SB 1 ANNUAL EFFICIENCIES REPORT 2018-19

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EXECUTIVE SUMMARY

Senate Bill (SB) 1 (Beall, Chapter 5, Statutes of 2017), also known as the Road Repair and Accountability Act of 2017, was passed by the California Legislature and signed into law by Governor Edmund G. Brown Jr. on April 28, 2017. SB 1 increases funding for California's transportation system by an average of $5.4 billion annually, and mandates that the California Department of Transportation (Caltrans) implement efficiency measures with the goal of generating at least $100 million in annual savings to be reinvested into the maintenance and rehabilitation of the State Highway System. The legislation requires that Caltrans report efficiency savings to the California Transportation Commission (Commission) annually.

The first Annual Efficiencies Report, for fiscal year 2017-18, identified $133 million in savings which exceeded the goal of generating at least $100 million to be reinvested in the maintenance and rehabilitation of the State Highway System. Caltrans presented the report at the October 2018, Commission meeting. Caltrans achieved these efficiencies through a combination of process improvements and innovative project delivery methods. The Independent Office of Audits and Investigations conducted an audit of the Annual Efficiencies Report and determined that $8.7 million out of the $133 million were overreported and offered recommendations that were incorporated into this report.

Caltrans continues to build upon the efficiencies from last year and look for opportunities within the department where process improvements can be achieved resulting in monetary savings or cost avoidance. Each efficiency specifies how the savings will be reinvested in the maintenance and rehabilitation of the state highway system. This Annual Efficiencies Report contains efficiencies totaling $233 million in the following categories:

EFFICIENCY CATEGORY	SAVINGS
Innovative Tools	$109 million
New Technology	$26 million
Process Improvements	$98 million
Total Savings:	**$233 million**

INTRODUCTION

Caltrans consistently aims to be a good steward of public funds and promote a culture that is innovative and efficient. For fiscal year 2018-19, Caltrans has identified savings of $233 million. Caltrans continues to expand future year opportunities to generate efficiencies by increasing Construction Manager/ General Contractor (CM/GC), as allowed by Senate Bill 1262; increasing the number of Value Analysis (VA) studies performed by lowering the threshold from $50 million to $25 million; establishing teams to develop strategies to further streamline the National Environmental Policy Act (NEPA) assignment; and encouraging employees to continue with process improvements throughout the department.

Senate Bill 1 (SB 1), (Beall, Chapter 5, Statutes of 2017), also known as the Road Repair and Accountability Act of 2017, was passed by the California Legislature and signed into law by Governor Edmund G. Brown Jr. on April 28, 2017. SB 1 provides mechanisms for increasing funding for California's transportation system by an average of $5.4 billion annually. SB 1 requires Caltrans to implement efficiency measures with the goal of generating at least $100 million in savings annually. The $100 million in savings are to be redirected towards maintaining and rehabilitating the state highway system. SB 1 requires that Caltrans report the savings to the California Transportation Commission annually.

Caltrans first Annual Efficiency Report for fiscal year 2017-18 identified $133 million in efficiencies which exceeded the goal of generating at least $100 million. This report outlines $233 million in efficiencies for fiscal year 2018-19, which is more than double the statutory goal of $100 million. These efficiencies result in reduced project costs which provide additional funding capacity for Maintenance and State Highway Operation and Protection Program projects and reduces the unfunded needs reported in the State Highway System Management Plan.

BACKGROUND

Caltrans is responsible for improving, maintaining, and operating California's State Highway System, which includes a network of streets, highways, and freeways across California. Caltrans accomplishes its mission to "provide a safe, sustainable, integrated, and efficient transportation system to enhance California's economy and livability" through 12 district offices located throughout the State and the support programs at its headquarters in Sacramento. Prior to the passage of SB 1, fuel excise tax revenues were declining due to the increase in fuel efficient vehicles and use of alternate fuels. This meant that transportation funding was not keeping up with inflation and the costs to maintain an aging system used by an increasing number of vehicles. SB 1 provides needed funding to fix California's roads, repair aging bridges, reduce traffic congestion, and improve safety and the movement of goods.

Caltrans continues pursuing new approaches to deliver transportation projects in more efficient and effective ways to reduce costs and accelerate project delivery. The use of innovative contracting tools and independent project evaluations, such as CM/GC and VA, have generated significant cost savings.

CM/GC allows Caltrans to engage the contractor during the design process to provide constructability reviews, value engineering input, construction estimates and other construction-related recommendations with the goal of finding more efficient methods and materials. CM/GC contracting results in projects being built faster with reduced costs. Caltrans is increasing its use of CM/GC, as authorized by Senate Bill 1262.

Caltrans and the Federal Highway Administration (FHWA) recognize VA as an effective process to identify innovative approaches that improve the overall value of the project and generate efficiencies. Caltrans reports to FHWA annually on VA accomplishments such as the number of studies conducted, proposed and implemented recommendations, the value of the approved recommendations, the cost to conduct the studies, and the total savings achieved. VA uses independent subject matter expert reviews to improve the performance of projects and reduce project costs. Most recently, Caltrans increased the number of VA studies to be performed by lowering the threshold for estimated project costs exceeding $25 million to optimize the ability to generate additional efficiencies for future years. The original threshold to perform VA studies was for estimated total project costs that exceeded $50 million which is a federal mandate.

Additionally, employees are encouraged to be innovative and to utilize continuous improvements related to business practices and product development. The Division of Research, Innovation and Systems Information supports programs designed to encourage employees to drive innovative ideas and improve practices and processes, such as the Lean 6-Sigma (L6S) and Innovation Station.

The L6S approach is designed to produce substantial results using a data-driven, focused approach to organizational issues. L6S accomplishes process transformations by integrating a set of powerful improvement tools with a five-phase methodology. These five phases are: Define, Measure, Analyze, Improve, and Control. Caltrans has several process improvements statewide in various stages.

Innovation Station is a crowdsourcing platform which supports the submission of ideas and the management of those ideas through a defined process. Caltrans leverages the value of crowdsourcing by supporting staff statewide as a community of participants who generate and discuss ideas. The success of this approach is premised on the assumption that the employees (or "crowd") are the organization's best resource for ideas and have the most relevant knowledge and experience to identify key issues and possible solutions.

The platform's goals are to encourage a culture of innovation and support statewide collaboration across organizational boundaries, breaking down silos in support of identified efficiencies.

METHODOLOGY

The efficiencies outlined in this report were developed by Caltrans Deputy Directors from the various programs and approved by Caltrans' Financial Policy Board (FPB.) The FPB is chaired by the Chief Deputy Director and its members include the Chief Financial Officer and the Deputies for Project Delivery, Maintenance and Operations, Planning and Modal, and Administration. Each program is responsible for developing efficiency measures that result in monetary savings or cost avoidance. Even though Caltrans has been working on delivering projects more efficiently for many years, fiscal year 2017-18, was the first time that efficiency measures were quantified, and reported pursuant to SB 1.

The FPB approved the definition of efficiencies as being either "cost avoidance or a reduction in support or capital costs (monetary savings)." For purposes of this report, we will specify for each efficiency whether the savings is considered a cost avoidance or a monetary savings.

