STATE OF CALIFORNIA
AIR RESOURCES BOARD

MEETING OF THE

RESEARCH SCREENING COMMITTEE

April 26, 2023
10:00 a.m.

California Air Resources Board
Research Division
Cal/EPA Building
1001 I Street
Sacramento, CA 95814
(916) 445-0753

CALIFORNIA AIR RESOURCES BOARD

Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Sacramento, California 95814
(916) 445-0753

April 26, 2023
10:00 a.m.

AGENDA

I.   Approval of Minutes of Previous Meeting

II. Discussion of Research Proposals

III. Other Business

1. Update on Research Planning

CALIFORNIA AIR RESOURCES BOARD

Research Screening Committee Meeting
Cal/EPA Headquarters Building
1001 I Street
Sacramento, California 95814
(916) 445-0753

February 10, 2023
9:00 a.m.

MINUTES

<u>**Research Screening Committee Members in Attendance via Teleconference**</u>
Aly Tawfik
Sam Silva
Bryan Hubbell
Francesca Hopkins
Roya Bahreini
Tim Wallington

I. Approval of Minutes of Previous Meeting

   October 14, 2022

II. Discussion of Responses to a Request for Proposals

   3. "Characterization of Tire-Wear and Brake-Wear PM Emissions Under On Road Driving Conditions," $650,000, RFP No. 22RD002

      The committee accepted the proposal without further discussion.

      Motion: Move to recommend that CARB accept the proposal.

      The committee approved the motion.

III. Discussion of a Proposed Contract Augmentation

   1. "Understanding and Characterizing Emission Factors from Burning Structures in California Due to Wildfires," University of California, Berkeley, $400,000, Contract No. 22RD004

      The committee requested the following clarifications:

      • Under Task 3: Laboratory-Scale Emissions Measurements, proposal states that "The Contractor will select specific components and samples/brands following a thorough literature review and consultation with CARB staff based on their availability, commonality, and use in

SSE burns". Please expand the discussion on target numbers of samples and materials to be tested in the University of California, Berkeley (UCB) lab.

- Under Task 5: Draft Final Report, with regards to "pre fire fuel characterization", please clarify who is doing the pre-fire component inventory, e.g., National Institute of Standards and Technology (NIST) or contractor. Furthermore, one committee member raised concern about the NIST Facility is currently closed, and whether this would cause a delay with overall contract time and schedule.

- The proposal should also include more literature citations, particularly to the contractor's own work, such as past work on the Firehawk. Overall, the task led by Co-PI, Dr. Gollner, lacks detail; for example, it is unclear how many samples or types of materials will be sampled.

Motion: Move to recommend that CARB accept this contract augmentation, subject to the inclusion of revisions based on comments from staff and the committee.

The committee approved the motion.

IV. Discussion of Draft Final Reports

1. "Environmental Chamber Experiments to Improve Secondary Organic Aerosol Model Prediction," University of California, Riverside, $450,000, Contract No. 18RD009

The committee requested the following clarifications:

- The staff review document states that "the investigators have published their results in several peer-reviewed journals". This is a significant achievement and should be highlighted in the executive summary with links to the papers which interested readers can follow.

- Please expand discussion on sensitivity of vapor wall loss to distribution of vapors in experiments with different volatile chemical product (VCP) precursors.

- The draft final report does not directly address the seed effects. Please describe what are the hypotheses for the discrepancy regarding seed effects in different chambers. Please explain the other factors impacting yield.

Motion: Move to recommend that CARB accept the draft final report, subject to the inclusion of revisions based on comments from staff and the committee.

The committee approved the motion.

