Exhibit C1 - Scope of Work

Section 3: Scope of Work

Task 1: Work Plan Development

1) Community support and participation

a. Details partnerships, support, and level of community involvement in proposed monitoring project.

With funding from the two previous Community Air Grant cycles, the three members (CCAC, CCEJN, CVAQ) of the San Joaquin Valley Environmental Justice Collaborative (Collaborative) previously developed a community air monitoring plan for the San Joaquin Valley (SJV). This plan was developed in consultation with 15 community-based organizations from across the region. Representatives from each of these organizations formed the present San Joaquin Valley AB 617 Environmental Justice Steering Committee (SJVEJSC) and have convened monthly since its inception to discuss the air monitoring plan/network, among other AB617-related issues. The SJVEJSC is presently made up of advocates from 17 CBO across the Valley - at least one in each of the eight counties that comprise the SJV - and includes Kevin Hamilton, Rey Leon and Gustavo Aguirre Jr., the Valley's three EJ representatives on CARB's AB 617 Statewide Consultative Group. The CBOs affiliated with the SJVEJSC serve as liaisons between the Collaborative and the disadvantaged communities in which they operate. Some of these groups have been organizing and advocating for their communities for decades. They bring strong social relationships to bear as they help provide additional on-the-ground organizing and outreach activities needed for effective implementation of a Community Air Monitoring Network (SJVAir) and AB 617 more generally. The SJVEJSC serves as the primary decision-making body in determining the purpose, scope and objectives of SJVAir. The Collaborative will continue to support and facilitate meetings with the SJVEJSC throughout the grant period, led by CVAQ.

The Collaborative partnered with three SJVEJSC member organizations to establish local, non-AB 617 Community Air Protection Plans (CAPP) local-community steering committees (L-CSC) in their regions, including Valley Improvement Project (VIP) in Stanislaus County, with a focus on South Modesto, El Quinto Sol (EQS) in Lindsay, with a focus on eastern Tulare County communities from Terra Bella to Farmersville, and Madera Coalition for Community Justice (MCCJ) in Madera County, with a focus on LaVina. These communities were selected based on geographic location, previous community

engagement related to local air quality concerns and CBO capacity. The L-CSCs have provided significant input to the Collaborative regarding air pollution concerns in their communities and developed local air monitoring plans to identify locations for community air monitor installation. These CBO partners and the Collaborative, in partnership with the majority resident member L-CSCs, utilized Tracking California's Guidebook for Developing a Community Air Monitoring Network to facilitate L-CSC meetings, replicating many of the processes of the formal CAPP steering communities in South Fresno, Shafter and South Stockton.

b. Identifies project contact person to address questions on the monitoring plan.

While the Collaborative shares the various air monitoring activities and responsibilities, described below, between its three core organizations -- CCAC, CCEJN, CVAQ --, CCAC (Tim Tyner) is the lead for the Community Air Monitoring Network (SJVAir), which is the primary focus of this proposal. However, staff and leadership from all three organizations provide support to successfully implement and achieve all the objectives.

2) State the community-specific purpose for monitoring

a. Identifies the community-specific air monitoring need(s).

The Collaborative previously hosted workshops with SJVEJSC members in 2019-2020 to determine the purpose, scope and objectives of a community air monitoring network. The SJVEJSC identified the opportunity to implement a broadly distributed network of PM2.5 sensors across the entire SJV, with a primary purpose of filling-in the geographic gaps in the existing regulatory PM2.5 monitoring network (operated by CARB and the Air District), providing residents access to local, real-time air pollution (PM2.5) data for their neighborhoods and communities.

SJVEJSC and L-CSC members have identified a variety of local PM2.5 sources of concern. These include but are not limited to, oil and gas operations in Kern County, distribution center-related diesel truck traffic in Fresno County, harvest-related diesel truck traffic in Stanislaus County, and port-related emissions in San Joaquin County. Of late, wildfire-related air pollution (PM2.5) has become a high priority for most every SJVEJSC and L-CSC member, especially those in the northern SJV. Feedback and assistance from the three L-CSCs have played the predominant role in identifying and implementing air monitoring plans.

As an example, the Stanislaus L-CSC identified ag harvest-related diesel truck traffic as one of their top concerns for local air pollution sources. In response, and as a component of CCAC’s current Community Air Grant, black carbon (BC) and PM2.5 (PurpleAir) monitors were collocated at 11 locations across

Stanislaus County. All locations were identified and siting permissions obtained by L-CSC members. BC was measured over two, 30-day sampling periods in 2020 (summer) and 2021 (winter). The results of this work are currently being analyzed by UC Berkeley (Thomas Kirchstetter's lab) and will be used to inform future air monitoring priorities in Stanislaus County (the Collaborative will be working with the Air District to bring available air monitoring assets to one or more of the locations identified by the BC data).

b. Provides background information on how the need was discovered.

PM2.5 represents the most significant air pollution problem facing the San Joaquin Valley. SJV communities experience the worst short-term (24 hour) PM2.5 in the US. These communities also have some of the highest ER rates for asthma and heart disease, two conditions associated with PM2.5 exposure. PM2.5 is a complex mixture of primary and secondary aerosols. In the San Joaquin Valley, PM2.5 consists primarily of carbon (EC/OC) and salt (NH_4NO_3) based particles, whose ratios vary depending on location (sources) and season (meteorology).

Prior to recent wildfire events, the highest concentrations of SJV PM2.5 were related to an accumulation of regional secondary particles during winter inversion events. However, AB 617 was written to identify and mitigate sources of local air pollution (primary emissions) directly impacting disadvantaged communities. In an effort to address both the regional and local impacts of PM2.5, the Collaborative implemented a network of low-cost PM2.5 air monitors (PurpleAir) in communities across the SJV. This network of monitors provides individual communities and neighborhoods local PM2.5 concentrations, which may differ from available regulatory data (nearest PM2.5 reference monitor), which may be located up to 30 miles away. For example, when regional levels are relatively low, community-specific concentrations may be higher due to local emissions sources, and when regional levels are relatively high, community-specific concentrations may be lower due to local geography and meteorology. Similar differences are observed in relation to wildfire smoke that can demonstrate high spatiotemporal variability which is reflected in difference measurements between reference monitors and community-based monitors.

