



Director's Message

It's been a little more than a year since Senate Bill 1 (SB 1), the landmark transportation funding law, allowed Caltrans and other agencies to begin working on a long pipeline of projects to turn around a road network in crisis.

Although a year is a very short time in which to judge the effectiveness of a program — after all, many Caltrans highway projects take multiple years to complete — I think that we are indeed delivering on SB 1's "Rebuilding California" promise to travelers and taxpayers.

We have been hard at work since the Road Repair and Accountability Act of 2017 was passed — starting *and finishing* numerous projects that were originally planned for years down the line.

As another construction season nears, Caltrans has completed more than 50 highway projects, awarded or begun construction on about 100, and has started work on nearly 400 more being wholly or partially funded by SB 1 dollars.

That's just for work connected to the State Highway System. We're seeing the same level of commitment from local governments and transportation agencies that receive about half the total revenues generated by SB 1, as they upgrade their road and transit systems.

The flurry of activity has been only a start. The California Transportation Commission and our partner agencies have recently added more than 100 projects to the SB 1 master construction list. (See stories on pages 30-31 and 32-33.)

Not only has Caltrans embarked on an ambitious repair and rehabilitation schedule, we're also becoming more efficient — and saving millions. SB 1 requires that we find ways to slash operational costs by at least \$100 million a year, and reinvest that money back into highway repair and rehabilitation.

I'm proud to report that Caltrans didn't just meet that target in SB 1's first year, but exceeded it by an impressive amount. According to our Annual Efficiency Report, recently presented to the CTC, we achieved \$133 million in savings through a variety of methods. (See story on page 31.)

It also should be remembered that we are just beginning to tap SB 1 revenues to make our streets, highways, bikeways, sidewalks and public transportation safer, more reliable, and sustainable.

That means SB 1 will be a major economic boost to the state of California for the foreseeable future. The transportation improvements and repairs undertaken by Caltrans and other agencies are creating jobs and investing in our communities' well-being. Every \$1 billion spent on infrastructure projects creates more than 13,000 jobs, according to the federal government. With SB 1 projected to raise \$54 billion for transportation purposes over the next decade, that translates to a lot of Californians working in high-paying jobs over the next decade.

It's easy to track SB 1-financed projects through the Rebuilding California website, with an interactive map showing the type of work, status and region. You can stay updated by signing up for the [Rebuilding California](#) newsletter distributed via email.

The most populated and geographically diverse state in the union, and the fifth-largest economy in the world, deserves a transportation foundation second to none. Caltrans will deliver on the commitments set forth in SB 1 and strive for much more.

Laurie Berman
Director of Caltrans

Cover: A Caltrans snowblower shaves back walls of snowpack building up along Interstate 80 in the Sierra Nevada after a series of cold storms in early February. The blower, an integral part of Caltrans's snow removal fleet, uses a spinning reel of sharp blades that grind through the thick layers, which are fed into a powerful fan and blown well off the roadway. Photo by Scott Lorenzo, Caltrans senior photographer

Mile Markers



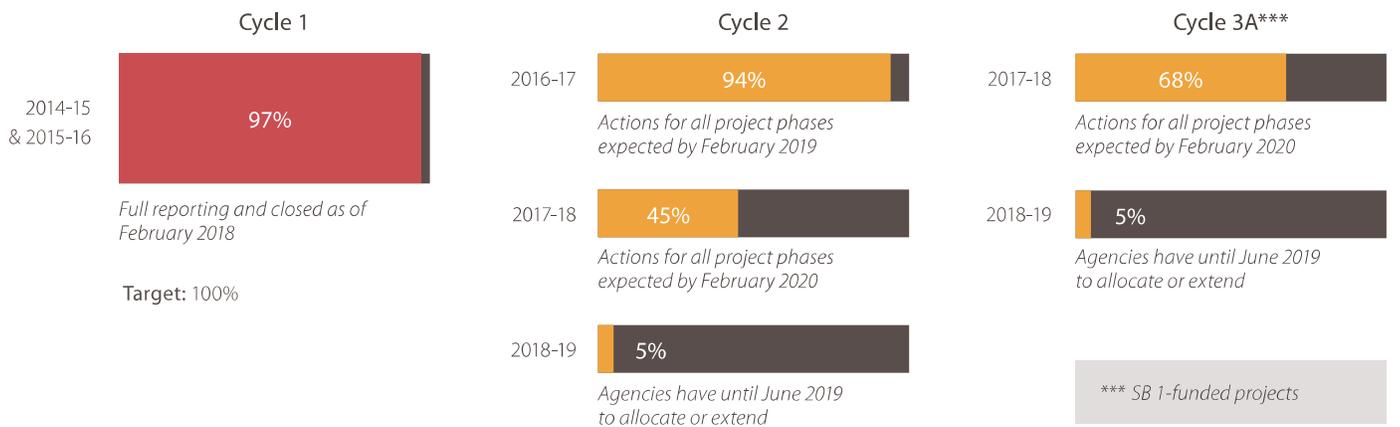
Goal: Safety and Health

Provide a safe transportation system for workers and users, and promote health through active transportation and reduced pollution in communities.

Fatalities	2015	2016	Target
Auto Fatalities per 100 Million Miles	0.74	0.88	Less than 0.5
Pedestrian Fatalities	234* +3.1%	279* +19.2%	10% Reduction per Year
Bicycle Fatalities	30* +87.5%	29* -3.3%	10% Reduction per Year

Most recent available data

Percentage of Allocated Active Transportation Funds to Date (by Funding Cycle)



Other Safety and Health Markers	Previous Reporting	Most Recent	2020 Target
Percentage of Active Transportation Projects Awarded Within Six Months	50% 2017-18, Q4	76% 2018-19, Q1	100%
Employee Work-Related Injuries/Illnesses per 200,000 Hours Worked*	6.06 2017-18, Q4	6.60 2018-19, Q1	4.5
Number of Injuries For Autos, Bicycles and Pedestrian Modes of Travel	+11% 82,838 2015**	+18% 97,823 2016**	Reduce 5% Annually
Worker Fatalities in Work Zones	2 2017	1 2018	0 Per Calendar Year

Includes Cal/OSHA reportable and non-reportable injuries/illnesses. Incident rate represents 12 months of data for each quarter. An average of the most recent five years of collision data up to 2013.

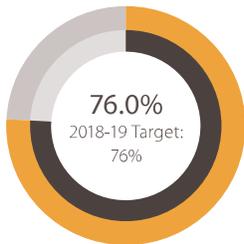
Performance Goals



Goal: Stewardship and Efficiency

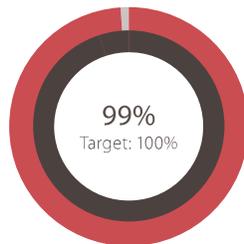
Money counts. Responsibly manage California's transportation-related assets.

Percentage of Transportation Management System Units Functional



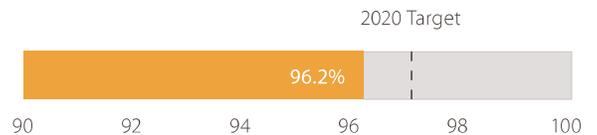
Target	90% by 2020
Apr-June 2018	77.0%
July-Sept. 2018	76.0%

Planned Projects Delivered in Fiscal Year



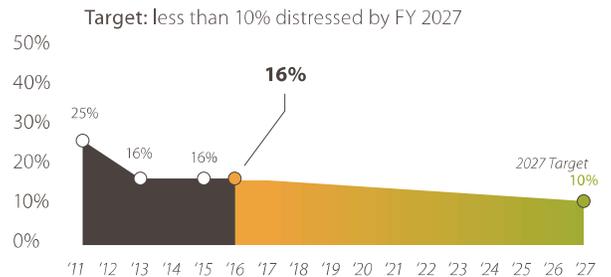
Target	100%
2016-17	97%
2017-18	99%

Percentage of Bridges in Good or Fair Condition



Target	Better than 97.2% rating by 2020
2016-17	96.5%
2017-18	96.2%

Pavement Health Index



Annual Percentage of Research Projects With Implementable Solutions

	2016-17	2017-18	2020 Target
Caltrans Research	61%	67%	75%
University Transportation Centers (UTC) Research	28%	28%	40%
National Cooperative Research	25%	52%	20%

■ Currently meeting goal target
 ■ Trending toward future goal target
 ■ Falling short of goal target

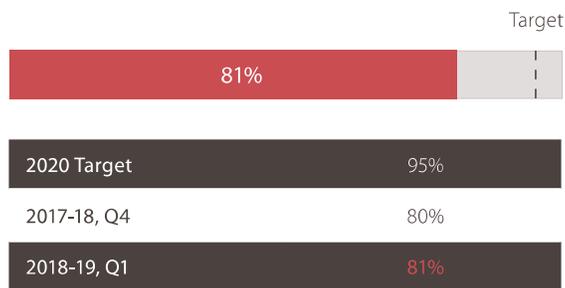
Mile Markers



Goal: Stewardship and Efficiency

Money counts. Responsibly manage California's transportation-related assets.

Encroachment Permits Approved or Denied Within 30 Days



Single Trip Permits for Oversized/Overweight Trucks Processed in Less Than Two Hours



*Due to increased workload in summer months and significant loss of experienced staff

Federal Funds Used in Year of Availability (Annually)



Contract and Procurement Dollars Awarded to Small Businesses Annually



Other Stewardship and Efficiency Markers	2016-17	2017-18	2020 Target
Americans with Disabilities Act (ADA) Expenditures Programmed (Annually)	\$40.7 Million	\$57.9 Million	\$35 Million
Number of Lane Miles of State Highway System Relinquished to Local Entities(Through 2020)	88.44 Lane Miles	115.24 Lane Miles	200 Lane Miles
Contract and Procurement Dollars Awarded to Disabled Veteran Business Enterprises Annually	3.30%	4.92%	5%

■ Currently meeting goal target
 ■ Trending toward future goal target
 ■ Falling short of goal target

Performance Goals

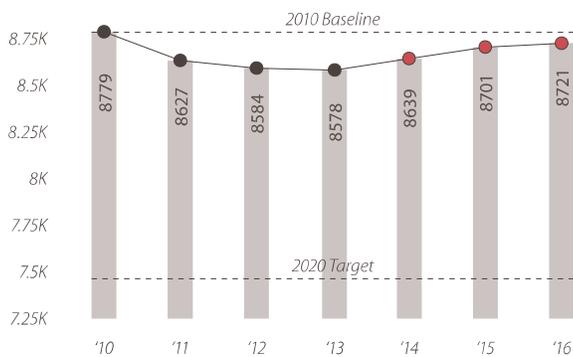


Goal: Sustainability, Livability and Economy

Make long-lasting, smart mobility decisions that improve the environment, support a vibrant economy, and build communities, not sprawl.

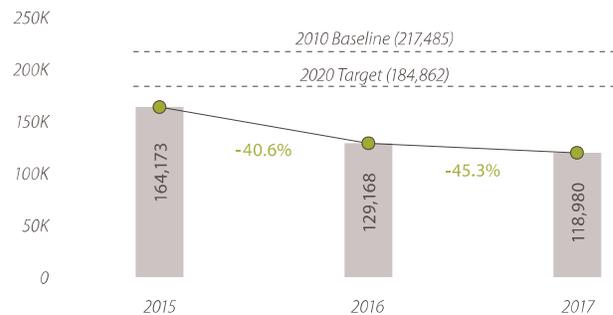
Vehicle Miles Traveled Per Capita, Statewide Average

2020 Target: 15% Reduction From 2010 Baseline



Greenhouse Gas Emissions from Caltrans Operations (in metric tons)

2020 Target: 15% Reduction From 2010 Baseline



Goal: System Performance

Utilize leadership, collaboration and strategic partnerships to develop an integrated transportation system that provides reliable and accessible mobility for travelers.

Complete Streets Implementation	Previous Reporting	Most Recent Reporting	2020 Target
Percentage of Projects That Include Complete Streets Features	27% 2017-18 (through Q4)	35.2% 2018-19 (through Q1)	68%
Number of Complete Streets Features on State Highway System	1,859 2017-18 (through Q4)	1,922 2018-19 (through Q1)	1,613
Percentage of Fully Implemented High-Focus Action Items From Action Plan 2.0	86% 2017-18 (through Q4)	86% 2018-19 (through Q1)	100% by 2018

Other System Performance Markers	Previous Reporting	Most Recent Reporting	2020 Target
Accurate Reporting of Traveler Information (Travel Times, Construction Activity, Incidents, and Adverse Weather)	95.66% 2017-18, Q4	96.00% 2018-19, Q1	85%
Provide Real-Time Multimodal System Information Available to the Public (Number of Corridors)	3 2017-18, Q4	3 2018-19, Q1	13
Completed Corridor Implementation Plans	4 2017-18, Q4	4 2018-19, Q1	5
Number of Corridors With Integrated Corridor Management Implementation	2 2017-18, Q4	2 2018-19, Q1	3

Mile Markers



Goal: System Performance

Utilize leadership, collaboration and strategic partnerships to develop an integrated transportation system that provides reliable and accessible mobility for travelers.

Accurate Reporting of Traveler Information (Travel Times, Construction Activity, Incidents, and Adverse Weather)



Target	85% by 2020
2017-18, Q4	95.66.0%
2018-19, Q1	96.00%

Average Growth in Daily Vehicle Hours of Delay (DVHD) vs. Projection



Average All-Stations On-Time Performance for Intercity Rail	2017-18, Q4	2018-19, Q1	2020 Target
---	-------------	-------------	-------------

Capitol Corridor	88.0%	94.2%	90%
Pacific Surfliner	86.0%	76.8%	90%
San Joaquin	81.0%	69.3%	90%

End Station On-Time Performance for Intercity Rail	2017-18, Q4	2018-19, Q1	Target
--	-------------	-------------	--------

Capitol Corridor	87.8%	93.6%	90%
Pacific Surfliner	83.8%	73.7%	90%
San Joaquin	79.9%	66.2%	90%

Daily Vehicle Hours of Delay*	2017-18, Q4 (Year Over Year)	2018-19, Q1 (Year Over Year)	2017-18 Target
-------------------------------	------------------------------	------------------------------	----------------

I-110	-7.6%	-5.7%	Less Than 6% Increase Annually
I-210	-2.0%	5.7%	Less Than 6% Increase Annually

Data for additional corridors was not available at the time of print for this publication.

Performance Goals



Goal: Organizational Excellence

Be a national leader in delivering quality service through excellent employee performance, public communication and accountability.

The Mile Marker publication has helped me understand what Caltrans does and how well it is performing (*internal survey data*).

Overall, the Department's internal communication, professionalism and quality of customer service has improved over the last year.