2. "Impacts of Train and Port Pollution and Air Toxics on Respiratory Symptoms and ED Visits within Vulnerable Communities in Southern California," University of California, Berkeley, $519,650, Contract No. 20RD016

Staff noted to the committee that the report has been extensively reviewed by staff at CARB, the California Department of Public Health (CDPH) and the Office of Environmental Health Hazard Assessment (OEHHA). Staff noted that while they are confident of the scientific value of the models used in the study, additional information and clarification on the models is needed in the report. Since the contract would not expire for a few months (May 19, 2023) the investigators will be able to incorporate this information into a final version of the report including additional information on the methods and potential uncertainties in the models.

The committee members noted that while the report represents an important scientific effort, substantial additional information needs to be provided in the report on the spatial resolution, validity, and uncertainties in the models. The following are major comments from the committee.

Provide more information on why the models used in the study were developed for the exposure analysis and the advantage of these models compared to other model systems.

Provide further information on the Land Use Regression (LUR) models on the monitoring data used in the models, predictors used, representativeness at fine spatial scale, validity of the models along with information on uncertainties in the models and a discussion of the issues and concerns in building LUR models for highly refined air pollution and health analysis.

The committee noted that the air toxics models are less precise than the criteria pollutant models with lower prediction power. Additional information on the uncertainties in these models needs to be added to the report.

Staff provided information on the predictive power of the models and the detailed modeling inputs that allow for estimation of fine resolution PM 2.5 data. However, staff agreed that additional information to explain these points is needed in the report. Staff agreed to work with the investigators to clarify these points and address all the required additions and changes in the draft report.

Motion: Move to recommend that CARB accept the draft final report, subject to the inclusion of revisions based on comments from staff and the committee.

The committee approved the motion.

3. "Improving Indoor Air Quality, Energy Efficiency, and Greenhouse Gas Reductions through Multifamily Unit Compartmentalization," University of California, Davis, $399,860, Contract No. 19RD013

The committee commented that the report was well written, and prior feedback was addressed well. One committee member asked staff to clarify several points, including:

1) How the calibration of CO_2 sensors had been conducted and its impacts on the field measurements;

2) The impact of not including a first-floor garage in the prototype building on modeling result; and

3) How the mechanical flow rate results have been averaged.

Another committee member suggested including a statement that cost-effectiveness analysis was beyond the scope of the project upfront in the report and emphasized the importance of sensitivity analysis. Staff provided further clarifications on these questions and agreed to ask investigators to modify the report to include the committee's comments.

Motion: Move to recommend that CARB accept the draft final report, subject to the inclusion of revisions based on comments from staff and the committee.

The committee approved the motion.

V. Other Business

1. Update: "Estimating the Health Benefits of Reducing Emissions of Toxic Air Contaminants in California," University of California, Davis, $529,857, Contract No. 20RD017

Staff provided an update on contract 20RD017. Staff explained that the principal investigator for this contract had not provided adequate evidence of progress on the project. CARB staff have cancelled the project to save state funds.

Staff and the committee agreed that the results of the project would have been valuable. Staff clarified that they hope to start a new project with similar goals in the future.

2. Update on Research Planning

   Research Division (RD) staff reviewed the annual planning process including how CARB identifies research priorities, develops projects, solicits and finalizes proposals, approves and kicks off active projects, and approves final results to close projects.

   RD staff then reviewed the changes to the updates to the Board which were recently presented and approved by the Board at the January 26, 2023 Board meeting. Staff detailed how the Research Division will now prepare five-year strategic research plans rather than triennial plans and go before the Board every two to three years. At those Board hearing, staff will provide more holistic, big picture updates that are topical, rather than presenting individual projects on a yearly basis. RD staff also explained other changes related to Board updates and provided reasoning related to leveraging funds.

   RD staff then went over next steps in the research planning process, including the steps left for the fiscal year 2023-2024 annual planning process, how RD will kickoff planning for fiscal year 2024-2025, and that a plan will be put in place to kick off efforts to develop the five year plan.

   A committee member asked for clarification on the annual research planning process and on when committee members are involved. RD staff clarified that their understanding was correct.

