

## Exhibit C1 - Scope of Work

### Section 3: Scope of Work

HECAM-OCC involves five tasks: (1) workplan development, (2) monitoring (3) community engagement, (4) workforce development, and (5) reporting.

#### 1. Task 1: Workplan development

Prior to implementing activities, from approximately March - May 2022, MPNA-GREEN will convene the HECAM-OCC project committee consisting of MPNA-GREEN's Executive Director, Project Director, and Community Organizer, and four CUAL committee members (2 youth and 2 adult), and UCI project partner representative(s), Dr. Shahir Masri and/or Dr. Mike Kleinman. Between March - May 2022, this committee will meet bi-weekly to develop a workplan for the cumulative project including all tasks as well as schedule upcoming meetings. This cumulative project workplan will build on the scope of work, timeline, and budget provided in this application, the HECAM-OCC project committee will confirm and refine goals, metrics, and activities.

After May 2022, this committee will meet quarterly for the remainder of the grant period in order to finalize, adjust, and evaluate progress on the project. During the quarterly meetings, the committee will assess progress both quantitatively and qualitatively. For example, it will assess the number of community engagement events and air monitoring collection days as well as the impact of the events. It will also assess what is working well and what needs to be improved to ensure residents are driving the process and meet goals. This committee will share updates with the MPNA-UCI collaborative during the collaborative's quarterly meetings, and with the MPNA-GREEN Advisory board and CUAL committees during their regular meetings.

Early in the grant period, estimated April 2022, the committee will form subcommittees that will complete a work plan for each of the subsequent tasks. Workplan development will include affirming project goals and activities and metrics for each task as well as roles and responsibilities of each project partner. It will also include finalizing timelines and scheduling activities in alignment with the public

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school district and university calendar and adjusting timelines as the project evolves. By May 2022, we will have formed a subcommittee and drafted the workplan for each task as well as have a schedule for regular meetings for each subcommittee as well as project committee.

The workplan development and subcommittee structure will ensure that impacted community members are driving the implementation of this project. Subcommittees will send updates to the HECAM-OCC committee quarterly. The HECAM-OCC subcommittee will report progress and results of each task to the MPNA-UCI collaborative table, MPNA-GREEN advisory board, to the full CUAL committees, and through our regular CARB reports.

## 2. Task 2: Monitoring

### Research design and data collection:

For this project we will conduct air monitoring, vehicle counts and noise measurement which will help better characterize major local pollution sources, to compare environmental and health risks in Madison Park to other parts of the city, and to understand personal health risks from exposure to air pollution. The air monitoring will build off MPNA-GREEN's pilot air monitoring project to examine ambient fine particulate matter (PM<sub>2.5</sub>) concentrations across the City of Santa Ana at residential locations and schools. Traffic counts reported by CalTrans on the nearest freeway (55) indicated that about 1% of the total vehicles were medium and heavy duty trucks. Because of the presence of several warehouse operations in the community, truck traffic is expected to be a major air pollution source. Vehicle counts will characterize the truck traffic activities at warehouses and on the streets to help understand the environmental impact of the corridor and the importance of this source of pollution. Emissions from heavy duty diesels are important sources of PM from tailpipe emissions, but also from tire wear, resuspension of road dust and brake wear. We will also be characterizing noise levels from traffic and other sources in Santa Ana, and examine the impact of fireworks ignition on PM<sub>2.5</sub> during the July 4 episode and other times in Santa Ana and Anaheim. Both noise and fireworks were concerns that residents brought up during the pilot period.

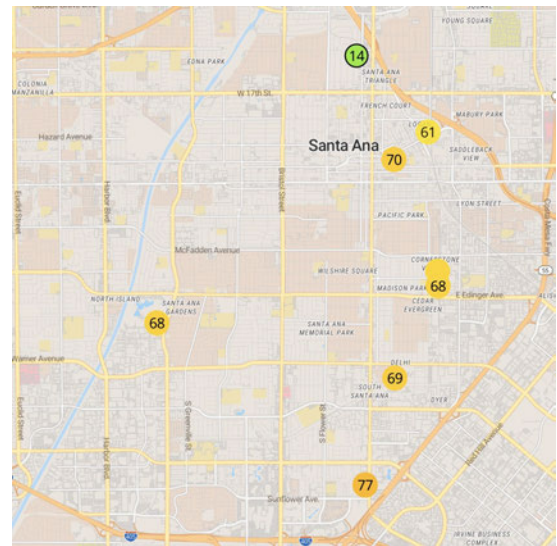
### Purple Air Monitoring:

