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*Making Conservation  
a California Way of Life.*

April 27, 2018

Ms. Diane Boyer-Vine  
Legislative Counsel  
State Capitol, Room 3021  
Sacramento, CA 95814

Mr. Daniel Alvarez  
Secretary of the Senate  
State Capitol, Room 3044  
Sacramento, CA 95814

Mr. E. Dotson Wilson  
Chief Clerk of the Assembly  
State Capitol, Room 3196  
Sacramento, CA 95814

Dear Ms. Boyer-Vine and Messrs. Alvarez and Wilson:

I am pleased to submit the California Department of Transportation's "High-Occupancy Vehicle Lane Degradation in California" as required by Vehicle Code Section 21655.9(f).

Distribution to the California State Legislature has been made pursuant to Government Code Section 9795. This report can also be found at <<http://www.dot.ca.gov/reports-legislature.htm>>.

Sincerely,

A handwritten signature in blue ink that reads "Laurie Berman".

LAURIE BERMAN  
Director

Enclosure

# High-Occupancy Vehicle Lane Degradation in California



Report to the Legislature

April 2018

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## Executive Summary

The California Department of Transportation (Caltrans) is pleased to submit this report to the Legislature on the degradation status of high-occupancy vehicle (HOV) lanes on the State Highway System, as required by Vehicle Code section 21655.9(f).

An HOV lane is a type of managed lane designated for exclusive use by vehicles with two or more occupants for all or part of a day. HOV lanes are a traffic management tool intended to promote and encourage ridesharing to reduce congestion and maximize the people-carrying capacity of California highways.

United States Code Title 23 section 166 authorizes public authorities to allow certain clean air vehicles and toll-paying vehicles to use HOV lanes without meeting occupancy requirements. When these vehicles are allowed to access HOV lanes, the operating agency must monitor and report on the performance of the lanes. An HOV lane is considered degraded if the average traffic speed during the morning or evening weekday peak commute hour is less than 45 miles per hour for more than 10 percent of the time over a consecutive 180-day period. Caltrans data shows 65 and 68 percent of HOV lanes were degraded in the first and second half of 2016, respectively.

When an HOV lane is degraded, the State must limit the use, or discontinue the use of degraded HOV lanes by exempted vehicles, or take other actions that will bring the operational performance into compliance with the federal standard. Caltrans plans to bring the facilities into compliance by implementing additional mitigation strategies.

Contributing factors to HOV lane degradation include HOV traffic demand exceeding capacity and gaps in the regional HOV lane networks. Between 2014 and 2016, the number of HOV lanes increased 10 percent from 1,606 lane miles to 1,765 lane miles. Statewide degradation also increased and this suggests that construction of HOV lane facilities has not kept pace with the traffic demand for HOV lanes. The connection between clean air vehicles and HOV lane degradation has yet to be established. If they are shown to impact HOV lane degradation, Caltrans would have to consider options which could include expansion of facilities, raising occupancy from two to three, or potentially restricting CAVs from those HOV lanes where the degradation impacts are the highest. The number of clean air vehicles eligible to use HOV lanes could vary substantially between years due to the implementation of decals with staggered expiration dates in 2017, with many decals expiring on January 1, 2019.

Caltrans will continue to monitor the effectiveness of its strategies to mitigate HOV lane degradation and will collaborate with stakeholders, including regional transportation agencies, the Legislature, and the Governor's Office to evaluate and implement other actions to improve HOV lane performance.

## **Background**

### **Statutory Reference and Purpose**

Section 21655.9(f) of the Vehicle Code requires the Department of Transportation (Caltrans) to prepare and submit a report on the degradation status of high-occupancy vehicle (HOV) lanes on the State Highway System to the Legislature on or before December 1, 2017.

Appendix A contains the text of Senate Bill 838 (Chapter 339, Statutes of 2016), which added section 21655.9(f) to the Vehicle Code.

