Version 1

May 2019

CALIFORNIA AIR RESOURCES BOARD

LOST HILLS AIR MONITORING PLAN

LOST HILLS, CA

Prepared by

Monitoring and Laboratory Division

Study of Neighborhood Air near Petroleum Sources (SNAPS)

California Environmental Protection Agency

CALIFORNIA
AIR RESOURCES BOARD

Approval of Monitoring Plan

Title:	SNAPS Lost Hills Air Monitoring Plan
Section:	Advanced Monitoring Techniques Section
Branch:	Community Air Monitoring Branch
Division:	Monitoring and Laboratory Division
Approval:	This plan has been reviewed and approved by

5/17/19

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Date

5-17-19

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Date

Contents

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CODAS	CARB Online Data Acquisition System
DNPH	2,4-Dinitrophenylhydrazine
EPA	Environmental Protection Agency
FID	Flame Ionization Detection
GC	Gas Chromatography
H_2S	Hydrogen Sulfide
MLD	Monitoring and Laboratory Division
MS	Mass Spectrometry
NIOSH	National Institute for Occupational Safety and Health
OEHHA	Office of Environmental Health Hazard Assessment
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter with Aerodynamic Diameters ≤2.5 µm
ppb	Part Per Billion
ppm	Part Per Million
QAPP	Quality Assurance Program Plan
SNAPS	Study of Neighborhood Air Near Petroleum Sources
SOP	Standard Operating Procedure
TACs	Toxic Air Contaminants
VOCs	Volatile Organic Compounds

1. Lost Hills Community Background

Lost Hills is an unincorporated community in Kern County, California with a population of approximately 2,400 residents as of 2010. The Lost Hills community is located less than a mile downwind of the Lost Hills Oil Field. The oil field produced 10.8 million barrels of oil and 9 billion cubic feet of natural gas in 2013[1] and is the 6th and 2nd largest oil and natural gas producer in California, respectively. Agricultural fields, transportation corridors, and other local sources also likely impact local air quality in Lost Hills.

A recent community-led air monitoring study measured air toxics near and around the Lost Hills Oil Field[1]. This study measured air pollutants related to oil and gas production near Lost Hills Oil Field and also carried out an informal survey of the Lost Hills community. Over 90% of residents surveyed reported odors in their community, and the majority of residents stated they experience headaches, nausea/dizziness, burning or watery eyes, and throat and nose irritation when odors were detected. The odors were described as petroleum, burning oil, rotten eggs, chemicals, chlorine or bleach, a sweet smell, sewage, and ammonia.

The regulatory air monitoring network utilizes Federal Reference and Federal Equivalent Methods (FRM/FEM) to produce air monitoring data of high quality at locations designed to characterize regional air quality. These data are used to assess whether regions in California are in attainment with federal and state ambient air quality standards. The closest regulatory air monitoring station to Lost Hills is located over 20 miles away (Shafter Monitoring Station, ID 15255). Air quality data from this regulatory air monitoring station may not be representative of the Lost Hills community (Figure 1) as Lost Hills has a variety of sources in very close proximity to the community.

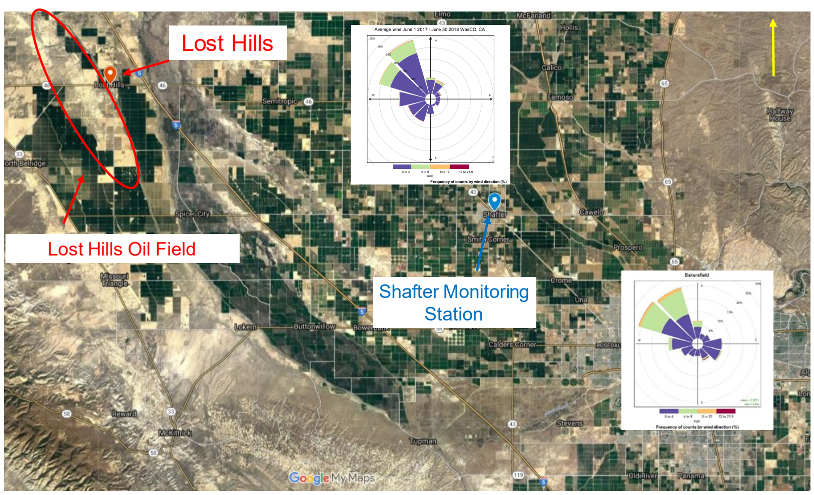

Figure 1: Map of the southern Central Valley. Wind data is shown in Wasco, CA (1 year average), and in Bakersfield (9 year average). Wind roses are centered on each location. The Shafter monitoring station is jointly operated by CARB and the San Joaquin Valley Air Pollution Control District (SJVAPCD) and currently measures: ozone, nitrogen dioxide, methane, total hydrocarbons, non-methane hydrocarbons, air toxics, and meteorological data.

[1] Arbelaez, J. & Baizel, B.: "Californians at risk: An analysis of health threats from oil and gas pollution in two communities", 2015

2. Purpose for Air Monitoring

The Study of Neighborhood Air near Petroleum Sources (SNAPS) is a program that conducts limited-term, intensive air quality monitoring to better characterize air quality in communities near oil and gas production operations. The SNAPS program aims to improve the California Air Resources Board's (CARB) understanding of potential impacts of criteria pollutants and toxic air contaminants within communities near oil and gas production activities.

