Request for Proposals for UCI Research Projects
USDOT
Pacific Southwest Region
University Transportation Center

RFP Issued: February 3rd, 2020

Proposals Due: February 28, 2020
Anticipated project start date: August 16th, 2020

Maximum project duration: up to 12 months

ITS·IRVINE
INSTITUTE of TRANSPORTATION STUDIES

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Introduction

The USDOT Pacific Southwest Region University Transportation Center (PSR) is the Regional UTC for US Region 9 (California, Arizona, Nevada, Hawaii, and the Pacific Islands). PSR is led by the Metrans Transportation Center, University of Southern California and includes the following partners: California State University, Long Beach, Northern Arizona University, Pima Community College, University of California, Davis, University of California, Irvine (UCI), University of California, Los Angeles, and University of Hawaii. PSR funded research is expected to result in scholarly publications and contribute to generating larger grants from other sources.

Funding for this RFP

Funding for this RFP is being provided by Caltrans Division of Research, Innovation and System Information. Caltrans has requested that PSR RFPs for all partner universities be synchronized this year in an effort to streamline the review and selection process. Total faculty research funding available to ITS-Irvine under this RFP is expected to be up to approximately $167,000. Caltrans funds are available only for PSR partner universities in California. *These funds have not yet been formally committed for potential UCI projects by Caltrans, nor have any other matching funds.* Thus, project awards will depend on both the availability of funding and the timing of project selections by Caltrans. While GSR appointments on successful project proposals could have an earliest start date of August 16th, 2020, past experience suggests that a later start date is quite possible so PIs should plan accordingly.

Given the anticipated competition for these funds, prospective applicants should carefully consider their expertise relative to the thematic areas and topics along with their ability to obtain Caltrans support as described below in the section Selection Criteria for all Proposals.

The remainder of this RFP describes eligibility requirements, research topics, selection criteria, funding guidelines and restrictions, project requirements, and proposal instructions as well as budget instructions and sample budget sheets. Submission instructions and a cover page are also provided.

Eligibility

Full-time ITS-Irvine Faculty Associates who are tenure track faculty, or ITS-Irvine Research Staff eligible to serve as Principal Investigators at UCI, are eligible to serve as Principal Investigators on PSR UTC grants. Proposals may include multiple investigators. Proposals may also include research faculty and non-tenure track faculty from the PSR partner universities as Co-Principal Investigators.

Caltrans Research Priorities

As the source of funds for this RFP is Caltrans, priority will be given to projects that help to implement and/or inform future activities associated with Caltrans priority research areas. Caltrans is seeking proposals on 34 specific research needs statements, which can be found in Appendix A - Caltrans Research Needs for FY 2020-21. **If you plan to respond to any of these priority topics, please**

complete an expression of interest by February 10th at 11:59 PM. To learn more about the Caltrans Division of Research, Innovation and System Information's ongoing goals, see Appendix B – Caltrans DRISI Research Goals.

If you have an applied or basic research idea that does not address a priority topic in Appendix A, but you think that a specific individual or department at Caltrans would have interest in based on previous contacts or knowledge of ongoing work, you are encouraged to apply. In this case (that a proposal does not address a specific research need outlined in Appendix A), the applicant must provide a short explanation in their proposal identifying whether or not they are currently working with Caltrans staff on the proposed work and, if so, must indicate the specific names, divisions, and email address(es) of those contacts. This will ensure that proposals not addressing a pre-specified Caltrans priority are routed to relevant Caltrans personnel. No expression of interest via the form linked above is necessary in this case.

Selection Criteria for All Proposals

The selection and submission of proposals to Caltrans for possible funding will follow procedures established by the PSR UTC Executive Committee and Caltrans. Proposals will first be evaluated by the ITS-Irvine Director for relevance to the PSR UTC research program themes as well as Caltrans priorities. Proposals are expected to be selected on the basis of their evaluations along with programmatic priorities. Proposals will compete both within topics and across topics. PSR does not guarantee that proposals will be funded in all topic areas, or that any proposal will be funded.

It is expected that both peer and Caltrans reviewers will evaluate proposals according to the following selection criteria:

1. Demonstrated relevance to the above research program themes (a requirement) and to Caltrans strategic goals
2. Quality and research significance
3. Student involvement
4. Reasonableness of budget and cost-effectiveness
5. Qualifications to perform work and likelihood of successful completion
6. Match funding, if any, and potential for attracting larger grant funding
7. Prior performance on grants (as applicable)

Proposals that involve collaboration between partner universities, interdisciplinary proposals that cross school boundaries as well as participation from outside organizations are encouraged.

Proposers are encouraged to communicate with members of the PSR Executive Committee or other outside organizations in the development of research proposals. A list of Executive Committee members can be found in the directory page of PSR at https://www.metrans.org/PSR_UTC_key_personnel.

Commitments of participation (for example data sharing or match funding) from outside of PSR will be a consideration in making awards. *Any project that involves data collection, access to facilities, or*

*cooperation of a private or public entity **must** include a letter of participation from the entity in the proposal. Without such verification of participation, the proposal will not be considered for funding.*

Proposers are encouraged to include undergraduate students in the research project if appropriate. There are potential funding opportunities through various university programs that could support students working on PSR projects. Proposers are strongly encouraged but not required by this RFP to explore such opportunities with their schools and the campus.

Match Funding

The USDOT University Transportation Center program requires a non-federal match as a condition of the federal funds. Caltrans provides only a portion of the required match. Thus PSR encourages proposals that include match funding from non-federal sources. Proposals that include at least a 10% hard match (e.g. contribution to direct costs from external source) will receive priority consideration. For additional information, contact ITS-Irvine Assistant Director for Research Coordination Craig Rindt <crindt@uci.edu>.

