAG plans to spend $xx to develop this system. Is there something else you would rather see that money used for?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Pete Magana, Secretary, American G.I. Forum, Oceanside Chapter**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 15, 2004**

Role in Project Planning or Implementation

Not applicable. The American GI Forum is a family veterans' organization established to improve lives of the local Latino community in the education, social and economic arenas. Its membership includes veterans of WWII, Korea, Vietnam and Desert Storm.

Perception of Existing and Future Corridor Mobility Conditions

Mr. Magana pointed out that the I-5 is congested nearly all day. "There are bottlenecks on every interchange between Oceanside and Del Mar." This means weaving and merging, with the passenger car traffic limited to two lanes, because the trucks take the outside two lanes. Mr. Magana expressed sympathy for the truck drivers, who must constantly break as cars cut them off to merge in and out of traffic in the main lanes.

All of the members of the GI Forum drive cars. Mr. Magana stated, "Really none of them that I know take transit. I have yet to take a bus and I'm 76 years old." His organization's membership is concerned with anything that has to do with mobility and access and congestion. Mr. Magana does not see an easy answer to these problems.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Magana is familiar with the I-15 Express Lanes, but has not used them. He has used the SR 73 toll road in Orange County once, but did not think they offered a time savings, given his particular destination for the trip (Long Beach).

Efficiency

Mr. Magana believes the carpool lanes work well, though they probably do not encourage new carpooling. He suggests they be open to all travelers.

Fairness

Mr. Magana thinks the lanes are somewhat unfair, because not everybody can afford to use them. "When the lanes were first built, it seemed as if they were for the rich. I still sort of feel that way. But if carpoolers still go for free, it's fair. Somebody has got to pay for the road."

Applicability to I-5 Corridor

Mr. Magana is concerned that allowing solo drivers to buy in to the HOV lanes would discourage carpooling. If this concern were allayed, Mr. Magana would not be opposed to a FasTrak application along the I-5.

Project Concept & Operations Pros and Cons

Current Community Issues

No particular issues noted.

Priorities for Use of Managed Lanes

Mr. Magana believes that the first priority should be to encourage the use of transit, vanpooling, and carpooling. If the lanes are full with carpoolers, it should be the solo drivers who are excluded from the lanes first. Mr. Magana would include solo motorcycle riders along with solo drivers in passenger cars as the first to be required to leave the managed lanes as they fill up.

Mr. Magana is not in favor of allowing trucks in the lanes, even if they have two passengers, because of the impingement on visibility for other drivers. He also noted the safety factor, adding, "If a truck is traveling 70 miles per hour with a load, it will take him two blocks to stop."

While Mr. Magana favors allowing emergency vehicles at no toll, he is not in favor of such a privilege for clean air vehicles. He stated, "Eventually we're all going to use them, so don't give them priority."

Access/Ingress/Egress

Mr. Magana believes that the more access points there are, the more they'll be used, and the more congestion we'll have. "The access points are really a problem with the trucks, and they keep moving over. At Vista, Caltrans added one northbound lane, then they made it two plus one lane going east and west on SR 78. That really helped, and gave about a mile long merge. Long merges really help, and limited exits—only major exits should have access."

Mr. Magana would prefer a physical barrier on the condition that there is a shoulder providing space between vehicles and the barrier itself. He has seen how drivers treat the painted barrier on the I-405 in Los Angeles County, where, if people don't see a police officer, they violate the lanes as if they weren't there.

Ingress to the lanes should be open to all eligible users, in Mr. Magana's view. To require them to merge into or out of lanes at different points would just create more problems. However, Mr. Magana can see the logic of giving exit priority to buses and carpoolers with longer merges, which, he adds, would be safer and more comfortable for older drivers to negotiate.

Signage and Toll Information

Mr. Magana believes that the conversion of named exits to numbered exits will help drivers plan their routes better. In a recent trip to Washington State he noticed that the numbering was effective in helping him anticipate when to merge for an exit.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

For the average person making under $15 per hour, Mr. Magana believes that's too high, certainly on a regular basis. However, people might use the managed lanes for emergencies, important appointments, or to make a ball game.

Use of Toll Revenue

Mr. Magana would like to see toll revenue reinvested in the section of road that generates the revenue. "I can guarantee we'll be upgrading the off-ramps and on-ramps at some point. Put it in a piggy bank and that's what we'll have to work with. It should be a transportation purpose."

Managed Lanes' Likely Impact on Travel Behavior

The lanes would have little impact on Mr. Magana's travel behavior, since he is now retired. He believes that the bus rapid transit proposed for the corridor would encourage transit use. He cautions that that the employers need to work with their employees, to make the options work. Mr. Magana would like to see Sorrento Valley employers phase their start times, for example, to reduce bottlenecks.

Effectiveness in Moving People

Mr. Magana believes the managed lanes would move approximately the same number of people as the same number of non-priced HOV lanes. However, the managed lanes will likely move more people, lane for lane, than the main lanes.

Environmental Issues

None identified.

Safety, Enforcement, and Related Operational Issues

Mr. Magana's perception is that, especially in HOV segments on overpasses and bridges, the center concrete barrier is only a stripe's width away from the car, and this creates a safety concern. He avoids taking the lanes at night for this reason, and because the lights of oncoming cars can be blinding.

Trucks should be excluded from the managed lanes, and limited to the two outside main lanes.

Mr. Magana believes that penalties for violating managed lanes access policies should be similar to the ticket a driver would get for crossing the double line lane markers. However, he is concerned about where CHP officers would be able to pull people over, and suggested that a better idea might be to mail them the ticket.

Pros

It makes sense to have more choices for travelers on the I-5. And it is worth six dollars to have a dependable trip time. Mr. Magana stated that, without the lanes, when he needs to catch a plane he doesn't know whether to allow 45 minutes or two hours and 45 minutes.

Project Concerns

The lanes could discourage carpool formation.

Environmental Justice Issues

Perceptions of Fairness

Although Mr. Magana believes that if managed lanes are built with everyone's tax dollars, there should be equal opportunity to use it, he thinks that as long as carpools, vanpools and transit riders can use the lanes for free, it does not pose an equity issue. Further, he believes that the toll-paying solo drivers should have to be the first to leave the lanes when they are congested.

Mr. Magana does not think low income groups would perceive a significant fairness problem with the lanes. However, members of ethnic minorities might object to the extent that the freeway widening itself disproportionately impacts their neighborhoods.

User groups should either be happy with the lanes (because they can use them as toll-paying solo drivers or occupants of high-occupancy vehicles) or because they can enjoy marginally better drive times in the main lanes (truckers and I-5 main lane users).

Other Public Input

Likely Sources of Project Support and Opposition

None identified.

Proposed Survey Question

None identified.

I-5 North Coast Managed Lanes Value Pricing Planning Study

Interview participant:	**Peter Norby, Executive Director, Downtown Encinitas MainStreet Association (DEMA)** ***(With City of Encinitas Mayor, Maggie Houlihan)***
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 10, 2004**

Note: City of Encinitas Mayor Maggie Houlihan stopped by during the interview with Mr. Norby, and remained for the duration of the interview. We were fortunate, then, to get Mayor Houlihan's views on the I-5 North Coast Managed Lanes, as well. All views expressed are the personal views of Mr. Norby and Mayor Houhilhan, or their perception of community views, unless otherwise noted.

DEMA's Role in Project Planning or Implementation

DEMA will be a voice for its stakeholders and will observe what is happening, especially regarding the I-5/I-805 merge, and issues related to the Coaster. DEMA is looking for things that are valuable for downtown and tries to stay aware of things that can hurt downtown Encinitas, including business, residents and the district as a whole.

Perception of Existing and Future Corridor Mobility Conditions

Mr. Norby describes conditions on I-5 as typical of corridors with similar population volumes nearby: "Congested, but not horribly congested." Transportation issues reflect what Mr. Norby sees as a "bifurcation of the County of San Diego" at freeway choke points that split the region on the I-15 at Rancho Bernardo, and on the I-5 at Del Mar. People are politically divided because of transportation."

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Although he doesn't use them, nor does he have a transponder, Mr. Norby is familiar with the I-15 FasTrak lanes.

Efficiency

Mr. Norby does not think that the FasTrak lanes provide an efficient mobility option. He does not like the concept, whereby the carrot (i.e., the opportunity to travel in lanes with free flow traffic) is used to get people to use the tolled lanes, while congestion remains on the main lanes.

Fairness

Mr. Norby does not think the lanes are fair, and doesn't like the idea that a wealthy commuter can pay to use something that a poor commuter can't. "I don't think we

should reward a behavior [solo driving] just because you can pay for that behavior. I don't necessarily object to a carpool lane, but as we expand that to the transponder, I'm against all that."

Applicability to I-5 Corridor

Mr. Norby does not want to see a managed lanes application on I-5. He suggests we either add capacity or use the space for light rail.

Project Concept & Operations Pros and Cons

Current Community Issues

The new and outstanding City of Encinitas Library will be able to be used by people from San Diego if the transportation problems are fixed. Mr. Norby states, "Right now there's a convenience and destination retail spot here in Encinitas. Destination is a 45-minute demographic, and we have trouble [attracting customers and tourists to Encinitas from within that 45-minute radius] because of the bottlenecks."

Priorities for Use of Managed Lanes

Mr. Norby is absolutely against allowing clean air vehicles to use the lanes for free. He feels it is a slippery slope that will dilute the purpose of the lanes. His view on preferential treatment is that it should encourage the development of "true HOV lanes." To that end, he would favor preferential merge lanes for higher occupancy vehicles (vanpools and transit buses).

Mayor Houlihan: The Mayor has encouraged people to use transit, in a variety of capacities, but more frequency is needed, because if people miss a train or an express bus, they're doomed. She supports giving priority to a bus rapid transit service along the managed lanes alignment, especially because it is more expensive to run a train than a bus.

Managing Demand: Access vs. Tolls

"Let the Caltrans engineers make this decision in order to move more people faster."

Importance of Modal Choice on the I-5 Corridor

Providing convenient alternatives to solo driving is of huge importance. "Give me a bus that can deliver five to ten thousand people a day. Give people options," says Mr. Norby.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Norby and Mayor Houlihan acknowledge that most people in Encinitas (at least two thirds of the population) could afford to pay tolls. "People spend $5 a day on Starbucks." However, they both reiterate that the managed lanes provide the worst example of how to change behavior—and the lanes reinforce the idea that "He who has the gold makes the rules." Children pick up on this message, and, warns Mr. Norby, they get the idea that the bus is viewed as a second-class system. "What we do when we say you pay to drive on the freeway is to further the perception that mass transit is for the disadvantaged."

Use of Toll Revenue

Mr. Norby supports using the toll revenue to provide new transit in the I-5 Corridor. He cautions, however, "If you're going to do it, do it right. Don't take 25% of it and mess it up. Spend 100% of it and make it effective."

Managed Lanes' Likely Impact on Travel Behavior

Mr. Norby: Whatever the likely impact, we must focus on changing behavior. If the occupancy level is an issue, change the eligibility.

Mayor Houlihan: Increase the carpool threshold to HOV 3 when necessary. In 30 years, population will be six million—double today's, yet we have no new roads. After we "buff out the ones we have, tweak the system—it still doesn't work. That leaves mass transit." Mayor Houlihan points out that if transit is removed from Washington, DC or San Francisco, the cities simply don't work. "We'd better implement transit now to be ready for the future. We can change peoples' attitudes toward buses with better service, better buses."

Pros

One possible "positive" side of this is that the lanes preserve real estate for mass transit in the future.

Project Concerns and Challenges

DEMA, as an organization, does not have a policy on managed lanes. However, Mr. Norby's concern is that as long as we give a way out for the wealthy, we won't invest in transit for the future. "We're all in it together."

To the following topics, Mr. Norby and Mayor Houlihan defer to Caltrans' expertise and/or have no opinion:

Access/Ingress/Egress

No opinion.

Signage and Toll Information

No opinion.

Effectiveness in Moving People

No opinion.

Environmental Issues

No opinion.

Safety, Enforcement, and Related Operational Issues

No opinion.

Operational Suggestions

Environmental Justice Issues

The only way Mr. Norby could support pricing is in the form of a pure toll road, where everyone pays for the road itself.

Other Public Input

Underrepresented Groups

Seniors, high school kids and the “almost invisible group of farm workers and domestic workers, who are here, legally or illegally” were identified as underrepresented groups. Often, says Mr. Norby, they take the Coaster.

Likely Sources of Project Support and Opposition

Mr. Norby indicated there are people who don’t want them or HOV lanes at all, because they think they don’t work.

Proposed Survey Question

No opinion.

