



INNOVATION EXCHANGE

A Newsletter Highlighting Innovation Across Caltrans

WINTER | JANUARY | 2022

Welcome to the Winter 2022 Edition of the Caltrans Innovation Exchange Newsletter!

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Caltrans Innovation is governed by the Caltrans Innovation Leadership Council (ILC) and is administered by the Caltrans Innovation Team (iTeam) in the Caltrans Division of Research, Innovation and System Information (DRISI).

Caltrans Innovation Liaisons



Caltrans employees are innovative and forward thinkers. Innovation is happening throughout Caltrans in our districts and programs every day. Caltrans has created the role of Innovation Liaisons to establish a statewide innovation network to communicate and share innovation activities and innovative projects across Caltrans. The Innovation Liaisons will help break down information silos and allow for easy sharing of knowledge and information. Innovation Liaisons are representatives in each district and program/division who are the main point of contact for innovation activities within their respective areas, who coordinate and communicate with the Caltrans Innovation Team (iTeam). The iTeam, who sit in the Division of Research, Innovation and System Information (DRISI), is tasked with fostering and promoting an innovative culture at Caltrans. The iTeam utilizes Innovation Liaisons to gather information from each district and program to share with Caltrans enterprise-wide, as well as connect innovation projects with subject matter experts.

The Caltrans Statewide Innovation Coordinator, Pauline Valenzuela, works directly with the Innovation Liaisons, who meet bimonthly, along with the Innovation Technical Advisory Committee and the iTeam, to help support and shape innovation at Caltrans.

Caltrans Employees - For a list of Innovation Liaisons and for more information, visit [Caltrans Innovation Liaison's website](#).

PRIMARY ROLE IS TO ACT AS COMMUNICATION BRIDGE BETWEEN DISTRICT/PROGRAM AND THE INNOVATION TEAM

Share District/Program Innovations with HQ

Share Activities, Innovation Fairs and Campaigns

Help Connect Innovation Suggestions with SME's in Districts/Programs

Manage District/Program Innovations in Innovation Exchange Repository

Central Point of Contact for Innovation Questions

Participate in Innovation Technical Advisory Committee Meetings to support the Innovation Leadership Council

Innovation Leader Spotlight



Get To Know **Christa Siegenthaler**, who was done paying annual maintenance fees for software features that she realized Excel could potentially do on its own. Her inspiration for advancing innovation within Caltrans brought her to discovering a new in-house software which creates an estimate model using a triangular distribution for each item.

Read more from her interview below:



What is your name, district or division you work in, and your position title?

Christa Siegenthaler, works in the Division of Engineering Services as the Office Chief for Structure Office Engineer.

What motivates you to be innovative?

To me, innovation means trying new things with the goal of finding the right path to improve the processes and tools that we use every day. I don't like to do things just because "it's how we've always done it." Nothing changes if we just accept the status quo. If there could be a more efficient or better way to accomplish a task, then it's worth pursuing.

Are you involved in innovation in your district/division? If yes, how so? (such as on an innovation committee)?

I am not involved with any of the formal innovation committees in the Department, but I believe that anyone can develop innovative ideas or solutions without being part of a formal team.

How can others embrace innovation or get involved with innovation? Advice or tips to be innovative or trying something new?

Don't be afraid to try new things. Innovation doesn't have to involve radical change – it can come from making small incremental improvements over time. If you just have a good idea but don't have the ability to act on it, you can submit it to one of the innovation teams or committees around the Department. Worst case, nothing changes, but we should always strive for improvements through innovation.

What inspired you to develop this innovation?

I saw that we were paying annual maintenance fees for software features that Excel could potentially do on its own.

Provide a description of your innovation.

The new in-house software (Cost Estimates Toolbar) replaced an Oracle Excel add-in that our office was using to develop our probabilistic structure cost estimates. [Click here to view the new in-house software \(Cost Estimates Toolbar\)](#). The new software creates an estimate model using a triangular distribution for each item. It runs a Monte Carlo simulation with 10,000 trials to develop a reasonable range of possible cost combinations.

When was your innovation implemented and where?