Caltrans has continued to build upon the efficiencies from the previous year and identified areas within the department where additional efficiencies could be achieved resulting in monetary savings or cost avoidance achieving $233 million in savings as outlined at right:

EFFICIENCY DESCRIPTION	SAVINGS
Innovative Tools	
1. Acceleration of Work	$64,000,000
2. Innovative Strategies in Striping Contracts	$30,400,000
3. Construction Manager / General Contractor	$14,400,000
4. Advance Mitigation Credits	$123,000
Sub-total Innovative Tools	**$108,923,000**
New Technology	
1. High Reflective Material for Striping	$16,500,000
2. Highway Lighting LED Retrofit Project	$5,700,000
3. Global Positioning Satellite in Fleet	$2,200,000
4. Mobile Field Devices	$1,500,000
5. High Performance Reflective Signs	$226,000
Sub-total New Technology	**$26,126,000**
Process Improvements	
1. Value Analysis	$49,000,000
2. Streamlining Environmental Review — NEPA	$41,500,000
3. Value Engineering Change Proposal	$4,400,000
4. Lean 6 Sigma Projects ■ Outdoor Advertising Relocation Agreement Time Reduction ■ Encroachment Permitting Time Reduction ■ New Product Evaluation Time Reduction ■ Reduction of Processing Time of Plans, Specifications and Estimates Contract Documents ■ Fleet Acquisition Planning Time Reduction ■ Building Projects Design Time Reduction ■ Asphalt Materials Sample Testing ■ Traffic Investigation Processing Time Reduction ■ Construction Support Costs Reduction ■ Equal Employment Opportunity Program Investigation Process ■ Formal Disciplinary Action Processing Time Reduction ■ Local Assistance Invoice Processing Time Reduction	$3,181,000
Sub-total Process Improvements	**$98,081,000**
TOTAL MONETARY SAVINGS/COST AVOIDANCE	$233.1 MILLION

The Independent Office of Audits and Investigations conducted an audit of the Annual Efficiencies Report (Annual Report) for fiscal year 2017-18. The purpose of the audit was to determine whether the savings reported in the Annual Report was supported and available for reinvestment in the maintenance and rehabilitation of the state highway system, as required by SB 1. The auditors tested approximately $119.5 million out of the $133 million reported in the Annual Report and found that $8.7 million in savings should not have been included. The auditors also found that approximately $1.5 million was not available for reinvestment in the maintenance and rehabilitation of the state highway system and offered recommendations. Therefore, approximately $123 million was available for the reinvestment in the maintenance and rehabilitation of the highway system.

The following recommendations were incorporated into this report.

- Reviewed the NEPA Assignment project list for completeness and accuracy.
- Used programmed capital construction amount instead of the estimated construction amount when calculating NEPA savings.
- Ensured innovation matrix for CM/GC projects is updated with accurate information and based on final unit prices.
- Ensured that cost avoidance estimates for VA studies are detailed, based on final unit prices, and quantities, and the estimates are updated based on final plans and specifications.
- Ensured that efficiency savings specify whether the monetary savings or cost avoidance will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

INNOVATIVE TOOLS

Caltrans encourages its employees to be innovative and to utilize continuous process improvements related to business practices and product evaluations. The following efficiencies fall in the category of innovative tools.

1. Acceleration of Work

COST AVOIDANCE :

$64 MILLION

Caltrans is faced with the reality that construction costs increase over time and many projects require multiple years to complete. Caltrans uses the escalation rate included in the approved Fund Estimate when programming projects to capture future increases in material and labor costs. With the additional resources generated by the passage of Senate Bill (SB) 1, Caltrans saw an opportunity to advance the development and delivery of critical maintenance and rehabilitation projects across the state. Due to the availability of additional funding, projects will move into construction sooner at a lower cost. By accelerating the rehabilitation and maintenance work of the state highway, California drivers can take advantage of the roadway improvements earlier than planned. Well maintained roads allow for decreased commute times, reduced wear and tear on vehicles, and allow for more efficient transport of goods.

Savings Calculation Methodology

Savings are considered a cost avoidance and as a result, related funds that were committed in future years will be

available to fund more highway rehabilitation projects. For 2018-19, the additional funding from SB 1 was $1.5 billion. The additional funding allowed Caltrans to increase the program and avoid the current escalation for one year. The escalation rate approved at the time of programming the 2018 State Highway Operations and Protection Program was 4.25 percent. Caltrans calculated savings of $64 million in cost avoidance by multiplying the additional funding of $1.5 billion for one-year times the 4.25 percent escalation rate.

Assumptions

Accelerating projects will allow construction to begin sooner at a lower cost. It is assumed that the escalation rate will continue being the same as when the projects were programmed.

Savings Available for Reinvesting in the State Highway System

The $64 million in cost avoidance achieved by accelerating work will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

2. Innovative Strategies in Striping Contracts

MONETARY SAVINGS:

$30.4 MILLION

Caltrans has started using high reflective durable material for striping instead of the conventional paint and thermoplastic. Traditionally, Caltrans used four-inch wide painted stripes to delineate both edge and lane lines on the state highway. Caltrans began deploying six-inch wide striping using more durable material and awarded 35 contracts in 2017-18.

The bids for the 35 contracts awarded in 2017-18, came in 4 percent higher than the engineer's estimate. The contract bids were evaluated and contractors were asked for ideas on ways to achieve efficiencies. These improvements were implemented in the 2018-19 striping contracts resulting in cost savings of $30.4 million. Contract working days are estimated by Caltrans engineers based on estimated production rates. Contractors often assume they will be successful bidders in multiple striping contracts at the same time which may cause them to not complete the work within the contract working days and incur liquidated damages. Contractors assume they would get multiple contracts and often bid higher on specific items to cover the cost of potential liquidated damages. The methodology of determining contract working days was improved to more accurately reflect anticipated production rates, which allows the contractor flexibility to manage multiple striping contracts. Additionally, working with the District Traffic Managers, moving lane closures were allowed in some instances instead of stationary lane closures and allowable working hours were increased. The length of the working area was also increased allowing contractors to move at a faster pace. All these strategies resulted in bids coming in an average of 27 percent lower than the Caltrans engineer's estimate.

Savings Calculation Methodology

The 28 statewide striping contracts awarded in 2018-19 achieved $30.4 million in savings using the following strategies:

- Increasing the number of working days allowed the contractors flexibility to manage multiple striping contracts with the same start date for construction. As a result, the bids came in lower for traffic control and other lump sum items.

SB 1 STRIPING PROJECTS 2018-19					
#	**District and Location of Project**	**Lane Miles**	**Caltrans Engineer Estimate**	**Contractor Bid Result**	**Difference**
1	D1 – Del Norte and Humboldt Counties, Routes 199 and 299	179	$2,993,353	$1,988,681	($1,004,672)
2	D1 – Lake and Mendocino Counties, Routes 20, 29 and 273	244	$3,966,605	$2,657,511	($1,309,094)
3	D2 – Shasta and Trinity Counties, Routes 299, 151 and 53	253	$4,125,765	$2,608,794	($1,516,971)
4	D3 – Sacramento County, Route 50	101	$2,031,005	$1,085,370	($945,635)
5	D3 – Sutter and Butte Counties, Route 99	233	$4,185,580	$3,098,747	($1,086,833)
6	D3 – Colusa, Sutter and Yuba Counties, Route 20	105	$1,694,341	$1,297,747	($396,594)
7	D3 – Nevada and Placer Counties, Route 20	65	$1,283,075	$928,831	($354,244)
8	D4 – Santa Clara County, Route 85	108	$2,480,760	$1,904,645	($576,115)
9	D4 – Alameda County, Route 580	93	$2,562,540	$1,657,657	($904,883)
10	D4 – Contra Costa County, Route 680	112	$2,188,170	$1,498,737	($689,433)
11	D5 – Monterey & Santa Cruz Counties, Routes 1 and 156	217	$3,461,349	$2,966,998	($494,351)
12	D5 – San Luis Obispo & Santa Barbara Counties, Routes 46, 166, 154, and 41	284	$4,473,941	$4,452,089	($21,852)
13	D6 – Fresno, King and Madera Counties, Route 41	142	$2,689,669	$2,366,543	($323,126)
14	D6 – Fresno County, Routes 168 and 180	154	$2,665,237	$2,265,554	($399,684)
15	D6 – Kern County, Routes 46 and 58	125	$1,269,316	$1,253,436	($15,880)
16	D7 – Los Angeles County, Route 105	127	$6,922,670	$4,290,710	($2,631,960)
17	D7 – Los Angeles County, Route 405	187	$8,241,860	$5,245,950	($2,995,910)
18	D8 – San Bernardino and Riverside Counties, Routes 60, 91, and 215	268	$6,362,548	$4,484,977	($1,877,571)
19	D8 – San Bernardino and Riverside Counties, Route 215	304	$7,951,715	$4,990,000	($2,961,715)
20	D8 – San Bernardino County, Routes 58, 210, and 395	280	$5,804,150	$3,899,930	($1,904,220)
21	D9 – Kern County, Route 58	225	$5,290,328	$4,728,966	($561,362)
22	D9 – Inyo County, Route 395	267	$5,017,647	$4,298,869	($718,778)
23	D10 – Merced County, Route 152	173	$3,776,058	$3,149,111	($626,947)
24	D10 – San Joaquin County, Routes 580, 205, 120, and 12	168	$3,972,430	$3,551,903	($420,527)
25	D11 – San Diego County, Route 8	225	$6,118,895	$4,038,256	($2,080,639)
26	D11 – San Diego County, Route 8	179	$5,431,678	$3,770,327	($1,661,351)
27	D11 – San Diego County, Route 163	82	$2,857,908	$1,448,560	($1,409,348)
28	D12 – Orange County, Route 91	120	$3,415,782	$2,859,451	($556,331)
Total		**5,020**	**$113,234,375**	**$82,788,350**	**($30,446,026)**

