Forty-one park-and-ride lots are in operation in the Bay Area. A study is underway to examine the usage of existing lots and the need for future facilities. These facilities are served by a mix of rail and bus services.

The District 4 HOV program started in 1984 when 1/2¢ of the local sales tax of Measure A was approved by the voters. The HOV lane on Route 237 was also opened in 1984. The permissive shoulder HOV lane was allowed due to right-of-way constraints. Due to the left turn conflicts and to reduce confusion, the HOV lanes were located on the right hand side. Also, in addition to the regulatory signs mounted on the right shoulder, mast arms with real time changeable message signs were also installed. These signs give real time information to the motorists on the hours of operations for the permissive shoulders and the HOV lanes.

In 1986, the first few miles of the HOV lane on Route 101 was opened. Today, this facility is about 25 miles long in each direction. Utilization levels have increased dramatically with the completion of the last section of Route 101 HOV lanes. This indicates that HOV utilization will increase with the development of the HOV system. When all of the HOV lanes programmed in the District are completed, there will be more than 400 lanemiles of HOV lanes in the Bay Area.

## San Dicgo's HOV Operations and Plans Carl West, California Department of Transportation



I would like to discuss both the HOV planning activities currently underway in the San Diego area and describe the operating HOV facilities. HOV lanes in San Diego represent one approach being used to maintain the quality of life in the area. The HOV plan has been integrated into the growth management plan and is being monitored as part of the overall planning process.

The population of San Diego County is approximately

2.6 million. When added with Tijuana, Mexico, some five million people are expected to reside in the area within the next 20 years. The existing freeway system is approximately 300 miles. This will expand to 375 miles in the near future. About a third of the existing system experiences fairly severe levels of congestion. The geography of the area, which includes numerous canyons, results in many short trips using the freeway system. All four Interstate routes have ADTs of over 200,000. Congestion levels are expected to double, even with a planned 1.4 vehicle occupancy level during the peak hours.

A 140-mile HOV system plan is proposed for the San Diego region. In the development of the plan, both congestion levels and adequate median width were considered. Many of the older freeways in the central areas do not have enough space in the median for HOV lanes to be added. A measure of at least 1,000 vehicles per hour is used as the benchmark for consideration of an HOV lane.

The Regional Transportation Plan includes other policies addressing HOV facilities and supporting services. The policies call for special consideration for bus operations in the design of HOV facilities. The types of improvements include elements such as direct bus ramps, on-line stations, and other priority treatments. Also, any time adding to a four lane freeway or building a new freeway is being considered, HOV lanes must be examined. If HOV lanes cannot be justified at this time, sufficient right-of-way for future lanes should be acquired.

There is an extensive system of freeway entrance ramp meters in the county. HOV bypass lanes are being implemented at many of these ramps. The park-and-ride lot system is also being expanded and coordinated with the HOV facilities. Priorities have been established for different parts of the proposed HOV system.

The San Ysidro border crossing is the largest international border crossing in terms of vehicles and people in the world. Recently an HOV lane was opened at this facility. It is operated only during the week. The vehicle occupancy requirement is four or more persons (4+). There is also an HOV lane on the Coronado Toll Bridge. Carpools, which also do not pay a toll, represent 35 percent of the Bridge traffic. A bypass for buses leaving downtown San Diego is in operation in the Balboa Park area. This provides significant travel time savings for buses in the afternoon peak-period.

Located on I-15 is a two-lane, reversible, barrier separated HOV facility. It is eight miles in length. It is open for three hours in the morning—toward downtown San Diego—and for 3.5 hours in the afternoon in the outbound direction. It is closed during the rest of the day. There is no intermediate access, so the facility serves long trips in the corridor. It was constructed at a cost of \$32 million in 1988 and could be converted to LRT in the future if necessary. The facility is managed by an off-site traffic management center. The signs and barriers are operated electronically, although a manual drive through is used to ensure that all vehicles have cleared the lane.

The I-15 HOV lanes have also been used for research and development activities associated with advanced technology projects. Tests have included IVHS technologies such as collision avoidance and high speed paint striping. These tests are conducted during the midday and on weekends. The lanes have also been used to manage traffic in the case of a severe accident in the general-purpose lanes. The criteria employed to determine if the HOV lanes should be used for traffic management purposes during an incident is that at least two general-purpose lanes must be anticipated to be blocked for at least one hour.

At the I-15 HOV entrance locations, electronic changeable message signs are used to communicate with motorists. Pop-up pylons and a barrier arm are used to close off entrance to the lanes. All of the devices are operated from the traffic management center.

A before and after study was conducted during the first few years of operation. Carpool volumes increased by some 53 percent during the first two years of operation. Vehicle volumes increased during the peak hour from approximately 900 vehicles to 1,900 vehicles. The public reaction to the facility has been generally positive.

The potential of congestion pricing or HOV "buy in" is being considered for the I-15 HOV facility with the excess revenue being used to support transit services in the corridor.