CENTRAL VALLEY GAS STORAGE, LLC

Methane Ambient Air Monitoring and Leak Screening Plan

Central Valley Gas Storage, LLC

PROJECT NO. 174579

REVISION 2

DECEMBER 12, 2024

Contents

FIGURES

Tables

List of Abbreviations

Abbreviation	Term/Phrase/Name
Cal e-GGRT	California Electronic Greenhouse Gas Reporting Tool
CalGEM	California Department of Conservation Geologic Energy Management Division
CARB	California Air Resources Board
CCR	California Code of Regulations
CVGS	Central Valley Gas Storage, LLC
FID	flame ionization detector
ID	identification
MAAMLSP	Methane Ambient Air Monitoring and Leak Screening Plan
LDAR	Leak Detection and Repair
OGI	optical gas imaging
P&ID	piping and instrumentation diagram
ppb	parts per billion
ppm	parts per million
ppmv	parts per million by volume
RMLD	remote methane leak detector
USEPA	United States Environmental Protection Agency

Management Approval

This Methane Ambient Air Monitoring and Leak Screening Plan has been reviewed and approved by management at a level with the authority to commit necessary resources for implementing this Plan. The programs and procedures outlined in the Plan will be implemented and periodically reviewed and updated in accordance with 17 CCR 95665-95677, as amended and applicable to state and local requirements. Central Valley Gas Storage is committed to the prevention of unauthorized and unnecessary emissions from the facility and maintains this commitment through regular review, updating, and implementation of this Methane Ambient Air Monitoring and Leak Screening Plan.

Signature_____________________ Date 12/18/2024

Name: Travis Reid

Title: Manager, Storage Operations

Document Revision History

Client Name	Central Valley Gas Storage, LLC
Report Title	Methane Ambient Air and Leak Screening Plan
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Document Revision History Table

Revision Number	Date	Issued By	Reviewed/Approved By	Description
0	12/27/2017	Burns & McDonnell	CVGS	
1	6/13/2018	Burns & McDonnell	CVGS	
2	12/11/2024	Burns & McDonnell	CVGS	Updated plan to reflect regulation changes effective April 1, 2024.

1.0 Introduction

1.1 Facility Background

Central Valley Gas Storage, LLC (CVGS) operates a natural gas underground storage facility located at 5285 McAusland Road near the unincorporated town of Princeton in Colusa County, California ("CVGS facility" or "Site"). The CVGS facility is located in a rural agricultural area, with historic gas production and ongoing gas storage and transmission operations. The facility location is approximately 60 miles north and west of the City of Sacramento. This *Methane Ambient Air Monitoring and Leak Screening Plan* (MAAMLSP) has been developed in accordance with 17 CCR 95665-95677 (Subarticle 13: Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities).

1.2 Site Description

The main elements of the CVGS facility consist of a compressor station, a series of injection/withdrawal wells located at a remote well pad, and high-pressure gas pipelines connecting the various parts of the facility. The main portions of the facility are located on two separate properties, known as the compressor station and the remote well pad. The remote well pad is located approximately one-quarter mile south of the compressor station. Each of the two areas is surrounded by a chain-link fence. Figure 1 depicts the layout of these two areas and adjacent properties. The compressor station occupies approximately 12 acres, and the remote well pad occupies approximately 8 acres (including a natural area buffer zone outside the well pad fence line).

The facility utilizes three natural gas-fueled reciprocating engine compressors, which are located inside a building at the compressor station. Nine injection/withdrawal wellheads are located at the remote well pad.

1.3 Purpose

Effective October 1, 2017, the California Code of Regulations (17 CCR 95665-95677) requires natural gas underground storage facilities to establish a program of monitoring and screening for emissions. This regulation is designed to serve the purposes of the California Global Warming Solutions Act, AB 32.

This MAAMLSP serves to monitor ambient concentrations of methane in air at the perimeter of the facility and to screen for emissions from individual components within the facility. This plan establishes baseline concentrations and collects data to determine if potential methane emissions from the facility are contributing to ambient methane concentrations. Potential sources of methane emissions at the CVGS site may include (but are not limited to) valves, flanges, and other connections; pumps; compressors; pressure relief devices; process drains; open-ended lines; pump and compressor seal system degassing vents; accumulator vessel vents; agitator seals; and access door seals. This plan describes how workers will conduct ambient air monitoring and methane leak screening to identify potential leaks and limit fugitive emissions of methane.

1.4 Scope/Application

This MAAMLSP has been developed to comply with 17 CCR 95665-95677 and updated to reflect changes to the regulation effective April 1, 2024, using United States Environmental Protection Agency (USEPA) Method 21, "Determination of Volatile Organic Compound Leaks" and available guidance documents including *Leak Detection and Repair – A Best Practices Guide* (USEPA 2007) (the USEPA LDAR Guide). Compliance with this regulation will consist of two separate activities:

- Continuous monitoring of methane concentrations in ambient air at the facility perimeter, and
- Daily leak screening at certain components within the facility.

This plan outlines equipment specifications and procedures for performing these activities, as well as procedures for validating data and responding to alarms. It also specifies requirements for repair of identified leaks, as identified in 17 CCR 95665-95677.

2.0 Methane Monitoring in Ambient Air

This section outlines general precautions, methodology, and schedule for continuous monitoring of methane in ambient air, as required by 17 CCR 95668(h)(4)(A).

2.1 General Precautions

Proper safety precautions must be observed when installing, calibrating, and maintaining instruments for monitoring ambient air. Refer to project safety plans and manuals for guidelines on safety precautions.

The following is a list of some items that should be considered for ambient air monitoring:

- If the instrument is not working properly, tag it and remove it from use.
- Observe shelf life of calibration standards.
- Read operational manuals.
- Exercise caution to prevent liquids, grease, dirt, etc., from being pumped into the instrument’s sensor.
- Maintain written documentation, as necessary, for field observations and activities related to the ambient air monitoring instruments.

2.2 Methodology and Procedures

A system of stationary automated instruments is used to perform continuous, real-time measurement of methane concentrations in ambient air. A meteorological monitoring station is also established onsite to provide continuous, real-time measurements of ambient temperature, ambient pressure, relative humidity, wind speed, and wind direction. These methane concentrations and meteorological information are transmitted and recorded using a digital data telemetry system, with data accessible to onsite and remote project personnel. The monitoring system is designed to obtain data to determine ambient methane concentrations in the surrounding area and evaluate whether potential emissions from the CVGS facility are contributing.

The CVGS facility is located in an agricultural area. As shown in Figure 1, the facility is surrounded on all sides by fields and orchards. Many of the nearby fields are used for cultivation of rice, a process that can be a source of methane due to microbial action resulting from flooding of the fields. The methane monitoring program, as outlined in the following paragraphs, has been designed to provide data to help in characterization of agricultural and other background conditions that may potentially affect measured methane concentrations in ambient air at the facility.

2.2.1 Monitoring Parameters

Real-time monitoring consists primarily of measuring methane concentrations in ambient air. Additional parameters to be monitored may include certain gases to aid in discrimination between potential facility emissions and background sources such as surrounding agricultural crops. These additional parameters may include ethane and/or various isotopes of methane. Methane concentrations at each station will be continuously monitored and recorded frequently using the digital data telemetry system.

2.2.2 Meteorological Monitoring Methods and Equipment

To determine the anticipated prevailing wind directions for the facility, multiple resources containing local climate and meteorological data were gathered and reviewed. These include:

- A document entitled “California Climate Zone 11,” prepared in 2006 by the Pacific Energy Center (an affiliate of Pacific Gas & Electric, the local gas and electric utility).
- A PowerPoint slide deck entitled Data for the ISCST3 Air Quality Model (CARB 2003), which includes a slide with a wind rose for the town of Colusa, located approximately 14 miles from the CVGS facility. This wind rose charts the wind directions and speeds recorded during the years of 1993, 1994, 1996, and 1997.
- Data from a monitoring station in the town of Marysville, located approximately 30 miles from the CVGS facility (Weather Underground, accessed May 2018)

These resources are reproduced in Appendix A. Together, they show that wind generally blows from the south-southeast in the summer months and from the northwest in the winter. Interviews with CVGS site personnel confirmed this assessment of wind patterns. Raw data collected using on-site weather instruments from February 2018 to May 2018 also conformed to the same pattern.

CVGS selected the Davis VantagePro2 instrument to perform onsite weather monitoring (specification sheet is presented in Appendix B). This weather station is installed within the remote well pad area to continuously measure and record ambient air temperature, wind speed, wind direction, relative humidity, and barometric pressure. The weather station is located in an open area of the ambient air monitoring zone, with the anemometer and wind vane positioned at a sufficient vertical and horizontal distance from obstructions to minimize interference with wind measurements. Meteorological data is continuously monitored and frequently recorded using the digital data telemetry system.

2.2.3 Monitoring Station Locations and Equipment

Real-time ambient air monitoring is performed at stationary locations along the facility perimeter. The monitoring system is intended to monitor methane concentrations both upwind and downwind from the facility. Based on the desktop review of historical weather conditions in the local region (as described in Section 2.2.2), prevailing winds are generally from the south-southeast in the summer, and from the northwest in the winter. Therefore, monitoring stations are established at the southeast and northwest corners of the compressor station area, and at the southeast and northwest corners of the remote well pad. Figure 2 presents the stationary ambient air sampling locations. Other locations may be added by the project management team if conditions warrant. In consultation with the California Air Resources Board (CARB), the locations of the stations may be changed to reflect site-specific prevailing wind conditions as indicated by the onsite meteorological station.

Each station consists of a methane sensor instrument mounted in a protective enclosure, equipped with a sampling cane/tubing to bring ambient air into the instrument. CVGS selected the Gazomat-ppb instrument (specification sheet provided in Appendix B), which uses a laser spectroscopy sensor. This instrument has the capability to measure ambient concentrations of methane within an accuracy of 250 parts per billion (ppb).

The maximum height of buildings and equipment in the compressor station area is approximately 85 feet above ground surface. The maximum height of buildings and equipment in the remote well pad area is approximately 25 feet above ground surface. However, the majority of the pipes and wellhead equipment containing natural gas are located at heights of 10 feet or less, or below the ground surface. Therefore, to capture potential facility emissions of natural gas (which is lighter-than-air) near the facility boundary and before they dissipate at higher elevations, the instrument sample inlet is situated at a height of approximately eight feet above the ground surface. Under most wind and pressure conditions, this inlet height will result in representative data for the facility.

2.2.4 Baseline Conditions

Baseline conditions were established using 12 months of continuous monitoring data collected from August 5, 2019 through August 4, 2020. Baseline concentrations were calculated as the 98th percentile of hourly averages and are presented in Table 1. CARB accepted the baseline concentrations in a letter dated March 1, 2021.

Table 1: Methane Baseline Concentrations

Station	Baseline Concentration[(a)] (parts per million [ppm])
Station 1	6.3
Station 2	6.0
Station 3	6.1
Station 4	6.0

(a) Baseline concentrations are rounded to two significant digits, as raw data is reported as two significant digits.

The upwind and downwind baseline conditions may be re-evaluated every 12 months to ascertain changes in local conditions, as part of annual reporting requirements. Modifications to baseline conditions must be approved by CARB. Requests for modification to baseline conditions are anticipated to be approved in full or in part, or disapproved in full or in part, by CARB within 3 months from the date of requested modifications.

2.2.5 Record Keeping

Ambient air monitoring field activities and data are recorded electronically by an automated digital data telemetry system. This system has the ability to store at least 24 months of continuous instrument data, as well as the ability to generate hourly, daily, weekly, monthly, and annual reports. Electronic meteorological files and real-time data files are maintained in an on-site database with additional remote online access and online backup. Records of both meteorological and upwind and downwind air monitoring data will be kept for a period of at least five years. Additionally, if the system is inactive, it will be recorded in a log with a time and date as well as the reasoning for the system inactivity. The reactivation time and date will also be recorded.

Paper data and files, such as field log forms related to maintenance and calibration, will be maintained at the onsite facility office for a period of at least five years. At regular intervals, this information will be scanned for electronic archival.

2.2.6 Training

Personnel will be trained on the operation and maintenance of the ambient air monitoring measurements, as well as appropriate onsite troubleshooting and repairs to the extent permitted by the instrument manufacturer. Personnel will demonstrate competency and proficiency with procedures such as calibrating the instruments, performing measurements manually, and initiating automated data collection functionality.

Personnel will also be familiar with this MAAMLSP and the overall objectives of the ambient air monitoring program. In addition, personnel will have on-site training regarding protected species that need to be avoided per US Fish and Wildlife regulations.

2.2.7 Maintenance and Calibration

All instruments placed in service will be factory-calibrated and/or field calibrated using appropriate calibration standards to ensure that they are operational with sufficient accuracy. If an instrument is not functioning properly, it will be tagged and taken out of service. An instrument that has been tagged will be repaired by personnel qualified to do instrument repair or by authorized company representatives.

The upwind and downwind instruments will be calibrated at least once annually unless more frequent calibrations are recommended by the equipment manufacturer. Additional calibration may be advisable in the event of anomalous readings or equipment maintenance and replacement. Finally, field bump tests may be conducted as desired to verify accuracy of instrument readings. Each calibration and bump test will be logged. Sample calibration forms are included in Appendix C.

Defective instrumentation will be repaired or replaced within 14 calendar days from the date of calibration or the discovery of a malfunction unless there is a delay that is granted by the CARB Executive Officer per 17 CCR 95670.1(a). The instrument will be calibrated according to the manufacturer's manual and then placed back into service. Repair records and a log will be maintained for each instrument. Each entry will be signed and dated.

2.2.8 Alarm Notification Procedures

The monitoring system is configured with an integrated alarm system that is audible and visible continuously in the control office at the facility, and in remote control centers. The system continuously monitors the wind conditions and measures methane concentrations at each station at a data resolution of 1 minute or less, to provide a live response and trigger the alarm system if the downwind sensors detect a reading that is greater than or equal to four (4) times the baseline concentration associated with the sensor, or in the event of a sensor failure. The alarm notification concentrations are listed in Table 2.

Table 2: Alarm Notification Concentrations

Station	Notification Concentration[(a)] (ppm)
Station 1	25
Station 2	24
Station 3	24
Station 4	24

(a) Alarm notification concentrations are rounded to two significant digits, as raw data is reported as two significant digits.

In the event that an alarm is triggered and remains active for 15 minutes or longer with a time resolution of once per minute, facility personnel will then contact CARB, the California Department of Conservation Geologic Energy Management Division (CalGEM), and Colusa County Air Pollution Control District within 24 hours to notify the agencies of the associated site conditions.

The alarm system will have two thresholds that are triggered as follows::

- Preliminary Alarm: The downwind sensor reading is greater than or equal to the notification concentration or if there is a sensor failure. This will sound the alarm in the control office and remote control centers to notify personnel on site to investigate potential issues with the monitoring system.
- Reportable Alarm: The downwind sensor reading remains greater than or equal to the notification concentration for a period of 15 minutes or longer, with a measurement time resolution of once per minute. This will indicate that there will need to be a notification to CARB, CalGEM, and Colusa County Air Pollution Control District within 24 hours. The 15 minute threshold was approved by CARB on March 1, 2021 as seen in Appendix F.

The data and relevant conditions/observations will be documented and carefully evaluated. In the event of an alarm condition, the agencies will be contacted within 24 hours and an explanation for the alarm condition will be provided.

The alarm system will be tested annually as follows:

1. Apply methane gas standard of known concentration (greater than the established baseline concentration) directly to the sensor instrument at one of the stations.
2. Maintain the flow of methane gas standard to the instrument for a period of 20 minutes.

3. Determine whether the audible and visible alarm notifications were activated, and document observations.
4. Repeat at the remaining three stations.

Notes and records of the annual alarm system test will be maintained at the onsite facility office for a period of at least five years.

2.3 Data Review and Reporting

Data will be reviewed to ensure that it is complete and meets the enforcement/technical requirements of the ambient air monitoring program objectives. The data will be reviewed and evaluated by CVGS personnel and other technical professionals, as appropriate. A complete report of the ambient air monitoring data, including meteorological data and data gathered by the upwind and downwind monitoring sensors, will be prepared annually for submission to CARB by July 1st of each year. These notifications and reports will be e-mailed to CARB with the subject line “Natural Gas Underground Storage Reporting” to oilandgas@arb.ca.gov.

Data collected by the monitoring system will be made available upon request of the CARB Executive Officer.

2.4 Schedule

The methane monitoring program became operationally effective on August 5, 2019. Following CARB’s acceptance of the baseline concentrations on March 1, 2021, the system was configured to trigger alarm conditions as presented in Section 2.2.7.

Ambient air monitoring will continue at all times on a 24 hours per day, 365 days per year basis. Interruption of monitoring is anticipated to be minimal, due to instrument calibration, maintenance, and repair. Interruption of monitoring due to loss of power may occur in certain situations as a result of weather or other conditions. If the system is inactive, it will be recorded in a log with a time and date as well as reasoning for the system inactivity. The reactivation time and date will also need to be recorded as described in Section 2.2.5.

3.0 Leak Screening and Repair

This section outlines general precautions, procedures for daily and quarterly leak screening, the schedule for implementation of daily leak screening at each injection/withdrawal wellhead assembly and attached pipelines, and procedures for repair, as required by 17 CCR 95668(h)(4)(B) and 17 CCR 95669.

The procedures specified in the following subsections are in accordance with 17 CCR 95669, USEPA Method 21 (incorporated for reference in Appendix D), and the USEPA LDAR Guide. These procedures are intended to locate and classify leaks only and are not to be used as a direct measure of mass emission rate from individual sources.

3.1 General Precautions

Proper safety precautions must be observed when conducting leak screening. Refer to project safety plans and manuals for guidelines on safety precautions.

The leak detection instrument should be intrinsically safe, as defined by the applicable standards for operation in explosive atmospheres that may be encountered during its use. The following is a list of items that should be considered when taking field measurements:

- If instrument is not working property, tag it and remove it from use.
- Observe shelf life of calibration standards.
- Read operational manuals.
- Wellheads, pipelines, and other apparatus should be in a normal operational state (whether injecting, withdrawing, or shut-in) when leak screening is being conducted.
- During direct monitoring of equipment, exercise caution to prevent liquids, grease, dirt, etc., from being pumped into the instrument's probe.
- Maintain written documentation, as needed, for monitoring data.

3.2 Identifying Components

Components to be monitored at each wellhead and pipeline include valves, flanges and other connections, pressure relief devices, process drains, open-ended lines or valves, seal system degassing vents and accumulator vents, and access door seals. Each applicable component is assigned a unique identification (ID) number that will be recorded in the project log books. Each applicable component in the facility will be identified on piping and instrumentation diagrams (P&IDs) or process flow diagrams. Figures 3 through 5 provide site maps containing well locations and facility pipelines. The logbooks will be updated, if necessary, and a physical tag will be placed on the component. Each regulated component will be identified on a site plot plan or on a continuously updated equipment log. When new and replacement pieces of equipment are added, and equipment is taken out of service, the equipment log will be updated. An electronic data management system for leak screening data and records will be instituted. Furthermore, a field audit will be periodically performed to verify that lists and diagrams accurately represent equipment installed in the facility. Appendix E presents a list of equipment and components to be monitored, as well as those that are inaccessible or unsafe to monitor and the frequency of leak inspections. This list is currently being updated due to the recent change in facility ownership and management.

3.3 Daily Screening

On a daily basis, CVGS personnel will walk each injection/withdrawal wellhead assembly and attached pipelines performing an audio-visual inspection (augmented by use of a remote methane leak detector) for indications of potential leaks. If there is evidence of a potential leak, a portable calibrated instrument will be used to quantify the leak in accordance with Method 21.

3.3.1 Procedure for Audio-Visual Inspection

Except for inaccessible or unsafe-to-monitor components, CVGS personnel will audio-visually inspect (by hearing and by sight) hatches, pressure-relief valves, well casings, stuffing boxes, and pump seals for leaks or indications of leaks at least once every 24 hours. Since the gas moving through facility components contains odorants, personnel should also be aware of odors in the vicinity of the components.

Audio-visual inspection will occur on a daily basis to assist in the detection of possible leaks from facility components. Plan monitoring around service and operational schedule. Methodically inspect relevant facility components for leaks using the senses of sight, hearing, and smell. Visual inspection and observation for fluids dripping, spraying, misting, clouding from or around components, hissing sounds, or smells will be conducted on pumps, agitators and compressors. Personnel will be trained on the use of audio-visual inspection techniques and must be familiar with the relevant facility components and how to complete the daily inspection log form.

This daily audio-visual inspection will be combined with the use of a remote methane leak detector (e.g., RMLD-IS, manufactured by Heath Consultants). This portable, hand-held device triggers an alarm when methane is detected. However, this instrument does not provide quantitative values for leak emission and will not be used for Method 21 monitoring. Proper training of the RMLD-IS should occur by reading the manual and demonstrating instrument use proficiency.

If potential leaks are identified during the daily inspection, they will be noted on field logs, and then quantified using Method 21 and a different instrument, following the procedure outlined in Section 3.3.2. Although the RMLD-IS is not the quantification instrument, the specification sheet is presented in Appendix B.

3.3.2 Procedure for Leak Quantification

If the audio-visual inspection indicates a potential leak that cannot be repaired within 24 hours, the potential leak will be quantified using USEPA Method 21. As a general practice, where possible, leak quantification will usually be performed regardless of the anticipated repair timeframe.

For leaks detected during normal business hours, the leak quantification will be performed within 24 hours. For leaks detected after normal business hours or on a weekend or holiday, the leak quantification will be performed by the end of the next normal business day.

CVGS will select the RKI GX-2012 portable methane-specific detector (specification sheet provided in Appendix B) for use in leak quantification for Method 21 leak quantification procedures. This instrument is intrinsically safe for explosive atmospheres and is capable of quantifying methane concentrations in the ppm range, down to concentrations of less than 500 parts per million by volume (ppmv), using a catalytic combustion detector. To determine the concentration of total hydrocarbons as required by the regulation, the results indicated by the methane-specific detector will be multiplied by a correction factor based on the measured proportions of various other hydrocarbon constituents (ethane, propane, butane, etc.) that are known to be in the stored gas at the facility. These proportions are measured daily using onsite instruments.

In accordance with Method 21 and the USEPA LDAR Guide, the following procedure will be used when quantification is conducted:

- Obstructions should be eliminated (e.g., non-essential wrapping, grease on the component interface) that could prevent monitoring at the interface.
- Place the probe at the surface of the component interface where leakage could occur.
- Move the probe along the interface periphery while observing the instrument readout.
- Locate the maximum reading by moving the probe around the interface.

- Keep the probe at the location of the maximum reading for a time duration of twice the instrument’s response time. Record the reading.

If quantification results indicate a leak concentration above 1,000 ppmv of total hydrocarbons, the leak will be repaired within the timeframes specified in Table 3. If quantification results indicate the leak is below the detection limit of the instrument, it will be documented in the field log with a notation such as “<500 ppmv”.

Upon detection of a component with a leak concentration measured above the standards specified in Table 3, a weatherproof readily-visible tag will be affixed to identify the date and time of leak detection measurement and the measured leak concentration.

3.3.3 Repairing Components

The leak identification tag will remain affixed to the component until the following conditions are met:

1. The leaking component has been successfully repaired or replaced, and
2. The component has been re-inspected and measured (using Method 21) below the lowest applicable standard.

Leaking components will be repaired as soon as practicable, but not later than the number of calendar days specified in Table 3 (next page) after the leak is detected. First attempts at repair may include, but are not limited to, the following practices where practicable and appropriate:

- Tightening or replacing bonnet bolts
- Tightening packing gland nuts
- Injecting lubricant into lubricated packing

These first attempts at repair will be recorded. Beyond these first attempts, the repair process may include the following considerations:

- If the repair of a component is technically infeasible without a process unit shutdown, the component may be placed on the Delay of Repair list, the component’s ID number recorded, and an explanation of why the component cannot be immediately repaired will be provided. An estimated date for repairing the component must be included in the facility records.
- After repairs are completed and the component is returned to service the component must be retested for possible leaks.
- The component is considered repaired only after it has been monitored and shown not to be leaking above the leak threshold of 1,000 ppmv of total hydrocarbons.

- Develop a plan and timetable for repairing components. Make a first attempt at repair as soon as practicable after a leak is detected. Monitor components daily and over several days to assess if a leak has been successfully repaired. Consider replacing problem components with "leakless" or other technologies.
- If the same component needs to be repaired more than five (5) times within a 12 month period, the component will need to be replaced within 30 days unless there is a delay that is granted by the CARB Executive Officer per 17 CCR 95670.1(a). CVGS will maintain a record of the replacement in a log which will be available upon request by the CARB Executive Officer.

Leak identification tags will be removed from components following successful repair. Successful repairs shall be confirmed by re-measuring the component using Method 21.

Table 3: Repair Time Periods

Leak Threshold	Repair Time Period
1,000-9,999 ppmv	First attempt at repair within 5 calendar days and successful repair within 14 calendar days
10,000-49,999 ppmv	5 calendar days
50,000 ppmv or greater	2 calendar days
Critical Components and Critical Process Units	Next scheduled shutdown or within 12 months, whichever is sooner

3.3.3.2 Delay of Repair

In the event of a delay, CVGS will request a delay of repair to the CARB Executive Officer before the repair timeframe is exceeded, provide justification and documentation for the delay, and provide an estimated date which the repairs will be completed. As stated in Sections 2.2.7 and 3.3.3, a delay in repair may be granted by the CARB Executive Officer per 17 CCR 95670.1(a). If the delay of repair is approved, CVGS will complete the repair by the estimated repair date and will notify the CARB Executive Officer and provide the date of successful repair and the repaired leak concentration or emission flow rate within three (3) calendar days after the successful repair.