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Erik Bruvold, Vice President, and Director, For Infrastructure Issues, San Diego Economic Development Corporation (SDEDC)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 16, 2004**

SDEDC's Role in Project Planning or Implementation\

SDEDC will have a stake and interest in how SANDAG and Caltrans provide mobility solutions up and down I-5. They are focused on solutions that provide the greatest mobility improvements for the most efficient cost. It is likely that they will be advocates for a solution that provides the use of transponders and thus enables the sale of excess capacity in the system to SOV drivers, through the payment of a premium with flexible pricing.

Perception of Existing and Future Corridor Mobility Conditions

Congestion on I-5 is bad: the region needs improvement here. SDEDC is concerned because managing the transportation system, and regional congestion and demand for mobility in San Diego County must be achieved to ensure that transportation mobility remains a regional competitive advantage.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Bruvold is familiar with the I-15 managed lanes (FasTrak) and uses them with a transponder, nearly every day. Sometimes, when he is particularly congestion sensitive, he has been willing to pay as much as six dollars. But the managed lanes have had problems during the recent construction. FasTrak users were stopped two miles before the merge, due to construction. This seems to have been relieved with the new configuration.

Efficiency

FasTrak is absolutely an efficient mobility option, although it is clear that the single entry and exit model is not the *most* efficient way of configuring the lanes.

Fairness

Mr. Bruvold believes the managed lanes are fair. That is, it is equitable to charge premium fees for premium service at peak periods, while also providing incentives to carpool and take transit. It's congestion relief for everyone. It's a fair way of allocating a scarce resource, namely "free-flow peak period mobility."

Applicability to I-5 Corridor

The plans for I-5 make good sense.

Project Concept & Operations Pros and Cons

Current Community Issues

There are people in the Solana Beach and other coastal areas who are concerned about how the right-of-way will affect their communities. We need this project, however, and property takes may be necessary to move it forward. Coastal lagoons are another concern, though the current project plans for the widening itself may actually improve that situation.

Priorities for Use of Managed Lanes

Manage the lanes to produce the greatest congestion relief possible, absent any other social concern. Clean air is important, but this is a congestion relief and demand management project, so that should come first. The singular focus for decisions should be moving the most people.

Managing Demand: Access vs. Tolls

Use tolls, and the sensitivity to price to reduce demand upon the facility. What conditions should be taken when lanes overload—should access be able to be closed at a specific location?

Closing off physical access will erode support for the project and compromise operation of the system. Caltrans won't get the behavior it wants if it takes that approach. If people go to the hassle of carpooling, they don't want to be denied access to the system. Move to HOV3+ if necessary, or raise the toll—that's not nearly as frustrating as being physically shut out of the system. Pricing is the thing that will change behavior.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Whatever allows for better demand management is the solution that should be chosen. A painted barrier may allow for greater flexibility in the event of non-recurrent congestion, but that advantage may be offset by weaving and enforcement problems.

Number of Access Points

The system should be as open as possible. In fact, one of SDEDC's concerns was the lack of sufficient direct access ramps. More slip ramps also are needed. This will increase the fairness of the system, and people won't be penalized for the particularities of where they live or work. Mr. Bruvold is especially concerned about access near the Del Mar area. Caltrans needs to examine trip origins and destinations closely.

Operating the Lanes: Ingress/Egress Priority

Ingress should be open to all eligible users of the facility. Merging back into main lanes should be configured to maximize the ability of the lanes to move people on the system.

Signage and Toll Information

The problem is that there is no way for consumers to make an informed choice about price much before accessing the system. What Mr. Bruvold suggests is development of an algorithm and associated signage that could tell Joe Smith, traveling northbound on the I-805 that the toll was "$4, going down to anticipated toll of $2 in 30 minutes." This might induce him to get off the freeway, "have a latte and do an errand" and spread the demand to the shoulders of the peak periods.

Importance of Modal Choice on the I-5 Corridor

Modal choice is solely a mechanism to get congestion relief. If it accomplishes that, then fine—but it's important to remember that it's a means to an end.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

"People will snap that up in a minute!"

Use of Toll Revenue

Toll revenues should be plowed back 100% into transit or transportation demand management programs within the I-5 Corridor, because that helps maximize the people-moving capacity of the corridor.

Managed Lanes' Likely Impact on Travel Behavior

Mr. Bruvold believes more people will be carpooling, spreading their trips outside of peak periods, if the project is done right. Also, by linking discounts to TDM programs, including flextime and other strategies, more people will be participating in reducing overall demand on scarce peak capacity.

Effectiveness in Moving People

Mr. Bruvold believes the lanes will be more effective in moving people than either regular carpool lanes or general purpose lanes.

Environmental Issues

There are no environmental concerns specifically related to the value pricing on managed lanes.

Safety, Enforcement, and Related Operational Issues

Mr. Bruvold does not see any particular safety or enforcement issues that cannot be handled through proper planning.

Operational Suggestions

Regardless of whether it's a barrier or painted, or the 5+2 or the 4+2, the lens that SDEDC will use is "which facilitates mobility and which maximizes mobility"

The I-5 Corridor itself is a challenge, with its multi-directional flow and multiple centers for origins and destinations.

In general, SDEDC would like to see SANDAG take a more creative approach to implementation. Possibilities could include more aggressive discounts for trip demand management on the corporate or community side, tied to discounts to transponder pricing. A discount could be negotiated, and tied to SANDAG's direction on increased TDM, in order to build a corporate constituency for implementing the program. Also, there needs to be more creative and aggressive discussions showing people the link between tolls and support for transit in the corridor. That could be something as simple as including explanatory material in the billing invoice that reminds people where their revenues go.

Pros

The managed lanes are an effective and fair way to maximize capacity and people moving ability of the freeway system.

Project Concerns and Challenges

SDEDC doesn't have a big problem with the managed lanes approach, but SANDAG will have a challenge getting the five communities along the coast to agree and move forward in a positive manger. Staging, or construction phasing also will be a big problem. It will be important for Caltrans to ensure that plans for structures and bridges don't get delayed up in Sacramento headquarters. District 11 and Sacramento will need to focus, and eliminate roadblocks if the project is to be completed by 2014.

Environmental Justice Issues

Equity

There really are no equity issues—except to maximize opportunities for ingress and egress for all travelers.

Perceptions of Fairness

Not sure; not really SDEDC's issue.

Other Public Input

Underrepresented Groups

None identified.

Likely Sources of Project Support and Opposition

SDEDC will be a strong support, as will most travelers.

Proposed Survey Question

"Agencies can either maximize the amount of community outreach and consensus-building to meet the concerns of neighbors immediately along the alignment, or build the project as soon possible. Should we take time to reach community consensus or build the project as soon as possible, with as much fairness as possible in that shorter amount of time?"

I-5 North Coast Managed Lanes Value Pricing Planning Study

Interview participant:	**Ceci Cazares, Legislative Chair San Diego County Hispanic Chamber of Commerce**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 8, 2004**

Hispanic Chamber of Commerce Role in Project Planning or Implementation

In her capacity as Chair of the Chamber's Legislative Committee, Ms. Cazares noted that the Chamber actively supported Proposition A, and in fact took strenuous steps to obtain a near-unanimous vote within that committee to move forward on that support. The Chamber worked cooperatively with Lisa Briggs to galvanize regional support of *TransNet*.

Perception of Existing and Future Corridor Mobility Conditions

Ms. Cazares likens the speed of traffic on I-5 to a "snail's pace" and notes that is has worsened in the past few years. As Chairperson of the Legislative Committee for the Hispanic Chamber of Commerce, Ms. Cazares stated that her constituents share a general concern over traffic onramps and exits and congestion.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Ms. Cazares utilized the I-15 FasTrak lanes as a carpooler during 1997.

Efficiency

When Ms. Cazares used the lanes, she thought they were "absolutely wonderful." Her time was so valuable that she would have been willing to pay in order to save half an hour every day for her family.

Fairness

As a demand management tool, the lanes are fair.

Applicability to I-5 Corridor

Ms. Cazares favors using a pricing strategy on the I-5 HOV lanes, but stresses that a universal (interoperable) transponder is important.

Project Concept & Operations Pros and Cons

Current Community Issues

Growth in San Diego County and neighboring areas has seriously affected the freeways. Ms. Cazares hopes that Transnet dollars will help out by expanding the freeway. The growth has seriously affected the freeways. There are a number of cross-border issues that will impact and be impacted by the project, as well.

Priorities for Use of Managed Lanes

Ms. Cazares believes the bulk of the capacity should go to high occupancy vehicles.

Trucks also should be given consideration, however, because the region's import/export business depends on truck mobility. The Hispanic Chamber has been discussing the possibility of asking Los Angeles to help pay for the local roads, because they are destined for Los Angeles, primarily. Emergency vehicles should be allowed at no toll, but only ambulances on current emergency duty-with their lights on. Ms. Cazares also supports clean air vehicle use of the managed lanes at no toll, at least initially.

Managing Demand: Access vs. Tolls

Ms. Cazares advocates a combination of tolls and physical access limits to manage demand, in order to ameliorate the pricing issue for low income workers.

Access/Ingress/Egress

Number and Location of Access Points

Ms. Cazares believes there should be community input on how many and where the access points should be located. In this way, diverse communities will have a fair share of benefits and access to the facility.

Physical vs. Painted Barriers

Caltrans should plan for the long term and avoid disrupting people and communities with double construction impacts.

Signage and Toll Information

Allow Caltrans to make the best engineering decision for safety.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

It would be worth it in some circumstances, but would not be affordable to all.

Use of Toll Revenue

No opinion.

Managed Lanes' Likely Impact on Travel Behavior

No opinion.

Effectiveness in Moving People

Would require more information, studies.

Environmental Issues

Environmental concerns are related to the freeway widening, not the managed lanes. However, Ms. Cazares notes, "We can't stop the river from flowing—developers are building houses, so we need to be creative about how we implement our alternative fuel mandates." Thus, Ms. Cazares believes managed lane policy should favor clean fuel vehicles.

Safety, Enforcement, and Related Operational Issues

This is an engineering issue.

Operational Suggestions

Caltrans must consider the construction impacts, and mitigate them as much as possible, such as doing work at night when possible.

Project Pros

Offers people a reliable alternative, and is still free to carpoolers and transit riders.

Project Concerns and Challenges

Ms. Cazares sees the amount of the toll as the project's biggest concern. She stated that, "The majority of Latinos in that area, especially in North San Diego County, are poor working people. People will sacrifice time rather than money." She is also concerned about a major communication gap with a lack of sufficient communications in Spanish. This is a problem even for documented workers, because technical issues and explanations of how to carpool need to be translated into Spanish. Ms. Cazares observed, "The Average Jose needs to understand how expanding the freeways and increasing opportunities for carpooling and quality transit can help him."

Environmental Justice Issues

Equity

Given the average salary of area Latino workers, Ms. Cazares is concerned that they would be precluded from using the lanes as toll-paying solo drivers, unless there was a low income rebate. The opportunity to use transit and to use the lanes free as carpoolers or vanpoolers does mitigate this problem to a large degree.

Perceptions of Fairness

Though some are likely to see managed lanes as unfair, carpoolers and transit riders should be pleased with the facility.

Other Public Input

Likely Sources of Project Support and Opposition

Not sure of specific support/opposition. Generally, carpoolers and transit riders, plus those who would be willing to pay, would be supportive.

Proposed Survey Question

"Would you be able to afford this? What would you be willing to pay for "x" amount of minutes off your travel time in the I-5 corridor?"

I-5 North Coast Managed Lanes Value Pricing Planning Study

Interview participant:	**Timothy A. Read, Director of Operations Del Mar Thoroughbred Club**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 10, 2004**

Del Mar Thoroughbred Club's Role in Project Planning or Implementation

Beyond this interview and other comments Mr. Read has made to Caltrans regarding the overall I-5 widening project, there is no role for the Del Mar Thoroughbred Club in project planning or implementation.

Perception of Existing and Future Corridor Mobility Conditions

Conditions are bad, and getting worse.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Read has used the current I-15 Express Lanes as a carpooler. He has also used the Orange County Express Lanes (SR 91) and toll roads (SR 73) when he worked in Los Angeles. He used these lanes even in non-congested periods, primarily for safety, but also because they were more relaxing. The SR 73 had the additional benefit of scenic beauty.

Efficiency

Mr. Read believes the FasTrak lanes do provide an efficient mobility option for people.

Fairness

Mr. Read is not sure that he thinks the lanes are "fair." However, he doesn't think that "unfairness" would necessarily be a reason not to use them or to have constructed them. Mr. Read stated, "The reality is that some people have money and some don't. If the idea is traffic efficiency, maybe fairness is relevant but not key."