All communities selected for SNAPS follow a selection process consisting of three stages: 1) identification, 2) evaluation, and 3) prioritization[2]. CARB staff selected the community of Lost Hills for air monitoring due to the community's close proximity to petroleum activities located upwind of the community, lack of information on the types and concentrations of air pollutants, preliminary air sampling data, previous exploratory studies, and public suggestions.

Air monitoring under SNAPS includes conducting measurements of criteria air pollutants and toxic air contaminants as well as supplemental parameters such as meteorological conditions to characterize local air quality. Data collected through the SNAPS program may be used to characterize the impacts of oil and gas production on local air quality, inform CARB and local residents of local air quality conditions, and may be used for follow-up health risk assessments.

3. Scope of Actions

CARB staff will conduct air monitoring using methods described later in this document. These data will be used to perform an initial analysis to identify the major sources impacting air quality in Lost Hills. Source attribution analysis will be performed using CARB's recommended source attribution approaches as described in CARB's Community Air Protection Program Resource Center[3]. Where appropriate, the Office of Environmental Health Hazard Assessment (OEHHA) will perform a health risk assessment using data collected via stationary monitoring. Results and findings may be used by CARB staff to inform program rules and regulations.

4. Air Monitoring Objectives

CARB staff will use stationary and mobile monitoring to characterize spatial and temporal air quality trends in Lost Hills. Intensive air monitoring is expected to occur for a period of 3-5 months at a site representative of local conditions in Lost Hills (outlined in section 8). This monitoring duration is subject to change based on results from preliminary and ongoing data analysis where appropriate. All modifications to air monitoring objectives will be noted within an appended monitoring plan.

This information will be used to help CARB better understand the impacts of oil and gas production on community air quality. Air monitoring under SNAPS focuses on toxic air contaminants and criteria air pollutants. Additionally, meteorological data will be collected throughout the duration of monitoring.

The following air pollutants will be measured in the SNAPS program:

- toxic air contaminants (TACs)
- volatile organic compounds (VOCs)

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[2] https://ww2.arb.ca.gov/our-work/programs/study-neighborhood-air-near-petroleum-sources

[3] https://ww2.arb.ca.gov/capp-resource-center/community-assessment-tools/source-attribution

- particulate matter (PM2.5)
- black carbon
- metals
- gaseous criteria pollutants

5. Roles and Responsibilities

The Monitoring and Laboratory Division (MLD) of CARB has primary responsibility for conducting air monitoring in Lost Hills and performing preliminary data analysis. MLD staff are fully trained on the proper use of all instrumentation and analytical tools described within this plan. A full description of CARB's staff's roles and responsibilities can be found within the SNAPS Quality Assurance Program Plan (QAPP).

6. Data Quality Objectives

Data quality attributes are unique to the instrumentation and methodologies used for analyte sampling, detection, and quantification of air pollutants. A full description of all pollutant data quality objectives can be found in the SNAPS QAPP. A brief description of SNAPS's data quality objectives is provided here.

In general, gaseous air pollutant monitors and instruments using gas chromatography – flame ionization detector (GC-FID) will be assessed for their bias and drift through the use of zero/span audits. Flow audits will be used for all PM instruments and samplers to verify proper instrument operation and sampling performance. Table 1 summarizes initial data quality objectives for each pollutant under the SNAPS program. It should be noted that data quality objectives are subject to change based on real-world performance and analytical objectives. In addition to the DQO listed in Table 1, field blanks and instrument blanks for discrete samples will also be performed. Information regarding blanks may be found in each method's respective SOP.

Table 1: Data quality objective for field measurements and sampling

Pollutants	DQO (Bias)	Quality Control Check schedule	Acceptance criteria	Reference
		On-site measurements		
O_3	Zero/Span	Biweekly	Zero < 5 ppb; Span drift <7.1% of the calibration point	EPA QA Handbook
H_2S	Zero/Span	Biweekly	Zero < 5.1 ppb; Span drift <10.1% of the calibration point	EPA QA Handbook
$CH_4/CO/CO_2$	one-point standard check	Monthly	CH_4< ±3 ppb; CO <±50 ppb; CO2 <± 0.5 ppm	Instrument Specifications

Pollutants	DQO (Bias)	Quality Control Check schedule	Acceptance criteria	Reference
On-site measurements				
VOCs (PAMS mixture)	one-point standard check	Daily	less than 20% from the calibration point	MLD070
	Field Blank	Daily	Analytes of interest less than their limit of quantification	
$PM_{2.5}$	Flow audit	Biweekly	Less than 4% of the set flowrate	AQSB SOP 400
Black carbon	Flow audit	Biweekly	Less than 4% of the set flowrate	AQSB SOP 400
Discrete samples				
PAHs (TO-13A)	Flow audit	Prior and after each sampling period	10% of the set flowrate	TO-13
Aldehyde	Flow audit	Semiannual	5% of the set flowrate	AQSP SOP 801
Glycols	Flow audit			
Metals	Flow audit			
VOCs (MLD058 compounds)	Flow audit	Semiannual	5% of the set flowrate	AQSP SOP 805

Table 2 shows data completeness targets for all collected data at several time intervals. Data completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under normal conditions. Completeness will be assessed by reviewing field and laboratory data logs and field and laboratory logbooks to ensure that all data are validated within specified DQOs.

