Caltrans
CALIFORNIA DEPARTMENT OF TRANSPORTATION

REBUILDING CALIFORNIA SB1

ANNUAL EFFICIENCIES REPORT to The California Transportation Commission

Fiscal Year 2017-2018

Annual Efficiencies Report
Fiscal Year 2017-18

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Executive Summary

Senate Bill (SB) 1 (Beall, Chapter 5, Statutes of 2017), entitled 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 the California Department of Transportation (Caltrans) implement efficiency measures with the goal of generating at least $100 million in annual savings to apply to the maintenance and rehabilitation of the State Highway System. The legislation further requires Caltrans to report efficiency savings to the California Transportation Commission (Commission) annually.

In January 2018, Caltrans developed and presented an Interim Efficiencies Report outlining a number of potential efficiency measures resulting from technology, innovative tools, and process improvements. Caltrans evaluated and analyzed the efficiency measures identified in the Interim Report and assessed the extent of cost avoidance or monetary savings achieved during Fiscal Year (FY) 2017-18. Only efficiency measures with significant savings are quantified in this report.

This is the first annual report to the Commission outlining the efficiencies achieved. Caltrans is focused on achieving efficiencies through the use of technology, innovative tools, and process improvements. Caltrans is pleased to report that in FY 2017-18, it achieved a total of $133 million in efficiency related savings. Out of the $133 million, $129 million are related to cost avoidance and $4 million are monetary savings. The savings achieved through cost avoidance will be used towards programming future projects that maintain, rehabilitate, replace and reconstruct the state highway system. The monetary savings achieved with the Highway Lighting LED Retrofit Project will be reinvested in asset management and other maintenance and operations activities.

Efficiency Description:	**Cost Avoidance:**
1. Value Engineering / Value Analysis	$62 million
2. Innovative Contracting Tools - CM/GC	$45 million
3. Streamlining Environmental Reviews - NEPA Assignment	$13 million
4. Acceleration of Work	$9 million
Sub-total	***$129 million***
	Monetary Savings:
5. Highway Lighting LED Retrofit Project	$4 million
6. Process Improvements through Lean 6 Sigma	n/a
Sub-total	***$4 million***
Overall Savings Achieved	**$133 million**

Fiscal Year 2017-18 Efficiencies Report

I. Introduction:

Senate Bill 1 (SB 1), (Beall, Chapter 5, Statutes of 2017), entitled 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 efficiency savings annually. The $100 million in efficiency savings are to be redirected towards maintaining and rehabilitating the State Highway System. SB 1 further mandates Caltrans report the savings to the California Transportation Commission (Commission) annually. This report outlines the efficiencies, and related savings, identified and achieved by Caltrans for Fiscal Year (FY) 2017-18.

II. Background:

Caltrans is responsible for the planning, design, construction, maintenance and operation of California's State Highway System, as well as for the portion of the interstate highway system within the boundaries of the state. 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 geographically located throughout the state and support programs located at its headquarters in Sacramento. Although Caltrans has worked hard to maintain its transportation assets, transportation funding has not kept up with inflation to maintain the aging system used by millions of vehicles throughout the state and declining revenues due to an increase in fuel efficient vehicles. The passage of SB 1 provides the much needed funding to fix California's roads, repair aging bridges, reduce traffic congestion, and improve safety and goods movement.

Caltrans has been pursuing new approaches to deliver transportation projects in more efficient and effective ways to reduce costs and accelerate project delivery. For example, the use of innovative contracting tools and independent project evaluations, such as Construction Manager/General Contractor (CM/GC) and Value Analysis (VA)/ Value Engineering have proven to have 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. The CM/GC contracting mechanism results in projects being built faster with reduced change orders. Caltrans was authorized to utilize the CM/GC project delivery method on 22 projects that met a criteria of construction costs greater than $10 million. SB 1262 (Beall, Chapter 465, Statutes of 2018) signed by Governor

Edmund G. Brown Jr. on September 17, 2018, removed the cap on the number of projects for which Caltrans is authorized to use the CM/GC method.

Caltrans has also been using VA to improve the performance of the projects and reduce project delivery costs. Caltrans encourages VA studies on projects if it determines that the project could benefit from the use of the study. Caltrans reports to the Federal Highway Administration (FHWA) annually on VA accomplishments such as the number of studies conducted, proposed and implemented recommendations, the value of the approved recommendation, the cost to conduct the studies, and the total savings achieved.