A total of 15 Purple Air sampling devices will be stationed throughout the city of Santa Ana, affixed to the exterior of the homes of 15 community volunteers so as to measure outdoor particulate matter concentrations on a continuous basis. PurpleAir is a low-cost sensor monitor that can be used to continuously measure particulate matter concentrations at many locations in a community. It has started to be deployed in the U.S. and worldwide since 2017. The latest model (PA-II-SD) contains two PMS5003 sensors (Plantower, Beijing, China), which estimate particle mass concentrations by measuring the amount of light scattered at ~680 nm. Initial assessment of the PMS5003 sensors by South Coast Air Quality Management

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District (AQ-SPEC team) showed low intra-model variability; PM<sub>2.5</sub> sensor data correlated very well with the corresponding reference monitor measurements ( $R^2=0.86-0.93$ ) (REF). Although PurpleAir reports mass concentrations of different sizes of particulate matter (i.e. PM<sub>1</sub>, PM<sub>2.5</sub>, and PM<sub>10</sub>), high correlations of PM concentration between different size ranges (correlation coefficient  $>0.9$ ) were detected in our previous work (Mousavi & Wu.<sup>3, 4</sup> PM<sub>2.5</sub> will be the focus of the monitoring position of this project as it is widely used as the PM standard by the U.S. Environmental Protection Agency and has been associated with most of the diseases caused or exacerbated by air pollution indoors and outdoors.

Thousands of PurpleAir sensors have been deployed in California since 2017. In 2020, South Coast Air Management District loaned 13 sensors to MPNA-GREEN. Since then, these sensors have been installed and in operation at the Madison Park Neighborhood Association and surrounding neighborhoods, close to the southeastern industrial corridor of the city. The other parts of the city do not have PurpleAir sensors. (see map to the right created using <https://www.purpleair.com/map?mylocation>).



In addition to PM<sub>2.5</sub>, PurpleAir also measures temperature and humidity data, which will also be retrieved and examined to understand outdoor temperature that Santa Ana residents experience, especially during summer time.

The purpose of HECAM-OCC air monitoring is to expand the air pollution sampling network of the 13 Purple Air sensors that are currently in operation in the city of Santa Ana. The 15 additional sensors will be placed strategically so as to characterize air pollution in residential areas that are currently not represented by the 13 existing sensors, and which are located in areas both near and distant to likely air pollution sources (e.g. high trafficked roadways, industry, parks, etc.). Purple air sensors will be installed and maintained by trained CUAL member volunteers who will serve as key “citizen scientists” during the study period. In order

<sup>3</sup> Mousavi A, Wu J. 2021. Indoor-generated PM<sub>2.5</sub> during COVID-19 Shutdowns across California: Application of Purple Air indoor-outdoor low-cost sensor network. Environmental Science & Technology. doi: 10.1021/acs.est.0c06937.

<sup>4</sup> Mousavi A, Yuan T, Masri S, Barta G, Wu J. 2021. Impact of July 4th fireworks on air quality in California: analysis based on high density low-cost air quality sensors. International Journal of Environmental Research and Public Health: 18, 5735. <https://doi.org/10.3390/ijerph18115735>

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to contribute toward prolonged community knowledge and resilience beyond the duration of the study, the 15 Purple air sensors will remain in the community to be maintained by citizen scientists and enable the continued monitoring of air pollution levels. This will also enable the continued reporting of publicly available air pollution data across the greater Purple Air network, in turn benefiting other communities and scientific inquiries.

Atmotube monitoring:

20 additional low-cost air pollution sensors called AtmoTubes will also be utilized to help characterize ambient PM<sub>2.5</sub> air pollution. Given that these devices are battery powered, they can serve as mobile monitoring devices that can assess air pollution concentrations where stationary PurpleAir devices are not feasible (since they need an electric power source). Moreover, while PurpleAir sensors will help to measure PM<sub>2.5</sub> across stationary locations throughout Santa Ana, additional PM<sub>2.5</sub> sensors called AtmoTube Pro sensors will be used to measure PM<sub>2.5</sub> concentrations where stationary sensors are not practical (e.g. near roadway intersections). In 2020, AtmoTube Pro devices were field tested by the South Coast Air Quality Management District (SCAQMD) and showed strong PM<sub>2.5</sub> measurement correlations when compared to simultaneously operated Federal Equivalent Method instruments ( $R^2 = 0.79-0.94$ ).<sup>5</sup> For data quality purposes, five AtmoTube Pro devices will be co-located alongside five PurpleAir sensors.