Table 2: Data completeness targets

Completeness Target	Relevant to
75% of minute data	5-minute average data
75% of 5-minute data	1-hr average data
75% of hourly data	24-hr daily average data
75% of daily data	Monthly or quarterly average data

7. Monitoring Methods and Equipment

Target analytes (Appendix A) are directly measured by a suite of instruments in the field (on-site measurements) or collected for laboratory chemical analysis using samplers (discrete samples). Additional information on these methods may be found in the SNAPS QAPP. Standard operating procedures (SOPs) for the instruments described below can be found (https://ww2.arb.ca.gov/our-work/programs/study-neighborhood-air-near-petroleum-sources).

Stationary Air Monitoring

Stationary monitoring is anticipated to occur at a single central location within the Lost Hills Community (see section 8) for a period of 3-5 months. A trailer equipped with a variety of instrumentation to provide continuous, high-time resolution measurements of criteria air pollutants and toxic air contaminants will be deployed at each stationary monitoring site.

Gaseous pollutants will be directly measured at the monitoring trailer. Gaseous pollutant measurements will include H_2S measured by UV-fluorescence (Teledyne T101), O_3 by UV absorption (Teledyne T400), CH_4/CO/CO_2 by cavity ring-down spectroscopy (Picarro 2401), and volatile organic compounds (VOC, PAMS mixture) by in-situ thermal desorption gas chromatography-flame ionization detection (Markes Air Server-unity system and Thermo trace 1300 gas chromatograph). Particulate pollutants directly measured in the field include $PM_{2.5}$ mass by beta-ray attenuation (Met One BAM 1022) and black carbon by optical absorption (Met One BC-1054).

Discrete samples will be collected for analysis of a wide range of compounds including polycyclic aromatic hydrocarbons (PAHs), aldehydes, glycols, VOCs (EPA TO-15 compounds), sulfur-containing gaseous compounds, and metals. PAHs are collected by sampling air through polyurethane foam using a high volume sampler. Aldehydes, glycols, and metals are collected by DNPH cartridges, XAD-7 tubes and Teflon filters, respectively, using an ATEC toxic multichannel sampler. VOCs and sulfur-containing gaseous compounds are sampled into separate canisters by the ATEC sampler.

Discrete samples will be transported to analytical laboratories for analysis upon completion of field sampling. PAHs will be analyzed by gas chromatography-mass spectrometry using EPA TO-13. Aldehydes will be analyzed by high performance liquid chromatography and UV detection using EPA TO-11A. Glycols will be analyzed by gas chromatography-flame ionization detection using NIOSH 5523. VOCs and sulfur-containing compounds will be analyzed by gas chromatography-mass spectrometry using the CARB’s MLD058 method and gas chromatography and chemiluminescence using the ASTM D5504 method, respectively. Metals will be analyzed by X-ray fluorescent spectroscopy using CARB’s MLD-034 method.

Mobile Monitoring Vehicle

The mobile monitoring vehicle is equipped with instrumentation to measure CH_4, CO_2, CO, and BTEX (benzene, toluene, ethylbenzene, and xylenes), a global positioning system (GPS), and a video camera to record the vehicle’s location and surroundings. All real time data are collected using a data logger which synchronizes data from the GPS and instruments into a central file that can be used for data analysis. The mobile monitoring vehicle is also capable of collecting grab samples for more comprehensive analytical analyses as needed.

Mobile monitoring expands the spatial range of air pollution measurements made via the SNAPS’s program and provides qualitative information that can be used to inform the program. For example, mobile monitoring may be used to characterize the spatial distribution of air quality within the community to assist with identifying locations for siting the monitoring trailer. Mobile monitoring can also serve as a temporary stationary site to characterize background concentrations when located upwind of the Lost Hills community and nearby sources. Mobile monitoring may also be deployed to provide prompt air pollution measurements during air pollution events. The mobile monitoring vehicle provides additional utility to better characterize the spatial or temporal distribution of target analytes along public thoroughfares within the study area.

CARB intends to utilize mobile monitoring to complement and supplement the measurements made by the stationary trailer. The mobile monitoring vehicle and stationary monitoring trailer have a common suite of measured pollutants including methane and BTEX. Leveraging mobile monitoring's capability to better characterize the spatial distribution of air pollutants with the stationary monitoring trailer's continuous and comprehensive measurements allows CARB to better characterize air quality in communities.

Table 3: Mobile Vehicle Monitoring Parameters

Parameter	Analyzer	Measurement Method	Frequency	Reporting Interval
Methane, carbon dioxide, carbon monoxide	Picarro G2401	CRDS	Continuous	One Minute Average
BTEX (benzene, toluene, ethylbenzene, xylenes)	Tricorn GC-PID	GC-PID	Continuous	30 minutes (2.5 minute sampling time followed by 27.5 minutes GC run time)
VOCs (Grab samples)	GC-MS	MLD 058	As necessary	N/A

8. Monitoring Areas

The Lost Hills community is located less than a mile east of oil and gas production activities in Kern County, CA. Meteorological measurements from nearby monitoring sites show that the prevailing wind is from the west-northwest as shown by the wind roses in Figure 1. A variety of sources including the oil and gas field, nearby highways, and agricultural activities are expected to impact local air quality. Close proximity to oil and gas production in combination with the dominant wind patterns suggests that the community of Lost Hills is likely impacted by emissions from oil and gas production activities. Additionally, the Lost Hills community is adjacent to agricultural fields and transportation corridors, Interstate 5 to the east and Highway 46 passing through the community. Monitoring sites are selected based on their ability to represent the overall impacts of pollution sources within and around the community while considering operational logistics, such as site access and electricity.