The software was fully implemented in 2021. It is being used by the Structure Cost Estimators in DES.

How does Caltrans or the traveling public benefit from your innovation?

Caltrans is saving time and money. Installation and running of the software is more efficient. Also, we are no longer paying the annual maintenance fees for Oracle Crystal Ball.

What hurdles or setbacks did you have to overcome and how did you overcome them?

Programming is not one of my strengths. I spent a lot of my own time outside of work troubleshooting the code and teaching myself VBA in Excel.

Caltrans Efficiencies Report































Caltrans has exceeded the \$100 million savings goal specified in Senate Bill 1

SB 1, the Road Repair and Accountability Act of 2017, was signed into law on April 28, 2017. This legislative package invests \$54 billion over the next decade to fix roads, freeways and bridges in communities across California and puts more dollars toward transit and safety.

These funds will be split equally between state and local investments. Caltrans is now required to implement efficiency measures with the goal of generating at least \$100 million in annual savings to be invested in the maintenance and rehabilitation of the State Highway System. In the current Annual Efficiencies Report for fiscal year 2020-21, Caltrans is reporting \$386 million in total efficiencies, with \$177 million towards the SB 1, efficiency goal.

Since the enactment of SB 1, and for the fourth consecutive year, Caltrans has exceeded the \$100 million savings goal specified in SB 1. Caltrans identified seven new efficiencies for this fiscal year to complement 17 ongoing efficiencies for a total of 24 efficiencies. A significant portion of this year's efficiencies total came from the Divisions of Maintenance, Design, and Environmental Analysis. The High Reflective Materials for Striping and Municipal Coordination Grant Program efficiencies contribute over \$84 million in cost savings or avoidance through partnerships and innovation, which are high priorities for Caltrans.












Type One efficiencies count towards the SB 1 goal:

TYPE ONE EFFICIENCIES	COST SAVINGS OR AVOIDANCE
Municipal Coordination Grant Program  	\$50,864,000
Cost Avoidance through Open-Graded Friction Course (OGFC) 	\$50,160,000
High Reflective Materials for Striping   	\$34,000,000
Value Engineering Change Proposals 	\$18,514,000
Highway Lighting LED Retrofit  	\$6,800,000
Automated Machine Guidance  	\$6,000,000
Value Analysis 	\$3,140,000
Mobile Field Devices  	\$2,580,000
Independent Assurance Program 	\$1,802,000
Global Positioning Satellites  	\$1,763,000
Unmanned Aircraft Systems   	\$710,000
X-Ray Fluorescence Technology   	\$477,000
Repurposed Changeable Message Signs  	\$300,000
State Office of Historic Preservation Electronic Form Submittal  	\$116,000
Advance Mitigation Credits  	\$93,000
Cost Estimates Toolbar 	\$22,000
Total Type One Efficiencies	\$177,341,000

[Click here to view the full report.](#)

The SB 1 Program will be conducting outreach for fiscal year 2021-22 soon, so start thinking about new tools, technology, or processes that can be captured for the next report.

Type Two efficiencies count towards the overall total:

TYPE TWO EFFICIENCIES	COST SAVINGS OR AVOIDANCE
Construction Manager/General Contractor 	\$59,600,000
Value Analysis 	\$50,205,000
Streamlining Environmental Review – NEPA 	\$49,200,000
Partnering  	\$31,600,000
Reclaimed Asphalt Pavement 	\$8,296,000
Partial Depth Recycling (Cold in-place Recycling) 	\$6,845,000
Smart Water Controllers   	\$3,600,000
Electronic Plans & Quantities Submittal  	\$24,000
Total Type Two Efficiencies	\$209,370,000

Caltrans IT Security Services Innovations and Accomplishments

By Richard Rau

Over the past year the Security Services Division has made substantial strides in increasing Caltrans cyber security profile, data security and integrity as well as bringing privacy awareness to the forefront of ongoing discussions.