If wildlife is found on a component and work must be halted or postponed within a certain distance of the wildlife in order to comply with state and federal wildlife regulations, then CVGS may delay inspection after reporting the delay to the CARB Executive Officer within 24 hours of discovering the wildlife. CVGS will provide a description of the type of wildlife, identify the regulations requiring work to be halted, and will resume work once the reason for delay is resolved. CVGS will notify the CARB Executive Officer within 24 hours after inspections have resumed.

All delay of repair requests and reporting of successful repairs following a delay of repair will be e-mailed to oilandgas@arb.ca.gov with the subject line “Delay of Repair.”

3.3.4 Maintenance and Calibration

Instruments placed in service will be calibrated before they are taken to the field. If the instrument is not functioning properly, it will be tagged and taken out of service. An instrument that has been tagged will be repaired by personnel qualified to do instrument repair or by authorized company representatives, then calibrated, and returned to service. The instrument will be calibrated using the calibration precision test prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later, as prescribed in Method 21. Repair records and a log will be maintained on each instrument. Each entry will be signed and dated. Each calibration and bump test will be logged. Sample calibration forms are included in Appendix C.

In accordance with USEPA Method 21:

- A calibration precision test will be completed prior to placing the instrument into service and at subsequent 3-month intervals.
- The calibration precision must be equal to or less than 10% of the calibration gas value (e.g., if a 100 ppmv methane calibration standard gas is used, the instrument response during calibration must be between 90 ppmv and 110 ppmv)

If the 10% precision requirement is not met, the instrument must be recalibrated. If, after recalibration, these values still cannot be met, the instrument will be taken out of service for repair.

3.3.5 Record Keeping

Daily leak screening activities and data will be recorded on field data log forms. Daily audio-visual screening will be recorded using the Daily Wellhead Methane Screening Log. Leak quantification activities will be recorded using the Leak Detection and Repair Inspection Record Keeping Form and the Component Leak Concentration and Repair Record Keeping Form (see Appendix C). Log forms documenting both the daily audio-visual inspections and leak quantification activities (as well as associated repairs) will be maintained in hard copy at the onsite facility office for a period of at least five years. At regular intervals, this information will be scanned for electronic archival.

Audits of leak screening, quantification, and repair records will be performed on a regular basis. Additional records will be maintained to document the order of parts or equipment required to make necessary repairs. Records and data will remain continuously up-to-date and properly organized; it should be noted that the CARB Executive Officer may perform an inspection at the facility at any time to evaluate compliance. CVGS operators will maintain, and make available upon request to CARB, a record of the initial and final leak concentration measurements for leaks identified during daily leak screening or by a continuous leak monitoring system that are measured above the minimum allowable leak threshold. CVGS will maintain records of any deviation from the leak detection and repair plan outlined in Section 3 or will provide a statement that there were no deviations for at least five years from each inspection.

3.3.6 Training

Personnel will be trained on the operation and maintenance of the leak detection and repair protocols. Personnel will demonstrate competency and proficiency with procedures such as calibrating the leak detection instruments, performing measurements manually, and documenting leak screening and repair. Personnel will also be familiar with this MAAMLSP and the overall objectives of the leak screening program. In addition, personnel will have on-site training regarding protected species that need to be avoided per US Fish and Wildlife regulations.

3.4 Quarterly Screening

On a quarterly basis, each injection/withdrawal wellhead assembly and attached pipelines will be screened using Method 21 with a flame ionization detector (FID), which directly quantifies concentrations of total hydrocarbons. All inaccessible or unsafe-to-monitor components will be monitored on an annual basis as part of one of the quarterly monitoring events. If components on equipment or wells are actively undergoing drilling, completion, or maintenance activities, such that quarterly screening cannot be completed, then the components will be inspected before the end of the calendar quarter in which the activities are finished. Component repairs will be conducted using the same procedures identified in Section 3.3.3. Records related to quarterly screening will be kept in the same manner as described Section 3.3.5.

3.5 Data Review and Reporting

Leak screening data will be reviewed for completeness and must meet the technical and regulatory objectives. The data will be reviewed by facility personnel, other technical experts, and other CVGS personnel, as appropriate.

Within 24 hours of identifying a leak that is measured above 50,000 ppmv total hydrocarbons, or a leak that is measured above 10,000 ppmv total hydrocarbons for more than five (5) consecutive calendar days at a natural gas injection/withdrawal wellhead assembly or attached pipeline, CVGS will notify CARB, CalGEM, and Colusa County Air Pollution Control District to report the leak concentration measurement.

In accordance with 17 CCR 95673(a)(9), quarterly reports will be prepared as necessary to document each leak identified during daily inspections and measured above the minimum allowable leak threshold. These reports will include the initial leak concentration measurement, as well as the final (post-repair) leak concentration measurements.

These notifications and reports will be e-mailed to CARB with the subject line “Natural Gas Underground Storage Reporting” to oilandgas@arb.ca.gov.

CVGS will submit an annual report on leak detection and repair inspections conducted in the calendar year as well as information pertaining to components measured above the minimum allowable leak threshold to CARB, with information specified in Tables A4 and A5 in Appendix C. These annual reports will be submitted through California Electronic Greenhouse Gas Reporting Tool (Cal e-GGRT), in accordance with 17 CCR 95673(b)(1). If a leak is found on a component associated with a well, CVGS will indicate whether the well is active or idle.

3.6 Schedule

Leak screening will continue on a 7 days per week, 365 days per year basis.

3.7 Remotely Detected Emission Plume

Per 17 CCR 95669.1, CARB may notify CVGS if remote monitoring data include a methane emission plume at the CVGS facility. CARB will send an e-mail notification to CVGS within seven (7) business days of receiving remote monitoring data. Upon receiving the notification, CVGS will inspect the facility for leaking or venting components and equipment within five (5) calendar days of notification using USEPA Method 21. CVGS may also submit records demonstrating venting was occurring at the time of the remote emission plume detection due to onsite activities instead of performing an inspection. The inspection will be performed until all CVGS components and equipment within a 100-meter radius of the notification location have been inspected or the emission source is found.

3.7.1 Record Keeping and Reporting

CVGS will report to CARB within 72 hours after conducting the inspection the information described in 17 CCR 95673(a)(15), including the date of CARB notification, emission ID number, date of inspection, type of inspection performed, type of emission source found, and the initial mitigation plan.

After conducting the inspection, CVGS will perform one of the following notifications:

- If the emission source is due to venting, CVGS will submit a report to CARB within five (5) calendar days, including the emission ID, description of the venting, and summary of the source and reason behind the venting as described in 17 CCR 95673(a)(16).
- If the emission source is a component leak identified by USEPA Method 21, CVGS will successfully repair the leak as described in Section 3.3.3 and will submit a report to CARB within five (5) calendar days, including the emission ID, type of equipment associated with the emission source, and date of repair as described in 17 CCR 95673(a)(17).
- If the emission source is an unintentional emission source that is not from a component, CVGS will repair the emission source within two (2) calendar days of discovery and will submit a report to CARB within five (5) calendar days of the repair with information as described in 17 CCR 95673(a)(17).

CVGS operators will maintain and make available to the CARB Executive Officer upon request a record of the Remote Emission Detection Follow-up Inspection Record Keeping Form (see Table A8 in Appendix C) for each notification received from CARB and will send an annual report to CARB per 95673. These notifications and reports will be e-mailed to CARB with the subject line “Remote Emission Detection Reporting” to oilandgas@arb.ca.gov.

Records of all leaks found above the minimum leak threshold will be maintained and made available upon request as described in Section 3.3.5, and an annual report will be submitted annually to CARB as described in Section 3.5.

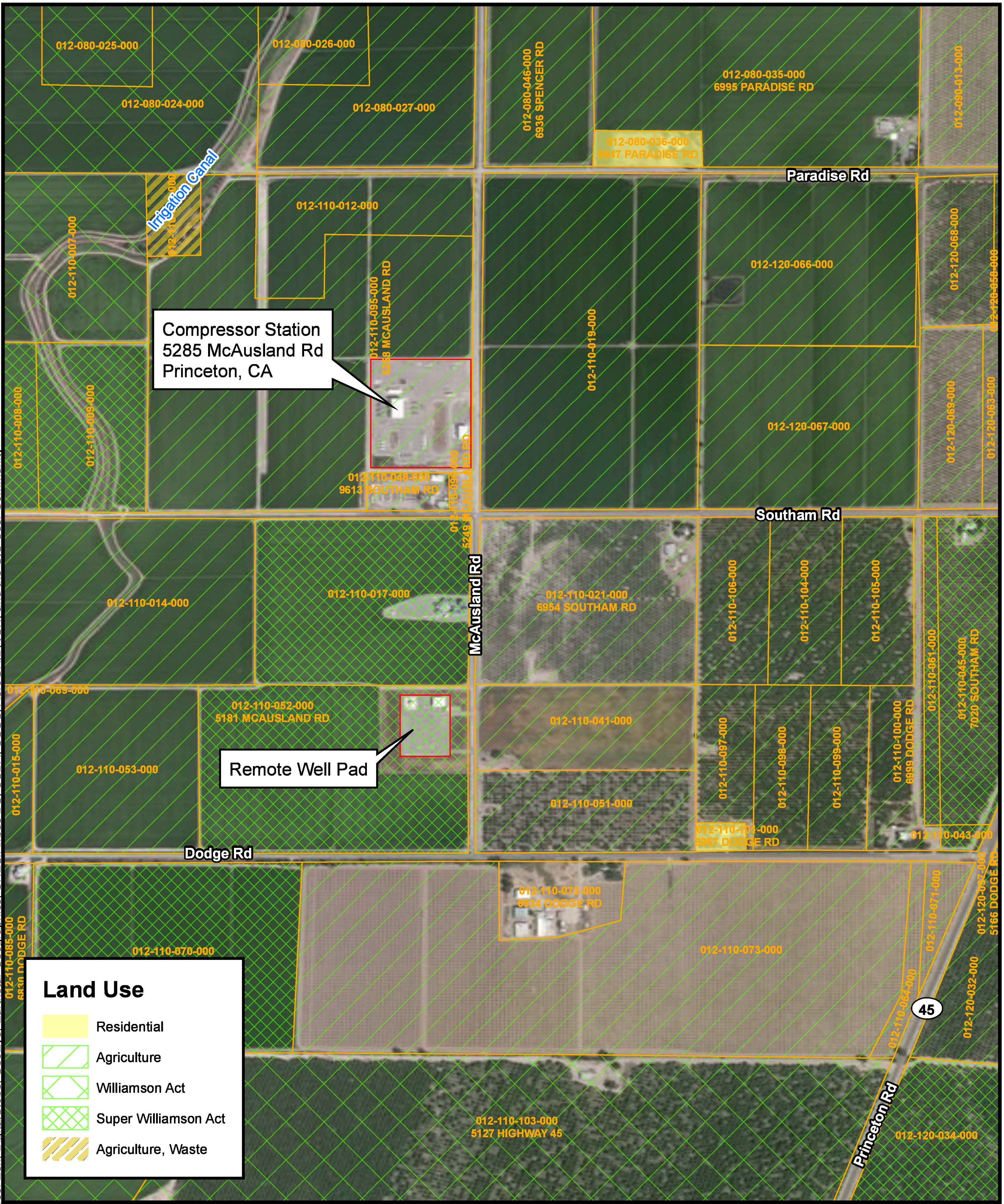
4.0 Monitoring Procedures for a Well Blowout

A "well blowout" is defined as the uncontrolled flow of gas, liquids, or solids (or a mixture thereof) from a well to the surface. If a well blowout is observed, the relevant field conditions will be logged and documented by onsite personnel. In addition, optical gas imaging (OGI) will be performed daily as required by 17 CCR 95668(h)(4)(C).

As soon as practicable after the beginning of a well blowout event, a contractor specializing in OGI will be mobilized to the facility. The contractor will provide OGI instruments as well as a technician with certification or training in basic thermal science, OGI camera operation and safety, and OGI inspections (e.g., OGI Certification or equivalent training). The OGI instrument will be an infrared thermography camera such as the FLIR G300a (specification sheet provided in Appendix B) or equivalent.

During the blowout event, OGI video footage of the leak will be recorded for a minimum of ten minutes every four hours. This video footage of the leak will be made available upon request by the CARB Executive Officer for publication on a CARB maintained public internet website. In addition, CVGS will make the video footage of the leak publicly available by posting it on a CVGS-maintained public internet website throughout the course of the blowout event.

Figures



Legend

- Gas Facility
- Parcel Boundary

NORTH

500 0 500

Scale in Feet

BURNS McDONNELL

Figure 1

SITE LAYOUT
MAAMLSP
Central Valley Gas Storage

Source: CVGS

Issued: 6/7/2018

Path: \\BRE-FPS-001\Data\Users\dwholder\CVGS\ArcDocs\CVGS_SiteLayout_MAAMLSP.mxd dwholder 6/7/2018

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Methane Monitoring Station
- Weather Station
- Gas Facility

NORTH

500 0 500

Scale in Feet

BURNS McDONNELL

Figure 2

METHANE MONITORING LOCATIONS
MAAMLSP
Central Valley Gas Storage

Source: CVGS

Issued: 6/12/2018

Path: \\BRE-FPS-001\Data\Users\dwholder\CVGS\ArcDocs\CVGS_MethaneMonitoringLocations.mxd dwholder 6/12/2018

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Bore Location

Gas Facility

NORTH

0 250 500

Scale in Feet

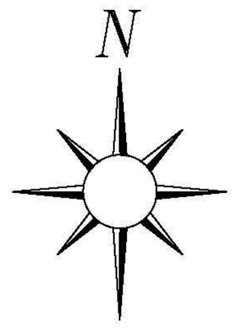
BURNS McDONNELL

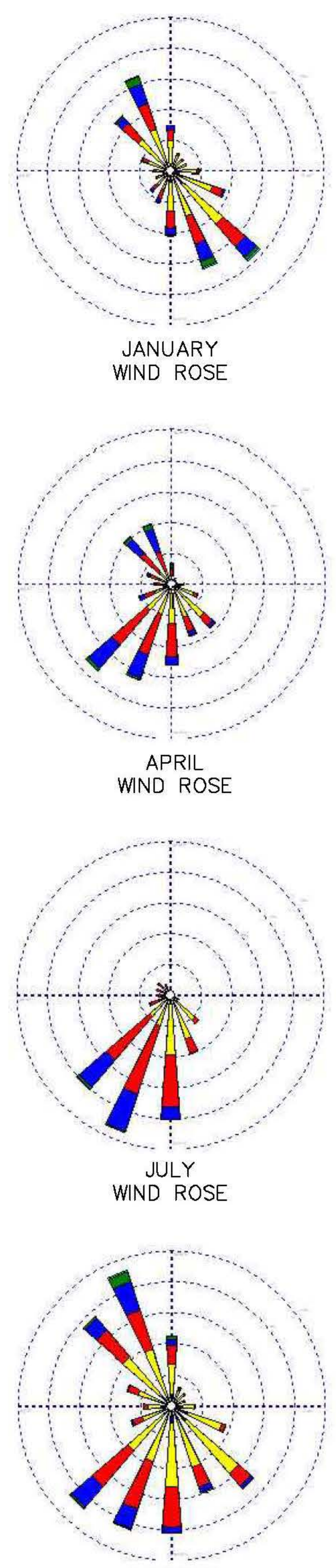
Figure 3
Site Map with Well Heads
Central Valley Gas Storage

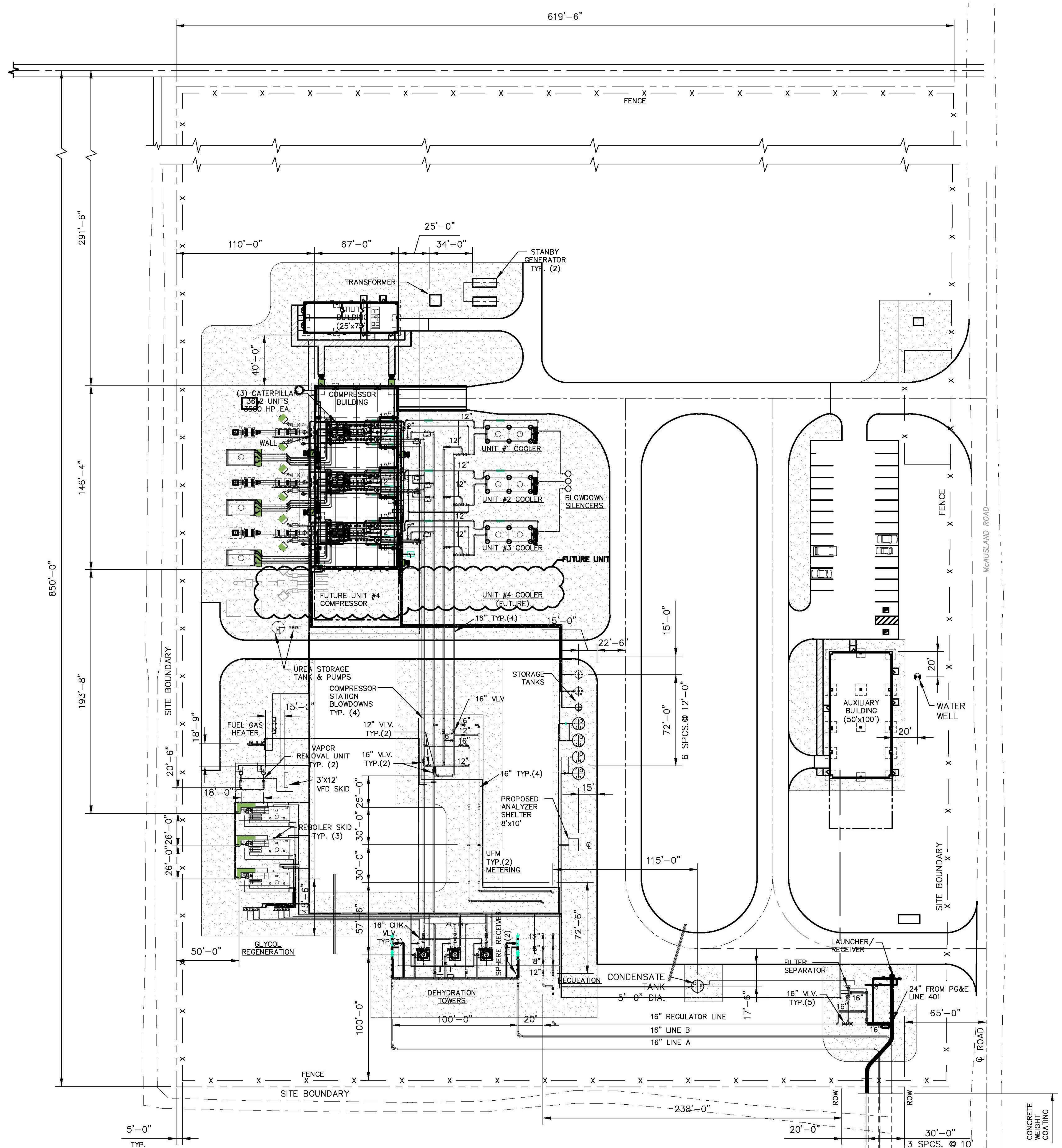
Path: \\bmcd.burnsmcd.com\dfs\Clients\ENS\CenValGasSto\174579_CVGSEnvSrv2425\Geospatial\DataFiles\ArcDocs\CVGS_SITE_FIGURES\CVGS_SITE_FIGURES.aprx ORParab 12/4/2024
Service Layer Credits: Google Earth: Google Earth

Source: ESRI, Burns & McDonnell, and CVGS.

Issued: 12/4/2024







ISSUED FOR BID PHASES 5-6 01/28/2011

DESIGNED IN ACCORDANCE WITH TITLE 49-PART 192 OF MINIMUM FEDERAL SAFETY STANDARDS AND GPTC GUIDE FOR GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS, LATEST EDITION.

PREPARED BY:

ENEngineering
7135 JANES AVENUE
WOODRIDGE, IL. 60517
TEL. 630-353-4000
FAX 630-353-7777
WWW.ENENGINEERING.COM

REV LEVEL	DATE	BY	DESCRIPTION	CK.	APP.
F	12/12/24	GP	REVISED FOR MINOR LABEL CHANGES		
E	01/28/11	AM	ISSUED FOR BID		
D	07/21/10	AM	REISSUED FOR REVIEW	DHF	MM
C	06/25/10	ASC	ISSUED FOR PHA		
B	05/17/10	ASC	ISSUED FOR REVIEW		
A	04/07/10	TSR	INSTALL COMPRESSOR SITE FACILITY		

REVISIONS

central valley gas storage LLC

CENTRAL VALLEY GAS STORAGE

Figure 4
Site Map For Compressor Station
Central Valley Gas Storage

COLUSA COUNTY — CALIFORNIA

DATE:	SCALE:	DRAWN BY:	LOC. NO:	DRAWING NUMBER:	SHEET NO:	REV:
07/09/09	1"=50'	TSR	-	CVGS1-M-200	00	E

DESIGNED IN ACCORDANCE WITH TITLE 49-PART 192 OF MINIMUM FEDERAL SAFETY STANDARDS AND GPTC GUIDE FOR GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS, LATEST EDITION.

PREPARED BY:

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REV LEVEL	DATE	BY	DESCRIPTION	CK.	APP.
F	12/12/24	GP	REVISED FOR MINOR LABEL CHANGES		
E	_/_/11	RSR	REVISED....		
D	06/25/10	JM	ISSUED FOR PHA		
C	05/17/10	JM	ISSUED FOR REVIEW		
B	04/23/10	JM	REVISED FOR (IP) PERMIT SUBMITTAL		
A	04/07/10	AM	INSTALL COMPRESSOR SITE FACILITY		

REVISIONS

central Valley gas storage LLC

PRELIMINARY
NOT FOR CONSTRUCTION

CENTRAL VALLEY GAS STORAGE

Figure 5
Site Map For Remote Well Pad
Central Valley Gas Storage

COLUSA COUNTY — CALIFORNIA

DATE:	SCALE:	DRAWN BY:	LOC. NO:	DRAWING NUMBER:	SHEET NO:	REV:
07/02/09	1"=30'	TSR	-	CVGS1-M-201	00	E

Appendix A - Local Climate/Meteorological References

California Climate Zone 11

Reference City: Red Bluff
Latitude: 40.09 N
Longitude: 122.15 W
Elevation: 342 ft

Basic Climate Conditions

	(F)
Summer Temperature Range	32
Record High Temperature (1978)	119
Record Low Temperature (1975)	20

Design Day Data

Winter	99%	29		
	97.5%	31		
Summer				
	1%:	105	MCWB	68
	2.5%:	102	MCWB	67

Climatic Design Priorities

Winter: Insulate
Reduce Infiltration
Passive Solar

Summer: Shade
Use Evaporative Cooling
Use High Thermal Mass with Night Ventilation

Title 24 Requirements

Package	*C*	*D*
Ceiling Insulation	R49	R38
Wood Frame Walls	R29	R19
Glazing U-Value	0.38	0.57
Maximum Total Area	16%	20%

Climate

Climate Zone 11 is the northern California valley, south of the mountainous Shasta Region, east of the Coastal Range, and west of the Sierra Cascades.

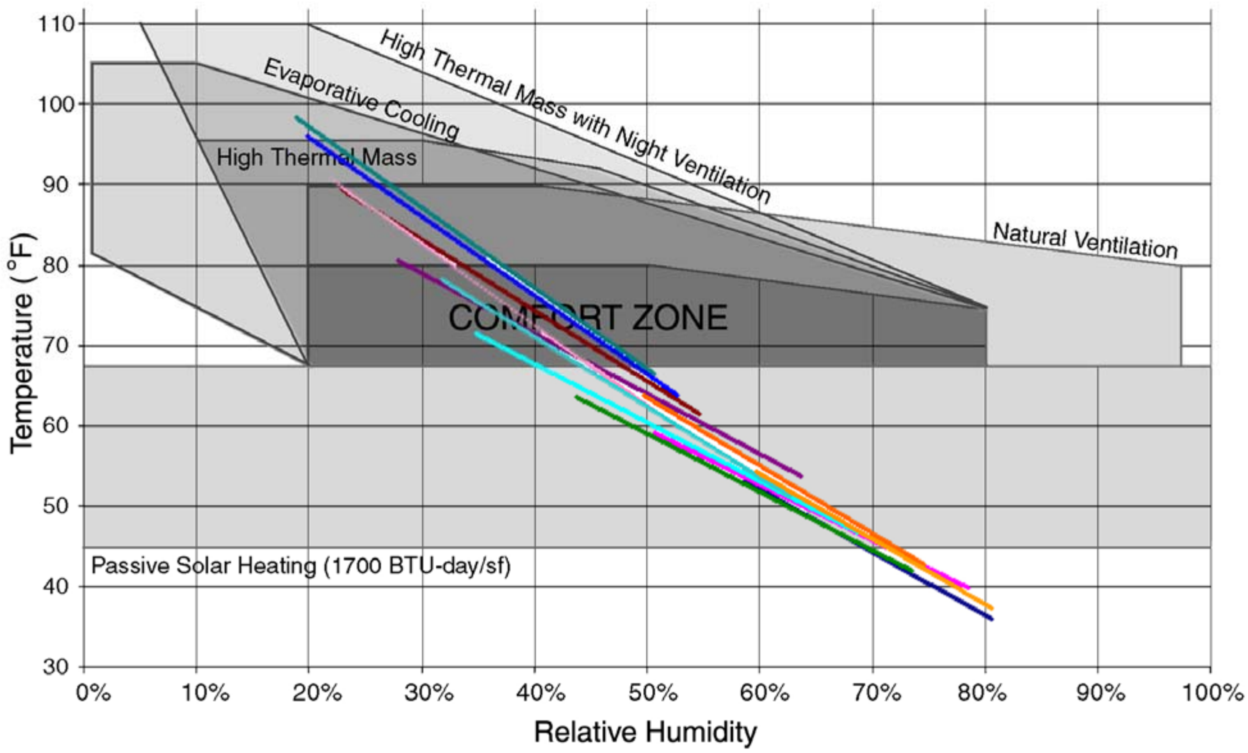
Seasons are sharply defined. Summer daytime temperatures are high, sunshine is almost constant, and the air dry. Winters are very cold with piercing north winds, possibility of snow and thick Tule fog. Cold air rolls off the hillsides on winter nights and pools in the colder flatlands. Quite a bit of rain falls between October and March, as much as 4.75" per month.

