



**Contract Administration System (CAS):  
An Analysis**

**Prepared for:**

**Department of Information Technology (DOIT)**

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## Executive Summary

The Contract Administration System (CAS) is designed to keep records on the construction phase of Caltrans Construction and to make payment to contractors for contract work completed. It is a critical system for Caltrans. It tracks over **7.0 billion dollars** in state highway projects, issues payment vouchers to the contractors for work done, and the CAS system expenditures make up about 90% of the Federal Bill.

CAS is an MVS mainframe system operated at the Teale Data Center using VSAM technology and consists of over 1,000 programs and reports, with over 220,000 lines of code. CAS has been operational for over 27 years, since 1974.

Over the last 27 years business rules have changed, new accounting practices have been instituted, and new federal and state requirements have had to be met. It was not possible to accommodate all these changes into CAS. These changes are described in later sections. As a result, Caltrans instituted manual procedures to meet all the requirements. Additionally, systems such as TRAMS were modified to meet accounting changes that CAS could not satisfy. The new Extra Work Billing systems (EWB) will meet some of the requirements in processing contracts.

If CAS is not upgraded, Caltrans is impacted as follows (these are described in more detail in later sections).

- Minority Business Enterprise needs are not being met.
- Manual calculations by the RE, which are subject to variation in method and accuracy lead to contract disputes.
- RE spends time doing manual accounting work, reducing the time available for contract management of construction projects.
- Contracts with lump sum items over \$10 million require Caltrans to break down the large lump sum items into smaller components, and then manually reconcile progress and payments.
- CAS is unable to track contract expenditures on an ongoing basis resulting in overpayments and contract overruns.
- CAS is unable to track subcontractors, resulting in missed payments to subcontractors – a violation for Federally funded projects – resulting in lawsuits.
- In CAS, payments are not tied to inspection; therefore some payments are made prior to actual inspections (particularly on materials).

Cost of implementing above deficiencies to CAS will be in excess of \$5 million dollars. Some of the deficiencies cannot be implemented due to the technical structure and design of CAS.

Caltrans could realize the following benefits by replacing CAS with a system using current design and technology:

- RE will spend more time managing construction projects rather than performing accounting procedures.
- Interest payments on late payments will decrease drastically.
- Will recover more federal funds
- Lower amount of lawsuits (especially those related to timely payments).
- Meeting mandated Minority Business Enterprise requirements.
- Easier and less costly implementation of future business changes.
- Will supply more accurate information and meeting reporting requirements for controlling agencies (DOIT, DOF, Federal reporting, Legislature).

Although CAS is operational, it is a system that requires substantial manual processes, technologically antiquated, difficult to modify, not designed to meet current accounting and business needs, expensive to operate and difficult to find trained resources to keep it operational.

By replacing CAS Caltrans will be able to manage its construction projects more economically, efficiently, effectively, and accurately.

## Introduction

CAS is a module of a larger system, PISA (Project Information System and Analysis). PISA is the result of a cooperative effort by the Planning, Design, Office Engineer, Bridge, and Construction units of the Department of Transportation. The primary purposes of this system are to:

- Provide service to the districts in contract administration
- Free the field engineers from tedious accounting and reporting procedures
- Eliminate duplication in bookkeeping
- Eliminate the transfer of hard copy reports between the district and headquarters
- Maintain a uniform system of accounting and record keeping

The CAS system is designed to keep records on the construction phase of Caltrans Construction and to make payment to contractors for contract work completed. Contracts are initiated into the system by Headquarters Office Engineers from the Bid Opening System when the winning bidder has been determined and approved by the Attorney General. The new contract is then available to the district for processing. The district is responsible for updating and maintaining the information regarding the contract until it has been completed.

The project information collected by the CAS system is used by

- Caltrans Audits & Internal Security
- Federal Aid
- Construction (HQ and District)
- Office Engineers
- Financial Operations & Control
- Local Streets and Roads
- Special Funded Projects
- Structures Construction
- Federal Highway Administration

The CAS system is a critical system in Caltrans. It tracks over 7.0 billion dollars in state highway projects, issues payment vouchers to the contractors for work done, and the CAS system expenditures make up about 90% of the Federal Bill. If the CAS system is down and can't process contract documents or make contract payments, it becomes very visible.

