



Director's Message

We're on it.

Caltrans has already begun the extensive effort to make improvements required by Senate Bill 1 (SB 1) — the Road Repair and Accountability Act of 2017.

The Act is expected to raise about \$54 billion over the next decade to fix roads, freeways and bridges. It also promises transformative investments in transit, rail, freight, and all components of a sustainable and integrated multimodal system.

SB 1 is, of course, much more than a funding package. It establishes high expectations for improvement over the next 10 years. The job is enormous. It will require every tool in our box. That will include bolstering our workforce. So we are holding career fairs across the state to recruit qualified workers to help us deliver on SB 1 commitments.

We are expediting more than \$285 million in pavement projects, months before revenue from SB 1 even starts to accrue this November. In many cases, construction crews are already on the job.

Along with the road surface improvements, you also will see hundreds of miles of new road striping. The striping we put on that pavement will be wider and brighter thanks to upgraded standards, and material quality and reflectivity. *(Details on page 27.)*

You can track our progress on our new website "Rebuilding California" that explains the many aspects of SB 1 and features an interactive map of projects that SB 1 makes possible.

This work is just the start — more than \$1.4 billion in major highway repairs and upgrades are lined up in the project queue.

We also will expedite the retrofit or replacement of 60 bridges along several of California's most important freight corridors — including I-5 and I-80 — as required by SB 1. *(Details on page 17.)*

You can track our progress on our new website "Rebuilding California" that explains the many aspects of SB 1 and features an interactive map of projects that SB 1 makes possible.

To bring our highway system up to the performance standards in SB 1, Caltrans will fix more than 17,000 lane miles of pavement, 500 bridges, and 55,000 culverts by 2027. We will also fix 7,700 traffic operating systems, such as ramp meters, traffic cameras and electric highway message boards.

Investing and improving California's infrastructure is too important to delay, and that's why we've already started. As I said, we're on it.

Malcolm Dougherty

Cover: Interstate 5 travelers north of Redding now have a new passage across a section of Shasta Lake. Antlers Bridge, curving gracefully over the Sacramento River arm of the lake, opened to traffic in September 2016 after a 6.5-year build. It replaced a steel deck truss bridge, seen in background, that was retired after 74 years of service. That span is being demolished now, the final part of the \$131 million contract. Photo by Scott Lorenzo.

Caltrans MileMarkers



Safety and Health

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

Fatalities	2013	2014	Goal
Auto Fatalities per 100 Million Miles	0.67	0.71	Less than 0.5
Pedestrian Fatalities	257	227* -11.7%	Reduce 10% Annually
Bicycle Fatalities	30	16* -46.7%	Reduce 10% Annually

* 2015 data will be available at the end of 2017

Programmed vs. Allocated Active Transportation Funds to Date			
	Fiscal Year	% of Programmed Funds Allocated	Goal
First Call for Projects	2014-15	99%	100%
	2015-16	85%	
Second Call for Projects	2016-17	77%	100%
	2017-18	N/A	
	2018-19	N/A	

Other Safety and Health Markers	Previous Reporting	Most Recent	Goal
Percentage of Active Transportation Projects Awarded Within Six Months	82% 2016-17, Q3	60% 2016-17, Q4	100%
Employee Work-Related Injuries/Illnesses per 200,000 Hours Worked ‡	5.76 2016-17, Q3	5.25 2016-17, Q4	5.45
Number of Injuries For Autos, Bicycles and Pedestrian Modes of Travel	77,222 2013	74,490 2014*	Reduce 5% Annually
Worker Fatalities in Work Zones	2 2016	1 2017	0 Per Calendar Year

* An average of the most recent five years of collision data up to 2013.

‡ Includes Cal/OSHA reportable and non-reportable injuries/illnesses. Incident rate represents 12 months of data for each quarter.

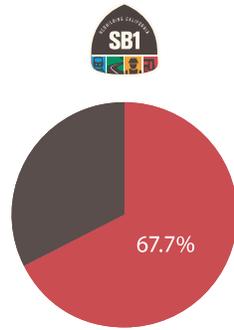
Performance Goals



Stewardship and Efficiency

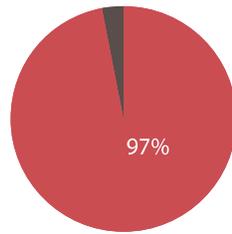
Money counts. Responsibly manage California's transportation-related assets.

Percentage of Transportation Management System Units in Good Condition **



Goal	90% by 2020
Jan.-Mar. 2017	65.9%
Apr.-June 2017	67.7%

Planned Projects Delivered in Fiscal Year



Goal	100%
2015-16	98%
2016-17	97%

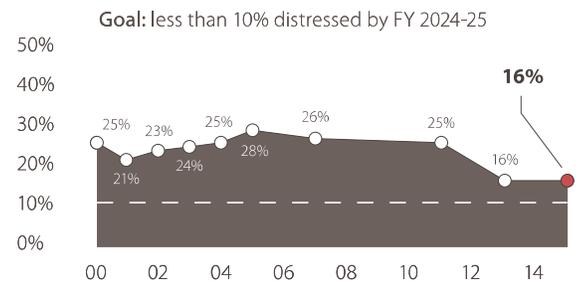
** Measure terminology has been updated to reflect new SB 1 rating system.

Percentage of Bridge Deck Area in Good or Fair Condition **



Goal	Better than 95 rating by 2020
2015-16	98.6
2016-17	96.7

Pavement Health Index



Information Technology Projects	2016-17, Q3	2016-17, Q4	Goal
Advantage System Analysis Uptime	99.35%	99.67%	99% by 2020
Network Analysis Uptime	99.62%	99.72%	99.5% by 2020
Response to Employee IT Requests Within Two Hours	38.90%	39.10%	40% by 2020

Annual Percentage of Research Projects With Implementable Solutions	2015-16 (first reporting)	2016-17 Goal	2020 Goal
Caltrans Research	50%	55%	75%
University Transportation Centers (UTC) Research	20%	24%	40%
National Cooperative Research	10%	12%	20%

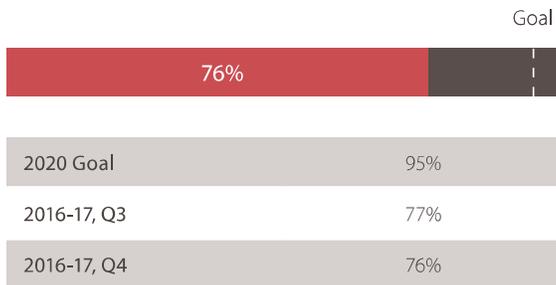
Caltrans MileMarkers



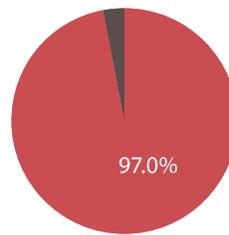
Stewardship and Efficiency

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

Encroachment Permits Approved or Denied Within 30 Days*

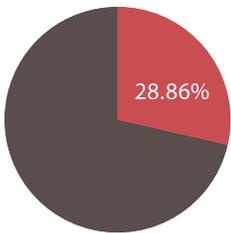


Percentage of Online Single-Trip Permit Requests Handled in Less Than Two Hours



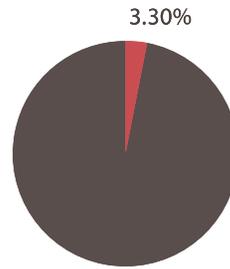
2020 Goal	90%
2016-17, Q3	97.7%
2016-17, Q4	97.0%

Contract and Procurement Dollars Awarded to Small Businesses Annually



2020 Goal	25%
2015-16	46.05%
2016-17	28.86%

Contract and Procurement Dollars Awarded to Disabled Veteran Business Enterprises Annually



2020 Goal	5%
2015-16	5.07%
2016-17	3.30%

Other Stewardship and Efficiency Markers	Previous Reporting	Most Recent Reporting	Goal
Federal Funds Used in Year of Availability (Annually)	100% 2014-15	100% 2015-16	100%
Americans with Disabilities Act (ADA) Expenditures Programmed (Annually)	\$39.8 Million 2015-16	\$40.7 Million 2016-17	\$35 Million
Number of Lane Miles of State Highway System Relinquished (Annually)	52.85 Lane Miles 2015-16	88.44 Lane Miles 2016-17	50 Lane Miles

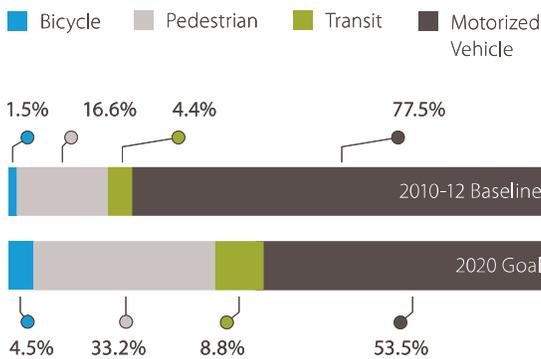
Performance Goals



Sustainability, Livability and Economy

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

Percentage of Trips



Vehicle Miles Traveled Per Capita, Statewide Average

Goal	By 2020, 15% lower than 2010 baseline
2010 Baseline	8,779
2015	8,701 -0.9%

Greenhouse Gas Emissions from Caltrans Operations (in metric tons)

Goal	By 2020, 15% lower than 2010 baseline
2010 Baseline	217,485
2016	129,168 -40.6%



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	Goal
Percentage of Projects That Include Complete Streets Features	33% 2015-16 (Baseline)	27% 2016-17	68% by 2020
Number of Complete Streets Features on State Highway System	1,264 2015-16 (Baseline)	1,543 2016-17	1,613 by 2020
Percentage of Fully Implemented High-Focus Action Items From Action Plan 2.0	36% 2015-16 (Baseline)	50% 2016-17	100% by 2018