As described above, the Collaborative has been working with residents and CBOs on CAPP and non-CAPP CSCs to both educate residents and learn about local air pollution. Through this process, community stakeholders have identified local industries (e.g. oil and gas operations, distribution centers, biomass incinerators) and neighborhood-level activities (e.g. residential wood burning, commercial charbroiling) as some of their primary concerns, which has helped to guide the planning and installation of SJVAir community air monitors.

c. Documents, to the extent possible, relevant to the information from previous, ongoing, and proposed air monitoring (regulatory, research, or other) and identifies gaps that this community-led air monitoring proposes to address.

The San Joaquin Valley Air Basin encompasses nearly 10,000 square miles and more than 4 million people. The regulatory PM2.5 network for the basin includes 20 sites with continuous PM2.5 data, operated by the Air District or CARB. The purpose of the regulatory monitoring network is to measure regional levels of air pollution. It is not designed or intended to capture local, neighborhood-level PM2.5 concentrations. Due to the Valley's vast geography, a significant number of communities are located many miles from the nearest PM2.5 regulatory monitor. These geographic "gaps" in real-time PM2.5 data force residents to rely on air pollution data that may not be representative of the current conditions in their communities to guide their outdoor activity planning and behavior.

Based on this information, the SJVEJSC determined that the SJV community air monitoring network (SJVAir) would prioritize communities located the furthest from regulatory monitors. The SJVEJSC also decided that SJVAir should utilize an open-source platform to "democratize" the data, ensuring a fully transparent system in which residents, researchers and agencies have complete access to the data.

d. Explores alternative approaches to investigating and addressing the air quality monitoring need(s).

Unfortunately, PM2.5 concentrations are much more difficult to model in real-time than other ambient pollutants, like ozone. In addition to challenges in estimating secondary PM formation based on meteorological variables, local emissions inventories are lacking reliable estimates of *area* source emissions that may represent the largest source of PM in the community. It is also unlikely that a sufficient number of regulatory monitors will be deployed to cover all SJV communities, based on the high cost to operate and maintain. Utilizing low-cost PM2.5 monitors, calibrated to nearby regulatory monitors, offers the most cost-effective method of providing all SJV residents local air quality information for their neighborhoods and communities.

While there are other sources providing access to real-time data from low-cost PM2.5 monitors in the SJV (e.g. purpleair.com and fire.airnow.gov), SJVAir includes methods and features that the other websites lack, including:

- SJVAir is the only website that allows residents to sign up for automated text message alerts from the monitor(s) nearest their home, school or work and based on the AQI threshold of their choosing.

- Whereas other websites that utilize PurpleAir data apply one, static calibration formula to all monitors across the SJV, SJVAir utilizes collocation data from multiple locations across the Valley to generate unique calibration coefficients for PurpleAir monitors nearest each collocation site (this will soon be increasing from 7 to 20 collocation sites). SJVAir calibration equations are currently updated monthly, based on the past 30 days of data, but will soon be updated daily, utilizing an automated regression process.
- SJVAir is the only website that includes *real-time* display of both PurpleAir (2, 15, 60 min avg) and regulatory monitor (60 min avg) data. The EPA fire.airnow.gov website includes both types of monitors, but all data shown is a 3-hour average.
- SJVAir is the only website available in multiple languages, including Spanish, Hmong and Filipino.

3) Identify the scope of actions

a. Defines actions that the air monitoring aims to support.

The SJVEJSC determined that a regional, community-based air monitoring network should provide real-time data to community residents, schools and local governments, similar to what is currently provided by the existing regulatory monitor network (Real-time Air Advisory Network). Communities located furthest from existing regulatory monitors are prioritized, however, the SJVEJSC recommended the air monitoring network include any community in the SJV that currently lacks a regulatory PM monitor. Therefore, the Collaborative, in coordination with SJVEJSC member organizations, has installed 65 low-cost PM2.5 monitors in communities across the SJV.

However, simply providing a web-based map of real-time PM2.5 values does not guarantee that residents will be able to utilize the information, therefore SJVAir provides residents the option of signing up to receive automated text alerts based on real-time PM2.5 concentrations from the monitor(s) nearest their home, school or work. Residents are able to select the concentration level (orange, red, purple, maroon) that they wish to receive the text notification (additional text alerts are sent if concentrations increase to the next AQI level). As a component of this proposal, the Collaborative will work with the Air District to determine if/how the SJVAir text alert system can be integrated into the RAAN notification system (like RAAN, the SJVAir text alert system also allows residents to include regulatory monitors in their selection of personal monitors linked to their alerts).

The Collaborative is also working directly with school districts that cannot rely on RAAN for air quality alerts due to their distance from the nearest reference

monitor. For example, the Collaborative installed and operates a BAM1022 and 11 PurpleAir monitors in cooperation with Delano Unified Elementary School District (DUESD). The PM2.5 reference monitor providing air quality data (RAAN) to DUESD is located in Bakersfield, approximately 30 miles away. The Collaborative is coordinating with the Air District to calibrate and maintain the Delano BAM. The Collaborative is also working with DUESD to develop a policy that would guide student outdoor activities based on real-time information generated by the local air monitoring network. In addition to providing reference monitor grade data for central Delano, the BAM1022 is also used to calibrate all of the DUESD PurpleAir monitors and other PurpleAir monitors operating in a 15-mile radius of Delano, CA.

In addition to maintaining the SJVAir infrastructure and community engagement described above, this proposal will replicate the work done in DUESD by installing a school-based air monitoring network in Los Banos, CA, which is similarly about 30 miles from the nearest reference monitor (Merced, CA). The superintendent of Los Banos Unified School District (LBUSD) was informed of the air monitoring network in DUESD and is eager to replicate the project in LBUSD (see attached Letter of Support). This proposal will also include development of an SJVAir app that will allow users to receive alerts based on the geolocation of their phone, in addition to other features, including information about PM2.5 sources, health effects and protective measures residents can take. Like the SJVAIR.com website, the app will be available in English, Spanish and Hmong.

Another component of this proposal includes the establishment of local Community Steering Committees in Delano and Los Banos, utilizing the school-based air monitoring networks and community engagement model previously implemented in Stanislaus, Madera and Tulare County communities to educate and increase air quality awareness throughout the community.

4) Define air monitoring objectives

a. States objectives: the air monitoring objective(s) that will address the stated community-specific purpose for monitoring.