Other Organizational Excellence Markers	2016	2017	2017 Target
Employees Who Indicate That They Work in a Positive Environment	57%	59%	60%
Caltrans Employees Who Agree That Employees are Encouraged to Try New Ideas	47%	49%	51%
Caltrans Employees Who Rate Caltrans Management as Open and Honest in Communications	54%	60%	57%
Mile Marker Publications Produced on Quarterly Schedule	4	4	4
Positive Responses to Ethics Questions on Employee Survey	74%	78%	78%
Documented LEAN 6 Sigma Process Improvements (Cumulative)	36	23	15
Number of Caltrans Employees Trained as LEAN 6 Sigma Green Belts and Black Belts	14	17	11

■ Currently meeting goal target
 ■ Trending toward future goal target
 ■ Falling short of goal target



These unsightly hunks of waste tires await further processing into crumb rubber, the particles of which are blended with asphalt paving mixes for use in Caltrans maintenance and construction projects. Caltrans asphalt mixes contained an average of almost 40 percent crumb rubber in 2016.

Retiring the Old Tires

They're Finding New Life in Pavement Mixes; 4.7 Million Used by Caltrans in 2016

Caltrans has again exceeded its state-mandated goal to use more ground-up rubber from old tires in its asphalt paving mixes.

Since 2007, Caltrans has been required by law to use a fixed amount of Crumb Rubber Modifier (CRM) per metric ton of asphalt paving material for projects, where feasible. In 2013, California raised the minimum to 11.58 pounds per metric ton, nearly double the amount required with the law's inception six years earlier — requiring about 35 percent of its total asphalt pavement material to contain CRM.

In 2016, the most recent record available, Caltrans projects using CRM diverted more than 4.7 million waste tires from landfills, tire stockpiles and other methods of disposal that carry potential long-term environmental impacts, according to Caltrans' 2016 Crumb Rubber Report.

That's a 39.8 percent CRM usage mark, exceeding the 35 percent requirement. Caltrans posted a slightly higher CRM usage percentage in 2015, 41.3 percent, but used more asphalt material in its 2016 pavement work that resulted in 100,000 more waste tires being consumed

than in 2015, despite the percentage decline of crumb rubber as part of the overall mix in 2016.

Assuming an average tire width of 26 inches, the total tires used for CRM in Caltrans projects that year translated to 122,200,000 inches, or 1,928 miles.

Using an average tire thickness of 8 inches, that's 3,133,333.33 feet, or 593 miles high, enough to place the stack into the earth's exosphere, well past the zone where the International Space Station and satellites circle.

Usage is increasing as Caltrans continues to explore and refine how crumb rubber modifiers can be applied to asphalt pavement mixes.

The Road Repair and Accountability Act of 2017 (Senate Bill 1) also will add to the volume of asphalt pavement, and CRM used, as more highway rehabilitation projects around the state are completed.

The report also analyzed the cost of crumb rubber asphalt vs. conventional asphalts for four different types of pavement projects: preservation (maintenance), rehabilitation, capital preventative maintenance and new/safety/temporary detours.

These cost variances, on a per-metric ton basis, range from 8 to 24 percent more for asphalt incorporating CRM. However, Caltrans' research has shown that asphalt containing crumb rubber better resists reflective cracking than conventional asphalt pavement. This is an especially relevant benefit given the ongoing costs of upkeep from such roadway cracking across the State Highway System. Caltrans will continue to use sound engineering judgment to decide when and where asphalt containing CRM will be used.

Asphalt pavement guidelines in Caltrans' Highway Design Manual were updated in 2017 to allow use of conventional asphalt by exception only. During construction, exceptions to using asphalt containing crumb rubber may be considered because of factors such as the availability of asphalt concrete, constructability, environmental considerations and cost. Exceptions may cover the following situations:

- When CRM project quantities are less than 1,000 metric tons, or stage construction operations require less than 1,000 metric tons per stage.
- When placed as a concrete pavement asphalt base.

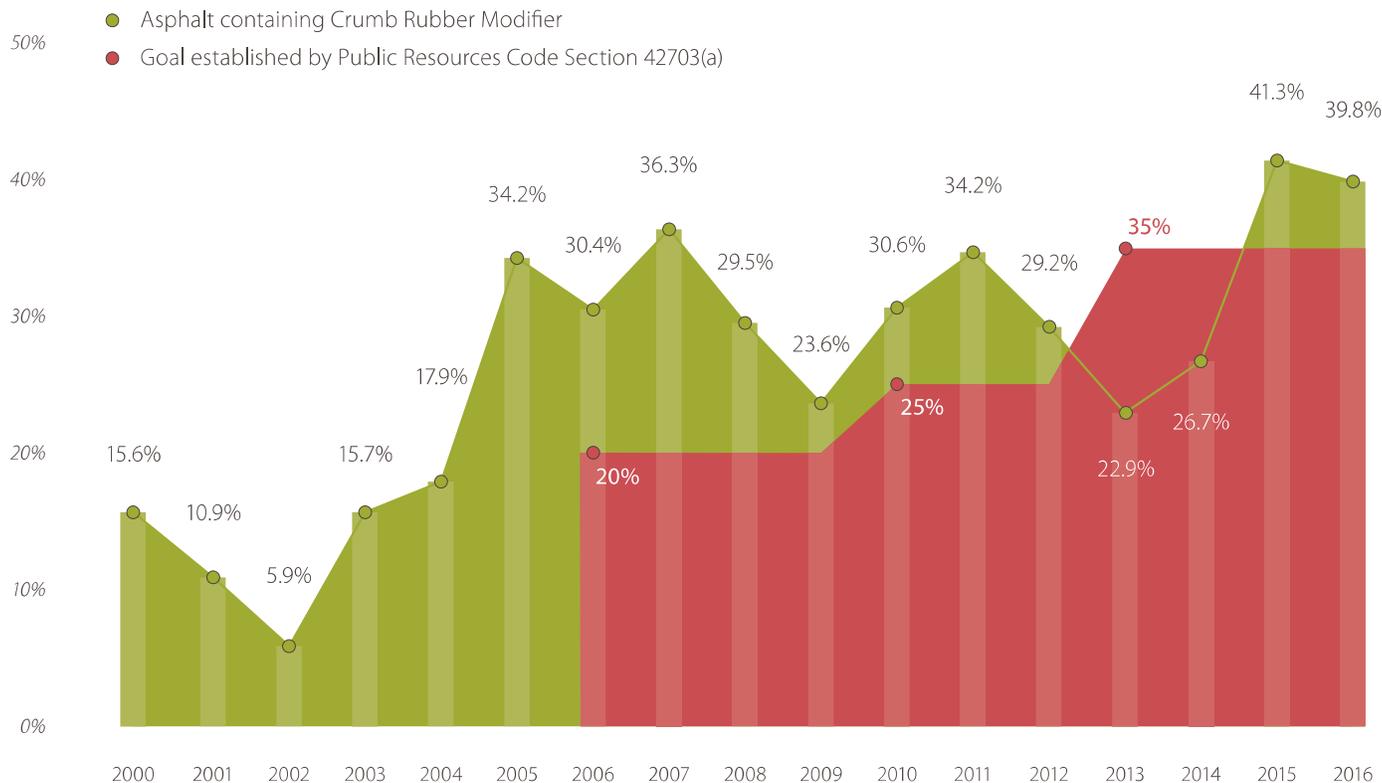
Caltrans' research has shown that asphalt containing crumb rubber better resists reflective cracking than conventional asphalt pavement.

- When the temperature is below 45 degrees Fahrenheit, when crumb rubber hardens and becomes difficult to work with.
- Where the roadway is above 3,000 feet in elevation, where snow chains and truck traffic adversely affect the material's performance.
- When placed as a bond breaker between the asphalt and concrete pavement layers.

Information about additional waste tire applications used by Caltrans is available on the [Department's website](#). **MM**

Source: 2016 Crumb Rubber Report; Jason Probst, Strategic Planning Manager, Caltrans Division of Maintenance

Percentage of Asphalt Containing Crumb Rubber Modifier (CRM) Used by Caltrans



Caltrans Adds Muscle for Heavier Workload

State Budget Includes More Money to Hire Staff, Deliver Wide Range of Projects

The outlook for California's beleaguered transportation network continues to brighten with the passage of the state budget that directs more money to Caltrans to make needed improvements.

The 2018-19 fiscal year budget authorized \$13.8 billion for Caltrans, an increase of \$1.9 billion from the previous budget year. With the increase, the Department can fill an additional 1,237 vacancies in this budget year, up to a maximum of 20,258 positions, and fund a spectrum of infrastructure improvements made possible by the Road Repair and Accountability Act of 2017 (Senate Bill 1).

SB 1 created a Road Maintenance and Rehabilitation Account that is projected to provide \$1.8 billion this fiscal year to tackle long-deferred maintenance needs on the highway system and local roads.

SB 1 also is projected to raise \$2.7 billion this fiscal year for larger-scale state and local capital projects, local transportation system assistance, and other maintenance-related projects. Specifically, those revenues will finance efforts to upgrade overloaded freight and commuter corridors, make repairs to bridges, drainages and traffic management systems, support alternate modes of transportation such as bicycling or walking, intercity and commuter rail service, and climate planning.

Internally, the budget gives Caltrans \$14 million to replace obsolete information technology resources,

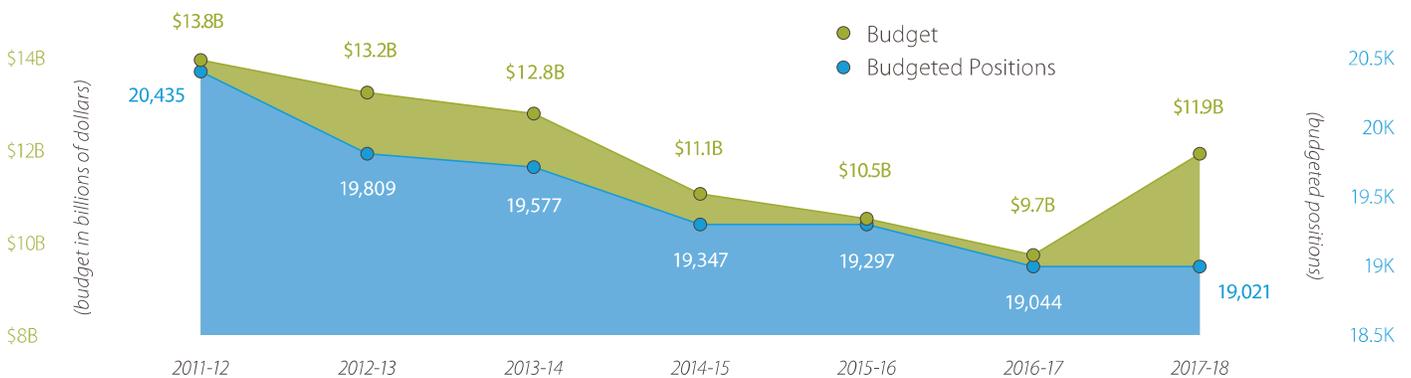
and provides an additional \$10.4 million to fortify cyber security that protects the Department's data resources.

Because of the extra work generated by SB 1, 872 of the 1,237 new budgeted positions are dedicated to the project delivery process, including architectural and engineering services. Caltrans projects spending \$4.6 billion on capital projects this fiscal year, its highest category of expenditure, and about \$2 billion on capital outlay support to bring that work to the construction stage.

Of the 20,258 positions budgeted for this fiscal year, 8,770 are designated for capital outlay support — Caltrans' largest workforce sector. The Department's Division of Maintenance, shouldering the labor-intensive duties of maintaining, rehabilitating and repairing the highway system, has the next highest employee total at 6,522.

Even with the overall increase allotted for personnel for the fiscal year, Caltrans will still have almost 10 percent fewer budgeted positions than it did in fiscal year 2008-2009, a decade before. For that fiscal year, Caltrans had a budget of slightly over \$13.8 billion — about the same as 2018-19 — and 22,277 budgeted positions, compared with 20,258 authorized under the most recent budget. The Department has found more efficient ways to deliver projects in recent years, through money-saving approaches prior to construction and cost reductions in operations. **MM**

Caltrans Budget and Staffing Levels Since 2011-12



New Inspector General Keeps SB 1 Watch

Eraina Ortega Uses Audits to Oversee Spending for Transportation Funding Law

Caltrans' independent Inspector General, Eraina Ortega, and her staff are making sure that agencies travel a fiscally responsible road when spending revenue from the Road Repair and Accountability Act of 2017 (Senate Bill 1).

Ortega was appointed as the first Inspector General in Caltrans history by then-Gov. Edmund G. Brown Jr. in October 2017. The position was created by the SB 1 legislation to ensure that revenues raised by the fuel tax and vehicle registration would be spent under the watchful eye of an independent administrator. Ortega's six-year term began Jan. 1, 2018, and she was confirmed for the post by the California Senate.

The Independent Office of Audits and Investigations that Ortega leads has a staff of about 60, including auditors and special investigators. She previously was Chief Deputy Director of Policy at the California Department of Finance.

Ortega says her office released a plan last July that identifies key audits to be conducted into Caltrans operations and contracts, and of entities that receive state and federal transportation funds from the Department during the 2018-19 fiscal year.

Under Ortega, the office has had a busy first year fulfilling its oversight responsibilities. The annual summary of activity can be viewed on the office's [new website](#).

A total of 126 audits were performed through the end of June 2018, including a first review of SB 1 performance and efficiency measures.

That audit concluded that Caltrans is making progress in developing processes and procedures to reach performance targets set by SB 1. The report noted that Caltrans needed to bolster its culvert inventory and inspection process, and is doing so, and make progress toward establishing a SB 1 performance baseline for pavement and traffic management systems. The new law requires Caltrans to fix more than 17,000 lane miles of pavement, 500 bridges, 55,000 culverts and 7,700 traffic management systems by 2027.



Eraina Ortega is leading a staff of about 60 persons in her position as Inspector General, the first in Caltrans history, required by SB 1 provisions.

Ortega's office also completed 151 reviews of architectural and engineering contracts with consultants during the last fiscal year, and concluded those reviews produced \$7.8 million in avoided costs. Auditors also combed through contracts with local agencies involving transportation funding, performing 75 reviews and 19 more extensive audits.

Another area of review involved Proposition 1B, approved in 2006 for various transportation projects sponsored by Caltrans or local agencies. Of the 84 projects scrutinized, \$33.6 million of the \$266.2 million spent was either questioned or disallowed, and the audits also uncovered various procedural deficiencies such as delayed reporting or lack of fiscal controls.

Ortega's office also is responsible for conducting internal investigations when incidents of misconduct are alleged. In the previous fiscal year, 91 allegations were made that resulted in 31 formal investigations. Of those cases, 28 were substantiated and disciplinary action taken.

The Independent Office of Audits and Investigations is required under SB 1 to report annually to the Legislature, Governor's Office and the California Transportation Commission. **MM**

Source: Eraina Ortega, Inspector General, Independent Office of Audits and Investigations

Yearly Review Rates Condition of Highways

2017 Level of Service Scores Show Litter/Debris Levels Got Worse in Past Year

Caltrans gave itself mixed grades on how well it performed its maintenance duties along the State Highway System in 2017.

The Department conducts yearly Level of Service (LOS) assessments on the thousands of lane-miles of highway, roadside acreage, culverts, signs, electronics and other transportation inventory in its 12 districts statewide. A numerical grade, with 100 being the maximum, is given by teams evaluating the condition of multiple transportation components that make up the highway system, based on guidelines established in the Caltrans Maintenance Manual.