	Red Bluff	*Auburn*	*Grass Valley*	*Marys-ville*
HDD	2688	3095	4287	2524
CDD	1904	1292	612	1607

HDD = Heating Degree Days (base 65F)
CDD = Cooling Degree Days

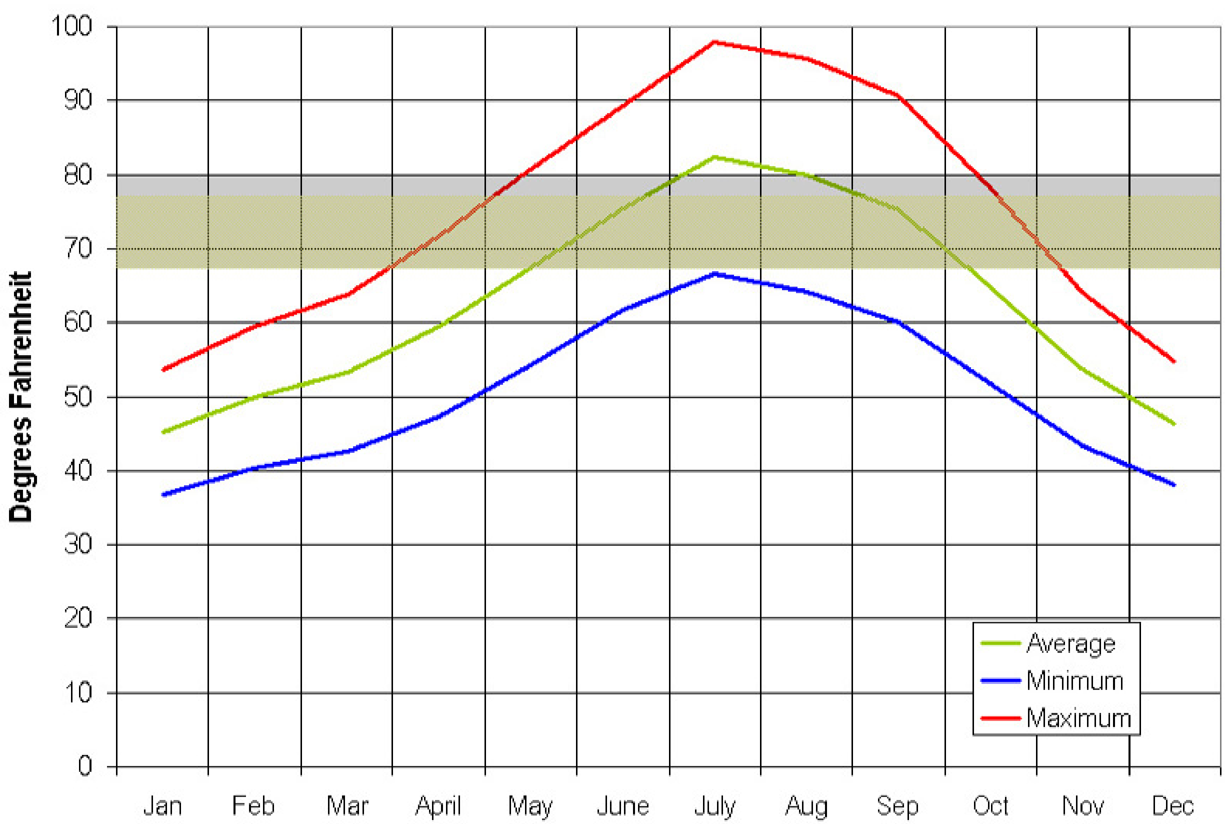
Because there is extreme weather, cooling and heating is necessary. Climate Zone 11 consumes a lot of energy consumption to meet comfort standards.

Bioclimatic Chart

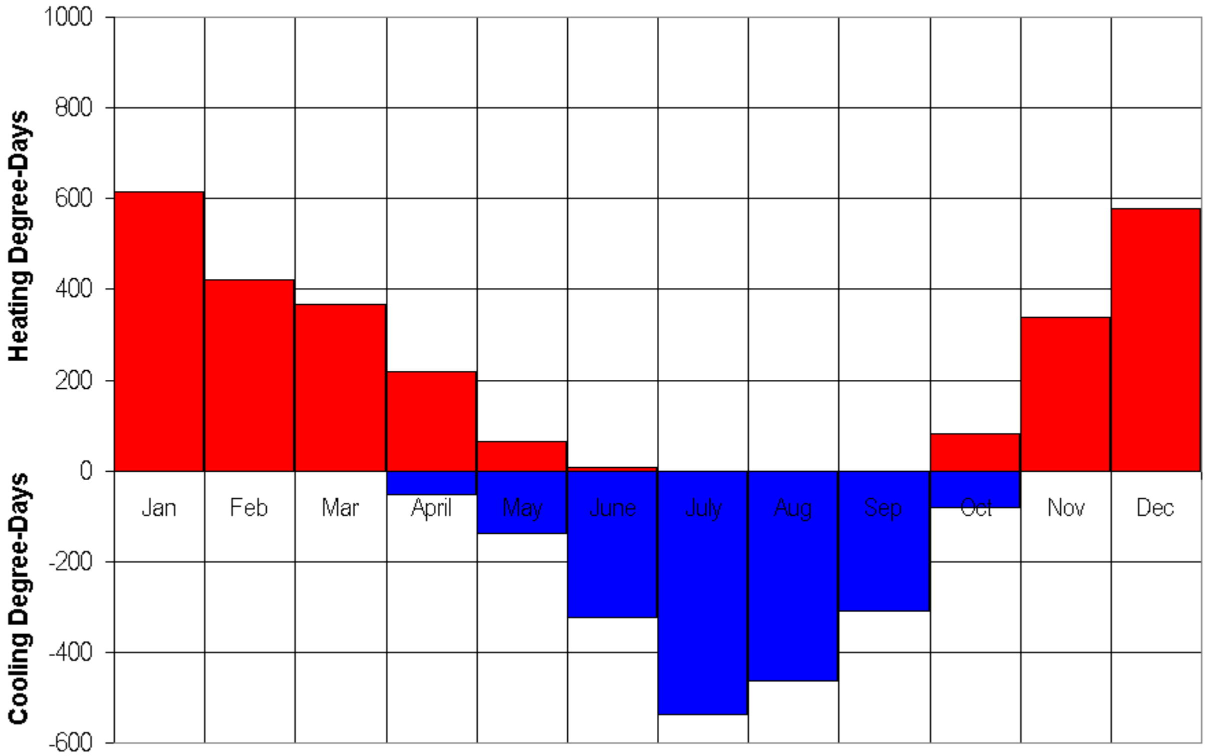


Temperature

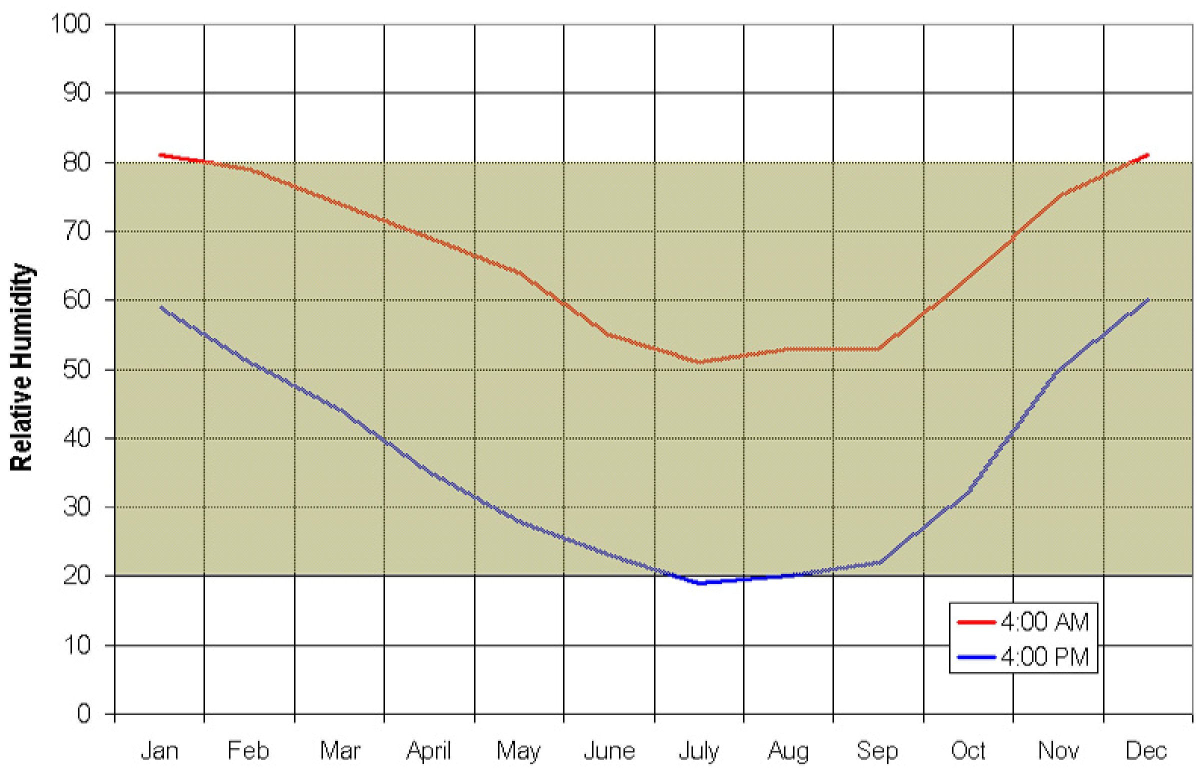
(Typical Comfort Zone: 68-80°F)



Degree Day
(Base 65°)

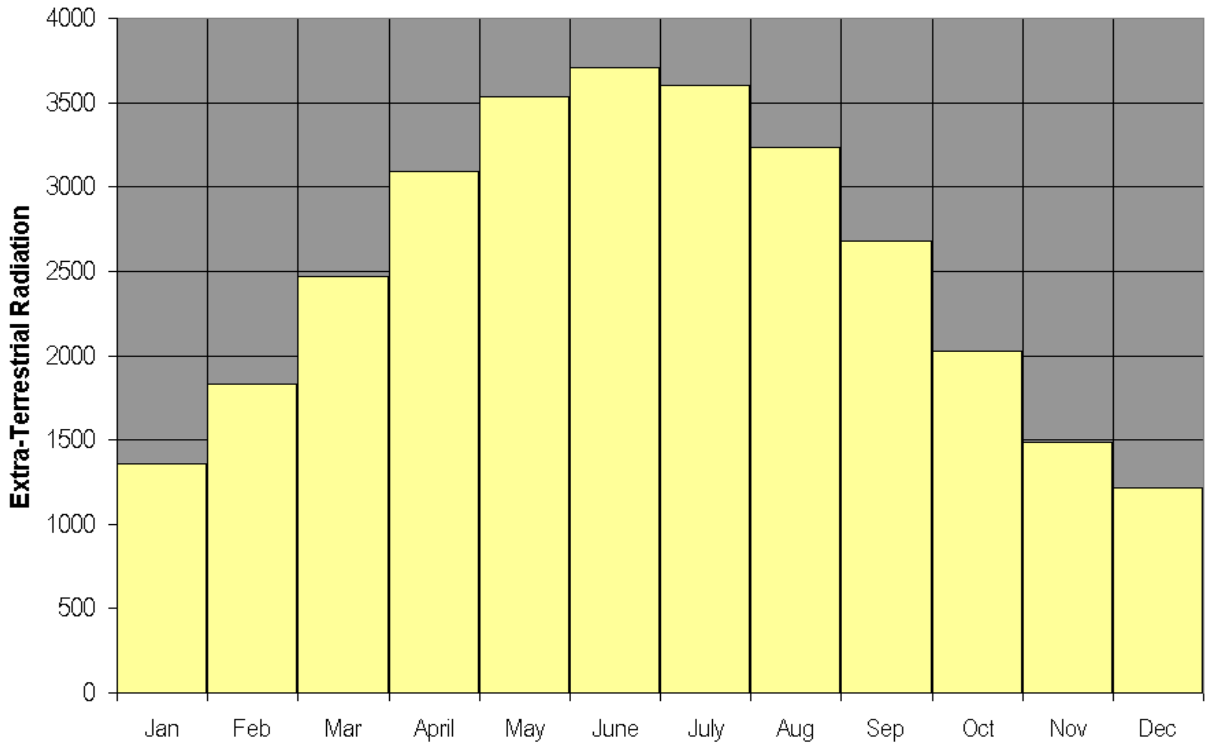


Relative Humidity
(Typical Comfort Zone: 20-80%)

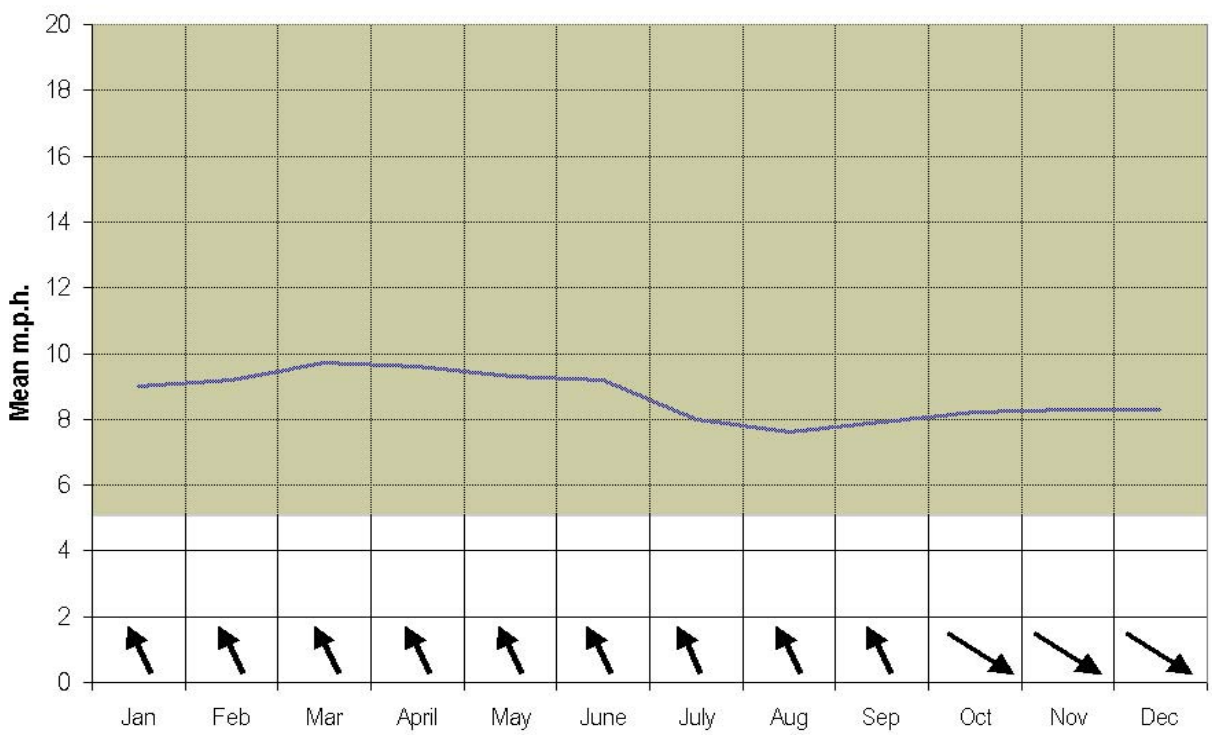


Extra-Terrestrial Radiation

Daily Mean ETR: 2519



Wind Speed



Prevailing Wind Direction
Summer: SSE
Winter: NW

Natural Ventilation is most effective when wind speed is 5 mph or greater.

Meteorological Wind Roses

Data for the ISCST3 air quality model.

T Servin (7/8/03)
Planning & Technical Support Division
California Air Resources Board

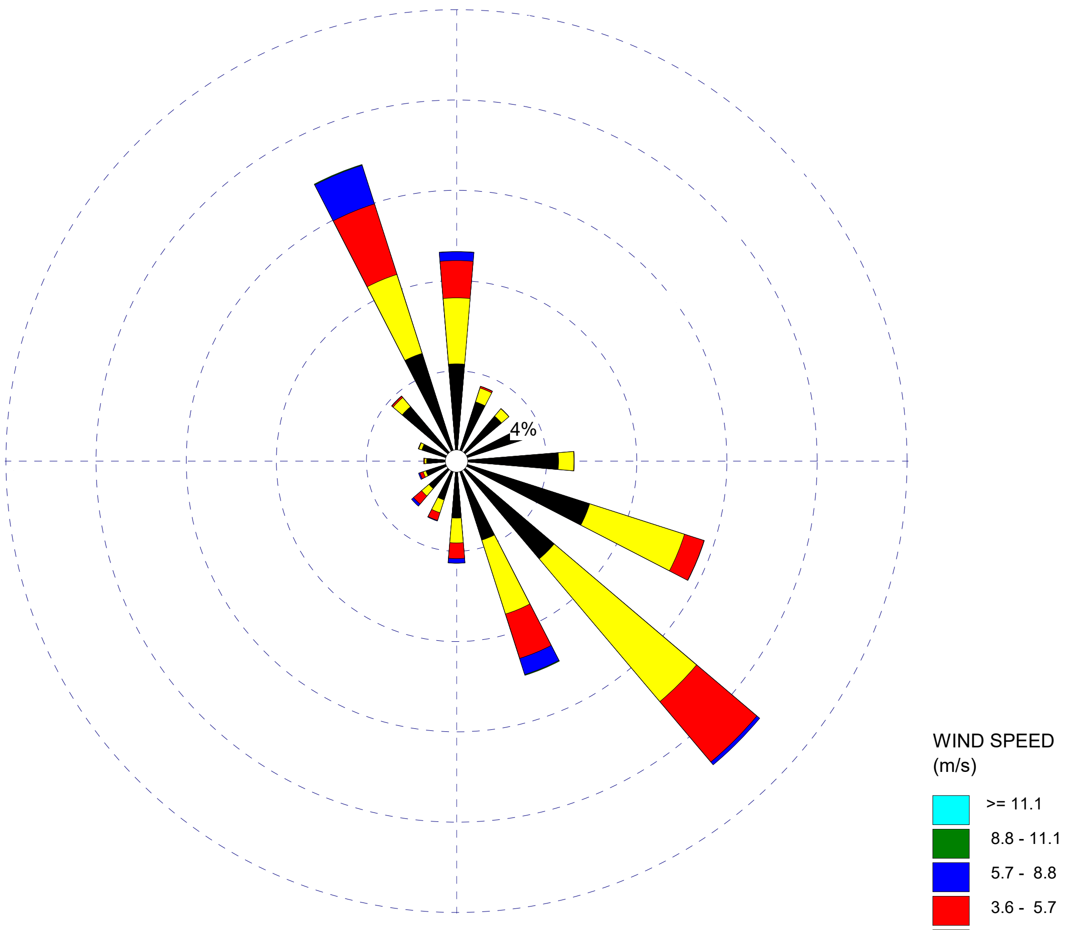
WIND ROSE PLOT:

Station #99032

Colusa CIMIS

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

DATA PERIOD:

1993 1994 1996 1997
Jan 1 - Dec 31
00:00 - 23:00

COMPANY NAME:

MODELER:

CALM WINDS:

3.93%

TOTAL COUNT:

35064 hrs.

AVG. WIND SPEED:

2.37 m/s

DATE:

7/15/2003

PROJECT NO.:

993, 1994, 1996, 199

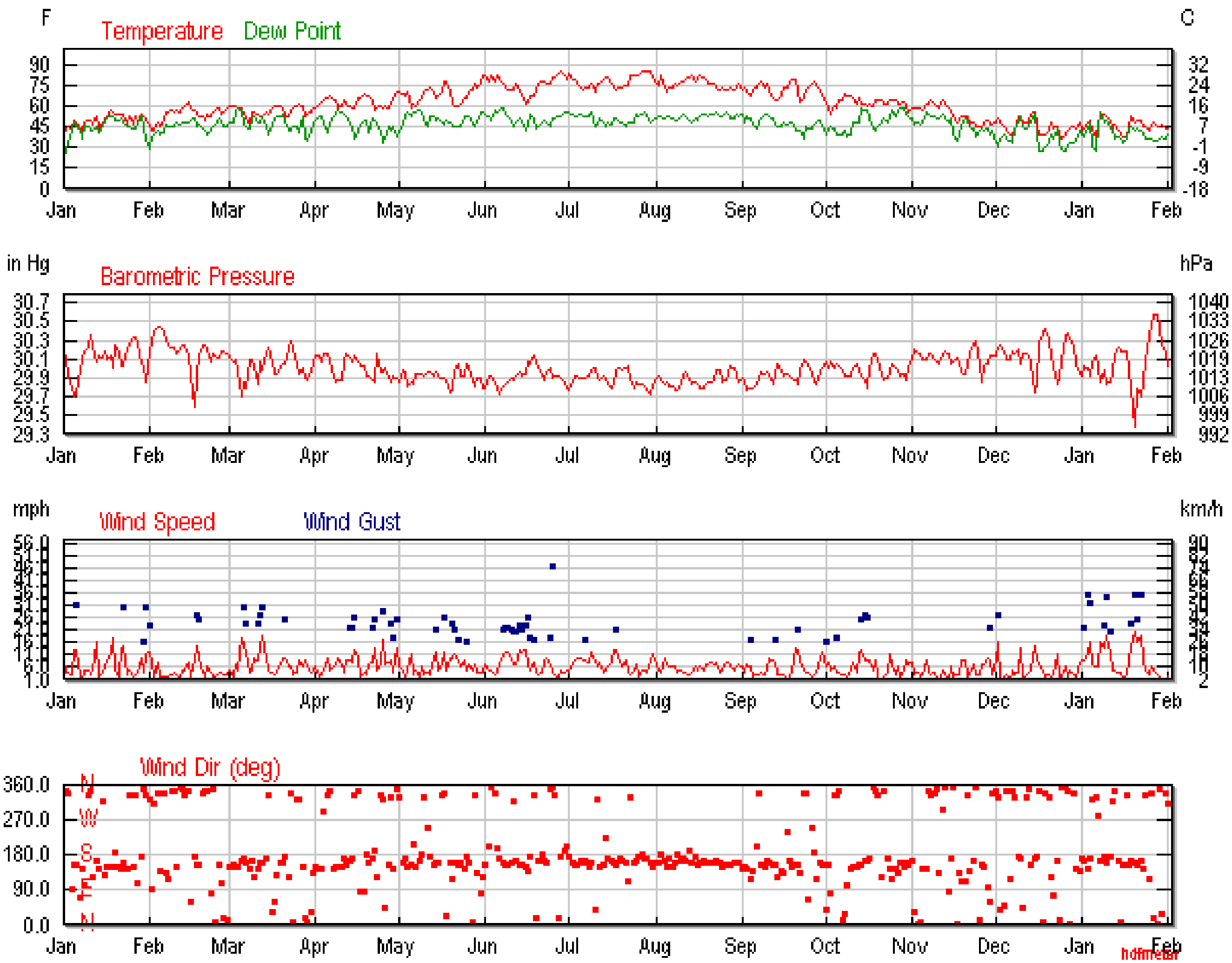
WRPLOT View - Lakes Environmental Software

Source: Weather Underground website, Accessed May 2018

https://www.wunderground.com/history/airport/KMYV/2015/1/1/CustomHistory.html?dayend=2&monthend=2&yearend=2018&req_city=&req_state=&req_statename=&reqdb.zip=&reqdb.magic=&reqdb.wmo=

Marysville, CA (near Yuba City) wind data from January 1, 2016 to January 1, 2017.

