Southbound I-680 Express Lane Performance Evaluation

An After Study

EXECUTIVE SUMMARY

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ALAMEDA
County Transportation Commission

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EXECUTIVE SUMMARY

The Southbound Interstate 680 (I-680) Express Lane Performance Evaluation or the "After" Study evaluated the effectiveness of the Express Lane using a set of performance measures compared to the goals of the Express Lane Demonstration Program (Program), under which this Express Lane is authorized. The "After" study results, from the data collected in the Fall of 2012, were compared to the conditions identified in a "Before" study conducted in 2008 before construction of the Express Lane.

The "After" study indicates that implementation of the Express Lane improved the performance of general purpose lanes and the Express Lane and overall corridor performance.

This executive summary describes the background for the study, includes highlights of data analysis and findings and conclusions for each performance measure in comparison with the results from the "Before" study, and summarizes how the Express Lane meets the objectives of the Program as identified in the "Before" study.

ES-1 STUDY BACKGROUND

The southbound I-680 Express Lane was the first High Occupancy Toll lane project implemented in northern California. It was opened to traffic in September, 2010. The evaluation of the Express Lane performance was prepared to fulfill the legislative mandate that requires an evaluation report within three years of opening. The Express Lane "study corridor" (see Figure ES-1) is southbound I-680 from the State Route 84 (SR 84) interchange in Alameda County to the State Route 237 (SR 237) interchange in Santa Clara County.

The "Before" study report was prepared in April 2009 based on data collected in the Fall of 2008 prior to construction of the southbound I-680 Express Lane. It establishes the baseline traffic conditions for comparison for the "After" study.

Transportation data were also collected on a control corridor, northbound I-680 between Alcosta Boulevard in San Ramon and Livorna Road in Alamo. The control corridor helps to determine if changes in Express Lane performance measures may be due to external factors that impact travel trends in the area as opposed to changes related to implementation of the Express Lane.

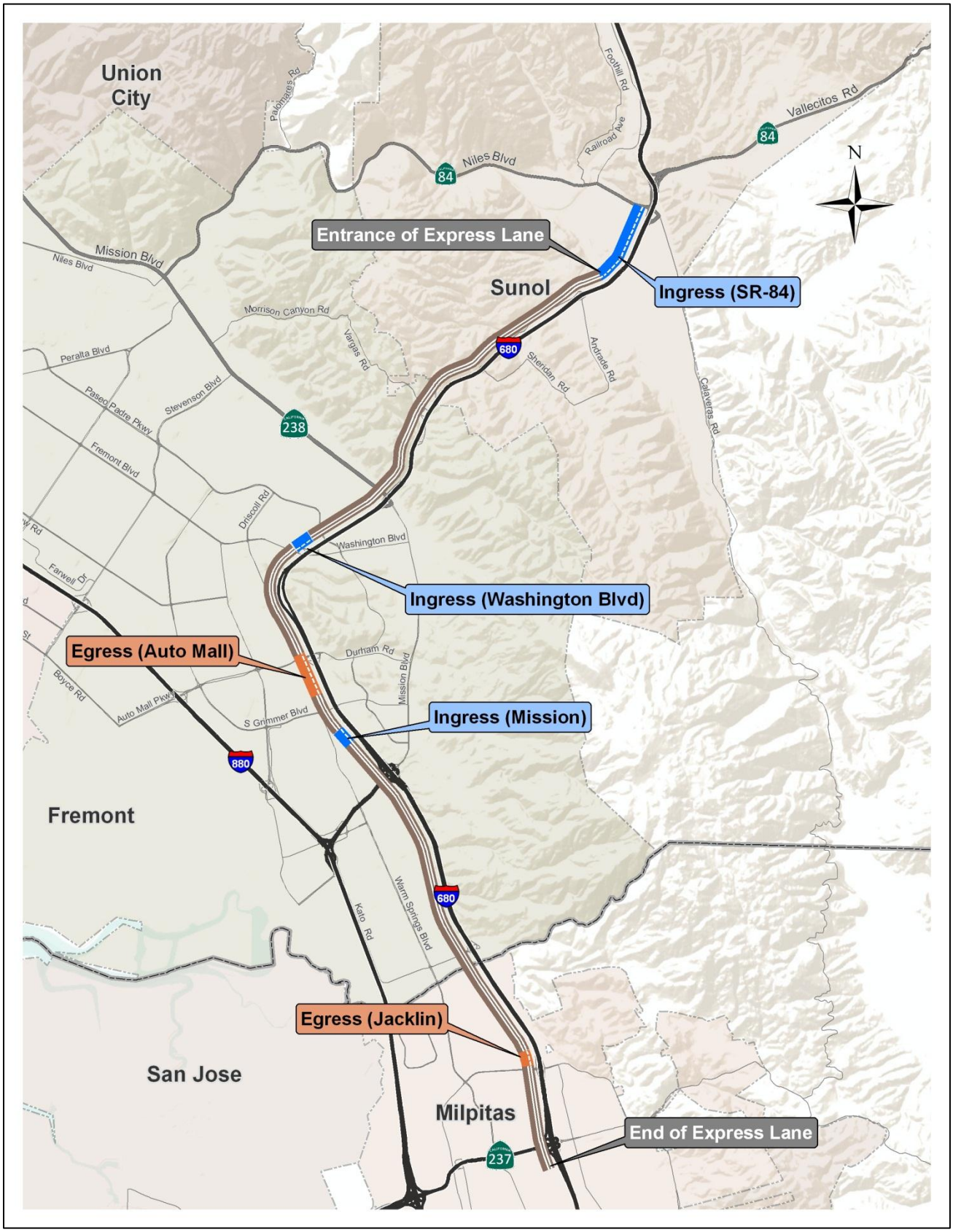
Input from the project partners and the local jurisdictions were received and used to inform the study development. Results from the study were shared with the project partners and comments received from Caltrans will be responded to and incorporated into the final report.