For Atmotube data collection, twenty trained CUAL committee member citizen scientists will visit designated roadways for a period of 1 hour during morning (7:30-8:30 AM) and evening (5:30-6:30PM) rush hour on one designated weekday each week for 4 weeks and for 1 hour during the same two time periods on 1 weekend day (5 sampling days total). Each participant will measure air pollution adjacent to the designated road while counting vehicle traffic and measuring ambient noise (see below). Roadways will include those that are near industrial sources, freeways, parks, and residential areas so as to enable a characterization of both vehicle traffic and air pollution near these respective areas.

Vehicle Characterization:

Vehicle counting will take place by trained CUAL committee members and community volunteers. Specifically, each participant will record the number of light-duty vehicles (e.g. passenger cars) and heavy-duty vehicles (e.g. large utility trucks) heading in one direction of the roadway across all lanes of a street for a period of 10 minutes. Where feasible counts will be made near warehouse locations and on roadways that are likely to 'feed' those locations. Counts shall be repeated 6

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<sup>5</sup> South Coast Air Quality Management District. (n.d.) Field Evaluation Atmotube Pro. <http://www.aqmd.gov/docs/default-source/aq-spec/field-evaluations/atmotube-pro---field-evaluation.pdf?sfvrsn=8>

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times throughout the hour, for a total of 60 minutes of traffic count data corresponding to 6 discrete time periods (10-min each) throughout the hour. In addition to counting trucks volunteers will be trained to also document emission plumes from trucks. If the truck traffic is too busy or location is too high in traffic to manually count, we will have volunteers record the location using their phones to collect video for the ten minute period. We will then examine the video to count trucks, confirm spot tabulations and then we could examine the opacity of emitted smoke using an opacity chart. We will also train volunteers to call the South Coast Air Quality Monitoring District hotline to report smoking trucks and cars if observed<sup>6</sup>.

#### Noise Measurement:

We will measure noise pollution using 20 community-owned iPhones equipped with a freely available data-logging noise dosimeter application (e.g. SoundMeter X by Faber Acoustical, LLC). The specific noise dosimeter application chosen for field use will be tested for quality data collection by comparing iPhone noise measurements collected by 3 separate iPhones with noise measurements collected by one co-located research-grade noise dosimeter (e.g. TSI® Sound Detector noise meter) which will be purchased for use in this study. For field data-collection, both the iPhone noise dosimeter and TSI® sound meter will be paired alongside AtmoTubes during traffic-related air pollution measurements. Dr. Wu had successfully measured short-term (i.e. 5 minutes) noise levels at over 200 locations in southern California, demonstrating the gradient from noise sources including roadway traffic and aircraft activities (unit in dBA; mean: 65, std: 7.1, range: 48-85). Given the automated nature of the noise measuring device, the addition of this measuring component of the study will contribute negligibly to the workload of the field participant and will therefore be readily feasible for all trained citizen scientists. When not in use, these 28 instruments will be placed at the sites of 28 PurpleAir monitoring sites for longer term evaluation of noise levels across the Santa Ana community.

We apply the above sampling protocol to one local, yet relatively pristine location outside of the city (e.g. Irvine Regional Park) on each sampling day to serve as a baseline measurement of noise and air pollution.

#### Statistical Analysis

Dr. Shahir Masri will conduct statistical analyses using the air pollution, noise, meteorological, and traffic count data collected in the field. Such analyses will involve summarizing the concentrations of both PM2.5 air pollution and ambient noise levels according to both season, time of day, and day of week (weekend vs. weekday) across the 28 PurpleAir and noise measurement locations.

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<sup>6</sup> South Coast Air Quality Management District. (n.d.) Smoking Vehicle.  
<https://www.aqmd.gov/home/air-quality/complaints/smoking-vehicle>

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Additionally, Dr. Masri will use ArcGIS software to calculate the length of all surface streets and freeways within various buffer sizes (radius: 100, 250, 500, and 750 meters) as well as the distance to the nearest surface street and freeways in order to generate a correlation matrix and regression model that enables an understanding as to whether such variables are correlated (or associated) with air pollution concentrations across the 53 measurement locations (PurpleAir + AtmoTube sites) during morning and afternoon rush hour periods. Correlations with other variables such as traffic count, number of industrial facilities within a buffer, temperature and wind speed will also be examined against air pollution concentrations. These same covariates will also be examined using noise measurements as the outcome variable in order to understand how noise is influenced by both land use and traffic in Santa Ana.

