Report on Quarterly Air Monitoring, Area IV, Fourteenth Quarter 2021

Santa Susana Field Laboratory Ventura County, California

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Prepared for:
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Prepared by:
North Wind Portage, Inc.

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Santa Susana Field Laboratory
Ventura County, CA

December 2021

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Prepared for:
U.S. Department of Energy
4100 Guardian Street, Suite 160
Simi Valley, California 93063

Prepared by:
North Wind Portage, Inc.
1425 Higham Street
Idaho Falls, Idaho 83402

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EXECUTIVE SUMMARY

This report summarizes the United States Department of Energy (DOE) air monitoring activities conducted during the fourteenth quarter (Q14) of the monitoring period (July 1, 2021, to September 30, 2021) at Area IV within the Santa Susana Field Laboratory (SSFL), located in Ventura County, California. The area specifically discussed within this report is the DOE portion, Area IV of SSFL, known as the Energy Technology Engineering Center (ETEC). Year one of the Baseline Air Monitoring Program consisted of Quarter 1 through Quarter 4. Year two consisted of Quarter 5 through Quarter 7. Year 3 consisted of Quarter 8 through Quarter 11. The program is continuing for a fourth year, which consists of Quarter 12 through Quarter 15.

This quarterly report has been developed by North Wind Portage, Inc., on behalf of DOE in cooperation with The Boeing Company (Boeing) and the National Aeronautics and Space Administration (NASA), as part of the Baseline Air Monitoring Program.

In accordance with *the Final Baseline Air Monitoring Work Plan, Santa Susana Field Laboratory, Ventura County, California* (NASA 2017), the responsible parties are monitoring for particulate matter between 2.5 and 10 microns in aerodynamic diameter (PM_{10}), volatile organic compounds (VOCs), and radionuclides at air monitoring stations DOE-1, DOE-2, DOE-3, and DOE-4 encompassing the ETEC, Area IV portion of SSFL. Having developed the baseline levels for PM_{10}, VOCs, and radionuclides helps distinguish between levels that naturally occur or were previously present at the ETEC site and if onsite remediation activities produce elevated results. Air monitoring will be continued throughout remediation activities to be able to compare results from onsite remediation activities to baseline data in the Annual Air Monitoring Reports.

The following air monitoring activities conducted during Q14 2021 by DOE within Area IV are summarized in this report:

- Collected meteorological data from one location (DOE-4);
- Collected PM_{10} data from four locations (DOE-1 through DOE-4);
- Collected air samples from four locations (DOE-1 through DOE-4) for VOC laboratory analysis; and
- Collected radionuclide samples for laboratory analysis from four locations (DOE-1 through DOE-4).

Meteorological data, PM_{10}, and radionuclide data all met the data completeness goal of 80% and VOC data met the completeness goal of 85% for Q14. The fifteenth quarter of the air monitoring program will continue, beginning October 1, 2021. Data collected during remediation activities will be compared to the baseline conditions in the year 4 annual report.

The following site activities were conducted during Q14 by DOE within Area IV:

- Quarterly site-wide groundwater level monitoring
- Demolition of contract line item number (CLIN) 8 facilities
- CDM Smith conducted groundwater sampling activities at the Former Sodium Disposal Facility as a part of groundwater interim measures
- Surveillance and maintenance
- Roof cover installation on building 4024 by Willkompany.

CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
°F	degrees Fahrenheit
µCi	microcurie(s)
µg/m^3	microgram(s) per cubic meter
Boeing	The Boeing Company
CAAQS	California Ambient Air Quality Standard
CFR	Code of Federal Regulations
CLIN	contract line item number
DASC	Data Assessment Statistical Calculator
DOE	U.S. Department of Energy
DTSC	State of California Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
ETEC	Energy Technology Engineering Center
GC	gas chromatography
Hg	mercury
HHRA	Human Health Risk Assessment
m	meter(s)
m/sec	meter(s) per second
mb	millibar(s)
MDC	minimum detectable concentration
mL	milliliter(s)
mph	miles per hour
MS	mass spectrometry
NAAQS	National Ambient Air Quality Standard
NASA	National Aeronautics and Space Administration
NIST	National Institute of Standards and Technology
pCi	picocurie(s)
PM_{10}	particulate matter less than 10 microns in aerodynamic diameter
Q14	fourteenth quarter
QA	quality assurance
QC	quality control
RAWS	Remote Automatic Weather Stations
RPD	relative percent difference
RSL	regional screening level
SDG	sample delivery group
SSFL	Santa Susana Field Laboratory
VOC	volatile organic compound

1. INTRODUCTION

National Aeronautics and Space Administration (NASA), The Boeing Company (Boeing), and the U.S. Department of Energy (DOE), also known as the responsible parties, are performing air monitoring at the Santa Susana Field Laboratory (SSFL) site located in Ventura County, California. The SSFL is a business segment of Boeing. SSFL operates the 2,849-acre site located atop a range of hills between the Simi and San Fernando valleys, north of Los Angeles. The westernmost 290 acres of the SSFL, known as Area IV, contains both DOE and Boeing facilities. The DOE portion is mainly contained within the 90 acres known as the Energy Technology Engineering Center (ETEC).

When opened in the late 1950s, ETEC was ideally remote from population centers to enable development of security-sensitive projects. These projects supported research for DOE and its predecessor agencies for nuclear research and energy development. Area IV includes buildings that house test apparatus for large-scale heat transfer and fluid mechanics experiments, mechanical and chemical test facilities, office buildings, and auxiliary facilities.

Air monitoring is being conducted in accordance with the *Final Baseline Air Monitoring Work Plan, Santa Susana Field Laboratory, Ventura County, California* (NASA 2017), which was submitted to the State of California Department of Toxic Substances Control (DTSC) on September 21, 2017. DTSC approved the Work Plan. Final locations of the air monitoring locations were approved by DTSC on January 30, 2018 (DTSC 2018).

The objective of the Air Monitoring Program is to evaluate project conditions and provide a basis for determining the magnitude of deviation from those baseline conditions that may result from onsite remediation activities (project) at SSFL. Responsible parties are monitoring for particulate matter between 2.5 and 10 microns in aerodynamic diameter (PM_{10}), and volatile organic compounds (VOCs), at 14 locations at SSFL. Data were collected for four perimeter samplers (DOE-1 through DOE-4) and analyzed for gross alpha and gross beta. Individual radionuclide concentrations were determined by analysis at an offsite laboratory for these same four locations. Meteorological data are also collected as a part of the Air Monitoring Program.

Figure 1 shows the air monitoring locations for the Air Monitoring Program. These locations were selected based on the areas to be remediated, with consideration of winds in the area, topographic features, and accessibility. The air monitoring sites were also selected based on guidance obtained from the U.S. Environmental Protection Agency's (EPA's) *Quality Assurance Handbook for Air Pollution Measurement Systems*, Volume II, Ambient Air Monitoring Program (EPA 2017) and *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000). Sites were evaluated per 40 Code of Federal Regulations (CFR) 58, Appendix C – Ambient Air Quality Monitoring Methodology. DOE is responsible for DOE-1, DOE-2, DOE-3, and DOE-4 of the 14 monitoring locations, represented in Figure 1. VOCs, PM_{10}, and radionuclides are monitored at the four DOE monitoring locations, and meteorological conditions are monitored at the DOE-4 location. The DOE monitoring locations DOE-1 through DOE-4 are shown in Figure 2.

This report summarizes the fourteenth quarter (Q14) quarterly results and quality assurance (QA) activities performed between July 1, 2021, and September 30, 2021.

1.1 Regional Climate and Wind Direction

The climate in the SSFL area is characterized as "Mediterranean." The mean temperature during the winter months is approximately 50 degrees Fahrenheit (°F) and the mean temperature in the summer months is approximately 70°F. Based on climate data between 2019 and 2020 from Weather Currents, average rainfall is on the order of 15.9 inches per year. The majority of the rainfall occurs between December and April with January and February being the wettest months.

The Simi Valley has recorded the driest year on record (through the first three quarters) in 2021, receiving only 40% of the normal recorded rainfall totals so far in 2021.

The average hourly wind speed in Simi Valley varies significantly by season. The more turbulent part of the year lasts for 6 months, from November to April, with average western wind speeds of more than 7 miles per hour (mph). The calmer time of year lasts for 6 months, with northerly winds from May to October.

During the fall, winter, and spring, Santa Ana winds can blow from the north or northeast in excess of 35 mph.

2. SUMMARY

This report summarizes the air monitoring data collected during the Q14 reporting period (July 1, 2021, through September 30, 2021). Elevated air sampling levels were recorded during Q14.

Quality objectives and data completeness were met for all meteorological, PM_{10}, VOC, and radionuclide data for Q14 of the Air Monitoring Program.

Urban background data compared with air monitoring data indicate that the PM_{10} concentrations measured at stations DOE-1, DOE-2, DOE-3, and DOE-4 during Q14 are comparable to the PM_{10} concentrations measured at stations characterizing urban background. Other sources that emit VOC characteristics are motor vehicle emissions, fossil fuel combustion, and wildfires. The results are reflected when considering SSFL site's urban background and relatively remote location from vehicle traffic. PM_{10} concentrations exceeded the California Ambient Air Quality Standard (CAAQS; 50 micrograms per cubic meter [$\mu g/m^3$]) one time, at DOE-4 (August 7, 2021), but the concentration was below the National Ambient Air Quality Standard (NAAQS; 150 $\mu g/m^3$). The highest readings for this day happened prior to work hours and after work was completed for the day.

During Q14 eight VOC analytes were detected above the EPA regional screening level (RSL). Ethyl acetate was detected at DOE-1, -2, and -4, Benzene was detected at DOE-2, Acrolein was detected at DOE-4, and cis-1,2-Dichloroethene was detected at DOE-2 and DOE-3. Ethyl acetate is a chemical used in glues, nail polish, and decaffeination processes. There is no source for ethyl acetate on site. Acrolein arises from vehicle emissions, wood combustion, smoking, and other sources. Cis-1,2-Dichloroethene can be found in solvents and waxes as well as rubber and refrigerants. Benzene can be found in groundwater and occurs naturally.

During Q14, detections for gross alpha and gross beta that exceeded the minimum detectable concentration (MDC) are all naturally occurring radionuclides. Detections are expected because the results are calculated at a 95% confidence level. No man-made radionuclides that are contaminants of concern at ETEC were detected above background levels. All radiological data reported for the air filter samples are naturally occurring, or a part of global fallout.

Data collected during Q14 agrees with data collected, analyzed, and reported by the State of California DTSC, Los Angeles County Emergency Response Organization, the DOE Emergency Response organization, or other Multi-Agency Task Forces. Air monitoring at Area IV of the SSFL is to be continued starting October 1, 2021, for the fifteenth quarter of the Air Monitoring Program.

Site activities during Q14 included quarterly site-wide groundwater level monitoring, demolition of contract line item number (CLIN) 8 facilities, roof cover installation on building 4024 by Willkompany, surveillance and maintenance, and groundwater sampling activities conducted by CDM Smith at the Former Sodium Disposal Facility as part of the groundwater interim measures. Work area air monitoring was conducted during asbestos abatement, confirming that there was no airborne contamination resulting from abatement activities. Trucking activities were not conducted near the perimeter air monitoring stations.

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3. ANALYTICAL SAMPLING EVENTS

VOCs are collected according to the EPA Toxic Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)* (EPA 1999). Twenty-four-hour time-integrated samples are collected into Summa canisters via a flow controller and sent to an offsite laboratory for analysis. VOCs are collected every other week. There were six VOC sampling events in this reporting period with six field duplicate samples collected during this reporting period.

During Q14, radionuclide samples were collected at four perimeter sampler locations, DOE-1 through DOE-4. These samples were collected on glass fiber (Type A/E) filters that are changed twice a week. After a minimum 120-hour holding time to allow the decay of short-lived radon and thoron daughter products, the samples are simultaneously counted for gross alpha and beta activity with a low-background, thin-window, gas-flow proportional-counting system continually purged with P-10 argon/methane counting gas over a preset time interval. There were 108 airborne radioactivity filter samples collected in Q14 — 27 each for DOE-1, DOE-2, DOE-3, and DOE-4. Following analysis for gross alpha and gross beta radiation, sample filters were combined to form one composite sample representative of each location. The four composite samples were then analyzed for individual radionuclides at an offsite laboratory.

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4. DATA

Sections 4.1 through 4.4 discuss Q14 air monitoring data.