The primary objective is to make local, accurate, real-time PM2.5 data easily accessible to residents in disadvantaged communities of the San Joaquin Valley. This will allow residents to adjust their outdoor activities based on local air pollution levels, as opposed to relying on PM readings from regulatory stations up to 30 miles away or other sources that provide less accurate and less real-time information. This is especially important for rural communities that may experience local events (e.g. ag-related burning or harvesting) that may result in PM levels significantly higher than what is being recorded at the nearest (often

urban) regulatory monitor. Within this objective, the Collaborative aims to 1) improve the accuracy of the low-cost monitors by improving the calibration process, as described above, 2) improve the geolocation capacity of real-time notifications sent to residents, and 3) expand school-based air monitoring projects utilizing a centralized BAM and distributed network of low-cost PM monitors.

b. Outlines pollutants, preliminary methods, technologies, and/or instrumentation, and air monitoring areas and frequency.

As described above, PM2.5 is the primary pollutant of concern for disadvantaged SJV communities. To maximize the community benefit, low-cost PM2.5 air monitors are being installed at school sites whenever possible, as described in the DUESD example above. There are several reasons why schools are a priority location to place air monitors: 1) typically located in neighborhoods providing good geospatial heterogeneity within the community, 2) secure location with access to power and wi-fi, 3) real-time, onsite data can inform children's outdoor activities while at school, 4) provides an opportunity to engage and educate youth about air pollution, and 5) provides an opportunity to measure/compare outdoor and indoor (classroom) concentrations during periods of high PM (e.g. wildfire events). In communities where it may not be possible to install monitors in schools, we have identified alternative locations, such as churches, small businesses and residences located in strategic locations (e.g. near a school or potential source of concern to the community).

To improve the accuracy of the low-cost PM2.5 monitors, the Collaborative is utilizing reference grade PM2.5 monitors (BAM1022) to serve as anchors for school-based, air monitoring networks, which also serves to expand the geospatial coverage of collocation sites that generate calibration coefficients for PurpleAir monitors in the region. In addition, the Collaborative will improve the QA/QC process for SJVAir low-cost monitors. The Collaborative currently assesses the correlation and deviation from the mean for A vs B sensors in each PurpleAir monitor. This process has identified monitors (mostly private PurpleAir monitors) that demonstrate either poor correlation between A and B sensors or good correlation, but a large standard deviation from the mean. In these cases, the sensors are compared to nearby monitors to ascertain which sensor is faulty.

Similar assessment of collocated PurpleAir monitors has identified monitors with strong inter-device correlations, but large standard deviation from the mean, with older monitors (deployed prior to SVJAir) typically recording lower counts than the newer SJVAir monitors. To address this potential drift, new PurpleAir monitors will be temporarily collocated with PurpleAir monitors that have been deployed for more than 24 months. If significant drift is detected (>10%), older

monitors will either be re-calibrated, based on the new PurpleAir monitor plus collocation equation, or they will be replaced with a new monitor. The Collaborative had previously intended to use the high performance BAM1022 to assess and re-calibrate PurpleAir monitors at multiple sites, but this proved to be impractical due to the technical challenges associated with setting up and operating the BAM (the opportunity to site the BAM at a school site also influenced the decision to leave it deployed at one location).

c. Specifies the community air monitoring draft design: i. Types of data needed, ii. Measurements to be made, iii. Duration of monitoring.

To achieve the primary objective, real-time, ambient PM2.5 data is being collected, calibrated and communicated as described above. This monitoring is intended to continue until either 1) a sufficient density of regulatory monitors are sited across the SJV, 2) reliable, real-time PM modeling data is applicable to rural SJV communities or 3) remote sensing (satellite) data can be used to generate accurate, real-time PM estimates at a 1 km^2 resolution.

d. Defines other information necessary to address objective(s) such as: i. Supporting measurements (e.g. meteorology), ii. Data sources to be accessed and used.

To support calibration of low-cost PM monitors, data from collocated high-performance monitors are being utilized to generate coefficient factors based on multivariate regressions (linear or polynomial). SJVAir accesses and stores real-time data from high-performance (BAM) monitors operated by the Collaborative (Delano) and regulatory agencies (CARB and Air District), as described above. The Collaborative also utilizes emissions inventories and other data (e.g. locations of active or orphaned oil wells) provided by regulatory agencies to educate L-CSCs, which may inform siting of low-cost monitors.

e. Incudes reference information and materials (e.g. maps, diagrams, previous studies, regulatory information / threshold levels).

SJVAir utilizes a cloud database (Heroku) to warehouse PurpleAir and *AirNow* data. Django (Fig 3) is used to interface with the database utilizing scripts written in Python by Collaborative partner Root Access. This allows for the automation of calibration regressions based on PurpleAir and AirNow data from multiple collocation sites across the SJV. The cloud database also provides the capacity and security to expand the network to include 150 new PurpleAir monitors and additional collocation sites.

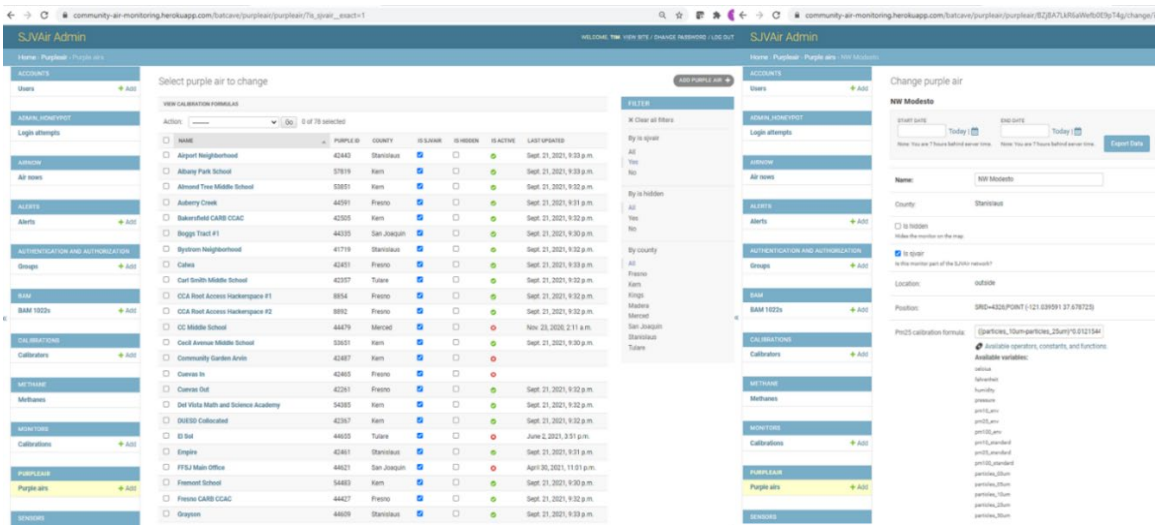

Figure 3. Example of Django backend administrative controls for SJVAir.