It should be noted that 2017 assessment was conducted prior to the series of highway improvements funded by the Road Repair and Accountability Act of 2017 (Senate Bill 1). The extra revenue is financing more repair and rehabilitation work that should result in higher state LOS scores in the next survey.

The 2017 statewide LOS awarded higher marks, above a cumulative score of 70, in the areas of roadway lighting (99); potholes and “flexible” (generally asphalt concrete mixes) pavement, (87 each); graffiti (87); signs (85); striping (76); litter/debris (72); and traffic signals (70).

Scoring lower were the highway asset categories of tree/brush encroachment (68); guardrails (58); rigid (typically concrete slab) pavement, spalls (areas of deteriorated concrete) (52) and cracks (43); flexible pavement, cracks (43); and bridge maintenance activities (35).

Year-to-year improvements were made in the categories of bridge maintenance activities (11 points), guardrails (five points) and traffic signals (four points).

Scores in six of the categories for 2017 declined from the previous year. The most marked decrease was in the litter/debris category, which fell from an 81 LOS score in 2016 to 72 last year.

The uptick in litter statewide has been felt across the highway system. In response, Caltrans is deploying strategies to combat the epidemic of garbage, including expanding its program that employs parolees on litter



The overall condition of guardrails statewide improved significantly in 2017 from the previous year, Caltrans' Level of Service report found.

pickup crews, as well as starting a veterans outreach program that hires those with military service. Also, Caltrans' highly successful Adopt-A-Highway Program allows groups or individuals to help maintain sections of state highway roadside.

Caltrans uses the LOS as a performance evaluation tool for its highway components in each regional district. The scores help determine the number of field staff and resources, establish performance targets, and are used to justify resource allocation and modifications.

How LOS scores are determined:

- Evaluation segments are determined through random sampling, typically comprising 20 percent of the total one-mile segments of state highway in each Caltrans district.
- For public facilities such as rest areas, 100 percent are evaluated.
- A headquarters quality assurance team conducts random checks of the segments already evaluated by individual districts. The team conducts more evaluations

if the discrepancy between its scoring and the district's evaluation differ by more than 10 percent.

A segment's LOS score is based on the number of deficient areas for the category being assessed. If no deficiencies in a particular category was found along a "localized" highway section — defined as one-tenth of a mile — a 100 score would be awarded. If one category deficiency was found, an LOS score of 50 was given. More than one deficiency along a localized section resulted in a score of zero.

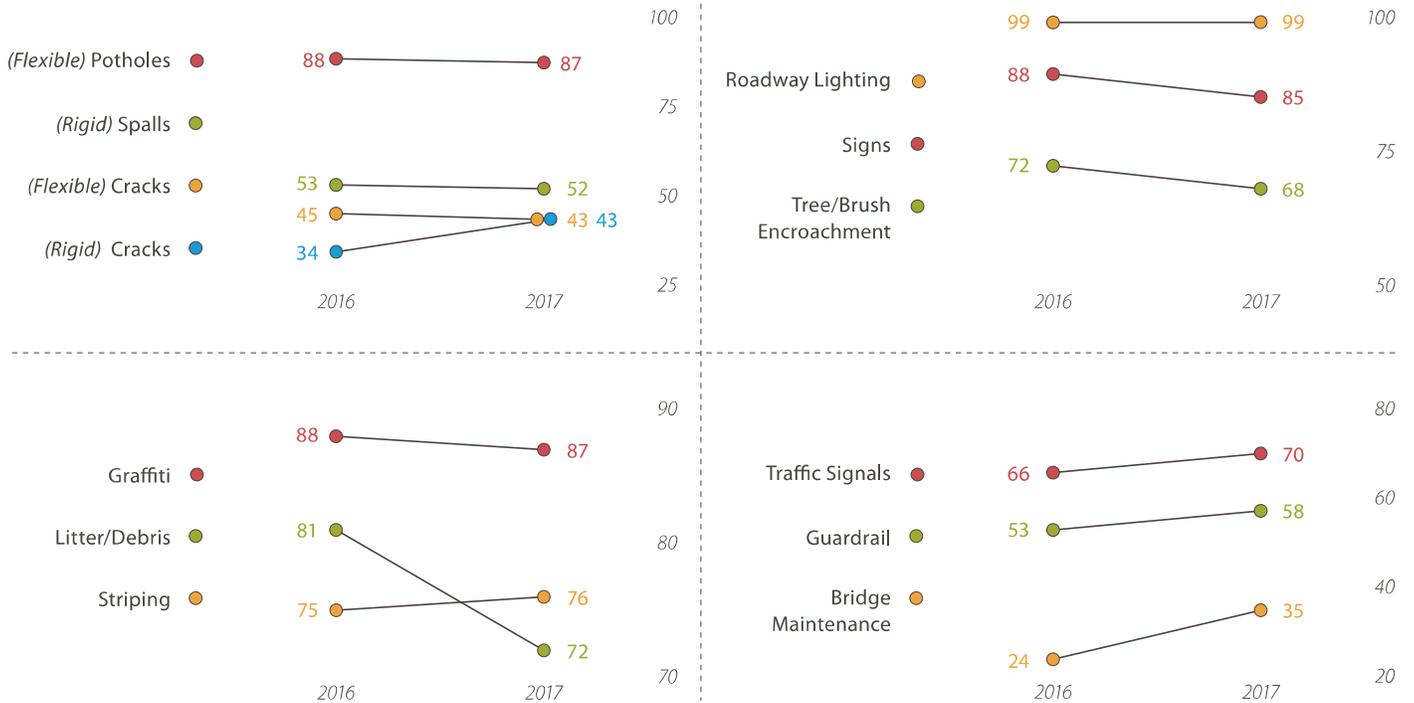
The segments are then averaged to determine an LOS

score for a given category. Some LOS scores can involve thousands of segments.

Caltrans' Maintenance Strategic Management Plan sets future performance targets for LOS categories. By 2021, for example, the plan calls for achieving an LOS of 90 or greater for safety-related highway elements such as guardrails and tree/brush encroachment. **MM**

Source: 2017 Level of Service report; Jason Probst, Strategic Planning Manager; Caltrans Division of Maintenance

Statewide Level of Service Scores



Highway Components Evaluated for Level of Service Surveys

Travelway	Rigid and Flexible Pavements	Landscaping	Weed Control, Irrigation System, Tree/Shrub Health and Prune and Encroachment, Ground Cover, Litter, Volunteer Plants, Mulch
Drainage	Surface Drains, Cross-Drains, Ditches, Slopes	Public Facilities	Rest Areas, Park and Ride Lots, Vista Points, Inspection Stations
Roadside	Roadside Vegetation, Litter and Debris, Graffiti, Tree/Brush Encroachment, Fences, Illegal Encampments	Traffic Signals	Signal Housing, Backing Plates, Visor, Cabinet, Handhole Covers, Pedestrian Signs and Push Buttons, Pull Box Covers, Pole Condition, Signal Indications (vehicle and pedestrian)
Traffic Guidance	Striping, Signs, Guardrail, Median Barriers, Attenuators, Pavement Markings, Reflective Markers, Night Inspections		



Along what had been State Route 275, now known as the Tower Bridge Gateway controlled by the city of West Sacramento, the conversion to arterial street included pedestrian-friendly features. Such planning is now standard for most Caltrans projects as part of a sustainability strategy.

Caltrans' Mantra: Do More, Use Less

Sustainability Roadmap Cites Progress in Managing Resources

Caltrans' Sustainability Program, established in 2014, has already helped the Department take major steps to reduce its impact on the environment by building on long-established practices including environmental compliance and use of recycled materials. Caltrans has already met water and energy conservation targets for 2020 in its facilities and on landscaped acreage, is completing comprehensive climate change assessments for each of the 12 districts, and has launched an ambitious program to rein in the greenhouse gas emissions it produces.

These efforts align with the Department's three sustainability priorities: champion active transportation that encourages travel other than by vehicle; promote clean fuels, vehicles and materials; and prepare for climate change and extreme weather.

The Caltrans Sustainability Roadmap 2018-2019 focuses on Caltrans' efforts to embrace sustainable practices in its operations, and outlines courses of action to comply with executive orders by then-Gov. Edmund G. Brown Jr. and state legislation.

Sustainability Roadmap 2018-2019

Progress Report and Plan Update
on Meeting the Governor's Sustainability Goals
for State Departments

California Department of Transportation
Edmund G. Brown Jr., Governor
December 2017



Nearly 40 percent of all greenhouse gas emissions in California come from vehicle emissions, not including emissions from construction materials and Caltrans facilities. Caltrans Director Laurie Berman, noting this, said the Department has a responsibility to continue reducing its carbon footprint

and adopt sustainable practices as stewards of the vast State Highway System.

In addition to the Sustainability Roadmap, which focuses on Caltrans operations, the Department's 2015-2020 Strategic Management Plan includes sustainability targets.

Caltrans oversees the construction and maintenance of about 50,000 lane-miles of pavement, 13,000-plus bridges, more than 200,000 culverts and almost 19,000 transportation management system (TMS) units. To keep

the integrated system safe and efficient for travelers, Caltrans has more than 20,000 full-time, permanent employees, and operates out of more than 500 facilities.

The Sustainability Roadmap highlights five target areas that all State agencies are addressing.

Climate Change Adaptation

This roadmap section identifies Caltrans' most vulnerable building facilities, investigates the vulnerability of the State Highway System to the likely impacts of climate change, and offers initial recommendations to protect vulnerable facilities, with a focus on buildings.

In the coming century, Caltrans facilities in certain locations are projected to experience:

- *Higher maximum and minimum temperatures, and more extreme heat events.* Maintenance facilities and equipment shops in inland Southern California face this prospect in particular, which has implications for staff safety and building integrity. The report offers mitigation strategies for at-risk facilities, and notes those practices are already in use at some locations. In addition, climate extremes in the next century are poised to threaten roadway surfaces, right-of-way vegetation and landscaping, and increase fire threats — and must be factored into policy decisions.
- *Changing precipitation patterns.* In the next century, climate change models forecast that as temperatures warm, snow levels will rise and more of the state's precipitation will fall as rain. If that occurs, Caltrans



Caltrans has made significant strides in cutting its overall power bills, due in part to facilities like this solar power station near Sacramento.

Caltrans' energy use in 2016 declined 28 percent compared with the 2003 baseline year, exceeding the 20 percent target and saving the Department an estimated \$23 million.

office buildings and maintenance facilities are more likely to sustain damage, as will roadways and other highway infrastructure.

- *Significant sea level rise.* Depending on the rise in global temperatures, Caltrans' coastal facilities in the Bay Area and portions of the coast are most at risk from seawater inundation.

These anticipated weather-related risks to the State Highway System are described in the regional vulnerability assessments that are being coordinated by Caltrans' Climate Change branch. Caltrans, through partnerships, is developing adaptation planning strategies to preserve facilities and transportation corridors.

Energy

Conservation efforts have cut the amount of power purchased, and the cost, since the governor's edict in 2012 that state agencies reduce energy purchases. Caltrans' energy use in 2016 declined 28 percent compared with the 2003 baseline year, exceeding the 20 percent target and saving the Department an estimated \$23 million.

Caltrans' estimated energy bill in 2016 was \$46.9 million for 335.3 million kBTUs (a measure of energy) used. Caltrans' 12 office buildings around the state were the largest power consumers, using almost half of the Department's total energy purchased in 2016. Maintenance stations, 369 in total and representing 70 percent of all Caltrans facilities, were the second-highest power user, followed by the Department's five transportation management centers (TMC), the nerve centers for highway operations in different parts of the state.

Individually, the five properties showing the highest energy use in 2016 were, in order, the District 7 (Los Angeles area) office, District 4 (San Francisco Bay Area) office, District 8 (San Bernardino) office, Los Angeles TMC, and Caltrans headquarters office in Sacramento.

The roadmap noted that Department office buildings offer the greatest potential for energy savings, and

conservation efforts are underway through a variety of programs such as conversion to LED lighting and measures to lower individual usage. Solar power systems have been installed at some facilities, and 41 buildings with a record of high energy consumption are identified as candidates for solar panel installation. The Department also is enrolled in programs offered by regional energy providers to reduce power demands during emergency energy events in exchange for lower rates.

Going forward, Caltrans also is committed to meeting the governor's zero net energy (ZNE) goals requiring that a percentage of state buildings produce as much energy as consumed. Caltrans has finished construction on one of the state's first pilot ZNE projects, the San Francisco-Oakland Bay Bridge warehouse.

Water Efficiency and Conservation

Despite wildly fluctuating conditions — from punishing drought to one of the wettest years on record — Caltrans managed to exceed water conservation goals set by the governor. The Department reduced overall water use by 66 percent from 2010 to 2016 through a variety of measures, from savings in highway irrigation to water-efficient practices for buildings and surrounding vegetation. Highway irrigation represents about 70 percent of all of Caltrans' water consumption.



At Caltrans regional District 10 in Stockton, water-saving techniques and maintenance are taught at a state-of-the-art landscape center.

Caltrans' effort to limit water use on its irrigated acreage was accomplished despite a 77 percent increase in amount of landscaped acres under its control since 1990.

Steps taken to save water include new or modernized irrigation equipment, increased use of recycled or nonpotable water, more efficient practices such as harvested runoff, use of compost and more selective plantings, and better monitoring and usage tracking. Those conservation measures are ongoing.

Caltrans' effort to reduce water use on its irrigated acreage was accomplished despite a 77 percent increase in amount of landscaped acres under its control since 1990.

Green Operations

Since the governor's 2012 order requiring state agencies to reduce their greenhouse gas emissions, Caltrans has sharply cut the amount of harmful gases associated with its activities (excluding the use of the State Highway System). Caltrans showed a 40 percent drop in greenhouse gas levels generated in 2016 from the baseline year of 2010, according to the roadmap, far exceeding the state target ordering a 10 percent reduction by 2015 and a 20 percent cut by 2020.

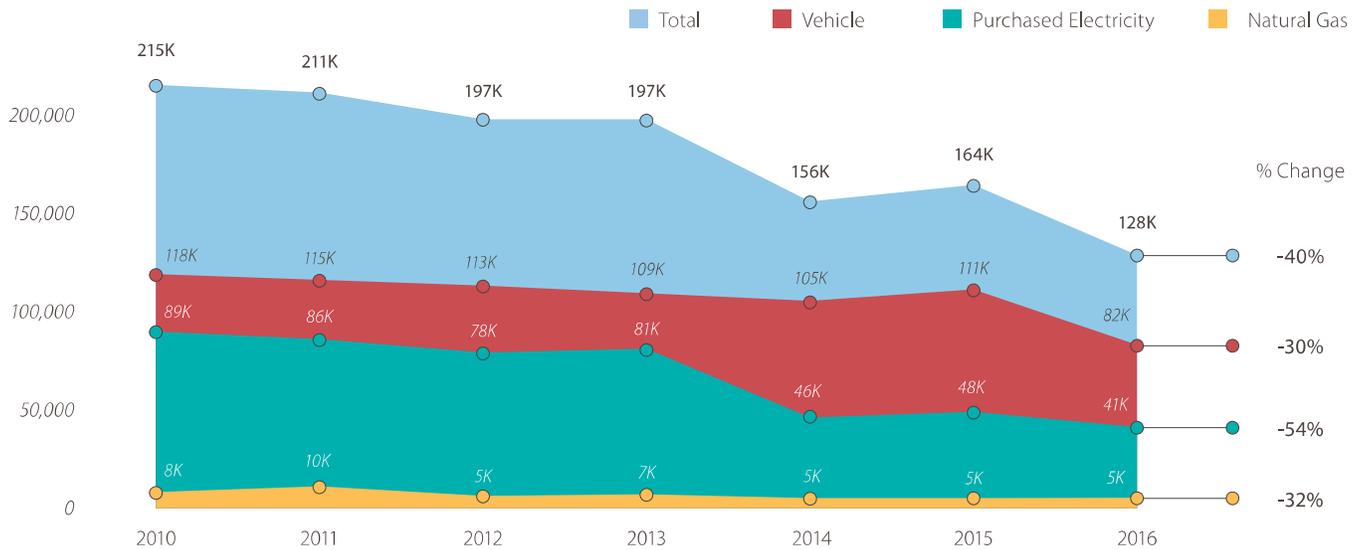
Steps taken to create a greener Caltrans include LED light replacement in buildings, HVAC upgrades and energy-efficient measures, solar power generation, an emphasis on renewable power or cleaner fuel purchases, and buying more zero-emission vehicles.