Other System Performance Markers	Previous Reporting	Most Recent Reporting	2020 Goal
Accurate Reporting of Traveler Information (Travel Times, Construction Activity, Incidents, and Adverse Weather)	94.0% 2015-16	93.9% 2016-17	85%
Provide Real-Time Multimodal System Information Available to the Public (Number of Corridors)	3 2016-17, Q2	3 2016-17, Q3	13
Completed Corridor Implementation Plans	3 2016-17, Q2	4 2016-17, Q3	5
Number of Corridors With Integrated Corridor Management Implementation	2 2016-17, Q2	2 2016-17, Q3	3

Caltrans MileMarkers



System Performance

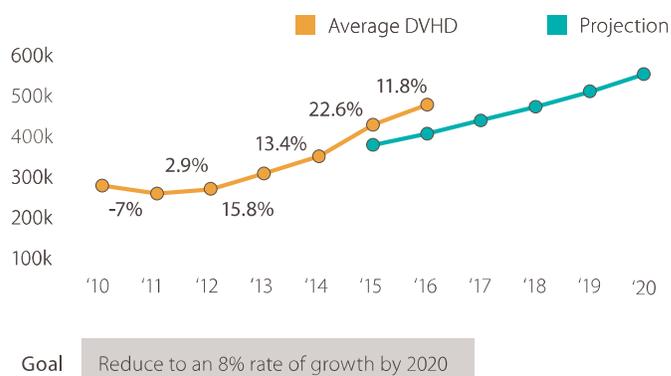
Utilize leadership, collaboration and strategic partnerships to develop an integrated transportation system that provides reliable and accessible mobility for travelers.

Travel Time Reliability

R Reliable M Moderately Reliable U Unreliable

	Baseline	2016-17 (Q3)	2016-17 (Q4)	2020 Goal
Highway 57	U	M	M	
I-110	M	R	M	One-tier improvement from baseline
I-80	U	U	M	
I-210	M	M	R	

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



Average All-Stations On-Time Performance for Intercity Rail

	2016-17, Q3	2016-17, Q4	Goal
Capitol Corridor	88.9%	95.4%	90%
Pacific Surfliner	70.5%	80.5%	90%
San Joaquin	66.4%	82.8%	90%

End Station On-Time Performance for Intercity Rail

	2016-17, Q3	2016-17, Q4	Goal
Capitol Corridor	92.3%	93.2%	90%
Pacific Surfliner	82.7%	64.4%	90%
San Joaquin	72.7%	80.1%	90%

Daily Vehicle Hours of Delay (Top Four Integrated Corridors)

	2016-17, Q3 (Year Over Year)	2016-17, Q4 (Year Over Year)	Goal
Highway 57	-13.81%	-15.3%	Less Than 6% Increase Annually
I-110	-1.66%	-5.4%	Less Than 6% Increase Annually
I-80	13.0%	30.0%	Less Than 6% Increase Annually
I-210	14.23%	23.4%	Less Than 6% Increase Annually

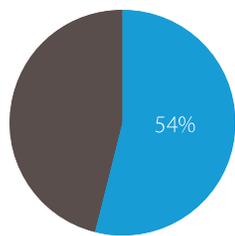
Performance Goals



Organizational Excellence

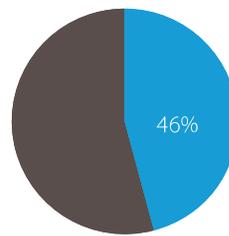
Be a national leader in delivering quality service through excellent employee performance, public communication and accountability.

Stakeholders Who Gave Positive Feedback About the Mile Marker in Annual Survey



Goal	5% annual improvement from 2015 baseline
2015	External 43%, Internal 37%
2016	External: 54% Internal: 49%

Stakeholders Who Feel That Department Communication, Professionalism, and Service Levels Have Improved

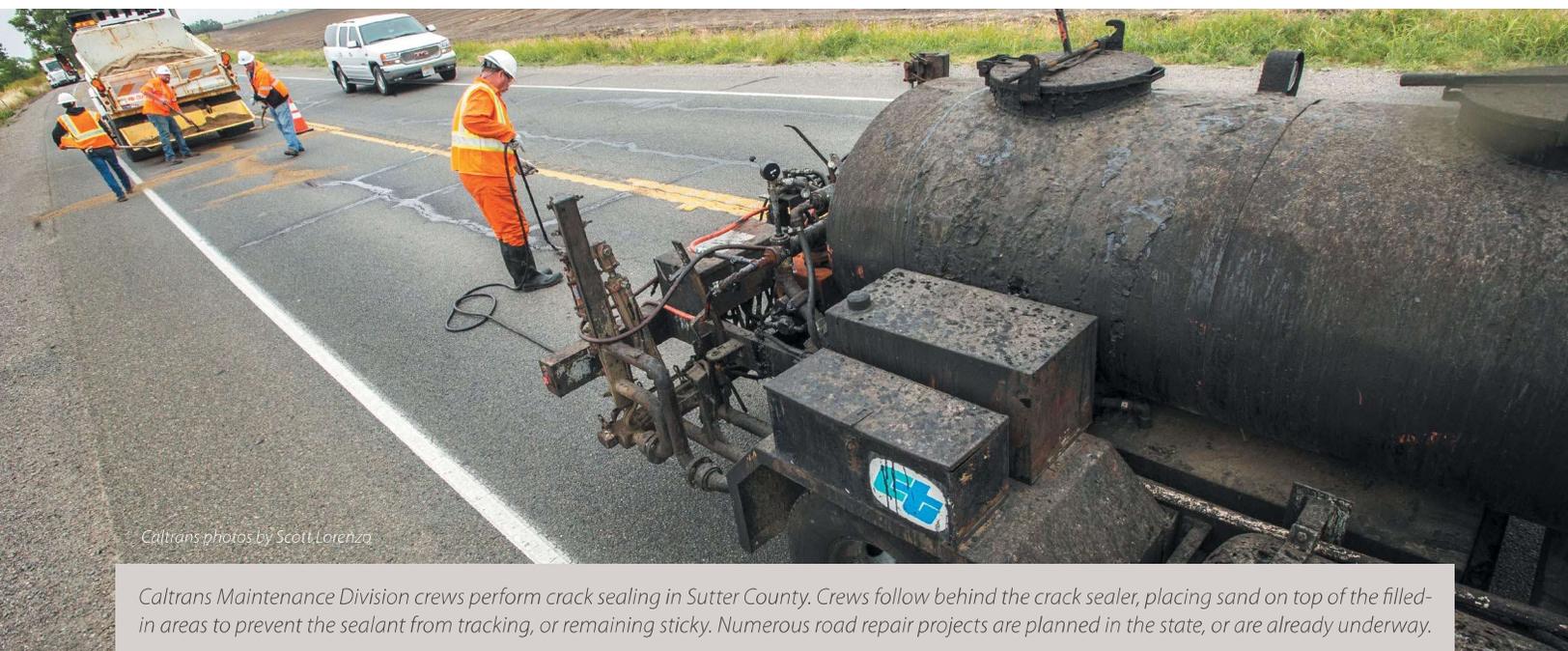


Goal	5% annual improvement from 2015 baseline
2015	External 36% Internal 32%
2016	External: 46% Internal 37%

Other Organizational Excellence Markers	2015	2016	Goal
Employees Who Indicate That They Work in a Positive Environment	50%	57%	5% annual increase
Abusive Conduct Prevention Trainings Provided Per Year	37%	81%	100% every 2 years
Caltrans Employees Who Agree That Employees are Encouraged to Try New Ideas	40%	47%	75% 2016 goal, then achieve and maintain through 2020
External Survey Respondents Who Said Caltrans Doing a Good or Excellent Job in Meeting Their Needs	40%	61%	75%
Caltrans Employees Who Rate Caltrans Management as Open and Honest in Communications	44%	51%	5% annual increase
Mile Marker Publications Produced on Quarterly Schedule	4	4	4
Positive Responses to Ethics Questions on Employee Survey	79%	81%	5% annual increase
Increase in the Number of Partners Who Agree or Strongly Agree That Caltrans is a Collaborative Partner	40%	50%	75% 2016 goal, then maintain or improve through 2020
Increase in Employees Serving on Research and Policy Committees to Further National Engagement	38	44	7% increase for 2016, then maintain or improve through 2020
Documented LEAN 6 Sigma Process Improvements (Cumulative)	19	36	30 internal improvements by 2016 with 15 each subsequent year
Number of Caltrans Employees Trained as LEAN 6 Sigma Green Belts	13	14	Train 10 yearly
Eligible Employees Who Have Completed Leadership and Development Training Programs, per Fiscal Year	52% 2016-17, Q3	54% 2016-17, Q4	85% by 2015 with a 2.5% annual increase to 90% in 2017

Starting to Fill In the Gaps

Busy Slate of Road Repairs Launched, Major Projects Around State Lined Up



Caltrans photos by Scott Lorenza

Caltrans Maintenance Division crews perform crack sealing in Sutter County. Crews follow behind the crack sealer, placing sand on top of the filled-in areas to prevent the sealant from tracking, or remaining sticky. Numerous road repair projects are planned in the state, or are already underway.

From the planning stage to shovel-ready projects, Caltrans is wasting no time laying the groundwork for the revitalization of the state transportation network in California.

Although revenues from the [Road Repair and Accountability Act of 2017](#) (Senate Bill 1) won't begin flowing until November, Caltrans and its partners have taken actions through the summer to begin reversing decades of deterioration that's hobbled the state's far-flung state highway system.

State and local governments will split a projected \$54 billion during the next decade through higher gas and diesel taxes beginning in November, and a new vehicle registration fee taking effect in 2018. A special fee on zero-emission vehicles begins in 2020. The fuel taxes will be adjusted for inflation beginning in fiscal year 2020-21.

The accelerated construction spurred by SB 1 has already begun. Almost \$43 million in pavement projects,

13 in all, started in July and represent the first round of improvements taking place up and down California, in urban, suburban and rural areas.