Custom Weather History Graph



Appendix B – Instrument Specification Sheets

NGMesh: A Complete Methane Emissions Monitoring System

Spec Sheet

GAZPOD


Control & communication module
Solar Panel
Gas instrument enclosure
Solar power supply and battery
Equipment stand (for demonstration purposes only) *GAZPOD units are custom installation solutions

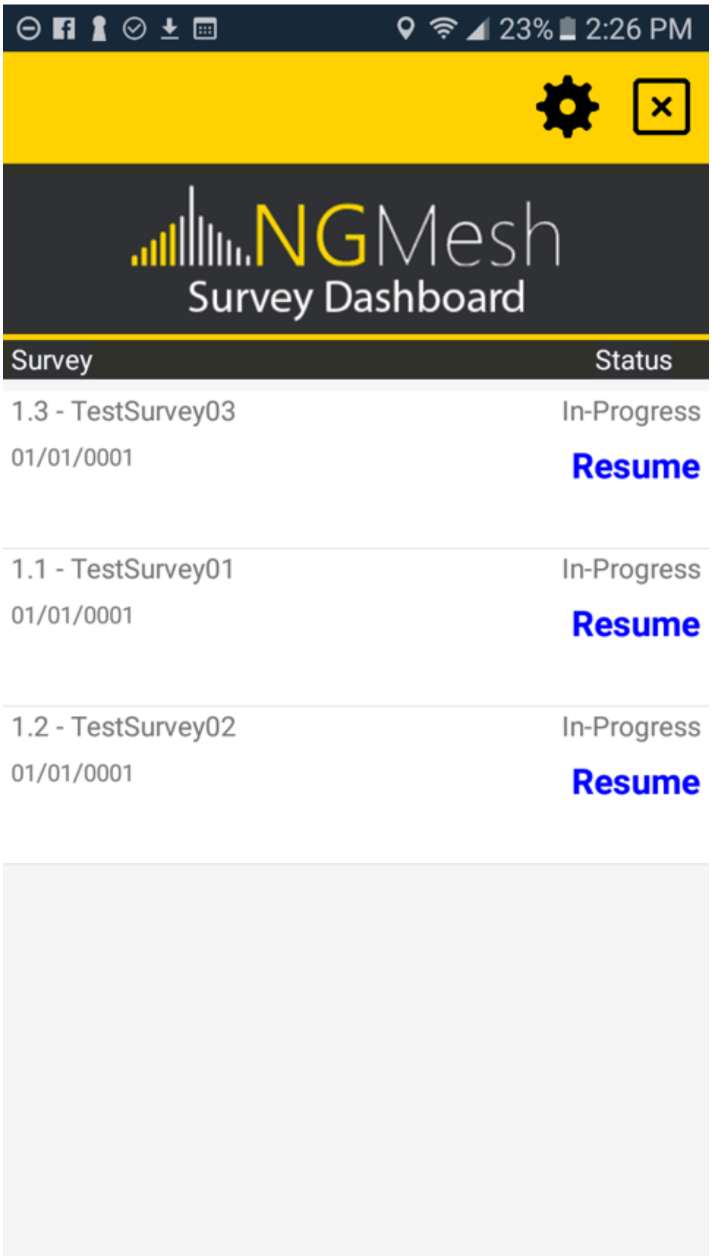
GAZPOD

Technical Specifications

	GAZPOD - ppb	GAZPOD - ppm	GAZPOD - lel	GAZPOD - VOC
Parameters Measured	CH4 (total methane selectivity)	CH4 (total methane selectivity)	CH4 *	Total VOCs (Volatile Organic Compounds)
Measurement Scales	250 ppb - 190 ppm (device calibrated and set for methane)	Scale 1: 0 ppm – 10,000 ppm Scale 2: 0% - 100% volume gas	0% - 100% gas volume	5 ppb - 20 ppm
Sensitivity	250 ppb	1ppm	± 0.1% volume or ± 5% of indication (whichever is greater) for CH4	250 ppb
Measurement Period	Variable, from 1 minute to 30 minutes	Variable, from 1 minute to 30 minutes	Variable, from 1 minute to 30 minutes	Variable, from 1 minute to 30 minutes
Gas Connection	- Quick-connect inlet coupling with locking mechanism - Quick-connect gas outlet coupling	- Quick-connect inlet coupling with locking mechanism - Quick-connect gas outlet coupling	N/A – Integrated Sensor	N/A – Integrated Sensor
Power Options	- External 12V DC power package - Solar power package	- External 12V DC power package - Solar power package	- External 12V DC power package - Solar power package	- External 12V DC power package - Solar power package
Wireless Data Communications	- Raw data sent to remote server via cellular network - data access contract required	- Raw data sent to remote server via cellular network - data access contract required	- Raw data sent to remote server via cellular network - data access contract required	- Raw data sent to remote server via cellular network - data access contract required
GPS	- On-board GPS chip automatically updates pod location	- On-board GPS chip automatically updates pod location	- On-board GPS chip automatically updates pod location	- On-board GPS chip automatically updates pod location
Web Application Software	YES	YES	YES	YES

** GAZPOD – lel uses an optical sensor that is not completely selective to CH4 and will also generate a response when exposed to VOCs.*

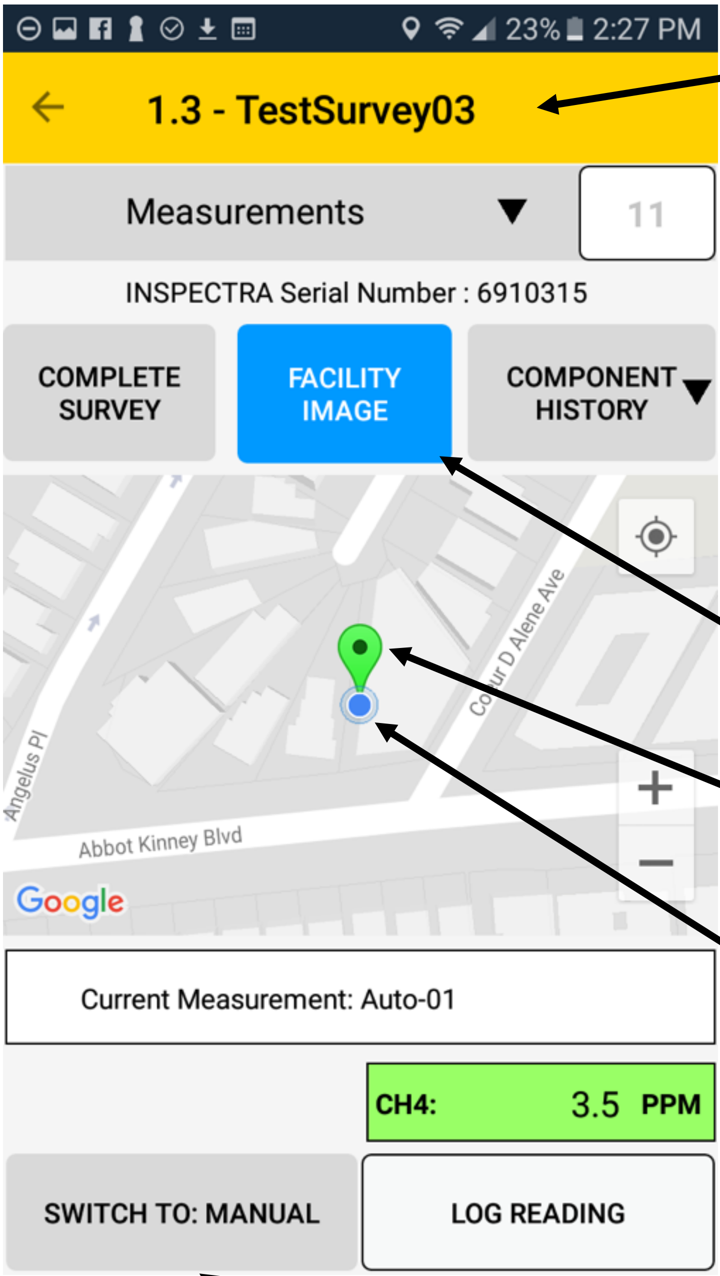
NGMesh Software: Mobile Application



Individual surveys listed in order of priority

- Survey name, due date, and status listed
- Users can start, pause, and resume any survey at any time

NGMesh Software: Mobile Application



Survey ID number and survey name listed to clearly identify the survey mission

Remaining components to measure:
- Unique components can be listed to ensure they get measured during survey (i.e. flange #3, valve #8)
- These components can be defined by the administrator using the NGMesh web application

Component history allows users to view the measurement data of components

Facility image allows users to view a reference photograph of the facility that is being surveyed for leaks.

Color-coded pins are dropped at each measurement location to indicate the methane detection level
- Green, yellow, & red indicate varying levels of methane (low, medium, high).

Blue dot indicates user's location

Methane level indicator (ppm)
- Updates automatically in real-time

Log reading allows users to log methane readings manually rather than automatically

Reading selector allows users to switch between manual and automatically logged methane readings

NGMesh Software: Mobile Application

Technical Specifications

	GAZPOD – NGMesh Mobile Application Software
Mobile device compatibility	iOS (Apple) iPhone, iPad Android (Google) Mobile phone, tablet
Wireless connectivity	Connection to NGMesh enterprise system via cellular Wi-Fi network
Account access	Each user is given a unique user ID and login credentials
Features	- Gas concentration data is automatically saved and synchronized with the NGMesh enterprise servers, allowing administrators to monitor the progress of all personnel as they progress through their leak detection surveys. - Each user can view all the leak detection surveys that they have been ordered to execute. - Users can start, pause, and resume any survey, allowing them to be flexible in how they collect gas measurement data. - User interface includes Google Maps display with pin dropping feature at the location of each gas sample. (Each dropped pin is color coded according to a user-defined alarm threshold, enabling simple identification of elevated gas concentration levels.

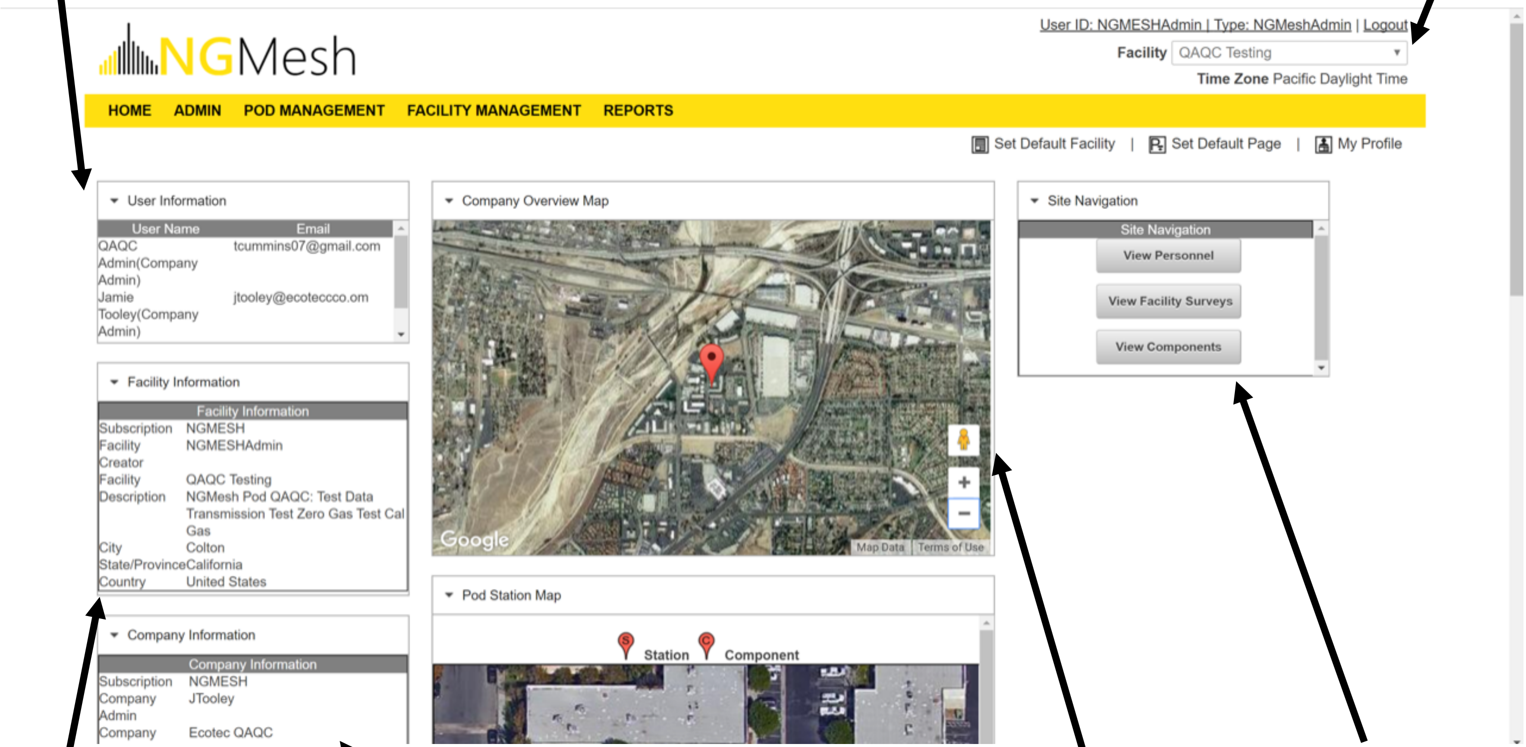
GAZOMAT™
an ecotec company

NGMesh Software: Web Application

Home Dashboard

Administration information

Facility selection list



Natural gas facility profile information

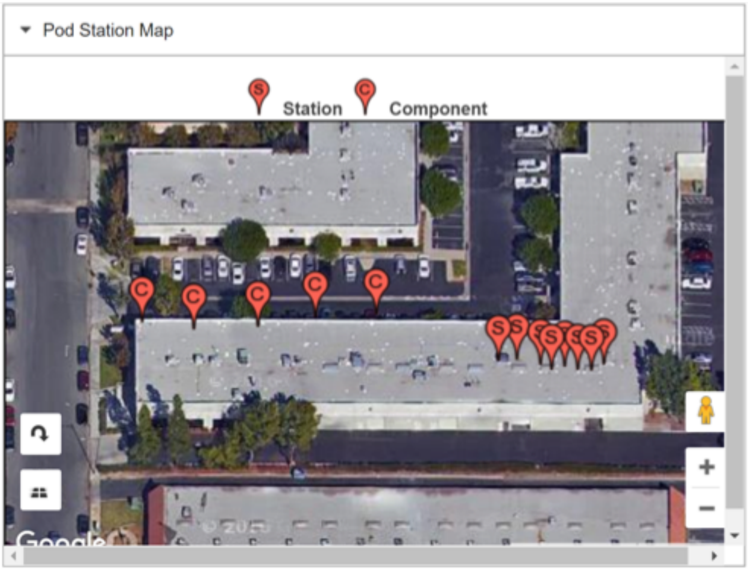
Natural gas company profile information

Map of all facilities

Site navigation options

NGMesh Software: Web Application

GAZPOD Station and Component Map



Map of components and GAZPOD stations at facility
- Components are identified with a "C" labeled pin
- GAZPODs are identified with an "S" labeled pin

NGMesh Pod Live Readings

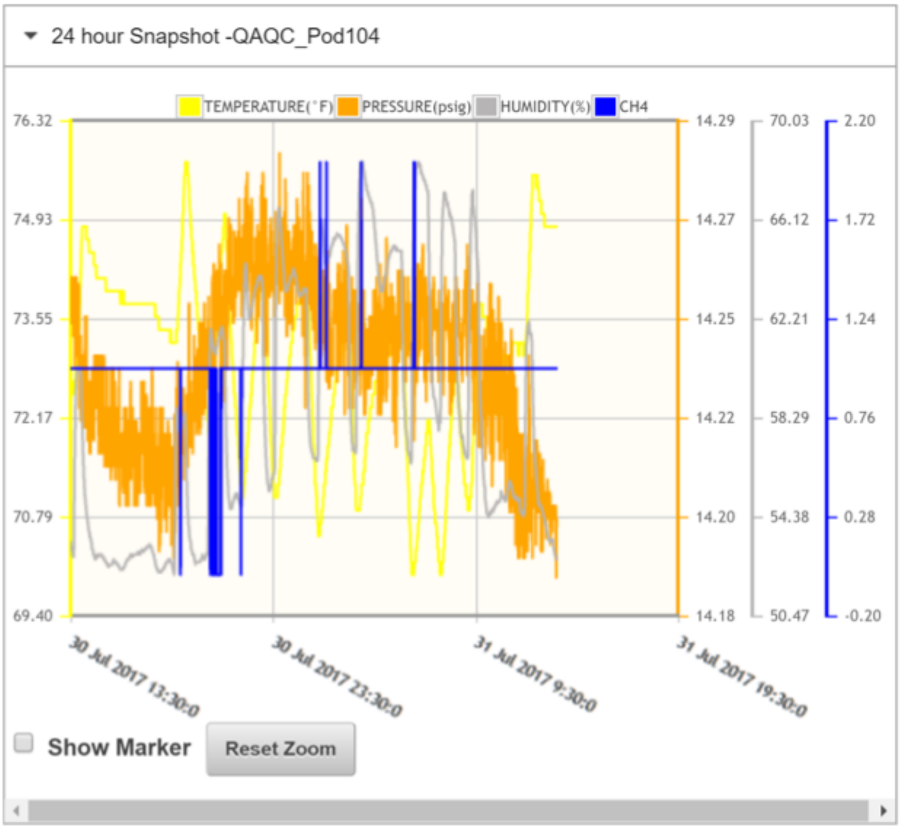
Reading is Maximum Value in past 24 hours
Above 500 | 350 to 499 | 200 to 349 | 0 to 199

Pod Station Name	Pod Serial Number	Methane (ppm)	Reading Date/Time
QAQC_Pod101	101		
QAQC_Pod102	102	104	7/31/2017 8:29:00 AM
QAQC_Pod104	104	2	7/30/2017 6:09:00 PM
QAQC_Pod105	105	106	7/31/2017 8:36:00 AM
QAQC_Pod106	106		
QAQC_Pod107	107		
QAQC_Pod108	108		

Live methane readings data with maximum reading in past 24 hours displayed for each GAZPOD station

NGMesh Software: Web Application

GAZPOD 24-hour Data Snapshot Display



GAZPOD data displayed for the previous 24 hours - Methane level (ppm), atmospheric pressure, temperature and humidity data included

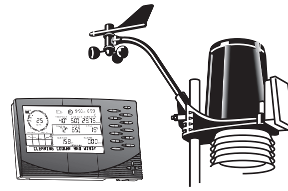
GAZOMAT™
an ecotec company

NGMesh Software: Web Application

Technical Specifications

GAZPOD – NGMesh Web Application Software	
Server Software	Web browser based, processing of raw data to give reading, database storage on secure server, data access – tables, graphs, data download, multi-user access, password controlled, optional API data access.
Computer Requirements	PC or Mac (Software is a web application that runs in an internet browser)
Web Browser Compatibility	Chrome, Safari, Internet Explorer, Firefox
Features	- View installed pod locations - Track gas concentration levels in real time - Set alarms and alerts to automatically notify personnel if gas concentrations rise above threshold levels. - Order leak detection surveys at any facility and assign any personnel to execute the survey (assignees mobile application will automatically synchronize to inform them of their new survey task) - Begin streaming data from new pods in minutes once they are installed on-site
URL	www.ngmeshdata.com

Cabled Vantage Pro2™ & Vantage Pro2 Plus™ Stations



6152C
6162C

Vantage Pro2™

The Vantage Pro2™ (# 6152C) and Vantage Pro2™ Plus (# 6162C) cabled weather stations include two components: the Integrated Sensor Suite (ISS) and the console. The ISS contains the sensor interface module (SIM), rain collector, an anemometer, and a passive radiation shield. The Vantage Pro2 console provides the user interface, data display, and calculations. The Vantage Pro2 Plus weather station includes two additional sensors that are optional on the Vantage Pro2 and purchased separately: the UV Sensor and the Solar Radiation Sensor. The console and ISS are powered by an AC-power adapter connected to the console. Batteries can be installed in the console to provide a backup power supply. Use WeatherLink® to let your weather station interface with a computer, log data, and upload weather information to the Internet. The 6152C and 6162C models rely on passive shielding to reduce solar-radiation induced temperature errors in the outside temperature sensor readings.

Integrated Sensor Suite (ISS)

Operating Temperature	-40° to +150°F (-40° to +65°C)
Non-operating Temperature	-40° to +158°F (-40° to +70°C)
Current Draw	5 mA (average) at 4 to 6 VDC for ISS only. 10 mA average for both console and ISS
Connectors, Sensor	Modular RJ-11
Cable Type	4-conductor, 26 AWG
Cable Length, Anemometer	40’ (12 m) (included); 240’ (73 m) (maximum recommended)

Note: Maximum displayable wind decreases as the length of cable increases. at 140’ (42 m) of cable, the maximum wind speed displayed is 135 mph (60 m/s); at 240’ (73 m), the maximum wind speed displayed is 100 mph (34 m/s).

Wind Speed Sensor	Solid state magnetic sensor
Wind Direction Sensor	Wind vane with potentiometer
Rain Collector Type	Tipping bucket, 0.01" per tip (0.2 mm with metric rain adapter), 33.2 in^2 (214 cm^2) collection area
Temperature Sensor Type	PN Junction Silicon Diode
Relative Humidity Sensor Type	Film capacitor element
Housing Material	UV-resistant ABS plastic
Sensor Inputs	
RF Filtering	RC low-pass filter on each signal line

ISS Dimensions(not including anemometer or bird spikes):

Vantage Pro2 with Standard Rad Shield	14.0" x 9.4" x 14.5" (356 mm x 239 mm x 368 mm)
Vantage Pro2 with Fan-Asprated Rad Shield	20.8" x 9.4" x 16.0" (528 mm x 239 mm x 406 mm)
Vantage Pro2 Plus with Standard Rad Shield	14.3" x 9.7" x 14.5" (363 mm x 246 mm x 368 mm)
Vantage Pro2 Plus with Fan-Aspirated Rad Shield	21.1" x 9.7" x 16.0" (536 mm x 246 mm x 406 mm)

Davis Instruments 3465 Diablo Ave., Hayward, CA 94545-2778 USA
(510) 732-9229 • FAX (510) 670-0589 • sales@davisnet.com • www.davisnet.com

Console

Console Operating Temperature	+32° to +140°F (0° to +60°C)
Non-Operating (Storage) Temperature	+14° to +158°F (-10° to +70°C)
Current Draw	5 mA average for console only, 10 mA average for both console and ISS
AC Power Adapter	5 VDC, 300 mA, regulated
Battery Backup	3 C-cells
Battery Life (no AC power)	1 month (approximately)
Connectors	Modular RJ-11
Cable Type	4-conductor, 26 AWG
Cable Length, Console	100’ (30 m) (included); 1000’ (300 m) (maximum recommended)
Housing Material	UV-resistant ABS plastic
Console Display Type	LCD Transflective
Display Backlight	LEDs
Dimensions (console: length x width x height, display length x height)	
Console	9.63" x 6.125" x 1.625" (245 mm x 156 mm x 41 mm)
Display	5.94" x 3.375" (151 mm x 86 mm)
Weight (with batteries)	1.88 lbs. (.85 kg)

Data Displayed on Console

Data display categories are listed with General first, then in alphabetical order.