The Department also is following the Leadership in Energy and Environmental Design (LEED) rating system and California Green Building Standards Code when constructing, renovating or maintaining its buildings. Indoor air quality standards also must be met at the time of new construction or alteration to gain LEED certification or meet CALGreen mandates.

Purchasing is another area where Caltrans, and other state agencies, have to meet green standards. Caltrans has committed to buy environmentally responsible products, including recycled ones such as antifreeze, paint and tires for its maintenance facility needs, and to reduce waste sent to landfills.

Caltrans Greenhouse Gas Emissions

In metric tons CO₂e



Zero-Emission Vehicles (ZEVs)

Caltrans has been buying more ZEVs as part of the push to modernize agency fleets across the state and meet greenhouse gas reduction targets. ZEVs consist of all-electric vehicles, plug-in hybrids and hydrogen fuel cell cars.

The Department is on track to have 261 ZEVs in its light-duty fleet by the end of the 2018-19 fiscal year, and its fleet purchases met the State target of 20 percent. State agencies, including Caltrans, are required to raise the percentage of ZEVs in their light-duty fleet by 5 percent a year starting in fiscal year 2017-18 and continuing through 2024-25, reaching 50 percent.

Caltrans' light-duty fleet consisted of more than 3,600 vehicles that include passenger vehicles, light-duty pickup trucks, and four-wheel-drive vehicles for use in the field. Those vehicles eligible for replacement for age or mileage reasons will be replaced by ZEVs when possible, although the report notes that these vehicles cost significantly more and only limited models are currently offered.

In pushing for a changeover of the fleet, Caltrans also has begun to develop a statewide ZEV fueling network to supply its own vehicles and public charging stations based on the governor's 2016 ZEV Action Plan. Caltrans has more than 100 electric vehicle charging stations at its facilities, but will need to install about 1,200 more in the next five years to support the growing need for workplace and public charging.

The Sustainability Roadmap also plots a course

of action for Caltrans' internal units to implement or advance green operations practices, and assigns deadlines to fulfill those commitments. State law, or executive orders, requires Caltrans and other state agencies to cut water and energy use, build or adapt existing facilities to ZNE standards, and grow their fleets of ZEVs through 2025.

Source: Caltrans Sustainability Roadmap 2018-2019



A Chevy Volt electric car that's part of Caltrans' growing fleet of zero-emission vehicles powers up at a Department charging station.



Program Lays Groundwork for Big Projects

SB 1 Workload Increases Need to Prepare Project Initiation Documents, or PIDs

Caltrans' Project Initiation Document (PID) program, which helps identify the scope, cost, schedules and potential risks of major projects before funds are committed, is prepared to undertake a workload that has increased since the passage of the Road Repair and Accountability Act of 2017 (Senate Bill 1).

The PIDs program received some welcome help in the 2017-18 fiscal year. The equivalent of about 100 additional positions were approved to keep pace with SB 1 demands that are bringing forward increasingly complex projects, according to a Caltrans [annual report](#) to the Legislature.

Caltrans delivered 520 PID reports in FY 2016-17 and began work on 143 others that carried over into 2017-18.

A PID is required for every capital project proposed for the State Highway System. The documents provide engineering details of planned projects to ensure a more predictable and efficient path toward their eventual inclusion in the funding cycle, and, ultimately, project delivery. PIDs help Caltrans identify potential risks before ground is broken, and limit cost overruns and delays.

Here are highlights from the FY 2016-17 Caltrans annual report:

- PIDs are an integral part of project development to repair damage from winter storms that devastated roadways, culverts and bridges in California. The damage that season was so great that then-Gov. Edmund G. Brown Jr. declared a state of emergency to secure funding to help communities recover.
- The program integrated climate change and greenhouse gas carbon estimates into PID documents, as well as analysis of Complete Streets elements, which seeks to provide safe mobility for all types of travelers.
- Several PIDs were prepared for high-priority freight corridor bridge projects.

Caltrans has increased efficiencies by incorporating asset management strategies into PID documents to ensure each "asset," or element of a highway project such as pavement, culvert or bridge repairs, help Caltrans achieve SB 1 and 2017 State Highway System Management Plan performance objectives. This strategy focuses on repairing multiple highway assets in a single

SB 1 is generating more comprehensive repair projects, such as bridges and pavement, that require extra planning and analysis during the PID process.

project, reducing the impact to the traveling public.

The SB-1 PID Program staff increases allow Caltrans to keep pace with new annual funding from the landmark transportation law.

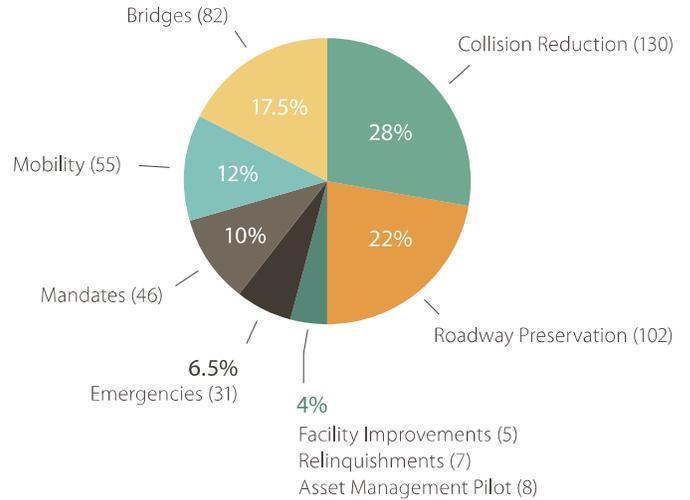
The majority of the 520 PIDs completed in FY 2016-17 are projects funded through the State Highway Operation and Protection Program (SHOPP), which is Caltrans' main source of funding for repair and rehabilitation of the existing transportation system. Of the 520 PIDs finished, 54 are for projects with non-SHOPP and local-sponsored funding sources. The projects have a total value of about \$16 billion.

Since 2013-14, Caltrans has prepared a total of 1,600 PIDs that analyzed highway capital projects.

SB 1 is generating more comprehensive repair projects, such as bridges and pavement, that require extra planning and analysis during the PID process. Meanwhile, PID planners are working with other Caltrans divisions to reduce document development costs, as well as streamline and complete analyses so projects can be more quickly programmed into the SHOPP funding cycles.

More projects also require consideration of advance mitigation measures to offset environmental impacts.

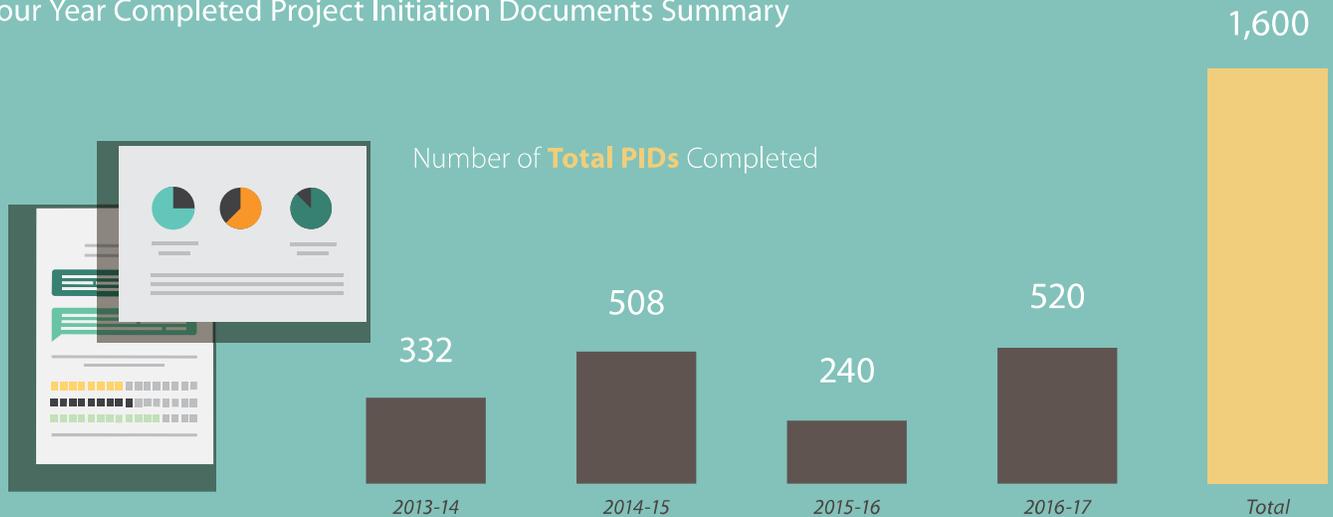
Type of SHOPP PIDs Completed in 2016-17



A more holistic approach to project development is required of Caltrans and other agencies by SB 1, and the new law directs that \$30 million be spent annually for the next four years to create an advance mitigation program. (See story, pages 34-35.) **MM**

Source: Project Initiation Document Program Report Fiscal Year 2016-17; Annette Clark, Chief, Office of Program and Project Planning.

Four Year Completed Project Initiation Documents Summary





Pavement route shields are new additions to highways in the San Diego, Sacramento, Stockton and Riverside-San Bernardino regions. The shields, made of heat-treated plastic material, help direct motorists into their desired lane toward an eventual destination, and avoid unsafe maneuvers.

Route Signs Go Ground-Level

New Pavement Shields Guide Travelers Safely Through Unfamiliar Interchanges

Caltrans is helping drivers negotiate unfamiliar or complex freeway interchanges with new pavement markings in the shape of the familiar route shields that they are used to seeing posted as signs on posts along the highways.

The route shield pavement markings, placed on selected highways around the state, are intended to give another visual aid to travelers who are more accustomed to looking up or to the side of the highway for traditional route shield signs.

These route shield pavement markings are large enough to be viewed with a quick glance at the road surface. They're approximately 6-foot-wide reproductions of signs that identify interstate or highway numbers. Recently, State Route 65 route shield pavement markings were laid down in Roseville, which lies within Caltrans District 3, and in the Sacramento area. In addition, route shield pavement markings also are guiding motorists in Riverside and San Bernardino counties (Caltrans District 8), Stockton, nearby foothills and central Sierra Nevada (Caltrans District 10) and greater San Diego (Caltrans District 11).

Caltrans workers install the decals at night, piecing together roughly 2-by-3-foot mats and heating them so they partially melt and adhere to the roadway surface in the middle of a lane.

Made of heat-treated plastic material, each marking contains thousands of miniature glass beads, as found in lane striping, that increase light reflection. Depending on traffic volumes and weather conditions, the route shield pavement markings should last three to five years.

The route shield pavement markings are one of Caltrans' newer driver information and collision reduction strategies. They are recommended for installation on freeways and highways where:

- There are complex freeway-to-freeway interchanges.
- There is a history of collisions likely due to drivers weaving.
- Where roads diverge and crash cushions are often hit.
- There are exit-only lanes or multiple-lane exits.
- Installation of overhead signs is impractical.

Route shield pavement markings also can be placed on surface streets that lead to freeway entrance ramps,

Watch how route shields were installed in Sacramento, and hear the positive reaction of two motorists, in Episode 185 of the Caltrans News Flash series posted online.

and where overhead signs cannot easily be built due to space constraints.

Route shield pavement markings are placed a short distance past overhead signs that announce the approaching interchange, but where drivers still have room to switch lanes, if necessary. Route shield pavement markings of two highways can be placed when a lane serves as a continuation and an exit lane. No more than two identical sets of route shield pavement markings are placed in any lane before an interchange.

For example, route shield pavement markings on eastbound US Route 50 (at this point also the Capital City Freeway) through Sacramento alert motorists about the lanes that continue, the ones that curve toward eastbound Interstate 80, and those connecting to southbound State Route 99.

Although the effectiveness of route shield pavement markings has not yet been subject to statistical analysis, anecdotal feedback has been positive.

The route shield pavement markings also are intended to reduce driver stress and act as reassurances or reminders to drivers who, although familiar with the



The shields, cut to size, are heated to adhere to the pavement. They're coated in reflective glass beads to stand out when illuminated.

roadways, might be distracted and risk missing their exit.

Another way drivers can familiarize themselves with a route is by using Caltrans' QuickMap, accessible online or as a mobile phone application. QuickMap is updated every five minutes with real-time traffic information to alert drivers about traffic slowdowns, chain requirements and road work, and provides rest stop locations among its many other features. A word of caution: Using mobile devices while driving is dangerous and against the law. **MM**

Sources: Duper Tong, Chief of Caltrans' Office of Traffic Engineering, Atifa Ferouz, Senior Traffic Engineer, and Arshad Iqbal, Chief of Traffic Signs Branch, Office of Engineering, Caltrans Division of Traffic Operations

Even Humble Signposts Are More Eye-Catching These Days

Caltrans has begun outfitting signposts with reflective material to enhance safety for those who walk, ride bikes, or go to school along or near a state highway.

The reflective material is being attached to the full length and width of the posts on the driver-facing side.

The reflective material on the posts and signs will be color-coordinated: fluorescent yellow or fluorescent yellow-green on bicycle and pedestrian signposts, and fluorescent yellow-green on school-related signs.

This newest safety feature is in line with the Department's ongoing commitment to improve safety on highways throughout the state by adopting the *Toward Zero Deaths* philosophy.



Caltrans has begun wrapping signposts in reflective material to alert motorists of the presence of cyclists, students or pedestrians.



At the California Highway Patrol testing facility in West Sacramento, bolts to secure a lighting pole are adjusted as part of a safety project to ensure that the pole separates from its base when struck by a moving vehicle. Caltrans initiates or supervises nearly 200 research tasks every year.

Science Drives Highway Solutions at Caltrans Department's Active Research Division, Partnerships Increase Knowledge Base

In contrast to its higher-profile projects on the State Highway System, Caltrans also maintains an active research division that quietly works to improve road reliability, functionality, efficiency, sustainability and worker and traveler safety.