5) Establish roles and responsibilities

a. Identifies all parties responsible for major aspects or phases of air monitoring (includes contractors)

The SJV community air monitoring network (SJVAir) is operated by Collaborative staff in coordination with SJVEJSC member organizations. Collaborative staff include:

- CCAC -- Tim Tyner, Project Director: Oversees all community air monitoring activities, including, deployment and operation of low-cost and high-performance monitors, development of calibration algorithms for low-cost monitors, QA/QC of air monitor data, web display of real-time data, development and implementation of text alert system, coordination with Air District staff to collocate monitors, deployment of additional Air District air monitoring resources and opportunities to integrate SJVAir with RAAN, and engagement with SJVEJSC and L-CSC members.
- CCAC -- Kevin Hamilton, Policy Director: Provides expert advice and consultation to L-CSCs and CBOs specific to various air pollution, climate and air toxic regulations, incentives, potential health impacts, and the intersection of those with local CERP and regional State Implementation Plans (will identify and report on project identified opportunities within those plans for air pollution mitigation). Will represent the Collaborative at various state and regional meetings with relevant agencies such as CARB, CEC, SJVAPCD Board and other stakeholders, including industry representatives, local government planning agencies, and CBOs whose communities are potentially impacted various AB 617-mandated activities.

- CCAC -- TBN, Air Monitoring Technician & Outreach Coordinator: Responsible for overseeing the siting and installation of new monitors, as well as organizing new L-CSCs in Delano and Los Banos and continued communication the SJVEJSC and existing CSCs (Stanislaus, Madera, Tulare County) regarding SJVAir.
- RA -- Derek Payton, SJVAir IT Consultant: Responsible for maintaining/improving SJVAir database, web portal and text alert system, and for developing the SJVAir app.
- CVAQ -- Cynthia Pinto-Cabrera, SJV EJ Steering Committee Coordinator: Responsible for coordinating and facilitating monthly SJVEJSC meetings.
- CRPE – Juan Flores, Community Steering Committee Coordinator (Delano): Responsible for developing, coordinating and facilitating an L-CSC in Delano, CA.
- CCEJN – Nayamin Martinez, SJV L-CSC Lead: Assist with coordination and facilitation of L-CSC meetings.
- LMR – Matt Holmes, SJVAir Collaborator: Responsible for testing and installing 150 new PurpleAir monitors (funded separately) to be added to SJVAir network.

b. Includes letters of commitment for projects that propose collaborating with or utilizing district resources on the proposed monitoring project (e.g. Air Districts, co-location of hardware, technical support).

See attached Letters of Commitment

Task 2: Monitoring

Community Air Monitoring *Elements 1-5* are described in the Work Plan Development section above.

Element 6: Data Quality Objectives

The Collaborative previously conducted an analysis of low-cost PM2.5 sensors, including the calibration and accuracy of existing sensors collocated with regulatory monitors in the San Joaquin Valley. The analysis also examined monitor functionality (power, connectivity, meteorology, # particle size channels, # optical sensors, data recording frequency), data access (private vs open source), cost and current use by public agencies (e.g. CARB, SCAQMD), other non-profits (e.g. CCA) and SJV residents. In addition, previous analyses of low-cost PM2.5 sensors presented at ASIC conferences (2018-2021), along with testing performed by air regulators (e.g. AQ-SPEC), were reviewed. Meetings were also held with technical experts from CARB's Advanced Monitoring Techniques Section (David Ridley and Walter Ham)

and the Collaborative's previous technical consultant at Tracking California (Graeme Carvlin, Puget Sound Air Agency) to better understand the capabilities and limitations of specific low-cost PM sensors.

While data generated by low-cost PM sensors do not meet the standards for sensitivity, precision, accuracy and bias of higher performance reference monitors, previous testing by AQ-SPEC, along with the Collaborative's analysis of collocated low-cost monitors in the SJV, demonstrated that calibrated Purple Air II monitor data can provide sufficient precision and accuracy for the described goals of the SJV Community Air Monitoring Network (SJVAir). While the current network of collocated PurpleAir-BAM monitors enables the calibration of low-cost monitors in many SJV communities, there are a few medium-sized (pop ~40,000), disadvantaged SJV communities, like Delano and Los Banos, that are 30 miles from the nearest reference monitor and whose schools have therefore had to rely upon PM2.5 data from monitors that may *not* reflect local air quality conditions (RAAN) to inform their students' outdoor activities.

Element 7: Monitoring Methods and Equipment

CCAC's previous Community Air Grants have allowed the Collaborative to develop and implement SJVAir in disadvantaged SJV communities, in partnership with the SJVEJSC and L-CSCs. The SJVAir.com website currently provides real-time PM2.5 data for hundreds of low-cost air monitors across the SJV (Fig 3). Each monitor is calibrated to the nearest collocated reference monitor, which currently includes CARB operated BAMs in Modesto, Fresno, Visalia and Bakersfield, Air District BAMs in Stockton and Clovis, and a Collaborative BAM in Delano. In addition to existing PurpleAir monitors at each collocation site (e.g. JPL and AMTS), the Collaborative has collocated its own SJVAir PurpleAir monitors at each site listed above, except for Clovis (SJVAir monitors are batch tested prior to collocation or community deployment to ensure correction coefficients will be applicable). CCAC has also partnered with the Air District to test 20 additional PurpleAir monitors (purchased by the Air District) that will soon be collocated with PM2.5 reference monitors operated by Air District, significantly increasing the geospatial coverage of SJVAir calibration sites.

As a component of CCAC's current Community Air Grant, the Collaborative installed a federal equivalent method beta attenuation monitor (BAM 1022) and twelve (12) PurpleAir monitors at elementary and middle schools in Delano, CA (Fig 4). The Air District is providing CCAC technical support to set-up and operate the BAM 1022, allowing more accurate calibration of the low-cost monitors installed at the other 11 schools in Delano Unified School District (DUESD). Without the BAM, the low-cost monitors in Delano would have to be calibrated from collocated monitors in Bakersfield or Porterville, each approximately 30 miles away. In

addition, CCAC is coordinating with DUESD STEM teachers to develop a curriculum based on the local air monitoring network to educate students about the sources and health effects of air pollution, as well as actions they can take to reduce exposure to wildfire smoke and other sources of PM2.5.