This report discusses the status of HOV lane degradation in California, the possible causes of the degradation, and remediation strategies to bring degraded HOV lane facilities into compliance with federal law.

### **Program Background**

An HOV lane is a type of managed lane designated for exclusive use by vehicles with two or more occupants for all or part of a day. Managed lanes use operational strategies such as access control, vehicle eligibility, and tolling, or a combination thereof, to optimize the performance of the State Highway System. They are intended to promote and encourage ridesharing to reduce congestion, reduce greenhouse gas emissions, and maximize the people-carrying capacity of California highways. These strategies are determined based on factors such as safety, regional and interregional consistency, impacts on freeway performance, enforcement needs, environmental considerations, and community support.

United States Code Title 23 section 166 authorizes states to allow clean air vehicles and toll-paying vehicles to access HOV lanes without meeting occupancy requirements. Clean air vehicles are alternative fuel vehicles that meet specific exhaust emissions standards. States that allow clean-air vehicles and toll-paying vehicles to use HOV lanes are required to monitor and report on the performance of those lanes to the Federal Highway Administration. By federal definition, an HOV lane is considered degraded if the average traffic speed during the morning or evening weekday peak commute hour is less than 45 miles per hour (mph) for more than 10 percent of the time over a consecutive 180-day period.

Caltrans uses the Performance Measurement System to monitor and analyze the operational performance of HOV lanes. This system serves as a central repository for collecting and storing traffic data, including speeds and volumes, from sources such as vehicle detectors and traffic census stations. Each HOV corridor is broken into segments of a maximum of five miles in length for data collection and analysis. Based on the federal standard, data is collected from January through June and from July through December. Only weekday data for each segment is analyzed, including data from holidays that fell on weekdays. For any given weekday, if either the morning or evening weekday peak hour average speed for a segment is below 45 mph, the segment is considered degraded for that weekday. When the percentage of degraded weekdays out of the total monitored weekdays exceeds 10 percent during the data collection period, the segment is identified as degraded.

States are required under federal law to bring the degraded lanes into compliance. This can be achieved through the following actions:

1. Increasing the occupancy requirement of the HOV lanes.
2. Varying the toll charged on high-occupancy toll lanes to reduce demand from toll-paying vehicles.
3. Discontinuing allowing non-HOV vehicles to use HOV lanes.
4. Increasing the available capacity of the HOV facility.

The Department of Motor Vehicles issues decals to identify clean air vehicles that can use HOV lanes, as prescribed in Vehicle Code sections 21655.9 and 5205.5. Vehicles powered 100 percent by battery or by compressed natural gas have white decals and vehicles that are typically plug in hybrid vehicles have green decals. There is no statutory limit on the number of white decals that can be issued. Initially, State law permitted only 85,000 green decals to be issued; Senate Bill 838 (Jackson, Chapter 339, Statutes of 2016) removed that statutory limit. As of March 3, 2018, 142,354 green decals and 174,249 white decals had been issued. Starting in spring 2018, all qualifying vehicles will receive red decals. DMV made the switch to a single decal color because the distinction between vehicle types is no longer necessary. Assembly Bill 544 (Bloom, Chapter 630, Statutes of 2017) made several changes to the decal program, which continue the program but limit the number of years that vehicles with decals can access HOV lanes.

1. Green and white decals issued in 2016 and earlier will expire on January 1, 2019.
2. Decals issued between January 1, 2017 and January 1, 2019 (whether they be green, white, or red) can be replaced with decals which expire on January 1, 2022. New decals issued during this period also will expire January 1, 2022.
3. Decals issued in 2019 and later will have staggered expiration dates on January 1 of the fourth year after the year of issuance.