   A committee member asked if they would be informed regularly as research planning efforts occurred. RD staff recommended that all committee members sign up for the research activities listserv and that they would continue to receive updates at each RSC meeting.

STAFF EVALUATION OF A NEW RESEARCH PROJECT

TITLE: Impacts of Air Pollution on Life Expectancy Across Multiple Generations: Race, Ethnicity, and Vulnerability Perspectives

PRIME CONTRACTOR: University of California, Berkeley $400,069

SUBCONTRACTOR(s):   Northern California Institute for Research and Education $99,931

PRINCIPAL INVESTIGATOR(s):   Jason Su, PhD

CONTRACT TYPE: Interagency Agreement

BUDGET: $500,000

CONTRACT TERM: **48 Months**

For further information, please contact Dr. Barbara Weller at (916) 324-4816.

I. SUMMARY

Although state regulatory efforts have focused on the reduction of air pollution to meet state and federal health-based standards and improve the health of Californians, pollution reductions have not been experienced equally in all communities. The purpose of this statewide study is to understand which communities in California continue to experience negative health impacts due to high levels of exposure to fine particulate matter ($PM_{2.5}$) by investigating the impacts of $PM_{2.5}$ on life expectancy. The study will assess the impacts to life expectancy from $PM_{2.5}$ exposure in California across time, generations, and within families to document the continued burden of impacts from $PM_{2.5}$. For this contract, UCB has assembled a multidisciplinary team to investigate $PM_{2.5}$ exposure and the years of life expectancy loss from $PM_{2.5}$ over 30 years (1990-2020). Using statewide Medi-Cal population data the impacts of $PM_{2.5}$ will be calculated for: 1) the first (1990-2005) and second (2006-2020) generations of the entire Medi-Cal population; 2) race/ethnicity and vulnerability (based on CalEnviroScreen scores) subgroups of each generation; and 3) the first and second generations within families. The study will map the disparities in $PM_{2.5}$

exposure and life expectancy loss over the two generations at the census tract level for the entire state. The final maps will be presented in an online and publicly accessible format and will allow for identification of communities that have the highest magnitude and persistence of $PM_{2.5}$ exposure and $PM_{2.5}$ specific impacts to life expectancy over two generations. In collaboration with the Regional Asthma Management & Prevention (RAMP) program, the project will conduct community outreach to solicit feedback on the project and maps, and to share the final research results. This research will support CARB's regulations, strategies, and programs to better protect vulnerable communities by understanding which census tracts and groups in California have continued to experience high air pollution exposure and pollution specific impacts to life expectancy.

II. TECHNICAL SUMMARY

Objective

The objective of this project is to understand the patterns of $PM_{2.5}$ exposure and its impact on life expectancy across two generations within racial/ethnic and vulnerability groups and census tracts for California. To meet this goal, the research team will: 1) conduct a literature review on the effects of air pollution exposure on life expectancy; 2) develop 100m and census tract $PM_{2.5}$ surfaces for the years 1989-2020; 3) Obtain Medi-Cal data including mortality and covariates; 4) Calculate $PM_{2.5}$-specific reductions in life expectancy across two generations and identify race/ethnicity and vulnerability disparities; 5) create maps for the study results; 6) Address impacts in communities; and 7) deliver a final research report, results, and data to CARB.

Background

A history of racism involving discriminatory practices such as redlining and other forms of environmental injustice has resulted in some communities that continue to live in areas with high pollution. The disproportionate pollution exposure and health impacts that result are experienced predominately in under-resourced communities and communities of color. For example, on the national scale, while the Clean Air Act and enforcement of the National Ambient Air Quality Standards reduced racial disparities in $PM_{2.5}$ exposure from 2000-2015, Black populations continue to experience higher pollution exposure compared to White populations across the U.S. Furthermore, research and community

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experience has documented exposure disparities in low-income communities and communities of color in California. Understanding which communities continue to experience high levels of pollution and negative health impacts over time and across generations, particularly in vulnerable communities and communities of color, is important to inform policies and resources that will reduce exposure and improve the health outcomes in these communities.