Potential monitoring locations were identified based on community comments, proximity to potential emission sources, proximity to the community/residents, and the ability to obtain site access and power the SNAPS monitoring trailer. We propose a primary monitoring location and two back-up sites within Lost Hills:

Primary Location: Department of Water Resources

The Lost Hills Department of Water Resources (DWR) Office is located near the center of Lost Hills along CA Highway 46 (Figures 2 and 3). This location was selected as a primary candidate because it is centrally locating within the community and expected to be representative of the overall air quality experienced by residents. Additionally, the DWR Office provides adequate power availability and security suitable for stationary monitoring.

Alternate Locations

1) Lost Hills Union School District Office: The School District office is located on the western boundary of Lost Hills, and is less than 0.75 miles from the oil field along CA highway 46. This site is ideal for monitoring fugitive emissions from oil field activities with few other pollutant sources in close proximity.
2) Wonderful Park: Wonderful Park is located on the eastern boundary of Lost Hills and offers a location to measure fugitive emissions from the oil field traveling through the community. The site may also be able to measure emissions from automobiles traveling along Interstate 5.

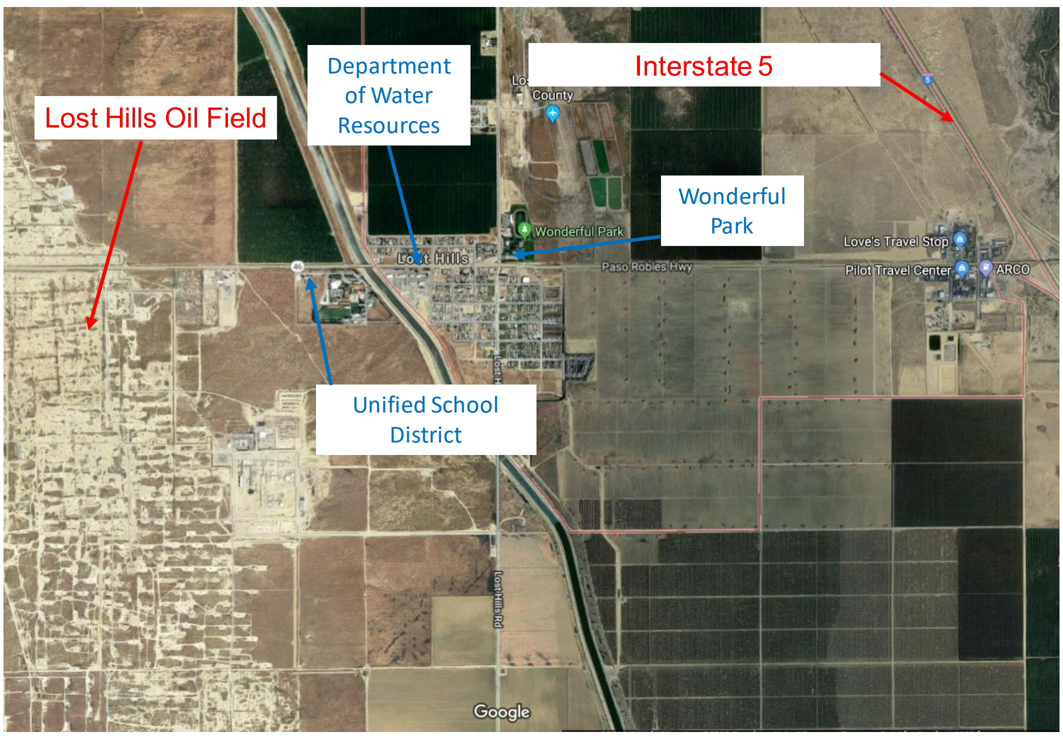

Figure 2: Map of the greater Lost Hills area. The Lost Hills Oil Field is located 1 mile west and Interstate 5 is located approximately 2 miles east of the community. The proposed sampling sites are labelled and shown.