Applicability to I-5 Corridor

Mr. Read is generally in favor of applying a pricing strategy to the I-5 corridor.

Project Concept & Operations Pros and Cons

Current Community Issues

Mr. Read stated that there is supposedly a metered ramp on Via de la Valle southbound on-ramp to I-5. Most people coming to the race track want to be there by 2:00 p.m., at the first post. The last race is at 5:30 p.m. on weekdays. The Thoroughbred Club has a typical crowd of 10,000 on Mondays, Wednesdays and Thursdays. On Friday, the Club runs a later post. On those days it takes Club patrons longer to get out of the parking lot and get onto the freeway southbound than it will on Saturday, when there are over 25,000 people in attendance.

Priorities for Use of Managed Lanes

Certainly, buses and transit vehicles should be priorities, according to Mr. Read. Vanpools are not a particular concern of the Club. However, increased options for solo drivers to buy in to the lanes make sense because "they can help pay for the lanes." Emergency vehicles should be given free access to the lanes only when in pursuit of a hot emergency "in process"—not just transporting a person. Mr. Read objects to using a uniform as an excuse to use the lanes when the vehicle is not in service. As for trucks permitted at "appropriate" times, Mr. Read said, "It depends on what you mean by 'appropriate'."

Managing Demand: Access vs. Tolls

Mr. Read believes that a workable combination of both tolls and limited access be used to avoid congestion on the managed lanes. He warns that, because people are "creatures of habit" it will be hard to re-route them if exits are closed with little notice. On the other hand, Mr. Read thinks it makes more sense to establish the access points to favor longer trips, and perhaps use the pricing along with limited access to discourage short hops on the freeways.

Access/Ingress/Egress

Physical barrier vs. painted barrier

Mr. Read believes that, on the freeway, a physical barrier is more desirable to preclude people from "doing dumb things." He notes that if he, as an area resident, misses Via de la Valle, he knows six ways to get back to it. However, some people who are new to the area may feel it's a "life-and-death" decision because they don't know there are alternatives, and thus they make hasty decisions and put others at risk because of it. Mr. Read suggests that physical barriers might not need to be everywhere—only where there's a decision point, and to channel people through merge areas.

Number of Access Points

Mr. Read thinks that access at every off-ramp would be too much access. He would decide in favor of safety over convenience. He believes that if people are forewarned with good signage and pre-publicity—so the news channels educate people on use of the facility, access points can be reduced.

Operating the Lanes: Ingress/Egress Priority

Rather than allowing differential "priority access," Mr. Read suggests that Caltrans keep it simple. He stated, "Selfishly, I don't like all vehicles having all access, because that adds volume that will restrict our peoples' ability to get on the freeway, but in a regional sense the easier access is, the better. Tourists might be sitting there baffled, making mistakes, getting into accidents. I think you can approach it form the idea that it's more open, and if you're inundated, then start closing some down."

Priority for merging back into general purpose lanes might be given to transit buses or emergency vehicles, according to Mr. Read.

Signage and Toll Information

Mr. Read feels the SR 73 and SR 91 are signed effectively, and seem like good models. The main thing is to give people enough information to make decisions in a safe manner. Venues such as the fairgrounds or Legoland might need special signage, and Caltrans could work with these venues to develop such things as real time information signs on changeable message boards (or other technology). Mr. Read hopes that Caltrans can provide technical assistance in developing the signs, and that the venues would be able to purchase them at Caltrans' state cost.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Read would pay such a toll "in a heartbeat." He is sure that a lot of his patrons would pay, as well.

Use of Toll Revenue

Mr. Read would like to see toll revenue go to pay for the facility and to provide ongoing maintenance for the facility.

Managed Lanes' Likely Impact on Travel Behavior

Mr. Read would use the priced lanes as a toll-paying solo driver. He doesn't believe there is great potential for transit and carpooling in the I-5 corridor, because transit does not accommodate complex trip making, and carpooling is not convenient for a lot of people. Perception, too, is a problem for non-users of transit, who feel it's too big a hurdle. But, since people hate the crowded freeway so much, Mr. Read thinks they will pay $100 per month. "There's no one out there who wouldn't rather spend a couple of extra hours with their kids or their wife or their dog." And some Thoroughbred Club members would be willing to pay, as well.

Importance of Modal Choice in the I-5 Corridor

Mr. Read does not think that people in Southern California have been brought up to embrace bus rapid transit. He's not sure they will ever use it, so modal choice is less important, in his view.

Effectiveness in Moving People

Mr. Read believes that the managed lanes will move more people than regular carpool lanes because they use up capacity.

Environmental Issues

Mr. Read hopes the project will reduce air pollution to some degree.

Safety, Enforcement, and Related Operational Issues

Mr. Read wonders about locations for emergency call boxes and turnouts for law enforcement to pull scofflaws over. "There should be a bubble where cops can pull people over, and some for breakdown spots."

Mr. Read thinks that penalties for violating access to the lanes should follow the trend of increasingly stiff traffic tickets, which, he says "are the best disincentive." He also favors photo enforcement over a CHP vehicle observing from some location along the freeway.

Mr. Read's theory about the problems with the two-lane on-ramps, one of which is exclusive HOV, is that as races end and attendees get on to Jimmy Durante, the general purpose on-ramp lane backs up, stacking up Jimmy Durante. The City of Del Mar is unhappy with the situation, and Mr. Read believes the Thoroughbred Club should be able to drain its parking lot in 30-40 minutes without much trouble. He notes that what has changed over time is that more people (maybe 80 percent) now come from San Diego, instead of LA, and that the roadways are built for the opposite situation. Mr. Read supposes that most people would like a southbound HOV direct on-ramp. Caltrans recently added a northbound outside line and that Mr. Read reports has been helpful. He suggests considering a third right turn lane at the end of the northbound off-ramp at Via de la Valle.

Pros

Mr. Read believes the Club would probably support the project if the pricing helps pay for it, or if it helps add the infrastructure sooner than otherwise. He noted, "A lot of our people would be willing to pay for the convenience."

Project Concerns and Challenges

Mr. Read does not anticipate any major conceptual problems that the Thoroughbred Club might have with the project. However, several operational issues exist, relating to how the managed lanes will affect the other lanes. Mr. Read is concerned about the lack of dedicated on-ramp/off-ramps. He also expressed concern about drivers merging at the last minute, and consequent safety problems, particularly those stuck in the right-hand lane that must exit onto SR 56. If they find themselves in that lane unintentionally, they often merge suddenly and dangerously to avoid being forced to travel farther north and backtrack. Better signage could rectify this, according to Mr. Read, who stated, "Normally Caltrans signage is very good, but here the signage is not effective."

Environmental Justice Issues

Equity

If there is an equity issue, it's related to income, not ethnicity, according to Mr. Read. He suggests that one of the uses of surplus revenue could be to subsidize travel of documented low income travelers.

Perceptions of Fairness

I-5 main lane users retain the option of finding a carpool partner and using the lanes for free, so they're not being precluded from the lanes, as long as they're willing to change their lifestyle a bit. But is it fair that people in Rancho Santa Fe can use it whenever they want? Perhaps not, Mr. Read says. Yet, limiting everyone to a maximum amount of uses per month doesn't make sense. "The key is to implement it as soon as possible. If we spend five years figuring out how to make it equitable, we're not doing anyone any favors. We can improve it as we go. We have an issue today. Get it going!"

Other Public Input

Likely Sources of Project Support and Opposition

Mr. Read suggests that the California Coastal Commission might have some problems with the project. He thinks that regular commuters will be in favor of anything that improves the quality of their commute. The business community in general should be in favor for the same reasons. "There will be a small negative minority that want to carry a torch for the fairness issue."

Proposed Survey Question

"At what price would you *not* use the lanes?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Milton Phegley, AICP, Campus Community Planner** **Government and Community Relations, University of California, San Diego**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 10, 2004**

UCSD's Role in Project Planning or Implementation

Because the southern terminus of the managed lanes are envisioned as connecting to Voigt Drive, UCSD will be very much involved in the project. Although the bridge is owned by Caltrans, access is across University property. The University is part of the Community Planning Group (CPG is one of a number of groups of part of the City's planning process) and in this capacity, the University has stated that there needs to be appropriate planning for SANDAG's super loop project, which would be the overall implementation umbrella for the interchange area.

Perception of Existing and Future Corridor Mobility Conditions

The University is very concerned about congestion, especially peak hour congestion. There is growing awareness and concern about the increasing number of hours of congestion during weekends as well as weekdays. People have more ability to deal with it and plan for weekday congestion, in Mr. Phegley's view. Weekend congestion, however, often extends across greater periods of the day and is often more unpredictable. It's very frustrating for people, reports Mr. Phegley, who added, "The general perception is that the I-5 is serving its intended need, but how do you address the congestion now and into the future?"

Commuting issues are looked at from the perspective of university employees, Mr. Phegley explained, because he has found that students tend to live closer to campus. He suggests that students may have made the economic tradeoff of higher rents for shorter commutes to campus. There are concentrations of students in areas where there is bus service to campus. The University instituted City Shuttle in the immediate area of the campus for resident students. Based on the numbers—over 30,000 per week, it's highly accepted and will only serve to put more students in proximity to campus because that dependable transit connection is there. In terms of longer commutes, if students are making a choice for longer commute, it's a choice based on non-transportation issues, reports Mr. Phegley.

As far as faculty and staff go, residential location choices and traffic patterns are influenced by housing availability and affordability, as well as personal housing preferences. Faculty and staff are willing to make the commute time trade in favor of longer commutes for more affordability, larger homes farther away.

Mr. Phegley observed that, in general, faculty members tend to live closer to campus, to the north or northeast, based on their ability to purchase more expensive close-to-

campus housing. Staff members tend to be located south and southeast, somewhat farther from the campus. Thus, the I-5 influences both faculty and staff, but in different directions.

University employees are concerned with trip dependability and predictability and view transportation as a quality of life link between home and job. They don't want the commute to become another uncontrollable driver in their lives. Even if the commute is long, if it's predictable people can structure and balance their lives.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Phegley is familiar with the I-15 Managed Lanes, but has used them only a dozen or so times, as a member of a carpool.

Efficiency

Mr. Phegley believes the I-15 Managed Lanes are efficient people movers, but, judging by the public perception of them and reaction to them, their initial implementation may have been somewhat "before their time." On that corridor, the need for them will grow over years to come, and so perhaps the facility was not ideal as a prototype. In addition, though I-15 FasTrak goals are worthy, the configuration of the facility (originally only one ingress and one egress) places operational constraints on its usefulness.

Fairness

Mr. Phegley believes the lanes are generally fair in that they offer people a choice to use the lanes at no cost, either by choosing to join or form a carpool, vanpool or taking transit. People trade their personal commitment and the time required to carpool for the benefit of a time advantage on the carpool lanes.

As for buying into the lanes as a solo driver, Mr. Phegley believes this option is currently perceived as a luxury. That there is a lack of understanding by the public on value pricing—they don't understand that the pricing is designed to provide better utilization, with a threshold level of service. Instead, the public tends to think that people who can afford to pay up to $4 per trip can use them, while those who can't afford them end up not being adequately served by the lanes. Thus, the carpool lanes are created with a benefit in mind, but people are not equal players in terms of who, besides HOV travelers, can use them.

Applicability to I-5 Corridor

As a strategy to be applied nearly a decade into the future (on the I-5) Mr. Phegley thinks that the level of congestion we will see in 2014 will combine with the availability of HOV lanes to bring more interest in carpools. Thus, Mr. Phegley suggests that value pricing may not be necessary. If there is an appropriate role for pricing in the I-5 corridor, however, it certainly needs to be controlled to leave capacity for HOVs. As congestion increases, we may choose to move more people efficiently in the HOV lanes by defining a carpool as three people.

Project Concept & Operations Pros and Cons

Current Community Issues

There's a growing move in the University City community, as density and population increase, to ensure that it gets ahead of the curve in how it deals with traffic and transportation. The City is fortunate to have a financing mechanism in place where developers pay assessment fees to build transportation infrastructure. But that pot of money is eventually going to run out when all development is tapped, and there's no guarantee that the amount of money from that source will be adequate to build identified facilities needed. Even if they were all built, there would still be unresolved congestion.

Future development will create both the need for the managed lanes as well as challenges to implementation. The University is in various stages of construction on its east campus facilities housing health sciences, ambulatory care, cardiovascular unit, a research park, and a cancer center. Substantial parts of the population from all over the San Diego region will need to be able to access these facilities. The managed lanes will help in that effort, if they are designed properly.