Project Selection

The PSR Executive Committee will make project recommendations to Caltrans, taking into account reviewer evaluations, programmatic priorities, prior project performance, and partner recommendations. Caltrans will conduct additional reviews of these recommended projects and approve selected projects for funding. Executive Committee members are allowed to submit proposals, but are not allowed to be present during deliberations and voting related to their proposals.

Funding Guidelines and Restrictions

Budgets should be conservative and cost-effective. Funding should be directed at new and original work. In some cases, PSR and Caltrans will consider continuations of prior PSR Caltrans match projects that have achieved significant results and have a high potential for deployment, scholarly products or large grants. PIs may submit multiple proposals, though it is unlikely that any PI will be awarded more than one grant. PIs with current PSR grants are eligible to apply. However, grants will not be awarded to PIs with outstanding deliverables (draft or final report; research brief; data management plan compliance) on prior PSR grants.

Budgets for research project proposals may include salary and benefits for one tenured faculty for one month, one assistant professor for two months, or one professional researcher (postdoc, project scientist, etc) for up to four months. Teams of investigators may receive pro-rated shares of these salary levels (e.g., 0.5 months for tenured faculty with two months for researcher). Research project proposals should include funding for one graduate student researcher (for 49% time during academic quarters, preferably for 3 quarters, and for 100% during summer, though shorter appointments may be allowed). Caltrans funds cannot be used for non-resident student tuition. Inclusion of funding for undergraduate student assistants is encouraged, but not required. For white paper proposals, funding for graduate students is

encouraged but not required. Note that inclusion of funding support for students is taken into consideration in the review and evaluation of proposals. Professional researchers such as postdocs are not considered students for this evaluation criterion.

A written justification for all supplies and travel is required. An amount not to exceed $4,999 may be included for office supplies, travel, and clerical support necessary for the conduct of the research and presentation of research findings at one academic or professional meeting (preferably in California). If more than $4,999 is requested, the applicant must provide a thorough explanation, and all costs must be itemized. Allowed additional expenses include the following: costs of travel for data collection, costs of leasing special equipment or purchasing data not otherwise available, and costs of printing, processing, and mailing questionnaires. Permanent equipment is not allowable. International travel is not allowable. Travel to any Transportation Research Board meetings or events is not allowable on Caltrans funds. Consultant services are not allowed, and Business Service Contracts should be avoided on Caltrans funds.

UCI PSR funded proposals will have accounts administered by ITS-Irvine. At partner universities, accounts will be set up within the subcontract per each partner's policies.

Funding Guidelines:

1. Research project awards should have a maximum of approximately $75,000 per year (including indirect costs of 20%)
2. The typical project duration is one year
3. **Note that conservative and cost-effective budgets are strongly encouraged.** PSR reserves the right to reduce the budgets of submitted proposals. Projects should be budgeted to begin on August 16th, 2020 and end by August 15th, 2021.

Project Requirements:

All research projects have the following requirements for PSR.

1. Semi-annual progress reports conforming to PSR guidelines
2. A Draft Final Report, conforming to PSR guidelines, which must be delivered 30 days prior to the completion date of the project. The Draft Final Report is subject to peer review. The Draft Final Report should include an executive summary, data management plan compliance explanation, and documentation of the research project. It should be complete, original, well organized and accurate; and comply with report content and format guidelines (posted to the PSR website)
3. A Final Report that complies with the review comments and requirements must be delivered within 30 days after the review of the Draft Report. Draft Final and Final Reports are distributed

via the PSR websites, and are submitted to PSR sponsors and to various publications databases

4. A separate statement listing publications, presentations and inventions resulting from research; names of students supported along with their degree status; and a summary of project results. This statement is to be submitted with the Draft Final Report
5. A 2- to 4-page Research Brief suitable for a general audience that summarizes the main findings of the research and its contribution to practice or policy. This brief is to be submitted with the Final Report
6. A brief Biographical Sketch for each of the project's investigators to be submitted with the Draft Final Report. A template for the biographical sketch will be provided with the notification of award. At least one presentation of the funded project's research at a thematic conference or seminar organized by PSR
7. Timely reporting of all information requested for the PSR Annual Report
8. Copies of all papers submitted to journals or conferences that are based on the project's research. Copies should be provided to the PSR Administrator
9. Acknowledgement of PSR support in all work that results from PSR funding, including peer-reviewed publications and conference presentations
10. **Conformance to new data management requirements imposed by DOT.** More information is available here: https://www.metrans.org/assets/upload/PSR_DMP.pdf
11. **PI ORCID number.** PIs are directed to obtain and provide this number to the center administrator within 30-days of notification of project selection. Numbers can be obtained at https://orcid.org/register

Projects funded by Caltrans will have additional reporting and budget requirements. Principal Investigators of proposals selected for Caltrans funding will be informed of these requirements during contract execution.

Proposal Instructions

Research Proposal Instructions

Research proposals should be succinct and clearly written for a mixed technical and non-technical audience. Each proposal must include the following sections:

1. Project title and basic info (See sample template in Appendix D)
2. Project abstract
3. Description of proposed research, including project purpose, and relevance to PSR themes

4. Methodology and scope of work
5. Tasks, Schedule and Deliverables (steps that will be followed in executing the methodology, and when they will be completed)
6. Description of the expected research product and contribution to practice (e.g. peer-reviewed publication)
7. Description of how the PI will comply with the PSR Data Management Plan (DMP). The DMP is available at https://www.metrans.org/assets/upload/PSR_DMP.pdf.
8. Qualifications (the research team's relevant skills and experience that will help ensure success)
9. Budget justification (strong justification should be provided for unusual expenses, e.g., equipment). The extent of student involvement should be clearly stated
10. Reference list
11. Budget (1 page.) See template in Appendix D. Contact Craig Rindt <crindt@uci.edu> for questions about creating a budget for PSR proposals. Budgets should assume a start date of 8/16/20.
12. Letters of participation, or match funding commitment (attached, any number and length) *Letters of participation are required for any project that involves data collection from private or public entities, access to private or public facilities, or cooperation of private or public entities.*
13. Short bios for all investigators and a list of recent (past 5 years or less) publications and funded research projects (2-page maximum)

