

SB 1 Research Activities Summary / Research Plan for 2023-2024

transweb.sjsu.edu/csutc

Prepared: October 8, 2023







TABLE OF CONTENTS

1.	Overview	3
2.	Summary of Research Activities	3
3.	Consortium Highlights	4
٦	Technology Transfer	5
l	_eadership	6
,	Awards	6
١	Workforce Development	7
l	_everaging Funding	8
4.	Year 6 Detailed Research Activities	9
/	A. CSUTC Partner Research	9
	1. CSU Chico	9
	2. CSU Fresno	9
	3. CSU Long Beach	10
	4. San José State University (Research and Workforce Development Activities).	10
ı	3. CSU-wide Competitive RFP Process	12
	Summary of Proposals Received	13
	Summary of Proposals Awarded	13
(C. Final Publication Process	14

1. Overview

The California State University Transportation Consortium (CSUTC) unifies and focuses the efforts of four outstanding CSU campuses that represent and support the geographical, cultural, racial, and socioeconomic diversity that makes California, and the CSU system, strong: (1) CSU Chico – California Pavement Preservation Center; (2) CSU Fresno – Fresno State Transportation Institute; (3) CSU Long Beach – Center for International Trade and Transportation/College of Engineering; and (4) San José State University – Mineta Transportation Institute. CSUTC is led by the Mineta Transportation Institute (MTI) at San José State University, a federally-funded University Transportation Center since 1991.

CSUTC researches safe, reliable solutions that increase the mobility of people and goods and strengthen California's economy. CSUTC research focuses on high priority areas as identified by SB1. These high priority areas include: congestion relief (including traffic management systems), trade corridor enhancements, improved transit and rail, pedestrian and cyclist safety projects, as well as maintenance and rehabilitation for California's road and bridge infrastructure. More information about SB 1 can be found at: http://rebuildingca.ca.gov/.

2. Summary of Research Activities

The table below summarizes research publications and research in progress across the Consortium since 2018.

Table 1. Summary of Research Activities Across the California State University Transportation Consortium, by Year

Consortiani, by rear	
Description	Number
Published Reports and White Papers	
Year 1	32 ^a
Year 2	37 ^b
Year 3	35 ^c
Year 4	27
Year 5	15
Subtotal	146
Submitted Drafts—In Publication Process	
Year 4	3
Year 5	7
Subtotal	10
Research in Progress	
Year 4 ^e	2
Year 5	10
Year 6	38
Subtotal	50

^a One project was jointly funded between Years 1 and 2 to allow for a more extensive research design. Recorded here with Year 1 publications.

^b One project was jointly funded between the Year 2 competitive RFP with supplemental funding from CSULB TRANSPORT Year 3. Recorded here with Year 2 publications.

To date, 146 white papers and research reports have been <u>published to the CSUTC website</u>. This work demonstrates the breadth of research undertaken system-wide funded through the Consortium. Research reports are peer-reviewed, professionally edited, and formatted with a consistent style to represent CSUTC. *A total of 14 unique CSU campuses have received project funding* (based on PI's home campus).

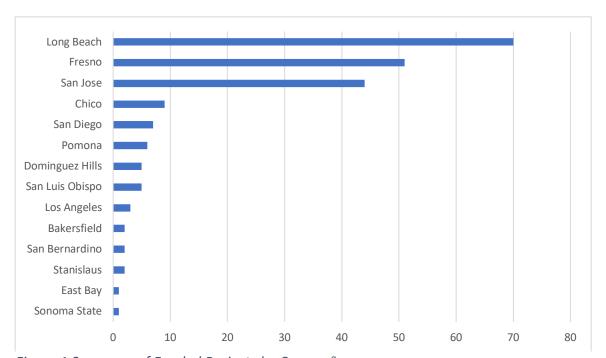


Figure 1 Summary of Funded Projects by Campus^a

3. Consortium Highlights

Developing a transportation workforce that possesses the skills needed to plan, design, deploy, operate, and maintain transportation systems that may not even exist today presents a unique and exciting challenge. As a Consortium, we engage with industry leaders on an ongoing basis to identify emerging career pathways, continually review and revise our existing K-12

^c Two projects were jointly funded between SB1 and MTI's USDOT grant to allow for a more extensive research design. One CSULB TRANSPORT project was jointly funded between Years 3 and 4 to allow for a more extensive research design and recorded here with Year 3 publications.