4.1 Meteorological Data

General Summary

Meteorological data, also called weather data, is being collected as part of the ETEC cleanup and restoration effort. This information, particularly the wind direction and wind speed, can be used to help understand how dust and other air pollutants from the site are carried by the wind to possibly affect nearby public and residential areas. This is especially important when the E-BAM particulate monitors at the site detect higher-than-normal amounts of dust in the air. Scientific computer models can be used with this weather data in association with the particulate monitoring data to describe the air quality for the communities near the ETEC site. However, before the weather data can be used with the computer models it must first be tested for completeness and accuracy. A detailed description of the weather data collection and quality testing is provided in the following paragraphs.

Monitored meteorology parameters at the DOE-4 station included wind speed, wind direction, air temperature at 2 meters (m) and 10 m, relative humidity, precipitation, barometric pressure, and solar radiation. In addition, statistical parameters provided by the data logger included delta temperature (i.e., defined as the 10-m temperature minus the 2-m temperature), maximum wind speed (i.e., wind gust), and standard deviation of wind direction. Observations were recorded at 15-minute intervals for :00, :15, :30, and :45 minutes each hour. There were 92 days in this reporting period (Q14), which covers July 1, 2021, to September 30, 2021, with a total of 8,832 possible 15-minute observations. This is the third quarter in Year 4 of the Air Monitoring program.

Data Validation and Statistics

Data validation screening was performed on the recorded meteorological observations pursuant to EPA's *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000), Table 8-4 (Suggested Data Screening Criteria) and Table 8-3 (Suggested Quality Control Codes). Validation screening provided the basis for evaluating data completeness and for determining sensor performance and/or maintenance status. Validation was performed following each weekly data download. Data validation quality control codes applied to the meteorological observations are defined in Table 1.

Table 1. Data screening quality control codes for meteorological data.

Code	Meaning	Description (as used for ETEC meteorological data validation)
0	Valid	PASS – Observation is accurate within the performance limits of the instrument (i.e., value passes all data validation screening criteria)
3	Acceptable	PASS – Observation originally failed initial quality control (QC) check (see Code 6), but additional review using other independent data and meteorological judgment support final validity.
6	Failed initial QC check	FAIL – Observation did not pass data validation screening criteria.
7	Suspect	FAIL – Observation failed initial data validation QC check (see Code 6) and could not be verified through additional review using other independent data.
8	Invalid	FAIL – Observation judged to be inaccurate or in error, and the cause is known.
9	Missing	FAIL – Observation was not collected.

The validation screening involved comparing, on an individual parameter basis, the recorded values (i.e., observations) against the EPA screening criteria shown in Table 2. The data validation procedure involved an initial automated review to apply a first level QC Code of 0 (valid), 6 (failed), or 9 (missing) as defined in Table 1. Observations initially flagged with a QC Code = 6 were then manually (i.e., second-level) reviewed by a project meteorologist. The procedure is outlined below:

- Values meeting all screening criteria for the respective meteorological parameter were automatically considered "valid" (QC Code = 0).
- Values not meeting a screening criterion were automatically flagged as "failed initial QC" (QC Code = 6). These values were subjected to second-level manual meteorological review using other available observations (e.g., 2-m vs. 10-m temperature at DOE-4 or from nearby Remote Automatic Weather Stations [RAWS] meteorological station CEEC1 in the Cheeseboro Canyon, California, area located 2.6 miles south of the DOE-4 site), and meteorological judgment:
  - Values confirmed by second-level review were deemed "acceptable" (final QC Code = 3).
  - Otherwise, the values were deemed "suspect" (final QC Code = 7).
- Observations known to be inaccurate (QC Code = 8).
- Missing observations were automatically flagged as "missing" (QC Code = 9).

Values that pass validation with a final QC Code of 0 or 3 are included in the data completeness statistics and the final validated meteorological data set. Values with a final QC Code of 7, 8, or 9 are excluded from the final dataset and counted against the data completeness percentage. Quarterly data statistics for the meteorological parameters are listed in Table 2 along with year-to-date and project-to-date results. Year-to-date and project-to-date percentages are calculated as total valid observations through the completed quarters for the year divided by the total possible observations through this same period.

The completeness goal for meteorological data is 80% on an annual basis. Data completeness statistics for all completed reporting quarters in Year 4 of the baseline monitoring are presented in Table 2. Note that a correction has been applied to the solar radiometer data to eliminate an upward trending bias detected in this sensor. Table 2 reflects updates to the solar radiometer Year-to-Date and Project Data Completeness Percent based on adjusting the data to remove the bias from Q8 through Q14. See Section 5.1.8.2 of this report for a discussion of the bias identification and removal procedure.

Wind Rose

The final validated 15-minute meteorological dataset was used to develop the wind rose for Q14 as presented in Figure 3. A wind rose is a graphical representation of wind speed and direction distribution (or climatology) for the period of interest. The frequency of winds blowing from a particular direction is shown as petals on the wind rose, with the frequency of wind speeds depicted by color bands. Calm winds are identified as being less than 0.5 meters per second (m/sec).

During Q14, data capture for wind speed and direction at DOE-4 was 99.97%. The average and maximum wind speeds were 3.39 m/sec and 11.9 m/s, respectively. The maximum recorded wind gust was 17.4 m/sec. There are two predominant wind directions: the first from the east-southeast (ESE) and the second clustered around northwest (NW).

Table 2. Data screening summary for monitored meteorological parameters.

Meteorological Parameter	Screening Criteria [1] (for valid sensor responses)	Data Completeness Percent (%) [2]				
		Q12	Q13	Q14	Year 4 to Date	Project to Date
Wind Speed	between 0 and 25 m/sec > 0.1 m/sec variation over 3 hours > 0.5 m/sec variation over 12 hours	100	100	99.97	99.99	93.77
Wind Direction	between 0 and 360 degrees > 1 degree variation over 3 hours > 10 degree variation over 12 hours	100	100	99.97	99.99	93.77
Standard Deviation of Wind Direction	Inherits the completeness stats of Wind Direction	100	100	99.97	99.99	93.77
Temperature @ 2 m	≤ local record high (monthly basis) ≥ local record low (monthly basis) > 0.5 degrees Celsius (°C) variation over 12 hours	100	100	99.97	99.99	93.77
Temperature @ 10 m	≤ local record high (monthly basis) ≥ local record low (monthly basis) > 0.5°C variation over 12 hours	100	100	99.97	99.99	93.77
Delta Temperature	≤ 0.1°C during daytime ≥ -0.1°C during nighttime between -3.0 and 5.0°C	100	100	99.97	99.99	93.77
Relative Humidity (and Dewpoint Temperature)	relative humidity between 0-100% dew point T ≤ ambient T dew point T ≤ 5.0°C variation over 1 hour dew point T > 0.5°C variation over 12 hours	100	100	99.97	99.99	86.67
Precipitation	≤ 1 inch in 1 hour ≤ 4 inches in 24 hours ≥ 2 inches in 3 months	100	100	99.97	99.99	93.76
Barometric Pressure	between 871 and 982 millibar (mb) (local) (i.e., between 940 and 1060 mb sea level) ≤ 6 mb variation over 3 hours	100	100	99.97	99.99	93.77
Solar Radiation	> 0 at night ≤ maximum possible for date and latitude	99.95	99.99	99.97	99.97	93.75

(1) Screening criteria from EPA Meteorological Monitoring Guidance (EPA 2000), Table 8-4.

(2) Data Completeness % = [Observations Passing] / [Possible Observations)].

a. Missing or suspect observations count against data completeness statistics.

b. Year Two is an abbreviated data collection year spanning the period Apr 15-Dec 31, 2019 (i.e., Quarters 5, 6, and 7). This was done to synchronize future data collection years with calendar years.

c. Last column in this table represents the cumulative Completeness % for all completed quarterly reporting periods.

(3) The number of possible 15-minute observations in the completed reporting periods:

- Q1 = 8,736
- Q2 = 8,832
- Q3 = 8,832
- Q4 = 8,640
- Q5 = 8,736
- Q6 = 8,832
- Q7 = 7,488 (only 3 quarters)
- Q8 = 8,736
- Q9 = 8,736
- Q10 = 8,832
- Q11 = 8,832
- Q12 = 8,640
- Q13 = 8,736
- Q14 = 8,832
- Year One = 35,040
- Year Two = 25,056 (abbreviated)
- Year Three = 35,136
- Year Four = 26,208 (to-date)
- Project = 121,440 (to-date)

4.2 PM_{10} Data

PM_{10} data, defined as coarse particles between 2.5 and 10 microns in aerodynamic diameter, are measured at the ETEC site. Sources of particulate matter can be naturally occurring or caused by human activity. The air monitoring conducted at ETEC is used to determine if any suspended particles are from activities conducted onsite or if they are consistent with surrounding air quality data. Some of the naturally occurring particles can originate from high winds, forest or grass fires, burning of fossil fuels in vehicles, or stirred-up road dust.

PM_{10} data are collected with Met One E-BAM monitors at four monitoring locations. The Met One E-BAM uses the principle of beta attenuation to provide a determination of mass concentration. Twenty-four-hour concentrations are calculated from the hourly concentrations. There were 92 days in this reporting period.

- DOE-1 had valid readings all 92 days.
- DOE-2 had valid readings all 92 days.
- DOE-3 had valid readings all 92 days.
- DOE-4 had valid readings all 92 days.

All four station units had 100% data completeness for PM_{10} for Q14, with a total data completeness of 100%, exceeding the project goal of 80% completeness for total samples collected (see Table 3). The complete table of daily averages is presented in Appendix A.

Table 3. PM_{10} data completeness for July 1, 2021, to September 30, 2021.

Location	Valid Readings (Days)	Possible Readings (Days)	Data Completeness (Percent)
DOE-1	92	92	100%
DOE-2	92	92	100%
DOE-3	92	92	100%
DOE-4	92	92	100%
		Average Total Data Completeness	100%

The five highest PM_{10} results identified for the reporting period are listed in Table 4 along with the CAAQS for PM_{10}. PM_{10} concentrations were consistent with levels typically found in urban air. Of these top five results, three were recorded at DOE-4 and one each at DOE-1 and DOE-2. One of the five values was above the CAAQS, but below the NAAQS of 150 µg/m^3. This occurred on August 8, 2021. The highest readings for this day happened prior to work hours and after work was completed for the day.

Table 4. Top five PM_{10} 24-hour average concentration days for Q14.

Date	Location	PM_{10} Value (µg/m^3)	CAAQS (µg/m^3)
8/7/2021	DOE-4	**62.083**	50
7/5/2021	DOE-4	41.166	50
7/12/2021	DOE-1	37.708	50
7/5/2021	DOE-1	36.541	50
7/14/2021	DOE-3	36.041	50

Note: The bold number is above CAAQS screening level.

4.3 Volatile Organic Compound Data

VOCs are organic chemicals that have a high vapor pressure, which causes them to evaporate quickly and enter the surrounding air. VOCs can be naturally occurring or man-made. The VOC data collected can

help distinguish between man-made detections from onsite activities or naturally existing organic chemicals. The VOC data collected are compared against screening levels. These screening levels are risk-based concentrations derived from standardized equations combining exposure information with toxicity data.

All four DOE locations were sampled each day during the six VOC sampling events this period. Data completeness goals for VOCs exceeded the project goal of 85% (see Table 5).

Table 5. Ambient air VOC data completeness.

Location	Valid Readings (Days)	Possible Readings (Days)	Data Completeness (Percent)
DOE-1	6	6	100%
DOE-2	6	6	100%
DOE-3	6	6	100%
DOE-4	6	6	100%
Average Total Data Completeness			100%

VOC detection results are presented in Table B-1 (Appendix B), including comparison to the April 2019 DTSC Human Health Risk Assessment (HHRA) Note 3 Screening Levels (DTSC 2019) or the May 2018 EPA RSLs (EPA 2018). Eight analytes were detected above the screening levels in Q14. Ethyl acetate was detected at DOE-1, -2 and -4 (July 8, 2021, July 21, 2021, and August 3, 2021), benzene was detected at DOE-2 (August 3, 2021), acrolein was detected at DOE-4 (August 17, 2021), and cis-1,2-Dichloroethene was detected at DOE-2 and DOE-3 (July 21, 2021). The analyte 4-isopropyltoluene was also detected at DOE-1 on September 16, 2021, but there is no screening level associated with the analyte.

Two man-made VOC analytes, dichlorodifluoromethane (freon-12) and ethyl acetate, have been detected routinely at all four monitoring stations, during all quarterly sampling events, and in duplicate samples. These analytes were also detected as estimated values at NASA stations, but were not detected at Boeing stations. Based on laboratory QC data (method blanks, clean canister certifications), the sampling process and laboratory process are not the sources of the two analytes. The onsite source of the analytes is currently unknown.