Real-time data from all of the SJVAir monitors is displayed on SJVAir.com. The website provides open access to download historical data from all PurpleAir monitors in the SJV, as well as twenty (20) PM2.5 regulatory monitors that are also displayed on the SJVAir map. Individuals can also sign up to receive automated text message alerts by selecting the monitor(s) nearest their home, school or work, and choosing their preferred AQI threshold.

For this proposal, the Collaborative will replicate a school-based network in Los Banos, CA, utilizing the same monitoring equipment (one BAM1022, 12 PurpleAir monitors) and design implemented in DUESD (Fig 4). CCAC recently met with LBUSD administers to discuss the project and were informed that the school district is very interested in implementing a similar air monitoring network and notification system based on local air quality data (see attached LOS). The BAM in LBUSD will be set-up and maintained by CCAC in coordination with Root Access and with support from the Air District, a process that has proven successful in operating the BAM in DUESD.

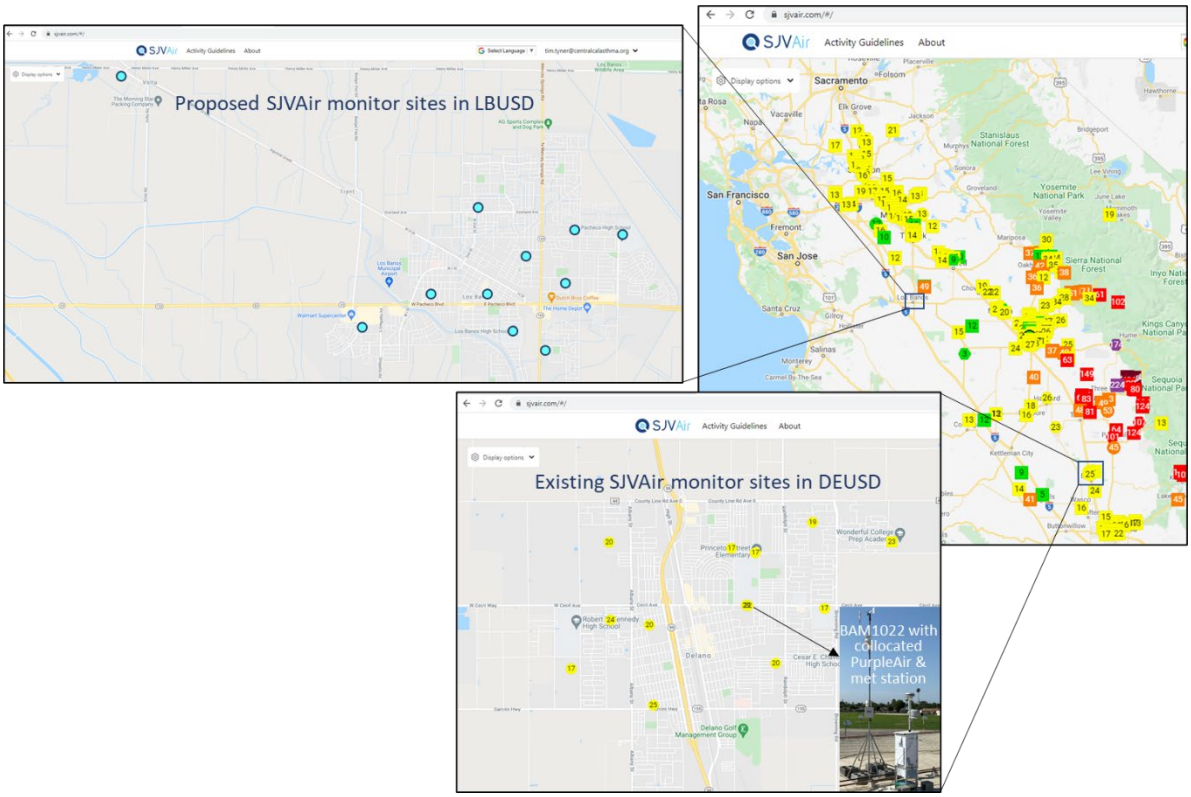

Figure 4. SJVAir monitoring locations across the SJV. Enlarged areas include the existing school-based network implemented in Delano Elementary Unified School District as part of

CCAC current Community Air Grant and a proposed school-based network in Los Banos Unified School District as a component of this proposal.

Element 8: Monitoring Areas

During development of the Air Monitoring Plan in 2018, the SJVEJSC reviewed and prioritized communities to participate in a *Valley-wide* community air monitoring network. The process was initially based on communities that had previously been nominated by SJVEJSC members for selection in the 2018 Community Air Protection Program and the presumption that available resources would limit the total number of low-cost PM monitors to no more than (20). Based on these criteria, the selected communities were subsequently prioritized based on distance from an existing PM2.5 regulatory monitor and the perceived need and organizing capacity of SJVEJSC member organizations working in those community. Through this process, the SJVEJSC identified 19 communities for inclusion in the monitoring network.

Collaborative staff then developed a CalEnviroScreen (CES) indicator based on the aggregate score of five CES variables identified by the SJVEJSC as being most relevant to Valley residents, including: 1) PM2.5 concentration, 2) Poverty, 3) Asthma ER Visits, 4) Pesticide Use, and 5) Clean Drinking Water. In the context of establishing a Valley-wide Community Air Monitoring Network, Poverty, PM2.5 and Asthma (PPA) were selected as the primary variables, while pesticide use and clean drinking water (pc) were considered secondary and assigned half the weighting of the three primary indicators. The aggregate indicator (PPA-pc) was used to re-assess the environmental, socioeconomic and health burden of disadvantaged SJV communities at the census tract level.

The 90th percentile of PPA-pc statewide census tracts was used to evaluate the 20 communities selected for the Community Air Monitoring Network (CAMN), as well as identify additional communities for potential inclusion in the network. As the *majority* of Valley communities fall within the 90th percentile, the PPA-pc indicators was further resolved to delineate 92nd, 94th, 96th and 98th percentiles and overlaid with SB535-defined census tracts (disadvantaged communities) to better evaluate neighborhood-level burden. Through this process, the SJVEJSC identified 37 additional communities to include in the CAMN. Further analysis of low-cost monitor options (described above) determined that the CAMN could be increased from 20 to 80 monitors, which would allow the Collaborative to include all 57 communities in the final Air Monitoring Plan.