^e One CSU Fresno FSTI project is jointly funded between Years 4 and 5 to allow for more robust data collection. Recorded here with Year 4 projects. One MTI project is a multiyear collaboration between UC Davis' City & County Pavement Improvement Center, which funds projects at three CSU campuses (Chico, Long Beach, and San Luis Obispo)

^a Includes 2 CSULB projects that were terminated. In addition, Sacramento State submitted a proposal during Year 1 which was funded through MTI's Caltrans USDOT match contract rather than through the CSUTC SB1 program. Three campuses--Chico, Long Beach, and San Luis Obispo--also receive additional funding through SB1 via a partnership with UC Davis and the City and County Pavement Improvement Center.

workforce development programs, find creative ways to attract potential entrants, and not only provide participants with the skills they need today but inspire them to lead the way into the future.

Technology Transfer

Faculty and students affiliated with CSUTC engage in a wide range of technology transfer activities including conference presentations, journal publications, media outreach, briefings, and other efforts to ensure that research is accessible to practitioners. Since inception in 2018, there have been *more than 175 presentations by CSUTC researchers at conferences and professional meetings and 44 journal articles or published conference proceedings.* In addition, MTI hosts webinars featuring CSUTC researchers and provides professional development hours (PDH) needed by mainly professionals to maintain their certification.

During this past year, CSUTC researchers and executive leadership have been called upon to share their expertise and knowledge. San Diego State's Dr. Bruce Appleyard was asked to provide expert advice to the California State Senate Transportation committee related to his CSUTC-funded research evaluating the state's Active Transportation Program (ATP).

One of the ways CSUTC ensures that research meets the needs of industry professionals statewide is by requiring that all proposals include a letter of support from a professional willing to serve as an external advisor throughout the research process. This requirement not only ensures that the research teams understands and can respond to industry needs, but also leads to a greater likelihood that the research will be used by professionals. External advisors working with CSUTC research teams on Year 6 projects include:

- American Road & Transportation Builders Association (ARTBA)
- Behavioral Interpretation, LLC
- California State Assembly Transportation Committee
- California State Senate Transportation Committee
- California Transportation Commission
- Caltrans
- City of Los Angeles
- International Transportation Learning Center
- New York Department of Transportation
- SPUR
- WSP

Journalists seek out CSUTC researchers experts on a number of hot transportation topics. MTI's Executive Director, Dr. Karen Philbrick, was featured in a June 2023 episode of Infrastructure Momentum Makers where she discussed the innovative research and workforce development programs taking place at MTI and across the CSUTC. Several media outlets, including the Los Angeles Times, covered the work being conducted by a team of CSUTC researchers to develop a transit survey to better understand harassment and assaults, particularly those faced by women and people of color. This research was requested by the California State Legislature through SB 1161.

Leadership

CSUTC partners bring an outstanding record of state, national and international leadership and success in advancing transportation policy and generating solutions. Since forming, we have advised our state's policy makers through such diverse venues as testimony; conference panels; briefings of senior policy makers and through board and committee service. Thought leadership and the representation of the CSU SB1 funded research and workforce development portfolio in multiple venues is critically important.

CSU Fresno's Dr. Aly Tawfik was appointed to the California Air Resources Board's (CARB) Research Screening Committee (RSC). The Board's legislatively mandated 11-member committee consists of scientists, engineers, and others knowledgeable, technically qualified, and experienced in air pollution problems. The committee provides guidance on the wide range of proposed and completed research projects relevant to CARB programs. Dr. Tawfik was also appointed by the American Society of Civil Engineers' (ASCE) Region 9 Board as founding Chair of the ASCE Region 9 committee on Justice, Equity, Diversity and Inclusion (JEDI).

MTI's Executive Director, Dr. Karen Philbrick, was elected to the American Public Transportation Foundation Board, was reelected President of the American Road and Transportation Builders Association Research and Education Division, and was elected as the 2023-24 President of the Rotary Club of San Jose, the 9th largest club in the world.

MTI's Dr. Hilary Nixon was recently elected to the Governing Board of the Association of Collegiate Schools of Planning and will serve a two-year term as Treasurer. She was also reelected as Secretary for the California Planning Roundtable for another term.

Awards

CSUTC research and researchers continue to receive awards and recognition for their accomplishments. The Women's Transportation Seminar (WTS)—San Francisco Bay Area Chapter recently awarded Dr. Karen Philbrick the Katherine G. Johnson Trailblazer Award for exceptional leadership in recruiting, retaining, and advancing women in transportation. In 2023 the Silicon Valley Business Journal released its inaugural Power 100 list of the most influential business leaders in the region. Dr. Karen Philbrick was featured along with SJSU President Cynthia Teniente-Matson, VTA General Manager & CEO Carolyn Gonot, Alphabet CEO Sundar Pichai, and Apple CEO Tim Cook.