Priorities for Use of Managed Lanes

Mr. Phegley believes priority should be accorded for the highest-occupancy down to the lowest (SOV), but that emergency vehicles should certainly be allowed at no toll.

Managing Demand: Access vs. Tolls

Because the concept of the lanes is to provide the ability to move as many people as possible, it seems that this calls for providing as much access as possible. But then, in their capacity as managed lanes, access is controlled. Limiting physical access provides equal (if limited) opportunity to use the lanes, though perhaps not as conveniently. However, Mr. Phegley says that a toll structure has some inherent equity issues.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Mr. Phegley believes that the barrier type should be determined by a reasonable evaluation of safety demands. He is less comfortable with the narrower the painted barrier, but does not feel inherently safer with the physical barrier, which usually gives less room to maneuver.

Mr. Phegley suggests that the facility could be constructed with open access—no physical barriers—at first. If necessary they could be added later. He believes the opposite would be more difficult (i.e., taking barriers away) because of public perception of waste money, and creating a less safe situation, etc.

Finally, Mr. Phegley thinks that by time the project is constructed, there will be a lot of technological advances and we may be able to embed Intelligent Transportation Systems (ITS) guidance and collision avoidance technologies into the roadway, and this might have implications for the decision on barrier type. We should ask which would be most flexible to accommodate potential new technologies.

Number of Access Points

Mr. Phegley thinks that if the direct access ramps are the primary access points, this might be too limited. On the other hand, he recognizes the undesirable weaving problems associated with multiple access points, there's weaving problems. Mr. Phegley hopes a solution allowing flexibility for responsiveness to localized traffic patterns can be found.

Operating the Lanes: Ingress/Egress Priority

Operational issues should be solved with a focus on better management of the lanes, although in general, HOVs should get priority. Mr. Phegley suggests it might be better to design a longer route in some cases to avoid merge problems.

Signage and Toll Information

Mr. Phegley thinks the I-15 FasTrak signage could be better. As long as there is no cash option, and only people with transponders will be permitted, that means only those familiar with the operation of the lanes will be in them. Mr. Phegley would like to see an improvement over the I-15 signage in terms of informing travelers about the HOV lanes themselves, and how to carpool or take the bus. He would also like to see more real-time information. By the time of project completion, Mr. Phegley believes that real time congestion levels on both the managed lanes and the main lanes could be reported.

Importance of Modal Choice on the I-5 Corridor

Modal choice is "absolutely essential" to corridor operations, says Mr. Phegley. "People can't choose to carpool or take transit unless the viable options are there. That's the University's whole approach in terms of light rail. We realize it won't be a cure-all, but if you can address the home/work trip and get people out of solo occupancy vehicles, you've done a lot. You've eliminated congestion and removed the need to physically and fiscally affect the environment here in terms of having to build parking structures that serve a very [time-of-day] limited need."

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Phegley said, "It's high, but it's an opportunity choice."

Use of Toll Revenue

Mr. Phegley would be in favor of using net toll revenues support new transit in I-5 Corridor, only.

Managed Lanes' Likely Impact on Travel Behavior

The toll will provide an incentive to help overcome all the negative factors that keep people from forming carpools. Mr. Phegley is unable to take public transit, himself, because it is infeasible logistically and time consuming. However, a trolley or bus rapid transit route would appeal to Mr. Phegley, even if it took more time, as long as it allowed him to use that time better.

Effectiveness in Moving People

Mr. Phegley doesn't know whether the managed lanes would move more people than regular carpool lanes. He thinks congestion would be reduced on the main lanes, however, and that the benefits of ridesharing and using would be greatly enhanced.

Environmental Issues

Mr. Phegley is confident that the environmental impacts will be evaluated and appropriately mitigated if necessary. Overrides may be necessary if they cannot be mitigated.

Safety, Enforcement, and Related Operational Issues

Mr. Phegley's only concern in terms of enforcement is safety of the CHP and other drivers. That might mandate some vehicle identification system.

Operational Suggestions

Mr. Phegley suggests a good plan, including well-placed parking structures and implementation of convenient and well-designed and integrated shuttle services could contribute to a resolution of the congestion problem at Genesee and Campus Point, and could redesign the intersection. Scripps Hospital, in-patient and out-patient clinics, the major medical complex, as well as Light Rail Transit (LRT) station need to be part of the solution. How is all that going to be accommodated in that area? The Trolley crossing I-5? How do you avoid conflict? There are topographic constraints that have to be reckoned with, as well, associated with expanding the managed lanes to the south in future years. And the proposed trolley cannot cross through the line of the direct access ramp because there's not sufficient clearance, so it has to be elevated.

Mr. Phegley believes we need the origin and destination (O&D) and volumes to determine what would really be the best and most effective solution.

Pros

Mr. Phegley believes the lanes would literally add "manageability" to University employees' lives by helping to make the trip more predictable. Current University thinking is that HOV lanes and the direct access ramps are very compatible with some of the thinking in the community.

Project Concerns and Challenges

The University is concerned about how the managed lanes will affect the University's ability to operate, as well as the project's impacts on the character of the campus. Although University people will be using the facilities, Mr. Phegley doesn't want to see a situation that exacerbates transportation problems in the immediate area. While the University doesn't want to be perceived as being the negative force that prevented the project from happening, Mr. Phegley cautions against good intentions (i.e., building a direct access ramp to the University) that might result in a bad project. More information will be needed for the University decision makers to come to a sound decision.

Mr. Phegley indicated that the University is very concerned that traffic volumes coming to and from direct access ramps will be too high, adversely impacting campus traffic. Another constraining factor is that Voigt Drive, east of the freeway overcrossing, intersects with a city intersection at Campus Point and Genessee. That future traffic is

already projected to be very impacted. The additional trips may not be able to make it through the intersection and may queue on the freeway.

Another challenge is educating people about the lanes—both potential impacts and benefits, as well as how they will operate.

Environmental Justice Issues

Equity

Mr. Phegley views transportation facilities and transportation problems as factors that contribute to the economic operation and success of the entire region. Thus, in Mr. Phegley's view, anything that facilitates a better and more equitable economy should be a high priority. He believes the managed lanes would help by alleviating problems associated with access to jobs and affordable housing. Because the lanes will provide more mobility for everyone, he does not see an environmental justice issue.

Mr. Phegley believes that anybody can make the choice to use the lanes once or occasionally. If someone chooses to use it more, then it's an opportunity choice and the $6 [example] toll serves as an incentive to choose behavior that allows people to avoid the toll.

Perceptions of Fairness

There will be concern about who's going to be able to afford, or perceived to be able to afford to buy their way into the system. Perceptions of unfairness will be associated mainly with income level, rather than ethnicity. Mr. Phegley also views fairness in terms of transportation connectivity. For example, one reason the University wants light rail to serve the campus is to provide a more seamless connection between campus and various communities, including minority communities.

Mr. Phegley believes that by time the managed lanes are built, the concept will be seen by all road users as an acceptable—and necessary—part of the modal option mix. The lanes will help people make more conscious trip choices. HOV lane users should be pleased, as long as they have access and have free flow conditions. Issues of HOV eligibility will be self-correcting as time goes on. Transit riders will have a favorable reaction because buses will enjoy the time advantage permitted by the lanes, and give bus riders a higher quality.

Mr. Phegley doesn't think San Diego commuters will be any different from interregional travelers in their perception of the lanes. Mr. Phegley suggests that rather than looking at truckers, we look at goods movement, there's a differentiation. He explains that there's already a high value/high time factor in goods movement, and that this means there's some opportunity for pricing (e.g., Federal Express), as long as safety is considered.

Other Public Input

Underrepresented Groups

Mr. Phegley observes that residential neighbors always feel they're not involved, not adequately informed and that they don't have any say. Part of what UCSD's strategy is to keep people informed, at the least, because surprises are unacceptable to people in these matters.

Likely Sources of Project Support and Opposition

Mr. Phegley believes that project support will come, in general, from people who are already in the planning process. He believes there's a considerable amount of support that could be generated by educating people about the project and the future without the project. Opposition is likely to come from those concerned about growth in general, and who feel they can stop it rather than deal with it.

Proposed Survey Question

"What would it take to get you out of your single occupancy vehicle and how much thought have you given to this in terms of if there was an alternative –why do you need your car if you can get to point a to point b without a car, what do you need it for?

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Armando Freire, President, Dimex Trucking**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 22, 2004**

Dimex's Role in Project Planning or Implementation

No role.

Perception of Existing and Future Corridor Mobility Conditions

During peak hours, conditions are horrible. Peak extends from 5:30 to 9:00 a.m. or 10:00 a.m. and 2:30 to 6:00 or 7:00 p.m. on weekdays, and the weekend peak seems to last all day.

Currently, Dimex has 27 trucks that Mr. Freire oversees. About 90 percent of its routes are cross-border at Otay Mesa. Its trucks are primarily destined for rail spikes and distribution centers on the north and east side of Los Angeles, so traffic and the price of fuel are key issues for the company.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Freire used the I-15 Express Lanes as a carpooler when he lived in Escondido.

Efficiency

Mr. Freire does not think the I-15 managed lanes are efficient. He thinks they are wasted space, even with the buy-in option. He believes a better solution would be to remove the barrier, gain the space taken up by the barrier and convert all of that to possibly three lanes of additional general purpose lanes.

Fairness

Fairness is not an issue for Mr. Freire in this regard; the wasted space is a bigger concern.

Applicability to I-5 Corridor

Mr. Freire would not favor an I-15 style facility on the I-5 Corridor. "We need pavement, not projects." He thinks a better example is the Coronado Bridge application, where all lanes can be directed to accommodate strong directional traffic flow.

Project Concept & Operations Pros and Cons

Current Community Issues

The trucking community cares about freeway operations because of safety. With the current environment, 80,000-pound vehicles and 5,000-pound vehicles share the roadway. The latter don't take into account the unpredictability of the 80,000-pound vehicles. Also, the border may increase to 20,000 moves per day, from 5,000-6,000 today. Between 96-98 percent of that volume goes over the roads. Truck lanes on I-5 or I-15 aren't a good idea either. Trucking is further limited by the hours of operation at the border. Mr. Freire's drivers prefer to leave around 3:00 or 4:00 AM, and arrive in Los Angeles by 5:00 or 6:00 a.m. That would put them returning south at 9:00 or 10:00 a.m.. Borders are open from 6:00 a.m. to 8:00 p.m., but the actual movement of goods is 7:00 p.m. to 7:00 a.m.

Priorities for Use of Managed Lanes

Buses should have top priority, then cars. The only purpose of having trucks on the lanes would be for safety. But off-peak use wouldn't provide much of an advantage. Emergency vehicles should be allowed at no charge, but not clean air vehicles—they serve a different purpose.

Managing Demand: Access vs. Tolls

Mr. Freire thinks that if Caltrans were going to block access physically, there would be disruption to travelers' expectations, and that therefore, it is preferable to use tolls to manage demand.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Barriers should be physical. Mr. Freire observes that nobody obeys the painted barriers, and they are not as safe as physical barriers.

Number of Access Points

This is an engineering question.

Operating the Lanes: Ingress/Egress Priority

If truckers aren't allowed access, it is of no concern. However, the more traffic that can be separated into different merge streams, the better.

Signage and Toll Information

Mr. Freire believes the I-15 facility is well signed, and that Caltrans generally does a good job with signage on the freeways.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Mr. Freire already thinks people pay way too much, and wants government to stop robbing the highway funds. Carpool lanes should be for carpools only. If people want to pay to use them as solo drivers, he believes they should be allowed, but he doesn't like the idea.

Use of Toll Revenue

Revenues should go to concrete—highways, not transit. Keep the money in the SR 905, I-8, I-5, and I-15 corridors, not SR 94. Revenues should support freeways connecting to Los Angeles and the rest of the country.

Mass transit only works in concentrated areas. Bus rapid transit would only be effective if it were connected to a distribution network at origins and destinations. "If you put one dollar into a bus and it's only 30% full, that's not effective."

Managed Lanes' Likely Impact on Travel Behavior

Mr. Freire thinks that as long as we support sprawling housing patterns, we're not going to get changed travel behavior. He would like to give up his own car and take transit, but the origin/destination shuttle network doesn't exist. If he has to get in the car to get to the train, then he'll just take the car—since the trip requires a car for one segment.

Effectiveness in Moving People

The managed lanes would move more people than regular carpool lanes, but not as much as general purpose lanes.

Environmental Issues

None identified.

Safety, Enforcement, and Related Operational Issues

None identified.

Operational Suggestions

Make the lanes general purpose lanes.

Pros

If the freeways were expanded there would be benefit to truckers remaining on the main lanes. The down side is that there's new pavement from which trucks are excluded.