Each year, Caltrans initiates or supervises nearly 200 research tasks with the goal of increasing knowledge of critical transportation issues, and developing potential solutions to the Department's infrastructure, policy, equipment and safety needs.

For the 2017-18 fiscal year that ended June 30, 2018, Caltrans put a total of \$26.3 million into research efforts conducted internally and in partnership with the federal government and university-based programs. For the current FY 2018-19, the Department budgeted \$27.5 million toward its overall research program that is overseen by its Division of Research, Innovation and System Information (DRISI).

The research funds are directed into six categories of programs: Caltrans in-house "functional" research efforts, U.S. Department of Transportation University

Transportation Centers (UTC) research and University of California-partnered research centers, national cooperative research programs, deployment/implementation to ensure findings become policy and procedure, and roadside safety research that includes crash testing of roadside safety devices.

The combined research efforts cover a broad swath of transportation issues, from technical studies—"Improving the Foundation Layers for Concrete Pavements," or "Post Tensioned Box Girder Deck Replacement Method," to name two — to broader discussions on safety, planning or fast-arriving changes to the transportation landscape — such as "The Mobility of Millennials in California."

Caltrans puts an emphasis on sponsoring research to achieve tangible results. The Department's 2015-2020 Strategic Management Plan sets performance targets for three broad areas of research to evaluate if Caltrans stewardship and efficiency goals are being met: Caltrans functional research, research done with UTCs, and cooperative national research programs.

Progress in the strategic plan is based on the

Caltrans also relies on collaborative ventures to stretch its research dollars, giving the Department access to transportation studies done at a national level.

percentage of research projects that yield implementable solutions. For 2017-18, Caltrans' functional research projects showed a 67 percent implementable outcome rate; a 6 percent improvement from the previous fiscal year. Caltrans' strategic plan calls for reaching a 75 percent performance target by 2020.

Work done through UTCs generated potential solutions 28 percent of the time in 2017-18 (40 percent target by 2020). Caltrans' national cooperative research most recently showed a 52 percent implementable solutions rate, already beating the 2020 target of 20 percent. The interim strategic plan target has been met or exceeded in all three categories in each of the years it has been listed as a Caltrans performance measure.

One of the success stories has been the development of the Mountain Pass Road Opening (MPRO) system in cooperation with University of California, Davis, researchers. Caltrans is increasing its use of the system that allows snow removal equipment operators to visualize the exact location of the road and roadside obstructions covered by ice and snow, increasing safety during mountain pass clearings. (See story, pages 24-25.)

Improving internal operations prioritized

Caltrans devotes the largest part of its overall research budget to its functional research. More than half of the total 2017-18 research budget, \$12.5 million, went toward research focused on improving Caltrans internal operations. Here, DRISI project managers lead selected projects that examine key parts of the transportation system, such as highway construction, design, environment, geology-based engineering (geotech) and structures, maintenance, pavement, multimodal transportation, transportation safety and other services. Individual studies frequently take several years to complete.

Caltrans also relies on collaborative ventures to stretch its research dollars, giving the Department access to transportation studies done at a national level. Caltrans

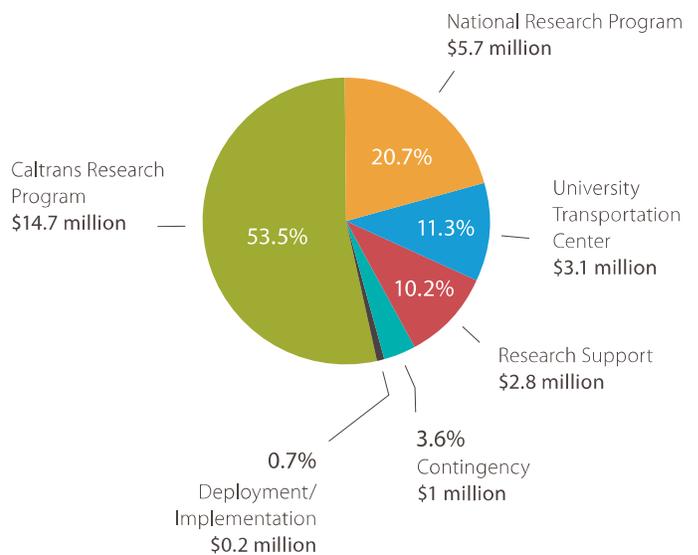
spent \$5.7 million in the last fiscal year to participate in national research programs and panels. As a testament to the powers of partnerships, the affiliation with the Transportation Research Board, an adjunct of the National Academy of Sciences in Washington, D.C., netted Caltrans an estimated \$32 worth of research-related activities for each dollar invested.

The Department also works extensively with universities that offer specialized technical expertise and state-of-the-art facilities, equipment and materials. Caltrans funded \$3.3 million in research activities in the last fiscal year at partnered research centers at UC Davis and UC Berkeley that do cutting-edge research in the fields of safety, seismic, intelligent transportation systems, alternative fuels and vehicles, and pavement.

Another \$2.1 million in task-based state matching funds went to three UTCs, led by San Jose State University, UC Davis and the University of Southern California. The centers provide Caltrans expertise in mass transportation, planning, rail and traffic operations. **MM**

Source: Caltrans Division of Research, Innovation and System Information

Allocation of Research Funds, 2018-19





Drivers of snow removal equipment have been field-testing the Mountain Pass Road Opening (MPRO) system in the Sierra Nevada for several years, including the monumental winter of 2016-17 along Tioga Pass in Yosemite National Park. Caltrans plans to deploy eight MPRO systems in the Sierra.

Way Paved for High-Tech Snow Clearing

Caltrans, Research Partners Devise System to Protect Workers, Spare Equipment

The development of the Mountain Pass Road Opening (MPRO) system provides a good example of how Caltrans' research projects can pay big dividends.

More than a decade after initiating studies to improve safety and efficiency for work crews clearing snow and ice from Sierra Nevada routes, Caltrans is now committing to a laser-based mapping system that gives exact coordinates of road locations — critical when you're working on the icy sides of precipices that can drop thousands of feet.

Until recently, snow equipment operators on Sierra passes had few visual indicators or landmarks to guide them as they drove 10-foot-wide snow removal machines along roadways often only 18 feet wide. Caltrans staff relied on techniques such as probing snowpack with poles, path staking, and using cable systems to mark road centerlines. Road markers can be damaged, or vandalized by winter users, resulting in operations delays and expensive repairs to guardrails, signage, roadside structures, and snow blowers — sometimes up to \$30,000 to \$40,000 for each incident.

Caltrans' Division of Research, Innovation and System Information (DRISI) first began looking for new ways to improve safety and efficiency on mountain snow-clearing operations in 2005. Working with the Advanced Highway Maintenance and Construction Technology Research Center at University of California, Davis, researchers developed an initial mapping system that created a high-accuracy Geographic Information System (GIS) map. After being successfully tested on State Route 108 (Sonora Pass) in Tuolumne County for five snow seasons, a more portable version of the MPRO system was developed and brought to State Route 120 through Tioga Pass in Yosemite National Park for a thorough evaluation.

The GIS map outlined buildings, road signs, and guardrails, based on information gathered with a Mobile Terrestrial Laser Scanner (MTLS) mounted on a Caltrans van during the summer months. The map's high-precision reference information is converted by the MPRO software into an image viewed by the equipment operator on the in-vehicle computer. The MPRO system also relies on a Global Positioning System receiver that

The MPRO system helped drivers safely navigate through deep snow, tracking the contours of the roadway underneath, and kept the snowblowing fleet out of harm's way.

receives satellite updates to enhance the GPS signal and improve accuracy.

Earlier DRISI research led to the development of the MPRO system. Stationary and airborne GPS data provided a foundation for the MTLs technology. Developed in collaboration with the UC Davis research center and Caltrans' Office of Land Surveys in 2008, the laser scanning system produces three-dimensional, photo-realistic geospatial data that combines high accuracy map coordinates with photos, and is used to help build the base data that guides the MPRO system.

The MPRO system got its real test during the 2016-17 winter, when more than 25 feet of snow buried Tioga Pass. Despite the challenging conditions, the system proved its worth in numerous ways, according to Caltrans managers.

Most important was the safety benefit for work crews. The MPRO system helped drivers safely navigate through deep snow, tracking the contours of the roadway underneath, and kept the snowblowing fleet out of harm's way.

The system also allows newer employees to get up to speed faster, and with more protections, on the hazardous job of pass clearings. Many years of light snowfall (with the exception of the 2016-17 drought-buster), and the difficulty in retaining seasoned personnel has cut into the amount of experience that Caltrans can call on during critical pass opening periods.

Obstacles hidden under mounds of snow and ice also pose a danger to crew and equipment. With an MPRO unit mounted on a snow removal vehicle, giving exact coordinates, operators can keep costly machinery out of debris fields outside of the roadways and avoid large rocks, trees, brush, and guardrail that can cause serious damage to equipment.

The task of mountain pass clearings is critically important to the economy of those regions. The spring openings turn on a spigot of tourist and recreation dollars that many mountain and foothills regions depend on until the next winter's arrival, when the gates again swing shut on high-country highways.

The MPRO system, and the research that went into it, demonstrates Caltrans' commitment to improving the efficiency and effectiveness of California's highway system, and also aligns with the Department's Strategic Management Plan goals of sustaining stewardship and efficiency. Caltrans plans on deploying eight new MPRO systems that will be redesigned on a tablet for portability. These systems will be used on SR 120, SR 108, and SR 4 (Ebbetts Pass) and are expected to be ready for use by spring 2020. **MM**

Source: Elaine Chan, Communications and Outreach analyst, Larry Baumeister, Project Engineer, Caltrans Division of Research, Innovation and System Information; Russell Modrell, Maintenance Manager, Division of Maintenance



A Mobile Terrestrial Laser Scanner was mounted on top of a Caltrans van in summer to map fixed road features for MPRO software.

Mileposts



The Mileposts section provides a summary of transportation issues affecting Caltrans and California.

MILE 1

Climate change reviews see hotter, smokier future

Hotter temperatures, more rainfall and an increased threat of wildfires are the biggest risks to Caltrans' highway network in far Northern California, Central Valley and adjoining Sierra Nevada, according to the latest in a series of climate change vulnerability assessments released by the Department.

District 2 is the second-largest of Caltrans' 12 regional districts. It takes in Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama and Trinity counties, and portions of Butte and Sierra counties. The terrain is heavily forested, and atmospheric warming is expected to increase both temperatures and rainfall — boosting the chances of flooding, wildfires and mudslides. A similar assessment was made for Caltrans District 6, made up of Madera, Fresno, Tulare, Kings and Kern counties. Risk assessments are being prepared for Caltrans' other regional districts.



MILE
2

Caltrans routes clean air funds to local transit systems

More than 150 local projects were earlier awarded nearly \$97 million from Caltrans' Low Carbon Transit Operations Program, funded through auction proceeds from the California Air Resources Board's Cap-and-Trade Program. These projects continue California's effort to reduce greenhouse gas emissions and improve the sustainability of public transportation systems around the state. More than 130 of the projects will specifically benefit the disadvantaged and low-income communities.

The \$97 million awarded for the 2017-2018 fiscal year was almost triple the previous year's \$34 million total.

Among the 152 total projects chosen for funding, 31 will offer free or reduced fares, 51 will see new or expanded service, 22 will add zero-emission vehicles, and 15 will improve passenger amenities at transit stops.

The Low Carbon Transit Operations Program was created to provide operating and capital assistance for transit agencies to reduce greenhouse gas emissions and



improve mobility, with a priority on serving disadvantaged communities. The Cap-and-Trade Program is one of many developed under [Assembly Bill 32](#) to fight climate change by reducing greenhouse gases and adopting other clean-air strategies.

MILE
3

Report updates lawmakers on project financing status



A law intended to keep transportation projects developed by regional or local agencies on track appears to be working as intended. As required by Assembly Bill 872, Caltrans submitted a yearly update on the Reimbursable State Transportation Improvement Program to the state Legislature. The law allows agencies to seek reimbursement from Caltrans for certain planned projects in advance of funds allocations made by the California Transportation Commission, with the aim of

removing financing delays and moving projects ahead. For the 12-month period ending March 31, 2018, Caltrans received 33 allocation requests from agencies seeking reimbursement for \$8.4 million in project costs, and 28 were filed within the required 90-day period and resulted in executed agreements. That compared with 21 of 30 projects in the previous year. The full [report](#) can be accessed on Caltrans website.



Dramatic, wide-open vistas — and a new, four-lane divided expressway — now greet travelers on State Route 14 north of the Lancaster/Palmdale area. Long envisioned by area officials, the project to revamp the four-mile stretch recently finished, and planning for the next stage of work is underway.

First Link of Safer Mojave Route Finished

State Route 14 Part of a Three-Stage Project Improving Access to Eastern Sierra

Recent travelers on State Route 14 in Kern County, a major freight and tourist corridor on the eastern side of the state, are now riding on a new stretch of highway in the rolling desert landscape that's a welcoming passageway to the beautiful Eastern Sierra. This corridor runs north from the Los Angeles/Lancaster area, connects with U.S. Highway 395, and brings local, national and international travelers as well as freight through the area that includes eastern Kern, Inyo and Mono counties.

The recent ribbon cutting for the first segment of the Freeman Gulch Project marked completion of the first of three projects planned to address critical voids between existing sections of four-lane divided expressway.

The completed segment converted what had been a two-lane highway into a four-lane expressway. It covers four miles, and improves safety for the traveling public by separating opposing traffic, removing passing restrictions, controlling and limiting access points, and providing adequate shoulder widths to allow drivers to regain control of errant vehicles without leaving the paved shoulder area.

In addition, the new shoulders provide much-needed areas for emergency and disabled vehicle parking, providing a safe refuge for vehicles until help arrives.

The former two-lane highway had become outdated for today's driving conditions. The mix of traffic and differences in posted speed limits — 65 mph for passenger vehicles and 55 mph for commercial and recreational vehicles — created congested conditions as cars slowed behind larger vehicles, leading to driver frustration and potentially unsafe passing maneuvers.

Segment two will upgrade 6.2 miles of two-lane conventional highway to four-lane expressway. This segment is currently in design, with construction expected to begin in 2020. Segment three will close the final gap and upgrade the last 7.1 miles of conventional highway to four-lane expressway, completing the long-anticipated vision for an Eastern Sierra Corridor.

This project that lies within Caltrans regional District 9 was made possible due to a unique partnership. A Memorandum of Understanding (MOU) was reached in 1999 and updated several times over the next 15 years

Project Spotlight



to leverage resources from three counties with a shared interest in transporting people and goods safely, and upgrading this corridor. The MOU covers several projects that are all recognized as mutually beneficial to all participants, and the agreement stipulates the funding structure for each project with the percentage and type of funding contributed by each participant. The State has committed just over \$5.5 million toward this \$37.4 million project. The agreement among Kern, Inyo and Mono counties and the State fully funds this project.

Caltrans regional District 6 based in Fresno and District 9 that oversees Eastern Sierra highway projects from its Bishop base carried the first segment of the Freeman Gulch work through to completion.

The project team faced extreme temperatures, high winds and encounters with the Mojave Green rattlesnake. The project was in a sensitive environmental area that presented several significant challenges.