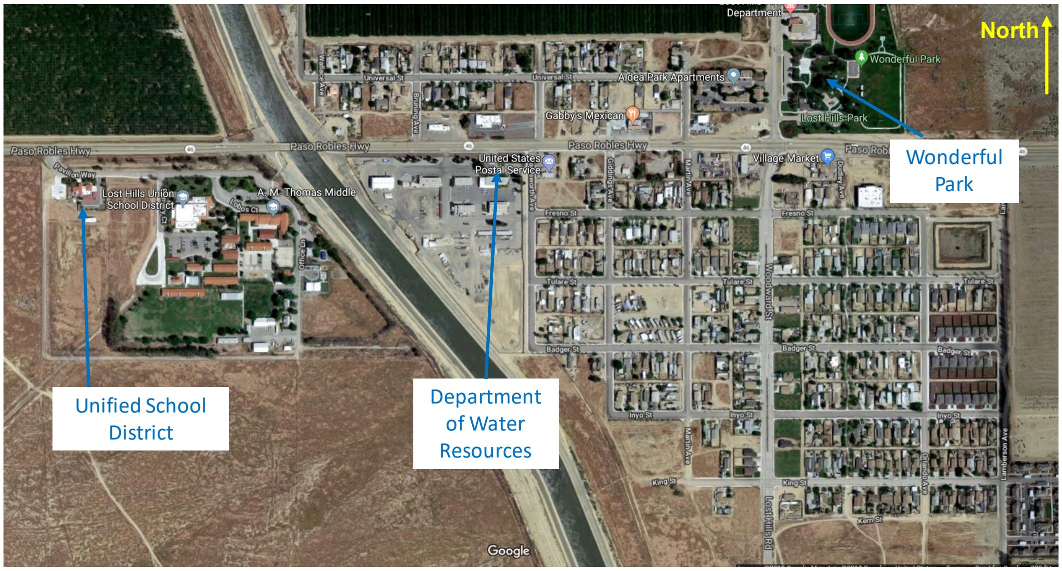

Figure 3: Map of Lost Hills Community with proposed sample sites listed.

9. Quality Control

CARB staff will perform standard calibrations, flow rate checks/verification, and preventative maintenance to ensure data quality. Expanded information can be found within the SNAPS QAPP.

Calibration

All instruments will be calibrated at the beginning and end of field monitoring campaigns. Instruments will also be calibrated as needed during the field campaign to improve data quality based on quality control checks. Calibrations will be conducted for both response and/or sampling flowrate on an instrument to instrument basis. Routine one-point standard checks/audits will be performed to evaluate the proposed initial data quality objectives listed in Table 1.

Quality Control Checks

1) The shelter temperature and humidity will be checked daily.
2) All data produced by on-site instrumentation will be reviewed daily. Any outliers or abnormal diurnal trends will be investigated and corrective actions will be performed as necessary to address anomalous data. Please see the Data Management section of this monitoring plan for more information.
3) The response of the thermal desorption GC-FID will be checked using zero air and VOC standards. If the response of the zero air and/or VOC standards do not meet established acceptance criteria for two consecutive days, the instrument will be diagnosed, repaired, and a new calibration will be conducted.
4) The response of the gas monitors (ozone and hydrogen sulfide) will be checked using zero air and gas standards on a biweekly schedule. CH_4, CO and CO_2 instrument responses will be checked monthly. If the zero/span response does not meet established acceptance criteria, corrective actions will be performed and/or the instrument will be recalibrated.

5) The sampling tape for on-site particle instruments will be checked biweekly. Filter tapes will be replaced as necessary.
6) Cylinder pressures for the GC, helium and nitrogen, will be checked biweekly. The water level of the hydrogen generator will also be checked biweekly.
7) The sampling flow rate, temperature, and pressure of instruments measuring the mass of atmospheric particles will be checked biweekly. If the audited sampling flow rate does not meet established acceptance criteria, the instrument will be diagnosed and corrected. Following the diagnosis, calibrations will be performed.

Maintenance

1) For gas monitors measuring CO, CO_2, CH_4, H_2S and O_3, the in-line filter, used to remove airborne particles, will be changed bi-weekly.
2) For instruments measuring the mass of $PM_{2.5}$ and black carbon, the cyclone particle trap will be cleaned monthly and cyclones will be cleaned every three months.

Discrete Sample Handling

Unused sample media and collected samples will be stored and transported to and from the MLD laboratory and contracted laboratory following the SOPs for each sample type.

Mobile monitoring

All instruments in the mobile monitoring vehicle will be calibrated before each trip to the community. The performance of instruments in the vehicle will also be evaluated using gas standards during mobile monitoring activities.

10. Data Management

The data management plan for the SNAPS program outlines methods and procedures for data acquisition, automatic quality control, data review, and data security. A brief description of the SNAPS data management protocol is provided here. Detailed information is provided in the SNAPS QAPP.

Data Acquisition

SNAPS obtains information from three different data sources: on-site measurements, offsite laboratory analysis, and mobile monitoring.

- On-site measurements include any measurements made with instruments designed to operate autonomously. Instruments, except for the auto GC, used for on-site measurements will be connected to CARBLogger. Data from these instruments will be sent to the Community Data Management System (CDMS) in Data Management System (DMS) pipe delimited format. For on-site measurements made with the auto GC, no direct data ingest will take place by CARBLogger because the identification and quantification of targeted compounds measured by the auto GC require confirmation by CARB staff. CARB staff will manually export and analyze files from the auto GC. CARBLogger will be used to automate data export and follow-up analysis will be conducted by CARB staff.

- Offsite laboratory analysis includes the collection of canister, cartridge, or filter samples from monitoring sites and physically shipping the media to laboratories (both MLD operated and contractor operated). In the case of MLD laboratory analyses, an automated mechanism will be implemented to aggregate and transfer data directly from LIMS into CDMS. Pending feedback from the MLD laboratory, results from contractor laboratories may or may not be transmitted in a similar fashion. All laboratory data will be uploaded to CDMS once it is delivered to MLD. Laboratories will report data as mass of analyte per sample. These data will be combined with filed sampling logs to convert laboratory results into airborne concentrations (e.g. ppbv or ng/m^3)
- Mobile monitoring includes special analysis methods and rapid data streams which report parameter values and GPS coordinates in a continuous fashion. Unlike other systems, this data will be reported by the CODAS system directly to CDMS.