Project Concerns and Challenges

Truckers are concerned about the wasted space. The majority of the trucking industry would not use the lanes if they had to pay for that use. Truck customers won't pay for it, and truckers don't operate on a big enough margin to include a toll in their operating expenses. Public perception is that the truckers destroy the roads. What they don't understand is the excessive amount of taxes they pay for the road--$2,200 to the state per truck per year, plus an additional $650 in federal taxes. Add to that the taxes on

purchase of a $140,000-$160,000 truck, and trucks pay more than their fair share of taxes. The problem is that this money never finds its way to the roadways.

Environmental Justice Issues

Equity

Mr. Freire does not see an equity issue relative to value pricing on managed lanes.

Perceptions of Fairness

Mr. Freire notes that he's a member of an ethnic group, and does not have an equity problem with the concept. He also thinks that, while transit riders and carpoolers should be happy with the new managed lanes, everyone sitting in congested main lanes will wish there were simply more general purpose lanes. He imagines that interregional travelers would benefit from the lanes. Truckers, however, are not happy about HOV lanes generally, and few think they're a benefit.

Other Public Input

Underrepresented Groups

People who travel through the corridor should be involved in the decision, through town-hall meetings.

Likely Sources of Project Support and Opposition

Opposition will come from communities concerned about the widening itself, and from people who don't perceive the benefits of the project.

Proposed Survey Question

"If SANDAG built managed lanes on the I-5, would you use them?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Yolanda Jimenez, President, Lucar Trucking** *Note: Two of Ms. Jimenez' drivers joined the interview and provided comments as well.*
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 16, 2004**

Lucar Trucking's Role in Project Planning or Implementation

None.

Perception of Existing and Future Corridor Mobility Conditions

It's very stressful for the truck drivers because of congestion. They can't move, traffic is at a standstill. It's very heavy from 12 p.m. on. And it's been getting worse over the last couple of years. Road construction and maintenance (sweeping, for example) makes the problem even worse.

I-5 is a concern because it connects to the Los Angeles area, and Lucar Trucking does a lot of business with firms in that area. Having more access and lanes is a concern to her in her role as president of a trucking company. "How it's done is no concern—just get it done."

Awareness of and Existing Attitudes about Managed Lanes

Ms. Jimenez feels neutral about the I-15 FasTrak lanes.

Project Concept & Operations Pros and Cons

Current Community Issues

Not applicable.

Priorities for Use of Managed Lanes

Trucks will not likely want to use the lanes, so that is not a priority. They prefer staying on the outside lanes for reasons of breakdown and exit access.

Managing Demand: Access vs. Tolls

Using tolls is preferable to closing entrances and exits as a means of keeping the managed lanes uncongested.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Truck drivers prefer a physical barrier, because if they, for example, fall asleep, they'd rather run into concrete than a vehicle. However, when she travels in a passenger car, Ms. Jimenez prefers the painted barrier because she doesn't like the feeling of being closed in.

Number of Access Points

A four-to-seven mile distance between direct access ramps seems about right.

Operating the Lanes: Ingress/Egress Priority

Give priority to transit buses only.

Signage and Toll Information

Caltrans does a good job, generally, with signage. Ms. Jimenez thinks the I-15 FasTrak facility is well-signed.

Importance of Modal Choice on the I-5 Corridor

Ms. Jimenez has no choice about whether to drive or not, but would like to see more choice for people on the I-5 Corridor.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

Skipped question.

Use of Toll Revenue

Ms. Jimenez would like to see revenues go to help goods movement and commercial movement through corridor. It helps the economy. Trucks have to maintain their delivery schedule, and if not, they're often returned by the corporation, or they lose time waiting to unload.

Managed Lanes' Likely Impact on Travel Behavior

People won't change, except to choose what's best for them. We still drive. Carpooling is hard to find a match.

Effectiveness in Moving People

No opinion.

Environmental Issues

Ms. Jimenez is concerned about diesel and the smog. But don't go "too far overboard protecting butterflies."

Safety, Enforcement, and Related Operational Issues

Must trust Caltrans engineers on this issue.

Operational Suggestions

Although this is north of the project area, truck drivers would like to see another truck pull-off or place to turn around between Pulgas and Christianitos. Also, have longer merges for truck drivers.

Pros

Ms. Jimenez is in favor of the project if it increases travel speeds and reduces congestion for trucks, even if they don't use the lanes.

Project Concerns and Challenges

Ms. Jimenez is concerned about how long projects take to build.

Environmental Justice Issues

Equity

Ms. Jimenez feels there's not an equity problem as long as she can pay for it. She believes lower income people will feel it's unfair because they can't pay but they still pay taxes. A mitigating factor is that at least the government is trying to give us options in this case.

Perceptions of Fairness

Although Ms. Jimenez thinks some members of ethnic groups will try to make it an ethnic group issue, she thinks fairness problems, to the extent they exist, are income related.

Most road users should be happy with the managed lanes. The carpoolers get two carpool lanes; the transit riders get quicker transit, and truckers will be happy because there will be more traffic in the center lanes, out of their way.

Other Public Input

Underrepresented Groups

None identified.

Likely Sources of Project Support and Opposition

People who think government spends money for no good reason are likely to oppose the project.

Proposed Survey Question

None identified.

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Mr. James R. (Ron) Popham, Director of Maritime Services Unified Port of San Diego** **Stuart A. Farnsworth, Esq., Maritime Program Manager, Maritime Division, Unified Port of San Diego**
Also in attendance:	**John Duve, SANDAG**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 22, 2004**

Port of San Diego's Role in Project Planning or Implementation

The Port is working with SCAG and Caltrans District 7 and with the federal government to develop a Southern California Gateway Freight Plan, trying to get some federal dollars to deal with goods movement, and that should gel with SANDAG's plans for the I-5 Corridor. The Port of San Diego is the mouth for freight that goes to the eastern part of the U.S.

Perception of Existing and Future Corridor Mobility Conditions

Conditions are worsening rapidly. Mr. Farnsworth moved to the area in 1995, and the commute from Encinitas that used to take 20 minutes now takes 50 minutes, more than doubling the commute time in nine years. Traffic will get worse before it gets better. The HOV lanes should be continued all the way to the SR 78 interchange. The I-5/I-805 construction impacts were worse than the SR 56 impacts, on I-805.

The Port is concerned about the freeways in general, and ultimate end user costs—which is sometimes equated to time. Congestion at the terminal limits moving product off ships onto trucks and out of the Port area. Mr. Popham discovered a lot of cargo going to Mexican ports is designed to have the ship come to San Diego. Marketing is needed to direct that cargo to San Diego and take the trucks off the road. Just one truck carries 15,000 tons of cargo. The managed lanes concept makes sense to control travel time.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Popham used the I-15 Express Lanes as a carpooler once.

Efficiency

Mr. Popham believes the lanes are effective, using the SR 73 toll road in Orange County as his reference.

Fairness

It's fair, because it's a premium that is entirely optional.

Applicability to I-5 Corridor

Mr. Popham is generally in favor of the managed lanes concept. He thinks the business user would be happy since, "Time is money."

Project Concept & Operations Pros and Cons

Current Community Issues

While a lot of the cargo goes south, there's still about 30-40 percent that goes north on I-5 and I-5 to Los Angeles. The idea now is that LA/Long Beach ports are too crowded, so the Port of San Diego gets the spillover. Currently San Diego is handling seven million tons. By 2020, that will be 25 million tons. The spillover effect could add even more to that, and all of this has implications for freeway mobility needs.

Priorities for Use of Managed Lanes

Allowing trucks to use the lanes off-peak at no toll would be supported.

Managing Demand: Access vs. Tolls

Whatever works best for efficiency of operation should be adopted.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

The barrier is an important consideration, since physical barriers provide the perception of safety for passenger vehicles and they can accommodate lane-keeping technologies within the barriers themselves. It's very easy to have alerts inside the trucks, and in the long range, to include automated guidance system. The trucks could go up in rubber-wheeled trains, essentially.

Number of Access Points

No opinion.

Operating the Lanes: Ingress/Egress Priority

Signage and Toll Information

No opinon.

Importance of Modal Choice on the I-5 Corridor

Providing options for goods movement on I-5 goes to providing fundamental efficiency on the system.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

The $6 fee could be passed on, and might be worth it to truckers if they're in stop and go traffic, since their operational costs are high. However, whether the toll is indeed worth it depends on whether the system as a whole is designed to support more efficient goods movement. For example, the border doesn't upon until 8 a.m, and by then, the trucks are lined up and waiting to go through, so managed lanes won't help that problem. The Port is not necessarily affected by this, but truckers in general are.

Use of Toll Revenue

No opinion.

Managed Lanes' Likely Impact on Travel Behavior

No opinion.

Effectiveness in Moving People

No opinion.

Environmental Issues

No opinion.

Safety, Enforcement, and Related Operational Issues

Physical barriers will increase passenger vehicle drivers' sense of security.

Operational Suggestions

A critical piece for the Port is the I-805 traffic, after the completed SR 56 and the traffic dumping off SR 52. The "S" curve in downtown San Diego and the 94, all of these interchanges are overloading I-5. Another issue is the possibility that the Port pushes up its traffic to 32nd Street, to I-15, to I-805, and I-5 for the trucks leaving the Port.

Pros

The lanes would provide options for drivers, and even if trucks can't use them, they can benefit from new capacity

Project Concerns and Challenges

Too bad the lanes don't extend farther south.

Environmental Justice Issues

Equity

The fairness of value pricing is not a forgone conclusion, but on the other hand, society charges for all goods, and it will improve everyone's quality of life by improving throughput. The Port is getting pressure from neighbors on the air quality issues related to diesel, and that will slow its growth.

Perceptions of Fairness

If the trucks could use the lanes at certain times with no toll, or if they could offset the toll as a credit against the federal gas tax, some trucking firms might use the lanes. Most trucks will not go out of the way 20 miles, or spend an extra 20 minutes if they can avoid it, so the tolls may seem very fair as an alternative. However, not all firms can afford it.

Other Public Input

Underrepresented Groups

"Freight doesn't vote," observes Mr. Popham. SANDAG responds to voters when it develops policy, and this tends to be more responsive to passenger vehicle needs. SANDAG should be designing facilities that accommodate the needs of all roadway users.

Likely Sources of Project Support and Opposition

There shouldn't be major opposition, because the lanes will benefit everybody. Possible concerns from environmentalists.

Proposed Survey Question

"How important is it to you that your daily goods arrive at the store? If you knew that there would be fewer trucks on the roads during peak and that your stores would be more efficiently stocked? Would you be willing to allow ***exclusive*** use of the managed lanes by trucks during off-peak hour? One lane? Would you be willing to allow them at off-peak with no toll? Or a toll that would be reimbursed through federal gas tax rebate?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Dan Beal,** **Managing Director, Public Policy,** **Southern California Automobile Club**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 8, 2004**

Auto Club's Role in Project Planning or Implementation

Mr. Beal hopes that the Auto Club will have input into the planning in order to represent club members' interests. He indicated that the Auto Club would be happy to be part of an educational component, helping to tell people what they could expect from the lanes, what the benefits are, and how to use them.

Perception of Existing and Future Corridor Mobility Conditions

Mr. Beal stated that current conditions on I-5 in North San Diego County are "pretty bad." Congestion is so bad, in fact, that when his daughter drives up to LA County from San Diego, he joked that, "Sometimes we don't know if she'll be arriving for dinner or breakfast." He believes the corridor is frequently at the tipping point for congestion—often experiencing severe stop-and-go traffic.

For Auto Club members, traffic congestion is a quality of life issue. "That's what we hear more than anything else. They know the symptoms, if not the Texas Transportation Institute numbers. They're telling us that congestion is a waste of time, and that it costs wear and tear. They don't feel like much is being done to make it better. They are also supportive of options, and are willing to pay for options to some extent. For example, five percent or less of travelers use transit, but most people don't have heartburn spending the money to provide those options, or other alternatives such as walking and biking. Auto Club members are, however, very negative about the Proposition 42 rip-off."

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Beal knows about them, but doesn't drive in the vicinity often.

Efficiency

Mr. Beal believes they probably do provide an efficient mobility option for travelers. Mr. Beal is somewhat equivocal about the efficiency because on the SR 91 there wasn't really a full analytic comparison of a general purpose lane alternative. Still, he believes that as an option to manage lanes, pricing does have some promise, and that they ease congestion on non-tolled lanes

Fairness

In a market sense, Mr. Beal thinks the I-15 Managed Lanes are fair enough. "If you have a need to pay for them, you pay for them. If you don't want to, or can't, you don't." Mr. Beal thought that the I-15 was the only facility that has a LOS threshold (was C and now D) Mr. Beal did not know whether the lanes were equitable in a societal sense. Freeing up non-tolled lanes provides a benefit to non-paying motorist in the general lanes.