Previous studies on global and national scales have shown that air pollution reduces life expectancy. For example, air pollution reduces current global life expectancy by ~2 years and has greater impacts to life expectancy when compared to other major threats to human health. While overall life expectancy for California is calculated each year by the Center of Disease Control & Prevention, how air pollution impacts life expectancy specifically for California and for specific racial/ethnic and vulnerable groups is not well studied. This project will look more deeply at the patterns of pollution exposure and air pollution specific impacts to life expectancy in California and will investigate how those patterns differ across different racial/ethnic groups and between more vulnerable and less vulnerable communities.

Proposal Summary

Task 1. Conduct a Literature Review

UCB and Northern California Institute for Research and Education (NCIRE) will conduct a systematic literature review, using peer-reviewed journal papers to identify effects of air pollution exposure on life expectancy with a focus on exposure to $PM_{2.5}$.

Task 2. Develop PM2.5 Surfaces for the Study Population

Under CARB contract 21RD004, UCB is developing highly comprehensive daily $PM_{2.5}$ air pollution models and surfaces for the State for the years 1990-2020. UCB will also generate daily $PM_{2.5}$ surfaces for 1989 to facilitate the requirement of estimating rolling average exposure for enrollees that died in 1990. Using daily land use regression (LUR) models for $PM_{2.5}$, UCB first identifies factors (i.e., source or sink) that might impact $PM_{2.5}$ concentrations and uses them as potential predictors. UCB identifies the optimal distance of impact for a potential predictor and models that can deal with multicollinearity among

predictors and can reduce model overfit. To avoid an excessive number of predictors in the final selected model, only a maximum of 15 predictors (in addition to four Seasons) will be used in the LUR model. UCB applies the Deletion/Substitution/Addition (D/S/A) algorithm for developing the daily prediction LUR model for $PM_{2.5}$. UCB will provide daily air pollution surfaces at 100 m resolution for $PM_{2.5}$ for the years 1989-2020 to CARB plus the modeling techniques used to derive those pollution surfaces. The 100 m spatial resolution surfaces allow for identification of small area variations of pollutant concentrations which result in more refined exposure estimates and better analyses of the differences between the groups in the study. Details on the validation and uncertainties of the model are included in the proposal and will be reported in the final results. CARB is confident that the modeling techniques and the high spatial and temporal resolution of the model will provide the best available data on $PM_{2.5}$ exposure for this study.

Task 3. Obtain Medi-Cal Data including Mortality and Covariates

UCB will obtain Medi-Cal data for the years 1990-2020 from the Department of Health Care Services. The subject level variables to be collected include age, sex, race/ethnicity, smoking status, primary chronic conditions, comorbidity index, and access to primary care. Subjects' home address data will be used for the purpose of identifying their spatiotemporal $PM_{2.5}$ exposure and vulnerability based on the CalEnviroScreen scores of their census tract of residence. Date of death of an enrollee will also be collected to assign one year of daily $PM_{2.5}$ exposure before date of death (i.e., rolling average).

UCB will also acquire census tract level race/ethnicity, socio-economic status, and household characteristics data for decennial years (i.e., 1990, 2000, 2010, and 2020) from the National Historical Geographic Information System. Census tract level race/ethnicity composition will be used as weights to estimate census tract level life expectancy. These data will also be used in the project for confounding control.

Task 4. Calculate PM2.5-specific reductions in life expectancy across two generations and identify race/ethnicity and vulnerability disparities

The research team will model statewide life expectancy and PM$_{2.5}$-specific life expectancy loss for the first generation and second generation for the total Medi-Cal population and for the race/ethnicity subgroups (Hispanics, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Other), vulnerability subgroups (vulnerable, marginal vulnerable, marginal non-vulnerable and non-vulnerable, respectively, for CalEnviroScreen scores of 76-100th, 51-75th, 26-50th and ≤25th), and within families for each generation.