Data from all AtmoTube and PurpleAir sites will be compared with baseline measurements collected in local, yet relatively pristine environments outside of the city (e.g. Irvine Regional Park) to enable an understanding of the contribution of the overall urban environment to our dependent variables of interest.

PM2.5 air pollution and noise levels will be examined immediately before, during, and after July 4th and December 31st in order to quantify the contribution of New Years Eve and 4th of July firework activity to local PM2.5 concentrations and noise levels, and therefore the impact such holiday activities may play in health. Community members have expressed concerns about the negative side effects of these fireworks in terms of increased exposure to air and noise pollution.

### 3. Task 3: Community Engagement

HECAM-OCC's community engagement task is two-fold. First is the CUAL committee, which is the heart of MPNA-GREEN's air monitoring project. The CUAL committee was convened by MPNA-GREEN during the first year of our first CARB grant. For this project there will be in-depth community engagement both of CUAL members and then CUAL members engaging with their neighbors and peers. MPNA-GREEN aims to recruit new members to both the youth and adult CUAL committees. MPNA-GREEN staff will recruit adult residents to CUAL from the 21 Environmental Justice Communities across Santa Ana, where the additional 15 Purple Air Monitors will be installed. They will recruit from youth from the MPNA-GREEN STEM Science Academy and Mentorship Pipeline students by making presentations at these programs and at local High Schools (e.g. Century High School) and possibly our local community college (e.g. Santa Ana Community College), where MPNA-GREEN has existing relations. CUAL members will be trained in data collection techniques as well as continue to learn about environmental justice, air pollution, and effective advocacy strategies. They will also be involved in the second part of HECAM-OCC's community engagement strategy by co-hosting

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and co-facilitating public events as well as sharing information in person and via social media.

The second part of HECAM-OCC's community engagement task is a broader public engagement effort to discuss HECAM-OCC to a wider audience and broader range of stakeholders. This will include a series of presentations and information sharing. Specifically will organize a series of talks on environmental justice, air pollution and its impact on health to be presented at neighborhood meetings, school parent meetings, and high school science clubs. We will also be using MPNA-GREEN's social media to share flyers, photos, charts, and infographics via Facebook and Instagram. We will also conduct public events and stakeholder meetings virtually using zoom and facebook live to be in compliance with COVID-19 safety measures as well as provide more accessibility to public events to people who are not able to travel to in-person event locations. This will all be done with the intention of increasing our presence in the community, sharing our knowledge, and empowering residents of communities disproportionately impacted by environmental justice to resolve the issue of air pollution within the city of Santa Ana.

HECAM-OCC will implement three town halls per year (see timeline below) to share updates on the project, community-based air monitoring, opportunities for engagement and local advocacy as it relates to the project (e.g. land use element update). HECAM-OCC will also present findings from air monitoring at these town halls and also plans to share these findings to the Santa Ana Unified School District school board and city council. We have existing relationships with these entities and they have requested we present on our air monitoring project pilot and so we plan to do an updated presentation to them. We will also present to the Science Club and the Advanced Environmental Health Class at Century High School as well as the parents of students. We will do these presentations both at Madison Elementary, including to parents of MPNA-GREEN's STEM academy, and Century High School.

We will collect sign-in sheets to count attendance at events as well as use pre-post assessments in events to assess learning. Regarding social media we will document reactions, comments, and track shares and reach. We aim for community engagement efforts to increase community awareness of issues, environmental justice, air pollution and public health will also support behavior changes that will help mitigate exposure for families in the immediate term. We also aim for it to increase participation of community members from the 21 environmental justice communities across Santa Ana in the EJ initiative and increase their participation in public policy and systems change advocacy efforts.