ES-2 DATA COLLECTION

The data collection for the "After" study was completed in October and early November, 2012, the same time of year as the data collection for the "Before" study in 2008. The data collection conducted for this study in 2012 included:

- Traffic counts;
- Travel time surveys using "floating car" runs;
- Manual counts of vehicle classification and occupancy at selected locations (four in the study corridor and two in the control corridor);
- Aerial photography; and
- Video recordings at selected locations.

Figure ES-1: Southbound I-680 Express Lane Study Corridor



Based on California Highway Patrol input regarding the safety of locating surveyors on the side of the road, three out of four study corridor survey locations and one out of two control corridor survey locations used for the "Before" study were relocated for the "After" study. As a result and in order to obtain comparable "Before" and "After" data, available data were also compiled from:

- Installed traffic and toll reader detectors;
- California collision records;
- California Highway Patrol citation history;
- Transit agency ridership statistics;
- Express Lane toll revenue records;
- Travel time data from the Caltrans Freeway Performance Monitoring System (PeMS) and the Metropolitan Transportation Commission (MTC) 511.org program; and
- American Community Survey data from the United States Census.

ES-3 PERFORMANCE MEASURES AND DATA ANALYSIS

The following performance measures were used to help evaluate the effectiveness of the Express Lane:

1. Travel Time
2. Travel Speeds
3. Vehicle and Person Throughput
4. Bottlenecks and Queues
5. Vehicle Occupancy
6. Level of Service
7. Transit Ridership
8. Safety
9. HOV/Express Lane Violations and Enforcement

All of these measures were used in the "Before" study to establish an existing conditions baseline on the study corridor prior to the implementation of the Express Lane. Analyses were performed for three distinct time periods, where applicable (primarily for Measures 1 through 7 above) for the study and control corridors. The three time periods were AM peak period (5 AM to 9 AM), PM peak period (3 PM to 7 PM) and daytime (7 AM to 7 PM). These time periods were selected based on the HOV operation hours in the study corridor during the "Before" conditions. The Control Corridor HOV operations during the "Before" conditions were between 6 AM and 9 AM in the morning and between 3 PM and 6 PM in the afternoon, and therefore these three-hour periods were used for the AM and PM peak periods respectively for the control corridor. For Throughput and Vehicle Occupancy, a two-hour AM peak period (7 AM to 9 AM) was analyzed due to visibility constraints in the earlier hours (5 AM to 7 AM). Since the AM peak period is the commute direction on the study corridor, focused analyses were performed for the AM peak period compared to the other two time periods analyzed. The performance measure results based on the data collection and analyses are summarized below.