By using the results from the baseline air monitoring program, along with other site characterization information, analytes were selected for routine air monitoring during soil disturbances. Establishing sources for specific contaminants, or performing source apportionment was not a requirement for identifying remedial air quality impacts nor was it within the scope or data quality objectives of the air monitoring program.

4.4 Radionuclide Data

ETEC continuously monitors air at multiple locations for radioactive particles. This is performed for two reasons: (1) to determine the background airborne radioactivity concentration so that any possible releases from work activities can be detected, and (2) to detect any possible release from existing activities. As shown on the trend graphs, the background airborne radioactive contamination continued at low and stable concentrations, and there was no detected release of material.

There were 108 airborne radioactivity filter samples collected in Q14 — 27 each for DOE-1, DOE-2, DOE-3, and DOE-4. Each sample was collected on a glass-fiber filter (as discussed in Section 3) and was analyzed using a “low background” Protean radiation counter system onsite. These samples included background radioactive materials and the potential of Area IV–specific radioactive materials.

The alpha and beta data are presented in Table C-1 (Appendix C). The onsite analysis determined only "alpha" or "beta/gamma" and did not analyze for specific isotopes. Isotopic analysis was performed later by an offsite laboratory. Each sample produced a gross alpha and beta-gamma count. The analysis compared these values with the background radiation count rates, and using the volume of air collected determined the net counts and the MDC for each sampling event. Some results in Table C-1 (Appendix C) are shown as negative values (because detector background is subtracted from the result).

All but one alpha sample was below the MDC, and this sample was only slightly greater than the MDC. Each MDC was below the airborne effluent limits specified in California regulations. There was no possibility of significant Area IV alpha radioactive material on these filters.

Approximately 3% of the beta samples were below MDC, and the gross (background radioactive material included) samples exceeded the MDC in 97% of samples, indicating the presence of airborne radioactive material (including background materials). The beta-gamma samples greater than the MDC were only slightly above the MDC, and were well below the effluent limits specified in California regulations. The elevated (but still low) results may be due to more airborne dust because of the dry weather.

Following collection and onsite analysis, the air filters were composited and analyzed for specific radionuclides by an offsite laboratory. This data is shown in Table C-2 (Appendix C). This laboratory data determined that most radioactive material present was natural in origin, consisting of beryllium-7, polonium-210, potassium-40, combined radium-226 and radium-228, thorium-228, thorium-230, thorium-232, uranium-233/234, uranium-235/236, and uranium-238.

While artificial radionuclides (e.g., Cs-137, Sr-90, Pu-239) were present in very small amounts, none of the results were above the MDC in Q14. The presence of these radionuclides is considered a part of the normal variation of global fallout and resuspension activities.

A summary of the gross air sampling data is shown in Table 6.

Table 6. Gross alpha and beta-gamma average results for Q14.

Location	Average alpha result (µCi/mL)	Average alpha MDC (µCi/mL)	Average beta result (µCi/mL)	Average beta MDC (µCi/mL)
DOE-1	4.16E-16	6.23E-15	4.33E-14	2.53E-14
DOE-2	1.28E-15	6.23E-15	5.44E-14	2.53E-14
DOE-3	1.12E-15	6.22E-15	4.45E-14	2.53E-14
DOE-4	8.55E-16	6.15E-15	4.58E-14	2.51E-14
Average	9.18E-16	6.21E-15	4.70E-14	2.52E-14

5. QA/QC ACTIVITIES

The following QA/QC activities were conducted for the PM_{10}, VOC, radionuclide, and meteorological data collection and analysis.

5.1 Field QA/QC

5.1.1 PM_{10}

The 24-hour daily averages for Q14 are presented in Appendix A along with the monthly minimum, maximum, and 95th percentile for each station location.

Flow Verifications

Functionality of the Met One E-BAM units is verified and recorded monthly during instrument audits; however, the instruments are also checked several times a week for operability. During the monthly audits, the Met One E-BAM temperature, pressure, and flow rate are verified against a National Institute of Standards and Technology (NIST) traceable flowmeter. E-BAM units are occasionally swapped out for maintenance, and preliminary audits of the new units are performed. The Q14 audit results for the four DOE sites showed bias percentages that ranged from -2.50 to 0.32%. None of the results exceeded the flow rate measurement quality objective of +/- 4%.

Complete audit reports and flow verification results for Q14 are presented in Appendix D of this document. The flow rate verifications were based on 40 CFR 58, Appendix A, 3.3.1 and 4.2.2 through 4.2.3, along with the *Guideline on the Meaning and the Use of Precision and Bias Data Required by 40 CFR Part 58 Appendix A* (EPA 2007). The *Data Assessment Statistical Calculator* (DASC) tool, which is an EPA Excel-based software application, was used to perform the necessary statistical calculations based on input audit data. Sections 2 and 2.5 of this EPA guidance document (EPA 2007) provide additional information and instruction for using the DASC tool.

5.1.2 VOCs

All data underwent at least two levels of QC review at the laboratory prior to transmission to North Wind. A minimum of 20% of the transmitted VOC results undergo a Level IV third-party data validation, annually. During this quarter, two of the six SDGs, P2104438 and P2103618, underwent the Level IV data validation. The data validation ensures that the required analytical measurement quality objectives are met to ensure the data are of sufficient quality for their intended purpose.

All six DOE locations had valid readings on all six sample days for a sample completeness of 100%. Data completeness goals for VOCs exceeded the project goal of 85%.

5.1.3 Field Duplicates

Six field duplicates were collected during this reporting period, one per sampling event. Ethyl acetate and toluene in SDGs #P2103618, P2103882, P2104101, and P2104629; and Dichlorodifluoromethane and trichlorofluoromethane in SDG #P2104629 were detected in four field duplicate pairs. All of these analytes exceeded the quality objective of +/- 15% relative percent difference (RPD). For SDG #P2104438 the analytes ethyl acetate and 2-butanone; for SDG# P2104629 the analytes 2-butanone and 4-methyl-2-pentanone; and for SDG# P2102984 the analytes 2-butanone, 4-isopropyltoluene, and ethyl acetate were detected at levels higher than the RL in either the sample or duplicate, and in comparison, were reported as a non-detect in the associated sample or duplicate and exceeded the quality objective of +/- 15% RPD. Thirteen sample and duplicate analyte detections were within the quality objective of

+/- 15% RPD. There were no other detections associated with the samples and associated duplicates collected during this reporting period.

5.1.4 Canister Pressure

Vacuum in the canisters is measured before and after sampling with an analog pressure gauge to ensure proper function. Final canister vacuums ranged from -7 inches mercury (Hg) to -2 inches Hg during this reporting period.

5.1.5 Radiological

The detector for onsite gross alpha and beta sample analysis is calibrated annually by a third-party vendor using sources traceable to the NIST. The detector is checked by counting alpha- and beta-emitting sources at the site when received from the vendor following calibration. This establishes an acceptable performance range for daily source checks. On each day the detector is used, performance is determined with the site source. The detector may be used if the daily check is within the acceptable performance range.

Samples analyzed at the offsite laboratory are QC-checked at the laboratory. These QC checks include blanks, laboratory replicates, matrix spikes, and matrix spike duplicates. Barium, which behaves chemically similar to radium, is used as a carrier to determine the yield of the chemical extraction.

During this quarter, SDG #559313 underwent data validation. Starting in Q13, 100% of the radiological analytical results undergo Level IV third-party data validation.

5.1.6 Meteorological

During the reporting period, a weekly data validation screening and review was performed on the monitored meteorological parameters based on the EPA guidance document *Meteorological Monitoring Guidance for Regulatory Modeling Applications* (EPA 2000), Table 8-4 – Suggested Data Screening Criteria, as outlined in Section 4.1. The data validation procedure provided the basis for evaluating data completeness and for determining sensor performance and/or maintenance status.

5.1.7 Maintenance

Routine visual checks were performed on the meteorological station during weekly data downloading site visits. This included inspection of the meteorological tower sensors, E-BAM monitoring unit wind sensors, and solar-powered batteries to ensure proper functioning.

5.1.8 Corrective Action

Issues and corrective actions regarding the PM_{10} monitors and the meteorological station are noted in Sections 5.1.8.1 and 5.1.8.2, respectively. No issues or corrective actions were noted regarding the remaining monitoring equipment or sampling events during this reporting period.

5.1.8.1 PM_{10} Monitors

Refer to Section 4.2 for a detailed description of PM_{10} air monitoring equipment issues.

5.1.8.2 Meteorological Station

Although the data percent completion goal during Q14 has been met: (1) the solar radiometer continued to record values that exceed the daily screening criteria and was affected by shadows cast by the tower,

(2) the data logger clock time had drifted (slowed) by approximately 45 minutes, and (3) the improperly programmed data logger continues to affect calculation of delta temperature (i.e., temperature difference between 2 m and 10 m). These three items are discussed below, including issues and corrective actions/resolutions. The recommend sensor maintenance schedule is provided as item (4) below.

(1) Solar Radiometer:

- Data Quality Issues:

  - The solar radiometer continues to record observations that exceed the maximum possible for the date, time of day, and latitude/longitude (i.e., exceeding the Level 1 screening criteria from Table 2 base on the Bird Clear Sky Radiation model curve). This is most notable during the peak solar hours on sunny days.

  - The solar radiometer had been mounted on the north side of the tower, resulting in distinct shadows (or "mini-eclipses" of the sun) caused by vertical poles comprising the tower mast.

- Corrective Actions:

  - Bias Removal – A statistical evaluation of the solar radiometer response during peak solar hours on sunny days identified an upward drift (i.e., bias) in sensor response that began shortly after the new solar radiometer was installed following the Woolsey Wildfire. In this evaluation, observed peak solar radiation values were averaged for each month and year of the data collection project (from May 2018 to September 2021 as shown in the table below). Prior to wildfire during baseline year 2018 the annual average was 88% (i.e., ratio of 0.88) of the Bird Clear Sky model's theoretical maximum predictions. This is reasonable considering that the Bird Clear Sky model provides upper values based on pristine clear sky conditions. However, subsequent months and years show an ever-increasing percent which is an indication of sensor drift since the sun's solar output remains constant from year to year.

    To compensate for the bias drift, quarterly adjustment factors were developed using a comparison of quarterly average ratios to the 2018 baseline year. Since there was no baseline data for the first quarter of 2018, data from first quarter of 2019 was considered as baseline. An adjustment factor was then calculated using the following equation:

    Adjustment Factor = (Quarter Average) / (Baseline Quarter Average)

    These "bias removal" adjustment factors were applied to the solar radiometer datasets starting with the first quarter of 2020 since this was the first quarter in which exceedances of the Bird Clear Sky Model curve occurred. The validated project meteorological datasets have been updated to reflect this bias removal.

"Solar Radiometer"-to-"Bird Clear Sky Model" Ratio - Monthly Average

MON	2018	2019	2020	2021
1		0.89	0.95	1.01
2		0.92	0.97	1.02
3		0.94	0.99	1.06
4		0.93	0.99	1.04
5	0.93	0.95	1.00	1.03
6	0.89	0.92	0.99	1.02
7	0.86	0.93	0.99	0.99
8	0.87	0.93	0.97	1.01
9	0.86	0.93	0.95	1.01
10	0.89	0.95	0.98	
11	0.87	0.94	1.00	
12	0.90	0.95	1.00	
Annual Avg	0.88	0.93	0.98	1.02

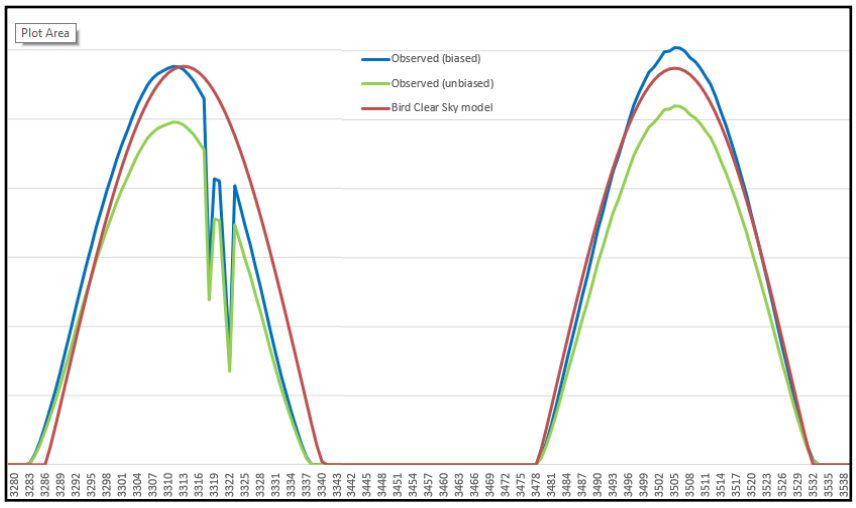
Solar Radiometer Adjustment Factor - Quarterly
(to eliminate drift bias)

MON	2018	2019	2020	2021
1	No Adj Factor for Baseline Qtrs	1.000	0.946	0.894
2				
3				
4		0.980	0.924	0.889
5				
6				
7		0.926	0.888	0.860
8				
9				
10		0.935	0.893	-
11				
12				

- Shadowing – On August 5, 2021, the solar radiometer was repositioned to the south side of the tower in accordance with the guidance provided by the manufacturer:

  "When installed on a mast, the preferred orientation should be such that no shadow is cast on the Net Radiometer at any time during the day. In the Northern Hemisphere this implies that the Net Radiometer should be mounted south of the mast."