The project site was within or near the habitat of 21 regulated species, and required nearly eight miles of exclusionary fencing to be cleared by biologists and installed before work could begin.

In addition, 60 days were planned to review the entire site prior to the preparation work ahead of construction. This was accomplished through coordination and communication between the contractor and Caltrans staff.

Granite Construction was the prime contractor on the first segment of the Freeman Gulch Project and completed the work on time and under budget.

When commitments are made among agencies on projects such as these that benefit residents, visitors, businesses and the goods movement industry, Caltrans fulfills a primary goal of providing safer roads and improving mobility while protecting the traveling public.

Lt. John Williams of Mojave California Highway Patrol said, "We are optimistic that through Caltrans' dedication to this project, in collaboration with the CHP, this project will help in reducing collisions and make the area a safer place to travel."

Ahron Hakimi, Executive Director of Kern Council of Governments, noted, "Great project, long overdue, it shouldn't take a generation for projects like this that saves lives, helps reduce congestion and helps move goods and people."

Caltrans District 9 Director Brent Green said, "I appreciate our local partners as well as the taxpayers, who recognized the importance of bringing this project to fulfillment." **MM**

Source: *Cindy Azima, Deputy District Director, Administration; Florene Trainor and Christine Knadler, public information officers, Caltrans District 9*



A pipeline to route water from the highway is installed as part of the Freeman Gulch project. The desert area is prone to flash flooding.



A \$55.2 million pavement replacement project is improving 104 lane miles of Interstate 880 in Alameda County from north of Fremont Boulevard overcrossing to the High Street separation and overhead. Construction began in May of last year and is due to be completed in January 2020.

Heading in the Right Direction

In SB 1's First Year, Hundreds of Highway Projects Under Way, and More Coming

A new slate of highway improvement projects for the coming years, funded in whole or part by the Road Repair and Accountability Act of 2017 (Senate Bill 1), were approved in October by the California Transportation Commission.

Meeting in Stockton, the Commission allocated \$669 million for more than 100 projects around the state. The funding will allow Caltrans to improve, repair or replace an additional 80 bridges, 200 drainage systems and more than 340 lane miles within California's highway network.

More than 50 of the projects will bring goods to market faster, help relieve traffic in the state's most congested cities, and provide additional funding on transportation investments that counties have made in their own communities.

The allocations represent the latest investment in the state highway network using SB 1 funds. In the past year, since approval of the new law, Caltrans crews on state highways have repaired more than 2,900 potholes, replaced or repaired more than 740 lane miles of pavement, repaired more than 37,500 feet of guardrail, replaced or repaired nearly 950 highway lights and traffic

signals, restriped more than 2,000 miles of highway to improve visibility and safety, and fixed 800 roadway signs.

To date, 53 projects have been completed. Caltrans has awarded or started construction on 90 projects and has begun work, including design and environmental clearance, on 357 projects. It's expected that the number of projects completed with SB 1 revenues will reach 100 by the end of 2018.

Among the projects approved:

- **Bridge Project on State Routes 57 & 91 in Orange County:** \$4.3 million bridge preservation project will revamp bridges on State Route 57 at various locations from I-5/SR-57 Interchange in the city of Orange to Nutwood Avenue in Fullerton, and on SR-91 at various locations from the SR-91/I-5 Interchange in Buena Park to Harbor Boulevard in Anaheim.
- **Bridge Replacement Project on State Route 44 in Shasta County:** Bridge project will replace the Hat Creek Bridge on State Route 44 in the town of Old Station. This bridge replacement project was allocated almost \$1.2 million of its \$9.8 million total cost; \$598,000 in funding was provided by SB 1.

- **Pavement Project on State Route 168 in Fresno County:** \$8.1 million pavement preservation project will upgrade barrier railing and improve 14.6 lane miles of State Route 168 from Sample Road to Oak Creek Road near Prather. This project was allocated \$1.2 million in SB 1 funds.
- **Traffic Management System Project on State Route 1 in San Francisco County:** \$6.6 million traffic management systems project will improve the flow of traffic by upgrading and interconnecting traffic signals on State Route 1 from Junipero Serra Boulevard to Lake Street in San Francisco. This project was allocated almost \$6.4 million; \$730,000 is coming from SB 1.

Many of the projects receiving allocations are part of the State Highway Operations and Protection Program (SHOPP), which is the state highway system’s “fix-it-first” program that funds safety improvements, emergency repairs, highway preservation and some operational highway improvements. While funding for this program is a mixture of federal and state funds, a significant portion comes from SB 1.

In another SB 1-related action, commissioners voted to commit more than \$72 million in new revenue

from the transportation funding law to dozens of local transportation improvement projects across the state.

The Commission approved 33 projects for paving, road rehabilitation, public transit expansion, pedestrian improvements and much more.

The 2019 Local Partnership Formulaic Program adopted by the Commission is the second cycle of SB 1 funding awarded to eligible cities and counties with voter-approved taxes, tolls and fees dedicated solely to transportation. In January, the Commission approved the first round of formula funding, dedicating \$176.5 million to 69 projects through fiscal year 2018-19.

The Local Partnership Program provides eligible self-help cities and counties with new revenue generated by SB 1 each year to fund a wide range of transportation improvement projects. Half of the funds are distributed by formula, while the other half are awarded through a competitive program. **MM**

Source: Caltrans Division of Public Affairs; California Transportation Commission

Caltrans Squeezes \$133 Million in Savings From Operations

Caltrans saved more than \$130 million in the 2017-18 fiscal year in its highway project delivery process, exceeding an annual efficiency target required as part of the Road Repair and Accountability Act of 2017 (Senate Bill 1).

Caltrans delivered its Annual Efficiencies Report to the California Transportation Commission at its October meeting.

In addition to directing half of its total revenues toward rehabilitating the State Highway System, SB 1 also requires Caltrans to find at least \$100 million in savings in its operations yearly that will go back into road repair and maintenance.

Caltrans identified how it saved \$133 million in the last fiscal year, which ended July 2018 — about \$129 million through cost avoidance measures, and \$4 million in cost reductions.

Caltrans credited these money-saving approaches:

- **Value Analysis studies.** A Caltrans team of subject matter experts not directly connected to the planning or design of a project are called on to analyze its function and cost. In 2017-18, nine major projects were assessed using the Value Analysis method. Studies on six of the projects yielded efficiencies valued at almost \$62 million, while three studies did not find less expensive alternatives to original plans.
- **Construction Manager/General Contractor program.** This process brings in a contractor much earlier than



Money was saved on the implosion of the old Bay Bridge footings.

the traditional design-bid-build method of developing highway improvement projects, where the contractor is hired after the design plans and specifications have been finalized. Caltrans saved an estimated \$44.5 million using this process for specified projects in 2017-18.

- **Streamlining environmental reviews.** By acting as the lead review agency for specified projects, Caltrans saved an estimated \$13.4 million in the fiscal year.
- **Accelerated projects.** There were 17 projects that were moved up in the delivery schedule, resulting in an estimated \$9.2 million in cost-escalation savings.
- **Highway LED lighting retrofit program.** Total annual savings were pegged at \$4.3 million.

- **Pavement Project on State Route 168 in Fresno County:** \$8.1 million pavement preservation project will upgrade barrier railing and improve 14.6 lane miles of State Route 168 from Sample Road to Oak Creek Road near Prather. This project was allocated \$1.2 million in SB 1 funds.
- **Traffic Management System Project on State Route 1 in San Francisco County:** \$6.6 million traffic management systems project will improve the flow of traffic by upgrading and interconnecting traffic signals on State Route 1 from Junipero Serra Boulevard to Lake Street in San Francisco. This project was allocated almost \$6.4 million; \$730,000 is coming from SB 1.

Many of the projects receiving allocations are part of the State Highway Operations and Protection Program (SHOPP), which is the state highway system’s “fix-it-first” program that funds safety improvements, emergency repairs, highway preservation and some operational highway improvements. While funding for this program is a mixture of federal and state funds, a significant portion comes from SB 1.

In another SB 1-related action, commissioners voted to commit more than \$72 million in new revenue

from the transportation funding law to dozens of local transportation improvement projects across the state.

The Commission approved 33 projects for paving, road rehabilitation, public transit expansion, pedestrian improvements and much more.

The 2019 Local Partnership Formulaic Program adopted by the Commission is the second cycle of SB 1 funding awarded to eligible cities and counties with voter-approved taxes, tolls and fees dedicated solely to transportation. In January, the Commission approved the first round of formula funding, dedicating \$176.5 million to 69 projects through fiscal year 2018-19.

The Local Partnership Program provides eligible self-help cities and counties with new revenue generated by SB 1 each year to fund a wide range of transportation improvement projects. Half of the funds are distributed by formula, while the other half are awarded through a competitive program. **MM**

Source: Caltrans Division of Public Affairs; California Transportation Commission

Caltrans Squeezes \$133 Million in Savings From Operations

Caltrans saved more than \$130 million in the 2017-18 fiscal year in its highway project delivery process, exceeding an annual efficiency target required as part of the Road Repair and Accountability Act of 2017 (Senate Bill 1).

Caltrans delivered its Annual Efficiencies Report to the California Transportation Commission at its October meeting.

In addition to directing half of its total revenues toward rehabilitating the State Highway System, SB 1 also requires Caltrans to find at least \$100 million in savings in its operations yearly that will go back into road repair and maintenance.

Caltrans identified how it saved \$133 million in the last fiscal year, which ended July 2018 — about \$129 million through cost avoidance measures, and \$4 million in cost reductions.

Caltrans credited these money-saving approaches:

- **Value Analysis studies.** A Caltrans team of subject matter experts not directly connected to the planning or design of a project are called on to analyze its function and cost. In 2017-18, nine major projects were assessed using the Value Analysis method. Studies on six of the projects yielded efficiencies valued at almost \$62 million, while three studies did not find less expensive alternatives to original plans.
- **Construction Manager/General Contractor program.** This process brings in a contractor much earlier than



Money was saved on the implosion of the old Bay Bridge footings.

the traditional design-bid-build method of developing highway improvement projects, where the contractor is hired after the design plans and specifications have been finalized. Caltrans saved an estimated \$44.5 million using this process for specified projects in 2017-18.

- **Streamlining environmental reviews.** By acting as the lead review agency for specified projects, Caltrans saved an estimated \$13.4 million in the fiscal year.
- **Accelerated projects.** There were 17 projects that were moved up in the delivery schedule, resulting in an estimated \$9.2 million in cost-escalation savings.
- **Highway LED lighting retrofit program.** Total annual savings were pegged at \$4.3 million.



Brighter Outlook for Transportation Network

SB 1 Grants Distributed for Highway Repairs, Transit Upgrades, Climate Projects

A wide range of transportation agencies, communities and projects throughout California have been the beneficiary of funding in recent months from the Road Repair and Accountability Act of 2017 (Senate Bill 1).

In August, California Transportation Commission (CTC) directed a total of \$690 million to more than 100 transportation projects. Depending on the project, that work will be paid for either entirely or in part by SB 1 revenues.

The CTC also approved spending more than \$1.3 billion on nearly 150 transportation projects to perform additional maintenance, improvements and construction in the state.

Most of these projects receiving allocations are part of the State Highway Operations and Protection Program (SHOPP), which is the State Highway System's "fix-it-first" fund that pays for safety improvements, emergency repairs, highway preservation and some operational highway improvements.

Other programs created by SB 1 — Solutions for Congested Corridors, Trade Corridor Enhancement, and Local Partnership Program — also will benefit from the latest round of allocations by the CTC. These programs are designed to tackle congestion, support valuable trade corridors, and bolster local agency efforts to invest in transportation.

The CTC also directed more than \$122 million in SB 1 dollars for 11 rail and transit projects under the Transit and Intercity Rail Capital Program that concentrates on modernizing transit systems, reducing greenhouse gas emissions, and making safety improvements.

Approvals for other SB 1-related transportation programs made recently:

Sustainable Communities grants

Caltrans earlier awarded \$41 million in local transportation planning grants for 64 projects that support more sustainable communities, reduce transportation-related greenhouse gases, and adapt for the effects of climate change.



The Altamont Corridor Express carries riders between the Central Valley and Bay Area. SB 1 funds will help study regional rail connectivity.

SB 1 provides \$25 million annually for this grant program, which is awarded competitively and by formula to eligible projects. A combination of state and federal sources provide the remainder of the funding.

Caltrans develops the grant guides and applications, and awards the money. To assure that funds are being spent properly, the Department receives and reviews all the invoices associated with approved projects, and gets quarterly progress reports. Representatives of Caltrans' district offices also participate in technical advisory committees for the grant studies.

The grants support regional strategies to cumulatively reduce state's greenhouse gas levels 40 and 80 percent below 1990 levels by 2030 and 2050, respectively.

Among the projects awarded funding:

- Altamont rail connection feasibility study, \$750,000;
- The Tri-Valley San Joaquin Valley Regional Rail

Authority will study the possibility of rail connectivity between Bay Area Rapid Transit (BART) and Altamont Corridor Express, providing direct service connections and helping meet mega-regional and state goals for a vital rail link between the Bay Area and Central Valley.

- Riverside County Highway 74 multi-modal transit plan, \$133,000: A multi-modal transit plan for the State Route 74 corridor from Lake Elsinore to Perris is being developed. Low-income communities along this route face significant barriers to mobility, including limited transportation infrastructure, lack of pedestrian and bicycle access to transit and community resources, and limited transit.
- Stockton Boulevard (Sacramento) Complete Streets Plan, \$354,120: The city of Sacramento plans an analysis of a four-mile stretch of Stockton Boulevard, with the intent to transform a blighted corridor with a history of traffic injuries and provide multi-modal transportation connections to the downtown city core. A complete list of grant projects can be found [here](#).

Adaptation Planning grants

The CTC earlier awarded \$7 million to 22 local and regional agencies to study ways to strengthen their transportation network in the face of climate change and extreme weather events. SB 1 will provide a total of \$20 million over three years for this grant program. Among projects awarded funding are:

- Sea level rise adaptation plan for Humboldt Bay transportation infrastructure, \$425,000: This project will develop a plan for vulnerable transportation infrastructure along the shoreline in Humboldt Bay that is highly susceptible to sea level rise and extreme weather events.
- Amador and Calaveras County extreme weather and natural disaster needs assessment, \$150,466: The impacts of extreme weather events caused by wildfires, droughts, flooding, mudslides and tree mortality on roadways and other related infrastructure in the Sierra Nevada foothills will be studied. Best practices against major damage, costs to the region, and funding sources will be identified.
- Ventura County transportation emergency preparedness plan, \$221,325: The Ventura County Transportation Commission and Santa Barbara County Association of Governments will coordinate with transit operators to better prepare for natural disasters.

These programs are designed to tackle congestion, support valuable trade corridors, and bolster local agency efforts to invest in transportation.

The Adaptation Planning grants are listed [here](#):

State of Good Repair program

Caltrans distributed \$105 million to dozens of local governments and agencies around the state to rehabilitate and modernize existing local transit systems for the 2017-18 fiscal year. SB 1 requires that qualifying agencies receive this amount from the State of Good Repair program each fiscal year.