MTI's Dr Hilary Nixon received the American Road & Transportation Builder's Association Excellence in Academia Award for her outstanding leadership, mentorship and significant educational and/or research contributions in the transportation industry.

CSU Fresno's Maria Calahorra-Jimenez received the Regional Teaching Award from the Associated Schools of Construction for her contributions to education, service, and overall dedication to the construction profession. In addition, Dr. Jorge Pesantez from CSU Fresno

received the 2023 Best Reviewer Award from ASCE's Journal of Water Resources Planning and Management (JWRPM).

Patrick Reily, a student at CSU Fresno won 28th place out of hundreds of participants at the 44th Annual Central California Research Symposium for his research on telecommuting in the U.S. In addition, Fresno State alumnus, Vajidullah Molvizadah won second place at the First Australian International Conference on Industrial Engineering and Operations Management for his graduate thesis research supported by the CSUTC program.

Workforce Development

CSUTC engages with the future of the transportation workforce in a number of different ways, including through research opportunities. Specifically, all of the Consortium's full-scale research projects are required to include students on the research team. These students benefit from working closely with faculty mentors. More than 330 students have participated as research assistants on CSUTC research projects, learning valuable and transferable skills.

The CSUTC-UC partnership to establish the City and County Pavement Improvement Center has trained over 1300 pavement professionals around the State. CCPIC offers the most current and comprehensive training curriculum available to California's pavement engineering and management workforce. Courses are intended for engineers, asset managers, upper-level managers, technicians, and construction inspectors, and cover Pavement Fundamentals, Management, Design, Materials, and Construction. This multi-campus partnership involves CSU faculty from SJSU, Cal Poly SLO, CSU Chico, and CSU Long Beach along with UC Davis and UC Berkeley.

CSUTC partner, CSU Chico, held the third Pavement Preservation Academy in 2023. This certificate program was developed using CSUTC funds in 2021. More than 100 attendees from Caltrans, local agencies, and industry participated this year. The purpose of the PPA is to help state and local agencies improve the design and construction of pavement preservation treatments and develop a workforce to utilize the latest pavement preservation technologies. Through training, the Academy empowers local agency staff and

CSUTC's workforce development efforts also emphasize engaging with K-12 students and teachers. The Center for International Trade and Transportation (CITT) at CSULB noted several key accomplishments in the past year. Findings from their evaluation of the Academy of Global Logistics (AGL) program has been used to improve three courses in the AGL curriculum which is a unique partnership between the Port of Long Beach and the Long Beach Unified School District. In addition, CITT's project, Equity in Learning Opportunities for Middle School Students: Connecting Communities and Transportation Through GIS, will be used in support of a geographic information systems summit scheduled for Fall 2023 that will bring together middle school teachers to learn how to incorporate this technical skill into their classrooms.

Another success in terms of building pathways to transportation careers is the <u>Transportation</u> Talent Pipeline project. This research led to the launch of a successful talent-pipeline pilot

programs in partnership with Gannett Fleming, a global engineering firm, and Jet Propulsion Laboratories, a global leader in space exploration and satellite technology.

Fresno State Transportation Institute (FSTI) organized the first K-12 Railroad Model Competition on April 29, 2023 at the Fresno State Satellite Student Union. More than 200 individuals attended, including elementary, middle, and high school students and their families. Volunteer judges came from Caltrans and California High-Speed Rail Authority, which showcased the continued strong partnership between CSUTC and state transportation agencies.



Both FSTI and MTI hosted <u>National Summer Transportation Institutes</u> for students. FSTI focused on middle school students, while MTI hosted a three-week, non-residential program for high school students, all of whom successfully earned three-units of CSU environmental studies credits. FSTI also held two additional summer camps for the Madera Unified School District which focused on introducing middle school students to transportation.

Another notable success is how the CSUTC program builds faculty research capacity across the CSU system and serves to recruit new faculty. Dr. Hamid Rahai, CSULB, received very positive feedback from a newly hired faculty member that noted their "decision to accept this job was solely based on the positive interaction [with Dr. Rahai] during my interview." CSUTC has supported Dr. Rahai's research as well as many other faculty at CSULB.

