RFP 23MLD017

Statewide Mobile Monitoring Initiative

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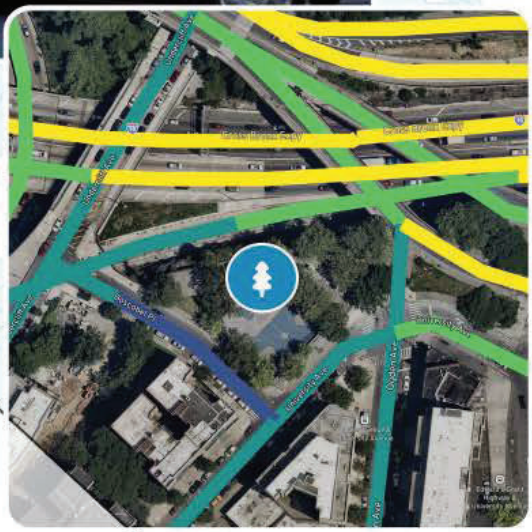

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Aclima, Inc.
March 11 2024

****DISCLAIMER****

This document is the technical proposal section extracted from a larger submission to the CARB RFP 23MLD017. It has been minimally edited to protect private/personal information. Some internal navigation links and page numbering may be affected as a result.

The work plans and timeline outlined in this proposal are subject – and expected – to change based on collaboration between Aclima and CARB.

Management plan

Summary

The Aclima management plan has been developed over 10 years of experience managing large mobile monitoring projects, and is modified and expanded to support the scale and nature of the SMMI. Brian LaFranchi will project manage in partnership with senior Aclima leadership. Progress will be tracked against the work plan and schedule, supported by transparent regular communications. Aclima operates an agile approach modified for mobile monitoring operations. A range of sub-plans operationalize specific areas of project management. See also Figure B: Project organizational chart and Table 8.1: Work plan and schedule.

Management goal

Aclima's management plan is designed to ensure Aclima and its partners and stakeholders can successfully work together to provide CARB and communities all deliverables on time and within budget. Aclima's project management plan and supporting processes are flexible and easily adaptable to meet the unique needs of the SMMI.

Project management experience

Aclima's approach to project management is honed through more than 10 years of air monitoring experience managing multi-million dollar contracts across more than 15 major projects similar to that proposed in this RFP – totaling over 8,000 square miles, ranging in scale from projects in a particular community to statewide deployments across multiple cities and regions. Aclima has project managed the measurement of criteria pollutants, greenhouse gases, and toxic air contaminants in a number of CAPP communities in California, in Climate Leadership and Community Protection Act (CLCPA) communities in New York state, and in Colorado, Louisiana, Washington, D.C., as well as several cities globally. Aclima's Project Management Plan is continually improved based on practical experience. The team also gathers insights from examples of similar scales of work conducted across a variety of domains and public sector needs.

Meeting project objectives

The Project Manager, Brian LaFranchi, and Project Steering Committee are responsible for executing on the project management plan, reporting directly to the CARB Project and Contract Managers while being supported by a broad coalition of Task Leads, operations staff, subcontractor leads and staff, and other key personnel (see Project organizational chart, Figure B). We have agreed upon roles (see Project organizational chart, Figure B) along with an accountability matrix (see RACI Chart, Table 8.2) to ensure Aclima is transparent about responsibilities. how the team is working together, and that all tasks and sub-task owners understand the milestones and success metrics that need to be met.

Measuring and tracking progress by task order in real-time

Through every phase of this project, Aclima will track and measure team progress against task orders through a standard operating structure which defines and drives the cadence for meetings and how we collaborate. We will hold recurring weekly and monthly team meetings paired with clear internal processes and expectations around reporting cadence, format and tools. We will use a master tracker (including but not limited to Google Sheets and Asana; see full list of tools in Table AX2.1, Appendix 2) to track progress and commit to following our internal working agreements and best practices to ensure Aclima is using every stakeholder's time respectfully and efficiently, constantly improving, and integrating lessons learned.

Communicating transparently

Key means of transparent and effective communication are described below. A full list of potential meetings is described in the Communications Matrix (Table AX2.5 in Appendix 2).

External weekly meetings

Aclima will hold external weekly meetings with the CARB contract and project managers to cover progress status of tasks and deliverables and proactively address any emerging issues or concerns.

Internal weekly meetings

Aclima will hold internal weekly team meetings with Task Leads, Steering Committee, and Cost/Contract/HR managers, led by the Project Manager. These meetings will cover a checklist with at least the following topics:

- Program review implementation review (by task and schedule)
- Change requests
- Communication needs
- Improvement opportunities and corrective actions
- Spatial coverage
- Fleet staffing
- Data quality reporting

Internal monthly meetings

Aclima will hold internal monthly team meetings with Task Leads, Steering Committee, and Cost/Contract/HR managers, led by the Project Manager. These meetings will cover a checklist with at least the following topics:

- Cost review
- Procurement review
- Contractor review
- Project resourcing
- Risk management
- Project scope review

Any ad-hoc issues will be discussed in real-time asynchronously through appropriate channels.

Iterative improvements and verifying milestones

Aclima uses an agile approach modified for mobile monitoring applications, supported by project management tools including the Google Drive suite and Asana (see Table AX2.5 in Appendix 2 for full details). This list is adaptive to CARB needs.

Agile is an adaptive framework that is effective in a fluid, complex project delivery environment. It ensures there is a focus on constant iteration, continuous improvement, and efficient decision-making while incorporating input across diverse stakeholders.

- All teams will work in short sprints, emphasizing manageable increments of progress towards deliverables to de-risk more complex tasks and provide opportunities for regular learning and feedback
- Aclima will prioritize learning directly and continuously from communities and key stakeholders
- Aclima will gather and review performance data to ensure the project stays on track, and feedback data from both CARB and communities
- Aclima will deliver functional products iteratively to provide value to CARB and communities as early as possible, e.g., sharing iterations of StoryMaps early for community feedback

Managing to the needs of SMMI across all tasks

Aclima's standard project management planning approach has been modified and expanded for this proposal through special attention to the needs of the SMMI, recognizing its specific demands of scale and complexity in both monitoring and public involvement. Aclima expects that the final approach will be refined based on iteration with the CARB project manager.

1. Managing for meaningful community engagement

Community engagement (tasks 1-4) relies upon the flexibility of the plan to account for the issues, concerns, and feedback gathered. Aclima intends to manage tasks 1-4 with a focus on efficient and effective communications to keep the iterative process moving; on human-centered, thoughtful and inclusive stakeholder engagement to ensure community needs are properly understood and co-developed into CAMP(s); on proactively identifying and managing risks and issues; and on excellent governance and forward-looking cost management, to ensure costs and duration remain as planned. Agile approaches will be essential in this phase, as will the community engagement expertise and experience provided by Community Engagement task leads and community engagement partner Kearns & West.

2. Managing for cost efficient monitoring

Conducting the monitoring itself, plus associated data storage, management and transfer (tasks 5-6) requires application of known techniques and standard approaches to an existing plan, while staying adaptive. Project management in this phase requires a more targeted focus on efficient and effective implementation. Aclima will prioritize cost management and attention to quality assurance and control as data are finalized and transferred to CARB. A complex subset of partner contracts must be managed to ensure standards propagate to all aspects of implementation. Risk and issue management will continue to be essential as unexpected events – like a new source of concern or a shift in a community's target pollutant priority – impact execution.

3. Managing for effective communication of results

Conveying the raw and finalized data into formats and tools that communities will find understandable and actionable (Task 6-7) will require an agile and flexible project management approach. Aclima will rely on a strong communications management plan to ensure that CARB's requirements for, e.g. populating AQview with the mobile monitoring data, are well understood. Work on data stories and reports will benefit from the modified agile approach and will follow the Community Engagement Plan to ensure that these are not built in a vacuum but continue to reflect community and stakeholder input, and are delivered on time.

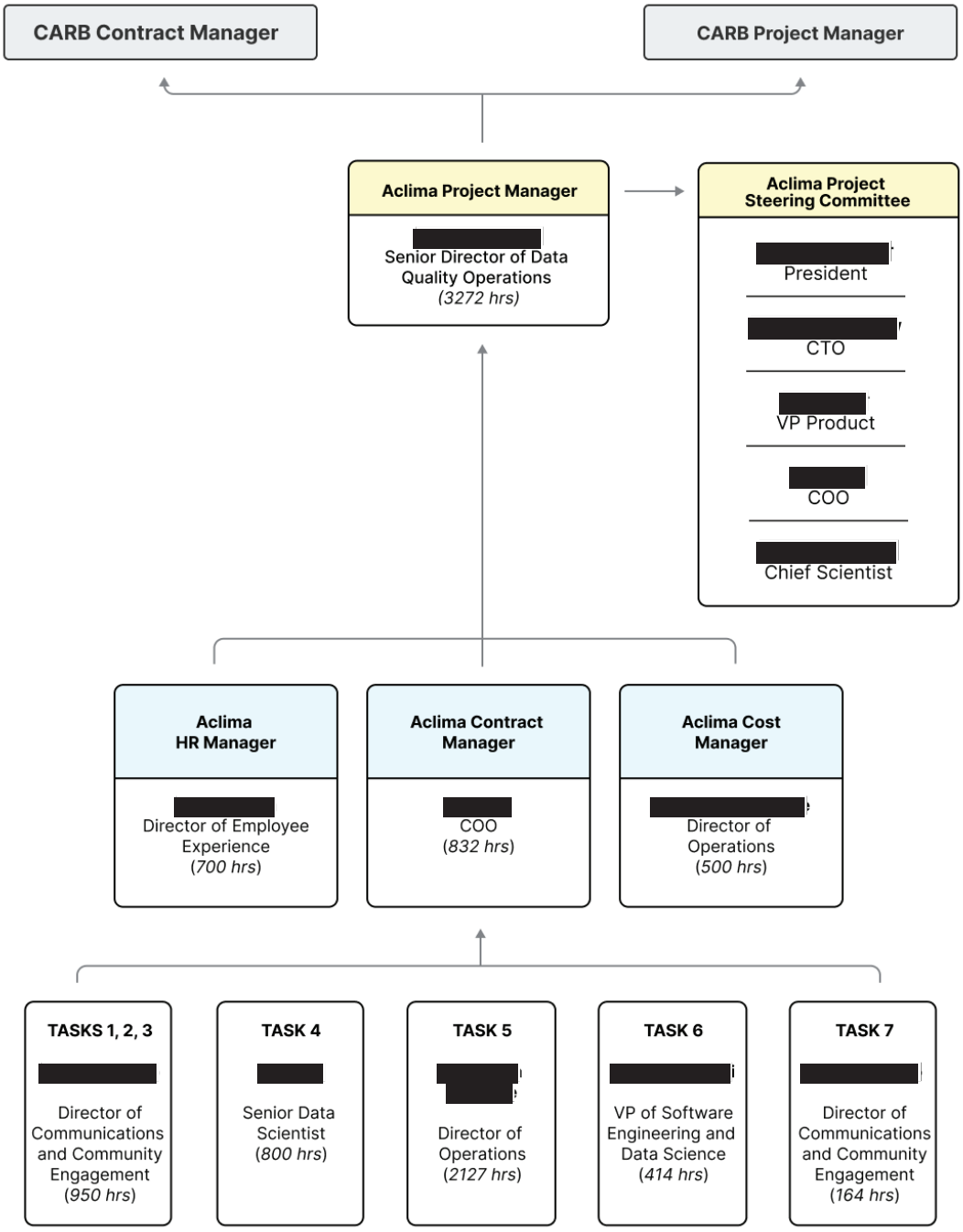

Figure B: Project organizational chart. Additional detail on staff under each task team lead is provided in further charts at the end of each task-related section.

Table F: Project work plan schedule at the CARB-defined sub-task level. See Work plan and schedule for a comprehensive work plan schedule down to Aclima-defined sub-tasks

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 1: Project Kick-Off and Updates		
1.1: Project Kick-Off Meeting	[redacted]	6/13/24
1.2: Weekly Monitoring Progress Updates	[redacted]	5/19/26
1.3: CCI Biannual Reports	[redacted]	5/19/26
Task 2: Form Project Expert Group		
2.1: Form Advisory Committee	[redacted]	6/20/24
2.2: Create Advisory Committee Plan	[redacted]	6/27/24
2.3: Summarize Advisory Committee Meetings	[redacted]	Beginning in Q3 2024 for the first meeting, extending through 5/19/26.
Task 3: Develop Community Engagement Plan		
3: Develop Community Engagement Plan	[redacted]	8/31/24
Task 4: Develop a Community Air Monitoring Plan		
4.1: Implement Community Engagement Plan	[redacted]	5/19/26
4.2: Develop Draft CAMP(s) for CARB review and Public Comment	[redacted]	4/30/25
4.3: Incorporate Public and CARB Comments into CAMP(s)	[redacted]	5/31/25
Task 5: Conduct Mobile Monitoring		
5: Conduct Mobile Monitoring	[redacted]	3/1/26
Task 6: Data Reporting and Presentation		

6.1: Establish Data Management Procedure	[redacted]	5/28/25
6.2: Establish Data Transfer Mechanisms	[redacted]	5/28/25
6.3: Provide Quarterly Data Transfers to CARB	[redacted]	5/19/26
6.4: Provide Finalized Data to CARB	[redacted]	5/19/26
6.5: Develop Data Management and Visualization System	[redacted]	3/31/26
Task 7: Project Wrap-up		
7.1: Summary of Findings (Public)	[redacted]	5/18/26
7.2: Technical Report	[redacted]	5/18/26
7.3: Project Conclusion Meeting (CARB)	[redacted]	5/19/26

Project management sub-plans

Aclima's project management plan is operationalized through a suite of sub-plans. The sub-plans provide comprehensive and detailed treatment of process, tools, and practical guidance for team members across governance, communications, contracts, quality, schedule, cost, issue, changes, risk, and stakeholder management areas, as described in Table G below.

Table G: Summary of Aclima project management sub-plans

Sub-Plan	Purpose	Details in Section
Governance	Describes governance structures and processes to ensure unambiguous lines of authority and accountability from operations staff up to the CARB Project Manager.	AX2.2.1
Changes	Monitors and controls for planned changes to scope.	AX2.2.2
Communications	Establishes an essential set of tools and best practices for communications internally and externally.	AX2.2.3
Contracts	Sets precedent for new and existing contract management to ensure transparency, high standards, and a fair and reasonable working environment for subcontractors.	AX2.2.4
Costs	Ensures oversight and control of project finances within Aclima and through subcontractors.	AX2.2.5
Issues	Takes a proactive, systematic, and transparent approach to identifying, tracking, communicating, and resolving emerging issues to minimize potential negative impacts on the project.	AX2.2.6
Transition	Ensuring CARB and community needs are met in final phases of the project and after Aclima commitments end.	AX2.2.7
Quality	Sets and applies qualitative and quantitative standards and preventive and corrective approaches to ensure high quality work across all areas, but especially in community engagement, technical activities, and reporting.	AX2.2.8

Risks	Provides structures and guidance for continuously and iteratively identifying, analyzing, prioritizing, mitigating, and monitoring risks to project success.	AX2.2.9
Schedule	Ensures a clear and granular work plan and schedule adheres to CARB requirements while structuring for operational and cost efficiencies.	AX2.2.10

Methodology (approach to work)

Aclima Community Engagement Model

Aclima's proposed Community Engagement Model (CEM) is predicated on the belief that communities must have a leading role in design, engagement, and implementation if any mobile monitoring initiative is to be successful. California community members and CBOs across the state have been leading air quality work at the local and regional level for decades. They have the resources, tools, and expertise to inform carrying out such an ambitious initiative on a short timeline. Those leaders should be at the forefront of this work.

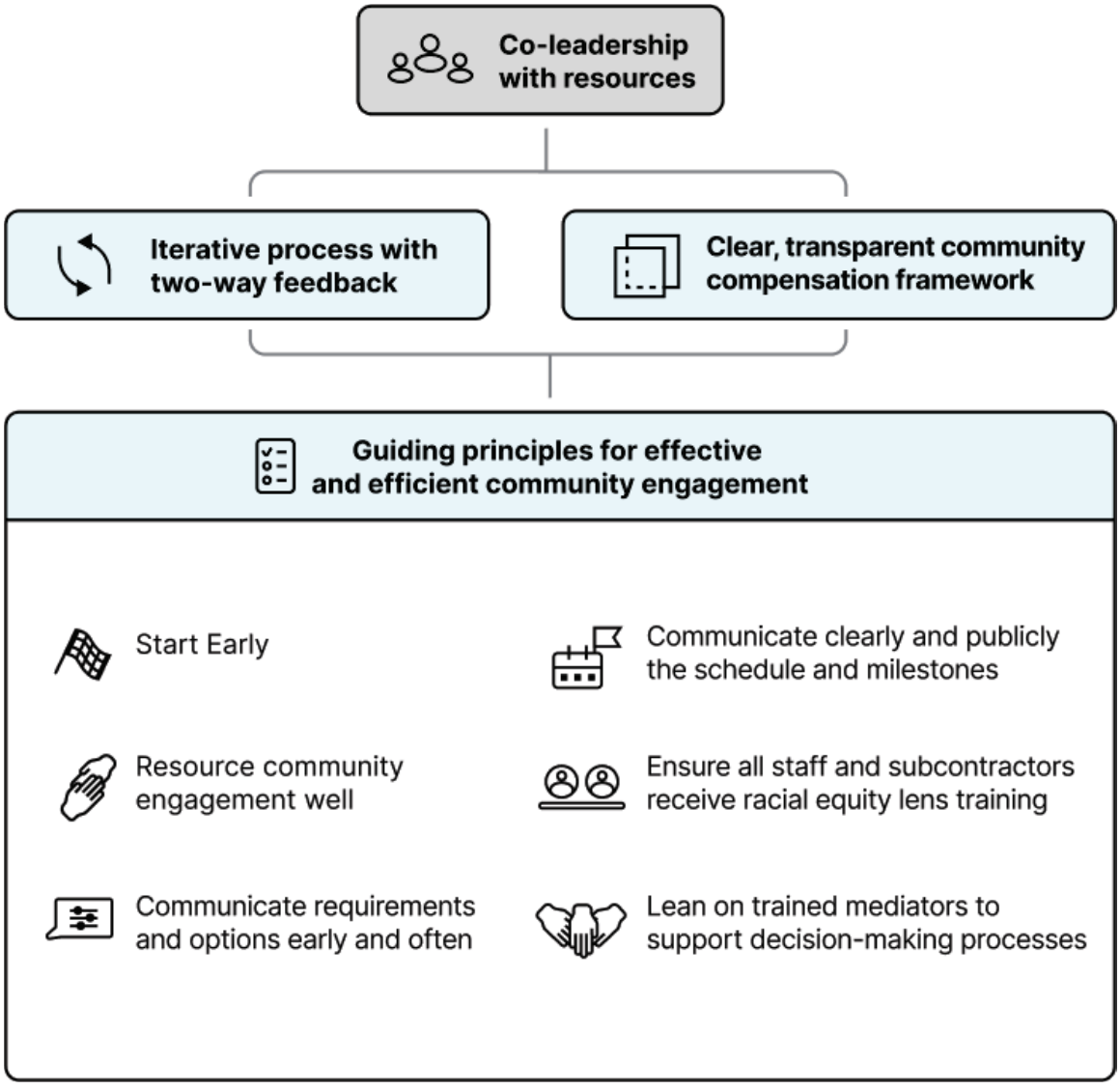

Figure C: Aclima's proposed community engagement model is predicated on giving communities co-leadership while ensuring communities have the resources they need to successfully engage with the CAMP(s) process. Aclima has used CARB's Community Engagement Model[5], the People's Blueprint, CARB's Blueprint 2.0[6], and Facilitating Power's Spectrum of Community Engagement to Ownership[7] to inform the model. Aclima spent time listening to and learning from community advisors and stakeholders statewide, including community leaders at West Oakland Environmental Indicators Project (WOEIP) and environmental justice leaders like Sacoby Wilson, Heather McTeer Toney, Veronica Eady, and Peggy Shepard. Additionally, Aclima leadership met with Tung Le, the Executive Director of CAPCOA, to get a better sense of air district expectations for this project.

Aclima's engagement model is informed by lessons learned from engagement with communities in mobile monitoring campaigns in California, New York, Washington, D.C., Louisiana, and elsewhere. Aclima has found that mobile monitoring data provides the highest value to communities when collected through an approach co-designed with communities, as in Aclima's partnerships with WOEIP and Louisiana Environmental Action Network (LEAN). In those communities and others, CBOs have been able to leverage Aclima's air quality data to further their own specific initiatives, using the data in the ways that are most valuable to their localized needs and goals.

Co-leadership with resources

Aclima proposes a co-leadership-based community engagement model, in which existing experts in the monitored communities are partners in the work and able to support the implementation of the initiative in an approach that centers community voices.

Aclima, in partnership with Kearns & West, will rely on the support of two key groups of people through all technical tasks:

[5] California Air Resources Board, (2023)
[6] Writer's Group Draft Assembly Bill 617 People's Blueprint, (2021)
[7] Gonzalez, R., (2021)

1. A team of expert community co-leads: experts who will partner regionally with community groups, air districts, and other stakeholders to inform the development and implementation of the Community Engagement Plan and Community Air Monitoring Plan(s).

2. A broad supporting network of community-based advisors, CBOs, and experts, including the RFP-designated Project Expert Group (PEG): a diverse mix of advisory and supporting roles.

In engaging with these experts and advisors and with the broader community, Aclima will emphasize an iterative, consistent two-way engagement process in which feedback loops are ongoing throughout the initiative. Aclima will also ensure community members are properly compensated for their time and expertise through a transparent compensation framework to be finalized early in the community engagement planning phase. The compensation framework will be informed by 1) existing best practices and standards in California and elsewhere, 2) input from Environmental Justice advisors and leaders, and 3) Project Expert Group and community input at the start of the SMMI. Kearns & West will manage distribution of funds per the compensation framework.

Aclima has dedicated a significant portion of the budget to resourcing community expertise and current community-driven air quality efforts. This budget includes two components: 1) ensuring community members, advisors, and other stakeholders are adequately compensated for the knowledge and expertise they provide throughout every phase of the initiative and 2) allocating funding to support community capacity-building directly related to the SMMI. Within this overall community resourcing budget, Aclima is allocating 33% towards community compensation and 67% towards community capacity-building work.

Efficient and effective delivery

Aclima acknowledges that (1) timeline and (2) technology requirements impact the potential for meaningful community engagement and require special consideration.

First, the RFP presents an accelerated timeline for community engagement, which will require the process to start as soon as possible and for Aclima's engagement team to be well-equipped, resourced, and prepared to begin work immediately. With Kearns & West and a team of expert community co-leads in place, Aclima is confident in the engagement model.

Second, due to the nature of mobile monitoring, there are technological and operational needs that are important to consider in CAMP(s) design. Aclima will work with communities to identify where mobile sampling approach options are pre-defined by the technology, and will highlight where and how communities can co-design a monitoring

plan to address their goals. Throughout this effort, Aclima will work with community partners to share the unique capabilities of mobile monitoring, so different communities can understand and plan for how the final data might support their decision-making.

Aclima will ensure that all staff and subcontractors working with communities have completed racial equity lens training prior to community engagement efforts. More details on Aclima's Community Engagement Model, including Partnership Principles and team roles, are provided in Appendix 1.

1. Project kick-off and updates

1.1 Summary

To begin the community engagement process and kick off the SMMI, Aclima will host a virtual public meeting in coordination and consultation with CARB and community partners from across the monitoring areas. The meeting will serve two proposed primary goals:

1. Provide key project information to California community members (via the meeting and a media availability session)
2. Begin the community engagement planning process, setting the tone for transparency and engagement throughout the entirety of the project

To keep closely aligned with CARB, Aclima will set up weekly meetings with the CARB project manager and other relevant internal stakeholders. Throughout the process, Aclima will adhere to the reporting requirements as outlined in the RFP.

More details on Aclima's Community Engagement Model are provided in Appendix 1.

1.2 Public kick-off

Community engagement is the core of Aclima's entire SMMI proposal and the first priority in project planning and timeline. To begin the community engagement process, Aclima will host a virtual public kick-off meeting within four weeks of the fully-executed contract. In consultation with CARB and community leaders from across the proposed monitoring areas, Aclima will plan, coordinate, and lead the virtual public kick-off meeting with the goal of tailoring to community needs and preferences regarding format, timing, language requirements, meeting access via multiple pathways (e.g. smartphones, computer browsers, community hubs with internet access, etc.), and other accessibility accommodations.

> Aclima is experienced in co-developing effective community meetings, both in-person and remotely, as part of an ongoing community engagement process (see Table A12.7 in Attachments). Aclima has found community meetings to be most effective when designed in partnership with community stakeholders and when clear

expectations are set around the purpose, agenda, and intended outcomes of the meeting.

Recognizing that different (often deeper) levels of engagement can be achieved in smaller, in-person or localized community meetings, Aclima appreciates the value of a larger, statewide public meeting as a kick-off (per CARB's RFP guidance) and will design the community engagement approach to flow from this initial meeting, leveraging the opportunity to reach a widespread audience and provide important information about the initiative to California communities, air quality leaders, and members of the media.

In public/community meetings, the Aclima team prefers to do more listening than speaking, and in the case of the kick-off meeting intends to incorporate as much agenda time as possible for information sharing from communities (including community co-leads and other community experts) and CARB in the context of the mobile monitoring initiative. Aclima will work alongside CARB and community representatives to ensure there is room for multiple voices to be heard across stakeholder groups, including speaking roles for CARB leadership and representatives from communities involved in the SMMI.

The meeting agenda, developed with input from community stakeholders, will include discussion of the anticipated project plan and schedule. The meeting will be designed to help recruit and begin community engagement activities, including serving as the kick-off for the community engagement planning process. If time allows, Aclima proposes virtual breakout sessions to provide community-specific logistics around the Community Engagement Plan (CEP) process and to engage in discussion about the kick-off event itself, beginning engagement early and immediately establishing a feedback loop. Regardless of whether or not breakout sessions are a part of the agenda, Aclima will collect initial thoughts and feedback from the public (via the written chat, discussion, and by providing a pathway for people to follow-up with additional ideas post-meeting) and submit those details to CARB in writing. Aclima will provide expert facilitation during the meeting to create a smooth and inclusive meeting environment.

The meeting will be designed to serve two proposed primary goals:

1. Provide information to California community members about the start of the SMMI, including background on mobile monitoring, information about Aclima, and the expected timeline
2. Kick off the community engagement planning process by sharing an anticipated schedule for community-based engagement activities that will inform the CEP and Community Air Monitoring Plan(s) (CAMP(s)) processes, including hiring plan

(including community roles that span all tasks of the RFP), iterative feedback mechanisms, community partner collaborations, in-person meetings, written materials, and virtual roundtables. Aclima will be clear that these processes are expected to develop and change based on input from community co-leads and other stakeholders.

Outcomes from the kick-off event will be communicated to all invited respondents who accepted or expressed interest, and a broader stakeholder list selected in consultation with CARB. The kick-off event may also include a media availability session, whereby media are provided with a press release and other collateral (video, photos) to further disseminate information to the broader California public about the initiative.

All virtual public and other community meetings will begin with a walkthrough of the meeting technology used, in order to ensure all participants feel equipped and familiar with the platform in order to participate meaningfully. This includes an overview of how to access interpretation, share their names and affiliations, mute/unmute, turn video on/off, raise hand, chat, and participate in polls or breakouts. It also includes a review of meeting participation guidelines.

Aclima also proposes consideration of a supplemental in-person event with members of a nearby community (location to be confirmed), CARB, and Aclima, where an Aclima mobile fleet vehicle is available for ride-alongs and demonstrations. (As an example, please see the New York State media and community ride-along[8]). This will be determined and planned in consultation with CARB.

1.3 CARB and Aclima weekly meetings

To keep closely aligned with CARB, Aclima's project manager will set up weekly recurring meetings with CARB's project manager — and other internal specialists as needed — to track project timeline, milestones, and the project lifecycle. Aclima will initiate the kick-off meeting with the project team and stakeholders from both organizations (including relevant subcontractors) to set the stage and launch the planning process. Aclima will use the online platform most easily accessible to CARB staff (Zoom, WebEx, Teams, etc.) to hold these meetings, as well as the project management software and document sharing platform that best suits existing CARB infrastructure.

Aclima will manage agendas and will flag potential issues, topics of discussion, and project status items ahead of the weekly meeting. Aclima will implement a meeting agenda and minutes template that aligns with the overall project management plan. The agenda will cover all the key elements of Agile project management meetings and will be a forum to discuss accomplishments, identify action items and expenditures, update the

[8] De Longis, C. (2023)

schedule, and review goals for the next month. The weekly meetings will also be designed to provide the CARB project manager with summaries and updates related to the deliverable schedule, as described in the CEP, approved CAMP(s), and other project timelines or materials.

Anticipated draft agenda

Immediate topics for discussion (initial meeting):

- High-level overview of project proposal and contract management
- Task progression and expectations for subsequent weekly meetings
- Process for determining community air monitoring boundaries (Aclima will share the results of initial multi-layer data analysis performed on each community, based on US Environmental Protection Agency (US EPA) neighborhood boundaries to support boundary identification efforts)
- Process for identifying sources and pollutants of concern (including enforcement concerns)

On-going topics for discussion (subsequent meetings):

- Agenda for upcoming community meeting(s)
- Timeline/progress/deliverable schedule check and any relevant risk mitigation
- Priorities for upcoming week

1.4 Reporting

Aclima will compile and report project information required by CARB in the California Climate Investments (CCI) Funding Guidelines and according to CARB guidance. Aclima's reporting will cover all project activities occurring during each six-month reporting cycle, in addition to add-on reporting as requested by the CARB team. Aclima acknowledges the reporting cycles cover December 1st through May 31st and June 1st through November 30th. Aclima will submit in the California Climate Investments Reporting and Tracking System (CCIRTS) database within the required 30 days after the end of a reporting cycle. Any work provided in PDF format will also be provided to CARB in the original electronic format (for example, Microsoft Word or Adobe InDesign).

Aclima will report project information on benefits to priority populations following the requirements in Section VI of CARB's Funding Guidelines. Where appropriate, Aclima will report priority population benefits using the Planning Benefit Criteria Table, including a description of community engagement approaches and how the project meaningfully

addresses an important need. Aclima's reporting around priority populations will be done in consultation with the paid community co-leads who will be members of the initiative's community engagement team and represent the interests and needs of those communities — and are therefore best positioned to speak to if and how the project is "meaningfully addressing an important need."

Aclima will summarize and report on community events, planning, and other efforts connected to community engagement (which includes essentially all of the initiative's efforts). This includes:

- Date, locations, formats (hybrid, in-person, town hall, open house, etc) estimated number of attendees for each public meeting held during the reporting cycle.
- Information on workshops and outreach events that are intended to raise awareness of the program, provide a forum for public or stakeholder input into the program, or increase participation in the program, regardless of the entity that hosted the event (e.g. subcontractors, grantees, community organizations, etc)
- Sentiment, feedback, and knowledge-sharing from community members and other stakeholders on initiative progress and goals, including limitations, conflicts, success stories, and areas for more opportunity.

1.5 Management and governance

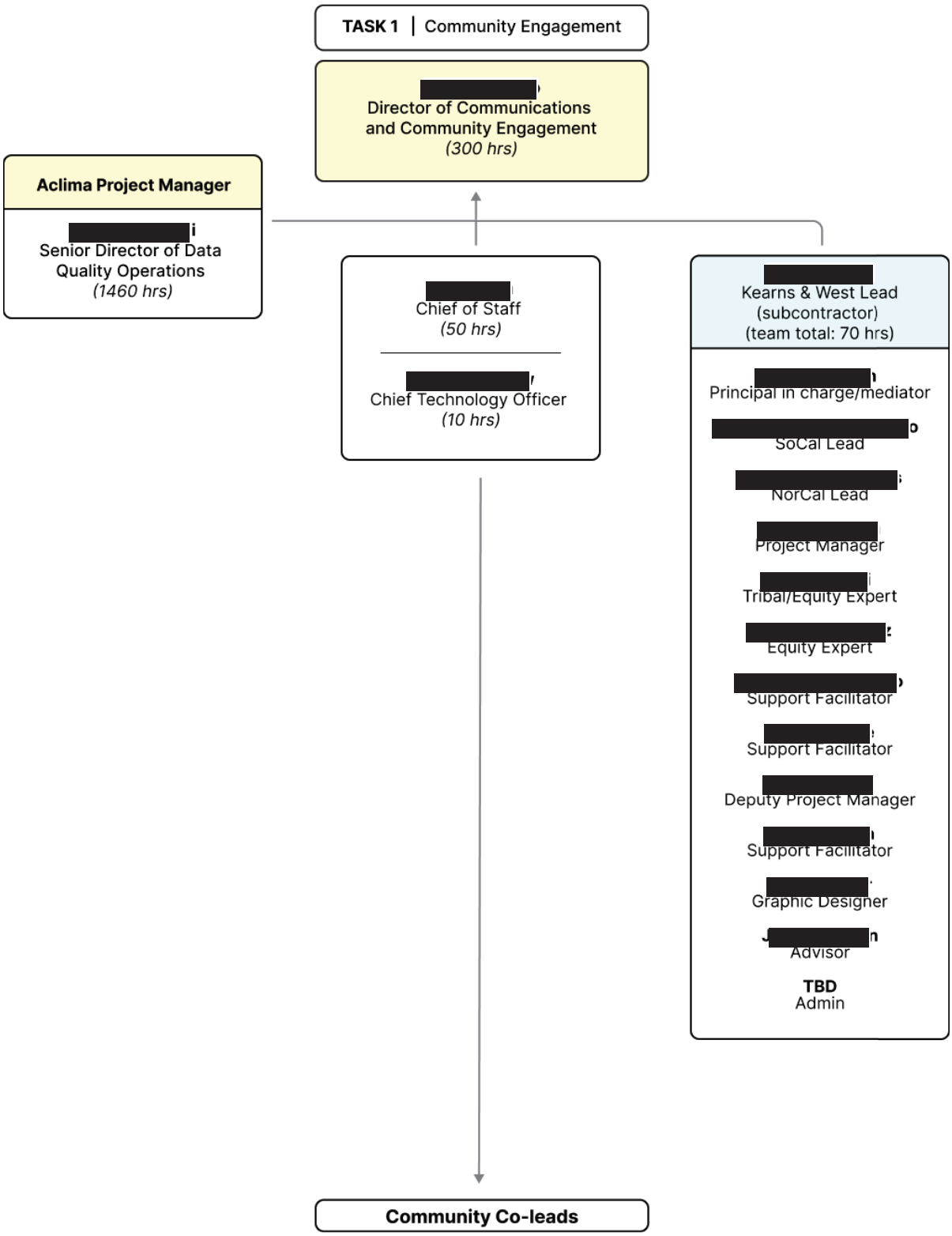

Figure 1.1: Task 1 management and governance structure

Table 1.1: Task 1 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 1: Project Kick-Off and Updates		
1.1: Project Kick-Off Meeting	[redacted] (subcontractor)	6/13/24
1.2: Weekly Monitoring Progress Updates	[redacted]	5/19/26

Table 1.2: Task 1 tasks and deliverables compliance

RFP Task #[9]	**RFP Task/Requirement**	**Aclima's Compliant Solution/Deliverable**
1	Project Kick-Off and Updates	
1.1	Project Kick-off meeting	Aclima will host a virtual public kickoff meeting within four weeks of the fully-executed contract.
1.1.a	Plan, coordinate, and lead a public meeting using an online platform within 4 weeks of the fully executed contract	Aclima will plan, coordinate, and lead the virtual public kick-off meeting with the goal of tailoring to community needs and preferences regarding format, timing, language requirements, meeting access via multiple pathways (e.g. smartphones, computer browsers, community hubs with internet access, etc.), and other accessibility accommodations.
1.1.b	Discuss anticipated project plan and schedule	The meeting agenda, developed with input from community stakeholders, will include discussion of the anticipated project plan and schedule.
1.1.c	Collect initial thoughts and feedback and submit to CARB	Aclima will collect initial thoughts and feedback from the public (via the written chat, discussion, and by providing a pathway for people to follow-up with additional ideas post-meeting) and submit those details to CARB in writing.
1.2	Set up recurring weekly meetings with the CARB	Aclima's project manager will set up weekly recurring meetings with CARB's project manager — and other

[9] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38-39 are covered in the proposal

	Project Manager using an online platform	internal specialists as needed — to track project timeline, milestones, and the project lifecycle.
1.2.a	Coordinate and lead weekly project update meetings to keep the CARB project team regularly updated on the project status and any potential issues	Aclima will schedule the meeting, coordinate attendance, and lead the meeting. Aclima will manage agendas and will flag potential issues, topics of discussion, and project status items ahead of the weekly meeting.
1.2.b	Discuss accomplishments, identify action items and expenditures, update the schedule, and review goals for the next month	The agenda will cover all the key elements of Agile project management meetings and will be a forum to discuss accomplishments, identify action items and expenditures, update the schedule, and review goals for the next month.
1.2.c	Provide summary and/or data in line with deliverable schedule laid out in the approved CAMP and agreed upon with the CARB Project Manager	The weekly meetings will also be designed to provide the CARB project manager with summaries and updates related to the deliverable schedule, as described in the Community Engagement Plan (CEP), approved CAMP(s), and other project timelines or materials.
1.3	Compile and report project information required by CARB in the California Climate Investments (CCI) Funding Guideline and according to CARB guidance	Aclima will compile and report project information required by CARB in the California Climate Investments (CCI) Funding Guidelines and according to CARB guidance.
1.3.a	This reporting must cover project activities occurring during each six-month reporting cycle	Aclima will submit in the California Climate Investments Reporting and Tracking System (CCIRTS) database within the required 30 days after the end of a reporting cycle.
1.3.b.	Project information on benefits to priority populations must be reported following the requirements in Section VI of CARB's Funding Guidelines	Aclima will report project information on benefits to priority populations following the requirements in Section VI of CARB's Funding Guidelines.

1.3.c	Information required to be summarized and reported (by the reporting deadlines of June 30th and Dec 30th) includes community events	Aclima will summarize and report on community events, planning, and other efforts connected to community engagement.

2. Form Project Expert Group

2.1 Summary

Aclima sees the Project Expert Group (PEG) as a trusted, credentialed group of experts who can help define and steer the SMMI and whose guidance will be critical to ensuring the project meets the needs of communities. Aclima envisages a 15-17 member PEG (also referred to as an Advisory Committee in the RFP), with at least 50% of the group directly representing the 64 CAPP Consistently Nominated Communities (CNCs), and prioritizing diversity along multiple dimensions. Aclima has begun listening conversations to gather stakeholder views of the PEG, and has assembled a list of those with early interest. Aclima will secure CARB's review and approval of invitees, provide maximum allowed compensation to those who can accept it, and adhere to all PEG criteria defined in the RFP. Aclima plans a minimum of four PEG meetings per contract year and at least four during Community Engagement Plan (CEP) development. Aclima and Kearns & West will propose a comprehensive draft PEG plan covering logistics and roles and responsibilities, as well as agendas before and summaries after each PEG meeting. Aclima has learned from extensive and direct past experience working with disadvantaged communities and reflects these lessons learned in this proposal.

2.2 Project Expert Group Composition

Based on initial discussions with California community leaders and environmental justice advisors, Aclima envisages that the PEG will be approximately 15-17 members. Aclima proposes that the PEG membership comprises (see Figure 2.1):

- At least 50% community representation from the regions and communities in the SMMI
- Two representatives from academia and research with relevant subject matter expertise,
- Two or three (or more based on need) current members of government, to include California air districts, state and government agencies
- One or more representatives from Native American Tribes, representing areas where proposed monitoring may overlap with/be adjacent to tribal lands or cultural resources
- One to two members of business, industry, or a CA-based foundation that is focused on air quality issues and solutions to these issues
- At least one youth movement leader who is part of a broader California Coalition, such as a member of the SCAQMD Young Leaders Advisory Council[10]

[10] SCAQMD (2017)

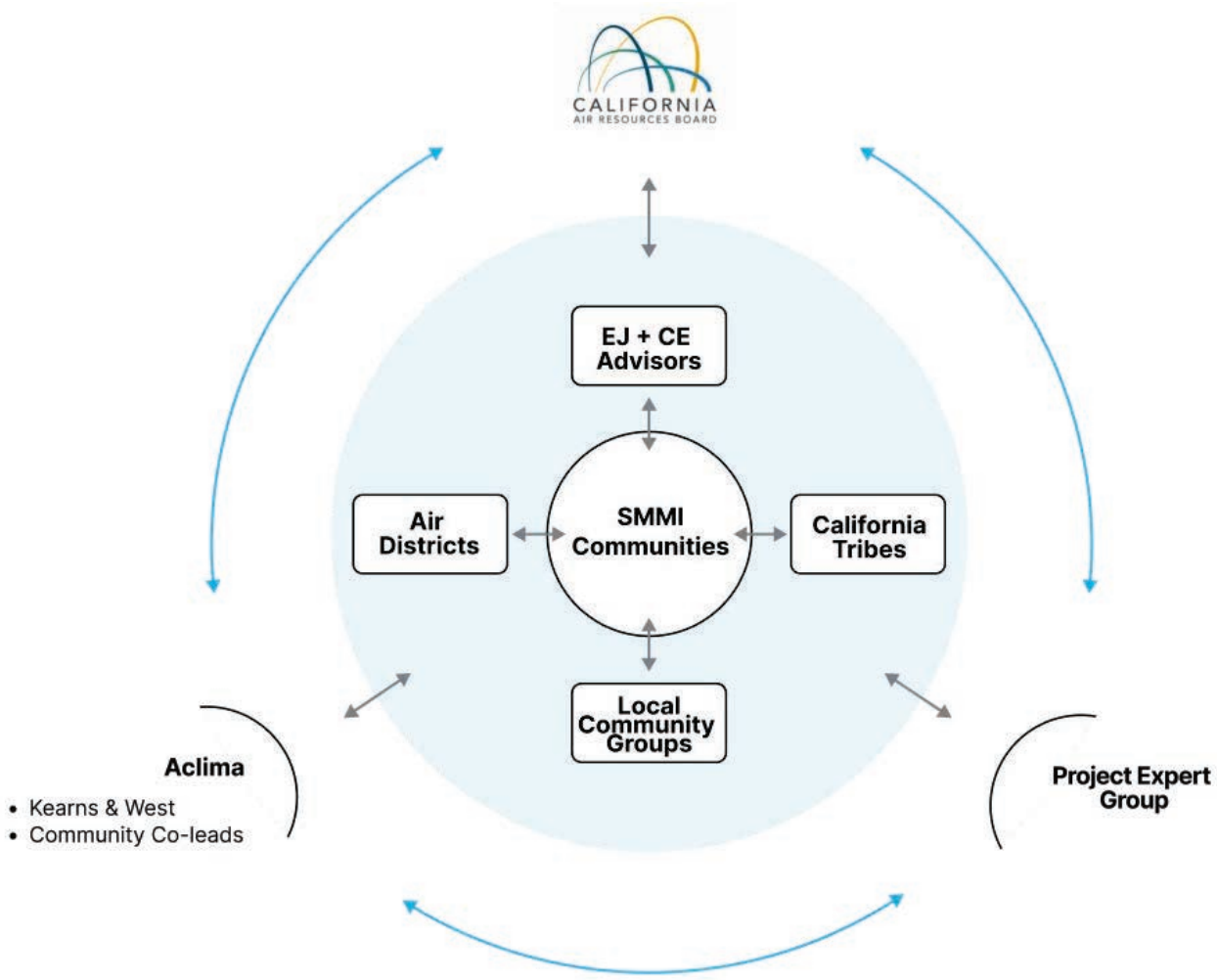

Figure 2.1: Possible composition of the PEG. CARB and community input and approval will determine final composition. Identities or memberships of stakeholders may overlap

Aclima has gathered feedback on PEG composition from representatives from Community Based Organizations (CBOs), academia, and government. Table 2.1 lists experts who have expressed interest to Aclima in supporting the SMMI project. CARB and community input and approval on the ideal membership of the group will be key for final selection.