The Security Services Division's Most Recent Accomplishments:

- A statewide upgrade and implementation of new and optimized Caltrans enterprise firewall technology, providing cloud-optimized features and security
- Deployed an enterprise class Public Key Infrastructure (PKI) certificate management system for Caltrans.
- In 2020 Caltrans demonstrated increased security aptitude, through the interaction with the California Military Department (CMD).
- The 2020 CMD evaluation campaign findings report addressed positive program growth and maturation, related to business and technical aptitude of the Caltrans security program division.



Read the full article on [Caltrans IT Security Services Innovations and Accomplishments](#) for information on:

- Telework Cybersecurity improvements
- Where the Security Services Division is going
- Security Services Division future state improvements



California Aviation System Plan (CASP) 2020 - Innovation in Planning



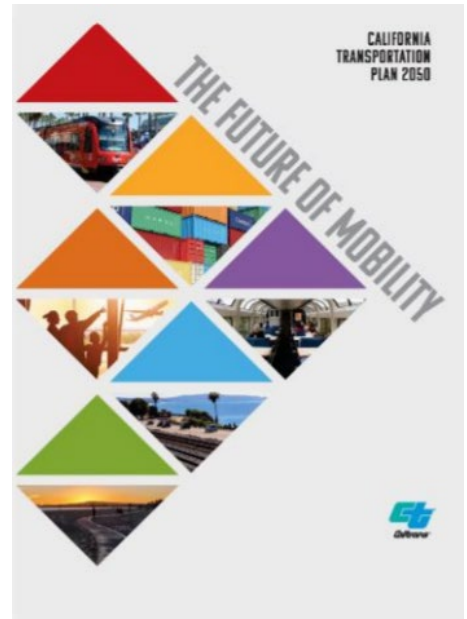
CASP 2020 is not focused on airports.

Unlike other State Aviation System Plans (SASPs) that are “airport-centric,” CASP 2020 includes California’s airports in a new format centered on aviation.



The new format of CASP 2020 defines six key subject areas about aviation’s role in California’s multi-modal environment:

- **Policy and Guidance:** the relationships of State and Federal policies
- **Economics and Funding:** aviation’s community impact and meeting capital needs with traditional and alternative funds
- **Infrastructure and Safety:** the practical application of project support. FAA rules and Caltrans requirements
- **Future Trends/Needs/Technologies:** the unfolding story of UAM/AAM and benefits from alternative fuels and aircraft engine efficiencies
- **Mobility and Access:** adding Active Transportation, reaching under utilized airports, seeing intermodal/interregional relationships
- **Land Use & Sustainability:** collaborative planning between airports and municipal planners, climate adaptation, vulnerabilities.



Compared to a “traditional” format from the FAA, the CASP six key subject areas replace FAA’s 15 “elements” in its project design. No other SASP does the same thing. The project met both FAA and Public Utilities Code (PUC) requirements for the State.

[Read the full article.](#)

Cone Penetration Test (CPT) Technology

and its Use in Geotechnical Site Characterization and Design of Bridge Foundation



State Route 405 widening project in Orange County California is a mega project with a budget of over \$2 billion dollars, listed as the largest state project currently under construction, rebuilding the busiest highway in America. Cone Penetration Test (CPT) technology was used extensively to define the geotechnical site characteristics where a total of 30 bridge structures are either replaced, widened, or newly constructed along a 16 miles long freeway. In addition, CPT was used in direct design of the bridge deep foundations. This methodology and technology have not been used before in any project of such magnitude and scope here in California.

The cone penetration or cone penetrometer test (CPT) is a method used to determine the geotechnical engineering properties of soils, delineating soil stratigraphy and characterizing subsurface conditions, without necessarily taking a soil sample. The CPT does not retrieve soil samples for classification. Soil classification estimation is typically based in interpreted Soil Behavior Type (SBT) (Figure 1).

The test method consists of pushing an instrumented cone, with the tip facing down, into the ground at a controlled rate (controlled between 1.5 -2.5 cm/s is accepted). The resolution of the CPT in delineating stratigraphic layers is related to the size of the cone tip, with typical cone tips having a cross-sectional area of either 10 or 15 sq cm, corresponding to diameters of 3.6 and 4.4 cm. CPT evaluates the cone tip resistance, the sleeve friction and the dynamic pore pressure during the geotechnical investigation.