- Increasing the number of working hours and utilizing moving lane closures allowed the contractor to work quickly and efficiently.

- Allowing longer work areas helped the contractor move at a faster pace and avoid continuous resetting of changeable message signs and cones on an hourly basis.

Savings Available for Reinvesting in the State Highway System

The $30.4 million in monetary savings will stay in the Maintenance and Operations Program and will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

3. Construction Manager/ General Contractor

COST AVOIDANCE:

$14.4 MILLION

An innovative method of project delivery known as Construction Manager/ General Contractor (CM/GC) enables Caltrans to engage the construction manager early to provide input during the design process. Under the traditional means of contracting for the construction of the highway improvement projects, construction of any portion of the project cannot begin until the implementing agency has developed complete plans and specifications for the entire project, placed the contract out for bid, and awarded the contract. Engaging the construction manager early allows the project team to work collaboratively to develop the project scope, optimize design, improve quality, manage costs, and share risks.

Savings are achieved due to the CM/GC contractor's input during the design resulting in a more constructible project, reduced costs, and a reduction in change orders. Caltrans hires an independent cost estimator to provide independent estimates and to advise Caltrans on cost related issues. The construction manager and independent cost estimator independently prepares a cost estimate and schedule based on the draft construction plans and specifications. If the CM/GC construction's estimate is not within 10 percent of the independent cost estimator's estimate, the team meets to review pricing assumptions and attempt to reconcile price differences. The CM/GC contractor develops an innovation register which identifies proposed innovations, including the value of the idea and identifies which innovations were incorporated into the final design and construction documents. The independent cost estimator reviews the innovation register to ensure that the estimated savings are reasonable and supported. When the design is approximately 90 to 95 percent complete, the CM/GC contractor will provide a price to build the project. If the proposed price is acceptable, the CM/GC contractor becomes the general contractor and constructs the project.

Savings Calculation Methodology

Savings are achieved at two different stages, when the construction contract is awarded (e.g. innovations) and at the completion of construction (e.g. reduction in change orders and claims.) The costs associated with CM/GC projects consists of the CM/GC contractor costs, independent consultant estimator costs, and Caltrans support costs. Costs are tracked and reported when the projects are completed. The associated costs for the two projects will be identified at the completion of construction. We reviewed the list of projects for which the CM/GC method was used and determined that two projects were awarded construction during 2018-19 achieving a savings of $14.4 million.

CONSTRUCTION MANAGER/GENERAL CONTRACTOR PROJECT LIST			
Project Name	**Work Description**	**Capital Cost**	**Project Savings**
San Mateo 101 phase 1 Innovation: ■ Revise highway alignment to avoid reconstruction of a pedestrian overcrossing. ■ Modify light foundation design to minimize drilling. ■ Utilize PVC conduit instead of metal conduit in barrier.	The Project will implement 22 miles of managed lanes each direction on Route 101 within the cities of South San Francisco, San Bruno, Millbrae, Burlingame, San Mateo, Foster City, Belmont, San Carlos, Atherton, Menlo Park and East Palo Alto in San Mateo (SM) County, and Palo Alto in Santa Clara (SCL) County. Package 1 is to convert the lanes in the southern portion of the project.	$ 59.5 million	$7 million
Interstate-5 North Coast Corridor phase 4 Innovation: ■ Incorporate a centralized recycling center to maximize reuse of materials and reduce the need to purchase new materials. ■ Reduce structural section through use of geogrid. ■ Utilize 56-hour closure to perform ramp work.	This project is a 27-mile long project that proposes improvements to I-5 coastal rail and transit enhancements, environmental protection and coastal access improvements over 4 phases. Phase 4 is to widen the highway.	$224 million	$7.4 million
Total		**$283.5 million**	**$14.4 million**

Assumptions

The use of the CM/GC method results in design innovations that improve constructability, a reduction in the number of contract change orders and minimal contractor disputes at contract completion. Once construction is completed, the two projects could achieve additional savings.

Savings Available for Reinvesting in the State Highway System

The $14.4 million in cost avoidance achieved with these two projects will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

4. Advance Mitigation Credits

MONETARY SAVINGS:

$123,000

Advanced mitigation purchases can save money by bundling the credits into one larger purchase for a potential discounted price and purchasing credits early before prices increase. The price of mitigation credits is based on supply and demand, so as the need for mitigation credits increases, the price

does as well. By purchasing them in advance, there is a financial benefit because typically the cost of mitigation credits increases over time. Additionally, by purchasing the credits in bulk, the banks will often negotiate a price reduction which provides an additional cost-savings benefit for advance mitigation purchases.

Caltrans developed an advance mitigation project to purchase California Tiger Salamander mitigation credits. The project purchased credits from two conservation banks, each approved by the California Department of Fish and Wildlife (CDFW) and United States Fish and Wildlife (USFWS). A total of $2,916,000 of credits were purchased in 2018, which would provide mitigation for projects both in the northern and southern portion of San Luis Obispo. Specifically, Caltrans purchased 58 credits from the La Purisima Conservation Bank in Santa Barbara County for $27,000 per credit and 45 credits from the Sparling Ranch Conservation Bank in San Benito and Santa Clara Counties for $30,000 per credit.

The Solomon Canyon paving project, requires mitigation of 15.43 acres, which Caltrans intends to fulfill by utilizing the advance mitigation credit purchase from the La Purisima Conservation Bank. This project required a Biological Opinion from USFWS and form 2081 from CDFW for impacts to the California Tiger Salamander. Caltrans is required to mitigate 15.43 acres. Caltrans intends to fulfill this requirement by utilizing the advanced mitigation credit purchase from La Purisima Conservation Bank. In June 2019, Caltrans requested a quote from the La Purisima Conservation Bank to determine current pricing for the credits. The Bank indicated that those 15.43 credits, if purchased in June 2019, would cost $35,000 per credit.

Savings Calculation Methodology:

Credits were purchased from two different Conservation Banks.

La Purisima Conservation Bank

- 2018 — Purchased 58 credits at La Purisima Conservation Bank. Actual price paid per credit is $27,000.
- 2019 — Price per credit $35,000 at La Purisima Conservation Bank if the credits were to be purchased individually one year later.
- 2020 — Price difference per credit $35,000 – $27,000 = $8,000 savings per credit in future years.