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#### 4. Task 4: Workforce Development

This project provides training for community residents from Santa Ana, CA and fellowships to two Graduate Student Fellows per year from UCI through MPNA-GREEN's partnership with the Research Justice Shop. CUAL citizen science volunteers will comprise 10 local highschool students and college youth, and 10 adult Santa Ana residents. The goal will be to reach a total of 20 CUAL members who will receive a stipend. Currently, MPNA-GREEN has existing relationships with Century High School and the Advanced Placement environmental health class at this school. The youth CUAL members will be recruited from various high schools in the city of Santa Ana including Century High School and the Advanced Placement environmental class. The CUAL youth and adult members will be trained and immersed in field work in order to collect air pollution, noise, meteorological, and traffic count data. The data will be collected around the following locations: local industries, residential homes, and schools in order to monitor the air quality in these locations. In addition to data collection, CUAL youth and adult members will participate in monthly workshops and attend the various presentations to report the progress and findings of the project. Specifically, the CUAL youth members will be presenting the findings to their peers and parents of students who participate in the AP environmental health class. Finally, CUAL members trained as HECAM-OCC citizen scientists will represent the CUAL Committee at public events and engage in public discourse in order to continue a dialogue around air quality issues within the Santa Ana community. In addition to community members and residents, the project will provide stipends to learning institution students. Research Justice Shop (RJS) fellows are graduate students from UC Irvine who will be receiving stipends to provide support for HECAM-OCC. RJS fellows will collaborate with the MPNA-GREEN Executive Director and MPNA-GREEN Community Organizer to submit the progress and final reports. In addition, the RJS fellows will also support the HECAM-OCC committee in organizing the MPNA-UCI collaboration team meetings. The MPNA-UCI collaborative table meets monthly to bring together MPNA-GREEN project staff with UCI researchers from multiple disciplines to coordinate and collaborate on research projects using a model that blends team-science and community-based research.

The success of the workforce development will be measured quantitatively by tracking the retention rates of the CUAL members, tracking the attendance of the town hall meetings. The success of the RJS fellows will be measured qualitatively through the submission and presentation of the project progress and findings. In terms of quantitative measurements, the RJS fellows success will be measured through the number of UCI collaboration meetings and attendance of collaborators.



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## 5. Task 5: Reporting

In collaboration with Dr. Shahir Masri and Research Justice Shop Fellows (RJS) from the University of California, Irvine, MPNA-GREEN executive director will generate reports of the project progress and findings. RJS fellows will support MPNA-GREEN in conducting the progress reports and developing materials in English and Spanish based on the findings (e.g. infographics) to share the findings with residents. Fellows will work in collaboration with MPNA-GREEN community organizer and executive director to develop these infographics. They will also vet and receive feedback on these materials from CUAL members.

The first progress report covering months 1-6 will be submitted June 15, 2022. The second progress report will cover months 6-12 of the project and will be submitted December 15, 2022. RJS fellows, TBN and Dr. Shahir Masir will support MPNA-GREEN Director, Jose Rea in preparing and submitting the progress reports. In addition, in the spring of 2023 the data collection using the purple air monitors will begin. Dr. Jun Wu, Dr. Sharhi Masir, and Dr. Michael Kleinman will support MPNA-GREEN Community Organizer, Leonel Flores and CUAL members in conducting the field work and data collection.

The second year will consist of continuing the data collection using the purple air monitors during Spring 2023. In addition to the purple air data collection, in summer 2023 the Atmotube, noise, and traffic count data collection will begin. The Atmotube, noise, and traffic count data data will be collected a second time during winter 2023. Dr. Jun Wu, Dr. Sharhi Masir, and Dr. Michael Kleinman will support MPNA-GREEN Community Organizer, Leonel Flores and CUAL members in conducting the field work and data collection.

The third year will consist of presenting the findings to the community. The findings will be presented in the third town hall meeting taking place in Spring 2024, where residents and community members will have the opportunity to discuss methods for engagement and local advocacy that can address the findings. The third town hall meeting will be led and organized by the Project Director, TBN and the Community Organizer, Leonel Flores. In addition to the town hall meeting, the findings will also be presented to MPNA-GREEN partners in fall 2024. MPNA-GREEN partners consist of the following local educational institutions: Century High School and Madison Elementary. Ideally, the youth and high school members of CUAL will be presenting the findings in Century High School to the science club, the AP Environmental Class, and parents of the high school students. The second educational institution in which the findings will be presented is Madison Elementary. CUAL members will present the findings to the ALMA science academy and the parents of students. In addition to local educational institutions, the findings will also be presented to city institutions in winter 2024. The city institution include the

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following: Santa Ana Unified School District, Santa Ana Unified School District school board, city of Santa Ana Mayor and city council. The presentation of the findings will be conducted by MPNA-GREEN Program Director, TBN; MPNA-GREEN Community Organizer, Leonel Flores and CUAL members. In the case of presenting the findings to the Science Club at Century High School, and the parents of the AP Environmental class students, ideally the youth and high school members of CUAL would be presenting the findings.

**Section 4: Budget narrative**

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