Altogether, Caltrans has been given the go-ahead to begin about \$1.4 billion in major repairs and upgrades to critical parts of the highway system this fall, before SB 1 funding arrives.

As construction projects take shape and break ground, the California Transportation Commission (CTC) has been developing guidelines and taking input on competitive SB 1-financed transportation programs. The new law gives the Commission oversight over five [SB 1-created programs](#), and [meetings](#) will be held through the end of the year, and into 2018 in some cases, to decide funding guidelines and specific projects.

It's estimated that the new law will generate \$900 million in first-year revenue and earlier loan repayments for Caltrans highway repair projects in the

2017-18 fiscal year. Beginning in FY 2018-19, Caltrans should receive about \$1.9 billion annually through SB 1 for maintenance and repair of state roads, bridges, culverts, and traffic management systems.

Ultimately, Caltrans will be responsible for fixing more than 17,000 lane miles of pavement, at least 500 bridges and 55,000 culverts, and 7,700 ramp meters, traffic cameras and electric highway message boards that help reduce highway congestion.

By 2027, 98 percent of pavement on state facilities is required to be good or fair condition, up from 85 percent today.

Caltrans also has been conducting an active outreach program to cooperate and consult with participating stakeholders on SB 1 implementation. Partnering forums are being held with representatives of cities, counties, resource agencies, regional partners and contractors. Discussions have already been held with construction industry officials on issues such as safety, labor force, trucking, traffic concerns, and equipment availability.

The Department also is looking to fill about 1,100 positions statewide as it gears up for heavier workloads from SB 1-related projects. A busy slate of [career fairs](#) has been lined up through the next year to find workers in various capacities.



Maintenance crews replace tri-beam guard rails in the median of Interstate 205 near Tracy. There will be \$50 million spent on guard rail repairs throughout the state starting in late fall.

SB 1 Programs Under CTC Oversight

Program	Amount Per Year	SB 1 Mandate	Estimated Timeline
Local Streets and Roads	\$1.5 billion	To repair or upgrade local/regional transportation systems	List of eligible cities and counties due for release in December
Active Transportation Program	\$100 million	To expand the state's growing network of pedestrian and cycle routes	Eligible projects are to be chosen by December
Local Partnership Program	\$200 million	To be used as matching funds for local entities to make their own extra investment in transportation	Program adoption in June 2018
Congested Corridors Program	\$250 million	To develop comprehensive corridor plans without expanding present highway capacity	May 2018 adoption
Trade Corridor Enhancement Program	\$300 million	To fund freight-related transportation system upgrades	May 2018 adoption



This photo shows a section of westbound Interstate 80 in West Sacramento that was prepared for a resurfacing project. Much of the existing asphalt concrete overlay, topping the Portland cement concrete pavement, was grinded away by crews in advance of the resurfacing work.

Here's a summary of SB 1-related actions taken to this point:

What's starting now

- The 13 pavement resurfacing or replacement projects taking place in 11 of Caltrans' 12 regional districts.
- Expedited design work for 50 more major pavement projects on the state highway system, with an estimated cost of about \$243 million. The work is intended to smooth and fix highways that have taken a pounding through the years, as well as extend the service lives of those routes. Construction should start by early 2018.
- Road striping contracts worth about \$150 million are being prepared for sections of six heavily traveled highways in the state: on Interstate 5 from Mexico to the Oregon border, I-10 from Los Angeles to Arizona border, I-15 from San Diego to Nevada border, I-80 from the San Francisco Bay Area to Nevada border, U.S. 101 from Los Angeles to north of San Francisco, and Highway 99 from the Grapevine north past Sacramento. The striping projects (*page 27*) will lay down high-visibility, wider lines that will be easier for travelers – and autonomous vehicles – to see.
- Guard rail repairs estimated at \$50 million are planned for late fall in all of Caltrans' 12 regional districts around the state. Twenty projects will be undertaken as the first round in an overall rehabilitation effort.

The inclusion of the new projects in Caltrans' State Highway Operation and Protection Program (SHOPP) puts them on a faster track toward completion.

What's coming

At its August meeting, the CTC approved nearly \$690 million in funding for 32 major projects. The work will involve extensive pavement preservation, culvert and bridge rehabilitation, or upgrades of Caltrans' traffic management systems along several congested corridors. The inclusion of the new projects in Caltrans' State Highway Operation and Protection Program (SHOPP) puts them on a faster track toward completion.

Plans for additional major projects are being prepared for the CTC's October meeting.

Caltrans is embarking on an ambitious bridge repair/replacement program. Thirty spans have been targeted for vertical clearance or weight limit upgrades under the Accelerated Bridge Freight Corridor Program (*page 17*). Another 30 are scheduled to be considered for the accelerated list at the next CTC meeting.

Under the accelerated program, project funding can start a year earlier than previously planned. Getting projects off to earlier start also moves up the de-

livery date, which can yield significant cost savings by keeping price inflation in check.

Status of other programs that will receive SB 1 funds from Caltrans

- The Freeway Service Patrol that dispatches tow trucks to aid stranded motorists on urban freeways will be getting an additional \$25 million a year. Plans call for expanding the hours and areas of service.
- Local planning grants to aid in creating sustainable communities are set to be awarded in December, with grant applications for the \$25 million available each year due in October. The same timelines apply to a program that disburses money to eligible communities that conduct climate adaption planning, with \$20 million available in annual grants over the next three years.
- The new law requires Caltrans to identify \$100 million yearly in efficiency measures to the CTC. The savings in those areas will be applied to other

Getting projects off to earlier start also moves up the delivery date, which can yield significant cost savings by keeping price inflation in check.

maintenance and repair work. To this point, the Department expects to see cost savings through a streamlined project delivery process that has been used to remove the foundations of the old San Francisco-Oakland Bay Bridge, as well as Highway 99 realignment in Fresno, and will be used for more projects in the future. More efficiencies are expected by reducing overhead costs, and improving internal processes. **MM**

Source: Caltrans Public Affairs Office; Caltrans Executive Office



Maintenance Division crews in Stockton-based District 10 repair a pothole with patching material on Interstate 5 outside Lodi.



This pothole developed between the asphalt concrete shoulder and Portland cement concrete pavement. Repairs were made.

Budget Picture Much Brighter for Caltrans

New Revenue from Senate Bill 1 Eases Repair Backlog; Full Impact Yet to Come

Last year, California's transportation budget was the smallest in a decade, continuing a downward trend broken in dramatic fashion this year with the passage of a landmark transportation package that will provide a tremendous funding boost and allow Caltrans to catch up on a multibillion-dollar backlog of deferred maintenance.

The funding provided by the Road Repair and Accountability Act of 2017 (Senate Bill 1) comes from modest increases to gas and diesel taxes at the pump, and new road improvement fees assessed on vehicles at the time of registration. These new taxes and fees won't start generating revenue until later in the fiscal year. Specifically, the gas taxes start on November 1, and the new Transportation Improvement Fee won't go into effect until January 1, 2018. Because the revenue inflow from the new law won't take full effect until early 2018, the new budget for 2017-18 is not as robust as future transportation budgets will be.

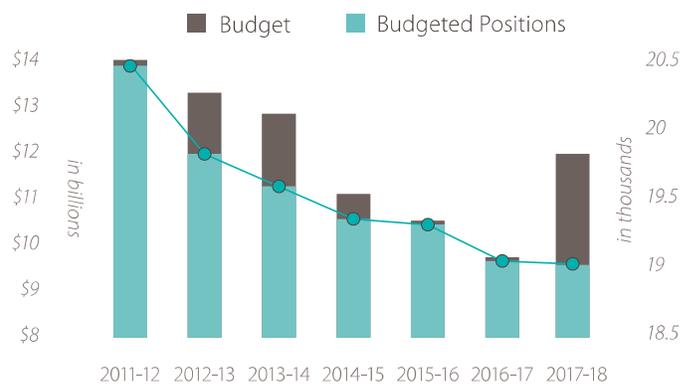
Importantly, fuel taxes and new fees will be indexed for inflation beyond 2021, and lawmakers eliminated a previous formula used to calculate fuel excise taxes that had caused unexpected fluctuations in transportation revenue. As a result, the Act stabilizes transportation funding, giving more certainty to project planning and budgeting.

The 2017-18 Budget Summary

The 2017-18 budget signed by Governor Edmund G. Brown Jr. in late June authorizes \$11.9 billion and 19,021 positions for Caltrans. This represents an increase of approximately \$2.2 billion and a decrease of 23 positions from the 2016-17 budget. Some of the increases come from traditional funding sources, but the vast majority of the new funding is made possible through SB 1.

Of the \$2.8 billion in first-year revenues and earlier loan repayments provided by SB 1, Caltrans' share comes to just over \$1.9 billion. Of this amount, \$655

Caltrans Budget & Staffing Levels Since 2011-12



million is devoted to local projects, including:

- \$330 million for Transit and Intercity Rail Program projects (including \$85 million in loan repayments);
- \$200 million for Local Partnership projects;
- \$100 million for Active Transportation (bicycle and pedestrian) Projects; and
- \$25 million for local planning grants.

The remaining \$1.3 billion is for state projects, including:

- \$446 million for highway maintenance and repairs (including \$75 million in loan repayments);
- \$400 million for bridges and culverts;
- \$250 million for congestion mitigation projects;
- \$150 million for trade corridor enhancement projects; and
- \$25 million for expanding freeway service patrols on state highways.

The budget for 2017-18 reflects significant increases in investments made possible by SB 1, but does not yet include the full benefit of the changes. Those changes will be fully evident as Caltrans prepares the upcoming 2018-19 transportation budget. The Governor's proposed budget for the state, including transportation, is set for release in January 2018. **MM**

Source: Steven Keck, Chief, Caltrans Division of Budgets



Caltrans photo by Scott Lorenzo

In July 2017, Caltrans began delivering tablet computers to landscape field staff to safely and remotely manage the new water-saving smart irrigation network. The steps taken to curtail water use exceeded an ambitious 50 percent reduction target set by Director Malcolm Dougherty.