## CAS System Overview

The Contract Administration System is owned by the Construction Division. Changes are authorized and budgeted through Construction and implemented by IT. The system is hosted on an IBM 390 MVS mainframe located in Teale Data Center. It is accessed in the field using 3278 Terminal Emulation and is maintained at Teale using the VM programmers' workbench computer TS1. The system is run exclusively in batch mode, on an as-needed basis.

The following tables give an overview of the CAS system.

### CAS Programs

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	Number	Lines of Code	Language
Online CICS screens	36	4,375	BAL
Online TS1 screens	14	19,875	Panels
Batch Cobol Programs	141	132,037	COBOL 370
CICS Cobol Programs	35	33,685	Command Level COBOL
REXX & EXEC Programs	11	5,513	REXX & EXEC
<b>Subtotal Mainframe Programs</b>	<b>237</b>	<b>195,485</b>	
Procedures	67	3,908	JCL
Apscctrl Members	120	300	JCL
SAS programs	46	1,856	SAS
Mark IV programs	553	19,351	MARK IV
<b>Total Programs</b>	<b>1,023</b>	<b>220,900</b>	

### CAS Files

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CAS Files	Number	Number of Bytes
VSAM files	24	4,568,484,453
Temp files	58	
External Files	9	1,000,000,000 (Approximate)

## CAS System Interfaces

The systems in the following table interface with the CAS at a number of levels and would require modification should any changes be made to the existing CAS system.

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<b>System ID and Name</b>		<b>Description</b>
BID	Bid Opening System	The BID system passes contract item information and the winning Bidders name and address when the project is initiated into the CAS System Files.
BDM	Bridge Data Management	Report of any structure work done on highway contracts.
CUC	Construction Unit Cost System	Contract Item prices are collected quarterly from the CAS files by the CUC system
CCIS	Construction Claims Information System	Enter Claim Disputes, Awards & Decisions
	Disbursing	Disbursing distributes the contract payment vouchers to the contractors
EWB	Internet Extra Work Billing System	Contractor enters billing information on Contract Change Order work.
PMCS	Project Management Control System	The PMCS system passes contract location, Federal Aid number, Project Type and Project descriptions to the CAS System. Project cost information is passed to the PMCS System from the CSR record
	State Controller	CAS passes a claim tape to the State Controller containing contractor payment information. The State Controller creates pay vouchers and sends them to CALTRANS Disbursing for distribution to the contractors
TRAMS	Transportation Accounting Management System	CAS places all contract payment transactions on a collector to be picked up by TRAMS. Payment information is used to make up the Federal Bill.
WCCP	Web Contractor Claims Payments	
WEB	Construction Program Internet Site	

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## Proposed Changes

The Construction Division has identified over 30 deficiencies in the Contract Administration System (CAS) that need to be addressed. In general, Districts must use non-standard manual systems to help the RE make timely and informed contract decisions. This negates much of the advantage inherent in the CAS system.

Many of these changes have been proposed over the years, but have not been deemed mission-critical. Taken individually, their impact can be relatively small – but in aggregate, they represent a significant number of manual workarounds that have a large effect on contractor and Agency relations.

The following is an analysis of the changes that the Construction Division needs to have the Contract Administration System (CAS) address.

- 1. Small business participation cannot be tracked or reported.**
- 2. Disadvantaged Business Enterprises cannot be tracked or reported to the Federal Highway Administration as required by new reporting rules.**
- 3. Disabled veteran-owned businesses cannot be tracked or reported to the Legislature.**



**California Department of Transportation  
Construction Manual • July 2001**

**Chapter 8 Employment Practices Section 3 - Disadvantaged Business**

Caltrans' policy is to ensure equal opportunity in the award and performance of its contracts. Part of this policy involves a program designed to increase the use of disadvantaged business enterprises (DBE) on federally funded contracts and disabled veteran business enterprises (DVBE) on state-funded construction contracts. For the overall Caltrans federally assisted program, Caltrans establishes an annual participation goal by DBEs.