- Resolutions – The graph below shows the resolution of two solar radiometer data quality issues. It presents two successive sunny days before and after repositioning the sensor to the south side of the mast, showing the elimination of shadowing. It also shows both the biased (blue line) and adjusted unbiased (green line) solar observations compared to the Bird Clear Sky model's maximum possible (red line). The unbiased observations are seen to now be in line with the baseline year observations relative to the Bird model. The sensor drift bias will continue to be evaluated and applied during the upcoming quarter (Q15).



(2) Data Logger Clock

- Data Quality Issue:
    - The datalogger clock had slowly drifted (i.e., slowed) approximately 45 minutes from the actual Pacific Daylight Time (PDT). Consequently, the timestamp for all observation was off by approximately 45 minutes. This can be seen on the left side of the graph above where the solar radiometer curve (blue and green lines) is offset from the Bird Clear Sky model curve (red line). Note that this data logger clock bias did not impact the solar radiometer sensor drift discussed in the previous corrective action subsection.
- Corrective Action:
    - Clock Adjustment – On August 5, 2021, at approximately 7:00 a.m. PDT the datalogger clock was reset to match the actual Pacific Daylight Time. This resulted in an apparent data gap for all parameters on August 5, 2021 for the logged 15-minute periods at 7:00, 7:15, and 7:30 a.m. No adjustments to previous timestamps were made to the project dataset to compensate for the clock drift.
    - Resolution – The right side of the graph above shows that the solar radiometer curve (blue and green lines) is no longer offset from the Bird Clear Sky model curve (red line), indicating that the observations and datalogger clock are now synchronized with the actual Pacific Daylight Time.

(3) Delta Temperature Calculation

- Data Quality Issue:
    - For meteorological monitoring, delta temperature should be defined as T at the higher level minus T at the lower level. However, the datalogger was improperly programmed to calculate the inverse of delta temperature when the station was replaced after the Woolsey Wildfire during Q3. Consequently, delta temperature observations are being calculated with an opposite sign compared to the values from the original data logger.

- Corrective Action:

    - Datalogger Equation – Instead of reprogramming the datalogger to correctly calculate delta temperature, an adjustment multiplication factor of "-1" has been applied to the delta temperature values from the new data logger prior to performing the data validation.

      Resolution – With application of the "-1" multiplication factor, delta temperature values in the validated project dataset accurately present delta temperature as:

      Delta Temperature = [Temperature @ 2 m] minus [Temperature @ 10 m]

(4) Recommended Maintenance Schedule:

Although not a corrective action, the manufacturer's recommended maintenance frequency for meteorological sensors is presented below for information purposes. Proper and timely maintenance of the meteorological sensors is critical for ensuring that the data are not only valid (based on screening criteria) but also accurate. Schedules for maintenance and calibration are provided in the sensor user manuals and based on the in-service time of the sensor. Table 7 lists the recommended maintenance schedules for the Met One sensors installed at the DOE-4 meteorological station.

Table 7. Meteorological sensor recommended maintenance frequency (Met One).

Sensor	Frequency	Maintenance
WS	6–12 Month	Inspect for proper operation (manual check of pulses per revolution, bearing condition, anemometer cup condition, and bearing replacement if warranted)
	12–24 Month	Return to Met One for complete overhaul
WD	6–12 Month	Inspect for proper operation (manual check of sensor readings through 360°)
	6–12 Month	Field calibration
	12–24 month	Replace bearings & potentiometer
T	6–12 Month	Inspect sensor for proper operation (field comparison sensor reading against a precision mercury thermometer)
RH	6–12 Month	Inspect sensor for proper operation (compare sensor reading against local weather service or field psychrometer)
	12 Month	Return sensor to Met One for calibration and replacement of O-rings and filter membrane
Rain Gauge	6 Month	Clean sensor and bucket and field verify proper operation
Pressure	12 Month	Return sensor to Met One for calibration and replacement of O-rings and filter membrane
Radiometer	Monthly	Clean sensor glass dome with clean rag/tissue

Note: Maintenance schedules as specified in the respective Met One sensor user manuals.

5.2 Laboratory QA/QC

This report covers 30 air monitoring samples for VOCs collected and analyzed according to the EPA Toxic Compendium Method TO-15, *Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)* (EPA 1999). These samples were reported under six SDGs by the laboratory. All six SDG analyses were performed by ALS in Simi Valley, CA. For each SDG, the laboratory ran continuing calibration verification, a method blank, and laboratory control samples, and verified surrogate recoveries for each sample.

The laboratory provided certified clean canisters for the sampling events. The certification of the canister batch is considered the equipment blank for each sampling event. The ALS case narrative discusses the cleaning of the canisters.

5.3 Audit Results

The PM_{10} instruments were calibrated at the manufacturer and were functioning properly upon installation. The PM_{10} instruments were audited monthly with a secondary NIST traceable flow meter. Although audits occur only monthly, the instruments were checked several times a week to ensure that they were functioning. Table 8 lists the dates for audits conducted in July through September. No flow rate comparisons exceeded the project's acceptance criterion of +/- 4. The sample nozzles and support vanes were cleaned as needed. Complete audit reports are presented in Appendix D.

Table 8. PM10 audit completeness.

Location	Met One E-BAM Serial Number	Parameter	Date
DOE-1	W23314	PM_{10}	07/26/2021
DOE-2	Y12096	PM_{10}	07/26/2021
DOE-3	W23313	PM_{10}	07/26/2021
DOE-4	X16067	PM_{10}	07/26/2021
DOE-1	W23314	PM_{10}	08/19/2021
DOE-2	Y12096	PM_{10}	08/19/2021
DOE-3	W23313	PM_{10}	08/19/2021
DOE-4	X16067	PM_{10}	08/19/2021
DOE-1	W23314	PM_{10}	09/24/2021
DOE-2	Y12096	PM_{10}	09/24/2021
DOE-3	W23313	PM_{10}	09/24/2021
DOE-4	X16067	PM_{10}	09/24/2021

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6. REFERENCES

10 Code of Federal Regulations (CFR) 20, Appendix B, "Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage," Table 2.

40 CFR 58, Appendix C – Ambient Air Quality Monitoring Methodology.

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Figure 1 – SSFL Air Monitoring Locations