Proposals are limited to no more than 8 pages in sections 3 – 7. **Submitters are strongly encouraged to use the standard PSR Proposal and Budget Templates to write their proposal**, which include the necessary formatting specified in Appendix D (append the second sheet of the budget template as item 11 for the requirements above). Both of these can be found in the online shared folder for this RFP. *Note that PIs of selected proposals will be asked to convert their proposal into a Caltrans-specific task order format prior to execution of the contract. Use of the standard templates will simplify this process.*

Proposals should demonstrate their responsiveness to PSR UTC selection criteria, according to the following guidelines:

Selection Criteria	**Most Relevant Section(s)**
Relevance to research theme areas	Background/Objective
Quality and research significance	Methodology/Tasks
Student involvement	Budget justifications

Reasonableness of budget and cost-effectiveness	Budget justification
Qualifications	Qualifications
Match funding & potential for other grant funding	Budget justification, Methodology/Tasks
Prior performance	Prior project accomplishments

Budget Instructions

For UCI: Please use the UCI Office of Research guidelines in preparing your budget. Tuition charges are not subject to F&A charges. The F&A cost rate for PSR Caltrans Match projects is 20%. Proposers should contact their home department financial analyst for budget assistance. Any budget questions related to PSR requirements should be directed to Craig Rindt <crindt@uci.edu>.

Submission Instructions

Proposals must be submitted via email to ITS Assistant Director for Research Coordination, Craig Rindt at crindt+psr2020@uci.edu **on or before 5:00pm PDT on February 28, 2020**.

NOTE to PIs: If more than one proposal is to be submitted, they must be submitted using separate emails. Proposals received later than the deadline will be rejected. **It is the responsibility of the PI to deliver the proposal by the deadline and to confirm receipt.**

Please note that all proposals must include a budget; proposals submitted without budgets will be determined to be incomplete and rejected.

PSR will reject proposals that: (1) are received after the deadline, (2) do not conform to eligibility requirements, (3) are incomplete, or (4) do not conform to thematic requirements.

Further Information

For further information, UCI PSR Associate Director Prof. Stephen Ritchie can be reached at (949) 824-4214 or srtichie@uci.edu . In addition, check https://www.metrans.org/psr-utc for center organization and links to outside agencies. For further information regarding program rules and procedures contact ITS Assistant Director for Research Coordination, Dr. Craig Rindt at (949) 824-1074 or crindt@uci.edu.

Appendices

- **Appendix A - Caltrans Research Needs for FY 2020-21**
- **Appendix B - Caltrans DRISI Research Goals**
- **Appendix C - PSR Research Themes**
- **Appendix D - Budget Information and Forms**

Appendix A - Caltrans Research Needs for FY 2020-21

Priority for the use of Caltrans funds will be given to projects that help to implement and/or inform future activities associated with the priority research topics summarized below. These research needs statements have been sorted by high-level categorizations. Because many are cross-cutting, it is recommended that applicants review all of the following research needs statements. Additional details, including the Caltrans representative requesting the research, can be found in the detailed research statements available online.

Applicants intending to respond to one or more priority research needs must complete an expression of interest by Monday, February 10, 2020, 11:59 PM.

VMT Reduction and Mitigation Strategies

Best Practices and Innovations in VMT Fee Application

Research Need: Caltrans seeks information regarding existing structures to reduce VMT through the use developer fees, and the potential for increased efficiency, either in collaborative structure, or the type of projects selected.

Research Description: The request is for a white paper investigating the question above. Alternatively, case studies and interviews could provide additional information about how fees collected from developers have been applied to VMT reduction efforts in the past.

Potential for Implementation: The information may be delivered in the form of guidance to regional and local agencies facing this issue.

Broadband as a VMT Mitigation Strategy

Research Need: Rural areas sometimes lack broadband infrastructure necessary to implement telecommuting options or take advantage of economies of scale in home delivery services. What are the potential effects of providing subsidized broadband service to underserved locations?

Research Description: The research would consider data about gaps in broadband service, the potential for broadband service subsidies to incentivize telecommuting, and potential VMT effects of increased telecommuting in one or more areas of the state.

Potential for Implementation: This research will help provide a basis for non-infrastructure state interventions for reduction of vehicle miles traveled.

Case Studies in Public-Private VMT Reduction Projects

Research Need: Many innovative programs to reduce VMT are not eligible for traditional transportation funding. What are some of the cooperative public/private mechanisms used to plan, fund, and administer cooperative efforts specifically aimed at VMT reduction?

Research Description: The request is for a white paper investigating the question above.

Potential for Implementation: The information in the report may be used in establishing VMT mitigation mechanisms in the state.

Effectiveness of Affordable Housing Subsidy as VMT Mitigation

Research Need: Would a subsidy for location-efficient affordable housing lead to a reduction in VMT or increase in transit or other non-auto transportation usage? What conditions would need to be present for improvements to occur?

Research Description: Seeking a research study that analyzes trip rates from affordable housing, benefits of increased affordability in transit-oriented development, and the potential for government subsidy to increase housing density in urban areas.

Potential for Implementation: This research will help provide a basis for non-infrastructure state interventions for reduction of vehicle miles traveled.

Effectiveness of Transportation Demand Management Strategies in Different Place Types

Research Need: Filling in knowledge gaps about suitability and anticipated effect of TDM strategies based on the conditions in which they are deployed.

Research Description: The research can take many forms, but potentially could involve case studies that demonstrate the extent to which specific interventions reduced vehicle miles traveled compared to baseline projections.

Potential for Implementation: The information may be delivered in the form of guidance to State, regional and local agencies to better hone projections of expected improvements from VMT reduction efforts.