Table 2.1: Experts who have expressed interest to Aclima in supporting the SMMI project

Expert	Sector	Institution	Notable expertise
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

2.3 CARB review and approval of PEG members and core deliverables

Aclima will propose a list of potential PEG members to CARB and copies of each member's subcontracted agreement within Q2 2024 (per RFP schedule), for CARB feedback on membership and agreements before CEP work commences. Aclima will ensure items from page 35, Task 2.1 (a-h) in the RFP are adhered to for PEG recruitment, retention, and implementation/facilitation. Ultimately, the PEG's purpose is to support the goals of CARB and the CNCs, facilitated by the Kearns & West and in coordination with community co-leads, CBOs, and government agencies.

Maximum compensation as designated by the RFP ($4,999 per year) will be offered to all PEG members, though Aclima recognizes that some members may not be able to accept compensation in cases where there may be a conflict of interest or participation is considered part of their existing jobs.

Aclima will work together with CARB and the PEG to define a specific list of the group's responsibilities, required documents to review, and any other deliverables. Aclima and Kearns & West will coordinate closely with the PEG to ensure buy-in and capacity to deliver all deliverables on schedule. It should be noted that additional deliverables may be added in the CEP and Community Air Monitoring Plan(s) (CAMP(s)) processes, pending what emerges through community engagement.

2.4 Expert Group plan (meeting schedule and facilitation approach)

The Aclima project manager and community engagement team will plan at least 4 PEG meetings per contract year, with a minimum of 4 PEG meetings during CEP plan development. Kearns & West will act as primary facilitator for the PEG, including organizing, scheduling, hosting (via online platforms), leading, and providing logistical support.

Aclima and Kearns & West, in consultation with CARB, will propose a draft PEG plan, including a virtual meeting calendar and overarching roles and responsibilities, during the first group meeting in order to establish capacity, availability, working agreements, conflict resolution guidelines, clear objectives, and channels of communication. Aclima and Kearns & West will provide CARB with a detailed agenda at least five business days prior to and a detailed summary within five business days after each expert group meeting. The meeting summaries will include names of all attendees, groups represented, and meeting agendas and summaries of topics discussed and outcomes. Proper records of recommendations, feedback, and advice provided by the expert group are key to every step of the SMMI, from CEP development to CAMP(s) development, implementation, and presentation of final results. Aclima will provide a record of every expert group meeting to CARB (RFP page 35, task 2.5).

Aclima and Kearns & West have extensive experience organizing, hosting, and facilitating meetings with multiple external organizations via online platforms.

2.5 Project Expert Group Roles and Responsibilities

The PEG will:

- Support identification and selection of community co-leads

- Coordinate with Aclima, Kearns & West, and community co-leads to develop the CEP
- Serve as advisors to Aclima and CARB
    - Support prioritization of monitoring to address community concerns
    - Review and provide feedback on all documents prior to submittal to CARB
    - Provide insights/perspective for successful engagement, monitoring, outreach, CEP, and CAMP(s)
- Participate in meetings
    - Participate in regular PEG meetings (including at least four during CEP development, and four in the second year of the contract) to review community engagement progress and provide feedback
    - Participate in high-visibility community meetings, as capacity allows
    - Participate in respective local community meetings, as capacity allows
- Support community engagement
    - Leverage networks to ensure as many community voices are engaged in the CEP and CAMP(s) processes as possible
    - Serve as advocates of the ongoing work
    - Serve as advocates of the communities the initiative intends to serve

To maximize efficient use of PEG member time, Aclima proposes that:

- Deliverables be sent out to the entire PEG, while acknowledging that level of detailed review for each document will depend on agreed-upon roles and responsibilities and a prioritization structure set by the PEG and agreed upon by CARB
    - Sub-groups within the PEG be established, who will be primarily responsible for reviewing certain types of documentation, relieving the burden on all PEG members
    - PEG members' areas of expertise are identified at the beginning of the process so that Aclima may flag relevant documents for review
- That the Aclima project manager and CARB project manager work together to refine the list of deliverables that needs all-PEG review

2.5.1 CARB Involvement with the PEG

PEG members are expert advisors both to Aclima and to CARB. The PEG will serve a similar function as the Community Steering Committees (CSCs) did in the CAPP structure. In order for the PEG to be as effective as possible in serving the needs of multiple communities and stakeholders, Aclima recommends that CARB enlist a senior representative from the Monitoring and Laboratory Division to attend every PEG meeting. Aclima also anticipates that CARB will send senior representation from the Office of Community Air Protection (OCAP) or the Office of Equity, Communities & Environmental

Justice (OECEJ) to attend every meeting so that the PEG can work directly with CARB staff involved in CAPP.

2.6 Task 2 relevant experience

Aclima has considerable experience working with a diverse set of stakeholders to inform mobile monitoring:

- In a mobile monitoring campaign across New York state in partnership with New York State Department of Environmental Conservation (NYSDEC), a cross-functional Aclima team of Project Managers, Community Engagement team, and Science team personnel worked closely with the Climate Justice Working Group, Co-conveners of Disadvantaged Communities (DACs), and the NYSDEC's Division of Air Resources to propose and adjust monitoring boundaries, to clarify goals, and to build data visualization tools informed by those goals, including a tool within Aclima Pro to share progress through the monitoring period and AirNY (anticipated release date: 3/31/24; video walk-through available here[11]).

- In a mobile monitoring campaign to identify pollution hotspots and map emissions from major facilities in the Mississippi River Industrial Corridor, in partnership with the CBO the Louisiana Environmental Action Network (LEAN) and funded by a US EPA grant, Aclima has worked closely with LEAN's team of community advocates and independent scientists to share Quality Assurance information for EPA approval, work with the Louisiana Department of Environmental Quality (LDEQ) to have Aclima data published on their website, and support LEAN as they prepared for collaborative roundtables with industry leaders in the area.

- Aclima collaborated with the Richmond-San Pablo Monitoring Outreach Team, a coalition of academics, professionals, and community members implementing the CAPP Richmond-San Pablo Community Air Monitoring Plan. Aclima's partnership included working with BAAQMD, Physicians, Scientists, and Engineers for Healthy Energy (PSE) and the community-based organization RYSE to conduct targeted air quality measurements in the Richmond-San Pablo area. Aclima engaged directly with local communities, with a focus on youth leadership through RYSE. By integrating stationary air quality measurement data from PSE, Aclima developed a hotspot data product and an interactive data visualization and analysis tool. This tool, along with an interactive data story, was shared with the public to highlight and prioritize areas of concern.

- One of many examples of Kearns & West's experience is their current work providing facilitation services to assist with the public engagement and Steering

[11] Aclima, Inc. (2024)

Committee (SC) aspects of the South Sacramento-Florin Community AB617 program in the Sacramento Metropolitan Air Quality Management District. The K&W project team coordinates and facilitates public engagement and hybrid meetings for the Community SC aspects of the Community Air Program, including planning for the Community Emissions Reduction Program, and providing conflict mediation services to resolve and clarify issues between the SC and Air District.

2.7 Management and governance

Figure 2.2: Task 2 management and governance structure

Table 2.2: Task 2 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 2: Form Project Expert Group		
2.1: Form Advisory Committee	[redacted]	6/20/24
2.2: Create Advisory Committee Plan	[redacted]	6/27/24
2.3: Summarize Advisory Committee Meetings	[redacted]	Beginning in Q3 2024 for first meeting, extending through 5/19/26.

Table 2.3: Task 2 tasks and deliverables compliance

RFP Task #[12]	**RFP Task/Requirement**	**Aclima's Compliant Solution/Deliverable**
2	Form project expert group	
2.1	Recruit and retain a subcontracted project expert group of community experts	Aclima proposes to recruit and retain a project expert group of approximately 15-17 members, complying with all PEG recruitment, retention, and implementation/facilitation requirements (2.1a-h).
2.2	Organize, schedule, host (via online platforms), lead/facilitate, and provide logistical support for expert group meetings. The Contractor shall meet with the expert group at least four (4) times per contract year.	Subcontracted Community Engagement Partner, Kearns & West, will act as primary facilitator for the PEG, including organizing, scheduling, hosting (via online platforms), leading, and providing logistical support. The Aclima project manager and community engagement team will plan at least 4 PEG meetings per contract year, with a minimum of 4 PEG meetings during CEP plan development.

[12] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38-39 are covered in the proposal

2.3	Include representative(s) from CARB project team in expert group meetings	Aclima will include a CARB representation in expert group meetings.
2.4	Consult the expert group to direct engagement, monitoring, and outreach activities	Aclima sees the PEG as a trusted, credentialed group of experts who can help define and steer the SMMI and ensure objectives align with community and stakeholder needs and goals.
2.5	Provide a record of expert group meetings including, but not limited to, names of all attendees, groups represented, and meeting agendas and summaries of topics discussed and outcomes	Aclima will provide this record.
2.6	Submit the expert group membership roster and deliverables for CARB review and approval before engagement plan work commences	Aclima will submit the roster for review before engagement plan work commences.

3. Develop Community Engagement Plan

3.1 Summary

Aclima sees the Community Engagement Plan (CEP or plan) as foundational to successful Community Air Monitoring Plan(s) (CAMP(s)) processes. Aclima proposes one overarching CEP document with designated chapters for each region and community, and will emphasize community-driven decision making. The Aclima community engagement team, including partners Kearns & West, will drive forward work on the CEP in close consultation with CARB, the Project Expert Group (PEG), advisory network, and other stakeholders. Aclima anticipates the CEP to cover a wide range of topics from history of different communities' air monitoring efforts to stakeholder engagement plans and meeting logistics. Drawing on extensive practical experience (see Table A12.7 in Attachments), Aclima will use a diverse range of methods to gather information during the CEP development process, and provide services to support multilingual access. All engagement will be informed by a defined compensation framework that compensates community members for their time and expertise.

3.2 Community Engagement Plan as foundation for CAMP(s)

The CEP will guide all planning, strategizing, implementing, and documenting of community engagement activities throughout the initiative. A primary goal of the plan is to gather and record the detailed knowledge and expertise of community members in all the proposed monitoring areas, as they are best positioned to provide insight on the conditions they experience every day. The CEP will also establish the framework for how community partners will co-develop monitoring objectives and other key details in the community air monitoring planning process and will serve as the first element of the CAMP(s), setting the paths for all engagement through planning and implementation.

> Aclima's community engagement experts have extensive experience in co-developing community engagement plans with environmental justice communities (in California and elsewhere in the US), Native American Tribes, CBOs, and other stakeholders on a variety of environmental topics, including air quality and mobile monitoring. Aclima reflects this experience in the emphasis on community interviews,

listening sessions, and one-on-one conversations for informing the development of the CEP.

3.3 CEP development process

Aclima proposes one overarching CEP document with designated chapters for each region and community. Facilitating Power's Spectrum of Community Engagement to Ownership[13] informs Aclima's approach to charting community engagement pathways. Recognizing that community engagement activities will fall along the spectrum of engagement from "Inform" to "Defer to," Aclima's community engagement team aims to foster democratic participation and equity through community-driven decision-making (see Aclima Community Engagement Model, Appendix 1).

CEP development will be driven by the community co-leads team in close coordination with community stakeholders and supported by Kearns & West, the internal Aclima team, and guidance from the PEG and advisory network. The final document will be designed for multiple audiences and readers (meeting interpretation and accessibility standards) and publicly available at the end of the community engagement planning period (May – September 2024, per RFP) on a public website and in print (based on need).

3.4 CEP topics

Table 3.1: The CEP may include, but not be limited to, these topics and sub-topics

Topic	Sub-topics	RFP Task
Overall framing of community engagement and the larger SMMI initiative.	Purpose	**3.1.a**
	Goals	
	Objectives	
Description of the communities (individually).	Needs, concerns, expectations around SMMI	
	Past history with monitoring/CARB initiatives	

[13] Gonzalez, R. (2021)

	Relevant historical information around the inequitable and persistent air quality challenges faced by the communities	
	Racial and social equity assessment exploring demographics, history, benefits, data gaps, and outcomes associated with the project	**3.1.d**
Background on mobile air quality monitoring.	How mobile monitoring works	
	Actions mobile monitoring can/cannot support	
Define all stakeholders.	Community-based organizations, local governments, Tribal members, Tribal governments, community members, places of worship, local businesses, air quality districts, academics, etc	**3.1.b.**
	Agreed-upon stakeholder engagement level	
A description of the methods of community/stakeholder outreach and engagement including but not limited to.	Focus groups and one-on-one conversations, community meetings, PEG meetings, public education campaigns, written materials (fact sheets, newsletters, etc.), social media, listening sessions, open houses	**3.1.f**
Communications plan.	Appropriate and preferred methods/approaches	**3.1.f, g**
	Language access considerations based on research and conversations as to what languages other than English are spoken by stakeholders and a plan for interpretation services and document accessibility	**3.1.g**
Description of roles and responsibilities.		
Action plan for co-creation and implementation of CAMP(s) with communities.	Community engagement objectives	**3.1.a**
	Consensus-building and decision-making processes	
	Level of community participation and compensation throughout the contract period	**3.1.c**
	Milestones for engagement activities and how they fit into the overarching timeline	**3.1.e**

	Community-specific information: ideal meeting locations, limitations on cellular coverage/internet, etc.	
	Logistical needs for holding meetings: dates, time of day, facilitation needs, access constraints, budget	**3.1.h**
	Collecting and integrating recommendations and follow-through	**3.1.i**
An outline of agreed-upon process for making changes to the CEP, officially through CARB and the PEG.		

Aclima will keep the CARB project team closely informed during the CEP development process, providing detailed agenda information ahead of each engagement event and summaries after each engagement event and provide updates during weekly project meetings. After consultation with the PEG, Aclima will submit the draft-final CEP for CARB review and approval. The team will meet with CARB to address any changes, make those changes, and finalize the document by publishing to a publicly-accessible website. An outline of the CEP change process will also be documented within the plan itself, for maximum transparency.

Aclima developed this proposed process based on initial discussions with CBOs and on the past experience of the Aclima community engagement team, but the structure is likely to change at the beginning of the project based on CARB and additional stakeholder feedback.

3.5 Engagement techniques

Aclima proposes to inform the CEP with a range of engagement techniques. Aclima's partnership principles, informed and inspired by the EJ Principles of Working Together[14], establish how the company works together with partners to create inclusive spaces for collaboration and discussion, establish feedback loops for continual improvement and accountability, and drive towards shared understanding, action, and goals. These will serve as a guiding force across all phases of community engagement in the initiative. Techniques may include:

[14] People of Color Environmental Justice "Principles of Working Together" (1991)

- Focused group and one-on-one conversations in person and virtually
- In-person/hybrid community meetings/workshops
- Listening sessions and conversations
- PEG meetings and interviews
- Community co-lead meetings and interviews
- CARB's public survey designed to collect data about air pollution concerns, locations, pollutants, and potential sources
- Public outreach and social media

The entire community engagement process, starting with plan development, will be rooted in a clearly defined and articulated community compensation framework, properly paying community members for their time, leadership, knowledge, and unique expertise.

3.5.1 Multilingual services

Aclima will provide multilingual services where applicable throughout the entire project in order to foster meaningful engagement across the diverse communities covered in the monitoring initiative. Aclima recognizes that access and participation in community engagement processes is critical to the success of the initiative. Aclima will work with CARB's project team and local air districts (in addition to communities) to understand the language preferences within the monitoring communities' boundaries.

3.6 Engagement planning experience

One example of community engagement partner Kearns & West's experience is in their work with the Bay Area Air Quality Management District (BAAQMD), where they led the development of a Public Participation Plan that identified principles, policies and implementation protocols for conducting the agency's air quality mandate. The plan includes guidance for conducting outreach to limited-English-proficient residents as well as environmental justice communities with significant air quality challenges. Kearns & West facilitated a 25-person Stakeholder Advisory Task Force and supported a series of regional public workshops to identify community priorities and evaluate the potential application of best practices.

3.7 Management and governance

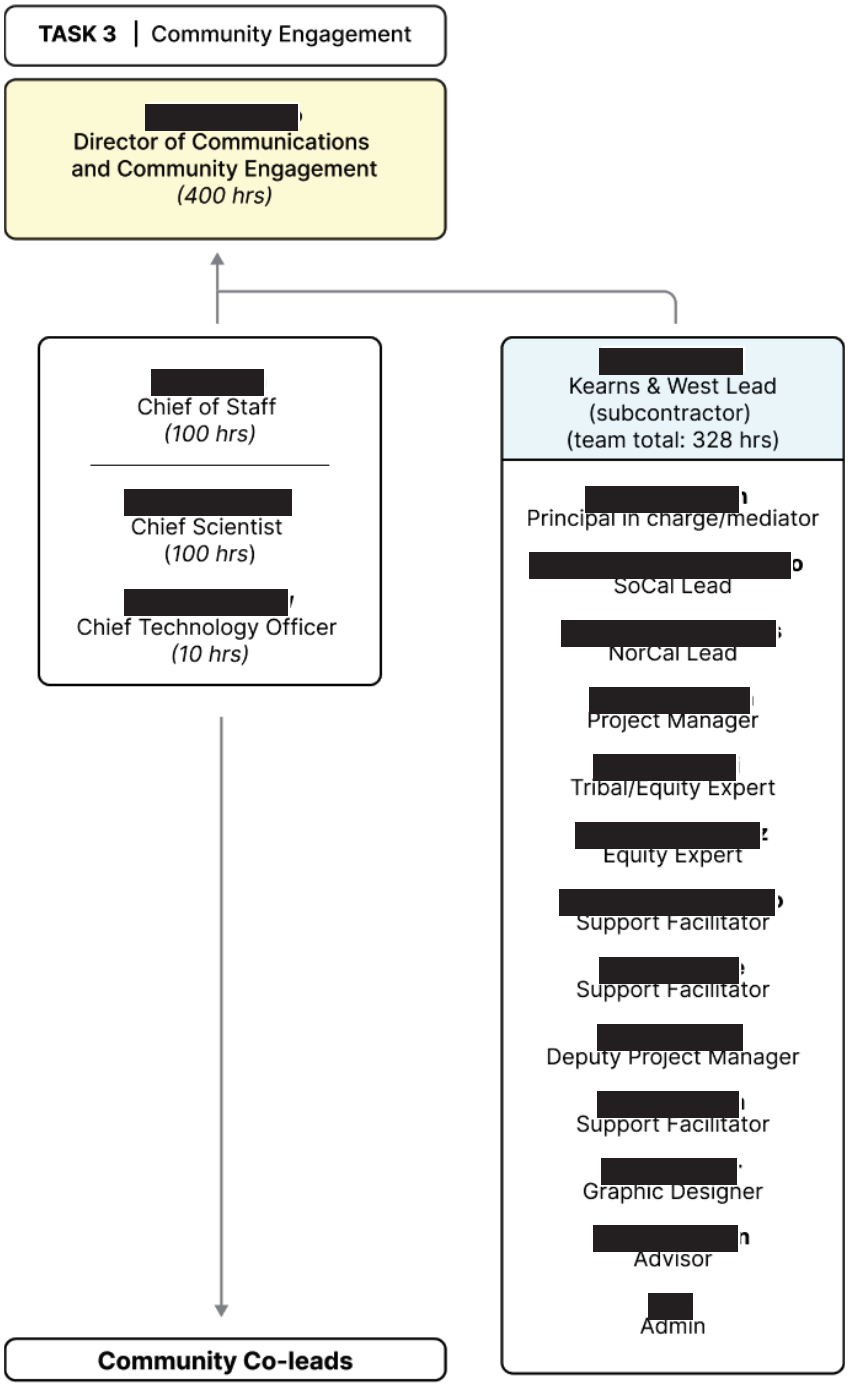

Figure 3.1: Task 3 management and governance structure

Table 3.2: Task 3 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 3: Develop Community Engagement Plan		
3: Develop Community Engagement Plan	[redacted]	8/31/24

Table 3.3: Task 3 tasks and deliverables compliance

RFP Task #[15]	**RFP Task/Requirement**	**Aclima's Compliant Solution/Deliverable**
3	Develop Community Engagement Plan	
3.1	Develop a community engagement plan in consultation with the project expert group.	Aclima will develop a CEP in consultation with the PEG that addresses all elements 3.1.a-i. Aclima will provide detailed agenda information to CARB before and after each engagement event.
3.2	Submit the finalized community engagement plan for CARB review and approval and meet with the CARB project team to address any changes	After consultation with the PEG, Aclima will submit the draft-final CEP for CARB review and approval. The team will meet with CARB to address any changes, make those changes, and finalize the document by publishing to a publicly-accessible website.
3.3	Provide multilingual services during the engagement period upon request and when feasible	Aclima will provide multilingual services when feasible throughout the entire project in order to foster meaningful engagement across the diverse communities covered in the monitoring initiative.
3.4	Include the community engagement plan as Element 1 in the CAMP	The CEP will establish the framework for how community partners will co-develop monitoring objectives and other key details in the community air monitoring planning process and will serve as the first element of the CAMP(s).

[15] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38-39 are covered in the proposal

4. Develop a Community Air Monitoring Plan

4.1 Summary

Community Air Monitoring Plans (CAMPs) are essential to a successful air monitoring program. CAMPs ensure that the results of the monitoring will support CARB and community action post-SMMI to reduce emissions and exposure. Aclima will develop CAMP(s) that will document how the mobile monitoring will be conducted, in consultation with the Project Expert Group and applying the information gathered from the community engagement process. To guide development of CAMP(s), Aclima offers a base of fixed components to control for schedule, cost, and scope risk, while also providing flexibility to tailor solutions to the needs of communities in support of the elements of CARB's CAMP guidance. For example, Aclima will emphasize co-design of partnerships, purpose, scope, objectives, and roles/responsibilities in developing Elements 1-5; and provide flexible tools to support community involvement in defining monitoring areas, selecting appropriate analyses, and defining final visualizations (Elements 8, 13, and 14). Aclima will provide an established base of data quality objectives, monitoring methods and equipment, QA/QC approach, and data management tools (Elements 6, 7, 9, and 10). Aclima will emphasize equitable resource distribution and maximizing coverage within budget. The number of CAMPs necessary to support the SMMI and community monitoring objectives will be determined through the community engagement process. The proposed plan is informed by Aclima's extensive experience (see Table A12.7 in Attachments for past projects) with CAMP-relevant projects including recent partnerships in New York, and with the West Oakland Environmental Indicators Project (WOEIP) in West Oakland. Per the RFP, CAMP(s) will be approved by CARB (after review by the PEG) and monitoring will begin by Q2 2025.

4.2 Aclima's approach to CAMP development: fixed versus flexible components

To be able to feasibly execute on development of CAMP(s) at statewide scales and to control for schedule, cost, and scope risk, Aclima proposes a base of fixed components. At the same time, Aclima recognizes the importance of tailoring solutions in partnership with communities, so is proposing flexibility in key areas. The division and make up of base versus flexible components is derived from Aclima's years of experience deploying mobile monitoring at scale, and a close reading of CARB, and community needs as expressed in the CAPP Blueprint 2.0 and the People's Blueprint. Aclima will consult with the expert group for CAMP recommendations, advice, feedback, and concerns while co-developing the CAMP(s) with communities.

Table 4.1: Breakdown of fixed (Aclima technology pre-defined) versus flexible (community co-designed) inputs to CAMP(s) development

CAMP Element	Aclima base components	Community co-designed (flexible)
1: Form community partnerships	Defined by CEP as developed in Task 3.	CEP developed in partnership with communities and PEG.
2: State the community-specific purpose for air monitoring	Based on RFP requirements and existing datasets: full pollutant list; potential sources; potential areas of concern.	Co-design final target pollutants, sources of concern, and monitoring boundaries with stakeholders and communities.
3: Identify scope of actions	*[Defined by CARB]*	Support design of scope of actions led by CARB, PEG, stakeholders, and communities.
4: Define air monitoring objectives	Based in RFP requirements and in mobile monitoring capabilities: (1) source identification and (2) locations of disproportionate objectives.	Co-design final monitoring objectives with CARB, stakeholders, and communities.
5: Establish roles and responsibilities	Proposed roles for Aclima, the PEG, Community Co-Leads, CARB, and other stakeholders, per proposal and CEP from Task 3.	Co-establish roles through the CEP and CAMP(s) process.
6: Define data quality objectives	Defined and established measurement and data quality objective, and performance and acceptance criteria for mobile monitoring.	How performance against data quality objectives are communicated during monitoring.
7: Select monitoring methods and equipment	Vehicles and list of pollutants measured. General monitoring methods of *broad area monitoring* combined with customizable *targeted area monitoring.* Available sampling designs under each monitoring method.	

	Available analyses.	
8: Determine monitoring areas	Coverage of 64 CAPP Consistently Nominated Communities. RFP requirements on priority coverage percentages.	Relative weighting of datasets for prioritizing areas within CNCs. Exact boundaries for each community. Sources or locations of concern for enhanced, targeted monitoring.
9: Develop quality control procedures	Aclima mobile monitoring QA/QC program.	How QA/QC activities are communicated during monitoring.
10: Describe data management	Aclima data management system.	
11: Provide work plan for conducting field measurements	The timeline given the restrictions laid out in the RFP (e.g., all data collection and verification activities completed within one year) Aclima operations plans and practices.	How milestones and activities are communicated during monitoring.
12: Specify process for evaluating effectiveness	Template of defined mobile monitoring effectiveness metrics.	Develop a procedure to track progress and adjust plans where necessary.
13: Analyze and interpret data	Defined set of available data analysis approaches.	Select types of analyses that are of most value to support the monitoring objectives for each community.
14: Communicate results to support action	AQview and StoryMaps as primary platforms.	Customizable templates and other interactive features.

4.3 CAMP Sections 1-5: reasons for conducting community air monitoring

Table 4.2: Description of Aclima's approach against CAMP elements 1-5

Community Air Monitoring Plan element	Aclima approach
1: Form community partnerships	Aclima recognizes that communities are best positioned to identify how air monitoring can and should support their unique air quality goals. As the CAMP process begins, Aclima, Kearns & West, and community co-leads will implement the CEP as Monitoring Plan Element 1 of the CAMP(s). Aclima will consult the PEG to identify and engage community partners in the measurement areas. Aclima will provide CARB with a detailed agenda prior to, and a detailed summary after, each engagement event (RFP Task 4.1).
2: State the community-specific purpose for air monitoring	In support of Monitoring Plan Element 2, Aclima, Kearns & West, and community co-leads will facilitate a community process to identify the community-specific purposes for the mobile air monitoring initiative.
3: Identify scope of actions	Aclima will support CARB, the PEG, and community co-leads, along with other community stakeholders, to define the scope of actions that the CAMP(s) aim to support. Aclima will help inform the scope by providing guidance on what kinds of actions mobile monitoring data and analyses have typically supported in past projects.
4: Define air monitoring objectives	Aclima proposes to support Monitoring Plan Element 4 in a way that allows flexibility for community input while operating within operational and technical constraints. See Element 4 discussion, below.
5: Establish roles and responsibilities	During CAMP(s) development, the team will establish roles and responsibilities (Monitoring Plan Element 5) to be followed throughout the monitoring, including identifying personnel and stakeholders in management plans, clarifying group roles and interactions, and specifying training requirements. See Element 5 discussion, below.

4.3.1 Discussion: Element 4 - air monitoring objectives

Aclima proposes that air monitoring objectives be tied to the fundamental capabilities and strengths of mobile monitoring, and to the core reasons why mobile monitoring is the chosen method for this initiative. Mobile monitoring is strongest when applied to

measuring the variability of air pollution at high spatial resolution. Mobile monitoring data can both show signals that indicate plumes from emissions sources and the location and spatial extent over which pollution impacts the community. This implies that two broad air monitoring objectives are most relevant for the SMMI:

1. Source identification: identify or confirm emissions from sources of concern
2. Locations of disproportionate impact: identify areas overburdened by specific pollutants or sources

These objectives help to focus mobile monitoring equipment and methods (see 4.4.2 Element 7, below), which define *what* can and should be measured, *where,* and *when*. Aclima proposes to make data generated by these methods more actionable for communities in the context of the broad air monitoring objectives, through application of appropriate analyses (see Figure 4.1, below; 4.5.2 Element 13, below; and Table 4.3, below).

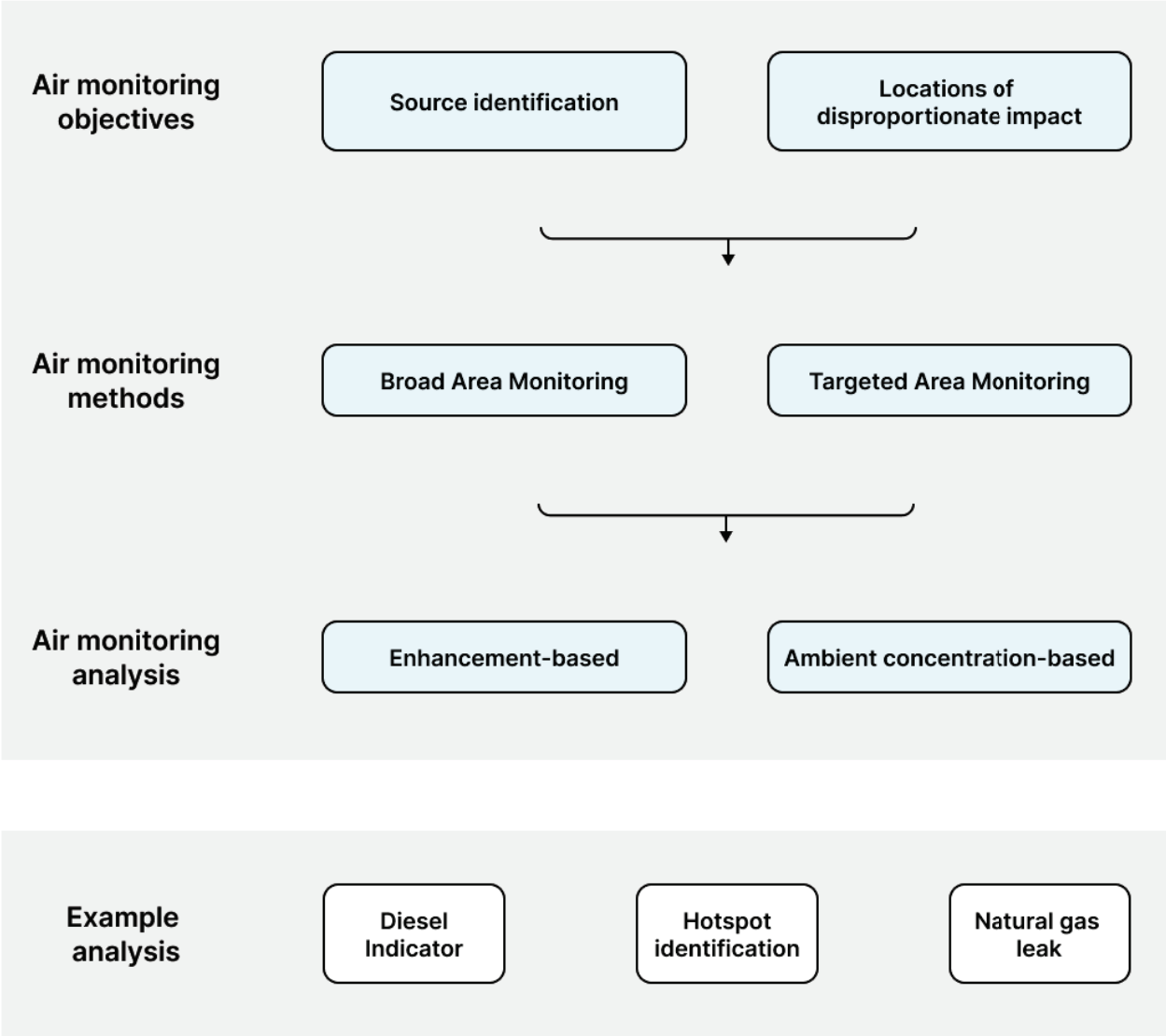

Figure 4.1: Mobile air monitoring objectives can be met through established air monitoring methods, which generate data that in turn can support a range of analyses

Aclima and communities, with input from the PEG and CARB, will set monitoring plan benchmarks for determining that these objectives have been met. These benchmarks will help ensure the project stays on track, properly allocates resources, and demonstrates how the project's results will support CARB and communities' air quality actions outside of the SMMI.

4.3.2 Discussion: Element 5 - roles and responsibilities

Aclima, Kearns & West, the PEG, community co-leads, and CARB will work together to assess any needs in community knowledge of the air quality science, the uses and

capabilities of mobile monitoring, the technology utilized to collect, review, and interpret data, and how data will be used. This group will develop and provide information and education materials, as outlined in the CEP, so that communities are in a position to make informed choices in the CAMP design process.

The role of PEG in CAMP(s) development

The PEG will be key advisors to ensure this initiative serves CARB and community air quality monitoring needs. Aclima will consult with the expert group for CAMP recommendations, advice, feedback, and concerns while developing and prior to submission of the CAMP to CARB. Aclima's community engagement team will document all expert group comments and how they were addressed prior to submission of the CAMP(s) to CARB. Aclima and the Community Co-leads will consult with the PEG to:

1. Provide insights/perspective for successful CEP and CAMP(s), such as public outreach strategies to promote widespread inclusion and accessibility in this multi-staged and broad-based initiative
2. Provide resource allocation guidance, such as how to weight the various criteria that may affect resource allocation for the broad area monitoring coverage of the 64 CAPP CNCs and locations for targeted area monitoring (section 4.4.2)
3. Support the design of a readiness and technical capacity assessment for eligible communities
4. Provide guidance to ensure equity in resource allocation, timelines, and community coverage: for example, the People's Blueprint emphasizes the importance of adequate time for communities to review, convene, and provide feedback on CAMPs. The PEG will support determining an adequate timeline, with at least 5-7 days as a minimum for any deliverables where community collaboration is needed.
5. Serve as advocates for the community in the CEP and CAMP(s) processes
6. Serve as representatives of the PEG through participation in high-visibility sub-regional or statewide community meetings, as well as respective local community meetings
7. Leverage networks to ensure as many community voices are engaged in CAMP(s) processes as possible
8. Advise as to how the CAMP(s) might go above and beyond community needs

4.4 CAMP Sections 6-11: How monitoring will be conducted

4.4.1 Element 6: Data quality objectives

Aclima's base method and equipment offerings come with established performance and acceptance criteria. In CAMP Element 6, Aclima will describe how the base methods and equipment translate into these criteria (including the precision, bias, accuracy, sensitivity, completeness and representativeness indicators described in CAMP guidance) and what type of conclusions can and cannot be drawn given overall data quality performance. Aclima will also propose unique data quality objectives that ensure data from mobile monitoring can support the air monitoring objectives, including ensuring that sampling strategy is representative of the specific phenomena being investigated and is sufficient to adequately characterize pollutant concentrations in the locations of concern during the periods of interest. Aclima will work with communities to define how performance against these objectives is communicated during monitoring.

4.4.2 Element 7: Monitoring methods and equipment

Aclima proposes to draw on its extensive experience building and operating mobile monitoring fleets at scale to offer a base set of methods and equipment, while providing some scope for communities to shape deployment. This ensures feasibility at scale. As part of Element 7, Aclima will provide stakeholders with a description of the mobile monitoring vehicles and equipment that will be used in support of the SMMI, with emphasis on how they will be used to support the community air monitoring objectives. The strength and limitations of the monitoring equipment will be outlined.

Equipment

Aclima will deploy a mixed fleet of Aclima Mobile Platforms (AMPs) and Partner Mobile Laboratories (PMLs) to simultaneously achieve the geographic scale required to deliver meaningful and representative air quality data to all 64 CAPP CNCs while also providing high-quality speciated measurements at more targeted scales to fully characterize sources in locations of concern to the communities with greater precision and specificity.

All AMPs have a standardized measurement suite that covers a core range of priority pollutants and greenhouse gases (GHGs), operating at a collection frequency of every second (1 Hz, with the exception of ozone which is measured at 0.5 Hz): carbon monoxide (CO), carbon dioxide (CO_2), nitric oxide (NO), nitrogen dioxide (NO_2), ozone (O_3), methane (CH_4), ethane (C_2H_6), total volatile organic compounds (TVOC), fine particulate matter ($PM_{2.5}$), and black carbon (BC). The Aclima fleet can be operated across all times of day and days of the week using Aclima-employed, locally-hired drivers.

Aclima will partner with experienced scientists from academia and industry to deploy three PMLs across the state: UC Berkeley, UC Riverside (whose team includes experts from University of Houston and Baylor University), and Aerodyne. These subcontracted technical partners include scientists who are thought leaders in the application of mobile methods for investigating air quality issues and have significant experience designing and executing mobile monitoring projects. PMLs are instrumented to measure a wide set of speciated air toxics, bringing these measurements to many parts of California for the first time in a comprehensive manner.

Methods

Aclima proposes two distinct but complementary monitoring methods enabled by the use of a mixed fleet of 42 AMPs and 3 PMLs:

- *Broad area monitoring* for ambient concentration estimates, collected by AMPs in all 64 CAPP CNCs, with sampling design guided by dynamic algorithm and partially informed by CAMP discussions
- *Targeted area monitoring* for investigations of sources and areas of concern, collected by AMPs and PMLs, with sampling design guided by community input and by concerns identified during broad area mapping

As part of the CAMP(s) process, Aclima will outline the air monitoring approach and work with communities and CARB to tailor the approach in response to community concerns and to ensure it meets community-specific monitoring objectives. Details about the two monitoring approaches are outlined below.

Broad area monitoring

In broad area monitoring, Aclima's fleet of Mobile Platforms collect data within every community in the monitoring areas (as finalized during the CEP and CAMP(s) processes). AMPs will measure on publicly accessible roads in the communities, gathering repeat measurements at different times of day, days of the week, and seasons. Aclima will target up to 9 months of monitoring time in each community, looking to maximize time spent conducting measurements while being able to complete the monitoring and meet data verification and delivery deadlines for the project. This approach captures data in a spatially and temporally comprehensive way across all included communities.

Aclima designs monitoring campaign sizes and durations such that the fleet will have achieved an average of 20 repeat measurements distributed across all residential and major roads in all census block groups to provide adequate coverage throughout the monitoring areas. However, rather than specify the number of samples on any specific length of road within each census block group, Aclima uses a dynamic sampling design

algorithm that adapts daily with the specific goal of collecting data that will maximize improvement in the characterization of a location's air quality. This approach ensures that enough repeated measurements are collected in areas where increased pollutant variability requires additional sampling to achieve representativeness. The system uses observed data in combination with predictive models to prioritize data collection where there is specific need based on observed characteristics like a large mis-match between the expected and observed air quality at a location, a relatively small amount of data collected to date, a need for a greater density of data collection at a specific location based on an identified community need, and other air quality considerations.

The sampling design algorithm ensures sufficient data collection to support the calculation of spatially resolved ambient concentration estimates. In addition, the method supports source identification and assessment of disproportionate impacts by directing more sampling either in regions where there is larger variation in pollution concentrations or around locations of interest for the community. For a detailed discussion of the broad area sampling design and the dynamic sampling design algorithm, see section 5.2.1 below.

Broad area monitoring: Case study

Aclima applied the broad area monitoring methodology across 7,187 square miles in the San Francisco Bay Area, collecting data from Fall 2019 to Spring 2023. This generated annual ambient concentration estimates for O_3, $PM_{2.5}$, NO_2, NO, CO, CO_2, BC, and CH_4 as well as air toxics (see Figure 4.2).

Lessons learned in the San Francisco Bay Area were pivotal to improving Aclima's broad area monitoring methodology:

- Mobile sampling is prone to exhibit temporal artifacts as spatial artifacts, especially when sampling using the same subregions, e.g. complete census tracts, to assign driving over the entire monitoring period. Aclima now minimizes temporal artifacts by sampling in a manner that is more diverse across the entirety of project coverage.
- Dense data collection that focuses on driving on all roads in an area over a short time window leads to high or unpredictable costs and highly spatially correlated data. Aclima now applies more intelligent drive planning and turn-by-turn routing algorithms that more efficiently cover a contract area and yield more informative data.
- Fluctuating levels of variance in aggregate pollution estimates throughout Aclima's monitoring area led Aclima to develop a system that determined where to drive based on observed variance at a location rather than on expected variance in an area.

- Driving almost continuously for two years out of multiple hub locations allowed Aclima to refine how the team tracks driving and understands what are the most informative metrics to help better monitor and manage data collection.

Figure 4.2: Example of plotted ambient concentration estimates for NO_2 in the San Francisco Bay Area, CA. This plot uses data generated by the broad area monitoring method.

Targeted area monitoring

To complement broad area monitoring, Aclima proposes targeted area monitoring that focuses on specific air pollution concerns at smaller spatial scales. This involves monitoring over a relatively small area over a shorter duration in time and is designed to complement the broad area monitoring coverage by providing more in-depth information about a specific area of concern. This can provide both enhanced characterization of sources as well as an assessment of the locations of concern and sensitive receptors in the community that are impacted by source emissions. Targeted area monitoring is designed to perform detailed chemical, temporal, and/or spatial characterization at a select number of locations of concern identified by communities. The characterization can include aspects such as more dense temporal information about pollutants by time of day, detailed chemical speciation around sources of concern in a particular area, or spatial information about the location of an emission source and extent of the areas and people impacted by the source.

Both AMPs and PMLs will be used for targeted area monitoring. PMLs will focus on detailed chemical speciation around locations of concern and exploration of the spatial impact of those pollutants. The Aclima fleet is well suited to temporal characterization due to the ability to drive around-the-clock, and can also be used for spatial characterization for source types or proxies supported by Aclima's core pollution measurement suite. The assignment of a particular target area to the AMP fleet versus a PML will largely be determined by the source of concern and the suite of pollutants necessary to characterize the source.

The mobile sampling strategy for targeted area monitoring is different from that used for broad area monitoring. Targeted area monitoring requires translating community concerns into monitoring outcomes that will require different sampling approaches. Suitable sampling strategies might entail mapping all publicly accessible streets around a location of interest within predetermined boundaries, or systematic sampling on a predetermined route around the perimeter of a facility of concern. As with the broad area monitoring, representativeness is achieved by conducting repeat measurements to sufficiently characterize pollutant concentrations; however, the repeat measurements will typically (though not exclusively) occur over a more condensed time period in these targeted investigations.

Aclima, in collaboration with its technical partners, will formalize a two-phase framework of sampling options for targeted area monitoring that can be used to address community concerns to monitoring outcomes. This framework will be used in the CAMP(s) processes, providing flexibility to accommodate different types of community concerns and a repeatable approach to responding to community concerns at scale. In Phase 1, Aclima will gather and prioritize community-identified concerns. In Phase 2, Aclima will conduct follow-up monitoring to respond to any concerns identified during broad area monitoring. See a detailed discussion of the goals and sampling designs of the targeted area monitoring method in section 5.2.2.