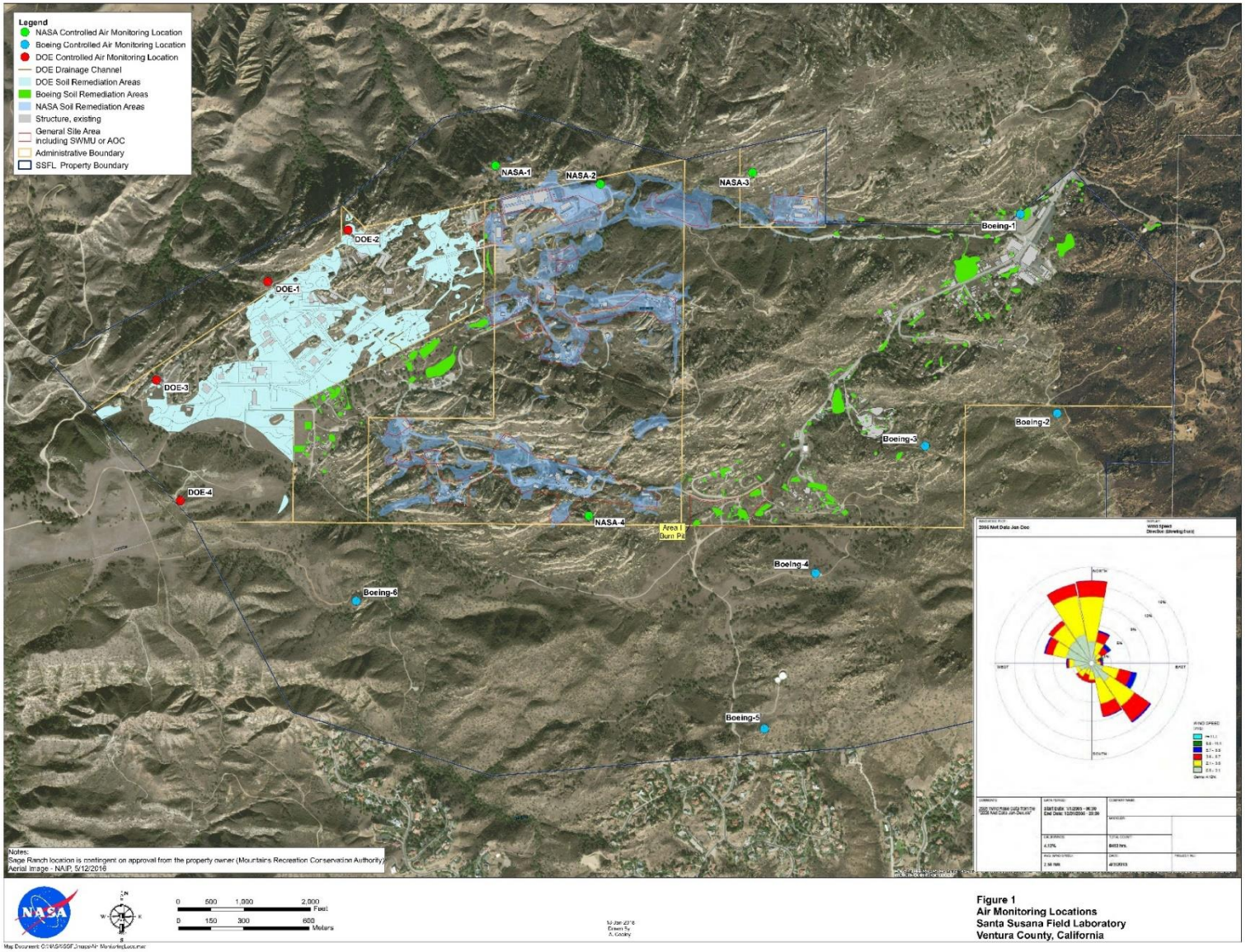


Figure 2 – DOE Air Monitoring Locations

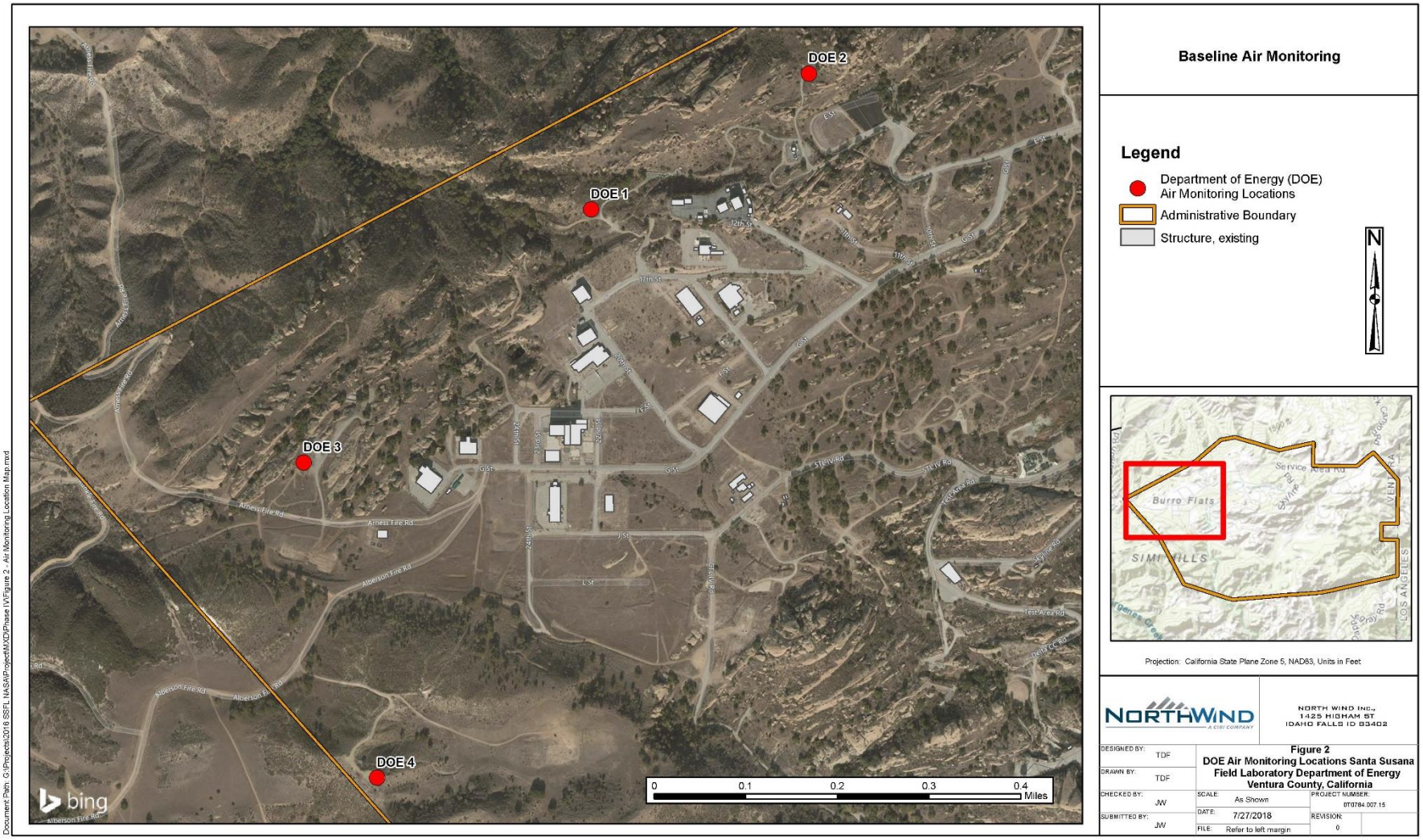
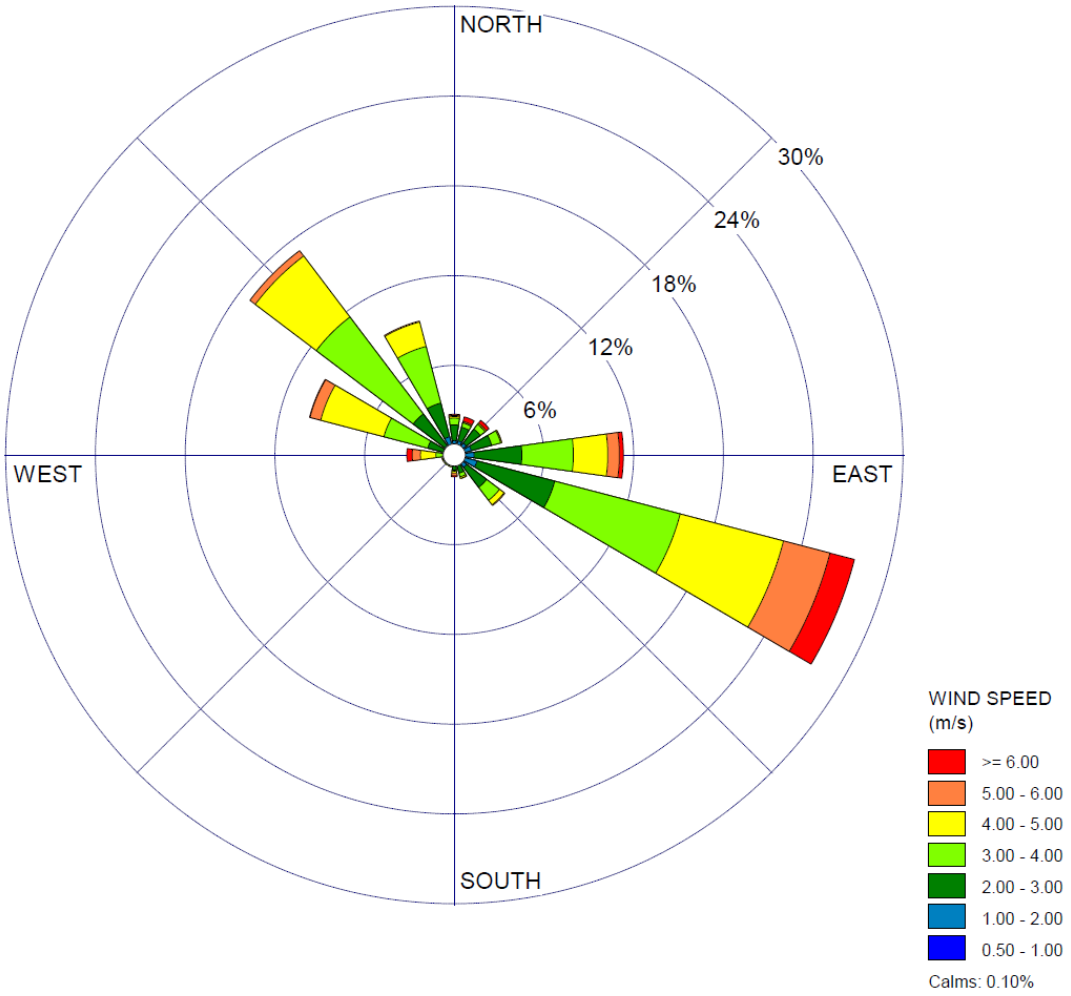


Figure 3 – DOE Quarterly Wind Rose

WIND ROSE PLOT:
SANTA SUSANA FIELD LABORATORY / Station ID: DOE-4

DISPLAY: • **Wind Speed (m/s)**
• **Direction (blowing from)**



COMMENTS: **ETEC BAM Quarter #14** • **Start: 01-Jul-2021** • **End: 30-Sep-2021**	DATA PERIOD: **Start: 07/01/2021** **End: 09/30/2021**	COMPANY NAME: **North Wind Portage, Inc.**	
		OBSERVATION BASIS: **15-minute averages**	NORTHWIND PORTAGE, INC.
	CALM WINDS: **0.10%**	TOTAL COUNT: **8829 observations (99.97%)**	
	AVG. WIND SPEED: **3.39 m/s**	DATE: **11/12/2021**	PROJECT NO.: **080153.015.02**

WRPLOT View - Lakes Environmental Software

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APPENDIX A

PM_{10} Daily Averages and Monthly Statistics

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PM_{10} Daily Averages

Site ID	DOE-1	DOE-2	DOE-3	DOE-4
Sample Date	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)
07/01/21	20.5	27.625	20.375	25.75
07/02/21	13.125	25.083	14.375	21.916
07/03/21	12.458	13.666	8.833	10.25
07/04/21	17.125	24.958	20.875	33.25
07/05/21	36.541	33.25	35.333	41.166
07/06/21	19.125	17.416	15.625	17.333
07/07/21	24.208	22.541	15.833	18.541
07/08/21	24.708	22.708	23.208	28.375
07/09/21	21.208	20.833	19.5	20.041
07/10/21	23.333	22.666	20.208	21.25
07/11/21	25.083	23.666	21.625	21.958
07/12/21	37.708	25.916	24	32.75
07/13/21	20.208	23.666	28.041	20.125
07/14/21	17.875	20.708	36.041	20.541
07/15/21	27.041	19.666	21.333	23.291
07/16/21	18.625	19.458	14.083	16.166
07/17/21	22.166	17.25	15.208	24.166
07/18/21	10.25	10.375	11.125	14.541
07/19/21	13.166	10.25	11.375	11.75
07/20/21	13.583	11.958	13.375	13.416
07/21/21	21.75	18.833	18.333	19.333
07/22/21	25.875	26.291	33.333	29.416
07/23/21	28.375	32.625	31.541	35.916
07/24/21	22.208	22.416	24.791	22.125
07/25/21	23.125	20.291	24.583	19.625
07/26/21	17.541	13.958	21.583	17.25
07/27/21	15.166	18.833	17.125	16.708
07/28/21	10.875	9.333	10.083	11.25
07/29/21	9.833	9.875	11	11.166
07/30/21	18.875	19.166	15.166	17.541
07/31/21	17.125	14.875	14.333	13.208
08/01/21	10.791	6.5	7.833	8.666
08/02/21	11.166	7.666	8.708	10.708
08/03/21	14.333	11.791	13.041	14.541
08/04/21	19.5	16.791	18.208	20.125

Site ID	DOE-1	DOE-2	DOE-3	DOE-4
Sample Date	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)	PM_{10} ($\mu g/m^3$) (CAAQS 50 $\mu g/m^3$)
08/05/21	22.833	19.458	22.041	25.791
08/06/21	22.583	25.791	26.666	25.083
08/07/21	21.333	26.541	22.583	**62.083**
08/08/21	15.958	14.875	19.708	21.75
08/09/21	23.416	15.5	15.666	16.833
08/10/21	12.083	11.208	11.666	12.333
08/11/21	15.416	14.25	17.75	14.791
08/12/21	12.791	10.375	11.916	12.416
08/13/21	15.916	11.541	14.458	13.916
08/14/21	15.583	12.791	11.916	13.541
08/15/21	14.625	14.041	17.5	15.083
08/16/21	18.375	22.708	18.541	18.666
08/17/21	19.125	26.208	20.541	18.791
08/18/21	9.75	8.208	10.708	7.833
08/19/21	9.958	9.208	11.625	14.125
08/20/21	10.958	12.916	13.125	13.458
08/21/21	13.5	8.791	9.375	11.875
08/22/21	11.416	12.666	12.958	13.375
08/23/21	17.291	14.833	18.25	18.125
08/24/21	17.541	20.041	19.416	24
08/25/21	23.5	22.958	22.25	23.666
08/26/21	18.916	17.25	18.291	20.666
08/27/21	21.166	18.375	19.458	20.333
08/28/21	19.166	16.708	16.208	19.458
08/29/21	13.166	11.916	12.041	12.125
08/30/21	31.916	25.5	29.208	31.75
08/31/21	30.458	24.666	26.375	26.708
09/01/21	16.583	18.083	16.875	20.75
09/02/21	16.625	15.5	19.25	17.916
09/03/21	18.25	18.708	21.333	19.666
09/04/21	8.833	7.291	8.625	9.083
09/05/21	9.875	8.916	9.791	9.625
09/06/21	25.5	26	24.875	29
09/07/21	26.333	22.458	33.291	19.333
09/08/21	21.875	19.833	19.916	25.583
09/09/21	20.083	19.208	20.916	21.916
09/10/21	14.166	13.25	15.333	17.708

Site ID	DOE-1	DOE-2	DOE-3	DOE-4
Sample Date	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)	PM_{10} (µg/m^3) (CAAQS 50 µg/m^3)
09/11/21	9.75	9.625	9.041	9.5
09/12/21	8.166	6.916	7.75	8.875
09/13/21	7.916	5.833	8.375	7.708
09/14/21	11.791	12.125	12.5	11.083
09/15/21	21.083	22.791	19.541	24.5
09/16/21	23.791	19.875	27.541	22.541
09/17/21	17.541	14.583	21.083	15.916
09/18/21	16.708	16.083	18.416	19.25
09/19/21	15.041	15.5	17.958	17.083
09/20/21	29.083	22.916	30.416	23.25
09/21/21	20.541	14.375	22.375	16.291
09/22/21	9.458	7.291	12.208	8.875
09/23/21	15.041	10.916	13.833	14.416
09/24/21	23.208	13.458	28.75	16.875
09/25/21	30.083	21.291	23.375	19.5
09/26/21	15.25	14.083	15.541	18.708
09/27/21	16.75	20.541	17.416	14.958
09/28/21	12.583	11.5	15.125	14.25
09/29/21	16.625	17.791	22.25	24.5
09/30/21	18.5	15.437	15.937	19.437

Note: The bold number is above CAAQS screening level.

PM_{10} Monthly Statistics

Location ID	July 2021			August 2021			September 2021		
	PM_{10}			PM_{10}			PM_{10}		
	High	Low	95th PCTL	High	Low	95th PCTL	High	Low	95th PCTL
DOE-1	37.70800	9.83300	32.45800	31.91600	9.75000	26.97900	30.08300	7.91600	27.84550
DOE-2	33.25000	9.33300	30.12500	26.54100	6.50000	25.99950	26.00000	5.83300	22.85975
DOE-3	36.04100	8.83300	34.33300	29.20800	7.83300	26.52050	33.29100	7.75000	29.66630
DOE-4	41.16600	10.25000	34.58300	62.08300	7.83300	29.22900	29.00000	7.70800	25.09565

PCTL = percentile

APPENDIX B

Analytical Results for Ambient Air VOCs

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Table B-1. Ambient air VOC detection results compared to RSLs.