**8-303 Monitoring and Enforcement Activities During Construction**

The following procedures are to be used in the monitoring and enforcement of the subcontracting, DBE or DVBE requirements and the prompt payment clauses of the special provisions.

The RE will receive the approved list of DBEs or DVBEs listed by the bidder for project award. If the list has not been provided or is incomplete, the RE must contact the district labor compliance officer to have it available before the pre construction conference. The approved list is based on the information the contractor submitted before, and as a condition of, contract award. The RE must monitor subcontractor use to ensure the contractor uses the DBEs or DVBEs listed. Unless the work is performed or supplied by the listed DBEs or DVBEs, contractors are not entitled to any payment for work or materials.

The above Minority Business Enterprise needs are not being met by the CAS system. All the tracking and reporting is done as a paper process, usually by the RE. To automate the tracking and reporting of this information in CAS would require adding a new subsystem. The paper process is slow and cumbersome, and frequently data is several weeks behind in the reporting schedule.

**The estimated cost of making these changes to CAS would be approximately:..... 6.0 PY**

***Impact on Caltrans if these functions not implemented:***

By relying on manual processes, Caltrans risks failure to meet Federal and State tracking and reporting requirements, with resulting delays in receipt of funding for projects. Automation of this function will ensure timely and accurate reporting of small, disadvantaged and veteran-owned business data.

**4. Time related overhead specification requiring variable markup rates are not accommodated.**

The markup rates for Extra Work Overhead are hard coded in CAS. Currently, RE has to 'fool' the CAS system into accepting values of markup that differ from the hard-coded values. To allow each contract to have its unique overhead markup, values would require a modification to 11 batch and on-line mainframe Cobol programs.

<b>The estimated cost of making this change to CAS would be approximately..... 1.5 PY</b>
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***Impact on Caltrans if this function not implemented:***

Manual calculations by the RE, which are subject to variation in method and accuracy, lead to contract disputes and put vendor payments at risk. Up to 25% of all Caltrans contracts are affected by Extra Work Overhead.

**5. Warranty specification requiring non-standard contract times cannot be accommodated.**

**6. CAS system does not accommodate non-standard workweek.**

Multi-year warranties after all construction is completed must have a work around, and cannot be addressed directly. For example, a contract for roadwork which has been completed, but which has a two-year warranty, must be kept open until the warranty expires.

The current CAS system computes contract progress using a standard five-day workweek calendar. When any other workweek is used, the CAS system is not able to determine whether the progress of the work is satisfactory. This requires the RE to track the progress of a job on a separate calendar and make the determination using a paper process rather than an automated one. When the progress of a contract is unsatisfactory, Caltrans has a right to retain an additional 5% of the contractor payment as a guarantee of the completion of work. To accommodate non-standard contract times in CAS would require modifying the entire payment estimating module and many of the edits in the Extra Work Billing module.

<b>The estimated cost of making these changes to CAS would be approximately..... 1.2 PY</b>
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***Impact on Caltrans if these functions not implemented:***

Reporting of incomplete contracts becomes very inaccurate, showing many contracts incomplete because of open warranties. This puts Caltrans at risk for contract disputes over work-completion payments.

Inaccurate tracking of workweek schedules results in incomplete progress reporting and risks forfeiture of 5% completion-of-work guarantee.

**7. Cannot override hard-coded business rule for retention due to unsatisfactory progress.**

The current CAS system automatically pays mobilization and materials on hand even though no work has been done. This includes the materials stockpiled by the contractor in its computation of the amount of work completed to date. Mobilization is paid automatically by the CAS system based on the percent of work completed. To fix this problem would require a considerable change in the payment estimate module

<b>The estimated cost of making this change to CAS would be approximately..... 1.5 PY</b>
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***Impact on Caltrans if this function not implemented:***

Contractors are frequently paid in advance for mobilization and materials. In the event of contract forfeiture for unsatisfactory progress or in the event of a contractor bankruptcy, the surety bond claims filed by the State are brought into question when the advance payments are greatly in excess of the work completed. There is a potential for lawsuits against Caltrans by the surety company.