Leveraging Funding

An important focus for the Consortium is to secure additional funding to support transportation research. CSUTC partner, CSU Chico, leveraged their SB1 funding to secure nearly \$1.8 million in funding since 2019. MTI, as a result of successfully leading multi-institution consortia such as CSUTC was recently awarded a ten-year, \$15M grant from the US Department of Transportation to lead a new university transportation center (UTC) grant. MTI is also a partner

on two additional USDOT UTC grants as well as a partner on a new \$17M grant from the Federal Railroad Administration. Other CSUTC researchers and partners were successful in obtaining grants through the USDOT recently including Dr. Tom O'Brien (CITT, CSULB), Dr. Bruce Appleyard (SDSU), Dr. Shailesh Chandra (CSULB), and Dr. Wen Cheng (Cal Poly Pomona). A hallmark of the CSUTC program is investing in CSU faculty to build research expertise in capacity.

4. Year 6 Detailed Research Activities

Consortium activities for Year 6 followed a similar pattern as the previous three years. First, each partner received a modest amount of funding to complete high-priority research projects aligned with SB1. CSU Fresno and Long Beach both ran internal competitions, while CSU Chico focused on high-priority pavement research and workforce development activities through the California Pavement Preservation Center. SJSU/MTI focused on high priority projects that were identified by key stakeholders – including Caltrans, California Transportation Commission, members of the California State Legislature, and others. Second, a CSU-wide competitive RFP process was led by MTI/SJSU. Selected projects are summarized below.

A. CSUTC Partner Research

1. CSU Chico

CSU Chico, through the California Pavement Preservation Center (CPPC), is focusing their Year 6 research efforts to develop an innovative pothole management system designed to increase the efficiency of pavement maintenance and improve public safety. In addition, CSU Chico will conduct a third year of the successful <u>Pavement Preservation Academy</u>. Key personnel include: DingXin Cheng, R. Gary Hicks, Lerose Lane, and Roger Smith.

2. CSU Fresno

CSU Fresno, through the Fresno State Transportation Institute (FSTI), conducted an internal competitive RFP, which funded nine research projects. The table below lists project titles and principal investigators.

Project Title	PI
Analysis and Modeling of California Central Valley Emergency	Jorge Pesantez
Evacuation	
Does California High-Speed Rail Promote Accessibility for Station Cities:	Chihhao Wang
Case study of Fresno, Merced, and Kings	
Exploring performance-based contracts: a good option to address long-	Maria Calahorra-
term road maintenance in California?	Jimenez
Fresno County Afterschool Transportation Education	Christian Wandeler
Intelligent Blind Crossings for Suburban and Rural Intersections	Shahab Tayeb
Smart Robot Design and Implementation to Assist Pedestrian Road	Hovannes
Crossing	Kulhandjian

Spatio-Temporal Analysis of the Roadside Transportation-Related Air	Jaymin Kwon
Quality: Mobile Air Sensors in Transit Pilot Study	
Strategic Approaches for Effective Implementation of Inspection	Manideep
Technologies for Construction and Maintenance of Bridges	Tummalapudi
Traffic Sign Extraction from Mobile LiDAR Point Cloud	Yushin Ahn

3. CSU Long Beach

CSU Long Beach ran an internal competitive RFP through TRANSPORT, Transportation Research & Training, a collaboration between the College of Engineering and the Center for International Trade & Transportation. Thirteen projects were selected for funding. The table below lists project titles and principal investigators.

Project Title	PI
Addressing Transportation Construction Workforce Needs Through Innovative Policies and Practices	Tom O'Brien
Assessing the Perceived Safety of Cyclists with Virtual Reality	Vahid Balali
Battery Management System Development for Electric Vehicles and Fast Charging Infrastructure Improvement	Yu Yang
Blockchains in Transportation Sector: Creating Integrative End-to-End Solutions	Forouzan Golshani
CONNECT: Collaboration and Optimization via Neighboring Networks for Efficient City Transportation	Tairan Liu
Development of A Conceptual Critical Success Factors Model on Infrastructure Sustainability Rating System for California Construction Projects	Joseph Kim
Effects of Low-Cycle Fatigue Fracture of Longitudinal Reinforcing Steel Bars on the Seismic Performance of Reinforced Concrete Bridge Piers	Yu-Fu Ko
Examining transit service improvements with Internet-of-Things (IoT): A Disparity Analysis	Shailesh Chandra
Experimental Investigations of Wind Shear from Passing a Vehicle	Hamid Rahai
Implementing University-Industry Partnership Gateways: Civic Market Blueprints for Innovation in the Trade and Transportation Sector	Tyler Reeb
Investigation of Biohealing Application for Micro-Size Fractures of Concrete Elements	Andrea Calabrese
Time-To-Failure Prediction of Fine-Grained Soil Slopes Subject to Weather- Driven Deterioration	Amr Morsy
Toward NetZero Carbon Pavements Using Amine-Impregnated Zeolite	Shadi Saadeh