Sparling Ranch Conservation Bank

- 2018 — Purchased 45 credits at Sparling Ranch Conservation Bank. The cost per credit is $30,000.
- 2019 — Price per credit $50,000 at Sparling Ranch Conservation Bank if the credits were to be purchased individually one year later.
- 2020 — Price difference per credit $50,000 – $30,000 = $20,000 savings per credit in future years.

Purchased credits from the conservation banks were applied to the following project:

Cost Savings for Solomon Canyon Project = $123,440

A total of 15.43 credits were required for mitigation. At a savings of $8,000 per credit, there is a savings of $123,440 for this project. Based on the estimated cost for mitigation the Solomon Canyon project initially programmed $542,000 in Right of Way Capital to accommodate anticipated mitigation costs.

Assumptions

Mitigation credits will be required for future projects and it is assumed that the price will continue being the same or increase. In total, the 58 credits purchased at La Purisima Conservation Bank have the potential to save $464,000 if the price per credit remains at $35,000 per credit. Additionally, the 45 credits purchased at the Sparling Ranch Conservation Bank have the potential to save $900,000 if the price per credit remains at $50,000 per credit. Additional savings would be achieved if the price per credit increases over time.

Savings Available for Reinvesting in the State Highway System

The $123,000 in monetary savings realized from purchasing advance mitigation credits will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

NEW TECHNOLOGY

Caltrans identified the following efficiencies that are technology driven to achieve savings. In calculating the efficiencies, the cost of the technology was taken into consideration and subtracted from the savings.

1. High Reflective Material for Striping

MONETARY SAVINGS:

$16.5 MILLION

Caltrans has historically used four-inch wide painted stripes to delineate both edge and lane lines on the state highway. More recently, Caltrans began deploying six-inch wide striping that uses more durable materials such as thermoplastic (hot when applied, hardens as it cools) and tape. Both thermoplastic and tape materials are embedded with glass beads to enhance reflectivity for better visibility at night and during inclement weather. The new materials are also more durable, lasting six years compared to one-year with painted stripes. This effort is in its early stages of implementation, but Caltrans expects that all 50,000 lane miles of the state highway system will be restriped within a decade. To date, Caltrans has used the new reflective material on approximately 16,000 miles (Routes 5, 10, 15, 80, 99, and 101).

Additional benefits with the reflective stripes include:

- Longer preview distance for motorists
- Improved guidance and safety for motorists
- Less impact on motoring public and improved safety

Savings Calculation Methodology

The more durable pavement markings reduce the need for ongoing annual maintenance and frequent replacement, lowering both labor and material cost. The thermoplastic applications will have a life span 6 times the life span of paint and the 16,000 miles of striping is under warrantee for six years. The baseline used for the savings calculation was the cost of painting traffic stripes. The savings is the cost difference of maintaining and replacing approximately 16,000 miles annually with the traditional painted stripes versus thermoplastic and tape over a six-year period. The average annual savings, based on the six-year number, is approximately $16.5 million as shown below.

SAVINGS CALCULATION	TOTALS
Six-year period using the old process (edge and line paint)	$258,013,843
Less – six-year period with new process, thermoplastic stripes	($158,592,556)
Difference – savings over a six-year period	$99,421,287
Average savings per year/ six years	$16,570,214

Assumptions

The savings calculation assumes Caltrans would continue with the old process of staff painting edge and line lanes annually.

Savings Available for Reinvesting in the State Highway System

The $16.5 million in monetary savings will stay in the Maintenance and Operations program and will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

2. Highway Lighting LED Retrofit

MONETARY SAVINGS:

$5.7 MILLION

In an ongoing statewide effort, Caltrans has been replacing existing high-pressure sodium (HPS) fixtures with light emitting diode (LED) lighting on highways statewide. HPS fixtures have been a mainstay on the highways for more than 30 years; however, LEDs are a superior alternative. LED fixtures are designed to operate for a minimum of 15-years with little to no maintenance, as compared to HPS lighting which require replacement every four-years. LEDs lights are also far more energy-efficient, reducing energy usage by 50 to 60 percent. Caltrans maintains approximately 80,000 pole-mounted streetlights statewide. As of the end of 2018-19, approximately 90 percent of the 80,000 pole mounted street lights have been replaced with LED lighting. Caltrans will continue replacing HPS with LED lighting until all lighting has been converted to LED. A reduction in maintenance on LED fixtures also lessens the frequency of lane closures and reduces the exposure of maintenance workers to the hazards of working in live traffic. The production of electricity is a major contributor to greenhouse gas emissions. Therefore, lowering energy usage results in a positive impact to the environment.

Savings Calculation Methodology

In calculating savings, the cost of replacing lighting using the traditional method was subtracted when compared with LED lighting as shown below:

HIGHWAY LIGHTING LED RETROFIT			
Description	**HPS Cost**	**LED Cost**	**Difference/Savings**
Energy Costs	$9,320,187	$4,660,094	$4,660,093
Estimated Labor Costs	$1,661,197	$371,206	$1,289,991
Vehicle Expenses	$218,579	$48,843	$169,736
Materials (light fixtures)	$683,620	$1,067,407	($383,787)
Total	**$11,883,583**	**$6,147,550**	**$5,736,033**

- Energy Costs — $4.6 million reduction in energy usage based on lab tested performance and industry data. The savings is the difference between HPS and LED energy usage.
- Labor Costs — $1.3 million reduction in labor cost associated with less frequent maintenance and replacement. Replacing HPS lights take approximately 18 staff per year compared to 4 staff time for LED lighting.
- Vehicle Usage — $169,736 additional savings due to the reduction of vehicles usage by maintenance crews in replacing highway lighting.
- Materials (light fixtures) — LED lighting is more expensive than HPS lighting. Therefore, it is estimated that this cost will be higher by approximately $383,787.

Assumptions

The calculations are based on the assumption that the inventory of lights will remain the same. There are 80,000 pole mounted streetlights statewide. Replacing HPS lighting with LED lighting will reduce energy needs, labor, equipment, and material costs.

Savings Available for Reinvesting in the State Highway System

The $5.7 million in monetary savings associated with this efficiency stay in the Maintenance and Operations program and have been redirected to other areas in Maintenance and Operations.

3. Global Positioning Satellites in Fleet

MONETARY SAVINGS:

$2.2 MILLION

In 2013 by executive order, all state agencies were required to reassess their vehicle fleet inventory and relinquish any vehicles that were deemed non-essential or not cost-effective. Caltrans reduced its fleet by approximately 1,300 vehicles, initiated a pilot program to evaluate the use of global positioning satellite (GPS) devices to improve fleet utilization and automate vehicle usage reporting. The pilot demonstrated that utilizing GPS devices would improve fleet management

practices. GPS installation in all light-duty vehicles (passenger cars and trucks) began in late 2013. To date, the devices have effectively eliminated the need for manual reporting of vehicle usage, while providing far more accurate data collection. By reducing the fleet, Caltrans also has reduced the cost of the smog checks. Furthermore, GPS devices dramatically improve operator safety through automatic alerts of vehicle diagnostics and location.

Savings Calculation Methodology

It is estimated that Caltrans has spent close to 17,700 hours manually logging vehicle usage each year. Approximately $1.3 million is saved annually by eliminating these manual logs. Additional savings are achieved by the elimination of smog inspections. The total efficiency savings for 2018-19 is approximately $2.2 million as shown below:

DESCRIPTION OF SAVINGS	SAVINGS
Elimination of Manual Usage Reporting (car tags)	$1,288,392
Elimination of Biennial Smog Inspections	$ 868,892
Total Savings	**$2,157,284**

Assumptions

Because vehicle use is recorded by employees working in many classifications, from Transportation Engineers to Office Technicians, the mid-range salary for the two classifications was used. It was assumed that each car tag entry took one minute per entry. Based on historical information, it was also assumed that it takes an average of two hours for a heavy equipment mechanic to take a vehicle to a smog inspection station.