**8. Many dollar fields are not big enough for today's contracts.**

The current CAS system input screens limit lump sum items prices and Contract Change Orders to less than \$10,000,000.00. The input forms would need to be changed to accommodate larger dollar values. The Basic Engineer Estimating System (BEES) is the only PISA system that needs to change the field size for item price. A change to the field size of an element would require a modification to every program that referenced the element in a calculation or used it in a report.

<b>The estimated cost of making this change to CAS would be approximately..... 3.0 PY</b>
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***Impact on Caltrans if this function not implemented:***

Caltrans must break down large lump sum items into smaller components, and then manually reconcile progress and payments. This consumes RE time and risks payment error, resulting in contract disputes and lawsuits.

**9. Current process requires centralized printing of reports that have to be distributed by mail or courier to the RE.**

Contract data is being input from the RE remote office. The Teale Data Center is not able to route the printout to each individual user. Teale can

only send print to printers that have been identified to it by California State Agencies. This limitation excludes any non State Agency printers (contractors & public) from accessing certain reports.

**Cannot be done at any cost by a mainframe system.**

***Impact on Caltrans if this function not implemented:***

The RE is often forced to make many critical financial decisions based on dated and incomplete information due to delays in getting reports. Losses due to these decisions risk vendor complaints and lawsuits.

**10. Current process for Extra Work Bills causes a slow turnaround on payments.**

Like many other functions, the current CAS system requires EWBs to be processed manually. The delays in processing paper forms frequently trigger a late fee or interest payment when payment goes beyond 30 days.

**Cannot be done at any cost by a mainframe system.**

***Impact on Caltrans if this function not implemented:***

The delay in processing EWBs results in increased costs for late payments to contractors, and resulting interest accrued on overdue accounts.

**11. Current contract item payment process which show only the quantity being paid, not the item quantity and amount.**

The majority of all data submitted to CAS will be contract transactions from the RE on Form CEM-6004, "Contract Transactions Input." On this form the RE enters the item quantity to be paid this estimate but not the amount. The RE will not see the result of the Contract Transactions Input until it is processed at Teale and the processing results are mailed back to the RE from the District Construction Office. This process makes it difficult to detect transposition and other data entry errors.

To correct this problem in the existing system would require moving the Contract Transactions Input from the static batch process to a dynamic on-line (CICS) process.

**The estimated cost of making this change to CAS would be approximately..... 3.0 PY**

***Impact on Caltrans if this function not implemented:***

Results in contract item overpayment because of transposition errors.

- 12. No detail tracking of Contract accounts (Contingency, SFM, Supplemental) forces RE to track expenditures that impact these accounts using a separate method of accounting.
- 13. Contract information is not available in the detail that is necessary to make sure that payments are charged to the correct funding source.
- 14. Current system cannot track how Supplemental Work funds are expended
- 15. Current system cannot track how State Furnished Material funds are expended
- 16. Current system cannot balance contract funds because charges are made to the EA that are outside the system.
- 17. Current system does not track 100% of phase 4 expenditures. (Minor "B" and emergency contracts)
- 18. Current system requires user to enter data in many different environments. (SCOPE, TS1, Internet, and Oracle)

The current CAS system has no place for the RE to record expenditures that are charged the project for the cost of highway patrol resources used for the Construction Zone Enhanced Enforcement Program (COZEED). The RE must track detailed disposition of the State Furnished Material and Supplemental Work funds outside of the CAS system. Some of the charges to these funds are made directly to TRAMS, which deplete the contract funds without the REs knowledge. It would require significant changes in the CAS system to accomplish the accurate tracking of these funds.

<b>The estimated cost of making this change to CAS would be approximately..... 3.0 PY</b>
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***Impact on Caltrans if this function not implemented:***

The large number of manual entries and tracking of funds outside of the CAS system results in depleted project funds before the completion of a project, forcing requests for additional funding.

- 19. Many business rules are not part of the system, leading to a multitude of problems due to employee turnover.

The CAS system was programmed to reflect the business practices and rules that were in place in 1969. Both business rules and accounting practices have changed in the last 32 years.

Tracking and reporting Minority Business Enterprise needs and COZEEP expenditures are just two examples.