Location ID	Sample Date	Analyte	Result (µg/m^3)	Screening Level Value (µg/m^3)	SL Source
DOE-1	07/08/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-1	07/08/2021	Ethyl acetate	39 (;J)	73	US EPA RSL
DOE-1	07/08/2021	Toluene	0.83	310	DTSC HHRA NOTE 3
DOE-1	07/08/2021	Trichlorofluoromethane	1	1300	DTSC HHRA NOTE 3
DOE-2	07/08/2021	Carbon disulfide	11	730	US EPA RSL
DOE-2	07/08/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-2	07/08/2021	**Ethyl acetate**	**92 (;J)**	73	US EPA RSL
DOE-2	07/08/2021	Toluene	1.5	310	DTSC HHRA NOTE 3
DOE-2	07/08/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-3	07/08/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-3	07/08/2021	Ethyl acetate	37 (;J)	73	US EPA RSL
DOE-3	07/08/2021	Toluene	1.1	310	DTSC HHRA NOTE 3
DOE-3	07/08/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-4	07/08/2021	2-butanone	1.6	5200	US EPA RSL
DOE-4	07/08/2021	Dichlorodifluoromethane	1.9	100	US EPA RSL
DOE-4	07/08/2021	Ethyl acetate	58 (;J)	73	US EPA RSL
DOE-4	07/08/2021	Toluene	1.6	310	DTSC HHRA NOTE 3
DOE-4	07/08/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-1	07/21/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-1	07/21/2021	**Ethyl acetate**	**97**	73	US EPA RSL
DOE-1	07/21/2021	Toluene	2.1	310	DTSC HHRA NOTE 3
DOE-1	07/21/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-2	07/21/2021	**cis-1,2-Dichloroethene**	**22**	8.3	DTSC HHRA NOTE 3
DOE-2	07/21/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-2	07/21/2021	Ethyl acetate	58	73	US EPA RSL
DOE-2	07/21/2021	Tetrahydrofuran	5.0	2100	US EPA RSL
DOE-2	07/21/2021	Toluene	1.8	310	DTSC HHRA NOTE 3
DOE-3	07/21/2021	**cis-1,2-Dichloroethene**	**9.7**	8.3	DTSC HHRA NOTE 3
DOE-3	07/21/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-3	07/21/2021	Ethyl acetate	25	73	US EPA RSL
DOE-3	07/21/2021	Toluene	0.81	310	DTSC HHRA NOTE 3
DOE-3	07/21/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-4	07/21/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-4	07/21/2021	Ethyl acetate	35	73	US EPA RSL
DOE-4	07/21/2021	Tetrahydrofuran	16	2100	US EPA RSL
DOE-1	08/03/2021	Dichlorodifluoromethane	2.3	100	US EPA RSL
DOE-1	08/03/2021	Ethyl acetate	37	73	US EPA RSL
DOE-1	08/03/2021	Toluene	1.2	310	DTSC HHRA NOTE 3
DOE-1	08/03/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-2	08/03/2021	**Benzene**	**0.99**	0.097	DTSC HHRA NOTE 3
DOE-2	08/03/2021	Dichlorodifluoromethane	2.4	100	US EPA RSL
DOE-2	08/03/2021	**Ethyl acetate**	**110**	73	US EPA RSL
DOE-2	08/03/2021	Toluene	1.9	310	DTSC HHRA NOTE 3

Location ID	Sample Date	Analyte	Result ($\mu g/m^3$)	Screening Level Value ($\mu g/m^3$)	SL Source
DOE-2	08/03/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-3	08/03/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-3	08/03/2021	Ethyl acetate	38	73	US EPA RSL
DOE-3	08/03/2021	Methylene chloride	1.0	1	DTSC HHRA NOTE 3
DOE-3	08/03/2021	Toluene	1.1	310	DTSC HHRA NOTE 3
DOE-3	08/03/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-4	08/03/2021	Dichlorodifluoromethane	2.4	100	US EPA RSL
DOE-4	08/03/2021	**Ethyl acetate**	**110**	73	US EPA RSL
DOE-4	08/03/2021	Tetrahydrofuran	4.6	2100	US EPA RSL
DOE-4	08/03/2021	Toluene	2.3	310	DTSC HHRA NOTE 3
DOE-4	08/03/2021	Trichlorofluoromethane	1.2	1300	DTSC HHRA NOTE 3
DOE-1	08/17/2021	Dichlorodifluoromethane	2.5	100	US EPA RSL
DOE-1	08/17/2021	Ethyl acetate	1.8	73	US EPA RSL
DOE-1	08/17/2021	Trichlorofluoromethane	1.3	1300	DTSC HHRA NOTE 3
DOE-2	08/17/2021	Dichlorodifluoromethane	2.5 (;J)	100	US EPA RSL
DOE-2	08/17/2021	Ethyl acetate	3.2	73	US EPA RSL
DOE-2	08/17/2021	Trichlorofluoromethane	1.3 (;J)	1300	DTSC HHRA NOTE 3
DOE-3	08/17/2021	Dichlorodifluoromethane	2.5 (;J)	100	US EPA RSL
DOE-3	08/17/2021	Ethyl acetate	8.1	73	US EPA RSL
DOE-3	08/17/2021	Trichlorofluoromethane	1.3 (;J)	1300	DTSC HHRA NOTE 3
DOE-4	08/17/2021	2-butanone	2	5200	US EPA RSL
DOE-4	08/17/2021	**Acrolein**	**1.9**	0.021	US EPA RSL
DOE-4	08/17/2021	Dichlorodifluoromethane	2.6 (;J)	100	US EPA RSL
DOE-4	08/17/2021	Ethyl acetate	1.9	73	US EPA RSL
DOE-4	08/17/2021	Isopropanol	1.6 (;J)	210	US EPA RSL
DOE-4	08/17/2021	Trichlorofluoromethane	1.3 (;J)	1300	DTSC HHRA NOTE 3
DOE-1	08/31/2021	Dichlorodifluoromethane	1.7	100	US EPA RSL
DOE-1	08/31/2021	Toluene	0.73	310	DTSC HHRA NOTE 3
DOE-1	08/31/2021	Trichlorofluoromethane	0.83	1300	DTSC HHRA NOTE 3
DOE-2	08/31/2021	Dichlorodifluoromethane	1.8	100	US EPA RSL
DOE-2	08/31/2021	Ethyl acetate	32	73	US EPA RSL
DOE-2	08/31/2021	Toluene	2.0	310	DTSC HHRA NOTE 3
DOE-2	08/31/2021	Trichlorofluoromethane	0.86	1300	DTSC HHRA NOTE 3
DOE-3	08/31/2021	Dichlorodifluoromethane	1.8	100	US EPA RSL
DOE-3	08/31/2021	Ethyl acetate	3.8	73	US EPA RSL
DOE-3	08/31/2021	Toluene	0.77	310	DTSC HHRA NOTE 3
DOE-3	08/31/2021	Trichlorofluoromethane	0.85	1300	DTSC HHRA NOTE 3
DOE-4	08/31/2021	Dichlorodifluoromethane	1.8	100	US EPA RSL
DOE-4	08/31/2021	Ethyl acetate	7.9	73	US EPA RSL
DOE-4	08/31/2021	Toluene	0.88	310	DTSC HHRA NOTE 3
DOE-4	08/31/2021	Trichlorofluoromethane	0.85	1300	DTSC HHRA NOTE 3
DOE-1	09/16/2021	2-butanone	2.0	5200	US EPA RSL
DOE-1	09/16/2021	4-isopropyltoluene	0.98	------	-------
DOE-1	09/16/2021	Dichlorodifluoromethane	2.2	100	US EPA RSL

Location ID	Sample Date	Analyte	Result (µg/m^3)	Screening Level Value (µg/m^3)	SL Source
DOE-1	09/16/2021	Toluene	0.85	310	DTSC HHRA NOTE 3
DOE-1	09/16/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-2	09/16/2021	Dichlorodifluoromethane	2.1	100	US EPA RSL
DOE-2	09/16/2021	Trichlorofluoromethane	1.0	1300	DTSC HHRA NOTE 3
DOE-3	09/16/2021	Carbon disulfide	2.1	730	US EPA RSL
DOE-3	09/16/2021	Dichlorodifluoromethane	2.2	100	US EPA RSL
DOE-3	09/16/2021	Ethyl acetate	3.9	73	US EPA RSL
DOE-3	09/16/2021	Tetrahydrofuran	1.8	2100	US EPA RSL
DOE-3	09/16/2021	Toluene	0.81	310	DTSC HHRA NOTE 3
DOE-3	09/16/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3
DOE-4	09/16/2021	Dichlorodifluoromethane	2.1	100	US EPA RSL
DOE-4	09/16/2021	Trichlorofluoromethane	1.1	1300	DTSC HHRA NOTE 3

Notes: The bold numbers / highlighted cells are above the screening levels. Qualifiers (;J) have been added in the results column if required.

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APPENDIX C

Radionuclide Results

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Table C-1. Gross alpha and gross beta air sample results for air samplers.

Sample Collection Date	Result Alpha (µCi/mL)	MDC – Alpha (µCi/mL)	Result Beta (µCi/mL)	MDC – Beta (µCi/mL)
Sample location DOE-1				
7/1/2021	3.04E-15	6.75E-15	4.23E-14	2.84E-14
7/6/2021	-5.65E-16	4.12E-15	5.62E-14	1.73E-14
7/9/2021	1.76E-15	6.92E-15	3.32E-14	2.91E-14
7/12/2021	2.35E-15	6.66E-15	5.01E-14	2.80E-14
7/15/2021	2.15E-15	7.07E-15	3.43E-14	2.97E-14
7/19/2021	1.28E-15	5.04E-15	3.95E-14	2.12E-14
7/22/2021	1.09E-15	6.95E-15	2.86E-14	2.92E-14
7/27/2021	3.10E-15	4.16E-15	4.02E-14	1.75E-14
7/30/2021	-6.02E-16	6.82E-15	5.35E-14	2.87E-14
8/2/2021	3.14E-15	6.77E-15	5.18E-14	2.82E-14
8/5/2021	4.35E-16	6.80E-15	3.00E-14	2.83E-14
8/9/2021	8.22E-16	5.02E-15	3.68E-14	2.09E-14
8/12/2021	3.91E-15	6.94E-15	3.61E-14	2.89E-14
8/16/2021	1.33E-15	5.03E-15	2.95E-14	2.09E-14
8/19/2021	-2.86E-15	6.56E-15	3.69E-14	2.73E-14
8/23/2021	5.89E-16	5.17E-15	1.28E-14	2.15E-14
8/26/2021	-2.47E-16	6.88E-15	6.46E-14	2.86E-14
8/30/2021	1.76E-15	4.84E-15	5.41E-14	2.02E-14
9/2/2021	-6.43E-16	7.43E-15	4.17E-14	2.83E-14
9/7/2021	8.26E-16	4.36E-15	4.88E-14	1.66E-14
9/10/2021	-1.65E-15	7.34E-15	7.71E-14	2.80E-14
9/13/2021	-1.64E-15	7.32E-15	3.92E-14	2.79E-14
9/16/2021	-3.02E-15	7.39E-15	6.09E-14	2.82E-14
9/20/2021	-2.96E-15	5.41E-15	3.98E-14	2.06E-14
9/24/2021	1.05E-15	7.33E-15	2.47E-14	2.79E-14
9/27/2021	2.84E-16	5.51E-15	6.89E-14	2.10E-14
9/30/2021	-3.51E-15	7.73E-15	3.84E-14	2.94E-14