Additionally, employees are encouraged to be innovative and to utilize continuous improvements related to business practices and product development. The Office of Innovation, Risk and Strategic Management, within the Office of the Director, has programs designed to encourage employees to drive innovative ideas, improved practices and processes, including the Lean 6-Sigma (L6S) and VA. In 2014, Caltrans was one of a number of state agencies to pilot the L6S program, designed to pinpoint waste and inefficiencies. Since then, Caltrans has completed 37 L6S projects with varying degrees of success. Some of the process improvements detailed in this report came as a result of the L6S process.

During preparation of the Interim Report, Caltrans engaged the consulting firm CTC & Associates to conduct preliminary research on best practices and to identify other state departments of transportation who have implemented efficiencies as part of an investment strategy. CTC & Associates' research was limited to identifying other state departments of transportation who are monitoring efficiencies and documenting cost savings. A number of Caltrans efficiency measures included in this report are similar to what other states are doing.

The following table shows the similarities other departments of transportation are reporting:

State:	**Efficiency Saving Strategy**
Colorado	Lean process
Minnesota	Value Engineering/ Value Analysis, LED Lighting, process improvements
Missouri	Value Engineering/ Value Analysis
Michigan	Value Engineering/ Value Analysis, LED Lighting, CM/GC
Utah	Value Engineering/ Value Analysis
Washington	Lean process
Wisconsin	Lean process, Value Engineering/ Value Analysis, LED Lighting
Wyoming	Value Engineering/ Value Analysis

III. 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 was designated as the governing body over efficiencies. 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 came up with efficiency measures that resulted in cost avoidance or monetary savings. Even though Caltrans has been working on delivering projects more efficiently for years, this is the first time the process is documented and efficiency measures monitored, quantified, and reported. The efficiencies in this report are the result of using technology, innovative tools and process improvements. Most of the efficiencies identified avoid costs.

SB 1 requires that the savings achieved through efficiencies be reinvested in the rehabilitation and maintenance of the highway system. The savings achieved through cost avoidance identified in this report will be used towards programming projects that maintain, rehabilitate, replace, and reconstruct the State Highway System. The monetary savings achieved in the Maintenance and Operations program will be reinvested in asset management and other maintenance and operations activities.

In addition, SB 1 established the Independent Office of Audits and Investigations led by an Inspector General who is responsible for ensuring transportation funds are used properly. The Independent Office of Audits and Investigations conducted an audit of the efficiency measures outlined in the Interim Report presented to the Commission at its January 2018 meeting. The Inspector General issued its final audit report on July 23, 2018, and concluded that Caltrans was proactive in identifying areas of efficiencies and developing processes and procedures to comprehensively and effectively achieve the required efficiency measures as outlined by SB 1.

Subsequent to the Interim Report in January 2018, Caltrans:

- ✓ Designated the FPB as the oversight body responsible for establishing a structure of authority, providing guidance, and monitoring the accuracy and reliability of the efficiencies savings reported in the annual report presented to the Commission. The FPB is made up of deputy-level representation of core funding programs and chaired by the Chief Deputy Director.

- ✓ Adopted a definition for efficiency savings as cost avoidance or monetary savings.

- ✓ Developed procedures and guidelines to assist programs, divisions, and districts in identifying, measuring, documenting, and reporting efficiency savings.

- ✓ Analyzed each strategy outlined in the Interim Report to determine whether the method for calculating the savings was appropriate and had sufficient support documentation.

- ✓ Incorporated the Independent Office of Audits and Investigations' Efficiency Measures recommendations into this report.