Applicability to I-5 Corridor

Mr. Beal thought an I-5 demonstration project was warranted, though he stressed that he believes the entire concept really still is in the demonstration phase—it is not yet an entirely proven tool. As such, he stated, "I think we might make a mistake if we apply such a limited case more broadly."

Project Concept & Operations Pros and Cons

Current Community Issues

Mr. Beal thought that environmental issues might arise. "Paint it how you want it, it's a widening. It's noisy, closer to land uses. It's a tradeoff between alternative uses."

Priorities for Use of Managed Lanes

Mr. Beal stated that encouraging HOV was a "no brainer." He supports preference for longer distance transit, vanpools, and carpools. In fact, if the lanes don't encourage formation of carpools and vanpools, there is a problem with the policy.

Allowing trucks in the managed lanes presents a problem, since the lanes need to be designed for that to begin with. Mr. Beal doesn't think trucks could safely cross four or five lanes of traffic—they'd have to have their own ramps.

In his Auto Club role, Mr. Beal supports the notion of free access for emergency vehicles, including Auto Club tow trucks.

Mr. Beal thinks it's inappropriate to allow clean air vehicles to use the managed lanes at no toll, since they also contribute to congestion, and do not seem to require incentives to sell.

Managing Demand: Access vs. Tolls

Which is preferable to avoid congestion on the managed lanes---limiting access, increasing tolls, or combination? I can't see paint and tolls in the same project. Too much unregulated egress. I've seen people run through the stanchions on the SR 91 to cheat the reader. The lanes must have limited ingress/egress. They also have to provide two travel lanes each way – one lane is too easily disrupted.

Access/Ingress/Egress

Mr. Beal believes that direct access ramps should be provided for transit, carpools and paying SOV's. However, Caltrans will have to consider the problem of solo drivers using park and ride lots and bypassing queues.

If lanes overload, the access may have to be able to be closed at specific locations. However, a physical barrier could be a problem—surprising someone who was used to

getting onto the lanes at the location. Mr. Beal does not like the painted barrier concept. He suggests that rubber poles could be provided as breaks to permit vehicles to get in to emergencies, if hard barriers are used.

Mr. Beal prefers less frequent access points. "More access equals more weaving, more short-distance users, more card readers and more complicated billing. Access points should be no closer than every three or four miles, and should be spaced to encourage for longer trips."

With respect to permitting preferential merge lanes, he thinks people should just recognize the need to merge back into the general lanes, and be happy with the time they've saved already.

Signage and Toll Information

Mr. Beal thought the signing on the I-15 Managed Lanes seemed to be effective.

Reaction to Example Toll Level:$6 for Minimum 24 Minute Trip Time Savings on Entire 26-Mile Facility

Mr. Beal's response was "Sounds like a deal to me, given the time savings. What's your time worth to you?"

Use of Toll Revenue

Mr. Beal points out that the toll "brings up a conundrum—to change behavior you will probably have to charge enough to bring in revenue in excess of capital and operating costs. He thinks they should return the money to the corridor it is collected from improve the driving experience. It should absolutely not go to the general fund. Mr. Beal thinks the first priority is to pay off the bonds to build the facility. Other possible uses include transit and road maintenance in the same corridor.

Managed Lanes' Likely Impact on Travel Behavior

Naturally, the impacts can include everyone who drives, including Auto Club's 5.5 million members in Southern California. Mr. Beal thinks the I-5 is probably a likely corridor to do change behavior in response to travel options that include pricing. "There aren't any other options. Either I pay, or I carpool." He added that the mix of modal choice on the I-5 corridor needs to include "fairly intensive transit." On the other hand, Mr. Beal thinks the lanes might have the adverse effect of encouraging longer distance commuting.

Effectiveness in Moving People

As for effectiveness, it remains to be seen whether the Managed Lanes will move more people than regular carpool lanes or main lanes.

Perceptions of Fairness

Mr. Beal thinks that some I-5 main lane users might not have a problem with the lanes as long as they, too, have the option to use them. Some, however, "might be pretty upset. If I'm not over there because I don't have a transponder, and the lanes don't accept cash and it's inconvenient, it may be a problem."

HOV lane carpoolers might be upset if they were used to using HOV lanes for free and the new paradigm requires a fee. They might feel, "Hey, I've been doing the right thing and now you're charging me!" It depends on the policy adopted.

Transit riders are not paying for the majority of the trip's cost anyway. "If a BRT trip costs $3 I'd be pretty happy." Truckers probably won't want to use the lanes—weaving through traffic to access them and speed differentials between cars and trucks would be a problem. But they might be happy about congestion reduction in the main lanes.

The issue of regional vs. through travelers has more to do with the requirement for transponders than trip origins and destinations, because without a transponder, you're frozen out of the lanes. This issue might be resolved in the future by in-car GPS systems.

Environmental Issues

Not applicable to Auto Club membership focus, though there will be concern from environmentalists.

Safety, Enforcement, and Related Operational Issues

Mr. Beal is not in favor of a painted barrier, and warned against too frequent ingress/egress. He identified the need for special enforcement zones to accommodate the CHP's need to pull someone over. "You don't want the CHP traveling for four miles with their lights on." There must be breakdown areas, and access to service vehicles and staging areas for them to operate.

Pros

It's an additional set of tools to manage the congestion on the road. Maybe managed lanes can serve as an emergency lane for evacuations—turn them all northbound or southbound, if needed. The lanes could also be reconfigured to accommodate different uses in the future. High capacity rail might work in the future, or perhaps they could be converted to general purpose lanes, if that's what the future needs. There's flexibility. Mr. Beal pointed out, "It's lower cost to widen now than 30 years from now. There's flexibility. Maybe they even become truck lanes. Whatever the best mix of uses in the future, you've got it. If managed lanes are what sells that, then fine."

Project Concerns

Mr. Beal says we must always ask whether the managed lanes represent the best possible use of the capacity compared to alternatives. Too, there are the equity issues. "Regardless of reality, there's the perception of have and have-not. As long as those who can't pay have alternatives, it's reasonable. But if there was then an attempt to use this as a stalking horse for a full corridor priced scenario, we [Auto Club] might have a problem."

Environmental Justice Issues

Regardless of previous studies indicating minimal "real" equity issues, Mr. Beal believes that there is an equity issue to be addressed. This is true despite the fact that the myth that low income people do not value their time has been dispelled. Everyone's time is valuable. People make choices about how they're going to use their money vs. their time. Mr. Beal doesn't think the issue is related to ethnicity as much as it is to income, though those two variables are interrelated.

Mr. Beal believes that it is the highway users themselves who don't get asked for their input very much or very often, especially at the community level.

Other Public Input

Likely Sources of Project Support and Opposition

People who think that every lane should be open to everybody will oppose the managed lanes, and those who think we should all be walking or biking or using transit may oppose the increase in road capacity the project represents.

Proposed Survey Question

Mr. Beal would like to know what peoples' tipping points are-–when would they be willing to increase what they pay for transportation, and how. The survey needs to ask people, "If you accept that we don't have enough resources, would you rather pay a toll, pay through property tax, sales tax, gas tax? Seek money from developers or Indian gaming? If you don't like this, what do you like?"

I-5 North Coast Managed Lanes
Value Pricing Planning Study

Interview participant:	**Hasan Ikhrata, Director of Planning Southern California Association of Governments (SCAG)**
Interview conducted by:	**Deborah Redman, Redman Consulting**
Interview date:	**November 30, 2004**

SCAG's Role in Project Planning or Implementation

SCAG is the MPO [Metropolitan Planning Organization] for all of Southern California except San Diego County. SCAG is concerned about how SANDAG's facility will connect to what is being planned in Orange County. SCAG also is required to meet legal and planning tests with respect to air quality conformity, as well as Title VI Environmental Justice requirements. In addition, SCAG's Regional Council has required a number of performance standards to be met. So if connectivity is important, SCAG and SANDAG should be in communication now. For example, Riverside County is planning four lanes going down to San Diego on I-15—and that will have to be coordinated with SANDAG if bottlenecks are to be avoided. On I-5, unfortunately, Orange County Transportation Authority (OCTA) is facing a lot of funding constraints. In short, the role for SCAG would be to help coordinate Orange County and San Diego County plans for the I-5 Corridor as a whole.

Perception of Existing and Future Corridor Mobility Conditions

In the peak period, the lanes are in failure. It's LOS F, and this is expected to get worse by a great factor over the next 25 years. SCAG is concerned about environmental issues, especially air quality associated with traffic on I-5. North/south goods movement is another issue of importance, along with housing affordability and the implications for traffic patterns.

Awareness of and Existing Attitudes about Managed Lanes

Familiarity

Mr. Ikhrata is familiar with value pricing as a concept, and with the local examples of pricing. He used the I-15 FasTrak lanes as a carpooler to attend the bi-state meeting in Tijuana.

Efficiency

The lanes absolutely provide an efficient mobility option.

Fairness

The lanes are fair in the sense that if you value your time you are free to pay to save it—if you have the means. Mr. Ikhrata does think there are some environmental justice

issues and that if the lanes are paid for by taxes, tolling them (even though designed to managed demand) gives at least the appearance of unfairness. This could be corrected to some extent by how and when SANDAG prices the lanes.

Applicability to I-5 Corridor

Mr. Ikhrata is in favor of a pricing strategy on I-5, and joked, "I hope it gets built while I'm still able to drive."

Project Concept & Operations Pros and Cons

Current Community Issues

Anytime an agency discusses projects that increase capacity, there will be community opposition. This should be confronted directly, and attempts to bring communities together to solve identified problems should be made early on.

Priorities for Use of Managed Lanes

Priority should be accorded to those vehicles with highest to lowest occupancy. Solo drivers should receive the lowest priority. Emergency vehicles should be allowed at no toll, as should clean air vehicles, at least on a temporary basis. Mr. Ikhrata favors opening HOV lanes and managed lanes to all traffic, at no tolls during the off-peak periods.

Managing Demand: Access vs. Tolls

Combining tolls with physical access constraints is the way to approach the problem. The average trip length in that area of the I-5 is much shorter than the regional average, so you cannot limit access without constraining people's opportunity to use the lanes.

Traffic should never be permitted to become congested on the managed lanes. SANDAG and Caltrans 11 will have to do what needs to be done. However, they should keep in mind that speeds of 55 or 65 MPH might not be necessary during peak, when even a 40 MPH steady flow would give people the reliable trip that surveys show they want as the highest priority.

Access/Ingress/Egress

Painted Barriers vs. Physical Barriers

Mr. Ikhrata feels that the visual impacts of a physical barrier make it undesirable, and that they can often increase, rather than reduce the potential for accidents.

Number of Access Points

Access at every four to seven miles seems reasonable.

Operating the Lanes: Ingress/Egress Priority

All entrances should be open to all eligible facility users—otherwise it may be too confusing to me. Mr. Ikhrata sees the logic in trying to allow longer merges for priority

vehicles (transit buses) but because right-of-way is so precious, he believes it may be complicated, if not entirely unfeasible.

Signage and Toll Information

For infrequent users, the I-15 FasTrak signage is very confusing. It's not very frequent, and it doesn't explain where to get off. Mr. Ikhrata hopes that by time the more complex I-5 managed lane facility opens, that IT solutions will permit fewer signs with more information.

Importance of Modal Choice on the I-5 Corridor

Choice is very important, and is too limited now. Metrolink and Amtrak are infrequent (in SCAG's area) and people are forced to use the freeway.

Reaction to Example Toll: $6 for Minimum 24-Minute Peak Time Savings on Entire 26-Mile Facility

This is "very much worth the price." When SCAG conducts performance evaluations, it looks at time savings on a societal basis. Out-of-pocket costs for individual users are compared to the value time saved, valued at about $6 per ten minutes. At that rate, some would find it beneficial to pay even double the sample toll described here. Most people are under so much time pressure that at some time, it would seem like a very good idea.

Use of Toll Revenue

Tolls should be used to correct for societal problems and environmental impacts, and addressing EJ issues—not simply building more freeways.

Managed Lanes' Likely Impact on Travel Behavior

The biggest impact (aside from the fact that the lanes would make life easier for people paying a toll) is that people who drive the regular freeway lanes will come to understand the value of mobility. That educational process can help build a constituency for transportation improvements. And it helps people come to the realization that we can't provide mobility for six million people. If people want new freeways, they have to pay for it. If not, then intense focus needs to be paid to public transportation.

Effectiveness in Moving People

The managed lanes will move more people than either regular carpool lanes or main lanes.