General

Historical Graph Data	Includes the past 24 values listed unless otherwise noted; all can be cleared and all totals reset
Daily Data	Includes the earliest time of occurrence of highs and lows; period begins/ends at 12:00 am
Monthly Data	Period begins/ends at 12:00 am on the first of the month
Yearly Data	Period begins/ends at 12:00 am on the first of January unless otherwise noted
Current Display Data	Current display data describes the current reading for each weather variable. In most cases, the variable lists the most recently updated reading or calculation. Some current variable displays can be adjusted so there is an offset for the reading.
Current Graph Data	Current data appears in the right most column in the console graph and represents the latest value within the last period on the graph; totals can be set or reset. Display intervals vary. Examples include: Instant, 15-min., and Hourly Reading; Daily, Monthly, High and Low
Graph Time Interval	1 min., 10 min., 15 min., 1 hour, 1 day, 1 month, 1 year (user-selectable, availability depends upon variable selected)
Graph Time Span	24 Intervals + Current Interval (see Graph Intervals to determine time span)
Graph Variable Span (Vertical Scale)	Automatic (varies depending upon data range); Maximum and Minimum value in range appear in ticker
Alarm Indication	Alarms sound for only 2 minutes (time alarm is always 1 minute) if operating on battery power. Alarm message is displayed in ticker as long as threshold is met or exceeded. Alarms can be silenced (but not cleared) by pressing the DONE key.
Update Interval	Varies with sensor - see individual sensor specifications

Barometric Pressure

Resolution and Units	0.01" Hg, 0.1 mm Hg, 0.1 hPa/mb (user-selectable)
Range	16.00" to 32.50" Hg, 410 to 820 mm Hg, 540 to 1100 hPa/mb
Elevation Range	-999’ to +15,000’ (-600 m to 4570 m) (Note that console screen limits entry of lower elevation to -999’ when using feet as elevation unit.)
Uncorrected Reading Accuracy	±0.03" Hg (±0.8 mm Hg, ±1.0 hPa/mb) (at room temperature)
Sea-Level Reduction Equation Used	United States Method employed prior to use of current "R Factor" method
Equation Source	Smithsonian Meteorological Tables
Equation Accuracy	±0.01" Hg (±0.3 mm Hg, ±0.3 hPa/mb)
Elevation Accuracy Required	±10’ (3m) to meet equation accuracy specification
Overall Accuracy	±0.03" Hg (±0.8 mm Hg, ±1.0 hPa/mb)
Trend (change in 3 hours)	Change 0.06" (2 hPa/mb, 1.5 mm Hg) = Rapidly Change 0.02" (.7hPa/mb,.5 mm Hg)= Slowly
Trend Indication	5 position arrow: Rising (rapidly or slowly), Steady, or Falling (rapidly or slowly)
Update Interval	1 minute or when console BAR key is pressed twice
Current Display Data	Instant
Current Graph Data	Instant, 15-min., and Hourly Reading; Daily, Monthly, High and Low
Historical Graph Data	15-min. and Hourly Reading; Daily, Monthly Highs and Lows
Alarms	High Threshold from Current Trend for Storm Clearing (Rising Trend Low Threshold from Current Trend for Storm Warning (Falling Trend)
Range for Rising and Falling Trend Alarms	0.01 to 0.25" Hg (0.1 to 6.4 mm Hg, 0.1 to 8.5 hPa/mb)

Clock

Resolution	1 minute
Units	Time: 12 or 24 hour format (user-selectable)
Date	US or International format (user-selectable)
Accuracy	±8 seconds/month
Adjustments	Time: Automatic Daylight Savings Time (for users in North America and Europe that observe it in AUTO mode, MANUAL setting available for all other areas) Date: Automatic Leap Year
Alarms	Once per day at set time when active

Dewpoint (calculated)

Resolution and Units	1°F or 1°C (user-selectable) °C is converted from °F rounded to nearest 1°C
Range	-105° to +130°F (-76° to +54°C)
Accuracy	±2°F (±1°C) (typical)
Update Interval	10 to 12 seconds
Source	World Meteorological Organization (WMO)
Equation Used	WMO Equation with respect to saturation of moist air over water
Variables Used	Instant Outside Temperature and Instant Outside Relative Humidity
Current Display Data	Instant Calculation
Current Graph Data	Instant Calculation; Daily, Monthly High and Low
Historical Graph Data	Hourly Calculations; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Calculation

Evapotranspiration (calculated, requires solar radiation sensor)

Resolution and Units	0.01" or 0.1 mm (user-selectable) °C is converted from °F rounded to nearest 1°C
Range	Daily to 32.67" (832.2 mm); Monthly & Yearly to 199.99" (1999.9 mm)
Accuracy	Greater of 0.01" (0.25 mm) or ±5%, Reference: side-by-side comparison against a CIMIS ET weather station
Update Interval	1 hour
Calculation and Source	Modified Penman Equation as implemented by CIMIS (California Irrigation Management Information System) including Net Radiation calculation
Current Display Data	Latest Hourly Total Calculation
Current Graph Data	Latest Hourly Total Calculation, Daily, Monthly, Yearly Total
Historical Graph Data	Hourly, Daily, Monthly, Yearly Totals
Alarm	High Threshold from Latest Daily Total Calculation

Forecast

Variables Used	Barometric Reading & Trend, Wind Speed & Direction, Rainfall, Temperature, Humidity, Latitude & Longitude, Time of Year
Update Interval	1 hour
Display Format	Icons on top center of display; detailed message in ticker at bottom
Variables Predicted	Sky Condition, Precipitation, Temperature Changes, Wind Direction and Speed

Heat Index (calculated)

Resolution and Units	1°F or 1°C (user-selectable) °C is converted from °F rounded to nearest 1°C
Range	-40° to +165°F (-40° to +74°C)
Accuracy	±2°F (±1°C) (typical)
Update Interval	10 to 12 seconds
Source	United States National Weather Service (NWS)/NOAA
Formulation Used	Steadman (1979) modified by US NWS/NOAA and Davis Instruments to increase range of use
Variables Used	Instant Outside Temperature and Instant Outside Relative Humidity
Current Display Data	Instant Calculation
Current Graph Data	Instant Calculation; Daily, Monthly High
Historical Graph Data	Hourly Calculations; Daily, Monthly Highs
Alarm	High Threshold from Instant Calculation

Humidity

Inside Relative Humidity (sensor located in console)

Resolution and Units	1%
Range	1 to 100% RH
Accuracy	±3% from 1% to 90%; ±5% from 90% to 100%
Update Interval	1 minute
Current Display Data	Instant (user-adjustable offset available)
Current Graph Data	Instant; Hourly Reading; Daily, Monthly High and Low
Historical Graph Data	Hourly Readings; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Reading

Outside Relative Humidity (sensor located in ISS)

Resolution and Units	1%
Range	1 to 100% RH
Accuracy	±2%
Temperature Coefficient	0.03% per °F (0.05% per °C), reference 68°F (20°C)
Drift	±0.5% per year
Update Interval	50 seconds to 1 minute
Current Display Data	Instant (user-adjustable offset available)
Current Graph Data	Instant and Hourly Reading; Daily, Monthly High and Low
Historical Graph Data	Hourly Readings; Daily, Monthly Highs and Lows
Alarms	High and Low Threshold from Instant Reading

Moon Phase

Console Resolution	1/8 (12.5%) of a lunar cycle, 1/4 (25%) of lighted face on console
WeatherLink Resolution	0.09% of a lunar cycle, 0.18% of lighted face maximum (depends on screen resolution)
Range	New Moon, Waxing Crescent, First Quarter, Waxing Gibbous, Full Moon, Waning Gibbous, Last Quarter, Waning Crescent
Accuracy	±38 minutes

Rainfall

Resolution and Units	0.01" or 0.2 mm (user-selectable) (1 mm at totals ≥ 2000 mm)
Daily/Storm Rainfall Range	0 to 99.99" (0 to 999.8 mm)
Monthly/Yearly/Total Rainfall Range	0 to 199.99" (0 to 6553 mm)
Accuracy	For rain rates up to 4"/hr (100 mm/hr): ±4% of total or ± one tip of the bucket (0.01" /0.2 mm), whichever is greater.
Update Interval	20 to 24 seconds
Storm Determination Method	0.02" (0.5 mm) begins a storm event, 24 hours without further accumulation ends a storm event
Current Display Data	Totals for Past 15-min
Current Graph Data	Totals for Past 15-min, Past 24-hour, Daily, Monthly, Yearly (start date user-selectable) and Storm (with begin date); Umbrella is displayed when 15-minute total exceeds zero
Historical Graph Data	Totals for 15-min, Daily, Monthly, Yearly (start date user-selectable) and Storm (with begin and end dates)
Alarms	High Threshold from Latest Flash Flood (15-min. total, default is 0.50", 12.7 mm), 24-Hour Total, Storm Total,
Range for Rain Alarms	0 to 99.99" (0 to 999.7 mm)

Rain Rate

Resolution and Units	0.01" or 0.1mm (user-selectable) at typical rates (see Fig. 3 and 4)
Range	0, 0.04"/hr (1 mm/hr) to 96"/hr (0 to 2438 mm/hr)
Accuracy	±5% for rates less than 5" per hour (127 mm/hr)
Update Interval	20 to 24 seconds
Calculation Method	Measures time between successive tips of rain collector. Elapsed time greater than 15 minutes or only one tip of the rain collector constitutes a rain rate of zero.
Current Display Data	Instant
Current Graph Data	Instant and 1-min. Reading; Hourly, Daily, Monthly and Yearly High
Historical Graph Data	1-min Reading; Hourly, Daily, Monthly and Yearly Highs
Alarm	High Threshold from Instant Reading

Solar Radiation (requires solar radiation sensor)

Resolution and Units	1 W/m^2
Range	0 to 1800 W/m^2
Accuracy	±5% of full scale (Reference: Eppley PSP at 1000 W/m^2)
Drift	up to ±2% per year
Cosine Response	±3% for angle of incidence from 0° to 75°
Temperature Coefficient	-0.067% per °F (-0.12% per °C); reference temperature = 77°F (25 °C)
Update Interval	50 seconds to 1 minute (5 minutes when dark)
Current Graph Data	Instant Reading and Hourly Average; Daily, Monthly High
Historical Graph Data	Hourly Average, Daily, Monthly Highs
Alarm	High Threshold from Instant Reading

Sunrise and Sunset

Resolution	1 minute
Accuracy	±1 minute
Reference	United States Naval Observatory

Temperature

Inside Temperature (sensor located in console)

Resolution and Units	Current Data: 0.1°F or 1°F or 0.1°C or 1°C (user-selectable) °C is converted from °F rounded to nearest 1°C Historical Data and Alarms: 1°F or 1°C (user-selectable)
Range	+32° to +140°F (0° to +60°C)
Sensor Accuracy	±1°F (±0.5°C) (typical) See. Fig. 2
Update Interval	1 minute
Current Display Data	Instant (user-adjustable offset available)
Current Graph Data	Instant Reading; Daily and Monthly High and Low
Historical Graph Data	Hourly Readings; Daily and Monthly Highs and Lows
Alarms	High and Low Thresholds from Instant Reading

Outside Temperature (sensor located in ISS)

Resolution and Units	Current Data: 0.1°F or 1°F or 0.1°C or 1°C (user-selectable) nominal °C is converted from °F rounded to nearest 1°C Historical Data and Alarms: 1°F or 1°C (user-selectable)
Range	-40° to +150°F (-40° to +65°C)
Sensor Accuracy	±0.5°F (±0.3°C) See Fig. 1
Radiation Induced Error (Passive Shield)	+4°F (2°C) at solar noon (insolation = 1040 W/m^2, avg. wind speed ≤ 2 mph (1 m/s)) (reference: RM Young Model 43408 Fan-Aspirated Radiation Shield)
Radiation Induced Error (Fan-Aspirated Shield)	+0.6°F (0.3°C) at solar noon (insolation = 1040 W/m^2, avg. wind speed ≤ 2 mph (1 m/s)) (reference: RM Young Model 43408 Fan-Aspirated Radiation Shield)
Update Interval	10 to 12 seconds
Current Display Data	Instant (user-adjustable offset available)
Current Graph Data	Instant; Daily, Monthly, Yearly High and Low
Historical Graph Data	Hourly Readings; Daily, Monthly, Yearly Highs and Lows
Alarms	High and Low Thresholds from Instant Reading

Temperature Humidity Sun Wind Index (requires solar radiation sensor)

Resolution and Units	1°F or 1°C (user-selectable) °C is converted from °F rounded to nearest 1°C
Range	-90° to +165°F (-68° to +74°C)
Accuracy	±4°F (±2°C) (typical)
Update Interval	10 to 12 seconds
Sources and Formulation Used	United States National Weather Service (NWS)/NOAA Steadman (1979) modified by US NWS/NOAA and Davis Instruments to increase range of use and allow for cold weather use
Variables Used	Instant Outside Temperature, Instant Outside Relative Humidity, 10-minute Average Wind Speed, 10-minute Average Solar Radiation
Formulation Description	Uses Heat Index as base temperature, affects of wind and solar radiation are either added or subtracted from this base to give an overall effective temperature
Current Graph Data	Instant and Hourly Calculation; Daily, Monthly High
Historical Graph Data	Hourly Calculation; Daily, Monthly Highs
Alarm	High Threshold from Instant Reading

Ultra Violet (UV) Radiation Dose (requires UV sensor)

Resolution and Units	0.1 MEDs to 19.9 MEDs; 1 MED above 19.9 MEDS
Range	0 to 199 MEDs
Accuracy	±5% of daily total
Drift	up to ±2% per year
Update Interval	50 seconds to 1 minute (5 minutes when dark)
Current Graph Data	Latest Daily Total (user resetable at any time from Current Screen)
Historical Graph Data	Hourly, Daily Totals (user reset from Current Screen does not affect these values)
Alarm	High Threshold from Daily Total
Alarm Range	0 to 19.9 MEDs

Ultra Violet (UV) Radiation Index (requires UV sensor)

Resolution and Units . . . . . 0.1 Index
Range . . . . . 0 to 16 Index
Accuracy . . . . . ±5% of full scale (Reference: Yankee UVB-1 at UV index 10 (Extremely High))
Cosine Response . . . . . ±4% FS (0° to 90° zenith angle)
Update Interval . . . . . 50 seconds to 1 minute (5 minutes when dark)
Current Graph Data . . . . . Instant Reading and Hourly Average; Daily, Monthly High
Historical Graph Data . . . . . Hourly Average, Daily, Monthly Highs
Alarm . . . . . High Threshold from Instant Calculation

Wind

Wind Chill (Calculated)

Resolution and Units . . . . . 1°F or 1°C (user-selectable); °C is converted from °F and rounded to the nearest 1°C
Range . . . . . -110° to +135°F (-79° to +57°C)
Accuracy . . . . . ±2°F (±1°C) (typical)
Update Interval . . . . . 10 to 12 seconds
Source . . . . . United States National Weather Service (NWS)/NOAA
Equation Used . . . . . Osczevski (1995) (adopted by US NWS in 2001)
Variables Used . . . . . Instant Outside Temperature and 10-min. Avg. Wind Speed
Current Display Data . . . . . Instant Calculation
Current Graph Data . . . . . Instant Calculation; Hourly, Daily and Monthly Low
Historical Graph Data. . . . . Hourly, Daily and Monthly Lows
Alarm . . . . . Low Threshold from Instant Calculation

Wind Direction

Range . . . . . 0 - 360°
Display Resolution . . . . . 16 points (22.5°) on compass rose, 1° in numeric display
Accuracy . . . . . ±3°
Update Interval . . . . . 2.5 to 3 seconds
Current Graph Data . . . . . Instant Reading (user adjustable); 10-min. Dominant; Hourly, Daily, Monthly Dominant
Historical Graph Data. . . . . Past 6 10-min. Dominants on compass rose only; Hourly, Daily, Monthly Dominants

Wind Speed

Resolution and Units . . . . . 1 mph, 1 km/h, 0.4 m/s, or 1 knot (user-selectable) Measured in mph; other units are converted from mph and rounded to nearest 1 km/hr, 0.1 m/s, or 1 knot.
Range . . . . . 1 to 200 mph, 1 to 173 knots, 0.5 to 89 m/s, 1 to 322 km/h
Update Interval . . . . . Instant Reading: 2.5 to 3 seconds, 10-minute Average: 1 minute
Accuracy . . . . . ±2 mph (2 kts, 3 km/h, 1 m/s) or ±5%, whichever is greater
Maximum Cable Length . . . . . 540’ (165 m) (Note that maximum wind speed reading decreases as length of cable from anemometer to ISS increases.)
Current Display Data . . . . . Instant
Current Graph Data . . . . . Instant Reading; 10-minute and Hourly Average; Hourly High; Daily, Monthly and Yearly High with Direction of High
Historical Graph Data. . . . . 10-min. and Hourly Averages; Hourly Highs; Daily, Monthly and Yearly Highs with Direction of Highs
Alarms . . . . . High Thresholds from Instant Reading and 10-minute Average

Sensor Charts

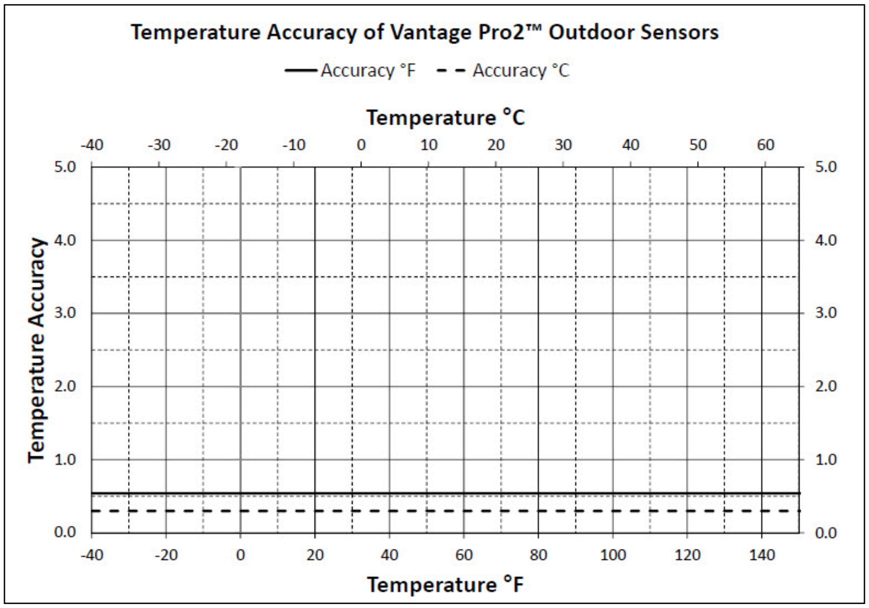


Figure 1. Temperature Accuracy of Vantage Pro2 ISS Sensors

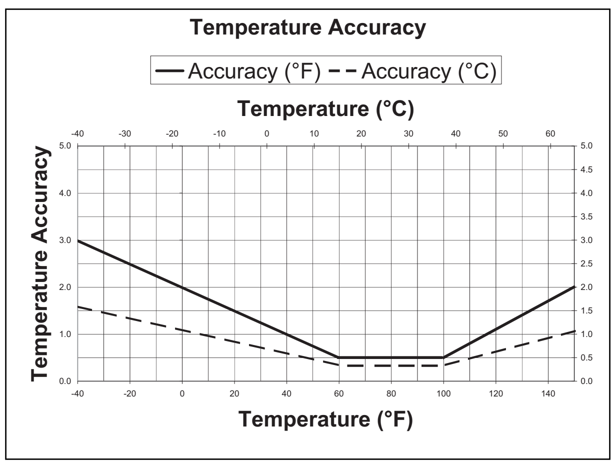


Figure 2. Inside Temperature Accuracy

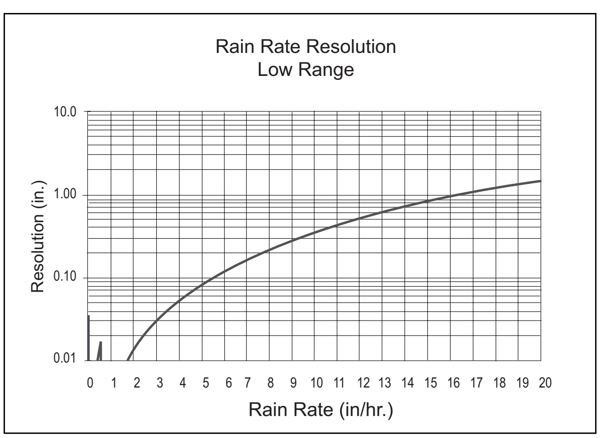


Figure 3. Low Range Rain Rate Resolution

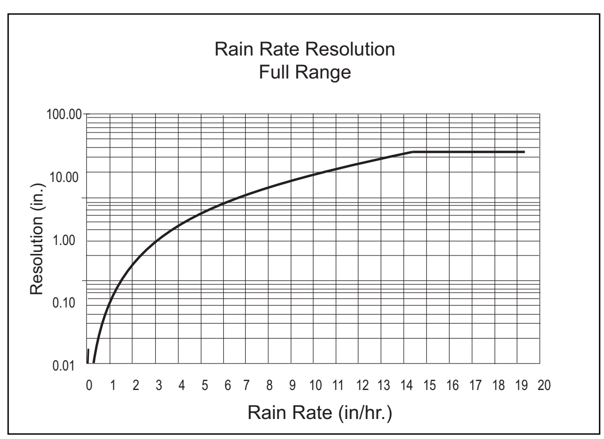


Figure 4. Full Range Rain Rate Resolution

Package Dimensions

Product #	Package Dimensions (Length x Width x Height)	Package Weight	UPC Codes
6152C 6152CEU 6152CUK	17.50" x 10.4" x 16.0" (445 mm x 264 mm x 406 mm)	12 lbs. 15 oz. (5.9 kg)	011698 00755 4 011698 00772 1 011698 00773 8
6162C 6162CEU 6162CUK		13 lbs. 4 oz. (6.0 kg)	011698 00756 1 011698 00774 5 011698 00775 2
6322C 6322CM	17.50" x 10.4" x 16.0" (445 mm x 264 mm x 406 mm)	9 lbs.. 1 oz. (4.1 kg)	011698 00777 6 011698 01048 6
6327C 6327CM		11 lbs. 2 oz. (5.0 kg)	011698 00782 0 011698 01049 3

TECHNICAL SPECIFICATIONS:

Detection Method:	Tunable Diode Laser Absorption Spectroscopy (TDLAS)
Measurement Range:	0 to 99,999 ppm-m
Sensitivity:	5 ppm-m at distances from 0 to 50 ft (15 m) 10 ppm-m or better at distances 50 to 100 ft (15 to 30 m)
Intrinsic Safety:	Class 1 Division 1 Group D, T4 in accordance with UL 913 & CSA C22.2 No 157, MetLab Listing #E112840
Detection Distance:	100 ft (30 m) nominal. Actual distance may vary due to background type and conditions.
Beam Size:	Conical in shape with a 22” diameter at 100 ft (56 cm at 30 m)
Detection Alarms Modes:	Digital Methane Detection (DMD): Audible tone relative to concentration when detection threshold exceeded Adjustable Detection Alarm Level from 0 to 255 ppm-m Pure Tone: Continuous audio tone relative to concentration Adjustable Volume: 8 Levels
System Fault Warning:	Unique audible tone and indication on the display
Self Test & Calibration:	Built-in Self Test and Calibration function verifies operation and adjusts laser wavelength for maximum sensitivity. Test gas cell integrated within carrying case.
Compliance:	EMC (EN61000-6-2, EN6100-6-4)
Laser Eye Safety: (CDRH, ANSI and IEC)	IR Laser: Class I Green Spotter Laser: Class IIIa; **Do not stare into beam or view directly with optical instruments**
Communications:	RS232 and Bluetooth Standard
Display:	Large, easy to read backlit LCD (.75” Numeric)
Operating Temperature:	0° to + 122° F (-17° to 50° C)
Humidity:	5 to 95% RH, non-condensing
Enclosure:	IP54 (Water splash and Dust resistant)
Instrument Weight:	10 lbs (Transceiver 3 lbs, Controller 7 lbs); (4.5 kg; 1.3 kg , 3.2 kg)
Carry Case:	14 lbs; 34” x 9 ½” x 14” (6.4 kg; 86 cm x 24 cm x 36 cm)
Battery:	Internal, rechargeable, Li ion battery pack, 11.1 Vdc
Battery Run Time:	8 hours at 32° F without backlight on, minimum
Battery Charging:	External, in-line, 110-240 Vac, 50 / 60 hertz, international, 19 Vdc power supply
Charge Time, Maximum:	8 hours
Charging Indicator:	Integrated into controller panel
Shoulder Strap:	Single over the shoulder padded strap with Ergonomic dual strap and belt system

HEATH CONSULTANTS

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RMLD-IS®

Remote Methane Leak Detector

R&D 100

Award Winner

Recognized as one of the 100 most technologically significant products introduced to the marketplace.

RMLD-IS® Remote Methane Leak Detector

Faster...Safer...Reliable...Efficient


Revolutionary Technology

The portable, reliable Remote Methane Leak Detector (RMLD-IS®) changed the way methane surveys are conducted.

Instead of having to walk the entire length of the service line to check for methane leaks…the RMLD-IS quickly and efficiently detects leaks up to one hundred feet away allowing remote detection of hard-to-reach areas and difficult terrains. Remote detection allows the user to safely survey difficult to reach areas, such as busy roadways, yards with large dogs, locked gates, compressor stations, offshore platforms and other hard to access places.

For utilities and their employees, this time-saving method represents the potential for significant productivity gains, reduced operations and maintenance costs, and a safer survey.

Tunable Diode Laser Absorption Spectroscopy

Available gas detectors that deploy technologies such as flame ionization must be positioned within the leak plume to detect the presence of methane. The RMLD-IS does not have to be within the gas plume because it uses laser technology known as Tunable Diode Laser Absorption Spectroscopy. When the laser passes through a gas plume, the methane absorbs a portion of the light, which the RMLD-IS then detects. This quantum leap in technology makes it possible to detect methane leaks along the sight line without always having to walk the full length of the service line.

Components

The RMLD-IS consists of two interactive components; a transceiver subsystem and a signal processing/user interface controller. The transceiver has two lasers; an infrared laser beam that is non-visible and is continuously on while the unit is turned on. The green spotter laser is similar to those used for presentation pointers and is turned on by the operator depressing the trigger button.

How Does It Work?

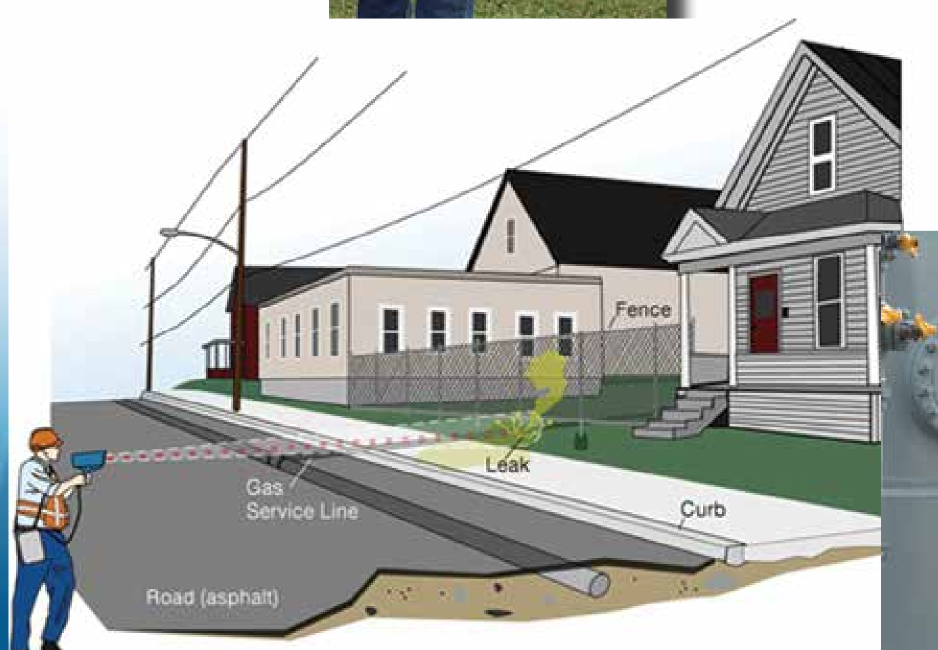
When the infrared laser beam is transmitted from the launch port some of the laser light is reflected by a normal background such as brick, concrete, grass, etc., to the detector. This reflected light is collected and converted to an electrical signal that carries the information needed to deduce the relative methane concentration. This signal is processed so that methane concentrations can be reported in parts per million meter or ppm-m. The laser has a nominal distance of up to 100 feet and is selective to methane only. It will not false alarm on other hydrocarbons.