The Collaborative later identified Delano, CA, as a community to implement a school district-based air monitoring network anchored with a BAM1022, as described above. In this proposal, the Collaborative has selected a second

school district, Los Banos Unified School District, to replicate the air monitoring network currently operating in Delano, CA.

Element 9: QA/QC Procedures

Fourteen PurpleAir monitors are currently collocated with regulatory PM2.5 monitors in seven (7) SJV communities (Stockton, Modesto, Fresno, Clovis, Visalia, Delano, Bakersfield). The collaborative is working in partnership with the Air District to collocate additional PurpleAir monitors (purchased by the Air District and tested by CCAC) with regulatory PM2.5 monitors at other monitoring stations across the SJV. For quality assurance, calibration algorithms are generated from the collocated BAM-PurpleAir monitors and applied to PurpleAir monitors installed in nearby communities, including existing, privately-operated monitors.

Calibration methods currently include running monthly multivariate (0.3-1.0 um/dl counts, 1.0-2.5 um/dl counts, RH) linear regressions for each collocation site based on the previous 30 days of hourly data. For this grant, we will be implementing an automated process that will include daily calibration for each site utilizing historical data from sixteen time periods (past 1-14 days, 21 days, 28 days) and the same variables listed above in linear and polynomial regressions. An algorithm that includes three regression outcomes (R2, SE and # obs) will be used to identify the best correction equation for each set of collocated monitors, from which calibration coefficients will be automatically applied to deployed PurpleAir monitors based on proximity to the collocation sites.

The Collaborative currently assesses the correlation and standard deviation from the mean for A vs B sensors in each PurpleAir monitor deployed. Monitor sensors with R2 < 0.90 or STD > 5 ug/m3 are flagged and further evaluated to determine which sensor is faulty (SJVAir default displays sensor A data and is manually switched to sensor B if sensor A is determined to be faulty). This process has identified monitors (mostly private PurpleAir monitors) that demonstrated either poor correlation between A and B sensors or good correlation, but a large standard deviation from the mean concentration. In these cases, the sensors are compared to nearby monitors to ascertain which sensor is faulty.

A similar assessment of collocated PurpleAir monitors has identified monitors with good inter-device correlations, but large standard deviations from the mean concentration, with older monitors (deployed prior to SVJAir) typically recording lower counts than the newer SJVAir monitors. To address this potential drift, this grant will support the temporarily collocation of new PurpleAir monitors with existing PurpleAir monitors that have been deployed for more than 24 months. If significant drift is detected (>10%), older monitors will either be re-calibrated, based on the new

PurpleAir monitor plus collocation equation, or they will be replaced with a new monitor.

Prior to community deployment, as well as collocation at BAM sites, all PurpleAir monitors are operated in batches for 4 weeks (with a minimum ambient PM2.5 mass variability of 35 ug/m3) on the roof of Collaborative partner Root Access. Data for each monitor is regressed on two other monitors in the batch to assess correlation and STD from mean. Monitors with R2 < 0.90 or STD > 5 ug/m3 are marked as faulty and are not deployed.

BAM1022(s) are maintained as described in section 6 of the operating manual. Prior to operation, flow and zero-test calibration are performed. Data are reviewed by CCAC and flagged for any potential errors (e.g. spikes that could be associated with BAM voltages and not PM2.5 concentrations). Data are also reviewed periodically with Air District monitoring technicians to further examine and resolve possible issues.

Element 10: Data Management

Scripts have been created to interface with ThingSpeak IoT to automatically download PurpleAir data from all SJV PurpleAir monitors. The data is stored in a cloud platform service (Heroku) which supports several programming languages, including Sequel Query Language (SQL), Python and R, allowing us to store, track and scale data display applications as follows: SQL is used to store and retrieve data; Python is used to communicate with the ThingSpeak Application Program Interface (API), generate the data display dashboard utilizing the Django web application development platform and run multivariate linear regressions (calibration algorithms). During the next project period, we will refactor database schema and audit database indexes to improve performance. We will also audit and update development dependencies as needed to improve performance and security, as well as refactoring map to Open Street Maps and updating front-end to Vue 3 to improve development speed.

Element 11: Work Plan for Conducting Field Measurements

As described above, monitor precision is evaluated prior to deployment by operating batches of PurpleAir monitors together in the same location. Monitors that meet the inter-device variability criteria are installed at schools and/or other locations in the selected communities. Sites are assessed to identify locations that provide the required power and wi-fi access, are secure and unlikely to be impacted by a nearby PM source (e.g. exhaust vent). If the monitor data suggests a potential hyper-local source may be impacting the sensor values, the location is further evaluated for potential upwind or temporary recurring sources (e.g. landscape maintenance) and if needed, the monitor is relocated to a

different location. All monitors are mounted at a similar height with unrestricted ambient air flow and protection from direct sunlight. A log of all installations is maintained by CCAC, including monitor ID, installation location and date, name of site contact/authorization, name of person installing monitor, Purple Air registration information, name/password for wi-fi network, and any other relevant information.

Element 12: Process for Evaluating Effectiveness

The effectiveness of this plan is based on four measurable outcomes which are being discussed regularly with the SJVEJSC:

1. *Number of locations with operating monitors*: The Collaborative initially identified 56 communities to install monitors. However, the emergence of COVID-19 in 2020 impacted the Collaborative's ability to work with schools and resulted in a modification to the Air Monitoring Plan by the SJVEJSC and L-CSCs to deploy a denser network of monitors in select communities, including AB617 communities (e.g. 5 monitors in South Modesto, 11 monitors in Delano, 5 monitors in South Stockton). To date, 65 monitors have been installed in 26 communities.
2. *Accuracy of data generated by monitors*: Calibration equations are generated from PurpleAir monitors collocated with reference-grade monitors (BAMs). Regressions between hourly PurpleAir and BAM data typically result in high correlations ($R2 > 0.90$), generating correction coefficient that can be applied to raw, real-time data from PurpleAir monitors in that area. The closer the community monitor is to the collocation site, the more applicable the calibration. To date, the Collaborative has seven (7) collocation sites, listed above, providing good geographical coverage to generate applicable calibrations for PurpleAir monitors deployed in most SJV communities. For this proposal, the Air District has agreed to collocate PurpleAir monitors at all of their regulatory PM2.5 sites, which will more than double the geospatial resolution of existing collocated monitors, increasing the proximity of deployed PurpleAir monitors to calibration sites and improving the accuracy of the PurpleAir data (CCAC has already tested the 20 monitors for inter-device variability).
3. *Residents' ability to access the data*: The Collaborative developed an online data portal (SVJAir.com) that displays real-time PM2.5 concentrations for each monitoring site (similar to the PurpleAir Map, but with more localized and dynamic calibrations). SJVAir.com also allows residents to sign up for automated, real-time text message alerts, as described above. This proposal includes development of an SJVAir app,

as described above, as well as collaboration with the Air District to integrate the SJVAir text alert system with the Air District's RAAN program.