Targeted area monitoring: Case study

In the Red Hook area of New York City, Aclima conducted a targeted monitoring study over a two week period in 2023 in response to community concerns about "last mile" warehouses in the area. The objective was to determine if an environmental justice community was statistically more impacted by diesel combustion due to last mile warehouses in the area. The monitoring was designed to include hourly pairwise sampling in Red Hook and a nearby but independent neighborhood without diesel traffic around warehouses. Aclima's study determined that there was significant spatial heterogeneity even within the small Red Hook study area, with significant localized diesel pollution (nitric oxide and black carbon) concentration enhancements observed along truck routes and near highway on ramps and that the community was impacted by higher ambient black carbon concentrations, primarily in the mornings, than in the nearby control

neighborhood (see Figure 4.3). These impacted areas were near parks and other sensitive sites, indicating that truck route adjustment could be a useful mitigation strategy to reduce neighborhood diesel PM exposure.

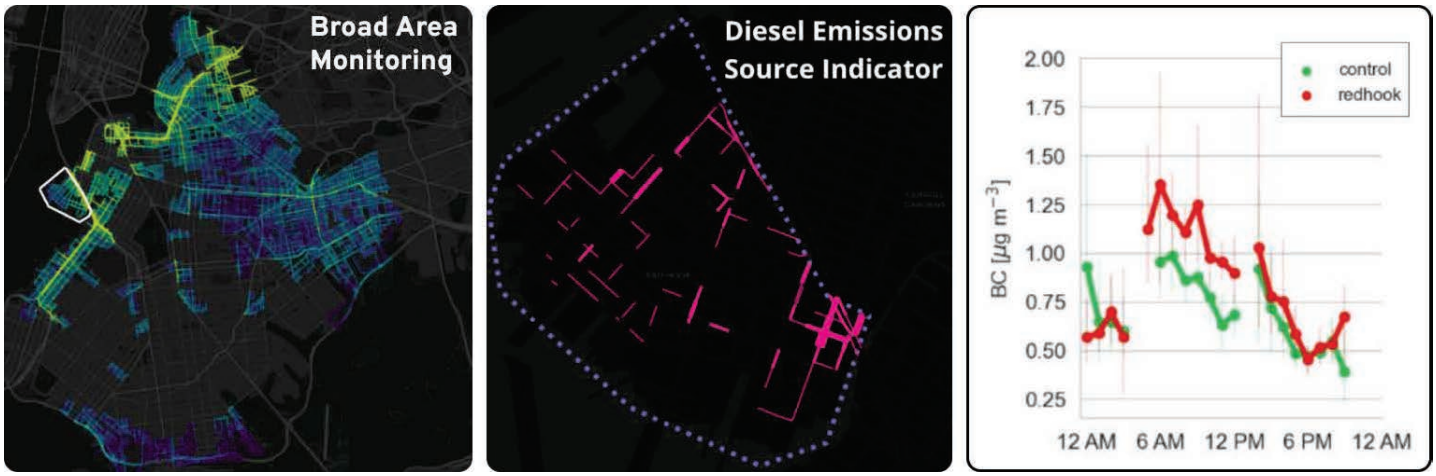

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Figure 4.3: Black carbon concentration results from mobile monitoring in the Red Hook area of New York City. The left image shows a map resulting from broad area monitoring in selected locations in Brooklyn for a year ending in August, 2023 with the Red Hook neighborhood outlined. The center and right images show the results of targeted area monitoring in the Red Hook neighborhood.

4.4.3 Element 8: Monitoring Areas

Aclima proposes mobile monitoring coverage across all 64 of the CAPP CNCs. The method Aclima used to identify an initial set of proposed monitoring areas was developed using the definition of priority populations as defined by CARB in the California Climate Investments Priority Populations 2023. Aclima's method identifies and ranks areas in the CNCs that contain priority populations, have minimal air quality monitoring data, and experience the potential for a high burden from nearby sources. For a detailed description of how the proposed monitoring coverage was developed for this proposal, see section 5.2.1.

During the CAMP(s) development process, Aclima will work with the PEG, community co-leads, and CARB to refine the distribution of monitoring resources among CNCs and finalize the proposed monitoring areas informed by local knowledge and expertise. In support of this work, Aclima can leverage the data-informed methodology used to develop Aclima's initial proposed monitoring areas (see section 5.2.1). In addition to CalEnviroScreen at the census tract level, Aclima will use additional data resources at a

higher spatial resolution, e.g. census block level, to help propose initial monitoring areas. Aclima will work with Kearns & West, who specializes in mediation, to ensure there is a neutral and equity-focused facilitator for these discussions. Aclima recognizes that a mobile monitoring approach may not support the specific air quality objectives of some communities and that some communities may decide not to participate in the SMMI.

4.4.4 Element 9: Quality control procedures

Aclima has a standard Quality Assurance/Quality Control (QA/QC) process with existing documentation used to support mobile monitoring work with regulators and CBOs in other jurisdictions. This will provide a starting point for discussions with communities on QA/QC processes in the SMMI, and how these activities should be communicated during monitoring. In addition, Aclima will work with technical partners to provide QA documentation for the mobile laboratories during the CAMP(s) process and make them available to communities and CARB. More detail about the goals and processes in Aclima's QA system can be found in Aclima section 5.6 below.

4.4.5 Element 10: Data management

Aclima's data management system collects and processes raw data through multiple levels of processing, storage, and tagging to create finalized data throughout the execution of the mobile monitoring campaign (section 6.2.1 below). Aclima will create a description of the data management plan, including data descriptors, data storage, and data review and flagging, and provide it to CARB. These will complement the QA system documents, which detail Aclima's data review and verification processes and ensure that invalid data are properly tagged for removal from any subsequent data analysis by Aclima and our technical partners and CARB.

4.4.6 Element 11: Field measurements

Aclima will provide details around how the monitoring work will be conducted, including specific field procedures. The CAMP(s) will provide information useful to communities including what they can expect from fleet operations in their neighborhoods (what vehicles will look like, driver safety protocols, etc.). The CAMP(s) will provide a clear timeline to ensure clear expectations on air monitoring duration, frequency, milestones, and deadlines.

4.5 CAMP Sections 12-14: Using the data to take action

4.5.1 Element 12: Evaluating effectiveness

Aclima will work with CARB, the PEG, and communities to develop a procedure to track progress and adjust plans where necessary to ensure actionable final data. Aclima will provide a template for this procedure based on past experience including: tracking completeness metrics for driving; identifying and documenting specific goals; and determining a plan for addressing and resolving issues. This plan will be consistent with the overall management plan and the changes and issues management sub-plans. Aclima will build in consistent feedback loops and ongoing engagement with communities throughout the initiative. As discussed above, Aclima will work to maximize collection time – up to 9 months in project year 2. Aclima acknowledges the SMMI to be a discrete, finite project but will also work to ensure CARB and communities have what they need to consider actions beyond the scope of this project.

4.5.2 Element 13: Analyze and interpret data

The data resulting from the SMMI are intended to facilitate focused actions by communities and CARB, including any future work to identify and prioritize locations for more comprehensive community-scale air monitoring, or develop Community Emissions Reduction Programs (CERPs). To support this potential future work, Aclima proposes to provide a defined suite of analyses and visualizations (see also Element 14, and Table 4.3) for which mobile monitoring data is well-suited and that can help communities better understand and interpret the data in the context of their goals. This suite comprises analyses for *identifying sources* and *identifying locations of disproportionate impact*, such as diesel indications, toxic air contaminants hotspots, and natural gas leaks (fully described in Table 4.3, below). The CAMP process will allow communities to tailor this subset depending on what is of most value for their specific air quality goals. Aclima's approach to preparing the data for these procedures, including QA/QC, are described in sections 5.6 and 6.2 and will be communicated in the CAMP process.

Source identification analyses

Enhancement-based analyses

These use a combination of measurements that are indicative of a particular source to suggest a source location. Aclima defines an enhancement as a localized elevation in concentration of a pollutant that is measurably distinguishable from the ambient background. These typically represent the detection of emissions in the form of a coherent plume in the vicinity of the source. Enhancements are typically identified in the

time-resolved data, and repeated observations of an enhancement in a given location suggest a degree of persistence in the signal and therefore more confidence in a hotspot and underlying source (see Figure 4.4 below). Temporal characterization can also be an important aspect of enhancement-based analyses. For example, identifying times when hotspots emerge and when they are mitigated, such as in the natural gas leak example in Figure 4.4 which shows the time of repair is coincident with enhancement detections ceasing.

Examples of source types that can be identified by this type of analysis include diesel particulate matter, natural gas leaks, and particulate matter (PM) from construction sites or other industrial facilities. In some cases, enhancement-based analysis results indicate the presence of a source and follow up using different measurement methods, typically involving more detailed chemical speciation, are necessary to confirm the identity of the source. For example, a cluster of TVOC enhancements from an industrial or commercial source where further chemical speciation would help to characterize the source.

Ambient concentration-based analyses

These use the presence of spatial gradients in the ambient concentrations observed for specific air pollutants (or combinations of different measured pollutants) that may indicate the presence of a source and the spatial extent of detectable emissions from that source (see Figure 4.4 below). These spatial gradients may be observed in the temporally averaged concentrations aggregated over multiple measurements or within individual time series of a single drive. Whereas enhancement-based analyses may more precisely indicate the location of a source and the extent to which pollution impacts the areas immediately downwind, ambient concentration-based analyses provide a wider spatial view of certain sources and the areas they persistently impact.

An example of this type of signal is the observation of mobile source tracers, such as NO_2, black carbon, or CO in a neighborhood bordering a freeway and the decay of concentrations with distance from the freeway. In some cases, a single pollutant can be associated with a specific source of concern, like arsenic from cement plants. For many source types, a combination of measurements are used to identify the source, such as the combination of methane, ammonia, and sulfur compounds identifying animal feedlots.

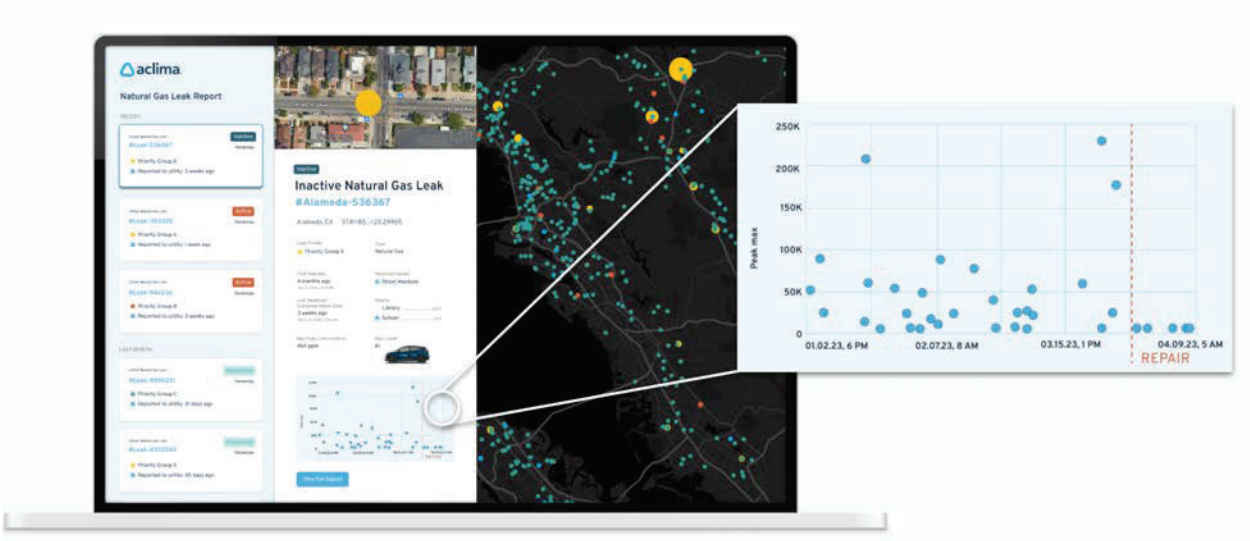


Figure 4.4: Example of an enhancement-based analysis of source identification of a natural gas leak

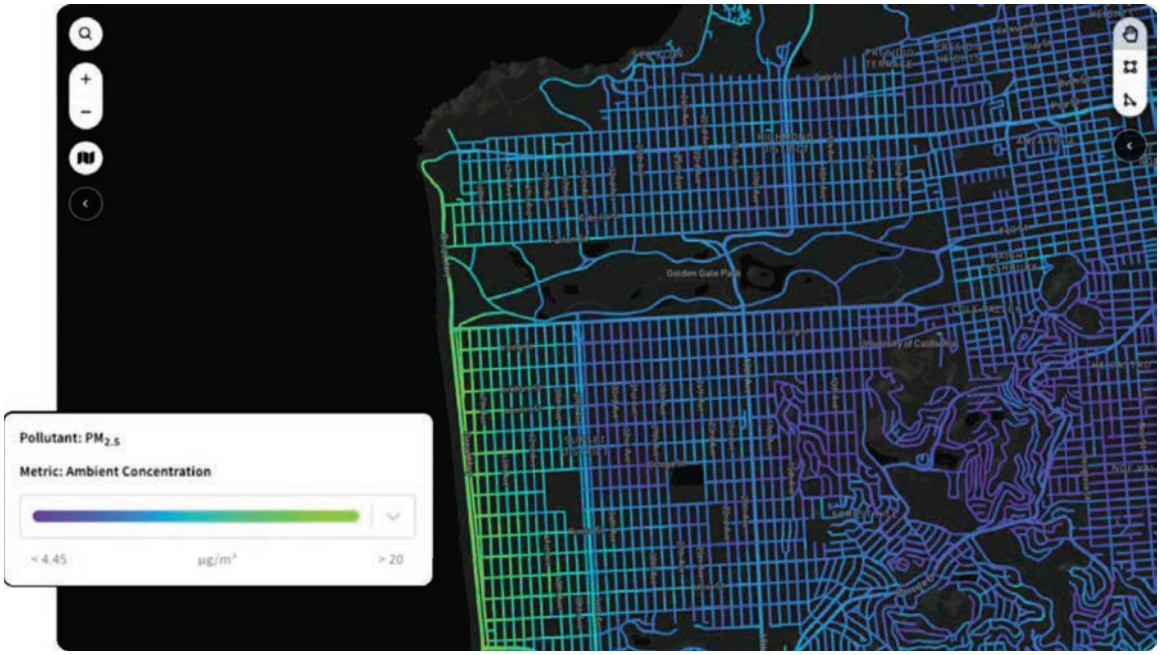


Figure 4.5: Example of an ambient concentration-based analysis for source identification. Estimates for $PM_{2.5}$ from broad area monitoring in San Francisco, CA, illustrate areas with consistently higher concentrations along the coast, plotted on a map. PM size fraction data from the AMP suggest that the source is sea salt aerosol

Locations of disproportionate impact analyses

Ambient concentration estimates from broad area monitoring
These can illustrate areas with consistently higher concentrations. This analysis can be based on temporally aggregated ambient concentrations or relative enhancements above a regional concentration.

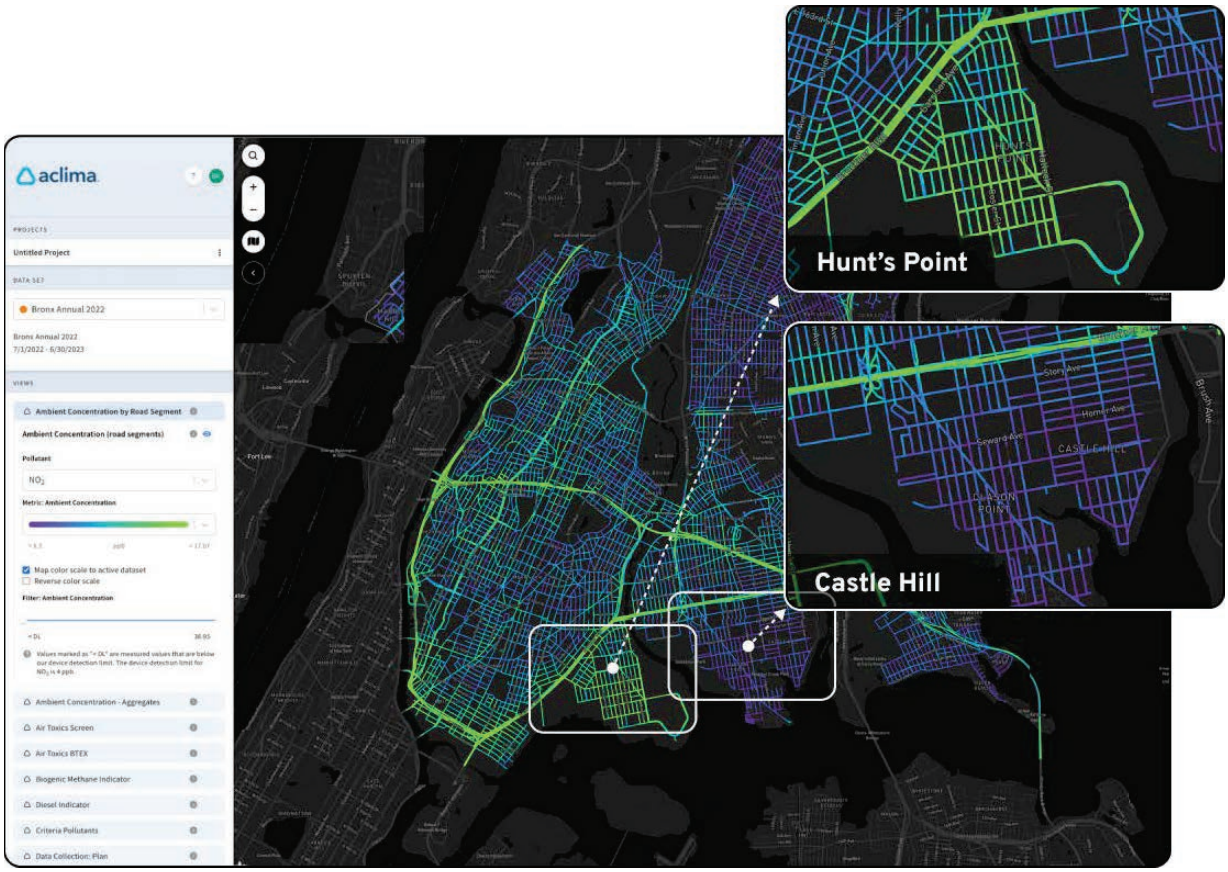


Figure 4.6: Example of ambient concentration estimates from broad area monitoring. This map shows areas with persistently higher and lower relative concentrations, such as Castle Hill versus Hunt's Point. Area labeled "Castle Hill" includes Soundview and Clason Point neighborhoods.

Ambient concentration estimates resulting from targeted area monitoring
When conducted around community locations of concern, these can provide more detailed information about the area over which the community is impacted. The analysis reflects measurements over a shorter period of time, but complement the results of the ambient concentration estimates from the broad area mapping (see Figure 4.3).

Table 4.3: Examples of possible analyses available to communities from past Aclima work, which can support identifying sources or locations of disproportionate impact

Identify sources	
Enhancement-based	
Indicators	Analysis of block level data for signatures.
Diesel	
Biogenic methane	
Size-resolved PM	
Toxic Air Contaminants	
Natural gas leak	Clear indication of a source and characterized as natural gas, plus localization. A probabilistic timeline of when a leak started and when it was resolved.
Speciated Toxic Air Contaminants characterization	Characterizing species from Toxic Air Contaminants indicators.
Hotspot identification	Localized, time-resolved hotspots tagged with wind direction at occurrence.
Ambient concentration-based	
Spatial gradients	Identify a clear gradient from a particular source to impacted areas.
Hotspot identification	Neighborhood-scale, persistent hotspots.
Identify locations of disproportionate impact	
Ambient concentration estimates from broad area monitoring	Spatial plot of average pollution across census block groups
Ambient concentration estimates from targeted area monitoring	Pollution fingerprints for Toxic Air Contaminants at census block group level.

4.5.3 Element 14: Communicate results

Aclima will work with communities and the PEG to identify the most valuable mobile monitoring data visualizations to communicate results to the public and in support of subsequent actions to reduce emissions. Aclima has extensive expertise producing online, interactive, and free-to-use hyperlocal air quality data visualization tools that meet community needs (Figure 4.7) and experience integrating community concerns, emission sources, sensitive sites, and socioeconomic data as context in visualizations alongside Aclima's air monitoring data (Figure 4.8). Data visualization elements that may be considered include summary statistics, hotspot visualizations, comparative analysis, pollution source identification among others. Aclima will provide a set of customizable templates and contextual data, built on the Esri platform, to ensure individual community preferences can be feasibly supported post-monitoring and maintained beyond the end of Aclima's involvement. Aclima's team will work to ensure that data visualization solutions are understandable by a non-scientific audience and are driven by community needs, input, and monitoring goals. See section 6.2.5 for more detailed information.

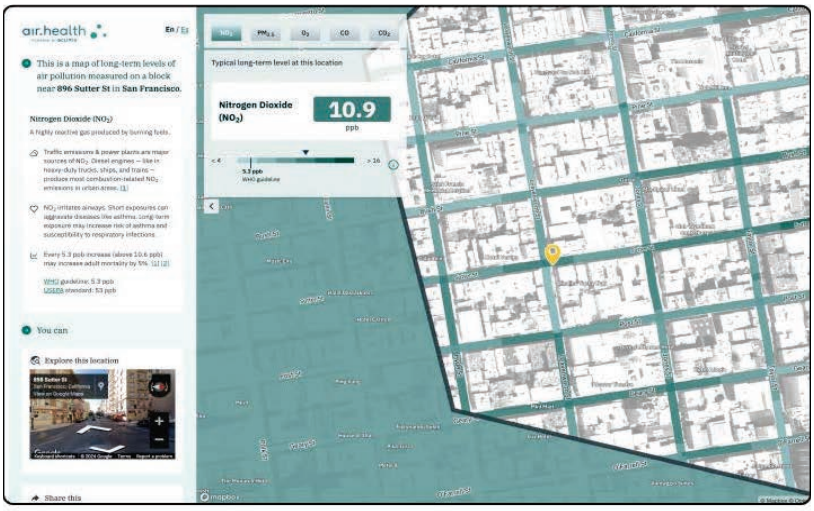


Figure 4.7: Screenshots of, respectively, the air.health and AirNY websites, as examples of online, interactive, and free-to-use hyperlocal air quality data visualization tools developed by Aclima. A video walk-through of the AirNY tool is available here[16].

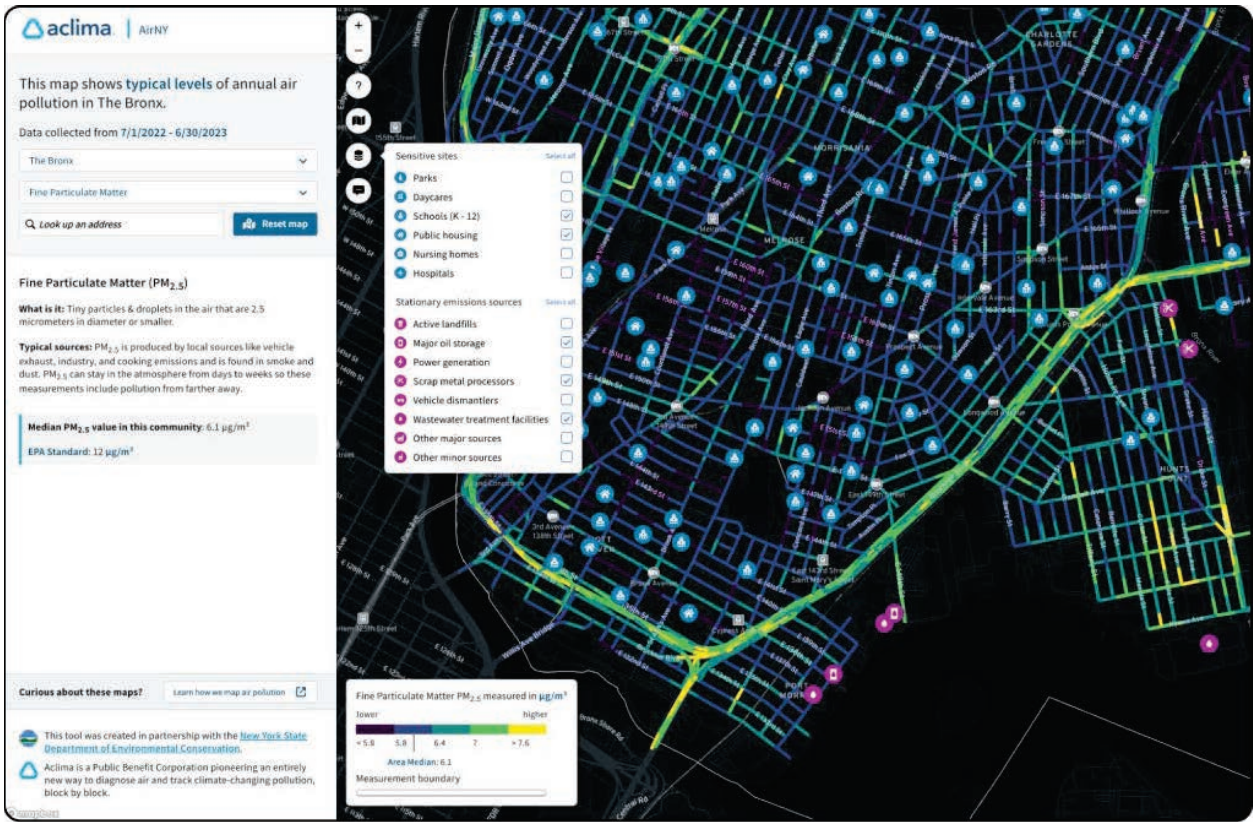


Figure 4.8: Screenshot displaying the integration of community concerns, emission sources, sensitive sites, and socioeconomic data in AirNY, as developed by Aclima in partnership with communities and NYSDEC

Ensuring equitable CAMP(s) resource allocation

In addressing the challenges of developing CAMP(s), Aclima places a strong emphasis on equitable resource distribution. Aclima's partnership with Kearns & West, a firm with extensive experience in designing and leading community engagement strategies across California, is a cornerstone of Aclima's approach. Their expertise is in facilitating virtual and hybrid community meetings that foster inclusivity and trust, making them instrumental in collaborating with CAPP CNCs.

To ensure maximum coverage within budget, Aclima employs a data-driven methodology. For example, in work with the New York State Department of Environmental Conservation (NYSDEC), Aclima utilized tools like the US EPA's EJScreen Environmental Justice Screening and Mapping Tool, combined with additional contextual data layers. This approach allowed us to propose measurement scenarios that align with community needs and regulatory criteria, such as New York state's Disadvantaged Communities Criteria.

By integrating Kearns & West and community co-leads' engagement expertise with Aclima's data-driven prioritization techniques, Aclima is well-equipped to navigate CAMP resource allocation and feasibility challenges. This ensures effective measurement campaigns that support CARB and community actions to reduce emissions and exposure.

4.7 CAMP(s) approval timeline and process

Per the RFP, CAMP(s) will be subject to approval by CARB (after review by the PEG) with monitoring planned to begin by Q2 2025. Dates named herein are based on CARB's schedule and are subject to change at CARB's discretion. Aclima will follow the process outlined by CARB for review and approval:

- Aclima will make the draft CAMP(s) available on a public website for a 14-day public review period following submission of the CAMP(s) to CARB. Aclima will provide a means for public comments to be posted to the document online.
- Aclima will respond to all comments on the document within fourteen (14) days of the end of the public comment period. Aclima will catalog and organize the comments and responses so that CARB can easily verify all comments were responded to or addressed.
- After CARB approval, Aclima will provide the final CAMP(s) to CARB for posting to their website.
- Begin conducting mobile monitoring only after CARB approval of the CAMP(s).

4.8 Task 4 experience

Aclima has considerable experience working with community groups and regulators to catalog large amounts of feedback and document how they were addressed. See Table A12.7 in Attachment 12 for full details of past projects, but CAMP-relevant highlights include:

- In New York State, Aclima worked with the NYSDEC to launch and implement a statewide Community Air Monitoring Initiative. Throughout this process, Aclima worked closely with the DEC team to discuss, understand, and incorporate several types of feedback. The Aclima team worked with DEC's Division of Air Resources scientists to ensure the technical documentation around QA/QC processes, methodology, and science communications met their needs. Through several rounds of feedback, where the Aclima team carefully responded to and documented each line item, Aclima and DEC were able to finalize technical documents that supported DEC's mobile air monitoring objectives for New York communities as well as plain language versions of these documents to share

methodology with the public. Aclima also worked with the DEC team and end users through the multiple product development stages of an iterative, human-centered design process. Aclima conducted user research, tested prototypes and collected feedback, and usability tested the public portal, AirNY, to ensure it was designed to be accessible and as useful as possible for communities across the state.

- In a mobile monitoring campaign in West Oakland in partnership with WOEIP, Aclima worked with WOEIP and its partners to prioritize pollutants and sources of concern to inform monitoring. WOEIP used Aclima data to identify impact zones and set emissions reduction targets. The Community Emissions Reduction Program (CERP), Owning Our Air, leverages block-by-block data to identify seven Impact Zones and design 89 interventions, a third of which were in active implementation as of July 2022.

4.9 Management and governance

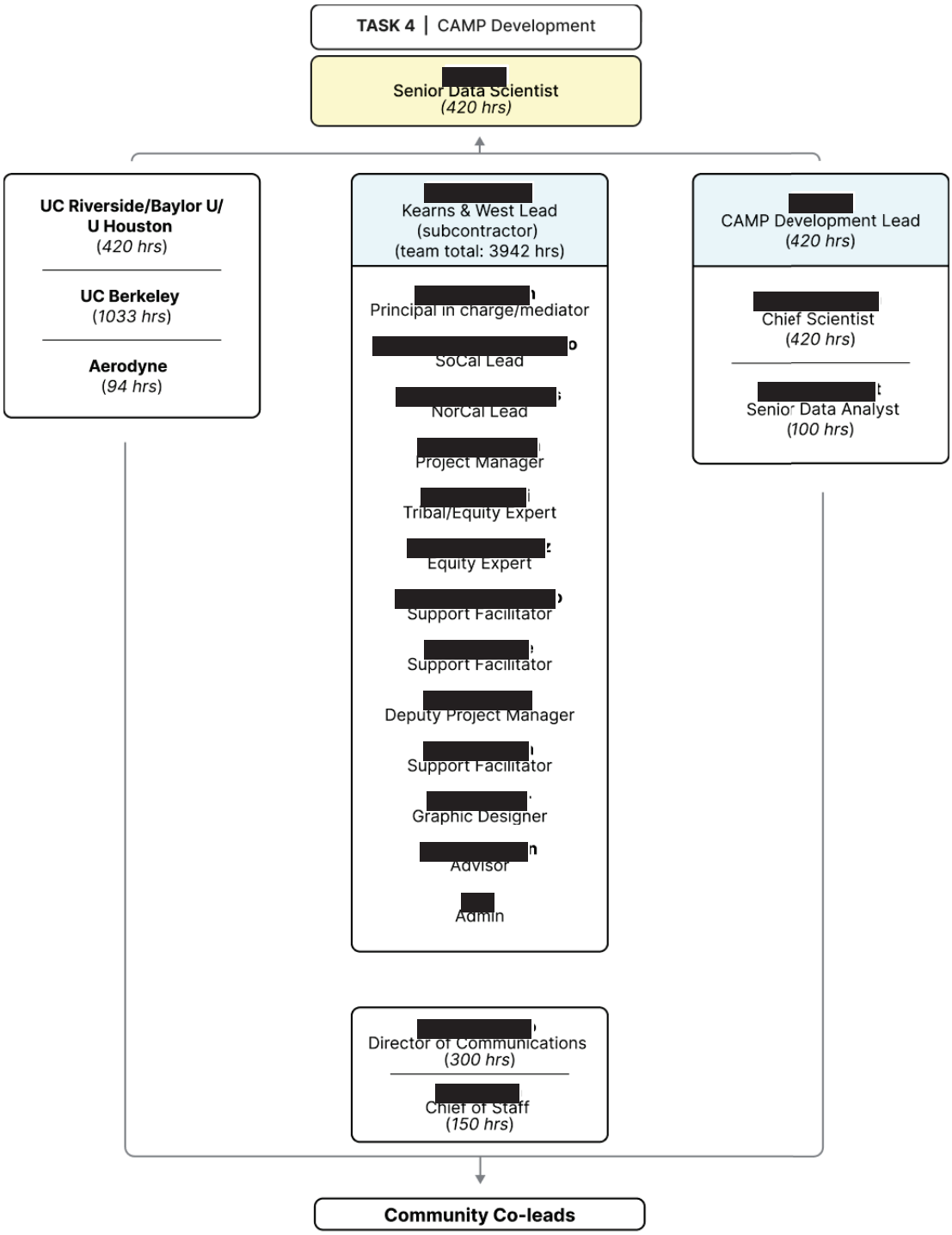


Figure 4.9: Task 4 management and governance structure

Table 4.4: Task 4 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 4: Develop a Community Air Monitoring Plan		
4.1: Implement Community Engagement Plan	[redacted]	5/19/26
4.2: Develop Draft CAMP(s) for CARB review and Public Comment	[redacted]	4/30/25
4.3: Incorporate Public and CARB Comments into CAMP(s)	[redacted]	5/31/25

Table 4.5: Task 4 tasks and deliverables compliance

RFP Task #[17]	**RFP Task/Requirement**	**Aclima's Compliant Solution/Deliverable**
4	Design a Community Air Monitoring Plan (CAMP)	
4.1	Develop CAMP(s) adhering to guidelines as outlined in CARB's Community Air Monitoring Plan Guidance website unless otherwise stated in this scope of work.	Aclima will develop CAMP(s) adhering to guidelines, with a mix of base (fixed) and flexible components to balance RFP requirements with community co-design.
4.2	Consult with the expert group for CAMP(s) recommendations, advice, feedback, concerns. prior to submittal to CARB. Document expert group comments and how they were addressed.	The PEG will be key advisors to ensure this initiative serves CARB and community air quality monitoring needs. Aclima's community engagement team will document all expert group comments and how they were addressed prior to submission of the CAMP(s) to CARB.

[17] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38-39 are covered in the proposal

4.3	Submit final CAMP, or CAMPs, to CARB for review and approval.	Aclima will submit the CAMP(s) for approval per requirements.
4.3.a	The Contractor will make the final CAMP available for a 14-day public review period following submission of the CAMP. The Contractor will host a copy of the CAMP on a public website and provide a means for public comments to be posted to the document.	Aclima will make the draft CAMP(s) available on a public website for a 14-day public review period following submission of the CAMP(s) to CARB. Aclima will provide a means for public comments to be posted to the document online.
4.3.b	The Contractor will address or respond to all comments received within 14 days of the end of public comment.	Aclima will respond to all comments on the document within fourteen (14) days of the end of the public comment period.
4.4	Begin monitoring and complete all CAMP(s) documentation by dates. outlined in the deliverable table.	Aclima will comply with deliverable table dates on the beginning of monitoring and completion of CAMP documentation.

5. Conduct mobile monitoring[18]

Summary

As Community Air Monitoring Plan(s) (CAMP(s)) are approved, Aclima will begin mobile monitoring operations as specified in the CAMP(s). Aclima will conduct mobile monitoring within the specified time frame, beginning no later than Q2 2025 and ending no later than Q2 2026, for up to 9 months. This proposal will be revised with input from CAMP(s).

In order to cover the geographic scale mandated by the RFP, Aclima is proposing a deployment of mobile monitoring resources to cover all 64 CAPP Consistently Nominated Communities (CNCs), meeting and exceeding priority population coverage requirements, via a mixed fleet of 42 Aclima Mobile Platforms (AMPs) and 3 Partner Mobile Laboratories (PMLs). Monitoring coverage will include 12,000 linear and 951,000 total miles[19] over an area of 1,300 square miles containing 5.2 million people (Figure 5.4). Aclima will maximize the duration and frequency of monitoring in order to produce a data set as representative as possible across multiple seasons, times of day, and days of week. This will deliver at the data quality and spatial scale mandated for addressing community air quality concerns in the most impacted populations in the state.

Table 5.1: Summary of key elements of the Aclima monitoring approach to the SMMI. These are discussed in more detail in the sections that follow

Monitoring Capabilities (section 5.1)	42 AMPs (42 Aclima Mobile Nodes or AMNs – sensor and hardware package including specialized sensors and platform connectivity – mounted in 42 Aclima vehicles) and in 3 PMLs (feeding data to Aclima data management system) to cover all RFP-listed pollutants and sources directly or through proxies.
Monitoring Methods (section 5.2)	Broad area monitoring (maximum spatial and temporal coverage of a core set of pollutants) and targeted area monitoring methods (advanced targeting of sources of concern) with dynamic sampling (an algorithm built and updated over multiple deployments at scale to maximize efficiency and minimize temporal artifacts).
Monitoring Execution (section 5.3)	Deployment of a scalable mixed fleet of 42 standard mobile platforms to support broad area monitoring across all hours

[18] The entirety of section 5 is hereby designated as confidential, trade secret and proprietary business information
[19] Linear = unique miles of monitoring. Total = all miles, including repeat visits. See glossary

	of the day (including routinely from 6pm to 8am and on weekends), complemented by three PMLs providing speciated measurements for targeted area monitoring.
Event Detection and Reporting (section 5.4)	Notification and communication to CARB of concentrations of concern that exceed California Office of Environmental Health Hazard Assessment (OEHHA) thresholds for acute exposure.
Weekly Reporting (section 5.5)	Weekly updates to CARB covering logistics and operations, QA, preliminary data and results, and any proposed amendments to monitoring strategy.
QA/QC (section 5.6)	Tested and vetted plan that emphasizes sensor performance at scale and characterizes and quantifies uncertainty across all data levels to the extent possible.

5.1 Monitoring capabilities

In the pursuit of comprehensive and accurate air quality monitoring, Aclima's capabilities extend far beyond data collection. The team's approach is grounded in the deployment of cutting-edge sensing hardware, a mixed fleet strategy for wide-area coverage at high spatial and temporal densities, and a deep understanding of the pollutants and source types relevant to the communities Aclima serves drawn from years of experience (see Table A12.7 in Attachment 12 for locations where Aclima has performed mobile monitoring projects similar to the proposed RFP.) This section outlines the three key pillars of Aclima's monitoring capabilities: the Aclima Sensing Hardware and Instrumentation, a Mixed Fleet Approach, and expertise in identifying and measuring a broad range of Pollutants and Source Types.

5.1.1 Aclima sensing hardware and instrumentation

The Aclima monitoring suite covers a core range of criteria pollutants, greenhouse gases, and other pollutants, operating at a collection frequency of every second (1 Hz, with the exception of ozone which is measured at 0.5 Hz): carbon monoxide (CO), carbon dioxide (CO_2), nitric oxide (NO), nitrogen dioxide (NO_2), ozone (O3), methane (CH_4), ethane (C_2H_6), total volatile organic compounds (TVOC), fine particulate matter ($PM_{2.5}$), and black carbon (BC). Additionally, each mobile platform will be outfitted with high frequency wind measurements (1 Hz). The complete sensor package, supporting hardware infrastructure, and vehicle, is referred to as a single "mobile platform." The wind sensor is mounted outside on the roof of the vehicle.

Table 5.2: Summary of pollutants in the Aclima monitoring suite, and collection frequency

Pollutant in Aclima monitoring suite	Collection frequency
Carbon Monoxide (CO)	1 Hz
Carbon dioxide (CO_2),	1 Hz
Nitric oxide (NO)	1 Hz
Nitrogen dioxide (NO_2)	1 Hz
Ozone (O3)	0.5 Hz
Methane (CH_4)	1 Hz
Ethane (C_2H_6)	1 Hz
Total Volatile Organic Compounds (TVOC)	1 Hz
Fine Particulate Matter ($PM_{2.5}$)	1 Hz
Black Carbon (BC)	1 Hz
Wind Speed and Direction	0.2 - 1 Hz

Aclima Mobile Node

At the core of the sensor package is a comprehensive sensor suite integrated into an Aclima-built hardware package, collectively called the Aclima Mobile Node (AMN). The AMN is a low power self-contained device that houses a range of different sensors in a temperature-controlled enclosure (solid state thermoelectric cooling) and includes a high quality GPS system and an LTE cellular router. The AMN is compatible with the DC power available in any vehicle (internal combustion engine, hybrid, and EV) and doesn't require external shore power, generators or additional batteries.

The AMN has significant computational capabilities and can also ingest, process and transmit data from external sensors and instruments, using a wide range of communications protocols.

Additionally, in the event of any connectivity issues the AMN can safely store a large amount of time-stamped sensor data to be transferred later once connectivity is restored.

Specialized sensors

Methane/ethane and BC sensors sit physically alongside the AMN in the vehicle but outside of the AMN enclosure, and use active flow sampling to draw ambient air from outside the vehicle. The AMN still functions as the communications portal to transfer gathered measurements from these specialized sensors to the cloud and as backup storage in the event of any connectivity issues. The AMN can also serve as a communications platform for additional sensors in custom applications.

Platform connectivity

Aclima's hardware platform has been designed to enable reliable and secure remote transfer of data from devices to the Aclima data management system. The AMN's firmware includes an Internet-grade firewall, a robust over-the-air (OTA) update mechanism using A/B partitioning, and advanced remote troubleshooting features. This leads to a very high mean time between failure (MTBF).

Table A12.7 in Attachment 12 describes which past Aclima projects have deployed AMPs.

5.1.2 Mixed Fleet Approach

Aclima's proposed mobile monitoring fleet for the SMMI is a first-of-its kind mix that simultaneously achieves the geographic scale required to deliver meaningful and representative air quality data to all 64 CAPP CNCs while also providing high quality speciated measurements at more targeted scales to fully characterize sources in locations of concern to the communities with greater precision and specificity. The components of the fleet include Aclima's scalable AMPs and three PMLs operated by subcontracted technical partners, UC Berkeley, Aerodyne, and UC Riverside.

Table 5.3: High level operational comparison of AMPs and PMLs

Fleet	Vehicle count	Proposed linear road miles[20] of measurement	Estimated weeks of operations
AMPs	42	12,156	2 (training) 39 (mobile monitoring)
PMLs	3	Approx. 150-200	32

Aclima Mobile Platforms (AMPs)

All vehicles in Aclima's fleet have a standardized measurement payload as described above (Table 5.2) providing measurements of a consistent set of pollutants in all locations. These vehicles sample in real time (from 0.5-1 Hz) and are operated as in-motion,

[20] Linear road miles: unique miles of monitoring. Total miles driven is much higher. See glossary

self-propelled, self-powered mobile platforms (without the need for an external onboard generator), but also have the ability to be powered from an onboard battery while stationary (temporarily parked or during breaks) for durations longer than 1 hour. The vehicles operate on publicly accessible roads and do not require a site lease or land access permissions. None of the proposed measurements require extended laboratory analysis. Staffing of Aclima's fleet vehicles ensures that monitoring occurs across all hours of the day within each community, including outside typical business hours (i.e. between 6pm and 8am) and on all days of the week.

Table 5.4: Summary of Aclima fleet compliance with Project Guidance Mobile Monitoring Definition

Mobile monitoring criterion	**Compliance**
Self-powered	Aclima vehicles are hybrid gasoline/electric-powered and do not require external power nor an external onboard generator.
Real-time	The Aclima vehicle+sensor platform samples in real time (from 0.5-1 Hz)
Self-propelled	Aclima vehicles are not stationary trailers. All sensors are included on the vehicle.
Able to collect measurements without requiring a site lease or land access permissions	Vehicles operate on publicly accessible roads and do not require a site lease or land access permission.
In-motion	Vehicles sample while in-motion, but have the ability to sample while stationary, powered by on-board battery, if desired.

The hardware components in each AMP include:

1. The AMN
2. Stand-alone black carbon and methane/ethane sensors
3. Roof-mounted wind sensing capability
4. A modular window panel that fits into any vehicle and contains sampling ports for the different sensors

5. A power and comms (LTE) hardware interface for power conditioning, overvoltage/overcurrent protection, with configurable “always-on” power rails. These components are flexible and modular, allowing for fast, scalable integration with most available passenger vehicles.