Savings Available for Reinvesting in the State Highway System

The $2.2 million in monetary savings achieved with this efficiency will stay in the Maintenance and Operations program and will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

4. Mobile Field Devices

COST AVOIDANCE:

$1.5 MILLION

As part of an ongoing effort to improve the project delivery process by effectively leveraging new technology, in 2017-18 Caltrans deployed 1,000 mobile field devices to enable field inspectors, resident engineers, and construction managers complete daily project diaries on site, to access electronic documents and to administer construction contracts directly from the job site. The ability to remotely access needed documentation significantly reduced the frequency of trips between the field office and job site and allowed construction staff to better utilize their time for high priority activities. The mobile field devices also allowed for elimination of unnecessary printing of millions of pages. In addition, the mobiles field devices enabled staff to immediately document on site daily construction activities. Caltrans plans to purchase additional devices which will increase the efficiency savings in future years.

Savings Calculation Methodology

Caltrans conducted a survey in 2018 and found that each mobile field device user saved 4.4 roundtrips weekly between the field office and the job site. The average distance between office and job site is about 17 miles. We calculated the mileage savings per year and subtracted the cost of the device and servicing per year. Based on the data collected, each mobile field device user can save an average of $1,500 per year over the expected life of the device which is 3 years. In total, the 1,000 devices are producing a net savings of $1.5 million annually and a total of $4.5 million over their expected 3-year life span. Additional savings are achieved from a reduction in printed documents.

Assumptions

It was assumed that all mobile field device users saved 4.4 trips per week as the survey indicated. The mobile field devices have improved the overall contract administration process by enabling construction staff to stay in constant contact with contractors and other interested parties via email.

Savings Available for Reinvesting in the State Highway System

The $1.5 million in cost avoidance achieved from this efficiency stay within the construction program and will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

5. High Performance Reflective Signs

MONETARY SAVINGS:

$226,000

Caltrans has been using reflective sign sheeting materials on its overhead and roadside signs for more than two decades to enhance the safety of the traveling public. The overhead signs had attached lights to enhance visibility for the traveling public. Caltrans is now implementing higher-performance reflective materials that are more visible at night and do not require the attached lighting. The brighter, more reflective signs allow for greater visibility from longer distances. The ability to see signs from a longer distance allows all drivers the additional time to react to unexpected conditions in a safe manner. The new reflective sheeting uses the light from vehicle headlights to make signs appear brighter and easier to read. Removing the unnecessary light fixtures eliminates the utility, maintenance, and replacement costs associated with lighting the older signs. Implementation of the new signs is still in the early stages and it is estimated that it may take up to a decade to fully replace approximately 20,000 overhead signs.

Savings Calculation Methodology

Removing the unneeded lights reduces electricity usage. To date, Caltrans has replaced approximately 10 percent of the total signs across the state. Additional savings include eliminating the need for crews to inspect and repair lights and other electrical components. The projected savings, once all the overhead signs have been replaced, is $2,260,195 million annually. Because only 10 percent of the signs have been replaced, the savings for this fiscal year are $226,118.

HIGH PERFORMANCE REFLECTIVE SIGNS		
Category of Expenses	**Full Implementation Projected Annual Savings**	**Estimated Savings on 10% Implementation**
Energy Cost	$2,128,347	$212,834
Labor Cost	$439,042	$43,904
Material Cost	$81,066	$8,106
Equipment Cost	$32,740	$3,274
Less Cost of reflective signs	($421,000)	($42,100)
Total	**$2,260,195**	**$226,118**

Assumptions

The brighter, more reflective signs allow for greater visibility from longer distances. The ability to see signs from a longer distance allows all drivers the additional time to react to unexpected conditions in a safe manner.

Savings Available for Reinvesting in the State Highway System

The $226,000 in monetary savings from this efficiency will stay in the Maintenance and Operations Program and will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

PROCESS IMPROVEMENTS

Caltrans has been working on making process improvements in many areas of the department. These process improvements have improved productivity and reduced project delivery costs. Some process improvements have also reduced backlog and improved customer service. The following are the process improvements identified for this report.

1. Value Analysis

COST AVOIDANCE:

$49 MILLION

Caltrans uses the Value Analysis (VA) process on individual projects to drive efficiency and add value or performance. VA is a systematic process of review and evaluation early in the project development life-cycle and it is one of the most effective processes used in project delivery to achieve efficiencies.

Conducted by a multidisciplinary team during the environmental and design phase, the goal is to identify innovative approaches that improve the overall value of the project. The team applies their knowledge in a systematic approach by utilizing function analyses tools to improve the value of a project. VA methodology is optimized through refining the design to increase performance and/or decrease costs, analyzing lifecycle costs, user benefits and overall return on investment. Value is added by improving functionality and/or reducing cost while maintaining the safety, necessary quality and environmental attributes of the project.

The team consists of independent subject-matter experts who are not directly involved in the project and will offer new perspectives.

Once the study is completed, a final report documents the process, results, decisions made, and implementation plans for moving the project

VALUE ANALYSIS PROJECT LIST

	Project Name	Total Project Cost	VA Study Savings	Associated Costs	Project Savings
1	San Bernardino – State Route 60 Truck Climbing and descending lanes *Improvement: Revise vertical profile and horizontal alignments and permanently close one lane in the westbound direction.*	$138,375,000	$13,454,492	$80,306	$13,374,186
2	Madera – State Route 99 Widening *Improvement: Additional Stormwater retention basins.*	$92,567,000	($1,082,550)	$49,144	($1,131,694)
3	Yuba – State Route 70 Replace Simmerly Slough Bridge # 16-0019 *Improvement: Lower entire bridge profile seven feet and shift the bridge alignment seven feet.*	$ 82,900,000	$ 9,080,000	$49,960	$9,030,040
4	Yuba – State Route 20 Timbuctoo Collision Severity Reduction. *Improvement: None of the alternatives were implemented because the project delivery team determined that further analysis was necessary due to the results of the geotechnical studies.*	$67,321,000	$0	$ 51,485	($51,485)
5	Lake – State Route 29 Improvement Project *Improvement: This VA study was combined with the one below.*	$105,218,000	$0	$0	$0
6	Lake – State Route 29 Improvement Project *Improvement: Improve cut slope from original designed slope of 4:1 to 1.5:1.*	$66,050,000	$28,426,000	$95,497	$28,330,503
7	San Diego – State Route 11 New 4 Lane Highway *Improvement: Improved delivery by splitting contracts.*	$142,529,000	$0	$71,650	($71,650)
8	Marin and Solano State Route 101 – Widen for HOV Lanes *Improvement: None of the alternatives were accepted because project phasing was no longer needed.*	$121,525,000	$0	$ 133,105	($133,105)
Total		**$816,485,000**	**$49,877,942**	**$531,147**	**$49,346,795**

forward. Recommendations, in most cases, reduce project costs. In some cases, the result is an increase to the overall cost of the project but improved overall performance. Federal regulations mandate that all projects on the National Highway System receiving federal funds, with an estimated total project cost exceeding $50 million perform a VA.

Caltrans recognizes the tremendous value in the VA process and the opportunity to generate future year efficiencies. Therefore, an internal VA policy was issued on February 5, 2019 requiring VA studies to be performed on projects where the total estimated project cost is $25 million or more and the benefit of VA is likely to exceed the cost of going through the VA process. Additional savings are anticipated in future years from the lower $25 million threshold.

Savings Calculation Methodology

Caltrans identified eight projects that had VAs and achieved "Ready to List" (RTL) for construction contract advertisement status in 2018-19. Projects are RTL when plans, specifications, and estimates are complete, environmental and right-of-way clearances are secured, and all necessary permits are obtained. Four out of the eight projects achieved savings and the other four projects did not achieve savings but improved performance. For accountability and transparency purposes, we are including all eight projects in our calculation of savings. Associated costs for VA studies consist of the cost of the study and Caltrans support costs. Associated costs were subtracted from the savings to arrive at the net savings for the fiscal year. Net savings for the eight projects is approximately $49 million.