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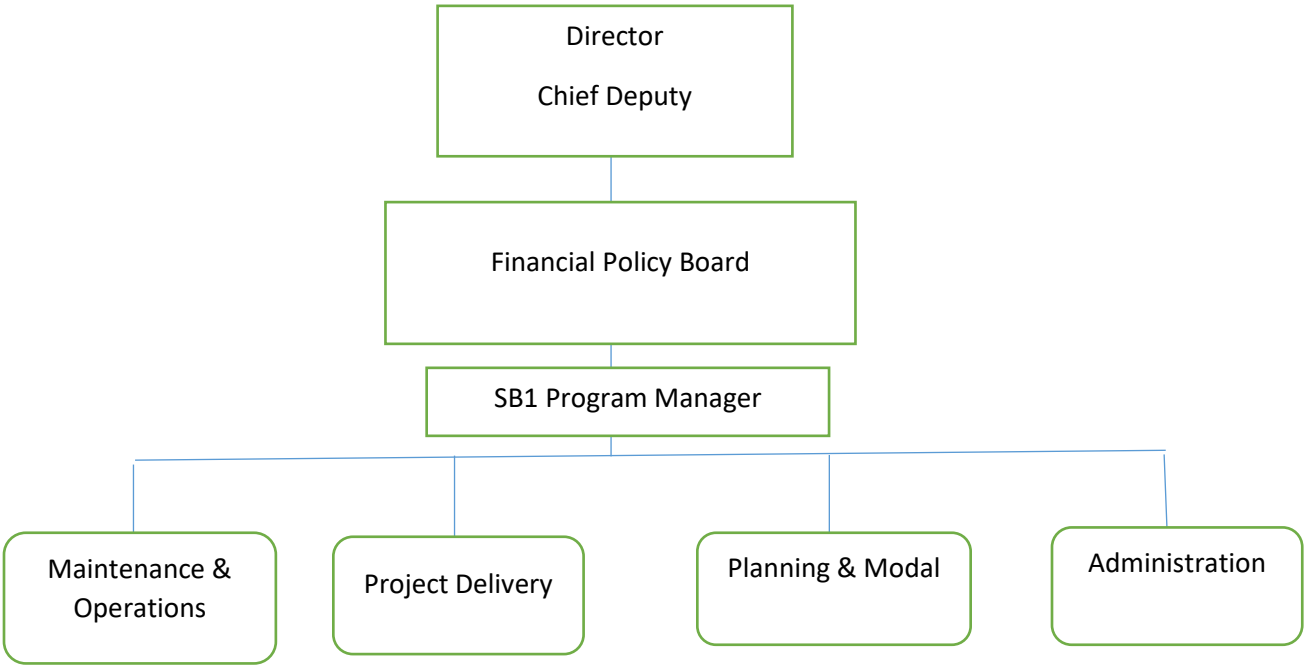

The Financial Policy Board approved the definition of efficiencies as being either cost avoidance or monetary savings. Specifically, the following is the definition of efficiency for purposes of this report:

"Caltrans will consider efficiencies that result in cost avoidance or a reduction in support or capital costs."

Each efficiency described in the Efficiency Measures Implemented section of this report will identify the assumptions made, cost associated with the efficiency, whether the efficiency is a cost avoidance or monetary savings, and whether the calculation was made using estimates or actual figures.

IV. Efficiency Measures Implemented:

1. ***Value Analysis /Value Engineering*** ***Efficiency Savings: $61.6 million***
Category: Cost Avoidance

Caltrans uses the Value Analysis (VA) study on individual projects to drive efficiency and add value or performance. VA is one of the most important processes used in project delivery to achieve efficiencies.

VA is a systematic process using a team from a variety of disciplines to conduct a study prior to construction to improve the value of a project. The VA study is conducted by a multidisciplinary team composed of individuals who are not directly involved in the planning or design of the project. The team applies their knowledge in a systematic approach by utilizing function analyses tools to improve the value of the project. Value can be increased by either improving the function or reducing the costs, while maintaining the safety, necessary quality and environmental attributes of the project. Every study generates a preliminary and final report. The purpose of the preliminary report is to provide documentation of the alternatives to the decision makers and get their responses to the viability and acceptability of the alternatives. The final report documents input received, decisions made, and implementation plans for moving the project forward.

Caltrans realizes significant savings utilizing an independent team of subject matter experts during the VA studies. Nine projects completed VA studies during Fiscal Year (FY) 2017-18. The VA recommendations, in most cases, reduced the cost of the project. However, in a few cases the recommendations resulted in an increase to the overall cost of the project but resulted in improved overall project performance. The value of the alternative per project is identified in Table 1. Costs associated with VA studies consist of consultant costs (administrative fees, quality control and travel expenses) and support costs for a team of six to eight subject matter expert employees.

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.