Travel Times

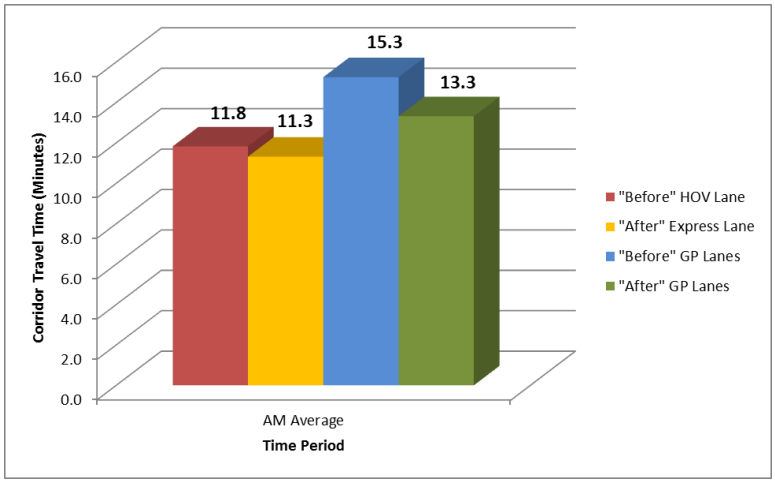
Travel times to travel from the beginning to the end of the corridor were evaluated. They were primarily measured by floating car travel time runs using Geographic Positioning System (GPS) equipment.

***Findings**:* As shown in Figure ES-2, on the Express Lane, the average travel times in the "After" study show slight improvement compared to average travel times measured on the HOV lane in the "Before" study. The average travel time improvement was 4 percent (0.5 minutes) in the AM peak period.

*Average **travel times** during the AM peak period in the "After" study reduced by less than 1 minute in the Express Lane and 2 minutes in the general purpose lanes compared to the "Before" study.*

The average travel times in the general purpose lanes were reduced by 13 percent (2 minutes) during the AM peak period. The highest reduction of 22 percent (4.4 minutes) was experienced during the 8:00 to 9:00 AM time period. The average travel times in the general purpose lanes during the PM peak period showed no significant change compared to 2008 conditions.

Figure ES-2: Southbound I-680 AM Peak Period Average Travel Times



The HOV lane in the "Before" study provided up to 7.5 minutes of travel time savings compared to the general purpose lanes in the AM peak period. The Express Lane provided less travel time savings compared to the general purpose lanes, a maximum of 4.2 minutes of travel time savings in the "After" study, because travel conditions had improved on the general purpose lanes.

Conclusions: After implementation of the Express Lane, travel times in the adjacent general purpose lanes were reduced by up to 22 percent during the AM peak period and were similar to the "Before" conditions for the PM peak period. The Express Lane provides modest improvements in travel times compared to the HOV lane in the "Before" study even after allowing toll-paying single occupant vehicles (SOV) to use the lane.

Travel Speeds

Travel speeds were evaluated for the overall corridor and for the individual segments of the corridor. They were based on the same floating car travel time runs as the travel time measurements.

***Travel speeds** during the AM peak period in the "After" study increased by up to 6 mph in the Express Lane and by up to 11 mph in the general purpose lanes compared to the "Before" study.*

***Findings**:* On the Express Lane, average travel speeds in the "After" study increased by 3 mph in the AM peak period and by 1 mph in the PM peak period compared to the "Before" study. The highest increase in average travel speed was 6 mph for the 8:00 to 9:00 AM peak hour, from 60 mph to 66 mph.

Average travel speeds in the general purpose lanes increased by an average of 6 mph during the AM peak period and 2 mph during the PM peak period. The highest increase occurred during the 8:00 to 9:00 AM time period, when the average travel speed increased by 11 mph, from 38 mph to 49 mph. The

speed differential between the Express Lane and the general purpose lanes continues to be the highest at the most congested segment between Washington Boulevard and Auto Mall Parkway/Durham Road.

Conclusions: Implementation of the Express Lane improved the travel speeds, particularly in the general purpose lanes, compared to the "Before" study. Travel speeds in the Express Lane are the same or faster than travel speeds in the prior HOV lane.

Vehicle and Person Throughput

Corridor throughput was measured in two different ways: vehicle throughput and person throughput. Vehicle throughput measures the number of vehicles counted at four survey locations along the corridor. Person throughput is the number of persons at the same four locations, accounting for vehicle occupancy.