## Program Status

In 2016, there were 1,765 lane-miles of HOV lanes in operation on state highways. Of those, 1,322 lane-miles (approximately 75 percent) were monitored for degradation. The remaining 25 percent were not monitored due to issues with obtaining detection data, or because they are express lanes which are exempt from degradation monitoring. Caltrans' Division of Traffic Operations is working with other divisions to ensure that detection data issues will be resolved. The Division is also in the process of collecting data on the utilization of HOV lanes, including exempt vehicles and ineligible vehicles, with expected completion by spring of 2018.

Of the monitored HOV lanes, 65 percent were degraded in the first half of 2016, and 68 percent were degraded in the second half of 2016. Furthermore, the number of degraded HOV lane-miles increased every year for the past three years.

**Table 1 – 2016 Statewide HOV Lane Degradation Summary**

Status	January to June 2016	July to December 2016
Degraded	864 lane-miles (65%)	902 lane-miles (68%)
Not Degraded	467 lane-miles (35%)	420 lane-miles (32%)
Total Lane-Miles	1,331 lane-miles (100%)	1,322 lane-miles (100%)

Note: An additional 9 lane-miles of detection data was not available in the second half of the year

From 2014 to 2016, HOV lane degradation increased from 59 percent to 65 percent during the January to June data collection period. HOV degradation increased from 63 percent to 68 percent during July to December data collection period.

**Table 2 – 2014-2016 Statewide HOV Lane Degradation**

Year	January to June	July to December
2014	784 lane-miles (59%)	844 lane-miles (63%)
2015	817 lane-miles (62%)	874 lane-miles (67%)
2016	864 lane-miles (65%)	902 lane-miles (68%)

Contributing factors to HOV lane degradation include:

- HOV lane traffic demand exceeding capacity.
- Gaps in the regional HOV lane networks.
- Large numbers of motorists merging into the lane at the end of an HOV lane facility, resulting in congestion in the HOV lane.
- Lane change conflicts from motorists who enter or exit the HOV lanes.
- Traffic incidents such as collisions and disabled vehicles.
- Motorists who do not qualify to use HOV lanes but use them anyway.

Following are some potential short and long-term strategies to remediate degradation that Caltrans is proposing:

- More focused enforcement of HOV lane rules by the California Highway Patrol.
- Convert HOV lanes to high-occupancy toll lanes and use congestion pricing to regulate demand on the lanes.
- Identify those peak periods when severe weather or traffic incidents affect HOV lane performance and exclude them from the degradation analysis.
- Increase occupancy requirements on HOV lanes. Comprehensive operational analyses would need to be conducted beforehand to determine the full effects of this change on freeway performance. HOV occupancy increases could be combined with conversion to a high-occupancy toll lane as a way to mitigate the effects.
- Construct additional HOV lanes. Caltrans continues to expand California’s HOV lane network to help reduce congestion, alleviate degradation, and improve air quality on the State Highway System. Between 2014 and 2016, the number of HOV lanes increased 10 percent from 1,606 lane-miles to 1,765 lane-miles.
- Limiting or discontinuing the use of HOV lanes by the exempted vehicles such as clean air vehicles at select locations where the degradation impacts are the highest.
- Update striping and pavement markings on HOV lanes to clearly emphasize the restrictions. As part of this effort, Caltrans will also evaluate a standard form of HOV lane access. Currently HOV lanes are striped to allow for continuous access at any point, or to only allow access at certain locations. The type of access used can have an impact on violations and operational performance.

**Table 3 – Number of HOV Lane-Miles in California**

<b>Year</b>	<b>HOV Lanes (lane-miles) excluding High-Occupancy Toll Lanes</b>	<b>High-Occupancy Toll Lanes (lane-miles)</b>	<b>Total HOV Lanes (lane-miles)</b>
2014	1,385	221	1,606
2015	1,436	224	1,660
2016	1,515	250	1,765

The changes to the clean air vehicle decal program that were made by Assembly Bill 544 may impact HOV lanes in the upcoming years. The number of decaled clean air vehicles will continue to increase through January 1, 2019, when decals issued in 2016 and earlier expire. More than 200,000 decaled clean air vehicles will be ineligible to use HOV lanes after January 1, 2019. For the remainder of 2019 through January 1, 2022, clean air vehicles would likely increase due to new decals issued and the continued eligibility of vehicles with decals issued since January 1, 2017. After January 1, 2022, the number of eligible clean air vehicles may fluctuate annually due to staggered decal expiration dates based on the year of issue.