Calculation Methodology: Projects analyzed were those that had a VA study completed and achieved an RTL milestone in FY 2017-18. Projects are considered to achieve the RTL milestone when plans, specifications, and estimates are complete, environmental and right-of-way clearances are secured, and all necessary permits are obtained. The associated cost to perform the studies was calculated by reviewing the attendance sheet for each member of the team participating in the study and using an average rate for engineers to calculate the total cost. It also includes the cost of consultants moderating the study. As noted below, not all projects showed monetary savings but all improved overall project performance. Table 1 lists the projects with VA studies and recommendations implemented for FY 2017-18.

TABLE 1 – Value Analysis Studies for FY 2017-18

Project Name	*VA Study Capital Construction Cost*	*VA Study Savings*	*Associated Costs*	*Project Savings*
1. Sac 5 HOV Lanes and Rehab – *Improvement: combined two nearby projects and adjusted work windows to allow for pre-cast slab replacement.*	$168,000,000	$1,534,000	$72,000	$1,462,000
2. Sac 5 HOV Lanes and Rehab – *project combined with the project above.*	$165,000,000	$2,751,000	$52,000	$2,699,000
3. Mon 101 Pavement Rehab – PM 36.9 to 47.7 *Improvement: increase ramp closures to allow for pavement curing in lieu of pre-cast slabs.*	$49,800,000	$ 6,445,000	$42,000	$6,403,000
4. Mon 101 Seismic Retrofit - *The results of the geotechnical studies eliminated the need for Cast in Steel Shell Piles. Another alternative was eliminated due to a project scope reduction.*	$29,800,000	$0	$46,000	($46,000)
5. Mon 101 PM 87.3 to PM 91.5 – *None of the study alternatives were accepted because of geometric concerns.*	$35,200,000	$0	$49,000	($49,000)
6. Ker 99 Roadway Rehab – *None of the study alternatives were implemented because they did not add value.*	$79,000,000	$0	$52,000	($52,000)
7. LA 60 Pavement Rehab – *The VA study identified user benefits that outweighed the slight increase in cost.*	$109,000,000	($1,080,000)	$52,000	($1,132,000)
8. Riv 10 Pavement Replacement – *Improvement: changed pavement type due to median rebuild, and saved thrie-beam barrier verses replacement.*	$239,000,000	$47,200,000	$47,000	$47,153,000
9. SBD 60 Pavement Replacement – *Improvement: changed pavement type due to lane closure timeframes.*	$92,000,000	$5,200,000	$48,000	$5,152,000
Total	$ 966,800,000	$62,050,000	$460,000	**$61,590,000**

2. ***Construction Manager/ General Contractor*** ***Efficiency Savings: $44.5 million***
Category: Cost Avoidance

Caltrans identified a number of innovative contracting tools that can be used to modify standardized processes and procedures in order to enhance and facilitate project delivery. These innovative contracting tools have proven to result in significant savings by completing projects faster and reducing escalation costs. Construction Manager/General Contractor (CM/GC) is an example of innovative contracting tools. During our review, five CM/GC projects were identified as having been completed this fiscal year. Caltrans was limited to 22 projects using the CM/GC method. However, Senate Bill 1262 (Beall, Chapter 465, Statutes of 2018), signed by Governor Brown on September 17, 2018, removed the cap.

Under traditional means of contracting for the construction of 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. As a result, the contractor who will be constructing the project has no involvement during the development of the project.

The CM/GC delivery method allows Caltrans to engage the construction manager early to provide input during the design process. The team works 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 prepare 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 delivers the project.

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.

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 consist 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 five projects will be identified at the completion of construction. For the purposes of this report, only savings at contract award were quantified.

- Contract Award - We reviewed the list of projects for which the CM/GC method was used and determined that the following five projects were awarded construction contracts in FY 2017-18. We divided the projects into projects that rehabilitate, reconstruct, or replace portions of the State Highway System and projects that don't rehabilitate the highway system but increase capacity, or have different funding sources. We are including all five projects in this table, but will only consider savings related to the projects that rehabilitate the State Highway System for purposes of the $100 million requirement. Table 2 shows each project and the innovation savings.