As recommended by the Independent Office of Audits and Investigations, future VA savings will be reported using actual bid prices when the contract is awarded instead of the current practice.

Assumptions

Assumptions related to value analysis studies are unique to each project but typically include similarities such as, construction item quantities, unit costs, overall performance, time savings, and/or other related factors.

Savings Available for Reinvesting in the State Highway System

The $49 million in savings are considered a cost avoidance that will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

2. Streamlining Environmental Review — NEPA

COST AVOIDANCE:

$41.5 MILLION

Caltrans was the first in the nation to sign a Memorandum of Understanding with the Federal Highway Administration (FHWA) to assume responsibility for compliance with the National Environmental Policy Act (NEPA). This assumption of this federal responsibility is commonly referred to as "NEPA Assignment." NEPA Assignment streamlines the federal environmental review and approval process by eliminating FHWA project-specific review and approval. NEPA Assignment does not alter federal environmental protection standards. California assumes sole responsibility and liability for its NEPA decisions and is required to waive its right to sovereign immunity against NEPA related actions

brought in federal court. Caltrans has established teams that are working on various strategies to further streamline NEPA Assignment. These strategies will be implemented in future fiscal years.

Caltrans has achieved significant time savings by completing environmental documents approximately 13 months earlier with NEPA Assignment. For projects that were determined to be exempt from preparing a major environmental document, or "Categorically Excluded," the review processing time savings is estimated at one month. The time savings during the environmental review has allowed construction to begin sooner, avoiding cost escalation of capital construction costs. Processing projects utilizing NEPA Assignment saves money through cost avoidance.

Savings Calculation Methodology

Projects that utilized NEPA assignment and completed the Project Approval and Environmental Document phase during fiscal year 2018-19 were identified. Categorical exclusions are estimated to have a one month in time savings and environmental assessments achieve 13 months in time savings. The time savings were multiplied by the approved capital cost escalation rate to determine cost savings. The Caltrans Legal Division provided the associated legal costs, which were subtracted from the savings. In addition, Caltrans subtracted the support costs for the program and the consultant costs associated with NEPA Assignment. As shown in the table below, there were 189 environmental documents completed utilizing NEPA Assignment achieving over $41 million in savings.

Assumptions

Time savings during the environmental process allows construction to begin sooner. When construction begins sooner, construction costs are lower due to capital cost escalation rates.

Savings Available for Reinvesting in the State Highway System

The $41.5 million in savings from NEPA Assignment are considered a cost avoidance. The savings will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

NEPA ASSIGNMENT CATEGORIES	NUMBER OF PROJECTS	SAVINGS	ASSOCIATED COSTS	TOTAL SAVINGS
Categorical Exclusions – 1 month	174	$6,652,597		
Environmental Assessments – 13 months	13	$35,824,011		
Legal Expenses			($383,953)	
Program Staff Support			($290,234)	
Consultant Costs			($346,342)	
Totals	**187**	**$42,476,608**	**($1,020,529)**	**$41,456,079**

3. Value Engineering Change Proposals

COST AVOIDANCE:

$4.4 MILLION

Caltrans encourages contractors to develop and implement innovative approaches to construction projects through the Value Engineering Change Proposals (VECP). The VECP process encourages contractors to think outside the box and find innovative methods, materials, and technologies that are new and unique to reduce cost, save time, reduce congestion and improve quality and safety. When these new approaches result in construction cost savings, Caltrans and contractors may share the cost savings. The VECP is a formal process whereby the innovation is proposed in writing to Caltrans and the merits of the approach are examined. If the innovation is accepted and concurrence is approved, a change order is prepared to authorize the VECP and the work can begin. Money saved through VECP enables Caltrans to get additional value from their highway construction dollars. More projects can be constructed for the same amount of money and new, innovative construction solutions may be applied to future projects.

Savings Calculation Methodology

Efficiency savings were calculated based on the number of projects that had accepted VECP for fiscal year 2018-19. There was a total of 26 accepted VECP for the year, representing $4.4 million in savings. The list of the 26 VECP, along with a description, the date it was approved, and the amount of savings is shown below.

Assumptions

Money saved through VECP enables Caltrans to get additional value from their highway construction dollars. More projects can be constructed for the same amount of money and new, innovative construction solutions may be applied to future projects.

Savings Available for Reinvesting in the State Highway System

The $4.4 million in savings from VECP are considered a cost avoidance. The savings will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

VALUE ENGINEERING CHANGE PROPOSALS			
#	**District and Description**	**Approval Date**	**Net Amount**
1	D1 – Modification of wall pilasters	03/15/19	($11,182)
2	D1 – Install new drainage system by jack and bore method	04/26/19	($71,348)
3	D2 – Modification of stage construction	08/23/18	($1,122,477)
4	D3 – Modification of stage construction	04/04/19	($19,243)
5	D4 – Drainage inlet adjustment	08/08/18	($41,652)
6	D4 – Modification of stage construction	09/05/18	($57,625)
7	D4 – Replace lean concrete base with class 2 aggregate base	10/25/18	($175,468)
8	D4 – Replace rubberized hot mix asphalt with hot mix asphalt	11/13/18	($85,145)
9	D4 – Eliminate willow median K-rail	11/20/18	($81,323)
10	D4 – Delete stage construction 2-2 temporary work	11/20/18	($334,376)
11	D4 – Stage Construction 2 detour – leave stage construction 1A temporary pavement section in place in lieu of remove and replace detour	12/05/18	($8,113)
12	D4 – Modification of stage construction	05/22/19	($113,578)
13	D4 – Eliminate contract items and provide lane closures	06/11/19	($52,089)
14	D4 – Modify sequence of stage construction, paving limits of hot mix asphalt	06/13/19	($50,995)
15	D6 – Replacement of plan sheet	07/16/18	($1,975)
16	D6 – Accelerated schedule of permanent erosion control	12/15/18	($106,258)
17	D6 – Revise temporary detour structural section	01/22/19	($138,871)
18	D6 – Modification of stage 1 traffic handling plan	04/25/19	($81,610)
19	D7 – Revise roadway structural section	07/30/18	($544,117)
20	D7 – Modification of structural painting requirements	12/11/18	($202,918)
21	D8 – Eliminate imported borrow	04/17/19	($684,302)
22	D8 – Modification of median structural section	05/06/19	($30,643)
23	D11 – Utilization of Tensar fabric in order to reduce aggregate base thickness within state right of way	08/06/18	($18,793)
24	D11 – Revise roadway structural section	08/15/18	($299,737)
25	D11 – Stage construction 2A re-stage by eliminating the stage construction 1A temporary paving	09/21/18	($74,086)
26	D11 – Eliminate planned placement of temporary zone guard barrier system	10/25/18	($26,850)
Total Savings			**$4,434,774**

4. Process Improvements through Lean 6 Sigma

Caltrans was one of several state agencies to pilot the Lean Six Sigma (L6S) program, designed to pinpoint waste and inefficiencies. Since then, Caltrans has completed over 50 projects statewide. The L6S approach is designed to drive innovation and produce substantial results using a data-driven, focused approach to organizational issues. L6S accomplishes process transformations by integrating a set of powerful improvement tools with a five-phase methodology. This methodology forms the roadmap for organizations to transform its processes and culture. The five phases are: Define, Measure, Analyze, Improve, and Control. The following process improvements were identified as having the potential for significant reduction in processing time and potential savings. Some of these process improvements achieved savings and others improved productivity and reduced backlogs.