The proposed monitoring objectives for the SMMI require an Aclima fleet size of 42 vehicles. This is to allow data collection to occur across the state simultaneously, ensuring that seasonally representative measurements take place in every community included in the monitoring plan. Smaller fleets would need to move from one part of the state to the next sequentially, resulting in disjointed seasonal sampling from one community to another. Aclima’s approach ensures that pollutant concentrations are adequately and consistently characterized across all communities over the full 9 month time period.

Partner Mobile Laboratories (PMLs)

Aclima will partner with experienced scientists from academia and industry (UC Berkeley, UC Riverside, and Aerodyne) to deploy 3 PMLs across the state that are able to make measurements of a wide set of speciated air toxics (see Table 5.7), bringing these measurements to many parts of California for the first time in such a comprehensive manner. This will close the gap between the specificity of the priority pollutants listed by CARB in the RFP and what AMPs can detect. Each vehicle is custom-built with different specifications and instrumentation (see section 5.1.3 for details on pollutants measured and instrumentation payloads in each vehicle). All 3 vehicles sample in real time (with sampling times ranging from 1 second up to 30 minutes, depending on instrument) and are primarily operated as self-propelled in-motion mobile platforms, but also have the ability to be self-powered while stationary (temporarily parked or during breaks) for certain types of measurements where it may be desirable to collect for up to 30 minutes in order to get detailed chemical information via Gas Chromatography/Mass Spectrometry (GC/MS) analysis. The vehicles operate on publicly accessible roads and do not require a site lease or land access permissions. None of the proposed measurements require sample durations longer than 30 minutes, and no extended laboratory analyses are proposed. The PML operations have flexibility to monitor both within and outside of typical business hours, depending on the time periods of interest for specific investigations.

Table 5.5: Summary of PML compliance with Project Guidance Mobile Monitoring Definition

Mobile Monitoring Criterion	Compliance

Self-powered	All PML vehicles are gasoline or electric-powered and do not require external power.
Real-time	PML samples in real time (from 1 Hz to every 30 minutes).
Self-propelled	PML vehicles are not stationary trailers. All sensors are included on the vehicles.
Able to collect measurements without requiring a site lease or land access permissions	PML vehicles operate on publicly accessible roads and do not require a site lease or land access permission.
In-motion	All PMLs will sample primarily while in-motion, but also have the ability to sample while stationary for improved precision and for measurements requiring longer response times (no longer than 1 hour).

Unlike AMPs, PMLs must return at the end of each sampling day to an operations base with specific power and other infrastructure requirements. Aclima will work with each team ahead of the monitoring period to set up operations hubs in strategically distributed parts of California in order to provide access for any of the vehicles to use as a base for efficient access to each community.

Aclima makes a preliminary proposal to divide sampling between the three PML teams along both geographic and source type divisions, although there is flexibility to adjust this plan to align with the final CAMP(s). The UC Berkeley team will cover primarily the Bay Area, Sacramento, and parts of the San Joaquin Air Districts. The UC Riverside team will cover the South Coast, Imperial County, and parts of the San Joaquin Air Districts. The Aerodyne team has specific capabilities to measure metals (in both the fine and coarse aerosol modes), ethylene oxide at very high precision, and complex VOC signatures (both in real time and with GC separation) that allow for fingerprinting of a variety of sources. The Aerodyne mobile lab will, therefore, be assigned to cover certain key source types, potentially in different parts of the state, that it is particularly well suited to monitor. These source types may include: cement plants, mineral processing, rendering plants, commodity fumigators, and sterilization facilities.

The sampling schedule for the PMLs will be determined once the CAMP(s) are approved. The proposed budget includes resourcing in terms of weeks (where 1 week is ~5 days of monitoring and ~8-10 hours per day) is included in Table 5.6 below.

Table 5.6: Summary of collection targets and budgeted monitoring weeks across PML operating teams

Team	Collection Targets	Monitoring Weeks Budgeted
UC Berkeley	Bay Area, Sacramento, San Joaquin	16
UC Riverside	South Coast, Imperial, San Joaquin	9
Aerodyne	Source Types: cement plants, mineral processing, rendering plants, commodity fumigators, sterilization fumigators	7

5.1.3 Pollutants and source types

To be responsive to the CAMP(s), Aclima has designed this proposal for extensive measurement capabilities (between AMPs and PMLs) and therefore the flexibility to characterize all of the source types listed in the RFP as well as many others that may be of interest to the communities. AMPs and PMLs allow for detection of all RFP-listed pollutants and sources directly or through proxies (see Figures 5.1 and 5.2, and Table 5.7 for details) with the exception of hexavalent chromium (particle bound total chromium in both $PM_{2.5}$ and PM_{10} can be measured), hydrogen sulfide (other sulfur containing compounds such as thiols can be a useful proxy), and ammonia (particle bound ammonium can be measured along with other agricultural tracers such as methane). Even with these three exceptions, the proposed monitoring will be able to detect localized enhancements of pollutants associated with all of CARB's priority source types, as listed in the RFP.

Aclima's proposed broad area monitoring coverage includes emissions sources spanning all of the sources prioritized in the RFP and the resulting measurements will allow for characterization of a core set of pollutants and proxies for certain pollutant classes (e.g. diesel PM) across the entire monitoring area. Some of the sources targeted and/or observed in prior Aclima deployments, and available to the SMMI, include, but are not limited to:

- Mobile sources, including diesel vs non-diesel emissions.
- Natural gas leaks from distribution systems.
- Biogenic methane sources (landfills, farms, wastewater treatment, etc.).
- Evaporative emissions from fuel storage sites.

- TVOC emissions from various industrial and commercial sources, including chemical manufacturing, paint supply stores, foam manufacturing, among others.
- Particulate matter (PM) from construction sites or industrial facilities, including cement manufacturing and mineral processing, that are sources of coarse mode aerosol.
- Diesel particulate matter (as Black Carbon detected concurrently with NO_x emissions) from truck traffic associated with last mile warehouses.

Aclima's subcontracted technical partners, UC Berkeley, Aerodyne, and UC Riverside, provide a larger set of mobile measurement capabilities that greatly expands both the types of sources that can be characterized as well as the specificity with which they can be characterized from a health perspective. These partners have experience monitoring the following source types, and can make this capacity available to the SMMI:

- Metal working and metal finishing industries
- Foundries and secondary smelters
- Sterilization facilities
- Commodity fumigators
- Oil and gas extraction, production, and distribution
- Chemical manufacturing
- Animal feedlots
- Rendering facilities
- Ports
- Airports
- Railyards
- Warehouses and distribution centers (other truck-related businesses)
- Other large, permitted sources (e.g. wastewater treatment plants, landfills, cement plants)
- Commercial activities (e.g. auto repair and auto body, dry cleaner, paint shop printing shop)

Appendix 9 provides examples of past monitoring efforts across some of these source types conducted by Aclima and its technical partners.

Aclima and technical partners' measurement capabilities are complementary in that both specificity and scale are achieved with the combined fleet. The source types that are observable by AMPs at large scale include practically all of the source types listed in the RFP (see Figure 5.1), with at least proxy measurements. The PMLs can achieve higher specificity for connecting observed signals to their source, albeit at small scales and must be used exclusively for targeted monitoring. Notably, natural gas, landfills, wastewater, and animal feedlots, can be detected with both high specificity and at large scales as a result of concurrent methane and ethane measurement in the AMP, which allows for distinguishing thermogenic from biogenic sources of methane.

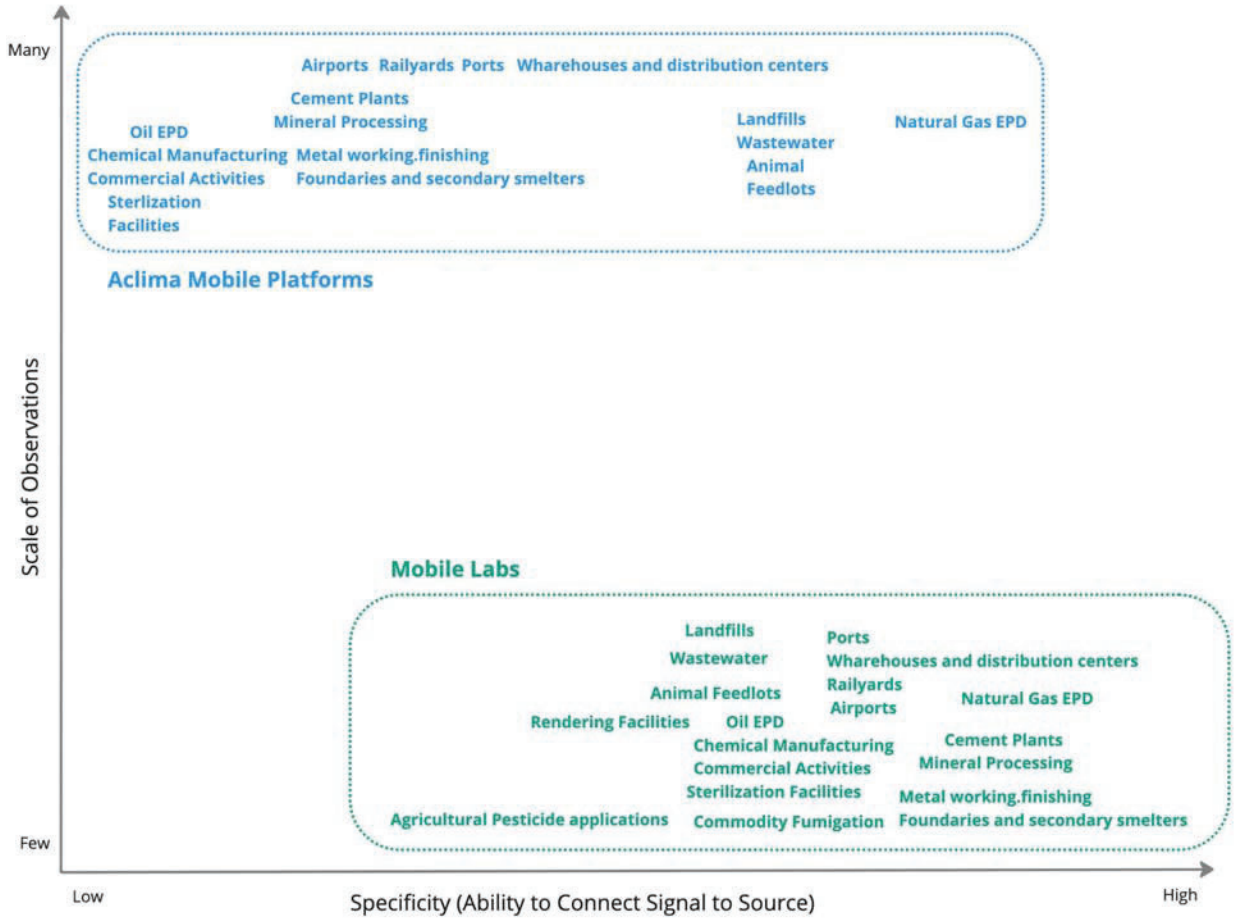


Figure 5.1: RFP priority sources detected by the AMPs (blue) and the PMLs (green) along the dimensions of scale (vertical axis) and specificity (horizontal axis)

As described in Figure 5.1 above, PMLs provide high specificity at small scales for the sources listed. Aclima's broad-coverage fleet provides large scale, but with less

specificity, especially for VOC-emitting source types, which are detected as a single TVOC class. Natural gas, landfills, wastewater, and animal feedlots can all be detected with both high specificity and at large scales due to the measurement of methane and ethane in all fleet vehicles.

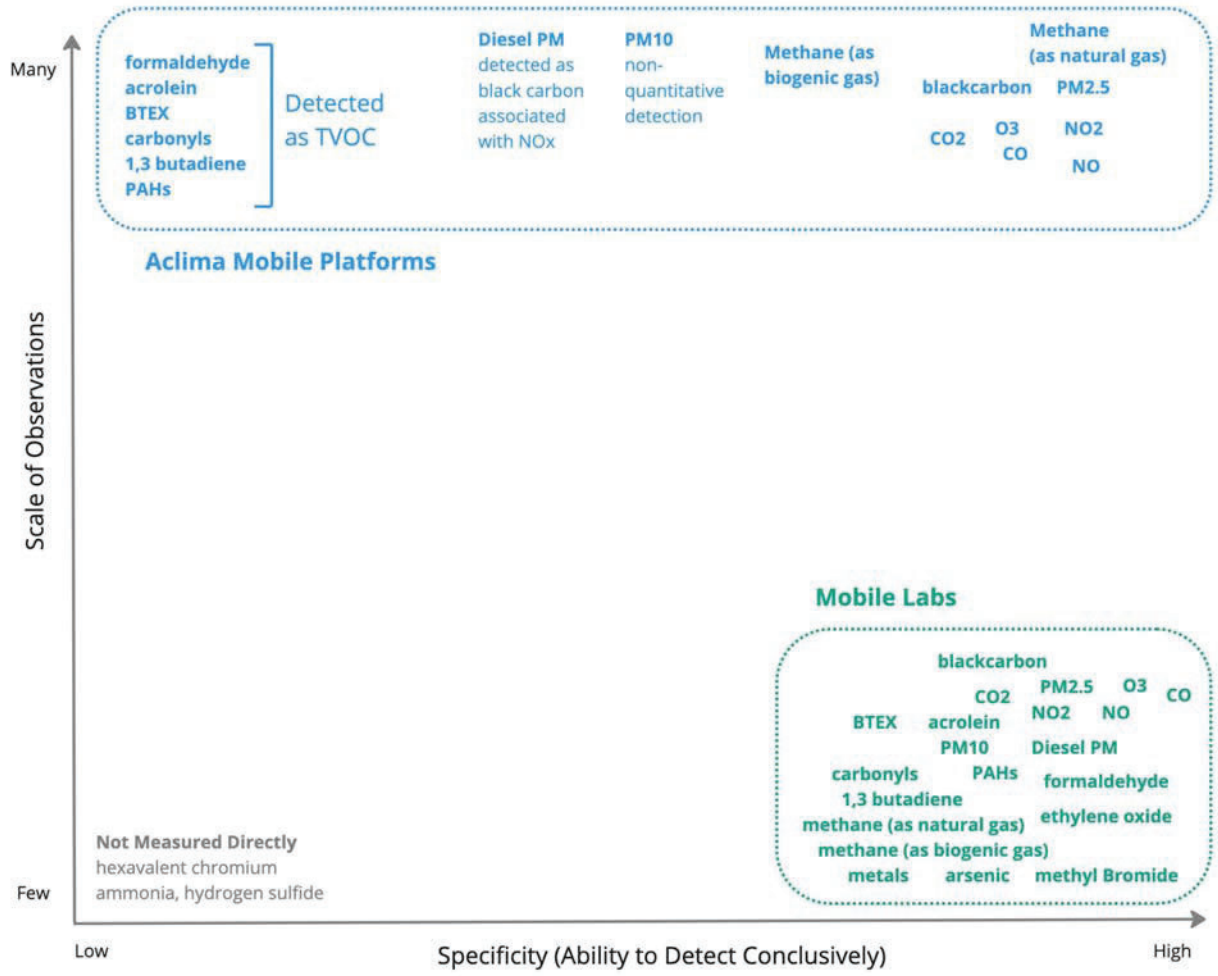


Figure 5.2: RFP priority pollutants detected by the AMPs (blue) and the PMLs (green) along the dimensions of scale (vertical axis) and specificity (horizontal axis)

As noted in Figure 5.2 above, hexavalent chromium, ammonia, and hydrogen sulfide are the only pollutants included in CARB's priority list in the RFP that are not included in this proposal; however, the suite of measured pollutants is fully comprehensive to allow for characterization of sources associated with these excluded measurements: (a) particle bound total chromium measurements (both in the fine and coarse modes) are included which may indicate locations where hexavalent chromium could be a concern; (b) particle bound ammonium and methane are included, which can be useful tracers for agricultural

sources of ammonia; and (c) certain sulfur containing compounds such as thiols are included, which are often co-emitted from hydrogen sulfide sources.

Table 5.7 provides a full list of the measurements proposed from each fleet along with sampling frequency and limit of detection (or precision where applicable), showing that all limits of detection are adequate for measuring near ambient concentrations typical in California. Figure 5.3 shows how the proposed pollutants measured map to each priority source type listed in the SMMI RFP.

Table 5.7: Full list of the measurements proposed from each team along with sampling frequency and limit of detection/precision. AMN: Aclima Mobile Node; SP-AMS: Soot Particle Aerosol Mass Spectrometer; Vocus PTR-ToF: Vocus Proton Transfer Reaction Time of Flight Mass Spectrometer ; GC-EI-ToF: Gas Chromatograph Electron Impact Time of Flight Mass Spectrometer; XRF: X-ray fluorescence

Instrument	Species measured	Sample Time	Limit of Detection or 3σ Precision	Group
AMN (electrochemical)	NO	1 sec	29.1 ppb	Aclima
AMN (electrochemical)	NO_2	1 sec	12 ppb	Aclima
AMN (UV absorption)	O_3	2 sec	5.4 ppb	Aclima
AMN (electrochemical)	CO	1 sec	84 ppb	Aclima
AMN (non-dispersive IR absorption)	CO_2	1 sec	10.2 ppm	Aclima
AMN (Optical particle counter)	$PM_{2.5}$	1 sec	4.2 µg/m3	Aclima
AMN (Optical particle counter)	Size Resolved Particle Counts (0.3 - 10 µm diameter)	1 sec	Min. resolvable concentration: 60 L-1	Aclima
AMN (multi wavelength aethalometry)	Black Carbon	1 sec	5.1 ug/m3	Aclima
AMN (direct IR absorption)	Ethane	1 sec	1.2 ppb	Aclima
AMN (direct IR absorption)	Methane	1 sec	7.5 ppb	Aclima

AMN (photoionization detection)	TVOC	1 sec	0.6 ppb	Aclima
Aerodyne Vocus PTR-ToF	Benzene	1 sec	30 - 300 ppt typical	Berkeley
Aerodyne Vocus PTR-ToF	Toluene	1 sec	30 - 300 ppt typical	Berkeley
Aerodyne Vocus PTR-ToF	Ethylbenzene	1 sec	30 - 300 ppt typical	Berkeley
Aerodyne Vocus PTR-ToF	Xylene (BTEX)	1 sec	30 - 300 ppt typical	Berkeley
Aerodyne Vocus PTR-ToF	Carbonyls	1 sec	30 - 300 ppt typical	Berkeley
Aerodyne Vocus PTR-ToF	Polycyclic Aromatic Hydrocarbons	1 sec	30 - 300 ppt typical	Berkeley
Aerodyne Vocus PTR-ToF	Acrolein	1 sec	30 - 300 ppt typical	Berkeley
Photoacoustic Extinctometer (PAX, Droplet Measurement Tech)	Black Carbon	1 sec	1.8 µg/m3	Berkeley
Cavity attenuation -phase shift NO2 analyzer (Aerodyne)	NO_2	1 sec	750 ppt	Berkeley
Dual beam O3 analyzer	O_3	2 sec	6 ppb	Berkeley
MIRA Ultra analyzer (Aeris)	CH_4	1 sec	7.5 ppb	Berkeley
MIRA Ultra analyzer (Aeris)	C_2H_6	1 sec	1.2 ppb	Berkeley
Water based condensation particle counter (TSI)	Ultrafine particles	1 sec	1500 cm-3	Berkeley
Fidas 100 (Palas GmbH)	PM (1, 2.5, 10)	1 sec	< 3 µg/m3	Berkeley

Closed-path CO2/H2O analyzer (Licor Biosciences)	CO_2	1 sec	< 3 ppm	Berkeley
Scanning mobility particle sizer (SMPS)	$PM_{2.5}$	60sec	0.1 µg/m3	Riverside
Handix optical particle counter (OPC)	$PM_{2.5}$	10 sec	N/A (limited by counting statistics only)	Riverside
Aerodyne Aerosol Mass Spectrometer (AMS)	$PM_{2.5}$	10 sec	0.1 µg/m3	Riverside
TSI Aerodynamec Particle Sizer (APS)	PM_{10}	10 sec	0.1 µg/m3	Riverside
Aerosol Devices condensation particle counter (CPC)	Ultrafine particles	10 sec	10 cm^-3	Riverside
Brechtel Tri-color Absorption Photometer (TAP)	Black Carbon	60 sec	0.2 µg/m3	Riverside
Brechtel Tri-color Absorption Photometer (TAP)	Diesel PM	60 sec	0.2 µg/m3	Riverside
2BTech UV absorption monitor	O_3	10 sec	3 ppb	Riverside
Thermo chemiluminesce sensor	O_3	10 sec	0.3 ppb	Riverside
Los Gatos Research integrated cavity spectrometer	CO	10 sec	12 ppb	Riverside
LiCor IR absorption sensor	CO_2	1 sec	75 ppb	Riverside
Air Quality Designs high sensitivity analyzer	NO_x	10 sec	0.15 ppb	Riverside
Picarro cavity ringdown analyzer	CH_4	10 sec	10 ppb	Riverside
Ionicon proton transfer reaction-mass spectrometer (PTR-MS)	Benzene	30 sec	0.18 ppb	Riverside

Ionicon proton transfer reaction-mass spectrometer (PTR-MS)	Toluene	30 sec	0.18 ppb	Riverside
Ionicon proton transfer reaction-mass spectrometer (PTR-MS)	Ethyl Benzene	30 sec	0.18 ppb	Riverside
Ionicon proton transfer reaction-mass spectrometer (PTR-MS)	Xylenes (BTEX)	30 sec	0.18 ppb	Riverside
Picarro cavity ringdown analyzer	Formaldehyde	10 sec	0.6 ppb	Riverside
Entanglement Technologies AROMA-VOC	Ethylene Oxide	10 sec	1 ppb	Riverside
Ionicon proton transfer reaction-mass spectrometer (PTR-MS)	1,3 Butadiene	30 sec	0.2 ppb	Riverside
Hills Scientific Reactive Alkene Detector	Unspeciated Alkenes	30 sec	< 10 ppb typical	Riverside
Thermo laser induced fluorescence	SO_2	10 sec	0.7 ppb	Riverside
Ionicon proton transfer reaction-mass spectrometer (PTR-MS)	Carbonyls	30 sec	0.5 ppb	Riverside
Aerodyne Aerosol Mass Spectrometer (AMS)	Polycyclic Aromatic Hydrocarbons (PAHs)	10 sec	0.1 µg/m3	Riverside
Vaisala ceilometer	Meteorological	16 sec	N/A	Riverside
Aerodyne Tunable Infrared Direct Absorption Spectrometer (TILDAS)	CO	1 sec	0.3 ppb	Aerodyne
Aerodyne Tunable Infrared Direct Absorption Spectrometer (TILDAS)	N_2O	1 sec	0.6 ppb	Aerodyne

Aerodyne Tunable Infrared Direct Absorption Spectrometer (TILDAS)	CH_4	1 sec	30 ppb	Aerodyne
Aerodyne Tunable Infrared Direct Absorption Spectrometer (TILDAS)	C_2H_6	1 sec	600 ppt	Aerodyne
Aerodyne Tunable Infrared Direct Absorption Spectrometer (TILDAS)	Formaldehyde	1 sec	300 ppt	Aerodyne
Aerodyne Tunable Infrared Direct Absorption Spectrometer (TILDAS)	Ethylene oxide	1 sec	225 ppt	Aerodyne
Aerodyne Cavity Attenuated Phase Shift Spectrometer (CAPS)	NO_2	1 sec	750 ppt	Aerodyne
Aerodyne Cavity Attenuated Phase Shift Spectrometer (CAPS)	NO_x	1 sec	750 ppt	Aerodyne
LI-COR 6262 CO2 Non-Dispersive Infrared Carbon Dioxide Analyzer	CO_2	1 sec	1.5 ppm	Aerodyne
2BTech Ozone Monitor	O_3	2 sec	6 ppb	Aerodyne
Aerodyne Vocus PTR-ToF	Benzene	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne Vocus PTR-ToF	Toluene	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne Vocus PTR-ToF	Sum of Ethylbenzene and Xylenes	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne Vocus PTR-ToF	Acrolein	1 sec	30 - 300 ppt typical	Aerodyne

Aerodyne Vocus PTR-ToF	Sulfur Containing Compounds (e.g. thiols)	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne Vocus PTR-ToF	Select PAHs	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne Vocus PTR-ToF	Unspeciated Carbonyls	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne Vocus PTR-ToF	Methyl Bromide	1 sec	30 - 300 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	Benzene	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	Toluene	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	Ethylbenzene	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	o-Xylene	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	Sum of m- and p-xylenes	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	Methyl Bromide	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	1,3-Butadiene	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne GC-EI-ToF	Select PAHs	30 mins	3 - 30 ppt typical	Aerodyne
Aerodyne SP-AMS	Black Carbon	1-10 sec	0.9 µg/m3	Aerodyne
Aerodyne SP-AMS	Organics	1-10 sec	0.9 µg/m3	Aerodyne
Aerodyne SP-AMS	Sulfate	1-10 sec	0.12 µg/m3	Aerodyne
Aerodyne SP-AMS	Nitrate	1-10 sec	0.06 µg/m3	Aerodyne

Aerodyne SP-AMS	Ammonium	1-10 sec	0.06 µg/m3	Aerodyne
Aerodyne SP-AMS	Chloride	1-10 sec	0.06 µg/m3	Aerodyne
Aerodyne SP-AMS	Lead	1-10 sec	LOD not quantified	Aerodyne
Aerodyne SP-AMS	Chromium	1-10 sec	LOD not quantified	Aerodyne
Aerodyne SP-AMS	Arsenic	1-10 sec	LOD not quantified	Aerodyne
Aerodyne SP-AMS	Cadmium	1-10 sec	LOD not quantified	Aerodyne
Aerodyne SP-AMS	Aluminum	1-10 sec	LOD not quantified	Aerodyne
Salibri Cooper Xact 625i (XRF)	Metals (PM_{10})	5 minutes	10-400 ng/m3 typical	Aerodyne
Salibri Cooper Xact 625i (XRF)	Arsenic (PM_{10})	5 minutes	10 ng/m3	Aerodyne
Salibri Cooper Xact 625i (XRF)	Chromium (PM_{10})	5 minutes	18 ng/m3	Aerodyne
Salibri Cooper Xact 625i (XRF)	Selenium (PM_{10})	5 minutes	12 ng/m3	Aerodyne
Salibri Cooper Xact 625i (XRF)	Bromine (PM_{10})	5 minutes	16 ng/m3	Aerodyne
Salibri Cooper Xact 625i (XRF)	Cadmium (PM_{10})	5 minutes	390 ng/m3	Aerodyne
Salibri Cooper Xact 625i (XRF)	Mercury (PM_{10})	5 minutes	18 ng/m3	Aerodyne
Salibri Cooper Xact 625i (XRF)	Lead (PM_{10})	5 minutes	19 ng/m3	Aerodyne
ARISense small sensor unit with Alphasense OPC	$PM_{2.5}$	10 sec	30 µg/m3	Aerodyne

ARISense small sensor unit with Alphasense OPC	PM_{10}	10 sec	60 µg/m3	Aerodyne
Condensation Particle Counter (CPC)	Ultrafine particles	1 sec	90 cm-3	Aerodyne

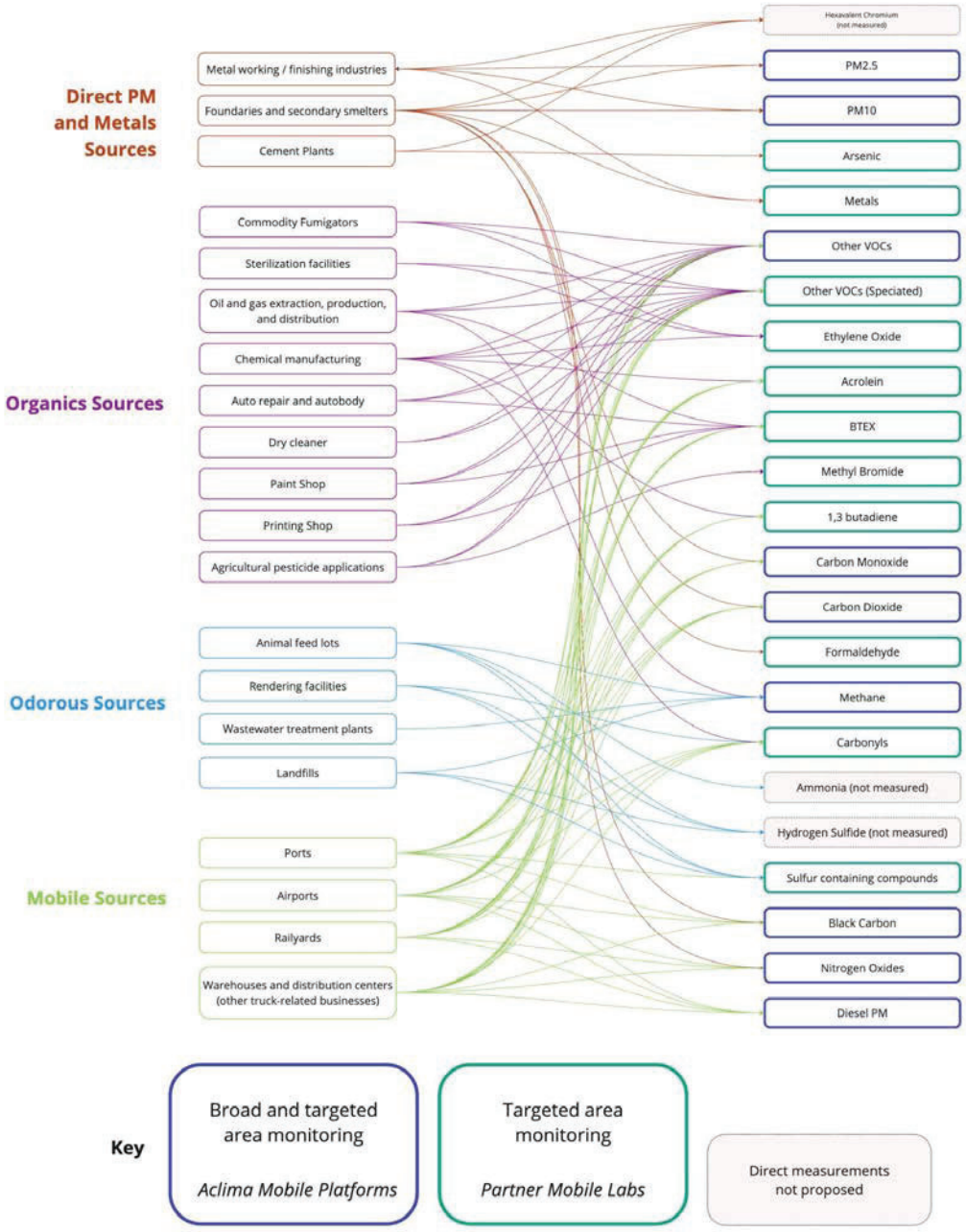


Figure 5.3: Diagram connecting CARB's priority source types and pollutants for the SMMI. Pollutants in blue represent pollutants measured in Aclima's Mobile Platforms (at least via a direct proxy), while those in green represent pollutants measured only in at least one of the three PMLs operated by Aclima's subcontracted technical partners. Hexavalent chromium, ammonia, and hydrogen sulfide are the only species listed that cannot be measured directly, but all three have reasonable proxies, total particulate chromium, particulate ammonium and methane, and organic thiols, respectively, in the Partner Mobile Labs.

5.2 Monitoring Methods

Summary

Aclima's broad area monitoring coverage plan covers all 64 CAPP CNCs, drawing on an initial analysis of a range of CARB and other pollutant, source, and impact datasets. This plan meets or exceeds the defined percentage coverage requirements for priority communities. Aclima will maximize the data collection period, for up to 9 months of continuous coverage across each community. Aclima will also maximize the frequency of monitoring, to cover multiple seasons, times of day, and days of week. Sampling design is driven by a dynamic algorithm that balances objectives and improves on survey-based approaches. Aclima proposes targeted area monitoring coverage within the 64 CAPP CNCs: a custom, two-phase approach that will target specific air pollution sources and concerns and provide additional temporal, speciation, and spatial characterization. This monitoring approach will be carried out by AMPs in combination with the PMLs. Various sampling designs are available for targeted area monitoring, including survey, test/control, and plume chasing.

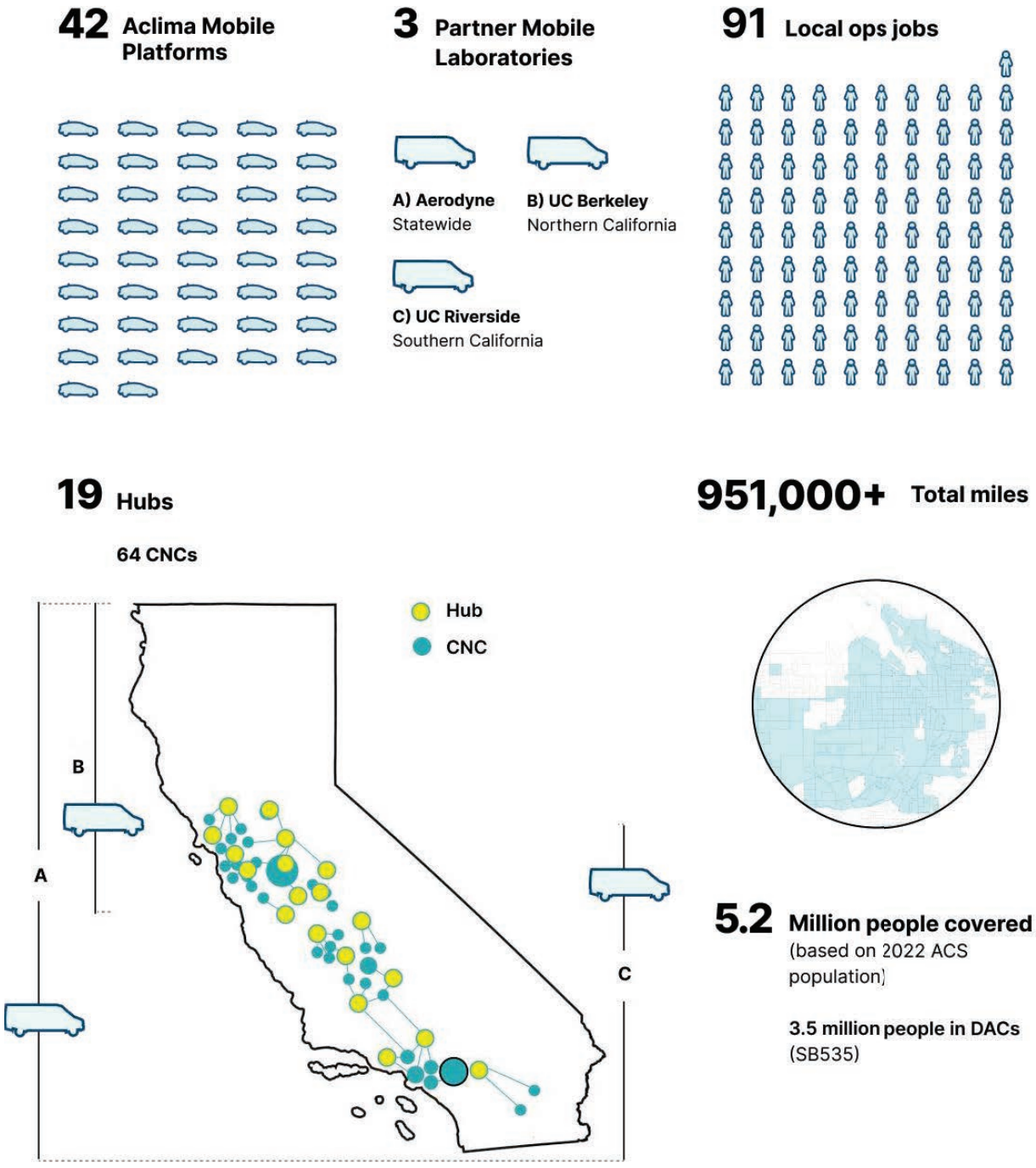
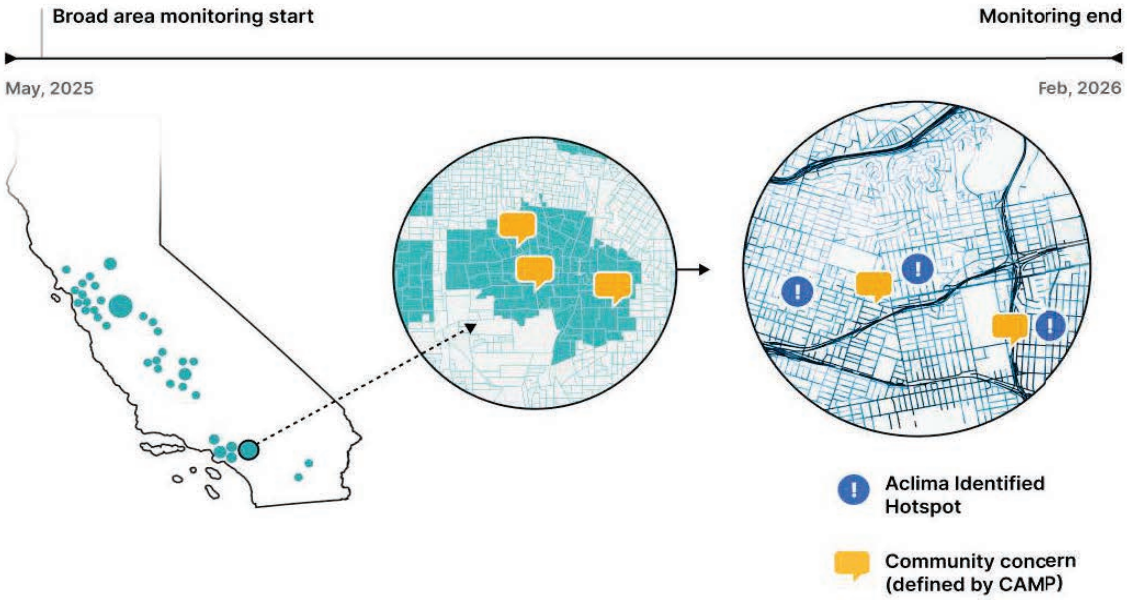


Figure 5.4: Aclima's 42 Mobile Platforms, 3 Partner Mobile Laboratories, and 91 operations members (not including community co-lead team), based out of 19 statewide operations hubs, execute mobile monitoring sampling plans to reach an estimated 5.2 million people through 951,000 total miles driven.

Mixed Fleet

Broad area monitoring

Spatial scale: 12,000 linear miles
Temporal scale: 9 months
Platform: Aclima Mobile Platform



Targeted area monitoring

Spatial: 10-15 linear miles of coverage per location
Temporal: 1-2 weeks per location
Platform: Air Toxics → Partner Mobile Lab
Other → Aclima Mobile Platform

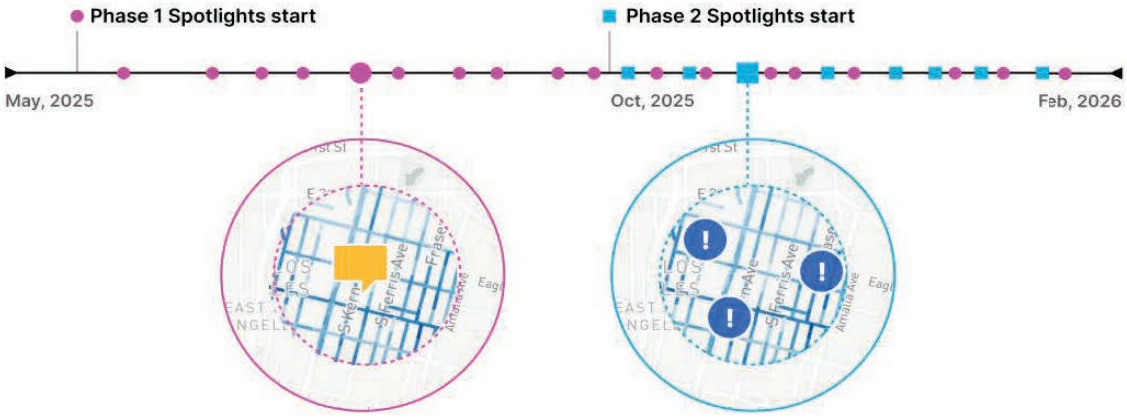


Figure 5.5: Aclima's mixed fleet allows for two forms of coverage: broad area monitoring and targeted area monitoring. In broad area monitoring, Aclima Mobile Labs gather data with the Aclima Mobile Node in all 64 CAPP CNCs. In targeted area monitoring, Aclima Mobile Labs and Partner Mobile Labs conduct follow-up investigation based on a two-phase approach.

5.2.1 Broad area monitoring coverage

Area covered

Aclima has the capacity for broad area monitoring coverage of all of the 64 CAPP CNCs as illustrated in Figure 5.4 and Figure 5.6, to help extend CAPP benefits as widely as possible. The area includes 12,000 linear road miles and 951,000 total road miles[21] over 1,300 sq miles containing 5.2 million people (based on 2022 ACS population). Of that population, about 3.5 million people reside in census tracts designated as a Disadvantaged Community (DAC) under SB535[22].

Figure 5.6: Aclima has the capacity for broad area monitoring coverage of all 64 CAPP CNCs. This describes a proposed area for monitoring of more than 12,000 linear road miles and 951,000 total road miles over approximately 1,300 square miles, containing 5.2 million total population. Note: There are a number of areas that have been identified by this metric (e.g., South Modesto Airport CNC) that may not be consistent with what communities intended and will be refined during CAMP(s) development. A zoomable, interactive map of proposed coverage areas is also available[23].

[21] Linear = unique road miles of monitoring. Total = all road miles, including repeat visits. See glossary

[22] For reference, the 2022 total population of all tracts flagged as a DAC under SB535 is approximately 11.2 million. The preliminary selected DAC population makes up about 31% of the overall SB535 DAC population

[23] Aclima Coverage Proposed for RFP 23MLD017: https://felt.com/map/Aclima-Coverage-Proposed-for-RFP-23MLD017-sWUH2jAAQBeQJ2uMb3S0WC?loc=35.997,-119.162,6.92z

The level of staffing resources needed for a broad area monitoring campaign is determined proportional to the size of area to be monitored (specifically, the length of roads in the area). Aclima designs monitoring campaign sizes and durations to achieve an average of 20 revisits along all residential and major roads within each census block group. The goal is not to target 20 revisits to every road. Rather, the sampling design algorithm (described in detail below in Sampling design) distributes monitoring to the areas within each census block group that have less certainty in measured pollution levels based on the data collected. This process equates to driving a distance of 20 times the total length of all major and residential roads in all targeted census block groups, which sets the requirement for how resourcing (vehicles and driver full time employees) and budgets scale for any given monitoring campaign. For a specific budget, the area covered, and therefore the communities and populations served, then depends on how that road distance is distributed. The following discussion details how Aclima arrived at its proposal for distributing those road miles to meet CARB's expectations for the SMMI.

Aclima's proposed map of potential monitoring areas uses an initial metric calculated based on a weighted modeling of a range of datasets to prioritize areas in the CNCs. The final metric would be informed by consultation with CARB and communities.

- **Identifying community boundaries:** Aclima approximated the preliminary boundaries of each CNC based on the name of each Community, drawing on UC Census TIGERLine places datasets, Zillow's US Neighborhoods shapefile, or available community maps or documents describing each CNC's nomination.[24] See Appendix 7 for the full method, and list of CAPP CNCs as used in this analysis.
- **Prioritizing census tracts within CNCs**: Census tracts within the approximate boundaries of each CNC were prioritized based on whether they contain priority populations, have minimal air quality monitoring, and have the potential for a high burden from nearby sources. The mobile monitoring coverage proposed by Aclima includes at least one census tract in all 64 of the CAPP CNCs. See Appendix 7 for the full methodology.