*Overall **vehicle throughput** increased in the corridor in most locations. The 12-hour daytime period showed a maximum increase of 20% while the AM and PM peak periods showed increases of 11% and 38% respectively.*

Findings: Comparing "Before" and "After" conditions, vehicle throughput showed modest to notable increases ranging between 0.6 percent and 11 percent at all 4 survey locations in the AM peak period. For the PM peak period and the 12-hour daytime period, improvements were observed at the three northern locations ranging between 1.4 percent and 37.9 percent for the PM peak period and 3.2 percent and 19.8 percent for the daytime period. The one location showing reductions during both the PM peak and daytime periods is at SR 237/Calaveras Boulevard. It is important to note that the improved I-880/SR 262/Mission Interchange opened in 2009 after completion of the "Before" study. This improved interchange combined with the implementation of the Express Lane appeared to have mostly contributed to the decrease in volume in the southern section of the study corridor due to trips from the City of Fremont using southbound I-880 through the improved interchange to go to Santa Clara County rather than using southbound I-680. This diversion would also include trips that normally would have used I-880 to go Santa Clara County but used I-680 instead for the last few years because of the construction at the SR 262/Mission Boulevard interchange on I-880. This is also shown in the decrease in average daily traffic volumes of 9% on the southbound I-680 and corresponding increase of 11% on the southbound I-880 at the Alameda and Santa Clara County Line experienced between 2008 and 2011 while volumes on southbound I-880 at northern Fremont showed a decline of 2% for the same period.

Person throughput showed slight declines to modest increases (-1.0 percent to 2.4 percent) during the AM peak period, and increased by 19 percent to 38 percent at 2 locations during the PM peak and daytime periods. Similar to the vehicle throughput, person throughput showed notable decreases at the southern survey location, due to the same reasons.

Conclusions: Overall, the implementation of the Express Lane increased the corridor vehicle and person throughput. The recently improved I-880/SR 262-Mission interchange combined with the implementation of the Express Lane appeared to have contributed to reductions in throughput in the southern section of the corridor.

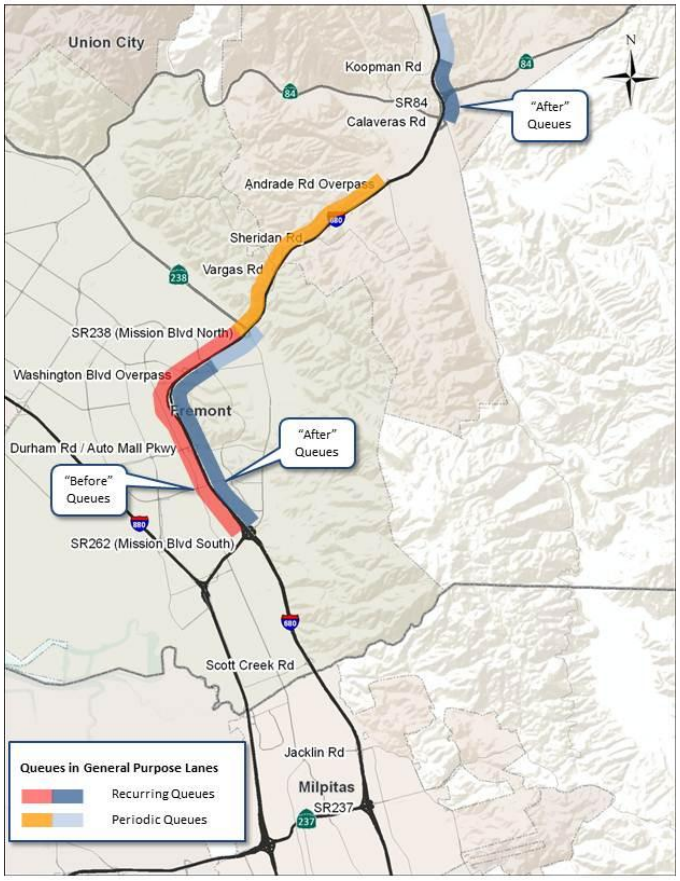
Bottlenecks and Queues

Bottlenecks and queues show the location and length of congestion on the corridor. They were identified based on floating car travel time surveys and verified using aerial photography.