Data Auto Quality Control

Automated data screening is integrated into the overall data transmission process (either on the data logger or the CDMS) so that data from faulty instruments are not automatically included into otherwise valid data streams.

This auto quality control primarily focuses on instrument operational states, such as manufacturer specified operational conditions, which can be assigned by CARBLogger, CODAS, or alternative datalogging systems. For instance, if the instrument's box temperature exceeds the maximum allowable temperature range, the site operator is notified via a daily status email or text message. This gives the operator the opportunity to review certain types of data more closely, validate/invalidate data, and/or perform maintenance.

Automatically-assigned data flags will not preclude an operator or manager from reviewing and marking data as valid at a later time if deemed appropriate. All changes to data flagging states will also be recorded into the CDMS data chain of custody for future inspection.

Manual Data Review

Manual data review involves the human review of monitoring data for anomalous behavior that may or may not be reflected by diagnostic parameters. Using tools provided by CDMS, the operator may examine the diurnal profiles of pollutants, time series, and shifts in wind direction to ensure that the instrument appears to be functioning nominally.

Unless otherwise determined appropriate by management, all data will include three levels of technical review. The first level of data review includes review of percent from true calibration, review of station control charts, review of instrument diagnostic data, verification of all automatic quality control flags, review of minute-based data, and review of hourly continuous data by parameter. The second level of data review includes review of quality control documents, maintenance check sheets, DMS control charts, hourly data for reviewed 1-minute data, and data completeness. Additionally, the second level review ensures that all QC practices were performed to meet data quality objectives for each pollutant or parameter. A third level of review will be conducted by CARB staff to ensure data completeness, proper maintenance, acceptable operating conditions for all instruments, and completeness of all study presentation materials (charts, analysis reports, data summaries, station logs, etc). A full description of the data verification and validation process can be found in the SNAPS QAPP.

Backup copies of data will be generated at various phases in the data collection process. Any changes made on CDMS are recorded inside the CDMS chain of custody. At any point in time, any of these data steps can be retraced to ensure data fidelity.

Data Security

Data privacy is safeguarded by requiring account access privileges to access the CDMS system and associated data acquisition systems. Data logger security will follow the due diligence of using a firewall, updating public facing applications, running antivirus, periodic log review, and external inspection by IT security.

11. Work Plan for Field Measurements

Field measurements are proposed to begin April 2019. This start date is dependent upon operational logistics such as obtaining access to monitoring locations and electricity for monitoring instruments. The duration of field measurements will be at least 3 months and may be extended if additional measurements are required to fulfill program objectives.

CARB staff will visit the monitoring site approximately once a week to perform quality control procedures outlined above in section 9. All quality control activities will be logged into appropriate logbooks. Continuous measurements will be collected 24 hours per day while discrete samples will be collected on a 1-in-6 day sampling schedule.

Table 4: Outline of site visit work plan.

Task	Calibration	Quality Control Check	Auto GC (cylinder pressure, Hydrogen generator)	Discrete samples	Flowrate for PAH sampling
Week1	All instruments		x	x (All discrete samples)	x
Week2	as necessary (x)		x	x	x
Week3	x	O_3, H_2S, $PM_{2.5}$, BC	x	x	x
Week4	x	$CH_4/CO/CO_2$	x	x	x
Week5	x	O_3, H_2S, $PM_{2.5}$, BC	x	x	x
Week6	x		x	x	x
Week7	x	O_3, H_2S, $PM_{2.5}$, BC, $CH_4/CO/CO_2$	x	x	x
Week8	x		x	x	x
Week9	x	O_3, H_2S, $PM_{2.5}$, BC	x	x	x
Week10	x	$CH_4/CO/CO_2$	x	x	x
Week11	x	O_3, H_2S, $PM_{2.5}$, BC	x	x	x
Week12	x		x	x	x
Week13	All instruments		x	x	x

12. Evaluating Effectiveness

Data will be analyzed on an ongoing basis to ensure that data quality objectives are met and data is of sufficient quality and quantity to meet all applicable requirements. Collected data must be of appropriate quality to conduct health-risk assessments and source attribution. CARB staff will meet regularly with CARB management to discuss data capture status, completeness, validity, representativeness, and any programmatic issues. Operational factors affecting program objectives will be quickly identified and corrective actions will be implemented to ensure the collection of an accurate, complete, and useful dataset.

13. Data Analysis and Interpretation

All collected data will be subject to three levels of data verification and validation described in section 9 of this monitoring plan. Once reviewed, the data will be passed to the corresponding staff for follow-up data analysis.

CARB staff will analyze measurement data to determine the concentration levels of pollutants in the community. Air pollutant time series, diurnal patterns, and time-averaged concentrations will be evaluated. These data will be compared with regional air quality data in Kern County such as the data produced by the Shafter monitoring station.

The Office of Environmental Health Hazard Assessment (OEHHA) may use measurement data to perform in-depth health analysis which may potentially include a health risk assessment.

CARB staff will potentially utilize measurement data to perform source attribution analysis to identify the major sources impacting air quality in the community. Source attribution analysis will be performed using CARB's recommended source attribution approaches as described in CARB's Community Air Protection Program Resource Center.