Funds are awarded to eligible agencies on the basis of population and transit operator revenues. The money is intended to maintain or repair existing transit vehicle fleets or facilities, or help in the design, acquisition or construction of new vehicles or facilities to maintain existing transit services.

Among the awards:

- \$87,090 to Tehama County for the Walnut Street rehabilitation and bringing the Red Bluff Transit Transfer Center up to ADA standards, as well as other facility upgrades.
- \$815,830 to the city of Los Angeles for the electrification of 20 bus shuttles.
- \$67,436 to the Morongo Basin Transit Authority in San Bernardino County for bus stop upgrades to improve accessibility and safety.
- \$1,256,425 to Los Angeles' Metrolink to refurbish and upgrade 14 railcars to improve passenger comfort and safety, reliability and upgrade to current standards.

Each recipient agency is required to submit an annual expenditure report on all activities completed with State of Good Repair funds to Caltrans. Revenues and expenditures also must be identified in agencies' annual audits.

State of Good Repair awards: www.dot.ca.gov/drmt/spstasgr.html. 

Source: Caltrans Public Affairs Office; public information officer Angela DaPrato



This section of rolling coastal foothills in Santa Barbara County is part of the La Purisma Conservation Bank that historically served as cattle grazing property. Caltrans has purchased conservation credits in the one-time ranch that is home to the endangered California tiger salamander.

Investing in Habitat Protection

Advance Mitigation Program, with SB 1 Funds, Balances Impacts from Projects

Caltrans is taking a proactive approach to offsetting the environmental impacts of transportation projects, particularly when mitigation is required. Now, recent California legislation and funding is backing those efforts with the establishment of an [Advance Mitigation Program](#).

The Road Repair and Accountability Act of 2017 (Senate Bill 1) directs \$30 million into an account over each of the next four years to pay for Caltrans' natural resource mitigation needs in advance of project impacts. Such purchases can come from conservation banks, mitigation banks, in-lieu fee programs or the payment of fees associated with conservation plans, mitigation credit agreements, or habitat restoration.

Future qualifying Caltrans transportation projects will "buy" mitigation from the Advance Mitigation Program, replenishing the program account and ensuring it is self-sustaining for future work that requires environmental safeguards.

With these funds, Caltrans' Advance Mitigation Program will plan and implement environmental

mitigation for selected transportation projects much earlier in the planning process.

Protecting habitat before a transportation project breaks ground is expected to assist with regulatory reviews and permitting, as well as save time and money. Advance mitigation also is intended to lead to more comprehensive environmental protection because the offsets will be done first and be better planned with resource agency input early in the process. Select mitigation sites can be purchased or restored early to compensate for future impacts from construction of one or more transportation projects in the area.

Caltrans has long strived to design transportation projects that impose the least possible impact on the environment. But when impacts to natural resources associated with proposed projects are unavoidable, Caltrans takes certain steps to offset or compensate for such an alteration. Purchasing land for habitat conservation or creation is one example.

This is called compensatory mitigation, and several laws require it. However, Caltrans' compensatory mitigation is

Advance mitigation will allow Caltrans to combine forecasted mitigation needs that are anticipated from multiple future transportation projects within the same general area.

usually tied directly to a transportation project, and the determination of impacts often comes late in the project development process. This delays transportation projects and adds costs, and sometimes restricts the extent of mitigation options.

In a typical year, Caltrans obtains environmental permits on about 100 transportation projects that each present unique regulatory challenges. For instance, Caltrans spends an estimated \$50 million on average just for wetlands and endangered species mitigation to comply with federal laws and regulations. That does not include expenditures to comply with California laws and regulations.

Advance mitigation can establish larger and better-connected ecological reserves and conservation areas. Advance mitigation will allow Caltrans to combine

forecasted mitigation needs that are anticipated from multiple future transportation projects within the same general area. With advance mitigation, Caltrans can meet conservation goals in addition to regulatory requirements.

And if Caltrans cannot use all its mitigation “credits,” the California Streets and Highways Code allows the sale of excess credits to other transportation agencies with mitigation needs.

Caltrans was in the process of finalizing its advance mitigation planning guidelines as of press time, and workshops to solicit public comment were held in January 2019. More information can be found at advancemitigation.dot.ca.gov. **MM**

Source: Caltrans' Project Delivery Quarterly, Summer 2017 issue; Amy Bailey, Office Chief, Caltrans Division of Environmental Analysis



A pond on the La Purisma Conservation Bank property nourishes wildlife that live on the land dedicated to habitat conservation.



The California tiger salamander is under threat in its historic range, and Caltrans is helping preserve the species with habitat purchases.



The Carr Fire along State Route 299 in Shasta and Trinity counties grew into a monster before finally being brought under control in early September. In addition to causing seven deaths and burning almost 230,000 acres, the blaze closed 27 miles of SR 299. Caltrans will spend \$21 million on repairs.

Signs of Fiery Times Ahead

Caltrans Mobilized Quickly to Protect Travelers, Restore Damaged Highways

Until recently, the fire season put Caltrans on alert for an intense but relatively short duration. Today, defending the State Highway System against destructive wildfires, and their aftermath, is no longer a three- to four-month exercise.

The disastrous Camp Fire, which now ranks as California's deadliest fire ever, and the Los Angeles-area blazes that broke out in mid-November last year are startling proof that the state's fire season is lasting longer, and becoming more destructive than ever.

After a series of small outbreaks last June, following a drier-than-usual winter, fires began to erupt around the state in July.

During one of the most fiery Augusts in the state's history, Caltrans deployed hundreds of employees and contractors who worked 12- to 16-hour days with little rest — staffing road closures, repairing sections of guardrail and scorched pavement, removing burned trees and debris, fixing drainages, replacing burned signs and highway sensors, and controlling erosion and stabilizing roadside terrain against mudslides.

Only a few months later, fires in Butte County and Southern California grew to monstrous proportions and caused the worst loss of lives and property in state history.

Costs are still being finalized, but it appears all but certain that fiscal year 2018-19 will go down as Caltrans' most costly fire season.

From July through the end of November, Caltrans' costs from 28 blazes that damaged state highway property and infrastructure approached \$150 million. Caltrans had already planned to spend almost \$100 million in repair costs before the Camp and Los Angeles-area fires struck. Those blazes were expected to add at least \$48.5 million to the final toll.

This year's path of destruction follows on the heels of a disastrous 2017 season. Caltrans spent a total of \$93.4 million to repair damages caused by 27 fires last year.

The estimated cost of fixing fire damages to the state highway network in the last two years will be \$243 million — almost six times the amount spent in FY 2016-17 and 2015-16. The cumulative damage in those two earlier years was less than \$47 million — \$13 million in 2016-17

From July through the end of November, Caltrans' costs from 28 blazes that damaged state highway property and infrastructure will likely approach \$150 million.

and \$33.4 million in the previous period.

Here's a breakdown of Caltrans' fire response efforts during, and after, major blazes in Northern, Southern and Central California.

Northern California

Driven by 50-mph winds, the Camp Fire erupted Nov. 8 in the Sierra Nevada foothills east of Chico and spread quickly. It roared through the town of Paradise, eventually charring more than 153,000 acres from Chico in the west to the Feather River Canyon in the east. More than 80 persons perished, and nearly 20,000 structures — including 13,500 residences — were destroyed.

State Routes 70 and 191 experienced the bulk of the damage and repairs. Caltrans took erosion control measures, such as hydroseeding and straw wattle placement, to prevent landslides.

By the time it was fully contained in late September, the Mendocino Complex Fire in Colusa, Lake, Glenn and Mendocino counties had become the largest wildfire in California's recorded history, topping last year's Thomas Fire in Ventura and Santa Barbara counties.

The Mendocino Complex Fire closed portions of State Routes 20, 29 and 175 in Caltrans' regional District 1 (North Coast) on its way to burning a total of 460,000 acres.

A \$10.5 million emergency contract was awarded to begin repairs on SR 175 and SR 20. Preliminary estimates list more than one mile of guardrail to be replaced, as well as damaged signs, fencing, drainage systems, slopes and other infrastructure.

The Carr Fire grew from a small blaze started by an errant vehicle along State Route 299 west of Redding to an inferno that blackened nearly 230,000 acres and claimed seven lives. The Carr Fire closed 27 miles of SR 299 in Caltrans District 2, which is based in Redding. SR 299 is a vital route for travel and commerce between interior Northern California and the North Coast.

Caltrans staff began assessing the damage and repairs needed to quickly return the highway to safe working condition. An emergency "director's" order, issued when

repairs are deemed critical, was obtained to replace guardrail, culverts, signs and re-do new erosion control, an estimated \$21 million cost.

The Klamathon Fire was the first of the major fires to strike the District 2 area, igniting next to Interstate 5 in Siskiyou County on July 5 and burning 38,000 acres in a two-week rampage. The fire destroyed 10 miles of fencing, guardrail, 120-plus road signs and sensitive highway electronics, and charred 500 trees. A \$1.5 million Director's Order was approved to fix those damages, and reseed the area before winter rains arrive.

The fire danger became very real for District 2 personnel working out of the Redding office. The fire roared to within a mile of the facility, cutting power to the neighborhood and forcing evacuations. Shortly before the lights went out, however, quick-thinking employees managed to move and set up critical communications and traffic management operations at a Caltrans facility one-half hour south in Red Bluff, out of fire danger.

Caltrans deployed three of its Satellite Communication Trailers, or SATCOMs, to aid communication, visual assessment and administer temporary power in District 1 and District 8 (San Bernardino/Riverside counties).

Hundreds of Caltrans employees who had to work long, stiflingly hot, and smoky hours in the field were aided this year by the arrival of safety vans — mobile storehouses stocked with personal protective equipment,



A contracting crew, under orders from Caltrans District 2, acted quickly to replace damaged signs along SR 299, near Whiskeytown.

such as respiratory and heat illness protection, safety glasses and vests, water, and food. During the fires, these vans traveled to the front lines to bring supplies to field employees at highway closures, maintenance stations and wildfire base camps.

Southern California

Losses from the **Woolsey** and **Hill** fires in the Los Angeles and Ventura County canyon lands are still being tallied. The flames shut down U.S. Highway 101 and Pacific Coast Highway, destroying hundreds of homes, buildings, power lines, vehicles and equipment. More than 100,000 acres were devoured.

The **Cranston Fire**, near the communities of Idyllwild and Mountain Center on State Routes 74 and 243, burned more than 13,000 acres and forced 7,000 residents to leave their homes.

In addition to the Cranston, Caltrans responders had to deal with multiple wildfires that included the **Valley Fire** in the San Bernardino Mountains and the **Holy Fire** in the Lake Elsinore area. More than 20,000 people had to flee the Holy Fire.

The Cranston Fire closed portions of SRs 74 and 243, and left a path of baked earth denuded of vegetation that's highly susceptible to flash flooding. More mudslides are feared over the next five years as the mountain landscape recovers.

Long-term repairs are being made to culverts, debris flow basins and vulnerable slopes.

Central California

The **Ferguson Fire** that began in mid-July closed portions of SR 140 and briefly forced the shutdown of Yosemite National Park. The fire claimed 97,000 acres before being contained in mid-August.

The **Donnell Fire** along SR 108 in the Carson-Iceberg Wilderness, within District 10, burned more than 36,000 acres and was brought under control in early September.

Caltrans also works with federal and state agencies to assess potential impacts to highway resources that lie in the path of fire-damaged watersheds. Caltrans participates in the federal Burned Area Emergency Response (BAER) program to identify and manage potential risks to resources within the National Forest System, and is a member of the state-level Watershed Emergency Response Team that also assesses post-fire changes to burned landscapes.

In the case of the Ferguson Fire that burned forested federal lands along State Route 140 to Yosemite National Park, a BAER assessment team that included Caltrans representatives concluded that up to 10 locations along SR 140, primarily culverts and bridges, were likely to be inundated this winter by post-fire debris flows through burn areas.

After an assessment of the area, a \$5 million director's order was issued to address drainage and culvert damages, erosion/debris flow issues, burned tree removal and other fire impacts. District 10 staff also have coordinated with the National Weather Service this winter on a new weather monitoring system for the section of SR 140 near the Ferguson Fire burn scar. A color-coded risk assessment is issued ahead of storms with potential to send post-fire debris flows onto the roadway, allowing Caltrans to close SR 140 and protect travelers.

Statewide

A total of six director's orders were executed statewide, with a total construction amount of about \$45 million. In addition, emergency declarations totalling \$48.5 million were ordered to repair damages from the Camp, Woolsey and Hill fires.

Not only is Caltrans replacing what's been destroyed, but is investing in materials that can better withstand disasters, such as new guardrail built with metal posts instead of wood.

At its Sacramento headquarters, Caltrans activated its Department Operations Center to coordinate resources



The Carr Fire on SR 299 burned right up to the road's edge, and in some spots jumped it, destroying guardrail, signs and pavement.



Caltrans District 2 crews inspect a section of Interstate 5 that had been closed because of the Delta Fire burning in the Shasta National Forest. The fire had consumed more than 62,000 acres north of Shasta Lake. Districts 2 and 1 had to contend with the largest and most deadly blazes in the state.

and strategy with its district offices and emergency response partners, such as the California Office of Emergency Services, National Guard and California Highway Patrol.

From its emergency center, Caltrans used a high-tech array of tools to monitor the fires and protect state highway resources. Caltrans utilizes a web-based map application, the Emergency Management Common Operational Picture, that allows emergency managers to monitor state highway assets during events such as fires, and get a real-time look at roads that may be threatened and need to be closed to protect the public.

Caltrans employees also joined other agency representatives in staffing the State Operations Center in Mather, outside Sacramento, which served as the central communications hub distributing information and fire updates.

Caltrans' other emergency response systems were put to the test. District 2 employees were notified of the pending emergency situation through the Everbridge communications system that relays text, email and phone calls. Everbridge has been recently installed at all 12 regional districts, and complements the existing Highway Information Network (CHIN) notification system.

Similarly, Caltrans used another email-based alert system, FireCast, to give field staff daily fire danger ratings. Eventually, it's expected that FireCast will project the path of blazes along the State Highway System to better warn

field staff and the public. It's intended to help guide where equipment should be staged and what roads should be closed. The Department already employs a ShakeCast alert system to notify Caltrans staff when an earthquake of a certain magnitude occurs.

In the future

Most climate models indicate that the past two years represent the new normal for California, with more frequent and intense wildfires fueled by higher temperatures and drier conditions. To better assess risks and proactively protect state highway infrastructure, Caltrans has commissioned climate change studies for each of its 12 regional districts.

Changing weather patterns now extend the danger of massive fires well into the winter months. For example, the Thomas Fire burned about 282,000 acres and destroyed more than 1,000 structures in Ventura and Santa Barbara counties in December 2017, well past the traditional fire season. In the near future, Caltrans crews can be expected to go from protecting travelers from wildfires — then a few days later, hop in the cabs of their snow removal machines to clear icy roads. **MM**

Source: Herby Lissade, Assistant Division Chief; Rene Garcia, Emergency Management Office Chief; Caltrans Division of Maintenance; Erin Von Tersch, public information officer, Public Affairs



The intercity train fleet overseen by Caltrans and operated by Amtrak throughout California is transitioning in new Charger locomotives that are more powerful, yet are far-cleaner burning, than previous diesel engines. The Chargers were paid for with federal and Proposition 1B funds.