Table 5.8: Datasets included in Aclima's initial proposed monitoring area and current weighting in the census tract selection model

Metric	Underlying dataset	Current weighting in model
CalEnviroScreen 4.0 Score	Multiple	80%

[24] As of January 2024, available spatial information for each CNC is in point format. Source: CARB Community Air Protection Program Consistently Nominated Communities Interactive Map

Distance from Census tract to nearest regulatory monitor	AQview Community Air Quality Viewer	20%

CES score was used to determine DAC status under SB 535[25]. To ensure Aclima can feasibly cover communities while meeting the metrics for the distribution of driving among disadvantaged, low income, and buffer communities detailed in the RFP, Aclima prioritized CES4 score. While Aclima designed the proposed map around CES4 and gaps in the regulatory monitoring network (as measured by distance from census tract to nearest monitor), Aclima also integrated the data layers described in Table 5.9 below as important contextual layers in understanding the complexity of overburdened communities. The assigning of relative weighting of different factors should ultimately be led by the communities during the CAMP(s) development process, and Aclima is prepared to respond to proposed changes in the relative weightings of these data sources.

Table 5.9: Additional tools that could be used to select driving areas, which will be informed by the communities during the CAMP(s) development process

Tool	Underlying dataset*	Metric included in CalEnviroScreen4?
CARB Pollution Mapping Tool	CEIDARS	Y
CARB Emission Inventory Data	CEIDARS	Y
AB 2588 Air Toxics Hot Spots Emission Inventory	CEIDARS	Y
OEHHA/CARB Approved Risk Assessment Health Values	OEHHA	Y
AQview Community Air Quality Viewer	AQview	N
MRR for greenhouse gases	MRR	N
ECHO - Enforcement and Compliance History	US EPA Compliance Database	N

[25] Source: CARB Community Identification Toolbox.

California Healthy Places Index 3.0 (HPI)	Multiple datasets including population, housing, land cover	N

***Source datasets:** the CARB Pollution Mapping Tool, Emission Inventory Data, and Air Toxics Hot Spots Emission Inventory are stored in the California Emissions Inventory Data Analysis and Reporting System (CEIDARS). Aclima accessed this data along with the MRR Greenhouse Gas Emissions inventory to aggregate emissions data by census tract for reported pollutants and matched these census tracts to the 64 CNCs. A Data Dictionary is available on request, containing the full list of data and fields compiled by Aclima when determining its preliminary tract selection.

Aclima recognizes that while significant effort went into the development of CES4, there is always an ongoing need for iteration with community members to validate the metrics used and how the resulting indices are translated to real-world allocation of resources. Aclima has also found that minor and subjective changes in the weighting of individual metrics could cause large changes in the census tracts identified for potential monitoring (similar to recent findings[26]). As such, Aclima's proposed map of potential monitoring areas represents a starting point only. The PEG and community groups in the development of the CAMP(s) will provide essential oversight to the proposed monitoring areas.

CARB's RFP requests that total monitored areas cover minimum percentages of priority communities, specifically, 50% in DACs, 5% low income, and 5% in buffer communities. Aclima's proposed coverage meets CARB's requested criteria (see Table 5.10), however this percentage may change slightly in the final coverage area, as many CNC boundaries have yet to be finalized.

CNC boundaries were determined based on place names as detailed in Appendix 6. As a result, the final monitored areas for each CNC may include neighboring tracts that fall outside of the preliminary CNC boundary. Community-led tract selections will be finalized based on DAC status, community-specific environmental concerns detailed in the Air Quality Concerns Survey[27], and community discussions guided by Aclima-compiled datasets.

[26] Huynh, et al. (2024)

[27] CARB Air Quality Concerns Survey (2023)

Table 5.10: Summary of Aclima proposal compliance with RFP requirements for priority population coverage

RFP requirement	Aclima approach
No less than 60% of monitoring to benefit priority populations*, of which:	Over 60% coverage in preliminary tract selection.
50% in disadvantaged communities.	Over 60% coverage in preliminary tract selection.
5% in low income communities.	Approximately 80% of preliminary tracts are Low-Income.
5% in buffer communities.	Approximately 20% of proposed tracts are flagged as buffer communities.

*Priority population percent composition in CNCs varies across the state. Depending on where the CNC census tract boundaries are finalized, the DAC percentages could change from community to community. Aclima will still reach the 60% target across all monitoring areas.

Time period covered

Aclima will maximize the duration and frequency of monitoring in order to produce a data set as representative as possible across multiple seasons, times of day, and days of week within the requirements of the timeline of the CAMP(s) approval process and the need to deliver finalized data, visualization, and final report by the end of the contract on May 19, 2026. The monitoring coverage is proposed to occur simultaneously across all communities for up to 9 months between the time that CAMP(s) are expected to be approved (May 20, 2025) and 3 months prior to the end of the contract (Feb 19, 2026). Monitoring will include coverage across all days of the week and times of day, including within and outside of standard business hours ("outside of business hours" defined as between 6pm and 8 am and on Saturdays and Sundays).

Sampling design

Aclima's sampling design algorithm ("the algorithm") supplies daily drive (routing) plans for the broad area monitoring. This algorithm improves on survey-based approaches: it is dynamic, making decisions on where to collect additional data based on a near-real-time view of all collected data and available resources; robust to unexpected variation in real world conditions, avoiding fragile a priori assumptions; and delivers a high quality dataset in a cost-efficient way at scale. The algorithm – and integrating turn-by-turn driver guidance – has improved Aclima driving efficiencies by 20-30% across a variety of monitoring projects, equivalent to 20-30% more diverse and informative data collected.

Aclima's sampling design for broad area monitoring coverage will be guided by a dynamic drive planning algorithm that balances a diverse range of community objectives, area coverage, and source types, in providing daily routes for AMP drivers to follow. The algorithm is built upon the well-established fundamental principle that repeat measurements are required for mobile monitoring outputs to produce temporally representative pollutant concentrations; however, it is a substantial improvement on historical survey-based approaches[28] in that it is designed for flexibility and adaptability as data collection proceeds. This allows for the generation of efficient sampling strategies at large geographic scales. It means the Aclima mobile fleet, equipped with non-FRM/FEM sensors, can collect high quality data at scale. Given its targeted focus on correctly characterizing the variability in air quality in space and diverse atmospheric conditions, Aclima's continuous deployment of fleet vehicles over broad areas compares favorably with the diminishing returns of small-scale deployments of high precision instrumentation.

Mobile monitoring sample design has traditionally adopted a static survey method: prior knowledge of the data being sampled are most influential on the representativeness of the resulting dataset (e.g., $PM_{2.5}$ concentrations are higher during rush hour, therefore measurements are made during rush hour) and drive plans are constructed assuming a fixed number of targeted repeat measurements per location. This is simple but fragile. If prior assumptions of observed data variance and real-world conditions prove incorrect, the resulting dataset is low quality. The survey approach is also infeasible for the SMMI: the number of required drive plans would grow linearly with fleet scale.

Aclima's algorithm is differentiated by dynamism: it bases drive planning decisions on a near-real-time "state-of-the-world" view of all to-date collected data[29] and available drivers and vehicles for monitoring. This is more complex but provides flexibility, cost savings, robust datasets, and smoother operations, over the survey-based approach. Functionally, this approach results in a different number of repeat measurements in different locations, with the sampling deliberately distributed to provide higher rates of repeat measurements in locations with higher observed variability. It helps ensure that the measurements generated via Aclima's mobile monitoring adequately and efficiently characterize the spatial and temporal variability in air quality in areas of concern during the monitoring time period.

[28] Apte, J. S., et al. (2017); Messier, K. P. et al. (2018); Miller, D. J., et al. (2020); Chen, Y., et al. (2022); Padilla, L. E., et al., (2022)

[29] Decisions on where to collect additional data are based on this state-of-the-world view, considering factors including but not limited to: what locations have lower sampling rates to-date, temporal trends occurring in the total dataset, what variability has been measured in user defined areas of interest, time since a location has been sampled, or the level of certainty the dataset supports about transient pollution events.

Aclima has continuously developed and improved sample design to overcome inherent challenges in mobile air quality monitoring. Aclima now:

- Optimizes the frequency of repeat measurements at each location to collect diverse, high value data at least cost
- Minimizes spatio-temporal correlations in data due to driving patterns
- Maximizes the flexibility of the drive planning system to account for a diversity of pollutants and atmospheric residence times
- Adapts repeat measurement rates to ensure they are proportional to the levels of localized variability and therefore resource efficient

More information on optimization objectives is provided in Appendix 4.

Steps in the Aclima drive planning algorithm

The drive planning algorithm automatically schedules drive plans on a daily basis. This system updates all internal models and datasets based on most recently performed analyses. Each of these models is analyzed for mischaracterization or uncertainty. Other criteria, such as stakeholder preferences for sampling, are updated. A prioritization surface is created across the coverage area, and the algorithm then optimizes vehicle routing before generating the final drive plan. This drive plan, which describes the specific route for the driver for that day, is displayed on a tablet computer inside the vehicle.

More information on these steps and enhancements based on deployment experience, is provided in Appendix 4.

5.2.2 Targeted Area Monitoring Coverage

In addition to Aclima's broad area monitoring coverage within all 64 CAPP CNCs, Aclima will offer capacity for more targeted area monitoring of specific air pollution concerns at

smaller spatial scales. This monitoring will be focused on a relatively small area and over a short duration in time, and is designed to complement the broad area monitoring by providing more in-depth information about specific areas of concern. Input from communities about pollution sources of concern will directly inform the locations targeted by this approach, and their monitoring objectives. See Figure 5.13 for details on the anticipated full sequence of steps.

The goal of this approach is to accomplish detailed chemical, temporal, and/or spatial characterization (see Table 5.11) at a select number of locations of concern identified by communities, providing valuable data to be used to inform health risk and emission reduction plans in those communities. If the monitoring finds commonalities among pollution sources of similar type, these can be used to provide generalized conclusions about those source types as a whole, and provide useful results that can be extrapolated across all impacted communities across CA (including those not specifically included in the SMMI).

Table 5.11: Support for additional characterization provided by targeted area monitoring

Characterization Type	Description	Platform
Temporal	More dense temporal information about pollutants by time of day in a particular area.	Aclima
Speciation	More detailed chemical information about the specific air pollutants in a particular area.	Partner Mobile Labs
Spatial	More detailed spatial information about the location of emissions sources and the people impacted.	Aclima or Partner Mobile Labs

Platforms for targeted area monitoring

The sampling to support targeted area monitoring will be carried out by both AMPs and PMLs in order to provide additional, actionable characterization of air pollution concerns in as many of the communities as possible. The AMP fleet is well-suited to characterize temporal variability because around-the-clock resources can be dedicated to monitoring

in a small area for short durations. PMLs, on the other hand, are particularly well-suited to provide chemical speciation due to the instrumentation in those platforms. Spatial characterization could be performed by either vehicle, depending on the expected pollution type and whether the AMP can detect it (or at least a proxy). The PMLs and AMPs will be outfitted with wind measurements that will aid in the interpretation of the results for connecting source location with elevations in pollutant concentrations.

Execution responsibility for the targeted monitoring will be split between AMPs and the PMLs as described in Table 5.12 below. The specific areas targeted will be informed primarily by the CAMP(s) and other existing and recent sources of community input such as the CARB's Air Quality Concerns Survey.

Table 5.12: Available targeted area monitoring capacity across Aclima's platforms

Platform	Allocation to targeted area monitoring	Available capacity (weeks)
PMLs	Dedicated	32
AMPs	Flexible	30-40
Total Weeks		62-72*

***** Aclima's operations will be able to flexibly accommodate additional targeted monitoring, depending on demand from the communities

Prioritizing targeted area monitoring deployments

Aclima recommends establishing a framework around additional data-driven decisions to ensure that the areas targeted return the most benefit for the ultimate purposes of reducing emissions in impacted communities across the state. This is because the number of sources of concern raised by the communities are likely to extend beyond the resources available to cover targeted area monitoring (both in terms of data collection and analysis) for every location of interest in every community. Based on CARB's criteria air pollutant and air toxics emissions inventories, health risk considerations detailed in the MATES V report[30], and other sources[31],[32]), Aclima recommends considering diesel PM, arsenic, acrolein, benzene, 1,3-butadiene, carbonyls, formaldehyde, and ethylene oxide as high priority for the targeted investigations (see Figure 5.7 below).

[30] Ahangar et al. (2021)
[31] Jinot et al. (2016)
[32] Union of Concerned Scientists (2023)

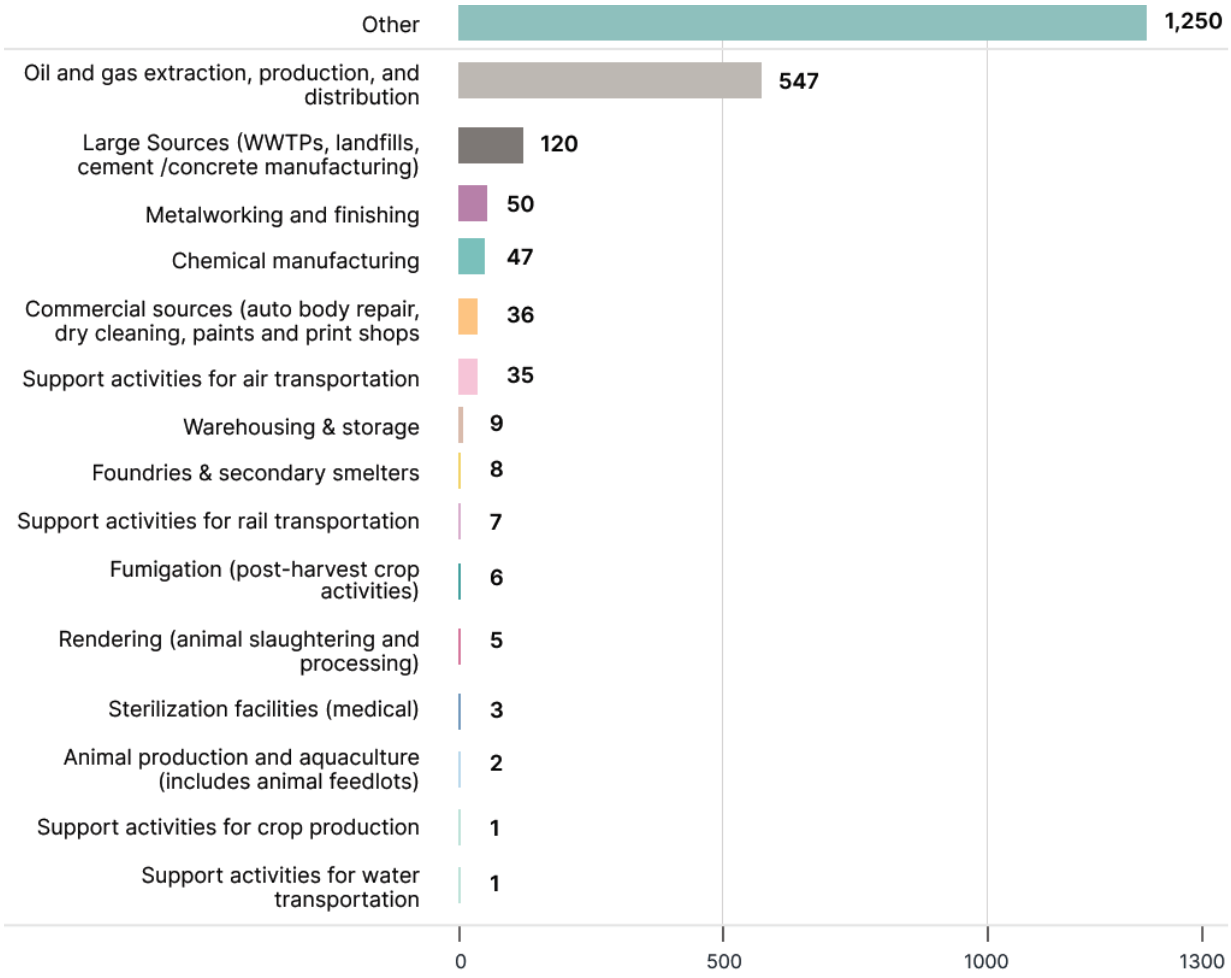


Figure 5.7: Number of facilities in the CARB's criteria air pollutant and air toxics emissions inventories associated with the source types specifically listed in the SMMI RFP that emit at least one of the following: diesel PM, arsenic, acrolein, benzene, 1,3-butadiene, formaldehyde, or ethylene oxide. The "Other" category includes facilities broadly categorized as supermarkets, hardware retailers, miscellaneous farming activities, construction, medical facilities, and more. Note that the number of facilities is not necessarily correlated with health risk for each source type. Once community sources of interest are identified, Aclima proposes to work with CARB to determine facility risk prioritization scores.

Aclima's mixed fleet has flexibility to design targeted area monitoring around a wide variety of source types of concern to the communities. Additional datasets will factor into

the final prioritization of source types to align with community concerns and CARB's feedback, such as criteria pollutant and greenhouse gas emissions, enforcement data (e.g. EPA ECHO), nuisance odors, and population density. Given the distribution of sources in the consistently nominated communities and the highest risk pollutants according to the MATES V study, Aclima target source types is anticipated to include:

- Oil and Gas Extraction, Production, and Distribution (subset of pollutants of concern: BTEX, PAHs, 1,3 butadiene)
- Metalworking and finishing (subset of pollutants of concern: metals, acrolein, 1,3-butadiene, BTEX, arsenic)
- Warehouses and distribution centers, ports, and railyards, especially those with high volumes of heavy duty trucking associated (subset of pollutants of concern: diesel PM, PAHs, BTEX, acrolein, 1,3-butadiene, carbonyls)
- Airports (subset of pollutants of concern: acrolein, 1,3-butadiene, carbonyls, diesel PM, BTEX, formaldehyde)
- Cement plants and mineral processing facilities (subset of pollutant of concern: arsenic and other metals)
- Sterilization facilities and commodity fumigators (subset of pollutant of concern: ethylene oxide)
- Chemical manufacturing (subset of pollutants of concern: BTEX, PAHs, 1,3-butadiene, ethylene oxide, carbonyls, formaldehyde)

Targeted area monitoring execution

Table 5.13 below describes Aclima's proposed sequences of steps for planning and executing targeted area monitoring. Phase 1 (Community-identified locations of concern) and Phase 2 (Follow-up mobile monitoring) are described in detail below.

Table 5.13: Proposed sequence of steps for executing targeted area monitoring

1	Identify the primary source types that are of concern to the communities across the state via the early CAMP(s) engagement meetings and any community survey results.
2	Weight the source types identified by the communities based on pollutants emitted according to highest health risk (e.g. from MATES V study and the AB2588 Hotspots Risk Assessment data), and additional factors such as criteria pollutant and greenhouse gas emissions, enforcement data (e.g. EPA ECHO) nuisance odors, and/or population density in the vicinity.

3	As part of the final CAMP(s): Commit to specific locations of interest for Aclima fleet and Partner Mobile Labs air toxics targeted area monitoring, ensuring even distribution across the various regions of the SMMI.
4	Work with Mobile Lab partners to define sampling strategies for the Phase 1 locations of interest.
5	Upon CAMP(s) approval: begin Phase 1 monitoring (concurrent with starting broad area monitoring).
6	As the broad area monitoring progresses, identify locations of persistent pollution based on enhancement event detection rates for certain proxy measurements (e.g. TVOCs for organic air toxics, coarse mode PM for metals air toxics, black carbon for diesel PM, etc) in order to inform Phase 2 monitoring.
7	Work with partners, CARB, and the PEG to define sampling strategies for the Phase 2 locations of interest based on the framework agreed upon in the CAMP(s).
8	Within 3-6 months of the start of the monitoring period: start Phase 2 monitoring.

Targeted area monitoring phase 1: Community-identified locations of concern

Phase 1 will target a prioritized list of source types derived from community input during CAMP(s) development. The initial prioritization will be based on:

1. The most common source types from community concerns
2. The CARB hotspots air toxics emissions inventory
3. The pollutants known or suspected to be associated with the highest health risk in California (based on e.g., the MATES studies)
4. Other relevant sources such as criteria pollutant and greenhouse gas emissions, enforcement data (e.g. EPA ECHO) nuisance odors, and/or population density

From this prioritized list of source types, specific locations of interest within each prioritized source type will be identified for targeting. These locations of interest will be approximately distributed across the state to the extent possible. Aclima will work closely with CARB, the PEG, community co-leads, and other stakeholders through the community engagement process during CAMP(s) development to inform the final specific locations where targeted area monitoring will be directed.

Aclima and the subcontracted technical partners will then design a monitoring strategy around specific sources of concern. Aclima, along with these technical partners, will

design a common set of template sampling strategies that can be drawn from and applied to each location of interest, based on any number of factors:

- expected pollutants
- expected meteorology
- expected temporal patterns
- population centers in the vicinity
- road distribution
- desire to characterize the source or the downwind receptors.

Aclima will draw on extensive experience in prioritizing community-identified locations of concern:

- Aerodyne has been a pioneer in mobile monitoring since the 1990s. They carried out monitoring[33] for the South Coast Air Quality Management District (SCAQMD) that targeted and detected nearly all of the sources identified by CARB in the RFP.
- The UC Berkeley team (in collaboration with Aclima) published one of the initial seminal studies in hyperlocal air quality monitoring in West Oakland CA, identifying a metal recycling plant as a source of NOx and black carbon, likely from idling trucks[34].
- The UC Riverside (along with Baylor University and University of Houston) team has a decade of experience in making both in-motion and stationary measurements over 3 iterations of their mobile air quality monitoring laboratory (MAQLs); in 2023 they conducted extensive in-motion measurements for TCEQ in Houston, TX, identifying correlations between BTEX and black carbon measurements near the port[35].

Targeted area monitoring phase 2: Follow-up mobile monitoring

Phase 2 will identify additional locations of interest from Aclima's broad area monitoring coverage monitoring after three to six months of collection. This follow-up monitoring may be limited and must conclude by mid-February 2026. Aclima will consult with CARB, the PEG, and community co-leads to develop a framework for Phase 2 follow-up investigation requirements. The locations will be selected based on identified locations of persistent

[33]Herndon, S., et al. (2018)

[34] Apte, J., et al. (2017)

[35] Sheesley, R., et al..

enhancements of non-specific proxy measurements for various source types. These locations will be shared in a prioritized list, with appropriate contextual data, with the CARB, PEG and communities. For example, Aclima's TVOC sensor is extremely sensitive (sub-ppb LOD) but also non-specific. From repeat passes across the full monitoring area, locations where persistent enhancements of TVOCs are detected over many repeat passes in the vicinity of a facility suspected to emit organic air toxics may indicate a potential source of concern to be further characterized with the mass spectral measurements of organic VOCs by one of the PMLs (e.g. see Figure 5.8 below).

Figure 5.8: Case study of persistent TVOC enhancements (as purple circles) detected in the vicinity of a flame retardant coating facility by Aclima's broad area monitoring in New York State. Targeted area monitoring as a follow-up in this location with BTEX measurement capabilities later found enhancements of benzene, toluene, ethylbenzene, and meta-xylene in the same location.

By using the PMLs to perform follow-up measurements, Aclima has the ability to more successfully deploy targeted area monitoring. A monitoring plan that is exclusively based on a priori known or suspected sources fails to take full advantage of what the scale of Aclima's mobile monitoring fleet can provide, which is a comprehensive survey of general pollution sources identifying both known and unknown persistent sources of pollutants, albeit with limited understanding of the health risks posed by that pollution. This coverage is complementary with the ability to do speciated follow-up measurements in locations of interest identified as persistent sources of pollution across the full monitoring area. These measurements will better characterize the chemical make-up, and therefore the health risk of sources across this state in a way that is: 1) more likely to find signals of interest and 2) is not exclusively influenced by pre-conceived notions of which pollution sources are most important.

Sampling Design

Aclima's sampling design for targeted area monitoring will be guided by a framework to be finalized through the CAMP(s). In this framework, community concerns will be translated into scientific questions, and an appropriate sampling strategy will be selected. Because of the small scale of targeted area monitoring, the sampling strategies are customizable and need not be guided by Aclima's broad area monitoring sampling design algorithm.

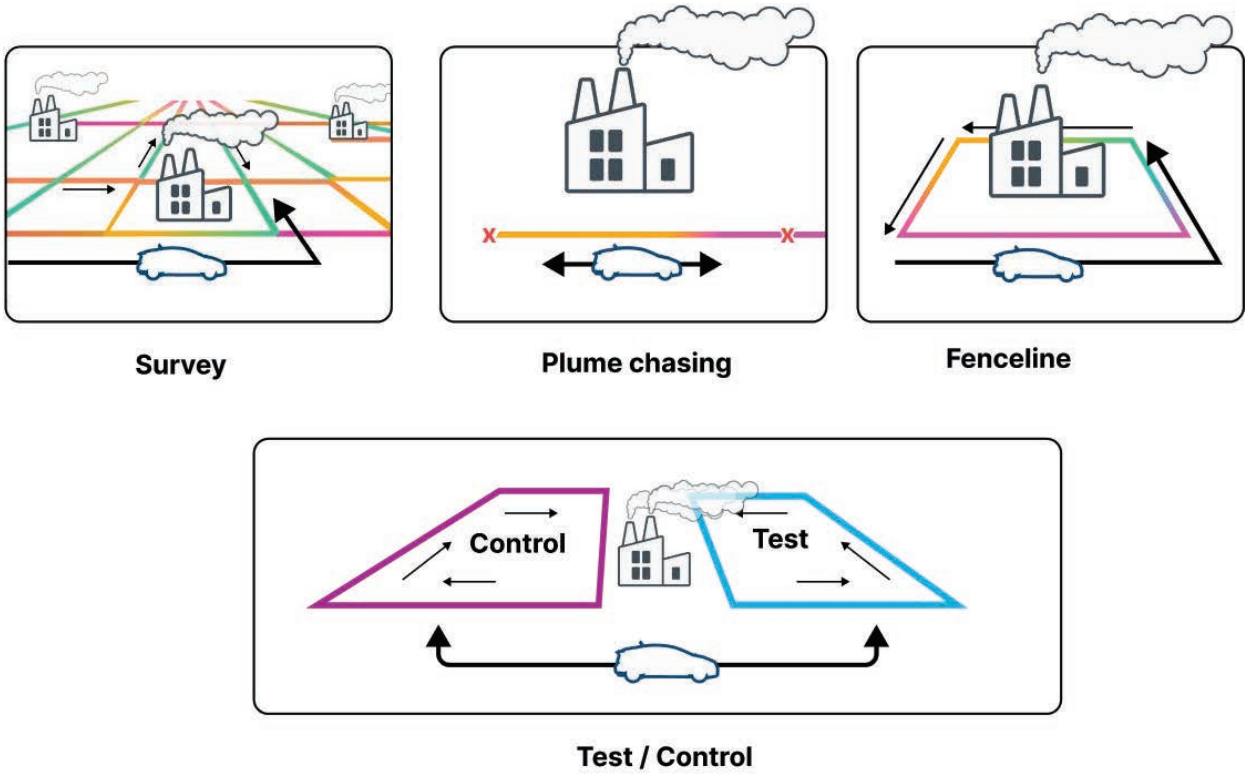


Figure 5.9: Targeted area monitoring has the option of at least four different sampling designs: fenceline; survey; test/control; and plume chasing. See Table 5.14 below for more details.

Targeted area monitoring sample design requires translating the community concern into a scientific question or hypothesis, and then selecting an appropriate sampling strategy (as shown in Figure 5.9 above). Aclima and its technical partners will work early on to formalize a framework for connecting concerns, scientific objectives, and outcomes, for the community to use within the CAMP(s) process. As a precursor to this formalized framework, Table 5.14 below shows some examples of how generalized questions or hypotheses would connect to specific proposed sampling strategies. This is not a comprehensive list of all possible monitoring strategies, but it provides a range of options that indicates flexibility to accommodate a wide spectrum of community concerns and monitoring objectives. In each case, repeat measurements over the monitoring period is a fundamental aspect of the sampling strategy to achieve representative results. Because of the smaller scale generally covered in these targeted areas, the dynamic planning algorithm is not strictly required and may not be desired depending on the science question formulated. Here, we use “Survey” sampling to describe systematic sampling within a predefined area and either historical pass-count based survey approaches (e.g. “polygon” sampling) or Aclima’s dynamic planning algorithm may be used.

Table 5.14: Examples of how certain general science questions about sources or impacted communities can inform the sampling design for targeted area monitoring. More details on sampling strategies are provided in Appendix 3.

Science Question	Sampling Strategy	High Level Product Outcome
What pollutants and at what concentrations are impacting a specific neighborhood? What is the hyperlocal spatial distribution of pollutants of concern impacting a specific neighborhood?	Survey: Systematic sampling on every publicly accessible road segment within predetermined boundaries, including repeated measurements. Aclima's dynamic planning algorithm or more standard survey approaches may be applied.	Locations of Disproportionate Impact
How does time of day impact concentrations of specific pollutants in a specific neighborhood or associated with a specific source?	Survey with Temporal Coverage: similar to Survey sampling, but with greater temporal coverage across time of day.	Locations of Disproportionate Impact Source Identification
How does a specific known or suspected source impact a particular neighborhood?	Test/Control: similar to standard sampling but with test and control areas strategically designed in order to test hypotheses about specific known or suspected pollution sources.	Locations of Disproportionate Impact Source Identification
What is the chemical makeup of emissions from a known or suspected source? What acute or chronic air toxics are present?	Fenceline: systematic sampling on predetermined routes around the perimeter of a known or suspected source facility. Plume Chasing: Systematic sampling on the predetermined routes is deviated from as soon as a viable plume is detected.	Source identification

5.3 Monitoring execution

5.3.1 Summary

Aclima's mobile monitoring strategy is grounded in years of experience scaling fleets up and down as needed and is designed to ensure a smooth launch and efficient operations, but will also be responsive to the results of the CAMP(s). Aclima proposes to create an estimated 91 local jobs on its operations teams through equitable hiring, providing direct benefits to local economies. Drivers receive extensive training, take part in a rigorous safety program, and are supported 24 hours a day by a Fleet Operations team. The daily routine follows a clear sequence of steps from arrival at a parking facility, through safety and instrument checks and the day's data collection driving, to a shutdown routine back at the facility. The PMLs will be mostly responsible for their own operations but in close cooperation with Aclima Fleet Operations, and in some cases using Aclima drivers. Aclima will look for and be open to opportunities to increase community awareness of the work throughout monitoring.

5.3.2 Rollout strategy

Aclima will be responsive to the specific results of the CAMP(s) in designing an appropriate rollout strategy. Aclima will have all necessary assets and mobile platforms ready before the anticipated CAMP(s) approval dates. If CAMP(s) approval is phased, the rollout strategy will be phased to match. The final rollout strategy will maximize the total duration of monitoring for as many regions as possible.

Aclima's scaling strategy relies on:

- Large sensor inventories and modular mounting and installation systems to allow for rapid platform commissioning
- Extensive experience conducting rapid hiring to quickly scale up new geographies
- Mature digital and in-person driver training programs
- Refined daily operations systems that ensure efficient in-field operations
- Thorough safety program

5.3.3 Fleet management

Embedded in the local community

Aclima's fleet operations are embedded in and aim to support the local community. For the duration of the monitoring program, AMPs are stationed in the monitoring region and operated by drivers hired from the local area. Parking fees, fuel purchases, vehicle

maintenance, repairs, and driver salaries will all feed money back into the local community.

High quality jobs

Aclima estimates that 91 new, high quality jobs will be created to operate the Mobile Platform fleet of 42 vehicles. All drivers in Aclima's core fleet are Aclima employees, not contractors. All full time drivers receive benefits including paid holidays, paid vacation, health insurance, and 401K. Driver beginning pay is aligned with living wage standards (specifically the MIT Living Wage Calculator, level "2 Adults (both working), 1 child"), ensuring the ability to meet costs of standard living in a specific area. Aclima offers both full time and part time (late shift) positions, making a potential fit for more work-life schedules. Aclima drivers work independently in the field, exercising a high degree of personal judgment and responsibility.

Equitable hiring

Aclima's hiring processes allow for rapid hiring of quality candidates. Equity is at the core of the company's mission and recruiting and hiring approach. Aclima believes team diversity is a core strength.

In addition to advertising through large online job search platforms, such as Indeed.com, Aclima advertises driver job openings through local community groups and other organizations which expands the pipeline and reaches more job seekers statewide. Aclima intends to work with community co-leads and other local CBOs and partners to develop the local hiring strategy in communities across the SMMI. Aclima conducts thorough candidate screening, including in person drive tests, DMV record checks, and (after offers are made) drug screening and background checks. Results of background checks are assessed on a case-by-base basis. A criminal record is not necessarily a bar to employment at Aclima. Beyond driving skills, candidates are evaluated for their ability to follow directions, adhere to schedules, handle minor vehicle and instrument maintenance issues, and communicate effectively.

Training

Aclima's training program brings newly hired drivers up to speed quickly, allowing them to operate independently within days of hire. Training begins with 3rd party video trainings on defensive driving, alert driving, and the dangers of distracted driving, including multiple choice checks for understanding. Aclima's custom digital driver training begins with drivers reviewing voice-over narrated slides, followed by multiple choice checks for understanding. The digital driver training covers an introduction to Aclima's mission and technology, Human Resources topics including Diversity, Equity, and Inclusion lens training, apps and tools used in daily operations, safety, and performance expectations. After completing the digital training at their own pace (allowing for returning to previous slides for review and to retake quizzes if needed) and achieving 100% correct quiz results

(demonstrating comprehension of the material covered), drivers proceed to in-person, hands-on training with a Fleet Operations team member. During hands-on training, drivers experience the content from the digital training in practice, learn more about the day-to-day operations, and have ample time to ask questions. Most drivers are able to begin their routine shifts after one hands-on training session.

COVID-19

The safety and wellbeing of all Aclima employees and the broader community is a priority at Aclima. Per Aclima's policies, if any employee or contractor is not feeling well or are experiencing any COVID or respiratory virus symptoms, they must contact our People Operations team & their manager and cannot enter any Aclima facilities or participate in any off-site Aclima events. If they have tested positive for COVID (symptomatic or asymptomatic) or other respiratory viruses, they must contact the People Operations team & their manager and cannot enter any Aclima facilities or participate in any off-site Aclima events until they are no longer in their infectious period (as defined by CDC[36] as of March 1st, 2024, employees may return to work if they have been fever-free for at least 24 hours without the aid of medications and if their symptoms are improving).

Aclima takes care to ensure drivers do not spread any infectious diseases among staff, including COVID-19. Drivers are encouraged to stay home when ill, making use of paid sick leave when available. Drivers are required to disinfect frequently touched surfaces at the beginning and end of each shift. Aclima will update its policies and processes to reflect any new state or federal guidance.

Aclima's drivers will not be working on-site or in contact with any CARB employees. As noted in Attachment 13, other Aclima will ensure that staff who may work on-site or in contact with CARB employees will either have provided Aclima proof of full vaccination or provide Aclima a negative test result from a COVID-19 test taken by the employee or subcontractor within seventy-two (72) hours prior to interacting in person with any CARB employees or performing work on site at any property owned or controlled by CARB.

Daily driver routine

A driver's daily routine (Figure 5.15) begins at a local Aclima parking facility with initial communications and training, powering up instruments, a safety check, and troubleshooting. Their driving day is managed by a mobile application in their vehicle and punctuated by mandated breaks. The day ends back at the facility and a shutdown routine. More details are provided in Appendix AX5.1.

[36] CDC (2024)

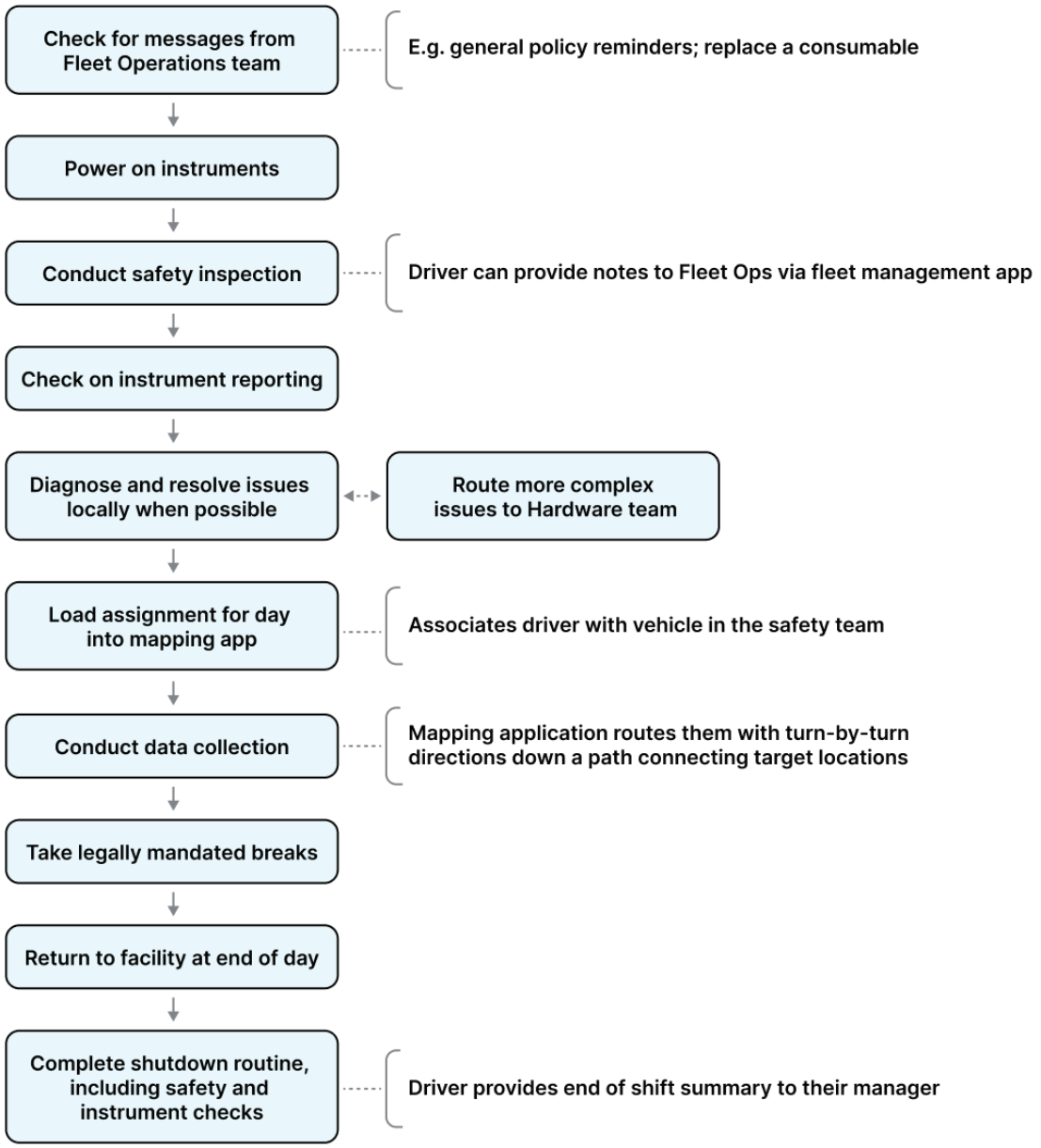


Figure 5.15: Summarized steps in the day of an Aclima fleet driver. More details provided in Appendix 5: Aclima Fleet Operations

Safety program

Aclima places a high priority on safety. The fleet safety program incompases a wide variety of elements to emphasize the importance of safety, provide training, and incentize the correct behaviors. The safety program includes:

- Thorough vehicle inspections by drivers
- Regular routine maintenance and safety inspections by professionals
- Digital and in-person training
- In-vehicle safety systems (including dashcams, sensors, and GPS)
- Safety software platform that integrates dashcam, sensor, and GPS information to generate safety scores and flag potential safety violations
- Random audits dashcam footage
- Extensive coaching
- Monthly monetary incentive (bonus) for drivers who achieve high safety score

PML fleet management

The subcontracted technical partners will handle most of the day-to-day fleet operations of their mobile laboratories, with logistical and quality management assistance from Aclima. In addition to established bases in the Bay Area and Riverside, Aclima will establish one to two additional bases distributed statewide to provide safe parking, overnight power, and locations to conduct needed maintenance, repairs, and calibrations. Aclima will provide drivers for the UC Berkeley mobile laboratory. Aclima will work with UC Riverside and Aerodyne to ensure that their fleet operations meet Aclima's safety and other critical operational standards.

5.3.4 Community engagement during monitoring period

Aclima aims to support CARB, air districts, and local communities in increasing awareness around air quality and related issues. Aclima will work with CARB, air districts, and local communities to design appropriate markings on Aclima's core fleet vehicles in order to increase community awareness. In many cases an Aclima vehicle can be made available at local community events for demonstrations of the project and air quality issues in general.

5.4 Event detection and notification

Aclima will notify and communicate concentrations of concern to CARB. Notification and communication focuses on pollutants – such as natural gas – which are most suitable for rapid notification and communication but can scale to provide responses for a range of pollutants.

Aclima has standardized notification and communication of concerns, first developed in Aclima's Gas Leak Intelligence[37] product. This follows a Standard Operating Procedure (SOP) which verifies that a detection is persistent and not impacted by sensor artifacts or transient sources before notifying both the local gas utility provider and regulator customers. Features of this SOP include:

- Alerting of signals detected above a certain concentration over a defined period, sent to Aclima and Partner technical staff
- Staff investigation of high concentration signals to confirm sources and eliminate artifacts
- Cross-checking against internal databases of existing detections and notifications
- Feedback loops to operations to allow for further monitoring
- For verified signals, direct and immediate reporting to responsible parties as well as roll-up reporting at regular intervals

This formal SOP-based system is designed to be ready for scaling to a range of pollutants and partners. PML measurements provide an expansive suite of measurements for specific air toxics that can have acute health impacts. The OEHHA thresholds for acute (1-hr) exposure will serve as a reference for detected concentrations that would initiate verification protocols outlined above. For each monitored pollutant included in the OEHHA acute exposure list, real-time alerting will be enabled to trigger these protocols. Aclima will work with CARB and communities during the CAMP(s) process to formalize the notification protocols for both acute toxic air contaminants as well as natural gas leaks.

5.5 Weekly mobile monitoring updates

Aclima has established systems in place for standardized routine operational updates for internal purposes for ongoing mobile monitoring deployments. Aclima will adapt these systems to provide mobile monitoring updates to CARB via the Weekly Progress Update meeting as well as in writing. These updates will cover:

[37] Aclima (2023)

- Logistical & operational updates: what has been accomplished since last meeting
- QA updates: any detected anomalies in data quality and actions taken to address
- Preliminary data and recent results: summaries of data gathered and interpretation/analysis highlights
- Proposed amendments to CAMP(s) monitoring strategies: any changes necessitated by learnings from ongoing operations
- Other actions to be taken
- Updated goals for the next reporting period

The specific content of the weekly updates will be modified based on mutual agreement about the topics and degree of detail CARB would like to receive on a weekly basis. Some content will be covered via a status by region or subregion, as on target, at risk, or off target. At risk or off target designations would be accompanied by additional contextual information and planned mitigation steps.