CPT are economical and convenient, which allows the design team to deliver more miles of highway and more bridge structures for the same project delivery budget. This is especially true in highly urbanized area of the coastal zones in Southern California, where innovative and alternative project deliveries such as Design Build are increasingly playing an important role. Another element that is important to consider is the role of CPT in reducing design and construction risk, which translates into time and dollars. In the right situations, CPT is used to provide a more complete picture of the subsurface conditions, thereby reducing uncertainties in design and risk in construction.

For questions on the Cone Penetration Test Technology, contact Sharid K. Amiri, Senior Transportation Engineer, Caltrans, at sharid.amiri@dot.ca.gov.

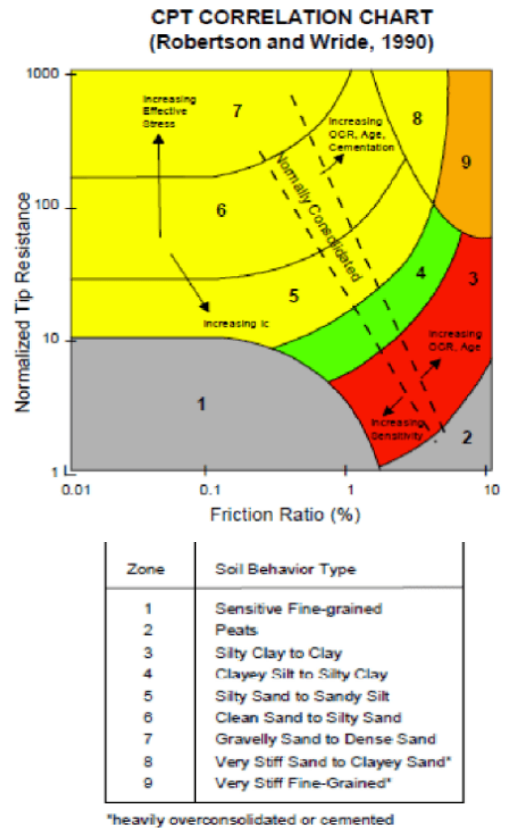


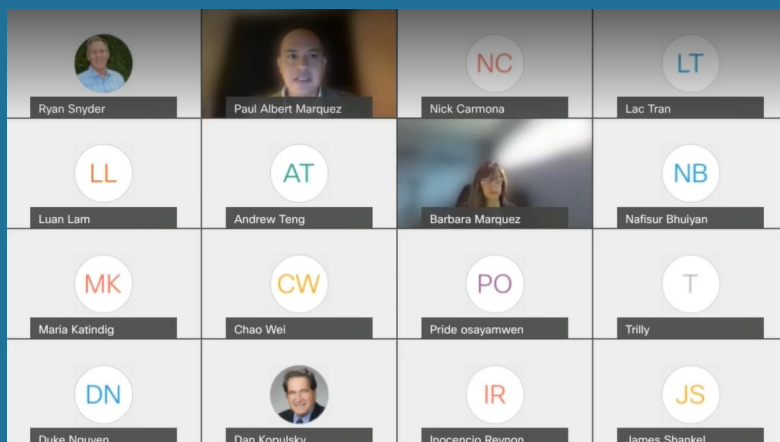
Figure 1

District 7 Culture Change Workshops



Caltrans District 7, Division of Sustainability and Innovation, recently hosted two Culture Change Workshops to assist the District's Planning Division adopt Caltrans' new Vision, Mission and Values and continue the forward momentum in placing reducing congestion at the highest priority, and conventional solutions that add capacity to address congestion. The purpose of the Culture Change Workshop is to move people toward embracing the direction of the new Caltrans, supporting Safety, Equity and Climate Action as the foundational principles, and focus on transit, bicycling, walking, electrification and similar projects.

[Click here to view the presentation.](#)



States Innovate!