The research team will first develop age group specific logistic regression models to determine the impact of PM$_{2.5}$ on mortality for Medi-Cal enrollees. All cause mortality and PM$_{2.5}$-deleted mortality (all cause mortality – PM$_{2.5}$ mortality) will also be derived. Using the mortality estimates, well established standard life table and survival curve methods will be used to model all cause life expectancy at birth and a counterfactual PM$_{2.5}$ cause-deleted life expectancy. The loss of life expectancy due to PM$_{2.5}$ exposure will then be calculated by the difference between all cause life expectancy at birth and life expectancy at birth eliminating the impact of PM$_{2.5}$ exposure.

Task 5. Create GIS Maps for the Study Results
Using findings from Tasks 2-4, UCB will map and analyze the research results at the census tract level. UCB will aggregate the 100 m daily PM$_{2.5}$ concentrations developed for 1999-2020 to generate census tract mean annual PM$_{2.5}$ concentrations. Trends in annual changes in PM2.5 exposure in census tracts from 1990 to 2020 will be identified. PM2.5 hotspots will be generated using top 25 percent of census tracts with the greatest PM2.5 exposure. UCB will use decennial census data as weights to adjust statewide impacts on life expectancy to create census tract level life expectancy loss from PM$_{2.5}$. Using geographic information system (GIS) software, UCB will map and overlay census tract life expectancy loss and PM$_{2.5}$ exposure for 1990, 2000, 2010, and 2020. UCB will also map the change in life expectancy loss and change in PM2.5 exposure from the 1st to 2nd generation at the census tract level. The GIS maps will also include disadvantaged census tracts from CalEnviroScreen as a layer. The final GIS maps will allow for identification of communities and vulnerable communities that have the highest magnitude and persistence of PM$_{2.5}$ exposure and impacts to life expectancy due to air pollution.

Summary of the GIS maps/layers:

- Census tract annual $PM_{2.5}$ concentrations for 1990, 2000, 2010, and 2020.

- $PM_{2.5}$ hotspots of top 25 percent census tracts with greatest exposure for 1990, 2000, 2010, 2020.

- CalEnviroScreen disadvantaged communities (census tracts with top 25 percent of overall CalEnviroScreen scores)

- Census tract life expectancy loss for 1990, 2000, 2010, and 2020

- Change in census tract life expectancy loss from the first to the second generation and within families.

- Change in census tract $PM_{2.5}$ concentrations from the first to the second generation.

Task 6. Address Impacts in Communities

RAMP will host two webinars at the beginning of the project to inform stakeholders about the research and to solicit feedback about its scope and direction. The community outreach will focus on feedback from communities on what areas of the research findings communities are most interested in and what form the research findings used for outreach, such as the factsheets and maps of the findings, should take. RAMP will also host two webinars toward the end of the project to share the research results and implications. UCB will work with RAMP to prepare webinar materials, including various maps generated from the project, written in lay person's language. RAMP will also translate the materials into Spanish and will offer simultaneous Spanish/English translation during the webinars.

Task 7. Reporting and Data Delivery

UCB will submit quarterly progress reports and a final report, as well as raw data, modeled data, and all the data analyses results to CARB.

III. STAFF COMMENTS

The solicitation for the research project was released in December 2022 as a part of CARB's Fiscal Year 2022-2023 research funds. The submitted proposal was reviewed by CARB staff in the Research Division and by staff at OEHHA. The proposal has gone through several rounds of revisions between CARB staff and the PI, Dr. Su. This latest version of the proposal will be sent again to OEHHA and the Department of Public Health for their review.

Staff requested additional detail and description of the methods for Dr. Su's air pollution exposure modeling in the proposal, similar to the detail being added to another CARB contract discussed at the February 2023 RSC meeting. In response to staff comments, Dr. Sue included more detail in how the models are developed, the data used in the models, and the validation techniques..