State Plan Puts Rail Revival on Fast Track

Workhorse of Yesteryear Can Help Solve Today's Congestion, Pollution Woes

Railroads that transformed California almost 150 years ago are poised to again be a vital transportation and economic force for the Golden State.

A vision for a new era of rail service to serve a changing California is presented in the California State Rail Plan, recently released by Caltrans after several years of study and consultation with its transportation partners and stakeholders.

The Rail Plan lays a path for modernizing the state's rail infrastructure and service through 2040. It proposes to build, in stages, a unified statewide rail network that better integrates passenger and freight service, connects passenger rail to other transportation modes, and supports expanded freight capacity to foster future economic growth.

Now is the time, the plan says, for California to embark on expanding and improving the state's rail network. The state represents the world's fifth-largest economy; is home to nearly 40 million people; supports world-class cities, universities and research centers; and hosts the world's most innovative and technologically advanced companies. The state's agricultural industry feeds the nation and world. Ports through which goods and products flow and supply the rest of the nation are a center for international trade. California also draws hundreds of millions of visitors each year.

But in its current condition, California's rail infrastructure and related services are too limited to meet the needs of many travelers, the growing economy, or more

stringent environmental standards. A significant portion of the state rail network, much of it built a century earlier, is reaching the end of its useful life.

Other parts of the state's aging transportation infrastructure are likewise overburdened. Vehicle congestion has led to crippling commute times on many of the state's highways, creating bottlenecks in the movement of goods and restricting access to workplaces and popular destinations. Quality of life is further impacted by transportation-related air pollution. Extreme weather generated by greenhouse gas (GHG) emissions and a changing climate also threatens the state's transportation network.

The Rail Plan contends a rail renaissance will go a long way toward solving those problems. Rail is well positioned to capture an increasing percentage of passenger market, and capacity already exists to expand service and improve performance. Longer trains, more frequent service, better connectivity and easier access will entice more ridership, the Rail Plan predicts, reducing average costs per passenger. Trains on more frequent schedules and traveling faster will be competitive with auto and air travel, and reduce harmful emissions.

To improve the freight rail network, the Rail Plan proposes staged investments. In turn, an upgraded freight system will help shift goods movement away from congested roadways. To accomplish these goals, a combination of public and private investment will be required.

View the plan at www.californiastaterailplan.com.

California Rail Network Today

Physical Size: Nation's most extensive passenger and freight rail system, with more than 10,000 passenger and freight route miles.

Freight Volume: About 51 million tons of freight generated in-state, 94 million tons received from out of state, representing 27 percent of the nation's intermodal volume in terms of units (more than 30 million tons of cargo annually). State's freight railroad loads projected to increase by 38 percent by 2040.

All Aboard: More than 70 State-supported and Amtrak-operated intercity trains run per day in California, attracting 5.6 million boardings annually, up from 3.6 million a decade earlier. California commuter rail ridership grew to nearly 33 million trips in fiscal year 2016, up from 21.6 million trips a decade earlier.

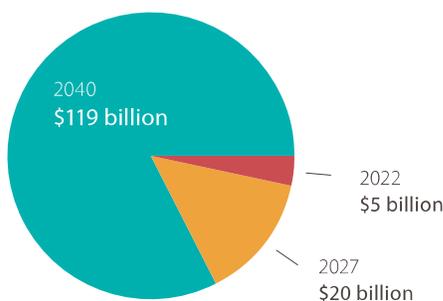
State Population: Now 39 million, almost four times its 1950 population of 10 million, when the core of California's highway (interstate) transportation system was built. The population is projected to grow to 50 million by 2040.

State Rail Plan: 2040 Vision

The Rail Plan sets these goals by 2040:

- **More Trains, More Often** — Expanding passenger rail services to serve most of the state, including rural areas.
- **Integrated Services** — Hub stations can allow seamless transfers among services, such as rail and bus or plane. Hubs provide connection points to local and regional transit systems, providing fast, frequent access to regional destinations. An integrated ticketing system allows trips to be booked on a single ticket, eliminating the need to piece together itineraries.

Overall Capital Program Time Horizon



Achieving the 2040 Vision will require State, regional and local investment totaling \$144 billion. This strategy of investment is intended to capture a bigger slice of the growth in all trips by 2040.

All Aboard: More than 70 State-supported and Amtrak-operated intercity trains run per day in California; attracting 5.6 million boardings annually, up from 3.6 million a decade earlier.



Ridership and fare revenue have risen substantially as a whole for the Amtrak intercity rail service, overseen by Caltrans, since 2014.

- **Coordinated Schedules** — Services will be coordinated in a "pulsed" schedule across the network to reduce wait times and allow direct transfers.
- **Frequent Service** — To grow ridership and drive down costs and subsidies. Trips would be significantly faster with High-Speed Rail service.
- **Customer Focus** — Enhanced ticketing, scheduling, and passenger information.

Timeline

2022

The electrification of Caltrain, the Bay Area-Santa Clara commuter line; expansion of rail service to Redlands, Salinas, and Larkspur; and increased schedule frequencies on intercity and regional rail corridors.

In addition:

- Assisting communities in better connecting transit systems to rail, and enhancing station area functions.
- More bus connections.
- Land use planning and development to cluster jobs and housing at station hubs.
- Strategic planning for fleet management, replacement and expansion.

- Conducting targeted investments in integrated ticketing and travel planning.
- Estimated 2022 capital costs: \$5.17 billion

2027

Focus on initial High-Speed Rail (HSR) services, improvements for integrating intercity and regional rail with initial HSR, and maximizing service in existing rail corridors. Key components: Beginning HSR service on initial segments; with significant growth in intercity and regional rail frequencies on all existing corridors.

In addition:

- Initiation of statewide hub operations with varied services and multimodal travel connections, and “pulsed” trip schedules.
- Full use of programmed passenger corridor capacity statewide.
- Full use of negotiated passenger service capacity on existing freight corridors.
- Targeted investments at hubs.
- Fully developed and operational integrated ticketing; and
- Implementation of a new fleet strategy.
- Estimated 2027 capital costs: \$19.76 billion.

2040

Represents the full build-out of an integrated statewide network. Highlights:

- Completion of the San Francisco Downtown Extension and a new Transbay tube, allowing fast service throughout the Bay Area and connecting Sacramento.
- Completion of corridor investments in the Los Angeles Basin.
- Significant new regional services in the Central Valley, on the Central Coast, and in the North Bay.
- Expansion of network capacity in full realization of the integrated service goals.
- Intensification of services, with more frequencies and higher speeds, implemented during the 2022 and 2027

horizon years.

- Estimated 2040 capital costs: \$119.8 billion

Freight

With competition from multiple transcontinental freight routes and seaports along the East Coast, West Coast, and the Gulf of Mexico, it’s imperative that California upgrades its freight transportation network, the Rail Plan contends. Through 2040, the plan calls for these improvements:

- Trade corridor improvements to shift a share of freight loads from highways-bound trucks to freight rail, and reduce transportation and delivery bottlenecks.
- Assistance to short lines that link many of the state’s freight-intensive industries, ports and principal trade corridors. Programs should provide grants and loans to improve and upgrade track, rail network access.
- Grade-crossing improvements or investing in grade separation programs to enhance safety and reduce vehicular and pedestrian delays.
- Additional terminal and yard capacity. Expand intermodal (rail/truck) terminal capacity in California, particularly in urban centers with access challenges on congested roadways.
- Short-haul rail shuttle improvements for more efficient freight connections between ports and distribution centers.
- Advancement of zero- and near-zero-emissions technologies for locomotives.

Estimated cost: Based on earlier analysis, the total freight improvements will cost between \$20 billion and \$40 billion. In some regions, most or all projects address joint-use passenger and freight facility needs.

Shared responsibility: Long-term planning for freight improvements can be difficult because the state does not own the infrastructure, and the freight rail industry is sensitive to releasing information on their long-term projects. However,

Spatial Efficiency

Passenger rail is far more spatially efficient than air travel or cars.

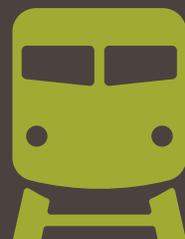
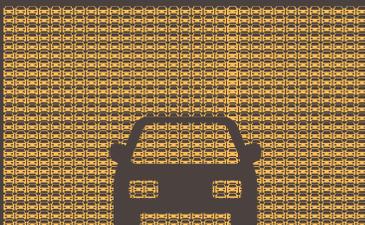
800 cars



7 airplanes



1 train



there are opportunities to work with the freight railroads, and to maximize state money by investing in projects that benefit an entire corridor rather than individual projects.

Improving Safety

Traveling by train is inherently safer than driving in a car. Fatalities per mile are 17 times more likely in an automobile than in an intercity passenger train, according to the Federal Railroad Administration.

Ongoing safety investments include:

- Positive Train Control, an advanced safety system designed to automatically stop a train before potential train-on-train, speed-related, and signal-related incidents occur.
- At-grade crossing improvements, such as crossing gates, warning systems and physical barriers.
- Grade separations to eliminate interaction between trains and roadway users.
- Convincing drivers to take trains instead will lead to reductions in the amount of vehicle miles traveled, which in turn lowers incidences of traffic accidents. Also, moving freight by rail reduces the number of trucks on roads — reducing congestion and the potential for truck-related accidents.

An Economic Engine

According to the plan, investments in California’s rail system will generate greater economic activity: new construction, more jobs, and growing tax revenues.

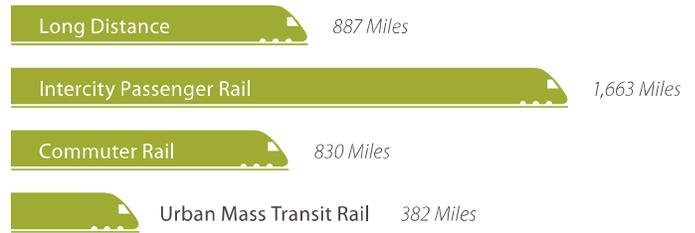
- The \$40.8 billion of direct expenditures identified in the Rail Plan will result in a total output for the economy of nearly \$77.5 billion by 2040 — a payout of nearly two dollars for every dollar invested.
- Predicted to create nearly 463,000 full-time jobs across various industries, with a \$28 billion payroll.
- By 2040, state and local tax revenues anticipated from the expenditures would approach \$2 billion, and federal tax revenues were estimated at \$5.4 billion.

A Greener Way to Travel

The Rail Plan advances the state’s commitment to reduce greenhouse gases and other pollutants.

- By 2040, more than half of passenger trips and the majority of passenger miles of travel is predicted to take place on electrified trains in California. Diesel-electric and other alternative clean technology passenger and freight locomotives will reduce greenhouse gas emissions.
- By diverting 88 million daily passenger miles from highways to cleaner-burning trains, more than 13 million metric tons of carbon dioxide equivalence would be eliminated annually — comparable to planting more than 166 million urban trees every year.

Passenger Rail Route Mileage



Freight Rail Route Mileage



- Rail is an energy-efficient way to move freight. According to federal statistics, an average freight rail car moves 10.6 miles per gallon of fuel consumed, while an average combination truck moves 5.9 miles per gallon.

Sparing the Highway System

The system could accommodate 1.3 million daily riders by 2040 if train service is expanded, upgraded and integrated with transit systems, the Rail Plan asserts — a twelvefold increase in ridership from current levels of 115,000 trips per day on intercity lines.

- The increased ridership represents the equivalent to the rail network accommodating 1.5 times the current daily traffic volumes of the entirety of I-5, from the Oregon state line to the border with Mexico.
- According to 2040 projections, the shift from roads to rail will result in 74 million fewer vehicle miles traveled on highways, easing congestion and wear-and-tear on highway infrastructure.

The Rail Plan Advisory Committee included representatives from diverse groups, including passenger rail operators, planning agencies, freight rail interests, tribal nations, private railroads, ports, transit operators and neighboring states. Advocacy groups representing environmental, disadvantaged communities, livable community/ active transportation, and agricultural interests also participated on the committee. **MM**

Source: *California State Rail Plan*



Caltrans Easing Burden for ADA Travelers

New Railcars, Station Platform Changes Will Improve Access and Comfort

New railcars that will give greater mobility to riders with disabilities have been ordered by Caltrans to add to its San Joaquin intercity train routes. The 49 cars should begin rolling on the tracks starting in 2020.

The new passenger cars, being built by Siemens Mobility in Sacramento, represent a major upgrade in comfort and accessibility for riders who rely on Americans with Disabilities Act (ADA) services. The total project cost is \$152 million, paid for by a Federal Railroad Administration grant and state Proposition 1B bond funds.

Among the state-of-the-art ADA amenities aboard the new cars:

- Aisleways throughout the entire train at least 32 inches wide to provide ample space for people using wheelchairs to access all rail car areas, including restrooms. Interior vestibule doors also will slide open and close automatically, offering passengers in wheelchairs easier access when moving from car to car, or the ability to execute a 180 degree turn.
- Café cars are still in the development stage, but will be designed with compliant reach ranges for ADA passengers to access food service amenities such as condiment station items, and accessible counter height at food service area for service and payment. The café cars will include ADA seating areas to accommodate passengers choosing to stay in their mobility device, and side transfer-capable seating to allow moving to a seat from a mobility device. For passengers choosing the latter, there will be an area for wheelchair storage.
- State-of-the-art restrooms will include touchless controls for sink, dryer and soap dispenser. The restroom is designed to be as roomy as possible, exceeding the 35 inch-by-60 inch federal clear floor space requirement.

Vertical and horizontal grab bars will be mounted along two walls. All restroom equipment will either be touchless or operable with one hand, and all push buttons can be activated by the touch of a finger or fist. Caltrans is conducting its accessibility work with input from disability access advocates throughout the state.

"We are very excited about the prospect for people who use wheelchairs to board trains independently once the mini-high platforms are constructed," said Autumn Elliott, senior counsel for Disability Rights California. "We were also thrilled to hear that people who use wheelchairs will be able to travel the full length of the train once the new train cars are in place."

Advocates from Disability Rights California and other disability rights organizations, including independent living centers throughout the state, have provided important feedback to Caltrans as it develops the design of its café cars and restrooms.

Caltrans also is working with the San Joaquin and Capitol Corridor Joint Powers Authorities to build mini-high platforms at existing stations to allow level boarding for passengers with disabilities. Automatic "gap fillers" on the new railcars will extend from the railcar to the mini-high platform, creating an ADA-compliant interface/ bridge between the train and platform, making it easy for passengers using wheelchairs, pushing strollers, rolling bikes, or carrying heavy luggage to board railcars without help.

Construction of the special platforms is scheduled to start in 2023. **MM**

Source: Momoko Tamaoki, Rail Transportation Manager, Caltrans Division of Rail and Mass Transit

From the Archives

Boulders that would serve as a retaining wall holding back the Pacific surf await placement during a construction project along State Route 1 near Sea Cliff, in Ventura County. The photo was taken on a mild day along the Southern California coast, April 1, 1955.