Article from FHWA Innovator, Issue 87



FHWA's Innovator Newsletter Highlights State Innovations

Find out what other states are doing by checking out FHWA's Innovator article on state innovations, including:



- States Employ Digital Drill Rigs – Use of Measurement While Drilling (MWD), Advanced Geotechnical Methods in Exploration (A-GaME)
- Alaska Deploys Unmanned Aerial Systems (UAS) for Project Design, Construction, and Monitoring
- PennDOT Tracks Roundabouts' Safety Benefits
- North Carolina Improves Traveler Information Accuracy
- Texas Uses Virtual Platform to Train New Traffic Incident Management (TIM) Trainers
- Virginia Institutionalizes Virtual Public Involvement (VPI)

[Read full States Innovate! article](#)

Award-winning Projects Employ EDC Innovations

Article from FHWA Innovator , Issue 87

The 2021 America's Transportation Awards featured several projects delivered with innovations that have been a part of Every Day Counts, such as [diverging diamond interchanges](#), [data-driven safety analysis](#), [design-build](#), [ultra-high performance concrete](#), [targeted pavement overlays](#), [unmanned aerial systems](#), and [community connections](#).

[Read the full article here.](#)

[Click here to sign-up for the FHWA Innovator Subscription!](#)

The mission of FHWA is to enable and empower the strengthening of a world-class highway system that promotes safety, mobility, and economic growth, while enhancing the quality of life of all Americans.

Gaming App Helps Users Explore Construction Industry Skills

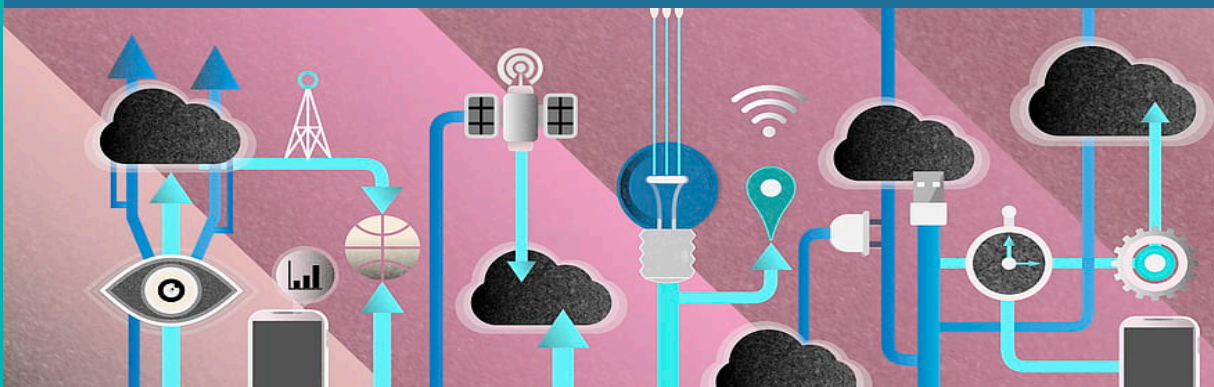


Stakeholders in Pennsylvania organized a working group to develop creative ways to market the highway construction industry to potential job candidates.

“One key action they are doing is promoting construction apprenticeships rather than the need for a four-year degree.”



One member of the working group, the Construction Association of Western Pennsylvania, developed an app, [Future Road Builders](#), that lets users explore a virtual highway construction project to see the skills needed for the job.



Learn about other strategies to [Communicate the Value of Highway Construction Careers in the Highway Construction Workforce Partnership \(HCWP\) playbook.](#)