TABLE 2 – CM/GC Projects for FY 2017-18

Project Name	*Work Description*	*Construction Capital Cost at Contract Award*	*Project Savings*
Highway Facility Rehabilitation, Reconstruction, or Replacement Projects Implemented by Caltrans			
1. SBD 58 Kramer Junction *Innovation: Earthwork and landscape changes*	Realign Highway	$165,245,000	$41,266,000
2. SBD 215 Barton Rd IC *Innovation: Project staging, temporary facility changes and elimination of items.*	Reconstruct Interchange	$47,401,000	$3,203,000
Sub-total for projects implemented by Caltrans		$212,646,000	$44,469,000
Non-Rehabilitation, Reconstruction or Replacement Projects			
3. ALA 80 Bay Bridge (*) *Innovation: Revised pile and concrete requirements.*	Foundation Removal	$44,079,000	$4,388,000
4. SD 5 North Coast Corridor – package 2 *Innovation: earthwork, use of on-site material plants and material recycling plants.*	HOV Lanes	$93,821,000	$31,050,000
5. SD 5 North Coast Corridor – package 3 *Innovation: changed aesthetic treatment and fencing.*	HOV Lanes	$5,330,000	$818,000
Sub-total for projects implemented by others		$143,230,000	$36,256,000
Totals for all Transportation Projects		**$355,876,000**	**$80,725,000**

(*) This project is one of 3 projects identified in the State Auditor's Report (2018-104) issued in August 2018, as having saved the State of California a total of $94 million in cost avoidance.

Cost avoidance on projects that rehabilitate the State Highway System: $44.5 million

- Completion of Construction – Savings are also achieved at the completion of construction by a reduction in change orders and contractor disputes. The list of projects using the CM/GC method did not have projects that completed construction in FY 2017-18. Costs associated with the five projects listed above will be calculated at project close out. We will evaluate and report on all associated costs (Caltrans staff, independent evaluator, and the CM/GC contractor), as well as change orders and claims savings at construction completion.

3. Streamlining Environmental Reviews - NEPA Assignment

Efficiency Savings: $13.4 million
Category: Cost Avoidance

Caltrans was the first state who signed a Memorandum of Understandings with the Federal Highway Administration (FHWA) to assume responsibility for the National Environmental Policy Act (NEPA). The term used for assuming this responsibility is "NEPA Assignment." NEPA assignment streamlines the federal environmental review and approval process by eliminating FHWA project-specific review and approval of NEPA documents and the removal of the exchange of documents and comments between Caltrans and FHWA, thus streamlining the federal environmental review and approval process. In addition, Caltrans acting as the federal lead is able to consult directly with federal resource agencies, achieving additional time savings. Assuming FHWA's responsibilities under the NEPA Assignment, requires that Caltrans waive its constitutional right under the Eleventh Amendment of the United States Constitution to sovereign immunity against federal lawsuits. In March 2017, authority for sovereign immunity was extended to January 1, 2020. This statute must be extended for Caltrans to keep NEPA Assignment.

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 outlay construction costs. Processing projects utilizing NEPA Assignment saves money through cost avoidance.

When calculating estimated savings for the Interim Report, Caltrans took an average for the projects completed over the past three years and did not take into consideration associated costs with NEPA assignment. Subsequently, the Independent Office of Audits and Investigations reviewed the methodology for the estimated savings and recommended, among other things, that the cost associated with NEPA Assignment be deducted from the savings. In calculating the final FY 2017-18 efficiency savings, all of the Inspector General's recommendations were implemented.

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.

Calculation Methodology: All projects that completed the Project Approval and Environmental Document phase during FY 2017-18 were identified, and verified that NEPA Assignment was used. The list was reviewed to ensure it was complete and accurate and to determine the estimated time savings. In reviewing the list, Caltrans noted that seven projects were also

included in the list of accelerated projects. The seven projects were excluded from this list. Categorical exclusions are estimated to have a one month in time savings and environmental assessments achieved 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 consultant costs associated with NEPA Assignment. Table 3 shows that for FY 2017-18, 232 environmental documents were completed utilizing NEPA assignment for highway rehabilitation, reconstruction and replacement projects. There were an additional two highway capacity increasing projects for a total of 234 projects. The two additional projects will not be included in the total for this efficiencies report since those projects were not for rehabilitating the State Highway System.