4. San José State University (Research and Workforce Development Activities)
SJSU, through the Mineta Transportation Institute, has undertaken five projects, two of which are led by faculty at other CSU campuses. MTI continues with a focus on responding to high-priority research needs. Year 6 projects are in direct response to

requests from the California State Senate Transportation Committee, the California Transportation Commission, the City of Los Angeles, the International Transportation Learning Center, and former CalSTA Secretary David Kim.

MTI has also undertaken the following projects:

Project Title	PI
Artificial Intelligence for Pedestrian and Bicyclist Safety:	Mohammad Pourhomayoun
Using AI to Detect and Report Near-Miss Collisions	(CSU Los Angeles)
Evaluating the Indirect ROI of Transit Agency Training	Kathleen McConnell, Priya
Partnerships with Two-year Colleges	Raman
How Will California's Electric Vehicle Policy Impact State-	Asha W. Agrawal
Generated Transportation Revenues?	
Transit Workforce Development Challenges and Mitigation	Jodi Godfrey
Practices	
Understanding Mobility-Related Challenges for AAPI Older	Yongping Zhang (Cal Poly
Adults	Pomona)

In addition to these research projects, MTI once again hosted the annual Garrett Morgan Sustainable Transportation Competition. This year, teams from across the country entered the competition with the winning team coming from Hopkins Junior High School in Fremont, California. MTI compiled a wideo with highlights from the 2023 competition.

MTI hosted the Mineta National Transportation Policy Summit in partnership with the Commonwealth Club of California on June 2, 2023. This year's theme was Getting to Zero Deaths on Our Roadways: Is the IIJA up to the Challenge? and our special guest was Robin Hutcheson, Administrator, Federal Motor Carrier Safety Administration. The keynote address was provided by Jennifer Homendy, Chair, National Transportation Safety Board. The program focused on the public health crisis the United States faces on its roads and how the 2021 Infrastructure Investment and Jobs Act (IIJA) provides a significant opportunity to reduce crashes through infrastructure redesign. Panelists included: Dr. Asha Weinstein Agrawal, Director of MTI's National Transportation Finance Center and SJSU professor; Ravinder S. Bhalla, Mayor, City of Hoboken; Beth Osborne, Vice President for Transportation and Thriving Communities, Smart Growth American; Emily Schweninger, Senior Policy Advisor, Transportation Health and Safety, U.S. Department of Transportation; and Tony Tavares, Director, Caltrans. The panel was moderated by Selika Talbott, MTI Research Associate, Founder and CEO, Autonomous Vehicle Consulting.

As lead institution for CSUTC, MTI also works to engage, connect, and promote research and researchers across the Consortium. MTI continues to expand a <u>section of the</u>

<u>Consortium website</u> to highlight the wide range of expertise and CSU campus

involvement. This information helps direct media representatives to CSU researchers for interviews, and also serves as a means to develop research collaborations across institutions.

B. CSU-wide Competitive RFP Process

MTI/SJSU, in collaboration with the CSU Chancellor's Office, implemented the Year 6 CSU-wide RFP process using the following approach outlined in Figure 5.



Figure 5 Overview of the Year 6 Competitive RFP Process

As part of the first stage of RFP development, MTI solicited research needs from a wide range of stakeholders including the California State Legislature, CalSTA, California Transportation Commission, California Association of Councils of Government, Caltrans, California Air Resources Board, and many others. A total of 10 research needs were received and incorporated into the RFP. The RFP was posted to the Chancellor's Office InfoReady site in December 2022 and an announcement was broadly distributed to all 23 campuses and the Chancellor's Office for dissemination.

Proposals were received January 23, 2023. MTI coordinated with 35 subject matter experts to conduct initial proposal reviews. After this first stage of review, the final review panel which includes representation from CalSTA, Caltrans, California Transportation Commission, and California-based academic institutions (non-CSU) select the final proposals to fund. Subcontracts were then issued to campuses with a start date of June 1, 2023.