Sample Collection Date	Result Alpha (μCi/mL)	MDC – Alpha (μCi/mL)	Result Beta (μCi/mL)	MDC – Beta (μCi/mL)
Sample location DOE-2				
7/1/2021	3.97E-16	6.75E-15	4.62E-14	2.84E-14
7/6/2021	2.87E-15	4.12E-15	4.28E-14	1.73E-14
7/9/2021	3.80E-15	6.92E-15	8.00E-14	2.91E-14
7/12/2021	2.68E-15	6.66E-15	6.97E-14	2.80E-14
7/15/2021	-9.70E-16	7.07E-15	6.13E-14	2.97E-14
7/19/2021	2.96E-16	5.03E-15	5.63E-14	2.12E-14
7/22/2021	7.51E-16	6.96E-15	5.45E-14	2.93E-14
7/27/2021	3.91E-15	4.16E-15	2.76E-14	1.75E-14
7/30/2021	2.41E-15	6.82E-15	4.99E-14	2.87E-14
8/2/2021	3.80E-15	6.75E-15	6.09E-14	2.81E-14
8/5/2021	1.11E-15	6.80E-15	3.57E-14	2.83E-14
8/9/2021	-4.31E-16	5.01E-15	5.47E-14	2.09E-14
8/12/2021	1.48E-15	6.94E-15	8.08E-14	2.89E-14
8/16/2021	-4.32E-16	5.03E-15	5.19E-14	2.09E-14
8/19/2021	-5.64E-16	6.56E-15	6.19E-14	2.73E-14
8/23/2021	-1.86E-16	5.17E-15	3.26E-14	2.15E-14
8/26/2021	8.35E-15	6.88E-15	2.93E-14	2.87E-14
8/30/2021	1.76E-15	4.84E-15	4.70E-14	2.02E-14
9/2/2021	3.80E-15	7.43E-15	4.92E-14	2.83E-14
9/7/2021	3.43E-15	4.36E-15	5.43E-14	1.66E-14
9/10/2021	1.73E-15	7.33E-15	1.13E-13	2.79E-14
9/13/2021	-3.66E-15	7.32E-15	6.20E-14	2.79E-14
9/16/2021	7.21E-16	7.39E-15	6.19E-14	2.82E-14
9/20/2021	7.76E-16	5.41E-15	6.89E-14	2.06E-14
9/24/2021	-2.97E-16	7.33E-15	3.93E-14	2.79E-14
9/27/2021	2.56E-15	5.50E-15	5.20E-14	2.10E-14
9/30/2021	-5.66E-15	7.75E-15	2.50E-14	2.95E-14

Sample Collection Date	Result Alpha (μCi/mL)	MDC – Alpha (μCi/mL)	Result Beta (μCi/mL)	MDC – Beta (μCi/mL)
Sample location DOE-3				
7/1/2021	5.36E-15	6.75E-15	2.57E-14	2.84E-14
7/6/2021	2.46E-15	4.12E-15	5.65E-14	1.73E-14
7/9/2021	2.11E-15	6.93E-15	6.81E-14	2.91E-14
7/12/2021	1.04E-15	6.66E-15	5.32E-14	2.80E-14
7/15/2021	3.19E-15	7.08E-15	3.47E-14	2.98E-14
7/19/2021	4.00E-15	5.04E-15	2.66E-14	2.12E-14
7/22/2021	2.46E-15	6.96E-15	2.58E-14	2.93E-14
7/27/2021	2.49E-15	4.16E-15	5.06E-14	1.75E-14
7/30/2021	6.68E-17	6.81E-15	3.95E-14	2.86E-14
8/2/2021	2.45E-15	6.75E-15	4.82E-14	2.81E-14
8/5/2021	-2.45E-16	6.80E-15	6.13E-14	2.83E-14
8/9/2021	-4.31E-16	5.02E-15	4.84E-14	2.09E-14
8/12/2021	2.18E-15	6.94E-15	4.44E-14	2.89E-14
8/16/2021	8.24E-16	5.03E-15	3.27E-14	2.09E-14
8/19/2021	9.18E-17	6.56E-15	3.07E-14	2.73E-14
8/23/2021	1.11E-15	5.17E-15	9.28E-15	2.15E-14
8/26/2021	2.85E-15	6.88E-15	4.73E-14	2.87E-14
8/30/2021	1.52E-15	4.84E-15	5.51E-14	2.02E-14
9/2/2021	-6.42E-16	7.43E-15	3.66E-14	2.83E-14
9/7/2021	8.27E-16	4.36E-15	6.85E-14	1.66E-14
9/10/2021	1.39E-15	7.33E-15	7.63E-14	2.79E-14
9/13/2021	7.05E-16	7.23E-15	3.34E-14	2.80E-14
9/16/2021	-1.98E-15	7.31E-15	4.31E-14	2.83E-14
9/20/2021	-9.54E-16	5.34E-15	4.37E-14	2.07E-14
9/24/2021	3.73E-16	7.25E-15	3.92E-14	2.81E-14
9/27/2021	-1.22E-15	5.43E-15	6.34E-14	2.10E-14
9/30/2021	-1.72E-15	7.64E-15	4.05E-14	2.96E-14

Sample Collection Date	Result Alpha (μCi/mL)	MDC – Alpha (μCi/mL)	Result Beta (μCi/mL)	MDC – Beta (μCi/mL)
Sample location DOE-4				
7/1/2021	-9.27E-16	6.75E-15	4.62E-14	2.84E-14
7/6/2021	2.46E-15	4.12E-15	4.05E-14	1.73E-14
7/9/2021	6.79E-17	6.93E-15	4.85E-14	2.91E-14
7/12/2021	6.53E-17	6.66E-15	4.38E-14	2.80E-14
7/15/2021	-1.32E-15	7.08E-15	6.26E-14	2.98E-14
7/19/2021	-9.38E-16	5.03E-15	3.71E-14	2.12E-14
7/22/2021	6.83E-17	6.96E-15	4.73E-14	2.93E-14
7/27/2021	1.47E-15	4.16E-15	4.48E-14	1.75E-14
7/30/2021	7.35E-16	6.81E-15	3.45E-14	2.87E-14
8/2/2021	3.80E-15	6.74E-15	3.26E-14	2.81E-14
8/5/2021	2.81E-15	6.80E-15	2.68E-14	2.83E-14
8/9/2021	1.82E-15	5.02E-15	4.55E-14	2.09E-14
8/12/2021	5.29E-15	6.94E-15	4.15E-14	2.89E-14
8/16/2021	5.73E-16	5.03E-15	7.01E-14	2.09E-14
8/19/2021	7.48E-16	6.57E-15	1.21E-14	2.73E-14
8/23/2021	5.89E-16	5.17E-15	4.69E-14	2.15E-14
8/26/2021	3.88E-15	6.89E-15	2.79E-14	2.87E-14
8/30/2021	1.04E-15	4.84E-15	5.16E-14	2.02E-14
9/2/2021	4.05E-17	7.34E-15	4.51E-14	2.84E-14
9/7/2021	1.41E-15	4.32E-15	5.27E-14	1.67E-14
9/10/2021	5.04E-15	7.24E-15	6.45E-14	2.81E-14
9/13/2021	-1.62E-15	7.24E-15	4.48E-14	2.80E-14
9/16/2021	-2.65E-15	7.31E-15	6.33E-14	2.83E-14
9/20/2021	2.95E-17	5.35E-15	3.89E-14	2.07E-14
9/24/2021	-2.29E-15	7.25E-15	8.60E-14	2.81E-14
9/27/2021	2.99E-17	5.42E-15	3.46E-14	2.10E-14
9/30/2021	-4.54E-15	7.66E-15	3.35E-14	2.97E-14

Note: Some values are negative after background subtraction

Table C-2. Individual radionuclide analysis for the composite filter samples.

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Location DOE-1 – Air volume/sample = 1.02E+09				
Cesium-137	0.64	6.59	U U	6.275E-16
Strontium-90	0.197	2.32	U U	1.931E-16
Cobalt-60	-0.715	6.14	U U	-7.010E-16
Potassium-40	20.6	64.5	U U	2.020E-14
Beryllium-7	250	86		2.451E-13
Plutonium-238	-0.0625	0.675	U U	-6.127E-17
Polonium-210	5.39	1.16		5.284E-15
Plutonium-241	-2.04	16.5	U U	-2.000E-15
Thorium-230	1.11	0.689	UJ	1.088E-15
Thorium-228	0.25	0.766	U U	2.451E-16
Actinium-228	0.894	26.8	U U	8.765E-16
Americium-241	0.0888	0.297	U U	8.706E-17
Plutonium-239	0.0408	0.638	U U	4.000E-17
Ra-228 – total	1.49	5.19	U U	1.461E-15
Radium-226, -228 combined	2.18	1.65	UJ	2.137E-15
Thorium-232	0.22	0.542	U U	2.157E-16
Uranium-238	0.735	0.213	UJ	7.206E-16
Uranium-233/234	0.794	0.221		7.784E-16
Uranium-235/236	0.172	0.161		1.686E-16
Location DOE-2 – Air volume/sample =1.02E+09				
Cesium-137	1.21	7.37	U U	1.186E-15
Strontium-90	0.678	1.13	U U	6.647E-16
Cobalt-60	1.39	7.08	U U	1.363E-15
Potassium-40	108	75.3		1.059E-13
Beryllium-7	99.4	81.5	U	9.745E-14
Plutonium-238	0.13	0.205	U U	1.275E-16
Polonium-210	13.6	1.21		1.333E-14
Plutonium-241	0.585	9.89	U U	5.735E-16
Thorium-230	1.18	0.388	UJ	1.157E-15
Thorium-228	0.622	0.413	UJ	6.098E-16
Actinium-228	0.201	27.7	U U	1.971E-16
Americium-241	0.201	0.308	U U	1.971E-16
Plutonium-239	-0.0577	0.4	U U	-5.657E-17
Ra-228 – total	-3.68	7.42	U U	-3.608E-15
Radium-226, -228 combined	1.55	2.01	U U	1.520E-15
Thorium-232	0.384	0.34	UJ	3.765E-16
Uranium-238	0.459	0.222	UJ	4.500E-16

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Uranium-233/234	0.527	0.243	J	5.167E-16
Uranium-235/236	0.1	0.075	U	9.804E-17
Location DOE-3 – Air volume/sample = 1.02E+09				
Cesium-137	-0.916	5.42	U U	-8.980E-16
Strontium-90	2.07	2.98	U U	2.029E-15
Cobalt-60	0.78	6.77	U U	7.647E-16
Potassium-40	72.2	83.8	U U	7.078E-14
Beryllium-7	136	85		1.333E-13
Plutonium-238	0.031	0.492	U U	3.039E-17
Polonium-210	10.6	1.64		1.039E-14
Plutonium-241	-1.6	11.5	U U	-1.569E-15
Thorium-230	0.912	0.323	UJ	8.941E-16
Thorium-228	0.504	0.429	UJ	4.941E-16
Actinium-228	-0.403	23.8	U U	-3.951E-16
Americium-241	0.02	0.289	U U	1.961E-17
Plutonium-239	-0.155	0.428	U U	-1.520E-16
Ra-228 – total	0.949	7.67	U U	9.304E-16
Radium-226, -228 combined	2.83	1.19	UJ	2.775E-15
Thorium-232	0.604	0.316	UJ	5.922E-16
Uranium-238	0.519	0.168	UJ	5.088E-16
Uranium-233/234	0.515	0.265	J	5.049E-16
Uranium-235/236	0.195	0.135		1.912E-16
Location DOE-4 – Air volume/sample = 1.02E+09				
Cesium-137	-1.16	13.4	U U	-1.137E-15
Strontium-90	-1.19	1.94	U U	-1.167E-15
Cobalt-60	2.94	15.7	U U	2.882E-15
Potassium-40	46.1	112	U U	4.520E-14
Beryllium-7	144	153	U U	1.412E-13
Plutonium-238	0.0248	0.327	U U	2.431E-17
Polonium-210	12	2.58		1.176E-14
Plutonium-241	-5.98	12.4	U U	-5.863E-15
Thorium-230	0.812	0.264	UJ	7.961E-16
Thorium-228	0.847	0.264	UJ	8.304E-16
Actinium-228	-33.1	50	U U	-3.245E-14
Americium-241	0.452	0.722	U U	4.431E-16
Plutonium-239	0.202	0.327	U U	1.980E-16
Ra-228 – total	2.57	7.28	U U	2.520E-15
Radium-226, -228 combined	2.43	0.944	UJ	2.382E-15
Thorium-232	0.426	0.255	UJ	4.176E-16

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Uranium-238	0.799	0.171	UJ	7.833E-16
Uranium-233/234	0.85	0.234		8.333E-16
Uranium-235/236	0.00777	0.174	U U	7.618E-18

Note - Data Qualifier meanings:

UU – Analyte was analyzed for but not detected and is qualified as a non-detect.

U – The analyte was analyzed for, but not detected or is qualified as non-detect because of blank contamination.

J – The analyte was positively identified; the quantitation is estimated because of discrepancies in meeting certain analyte-specific QC criteria.

UJ – The analyte was not detected; however, the result is estimated because of discrepancies in meeting certain analyte-specific QC criteria.