1. Outdoor Advertising Relocation Agreement Time Reduction

Savings: 25 Days

Caltrans regulates the placement of outdoor advertising displays visible on state highways and regularly reviews and enforces outdoor advertising requirements under the Federal Highway Beautification Act and the State's Outdoor Advertising Act. Caltrans improved customer service by reducing the processing time to reach a settlement agreement to relocate outdoor advertising displays subject to condemnation pending a Caltrans or local highway project. Relocation agreements are now settled following a standardized process which significantly reduced the processing time to reach a settlement and provides consistency and more equitable treatment to industry stakeholders. Relocation agreements normally took an average of 90 days to settle. Three relocation agreements were completed in 2018-19 and took 22, 70 and 153 days to complete. By standardizing and streamlining the process, Caltrans improved their customer service and reduced processing time.

2. Encroachment Permitting Time Reduction

Savings: 55 Days

Caltrans issues encroachment permits when there is a request to encroach on the State right of way either temporarily or permanently. The encroachment permit ensures the safety of the traveling public, highway workers and permittees, and protects the State's and public's investment in the highway facility. The approval or denial of encroachment permit applications were taking an average of 85 days. As part of the L6S effort, the process to review a permit application was streamlined and standard operating procedures were developed and implemented as a pilot. In 2018-19, the pilot issued 1,201 permits. Of those, 1,149 permits were issued within the 30-day timeframe. Lessons learned from this pilot project resulted in modifications to the current process and statewide implementation is expected in 2019-20.

3. New Product Evaluation Time Reduction

Savings: 144 Days

New product evaluations have undergone several changes to improve the program's efficiency and overall effectiveness. The objective of this L6S process was to reduce processing time for 95 percent of new product evaluations. The changes implemented take a proactive approach that places more responsibility on the vendors before submitting products for consideration. As a result, the program has seen improvements in processing as well as a dramatic decrease in the backlog of outstanding submittals. Specifically, a new Vendor Submittal Guide was

created to assist vendors in submitting a new product to the Department. The process distinguishes a new product from a product that meets the criteria for an Authorized Material List (AML). An AML is a family of products that must meet specified authorization criteria. Vendors are required to submit third party laboratory test data to demonstrate conformance, reducing the workload placed on Caltrans' technical committees.

This process improvement reduced the overall turnaround time from an average of 931 days to 144 days. Another benefit from this process improvement was decreasing the backlog of outstanding submittals. The backlog in April 2017 consisted of 284 open submittals and as of July 2019, it is reduced to 98.

4. Reduction of Processing Time of Plans Specifications and Estimates Contract Documents

Cost Avoidance: $1.4 million

Preparing roadway contract documents was taking 24 weeks which increased costs and delays to construction. The objective of this L6S process improvement was to reduce processing time from 24 to 12 weeks. This process improvement recommended revised checklists, templates and clarified requirements. It also scheduled standard safety and constructability reviews early in the process to identify potential issues and reduce re-work by functional groups. Additionally, staff started working on advanced coordination with utility companies, improving the utility mapping process to accelerate resolution conflict relocations with earlier design information, earlier environmental permit application submittals and improving the project initiation document process to better scope, schedule and resource projects with earlier involvement. In addition to the streamlined process described above, Caltrans piloted the use of the "Exception to Advertise before the California Transportation Commission Allocation" on 15 projects in 2017-18 and achieved $526,127 in savings.

In 2018-19, 20 projects followed this process and achieved $1,378,244 in cost avoidance. Additional savings could be achieved from a reduction in change orders due to the improved PS&E quality.

Savings Calculation Methodology: Savings were calculated by multiplying the construction capital amount by the approved escalation rate and the number of days advertised early.

Savings available for Reinvesting in the Highway System: The $1.4 million in cost avoidance achieved with this process improvement will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

5. Fleet Acquisition Planning Time Reduction

Monetary Savings: $191,000

Typically, approval of the Fleet Acquisition Plan (FAP) takes up to two years to obtain approval causing long delays for new vehicles and equipment to be delivered to Caltrans' functional programs. The objective of this L6S process improvement is to reduce this approval time to 6 months. This process improvement reduced the process from 25 steps to 6 steps; updated replacement and retention standards; developed justification templates; and implemented workshops in all districts. Preliminary results show a reduction in processing time from 243 days to 59 days.

Savings Calculation Methodology: Processing time went down from 243 days to 59 days or a reduction of 134.9 days for two staff or $144,882. Additionally, the 5-year Fleet Acquisition plan was delivered which means no FAP was necessary for 2018-19, resulting

in additional savings of $46,504 for a total annual savings of $191,386.

Savings available for Reinvesting in the Highway System: The $191,000 in monetary savings achieved with this process improvement will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

6. Building Projects Design Time Reduction

Savings: Future Years

The Office of Transportation Architecture and Office of Electrical, Mechanical, Water and Wastewater Engineering are responsible for developing Plans, Specifications and Estimates (PS&E) for building projects statewide. Currently, it takes an average of 455 days and includes 14 milestones for a standard building type (e.g. pump houses, equipment shops, roadside rest areas, toll plazas). The objective of this L6S is to reduce the time it takes to deliver PS&E for a standard building project from 455 to 90 calendar days. This process improvement developed standard designs and new plan layouts for non-custom facilities; created a catalog of design options for standard building types and systems selection meeting before starting PS&E; established new process map with an expedited schedule for projects selected from the catalog; and reduced the number of milestones from 14 to 7 or half of the original milestones.

Implementing all these solutions resulted in reducing the average number of days from 455 to 260 days or approximately 43 percent. As the scope of these projects get finalized using the checklist, further efficiencies are anticipated in support costs. It is assumed that customers will select a standard building design from the catalog and the systems in the facility are selected before PS&E starts. Monetary savings or cost avoidance will be calculated in future years when more data is available.

7. Asphalt Materials Sample Testing

Savings: 21 days

The Asphalt Binder Laboratory in the Materials Engineering and Testing Services (METS) Office of Roadway Materials Testing is responsible for testing asphalt materials for quality assurance on construction contracts and for supplier-certification. The purpose of this process improvement was to reduce the time it takes to process asphalt binder samples, from the time the sample is received at Asphalt Binder lab to the time the results are sent to the Resident Engineer. Several critical issues were identified in the old process, clear procedures for sample login, test result reporting and technician back up were developed and implemented.

Process improvements have been implemented and turnaround times improved from 48 to 21 days.

8. Traffic Collision Investigation Report Processing Time Reduction

Monetary Savings: $1 million

Caltrans investigates identified collision locations to reduce the number of fatalities on the State Highway System. Traffic Investigation Reports are used to complete the investigations. As part of the L6S effort, the process to investigate identified collision locations and prepare Traffic Investigation Reports was streamlined and standard procedures were developed. The streamlined process was used in one district as a pilot and it showed a reduction in the average time to complete a Traffic Investigation Report from 57 hours to 26 hours. The lessons learned from this pilot project resulted in modifications to the current process and the modified process is scheduled to be implemented statewide in 2019-20.

Savings Calculation Methodology: Savings were calculated in the pilot district by calculating the traffic investigation report production hours and dividing it by the number of investigation reports. The calculations showed savings of $928,898 in labor hours. These savings will be used to ensure there are no backlog in investigations.

Savings available for Reinvesting in the Highway System: The $1 million in monetary savings achieved with this process improvement may not be available for the reinvestment in the state highway system.

9. Construction Support Costs Reduction

Monetary Savings: $476,000

Caltrans noted a need to reduce construction support costs because they were about 50 percent of project development costs. The objective of this L6S process improvement is to reduce construction support costs for surveys, earthwork, and working days from the current average of 260 days. This process improvement implemented automated machine guidance on the State Route 191 pilot project. The new technology reduced inspection and survey crew time. In addition, the Construction Manual was updated to establish a "level of inspection" standard for item work activities and clarified inspection frequency standards for staff. Implementing this process improvement achieved efficiencies in survey support and construction earthwork support.