Additional staff recommendations included analyzing statewide $PM_{2.5}$ impacts on life expectancy by vulnerability based on CalEnviroScreen scores instead of income, including 'Other' as a race category, providing clarification and clearer summaries of the deliverables, conducting sensitivity analyses, and clarifying the outreach task to say that communities will provide feedback on the format of the findings , including the final format and layers for the GIS maps. All these comments have been addressed in the project.

Staff expressed the importance of adequately addressing the potential confounders and covariates in the life expectancy analyses and including life expectancy measures that are specific to air pollution. Staff worked with Dr. Su to ensure the project uses established methods and published studies specific to life expectancy and calculates a final metric specific to life expectancy.. In Task 4, staff suggested that the paper "*Ambient PM2.5 Reduces Global and Regional Life Expectancy. Joshua S. Apte, Michael Brauer, Aaron J. Cohen, Majid Ezzati, and C. Arden Pope III. Environmental Science & Technology Letters 2018 5 (9), 546-551. DOI: 10.1021/acs.estlett.8b00360*" be cited and used to replace the Measure Evaluation reference. All staff comments have been incorporated into the project.

Dr. Sei Lee, a physician with expertise on mortality prediction in older adults, is a subcontractor to assist with the literature review and the life expectancy analyses. Staff has suggested that an epidemiologist/biostatistician with expertise in life expectancy modeling and the impacts of air pollution on life expectancy be also added to the project as an advisor or consultant to review the life expectancy analyses. Dr. Su is pursuing this additional expertise for the project.

<u>Investigator Qualifications</u>

1) Dr. Jason Su, PI is an Associate Researcher & Principal Investigator of Public Health at UC Berkeley. He has strong expertise in GIS, remote sensing, statistic and machine learning modeling skills for air pollution exposure assessment, and environmental epidemiology. He has the expertise, leadership, and training necessary to successfully carry out the proposed research project. Dr. Su is currently funded by three ongoing CARB research projects focused on the health impacts of pollution exposure.

2) Dr. Sei Lee, Subcontractor is a Professor in the UC San Francisco Division of Geriatrics and a physician-researcher at the San Francisco Veterans Affairs (VA) Medical Center. NCIRE is a non-profit institution located at the San Francisco VA Health Care System (SFVAHCS) and administers non-VA grants for SFVAHCS PIs. He is a geriatrician and his research focus is how best to individualize treatment and prevention in older adults. He has led numerous studies focusing on predicting mortality risk and life expectancy in older adults. He will provide his perspective as a geriatrician to ensure that important associations between age, chronic conditions and mortality are modeled appropriately.

3) Dr. Rob McConnell, Project Advisor is a Professor of Preventive Medicine at the University of Southern California and will be an unpaid advisor on the project. His research interests include environmental contributions to autism in children, novel methods for assessment of environmental exposure, and understanding childhood susceptibility to the effects of air pollution related to psychosocial stress and social factors, exercise, and environmental disparities. He has estimated the burden of disease associated with near-roadway air pollution as a local tool for risk

communication with communities and policy makers. He has also developed innovative approaches to estimating the burden, cost and public health impact of air pollution exposure including in the context of climate change, focused on policy-relevant outcomes at a local scale.

IV. STAFF RECOMMENDATION

Staff recommends that the Research Screening Committee recommend that CARB move forward with this proposal for $500,000.

STAFF EVALUATION OF A NEW RESEARCH PROJECT

TITLE: Long-term Chemical Characterization and Source Apportionment of PM$_{2.5}$ in the San Joaquin Valley

PRIME CONTRACTOR: University of California, Davis

PRINCIPAL INVESTIGATOR(s): Qi Zhang, Ph.D.

CONTRACT TYPE: Interagency Agreement

BUDGET: $950,000

CONTRACT TERM: **36 Months**

For further information, please contact Dr. Toshihiro Kuwayama at (279) 984-9873.