4. *Residents' use of the data*: The Collaborative, in coordination with SJVEJSC member organizations, has been and will continue to give SJVAir data presentations to L-CSCs, including the identification of sites with abnormal (elevated) PM2.5 levels and general trends in PM2.5 concentrations associated with wildfire smoke, winter inversions or local sources. The L-CSCs are educated on how this information can be used to advocate for additional monitoring (Air District) and/or policies related to local emissions sources (Air District and/or CARB).

Element 13: Analyze and Interpret Data

The Collaborative will analyze short- and long-term data trends, including, but not limited to:

- Comparing trends in annual and daily PM concentrations at rural and urban locations in the north, central and south Valley;
- Assessing short-term increases associated with extreme events (e.g. wildfires);
- Assessing trends in chronic exposure (annual average), including geographic differences in local, primary PM, based on particle size, during different seasons;
- Utilizing data from the SJVAir BAM 1022s and low-cost air monitors in Delano and Los Banos to compare with data from the nearest reference monitors providing RAAN alerts to the school districts (e.g. Merced BAM for LBUSD and Bakersfield BAM for DUESD) and how the differences impact air quality alert and student outdoor activities.

Detailed methods and results will be shared with the SJVEJSC and Valley stakeholders, including the Air District. As described above, BAM1022 data are also reviewed with Air District technical staff.

Element 14: Communicate Results to Support Action

The Collaborative will communicate all activities and results to the SJVEJSC and L-CSCs, which will work in concert with the Collaborative leadership team and staff to inform other advocacy organizations, local and state government agencies, community residents and other stakeholders. This information will be shared through a variety of strategies, including, but not limited to:

- Maintain and enhance data available through SJVAir.com
- Provide presentations to L-CSCs.

- Provide regular updates to the SJVEJSC.
- Work with the Air District to integrate the SJVAir text alert system with RAAN.
- Coordinate with LBNL SUMMATION team to obtain and communicate ambientmethane information to community groups and residents through community meetings, social media and other outlets.
- Prepare and disseminate bilingual materials, including information on wildfire smoke risk and protection, through the Collaborative and partners' websites, list-serves and social media, as well as L-CSC meetings.
- Utilize social media platforms (Twitter, Facebook, Instagram, etc.), online community calendars, email, telephone, to make public meeting announcements prior to all L-CSC meetings. Photos and/or videos will also be posted to social mediaplatforms and/or website to keep online audiences engaged in the ongoing process.

Task 3: Community Engagement

Starting shortly after the passage of AB 617 in the fall of 2017, the Collaborative, working with other EJ partners, such as the Center for Race Poverty and the Environment (CRPE) and Leadership Council for Justice and Accountability (LCJA), established frequent meetings with community members to first educate then actively engage residents to further amplify the community's concerns, expectations and objectives throughout the AB 617 process. The community meetings were located and scheduled to ensure inclusivity and accessibility by securing meeting locations in the community, addressing transportation issues, providing translation and interpretation of meeting materials, and by creating multiple avenues for communication. The Collaborative actively sought to create meeting environments that were community-driven with the Collaborative serving the role of partner to support the community in creating changes that would positively impact San Joaquin Valley residents in any potential AB 617 selected community.

Early in the process and working with existing partners who also work on these issues from a regional perspective, the Collaborative realized the region needed to work in a cohesive and collaborative fashion. In the winter of 2018, the Collaborative established the SJV AB617 EJ Steering Committee (SJVEJSC) with 14 other community-based organizations, as described above, to initially serve as advisors to the two Collaborative members who were selected EJ representatives to the state's AB 617 Statewide Consultative Group. With the AB 617 CAPP selection process following close behind, the SJVEJSC pivoted quickly to actively engage in that process to both ensure transparency on the part of the Air District and CARB, then inform, educate and engage the communities supported by SJVEJSC member organizations about AB 617.

As part of the Collaborative's current Community Air Grants, the Collaborative has engaged SJV SB 535 and AB 1550 communities through local CBO-led meetings, social media and email list serves. In addition to existing criteria and toxic pollution, residents have learned about associated, short-lived climate pollutants, like black carbon, and their sources, including diesel trucks, cooking and biomass combustion (agricultural burning, residential fireplaces and, of course, wildfires). The Collaborative has developed social media skills among local CBOs and residents by providing a "Social Media and Environmental Justice 101" training during L-CSC meetings, as well as educating L-CSC members about low-cost air monitor technology for PM2.5 and black carbon, and providing updates on air pollution trends in their communities based on data from the SJVAir network, as described in multiple progress reports submitted to CARB. The Collaborative has also worked closely with CBOs and residents to develop new educational materials (infographics) that can be shared with residents in their communities (this iterative process included all three L-CSCs working together to provide feedback on three different air quality infographics).

More recently, the Collaborative launched an air quality text alert system as a component of SJVAir. The SJVEJSC and L-CSCs were educated about the text alert system and provided easy to follow instructions for residents to sign up for this free service. Unlike the existing air quality alert system operated by the Air District (RAAN), the SJVAir text alerts are based on both the 20 regulatory and over 200 PurpleAir monitors across the SJV. The PurpleAir alerts are based on 30-minute average concentrations, rather than 1 hour or 2 minutes average. The SJVEJSC determined that real-time (2 min) PurpleAir data would result in too many transient increases that were not likely to pose a health risk, whereas 1-hour averages have been demonstrated to be insufficient for rapidly changing conditions associated with smoke from wildfires or ag burning (Fig. 5).