TABLE 3 – NEPA Assignment Totals for FY 2017-18

Highway Rehabilitation, Reconstruction and Replacement Projects:	***No. of Projects***	***Savings:***	***Associated Costs***	***Total Savings***
Categorical Exclusions – 1 month	222	$7,387,679		
Environmental Assessments – 13 months	10	$6,694,392		
Legal Expenses			$183,225	
Headquarters Staffing Expenses			$171,600	
Consultant Costs			$306,540	
Total	**232**	**$14,082,071**	**$661,365**	**$13,420,706**

Total NEPA Assignment Savings on SHOPP Projects: $13,420,706

4. Savings due to Acceleration of Work ***Efficiency Savings: $9.2 million***
Category: Cost Avoidance

Caltrans estimates the cost of projects in the State Highway Operation and Protection Program (SHOPP) using current costs. Caltrans then escalates the cost to a planned delivery date using an escalation rate included in the approved Fund Estimate. By programming project costs using an escalation rate, Caltrans ensures that any future cost increases in material, labor and benefits are reflected in the estimated project cost. With the passage of SB 1 and the increase in revenues, Caltrans had the opportunity to accelerate delivery of 17 projects included in later years of the 2016 SHOPP. The 2016 SHOPP had an approved annual escalation rate of 4.5 percent. Additional resources were provided through the budget process to accelerate the delivery of the projects.

Assumptions – Accelerating projects allows construction to begin sooner at a lower cost due to the de-escalation of capital costs. Those 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.

Calculation Methodology – We determined that 17 projects included in the 2016 SHOPP were accelerated into FY 2017-18. We reviewed the list of accelerated projects (projects delivered earlier than the programmed delivery year) and based on the planned "ready to list" date, calculated the number of months of acceleration. We calculated the savings by multiplying the current estimated capital costs by the number of months delivery was accelerated, and by the escalation rate. The annual escalation rate approved at the time of programming for the 2016 SHOPP was 4.5 percent. Table 4 lists the SHOPP projects that were accelerated.

TABLE 4 – Accelerated Projects

2017-18 Accelerated Projects from Future Years of the SHOPP			Accelerated Delivery			Original RTL (2016 SHOPP)		Savings based on a cost de-escalation rate of 4.5 percent	
Dist	EA	Project Name	RTL Date	COMMISSION Allocation Date	Estimated Capital Cost (1,000s)	Programmed RTL Date	Estimated Capital Cost (1,000s)	Months Accelerated	Efficiency Savings (1,000s)
01	41550	Men 128 PM 0.0/23.8 Pavement Rehabilitation	4/16/18	June 2018	$13,260	10/1/18	$17,419	6	$302
02	3E740	Sha 299 PM 7.6/18.3 Pavement Rehabilitation	3/20/18	May 2018	$16,270	7/1/19	$14,310	16	$989
03	0H10U	Sac 5 PM 13.0/24.9 Pavement Rehabilitation	3/26/18	May 2018	$254,500	7/1/18	$227,273	4	$3,868
04	15148	Ala 880 PM 4.6/7.4 Widen Ramps and install Ramp metering	6/29/18	Oct 2018	$14,477	8/1/18	$13,281	2	$110
04	4J281	SCl 82 PM 10.4/14.4 Pavement Rehabilitation	6/8/18	Aug 2018	$9,380	3/1/19	$8,000	9	$321
05	1F520	SCr 1 Bridge Rail Replacement and Upgrades	6/14/18	Oct 2018	$4,112	7/2/18	$4,167	1	$16
05	1F760	SCr 17 PM 6.0/12.6 Pavement Rehabilitation	6/14/18	Aug 2018	$15,353	7/16/18	$15,381	1	$58
06	0T200	Ker 99 PM 0.0/11.2 Pavement Rehabilitation	5/1/18	Oct 2018	$47,972	12/1/18	$48,000	7	$1,276
06	0S490	Kin 5 PM 0.0/9.0 Pavement Rehabilitation	10/12/17	Dec 2017	$23,357	2/15/19	$25,000	16	$1,420
08	1C330	SBd 10 PM 21.6/23.6 Roadway Safety Improvements	6/25/18	Aug 2018	$1,190	7/15/19	$2,203	13	$59
08	1F920	Riv 10 PM 3.2/5.3 Install Changeable Message Signs	6/18/18	Aug 2018	$3,166	9/17/18	$3,228	3	$36
09	36590	Iny 395 PM 54.6/57.4 Pavement Rehabilitation	6/13/18	Aug 2018	$7,969	8/23/18	$7,170	2	$61
10	1C870	Sta 99 PM 13.9/15.1 Replace Bridge Approach Slabs, Joint Seals and Repair Bridge deck	5/4/18	June 2018	$5,585	1/17/19	$ 4,929	8	$170
11	41950	SD 78 PM 2.3 Replace Culvert	6/20/18	Aug 2018	$13,104	11/16/18	$15,248	5	$249
11	41990	SD 805 PM 27.1/28.9 Pavement Rehabilitation	3/29/18	June 2018	$6,782	11/16/18	$8,120	8	$206
11	42080	SD Var Replace Changeable & Advanced Variable Message Signs	6/18/18	Aug 2018	$3,004	7/13/18	$4,586	1	$ 11
12	0H028	Ora 5 PM 23.2/30.2 Upgrade Fiber Optic Communication System, Electronic Equipment	5/4/18	June 2018	$2,132	8/1/18	$3,000	3	$24
								Total	**$ 9,177**