Environmental Issues

Mr. Ikhrata thinks the project will benefit air quality, especially if it allows clean fuels to use the lanes at no toll. It can also help build the infrastructure for clean fuel vehicles. There are also likely to be visual and noise impacts with competing mitigations (i.e., noise walls create visual impacts).

Safety, Enforcement, and Related Operational Issues

Violators should be ticketed with both a moving violation and a pricing penalty.

Operational Suggestions

Caltrans District 11 can figure it out.

Pros

Maximizes capacity of the system.

Project Concerns and Challenges

None identified.

Environmental Justice Issues

Equity

Equity is a real issue. Who pays and who benefits is something that both public and private sectors need to consider. However, the issue is larger than "rich people can pay"—because the lanes offer benefits to transit riders and carpoolers, and even to main lane users who will see some increased capacity on the untolled lanes.

Perceptions of Fairness

The impacts likely fall on income, not ethnicity. Unfortunately, there is a strong connection between ethnicity and income, as well.

I-5 main lane users who decide (whether regularly or occasionally) to use the managed lanes as toll payers will experience great relief. It's also a big step in the right direction to fixing the "empty lane syndrome" that is sometimes real, and sometimes only perceived, relative to HOV lanes. And it may comfort main lane users that "somebody's finally listening and providing solutions." Commuters from outside the region and within the San Diego area are likely to experience the lanes similarly. Truckers, too, will enjoy some amount of benefit from getting vehicles off the lanes they use. Carpoolers, vanpoolers and transit riders are likely to be happy with the lanes, although when the lanes reach capacity and eligibility changes, there may be some difficulty.

Other Public Input

Underrepresented Groups

Transit users are frequently underrepresented, along with most of the typically targeted EJ groups. There is overrepresentation from the highway advocates. The public at large is also underrepresented, and they rarely come to meetings.

Likely Sources of Project Support and Opposition

Communities along the alignment might perceive that increased access to their communities increases crime, traffic and graffiti, and thus oppose it. Civil rights groups might object to the lanes as an EJ issue. And there will be the "Drivers for Highway Safety" types that will favor it, especially as the lanes impact and connect to Orange County. Labor and concrete industry will be for the lanes. Many environmentalists have also come out in favor of value pricing as a tool for managing demand.

Proposed Survey Question

"Would it be worth it to you to pay $6 to travel 40 miles per hour for 26 miles? Do you think your property values would go up or down [for those who live along the alignment]? What air and noise impacts from the facility would you perceive?"

Mr. Ikhrata also suggests that a sufficient set of demographic questions be asked to help planners understand people's expressed opinions.

APPENDIX C

I-5 NORTH COAST MANAGED LANES

FIRST ROUND PARTICIPANTS:

FOCUS GROUPS 1 & 2

Participants Focus Group 1

Dana

- Female, under 30, works full-time, uses freeway 7 days/week, zip 92075
- Lives in Solana Beach
- As a sales rep travels a lot
- Drives alone
- 26 mile commute one-way
- Has flexibility in schedule to avoid traffic
- Chose where to live partly based on freeway congestion
- Concerns about pollution in fields near the freeway

Mark

- Male, age 30-45, works full-time, uses freeway 7 days/week, zip 92014
- Lives in Encinitas Ranch
- Works in Del Mar
- Self-employed attorney
- Considers I-5 as “second home”
- Trip length generally about 12 miles, and takes 15-30 minutes depending on traffic
- Has flexibility in schedule to avoid traffic
- Often travels to Coronado and LA

John

- Male, age 45+, works full-time, uses freeway 5+ days/week, zip 92054
- Lives in Oceanside
- SD native
- Works in construction so travels all over the county for work
- Recently been commuting to Carlsbad
- Tries to start out before traffic
- Carpools with coworkers sometimes

Julieann

- Female, age 30-45, works full-time, uses freeway 6 days/week, zip 92009
- Lives in South Carlsbad
- San Diego native
- Commutes to San Diego for work
- Carpools regularly with husband
- Used to ride Coaster regularly, loved it
- Commute takes about 40 minutes in the morning, 1 hour in afternoon

Gregory

- Male, age 45+, works part-time, uses freeway 5 days/week, zip 92054
- Lives in Oceanside
- Travels to Del Mar for work
- Leaves as early as possible to avoid traffic (5:00 am)
- Carpools with wife but would prefer not to, likes independence of leaving when he wants
- Takes about 35-45 minutes in the morning and 45 min-1 hr in afternoon

Randolph

- Male, age under 30, works full-time, uses freeway 3+ times/ week, zip 92054
- Lives in Oceanside
- Works in Carlsbad, San Diego and Irvine
- Has three jobs
- Leaves home at 4:30 am
- Concerned about smog at the intersection of SR 78/SR 76/I-5, also noise pollution and accidents

Jeff

- Male, age 30-45, works full-time, uses freeway 7 days/week, zip 92130
- Lives in Carmel Valley off Del Mar Heights Rd
- Works in Mission Valley
- Used to work at base on Coronado
- Commute is 25 miles one-way
- Drives alone
- Tried Coaster and carpooling but it did not work for him because of limited schedule
- Concerns about the SR 56 connector increasing crime in his neighborhood and about traffic causing more cars to sit on the freeway and idle, causing pollution and wasting resources

Participants Focus Group 2

Emile

- Male, age 30-45, works full-time, uses freeway 4 days/week, zip 92009
- Lives in Carlsbad near La Costa Country Club
- Works as software developer so has irregular schedule
- Drives to Encinitas, Oceanside, Birmingham
- Drives alone mostly
- His commute is about 10 minutes, 6-7 miles, it is a reverse commute
- Usually drives more on weekends now
- Tries to avoid busiest traffic times if going downtown or far south
- Chose to live close to I-5 because it provides easy access and is closer to the ocean

Evelyn

- Female, age 45+, works full-time, uses freeway 5 days/week, zip 92130
- Lives in Carmel Valley, uses new highway, SR 56
- Works in at VA medical Center
- Commute is about 7 miles which takes 20-25 minutes in the morning and over 30 minutes in afternoon
- Has flexibility in schedule to avoid traffic
- Believes more traffic now that 56 opened
- Has had jury duty for past 7 weeks, she has been carpooling. Not due to carpool lane but for ½ price parking and gas and social reasons.
- Concerned about hearing traffic noise in the morning, she lives about 2-3 miles from freeway.

David

- Male, age under 30, works full-time, uses freeway 5+ days/week, zip 92009
- Lives in Solana Beach
- Uses Villa de la Valle entrance
- Commutes to Miramar Rd in Mira Mesa
- Has fixed schedule so can’t plan around traffic
- Drives alone because he needs his car at work
- Can see the freeway from his house, lots of road noise

Robert

- Male, age 30-45, works full-time, uses freeway 3 days/week, zip 92014
- Lives in Del Mar
- Works at home, doesn't commute to work, has irregular usage patterns
- Thinks about traffic before planning a trip especially because of events such a racetrack
- Concerned about noise of freeway, also used to be a problem for crime, but now it is not an issue for him, but he thinks it may be for others.

Chris

- Male, age 30-45, works full-time, uses freeway 5 days/week zip 92054
- Lives in South Oceanside
- Travels to Carlsbad Palomar for work 8-5, Monday through Friday
- Does not have a lot of flexibility in schedule
- Drives alone to work
- Concerned about the effects of traffic on local streets of people trying to avoid congestion on freeway

Andrea

- Female, age 45+, works full-time, uses freeway 5 times/ week, zip 92075
- Lives in Poinsettia/La Costa
- Works on San Diego on Normal Street
- Her commute is about 26 miles one-way, it takes 30 minutes to an hour
- Morning traffic used to be lighter, but now mornings are worse than afternoons
- Drives alone because husband has different hours
- Can hear freeway noise at home, but can't tell it from the ocean

Richard

- Male, age 45+, works full-time, uses freeway 5 days/week, zip 92054
- Lives in Oceanside
- Drives to Carlsbad, Clairemont Mesa, El Cajon for work
- Generally using freeway from early morning to early afternoon
- Never know when there will be traffic, so gives himself extra time
- Always thinks about traffic before leaving

APPENDIX D

I-5 NORTH COAST MANAGED LANES

SECOND ROUND PARTICIPANTS:

FOCUS GROUPS 3 & 4

Participants Focus Group 3

Lori

- Female, age 45+, working part-time
- Leucadia Blvd exit
- Travels I-5 all times of day, six days per week
- Uses I-5 to go to work twice per week (3-4 miles), driving kids, shopping
- Oceanside to La Jolla is usual route
- Says "I-5 and I are best friends"
- I-5 congestion has gotten horrible in last two years
- Vaguely familiar with I-15 express lanes

Ron

- Male, 45+, retired
- Via de la Valle, Solana Beach
- Does not travel often during rush hour
- Usually 30 minute trips
- Carpools on Mondays, drives with grandson on Fridays
- Congestion has gotten a lot worse in last two years
- Familiar with I-15

Stephen

- Male, 45+, retired
- Via de la Valle, Solana Beach
- Doesn't go downtown much, but occasionally goes to Home Depot and the airport
- Usually six to eight mile trips
- Traffic has gotten a lot worse going north
- Does not regularly use I-15

Charlene

- Female, 30-45, full time student at UCSD
- Del Mar Heights, Carmel Valley
- Can avoid rush hour when planning travel
- Often takes the coast route to avoid I-5
- Noticed a 50 percent increase in congestion in past two years
- Sometimes carpools with roommates
- Used I-15 Express Lanes once, saved her one hour

Leo

- Male, 45+, works full time
- Birmingham Drive
- Office in Carlsbad also telecommutes
- Takes surface streets if I-5 is awful
- Usually drives alone
- Regular commute is 10-15 miles
- Goes to Orange County once a week for work
- Believes traffic is not so bad if you avoid the merge
- Hasn't used I-15

Terry

- Female, 30-45, works full time
- Via de la Valle, Solana Beach
- Carlsbad to La Jolla is regular drive
- Uses I-5 freeway a lot for work, errands, shopping
- Carpools 80 percent of time when not going to work
- Judges whether to take roads or freeway
- Has noted an improvement in congestion at the on ramps due to end of construction
- Has never used I-15

Ryan

- Male, under 30, works part time
- Lives and works in Solana Beach
- Doesn't use I-5 to travel to work but is student and takes I-5 to school twice a week
- Not too much traffic on I-5 at that time
- Thinks traffic has gotten better around Del Mar Heights
- Does not use I-15

Participants Focus Group 4

Neil

- Male, age 45+, works part-time
- Manchester or Leucadia
- Uses I-5 at random times, usually not rush hour
- Either alone or carpools
- One third of time going from Encinitas to La Jolla, or Airport
- 10% of the time going to Los Angeles
- Thinks traffic is the same as 2 years ago
- Does not use I-15

Christine

- Female, 30-45, works full time
- Via de la Valle
- Uses I-5, five days per week Monday through Friday
- Travels a lot, meetings in different areas, drives from Oceanside to LA
- Drives alone primarily
- Commute is usually 35 minutes one-way
- Area has gotten 20% more congested in two years
- Does not use I-15

Antonia

- Female, 30-45, works full time
- Via de la Valle
- Travels throughout corridor every day, mostly drives alone
- Congestion has gotten 10 percent worse
- Has used the I-15 Express Lanes

Kevin

- Male, 30-45
- Via de la Valle to Palomar twice a week
- Los Angeles once or twice per month
- Usual commute is 30 miles each way
- Drives alone
- Uses Caltrans' Web site to decide when to leave home
- Congestion is 30 percent worse than two years ago

Joseph

- Male, <30, works full time
- Works Monday – Friday in different locations, and different times
- On and off I-5 all day
- Usually relatively short trips
- Notices congestion all times of the day

Joe

- Male, 45+, retired
- La Costa, Leucadia
- All times of the day on I-5
- Each trip is about 30 minutes each
- Travels alone or with spouse
- He and wife chose jobs based on location
- Tries to avoid traffic
- South is heavier than North
- Interstates 5/805 split has gotten better going north
- Never seen express lanes on I-15 open

Jonathan

- Male, 30-45, works full time
- Via de la Valle, Encinitas
- Uses I-5 seven days a week, 40-60 miles per day
- Usually drives alone
- Has noticed a huge increase in traffic, rush hour starts earlier last longer
- Traffic 15 percent heavier than two years ago
- Has used express lanes on I-15, but doesn't like that you can't get off until Escondido

Phil

- Male, 45+, works full time
- Leucadia to Carlsbad
- Used to drive from Leucadia to OC for work
- Now commute five times a week, about 10 miles each trip
- Usually drive alone
- Used to carpool half the time when drive to Orange County
- More pleasant to have someone in the car and you can take carpool lane
- Same level of congestion as two years ago
- Has taken I-15 in the past

Joseph

- Male, 45+, works full time
- State Route (SR) 76 to La Jolla
- Commutes five times per week
- Drives alone
- One hour each way or more
- South in the morning is more congested from La Costa to SR 56
- North bottleneck at Villa de la Valle

APPENDIX E

I-5 NORTH COAST MANAGED LANES

FIRST AND SECOND ROUND DISCUSSION GUIDE

FOCUS GROUPS 1, 2, 3, & 4

I-5 North Coast Managed Lanes Focus Group Discussion Guide – Round One

OBJECTIVES

- Determine travelers' perceptions of current traffic conditions and transportation planning alternatives
- Explore reactions to value pricing and managed lane alternatives
- Assess perceptions of effectiveness and equity of proposed program – specifically if value pricing is perceived as equitable used in isolation or in combination with access restrictions on the lane
- Identify safety and environmental concerns (e.g. additional footprint barrier vs. buffer, environmental justice)
- Establish language to be used in subsequent quantitative phone survey

PARTICIPANTS

- Commuters on I-5 Corridor 3+ days per week between I-5/805 split and South Oceanside.