## Conclusion

More than half of the HOV lanes on the State Highway System are degraded and the amount of degraded lanes increases each year. There are multiple potential causes for degradation, including high demand and operational issues. Caltrans continues to identify and address the causes of degradation on various HOV facilities. Strategies for reducing degradation include constructing new HOV lanes to complete the HOV network, converting HOV lanes to high-occupancy toll lanes, and possibly increasing vehicle occupancy requirements.

The number of clean air vehicles eligible to use HOV lanes could vary substantially between years beginning in 2018 due to the implementation of decals with staggered expiration dates. The role that clean air vehicles have on degradation will be better known once there is updated data on how many of these vehicles are using HOV lanes. This data is currently being collected.

It should be noted that clean air vehicle access to HOV lanes is a strategy that complies with the Governor's Executive Order B-16-2012, which supports the rapid commercialization of clean air vehicles. The executive order cites multiple benefits including reducing greenhouse gas emissions and conventional pollutants.

Caltrans will continue to monitor the effectiveness of its strategies to mitigate HOV lane degradation and will collaborate with stakeholders, including regional transportation agencies, the Legislature, and the Governor's Office to evaluate and implement other actions to improve HOV lane performance.

## References

- A. 2014 California High-Occupancy Vehicle Lane Degradation Determination Report, Caltrans, September 1, 2015  
<http://www.dot.ca.gov/trafficops/tm/docs/2014-HOV-degradation-report.pdf>
- B. 2015 California High-Occupancy Vehicle Lane Degradation Determination Report, Caltrans, December 1, 2016  
<http://www.dot.ca.gov/trafficops/tm/docs/2015-HOV-degradation-report.pdf>
- C. 2016 California High-Occupancy Vehicle Lane Degradation Determination Report, Caltrans, October 2017  
<http://www.dot.ca.gov/trafficops/tm/docs/2016-HOV-degradation-report.pdf>
- D. Assembly Bill 544 (Bloom, Chapter 630, Statutes of 2017)  
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- E. California Vehicle Code section 21655.9  
[https://leginfo.legislature.ca.gov/faces/codes\\_displaySection.xhtml?lawCode=VEH&sectionNum=21655.9](https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=VEH&sectionNum=21655.9).
- F. California Vehicle Code section 5205.5  
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- G. Governor's Executive Order B-16-2012  
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<https://www.gov.ca.gov/news.php?id=17472>
- H. Senate Bill 838 (Jackson, Chapter 339, Statutes of 2016)  
[https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill\\_id=201520160SB838](https://leginfo.legislature.ca.gov/faces/billCompareClient.xhtml?bill_id=201520160SB838)
- I. U.S. Code Title 23 section 166  
<https://www.gpo.gov/fdsys/pkg/USCODE-2010-title23/html/USCODE-2010-title23-chap1-sec166.htm>

## **Appendix A. Statutory Reporting Reference**

Senate Bill 838 (Chapter 339, Statutes of 2016) amended section 21655.9(f) of the Vehicle Code to read:

(f) (1) The Department of Transportation shall prepare and submit a report to the Legislature on or before December 1, 2017, on the degradation status of high-occupancy vehicle lanes on the state highway system.

(2) The requirement that a report be submitted pursuant to paragraph (1) shall be inoperative on December 1, 2021, pursuant to Section 10231.5 of the Government Code.

(3) A report submitted pursuant to paragraph (1) shall be submitted in compliance with Section 9795 of the Government Code.