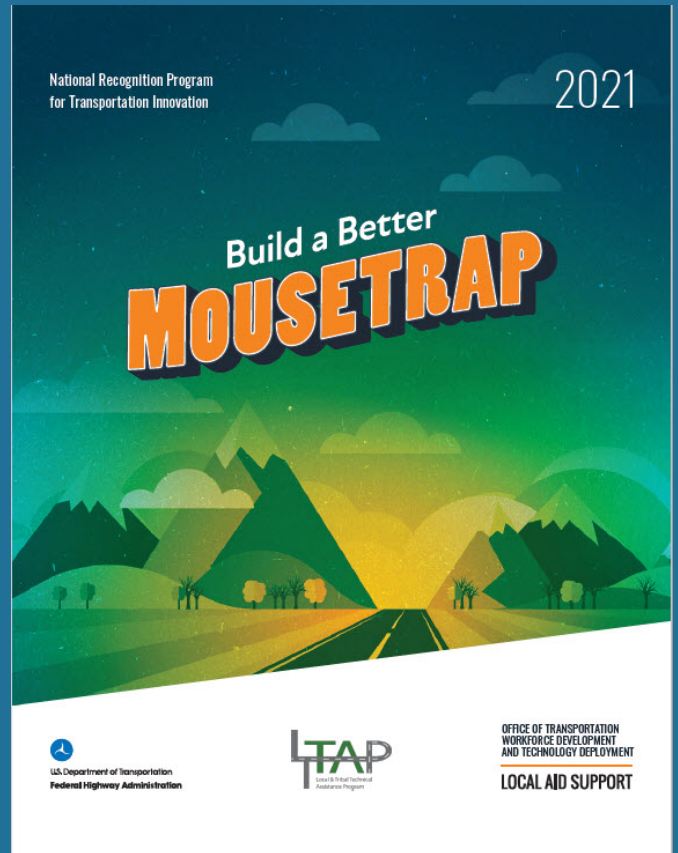
Build a Better Mousetrap

Highlights



You may know the popular phrase, “build a better mousetrap, and the world will beat a path to your door.” Coined by American essayist and philosopher Ralph Waldo Emerson, its meaning is clear:

“To invent the next great thing, you have to have a better idea.”



Build a Better Mousetrap Booklet

Each year, FHWA and Local Technical Assistance Program (LTAP) Centers recognize government agencies that build a better mousetrap to creatively solve problems and improve transportation in their communities. BBMT celebrates innovative solutions for challenges that local and tribal transportation workers encounter and these innovations can range from the development of tools and equipment modifications to the implementation of new processes that increase safety, reduce cost, and improve efficiency of our transportation system.

Learn more about BBMT, recent winning projects and how you can enter your innovation into this nationally recognized program by visiting FHWA’s Center for Loan Aid Support’s [Build a Better Mousetrap website](#).

FHWA video about BBMT: <https://youtu.be/OhPV4we6zF0>

Where Good Ideas Come From

“An Idea is a network”

TED

People often credit their ideas to individual "Eureka!" moments. You will want to tune into this TED Talk when best seller author, Steven Johnson, shows how history tells a different story. Steven weaves a fascinating tour that takes us from the "liquid networks" of London's coffee houses to Charles Darwin's long, slow hunch to today's high-velocity web in this short, informative TED Talk.

Speaker:

Steven Johnson is a leading authority on innovation. His books, podcasts and television series have explored the stories of some of the most crucial breakthroughs in the history of health, medicine and technology. He is the author of 13 books, including *The Ghost Map*.



To view, click on the play button above or [here](#).

LinkedIn Learning

Developing Your Creativity as a Leader

Creativity is the top skill that companies seek in their employees, but as leaders, how many of us optimize our own creative skill-building? In this course, instructor Denise Jacobs identifies how to shift into a creativity mindset, ignite and up-level your own creative thinking, and cultivate creative confidence in your teams. Denise begins with ways you can develop a creativity-thinking mindset, prevail over perfectionism, and lay a foundation to amplify creative thinking. She steps you through techniques to ignite your creative spark and up-level your creative problem-solving. Denise concludes by teaching you ways you can build creative confidence in yourself and your teams. By building your creativity-thinking skills, you can become a connected and trusted role model, able to spark change that transforms workplaces for the better.

To view this class, [click here](#) while logged in to LinkedIn Learning. If you do not have LinkedIn learning access, you have the option to buy the course.



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About Us

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[Click here to sign up to receive this newsletter and other Caltrans innovation news.](#)



For more information on innovation activities and this newsletter, email innovate@dot.ca.gov or contact Pauline Valenzuela, Caltrans Statewide Innovation Coordinator, at 916-584-2177 or pauline.valenzuela@dot.ca.gov.