Establishing Nexus / Additionality for Transportation Projects Used as Mitigation

Research Need: Spatial distribution, connectivity, and timing are key metrics in establishing nexus and additionality. How do these metrics interact at the regional scale, and how should off-site VMT reduction projects be assessed to ensure that they are appropriately claiming credit as a mitigation?

Research Description: The request is for a white paper investigating the question above.

Potential for Implementation: The information in the report may be used in establishing VMT mitigation mechanisms in the state.

Lifecycle Cost Assessment for VMT Reduction Strategies

Research Need: State, regional, and Local jurisdictions need more information about the relative effectiveness of VMT reduction strategies, accounting for cost. What is the best investment to offset VMT from development or transportation projects?

Research Description: Using Lifecycle cost analysis, define direct and exogeneous costs and benefits of particular VMT reduction strategies.

Potential for Implementation: This information can be used to create tools for compliance with SB 743.

Mitigating Local VMT Impacts for Capacity-Enhancing Highway Projects

Research Need: New capacity enhancing projects on the highway will have local VMT impacts. As a responsible agency for these types of projects, how can Caltrans mitigate or avoid VMT impacts when circumstances dictate that capacity enhancing projects are needed?

Research Description: The request is for a white paper investigating the question above. The assessment should include a comprehensive list of both well-known and innovative VMT reduction strategies that could be enacted through direct or partnered investment by the state.

Potential for Implementation: This research will help provide a basis for state interventions for reduction of vehicle miles traveled.

Monitoring VMT Reduction Claims in Local Development Review

Research Need: Determination that a mitigation for a VMT impact is sufficient is based on projections. Especially if a measure for VMT reduction is untested, how can the state or local jurisdictions monitor the efficacy of projects and programs administered specifically to reduce VMT? What current or theoretical mechanisms exist to ensure that the reductions actually occurred?

Research Description: The request is for a white paper investigating the question above.

Potential for Implementation: The information in the report may be used in establishing VMT mitigation mechanisms in the state.

Repurposing LOS-Based Fee Structures for VMT Reduction

Research Need: LOS-based analysis necessarily includes an assessment of total traffic load expected from a particular development. What opportunities exist to repurpose existing LOS-based fee structures for a new VMT reduction paradigm?

Research Description: White paper that identifies some common LOS-based fee structures and analyzes ways that the same structure can be applied to a VMT reduction program while still meeting the intended congestion reduction goals.

Potential for Implementation: The information in the report may be used in establishing VMT mitigation mechanisms in the state.

Shared Mobility

State-Supported Local Bikeshare Programs

Research Need: What are the potential benefits of a state-sponsored local bikeshare program, including expected mode shift, VMT reduction potential, and effects on accessibility?

Research Description: Caltrans seeks a research paper that describes considerations for the creation and deployment of a program that offers assistance to localities in setting up city-wide bike share programs.

Potential for Implementation: This research will help provide a basis for non-infrastructure state interventions for reduction of vehicle miles traveled.

State-Supported Tools for Promoting Ride-share at Primary and Secondary Schools

Research Need: Assess the feasibility of a smart phone app that pairs volunteer drivers with students in need of a ride to school or other school related events. Phase one would assess the potential impact of such a program and look at potential regulatory and cooperative scenarios for deployment.

Research Description: A research paper that identifies considerations for the development of a research prototype and cooperative structures that include multiple state and local jurisdictions.

Potential for Implementation: If successful, the research may lead to the development of a new system for providing essential transportation services at increased efficiency throughout the state.

Congestion Management

Advanced Parking Management Systems and Integrated Corridor Management with Transit Component

Research Need: Congestion is an ever-growing problem in California, but solutions are possible through underutilized transportation resources, namely transit, cutting-edge connected vehicle technologies, ramp metering, roadway shoulders, and bicycle/pedestrian facilities. What is needed is a way to integrate these resources so that they can serve as innovative means to reduce

roadway congestion.

Research Description: Researchers will coordinate on a pilot project that aims to link Dedicated Short Range Communications (DSRC) On-Board Units (OBU) to Ramp Metering (RM) Universal Ramp Metering Systems (URMS) cabinets to modify ramp meter green time, parking, and transit services.

Potential for Implementation: The knowledge gained will be how feasible this pilot project is, how connected vehicle technologies could be used in this pilot project, and how transit agencies may assist.

Opportunities and Barriers of Various Congestion Pricing Strategies that have the Potential to Equitably Reduce VMT

Research Need: Several potential research needs are identified in the following:

Caltrans seeks investigation of whether or not the burden caused by congestion pricing is disproportionately larger for low-income people, taking vehicle ownership, existing mode share, and potential use of revenues from pricing. Some questions to address:

- How is personal vehicle ownership related to one's opportunity for income or social mobility? Is this a factor if one has access to well-funded public transportation?
- What reforms can be made to traditional congestion pricing techniques to ensure that costs and benefits are equitably distributed?
- Could congestion pricing revenue be structured so that we offset costs for low-income drivers, similar to price offsets used in the home heating/energy industry, for example?
- How would congestion pricing react to changes in the economy, such as a recession? Are there any best practices that touch on this question?

Data Gaps:

- What is the longitudinal relationship between good access to public transportation and income mobility?
- What is the longitudinal relationship between personal vehicle ownership and income mobility?

Desired Improvement: The desired outcome is that a mix of congestion pricing strategies, when structured equitably, can effectively reduce vehicle miles traveled. Research Description: This research activity examines the opportunities and barriers of various congestion pricing strategies that have the potential to equitably reduce vehicle miles traveled.

Potential for Implementation: This information will be used to inform discussions around the equitability of congestion pricing regimes.

Equity

Assisting ADA customers with Innovative Technology

Research Need: Currently, many people with disabilities face difficulties accessing rail and mass transportation services. There are a lot of technologies being developed right now to assist people with disabilities in basic mobility and other needs. A study is needed to review and summarize technologies in development and survey members of the disability community to make recommendations on technologies that can assist people in accessing transit.