Strategy to Cut Water Use Pays Off Big

Caltrans Shows 65 Percent Reduction Since 2013 With Smart Tech, Conservation

The five-year drought is over, but water conservation remains a way of life in California and at Caltrans.

The Department is using new technology to balance transportation goals, worker safety and resource conservation as it manages 32,000 acres of roadside vegetation and 29,000 acres of irrigated landscaping along California’s vast transportation system.

After a winter of record-setting rainfall, Governor Edmund G. Brown Jr. in April lifted his 2014 state of emergency drought order in all counties except Fresno, Kings, Tulare and Tuolumne.

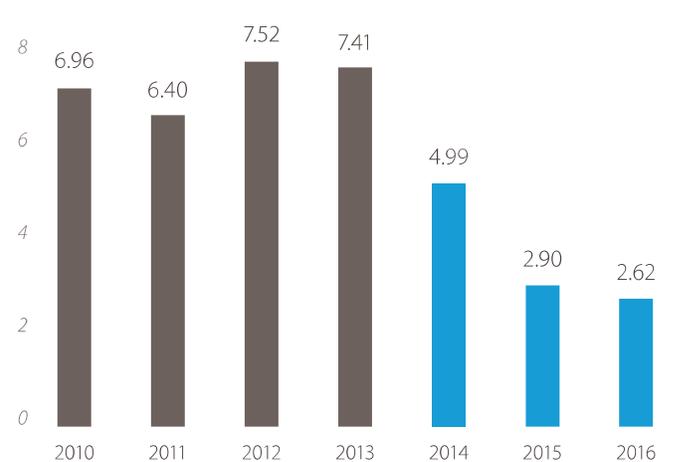
However, the Governor wants Californians to continue conserving water because “the next drought could be around the corner,” he cautioned.

During the long drought, Caltrans made great strides in water conservation, saving more than three times Gov. Brown’s 20 percent water reduction order in 2014 and topping the even more ambitious 50 percent reduction target set by Caltrans Director Malcolm Dougherty.

In 2013, Caltrans used 7.41 billion gallons of water on its roadside landscape. But by 2016, Caltrans had cut that amount by 65 percent, to 2.62 billion gallons.

Almost 12 billion gallons of water have been saved since 2013 — enough to supply 35,677 Cali-

Caltrans Statewide Water Use (in Billions of Gallons)



fornia households for a year. These savings resulted largely from a series of strategic policy changes.

In 2013, Caltrans set a goal to convert all irrigation controllers to “smart” controllers, unless a location is more appropriate for a conventional controller. By July 2017, Caltrans’ water-saving smart controller inventory had grown from 2,358 in 2014 to 3,268.

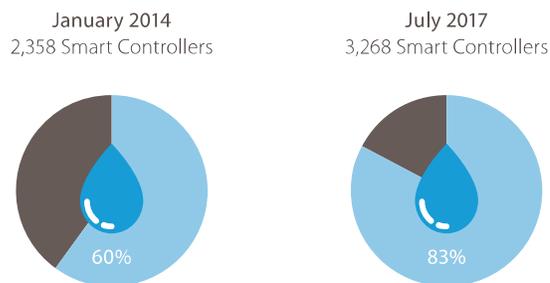
Caltrans updated its Highway Design Manual in 2016 with a goal to irrigate all landscaping, where possible, with recycled water. Caltrans must follow specific state guidelines for non-potable water use as the Department installs miles of piping to route recycled water to highway landscaping.

From March 2014 to June 2017, Caltrans increased recycled water use statewide from 14 to 23 percent by converting 48 irrigation water sources to recycled water, and expanding the reach of five existing mainlines. Each year, Caltrans is now saving 228 million gallons of drinking water, which was previously used to irrigate roadside landscaping that is now thriving on recycled water.

Caltrans’ Highway Design Manual updates likely will multiply the water savings in the future, since regional and local agencies generally follow the Department’s guidelines when upgrading their local street landscaping infrastructure.

The drought and ensuing order from Caltrans Director Dougherty spurred investments in landscape irrigation, ranging from the installation of 1,439 sensors that measure water flow, to adding nearly 152,000 linear feet of recycled water piping alongside highways. Caltrans also replaced or installed 2,544

Inventory of Smart Irrigation Controllers



Between January 2014 and July 2017, Caltrans increased its inventory of smart irrigation controllers from 60 percent to 83 percent. Smart controllers have water-saving features, including a weather sensor to adjust sprinklers.

smart controllers, on which water schedules can be adjusted to match weather forecasts, leaks and location identified, and problem valves or the entire system shut down.

In addition, Caltrans upgraded 661 communication software components to relay information on troublesome irrigation valves to Caltrans district water managers’ mobile devices. Previously, Caltrans employees only knew about water leaks when they saw them. In addition to saving water, smart irrigation systems reduce employee exposure to traffic and trips to the site, which increases worker safety. Caltrans also installed 2,157 anti-theft fence enclosures and valve boxes to protect its smart system investment.

To show employees how to use and repair irrigation systems without the dangers of traffic nearby, Caltrans built a water conservation training center at the District 10 office in Stockton. (See accompanying story.) In 2016, Caltrans trained nearly 1,500 employees statewide on how to operate, maintain and repair the new smart irrigation systems.

Conservation will continue to be a way of California life as Caltrans strives to meet its ambitious water-saving goals. **MM**

Caltrans Water Savings from Policy Changes



Almost 12 billion gallons of water have been saved since 2013 — enough to supply 35,677 California households for a year. Households average 2.7 people.

Source: Elbert Cox, Supervising Landscape Architect; Jack Broadbent, Supervising Landscape Architect; Camilo Arellano Jr., Statewide Water Manager

Teaching Water-Wise Ways

District 10 Training Center Focuses on Landscape Maintenance in a Safe Setting

Although the drought has been washed away in California this year, Caltrans hasn't eased up on its commitment to save water. Nowhere is that more apparent than in Stockton, where Maintenance Division staff operate a training center where workers tackle different repair scenarios and learn sustainable landscape practices.

Located at Caltrans' District 10 office, the planted and mulched training grounds are irrigated through a new-generation control center. Drawing water from an underground cistern filled with rainwater runoff demonstrates how nonpotable water can safely keep roadside planted areas green.

It's all part of Caltrans' effort to sharply cut water use on its irrigated acreage throughout the state. Although it has practiced water conservation for decades, the department stepped up its conservation commitment several years ago as drought conditions intensified. With the situation increasingly dire in early 2015, Caltrans Director Malcolm Dougherty called for the department to reduce its water use by 50 percent from 2013 totals. (See accompanying story.)

District 10 maintains 121 irrigation control centers to deliver water to landscaped roadside areas along state highways between Merced and Lodi, the southern and northern limits of the district.



District 10's landscape training center features different zones where new equipment is tested and irrigation repair scenarios presented.

The controllers can be set or monitored using smartphones or tablets. District staff can view the amount of water use at each landscaped site and quickly see when and where any excess is occurring. The information from each controller is transmitted to a hub, which feeds water usage details into a database.

The district's water use fell from about 81.7 million gallons in fiscal year 2014-15 (July 1-June 30) to 67.1 million gallons in FY 2015-16. Usage did rise to 84.5 million gallons in FY 2016-17, but more irrigated landscape acreage was added in the Modesto and Stockton areas.

This modernization of irrigation systems statewide reflects the department's commitment to efficiency and stewardship of the resources it manages, as outlined in the 2015-2020 [Strategic Management Plan](#) (SMP). In District 10's case, the establishment of a training center also affirms Caltrans' No. 1 goal listed in the SMP: the safety of its workers. Landscape employees are now able to learn how to operate irrigation systems in a safe environment, away from traffic hazards that are always present when working in the field. ■



Caltrans photos by Steven Hellon

A new generation irrigation controller makes the job of setting, and tracking water use in planted areas much more precise.

Sources: District 10: Kent Kibble, Maintenance Manager; Russ T. Lake, Assistant Resident Engineer; John Spithorst, District Landscape Specialist.



The MacArthur Maze is a well-known San Francisco Bay Area freeway interchange. Three interstates come together: I-80, I-880, and I-580. With its location next to the Port of Oakland, and leading to and from the San Francisco-Oakland Bay Bridge, the aptly named Maze is very congested.



Freight Route Bridges Top SB 1 Fix-It List

Work to Start on 30 Interstate Spans That Don't Meet Height, Weight Standards

Caltrans has added 30 bridges on several of California's most important freight corridors to its fast-track schedule for improvements or replacement under Senate Bill 1.

The spans along freight-critical junctures on Interstate 80 in Northern California, and I-5 in Southern California merited inclusion on Caltrans' Accelerated Bridge Delivery schedule, and earlier funding to begin the project delivery process, the California Transportation Commission recently decided. The CTC is scheduled to consider adding another 30 to the accelerated list in October.

The 30 bridges authorized — 18 in Southern California and 12 in the Bay Area — will be the first to receive SB 1 funding for bridge repair or replacement. The Road Repair and Accountability Act of 2017 specified that 500 bridges would be fixed in the next decade, as will other parts of the state transportation system, with extra revenues from higher fuel taxes and new road improvement fees.

Almost \$34 million will be spent to perform environmental and engineering studies necessary for the I-5/I-80 bridge projects to proceed. The work on these bridges will involve expanding vertical clear-

ances to current standards, or improving load-carrying capacity, depending on the deficiency.

The bridges are located on routes deemed critical to the movement of goods and services throughout the state. I-5 and I-80 link California's ports with markets inside the state and throughout the nation; about one-third of California's \$2.2 trillion economy depends on freight movement.

But because the older bridges don't meet current height or weight standards, trucks carrying larger or heavier loads are forced to make lengthy detours around them. This results in lost revenues, higher costs, more greenhouse gas emissions from longer trips, traffic impacts, and damage to infrastructure not constructed to interstate pavement standards.