5. Highway Lighting LED Retrofit Project ***Efficiency Savings: $4.3 million***
Category: Monetary Savings

Maintenance and Operations has been replacing existing high-pressure sodium (HPS) fixtures with light emitting diode (LED) lighting on highways statewide since 2013. The retrofit project is being implemented over two 4-year replacement periods and it's expected to be completed in FY 2019-20. Caltrans is replacing the HPS lamps as their useful life expires which is typically 4 years. The LED lighting has a longer life span resulting in replacement savings and savings of staff time replacing the lighting. The LED fixtures are expected to last between 15 and 20 years without maintenance and reduce energy usage by 50 to 60 percent.

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. It is estimated that replacing HPS lights statewide takes approximately 18.4 staff a year compared to 4.1 staff for LED lighting.

Calculation Methodology: Caltrans has replaced 85 percent of the 80,000 pole mounted street lights as of the end of FY 2017-18, resulting in the following savings:

- Energy costs – $4,048,644 estimated savings in energy costs based on lab tested performance and industry data. The savings is the difference between HPS and LED energy usage.
- Labor costs – $1,214,126 estimated savings in labor costs. Replacing HPS lights takes approximately 18 staff per year compared to 4 staff for LED lighting.
- Materials (light fixtures) – LED lights are more expensive than HPS lighting. Therefore, it is estimated that this cost will be higher by approximately $361,216.
- Vehicle Expenses – $159,753 additional savings due to the reduction of vehicle usage by maintenance crews in replacing highway lighting.

Table 5 has the savings per category. The savings associated with this efficiency are being reinvested in asset management and maintenance and operations activities.

TABLE 5 – Highway Lighting Retrofit Project

	HPS	***LED***	***Difference /Savings***
Energy Costs	$8,097,289	$4,048,644	$4,048,644
Estimated Labor Costs	$1,563,501	$349,375	$1,214,126
Materials (light fixtures)	$643,416	$1,004,632	($361,216)
Vehicle Expenses	$205,724	$45,970	$159,753
Total Annual Savings for full implementation	$10,509,929	$5,448,622	$5,061,308
Annual Savings with 85% implementation to date:			**$4,302,111 per year**

6. Process Improvements through Lean Six Sigma

Caltrans has been working on innovative ways of doing business or process improvements by employing the Lean Six Sigma (L6S) process review procedure. These process improvements have improved productivity and reduced backlogs and/or error. 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. This methodology forms the roadmap for organizations to transform its processes and culture. These five phases are: Define, Measure, Analyze, Improve, and Control.

Since adopting the L6S process review, Caltrans has completed 37 process improvements with various degrees of success. The following process improvements were identified in the Interim Report. We monitored the process improvements and monetized efficiencies where possible. However, not all of the process improvements showed a monetary savings. Caltrans will continue to monitor these projects to determine savings achieve. It is anticipated that some of these projects will achieve cost avoidance or monetary savings in future years.

- ***Federal Authorization Improvements (E-76)*** – Streamlined the review and preparation process of the federal authorizations and adjustments submitted by local agencies to the Division of Local Assistance. The revised process is anticipated to reduce processing time from 42 days to 14 days. As of August 2018, 47 percent of the authorizations are processed within 14 days.