RMLD-IS Intrinsically Safe

With its intrinsically safe rating the RMLD-IS opens a new realm of survey applications such as:

- Offshore Platforms
- Plant and Industrial Inspections
- Compressor Stations
- Production Facilities – gas gathering, drilling sites etc.
- LNG Ship Inspections
- First Responders for Leak Investigation
- First Responders to Odor Complaints
- Gas Processing Plant Inspections







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Detection Distance:	100 ft (30 m) nominal. Actual distance may vary due to background type and conditions.
Beam Size:	Conical in shape with a 22” diameter at 100 ft (56 cm at 30 m)
Detection Alarms Modes:	Digital Methane Detection (DMD): Audible tone relative to concentration when detection threshold exceeded Adjustable Detection Alarm Level from 0 to 255 ppm-m Pure Tone: Continuous audio tone relative to concentration Adjustable Volume: 8 Levels
System Fault Warning:	Unique audible tone and indication on the display
Self Test & Calibration:	Built-in Self Test and Calibration function verifies operation and adjusts laser wavelength for maximum sensitivity. Test gas cell integrated within carrying case.
Compliance:	EMC (EN61000-6-2, EN6100-6-4)
Laser Eye Safety: (CDRH, ANSI and IEC)	IR Laser: Class I Green Spotter Laser: Class IIIa; **Do not stare into beam or view directly with optical instruments**
Communications:	RS232 and Bluetooth Standard
Display:	Large, easy to read backlit LCD (.75” Numeric)
Operating Temperature:	0° to + 122° F (-17° to 50° C)
Humidity:	5 to 95% RH, non-condensing
Enclosure:	IP54 (Water splash and Dust resistant)
Instrument Weight:	10 lbs (Transceiver 3 lbs, Controller 7 lbs); (4.5 kg; 1.3 kg , 3.2 kg)
Carry Case:	14 lbs; 34” x 9 ½” x 14” (6.4 kg; 86 cm x 24 cm x 36 cm)
Battery:	Internal, rechargeable, Li ion battery pack, 11.1 Vdc
Battery Run Time:	8 hours at 32° F without backlight on, minimum
Battery Charging:	External, in-line, 110-240 Vac, 50 / 60 hertz, international, 19 Vdc power supply
Charge Time, Maximum:	8 hours
Charging Indicator:	Integrated into controller panel
Shoulder Strap:	Single over the shoulder padded strap with Ergonomic dual strap and belt system

1/15

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RMLD-IS®

Remote Methane Leak Detector

R&D 100

Award Winner

Recognized as one of the 100 most technologically significant products introduced to the marketplace.

RKI INSTRUMENTS

CONFINED SPACE MULTI GAS MONITOR

Gas Detection For Life

GX-2012 Model

Normal Operating Mode

Leak Check Mode

Bar Hole Mode

Features

- Monitors ppm LEL, and % volume methane, O2, CO and H2S
- 0 to 100% volume methane option
- Auto-ranging display of % LEL and % volume 3 Operating modes: Normal, leack check, & bar hole
- Leak check mode:
  - PPM leak detector, detects down to 100 ppm CH4
  - Adjustable display ranges: 500/1000/2000/5000 ppm
  - Visual / audible pulses change with gas concentration
  - CO display in leak check mode, ideal for residential investigations
- Barhole test mode for underground leak checks
- Status indicators: Pump active, microprocessor status and battery level
- Internal sample drawing pump with up to 50 foot range
- Vibration, visual, and audible alarms
- Automatic backlight during alarms
- Bump test and calibration reminder with lock out option
- Lithium ion or alkaline battery packs (interchangeable)
- Alarm latching or non-latching
- High impact, dust and water resistant design
- Up to 600 hours of datalogging with alarm trends
- Snap-logging - on demand data recording
- TWA and STEL readings with lunch-break mode
- Intrinsically safe, ATEX/IECEx/CE and (CSA version also available)
- 2 year warranty

With the GX-2012, you have multiple tools in one instrument. Having 3 operating modes, the GX-2012 can be used for confined space, safety monitoring in it's Normal Operating mode; for leak investigation in Leak Check mode; and for underground leak checking in Bar Hole mode. When equipped with an optional TC sensor, the GX-2012 can measure 100% volume methane and dynamically auto range from % LEL to % volume. This is ideal for line purge testing.

Built around high-quality micro-sensor technology, the GX-2012 is RKI's smallest personal 1-5 sensor gas monitor with a built in sample pump. Weighing only 12.3 ounces, the GX-2012 can monitor the standard confined space gases (LEL combustibles, Oxygen content, Carbon Monoxide, and Hydrogen Sulfide).

The GX-2012's large LCD display shows all gas readings, battery level, current time, and will automatically backlight in alarm conditions. Standard alarm types include vibration, visual, and audible alarms, which can be set to latching or non-latching. Controlled by a microprocessor, the GX-2012 continuously checks itself for sensor connections, low battery, circuit trouble, low flow, and calibration errors. The GX-2012 can interchangeably operate on either a Li-ion battery pack or an alkaline battery pack. The batteries are simple to replace requiring no tools to access the removable battery compartment or pack.

Calibration and bump test intervals and reminders are user adjustable and can be set to either go into alarm or to lock the user out of normal measurement mode once a calibration period has expired. Calibrations can be performed automatically or individually in single calibration mode. The GX-2012 is also compatible with the economical SDM-2012 single channel calibration station.

RKI Instruments, Inc. • 33248 Central Ave. Union City, CA 94587 • Phone (800) 754-5165 • (510) 441-5656 • Fax (510) 441-5650

GX-2012 Model

Gas Detected	Combustible Gases (Methane as standard)	% Volume Methane	Oxygen (O2)	Hydrogen Sulfide (H2S)	Carbon Monoxide (CO)
Detection Principle	Catalytic combustion	Thermal conductivity	Galvanic cell	Electrochemical cell	
Detection Range	0 ~ 100% LEL 0 ~ 500 / 1,000 / 2,000 / 5,000 ppm	0 ~ 100% Vol.	0 ~ 40% Vol.	0 ~ 100 ppm	0 ~ 500 ppm
Accuracy Statement (whichever is greater)	± 5% of reading or ± 2% LEL (LEL mode only)	± 5% of reading or ± 2% of full scale	± 0.5% O2	± 5% of reading or ± 2 ppm H2S	± 5% of reading or ± 5 ppm CO
Sampling Method	Internal sample pump, flow rate nominal 0.5 LPM, includes hydrophobic filter				
Display	Digital LCD with 7 segments, auto backlight during alarm				
Preset Alarms (User Adjustable)	1st alarm 10% LEL 2nd alarm 50% LEL Over alarm 100% LEL	No alarms for % Vol. CH4	Low alarm 19.5% High alarm 23.5% Over alarm 40.0%	1st 5 ppm 2nd 30 ppm TWA 10 ppm STEL 15 ppm Over 100 ppm	1st 25 ppm 2nd 50 ppm TWA 25 ppm STEL 200 ppm Over 500 ppm
Alarms Types	Gas alarms: 1st and 2nd, STEL, TWA (user adjustable) and OVER Trouble alarms: Sensor connection, low battery, low flow, circuit trouble and calibration error				
Alarm Methods	Gas alarms: Flashing lights, two tone buzzer, and vibration Trouble alarms: Flashing lights, trouble displayed, intermittent buzzer, and vibration				
Operating Temp. & Humidity	-20°C to +50°C (-4°F to 122°F) 0 to 95% RH, non-condensing				
Response Time	Within 30 seconds (T90)				
Continuous Operation	Alkaline battery: 15 hours Li-Ion battery: 10 hours 70°F (21°C)				
Power Source	Li-Ion battery pack, or 3 "AA" Alkaline battery pack; interchangeable				
Safety Rating	ATEX, TIIS, IECEx, CE, CSA classified (as standard), as intrinsically safe. Class I, Division 1, Groups A, B, C, D (optional version available)				
Dimension & Weight	Approx. 143 (H) x 71 (W) x 43 (D) mm (5.6" H x 2.8" W x 1.6" D), approx. 350 g (12.3 ounces)				
Case Material	High dust & water resistant design. RFI shielded high impact plastic with protective rubber overmolding				
Controls	Five buttons: POWER / ENTER, DISPLAY, AIR, RESET, SHIFT				
Standard Accessories	• Belt clip • 10" Probe • 10' Hose • Rubber nozzle, 3.5" • Manual • Training CD • Datalogging software • Quick reference card				
Optional Accessories	• SDM-2012 calibration stations • Li-Ion battery pack • Sample draw hoses (10' standard, up to 50' max. available) • Calibration kit • AC or DC Charger • Carrying case 				
Configurations	1, 2, 3, 4, or 5 sensor units Li-Ion or alkaline battery pack options				
Warranty	Two years material and workmanship				

Specifications subject to change without notice.

RKI INSTRUMENTS

RKI INSTRUMENTS, INC. UL REGISTERED FIRM ISO 9001 10000363

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Authorized Distributor:

FLIR G300 a

Optical Gas Imaging Cameras For Continuous Gas Leak Detection

Optical gas imaging cameras from FLIR can visualize and pinpoint gas leaks that are invisible to the naked eye. With an optical gas imaging camera it is easy to continuously scan installations that are in remote areas or in zones that are difficult to access.

Continuous monitoring means that you will immediately see when a dangerous or costly gas leak appears so that immediate action can be taken. Optical gas imaging (OGI) cameras are widely used in industrial settings, such as oil refineries, natural gas processing plants, offshore platforms, chemical/ petrochemical complexes, and biogas and power generation plants.

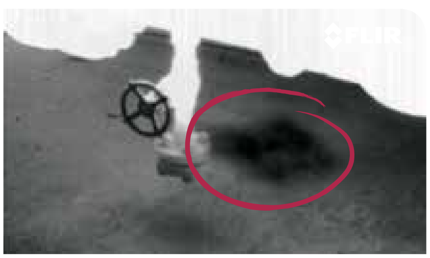
OGI cameras like the FLIR G300 a can detect harmful VOC's (volatile organic compounds) that can seriously harm the environment.

FLIR G300 a optical gas imaging camera can be easily integrated in housings with application specific requirements.

COOLED DETECTOR MAKES THE SMALLEST TEMPERATURE DIFFERENCES VISIBLE

FLIR G300 a contains a cooled Indium Antimonide (InSb) detector that produces thermal images of 320 x 240 pixels. With its low F-number and high sensitivity, G300 a detects the smallest of leaks.

The high sensitivity mode further enhances the detection level of the camera so that the smallest gas leaks can be detected.



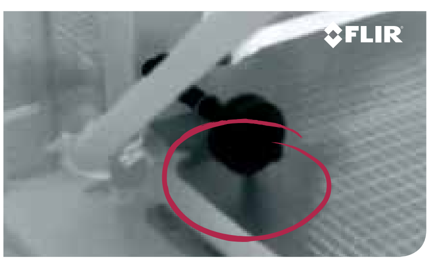
Captured gas leak from production site.

EASY TO CONTROL

All models are easy to control from a safe distance. They can be fully controlled over Ethernet. They can easily be integrated in a TCP/ IP network.

AVAILABLE LENSES

The FLIR G300 a is available with a 23 mm (FOV: 24° × 18°) or 38 mm (14.5 x10.8) lens. Longer lenses give you a narrower field of view so that you can detect gas leaks from further away.



Captured gas leak.

FLIR G300 A DETECTS THE FOLLOWING GASES:

Benzene, Ethanol, Ethylbenzene,Heptane, Hexane, Isoprene, Methanol, MEK, MIBK, Octane, Pentane, 1-Pentene, Toluene, m-xylene, Butane, Methane, Propane, Ethylene and Propylene.

Technical specifications FLIR G300 a

Imaging & Optical Data	FLIR G300 a
IR resolution	320 × 240 pixels
Thermal sensitivity/NETD	<15 mK @ +30°C (+86°F)
Field of view (FOV)	24° × 18° with 23 mm lens; 14.5 x10.8 with 38 mm lens
Minimum focus distance	0.3 m (1.0 ft.) for 23 mm lens; 0.5 m (1.64 ft.) for 38 mm lens
F-number	1.5
Focus	Automatic using FLIR SDK, or manual
Zoom	1–8× continuous, digital zoom
Digital image enhancement	Noise reduction filter, High Sensitivity Mode (HSM)
Detector data	
Detector type	Focal Plane Array (FPA), cooled InSb
Spectral range	3.2–3.4 µm
Image presentation	
Automatic image adjustment	Continuous/manual; linear or histogram based
Manual image adjustment	Level/span
Image presentation modes	
Image modes	IR-image, High Sensitivity Mode (HSM)
Electronics and data rate	
Full frame rate	60 Hz
Temperature ranges	
Temperature range	–20°C to +350°C (–4°F to +662°F)
Video streaming	
Non-radiometric IR-video streaming	RTP/MPEG4
USB	
USB	Control and image
USB, standard	2.0 High Speed
USB, connector type	USB micro
USB, communication	TCP/IP socket-based, Microsoft RNDIS and/or USB video class
USB, video streaming	640 × 480 pixels at 30 Hz
USB, image streaming	16-bit 320 × 240 at 30 Hz
USB, protocols	TCP, UDP, RTSP, RTP, HTTP, ICMP, IGMP, ftp,DHCP
Ethernet	
Ethernet	Control, result and image
Ethernet, type	100 Mbps
Ethernet, standard	IEEE 802.3
Ethernet, connector type	RJ-45
Ethernet, communication	TCP/IP socket-based FLIR proprietary
Ethernet, video streaming	640 × 480 pixels at up to 15 Hz, MPEG-4, ISO/IEC 14496-1 MPEG-4 ASP@L5
Ethernet, image streaming	16-bit 320 × 240 pixels at up to 10 Hz
Ethernet, protocols	TCP, UDP, RTSP, RTP, HTTP, ICMP, IGMP, ftp,DHCP, MDNS (Bonjour), SMB/CIFS

Data communication interfaces	
Interfaces	Ethernet / HDMI
Composite video	
Video out	Digital Video Output (image)
Power system	
DC operation	10–28 V DC, polarity protected
Start-up time	Typically 7 min. @ 25°C (+77°F)
Environmental data	
Operating temperature range	–20°C to +50°C (–4°F to +122°F)
Storage temperature range	–30°C to +60°C (–22°F to +140°F)
Humidity (operating and storage)	IEC 68-2-30/24 h 95% relative humidity +25°C to +40°C (+77°F to +104°F) (2 cycl)
Directives	Low voltage directive: 2006/95/EC , EMC: 2004/108/ EC , RoHS: 2002/95/EC, WEEE: 2002/96/EC
EMC	EN61000-6-4 (Emission) / EN61000-6-2 (Immunity) / FCC 47 CFR Part 15 class A (Emission) / EN 61 000-4-8, L5
Shock	25 g (IEC 60068-2-27)
Vibration	2 g (IEC 60068-2-6)
Physical data	
Weight	1.4 kg (3.1 lb.), incl. 14.5° lens
Cameras size, incl. lens (L × W × H)	242x80x105mm (9.5x3.1x4.1 in.) incl. 14.5° lens
Housing material	Aluminum

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Appendix C – Sample Field Log Forms

Instrument Calibration Log
Central Valley Gas Storage

Instrument: **Methane Ambient Air Monitoring Sensor**
Manufacturer/Model #: Gazomat Gazpod ppb
Serial #: ____________________

Calibration Gas Lot #: ____________________
Calibration Gas Expiration Date: ____________________

Date	Time	Weather Conditions	Gas Standard	Standard Concentration (ppm)	Zero Calibration Result (ppm)	Span Calibration Result (ppm)	Calibration Notes and Comments
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
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			Methane				
			Methane				
			Methane				

Instrument Calibration Log
Central Valley Gas Storage

Instrument: **Method 21 Leak Quantification Instrument**
Manufacturer/Model #: RKI GX-2012
Serial #: ______________________

Calibration Gas Lot #:_________________________
Calibration Gas Expiration Date:_________________

Date	Time	Weather Conditions	Gas Standard	Standard Concentration (ppm)	Zero Calibration Result (ppm)	Span Calibration Result (ppm)	Calibration Notes and Comments
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
			Methane				
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			Methane				
			Methane				
			Methane				

Daily Wellhead Methane Screening Log
Central Valley Gas Storage

Date Surveyed: ____________________ Survey Begin Time: ____________________

Surveyed By: ____________________ Survey End Time: ____________________

	Is there an audible or visible indication of a leak? (circle Y or N)													
Well head:	**1A-U**	**3-U**	**5-U**	**7-U**	**2-L**	**4-U**	**2-U**	**1-L**	**3L**	**Southam 3**	**SWD**	**Sara Louise**	**Southam 2**	**Southam 4**
Piping	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Surface Casing	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Vent Cap	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	NA	NA	NA	NA	NA
Flanges	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Cellar	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N

	Does the RMLD-IS indicate a potential leak? (circle Y or N)													
Well head:	**1A-U**	**3-U**	**5-U**	**7-U**	**2-L**	**4-U**	**2-U**	**1-L**	**3L**	**Southam 3**	**SWD**	**Sara Louise**	**Southam 2**	**Southam 4**
Piping	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Surface Casing	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Vent Cap	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	NA	NA	NA	NA	NA
Flanges	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N
Cellar	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N	Y N

Describe any ambient noise potentially affecting this daily screen:

Describe each "Y" marked above:

Action items:

Weather Conditions	
Temperature (F)	
Wind Direction	
Wind Speed	

Table A4
Leak Detection and Repair Inspection
Record Keeping Form

Facility Name:			Air District:		
Owner/Operator Name:					
Address:					
City:			State:		Zip:
Contact Person:			Phone Number:		
			Count of Leaking Components in each Category		
Quarter	Date of Inspection	Total Count of Components Inspected	1,000 to 9,999 ppmv	10,000 to 49,999 ppmv	50,000 ppmv or greater
Q1					
Q2					
Q3					
Q4					

Table A5
Component Leak Concentration and Repair Record Keeping Form

Facility Name:	Air District:	
Owner/Operator Name:		
Address:		
City:	State:	Zip:
Contact Person:	Phone Number:	

Inspection Date	Method 21 Instrument (make and model)	Method 21 Instrument Calibration Date	Component Type*	Component Type - Other (please specify here)	Component ID, if applicable	Equipment ID or detailed description for the equipment this component is on	Active or Idle Well, if applicable	Initial Leak Concentration (ppmv)	Repair Date	Concentration After Repair (ppmv)

*Component type includes valve, connector, flange, fitting – pressure meter/gauge, fitting – not pressure meter/gauge, open-ended line, plug, pressure relief device, stuffing box, and other.

Table A8
Remote Emission Detection Follow-up Inspection Record Keeping Form

Facility Name:								Air District:							
Owner/Operator Name:															
Address:															
City:								State:				Zip:			
Contact Person:								Phone Number:							
For all notifications, record the columns below						For venting, also record	For unintentional emission sources requiring repair, also record								
Emission ID (provided by CARB)	Date of Emission Notification from CARB	Inspection Date*	Instrument Used**	Method 21 Instrument Calibration Date, if applicable	Type of Emission Identified ***	Description of Venting****	Emitting Equipment Type	Emitting Equipment ID or detailed description for the equipment	Emitting Component Type, if component source *****	Emitting Comp. Type – Other (specify here)	Emitting Comp. ID, if component source	Active or idle well, if applicable	Initial Leak Conc. (ppmv), if comp. source	Repair Date	Conc. After Repair (ppmv), if comp. source

*If an inspection did not occur pursuant to section 95669.1(b)(1), enter "reported venting."
**Instrument used shall be optical gas imaging (OGI) or Method 21 and include make and model.
***Type of emission identified includes unintentional-leak, unintentional-below leak threshold, unintentional-non-component, venting-routine, venting-construction/maintenance, or none.
****Description of venting shall include a brief summary of the source of the venting and why it occurred.
*****Component type includes valve, connector, flange, fitting – pressure meter/gauge, fitting – not pressure meter/gauge, open-ended line, plug, pressure relief device, stuffing box, and other.

Appendix D – USEPA Method 21

While we have taken steps to ensure the accuracy of this Internet version of the document, it is not the official version. To see a complete version including any recent edits, visit: https://www.ecfr.gov/cgi-bin/ECFR?page=browse and search under Title 40, Protection of Environment.

METHOD 21 - DETERMINATION OF VOLATILE ORGANIC COMPOUND LEAKS

1.0 Scope and Application

1.1 Analytes.

Analyte	**CAS No.**
Volatile Organic Compounds (VOC)	No CAS number assigned.

1.2 Scope. This method is applicable for the determination of VOC leaks from process equipment. These sources include, but are not limited to, valves, flanges and other connections, pumps and compressors, pressure relief devices, process drains, open-ended valves, pump and compressor seal system degassing vents, accumulator vessel vents, agitator seals, and access door seals.

1.3 Data Quality Objectives. Adherence to the requirements of this method will enhance the quality of the data obtained from air pollutant sampling methods.

2.0 Summary of Method

2.1 A portable instrument is used to detect VOC leaks from individual sources. The instrument detector type is not specified, but it must meet the specifications and performance criteria contained in Section 6.0. A leak definition concentration based on a reference compound is specified in each applicable regulation. This method is intended to locate and classify leaks only, and is not to be used as a direct measure of mass emission rate from individual sources.

3.0 Definitions

3.1 *Calibration gas* means the VOC compound used to adjust the instrument meter reading to a known value. The calibration gas is usually the reference compound at a known concentration approximately equal to the leak definition concentration.

3.2 *Calibration precision* means the degree of agreement between measurements of the same known value, expressed as the relative percentage of the average difference between the meter readings and the known concentration to the known concentration.

3.3 *Leak definition concentration* means the local VOC concentration at the surface of a leak source that indicates that a VOC emission (leak) is present. The leak definition is an instrument meter reading based on a reference compound.

3.4 *No detectable emission* means a local VOC concentration at the surface of a leak source, adjusted for local VOC ambient concentration, that is less than 2.5 percent of the specified leak definition concentration. that indicates that a VOC emission (leak) is not present.

3.5 *Reference compound* means the VOC species selected as the instrument calibration basis for specification of the leak definition concentration. (For example, if a leak definition concentration is 10,000 ppm as methane, then any source emission that results in a local concentration that yields a meter reading of 10,000 on an instrument meter calibrated with methane would be classified as a leak. In this example, the leak definition concentration is 10,000 ppm and the reference compound is methane.)

3.6 *Response factor* means the ratio of the known concentration of a VOC compound to the observed meter reading when measured using an instrument calibrated with the reference compound specified in the applicable regulation.

3.7 *Response time* means the time interval from a step change in VOC concentration at the input of the sampling system to the time at which 90 percent of the corresponding final value is reached as displayed on the instrument readout meter.

4.0 Interferences[Reserved]

5.0 Safety

5.1 Disclaimer. This method may involve hazardous materials, operations, and equipment. This test method may not address all of the safety problems associated with its use. It is the responsibility of the user of this test method to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to performing this test method.

5.2 Hazardous Pollutants. Several of the compounds, leaks of which may be determined by this method, may be irritating or corrosive to tissues (*e.g.,* heptane) or may be toxic (*e.g.,* benzene, methyl alcohol). Nearly all are fire hazards. Compounds in emissions should be determined through familiarity with the source. Appropriate precautions can be found in reference documents, such as reference No. 4 in Section 16.0.

6.0 Equipment and Supplies

A VOC monitoring instrument meeting the following specifications is required:

6.1 The VOC instrument detector shall respond to the compounds being processed. Detector types that may meet this requirement include, but are not limited to, catalytic oxidation, flame ionization, infrared absorption, and photoionization.

6.2 The instrument shall be capable of measuring the leak definition concentration specified in the regulation.

6.3 The scale of the instrument meter shall be readable to ±2.5 percent of the specified leak definition concentration.

6.4 The instrument shall be equipped with an electrically driven pump to ensure that a sample is provided to the detector at a constant flow rate. The nominal sample flow rate, as measured at the sample probe tip, shall be 0.10 to 3.0 l/min (0.004 to 0.1 ft^3 /min) when the probe is fitted with a glass wool plug or filter that may be used to prevent plugging of the instrument.

6.5 The instrument shall be equipped with a probe or probe extension or sampling not to exceed 6.4 mm (1/4in) in outside diameter, with a single end opening for admission of sample.

6.6 The instrument shall be intrinsically safe for operation in explosive atmospheres as defined by the National Electrical Code by the National Fire Prevention Association or other applicable regulatory code for operation in any explosive atmospheres that may be encountered in its use. The instrument shall, at a minimum, be intrinsically safe for Class 1, Division 1 conditions, and/or Class 2, Division 1 conditions, as appropriate, as defined by the example code. The instrument shall not be operated with any safety device, such as an exhaust flame arrestor, removed.

7.0 Reagents and Standards

7.1 Two gas mixtures are required for instrument calibration and performance evaluation:

7.1.1 Zero Gas. Air, less than 10 parts per million by volume (ppmv) VOC.

7.1.2 Calibration Gas. For each organic species that is to be measured during individual source surveys, obtain or prepare a known standard in air at a concentration approximately equal to the applicable leak definition specified in the regulation.

7.2 Cylinder Gases. If cylinder calibration gas mixtures are used, they must be analyzed and certified by the manufacturer to be within 2 percent accuracy, and a shelf life must be specified. Cylinder standards must be either reanalyzed or replaced at the end of the specified shelf life.