5.6. Quality assurance plan

Summary

Aclima's holistic quality assurance and quality control program is designed to respond to the calibration challenges with mobile platform sensors and fleets operating at scale, maximizing uptime while thoroughly characterizing sources of sensor uncertainty. QA/QC activities at the device level include calibration, data review, data verification, and routine maintenance. At the level of analytical outputs, Aclima characterizes uncertainty and uses this to inform the analyses. The subcontracted technical partners are recognized experts in their field and will follow established SOPs and QA processes for their Mobile Labs; Aclima will work with these partners for additional QA activities, including utilizing CA regulatory site data if CARB and local air districts approve. Aclima acknowledges that mobile monitoring has certain capabilities, which include limits to how much temporal information can be provided, susceptibility to false negatives, and the need to closely tailor sample collection design to desired outcomes. Additional measurement limitations are discussed, including susceptibility to long term drift, and the use of proxy measurements.

Aclima's QA/QC program was developed through coordination with scientific regulatory staff in support of the company's air monitoring activity in California and New York as well as through partnership with researchers in academia and at the EPA (as part of a 10 year Cooperative Research and Development Agreement or CRADA). Operational and logistical infrastructure has been built to support this QA/QC system at a large scale across a variety of environments.

5.6.1 General QA approach and objectives

Aclima's general QA approach is designed to address the fact that, due to the nature of the mobile platform sensors and the scale at which the fleet operates, it is not feasible to run calibration checks across all sensors in the Aclima fleet more than once a quarter (see Appendix 6 for a more detailed discussion). The QA approach is built around a careful consideration of sensor limitations within the context of how the data is collected and how they are being used. The approach thoroughly characterizes sources of sensor uncertainty and closely couples sensor limitations with the data and analyses that produce insights for customers and communities.

The objectives of Aclima's QA system are to ensure that:

- Performance (uptime, accuracy, and precision) of each individual sensor platform is maximized.
- All distinct sources of uncertainty are characterized and quantified to the extent possible: from the device/sensor level, through the sampling methodology, to the statistical processing that goes into generating the final temporally aggregated geospatial data products.

Aclima is committed to technical transparency on QA/QC and maintains documentation that includes specific details of the QA/QC system and procedures, as well as QA/QC topics relevant to specific analytical products. Additional information on how QA/QC is incorporated into Aclima's data management system is provided in section 6. The QA/QC

discussion here is built around Aclima's data processing levels: see Figure 6.1 and related discussion for explanation of these levels.

5.6.2 Level 2a (device level) data QA/QC

At each data processing level, there are different QA/QC aspects involved. This section provides a description of the device level quality assurance that directly applies to Level 2a, which is Aclima's proposed finalized raw data for the purposes of delivery to CARB (provided at the base sampling time base, typically 1 second, and associated with a GPS position; see Definition of Finalized Raw Data).

Calibration

All sensors used in Aclima's mobile platform undergo at minimum, both pre- and post-deployment calibration testing (Figure 5.16). Aclima defines a deployment as the time period that a specific AMN spends in a particular mobile platform. The specific calibration methods vary, depending on the sensor type, but most require a ~1 week time period of collocation in a Mobile Calibration Laboratory, which is deployed on a daily basis from one of Aclima's calibration hubs with specified drive plans in order to test the sensors under conditions similar to those it would experience while deployed. This ensures that these sensors are calibrated over a large dynamic range of analyte concentrations and measured under atmospherically relevant on-road conditions, including variations in pollutant gases and particle concentrations, varying vibrational impacts from the moving vehicle, and varying meteorological conditions. Some sensors can be calibrated using traceable reference gases, while others are calibrated via a flow rate reference standard. In these specific instances, removal of the sensor from the mobile platform is not required and mid-deployment calibration tests can be employed. For all methods, we use established Measurement Quality Objectives, or acceptance criteria, based on bias and precision metrics, that must be met during the pre-deployment calibration test prior to being installed in a vehicle or during mid-deployment calibrations in order to remain deployed.

Figure 5.16: Illustration of the deployment sequencing for an example AMN before, during, and after deployment. Depending on the specific sensor, mid-deployment calibrations may be possible, but are not required. The calibration cadence and/or deployment length defines how quickly data can be reviewed and finalized for delivery. There will be no more than a 3 month gap between calibration events to meet the proposed data delivery schedule.

At the end of deployments, each sensor undergoes the same calibration test and is evaluated against the same acceptance criteria. For sensors that fail the acceptance criteria at post deployment calibrations, it is determined whether the sensor has completely failed, whether the flow system has lost integrity, or whether the sensor has simply undergone calibration drift. If the sensor has failed or the flow system integrity is compromised, then all data collected after the time of failure is flagged for omission. If the sensor has drifted, then the new calibration parameters are retroactively applied to the data collected while deployed. Typically, drift correction is applied as a linear function of time between two calibration events, while other times it is applied as a step function. Manual review of data collected while deployed in comparison with other nearby vehicles or stationary monitors can often inform how drift varies over time[38], but the fact that certain sensors (in particular NO_2, NO, CH_4, C_2H_6, TVOCs, and CO_2) can be prone to long term drift is an important limitation for understanding use cases of Aclima's mobile measurements.

The frequency with which mid- or post-deployment calibrations occur is flexible. For the proposed monitoring plan, Aclima will commit to a 3 month maximum calibration cadence for all sensors deployed in order to ensure that finalized data delivery can occur on a monthly basis with a 3 month lag.

Data review

Aclima conducts extensive data review checks, defined as the manual or automated flagging of anomalous signals from sensor time series. Automated flagging occurs within Aclima's data processing pipeline while manual review is performed and tracked by a team of analysts reviewing data collected on a weekly basis using off-the-shelf platforms Tableau and Jira. A range of data visualizations in Tableau is used to identify anomalous behavior and sensor drift and uncovered issues are tracked in Jira. This review is a key step in Aclima's QA/QC process, ensuring quality assured data is delivered and monitoring equipment has maximal uptime (e.g., see Figure 5.17 below).

During deployments, Aclima technical staff are notified of potential sensor performance issues based on the following:

[38] Whitehill, A. R., et al., (2023)

- notifications from drivers or hardware technicians as they perform their routine system checks
- as a result of automated flagging within Aclima's data processing pipeline
- during regular (weekly) device-level data reviews by analysts

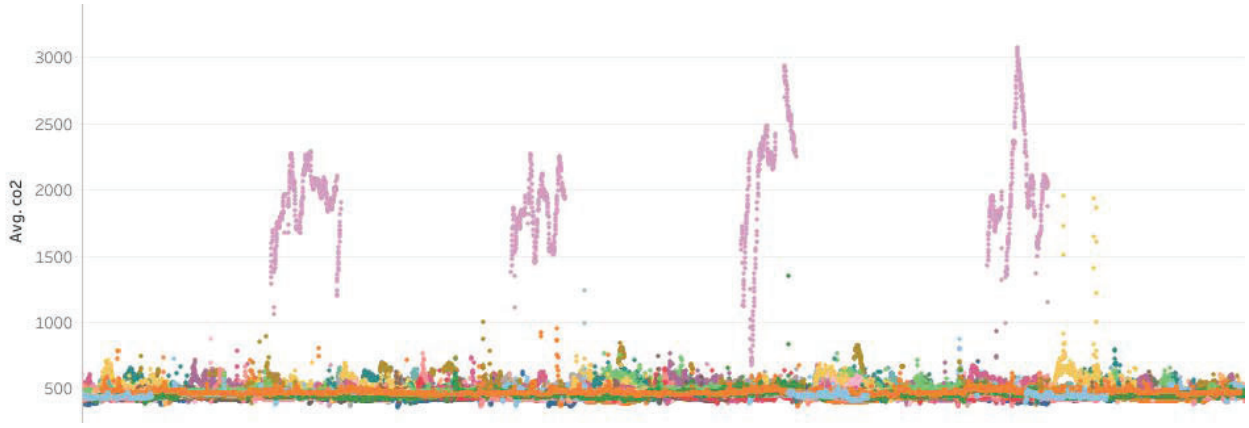


Figure 5.17: Example CO_2 time series data used in manual data review from many different Aclima fleet vehicles. In this example, one anomalous time series with sustained high concentrations above 1000 ppm is easily identified, indicating the presence of a sample line leak. Data reviewers reached out to the driver in this instance, who confirmed a damaged sample line.

Automated status indicator flags within Aclima's data pipeline signal when measurements are collected outside the environmental or physical specifications of the sensors, such as values greater than or less than the acceptable concentration range of the sensor or negative values below the uncertainty of the detection limit, data reported during quality control checks (e.g., zero and span checks), or periods where the flow rate is out of the optimal range. In many cases, status indicator flags are part of normal operation of certain sensors, for example when temperature is changing rapidly at warm-up. In other cases, excessive data flagging can be an indication of a hardware issue that requires a corrective action (i.e., low flow rates due to a failing pump or blocked flow path). In addition to these automated flags, manual data review is conducted on a weekly basis over all deployed sensors.

For deployments where there are active National Ambient Air Quality Standards (NAAQS) sites established by regulators in the mapping area, data review can rely on data from these sites for contextualizing large scale trends in different air pollutants over time. This is a useful tool for understanding whether features in Aclima's sensor data are anomalous or consistent with trends detected by the regulatory network. It is often possible to

detect systematic bias across the network or identify individual sensors that have drifted substantially between their pre- and post-deployment calibration checks.

In addition, customized alerts can be set by the technical team to alert for specific conditions that may indicate atypical behavior for a given sensor that needs to be resolved. For example, prolonged periods of elevated CO_2 may indicate possible sampling from inside the vehicle. This can alert the team to potential issues to trigger an intervention in a more efficient way than the standard weekly data review. For certain conditions, these customized alerts can assign a preliminary QA/QC flag. These preliminary flags do not automatically exclude or omit the data; instead they trigger a manual review by an analyst who makes the final decision as to whether data needs to be omitted or not. This preliminary flagging data pipeline is referred to as the Omissions Engine and is designed to automate as much as possible of the manual data review process.

When issues are detected, they are documented and tracked through an internal ticketing system. On average, about 5% of sensors in Aclima's mobile fleet experience some type of documented issue each month (ranging from false alarms, to minor issues, to major issues). Each ticket is tied to a specific vehicle, sensor serial number, and AMN ID and contains a description of the symptom, which sensors are impacted, recommendation for intervention, description of how the issue was resolved, and the date resolved. If any manual omissions of data are required as a result of any issue, this is noted in the ticket in a manner that provides traceability in Aclima's database back to the reason for omission.

Some issues can be addressed remotely (i.e. firmware update or settings modification), but most issues rely on a physical intervention by either the driver or a trained hardware technician. Once identified, issues are resolved as soon as possible. When a notification is received, Aclima engineers and technical staff work with drivers to perform simpler repairs in the field, such as a loose wire or blocked tubing. If fixing the issue in the field is not possible or if in-field service impacts performance, the sensor (AMN if the sensor is within the AMN) is returned to one of Aclima's Mobile Calibration Laboratories for service and repair or swapped for a newly calibrated sensor (or AMN). The returned device is fixed, recalibrated, and re-deployed when needed. A key advantage of the AMP architecture is the fast replacement of AMNs: monitoring uptime is not significantly impacted when an AMN needs to be repaired.

This data review system has been used and refined over the past 5 years to review on average ~100 million data points each month.

Routine maintenance

Aclima's mobile sensing hardware is designed with scalability in mind, and there is minimal maintenance required on a day-to-day basis. This is a key enabler of monitoring at the scales required to meet the needs of the SMMI. Drivers perform basic system checks to

ensure the sampling, communications, and power systems are intact, and they perform a filter zero on the particulate matter inlet prior to each shift. Most other routine maintenance is performed by hardware technicians and takes place during calibration events and in between deployments.

Data verification

Data verification is the process by which Aclima generates finalized data from preliminary data. Data are verified at the one-second level (Level 2a according to the schema in Section 6.2.1). In order for data to be verified, two events must occur: 1) a mid- or post-deployment calibration and 2) a final data review of all data collected between two calibration events (the second of which is either a mid- or post-deployment calibration). This final data review involves reviewing calibration results, following up on any issues identified during deployment to ensure they were resolved adequately and any impacted data have been omitted, and a final review of time series data similar in approach to the on-going data review during deployments, as described above. Figure 5.18 below provides an overview of the data verification process, showing the high level steps involved and their dependencies. Figure 5.19 below shows a sample timeline for a single deployment including the occurrence of calibration events, data verification, and finalized data delivery.

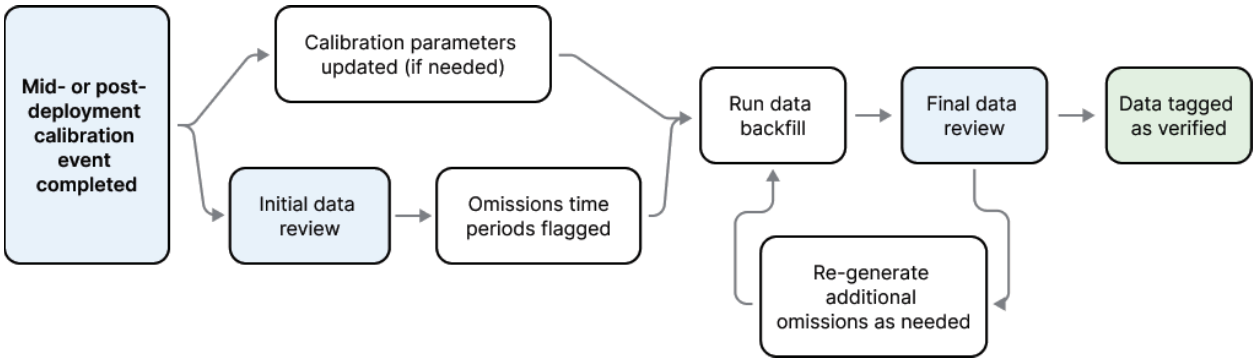


Figure 5.18: Overview of the data verification process

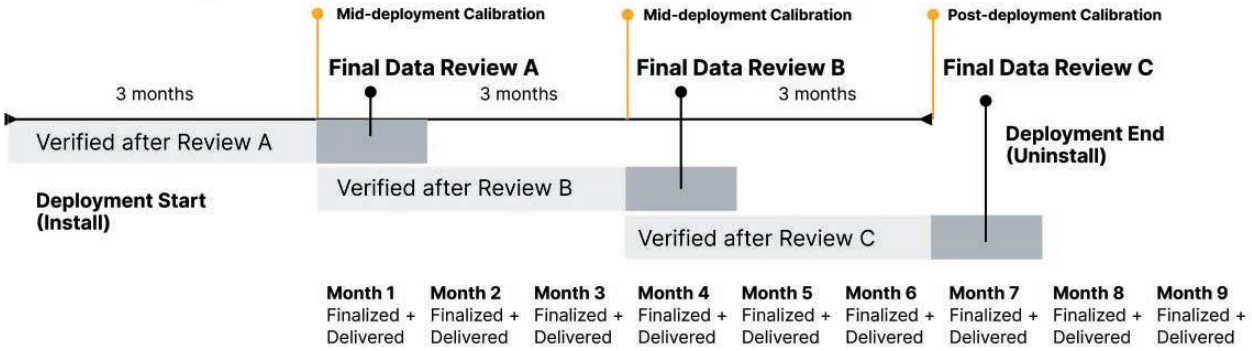


Figure 5.19: Deployment timeline for a single AMN, indicating the final data review and data verification process for an example where two mid-deployment calibration events take place over the course of a nine month deployment. In this case the data verification takes place in three steps, and keeps to a schedule that allows finalized data delivery to occur monthly with a three month lag. All AMNs will have their own deployment timelines, following a similar structure.

5.6.3 Level 3 and 4 data QA/QC

The primary data deliverable to CARB per the RFP is the finalized raw (Level 2a) data, which will support researchers and communities alike in pursuing their own detailed examination and distillation of collected measurements. A series of Level 3 and 4 data analytical outputs are available, which require their own QA/QC considerations.

Analysis of Level 3 data focuses on identifying pollution sources, where Aclima uses a combination of signals to indicate a likely source, characterize the type, and determine the location of pollution. Analysis of Level 4 data identifies overburdened areas through the measurement of long term ambient concentrations of pollutants at high spatial resolution to understand geographic differences in relative impact across an area. These analyses are also necessary for summarizing results as part of the community visualizations, e.g., being able to show long term ambient concentrations or toxic air contaminant fingerprints on a map. Aclima's QA approach aims to understand and quantify how measurement uncertainty propagates and combines with sampling uncertainty into these outputs derived from Level 2a data. This section describes some of the important considerations for understanding uncertainty of Aclima's different classes of Level 3 and Level 4 analyses.

Level 3: Identifying sources

Level 3 supports a variety of analyses, including those derived from the detection of concentration enhancement events. An enhancement event is defined as a temporary increase in concentration observed from a single mobile platform as it travels through a region of elevated concentrations for a particular pollutant (e.g., an emissions plume).

Level 3 analyses draw on the spatial aggregation and/or chemical classification of these enhancement events detected over time within a given monitoring domain. Figure 5.20 below shows an example of a Level 3 analysis that displays TVOC enhancement events detected over a one year period in close proximity to fuel storage tanks. The individual events are classified according to other pollutants that are concurrently detected as enhancements, specifically combustions tracers (indicated in orange), indicating a likely combustion source, or other pollutants, for example methane (indicated as blue); TVOC detections in the absence of other pollutant enhancements are indicated in purple.

Figure 5.20: An example of a Level 3 analysis that displays TVOC enhancement events detected over a one year period in close proximity to fuel storage tanks, collected as part of larger monitoring effort over a wide area within this community. The individual events are classified according to other pollutants that are concurrently detected as enhancements, specifically combustion tracers (indicated in orange), indicating a likely combustion source, or other pollutants, for example methane (indicated as blue); TVOC detections in the absence of other pollutant enhancements are indicated in purple.

Characterizing uncertainty at Level 3

The key measurement uncertainty metric for Level 3 data is the limit of detection at the base sampling frequency (as listed in Table 5.7 above), which governs the minimum concentration enhancement event that can be detected. Importantly, the detection of enhancement events is relatively insensitive to sensor drift because the signals are

always quantified as concentrations above background, which are therefore normalized with respect to sensor baseline or offset drift. Drift in measurement gain translates directly to uncertainty in the enhancement peak concentration, but in general these uncertainties are very small compared to variability in the behavior of an emissions plume. For example, Von Fischer et al. (2017) and Weller et al. (2018) show significant variability in observed concentrations and estimated leak rates from repeated mobile sampling of both simulated and real-world natural gas leaks.

For Aclima's broad area monitoring, a major benefit of Level 3 analyses is simply the identification and localization of emissions sources across a large geospatial area, which may otherwise go undetected. Within this context, the persistence or detection probability of enhancement events in a given location may be equally or even more important than the magnitude of the enhancements. Detection of pollutant enhancements in the same location on multiple occasions can improve confidence in the presence of a source in that location. Two metrics that can be useful in determining emission source persistence are the detection probability (i.e. the number of enhancements detected per unique visit to that location) and the number of distinct days on which a detection is observed. Both of these metrics can serve to identify sources of sustained pollutant emissions from transient sources in order to more successfully target either follow up measurements or regulatory action.

Level 4: Identifying locations of disproportionate impact

Aclima's hyperlocal ambient concentration estimate maps are based on a widely used class of mobile air quality monitoring data products that can be used to visualize locations of disproportionate pollution impact[39]. Aclima's maps are designed to quantify locations of disproportionate pollution impacts to communities at finer spatial scales than is possible using existing stationary monitoring networks in most locations. The intent of these maps is to produce values (with associated confidence intervals) that approximate the average pollutant concentration from hypothetical stationary monitors if they were to be placed in each census block group levels across the mapped area (see Figure 5.21 below).

[39] Ranasinghe et al., 2016; Apte et al., 2017; Miller et al., 2020; Chambliss et al., 2021

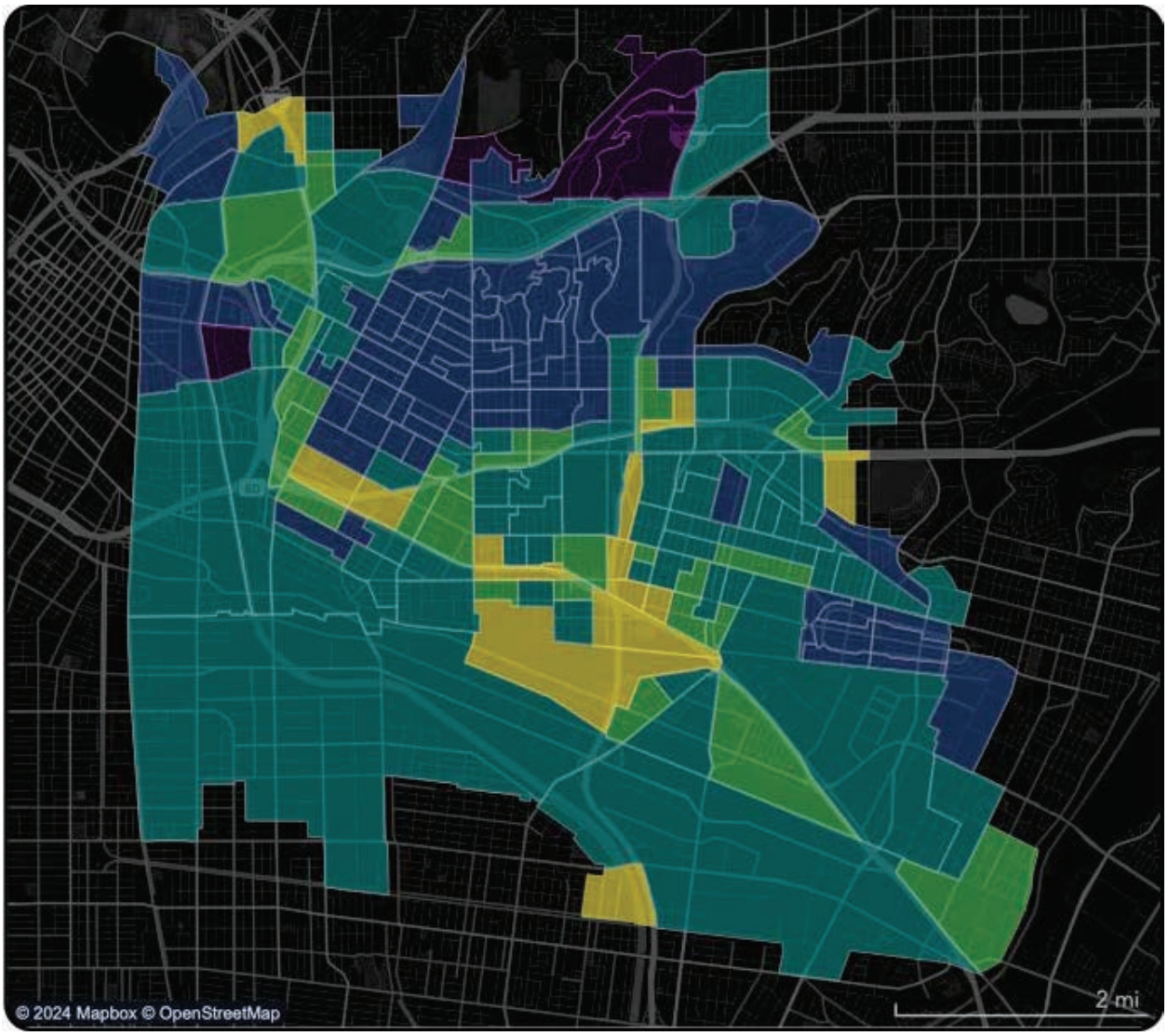


Figure 5.21: Example Level 4 data product (for NO2), collected over 3 months in Los Angeles for SCAQMD, aggregated and visualized at census block group spatial units

These maps are produced by collecting repeat measurements over time on publicly accessible roads within a desired geographic area and aggregating those measurements to produce a long term average at the desired spatial scale that represents typical pollution concentrations over the monitoring period.

Characterizing uncertainty at Level 4

While measurement error at the device level can be an important source of uncertainty in Level 4 analyses, additional sources of uncertainty must also be considered. Uncertainty in any given location at Level 4 is generally understood to decrease as a function of the

number of repeat measurements at that location[40]. The rate at which uncertainty decreases with repeat measurements in any given location can be strongly driven by temporal variability in atmospheric concentrations, which is often the limiting factor in defining confidence intervals for these types of data products. Nevertheless, it is important to quantify the predicted contribution of measurement error to total uncertainty. Measurement precision error generally decreases with increased number of samples aggregated as predicted by standard statistics. Table 5.15 below shows how one second precision for Aclima's sensors decreases with increased averaging time at eight seconds (which is a typical sample time for a single pass through a 100 m road segment) and at 170 seconds (which is a typical sample time for 20 repeat measurements on a 100 m road segment). These values are determined based on evaluations of comparisons of two collocated sensors in the same mobile platform while in motion, thus reflecting typical in situ performance and at typical ambient concentrations in urban and suburban areas.

Another important source of uncertainty is sensor drift, also listed in Table 5.15 below, which can increase the total error of a single segment average when the 20 repeat passes occur over the course of months to a year. Sensor drift is determined based on typical differences in bias between pre- and post-deployment calibration tests, thereby indicating by how much the sensor bias has changed over the course of a typical deployment, generally lasting somewhere between a few months to a year. Between the sensor precision (at 170 s) and sensor drift, these values characterize the contribution of measurement uncertainty to the total uncertainty for ambient concentration estimates specifically for 100 m road segments with approximately 20 passes. The number of data points collected will vary across a monitoring area and with the choice of spatial aggregation unit, but these estimates provide a general approximation of the magnitude of the contribution of measurement error to spatially aggregated concentrations.

Table 5.15: Drift and precision estimates for pollutants typically included in Aclima's Level 4 data products

Pollutant	**Drift**	**Precision**		
		1 s	**8 s**	**170 s**
NO_2 (ppb)	4.6	4	3.1	2.1
O_3 (ppb)	1.5	1.8	1.8	1.2
CO (ppm)	0.03	0.028	0.026	0.023
CO_2 (ppm)	18.1	3.4	3.3	3
$PM_{2.5}$ (µg/m3)	0.6	1.4	0.9	0.5
BC (µg/m3)	0.14	1.7	0.60	0.26

[40] Apte et al., 2017; Messier et al., 2018; Miller et al., 2020; Chen et al., 2022; Padilla et al., 2022; and others

Ultimately, the total uncertainty of hyperlocal ambient concentration estimates will be a combination of many factors in addition to measurement uncertainty, including temporal artifacts that result from sparse temporal sampling over large areas. Aclima provides confidence intervals alongside estimated concentrations at the spatial unit of interest with Level 4 data, which are derived based on standard statistical methods that are intrinsic to the data processing approach. Aclima also characterizes uncertainty using a more "top-down" approach, validating against independent measurements representing the same quantity as the Level 4 data. The unique value of hyperlocal maps resulting from mobile air quality monitoring also makes this type of validation difficult as independent data at this spatial resolution are not available for comparison. However, one approach that Aclima implements as part of its standard QA evaluations is to compare the long term hyperlocal estimates with the long term median concentrations from regulatory stationary sites within the monitoring domain. For Aclima's past deployments across California, Table 5.16 provides a compilation of comparison metrics for ambient concentration estimates within 250 m of a regulatory site for four criteria pollutants. These comparisons are distilled from individual comparisons across 20-30 individual sites (depending on pollutant) located in the Bay Area, South Coast, and Sacramento Air Districts. This gives a general sense of typical uncertainties and representativeness of Level 4 data products in California, and, critically, provides a framework for how uncertainty and representativeness in Level 4 data products for the CARB SMMI can be evaluated.

Table 5.16: Performance metrics for comparison of concentration estimates within 250 m of a regulatory site to that site from historical Aclima mobile monitoring activities. The metrics include mean bias error (MBE, which indicates systematic bias), mean absolute error (MAE, which is an estimate of absolute bias), and centered root mean square error (CRMSE, which indicates random precision error).

	MBE	**MAE**	**CRMSE**
$PM_{2.5}$	+0.5 µg/m3 (11%)	1.7 µg/m3 (23%)	2.2 µg/m3 (30%)
NO_2	-0.2 ppb (-5%)	1.7 ppb (30%/22%*)	2.2 ppb (44%/28%*)
O_3	+0.4 ppb (+2%)	1.2 ppb (5%)	1.4 ppb (6%)
CO	+0.04 ppm (+15%)	0.06 ppm (21%)	0.07 ppm (25%)

* NO_2 % MAE and % CRMSE values are heavily influenced by several sites where NO_2 concentrations are relatively low. When excluding sites with annual median concentration less than twice the CRMSE value (i.e. 4.4 ppb), the % MAE and % CRMSE reduce to 22% and 28%, respectively.

5.6.4 Partner fleet QA/QC

Aclima's subcontracted technical partners are recognized experts in the field of mobile monitoring and air quality measurement technology. They have conducted research – in many cases directly in support of CARB or the California Air Districts – and have collectively published hundreds of peer-reviewed papers. They follow well established SOPs and QA processes for maintenance and calibration of the instrumentation in each of the PMLs. Each sub-contractor will provide written documentation of their SOPs and QA procedures prior to the start of monitoring.

The operation of the PMLs requires more hands-on technical support than Aclima's mobile fleet, and the operations plan is for PMLs to have daily to weekly hands-on support from technical staff that will perform calibration checks, routine instrument maintenance, and any on-demand maintenance and troubleshooting that is required.

Examples of these routine activities during the monitoring period include:

- Span and zero checks with reference gases
- HEPA filter zeros for particle-phase instruments
- Flow checks
- Consumables replacement
- Sample line filter changes

Each technical partner team will be responsible for applying time shifts to align measurement times from the various instruments having different sampling response and transit times. All PMLs will be time-synchronized via a network time server.

Additionally, each technical partner will perform their own data review to identify data quality issues for exclusion/omission prior to finalizing data for delivery. Each team will provide final data delivery to Aclima on a monthly cadence with no more than a three month lag. Aclima will then be responsible for delivery of that data to CARB.

5.6.5 Limitations of Aclima measurements

A critical part of Aclima's quality assurance plan is to identify and communicate to data users the limitations of the measurements, derived data products, and mobile monitoring

in general. This section lists some of the important limitations of Aclima's mobile monitoring network as a whole as they pertain to the specifics of this proposal.

General mobile monitoring limitations

1. Mobile monitoring increases spatial information about air pollutants, but there is a fundamental limitation to how much temporal information can be provided from mobile monitoring (e.g., day of week, time of day, seasonal, etc). In certain cases, with explicitly targeted sample designs and careful analysis approaches, temporal information is possible (e.g., with targeted area monitoring), but, in general the broad area monitored in this proposal cannot provide consistently reliable temporal information.

2. Mobile monitoring achieves a low false positive rate, but can be susceptible to false negatives. Mobile monitoring at the spatial scales proposed results in a spatially dense, but temporally sparse data set[41]. Certain hyperlocal pollution events that are sporadic or one-off events may not necessarily be captured. Mobile monitoring can provide high confidence in the presence and location of detected events, but it is more limited in its ability to conclusively prove the absence of pollution sources in specific locations.

3. Sample collection design must be closely tailored to the desired outcomes. As such, using the raw data (i.e. Level 2a 1 second data as defined in Section 6) without information about the context for how they were collected and why will limit the use cases of that data to inform community pollution concerns. Derived data products that take into account sample collection and intended use cases are critical to extracting value from the raw data.

Measurement limitations

1. Some measurements in Aclima's sensor platform can be susceptible to long term drift, which limits how the Level 2a data can be used. Level 4 spatial aggregation is not appropriate for certain sensors (e.g. nitric oxide, TVOCs, and ethane) as a result of the large measurement uncertainty compared to typical ambient concentrations. Instead, enhancement-based Level 3 analysis are more appropriate use cases.

2. Certain measurements are considered proxy measurements, and thus may not directly correlate with health risk. For example, TVOCs in Aclima's platform are sensitive to an extremely wide range of different classes of organic molecules, and the toxicity of detected TVOC enhancements cannot be directly inferred without accompanying speciation measurements (PML follow up measurements will need to be conducted in these cases). Other proxy measurements from Aclima's fleet

[41] Chambliss et al., (2020)

include size-resolved PM to indicate coarse aerosol concentrations as a proxy for PM_{10}, concurrent black carbon and nitric oxide measurements as a proxy for on-road mobile diesel PM. These specific limitations are detailed in Aclima's QA documentation.

Other limitations and considerations

Targeted area monitoring will necessarily generate data that is limited in terms of representativeness over time as a result of the need to balance coverage over the wide range of pollution sources of concern and the time resourcing available. Many monitoring efforts will occur over a 1-2 week period, and the time of year that this occurs may impact the results of the investigation. In designing the overall sampling strategy and schedule, the potential seasonal impacts will be taken into account. The seasonality will also be taken into account in the analysis phase and in how conclusions can be drawn from the results. Where possible, connections between the long duration measurements (from broad area monitoring) and the short duration measurements (from targeted area monitoring) will be made in order to extrapolate findings where possible.

5.6.6 Additional QA activities planned

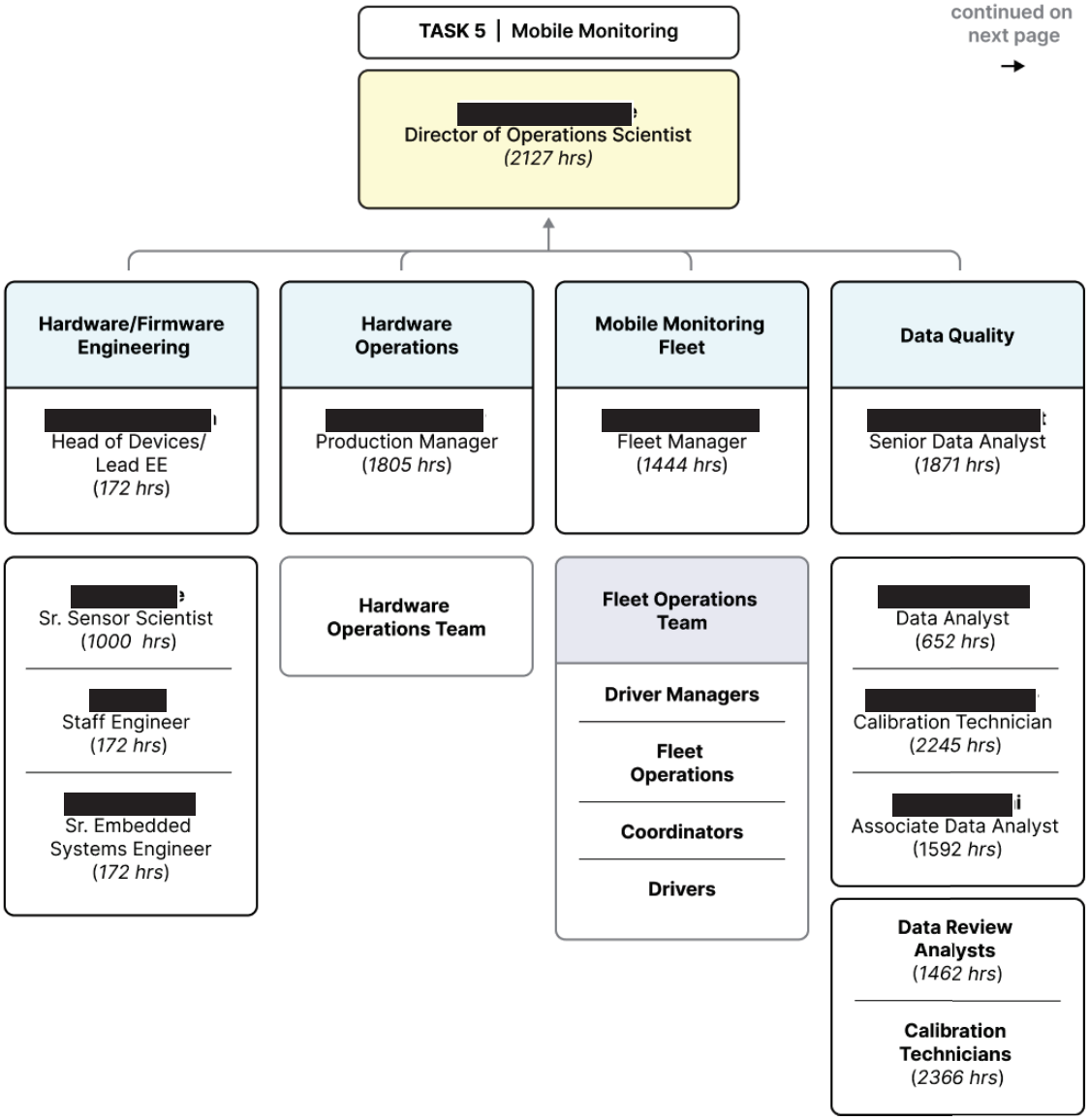
Aclima will plan additional QA activities to check for comparability between the PMLs, AMPs, and regulatory sites (CARB, Air District, or other), including:

- Identifying opportunities for concurrent sampling for the AMPs and all four PMLs around the same location of interest
- Each PML will include Aclima's sensor platform in its payload for the duration of the monitoring effort
- Pending the willingness, agreement, and logistical support of CARB and local Air Districts, Aclima plans to place its sensing hardware at stationary regulatory sites (ideally 3-4 at sites in different Air Districts) in order to identify any systematic bias between regulatory and Aclima and to provide transparency into Aclima's sensor performance.

5.6.7 QA reporting

QA documentation from both Aclima and its technical partners will be provided to CARB. All of the relevant QA/QC and analysis information will be included as an appendix in the Final Report, including calibration results, device level uncertainty estimates, collocation results for the activities listed in section 5.6.6, and any other relevant information.

5.7 Management and governance



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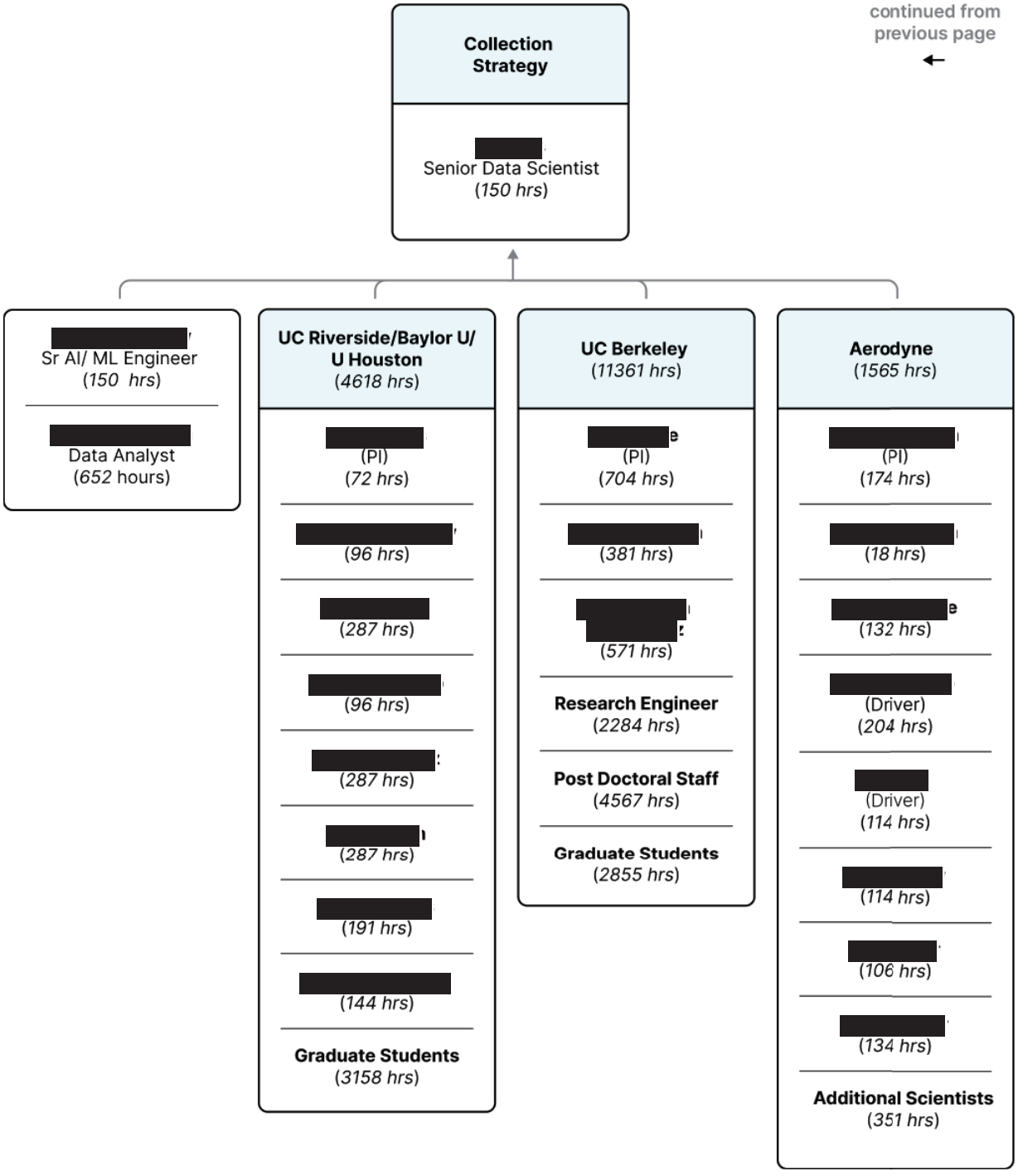


Figure 5.22 (above): Task 5 management and governance structure

Table 5.17: Task 5 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 5: Conduct Mobile Monitoring		
5: Conduct Mobile Monitoring	[redacted]	3/1/26

Table 5.18: Task 5 tasks and deliverables compliance

RFP Task #[42]	**RFP Task/Requirement**	**Aclima's Compliant Solution/Deliverable**
5	Conduct Mobile Monitoring	
5.1	Conduct mobile monitoring by executing the approved CAMP(s).	Aclima will execute on mobile monitoring as defined in approved CAMP(s).
5.2	Provide weekly mobile monitoring updates to CARB via a recurring weekly check-in meeting.	Aclima will provide weekly updates to CARB covering logistics and operations, QA, preliminary data and results, and any proposed amendments to monitoring strategy.
5.3	Notify appropriate local authorities and CARB immediately if local air pollutant concentrations exceed any established acute health-based threshold during monitoring.	Aclima will notify and communicate to CARB any concentrations of concern that exceed OEHHA thresholds for acute exposure (or other thresholds as agreed upon with CARB).

[42] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38-39 are covered in the proposal

6. Data reporting and presentation[43]

6.1 Summary

Aclima's existing data management (collection, storage, and reporting) system and capabilities will be applied to provide high-quality finalized raw data, and additional desired analyses as appropriate, to inform air quality decisions at local, regional, and statewide levels and support community emissions reduction planning. Aclima's data management system reliably collects and pushes raw data through multiple levels of processing, storage, and tagging throughout a collection campaign, including data from Partner Mobile Laboratories (PMLs). The system will transfer finalized raw data to CARB via cloud storage data bucket, use API access to support visualizations and reporting, and use near real-time workflows to alert CARB of safety concerns. Aclima's team of data visualization, public communication, and community engagement experts – in consultation with the Project Expert Group (PEG) and community co-leads – will work to ensure that outputs are accurate summaries and are understandable by a non-scientific audience, meet accessibility standards, and are driven by community needs. Aclima will provide complete summaries of all mobile monitoring to communicate to the public our findings.

Definition of Finalized Raw Data

Aclima proposes to define "raw" data as:

Sensor signals transformed to geophysical quantities of measurement, estimated using the sensor signal plus associated physical measurements directly related to the measurement principle such as temperature and relative humidity measurements at the sensor aperture for correction of interferences, with flagged artifacts included.

In effect, the raw data will be the geotagged time series data for each pollutant. Aclima proposes to define "finalized" data as:

Data with final calibration parameters applied.