Research Description: The researcher should review those assistive technologies that could assist people with disabilities in accessing rail and mass transportation services. The researchers should also visit schools for the deaf and the blind to hear more about their needs and get their feedback on assistive technologies.

Potential for Implementation: The final product is a research report that summarizes their activities and makes recommendations.

History of Caltrans Freeway Decisions, Placement, Construction, and Their Racial Consequences

Research Need: Disparities exist statewide regarding the transportation system, with benefits and burdens being inequitable in distribution. Caltrans would like to gather information on the creation of the State Highway System, including the governing laws and incentives for freeway placement, how the locations were selected, and the impacted communities. Some of this information has already been developed, but our major interest is focused about the communities and people that were/continue to be affected.

Data Gaps:

- What were the racial demographics of the people/communities that were displaced?
- Which freeways were designed as “slum clearage” or some other form of social “betterment”?
- Was there any community engagement and/or backlash surrounding placement of freeways?
- What was the average price of the homes in the communities we built in at the time?
- What was the fair market value paid home owners and/or renters to acquire their land?
- What were the policies and practices surrounding displacement of renters historically?
- What were the average prices of homes in neighboring communities at the time? Now?
- What is the Department currently doing surrounding anti-displacement with development of new projects and because of investments/gentrification?
- What are other State DOTs doing regarding transportation equity?
- How are other jurisdictions analyzing and/or addressing historical decisions and

impacts?

Desired Improvement: The desired outcome is to have a thorough knowledge of the Department's history, especially with regards to the racial impacts of transportation decisions. As we begin to explore the "why" of the current disparities, and how to create structural change and make equitable decisions moving forward, it is imperative that we understand this historical context in which we are operating.

Research Description: This research activity examines the consequences both, immediate and lasting, of Caltrans transportation decisions, development, and investments.

Potential for Implementation: As disparities persist, we need to understand why they exist, and how we can address the root causes. We also want to look at solutions and community engagement in the future and authentic change must come with acknowledgement and accountability for our historical impacts.

Freight

Assessing the Role of Indian Reservation Roads in Freight Movement

Research Need: The Indian Reservation Roads (IRR) program, established in 1928, funds maintenance, construction, and improvement of IRR routes that do not receive state funding through federal-aid funding.[1] Currently, FHWA is assigned oversight of the Tribal Transportation Program (formerly the IRR program) and is responsible for determining available funding to allocate to the Bureau of Indian Affairs (BIA) for projects on the National Tribal Transportation Facility Inventory (NTTFI), formerly the IRR system.4 Many of California's Tribal lands are accessed from or served directly by the state highway system, including routes identified within the State Highway Freight Network. Future study is needed to determine what role the NTTFI plays in the movement of freight to and from the Tribal lands of California.

Research Description: The objective of the proposed study would be to analyze California's NTTFI designated roads to identify which Tribal Transportation Program routes (or portions of routes) are already on the California State Freight Highway Network, to collect goods movement data on the IRR system, and to determine how the NTTFI system supports freight movement within the California as a whole.

Commodity Flow Survey for Pass-through Cargo

Research Need: More information is needed on the composition and volume of pass-through traffic, that with both an origin and destination outside of California, in order to better understand the related costs and benefits.

[1] California Indian Reservation Roads Technical Report.

Research Description: Analysis of commodity flows to more accurately assess multi-modal freight related travel with both an origin and destination outside of California. Also, the study may include an economic analysis of these freight movements, including environmental effects.

Economic and Environmental Impacts of Expanded Short Rail Service

Research Need: To shippers, the ability to use short line railroads means lower transportation costs, more flexible local service options, and a greatly expanded market reach for local products through their Class I railroad partners. In order to promote smart investments in short line rail service, it is important to understand and quantify the potential benefits of short line rail versus the cost of expansion.

Research Description: A paper outlining the current state of knowledge around suitable markets for short line rail, potential for modal shift to rail, cost of expansion or other barriers to entry, and expected travel related effects of different short line expansion scenarios.

Environmental Impact Avoidance in Freight Corridors

Research Need: While California sees significant economic benefit (such as jobs, sales tax) by serving as the nation's global gateway, there is an associated cost exerted by the significant pass-through freight moving by truck and train. Research is needed to explore methods to reduce or eliminate negative externalities from freight movement, especially air quality effects.

Research Description: A white paper or small research project reviewing best practices or case studies around freight-related impact mitigation. Another potential product is a list of strategies with an assessment of their effectiveness in certain situations.

Feasibility and Efficiency Benefits of Dedicated Truck Lanes

Research Need: Separating freight from other traffic may reduce congestion and the chance of traffic incidents related to mixing commercial and non-commercial vehicles. What are factors that have led to successful truck-only projects in the past, what are some current barriers in California, and what benefits could be expected from separating truck and non-truck facilities?

Research Description: Study looking at considerations in the planning of truck-only facilities, successful and unsuccessful cases of the past, and the creation of a methodology to accurately assess costs and benefits.

Modeling Truck/Bus Created Fugitive Dust on Highway Roadsides with Narrow or Absent Shoulders

Research Need: Most of the existing fugitive dust studies found on a search of the literature investigated dust created by traffic on the paved highway surface. A study completed by the University of Nevada and the San Joaquin Valley Unified Air Pollution Control District in 2011

reports the first empirical estimate of particle emissions from unpaved shoulders of paved roads.[2] This study confirms the theory that large vehicles with poor aerodynamics traveling at high speed result in significant dust entrainment. While not the source of the highest fugitive dust emissions for the basin, depending on conditions, shoulder-generated dust could have significant effect on local air quality.