- ***Local Assistance Progress Invoice Improvements*** – Developed standard procedures and tools to reduce local agency invoice errors and processing time. The standardized process is anticipated to reduce processing time from an average of four hours to 30 minutes per invoice. As of July 2018, the sample pilot data shows 89 percent of the invoices are reviewed within 30 minutes.

- ***Discrimination Investigations Unit*** – Identified process improvements reducing the number of day to complete discrimination complaint investigations. Discrimination complaint investigations historically took over 200 days to complete and, as of June 30, 2018, the average is 165 days with 52 percent of investigations completed within 45 days.

- ***Discipline Process Improvement*** – Identified process improvements reducing the number of days it takes to process formal disciplinary actions from 73 to 19 working days as of June 30, 2018.

- ***Streamline the Architectural & Engineering Contracting Process*** – By streamlining the Architectural & Engineering process for the planning phase, Caltrans reduced the average process time from 111 days to 46 days as of June 30, 2018. The current average number of days for post-planning phase to execution went from 125 calendar days to 94, or a 25 percent efficiency for the same period.

V. Independent Office of Audits and Investigations - Audit Results

The Independent Office of Audits and Investigations conducted an audit of the efficiency proposals included in the Interim Efficiencies Report and issued its final report on July 23, 2018. The purpose of the audit was to determine if Caltrans has internal controls in place to ensure that it meets the goal of generating at least $100 million per year to invest in maintenance and rehabilitation of the State Highway System as required by SB 1. Specifically, the auditors evaluated the processes, policies, procedures, and methodology used in identifying and measuring the following efficiency savings identified in the Interim Efficiencies Report:

- Value Analysis
- Innovative Contracting Tools - CM/GC
- Streamlining Environmental Reviews - NEPA Assignment
- Savings Due to Acceleration of Work

The audit report concluded that Caltrans programs were proactive in identifying areas of efficiencies and developing processes and procedures to comprehensively and effectively achieve the required SB 1 efficiency measures. The audit report identified general recommendations to assist Caltrans in meeting the SB 1 efficiency requirement and specific recommendations for each program area reviewed. Caltrans incorporated all the recommendations identified in the audit report into this report.

VI. 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 Commission. Several other strategies have been identified and are being implemented. Caltrans continues to evaluate and deploy technologies, innovative tools, and process improvements to identify efficiencies. The following are additional efficiency strategies Caltrans is currently evaluating for potential savings in future years.

Mobile Field Devices – The Interim Report identified several efficiencies that were technology driven. One of those efficiencies is the use of mobile field devices for construction field engineers, which is currently in the pilot phase. The Division of Construction deployed 750

mobile field devices as of the end of FY 2017-18. It is anticipated that, with the mobile field devices, construction field engineers will save time in the administration of assigned contracts as they will be able to access all project related information without having to be at a stationary desk-top. Additional anticipated benefits in future years includes the reduction in paper usage, copy machine and printing costs, and the greenhouse gas footprint of going back and forth to the office, to name a few. Full implementation is expected by the end of 2019.

High Reflective Sign Sheeting – Caltrans is replacing all large overhead and roadside signs to meet federal requirements for retro-reflectivity and to enhance the safety of the traveling public. The high reflective sign panels use an innovative product that makes signs more visible during the day and night. The new product achieves efficiencies by reducing energy, and approximately 75 percent of staff's time that is normally required to inspect lights, change electrical components, and clean up graffiti. Additional benefits to the high reflective sign panels is improved visibility for the traveling public during the day and night, increased sign service life to up to 20 years, and a reduction in graffiti mitigation with the removal of cat walks. Because the reflective signs do not require lights, there will be a reduction in utility costs and the cost to repair and replace sign lighting annually. This innovative project is in the early stages of implementation. It is anticipated that it will take up to ten years to be fully implemented.

High Reflective Material for Striping – Historically, Caltrans maintenance crews used paint for stripping the traditional 4-inch stripes on all highways. More recently, maintenance crews deployed 6-inch striping using permanent thermoplastic traffic stripes on the edge lines and tape traffic stripes on the lane lines. The permanent thermoplastic traffic stripes enhance night visibility and have a longer life-span which results in reduced striping cycle costs. In addition, the application process minimizes the number of required lane closures, reducing public inconvenience. This effort is in its early stages of implementation. Substantial savings are estimated with the new reflective material once it is fully implemented.