Findings: Overall, in the general purpose lanes, the "Before" study identified AM peak period congested queues from Andrade Road all the way to SR 262/Mission (7.4 miles), while queues in the "After" study extended from Washington Boulevard to SR 262/Mission (2.9 miles). Figure ES-3 shows the length and location of the queues. Slow speeds and queuing were observed in the "After" conditions during the early part of the AM peak period on the segments just north of SR 84 (from Koopman Road) and just south of the SR 84 on-ramp merge, near the entry to the Express Lane. These locations did not have slow speeds and queuing during the "Before" study, and are appeared to be caused by weaving to enter the Express Lane. Later in the AM peak period, queues and slow speeds occurred approaching the Auto Mall Parkway/Durham Road interchange and in the right lane approaching the SR 262/Mission Boulevard interchange. These two congestion locations were consistent with observations during the 2008 "Before" study. Congestion at these locations appears to be caused by backups from the signalized intersections at or adjacent to the southbound off-ramps, rather than conditions on the freeway mainline.

***Queues** in the general purpose lanes north of SR 262/Mission Boulevard reduced from 7.4 miles in the "Before" conditions to 2.9 miles in the "After" conditions.*

Figure ES-3: Southbound I-680 AM Peak Period Queues in General Purpose Lanes



No queues were observed during the PM peak period in either the "Before" or "After" conditions

Conclusions: The "After" conditions showed slow speeds and queuing for a shorter distance (7.4 vs. 2.9 miles) north of SR 262/Mission compared to "Before" conditions. Implementation of the Express Lane introduced slow speeds north and south of the SR 84 on-ramp, near the entry to the Express Lane, due to weaving to enter the Express Lane, and did not eliminate existing queues from the southbound off-ramps at Auto Mall Parkway and SR 262/Mission Boulevard.

Vehicle Occupancy

Vehicle occupancy was analyzed based on the numbers of vehicles of each type (auto, bus, motorcycle, truck) and numbers of occupants manually counted at four survey locations along the study corridor and two locations on the control corridor.

Findings: The "Before" study reported 27 percent to 35 percent single-occupant vehicles (SOVs) in the I-680 HOV lane. These SOVs would either have been eligible clean-air vehicles or were in violation of the

HOV restrictions. The "After" conditions showed 54 percent to 61 percent SOVs in the HOV lane, including toll vehicles, eligible clean air vehicles and potential violations.

The average HOV percentages and volumes in all lanes decreased by 32 percent in the AM peak period and by 7 percent in the PM peak period. The decrease may be attributable to an overall declining trend in carpool use, changes in employment in the sub-region and improved operating conditions in the general purpose lanes.

The total number of HOVs on the study corridor (Express Lane and general purpose lanes) decreased by an average of 32 percent in the AM peak period, 7 percent in the PM peak period and 11 percent for the 12-hour daytime period in the "After" study compared to the "Before" study conditions. This pattern is also seen in the control corridor, where the average HOV percentage decreased by 24 percent for the AM peak period and 20 percent for the PM peak period between the "Before" and "After" studies with no changes in HOV lane operations.

The overall decline in carpool usage is corroborated using the American Community Survey data which shows that the percentage of commuters using carpools declined 4 percent between 2000 and 2012 in Alameda County. These same data show that, between 2008 and 2011, carpool work trips declined in Alameda County by 0.3 percent and in Contra Costa County by approximately 2 percent. Further, the change in employment due to the economic downturn, approximately 80,000 jobs in Santa Clara County and 60,000 jobs in Alameda County, since 2008 may have contributed to some shift in modal preferences in work trips.

Conclusions: The "After" study showed a decrease in HOV usage in the study corridor and the control corridor. The decreases in HOV usage could be due to a combination of factors such as a general decline in carpooling, overall changes in employment in the sub-region, and improvements in speed and travel time in the general purpose lanes for the study corridor.

Level of Service and Related Measures

The level of service (LOS) of each segment was evaluated using freeway analysis procedures from the 2000 *Highway Capacity Manual*, similar to the "Before" conditions. The LOS analysis was based on freeway mainline and ramp traffic counts and used the FREQ analysis software. This analysis also estimated corridor-wide performance measures such as vehicle miles traveled (VMT) and vehicle hours of travel and delay (VHT and VHD). VMT is a measure of the total density of traffic while VHT and VHD indicate the overall delay due to congestion.