Research Description: The objective of the proposed study would be to model dust plumes to determine extent and volume of dust plume under expected climate change conditions (warmer, drier for longer periods) at different shoulder widths to determine optimal widths of paving necessary to alleviate the additional dust created by an ever-increasing number of large vehicles.

Projecting and Mitigating Potential Job Loss from Freight Sector Automation

Research Need: While the use of automation in warehouses, marine terminals, and trucking offers many benefits, their implementation also poses complex planning dilemmas. For example, although automated trucks may address major industry challenges such as the national truck driver shortage, there is also the potential for unintended economic impacts of job loss if these workers are not transitioned into other jobs. What sub-sectors of the freight economy are experiencing or will experience effects of automation, and what are the effects on total productivity, total employment, wages, and other important labor statistics? What are some ways that negative effects can be mitigated?

Research Description: White paper looking at the effects of automation, potential to shift jobs, and common or experimental methods of mitigating any negative effects

VMT Impacts of E-commerce Logistics Facilities and Warehousing

Research Need: As growth in e-commerce continues, it is critical to understand how the use of logistics facilities and warehouses is changing over time, and what that means in terms of the expected travel to and from those facilities. A warehouse might go from passive use to handling a part of the delivery supply chain for a large online retailer, for instance. How should regional and statewide traffic models adjust to anticipate more transportation-intensive uses in those sites? Are those trips replacing trips that would have previously been assigned to traditional retail?

Research Description: A study outlining the expected impact of e-commerce versus other types of facilities that may have similar location or zoning, either through modeling, case studies, or before and after travel data.

[2] H. Moosmüller, J. A. Gillies, C. F. Rogers, D. W. DuBois, J. C. Chow, J. G. Watson & R. Langston (1998) Particulate Emission Rates for Unpaved Shoulders along a Paved Road, Journal of the Air & Waste Management Association, 48:5, 398-407, OI:10.1080/10473289.1998.10463694.

Connected and Autonomous Vehicles

Intersection Movement Assist

Research Need: Vehicle-to-infrastructure (V2I) technologies facilitate communication between vehicles and infrastructure. Transit vehicle drivers face complex urban driving environments, with blind spots, differing turning radii, and left turns. V2I technologies can potentially improve safety by assisting transit drivers in negotiating differing driving environments. Further research is required to determine how V2I technologies can be used to improve transit vehicle safety.

Research Description: The researcher will use a test track to investigate which V2I technologies to use and how V2I technologies can be used to assist transit drivers in negotiating real-world environments.

Potential for Implementation: A research report that describes the specific V2I technologies and how they can be used to improve transit vehicle safety.

Vehicle Turning Right in Front of Bus Warning

Research Need: Vehicle to Infrastructure (V2I) technology is the communication between vehicles and infrastructure to improve traffic flow and improve safety. V2I can be used to alert drivers when they are about to turn right in front of a transit vehicle. It can also be used to alert transit drivers when someone is about to right in front of them. What is needed is further research into how best to use V2I technologies, which specific technologies to use, and how these can be integrated in test simulations.

Research Description: The researcher will use a test track to research various V2I technologies for how best they can be integrated to provide the warning.

Potential for Implementation: A research report that describes the specific technologies used and how those technologies can best be used to warn drivers.

Modeling Autonomous Vehicle Effects in Rural and Small Urban Settings

Research Need: What factors must be considered in modeling autonomous vehicle ownership rates and travel behavior in rural areas of the state?

Research Description: Reviewing the literature and using surveys and other data where necessary, the goal would be to determine a methodology to account for rural and small urban place types in modeling the effects of AV ownership and usage.

Potential for Implementation: The product would be a report and modeling considerations that can be used by rural areas in projecting future travel behavior.

Transit

Network Integration: Trip Planning, Transactions, and Journeys

Research Need: There are over 200 transit agencies in California, each with their own routes, fare systems, and in some cases trip planning applications. The transit user faces barriers when traveling between agencies' service areas. Further integration is needed in the areas of trip planning, transactions, and travel, including multi-modal access to and from station areas.

Research Description: Research is needed to explore further network integration of the several transit and rail agencies in the current California context given recent developments in technology and integration. What further ways are there to integrate the systems, and how can agencies collaborate further?

Potential for Implementation: The deployable product is a research project that documents current network integration efforts and opportunities. This report and the underlying research will make recommendations on how network integration can best proceed.

Network Integration: Post-Journey Phases

Research Need: Efforts are ongoing to further integrate the transit and rail agencies' services in California. Several components of network integration do not directly involve customers' travel and trip-planning but rather support them. In particular, transit and rail agencies need further coordination and integration in mobility service data, payment systems, wayfinding, customer service/feedback, and user data/accounts. Further research is needed in these areas to explore the direction California should go.

Research Description: The research will focus on new and cutting edge means to provide support to network integration. It will focus on how those can be used in an integrated setting in the California context.

Potential for Implementation: The research will result in a report that surveys the state-of-the-practice and cutting edge practices in network integration with recommendations for further steps to integrate the network.

Zero-Emission Vehicle and Fuel Technologies

Assessment of Requirements, Costs, and Benefits of Providing Charging Facilities for Battery Electric Heavy-Duty Trucks and Buses at Safety Roadside Rest Areas

Research Need: Research is needed to better define possibilities for and barriers to the provision of charging infrastructure for heavy vehicles at roadside rest areas.

Research Description: Potential topics include assessing the load capacity, type of infrastructure needed (charging stations, safety equipment, design of facilities, plug types, etc.), potential rates for electricity, hours needed for charging for a range of heavy duty vehicles.

Leveraging Pedal Signal Correction to Reduce Fuel Use and Charge Times

Research Need: Caltrans would like to assess claims by Smart Pedal Inc. that their signal correction mechanism produces mileage and range increases in electric and hybrid vehicles. Are there other products that have the same general purpose and are they as effective?

Research Description: Seeking a research study that tests and compares after-market signal correction apparatus.