The cost for fixing all 30 bridges is estimated at about \$737 million. The most expensive repairs are projected for the series of spans on I-5 in the Los Angeles area, where initial estimates call for investing \$130 million to bring 10 bridges up to modern standards by either lowering the roadways or outright replacement to create more vertical space, or fortifying the structures.

The other two bridges in Southern California that

need work are on I-5 near the Grapevine in Kern County. More vertical clearance is required where the interstate separates from Highway 99, while another span near the California Aqueduct needs widening and a new surface.

In Northern California, six of the major projects will be clustered on I-80 near the port of Oakland, which is the fourth busiest port in the nation. An estimated \$22 million is needed to improve vertical clearance at the MacArthur Maze interchange where I-80, I-580 and I-880 meet. An I-80 overpass in Berkeley has the same issue that will cost \$12 million to fix, while farther east on the interstate in Vallejo, a bridge structure must be replaced to permit heavier truck loads at the I-80/State Route 29 separation, an estimated \$7 million project.

Six more bridges between the Carquinez Bridge Toll Plaza and Vallejo are scheduled to undergo ver-

tical clearance work to comply with a 16 ½ foot interstate standard. The estimated cost for that project is almost \$16 million.

Two bridges on I-5 in the Lathrop area that see heavy truck traffic also are on the project list. Structure strengthening is proposed on both to accommodate heavier loads, at a cost of almost \$4 million.

To further expedite some of the 30 projects under SB 1, Caltrans will weigh alternative project delivery methods that could cut more time from the process. Even with an accelerated timetable, however, construction still isn't slated to start for the major projects in Los Angeles and Bay Area until 2020 or 2021. **MM**

Source: Caltrans Division of Maintenance

Caltrans Keeps Close Eye on Bridge Condition

Inventory is Aging, but New Funds Will Repair, Upgrade Many Spans to Higher Standards

Caltrans maintains a vigilant bridge inspection program to ensure the safety and structural integrity of the 13,100-plus bridges in the state that it maintains.

Just in the last fiscal year, from July 1, 2016-June 30, 2017, Caltrans' Structure Maintenance & Investigations unit conducted 11,430 inspections as part of a rotating review process of all bridges on the state and local highway system in California.

Maintaining the health of the bridge network is a critical responsibility in Caltrans' management of the state highway system. In total, the Department monitors more than 245 million square feet of bridge deck area, which encompasses the length and width of the roadway area of the supporting structure.

And that inventory is getting older. The average age of a bridge in California is 45 years, and maintenance needs for the aging structures is increasing. In the last four fiscal years, about \$696 million was spent on repair, or replacement, of state-owned bridges, with the federal government paying almost \$596 million of that amount.

That amount will increase in the coming years as revenues begin to flow from the Road Repair and Accountability Act of 2017 (Senate Bill 1). The new law requires



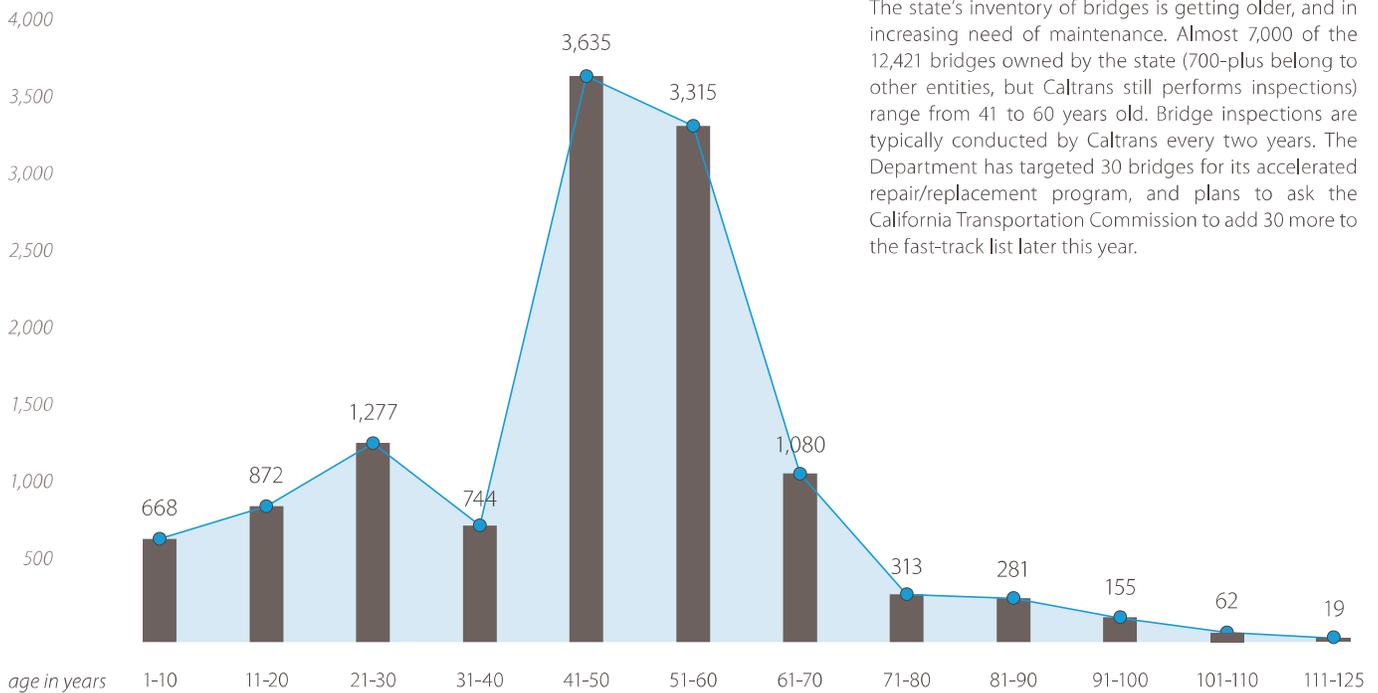
Caltrans photo by Scott Lorenzo

The State Highway 20 Meridian Bridge, a Colusa County drawbridge built in 1977 over the Sacramento River, is swung open for its annual inspection in 2014.

Caltrans to fix, or replace, not less than an additional 500 bridges in the next decade to reach new performance targets established by the Department's 2017 State Highway System Management Plan.

The plan applies a good/fair/poor standard in evaluating Caltrans-maintained bridge deck areas. By 2027,

California State Bridges by Age



The state's inventory of bridges is getting older, and in increasing need of maintenance. Almost 7,000 of the 12,421 bridges owned by the state (700-plus belong to other entities, but Caltrans still performs inspections) range from 41 to 60 years old. Bridge inspections are typically conducted by Caltrans every two years. The Department has targeted 30 bridges for its accelerated repair/replacement program, and plans to ask the California Transportation Commission to add 30 more to the fast-track list later this year.

83.5 percent of all bridge deck areas, measured in square feet, should be in good condition, according to the plan, with 15 percent in fair condition and no more than 1.5 percent of all deck areas designated as poor condition.

Currently, about 97 percent of the bridge deck areas of spans within the state highway system are rated in good or fair condition, and 3 percent as poor. Poor condition does not mean the bridge is unsafe, but falls below acceptable standards. Any Caltrans transportation asset, such as bridges, found to be unsafe would be immediately closed and repaired.

Caltrans and the California Transportation Commission (CTC) is already moving to improve those numbers. With SB 1 revenue soon to arrive, the CTC earlier agreed to fast-track the planning process for improvements to 30 bridges on Interstates 5 and 80, the state's busiest freight routes. Caltrans plans to propose another 30 bridges for its priority delivery list at the October CTC meeting.

For smaller projects, Caltrans crews focus on preventative maintenance to keep bridge decks in good condition, and perform repairs on those structures that fall into the fair category. Bridges with structural deterioration, or deck/superstructure/substructure areas rated in poor condition, must undergo major rehabilitation or replacement through Caltrans' State Highway Operation and Protec-

tion Program (SHOPP). It's estimated that meeting bridge deck area performance targets under the Bridge Health objective will cost \$6.1 billion over the next decade.

Bridge inspections are carried out by Caltrans through the federal National Bridge Inspection Program, which requires routine inspections typically once every two years for bridges that are a part of the federal-aid highway system. About \$35 million was spent in the 2016-17 fiscal year on inspections, with the federal government paying about \$24 million of that amount. **MM**

Source: Rita Gerlach, Bridge Maintenance Information Manager, Structure Maintenance and Investigations; John Gillis, Bridge Asset Management

State and Local Bridge Inspections, FY 16-17

Quarter	Routine Inspections	Fracture Critical Inspections	Underwater Inspections
2016-17, Q1	2,708	123	29
2016-17, Q2	2,721	126	14
2016-17, Q3	3,373	78	39
2016-17, Q4	2,628	138	13
Total	11,430	465	95

Projects Relieve Traffic Squeeze on I-15

Major Improvements Made to Key Freight, Commuter Route in South State



The Devore Interchange where Interstates 15 and 215 meet in San Bernardino County is an extremely busy gateway for freight, commuter and recreational traffic. This photo shows I-215, appearing vertically at bottom, joining I-15 before its ascent through the Cajon Pass.

A notorious traffic bottleneck on a section of a Southern California interstate that frustrated travelers for decades has been eased with the completion of a pair of transformative projects spearheaded by Caltrans and supported by San Bernardino County Transportation Authority.

The Devore Interchange Project and the Cajon Pass Rehabilitation Project in San Bernardino County wrapped up in mid-2016, and since then have made life and business easier for those who travel to work in the Inland Empire and for companies that transport goods and services along this heavily traveled stretch of Interstate 15.

It took about three years to complete extensive renovations to each section of the interstate routes. The Devore Interchange Project where Interstates 15 and 215 meet cost \$324 million to construct, while \$121 million was spent improving I-15 that traverses Cajon Pass.