*The **level of service** on the Express Lane stayed at LOS A or B, above the required service level of LOS C.*

Findings: In the Express Lane, AM peak period LOS was similar in the "Before" and "After" studies, varying between LOS A and LOS B, and improved from LOS B to LOS A in the PM peak period. In the general purpose lanes, LOS improved from LOS F to D in a number of segments in the middle of the corridor, between Sheridan Road and Auto Mall Parkway/Durham Road, while new LOS F segments appeared in the north end of the corridor near the entry to the Express Lane and at the southern section approaching SR 262/Mission Boulevard. Within the

***Vehicle Miles of Travel** increased by 24% and **Vehicle Hours of Delay** reduced by 16% for the AM peak period compared to the "Before" conditions.*

study corridor limits, VMT increased by 24 percent and VHD reduced by 16 percent for the AM peak period compared to the "Before" conditions.

Conclusions: Conditions after the implementation of the Express Lane showed that LOS in the Express Lane either improved or stayed the same. The general purpose lanes showed improved LOS in the mid portion of the corridor, and LOS F conditions at the north end of the corridor and approaching SR 262/Mission Boulevard. The analyses show significant increases in VMT and reductions in delay mostly due to the improved corridor travel conditions.

Transit Ridership

Transit ridership in the corridor was identified based on data from transit operators on average ridership for each bus line that uses the I-680 corridor.

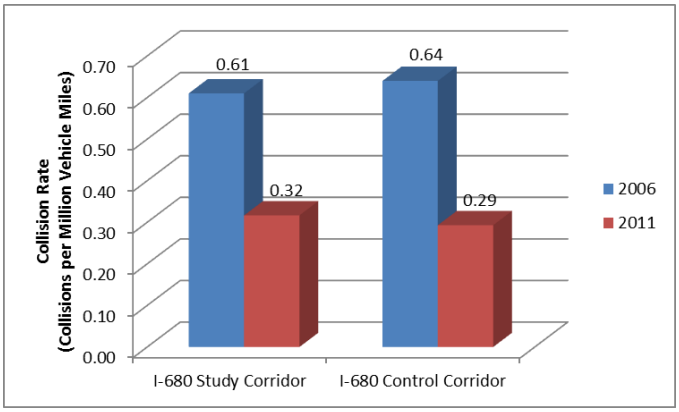
Findings: The average weekday transit ridership decreased in the study corridor by 6 percent and in the control corridor by 5 percent. Transit services were reduced in both the study and control corridors compared to the "Before" conditions. In the study corridor, out of a total of 10 lines that operated during the "Before" conditions, 5 lines were not operating and one new line was added in the "After" study. In the control corridor, out of a total of 9 lines operating during the "Before" study, 4 lines were eliminated in the "After" study. The ridership decreases experienced in both corridors were related to service reductions by the transit operators. It is likely that the service reduction is part of larger level trends and not related to Express Lane operations.

Conclusions: The amount of transit service operating in the study corridor was significantly reduced between 2008 and 2012, and therefore decreases in transit ridership were not related to implementation of the Express Lane.

Safety

Safety is measured by the number of collisions on the corridor and the collision rate, which is calculated by dividing the number of collisions by the amount of total travel measured as annual million vehicle miles of travel.

Figure ES-4: Average Collision Rates



Findings: Between 2006 and 2011, the collision rates on the I-680 study and control corridors both dropped by 50 percent. Reasons for such significant changes could not be obtained from the CHP at the time of report development.

Conclusions: Since the control corridor also experienced a decrease in collision rate, it cannot be inferred that the decrease in collision rate on the study corridor can be directly attributed to the Express Lane. However, it may be concluded that the Express Lane did not cause an increase in accident rates on the study corridor.

Violations and Enforcement

Violations on the Express Lane were measured based on the estimation of single-occupant vehicles not paying tolls, observation of illegal crossings of the solid double white line separating the Express Lane from the general purpose lanes, and calculation of vehicles illegally using an ingress as egress and vice versa. Based on observations and stakeholder comments, the Washington Boulevard ingress to the Express Lane was analyzed for its use as an illegal egress from the Express Lane. Enforcement is measured by the number of citations issued by the California Highway Patrol.