TOPICS

- **Explain purpose of Group**
  - Explore issues to find out what is important to commuters
  - New transportation facilities – want feedback on options and issues related to the project
  - Will be used to design a telephone survey with a representative sample of I-5 corridor commuters

- **Ground Rules**
  - Group will last 1.5 – 2.0 hours
  - Being observed and recorded (will not be made public)
  - Speak one at a time to facilitate reporting
  - No wrong answers – want to hear all sides of each issue

- **Introductions**
  - Where you get on/off I-5, timing and frequency of commute
  - Commute mode
  - How many miles/minutes
  - How this has changed over last two years, and if so, how much
  - What sort of freeway-related environmental issues do you experience at home (as opposed to when you are driving) e.g. noise, visual, safety, diversion of traffic, etc.

- **I-15 facility**
  - Familiarity with how reversible facility operates (not freeway per se)
  - What are pros and cons about the current I-15 Express Lanes

- **I-5 Facility**
  - Description of corridor and projected congestion levels
  - Timing and physical description of planned option (Option A: 10+4 painted, present graphics and explain how different than I-15)
  - Pricing
  - Positive comments about this approach
  - Concerns or problems with this approach
  - Perceived effectiveness
  - Environmental benefits/concerns (noise, pollution, impact on lagoons)
  - Safety and/or enforcement concerns
  - Perceived equity

- **Access/Egress**
  - How open or closed should the facility be
    1. Physical barrier vs. painted barrier
    2. Frequency of access points – speed & safety vs. access
  - Efficiency of operation
  - Equity
  - Safety

- **Tolls**
  - Fixed vs. variable
  - Zoned or flat (one segment higher than another)
  - Time of day vs. congestion pricing
  - Predetermined amount or whatever it takes to maintain free-flow
  - What is the cost/benefit trade-off of value of time saved commuting (and added safety)

- **Access vs. Tolls**
  - Which is preferable to avoid congestion limiting access, increasing tolls, or combination

- **Option B (8+4 physical barrier)**
  - Pros and cons (performance, equity, safety, environmental)

- **Impact on travel mode**
  - Impact on travel behavior for corridor commuters overall
  - Personal impact on travel patterns, mode, time (e.g. would you use transit or carpool more often, would you change the time of day you commute?)
  - Perceived effectiveness of proposed facility
- **Use of Revenues**
  - Future revenues – awareness of how current FastTrak revenues are spent and how future revenues could be spent

- **Wrap up**
  - Ask observers if any follow-up questions
  - Thank participants and provide incentives

Target Zip Codes for Recruiting

92007
92008
92009
92014
92024
92037
92054
92067
92075
92091
92121
92130

I-5 North Coast Managed Lanes Focus Group Discussion Guide – Round Two

OBJECTIVES

- Better understanding of how the short-haul users feel about the managed lanes project and how their concerns can be addressed.
- Better idea of how long a trip it takes for long-haul users to take the managed lanes (given 3-4 mile frequency of access)
- Identification of any toll feasibility fatal flaws: (i.e., expected benefits, willingness to pay, advance notice to potential users if lanes are not providing benefits, frequency of access, advance knowledge of toll rate, perceived safety, and equity if toll rate varies between segments)
- Phone survey respondents prefer inflexible tolls to variable tolls. How can that be reconciled with ensuring free flow conditions on the managed lanes but also allowing them to be used productively during off-peak periods?

I. WARM-UP INTRODUCTIONS (15 MINS)

GROUND RULES

- Topic is I-5 expansion project
- Group will last 1.5 – 2.0 hours
- Being observed and recorded (will not be made public)
- Speak one at a time to facilitate reporting
- No wrong answers – want to hear all sides of each issue

INTRODUCTIONS

1. Where you get on/off I-5, timing and frequency of commute
2. Commute mode
3. How many miles/minutes
4. How this has changed over last two years, and if so, how much
5. Familiarity with I-15 Express Lanes?

GROUP AND PROJECT PURPOSE EXPLANATIONS (10 MINS)

Explain Purpose of Group

1. Explain that this is the second round of focus groups
2. Telephone surveys have been conducted with I-5 travelers
3. Intercept surveys conducted at park and ride lots and onboard the Coaster and express bus service between the Oceanside Transit Center and UTC Mall.
4. The purpose of this group is to go into more depth on the findings of the previous survey results.

Explain North Coast Managed Lane Project

GRAPHICS: EXISTING FREEWAY AND #1

Show graphic of overall facility and graphic of direct access ramps to the lane and access points from the freeway to the lanes explaining how each work

1. Considering adding approximately **26 miles** of new **MANAGED** lanes to I-5 between Oceanside and I-5/I-805 split

2. Users of these lanes would have to pay a toll

3. In order to control the express lanes so that they are 'free flowing' – meaning that as many vehicles as possible can be accommodated while still maintaining the benefit of "free flow" conditions for users of the lanes

4. Another goal of the express lanes is to help promote transit and ridesharing. Some believe that providing these users a reduced or free toll encourages people to carpool, which can result in fewer vehicles trying to use the same number of lanes than if everyone drove alone

5. Control of the Express lane can take the form of allowing certain kinds of vehicles to use the lane (having to be a carpool), charging tolls, managing entry and exit to the express lanes, or a combination.

6. At a <u>minimum</u> **2** new lanes in each direction

7. Carpoolers and transit will operate free or for a reduced toll.

8. One additional general purpose lane <u>may</u> also be included.

9. A typical rate that will be charged would be $.25 per mile and could go higher, to as much as $1.00 or more per mile for a segment that is experiencing congestion. This would mean that the cost of traveling the entire length of the express lanes from Oceanside to the I-5/I-805

split would typically be $6.50 but could go significantly higher under high congestion conditions.

10. Express lane users will have to be signed up in advance and have a transponder in their vehicle in order to use the lanes.

PROJECT FEEDBACK (90 MINS)

A. ACCESS *(25 MINS) GRAPHIC #2 & 3*

1. Access is currently planned every 3 to 4 miles over the 26-mile span between Oceanside and the I-5/I-805 split.

a. Do you think that access should be more restricted (more distance between access points) to reduce demand on the EXPRESS lanes?

b. Would reducing access influence your choice in using the lanes?

c. Would less frequent access be any safer (keep discussion in general – not which ones would be removed, i.e. not mine)?

2.Some **access points** would require weaving from the freeway entrance ramp to the express lane entrance (similar to current carpool lanes). **Direct median access ramps** will also be provided in the same vicinity. However median ramps would only be available every 5 miles or so, and connect to only one overcrossing street.

a. Which access would you most likely use if you traveled in the express lanes? Why?

b. If you had to travel an additional 2 miles to get to a direct median access ramp, do you think you would use the closer slip access or the more distant direct access ramp?

c. If one access in the same location were priced twice as high as another, would this influence which one you used? How high would the toll have to be on an access to keep you from using it?

B. Tolling (40 MINS) SAMPLE TRIP COSTS

1. Which would you prefer; tolls that **change** to maintain free flow on the express lanes, or **fixed** tolls that do not change?

a. Why do you prefer that option?

b. What don't you like about the other option?

2. What do you think about tolls that are **set by time** period but are **higher during peak** commuting periods and **lower** when there is **less traffic** (e.g. midday and between 8PM and 5AM)?

3. Our analysis indicates that tolls that are fixed (don't vary by time of day) will not be as effective as variable tolls (change in response to actual traffic conditions or time of day) in maintaining free flow conditions. The analysis indicates that if fixed tolls are used, the toll will have to be set at higher rate to guarantee free flow conditions in the express lanes.

    a. Do you still prefer fixed tolls over variable tolls? Why?

4. Current plans call for carpools paying a reduced toll to encourage carpooling.

    a. Do you think a reduced toll will encourage carpooling?

    b. Do you think carpools should pay no toll?

    c. If the toll to travel the full facility is typically about from $6.50, what toll do you think carpools should pay? (probe for either a fixed rate or "%" rate of whatever the full toll is…)

6. How high do you think the tolls will have to be to sufficiently reduce demand on the express lanes to maintain free flow conditions on the express lanes?

7. Congestion on I-5 varies from location to location and can also change quickly from one moment to the next on any specific part of the freeway.

    Even with variable tolls, it is possible that free flow conditions could not be guaranteed, because more people might be getting on further down the road.

    Skewed Rate: One way to do a better job of ensuring free flow conditions would be to have **different fees or tolls based on the level of congestion when entering the express lanes**. For example, a car entering the lanes in Oceanside might pay $.15 per mile based on traffic conditions when entering the lane, but a vehicle entering the lane in Carlsbad might pay $.25 per mile based on the level of congestion when they entered the lane.

    This is going to be implemented on the expansion of the I-15.

    a. What do you see as the advantages of this approach? What do you see as disadvantages?

b. Which do you prefer?

c. Do you still prefer knowing the total cost in advance, even though it means it is not possible to ensure free flow conditions? Why?

C. Communications (10 MINS)

Over time, there will be more and more people trying to commute on the I-5 resulting in continuing increases in congestion.

The addition of the new express lanes and perhaps one additional general purpose lane will help reduce congestion from what it would be if the lanes were not added, but will probably not eliminate congestion at all times of the day because demand is simply outpacing supply.

1. How would you explain the benefit of the roadway expansion program we have been talking about so that other people understand how it will help, but without making unrealistic promises about 'reducing congestion'?

2. How would you explain why tolling is being used to help control how the lanes operate?

D. Occupancy (10 MINS)

1. Over time, the number of people who travel on I-5 will continue to increase. In order to maintain free flow conditions in the managed lanes it may be necessary to increase the occupancy requirement for HOVs from 2 to 3.

   a. What do you see as the positives and negatives of this step to manage demand?

   b. Do you support it?

E. Wrap up (5 MINS)

OPTIONAL IF TIME PERMITS

F. Barriers

The barriers might be a double solid painted line, plastic "channelizers," or a physical, concrete barrier. One of the advantages of using painted lines is that in the case of an accident blocking the express lanes; it would be possible to exit from any point. However, since it would be physically possible to enter or exit the express lanes at any location there is concern that scofflaws would exit without paying the toll and/or drivers who don't have a transponder might enter the express lanes between toll collection readers.

1. What do you see as the biggest benefits of the painted line approach?

2. Of the physical barrier approach?

3. Any additional problems with the painted line approach?

4. With the physical barrier approach?

5. If the painted line approach is used, do you think people will cross the lines to avoid paying tolls, and/or to use the express lanes without a transponder?

6. Do you think that having many readers so that the toll at each reader is only $0.25 instead of having only 2-3 readers with tolls of roughly $0.90 to $1.30, would significantly reduce 'cheating' on a lined express lane system?

APPENDIX F

I-5 NORTH COAST MANAGED LANES

SECOND ROUND FOCUS GROUP GRAPHICS

APPENDIX C: GRAPHICS

I-5 Managed Lanes Value Pricing Planning Study
INTERSTATE
5
Shoulder
HOV
HOV
Shoulder
1
2
3
4
1
2
3
4
PROPOSED
Shoulder
EXISTING
5
50'
Shoulder
Typical Cross Sections
SANDAG
1

I-5 Managed Lanes Value Pricing Planning Study
Lane Separation Strategies
CARPOOLS ONLY
Buffer Separation
Barrier Separation
Pylon Separation
SANDAG
2

I-5 Managed Lanes Value Pricing Planning Study
HOV Lane
Access Points
Slip Access
Direct Access Ramp (DAR)
SANDAG
3