The route is a key economic lifeline in Southern California. Interstate 15 in the area of the two proj-

ects serves as a major route for commuters traveling from the high desert communities to jobs in the Inland Empire and Los Angeles basin, and it also serves as a recreational gateway to Las Vegas, the Colorado River and destinations beyond.

This route is also federally designated as a Trade Corridor of National Significance because of the heavy goods movement it accommodates.

The Devore interchange, located just north of the San Bernardino city limit, had been known as one of the worst grade-related traffic squeezes in the nation, with more than one million motorists traveling through weekly.

There was a critical need to help reduce congestion, collisions and improve overall freeway operations through the Devore Interchange, especially during peak afternoon and weekend hours when traffic back-ups often extended for miles and caused major delays. The Cajon Pass grade itself rises to an elevation of almost 3,800 feet through the San Gabriel Mountains east to the rapidly growing High

Project Spotlight



Desert area, including the cities of Victorville and Apple Valley.

After years of discussion and planning with local partners, and financing secured, construction on the Devore and Cajon Pass rehab projects began mid-2013. Caltrans opted to use a pilot construction method for both projects known as design-build, in which the contracting firm chosen designs and builds the project. Atkinson Construction of Colorado won the contract to design and rebuild the Devore Interchange. For Cajon Pass, the work was completed in a joint venture between Coffman Specialties in San Diego and Pasadena's Parsons Corp.

This streamlined approach to project delivery was credited for helping deliver each project on schedule and within budget.

Several major improvements were made to improve traffic flow and safety where I-15 and I-215 come together at Devore. They include:

- **Addition of Truck Bypass Lanes** — Two miles of truck bypass lanes were added in each direction to allow slower-moving trucks and vehicles to stay to the right and steer clear of faster-moving traffic passing through the area.
- **Addition of General Use Lanes** — One lane in each direction was added through the project area to reduce congestion and minimize the need for multiple lane changes. The additional lanes also improve transitions in all directions between I-15 and I-215.
- **Interchange Brought Up to Operational Standards** — Local ramp interchanges and connectors were reconfigured and upgraded.
- **Reconnection of Route 66** — A key section of Cajon Boulevard, which is part of historic Route 66, was reconnected between Kenwood Avenue and Devore Road/Glen Helen Parkway. This improvement provides local residents and motorists traveling through the pass an alternate route traveling through the Devore area.



A series of reinforcing steel bars for the new Devore Road overcrossing bridge deck give off an almost water-like shimmer in the afternoon sun. The Cajon Pass and Devore Interchange projects took about three years to complete, and were completed on time and within budget.

The Cajon project reconstructed 50 lane-miles of pavement between the Kenwood Avenue exit ramp and two miles south of U.S. Highway 395, focusing on the two outer lanes in each direction, along with other improvements. The new pavement has a predicted service life of 40 years, with minimal maintenance required, and replaces 1970s-era concrete that had exceeded its life cycle.

- **Replacement of Two Outer Concrete Pavement Lanes, Asphalt Concrete Shoulders and Patched Areas** — The outside two lanes and outside shoulder were replaced for 12 miles in both northbound and southbound directions. The inside shoulders were replaced at various locations.
- **Grinding and Slab Replacement of Interior Lanes** — Inside lanes were resurfaced for a smoother ride. At various locations, selected interior lane slabs were replaced.
- **Ramp Pavement Rehabilitation** — The on- and off-ramps at Oak Hill Road, Highway 138/I-15 junction, and Cleghorn Road were replaced.
- **Roadside Safety Features** — Roadway and safety features were added and/or upgraded, including additional signage, sign reflectivity, and additional metal beam guardrail.

- **Future Median Striping Features** — Future center median permanent striping was added to accommodate 12 miles of high occupancy vehicle or toll lanes in the future.

The Cajon project contractor also had the additional challenge of replacing damaged pavement without disturbing the area outside of the roadway shoulders. A significant portion of the I-15 through the Cajon Pass lies within the boundaries of the San Bernardino National Forest, and Caltrans did not have clearance to work outside the state right of way.

That restriction led to innovative traffic control strategies that kept construction on schedule, such as 55-hour lane closures, creation of construction islands, crossover lanes, and reversing lane flows by using moveable barriers to accommodate rush hour traffic.

Although complete traffic data is not yet available due to the recent completion of the projects, traffic reports show that bottlenecks that developed at the I-15/I-215 interchange have been mostly eliminated. **MM**

Source: Tyeisha Prunty, Public Information Officer, District 8



Caltrans photos by Jonathan Den Hartog

The Devore Road overcrossing bridge deck is lifted into place prior to the concrete pour as part of the interchange construction.



Precast bent cap beams are laid atop of bridge columns for what would be northbound I-15 to the southbound I-215 connector bridge.

Solar Keeps Caltrans on Green Goal Track

Systems Financed by Feds Delivering Cheaper, Cleaner Power to 70 Facilities

Caltrans' solar power program continues to save money and help the Department comply with Governor Edmund G. Brown Jr.'s 2012 executive order for state agencies to reduce grid-based energy purchases by at least 20 percent by 2018.

The status of the Clean Renewable Energy Bonds (CREBs) program was outlined in an annual report recently released by Caltrans.

Through a federal financing program, Caltrans installed and now operates 70 photovoltaic solar collection systems at its facilities around the state. The CREBs program provided Caltrans with a \$20 million bond for construction and installation costs, at a 1.45 percent interest rate.

The system has had some minor issues. Components of the system, which have been generating electrical power since 2010, have required repairs that cut into operating time. Other factors, such as sun angle, building orientation, dirt and dust, and temperature variation also have contributed to reduced power generation, the report said.

Despite these logistical issues, by the time the bonds are paid off in 2023-24, Caltrans will have saved an estimated \$2.8 million in energy costs, the report estimates.

At peak efficiency, the system can generate 2.4 megawatts of power — enough to satisfy the average energy needs of 500 homes. By comparison, Caltrans' 344 maintenance stations require 2.1 megawatts of electricity annually.

Of the 70 Caltrans facilities with solar systems financed through the CREBs program, 55 are at the agency's maintenance or equipment shops. The remaining 15 operate at Caltrans office buildings, materials laboratories, roadside rest areas, transportation management centers, and toll bridge or truck inspection facilities.

Several of Caltrans' regional districts also have installed photovoltaic systems not associated with the



Caltrans photo by Steven Hellon

Although this solar array in Caltrans District 8 is not part of the CREBs program, it contributes to the Department's efforts to reduce grid-based power purchases 20 percent by 2018 from 2012 levels.

By the time the bonds are paid off in 2023-24, Caltrans will have saved an estimated \$2.8 million in energy costs, the report estimates.

CREBs program, including District 8 in the Inland Empire area, and Stockton-based District 10. Solar facilities independent of CREBs also have been built at the San Francisco-Oakland Bay Bridge Maintenance Complex, and at State Route 99 rest areas outside Tulare.

Utilizing this clean power source also supports the state's ambitious climate goal of cutting greenhouse gas emissions 40 percent below 1990 levels by 2030. **MM**

Source: Clean Renewable Energy Bonds Program 2017 Annual Report; Division of Business, Facilities and Security

Litterbugs Still Foul Roads, Local Waters

Despite Awareness Campaigns, Many Still Tossing Out Trash, Survey Finds

Californians know they shouldn't trash their roadways, but many still admit doing it despite efforts by Caltrans and other groups to educate the public about how roadside garbage pollutes area waters.

As part of the "Protect Every Drop" campaign, more than 300 California drivers were surveyed in June on their highway and water pollution awareness, attitudes and behaviors. While 84 percent of those surveyed said they know there is a connection between highway pollution and water quality, only 53 percent said they never litter on highways, and just 43 percent said they never pour automotive fluids in the trash or on the ground.

Caltrans, the State Water Resources Control Board and the California Stormwater Quality Association are steering the Protect Every Drop campaign's public relations, advertising and community outreach programs, urging Californians to:

- properly dispose of trash, recyclables and pet waste;
- cover truckloads to keep debris from flying out;
- maintain vehicles and tires to reduce pollution; and
- properly dispose of cigarette butts.

Each year, Caltrans spends millions of dollars on sweeping, litter pick-up, installing trash and recycling bins at rest stops, and broadening its reach with partnerships. But litter still lines many of California highways and eventually winds up in waterways used for fishing, swimming and household consumption.

Rain and wind can carry litter and pollution from vehicles and roadways into storm drain systems. Polluted water then flows into connecting city or county storm drain systems, or to streams, rivers and lakes — and eventually to bays and the ocean.

Caltrans owns and operates the state transportation system, which includes 50,000-plus lane miles



Despite awareness campaigns, Caltrans still fights an uphill battle against roadside trash. Caltrans spent more than \$67 million in 2016 keep garbage from reaching storm drains and waterways.

and thousands of storm drains. To keep garbage from reaching its drainage system, the Department spent more than \$67 million in 2016 to remove 142,000 cubic yards of debris from California's highways.

Caltrans maintains many partnerships, including one with the state Department of Corrections and Rehabilitation to give parolees work responsibilities as they help remove highway litter. Businesses and volunteers help combat litter through the Adopt-A-Highway Program, and in early 2017, Caltrans started a Veterans Outreach Program to employ those who served our country. This new program proved instrumental in clearing Solano County storm drains during the record-setting rainfall last winter, and keeping flooding to a minimum.

Caltrans' Protect Every Drop campaign continues to play an important role in preventing stormwater pollution by informing and educating the public. The campaign has partnered with organizations with similar goals, such as Keep California Beautiful, Splash, and the North Coast Stormwater Coalition. **MM**



**Protect
Every Drop**SM

Source: Ana Serrano, Caltrans Senior Stormwater Engineer; and 2017 Caltrans Stormwater Awareness, Attitudes & Behaviors Study



Three 18-wheelers that were used in the testing of the Cooperative Adaptive Cruise Control system pull out on their way to give a highway demonstration. After a successful trial period, Caltrans and other groups are recommending lawmakers authorize a new round of testing of the system.