Potential for Implementation: This study would confirm potential cost and energy savings from these devices, and serve as justification for potential deployment in Caltrans fleet vehicles.

Zero-Emissions Vehicles Technology Feasibility Study for Intercity Passenger Rail

Research Need: California has set very ambitious greenhouse gas reduction goals for the state. One of the main strategies to achieve these reductions is the use of rail and transit, particularly zero-emission vehicles. It is unknown which rail technologies, such as hydrogen trains and electric trains, will be most viable for intercity passenger rail. Further research is needed to determine which are the most feasible zero-emission vehicles to use, or how transitions to new vehicles can be managed.

Research Description: The researcher will investigate the feasibility of zero-emission vehicles in intercity passenger rail for use in California.

Potential for Implementation: A study that documents the feasibility of particular zero-emission vehicle types for use in California's intercity passenger rail system.

Safety

Vulnerable Road Users in Signalized Crosswalks

Research Need: Crashes involving vulnerable road users, namely bicyclists and pedestrians, have increased in recent years due to several factors, such as growing SUV sales, increased walking and bicycling, and inattentive driving. Connected vehicle technology links vehicles to other vehicles and infrastructure, communicating data to improve travel flow and safety. Vehicle-to-infrastructure (V2I) technologies hold the promise to alert drivers when a bicyclist or pedestrian is in a signalized crosswalk, potentially decreasing road crashes. Further research is needed in this area to determine how V2I technology best works.

Research Description: The researcher will use various V2I technologies on a test track to see

how V2I can alert drivers to vulnerable road users in a signalized intersection with the aim of decreasing crashes.

Potential for Implementation: A report that documents how V2I technology for improved safety of vulnerable road users can work. The report should identify specific technologies and strategies in these areas.

Environmental Review

GIS Methods for CEQA Project Screening Based on Site, Project Context, and Impact on the State Highway System

Research Need: There is a need to identify and understand project significance in a geographical and visual way. Being able to identify project area context, view relevant information, and change for how projects are screened as conditions and laws change is critical. Research into what data and methodologies are applicable toward environmental review at for impacts on the State Highway System.

Research Description: Changes in land-use and project location in order to screen projects for environmental review and project significance. Methodology should include GIS applications and demonstrations on what data could be collected to facilitate project screen criteria using GIS applications. For example, if an environmental reviewer can see the boundaries of transit priority zones, water sheds, local land-use planned projects, and other information that is critical to understanding their environmental review, it would save time and increase effectiveness.

Potential for Implementation: The deployable product would be a GIS project screening web application that could facilitate intergovernmental review of CEQA and NEPA projects and their potential impacts on the State Highway System.

Appendix B - Caltrans DRISI Research Goals

The Caltrans Division of Research, Innovation and System Information (DRISI) "advances California's transportation system, develops comprehensive transportation solutions, and creates and distributes transportation-related knowledge and information." DRISI's purpose and goals support Caltrans' mission to provide a safe, sustainable, integrated, and efficient transportation system to enhance California's economy and livability. Applicants may find it helpful to review DRISI's research goals, below, when considering research topics.

- Critical societal and technological trends for consideration in the California Transportation Plan and subsidiary Caltrans modal plans, including (not limited to):
  - Impacts of shared mobility on vehicle miles traveled (VMT)
  - Transportation-related cybersecurity risk
  - Meeting transportation needs in the midst of changing California demographics
- Implementation of the statewide freight plan and emerging sustainable freight trends, including but not limited to:
  - Methods for determining freight origin and destination
  - Truck parking innovations
  - Modal shifts from trucks to rail or barge
  - Intelligent transportation systems for freight
- Meeting transportation system performance measurement requirements of the FAST Act and California Senate Bill 1, including but not limited to:
  - Data collection needs for new performance metrics in the Caltrans Strategic Management Plan including prosperity, accessibility, livability, and resiliency
  - Best practices in performance-based transportation planning in the U.S.
  - How to use GPS data for mode and activity deduction including how other DOTs use big data
  - How to use Big Data platform for integrating land use and transportation planning
  - How to incorporate contingency planning into corridor planning (Shared mobility (TNCs), AV/CV deployment, Climate Change, economic uncertainty, etc.); how to incorporate health and accessibility scores into corridor planning
  - How to identify data sources and develop parameters for qualitatively ranking critical corridors and optimal projects
  - Improved active transportation safety, mobility, and equity aimed at fostering healthy and sustainable communities, including but not limited to:
    - Access to data need to effectively evaluate systemwide or location-specific safety issues
    - Analysis of benefits and costs of bicycle and ped. safety infrastructure projects
    - Estimating greenhouse gas reduction potential of active transportation facilities
    - Bicycle and pedestrian trip data collection methodology and forecasting
- Tools for assessing lifecycle GHG emissions and costs for highway and other projects, as per Executive Order B-30-15
- Tools for predicting and mapping mudslides as a result of the environmental effects of wildfires
- Case studies in transportation equity.
- Racial history and impacts of transportation decisions in the state of California and at Caltrans

Appendix C - PSR Research Themes

This funding for this RFP is being provided by Caltrans match funding for PSR UTC so proposers should target the priorities in Appendix A. The PSR themes are provided below to provide additional context.

Theme 1: Technology for improved mobility

We are on the threshold of a largely unforeseen technological and social transformation in connectivity, automation, and the sharing economy that promises to revolutionize travel in our Region and beyond. This theme explores technology solutions for improving mobility for both passengers and freight. Our Theme 1 research program is organized around three topic areas.

Topic 1-1: Technology and mobility: This topic examines emerging technologies and their potential for improving passenger and freight mobility. Innovation is rapid across both passenger and freight modes. Examples include smart parking, dynamic routing, delivery consolidations, and integrated transit fare systems, in addition to the well-known transportation network companies (TNCs). This topic examines the potential of these innovations to solve the transport problems of Region 9.