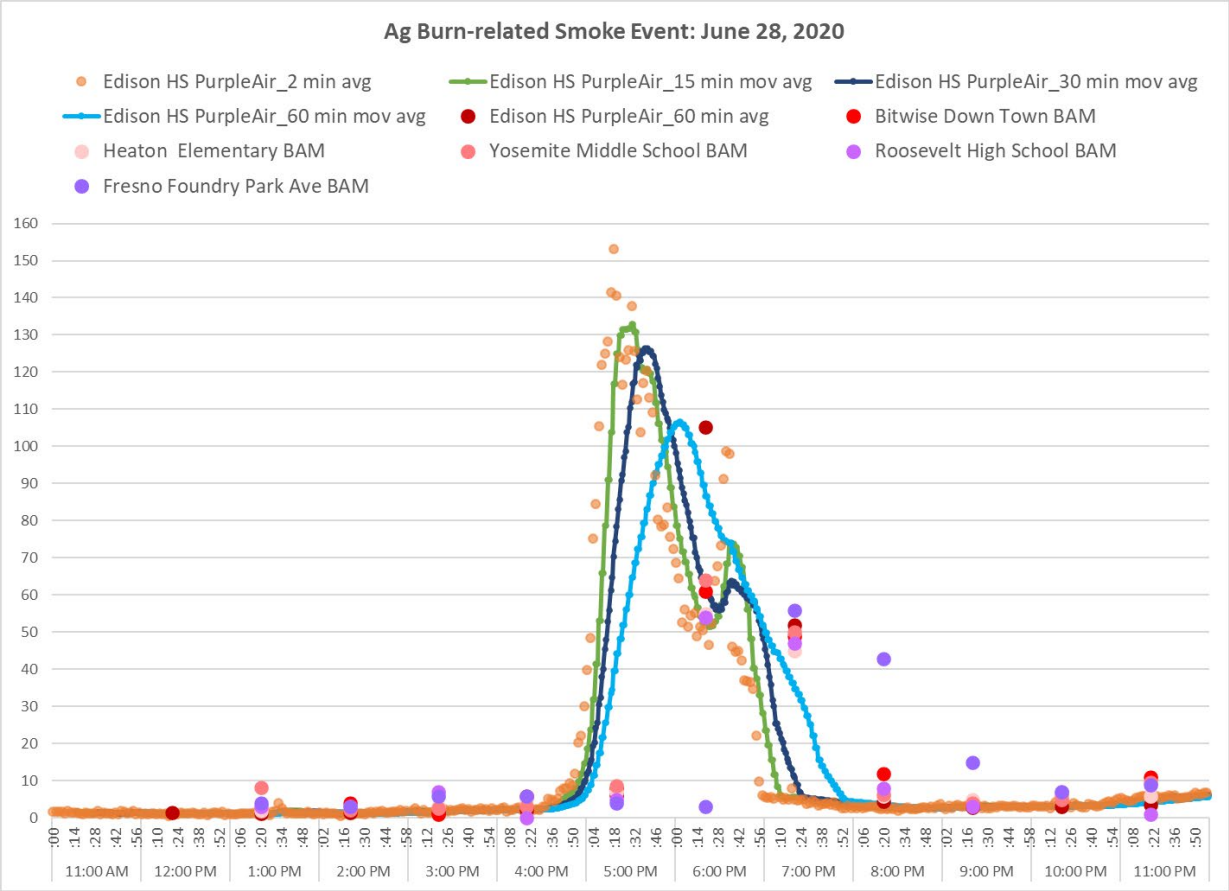

Figure 5. Impacts of different averaging and reporting times on short-term exposures to PM2.5.

For this proposal, the Collaborative will continue to engage and update the existing L-CSCs about SJVAir and air quality trends in their communities. The Collaborative is also proposing to establish two, new L-CSCs in the communities of Delano and Los Banos. Unlike the previous L-CSCs, these new communities will already have school-based air monitoring networks in place, as described above. The Collaborative will work with the school district to engage parents, teachers and residents in forming the L-CSC, which will be educated about air pollutants, air monitoring and the SJVAir monitoring network and text alert system available for their community. In Delano, CA, the Collaborative will partner with the Center for Race, Poverty and the Environment (CRPE) to develop, coordinate and facilitate L-CSC meetings. The new L-CSCs will also be engaged to conduct outreach in their communities about SJVAir, similar to the outreach currently being done by the L-CSCs in Stanislaus, Madera and Tulare County.

Task 4: Workforce Development

The Collaborative has a total workforce of approximately 30 employees. All three Collaborative organizations provide wages that are above prevailing wage, generous health insurance, sick time off, retirement, paid leave and vacation. Some of its employees will be working full or part-time on this project. The majority of employees are also residents of the communities they serve. Approximately 20% of Collaborative

personnel are supported by CARB Community Air Grants. The Collaborative also subcontracts to CBOs supporting the L-CSCs, in total funding another full-time position.

The collaborative also provides internships and preceptorships to both college and high school students from underserved populations. As a part of this project, the Collaborative has and will continue to give priority to providing these opportunities to low-income students who come from SB 535 and AB 1550 communities, where students are educated and gain experience in air monitoring technology, data analysis and community outreach. Interns will attend community meetings, assist in creating and distributing educational materials, and assist with air monitor deployment and data analysis, amongst other tasks. Internships may be paid or receive school credits. The majority of internships have involved CSU Fresno's College of Health and Human Services. In providing the Graduate Internship in Public Health preceptorship to Master of Public Health students, the Collaborative has and will continue to build capacity that will lead to industry-recognized credentials, such as PH 285F (Fieldwork in Health college-level repeatable units that is taken during the fifth and sixth semester of the student's academic program at CSUF). A number of previous interns have since been hired by one of the Collaborative organizations or another CBO in the region.

Task 5: Reporting

The Collaborative will compile and submit quarterly and annual reports and one final report at the end of the grant term or until the funds have been liquidated, as we have done for past two Community Air Grants. These reports will be submitted to the Grant Liaison or a program designee. Progress reports will utilize the template provided by CARB that includes % of work completed, funds spent, work accomplished, challenges or barriers encountered, and any changes to the work plan during the reporting period for each Task and the overall project, as well as work planned for the subsequent reporting period.

The Collaborative will track all project-related expenses by Task in an electronic database. At the end of each reporting period, the Collaborative will submit a detailed breakdown of costs associated with each project task and provide fund advance and overall project balances at the end of the project period. The final report will include all the above as well as an accounting summary of funds expended and a summary of how the goals of the program were accomplished.

The Collaborative will use secure documentation software to write and create all necessary spreadsheets and databases to collect all data required for all above reporting procedures. We will use computers, laptops, and handheld devices to capture information and data that pertains to the reporting and advancing of the project.

[redacted]