14. Communicate Results

Collected data will be summarized and shared by CARB staff via several methods including; publishing near real-time data on-line, providing interim updates at community meetings, and publishing a final report.

All collected data will be categorized into two Tiers for data publishing (Table 5). Tier I data is from real-time and near real-time air quality measurements. Tier I data will be reported as hourly concentrations and as estimated Air Quality Index (AQI) values. Pollutant concentrations will be compared to relevant health standards and regional pollutant concentrations, where appropriate, to provide context. Tier II data, including semi-continuous auto GC measurements and data acquired from discrete samples, will be included in the final report.

CARB staff will hold local public meetings during the monitoring and will share monitoring results with community residents upon completion of the monitoring campaign.

CARB staff will prepare a final report to summarize all findings, including both health assessment and source attribution. All validated data for the duration of the monitoring will be available as part of this report.

Table 5: Data availability schedule

Measurement	Pollutants	Time to Public Posting of Data
Tier I data	CH_4, H_2S, O_3, CO, CO_2, $PM_{2.5}$, black carbon (BC)	Hourly(1)
Tier II data	Toxic air contaminants (TACs), non-TAC VOCs and metals	With published report(2)

Notes: (1) Results streamed hourly on project website.
(2) Report published 6 months following the completion of monitoring.

Appendix A. Analytes measured for SNAPS

Table A1. On-site Measurements

Analyte name	On-site Measurements					
	PAMS	Beta-ray Attenuation	Light Absorption	CRDS	UV Fluorescence	UV Absorption
PM2.5		x				
Black carbon			x			
Carbon dioxide				x		
Carbon monoxide				x		
Methane				x		
Hydrogen sulfide					x	
Ozone						x
Ethylbenzene	x					
Styrene	x					
Propylbenzene (or n-Propylbenzene)	x					
Diethylbenzene - P (p-Diethylbenzene)	x					
Butane (or n-Butane)	x					
1-Butene	x					
2-methylpentane (Isohexane)	x					
2,4-dimethylpentane	x					
Xylenes (m & p)	x					
1,3,5-Trimethylbenzene	x					
Methylcyclohexane	x					
Toluene	x					
Pentane (n-Pentane)	x					
1-Pentene	x					

Analyte name	On-site Measurements					
	PAMS	Beta-ray Attenuation	Light Absorption	CRDS	UV Fluorescence	UV Absorption
Hexane (n-Hexane)	x					
Cyclohexane	x					
Octane (n-Octane)	x					
Nonane (n-Nonane)	x					
Undecane (or n-Undecane)	x					
Dodecane (or n-Dodecane)	x					
Propylene (or Propene)	x					
Decane (n-Decane)	x					
m-Diethylbenzene	x					
Heptane (n-Heptane)	x					
Cyclopentane	x					
1,2,3-trimethylbenzene	x					
2,2,4-trimethylpentane	x					
2,3-dimethylpentane	x					
2,3,4-trimethylpentane	x					
3-methylhexane	x					
3-methylheptane	x					
cis-2-butene	x					
2-methylhexane	x					
2-methylheptane	x					
1-Hexene	x					
2-Ethyltoluene	x					
3-Ethyltoluene	x					
4-Ethyltoluene	x					
trans-2-butene	x					

Analyte name	On-site Measurements					
	PAMS	Beta-ray Attenuation	Light Absorption	CRDS	UV Fluorescence	UV Absorption
cis-2-pentene	x					
trans-2-pentene	x					
Benzene	x					
Ethane	x					
Ethylene (or Ethene)	x					
Acetylene (or Ethyne)	x					
Propane	x					
Isobutane (or 2-Methylpropane)	x					
2,2-dimethylbutane	x					
Isopentane (or 2-Methylbutane)	x					
Isoprene (or 2-methyl-1,3-butadiene)	x					
2,3-dimethylbutane	x					
Xylene (o)	x					
1,2,4-trimethylbenzene	x					
3-methylpentane	x					
Methylcyclopentane	x					
Cumene (or Isopropylbenzene)	x					

Table A2. Discrete Samples

Analyte name	Discrete samples						
	MLD058	TO-13 SIM mode	TO-13 Scan mode	XRF	NIOSH 5523	MLD022	ASTM D5504
Benzene	x						
Ethylbenzene	x						
Styrene	x						
Toluene	x						
Xylene (o)	x						
Xylenes (m & p)	x						
1,1,1-Trichloroethane	x						
1,3-Butadiene	x						
Acetone	x						
Acetonitrile	x						
Acrolein	x						
Acrylonitrile	x						
Bromomethane	x						
Carbon tetrachloride	x						
Chloroform	x						
cis-1,3-Dichloropropene	x						
Dichloromethane	x						
Ethanol	x						
Freon 11	x						
Freon 113	x						
Freon 12	x						
Perchloroethylene	x						
trans-1,3-Dichloropropene	x						