Aclima uses the term "finalized raw data" to describe a single entity: raw data that has then been finalized. Aclima equates this to the RFP use of "raw and finalized data"

[43] **The entirety of section 6 is hereby designated as confidential, trade secret, and proprietary business information**

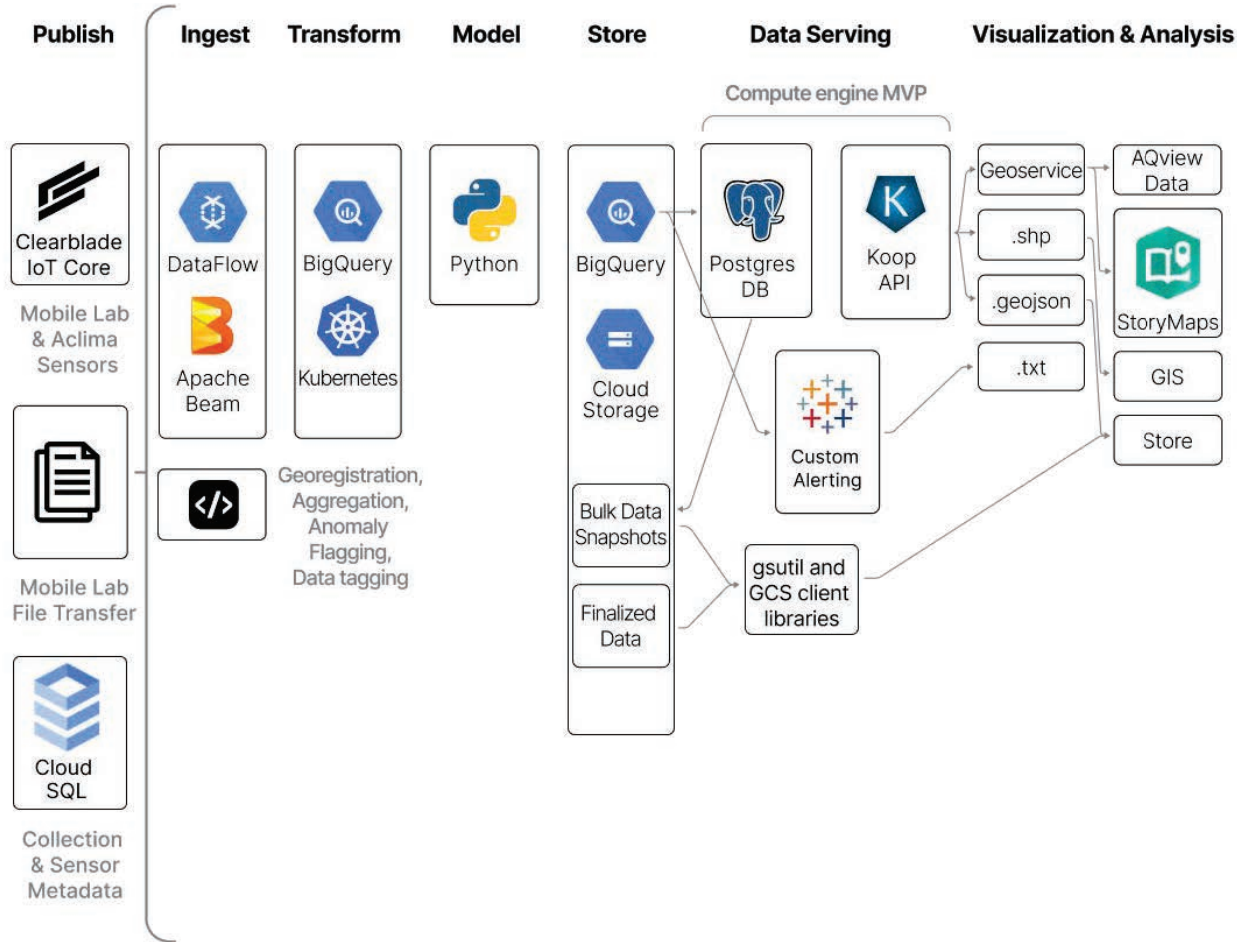


Figure 6.1: The primary flow of information from the publication of 1 Hz sensor and instrumentation data at the point of measurement through processing, storage, alerting, and serving of data and analysis products to summarize findings to the community.

6.2 Data management

Aclima's data management system for collection, storage and reporting comprises data ingestion and storage systems, processing pipelines used to ensure the availability of data at all levels (see Table 6.1 below), and the architecture that supports the sharing of information via a publicly-accessible visualization (see Figure 6.1 above for an overview of the flow of information; and Table 6.4 below for description of off-the-shelf components). The existing capabilities supporting these procedures have been deployed successfully on large-scale mobile monitoring campaigns — the New York State Department of Environmental Conservation (NYSDEC) statewide annual effort is especially notable with respect to scale — and satisfies RFP subtask 6.1, but they also serve as a critical

foundation to many of the other subtasks constituting RFP task 6. All data management procedures will be established and provided as stated in CAMP(s) Elements 10, 13, and 14.

6.2.1 Aclima data levels

The categories of data Aclima will make available to CARB and communities will span 1 Hz measurements for analysis and development, aggregations of data taken throughout the observation period, and low latency alerts for detection of high concentration signals. Aclima further organizes these data into levels reflecting the degree of processing applied, from the lowest level (level 0) at sensor readout to high level (level 4) modeled analyses which synthesize individual data points into actionable insights and data summaries for dissemination through visualization and reporting. These definitions extend the Schneider et al. (2019) framework — which focuses on data processing and output for a single pollutant — by including processing steps that can involve advanced transformations of multiple pollutants and other atmospherically relevant context (e.g. meteorological data) to provide data-based insights about specific emissions sources and probabilistic estimates of concentration, which can potentially be more actionable for regulators and communities. See Table 6.1 below for description of all data levels.

Table 6.1: Aclima's Data Processing Levels. Asterisks (*) indicate data levels provided to CARB or in support of non-scientific communication and community visualization.

Data Level	Name	Definition	Example
0	Raw Signal	Original signal produced by the sensor.	Voltage, digital number, raw mass spectral data.
1	Intermediate geophysical quantities	Derived from Level 0 data using basic physical principles or calibration equations.	Concentration in ppb or $\mu g/m^3$.
2a*	Standard geophysical quantities	Estimate using sensor plus associated physical measurements directly related to measurement principle.	NO_2 derived from O_3 and O_x (O_3+NO_2). Temperature and humidity corrections to sensor estimates. Methane and speciated air

			toxics peaks derived from time series data.
2b	Standard geophysical quantities, extended	Level 2a but using external data sources for artifact correction & directly related to measurement principle.	Enhancements corrected by external data like stationary data. Concentrations aggregated to a single pass of a 100 m road segment.
3*	Advanced geophysical quantities	Estimate using sensors, both single pollutant and in combination, along with external contextual data and information to add value to the data product.	Diesel, traffic, and related source indicators. TVOC peak clusters and cluster classification.
4*	Spatially continuous geophysical quantities, modeled spatio-temporal phenomenology	Spatially continuous maps, statistical inference of concentrations, probabilistic modeling across space and time.	Probabilistic estimate of pollutant averages, Probabilistic estimate of likelihood of a methane leak in an area.

The primary data deliverable to CARB per the RFP is the finalized raw (Level 2a) data: the lowest level of geophysical measurement, which includes a transformation from the sensor readout board units to an interpretable quantity. Level 2a are finalized raw data, with mid and post-deployment calibration updates applied, and annotated omissions (see Definition of Finalized Raw Data or in glossary; and Table 6.2 below). Level 2a data will support researchers and communities alike in pursuing their own detailed examination and distillation of collected measurements. A series of analyses based on Level 3 and 4 data support community communication and visualizations, focused on identification and characterization of sources, and identification of overburdened areas. Included in the level 3 data are detections and identifications of events, which may trigger an alert to the end user. As discussed above in 5.4 Event Detection and Notification, an alerting protocol has been established for methane leak events in gas distribution pipelines. This alerting system will be adapted to other events of concern such as high levels of air toxics derived from Partner Mobile Laboratory (PML) measurements.

Table 6.2: Data are tagged with two different stages during processing: preliminary and finalized. Finalized data are provided to end users through visualizations and reports, as well as direct data transfer.

Data Stage	Description
Preliminary	Data which use the initial set of calibration parameters, available at initial ingestion processing.
Finalized	Data which have post collection calibration updates applied.

The data handling system has been designed to deliver on all of the above data processing levels and stages, with considerations for timeliness, robustness, data lifecycle management, scalability and resource management, extensible data integration of new data sources, and flexible output formats for interoperability with customer systems.

Data are ingested in near real time to Google Cloud Platform (GCP), with careful labeling and archiving of data to ensure all data from sensors and instrumentation are retained and capable of being reprocessed as needed. Level 2a through Level 4 data are made available via an API, which supports a customizable set of data analyses exposed for visualization via a publicly accessible front end.

6.2.2 Steps in Aclima data management procedures

Key steps in Aclima data management are summarized in Table 6.3 below. Steps 1-3 are discussed in depth in the discussion following. Table 6.4 above describes off-the-shelf elements within the data management pipeline.

Table 6.3: An overview of the major components of the data management from device through transfer of finalized raw data to visualizations fed by APIs.

Data management pipeline		
1	**Publish**	Publish 1 Hz sensor data along with metadata such as sensor-specific temperature, relative humidity, pressure, latitude and longitude (GPS), and flow rate from remote devices to the cloud, using lightweight transport industry standard format and LTE connection. Local storage for robustness in outages.
2	**Ingest**	Ingestion of data into the cloud via ClearBlade IoT Core as the MQTT broker, running in conjunction with Dataflow/ Apache Beam to stream data into Google BigQuery. Data are sent to two permanent archives, one in BigQuery and one in GCS. Level 0 data in the GCS archive are never removed.

		Custom code to pull third party data for contextual data layers and features such as weather data, stationary site data, and digital elevation model (DEM) data.
3	**Transform**	Process sensor readout data into geolocated measurements with physical meaning.
		Flag anomalous data from instrumentation faults, warmup periods, out of range readings.
4	**Model**	Data transformations to create multi-pollutant data analyses focused on identification of locations of concern and areas overburdened by known pollutants.
		Provide information to the mobile collection route planning system on areas with high variability and other metrics signifying areas in which the models need additional information to best support the suite of data analyses.
5	**Store**	Label and store all levels of processed data in a data lake. Make data accessible for further processing, analysis, and direct delivery to customers through a combination of Google BigQuery and Google Cloud Storage (GCS) buckets or AWS S3 as necessary.
		Preserve snapshots of data at critical processing stages such as at finalization of calibration.
Data Transfer		
6	**Transfer**	Provide access to finalized raw data for customers to transfer to their own storage, via GCS, or AWS S3 as necessary.
7	**Serve**	Expose data in a postgres GIS database for exporting via API into a variety of formats, for ease of use by end-users as well as for use in visualizations.
Data Reporting and Presentation		
8	**Alert**	Pipeline for providing timely updates on identified gas leaks, or other potentially dangerous detections.
9	**Visualize**	Community-focused publicly accessible web-based visualizations with a set of standard views such as ambient pollutant concentration estimates at the spatial resolution of census block groups and a set of custom selected elements tailored to specific concerns in an area.

Table 6.4: Description of off-the-shelf components and their role in the Aclima data management and transfer system. Google is a strategic Aclima partner.

Off-the-Shelf Component / Framework	Function
Clearblade IoT Core	Device Registry and MQTT broker that serves as a secure gateway for data streaming into Aclima's Cloud Infrastructure from the AMNs.
Google Cloud Pub/Sub Google Cloud Dataflow	Streaming data pipeline that accepts data forwarded from Clearblade IoT Core and both (i) creates permanent archives of level 0 data and (2) transforms data from level 0 to level 1, seeding the results in the Google BigQuery data warehouse for downstream processing via ETL.
Google BigQuery Google Kubernetes Engine	Core ETL infrastructure that generates data downstream of level 1 via a combination of SQL (executed by BigQuery) and python (executed by Google Kubernetes Engine). Google BigQuery also serves as a platform for the production data warehouse through which most internal tools interact with mobile monitoring data.
PostgresDB	An endpoint database that stores level 4 data. PostgresDB provides an analytical backend that supports geospatial visualization and analysis tools requesting data via an intermediate API.
MySQL	A core database that stores metadata detailing hardware associations and calibration information. This database supports a number of internal tools in addition to Aclima's core ETL pipeline.
Koop	Esri-sponsored, extensible framework for building applications that can serve Geospatial data in the GeoServices specification supported by ArcGIS, vector tiles that are optimized for web visualizations, and GeoJSON for general-purpose use.
ArcGIS	Spatial visualization via StoryMaps feature.
Jira	An industry-standard ticketing and task management platform that Aclima uses heavily for documenting deployments, omissions, and other metadata used to support the data review process and other QA/QC procedures.

6.2.3 Data management pipeline

Publish: collect and transmit sensor and metadata to the cloud

The Aclima Mobile Node (AMN) polls the physical sensors and lab-grade reference equipment for data every second. Raw mobile sensor measurements are recorded along with the associated date, time, and location of each measurement as well as other critical diagnostic parameters such as sensor-specific temperature, relative humidity, pressure, latitude and longitude (GPS), and flow rate. All raw sensor readings, location, and diagnostic data are packaged into structured messages with an associated network timestamp and transmitted to Aclima's cloud-based backend through an internal LTE module. During times when LTE connectivity is poor, data messages are queued on the device and sent when connectivity returns. The AMN contains enough flash storage to store up to a few weeks of 1-second data.

The structured messages are transmitted from devices using an industry standard Internet-of-Things (IoT) lightweight transport format, Message Queuing Telemetry Transport (MQTT), to minimize code footprint and network bandwidth. Transmissions are brokered by a robust, scalable, commercial IoT service, Clearblade IoT Core.

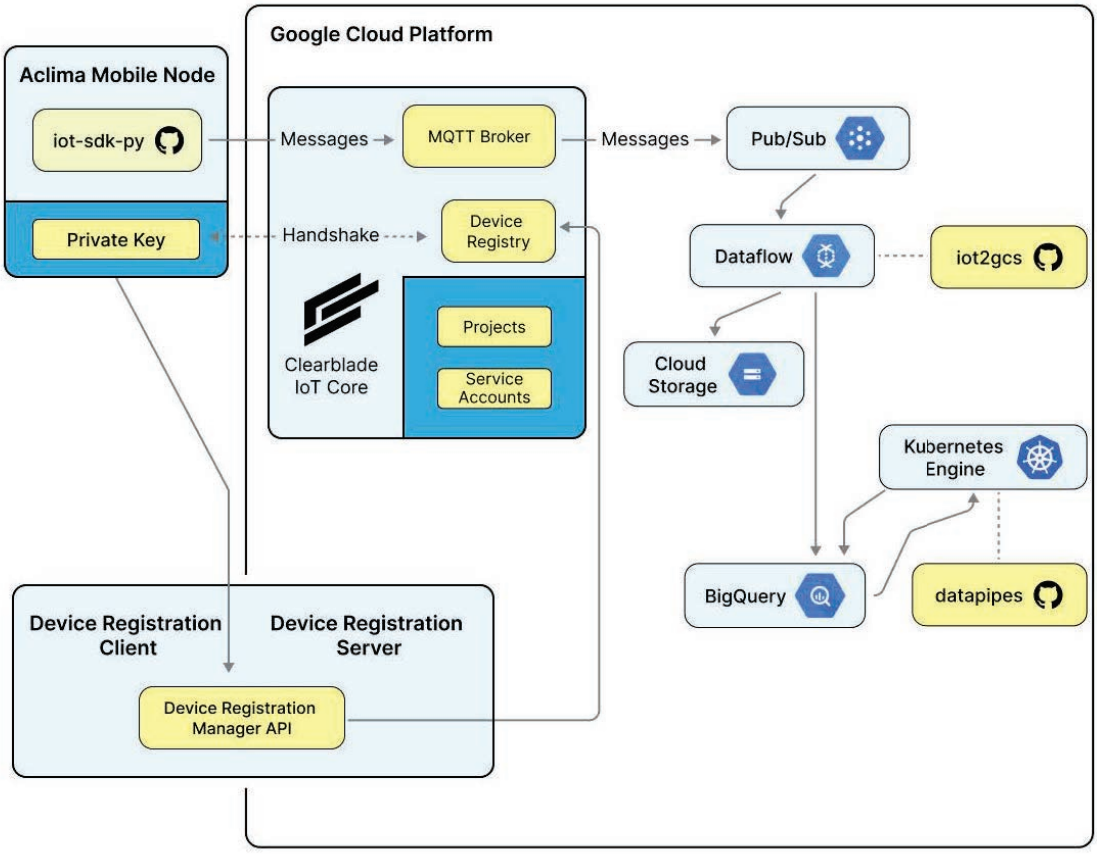


Figure 6.2: Sensor, instrument, and third party data ingestion

Clearblade IoT Core has two critical components that enable transfer of data to Google Cloud: a device registry that authenticates devices so they can communicate and an MQTT broker that forwards data streaming from the AMNs to other Google Cloud services where they can be archived and processed further.

Ingest: bring data into cloud from Aclima and other sources

Packets of data arriving into Google Cloud via the Clearblade gateway are forwarded to Google Dataflow, a streaming data processing service that leverages the open source Apache Beam project. Data are sent to two permanent archives, one in BigQuery and one in GCS. Level 0 data in the GCS archive are never removed.

Partner Mobile Lab (PML) data from subcontracted technical partners will be handled through a combination of streaming time series into GCP via the Clearblade IoT service, bespoke Apache Beam pipelines that will process data in batches, and post processing file transfer.

Aclima additionally ingests a number of third-party data sets that support important operational and product data processing into the data warehouse. These include modeled meteorological data from the NOAA HRRR model, Digital Elevation Models (DEM), and stationary air quality monitoring data from sites such as AQMIS, AirNow, and OpenAQ.

Transform: transform data into Standard Geophysical Quantities

Raw signals are transformed into calibrated physical quantities representing pollutant concentrations using hardware calibration data stored in a MySQL database, including dynamic associations between hardware components, sensors, AMNs, vehicles, and calibration parameters.

Aclima uses a simple data stage system that identifies each individual 1 Hz data point by one of two possible stages: (1) Preliminary (data are likely to change) and (2) Verified (data should be considered final). Preliminary data are based on pre-deployment calibration parameters, and are available within 24 hours of collection. Finalized data are based on mid or post-deployment calibration (See Section 5.6.2).

The mid and post-deployment calibration processes result in a set of manual omissions, updated calibration values, and calibration functions to apply. In order for these corrections to be applied, a *backfill* must be triggered to reprocess level 1 transformations that make use of sensor calibration values and any downstream aggregations for all data collected in the field. A backfill is a process by which the entirety (or some subset) of the daily workflow is rerun to incorporate the updated parameters and is critical for mobile monitoring. The backfill process is costly, so Aclima has designed both the data warehouse and Extract Transform Load (ETL) pipelines with features that allow for efficient, automated, and observable backfills. Tables in the data warehouse include data versions associated with the code used to process the data to track the lineage of data.

Aclima maintains metadata that categorize omissions and detail the period for which they were made in Jira, a ticketing and task management platform. As part of the Serve data step (see section 6.X, below), Aclima will make these annotations available to CARB. There is overlap between the omissions categories Aclima maintains and the null codes defined in the Air Quality System (AQS) data coding dictionary. As part of the data management process in the SMMI, Aclima will preferentially use AQS codes when annotating omitted data where applicable. For any omissions that are not well-described by existing AQS null codes, Aclima will work with CARB to ensure annotations are clear and well-documented.

A snapshot system creates backups of verified data for each customer area once it is generated, writing new tables to a backup archive. A default snapshot is created when 1 Hz data are finalized. Multiple snapshots are supported for aggregated data to accommodate release of new analysis products. This snapshot system will be extended

to write finalized 1 Hz data to the GCS bucket described in section 6.24 below, ensuring that CARB receives a copy of the verified 1 Hz data.

Model: transform data for analytical purposes

Data is further examined to create multi-pollutant data analyses focused on identification of locations of concern and areas overburdened by known pollutants. These analyses utilize knowledge of source characteristics such as co-emitted pollutants and atmospheric dispersion to help identify sources and patterns, which in turn provide actionable data and identify modifiable factors to improve air quality. These analyses also directly support scientific communication and visualization to communities and other non-scientific stakeholders. As discussed in more detail in section 4.5.2 above, the analyses include:

- Enhancement-based analyses, which identify spatially and temporally localized amplifications in concentration of a pollutant that are measurably distinguishable from the ambient background, using the time-resolved data
- Ambient concentration-based analyses, which identify spatial gradients in the ambient concentrations observed for specific air pollutants (or combinations of different measured pollutants), using temporally average concentrations aggregated over a longer time period or within individual time series of a single drive
- Ambient concentration estimates from broad area monitoring, which use temporally aggregated ambient concentrations, or relative enhancements above a regional concentration
- Ambient concentration estimates resulting from targeted area monitoring, which also use temporally aggregated ambient concentrations but derived from mapping conducted over a shorter period of time

Store: all levels of data stored in a data lake for further use

The critical infrastructure components needed to support an extract, transform, load (ETL) workflow are *storage* and *compute*. The storage platform Aclima uses for data warehousing is Google BigQuery, an off-the-shelf cloud-native database application that supports highly concurrent workloads and provides serverless computing options. Compute tasks for which the analytical features of BigQuery SQL are not sufficient are executed on a Google Kubernetes Engine (GKE) cluster, a Google Cloud Platform service wrapping the open-source container orchestration framework, Kubernetes, and providing additional features including built-in logging and monitoring, fully-managed hardware, and security management.

BigQuery both stores the data and performs computation on the data when it's being queried. Aclima leverages BiqQuery's efficient access to large datasets via partitioned tables and clustered fields. Compute tasks pull in data using BigQuery, transform it, and write the data back into a different location in the data warehouse. BigQuery computes infrastructure scales automatically with the workload provided, allowing Aclima to increase the amount of resources during peak use. Compute tasks additionally write to data stores other than BigQuery that support client applications. These data stores include backend databases supporting production APIs, like PostgresDB and flat-file storage for internal and external data distribution.

6.2.4 Data transfer

Transfer: make finalized raw data available to customers

Aclima proposes to make finalized raw data available to CARB via Google Cloud Storage, or AWS S3 buckets if necessary (per mutual agreement with CARB). This will be available on a monthly basis where the data delivered incorporates a three month lag, and as a complete dataset at the end of the contract period, along with QA/QC information. Aclima expects to generate approximately 2 TB of uncompressed Level 2a data per month. Data formatting and metadata requirements will be determined with CARB during the development of the CAMP(s).

Transferring finalized raw data

Finalized raw data will be transferred to CARB on a monthly basis beginning four months after monitoring has commenced, in accordance with the RFP requirements, and facilitated by the mid-deployment calibration process outlined in section 5.6.2. An automated backfill process will be launched each month to flow the updated parameters through all data processing levels and to stage finalized data snapshots in a GCS bucket where it is available to CARB. The expected end date for mobile monitoring is three months prior to the end of contract; this provides sufficient time for Aclima to perform final calibrations and backfills so that finalized data is transferred to CARB by the end of the contract.

Aclima proposes to use GCS to facilitate both the monthly deliveries of finalized raw data and the bulk delivery of all mobile monitoring data to CARB. Aclima proposes to provide data downloads via the Google Cloud console user interface, client libraries that are available in a variety of programming languages, and a command line utility. These options support a number of use cases, from ad-hoc downloads by non-technical users to automated scripts and tools developed by software engineers. It also provides a number of features allowing for fine-grained access control and data retention policies. In

the case that GCS is not an acceptable tool for making these transfers, Aclima can stage data for download by CARB in AWS S3 storage, a similar storage platform.

Aclima uses Google Cloud Identity and Access Management (IAM) tools and minimum access best practices for securing all the mobile monitoring data it collects. These practices govern access to data stored in Cloud Storage, BigQuery, open source databases running in GCP, and all other infrastructure used to process data.

Data will be stored in formats that provide high compression rates for efficient bulk transfer that decompress into human-readable formats incorporating EPA Air Quality System (AQS) coding standards where applicable. Raw 1 Hz data will be provided in gzipped comma-separated value (csv) files. These files are human-readable and widely supported by analysis and ingestion tools.

Serve: expose data to support web applications

In addition to making data available for direct transfer to CARB via GCS or other appropriate cloud storage provider, Aclima will also:

1. Provide data to publicly accessible visual summaries of mobile monitoring data following procedures outlined in the CAMP(s)

2. Support the integration of mobile monitoring data with AQView as part of the data management plan

Aclima will use a combination of open source tools and off-the-shelf cloud services to accomplish these tasks. Aclima will ensure data is accessible in a variety of standard GIS formats (e.g. GeoServices, vector tiles, GeoJSON), backend services supporting visual summaries are portable and easy to populate with finalized mobile monitoring data, and data formatting specifications reflect CARB stakeholder needs and conform to AQS data coding standards wherever applicable.

Serving web application data

To serve mobile monitoring data to web applications, Aclima proposes to provide an application composed of a Koop API wrapping on top of a Postgres database containing mobile monitoring data (see Data Serving layer in Figure 6.1). This provides portability, flexibility, and scalability to meet a variety of CARB hosting and running needs.

The Koop API plus Postgres database will provide the portability and flexibility to different host environments and outputs which SMMI needs. Past Aclima web applications (supporting customers including NYSDEC, CARB, and LEAN) have used a tileserver built

on open-source libraries capable of using PostGIS function sources that generate tile sets based on stored queries. For the SMMI use case, Aclima recognizes there is less need for resources generated on-the-fly in response to API requests but much greater need for portability and flexibility with regards to where the application runs and the variety of visualization and analytical workloads it can support. This solution will be simple for CARB or communities to replicate on their own infrastructure as a result of a single Virtual Machine (VM) design, regularly updated database snapshots made available in GCS, and automated tools that can build and run the application on a variety of infrastructure platforms and operating systems.

Koop is an Esri-sponsored, extensible framework for building applications that can serve Geospatial data in the GeoServices specification supported by ArcGIS, vector tiles that are optimized for web visualizations, and GeoJSON for general-purpose use. Koop has a plugin architecture that allows for developers to integrate data providers or output formats if they are not already supported. In this use case, there is existing support for Aclima's intended data source (PostgresQL running PostGIS) and the output formats Aclima plans on supporting (GeoServices, vector tiles, and GeoJSON).

The application's deployment will be managed with Docker Compose, a tool for orchestrating multi-container applications. It allows developers to define the entire application stack — including services, network information, and data stores — with a single configuration file and then deploy the application with a single command. The simplicity of deploying applications with compose combined with containerization's isolation from the hardware on which the application runs makes it a good choice for ensuring simple deployments on most hardware.

All of the data stored in the Postgres database and served via Koop will be provided to publicly accessible and CARB-hosted visualizations. Therefore, user-oriented authentication is not necessary. However, Aclima will provision API keys to the front end applications so that CARB can better understand where request traffic originates. Aclima can use an API gateway that offers features that will support this security posture, including app authentication tools and policies like rate-limiting. The API Gateway can also provide automated monitoring so Aclima and CARB can track API performance.

In the event that a single server running the Koop application cannot handle the volume of traffic originating from frontend visualizations, API Gateways have load-balancing capabilities that will support duplication of backend servers and distribution of requests to those servers such that more traffic can be robustly handled with minimal latency.

Aclima will develop an appropriate specification for mobile monitoring data uploaded to AQview in collaboration with CARB, building on past experience. Aclima has previously

provided technical support in ingesting, formatting, and transferring data to AQView in a 2021 partnership between Aclima; Physicians, Scientists, and Engineers for Healthy Energy (PSE Healthy Energy); and CARB. A result of this partnership was a data formatting specification for storing stationary monitoring data using low-cost sensors. This specification incorporates AQS data codes and reflects many of the requirements of AQView. Aclima will leverage this experience to develop a similar specification for mobile monitoring data through collaboration with CARB as part of the SMMI.

Aclima has experience supporting the transfer of large volumes of mobile monitoring data at all levels of processing. In one project, Aclima provided level 3 and 4 data products generated by the core ETL pipeline, via GCS, to partners in Louisiana. This allowed them to transfer the data to their systems in bulk for public dissemination. On another project, Aclima provided access to a data export interface which the NYSDEC used to download selections of finalized raw data for conducting their own analyses.

6.2.5 Data reporting and presentation

Alert: communicating concentrations of concern

As described in detail in Section 5.4, Aclima will notify and communicate concentrations of concern to CARB. Notification and communication focuses on pollutants such as natural gas which are most suitable for rapid notification and communication but can scale to provide responses for a range of pollutants.

Community Interactive Visualization

The Aclima team will work with communities through the engagement process and in CAMP-specific design workshops to help craft their data visualizations, with visualization and analysis/interpretation requirements approved by CARB during the CAMP(s) review period. Aclima will use customizable templates and contextual data to ensure all outputs are accurate summaries understandable by non-scientific audiences. Aclima will make available the suite of analyses which can support source identification, and identification

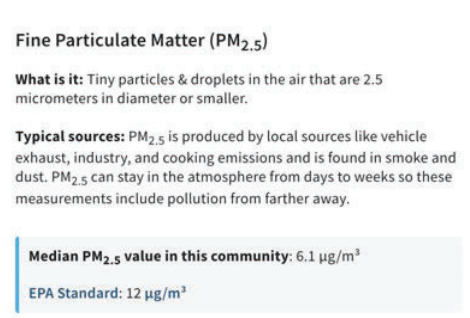
of locations of disproportionate impact, which may support future actions by CARB and communities. These are described in Table 4.3 above, which provides examples of analyses in relation to these objectives. Through Aclima's past experience in California and New York, the team has identified a recurring set of user needs which Aclima will use to support co-creation work with communities. Aclima is open to whatever tooling is identified by the CAMP(s) process, but proposes Esri tools to ensure that they can easily be hosted on CARB's servers and existing ArcGIS hubs, in service of an online, interactive, free-to-use visualization.

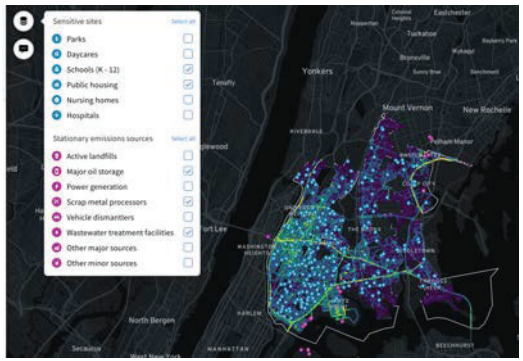
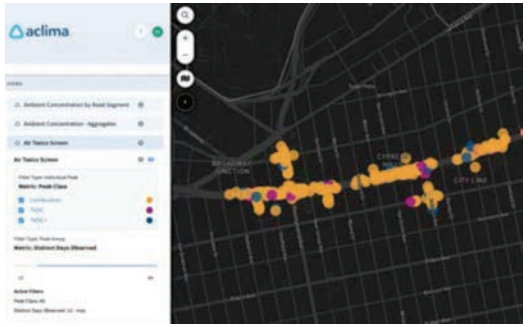
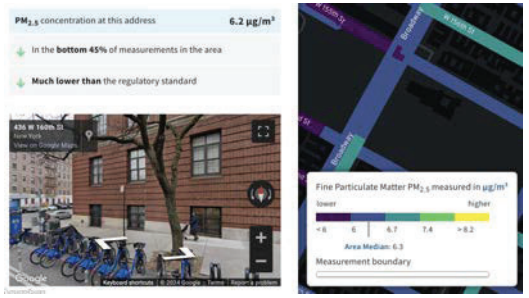
Insights from past experience

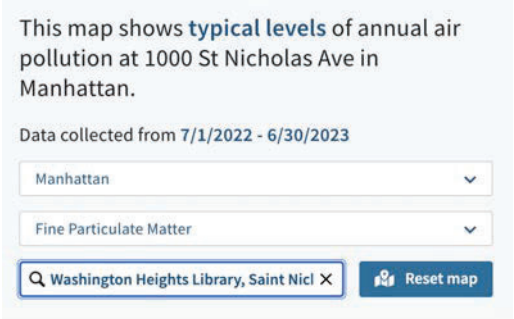
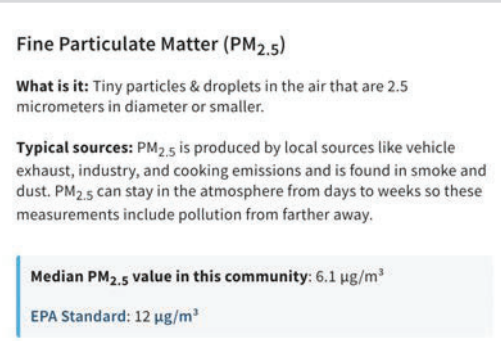
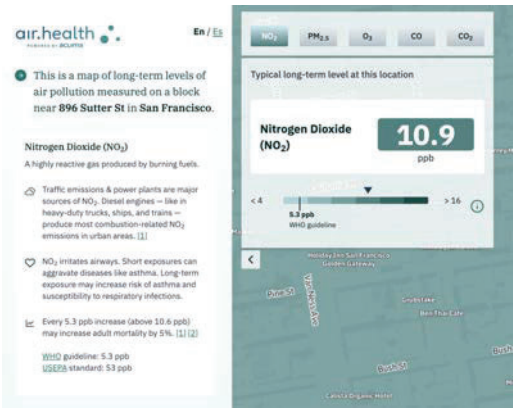
Aclima has considerable experience with data processing of large volumes of air monitoring data into geospatial- and narrative-based publicly consumable visualizations and reports, that support understanding, and action in partnership with regulators where appropriate. Among other projects, AirNY is a data-centric visualization tool built in partnership with statewide communities and NYSDEC (anticipated release date: 3/31/24; video walkthrough available here[44]), which integrates community concerns, emission sources, roadways, sensitive receptor sites, and socioeconomic data with Aclima's hyperlocal air monitoring data. Aclima has also built narrative-driven tools, such as reports[45] with SCAQMD.

Through these experiences, the Aclima team has found a recurring set of user needs for varying levels of technical acumen and internet access and recommends reflecting these in templates for SMMI visualization tools, as described in Figure 6.3 below.

[44] Aclima, Inc. (2024)
[45] Aclima, Inc. (2022)

Template for SMMI communities	Best practice to be applied to SMMI	Examples from live Aclima platforms
Upfront summaries	Present takeaways up front. This is important for users to develop enough interest in a website to invest in learning more through exploration	
Accessibility elements	Present the data in an easy-to-understand way for the general public, including using plain language and ensuring the tool is ADA-compliant and accessible on mobile and desktop devices	

Contextual layers	Layer Aclima's hyperlocal air quality data with contextual datasets, such as sensitive receptor sites, stationary sources, or socioeconomic data, to help people situate the data within their own knowledge of their community	
Hotspot layers	Visualize areas of significantly high pollution levels to support community prioritization of follow-up monitoring	
Comparative analyses	Compare typical air quality across different regions, times, or set regulatory standards, to help communities understand relative impact	

Wayfinding tools	Allow users to submit an address of interest and learn about air quality at that location to help communities localize their concerns	
Pollution source identification explanations	Highlight the origins and types of pollutants to help inform community action plans	
Data trends and insights explanations	Highlight what significant patterns, trends, or summaries can users gain from the data to make the data more accessible and actionable	

Directives towards action	Explain what is coming next and what can users do with these data, to make the data more actionable	Aclima would develop directives, if any, in consultation with CARB and communities

Figure 6.3: Recommended visualization interface elements for templating, and best practices based on past Aclima experience.

Aclima recognizes that some CAMP(s) may have needs that will fall outside of those listed above, and will adjust to meet these needs.

Aclima's team of data visualization, public communication, and community engagement experts will work to ensure that outputs are accurate summaries, properly displayed, and are understandable by a non-scientific audience and are driven by community needs, input, and air quality goals. Aclima will provide complete summaries of all mobile monitoring, including our maps depicting ambient concentrations and enhancements detected by broad area monitoring, as well as high-level details of data processing methodology, in accessible communications materials designed for the public. Aclima will also provide summary statistics so that users can have a greater understanding of how the results of the mobile monitoring effort can help communities work with CARB to inform future emissions reductions plans.

Proposed tooling

Aclima is open to whatever tooling is identified by the CAMP(s) process, but does have a preference for using Esri tools to ensure that they can easily be hosted on CARB's servers and existing ArcGIS hubs. Esri software easily integrates with the Koop API that will be used to serve the data. Esri software will also allow for addition of data layers that exist in common formats, such as ArcGIS FeatureServices, like CalEnviroScreen 4.0[46], to provide additional context to the air quality monitoring data. There will be seamless integration for CARB IT staff when handing off the tool, as Aclima understands that this software is already in use at CARB. For whatever user needs Aclima cannot meet with off-the-shelf Esri tools, the team of engineers are able to build custom components or widgets using Esri's Javascript SDK.

AQview visualization

Aclima will support CARB in making mobile monitoring data available in AQview by deriving formatting specifications that satisfy requirements of the AQview system and encompasses the finalized dataset. Any stories, summaries, or reports will also be shared with CARB in common formats (e.g. PDF) so that they can be easily added to the Additional Monitoring & Reports in AQview.

Insights from past experience

Aclima has previously transferred stationary monitoring data to the AQview system in an agreed upon format via Secure File Transfer Protocol (SFTP) during its partnership with PSE Healthy Energy. Aclima will leverage this and its other experience building web-based visualization and analysis tools used by NYSDEC, LEAN, and more when working with CARB to derive a formatting specification supporting AQView integration. Additionally,

[46] CalEnviroScreen 4.0 Results (2021)

Aclima is open to multiple mechanisms of transfer for this data including SFTP transfers as in past engagements or the normal SMMI data transfer mechanisms detailed in 6.2.4.

Optional, no-cost Google Public Sector partnership

In addition to final data delivery, Aclima proposes an optional, no-cost partnership with Google Public Sector to leverage Google's large language model, Gemini Pro, to support the follow-on analysis of the SMMI dataset at CARB. Google is already an Aclima strategic partner, and Google technologies underpin the data management system.

The SMMI dataset will be unprecedented in scale, and valuable for developing a more integrated understanding of sources and exposure at the community scale and across the state. However, these analyses are intrinsically time-consuming using traditional methods. Large-language models like Gemini Pro are valuable for more efficiently mining complex datasets for insights by identifying correlations with contextual datasets and finding patterns. With the support of machine learning engineers from Aclima and Google, the SMMI dataset could be used as a sandbox for CARB engineers to explore these methods to streamline the use of the data for emissions reduction planning and further investigation. See Appendix 10 for more details of this optional, no-cost additional work.

6.2.6 Ensuring ADA compliance

Aclima will work to ensure all public visualizations are ADA compliant, including compliance with WCAG 2.0, levels A and AA; California Government Code Sections 7405 and 11135; Section 202 of the ADA; and Section 508 of the Rehabilitation Act and related regulations.

To ensure compliance, Aclima has selected industry standard tools (e.g. Esri StoryMaps) that have been evaluated for conformance to WCAG 2.0 AA, WCAG 2.1 AA, and the Revised Section 508 standards. Aclima's team of experienced designers and engineers will add alternate text and additional improvements to the custom elements built to ensure ADA compliance.

Language access considerations will be addressed based on research and conversations during the community engagement process. Aclima will seek to understand what languages other than English are spoken by stakeholders, work with CARB and communities to prioritize, and develop a plan to ensure all visualization tools have acceptable language access where feasible.

6.3 Management and governance

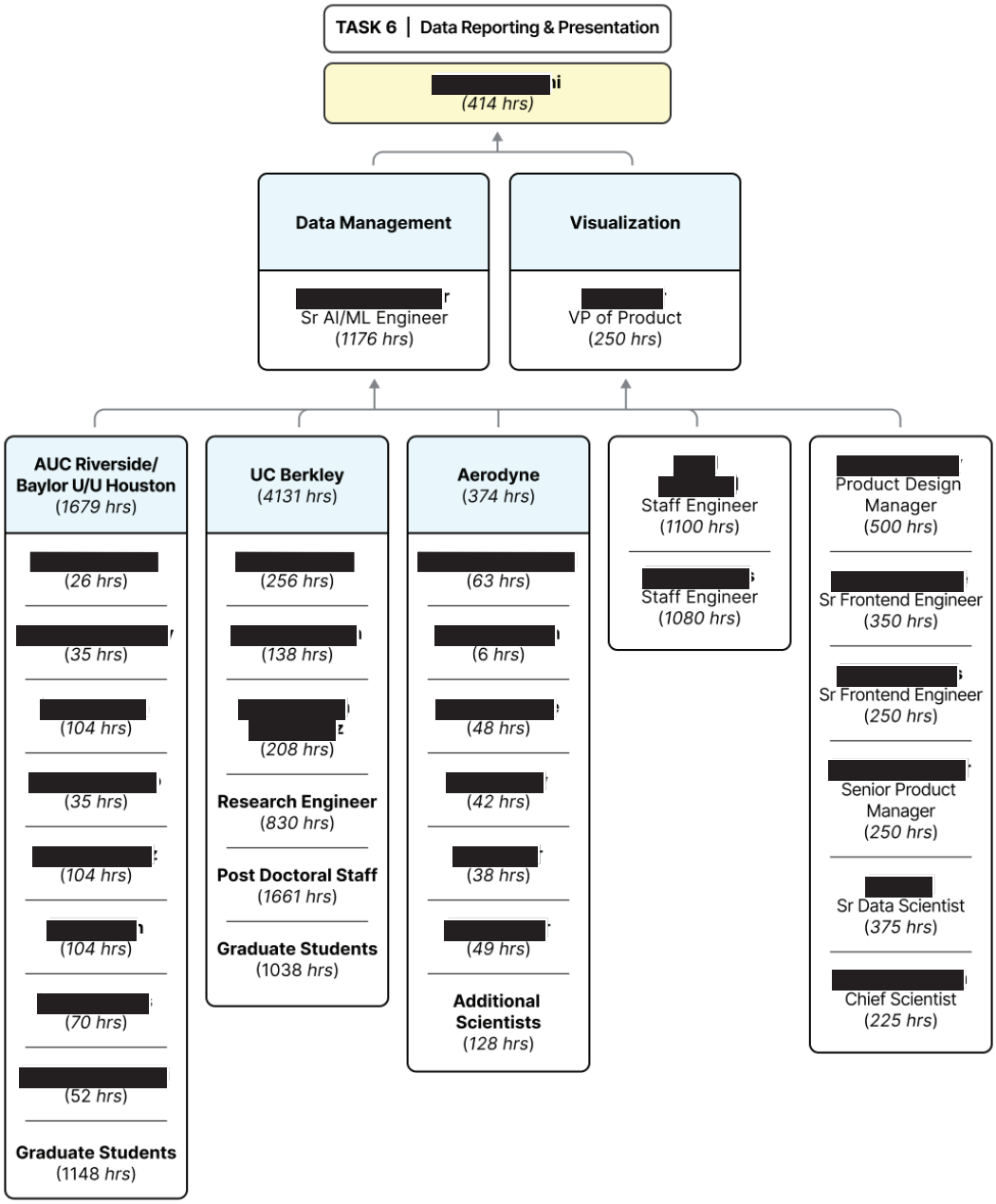


Figure 6.4: Task 6 task management and governance structure

Table 6.5: Task 6 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 6: Data Reporting and Presentation		
6.1: Establish Data Management Procedure	[redacted]	5/28/25
6.2: Establish Data Transfer Mechanisms	[redacted]	5/28/25
6.3: Provide Quarterly Data Transfers to CARB	[redacted]	5/19/26
6.4: Provide Finalized Data to CARB	[redacted]	5/19/26
6.5: Develop Data Management and Visualization System	[redacted]	3/31/26

Table 6.6: Task 6 tasks and deliverables compliance

RFP Task #	**RFP Task/Requirement**[47]	**Aclima's Compliant Solution/Deliverable**
6	Data Reporting and Presentation	
6.1	Establish Data Management Procedures	Aclima will apply its standard data management stack to adhere to CAMP(s) elements 10, 13, and 14.
6.2	Establish Data Transfer Mechanisms	Aclima will prioritize the transfer of finalized raw data (equates to "raw and finalized" data in RFP language), as defined in collaboration with CARB, via channels and formats that support CARB needs.
6.3	Provide Quarterly Data Transfers to CARB	Aclima will store finalized data in a GCS bucket for delivery to CARB in discrete monthly intervals beginning four months after monitoring has commenced, via a data delivery method and format agreed upon with CARB and through the CAMP(s)

[47] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38 are covered in the proposal

		process - for example, a transfer from GCS to CARB-managed AWS S3 bucket.
6.4	Provide All Finalized Data to CARB	Aclima will ensure that data delivery timing aligns with the end of the contract period such that all finalized data from all periods of collection are available at that time. Aclima will work with CARB to ensure AQS coding standards are followed wherever and whenever possible, and to ensure any non-AQS elements are sufficiently documented. Aclima will provide extensive documentation on data exports at all delivered levels of processing, and will tailor this where necessary for public consumption.
6.5	Develop Data Management and Visualization System	Aclima will deploy the finalized raw data and appropriately-selected data analyses in summary reports and accessible online, public, interactive and free-to-use visualizations built on the Esri platform. These visualizations will be in two classes: a customized platform built with Esri StoryMaps and hosted by CARB; and integration of data with AQview. The exact set and prioritization of analyses will be co-defined with communities in the CAMP process, but a range of analyses are available to identify sources and to identify locations of disproportionate impact, drawing on data collected through targeted area and broad area monitoring.