7.3 Prepared Gases. Calibration gases may be prepared by the user according to any accepted gaseous preparation procedure that will yield a mixture accurate to within 2 percent. Prepared standards must be replaced each day of use unless it is demonstrated that degradation does not occur during storage.

7.4 Mixtures with non-Reference Compound Gases. Calibrations may be performed using a compound other than the reference compound. In this case, a conversion factor must be determined for the alternative compound such that the resulting meter readings during source surveys can be converted to reference compound results.

8.0 Sample Collection, Preservation, Storage, and Transport

8.1 Instrument Performance Evaluation. Assemble and start up the instrument according to the manufacturer's instructions for recommended warm-up period and preliminary adjustments.

8.1.1 Response Factor. A response factor must be determined for each compound that is to be measured, either by testing or from reference sources. The response factor tests are required before placing the analyzer into service, but do not have to be repeated at subsequent intervals.

8.1.1.1 Calibrate the instrument with the reference compound as specified in the applicable regulation. Introduce the calibration gas mixture to the analyzer and record the observed meter reading. Introduce zero gas until a stable reading is obtained. Make a total of three measurements by alternating between the calibration gas and zero gas. Calculate the response factor for each repetition and the average response factor.

8.1.1.2 The instrument response factors for each of the individual VOC to be measured shall be less than 10 unless otherwise specified in the applicable regulation. When no instrument is available that meets this specification when calibrated with the reference VOC specified in the applicable regulation, the available instrument may be calibrated with one of the VOC to be measured, or any other VOC, so long as the instrument then has a response factor of less than 10 for each of the individual VOC to be measured.

8.1.1.3 Alternatively, if response factors have been published for the compounds of interest for the instrument or detector type, the response factor determination is not required, and existing results may be referenced. Examples of published response factors for flame ionization and catalytic oxidation detectors are included in References 1–3 of Section 17.0.

8.1.2 Calibration Precision. The calibration precision test must be completed prior to placing the analyzer into service and at subsequent 3-month intervals or at the next use, whichever is later.

8.1.2.1 Make a total of three measurements by alternately using zero gas and the specified calibration gas. Record the meter readings. Calculate the average algebraic difference between the meter readings and the known value. Divide this average difference by the known calibration value and multiply by 100 to express the resulting calibration precision as a percentage.

8.1.2.2 The calibration precision shall be equal to or less than 10 percent of the calibration gas value.

8.1.3 Response Time. The response time test is required before placing the instrument into service. If a modification to the sample pumping system or flow configuration is made that would change the response time, a new test is required before further use.

8.1.3.1 Introduce zero gas into the instrument sample probe. When the meter reading has stabilized, switch quickly to the specified calibration gas. After switching, measure the time required to attain 90 percent of the final stable reading. Perform this test sequence three times and record the results. Calculate the average response time.

8.1.3.2 The instrument response time shall be equal to or less than 30 seconds. The instrument pump, dilution probe (if any), sample probe, and probe filter that will be used during testing shall all be in place during the response time determination.

8.2 Instrument Calibration. Calibrate the VOC monitoring instrument according to Section 10.0.

8.3 Individual Source Surveys.

8.3.1 Type I—Leak Definition Based on Concentration. Place the probe inlet at the surface of the component interface where leakage could occur. Move the probe along the interface periphery while observing the instrument readout. If an increased meter reading is observed, slowly sample the interface where leakage is indicated until the maximum meter reading is obtained. Leave the probe inlet at this maximum reading location for approximately two times the instrument response time. If the maximum observed meter reading is greater than the leak definition in the applicable regulation, record and report the results as specified in the regulation reporting requirements. Examples of the application of this general technique to specific equipment types are:

8.3.1.1 Valves. The most common source of leaks from valves is the seal between the stem and housing. Place the probe at the interface where the stem exits the packing gland and sample the stem circumference. Also, place the probe at the interface of the packing gland take-up flange seat and sample the periphery. In addition, survey valve housings of multipart assembly at the surface of all interfaces where a leak could occur.

8.3.1.2 Flanges and Other Connections. For welded flanges, place the probe at the outer edge of the flange-gasket interface and sample the circumference of the flange. Sample other types of nonpermanent joints (such as threaded connections) with a similar traverse.

8.3.1.3 Pumps and Compressors. Conduct a circumferential traverse at the outer surface of the pump or compressor shaft and seal interface. If the source is a rotating shaft, position the probe inlet within 1 cm of the shaft-seal interface for the survey. If the housing configuration prevents a complete traverse of the shaft periphery, sample all accessible portions. Sample all other joints on the pump or compressor housing where leakage could occur.

8.3.1.4 Pressure Relief Devices. The configuration of most pressure relief devices prevents sampling at the sealing seat interface. For those devices equipped with an enclosed extension, or horn, place the probe inlet at approximately the center of the exhaust area to the atmosphere.

8.3.1.5 Process Drains. For open drains, place the probe inlet at approximately the center of the area open to the atmosphere. For covered drains, place the probe at the surface of the cover interface and conduct a peripheral traverse.

8.3.1.6 Open-ended Lines or Valves. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.7 Seal System Degassing Vents and Accumulator Vents. Place the probe inlet at approximately the center of the opening to the atmosphere.

8.3.1.8 Access door seals. Place the probe inlet at the surface of the door seal interface and conduct a peripheral traverse.

8.3.2 Type II—"No Detectable Emission". Determine the local ambient VOC concentration around the source by moving the probe randomly upwind and downwind at a distance of one to two meters from the source. If an interference exists with this determination due to a nearby emission or leak, the local ambient concentration may be determined at distances closer to the source, but in no case shall the distance be less than 25 centimeters. Then move the probe inlet to the surface of the source and determine the concentration as outlined in Section 8.3.1. The difference between these concentrations determines whether there are no detectable emissions. Record and report the results as specified by the regulation. For those cases where the regulation requires a specific device installation, or that specified vents be ducted or piped to a control device, the existence of these conditions shall be visually confirmed. When the regulation also requires that no detectable emissions exist, visual observations and sampling surveys are required. Examples of this technique are:

8.3.2.1 Pump or Compressor Seals. If applicable, determine the type of shaft seal. Perform a survey of the local area ambient VOC concentration and determine if detectable emissions exist as described in Section 8.3.2.

8.3.2.2 Seal System Degassing Vents, Accumulator Vessel Vents, Pressure Relief Devices. If applicable, observe whether or not the applicable ducting or piping exists. Also, determine if any sources exist in the ducting or piping where emissions could occur upstream of the control device. If the required ducting or piping exists and there are no sources where the emissions could be vented to the atmosphere upstream of the control device, then it is presumed that no detectable emissions are present. If there are sources in the ducting or piping where emissions could be vented or sources where leaks could occur, the sampling surveys described in Section 8.3.2 shall be used to determine if detectable emissions exist.

8.3.3 Alternative Screening Procedure.

8.3.3.1 A screening procedure based on the formation of bubbles in a soap solution that is sprayed on a potential leak source may be used for those sources that do not have continuously moving parts, that do not have surface temperatures greater than the boiling point or less than the freezing point of the soap solution, that do not have open areas to the atmosphere that the soap solution cannot bridge, or that do not exhibit evidence of liquid leakage. Sources that have these conditions present must be surveyed using the instrument technique of Section 8.3.1 or 8.3.2.

8.3.3.2 Spray a soap solution over all potential leak sources. The soap solution may be a commercially available leak detection solution or may be prepared using concentrated detergent and water. A pressure sprayer or squeeze bottle may be used to dispense the solution. Observe the potential leak sites to determine if any bubbles are formed. If no bubbles are observed, the source is presumed to have no detectable emissions or leaks as applicable. If any bubbles are observed, the instrument techniques of Section 8.3.1 or 8.3.2 shall be used to determine if a leak exists, or if the source has detectable emissions, as applicable.

9.0 Quality Control

Section	Quality control measure	Effect
8.1.2	Instrument calibration precision check	Ensure precision and accuracy, respectively, of instrument response to standard.
10.0	Instrument calibration	

10.0 Calibration and Standardization

10.1 Calibrate the VOC monitoring instrument as follows. After the appropriate warm-up period and zero internal calibration procedure, introduce the calibration gas into the instrument sample probe. Adjust the instrument meter readout to correspond to the calibration gas value.

Note: If the meter readout cannot be adjusted to the proper value, a malfunction of the analyzer is indicated and corrective actions are necessary before use.

11.0 Analytical Procedures[Reserved]

12.0 Data Analyses and Calculations[Reserved]

13.0 Method Performance[Reserved]

14.0 Pollution Prevention[Reserved]

15.0 Waste Management[Reserved]

16.0 References

1. Dubose, D.A., and G.E. Harris. Response Factors of VOC Analyzers at a Meter Reading of 10,000 ppmv for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81051. September 1981.

2. Brown, G.E., *et al.* Response Factors of VOC Analyzers Calibrated with Methane for Selected Organic Compounds. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81–022. May 1981.

3. DuBose, D.A. *et al.* Response of Portable VOC Analyzers to Chemical Mixtures. U.S. Environmental Protection Agency, Research Triangle Park, NC. Publication No. EPA 600/2–81–110. September 1981.

4. Handbook of Hazardous Materials: Fire, Safety, Health. Alliance of American Insurers. Schaumberg, IL. 1983.

17.0 Tables, Diagrams, Flowcharts, and Validation Data[Reserved]

Appendix E – List of Equipment and Components to be Monitored for Leak Detection

TAG NO.	DESCRIPTION
MAF-1210	Line B Dehy
FSV-2141	2" Check Valve
BV-2141	2" Ball Valve
BV-1212	16" Ball Valve
HBG-2140	Sivalls Heat Exchanger
BV-12115	2" Ball Valve
BV-1219	2" Ball Valve
LV-1213	1" Level control valve
BV-1217	2" Ball Valve
BV-1215	2" Ball Valve
BV-1218	2" Ball Valve
LV-1214	1" Level Control Valve
FSV-12112	2" Check Valve
BV-1216	2" Ball Valve
BV-12115	16" Ball Valve
BV-1455	16" Ball Valve
BV-1452	2" Ball Valve
MAF-1220	Backup Dehy
FSV-2151	2" Check Valve
BV-2151	2" Ball Valve
BV-12215	16" Ball Valve
BV-12216	16" Ball Valve
HBG-2150	Sivalls Heat Exchanger
BV-1221	16" Ball Valve
BV-12213	16" Ball Valve
BV-12214	2" Ball Valve
BV-12217	2" Ball Valve
BV-1229	2" Ball Valve
BV-1227	2" Ball Valve
BV-1225	2" Ball Valve
BV-1228	2" Ball Valve
BV-1224	2" Ball Valve
LV-1224	1" Level Control Valve
FSV-12212	2" Check Valve
BV-1226	2" Ball Valve
BV-1223	16" Ball Valve
MAF-1210	Line A Dehy
FSV-2161	2" Check Valve
BV-2161	2" Ball Valve
BV-1232	16" Ball Valve

BV-1231	16" Ball Valve
HBG-2160	Sivalls Heat Exchanger
BV-12315	2" Ball Valve
BV-1239	2" Ball Valve
LV-1233	1" Level control valve
BV-1237	2" Ball Valve
BV-1235	2" Ball Valve
BV-1238	2" Ball Valve
LV-1234	1" Level Control Valve
FSV-12312	2" Check Valve
BV-1465	16" Ball Valve
BV-1462	2" Ball Valve
	East BI-DIRECTIONAL METER RUN
BV-0053	16" Ball Valve
BV-0054	12" Ball Valve
BV-00531	2" Ball Valve
BV-00530	2" Ball Valve
BV-00514	2" Ball Valve
BV-0057	16" Ball Valve
BV-0052	12" Ball Valve
BV-0051	16" Ball Valve
BV-00512	2" Ball Valve
BV-00511	2" Ball Valve
BV-00510	2" Ball Valve
BV-00520	3" Ball Valve
FSV-00521	3" Check Valve
BDV-00522	3" Ball Valve
BV-0081	12" Ball Valve
BV-0089	2" Ball Valve
FCV-0082	8" Flow Control Valve
BV-0085	2" Ball Valve
PCV-0083	8" Ball Valve
BV-0084	12" Ball Valve
BV-0087	2" Ball Valve
BV-0086	2" Ball Valve
BV-0088	6" Cross connect ball Valve
	West BI-DIRECTIONAL METER RUN
BV-0043	16" Ball Valve
BV-0044	12" Ball Valve
BV-00415	4" Ball Valve
BV-00414	2" Ball Valve

BV-00413	2" Ball Valve
BV-0047	16" Ball Valve
BV-0042	12" Ball Valve
BV-0041	16" Ball Valve
BV-00412	2" Ball Valve
BV-00411	2" Ball Valve
BV-00410	2" Ball Valve
BV-00420	3" Ball Valve
FSV-00421	3" Check Valve
BDV-00422	3" Ball Valve
BV-0091	12" Ball Valve
BV-0098	2" Ball Valve
FCV-0092	8" Flow Control Valve
BV-0095	2" Ball Valve
PCV-0093	8" Ball Valve
BV-0094	12" Ball Valve
BV-0097	2" Ball Valve
BV-0096	2" Ball Valve
BV-0098	6" Cross connect ball Valve
MBP-1010	STATION 401 PIPELINE PIG LAUNCHER
BV-1014	8" Ball Valve
BV-1017	2" Ball Valve
BV-1018	2" Ball Valve
BV-1019	1/2" Ball Valve
BV-10110	1/2" Ball Valve
BV-1011	24" Ball Valve
BV-10111	1" Ball Valve
BV-10112	1" Ball Valve
BV-1012	16" Ball Valve
BDV-10115	2" Ball Valve
PCV-1011	12" Flow Control Valve
BV-1013	16" Ball Valve
BV-10117	2" Ball Valve
BV-10119	1" Ball Valve
BV-10120	1" Ball Valve
BV-10113	8" Ball Valve
MBD-1030	UNIT #1 SUCTION SCRUBBER (LT.SIDE)
CBL-1040	UNIT #1 COMPRESSOR SUCT. BOTTLE (LT. SIDE)
CBL-1050	UNIT #1 COMPRESSOR DISCH. BOTTLE (LT.SIDE)
MBD-1060	UNIT #1 SUCTION SCRUBBER (RT. SIDE)
CBL-1070	UNIT #1 COMPRESSOR SUCT. BOTTLE (RT.SIDE)

CBL-1080	UNIT #1 COMPRESSOR DISCH. BOTTLE (RT. SIDE)
LV-1061	1" Level Control Valve
FSV-1061	1" Check Valve
LV-1031	1" Level Control Valve
FSV-1032	1" Check Valve
BV-5015A	4" Ball Valve
FCV-5019	8" Flow Control Valve
BV-5011	12" Suction Valve
BV-50111	2" Ball Valve
BV-50112	2" Ball Valve
BV-5016	2" equalization valve
BV-5012	12" Suction Valve
BV-50113	2" Ball Valve
BV-50114	2" Ball Valve
BV-5017	2" equalization valve
BV-5014	12" Ball Valve
BV-5015	1" Ball Valve
BV-5013	12" Ball Valve
FSV-5011	Power Check Valve
HAL-2010	UNIT #1 GAS COOLER
BDV-5018	Unit 1 Blow Down Valve
MBD-1090	UNIT #2 SUCTION SCRUBBER (LT. SIDE)
CBL-1100	UNIT #2 COMPRESSOR SUCT. BOTTLE (LT. SIDE)
CBL-1110	UNIT #2 COMPRESSOR DISCH. BOTTLE (LT. SIDE)
MBD-1120	UNIT #2 SUCTION SCRUBBER (RT. SIDE)
CBL-1130	UNIT #2 COMPRESSOR SUCT. BOTTLE (RT. SIDE)
CBL-1140	UNIT #2 COMPRESSOR DISCH. BOTTLE (RT. SIDE)
LV-1121	1" Level Control Valve
FSV-1121	1" Check Valve
LV-1091	1" Level Control Valve
FSV-1091	1" Check Valve
BV-5025A	4" Ball Valve
FCV-5029	8" Flow Control Valve
BV-5021	10" Suction Valve
BV-50211	2" Ball Valve
BV-50212	2" Ball Valve
BV-5026	2" equalization valve
BV-5022	12" Suction Valve
BV-50213	2" Ball Valve
BV-50214	2" Ball Valve
BV-50217	2" equalization valve
BV-5024	12" Ball Valve

BV-5025	1" Ball Valve
BV-5023	12" Ball Valve
BV-50216	10" Ball Valve
BV-50213	2" Ball Valve
BV-50214	2" Ball Valve
BV-50217	2" equalization valve
BV-5023	12" Ball Valve
FSV-5021	Power Check Valve
HAL-2020	UNIT #2 GAS COOLER
BDV-5028	Unit 2 Blowdown Valve
MBD-1150	UNIT #3 SUCTION SCRUBBER (LT.SIDE
CBL-1160	UNIT #3 COMPRESSOR SUCT. BOTTLE (LT. SIDE)
CBL-1170	UNIT #3 COMPRESSOR DISCI BOTTLE LT SIDE
MBD-1180	UNIT #3 SUCTION SCRUBBER (RT. SIDE)
CBL-1190	UNIT #3 COMPRESSOR SUCT. BOTTLE RT SIDE
CBL-1200	UNIT #3 COMPRESSOR DISCH. BOTTLE (RT. SIDE)
LV-1181	1" Level Control Valve
FSV-1181	1" Check Valve
LV-1151	1" Level Control Valve
FSV-1151	1" Check Valve
BV-5035A	4" Ball Valve
FCV-5039	8" Flow Control Valve
BV-5031	12" Suction Valve
BV-50311	2" Ball Valve
BV-50312	2" Ball Valve
BV-5036	2" equalization valve
BV-5032	12" Suction Valve
BV-50313	2" Ball Valve
BV-50314	2" Ball Valve
BV-5037	2" equalization valve
BV-5034	12" Ball Valve
BV-5035	1" Ball Valve
BV-5033	12" Ball Valve
BV-50313	2" Ball Valve
BV-50314	2" Ball Valve
BV-50217	2" equalization valve
BV-5033	12" Ball Valve
FSV-5031	Power Check Valve
HAL-2030	UNIT #3 GAS COOLER
BDV-5038	Unit 3 Blowdown Valve
MAK-1510	FILTER SEPARATOR - CVGS PIPELINE
BV-1512	16" Ball Valve

BDV-1513	2" Ball Valve
BV-1511	16" Ball Valve
BDV-1512	2" Ball Valve
BV-1514	2" Ball Valve
BV-1516	16" Ball Valve
BV-1513	16" Ball Valve
BV-1515	16" Ball Valve
FSV-1511	1" Check Valve
LV-1513	1" Level Control Valve
LV-1514	1" Level Control Valve
FSV-1512	1" Check Valve
MAK-1240	FILTER SEPARATOR - LINE B
BV-0031	16" Inlet/outlet Valve
BV-1242	16" Inlet/outlet Valve
BV-1241	16" Inlet/outlet Valve
BDV-1241	2" Ball Valve
BDV-1242	2" Ball Valve
BV-1246	2" Ball Valve
BV-0022	12" Ball Valve
BV-0024	2" Ball Valve
LV-1248	1" Level Control Valve
LSV-1249	1" Level Control Valve
LV-1246	1" Level Control Valve
LSV-1247	1" Level Control Valve
MAK-1250	FILTER SEPARATOR - LINE A
BV-0021	16" Inlet/outlet Valve
BV-59013	8" Ball Valve
BV-1252	16" Inlet/outlet Valve
BV-1251	16" Inlet/outlet Valve
BDV-1251	2" Ball Valve
BDV-1252	2" Ball Valve
BV-1256	2" Ball Valve
BV-0022	12" Ball Valve
BV-0024	2" Ball Valve
LV-1258	1" Level Control Valve
LSV-1259	1" Level Control Valve
LV-1256	1" Level Control Valve
LSV-1257	1" Level Control Valve
MBD-1260	WELLHEAD SEPARATOR - UPPER SAND #1 (WELL 1-AU)
LV-1261	1" Level Control Valve

LV-1262	1" Level Control Valve
FSV-1261	1" Check Valve
SSV-7011	6" Isolation Valve
CHV-7012	2" angle Valve
WV-7082	2" Isolation Valve
MV-7011	6" Master Valve
MV-7012	2" Isolation Valve
WV-7011	6" Wing Valve
WV-7013	6" Wing Valve
CHV-7011	Choke Valve
BV-1261	6" Isolation Valve
MBD-1270	WELLHEAD SEPARTOR-UPPER SAND#2 (WELL 2-U)
LV-1271	1" Level Control Valve
LV-1272	1" Level Control Valve
FSV-1271	1" Check Valve
SSV-7021	10" Isolation Valve
CHV-7022	2" angle Valve
MV-7022	2" Isolation Valve
MV-7021	6" Master Valve
MV-7022	2" Isolation Valve
WV-7021	6" Wing Valve
WV-7023	6" Wing Valve
CHV-7021	Choke Valve
BV-1271	6" Isolation Valve
MBD-1280	WELLHEAD SEPARATOR - UPPER SAND #3 (WELL 3-U)
LV-1281	1" Level Control Valve
LV-1282	1" Level Control Valve
FSV-1281	1" Check Valve
SSV-7031	6" Isolation Valve
CHV-7032	2" angle Valve
MV-7032	2" Isolation Valve
MV-7031	6" Master Valve
MV-7032	2" Isolation Valve
WV-7031	6" Wing Valve
WV-7033	6" Wing Valve
CHV-7031	Choke Valve
BV-1281	6" Isolation Valve
MBD-1290	WELLHEAD SEPARATOR- UPPER SAND#4 (WELL 4-U)
LV-1291	1" Level Control Valve
LV-1292	1" Level Control Valve

FSV-1291	1" Check Valve
SSV-7041	6" Isolation Valve
CHA-7042	2" angle Valve
MV-7042	2" Isolation Valve
MV-7041	6" Master Valve
MV-7042	2" Isolation Valve
WV-7041	6" Wing Valve
WV-7043	6" Wing Valve
CHV-7041	Choke Valve
BV-1291	6" Isolation Valve
MBD-1300	WELLHEAD SEPARATOR - UPPER SAND #5 (WELL 5-U)
LV-1301	1" Level Control Valve
LV-1302	1" Level Control Valve
FSV-1301	1" Check Valve
SSV-7051	6" Isolation Valve
CHV-7052	2" angle Valve
MV-7052	2" Isolation Valve
MV-7051	6" Master Valve
MV-7052	2" Isolation Valve
WV-7051	6" Wing Valve
WV-7053	6" Wing Valve
CHV-7051	Choke Valve
BV-1291	6" Isolation Valve
MBD-1320	WELLHEAD SEPERATOR - UPPER SAND #7 WELL (7-U)
LV-1321	1" Level Control Valve
LV-1322	1" Level Control Valve
FSV-1322	1" Check Valve
SSV-7071	6" Isolation Valve
CHV-7072	2" angle Valve
MV-7072	2" Isolation Valve
MV-7071	6" Master Valve
MV-7072	2" Isolation Valve
WV-7071	6" Wing Valve
WV-7073	6" Wing Valve
CHV-7071	Choke Valve
BV-1321	6" Isolation Valve
MBD-1330	WELLHEAD SEPARATOR- LOWER SAND #1(WELL 1-L)
LV-1331	1" Level Control Valve
LV-1332	1" Level Control Valve
FSV-1331	1" Check Valve

SSV-7081	10" Isolation Valve
CHV-7082	2" angle Valve
WV-7082	2" Isolation Valve
MV-7082	2" Isolation Valve
MV-7081	6" Master Valve
WV-7081	6" Wing Valve
WV-7083	6" Wing Valve
CHV-7081	Choke Valve
BV-1331	10" Isolation Valve
MBD-1340	WELLHEAD SEPARATOR - LOWER SAND #2 (WELL 2-L)
LV-1341	1" Level Control Valve
LV-1342	1" Level Control Valve
FSV-1331	1" Check Valve
SSV-7091	10" Isolation Valve
CHV-7092	2" angle Valve
WV-7092	2" Isolation Valve
MV-7092	2" Isolation Valve
MV-7091	6" Master Valve
WV-7091	6" Wing Valve
WV-7093	6" Wing Valve
CHV-7091	Choke Valve
BV-1341	10" Isolation Valve
MBD-1390	WELLHEAD SEPARATOR - UPPER SAND #7 (WELL 3L)
LV-1351	1" Level Control Valve
LV-1352	1" Level Control Valve
FSV-1351	1" Check Valve
SSV-7100	10" Isolation Valve
CHV-7102	2" angle Valve
WV-7102	2" Isolation Valve
MV-7102	2" Isolation Valve
MV-7101	6" Master Valve
WV-7101	6" Wing Valve
WV-7103	6" Wing Valve
CHV-7101	Choke Valve
BV-1351	10" Isolation Valve
MBP-1470	SPHERE LAUNCHER- LINE B (UPPER SAND)
BV-1471	16" Inlet Valve
BV-1473	2" Ball Valve
BV-1472	6" Ball Valve
BV-1475	2" Ball Valve