Early Truck 'Platoon' Tests Show Promise

Advanced Cruise Control Technology Could Yield Safety, Other Benefits

The latest generation of cruise control technology for commercial trucks intended to improve safety, lower vehicle emissions and save fuel has undergone successful testing by Caltrans and other groups, completing 8,000 miles without an incident. A report prepared by Caltrans on the new technology recommends that the legislation authorizing the first round of testing be extended.

Cooperative Adaptive Cruise Control (CACC) technology enables vehicles to safely travel closer together than what is normally considered safe. Caltrans recently released a report to the Legislature detailing the results of close-proximity CACC testing of heavy-duty trucks, and based on the data collected, is recommending that lawmakers extend the pilot authorized in Senate Bill 719 (Hernandez, Statutes of 2015).

California is well-suited to benefit from enhanced cruise control technology, particularly for trucks moving freight. More than 40 percent of the nation's container freight enters the United States

through Southern California's ports, and trucks carry these goods across state highways to their final destinations.

According to transportation analytics researcher INRIX, Los Angeles was the global leader in urban congestion in 2016. Freight trucks contributed to that congestion as they fanned out across the state and nation from the ports of Long Beach and Los Angeles on Interstates 710, 110 and 405.

As outlined in Caltrans' 2015-20 Strategic Management Plan and the goals of Senate Bill 1, the landmark transportation funding law passed in spring 2017, the Department aims to find new ways to improve the flow of traffic, reduce greenhouse gas emissions and move freight more efficiently and safely along California highways and railways.

And CACC technologies have demonstrated that such a system could prove to be a valuable safety and traffic management tool.

CACC is the next step in the development of vehicle cruise control systems. In the trials, trucks

This technology improves traffic flow stability since trucks respond together, rather than as individual vehicles.

were equipped with state-of-the-art, vehicle-to-vehicle communication systems that shared information in live traffic conditions and on a test track. The system shared data between the trucks to automatically adjust speeds in a cooperative formation called a “truck platoon.”

The lead driver in the three-truck platoon set the pace, while the two trailing drivers steered their trucks as they cruised at a controlled and mirrored speed. Radar and video sensors measured the distance between vehicles and relayed signals to maintain a pre-set safe distance. If the first truck sped up or braked, the other trucks automatically adjusted their speed accordingly within a fraction of a second — as a coordinated unit. This technology improves traffic flow stability since trucks respond together, rather than as individual vehicles.

CACC systems also improve safety through reduced reaction times. During the testing of the three-truck platoon, the trailing trucks responded to a leading truck’s acceleration or braking within two-tenths of a second. Human reaction times, however, can vary greatly depending on driver attention and experience.

Truck platooning also minimizes aerodynamic drag for the trailing trucks, which saves fuel and money, and reduces emissions. The drivers remain in control at all times and steer the vehicle, but — like traditional cruise control — CACC technology can provide relief to long-haul truck operators.

The electronically tethered trucks logged more than 5,500 miles on California highways without an incident. An additional 2,500 miles were driven on a test track for fuel consumption experiments that demonstrated fuel savings ranging from 5 to 14 percent.

To evaluate CACC system performance and commercial driver acceptance, Caltrans and its partners tested heavy trucks on the state highway system with less than 100 feet separating them at 55 mph. California Vehicle Code requires a minimum spacing of 100 feet between vehicles traveling in a pla-

toon. To address this conflict between current law and the need to test at reduced distances, SB 719 added an exemption from state law to allow testing of driver-assist technologies that enabled truck drivers to operate vehicles within shorter following distances.

Caltrans and a group of public and private partners received a Federal Highway Administration grant in 2014 to develop and test new cruise control technology for heavy trucks. Testing was conducted by Caltrans in cooperation with the California Highway Patrol.

An extension of the project would allow testing partners to incorporate commercial truck drivers’ assessment of CACC technology, measure energy savings for commercial driver-preferred truck-to-truck spacing, continue testing interaction with other vehicles, and demonstrate CACC benefits to industry and public stakeholders. MM

Source: Truck Platoon Testing Allowed Under SB 719 report and Matt Hanson, Caltrans Freight Research Project Manager



In the cab of a truck equipped with Cooperative Adaptive Cruise Control technology, drivers monitor an interface tablet screen at left. A shut-off device, with red button, is positioned at center.

Staying in Your Lane Just Got Easier

Wider, Brighter, Longer-Lasting Road Striping To Help Drivers Today, in Future

Caltrans' new, 6-inch-wide, highly reflective road striping was introduced on Interstate 80 through Sacramento as part of a statewide effort to restripe the 50,000-plus lane miles of state highway system in the next decade.

Motorists in many areas will notice the difference that the higher-profile striping makes on their driving experience. The new road demarcation lines, which consist of tape or thermal plastic embedded with glass beads, are replacing the longtime standard 4-inch-wide stripes.

Also disappearing, as the new striping is laid, are the raised, non-reflective pavement markers known as Botts Dots, named after the Caltrans scientist who invented them in 1953. With the advent of the new striping, the ubiquitous little bumps have outlived their usefulness as lane separators.

The wider, brighter striping debuted as part of the "Across the Top" I-80 project that made various improvements across a 10-mile section of heavily traveled interstate through the capital city. In the next few years, all of the state's 27,000 lane miles that make up the freight corridors — Interstates 5, 10, 15 and 80 — will be restriped. It is expected that all of state highway system will be restriped within a decade, funded in part by revenues from the Road Repair and Accountability Act of 2017 (Senate Bill 1).

Both the thermoplastic material and tape used in striping contain tiny glass beads that enhance reflectivity, particularly when illuminated by vehicle headlamps or in rainy conditions. The materials have proven very durable, and is expected to retain a minimum level of reflectivity despite constant heavy wear.

The new striping, with its wider and brighter profile, is expected to enhance safety for older drivers and truckers, and in challenging conditions such as rain.

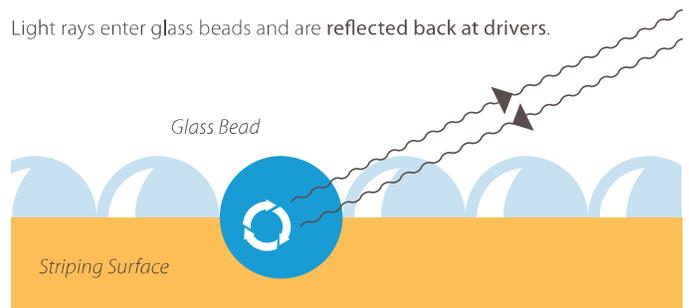
It also will be a better roadway guide for autonomous vehicles. Caltrans has consulted with auto



A section of new-generation road striping was recently laid on Interstate 5 near Orland, about two hours north of Sacramento.

Glass Bead Retro-Reflectivity

Light rays enter glass beads and are reflected back at drivers.



manufacturer Tesla and Google, two major players in the autonomous vehicle industry, about the striping changeover.

Not all parts of the state will see the new striping material. It will not be applied on roadways above 3,000 feet in elevation where snow removal equipment is used. The shovels that scrape snow and ice off the roadway also would remove the thermoplastic striping, so Maintenance Division crews will repaint those lines when damage occurs. **MM**

Source: Tony Tavares, Chief, Maintenance Division

Caltrans Keeps Project Pipeline Filled

Department Showed a 97 Percent Delivery Rate in '16-'17; Work Will Ramp Up

Even one of the fiercest winters in California history didn't bog down Caltrans' Project Delivery that's responsible for planning, developing and managing construction projects to improve and preserve the state highway system.

At the start of the fiscal year 2016-17, Caltrans committed to make 227 projects ready to build. That meant laying all the groundwork before construction could begin — developing plans, specifications and estimates for these projects, including obtaining right-of-way access, environmental clearance and permits.

By the time the fiscal year ended on June 30, Project Delivery had delivered 97 percent, or 220, of those projects valued at \$2 billion to the construction phase. In addition, the Division also oversaw the completion of 210 construction projects during the fiscal year.

Although Project Delivery didn't quite meet its goal of bringing 100 percent of its projects during the fiscal year to the construction stage, the winter of 2016-17 might have had something to do with that.

More than \$1 billion in state highway storm damage has been recorded during the 2016-17 fiscal year, and the toll is still increasing as damage becomes fully known. At one time during the ferocious winter, 44 highways were closed because of weather-related damage. Caltrans' Maintenance and Construction di-



Caltrans photo by Steven Hellon

Getting projects to construction stage is the job of Caltrans' Project Delivery. Senate Bill 1 revenues will mean more work for the division.

visions, along with its contractors, are still repairing parts of the system.

As a result of the storm damage — which was especially extensive in certain regions — 258 projects worth \$482 million had to be engineered, and constructed prior to reopening the highway to traffic. This unplanned work impacted Caltrans' 2016-17

Planned Projects: Statewide 2016-17

Milestone	Planned	Actual	Goal	Percentage	Goal Met
Draft Environmental Documents Completed	65	49	>80%	75%	No
Projects Approved	197	176	>90%	89%	No
Projects with Right of Way Certified	222	215	100%	97%	No
Projects Designed and Ready for Construction	227	220	100%	97%	No
Value of Projects Ready for Construction (millions)	\$2,176	\$2,008	100%	96%	No
Construction Contracts Accepted	249	210	>95	84%	No

project delivery commitments by diverting resources to these high priority projects. However, Caltrans made every effort to meet its challenging project delivery commitments.

Project Delivery staff continue to work on the remaining seven projects of the 227 that were planned for delivery last fiscal year. Five of the seven projects have since been completed, and the last two are expected to be build-ready by August 2018.

Fiscal year 2017-18 will bring more extensive commitments with the enactment of SB 1, which is expected to generate about \$26 billion over the next decade for repairs and improvements to the state transportation network. Although the money won't begin arriving until November, when increased fuel taxes take effect, Caltrans has identified projects to accelerate in anticipation of those funds.