**The estimated cost of making this change to CAS would be approximately..... 3.0 PY**

***Impact on Caltrans if this function not implemented:***

The current system requires continual adjustments to programming to deal with the accrued changes in business and accounting rules, leading to increased costs of maintenance. Very few people know the current system well enough to make these changes, which leads to costly errors.

**20. The CAS does not enforce standard accounting practices and rules.**

**21. No date/time stamp on transactions at the detail level; usually just the bottom line numbers**

**22. Review/Approval and Payment are done at the same time with no separation of duties.**

**23. No audit trails of transaction (who does what, where, and when)**

In the thirty years since CAS was initially programmed, standardized accounting practices and rules have been developed and are now required by virtually all parties involved in projects: funding agencies, contractors and legislative bodies.

CAS does not have the ability to distinguish between who reviews a payment and who approves the payment.

**Cannot be done at any cost by a mainframe system.**

***Impact on Caltrans if these functions not implemented:***

Inadequacies in reporting result in complaints from oversight agencies, and reductions in funding. Engineers are acting as accountants rather than having the accounting features built into the system.

**24. No structural logic; structural fields on various screens are for reporting purposes only**

There is a need to track and report contract expenditures by structure and location. The CAS system does not provide the breakdown of payment for structure work at a sufficient level.

**Cannot be done at any cost by a mainframe system.**

**Impact on Caltrans if this function not implemented:**

Staffing allocations (especially inspectors) are used inefficiently, either requiring inspectors to be on-site when work has been completed, or having Caltrans pay for materials which have not been properly inspected. This results in cost overruns.

**25. Hard-coded business logic for EWB markups will not allow variable markups to be entered by contract.**

The CAS system would require modification to allow the user to enter variable markups (equipment, labor, material, and subcontractor) to extra work bills. When CAS was written, all contracts had the same markup for overhead when performing extra work. Now the Contractors overhead markup may be part of the contract bid elements and CAS needs to be more flexible.

<b>The estimated cost of making this change to CAS would be approximately..... 1.6 PY</b>
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**Impact on Caltrans if this function not implemented:**

RE is required to manually recalculate EWB markups and enter “fudged” data into CAS simply to fool the system into using the proper markups. Inadequate documentation of such accounting procedures results in contract disputes and inaccurate payments.

**26. Construction Change Orders cannot be tracked by progress payments or by location**

There is a need to track and report contract expenditures by structure and location. The CAS system does not provide the breakdown of payment for structure work at a sufficient level. To provide this would require a major modification to CAS. CCOs that need to be tracked and reported – Supplemental Allocations, Late Payments (Interest), Partnering and Overhead payments.

<b>The estimated cost of making this change to CAS would be approximately..... 4.5 PY</b>
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**Impact on Caltrans if this function not implemented:**

Results in inaccurate cost tracking, budget overruns and incomplete or late payments to contractors.

**27. Retention and payment deduction business rules are hard-coded – need to be flexible.**

**28. Deductions must be manually entered every progress pay cycle**

**29. Security is hard coded in the system and requires program changes to assign or remove users.**

Flexible rules regarding subjects such as payroll need to be incorporated into CAS. The mainframe is not able to provide security at the record level and it excludes other Caltrans partners (Contractors, FHWA, and other Agencies) from participating in the process. A system is needed which provides security at the record level and controls access for multiple users.

**Cannot be done at any cost by a mainframe system.**

***Impact on Caltrans if these functions not implemented:***

Externals rely on costly reports and files produced by Caltrans rather than accessing information on line.

**30. Need a valid list of primes and subcontractors due to spelling inconsistencies.**

The CAS system is not able to edit prime contractor names for consistent spelling. To be able to accomplish this would require a modification to the project initiation subsystem of CAS.

**The estimated cost of making this change to CAS would be approximately..... 2.1 PY**

***Impact on Caltrans if this function not implemented:***

The current system makes it difficult to reconcile accounts and track contractors. Often the same contractor will be in the system under several name variants, which makes aggregate reporting virtually impossible without a great deal of time-consuming manual labor.