Findings: The percentages of single-occupant vehicles that were not recorded as paying a toll were approximately 25 percent of single-occupant vehicles or 13 percent of all vehicles in the Express Lane. A portion of these vehicles could be qualified clean air vehicles or vehicles with legal transponders that were not working properly. The approximate volume of eligible clean air vehicles is estimated as 2.4 percent of all vehicles in the Express Lane, based on prior surveys and clean air vehicle registration totals. Therefore, the estimated toll violation rate on the Express Lane is estimated to be approximately 20% of single-occupant vehicles or 11% of all vehicles in the Express Lane.

*The estimated toll **violation rate** (single-occupant vehicles not paying a toll) observed on the Express Lane was 20% of single-occupant vehicles or 11% of all vehicles in the Express Lane.*

Video recording surveys from 8 locations along the study corridor indicated a very low (less than 1 percent of all Express Lane vehicles in each location) violation rate for illegal crossings of the double white line between the Express Lane and general purpose lanes. These surveys represent observations in just the 8 specific locations in the corridor, and additional illegal crossings may occur in other portions of the corridor. However, the percentage of drivers performing illegal movements in each portion of the corridor is expected to be similar to the observed driver behavior.

A minimum violation rate of 6 percent was estimated for vehicles using the Washington Boulevard Express Lane ingress as an egress. This is likely due to the vehicles that needed to use the Auto Mall Parkway off ramp for which there is no legal egress available from the Express Lane, and therefore using the Washington Boulevard ingress as egress.

The number of California Highway Patrol citations for HOV lane violations in the study corridor increased during the first full year of Express Lane operation from 205 citations in 2009, and 400 citations in 2010 to 478 in 2011, but then decreased significantly in 2012 to 223 citations.

Conclusions: The maximum toll violation rates on the Express Lane are approximately 20 percent of single occupant vehicles or 11 percent of total vehicles in the Express Lane, and are higher than the 3 to 5 percent auto occupancy violation rates reported by Caltrans on the HOV lane in prior years. The number of CHP citations increased initially and reduced later, indicating that increased enforcement for the Express Lane likely is resulting in reduced citations. License plate readers and self-identification of carpools (using switchable toll tags or web-based applications) are being explored for use in the Bay Area region to improve enforcement and potentially reduce violations.

ES-4 OTHER FACTORS AFFECTING STUDY CORRIDOR

Other factors potentially affecting the study corridor "After" study results include economic conditions, gasoline prices and the implementation of ramp metering, completion of nearby major roadway improvements, and general travel trends in the area.

Economic Conditions

Findings: The California unemployment rate was 8 percent at the time of the "Before" studies in Fall 2008, and rose to 12 percent between 2009 and 2012. During the time of the "After" study in Fall 2012, it was at 10 percent. During this period, Alameda and Santa Clara counties lost about 60,000 and 80,000 jobs respectively while recovering to 2008 employment levels by 2011.

Conclusions: While the unemployment rate or employment levels are comparable between 2008 and 2012, the significant drop in employment that occurred in the years in between due to the economic downturn may have created some changes in the types of employment and number of workers by employment type, and therefore resulted in shifts in modal preferences.

Gasoline Prices

Findings: Gasoline prices during the Fall 2012 "After" study were very similar to gasoline prices during the Fall 2008 "Before" studies.

Conclusions: Travel demand characteristics should not have been affected by gasoline price differences between the "Before" and "After" conditions.

Ramp Metering

Ramp metering was implemented along the southbound I-680 corridor on July 25, 2011. The Metropolitan Transportation Commission (MTC) prepared a I-680 Southbound Ramp Metering "Before and After" Study***.***

Findings: Average southbound traffic volumes increased by 2 percent between the "Before" and "After" ramp metering conditions, with most of the increase occurring in the Express Lane (18 percent increase in traffic volume). Two "After" ramp metering studies prepared by MTC showed that while ramp metering initially reduced travel times, by up to 8 percent during the AM peak period, at a later time in May 2012 average travel times had increased by 2.5 minutes. The ramp metering "After" studies concluded that increased travel times were likely contributed by a combination of increased traffic volumes and travelers adjusting their travel patterns in response to ramp metering and ramp metering adjustments to the north at Bernal Avenue.

Conclusions: The implementation of ramp metering in the study corridor slightly increased traffic volumes and travel times in the Express Lane. Even with these increases, a comparison of the Express Lane "Before" and "After" studies travel times showed overall modest to notable improvements in both the general purpose lanes and Express Lane as discussed earlier.