Of the 282 projects Caltrans commits to deliver in fiscal year 2017-18, 20 were originally slated to be designed and delivered in future years, but are being moved into this year's delivery commitment due to SB 1.

Most projects in recent years have been funded from Caltrans' State Highway Operation and Protection Program (SHOPP), designed to protect state

Built Projects: Statewide 2016-17

Milestone	Planned
Draft Environmental Documents Completed	19
Projects Approved	57
Projects with Right of Way Certified	47
Projects Designed and Ready for Construction	38
Value of Projects Ready for Construction (millions)	\$270
Construction Contracts Accepted	88

highway system assets and help the transportation network operate most efficiently.

Caltrans also designs and develops capital improvement projects through the State Transportation Improvement Program (STIP), another category of funding specifically for upgrades to the highway system. **MM**

Source: Horacio Paras Jr., Office of Project Delivery and Workload Development Engineer

Projects Constructed: Contract Value by Program Funding

Transportation Programs	Projects	Program Dollars (millions)	Percentage of Major Programs	Percentage of All Programs
<i>Preservation Programs</i>				
State Highway Operation & Protection Program (SHOPP)	174	\$988.8	69%	36%
Emergency Response — Major Damage Restoration (SHOPP)	127	\$257.0	18%	9%
Minor Program (SHOPP)	62	\$194.1	13%	7%
Subtotal — Preservation Programs (SHOPP)	363	\$1,439.9	100%	53%
<i>Improvement Programs</i>				
Regional Improvement Program		\$93.4	6%	2%
Interregional Improvement Program		\$171.2	17%	6%
SHOPP Funds on Improvement Projects		\$63.5	6%	2%
Partnership Programs (Local & local federal funds)		\$376.4	37%	14%
Proposition 1B Bond Programs		\$326.1	32%	12%
Subtotal — Improvement Programs	30	\$1,030.7	100%	38%
Total	526	\$2,719.1		100%

SB 1 Puts Strategic Vision in Motion

Caltrans 2-Year Plan Identifies Priorities, Charts Progress Ahead of New Law

Closing in on mid-point of its 2015-2020 Strategic Management Plan (SMP), Caltrans is well on the way toward meeting many of its ambitious goals.

A 2-Year Plan prepared by Caltrans — prior to the Road Repair and Accountability Act of 2017 (Senate Bill 1) becoming law — calls out 12 priority policy and program objectives that are representative of the Strategic Management Plan.

Topping the list of objectives, at that time, was the securing of a stabilized transportation revenue source that would fund significant repairs and improvements to the state's network of roads, bridges, public transit and other travel components.

The passage of SB 1 will deliver on that goal. The transportation funding package will raise, through higher fuel taxes and a transportation improvement fee, about \$54 billion in revenues during the next decade, of which Caltrans will receive roughly half — \$26 billion.

Other objectives in the 2-Year Plan are:

Accelerated Delivery Bridge Program

This program identifies high-volume corridor bridges in the state to repair or reconstruct. The report describes how key structural components of the bridges will be strengthened, and bridge decks repaired to extend service life, and how these fixes will allow the lifting of weight restrictions on some bridges along critical freight corridors. Thirty spans on Interstate 5 and I-80 have already been targeted for accelerated action under SB 1 (page 8), and 30 more will be coming. *Supports Stewardship and Efficiency*

Integrated Corridor Management (ICM)

Caltrans plans to put in place five more ICM operation systems on highway systems in heavily traveled urban areas. The ICM uses a network of high-tech traffic components and innovative prac-



Caltrans has a fleet of 133 zero-emission vehicles as part of its commitment to Gov. Brown's 2016 ZEV Action Plan.

tices to manage freeway, transit, arterial and parking elements within a transportation corridor as a single unit, rather than individual pieces. Caltrans expects to install ICM systems on selected Los Angeles County and Orange County corridors, and extend the system along I-80 in Alameda and Contra Costa counties. One other ICM system is operating on I-15 in San Diego County. *Supports Safety and Health, Stewardship and Efficiency*

ZEV Action Plan

Under Gov. Edmund G. Brown Jr.'s plan, Caltrans plans to install at least 30 public fast-charging stations at highway rest stops and other strategic locations, develop three hydrogen fuel stations, and increase workplace battery charging by 5 percent. Caltrans' fleet already includes 133 ZEVs. *Supports Sustainability, Livability, and Economy*

California Sustainable Freight Action Plan

The plan was crafted in 2016 based on the governor's executive order to improve the state freight

system that affects about one-third of the state's \$2.2 trillion economy. The plan calls for an increase in freight system efficiency by 25 percent, deploying more than 100,000 zero-emission freight vehicles, and maximizing the use of near-zero emission freight vehicles and equipment powered by renewable energy by 2030.

Those goals will be supported by the passage of SB 1, which will establish a Trade Corridor Enhancement Program to identify and fund high-priority freight transportation projects in the state. The program is scheduled to receive \$300 million annually from increased diesel fuel excise taxes. *Supports Sustainability, Livability, and Economy*

Complete Streets Implementation Plan

The SMP laid out goals to triple the amount of bicycling, and double pedestrian and transit trips in the state by 2020. To reach those targets, Caltrans now requires 39 percent of its projects incorporate complete streets features such as bike lanes and separated pathways, transit pullouts, better lighting, or improvements that assist pedestrians or the mobility-impaired. Caltrans' current rate of compliance is about 35 percent, and more projects will incorporate complete streets planning to achieve the 39 percent target by 2018.

SB 1 directs an additional \$100 million yearly into Caltrans' Active Transportation Program (ATP) that

finances complete streets projects and features — almost doubling current ATP funding levels. *Supports Sustainability, Livability, and Economy*

Tier 4 Construction Equipment Pilot Projects

Caltrans already awarded one construction pilot project requiring the contractor to use cleaner-burning Tier 4 diesel equipment in Kern County. A second contract is expected to be awarded this year in San Bernardino County. Caltrans plans to establish an ongoing program requiring Tier 4 diesel equipment on select construction projects in 2018.

Other Objectives

The 2-Year Plan includes other objectives that support the SMP, such as the development of a bicycle and pedestrian safety plan, testing of an “e-Construction” program that would supply construction staff in the field with tablet devices instead of working with paper documents, wrap-up of a road charge pilot program and an analysis of the results, and in-house programs to improve the Department. *Supports Sustainability, Livability, and Economy; Safety and Health* **MM**

Source: Caltrans Director's Office

2015-2020 Strategic Management Plan



Caltrans' 2015-2020 Strategic Management Plan laid out five goals to manage, protect and improve California's transportation network, and position the Department to meet future challenges:

Safety and Health: “Provide a safe transportation system for workers and users, and promote health through active transportation and reduced pollution in communities.”

Stewardship and Efficiency: “Money counts. Responsibly manage California's transportation-related assets.”

Sustainability, Livability and Economy: “Make long-lasting, smart mobility decisions that improve the environment, support a vibrant economy, and build communities, not sprawl.”

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

Organizational Excellence: “Be a national leader in delivering quality service through excellent employee performance, public communication, and accountability.”

New Caltrans App Can Be a Lifesaver

Mobile 'HeliPlates' Allows Pilots To Retrieve Hospital Helipad Data in a Touch

Not all emergency medical helicopter pilots know which local hospital offers the services their transport patient needs, the best way in or out of the landing area, or the size and weight limit of the landing pad — but Caltrans does.

Each year, Caltrans' Division of Aeronautics staff inspect hospital and public use airports to ensure the safety of the facilities and compliance with permit requirements.

Caltrans used this information to create the "Caltrans HeliPlates" app, an interactive map now available in iOS and Android formats at the App Store or Google Play. The app provides information on all 166 state-permitted hospital heliports. It breaks down information by geographical area, with pinch and zoom capabilities and drop-down menus detailing specific hospitals and helipads.

In 2012, Caltrans created a [website](#) with "data plates," or web pages of hospital and helipad data, to help connect helicopter pilots with hospital helipad data. Pilots said the website was good for planning ahead, but requested a mobile app to access information during emergency situations on the fly.

So Caltrans continued its work with medical air transporters, hospitals and U.S. armed forces branches to develop Caltrans HeliPlates.

By tapping on a hospital name on a map, pilots can access specific medical services and heliport information for each facility. This is critical for day-to-day emergency responder use, as well as for large-scale emergencies when pilots unfamiliar with an area must transport patients needing immediate care.

Pilots also can preload the Caltrans HeliPlates app onto their tablet or cell phone so they can still access up-to-date information even in a location without a signal. This is an example of how Caltrans is providing a safe transportation system for workers and users.



Helicopter pilots fly critical missions for California hospitals, such as this one in Fresno. A Caltrans app gives them details on landing pads.

CalStar Pilot Mark Ramos flies a medical helicopter to rescue and transport the critically injured or ill to the nearest appropriate hospital as safely and quickly as possible. Ramos tested Caltrans HeliPlates app and said, "This app is quick and easy to navigate with accurate information that is good to know. It saves me time and is really helpful for new nurses and pilots."

Other air ambulances that use California hospital helipads include REACH Air Medical Services, Air Methods, Enloe FlightCare, Stanford Life Flight, Children's Hospital of Los Angeles, as well as local sheriff, fire and California Highway Patrol pilots.

Caltrans was recently honored by other state agency peers for its innovative QuickMap mobile app, which allows motorists to view closures, traffic incidents and other travel information. **MM**

Source: Jeff Brown, Caltrans Office of Airports Chief, and George Williford, Associate Transportation Planner

From the Archives

Driving in the San Francisco Bay Area in 1961 was a much different experience than it is today, as this photo of Interstate 80 at San Pablo Avenue in Richmond shows. This stretch of I-80 just east of the San Rafael Bridge turnoff has an almost relaxed, country road feel to it — a far cry from challenging conditions and congestion of present-day travel.