I. SUMMARY

The San Joaquin Valley (SJV) in California consistently encounters air quality issues associated with PM and frequently violates the 24-hr PM$_{2.5}$ National Ambient Air Quality Standards (NAAQS). The SJV is currently implementing several PM$_{2.5}$ control strategies to achieve air pollution reduction goals as laid out in the latest State Implementation Plan (SIP) that guides the SJV to achieve PM$_{2.5}$ reduction milestones by the end of 2025. The Senate Bill (SB) 1383 also mandates the reduction of anthropogenic black carbon (BC) emissions, a component of PM$_{2.5}$, by 50 percent below 2013 levels by 2030. To evaluate the progress of ongoing air pollution mitigation strategies, it is important to link continuous, long-term measurements of ambient PM$_{2.5}$ concentration and chemical composition in the SJV with the changing influences of primary emission sources, chemical pathways, and meteorological conditions.

II. TECHNICAL SUMMARY

The overarching goal of this project is to gain a comprehensive understanding of the primary emission sources, chemical pathways, and meteorological conditions that affect ambient PM$_{2.5}$ levels in the SJV. To achieve this goal, the University of California, Davis

(UCD) research team will collect sub-hourly measurements of non-refractory $PM_{2.5}$ (NR-$PM_{2.5}$) concentration and chemical composition using an Aerosol Chemical Speciation Monitor (ACSM; Aerodyne Research Inc.) at Fresno, CA for the next three consecutive years. UCD will also carry out parallel ACSM measurements at Bakersfield, CA during the same period. The project will combine the ACSM data with co-located measurements of BC, volatile organic compounds (VOC), and meteorological conditions (e.g., aerosol layer height) collected by the CARB, to conduct advanced analyses that will help elucidate $PM_{2.5}$ characteristics in the SJV and identify the major drivers affecting ambient $PM_{2.5}$ levels and their constituents. Furthermore, UCD will conduct a month-long intensive measurement campaign in Fresno during the fall/winter of 2023 using two state-of-the-science real-time aerosol mass spectrometers – an Aerodyne high-resolution Soot Particle Aerosol Mass Spectrometer (SP-AMS) and a Long Time-of-Flight Chemical Ionization Mass Spectrometer (LTOF-CIMS). The project will use this data to study the contribution of various primary emission sources (e.g., mobile, biomass burning, cooking, and agricultural activities) to ambient $PM_{2.5}$. UCD will also examine the influence of secondary formation pathways and nocturnal residual-layer chemistry on the ambient concentrations and temporal patterns of critical secondary inorganic and organic PM species in the SJV. Lastly, this project will synergistically compare these results to the findings from CARB-funded contract #17RD008 to inform CARB, the local government, and the community of the effects of ongoing $PM_{2.5}$ control strategies in the SJV. Through these endeavors, the project will significantly advance the understanding of the complex mechanisms that contribute to elevated ambient $PM_{2.5}$ levels in the region. Ultimately, the outcomes of this project will aid in the development and refinement of future SJV SIPs and SB1383 initiatives.

III. STAFF COMMENTS

Staff at CARB's Air Quality Planning and Science Division (AQPSD), Monitoring and Lab Division (MLD), Office of Community Air Protection (OCAP), and at the San Joaquin Valley Air Pollution Control District (SJVAPCD) reviewed and support this project because SIPs and SB1383 development and reassessment will benefit from the data product to improve modeling predictions and source evaluation. CARB believes this PI is the best person qualified for this research project, because of the success of a

previous project about PM$_{2.5}$ in SJV (CARB contract #17RD008) and the PI's reputation and establishment (200 peer-reviewed journal articles cited more than 30,000 times in total).

IV. STAFF RECOMMENDATION

Staff recommends that the Research Screening Committee recommend that CARB move forward with this proposal for $950,000.