Topic 1-2: Smart infrastructure and vehicles: Technology for connected and autonomous vehicles (CAVs) is advancing rapidly. This topic examines AVs and CAVs. Examples of research include: 1) development of models and algorithms for managing shared CAVs; 2) impacts on travel behavior; 3) impacts on traffic flow and management in mixed fleets; and 4) truck platoons. This topic also examines the potential long term impacts of AVs and CAVs on travel behavior, location choices of households and firms, and metropolitan spatial structure.

Topic 1-3: Public policy and implementation: This topic explores the role of government in technology implementation and regulation. Research is needed on the role of government in this changing environment. A second issue is cooperation. A future of vehicles managed at the system level requires cooperation of public and private entities involved, yet there are many barriers to such cooperation. Finally, there are questions about the viability of CAVs.

Theme 2: Improving mobility for disadvantaged populations

This theme addresses mobility and accessibility problems of disadvantaged populations.

Topic 2-1: Novel modes for improved mobility and accessibility: This topic explores the potential of novel modes, new models of public transport, and new models of private vehicle access to address mobility problems. Research may include challenges to implementation and strategies to overcome them.

Topic 2-2: Land use, accessibility, mobility: Addressing the needs of the disadvantaged includes studying relationships between land use and transport with respect to minority and

disadvantaged populations. This topic examines the impacts of limited accessibility and mobility both in urban and rural areas. It also explores the role of land use policies in reducing access barriers for underrepresented groups.

Theme 3: Improving resilience and protecting the environment

Resilience, or the ability to absorb shocks, recover quickly, and adapt to changing social, economic, and environmental conditions is essential to ensuring well-functioning and sustainable communities. Sustainability also requires reducing environmental problems. This theme addresses all aspects of environmental protection.

Topic 3-1: Analyzing alternative resilience strategies: More effective resilience strategies can reduce the damages of natural disasters, accidents, or terrorist events. There is a need for research on frameworks to analyze resilience strategies at different geographic scales. Effectiveness of resilience strategies is often analyzed via economic impact models. In the case of transportation, these models could be linked with transportation network models to quantify the cost-effectiveness of different strategies. Methods to examine distributional impacts of disruptions and resilience across socioeconomic groups is also needed.

Topic 3-2: Smart technologies: Smart technologies can improve system monitoring. Smart sensing systems, including those powered through solar or power harvesting, can provide the necessary information to monitor the health of systems so that proactive repair and replacement can be dealt with through normal crew duties.

Topic 3-3: Reducing environmental impacts: The challenge for Region 9 is to reduce environmental impacts while meeting the mobility needs of society, fostering healthy communities, and supporting economic growth. Research is needed to address this challenge along three fronts:1) *Infrastructure and operations*: lifecycle use of materials and practices in roadway construction, maintenance, and operation; assessment of environmental implications of Intelligent Transportation System (ITS) strategies; 2) *Travel demand*: effectiveness of strategies for shifting driving to transit, walking, and bicycling; implications of automated cars for land development patterns; role of new mobility services in daily household travel; and 3) *Vehicle and fuel technologies*: assessment of new-generation fuel and vehicle technologies, including battery, plug-in hybrid, roadway-powered, and fuel cell electric vehicles, with respect to lifecycle emissions, private and social costs, consumer behavior, and regulatory and market policies.

Theme 4: Managing mobility in high growth cities and regions

This theme addresses the transportation problems of regions and metro areas experiencing rapid population and employment growth are expecting to continue to grow.

Topic 4-1: Managing passenger demand: This topic explores meeting human needs while lessening travel required. The emphasis is on “accessibility” rather than “mobility.” Well-being

is enhanced when people are able to acquire goods and services, employment and education, but not necessarily by increasing travel volume. There is increasing emphasis on combining land use planning with transportation capital investments to achieve efficient movement patterns.

Topic 4-2: Managing freight demand and its impacts: This topic addresses the challenges of managing freight, both last mile and regional. For example, the rise of e-commerce has brought about changes to global and local supply chains and greatly increased urban freight deliveries. The revitalization of our urban cores adds another increase in demand that translates into additional trips made by trucks and delivery vans. Research is needed to examine the impacts of e-commerce and other changes on local and regional mobility, economic activity, and employment patterns, such as passenger-freight conflicts, dynamics of shifts and their local impacts, and effective strategies for managing trade-related traffic, including better balancing demand across time intervals, routes, and modes.

Appendix D - Budget Information and Forms

UCI Budget Form [SAMPLE]

Category	Monthly Salary		% of Time on Program		Number of Months		Budget ($)
Faculty Salary	_____	x	_____	x	_____	=	_____
Faculty Salary1	_____	x	_____	x	_____	=	_____
Student Support	_____	x	_____	x	_____	=	_____
Type of Student	_____						
Student Support*	_____	x	_____	x	_____	=	_____
Type of Student	_____						
Fringe Benefits	Rate _____				Total		_____
Tuition	Units _____		Rate_____		Total		_____
Conference Travel Conference Name/Date _____							_____
Other Travel							_____
Materials and Supplies							_____
Equipment (list) _____ _____							_____
Other Direct Expenses (itemize) _____							_____
Tuition cost share	Units_____		Rate_____		Total		_____
Overhead (20%)							_____
TOTAL FUNDS REQUESTED							_____

*Use additional faculty and student lines only if more than one professor or student.

PSR Cover Page [SAMPLE]

Title _____

Theme _____

Topic Area_____

Caltrans Topic (if applicable)_____

Principal Investigator _____

Mailing Address _____

_____

_____

E-mail _____

Phone _____

Fax _____

Co-Principal Investigator_____

Are you submitting this proposal elsewhere, or are you currently receiving funding in the same area of research? Yes _____ No _____

If yes, please describe circumstances and funding source

Does this proposal comply with the PSR Data Management Plan? Yes No