Major Roadway Improvements

The I-880/SR 262-Mission interchange improvements in Fremont were completed in Spring 2009 after the "Before" study was completed.

Findings: The interchange improvements provided an improved connection between I-680 and I-880 for trips going to Santa Clara County, providing an alternative to using I-680. Volumes at the three

major on-ramps from the City of Fremont to southbound I-680 showed decreased volumes of about 800 vehicles in the 2-hour AM peak period compared to "Before" conditions.

Conclusions: The reduction in throughput volumes experienced at the southern end of the I-680 study corridor is appeared to be mostly contributed by a combination of trips using I-880 through the improved I-880/Mission interchange to travel to Santa Clara County and implementation of the Express Lane.

Other Related Trends

The American Community Survey from the United States Census showed that the percentage of commute trips using carpooling declined in Alameda County between 2000 and 2012 by 4 percent from 14 to 10 percent.

Findings: Between 2008 and 2011, carpooling work trips alone decreased in Alameda County by 0.3 percent and in Contra Costa County by approximately 2.0 percent. Alameda and Contra Costa Counties along with San Joaquin County make up the majority of the trips on the southbound I-680 study corridor during the morning commute.

Conclusions: Decreases in vehicle occupancy in the study and control corridors are affected by the overall larger declining trend in carpool trips.

ES-5 EXPRESS LANE REVENUES

Toll revenues collected on the I-680 Southbound Express Lane have been fully utilized to pay for operations and maintenance of the Express Lane facility. In the current facility ramp-up period, the revenues do not exceed operating costs. The operating cost has been subsidized by the unspent grant funds available in the Project. When the Express Lane becomes financially sustainable (i.e., the toll revenues exceed the operations and maintenance costs), the Sunol Smart Carpool Lane JPA Board will determine how to reinvest these funds into the project corridor.

ES-6 CONCLUSIONS

Both "Before" and "After" studies identified key objectives related to performance of the Express Lane in meeting the legislative mandate. Based on the results summarized above for various performance measures, the following summary describes how the objectives are met:

- ***Objective:*** Optimize the HOV lane usage to improve traffic throughput in the corridor

  Results: Overall vehicle and person throughput in the corridor increased, average travel times decreased by 2 minutes (13 percent) in the general purpose lanes and I minute (4%) in the Express Lane, and average speeds increased by 6 mph in the general purpose lanes and 3 mph in the Express Lane.

- ***Objective:*** Maintain LOS C or better for all Express Lane users

  Results: Express Lane LOS levels did not go below LOS B

- ***Objective:*** Use net revenue to improve highway and transit in the corridor

  Results: Currently all toll revenues are being used towards the Express Lane operations. When net revenue becomes available over and above covering the Express Lane operations, it will be used to improve highway and transit in the corridor

- ***Objective:*** Employ new intelligent transportation system (ITS) technologies

  Results: Dynamic pricing is currently being deployed to optimize the throughput. Working with the regional partners, technology options for other purposes are being explored including switchable toll tags and automated license plate reading for enforcement purposes.

ES-7 RECOMMENDATIONS

Analysis of performance measures for the "Before" and "After" Studies shows that some improvements can be implemented to further improve the corridor performance in both the Express Lane and general purpose lanes. These improvements will aim to improve occupancy (carpool use), transit ridership, level of service and related bottlenecks, and toll violations. Recommendations regarding these potential improvements are presented below:

- Increased HOV usage and transit ridership for trips within Alameda County could be achieved through focused implementation of a Transportation Demand Management program that includes tools to promote use of alternate modes. The implementation of the Travel Demand Management program will be done in coordination with the large employers in Alameda, Santa Clara and Contra Costa Counties and with MTC's Regional Ride Share program.
- Toll violation rates could be reduced through implementation of new technologies such as automated license plate reading combined with the switchable toll tag capabilities that are currently being explored.
- To improve the new bottleneck at SR 84 and the two existing bottlenecks at the southern portion of the Express Lane at the Auto Mall Parkway/Durham Road and SR 262/Mission Boulevard interchanges, and to address the access issues experienced at the Washington Boulevard and Auto Mall Parkway/Durham Road interchanges, further studies could be performed to identify potential improvement options.
- Alameda CTC will work with the Legislature regarding the need for increased California Highway Patrol enforcement and related resources along the Express Lane to reduce the toll and access violations.

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