MBP-1480	SHPERE LAUNCHER- LINE A (LOWER SAND)
BV-1481	16" Inlet Valve
BV-1483	2" Ball Valve
BV-1482	6" Ball Valve
BV-1485	2" Ball Valve
MBF-1350	UNIT #1 FUEL GAS SCRUBBER
MBF-1360	UNIT #2 FUEL GAS SCRUBBER
MBF-1370	UNIT #3 FUEL GAS SCRUBBER
MAJ-1420	WATER DISPOSAL WELL INJECTION FILTER #1
MAJ-1430	WATER DISPOSAL WELL INJECTION FILTER #2
NAP-1440	DOMESTIC WATER HEATER (ELECTRIC)
MBP-1450	SPHERE RECEIVER - LINE B
BV-1454	4" Ball Valve
FSV-1451	2" Check Valve
BV-1456	2" Ball Valve
BV-1451	16" Inlet Valve
MBP-1460	SHPERE RECEIVER - LINE A
BV-1461	16" Inlet Valve
BV-1463	3" Ball Valve
BV-1467	4" Ball Valve
FSV-1466	2" Check Valve
BV-1466	2" Ball Valve
MAJ-1490	STATION FUEL GAS FILTER
MBP-1500	PIG RECEIVER - CVGS PIPELINE
BV-1503	4" Ball Valve
BV-1504	8" Ball Valve
BV-15010	4" Ball Valve
BV-1509	2" Ball Valve
FSV-1501	2" Check Valve
BV-1502	16" Ball Valve
BV-1501	24" Ball Valve
BDV-1507	8" Ball Valve
BV-1507	2" Ball Valve

MBL-1540	DOMESTIC WATER WELL BLADDER TANK
MAJ-1550	DOMESTIC WATER WELL FILTER
MBJ-1560	ENGINE AND COMPRESSOR FRAME OIL STORAGE TANK
MBJ-1570	COMPRESSOR CYLINDER OIL STORAGE TANK
MBU-1580	UNIT #3 STARTING AIR SILENCER
MBU-1590	UNIT #2 STARTING AIR SILENCER
MBU-1600	UNIT #1 STARTING AIR SILENCER
HAL-2040	UNIT #1 UTILITY COOLER
HAL-2050	UNIT #2 UTILITY COOLER
HAL-2060	UNIT #3 UTILITY COOLER
ABJ-3130	COMPRESSOR STATION CONDENSATE TANK
ABJ-3140	USED OIL STORAGE TANK
ABJ-3150	ENGINE/COMPRESSOR LUBE OIL TRANSFER TANK
AAY-3160	COMPRESSED AIR CONDENSATE HOLDING TANK
ABJ-3170	METHANOL STORAGE TANK
ABJ-3180	USED TRIETHYLENE GLYCOL (TEG) STORAGE TANK
ABJ-3190	UREA TANK
ABJ-3210	SEWAGE HOLDING TANK
ABJ-3220	TRIETHYLENE GLYCOL (TEG) STORAGE TANK
ABJ-3230	ENGINE COOLING WATER/GLYCOL STORAGE TANK
ABJ-3240	USED ENGINE COOLING WATER/GLYCOL STORAGE TANK
ABJ-3250	UNIT #1 COMPR. CYL. DISTANCE PIECE DRAIN TANK
ABJ-3260	UNIT #2 COMPR. CYL. DISTANCE PIECE DRAIN TANK
ABJ-3270	UNIT #3 COMPR. CYL. DISTANCE PIECE DRAIN TANK
ABF-3310	WEST VAPOR REMOVAL INLET SCRUBBER
ABF-3320	EAST VAPOR REMOVAL INLET SCRUBBER
EAP-4010	ENGINE FUEL GAS HEATER
BV-4012	3" Ball Valve
BV-4011	3" Ball Valve
BV-4012	3" Ball Valve
BV-4014	2" Ball Valve

BV-4015	2" Ball Valve
MAJ-1490	Fuel Filter Strainer
BV-1491	Filter Inlet
BV-1492	Filter Outlet
PCV-0101	Fuel Pressure Regulator
PCV-0102	Fuel Pressure Regulator
PCV-0103	Fuel Pressure Regulator
PCV-0104	Fuel Pressure Regulator
BV-0101	2" Ball Valve
BV-0102	2" Ball Valve
BV-0105	2" Ball Valve
BV-0110	2" Ball Valve
CAE-5010	UNIT #1 COMPRESSOR
RAE-5010	UNIT #1 ENGINE
UCP-5011	UNIT #1 UNIT CONTROL PANEL
UCP-5012	UNIT #1 SCR CONTROL PANEL
CAE-5020	UNIT #2 COMPRESSOR
RAE-5020	UNIT #2 ENGINE
UCP-5021	UNIT #2 UNIT CONTROL PANEL
UCP-5022	UNIT #2 SCR CONTROL PANEL
CAE-5030	UNIT #3 COMPRESSOR
RAE-5030	UNIT #3 ENGINE
UCP-5031	UNIT #3 UNIT CONTROL PANEL
UCP-5032	UNIT #3 SCR CONTROL PANEL

Notes:
Daily audio and visual screenings are conducted on all components and quarterly screenings in accordance with USEPA Method 21 with a flame ionization detector (FID) are conducted on all components

Appendix F – CARB and CVGS Letters

CALIFORNIA
AIR RESOURCES BOARD

Mary D. Nichols, Chair
Jared Blumenfeld, CalEPA Secretary
Gavin Newsom, Governor

February 8, 2019

Mr. Dennis Chappell
Manager – Storage Ops
Central Valley Gas Storage
5285 McAusland Road
Princeton, California 95970

Dear Mr. Chappell:

I am writing to inform you of the review status for your submitted *Methane Ambient Air Monitoring and Leak Screening Plan for* ***Central Valley Gas Storage*** (received on June 13, 2018), which was required under the California Air Resources Board's (CARB) Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities Regulation (Oil and Gas Regulation).

Based on the reviews conducted jointly by our staff and the staff of the Colusa County Air Pollution Control District (CCAPCD), we have determined that the proposed plan fulfills the monitoring requirements as specified in the Oil and Gas Regulation and is therefore approved for implementation.

Although the regulation allows for 180 days from the date of this letter to begin monitoring, we would appreciate it if you could expedite the beginning of your ambient air monitoring, to the extent feasible. This will allow for the collection of the required 12 months of baseline ambient air data as soon as possible.

We request that you inform us once the monitoring program is operational. Not only will that notify us of the start of the 12 month data collection period, but at that time this approved plan will replace any leak detection protocols for your facility that are complying with the Department of Conservation's Division of Oil, Gas, and Geothermal Resources Underground Gas Storage Project Regulations (Section 1726.7, effective on October 1, 2018).

If you have any questions, please contact Jim Nyarady, PE, Manager of the Oil and Gas Section, at (916) 322-8273 or via email at Jim.Nyarady@arb.ca.gov.

Sincerely,

for FVV

Floyd V. Vergara, Esq., P.E.
Chief, Industrial Strategies Division

cc: Jim Nyarady, Manager
Oil and Gas Section

BURNS & McDONNELL

August 5, 2019

Mr. Jim Nyarady
Manager, Oil & Gas Section
California Air Resources Board
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Sacramento, California 95814
oilandgas@arb.ca.gov

Re: Notification of Operational Monitoring Program for Central Valley Gas Storage Methane Ambient Air Monitoring and Leak Screening Plan

Dear Mr. Nyarady:

Burns & McDonnell Engineering received a California Air Resources Board letter dated February 8, 2019, regarding approval of the *Methane Ambient Air Monitoring and Leak Screening Plan* (MAAMLSP) for Central Valley Gas Storage, submitted on June 13, 2018.

On behalf of Central Valley Gas Storage, and in accordance with the requirements of California Code of Regulations Title 17 Section 95668(h) for underground natural gas storage facilities, Burns & McDonnell is pleased to submit this notification that the CVGS monitoring program will be operational effective August 5, 2019. As stipulated in the MAAMLSP, the first 12 months of measurements will be collected to establish baseline concentrations.

If you have any questions or need additional information, please do not hesitate to contact me at (626) 817-7911 or achristensen@burnsmcd.com.

Sincerely,

Aaron J. Christensen, PE
Senior Engineer
Enclosure: *Methane Ambient Air Monitoring and Leak Screening Plan*

cc: Jim Nyarady, California Air Resources Board, oilandgas@arb.ca.gov
Dennis Chappell, CVGS
John Boehme, CVGS
Keith Bodger, CVGS
Robert Cornell, CVGS

Crystal Chang, Burns & McDonnell
Nancy Pratheepmanowong, Burns & McDonnell
Galen Kenoyer, Burns & McDonnell

BURNS & McDONNELL

September 2, 2020

Mr. Jim Nyarady
Manager, Oil & Gas Section
California Air Resources Board
1001 I Street
Sacramento, California 95814
oilandgas@arb.ca.gov

via email

Re: Submittal of Baseline Concentrations for Methane Ambient Air Monitoring
Central Valley Gas Storage, Princeton, California

Dear Mr. Nyarady:

On August 5, 2019, Burns & McDonnell Engineering Company (Burns & McDonnell) submitted a notification to the California Air Resources Board (CARB) indicating that the Central Valley Gas Storage (CVGS) methane monitoring program would become operational effective August 5, 2019. As of that date, CVGS began a 1-year period of measurements for characterization of baseline methane concentrations at the facility.

On behalf of CVGS, and in accordance with the requirements of California Code of Regulations Title 17 Section 95668(h) for underground natural gas storage facilities, Burns & McDonnell is pleased to submit this report regarding the baseline concentrations after gathering 12 months of ambient methane data. This report includes an electronic zip file attached with this submittal via email containing the raw ambient methane data used to determine the baselines, the calculated hourly averages, and a compilation of data gaps greater than 15 minutes.

DATA COLLECTION

As stipulated in the *Methane Ambient Air Monitoring and Leak Screening Plan* (MAAMLSP) submitted to CARB on June 13, 3018 and approved by CARB on February 8, 2019, 12 months of ambient concentrations of methane in the air were collected around the perimeter of the facility using a system of stationary automated instruments to perform continuous, real-time measurements. This data was transmitted and recorded using a digital data telemetry system, with data accessible to onsite and remote project personnel.

BASELINE CALCULATIONS

The calculated baseline methane concentrations and alarm detection limits are presented in Table 1 (below). These results are based on methane data collected from August 5, 2019 through August 4, 2020. Per the MAAMLSP and as required by the regulation, baseline concentrations are calculated as the 98th percentile of hourly averages of 12 months of continuous data. The alarm detection limits are four times the baseline concentration.

Table 1: Methane Baseline Concentrations and Alarm Detection Limits

Station	Baseline Concentration[(a)] (parts per million [ppm])	Alarm Detection[(a)] Limit (ppm)
Station 1	6.3	25
Station 2	6.0	24
Station 3	6.1	24
Station 4	6.0	24

(a) Baselines and alarm concentrations are rounded to two significant digits, as raw data is reported as two significant digits.

Per the MAAMLSP and in accordance with the regulation, when the active monitoring program begins, an alarm will be triggered when a downwind sensor reads greater than or equal to four times the baseline concentration for a period of 15 minutes or longer, with a measurement time resolution of once per minute.

DATA GAPS

Data gaps can occur for several reasons such as loss of connectivity, power outages, brown outs, and other variables. For completeness, Appendix A lists the gaps in monitoring for periods of time greater than or equal to 15 minutes during the baseline calculation period from August 5, 2019 through August 4, 2020.

Table 2 summarizes the total number of data gaps, maximum gap length, total time unaccounted for, and percentage of data missing.

Table 2: Data Gaps (≥ 15 min) from Aug. 5, 2019 to Aug. 4, 2020

Station	Total Number of Gaps	Maximum Gap Length (H:mm:ss)	Total Time Missing (H:mm:ss)	Percentage of Data Missing[a]
Station 1	53	21:47:04	139:17:51	1.6%
Station 2	32	12:53:55	70:38:09	0.8%
Station 3	14	12:53:53	35:02:09	0.4%
Station 4	35	12:53:59	81:34:29	0.9%

(a) Percentage of Data Missing was calculated by dividing the Total Time Missing by 8,784 (hours per Leap Year).

The percentage of ambient methane concentrations missing was less than two percent at each of the stations. These data gaps would have a negligible impact on the 12 months of data used to

Mr. Jim Nyarady
California Air Resources Board
September 2, 2020

calculate the baseline concentrations. Therefore, no interpolation between gaps was performed and baselines were calculated with the data available.

If you have any questions or need additional information, please do not hesitate to contact Crystal Chang at (626) 817-7912 (cichang@burnsmcd.com).

Sincerely,

Kathrine R. Muirhead, EIT
Assistant Environmental Engineer

Crystal Chang, PE
Project Manager

Attachments:
Appendix A - Data Gaps Greater Than 15 Minutes
Appendix B - Electronic copies of the raw data, hourly averages, and data gaps

cc: Kelly Yonn, California Air Resources Board
Dennis Chappell, CVGS
John Boehme, CVGS
Keith Bodger, CVGS
Robert Cornell, CVGS
Aaron Christensen, Burns & McDonnell
Crystal Chang, Burns & McDonnell
Galen Kenoyer, Burns & McDonnell

APPENDIX A - DATA GAPS GREATER THAN 15 MINUTES

Table 1: Station 1 Data Gaps

Start Date and Time of Gap	End Date and Time of Gap	Gap Length (H:mm:ss)
2019-08-22 08:42:10	2019-08-22 08:59:05	0:16:55
2019-08-28 18:38:10	2019-08-29 02:35:05	7:56:55
2019-09-19 02:32:47	2019-09-19 06:30:01	3:57:14
2019-09-24 13:20:19	2019-09-24 14:10:26	0:50:07
2019-10-27 00:16:26	2019-10-27 01:33:00	1:16:34
2019-10-27 01:57:46	2019-10-27 12:00:56	10:03:10
2019-10-27 12:07:43	2019-10-27 12:53:22	0:45:39
2019-10-27 13:34:51	2019-10-27 14:35:10	1:00:19
2019-11-04 09:22:26	2019-11-04 11:35:48	2:13:22
2019-11-07 12:06:07	2019-11-07 14:16:44	2:10:37
2019-11-20 07:08:41	2019-11-20 07:55:59	0:47:18
2019-11-20 09:56:15	2019-11-20 10:21:32	0:25:17
2019-11-20 11:07:21	2019-11-20 11:35:23	0:28:02
2019-11-24 12:08:28	2019-11-24 12:30:58	0:22:30
2019-11-28 08:44:29	2019-11-28 12:32:39	3:48:10
2019-11-28 12:32:39	2019-11-28 14:20:00	1:47:21
2019-12-09 10:28:07	2019-12-09 11:41:38	1:13:31
2019-12-10 04:32:57	2019-12-10 05:35:16	1:02:19
2019-12-10 13:55:29	2019-12-10 17:35:18	3:39:49

2020-02-08 19:22:00	2020-02-08 21:45:00	2:23:00
2020-02-11 15:40:00	2020-02-11 17:35:00	1:55:00
2020-02-11 18:21:00	2020-02-11 20:35:00	2:14:00
2020-02-12 16:00:00	2020-02-12 17:35:00	1:35:00
2020-02-15 01:23:00	2020-02-15 11:35:00	10:12:00
2020-02-17 16:30:00	2020-02-17 16:48:00	0:18:00
2020-02-21 04:14:00	2020-02-21 06:23:00	2:09:00
2020-02-21 06:23:00	2020-02-21 07:05:00	0:42:00
2020-02-25 16:44:00	2020-02-25 17:06:00	0:22:00
2020-03-02 10:59:33	2020-03-03 08:46:37	21:47:04
2020-03-08 01:59:57	2020-03-08 03:00:13	1:00:16
2020-03-12 18:03:13	2020-03-12 19:42:49	1:39:36
2020-03-13 17:32:36	2020-03-13 19:27:41	1:55:05
2020-03-16 07:24:37	2020-03-16 07:39:46	0:15:09
2020-03-25 10:14:53	2020-03-25 10:36:20	0:21:27
2020-05-01 20:09:02	2020-05-01 22:01:07	1:52:05
2020-05-08 07:59:43	2020-05-08 10:13:50	2:14:07
2020-05-10 07:09:05	2020-05-10 10:08:54	2:59:49
2020-05-19 16:47:43	2020-05-19 17:19:00	0:31:17
2020-05-22 19:19:29	2020-05-22 20:46:09	1:26:40
2020-05-23 22:51:27	2020-05-24 07:04:14	8:12:47

2020-05-27 05:54:19	2020-05-27 07:15:09	1:20:50
2020-05-27 23:46:56	2020-05-28 00:53:30	1:06:34
2020-05-29 08:00:18	2020-05-29 09:33:27	1:33:09
2020-05-30 09:43:18	2020-05-30 09:59:21	0:16:03
2020-06-15 06:25:51	2020-06-15 07:00:46	0:34:55
2020-06-16 09:35:14	2020-06-16 11:48:55	2:13:41
2020-06-16 11:49:10	2020-06-16 15:38:57	3:49:47
2020-06-16 15:40:25	2020-06-16 17:03:06	1:22:41
2020-06-23 03:29:25	2020-06-23 04:30:36	1:01:11
2020-07-14 23:35:12	2020-07-15 12:29:00	12:53:48
2020-07-22 04:53:24	2020-07-22 05:44:48	0:51:24
2020-07-22 05:46:02	2020-07-22 07:31:20	1:45:18
2020-07-27 16:14:19	2020-07-27 16:32:18	0:17:59

Table 2: Station 2 Data Gaps

Start Date and Time of Gap	End Date and Time of Gap	Gap Length (H:mm:ss)
2019-08-22 08:42:13	2019-08-22 08:59:07	0:16:54
2019-08-28 18:38:11	2019-08-29 02:35:17	7:57:06
2019-09-05 13:30:44	2019-09-05 13:55:00	0:24:16
2019-10-27 00:15:04	2019-10-27 05:34:23	5:19:19
2019-10-27 07:11:48	2019-10-27 08:34:22	1:22:34

2019-10-27 12:07:39	2019-10-27 12:25:46	0:18:07
2019-10-27 13:34:52	2019-10-27 14:35:11	1:00:19
2019-11-04 09:22:26	2019-11-04 11:34:18	2:11:52
2019-11-07 12:06:07	2019-11-07 14:16:58	2:10:51
2019-11-20 09:56:30	2019-11-20 10:21:31	0:25:01
2019-11-20 11:07:15	2019-11-20 11:35:17	0:28:02
2019-12-10 04:33:07	2019-12-10 05:35:11	1:02:04
2019-12-10 13:55:31	2019-12-10 17:35:18	3:39:47
2020-02-11 15:40:38	2020-02-11 17:35:20	1:54:42
2020-02-11 18:21:13	2020-02-11 20:35:20	2:14:07
2020-02-12 16:00:19	2020-02-12 17:35:15	1:34:56
2020-02-15 01:23:23	2020-02-15 11:35:17	10:11:54
2020-02-17 16:30:36	2020-02-17 16:48:08	0:17:32
2020-03-08 01:59:57	2020-03-08 03:00:13	1:00:16
2020-03-16 07:24:36	2020-03-16 07:39:45	0:15:09
2020-05-01 20:09:04	2020-05-01 22:01:07	1:52:03
2020-05-08 07:59:46	2020-05-08 10:18:38	2:18:52
2020-05-10 07:09:10	2020-05-10 09:59:27	2:50:17
2020-05-19 16:47:45	2020-05-19 17:21:16	0:33:31
2020-05-22 19:19:27	2020-05-22 20:46:07	1:26:40
2020-05-27 05:54:24	2020-05-27 07:15:13	1:20:49

2020-05-27 23:46:53	2020-05-28 00:53:33	1:06:40
2020-05-30 09:43:26	2020-05-30 09:59:24	0:15:58
2020-06-15 06:26:01	2020-06-15 07:00:47	0:34:46
2020-06-23 03:29:19	2020-06-23 04:30:37	1:01:18
2020-07-02 09:05:47	2020-07-02 09:24:19	0:18:32
2020-07-14 23:35:09	2020-07-15 12:29:04	12:53:55

Table 3: Station 3 Data Gaps

Start Date and Time of Gap	End Date and Time of Gap	Gap Length (H:mm:ss)
2019-08-14 12:57:46	2019-08-14 13:20:16	0:22:30
2019-10-26 23:22:19	2019-10-27 11:32:59	12:10:40
2019-10-27 12:03:02	2019-10-27 12:38:54	0:35:52
2020-03-08 01:59:45	2020-03-08 03:00:00	1:00:15
2020-05-01 20:09:07	2020-05-01 22:00:55	1:51:48
2020-05-08 07:59:53	2020-05-08 08:36:09	0:36:16
2020-05-10 07:08:49	2020-05-10 07:40:19	0:31:30
2020-05-19 16:47:45	2020-05-19 17:21:32	0:33:47
2020-05-22 19:19:22	2020-05-22 20:46:10	1:26:48
2020-05-27 23:46:57	2020-05-28 00:53:44	1:06:47
2020-05-30 09:43:23	2020-05-30 09:59:23	0:16:00
2020-06-15 06:25:52	2020-06-15 07:00:38	0:34:46

2020-06-23 03:29:18	2020-06-23 04:30:35	1:01:17
2020-07-14 23:35:04	2020-07-15 12:28:57	12:53:53

Table 4: Station 4 Data Gaps

Start Date and Time of Gap	End Date and Time of Gap	Gap Length (H:mm:ss)
2019-08-14 13:16:28	2019-08-14 13:33:31	0:17:03
2019-08-28 18:38:01	2019-08-29 02:35:11	7:57:10
2019-09-18 11:22:15	2019-09-18 11:40:10	0:17:55
2019-10-26 23:26:10	2019-10-27 11:36:40	12:10:30
2019-10-27 12:06:53	2019-10-27 12:38:46	0:31:53
2019-10-27 13:35:03	2019-10-27 14:35:20	1:00:17
2019-11-04 09:22:26	2019-11-04 11:32:09	2:09:43
2019-11-07 12:06:12	2019-11-07 14:17:01	2:10:49
2019-11-20 09:56:23	2019-11-20 10:21:40	0:25:17
2019-11-20 11:07:13	2019-11-20 11:35:15	0:28:02
2019-12-10 04:33:02	2019-12-10 05:35:19	1:02:17
2019-12-10 13:55:26	2019-12-10 17:35:25	3:39:59
2019-12-13 12:30:35	2019-12-13 15:14:47	2:44:12
2019-12-16 15:24:42	2019-12-16 16:02:56	0:38:14
2020-02-11 15:40:43	2020-02-11 17:35:11	1:54:28
2020-02-11 18:21:23	2020-02-11 20:35:11	2:13:48

2020-02-12 16:00:21	2020-02-12 17:35:25	1:35:04
2020-02-15 01:23:21	2020-02-15 11:35:03	10:11:42
2020-02-17 16:30:31	2020-02-17 16:48:17	0:17:46
2020-03-08 01:59:58	2020-03-08 03:00:14	1:00:16
2020-03-16 07:24:38	2020-03-16 07:39:46	0:15:08
2020-05-01 20:09:02	2020-05-01 22:01:07	1:52:05
2020-05-08 07:59:51	2020-05-08 10:19:40	2:19:49
2020-05-10 07:09:11	2020-05-10 10:08:50	2:59:39
2020-05-15 05:38:40	2020-05-15 06:30:20	0:51:40
2020-05-15 06:30:20	2020-05-15 07:29:45	0:59:25
2020-05-19 16:47:43	2020-05-19 17:21:40	0:33:57
2020-05-22 19:19:32	2020-05-22 20:46:09	1:26:37
2020-05-27 05:54:18	2020-05-27 07:15:06	1:20:48
2020-05-27 23:46:53	2020-05-28 00:53:31	1:06:38
2020-05-30 09:43:26	2020-05-30 09:59:24	0:15:58
2020-06-15 06:25:58	2020-06-15 07:00:46	0:34:48
2020-06-23 03:29:20	2020-06-23 04:30:51	1:01:31
2020-07-02 09:05:37	2020-07-02 09:21:39	0:16:02
2020-07-14 23:35:00	2020-07-15 12:28:59	12:53:59

CALIFORNIA AIR RESOURCES BOARD

Gavin Newsom, Governor
Jared Blumenfeld, CalEPA Secretary
Liane M. Randolph, Chair

March 1, 2021

Dennis Chappell
Manager, Storage Operations
Central Valley Gas Storage
5285 McAusland Road
Princeton, California 95970
dchappel@southernco.com

Dear Mr. Chappell:

I am writing to respond to your *Submittal of Baseline Concentrations for Methane Ambient Air Monitoring* (report received on September 2, 2020) and *Number of Potentially Reportable Alarms during the Baseline Monitoring Period* (memo received on February 19, 2021) for Central Valley Gas Storage, which were required under California Air Resources Board's (CARB) Greenhouse Gas Emission Standards for Crude Oil and Natural Gas Facilities Regulation (Oil and Gas Regulation).

Based on the review of the submitted documents, we have accepted: (1) the baseline calculations using the 98th percentile of continuous 1-hour average concentrations, and (2) the application of 15-minutes or longer, with a measurement time resolution of once per minute, for the alarm trigger.

CARB will allow a 30-day implementation period from the date of this letter for you to program the alarm systems according to the approved baseline methane concentrations and alarm triggers. We request that you notify us once the monitoring program is fully operational, initiating the start of data collection that is required to be reported annually to CARB on July 1, 2022, for 2021 data, and every July 1 thereafter, under the Oil and Gas Regulation.

If you have any questions, please contact Jim Nyarady, PE, Manager of the Oil and Gas Section, via email at Jim.Nyarady@arb.ca.gov.

Sincerely,

Carolyn Lozo

Carolyn Lozo, Chief
Oil and Gas and GHG Mitigation Branch

cc: See next page.

cc: Jim Nyarady, Manager, Oil and Gas Section

Aaron Christensen, Environmental Consultant, Burns & McDonnell
Achristensen@burnsmcd.com

Don Kitamura, Deputy Air Pollution Control Officer, Colusa County Air Pollution Control District
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John Boehme, Manager, Regulatory Affairs, Central Valley Gas Storage
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Keith Bodger, Manager, Environmental Programs, Central Valley Gas Storage
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