Analyte name	Discrete samples						
	MLD058	TO-13 SIM mode	TO-13 Scan mode	XRF	NIOSH 5523	MLD022	ASTM D5504
Trichloroethylene	x						
Vinyl chloride	x						
2-Methylnaphthalene		x	x				
Acenaphthene		x	x				
Acenaphthylene		x	x				
Anthracene		x	x				
Benzo[a]anthracene		x	x				
Benzo[a]pyrene		x	x				
Benzo[b]fluoranthene		x	x				
Benzo[g,h,i]perylene		x	x				
Benzo[k]fluoranthene		x	x				
Chrysene		x	x				
Dibenz[a,h]anthracene		x	x				
Fluoranthene		x	x				
Fluorene		x	x				
Indeno[1, 2,3-cd]Pyrene		x	x				
Naphthalene		x	x				
Phenanthrene		x	x				
Pyrene		x	x				
1, 3-Dichlorobenzene			x				
1,2,4-Trichlorobenzene			x				
1,2-Dichlorobenzene			x				
1,4-Dichlorobenzene			x				
2,4,5-Trichlorophenol			x				
2,4,6-Tribromophenol			x				

Analyte name	Discrete samples						
	MLD058	TO-13 SIM mode	TO-13 Scan mode	XRF	NIOSH 5523	MLD022	ASTM D5504
2,4,6-Trichlorophenol			x				
2,4-Dichlorophenol			x				
2,4-Dimethylphenol			x				
2,4-Dinitrophenol			x				
2,4-Dinitrotoluene			x				
2,6-Dinitrotoluene			x				
2-Chloronaphthalene			x				
2-Chlorophenol			x				
2-Fluorobiphenyl			x				
2-Fluorophenol			x				
2-Methylphenol			x				
2-Nitroaniline			x				
2-Nitrophenol			x				
3 & 4-Methylphenol			x				
3,3'-Dichlorobenzidine			x				
3-Nitroaniline			x				
4,6-Dinitro-2-methylphenol			x				
4-Bromophenyl phenyl ether			x				
4-Chloro-3-methylphenol			x				
4-Chloroaniline			x				
4-Chlorophenyl phenyl ether			x				
4-Nitroaniline			x				
4-Nitrophenol			x				
Benzoic acid			x				
Benzyl alcohol			x				

Analyte name	Discrete samples						
	MLD058	TO-13 SIM mode	TO-13 Scan mode	XRF	NIOSH 5523	MLD022	ASTM D5504
Bis (2-chloroisopropyl) ether			x				
Bis(2-chloroethvl)ether			x				
Bis(2-ethylhexyl) phthalate			x				
Bis(2-chloroethoxy)methane			x				
Butyl benzyl phthalate			x				
Dibenzofuran			x				
Diethyl phthalate			x				
Dimethyl phthalate			x				
Di-n-butyl phthalate			x				
Di-n-octyl phthalate			x				
Hexachloro-1,3-cyclopentadiene			x				
Hexachlorobenzene			x				
Hexachlorobutadiene			x				
Hexachloroethane			x				
Isophorone			x				
Nitrobenzene			x				
N-Nitrosodimethylamine			x				
N-Nitrosodi-n-propylamine			x				
N-Nitrosodiphenylamine			x				
Pentachlorophenol			x				
Phenol			x				
Aluminum				x			
Antimony Compounds				x			
Arsenic (elemental or salt composite)				x			
Barium				x			

Analyte name	Discrete samples						
	MLD058	TO-13 SIM mode	TO-13 Scan mode	XRF	NIOSH 5523	MLD022	ASTM D5504
Bromine				x			
Calcium				x			
Chlorine				x			
Chromium & chromium compounds				x			
Cobalt (elemental form or inorganic compounds)				x			
Copper				x			
Iron				x			
Lead				x			
Manganese (and manganese compounds)				x			
Mercury (and inorganic mercury compounds)				x			
Molybdenum				x			
Nickel (metallic nickel and inorganic nickel compounds)				x			
Phosphorus				x			
Potassium				x			
Rubidium				x			
Selenium (and selenium compounds)				x			
Silicon				x			
Strontium				x			
Sulfur				x			
Tin				x			
Titanium				x			
Vanadium				x			
Yttrium				x			
Zinc				x			
1,3-Butylene glycol					x		

Analyte name	Discrete samples						
	MLD058	**TO-13 SIM mode**	**TO-13 Scan mode**	**XRF**	**NIOSH 5523**	**MLD022**	**ASTM D5504**
Diethylene glycol					x		
Ethylene glycol (1,2-ethanediol)					x		
Propylene glycol					x		
Tetraethylene glycol					x		
Triethylene glycol					x		
Acetaldehyde						x	
Formaldehyde						x	
Methyl Ethyl Ketone, MEK (2-Butanone)						x	
Hydrogen Sulfide							x
2,5-Dimethylthiophene							x
2-Ethylthiophene							x
3-Methylthiophene							x
Carbon Disulfide							x
Carbonyl Sulfide							x
Diethyl Disulfide							x
Diethyl Sulfide							x
Dimethyl Disulfide							x
Dimethyl Sulfide							x
Ethyl Methyl Sulfide							x
Ethyl Mercaptan							x
lsobutyl Mercaptan							x
lsopropyl Mercaptan							x
Methyl Mercaptan							x
n-Butyl Mercaptan							x
n-Propyl Mercaptan							x

Analyte name	Discrete samples						
	MLD058	TO-13 SIM mode	TO-13 Scan mode	XRF	NIOSH 5523	MLD022	ASTM D5504
tert-Butyl Mercaptan							x
Tetrahydrothiophene							x
Thiophene							x