**31. Need subcontractor information from the system**

Subcontractor names are not part of the current CAS system. Caltrans is currently required by law to track subcontractor usage by primary contractors to ensure that subcontractors get paid in a timely manner. In addition, Caltrans is required to report usage of small, disadvantaged and veteran owned subcontractors to various entities. Contractors will sometimes bid one subcontractor at a higher rate and then substitute another subcontractor at a lower rate (a process known as "bid shopping"), while billing Caltrans for the higher-priced subcontractor. To record and edit subcontractor names would require adding an entirely new sub system to CAS.

**The estimated cost of making this change to CAS would be approximately..... 3.0 PY**



**Impact on Caltrans if this function not implemented:**

Failure to track subcontractors leads to inaccurate reporting of usage to the Legislature and Federal Highway Authority. Tracking subcontractors accurately and efficiently helps eliminate bid shopping and ensure that subcontractors are paid in a timely manner, eliminating disputes and lawsuits.

**32. Many construction report needs are not met by the current system because the information is not tracked.**

The CAS system maintains over 500 Mark IV special reports that only the IS Analyst can run.

Also the CAS system can only manage text and numeric data. The Teale mainframe is not able to handle objects (drawings, scanned documents, etc.)

<b>The estimated cost of making this change to CAS would be approximately..... 3.6 PY</b>
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**Impact on Caltrans if this function not implemented:**

The inability to generate ad hoc reports reduces the ability of RE to monitor and control costs on individual projects. Not being able to easily associate printed documents with CAS resources provides additional opportunities for error and inaccuracy in the system, and miscommunication with contractors. Construction Change Orders would especially benefit from the ability to scan and associate digital objects with specific contracts.

## Summary of Potential Costs to Upgrade CAS

Eleven of the changes above cannot be achieved in a mainframe system at any reasonable cost, and have not been estimated. Of those that can be achieved, the summary of potential costs is based on the following staffing assumptions:

- Consultant cost is assumed at \$200,000 per year
- Staff programmers cost is assumed at \$96,000 per year

### CAS Upgrade Costs

<b>No.</b>	<b>Description</b>	<b>PYs</b>	<b>Cost in \$</b>
1-3	Small, disadvantaged & veteran-owned business tracking and reporting	6.0	\$786,000
4	Variable markup rate overhead specification	1.5	196,500
5,6	Non-standard warranty/workweek specification	1.2	157,200
7	Flexible business rules for retention due to unsatisfactory progress	1.5	196,500
8	Revise dollar fields to support today's contracts	3.0	393,000
11	Convert Contract Transactions from batch processing to dynamic on-line CICS process	3.0	393,000
12-18	Tracking and reporting of detailed funding sources and construction expenditures	3.0	393,000
19	Update business rules and accounting practices	3.0	393,000
25	Flexible business logic for EWB contract markups	1.6	78,600
26	Automated tracking and reporting of CCOs by progress payment and location	4.5	589,500
30	Editing of prime contractor names	2.1	275,100
31	Subcontractor tracking and editing	3.0	393,000
32	Conversion of Mark IV reports, handling of objects (drawings, scanned documents, etc.)	3.6	471,600
<b>Total</b>		<b>37.0</b>	<b>\$4,847,000</b>

## Conclusions

The principal problems with the Contract Administration System lie not with the effect the system deficiencies have on contractors. The system - combined with a large number of manual processes and workarounds - does manage to pay vendors, and allow Caltrans to keep a general eye on projects. The problem lies in the amount of staff resources that are necessary to “fool” the system into doing what needs to be done. Reporting and account reconciliation has become an onerous task, requiring many staff hours that are better spent on engineering tasks.

The fact that the CAS works as well as it does is a tribute to the RE who daily performs a wide variety of workarounds and accounting gymnastics to make it pay vendors. However, the fact that they are required to do so many manual accounting tasks points up the weaknesses in the system. A significant portion of the RE’s time is spent on accounting tasks that are better left to automated systems. Manual accounting processes are required to feed CAS the many workarounds necessary to get the results required for today’s more complex projects take valuable time that should be dedicated to actually managing those projects. This in turn could increase the number of projects that are active at any given time and in support of the Governor’s Congestion Relief Program.