7. Project wrap-up

7.1 Summary

The SMMI's results will provide the most value to communities and CARB if they are presented in an understandable way and made as accessible as possible to the public. To ensure this is done, Aclima will follow all requirements regarding the conclusion of the project, including holding a public meeting to share a summary of findings, providing a final technical report to CARB, and closing out the project with a final meeting with CARB. Aclima will not disclose data or documents or disseminate the contents of the final or any preliminary report without express written permission of CARB's Contract Manager.

7.2 Summary of findings

When monitoring and data visualization are complete, Aclima will work in consultation with CARB, the Project Expert Group (PEG), and community co-leads to share a summary of findings with the public.

The team will plan, coordinate, and lead a virtual public meeting using an online platform that is designed to meet California accommodation requirements and provide multilingual services as requested and feasible. The meeting will present the final data visualizations and include a discussion of findings, a discussion of action items and follow-up activities with CARB and community members, and a review of other helpful communications collateral to close out the project (fact sheets, training materials and in-context help on websites, etc.). During the meeting, experts from the community, PEG, CARB, and Aclima will share findings and takeaways from the initiative in an understandable, non-technical format. As with all community/public meetings across the initiative, Aclima will ensure that outputs are accurate summaries that are understandable to a non-technical audience and will provide opportunity for the public to join via multiple pathways, including via mobile devices and in person through local community hubs (as necessary).

7.3 Technical report

With the completion of monitoring and data visualization, Aclima will provide a detailed written report covering all findings, conforming to RFP Exhibit F - Final Report Format. Any work provided in PDF format will also be provided to CARB in the original electronic format (for example, Microsoft Word or Adobe InDesign). The final report will include discussion of how data were collected, validated, analyzed, and disseminated to address the objectives of the SMMI. It will include input from stakeholders across the initiative, including the project experts, community representatives, Tribal representatives, air quality officers, environmental justice leaders, and others.

7.4 Project conclusion meeting

Aclima will organize and lead a wrap-up project meeting with CARB staff to hand over the technical report, provide summaries of any key takeaways, frequently asked questions/answers, and follow-ups from throughout the monitoring and community engagement process, and any other relevant details from the members of the project expert group and other key stakeholders. The Aclima team will provide a high-level oral summary of the technical report during this meeting.

7.5 Task 7 experience

- In Aclima's Richmond-San Pablo project, Aclima's final report detailed the team's approach to data collection and quality assurance, ensuring the integrity and reliability of the data gathered. Aclima's analysis leveraged enhancement-based analyses to identify and highlight key areas of concern, providing actionable insights into prioritizing air quality concerns. These findings were communicated through an interactive data visualization tool, which Aclima designed to make complex data accessible and understandable to the public. The team presented these results as part of the Richmond-San Pablo Monitoring Outreach Team's public meeting, supporting their commitment to transparent and collaborative community engagement.

- Aclima collaborated with the SCAQMD and local community organizations, such as East Yard Communities for Environmental Justice and the Center for Community Action and Environmental Justice (CCAEJ), to support CAPP communities in the East Los Angeles, Boyle Heights, West Commerce, San Bernardino, and Muscoy areas. Aclima staff conducted interviews before, during, and after measurement activities to ensure a comprehensive understanding of community concerns and needs. Employing user-centered design principles, Aclima developed an interactive report tailored to the specific requirements of SCAQMD and the communities they serve. The final report and key findings were presented at the AB 617 Community Steering Committee meetings for each respective community, where we engaged directly with the public, addressing their questions and facilitating a transparent discussion of the results.

- In a community-oriented measurement campaign, Aclima partnered with the Washington DC Department of Energy and Environment (DC DOEE), local Advisory Neighborhood Commissions (ANCs), and community groups such as EmpowerDC. The team developed and executed a community engagement strategy that included listening sessions and presentations both before and after the measurement period. In collaboration with the DOEE community engagement team, Aclima convened stakeholders at the end of the campaign to present and

share the findings, facilitating discussions between the communities, the DOEE, and Aclima. The team's approach ensured clear and accessible scientific communication, enabling all participants to easily understand the insights and implications of the data collected.

7.6 Management and governance

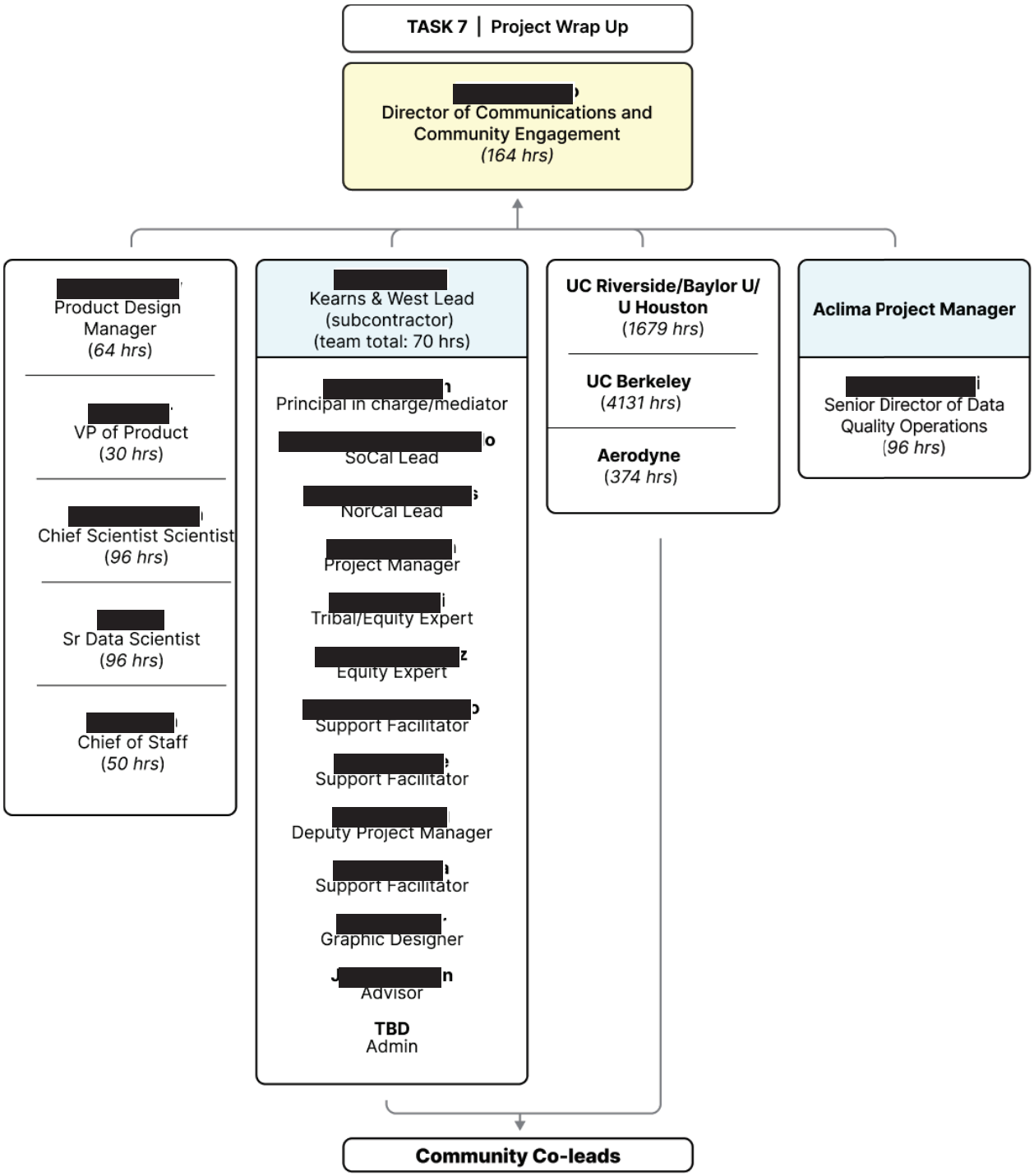


Figure 7.1: Task 7 management and governance structure

Table 7.1: Task 7 work plan schedule

Tasks	**Responsible Party** Prime/Subcontractor	**Date of Completion**
Task 7: Project Wrap-up		
7.1:Summary of Findings (Public)	[redacted]	5/18/26
7.2: Technical Report	[redacted]	5/18/26
7.3: Project Conclusion Meeting (CARB)	[redacted]	5/19/26

Table 7.2: Task 7 tasks and deliverables compliance

RFP Task #[48]	**RFP task/requirement**	**Aclima's compliant solution/deliverable**
7	Project Wrap-Up	
7.1	Summary of Findings	Aclima will work in consultation with CARB, the PEG, and community co-leads to plan, coordinate, and lead a virtual public meeting using an online platform that is designed to meet California accommodation requirements and provide multilingual services as requested and feasible.
7.2	Technical Report	Aclima will provide a written final report that includes discussion of how data were collected, validated, analyzed, and disseminated to address the objectives of the SMMI. Report will conform to RFP *Exhibit F - Final Report Format*. Aclima will include input from stakeholders across the initiative.
7.3	Project Conclusion Meeting	Aclima will organize and lead a wrap-up project meeting with CARB staff to provide final materials, summaries of any key takeaways and suggested follow-up from throughout the monitoring and community engagement process, and other relevant details from the members of the project expert group and other key stakeholders.

[48] Aclima has used the task/requirement numbering from RFP page 18, while ensuring all requirements as documented on page 38-39 are covered in the proposal

Work plan and schedule

Aclima presents the consolidated Work plan and schedule in Table 8.1, below.

For all the tasks and subtasks outlined in the RFP's "Tasks and Deliverables" table, Aclima has documented deliverables, timelines, responsible individuals who will own the delivery of each task or subtask, an approximation of the total hours required for each task and subtask, and high level pricing. Aclima has further outlined additional detailed subtasks that will be necessary steps to accomplish CARB's defined tasks and subtasks. In cases where there is a strong dependency on community engagement, i.e., tasks 1-4, Aclima has not defined the specific timelines for all Aclima-defined subtasks. However, in cases where the CARB-defined tasks and subtasks are broader, i.e., tasks 5 and 6, there are additional timelines and deliverables included to create a more complete picture of how the work will be accomplished. Figure 8.1 lays out the overall project timeline, to which the work plan and schedule conform.

For task 7, Aclima has interpreted the subtasks in a manner consistent with pages 38 and 39 of the RFP. We infer two discrete subtasks: (1) Summary of Findings delivered in a Final Public Meeting; (2) A Project Wrap-Up meeting with CARB with delivery of final materials (i.e., Technical Report and conclusions from task 7.1)

Oversight via RACI: For each primary task, Aclima has defined a Responsible, Accountable, Consulted, and Informed framework to provide project oversight and ensure the project will remain on schedule (Table 8.2). Ultimately, the Accountable party for each task will be required to report task status on a weekly basis to the Aclima Steering Committee and Project Manager as a part of Aclima's internal project management plan. The Aclima Steering Committee, which includes the President and COO of the company, will ensure adequate resourcing to support the Project Manager in maintaining the project schedule and deliverables by managing risks and mitigating issues that emerge.

Appropriate Workload: The workload for each activity listed in the Draft Standard Agreement has been estimated in the work plan and schedule, including identifying responsible individuals for each CARB-defined task and subtask. Tables 9.3 and 9.5 (for subcontractor staff) and Figure B (for Aclima staff) accounts for estimated hours per individual for key personnel, ensuring that the work laid is distributed reasonably across staff and that no individual is assigned more than full time work (defined as 48 x 32-hour work weeks per year).

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
1 Project Kick-Off and Updates					5/20/24	5/19/26	[redacted]	[redacted]	[redacted]
	1.1 Project Kick-Off Public Meeting			Successful public meeting + summary provided to CARB	5/20/24	6/13/24	[redacted]	[redacted]	[redacted]
		1.1.1	Draft event plan and share with CARB for review and finalizing						
		1.1.2	Work with CARB and community leaders to create and finalize invitee list						
		1.1.3	Propose agenda to CARB with input from community leaders						
		1.1.4	Conduct photo/video collateral collection ahead of event						
		1.1.5	Collaborate with CARB on press release & media strategy						
		1.1.6	Draft messaging and presentation materials						
		1.1.7	Finalize communications plan						
		1.1.8	Confirm necessary accessibility and multilingual accommodations are met						
		1.1.9	Determine online meeting platform and technology support						
		1.1.10	Send out invitations						
		1.1.11	Determine roles, including facilitation, for meeting (Aclima, CARB, communities, etc)						
		1.1.12	Dry run						
		1.1.13	Hold meeting						
		1.1.14	Summarize meeting, including community feedback, and present summary to CARB						
	1.2 Weekly Progress Updates			Regular weekly meetings with CARB <> Aclima for the duration of the contract	5/20/24	5/19/26	[redacted]	[redacted]	[redacted]
		1.2.1	Initiate kickoff meeting with project team and stakeholders from Aclima and CARB						
		1.2.2	Determine appropriate project management tools for collaboration (document sharing, video calls, etc.)						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		1.2.3	Draft agenda and share with CARB project manager in advance						
		1.2.4	Set weekly meeting schedule						
		1.2.5	Hold first meeting						
	1.3 CCI Biannual Reports			Meet every reporting deadline	12/1/24	5/19/26	[redacted]	[redacted]	[redacted]
		1.3.1	Review all reporting requirements						
		1.3.2	Create reporting schedule to share with CARB						
		1.3.3	Leverage weekly progress meetings to confirm adherence to reporting requirements						
		1.3.4	Summarize and log all community engagement events as they occur						
		1.3.5	Submit in CCIRTS database within 30 days after reporting cycle (June & December, May 19 for H1 2026)						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
2 Form project expert group									
	2.1 Form Project Expert Group			Advisory committee formed meeting CARB criteria established in the RFP.	6/13/24	6/20/24			
		2.1.1	Draft letter of invitation to join PEG						
		2.2.2	Share letter and proposed PEG invitees with CARB for feedback						
		2.2.3	Officially reach out to PEG invitee list						
		2.2.4	Provide membership roster to CARB for review and approval						
		2.2.5	Send PEG agreements to approved PEG members for review and signature						
		2.2.6	All PEG agreements signed						
	2.2 Create Expert Group/Advisory Committee Plan			All PEG members have signed off on working agreements and objectives.	6/20/24	6/27/24			
		2.2.1	Propose meeting calendar, member expectations, channels of communication, and roles at first PEG meeting.						
		2.2.2	Co-create working agreements and schedule of clear objectives at first PEG meeting.						
		2.2.3	All PEG members to confirm capacity availability and accordance with working agreements, objectives, and channels of communication within ten calendar days of first meeting.						
	2.3 Summarize Expert Group Meetings			CARB has received post-meeting summary within 5 business days of each PEG meeting, starting with first meeting in Q3 2024	6/27/24	5/19/26			
		2.3.1	Provide to CARB a detailed agenda prior to each expert group meeting						
		2.3.2	Facilitate at least 4 PEG meetings per contract year, with 4 in the CEP stage						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		2.3.3	Provide to CARB a detailed summary after each PEG meeting						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
3 Develop Community Engagement Plan									
	3.1 Develop community engagement plan			CARB Approved and published Community Engagement Plan	6/20/24	8/31/24			
		3.1.1	Include community engagement planning in first PEG meeting agenda						
		3.1.2	Hire community co-leads with hiring framework input from CARB, PEG, and community leaders						
		3.1.3	Finalize compensation framework for community engagement						
		3.1.4	Develop CEP timeline						
		3.1.5	Develop outline of content for CEP						
		3.1.6	Gather list of potential interviewees from CARB, PEG, and community co-leads						
		3.1.7	Finalize list of stakeholder interviews (CBOs, PEG, tribal representatives, air district representatives, community leaders, government, business, etc.)						
		3.1.8	Hold community meetings across all regions						
		3.1.9	Schedule interviews						
		3.1.10	Organize necessary accommodations including venue and accessibility						
		3.1.11	Provide multilingual services upon request and when feasible						
		3.1.12	Draft and finalize stakeholder interview questions						
		3.1.13	Hold interviews						
		3.1.14	Ingest notes and create key takeaways						
		3.1.15	Review and ingest takeaways from CARB's public survey						
		3.1.16	Draft CEP narrative						
		3.1.17	Collect feedback from CARB, PEG, and interviewees						
		3.1.18	Graphic design layout of CEP for review						
		3.1.19	Ensure accessibility standards are met						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		3.1.20	Present draft to PEG						
		3.1.21	Submit finalized CEP to CARB for review and approval						
		3.1.22	Meet with CARB project team to address any changes						
		3.1.23	Finalize CEP and publish online						
		3.1.24	Print a select number of copies (TBD) for each region						

Budget continues on next page

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
4 Develop a Community Air Monitoring Plan				CAMP approved by CARB	9/1/24	5/30/25	[redacted]	[redacted]	[redacted]
	4.1 Implement Community Engagement Plan			Submittal of summary of research to CARB	9/1/24	5/19/26	[redacted]	[redacted]	[redacted]
		4.1.1	Conduct/attend meetings						
		4.1.2	Ensure Aclima follows communication pathways (e.g. pamphlets, community websites)						
		4.1.3	Incorporate/translate information from the meetings						
		4.1.4	Leverage community networks to ensure adequate engagement and participation						
		4.1.5	Implement compensation framework						
		4.1.6	Work with communities to identify monitoring areas, sources, and pollutants of concern						
		4.1.7	Select data visualizations and analyses that will be used to support community action						
		4.1.8	Provide CARB a detailed agenda prior to each engagement event and a detailed summary after each event						
	4.2 Develop Draft CAMP(s) for CARB review and Public Comment			Submittal to CARB and public review	9/30/24	4/15/25	[redacted]	[redacted]	[redacted]
		4.2.1	Draft CAMP(s) with input from the CEP implementation and Project Expert Group		12/1/24	4/1/25			
		4.2.2	Share draft CAMP with communities						
		4.2.3	Submit CAMP(s) and QA documentation to CARB for review			4/15/25			
		4.2.4	Make the draft CAMP(s) available on a public website for a 14-day public review period (concurrent with CARB review period)		4/15/25	4/30/25			
	4.3 Incorporate Public and CARB Comments into CAMP(s)			Approval of CAMP(s) by CARB	4/15/25	5/31/25	[redacted]	[redacted]	[redacted]
		4.3.1	Review and draft internal responses to the public and CARB comments						
		4.3.2	Share responses with CARB project manager						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		4.3.3	Post public comments and responses to the online document						
		4.3.4	Submit final CAMP(s) to CARB for approval						

Budget continues on next page

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion
5 Conduct Mobile Monitoring				All verified data staged for delivery to CARB		
	5.1 On-going weekly mobile monitoring updates to CARB			All weekly updates completed	5/20/24	3/1/26
		5.1.1	Conduct on-going weekly monitoring updates to CARB		5/20/24	3/1/26
	5.2 On-going alerting and notifications			100% of alerts delivered for measurements above threshold during 9 month monitoring period	6/1/25	3/1/26
		5.2.1	Conduct on-going alerting and notification of CARB and local authorities as needed		6/1/25	3/1/26
	5.3 Initiate mobile monitoring across all CAMP(s)			Monitoring underway in all CAMP regions	8/1/24	6/1/25
		5.3.1	Prepare Aclima mobile monitoring platforms		1/1/25	4/30/25
		5.3.2	Coordinate with Technical Partners on Integration		9/1/24	2/28/25
		5.3.3	Engineer Ingestion Pipelines for Partner Mobile Lab data to Aclima Backend		9/1/24	2/28/25
		5.3.4	Scout likely collections areas: Fleet parking, vehicle service locations, etc.		3/1/25	4/30/25
		5.3.5	Calibration hub - Find, source equipment, and set up		9/1/24	3/30/25
		5.3.6	Prepare driver recruiting materials & processes		2/1/25	3/31/25
		5.3.7	Prepare driver training materials & processes (Aclima mobile monitoring platform)		10/1/24	11/30/24

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion
		5.3.8	Prepare driver training materials & processes (Partner mobile monitoring platforms)		1/1/25	2/28/25
		5.3.9	Aclima node deployed at regulatory sites for intercomparison testing		8/1/24	8/1/25
		5.3.10	Pre-deployment calibration processing		2/1/25	5/31/25
		5.3.11	Pre-deployment calibration execution		2/1/25	5/31/25
		5.3.12	Pre-deployment calibration and platform readiness (Partners)			
		5.3.13	Generate drive plans for basemap driving		3/1/25	5/31/25
		5.3.14	Generate drive plans for Spotlight driving		3/1/25	5/31/25
		5.3.15	Driver hiring		4/1/25	5/31/25
		5.3.16	Driver training		5/1/25	5/31/25
	5.4 Complete mobile monitoring			Mobile monitoring complete for all CAMP(s)	6/1/25	3/1/26
			Aclima			
		5.4.1	Conduct on-going mobile monitoring		6/1/25	2/18/26
		5.4.2	Conduct on-going driver hiring & training		6/1/25	2/18/26
		5.4.3	Conduct on-going spotlight driving (Phase 1)		5/20/25	3/1/26

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]
		5.4.4	Conduct on-going data quality monitoring		5/20/25	3/1/26	
		5.4.5	Identify locations for follow up driving		10/1/25	1/1/26	
		5.4.6	Conduct follow-up (Phase 2) Spotlight driving		8/20/25	3/1/26	
		5.4.7	Conduct daily, weekly, & monthly safety monitoring processes		5/1/25	2/18/26	
			UCB				
		5.4.8	Pre-monitoring team meetings				
		5.4.9	Complete Integration				
		5.4.10	Field Testing - Mobile Operations				
		5.4.11	Field Testing - Data Transfer				
		5.4.12	Develop Phase 1 sampling plans according to approved CAMPs				
		5.4.13	Monitoring phase team meetings		6/1/25	2/20/26	
		5.4.14	Conduct mobile monitoring	16 weeks of monitoring completed	7/1/25	2/28/26	
			Aerodyne				
		5.4.15	Pre-monitoring team meetings				
		5.4.16	Complete Integration				
		5.4.17	Field Testing - Mobile Operations				
		5.4.18	Field Testing - Data Transfer				

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion
		5.4.19	Develop Phase 1 sampling plans according to approved CAMPs			
		5.4.20	Mobile Lab Transport	Mobile Lab arrives in CA		
		5.4.21	Monitoring phase team meetings		6/1/25	2/20/26
		5.4.22	Conduct mobile monitoring	6.8 weeks of monitoring completed	7/1/25	2/28/26
			UCR			
		5.4.23	Pre-monitoring team meetings			
		5.4.24	Complete Integration			
		5.4.25	Field Testing - Mobile Operations			
		5.4.26	Field Testing - Data Transfer			
		5.4.27	Finalize start and end of monitoring period			
		5.4.28	Develop Phase 1 sampling plans according to approved CAMPs			
		5.4.29	Monitoring phase team meetings		6/1/25	2/20/26
		5.4.30	Conduct mobile monitoring	9 weeks of monitoring completed	7/1/25	2/28/26
	5.5 QA/QC & finalize all data			All data QA/QC'd and finalized	6/1/25	5/19/26
		5.5.1	On going Post-deployment calibration execution		6/1/25	5/1/26
		5.5.2	On going Post-deployment calibration processing		6/1/25	5/1/26

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		5.5.3	Complete QA/QC and data finalization		6/1/25	5/19/26	[redacted]	[redacted]	

Budget continues on next page

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
6 Data Reporting and Presentation					8/1/24	5/19/26			
	6.1 Establish Data Management Procedure				8/1/24	5/28/25			
		6.1.1	Draft data management plan developed and documented	Early Draft Data Management Plan	8/1/24	12/31/24			
		6.1.2	Data Management Plan iteration via the CAMP process, with focus on analysis of data and communication of results to support action	Draft Data Management Plan	1/1/25	4/15/25			
		6.1.3	Final Sign off on Data Management Plan	Final Data Management Plan		5/28/25			
	6.2 Establish Data Transfer Mechanisms				8/1/24	5/28/25			
		6.2.1	Data transfer to CARB: interface requirements gathering	Draft Requirements document	8/1/24	12/31/24			
		6.2.2	Data transfer to CARB: interface requirements documentation finalized	Interface requirements document		4/15/25			
		6.2.3	Data transfer to CARB: data schema requirements gathering	Draft Schema Requirements document	8/1/24	2/1/25			

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		6.2.4	Data transfer to CARB: data schema requirements documentation finalized with CARB	Data schema requirements document		4/15/25			
		6.2.5	Test transfer of data, according to schema and interface requirements	Test data successfully transferred	4/15/25	5/1/25			
		6.2.6	Signoff on finalized Data Transfer schema and method	Interface requirements document with schema.		5/28/25			
		6.2.7	Requirements on AQView data transfer	Requirements document	1/1/25	5/28/25			
	6.3 Provide Quarterly Data Transfers to CARB				10/1/25	5/19/26	[redacted]	[redacted]	[redacted]
		6.3.1	Monthly transfer of finalized data, including data from subcontractors	Delivery of 6/25 dataset	10/1/25	10/1/25			
		6.3.2	Monthly transfer of finalized data, including data from subcontractors	Delivery of 7/25 dataset	11/1/25	11/1/25			
		6.3.3	Monthly transfer of finalized data, including data from subcontractors	Delivery of 8/25 dataset	12/1/25	12/1/25			
		6.3.4	Monthly transfer of finalized data,	Delivery of 9/25 dataset	1/1/26	1/1/26			

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
			including data from subcontractors						
		6.3.5	Monthly transfer of finalized data, including data from subcontractors	Delivery of 10/25 dataset	2/1/26	2/1/26			
		6.3.6	Monthly transfer of finalized data, including data from subcontractors	Delivery of 11/25 dataset	3/1/26	3/1/26			
		6.3.7	Monthly transfer of finalized data, including data from subcontractors	Delivery of 12/25 dataset	4/1/26	4/1/26			
		6.3.8	Monthly transfer of finalized data, including data from subcontractors	Delivery of 1/26 dataset	5/1/26	5/1/26			
		6.3.9	Monthly transfer of finalized data, including data from subcontractors	Delivery of 2/26 dataset	5/19/26	5/19/26			
	6.4 Provide Finalized Data to CARB				10/1/25	5/19/26	[redacted]		
			(see 6.3)		10/1/25	5/19/26			
		6.4.1	Delivery of data and visualizations for use in AQView	CARB receives data in specified format through SFTP or whatever is agreed upon		5/19/26			

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		6.4.2	Summary of Data Processing Methodology & Relevant QA/QC Analysis Information	Delivery of data processing methodology to CARB		5/19/26			
	6.5 Develop Data Management and Visualization System			Deliver finalized online visualization to CARB	3/1/25	3/31/26	[redacted]	[redacted]	[redacted]
		6.5.1	Requirements gathering on CARB server, authorization /IAM , software licenses, data hosting	Requirements document	3/1/25	5/1/25			
		6.5.2	Finalized Requirements document on CARB data hosting and serving for community visualizations	Requirements document	3/1/25	6/1/25			
		6.5.3	Koop API development	Koop endpoints accessible to Esri StoryMaps	6/1/25	10/1/25			
		6.5.4	Community visualization requirements gathering and user research using outcomes from CAMP process	Requirements document	3/1/25	6/1/25			
		6.5.5	StoryMap template development, any additional widget development	ArcGIS StoryMap templates with signoff	6/1/25	12/1/25			

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		6.5.6	Present draft product to CARB, PEG, and community co-leads for input and approval			3/2/26			
		6.5.7	Incorporate early release subcontractor data products into StoryMap		12/1/25	3/31/26			
		6.5.8	StoryMap development with finalized data	StoryMaps delivered	12/1/25	3/31/26			
		6.5.9	Accessibility testing		1/1/26	3/31/26			
		6.5.10	StoryMaps Published	StoryMaps published	12/1/25	3/31/26			
		6.5.11	Final Interpretable derived products - UCB	Visual of key results to Aclima	*10/1/25*	*4/30/26*			
		6.5.12	Final Interpretable derived products - Aerodyne	Visual of key results to Aclima	*10/1/25*	*4/30/26*			
		6.5.13	Final Interpretable derived products - UCR	Visual of key results to Aclima	*10/1/25*	*4/30/26*			
		6.5.11	Deliver optional refined final visualizations	Optional StoryMap updates delivered	3/31/26	5/19/26			

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
7 Project Wrap-up									
	7.1 Summary of Findings & Host a Public Project Conclusion Meeting			Conduct meeting & deliver written summary to CARB	4/1/26	5/18/26			
		7.1.1	Work with CARB, PEG, and community co-leads to design event plan for public meeting						
		7.1.2	Propose public meeting agenda						
		7.1.3	Collaborate with CARB on press release & media strategy						
		7.1.4	Draft messaging and presentation materials						
		7.1.5	Finalize communications plan						
		7.1.6	Confirm necessary accessibility and multilingual accommodations are met						
		7.1.7	Determine online meeting platform and technology support						
		7.1.8	Send out invitations						
		7.1.9	Determine roles, including facilitation, for meeting (Aclima, CARB, communities, etc)						
		7.1.10	Dry run						
		7.1.11	Hold final public meeting		4/30/26	5/8/26			
		7.1.12	Summarize meeting, including community feedback, action items, and follow-up activities in writing and deliver to CARB			5/18/26			
	7.2 Hold a Project Conclusion Meeting with CARB staff and provide final report and materials				4/1/26	5/19/26			
		7.2.1	UCB Contributions to Final Report						
		7.2.2	Aerodyne Contributions to Final Report						
		7.2.3	UCR Contributions to Final Report						

CARB task	CARB sub-task	#	Aclima & Partner sub-tasks	Milestone or deliverable	Start date	Date of Completion	[redacted]	[redacted]	[redacted]
		7.2.4	Draft final report that includes discussion of how data were collected, validated, analyzed, and disseminated to address the stated monitoring objectives.						
		7.2.5	Report graphics generation						
		7.2.6	Layout and formatting of report						
		7.2.7	Present draft report to CARB, PEG, and community co-leads for input and approval						
		7.2.8	Revise technical report based on CARB guidance						
		7.2.9	Accessibility needs for print document (alt text, color design, etc)						
		7.2.10	Print copies (number TBD) for stakeholders (*adhering to sustainable/environmentally friendly printing guidelines and prioritizing local businesses for printing needs*)						
		7.2.11	Deliver final technical report to CARB			5/18/26			
		7.2.12	Plan, coordinate, and lead a meeting with CARB to discuss technical results, frequently asked questions and answers, suggested follow-up.			5/18/26			
		7.2.13	Share final, approved technical report with communities in meeting and via multiple comms pathways as designated in the CEP and CAMPs						
		7.2.14	Confirm all deliverables have been provided and close out contract			5/19/26			

Table 8.1: Project work plan and schedule

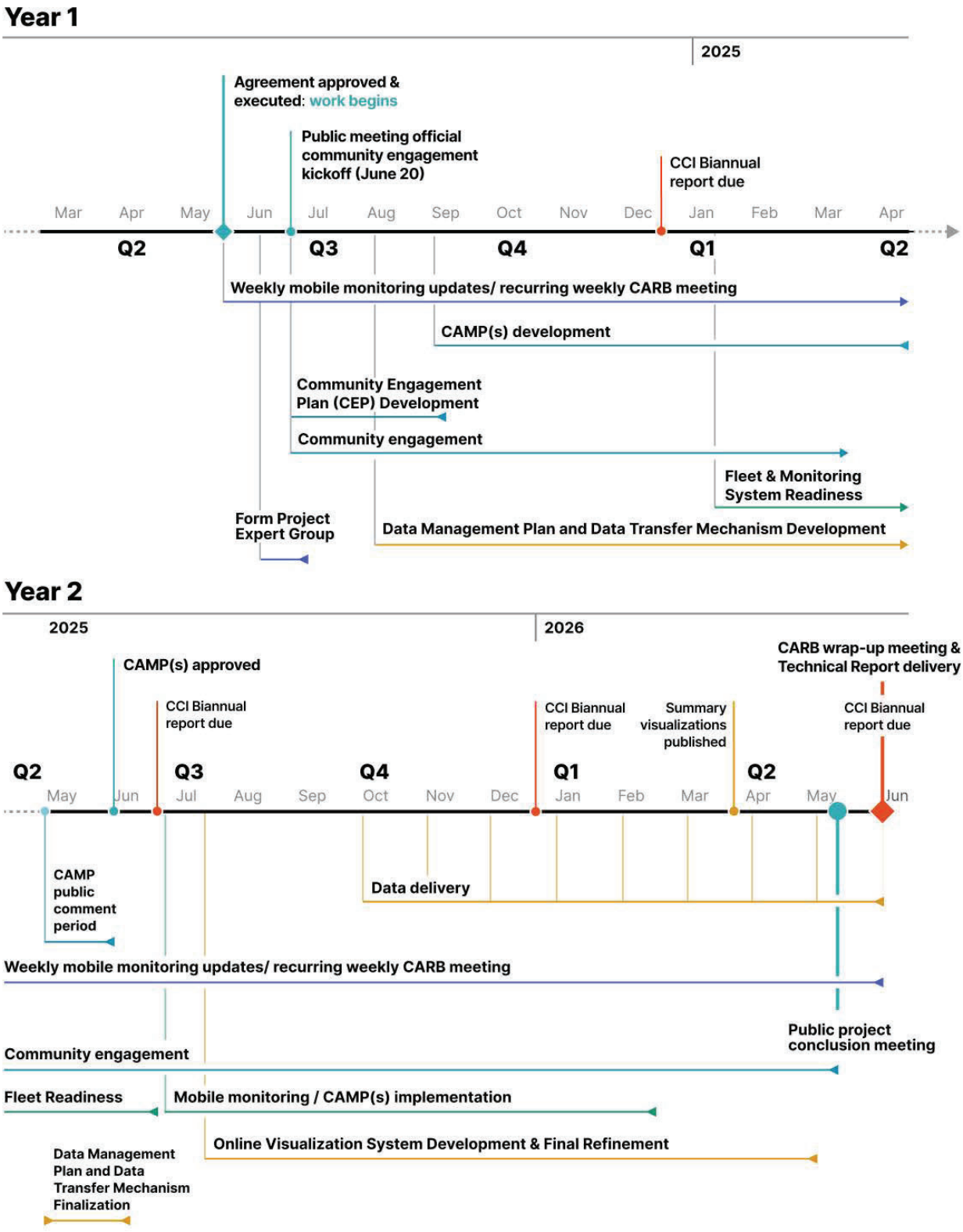


Figure 8.1: Project timeline

Cost Proposal

Attachment 11

Aclima's proposed budget for this work is $26.88M. See next 2 pages for Attachment 11 details. This is also reproduced in the Attachments section along with Attachment 9. Full itemized budgets for Aclima and all subcontractors are available on request.

ATTACHMENT 11
CONTRACTOR COST SHEET

Submission of this attachment is required. Failure to complete and return this attachment will cause your proposal to be rejected and deemed non-responsive. The Proposer must provide the cost for each task listed below. This project has a budget amount of **$27,000,000.00**. Proposals exceeding this amount may be deemed non-responsive and ineligible for award.

Please provide an all-inclusive cost for each task below. NOTE: All costs must include personnel, labor, subcontractors, materials, travel, reports, tax, and any other items necessary to perform and complete all tasks.

Task Description	Total
Task 1:	
1.1 – Project Kick-Off Meeting	$
1.2 - Weekly Monitoring Progress Updates	$
1.3 – CCI Biannual Reports	$
Task 2:	
2.1 - Form Advisory Committee	$
2.2 - Create Advisory Committee Plan	$
2.3 - Summarize Advisory Committee Meetings	$
Task 3:	
3 - Develop Community Engagement Plan	$
Task 4:	
4.1 – Implement Community Engagement Plan	$
4.2 – Develop Draft CAMP(s) for CARB Review and Public Comment	$
4.3 – Incorporate Public and CARB Comments into CAMP(s)	$
Task 5:	
5 – Conduct Mobile Monitoring	$

Task 6:	
6.1 – Establish Data Management Procedures	$
6.2 – Establish Data Transfer Mechanisms	$
6.3 – Provide Quarterly Data Transfers to CARB	$
6.4 – Provide all Finalized Data to CARB	$
6.5 – Develop Data Management and Visualization System	$
Task 7:	
7.1 – Summary of Findings	$
7.2 – Project Conclusion Meeting	$
TOTAL PROPOSED COST	**$**

Total Cost Shall be used for evaluation purposes.

Acronyms

AMN: Aclima Mobile Node

AMP: Acilma Mobile Platform

ANC: Advisory Neighborhood Commission

API: Application Programming Interface

AQS: Air Quality System

AWS: Amazon Web Services

BAAQMD: Bay Area Air Quality Management District

CAPCOA: California Air Pollution Control Officers Association

CAMP: Community Air Monitoring Plan

CAPP: Community Air Protection Plan

CCAEJ: Center for Community Action and Environmental Justice

CDPH: California Department of Public Health

CERP: Community Emissions Reduction Program

CES: CalEnviroScreen

CBO: Community Based Organization

CCI: California Climate Investments

CCIRTS: California Climate Investments Reporting and Tracking System

CEIDARS: California Emissions Inventory Data Analysis and Reporting System

CEP: Community Engagement Plan

CLCPA: Climate and Community Leaders Protection Act

CNC: CAPP Consistently Nominated Community

CRADA: Cooperative Research and Development Agreement

CRMSE: Centered Root Mean Square Error

CSC: Community Steering Committee

DAC: Disadvantaged Community

DC: Direct Current

DC DOEE: Washington, D.C., Department of Environment and Environment

DEM: Digital Elevation Model

EPD: Extraction, Production, and Distribution (Oil and Gas)

ETL: Extract Transform Load

EV: Electric Vehicle

FRM/FEM: Federal Regulatory Method/Federal Equivalent Method

GCP: Google Cloud Platform

GCS: Google Cloud Storage

GKE: Google Kubernetes Engine

GC/MS: Gas chromatography/mass spectrometry

GPS: Global Positioning System

IAPP: International Association of Public Participation

LDEQ: Louisiana Department of Environmental Quality

LEAN: Louisiana Environmental Action Network

LOD: Limit of Detection

LTE: Long Term Evolution cellular technology

MAE: Mean Absolute Error

MQTT: Message Queuing Telemetry Transport

MRR: Mandatory Reporting of Greenhouse Gas Emissions

MTBF: Mean Time Between Failure

NAAQS: National Ambient Air Quality Standards

NSF: National Science Foundation

NYSDEC: New York state Department of Environmental Conservation

OCAP: CARB Office of Community Air Protection

OECEJ: CARB Office of Equity, Communities & Environmental Justice

OEHHA: California Office of Environmental Health Hazard Assessment

OTA: Over-the-air update

PEG: Project Expert Group

PML: Partner Mobile Laboratory

PSE: Physicians, Scientists, and Engineers for Healthy Energy

QA/QC: Quality Assurance/Quality Control

SCAQMD: South Coast Air Quality Management District

SDAPC: San Diego Air Pollution Control District

SDK: Software Development Kit

SFTP: Secure File Transfer Protocol

SOP: Standard Operating Procedure

TVOC: Total Volatile Organic Compounds

UCB: University of California Berkeley

UCR: University of California Riverside

UH: University of Houston

US DOE: US Department of Energy

US EPA: US Environmental Protection Agency

VM: Virtual Machine

WOEIP: West Oakland Environmental Indicators Project

Glossary

Aclima Mobile Platform: unifying term for Aclima's monitoring suite, supporting hardware infrastructure, and the vehicle these are installed in

Aclima Mobile Calibration Laboratory: specialized vehicle with FRM/FEM and other high precision reference instruments installed alongside Aclima Mobile Nodes used to conduct on-road calibrations of Aclima Mobile Platform sensors

AirNY: web-based visualization platform to communicate mobile air monitoring results to non-scientific communities across New York state, as part of the collaboration with New York state Department of Environmental Conservation

Broad area monitoring: data collection conducted by Aclima Mobile Platforms to gather ambient concentration data, in all 64 CAPP Consistently Nominated Communities, with sampling design guided by dynamic algorithm and partially informed by CAMP(s) discussions

Community co-leads: team of paid experts who will partner regionally with community groups, air districts, and other stakeholders to inform the CEP and CAMP(s) development and implementation. These are current members of the communities they will be representing, possibly staff from local CBOs (if their positions allow for additional work) or in other community leadership roles.

Data review: the manual or automated flagging of anomalous signals from sensor time series

Finalized raw data: Aclima defines *raw* data as sensor signals transformed to geophysical quantities of measurement, estimated using the sensor signal plus associated physical measurements directly related to the measurement principle, with flagged artifacts included. Aclima defines *finalized raw data* as *raw* data that has had final calibration parameters applied

Linear road miles: unique miles of road monitored. Any single mile of road in the monitored area will be traveled more than once by an AMP or PML, consistent with mobile monitoring methodologies, but only counts as one unique mile of road monitored

Partner Mobile Laboratory: vehicle equipped with instruments to measure a wide set of speciated air toxics

Subcontracted technical partner: one of the three technical partners, UC Berkeley, UC Riverside, and Aerodyne, providing Mobile Laboratory services

Targeted area monitoring: data monitoring conducted by Aclima Mobile Platforms and Partner Mobile Laboratories, investigating sources and areas of concern at smaller spatial scales than broad area monitoring, with sampling design guided by community input and by concerns identified during broad area mapping

Total road miles: all miles of road driven, including repeat visits. A one mile segment of road visited three times equates to three total miles

References

Key publications by Aclima staff

Apte, J.S., Messier, K.P., Gani. S., Brauer, M., Kirchstetter, T.W., Lunden, M.M., Marshall, J.D., Portier, C.J., Vermeulen, R.C.H., and Hamburg. S.P. (2017) High-resolution Air Pollution Mapping with Google Street View Cars: Exploiting Big Data. Environ. Sci. Technol., 51(12), 6999-7708. doi:10.1021/acs.est.7b00891

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