Each project starts with a kick-off meeting with MTI, external advisors, and the research team. Projects typically take 12 months to complete. Once draft reports are submitted to MTI, each one is peer reviewed through a double-blind process, editing, and formatting prior to publication. Finally, MTI engages in a comprehensive technology transfer program to disseminate findings. This program includes a press release, newsletter article, targeted outreach to key stakeholders, and a social media campaign.

Summary of Proposals Received

A total of 21 proposals were received from ten CSU campuses (see Figure 4).

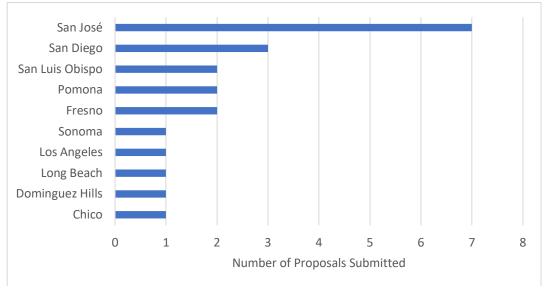


Figure 6 Summary of Proposal Submissions, by Campus

Summary of Proposals Awarded

Table 1, below, identifies all projects selected through the competitive RFP process currently under contract or in the final contracting stage. In addition, one additional project is going through final revisions at the request of Caltrans, the project's external advisor.

For the Year 6 CSU-wide program, six different campuses are represented as project leads. In addition, two of the projects listed in Table 1 include multi-campus research teams. External advisors are from seven different organizations including two different state Departments of Transportation, which was commended by Caltrans during the final review process. Four projects are directly in response to a specific research need from the California State Assembly Transportation Committee.

In addition to the projects selected for funding with SB1 dollars, Caltrans identified a proposal submitted through the competitive RFP process that was of interest. MTI is using its master contract with Caltrans to fund that research led by Dr. Mehran Mazari from CSU Los Angeles. In addition, MTI has used the master contract with Caltrans to fund an additional research project led by Dr. Maria Calahorra-Jimenez at CSU Fresno.

Ten projects were selected for funding by the review panel and six CSU campuses are represented among the PIs. Subcontracts have all been issued between the SJSU Research Foundation and the respective campus Offices of Sponsored Programs. MTI held a kick-off meeting with each PI with detailed information regarding managing their project and submitting regular progress reports.

Table 1 Research Projects Funded through the CSU Competitive RFP Process (Year 6)

Title	PI	CSU Affiliation	Award \$
Assessing Perceived Safety of Non-Motorized Travel with Virtual Reality	Vahid Balali	CSU Long Beach	\$75,000.00
Consistent VMT Mapping and Modeling in California: How Can We Better Assess the VMT Impacts of State and Local Transportation Projects?	Serena Alexander	SJSU	\$73,943.86
Construction Contracting in the Zero-emission Transportation Sector: A State Program for Disadvantaged Businesses	Gokce Soydemir	CSU Stanislaus	\$74,491.00
Cost Estimating Models for the State Highway Operation and Protection Program (SHOPP) Portfolio of Projects	Elhami Nasr	CSU Long Beach	74,723.00
Developing an ROI Assessment Model of Training, Apprenticeship, and Mentorship Programs in California Transit Agencies	Tyler Reeb	CSU Long Beach	\$75,000.00
Development of Physics-Based Deterioration Models for Reinforced Soil Retaining Structures	Amr Morsy	CSU Long Beach	\$75,000.00
Effects of COVID-19 on Public Transit Ridership in the Bay Area	Richard Lee	SJSU	\$74,898.01
Forecasting Commercial Vehicle Miles Traveled (VMT) in Urban California Areas	Steve Chung	CSU Fresno	\$59,392.00
Is Parking Cash-Out Worth it? Comparing the Cost-Effectiveness and Climate and Equity Benefits in the Bay Area and South Coast Air Quality Management Districts	Tianjun Lu	CSU Dominguez Hills	\$74,942.00
Right on Red: Energy Saving Measure or Unsafe Maneuver	Bruce Appleyard	SDSU	\$75,000.00

C. Final Publication Process

All research projects undertaken as part of the CSUTC result in a final report. Research teams submit a draft version of the report to MTI and MTI manages a technical peer review, professional editing and formatting, and publication of the final report on the CSUTC website.

Finally, to move research results into practice, a robust technology transfer program is used, including promotion via press releases, social media, newsletters, as well as the CSU Transportation Research Spotlight in Sacramento, planned for Spring 2024.

CSUTC remains dedicated to addressing the complex nature of today's mobility challenges to advance the body of usable transportation knowledge and identify implementable solutions for California.