Savings Calculation Methodology: Savings were calculated by determining the baseline number of hours and associated cost before the pilot and after the pilot. Overall, there was a reduction of 2,100 hours in survey support representing $210,000 and 2,130 hours in earthwork support representing $266,000. In total the process improvement achieved savings of $476,000.

SAVINGS CALCULATION	SURVEY SUPPORT	EARTHWORK SUPPORT
Baseline before L6S	$300,000	$470,000
Less actual after L6S	($90,000)	($204,000)
Savings	$210,000	$266,000

Savings available for Reinvesting in the Highway System: The $476,000 in savings achieved with this process improvement will be available for reinvestment in the maintenance and rehabilitation of the state highway system.

10. Equal Employment Opportunity (EEO) Program

Monetary Savings: $35,000

The EEO Program implemented a L6S effort for its investigations process and successfully reduced the turn-around time for discrimination complaint investigations. Before the L6S process review, discrimination complaint investigations had a backlog of over 100 cases. The objective of this process improvement was to eliminate the backlog, and complete investigations within 45 days from receipt of complaint without eliminating any of the necessary steps taken in the investigative process. In addition, implemented a timeline with milestones for each investigation and streamlined some of the steps. Before the process improvement, only 7 percent of cases were meeting the 45-day target.

Efficiency Savings Calculation: In 2018-19, the backlog was reduced to zero and 200 out of 309 cases were closed within 45 business days. Efficiency savings are estimated at $35,000 for the 2018-19 fiscal year.

Savings available for Reinvesting in the Highway System: The $35,000 in monetary savings achieved with this process improvement will not be available for the reinvestment in the state highway system.

11. Formal Disciplinary Action Processing Time Reduction

Monetary Savings: $79,000

Formal disciplinary actions were taking an average of 99 days to process. Delays resulted in the perception of ineffectiveness and lack of accountability. Furthermore, failure to address employee issues may potentially effect morale, disrupt the workplace and create a hostile work environment. The objective of this L6S process improvement was to reduce the time of processing the disciplinary actions to an average of 14 days without compromising any of the required steps in the investigative process. The process improvement determined that each case manager was performing 17 percent of unnecessary functions such as duplicate reviews, and other unnecessary administrative functions, to produce one adverse action. The 17 percent spread over 6 case managers equaled one case manager position. Implementing the process improvement reduced the average number of days to process a disciplinary action from 99 days to 15 days for 2018-19.

Efficiency Savings Calculation: Savings associated with one less case manager was calculated at $79,000. Additional benefits include improved morale and more discipline training to the entire department.

Savings available for Reinvesting in the Highway System: The $79,000 in monetary savings achieved with this process improvement will not be available for the reinvestment in the state highway system.

12. Local Assistance Progress Invoice Improvements

Savings: Future Years

Caltrans Local Assistance Program and Local Program Accounting reviews invoices to reimburse local agencies. Invoices submitted typically had errors and omissions that required unnecessary rework, multiple reviews, and delay in processing reimbursement to the local agencies. In addition to invoice errors and omissions, the invoice process needed to be documented and standardized statewide. The L6S team consolidated nine old forms into one dynamic invoice builder form with formulas and warning controls, developed instructions and standard review procedures, and conducted statewide training for districts and local agencies. The objective of this L6S was to reduce errors by 90 percent. The invoice builder was piloted in one district and achieved 70 percent reduction in errors. Savings will be achieved from spending less time correcting invoices by Caltrans and local agencies. The data to establish a baseline to be able to calculate cost savings is still being collected. Savings will be reported in future years.

FUTURE EFFICIENCIES

As required by SB 1, Caltrans is committed to implementing efficiency measures with the goal of generating at least $100 million dollars annually and reporting to the California Transportation Commission. New opportunities to generate efficiencies are being considered and will require implementation strategies. Caltrans continues to evaluate and deploy new technologies, innovative tools, and process improvements to identify efficiencies. The following opportunities are being evaluated for potential savings in future years.

- **Advance Mitigation Program** — Caltrans established an Advance Mitigation Program to plan and implement advance mitigation solutions for its future transportation projects. The new business practice allows Caltrans to reduce delays by proactively obtaining environmental mitigation in advance of transportation projects. The primary goal of the program is to address long term future environmental needs resulting in improved environmental, economic and project delivery outcomes. Draft guidelines have been developed and are currently moving through the review process. Once fully implemented, the program is expected to achieve savings from faster project delivery.

- **Streamlining the Permitting Process** — As required by Assembly Bill 1282, a task force will be developing a detailed analysis of the existing permitting process for transportation projects in California. This effort should result in significant savings as the analysis will identify points of delay where projects can be combined in the project development and permit process. The task force will include management from Caltrans, the State Water Resources Control Board, the California Department of Fish and Wildlife, the California Coastal Commission, and the High- Speed Rail Authority.

- **Project Bundling** — Project bundling is a proven method of streamlining the project delivery process by bringing together multiple projects under a single contract award to achieve time or cost savings. A bundled contract can cover a single county, or district, and may include a combination of work types, including design, preservation, rehabilitation, or complete replacement. Bundling projects expedites timelines by streamlining various requirements, such as environmental agreements and standardized design. In addition, projects with shared features can leverage design expertise to lower overall cost through economies of scale and reduced procurement times. Significant savings are anticipated next fiscal year from two projects. One of the projects will upgrade traffic signals and the other project will improve pedestrian access facilities to reduce collision severity.

- **Unmanned Aircraft Systems (UAS)** — Implementing UAS technology will increase safety, improve efficiency, and decrease operational costs in surveys, bridge inspections, environmental investigations and non-precision aerial photography.

- **Early Design in Project Approval and Environmental Document (PA&ED)** — Implementing early design in PA&ED will shorten design time in the plans, specifications and estimates phase and will accelerate time to get projects into construction.

- **Accelerated Bridge Construction (ABC)** — ABC employs innovative design and construction methods to reduce the number of construction days and construction related impacts. Methods include fabricating bridge parts away from traffic and quickly assembling them onsite in a matter of weeks.

- **Traffic Windows** — Implementing longer traffic windows to reduce construction project duration while minimizing overall traffic impacts will reduce the delay to the public. Efficiencies may arise from reduced design support needed to create traffic management plans.

- **Improved Traveler Information** — A new version of the Caltrans Highway Information Network (CHIN) will be rolled out, allowing data to flow directly from the Traffic Management Centers to the CHIN webpage and phone service. The new CHIN will eliminate the need for Headquarters to manually input the information and Caltrans will be able to improve emergency response time.

- **Corridor Management** — This efficiency will develop and review corridor strategies for defined routes. This will allow Caltrans to more effectively, plan, and develop an investment strategy for a corridor and obtain buy-in from partnering agencies on projects.

- **National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) Reciprocity** — Receiving approval to use one document, NEPA or CEQA will save staff time and reduce delivery time.

- **Printer Efficiency Reduction** — Caltrans Information Technology recently conducted a printer efficiency project that is expected to result in cost savings. The estimated savings are anticipated from having to replace less printers, less use of paper and toner and reduced energy consumption.

- **Architectural and Engineering (A&E) Contracts Process** — The Division of Procurement and Contracts reviewed its A&E contracting process and identified eight areas of improvements. The areas of improvement include eliminating specific forms or combining them to be more efficient, using checklists, where appropriate, and reducing the negotiations phase from 41 days to 11 days.

- **Innovation Station** — Innovation Station is Caltrans' online innovation platform. Employees can collaborate on ideas for a variety of sponsored, targeted initiatives. One of the challenges for the 2018-19 fiscal year was "Better, Faster, Cheaper" which focused on ideas to make Caltrans be more efficient. During the challenge, employees submitted ideas that were subsequently reviewed, and a feasibility study was completed to determine the requirements for implementation. Moving forward a group of subject matter experts will analyze the feasibility of implementing the idea and will recommend implementation or additional vetting with the functional area. Once the ideas are implemented, significant savings can be achieved in future years.