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APPENDIX D

PM_{10} Monthly Audit Reports and Flow Verification Results

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NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

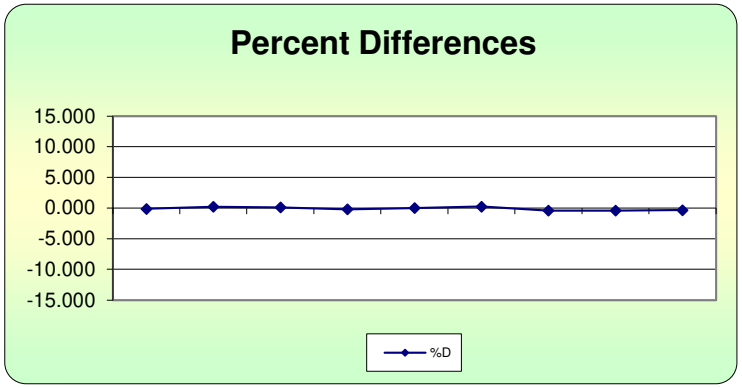
ETEC Site: DOE-1	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
14	W23314	7/26/2021	14.00	14.02	-0.143		0.020	0.143	0.020
			16.70	16.66	0.240	**25th**	0.058	0.240	0.058
			17.50	17.48	0.114	-0.342	0.013	0.114	0.013
14	W23314	8/19/2021	14.00	14.03	-0.214		0.046	0.214	0.046
			16.70	16.70	0.000	**75th**	0.000	0.000	0.000
			17.50	17.46	0.229	0.114	0.052	0.229	0.052
14	W23314	9/24/2021	14.00	14.06	-0.427		0.182	0.427	0.182
			16.70	16.77	-0.417		0.174	0.417	0.174
			17.50	17.56	-0.342		0.117	0.342	0.117

n	$\sum\|d\|$	"AB" (Eqn 4)
9	2.126	0.236
n-1	$\sum\|d\|^2$	**"AS" (Eqn 5)**
8	0.662	0.142

Bias (%) (Eqn 3)	Both Signs Positive
0.32	FALSE
Signed Bias (%)	Both Signs Negative
+/-0.32	FALSE

Note: No issues encountered with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

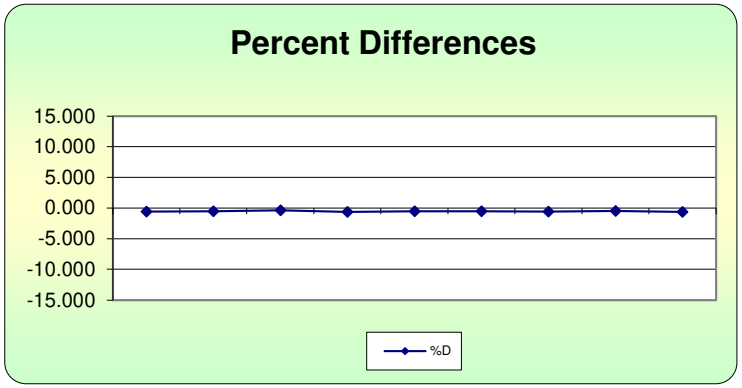
ETEC Site: DOE-2	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
14	Y12096	7/26/2021	14.00	14.08	-0.568		0.323	0.568	0.323
			16.70	16.79	-0.536	**25th**	0.287	0.536	0.287
			17.50	17.56	-0.342	-0.568	0.117	0.342	0.117
14	Y12096	8/19/2021	14.00	14.09	-0.639		0.408	0.639	0.408
			16.70	16.79	-0.536	**75th**	0.287	0.536	0.287
			17.50	17.59	-0.512	-0.512	0.262	0.512	0.262
14	Y12096	9/24/2021	14.00	14.08	-0.568		0.323	0.568	0.323
			16.70	16.78	-0.477		0.227	0.477	0.227
			17.50	17.61	-0.625		0.390	0.625	0.390

n	$\sum\|d\|$	"AB" (Eqn 4)
9	4.802	0.534
n-1	$\sum\|d\|^2$	**"AS" (Eqn 5)**
8	2.624	0.088

Bias (%) (Eqn 3)	Both Signs Positive
0.59	FALSE
Signed Bias (%)	Both Signs Negative
-0.59	TRUE

Note: No issues encountered with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

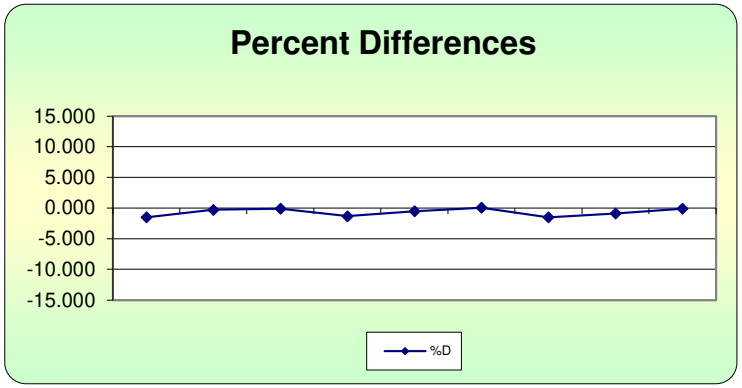
ETEC Site: DOE-3	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
14	W23313	7/26/2021	14.00	14.21	-1.478		2.184	1.478	2.184
			16.70	16.75	-0.299	**25th**	0.089	0.299	0.089
			17.50	17.52	-0.114	-1.339	0.013	0.114	0.013
14	W23313	8/19/2021	14.00	14.19	-1.339		1.793	1.339	1.793
			16.70	16.79	-0.536	**75th**	0.287	0.536	0.287
			17.50	17.49	0.057	-0.114	0.003	0.057	0.003
14	W23313	9/24/2021	14.00	14.21	-1.478		2.184	1.478	2.184
			16.70	16.85	-0.890		0.792	0.890	0.792
			17.50	17.52	-0.114		0.013	0.114	0.013

n	$\sum\|d\|$	"AB" (Eqn 4)
9	6.305	0.701
n-1	$\sum\|d\|^2$	**"AS" (Eqn 5)**
8	7.359	0.606

Bias (%) (Eqn 3)	Both Signs Positive
1.08	FALSE
Signed Bias (%)	Both Signs Negative
-1.08	TRUE

Note: No issues encountered with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
Quality Indicator Assessment Reports
Data Assessment Statisical Calculator - Software to calculate precision and bias statistics
MS Excel filename - *"11/3/2017 (dasc_11_3_17.xls)"*
https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND PORTAGE, INC.

One-Point Flow Rate Bias Estimate

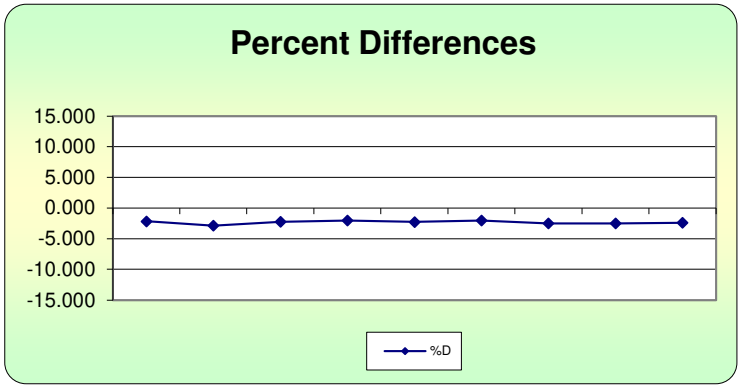
ETEC Site: DOE-4	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
14	X16067	7/26/2021	14.00	14.31	-2.166		4.693	2.166	4.693
			16.70	17.19	-2.850	**25th**	8.125	2.850	8.125
			17.50	17.90	-2.235	-2.507	4.994	2.235	4.994
14	X16067	8/19/2021	14.00	14.29	-2.029		4.118	2.029	4.118
			16.70	17.09	-2.282	**75th**	5.208	2.282	5.208
			17.50	17.86	-2.016	-2.166	4.063	2.016	4.063
14	X16067	9/24/2021	14.00	14.36	-2.507		6.285	2.507	6.285
			16.70	17.13	-2.510		6.301	2.510	6.301
			17.50	17.93	-2.398		5.751	2.398	5.751

n	$\sum\|d\|$	"AB" (Eqn 4)
9	20.994	2.333
n-1	$\sum\|d\|^2$	"AS" (Eqn 5)
8	49.538	0.266

Bias (%) (Eqn 3)	Both Signs Positive
2.5	FALSE
Signed Bias (%)	Both Signs Negative
-2.5	TRUE

Note: No issues encountered with this E-BAM unit during this quarter.



Reference: U.S. EPA, Ambient Monitoring Technology Information Center (AMTIC)
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https://www3.epa.gov/ttn/amtic/qareport.html

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 7/26/2021 Audited By : T.S. Willeford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.3 as left: 0.3

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	23.3 °C	22.6 °C	as left:	23.3 °C	22.6 °C
Barometric Pressure:	as found:	712.5 mmHg	712.0 mmHg	as left:	712.5 mmHg	712.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.66 lpm	as left:	16.7 lpm	16.66 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.02 lpm	as left:	14.0 lpm	14.02 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.48 lpm	as left:	17.5 lpm	17.48 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	Pump Test		
Expected Span Mass (mg/cm2) : 0.919	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) : 0.920			
Difference (mg/cm2) : 0.001			
% Difference / Pass or Fail: 0.11%	14.6	408.3	Good/Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0936	0936	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	1	1	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5 v
Tape Advance	24 hrs	24 hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

	Error	Date	Time		Error	Date	Time
1	No New Messages	7/26/21	~~09~~ 1044	4			
2			1043	5			
3				6			

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 8/19/21 Audited By: TS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.3 as left: 0.3

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	24.5 °C	23.7 °C	as left:	24.5 °C	23.7 °C
Barometric Pressure:	as found:	709.8 mmHg	709.5 mmHg	as left:	709.8 mmHg	709.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.7 lpm	as left:	16.7 lpm	16.7 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.03 lpm	as left:	14.0 lpm	14.03 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.46 lpm	as left:	17.5 lpm	17.46 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2):	0.919	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2):	0.921			
Difference (mg/cm2):	0.002			
% Difference / Pass or Fail:	0.22%	14.4	403.6	Good / Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0715	0715	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	1	1	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hrs	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0v	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	8/19/21	0821	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 9/24/2021 Audited By : TSwilliford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.3 as left: 0.3

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	26.9 °C	25.9 °C	as left:	26.9 °C	25.9 °C
Barometric Pressure:	as found:	712.1 mmHg	711.5 mmHg	as left:	712.1 mmHg	711.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.77 lpm	as left:	16.7 lpm	16.77 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.06 lpm	as left:	14.0 lpm	14.06 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.56 lpm	as left:	17.5 lpm	17.56 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	Pump Test		
Expected Span Mass (mg/cm2) : 0.919	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) : 0.909			
Difference (mg/cm2) : 0.01			
% Difference / (Pass) or Fail: 1.1%	14.4	413.3	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1114	1114	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	1	1	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

	Error	Date	Time		Error	Date	Time
1	No New Messages	9/24/21	1220	4			
2				5			
3				6			

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-2 Serial # Y12096

Audit Date: 7/26/2021 Audited By : JS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM		Ref. Std.			E-BAM		Ref. Std.	
Ambient Temperature:	as found:	23.9	°C	23.2	°C	as left:	23.9	°C	23.2	°C
Barometric Pressure:	as found:	709.1	mmHg	709.5	mmHg	as left:	709.1	mmHg	709.5	mmHg
16.7 lpm Flow Rate	as found:	16.7	lpm	16.79	lpm	as left:	16.7	lpm	16.79	lpm
14.0 lpm Flow Rate	as found:	14.0	lpm	14.08	lpm	as left:	14.0	lpm	14.08	lpm
17.5 lpm Flow Rate	as found:	17.5	lpm	17.56	lpm	as left:	17.5	lpm	17.56	lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.891	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.910			
Difference (mg/cm2) :	0.019			
% Difference / Pass or Fail:	2.20%	14.4	410.2	Good / Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1016	1016	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	2	2	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24 hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0 V	Flow Setpoint	16.7	16.7	Pump Protect	Off	OFF

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No new messages	7/26/21	11:28	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-2 Serial # Y12096

Audit Date: 8/19/21 Audited By : TS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	27.2 °C	26.2 °C	as left:	27.2 °C	26.2 °C
Barometric Pressure:	as found:	705.9 mmHg	706.0 mmHg	as left:	705.9 mmHg	706.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.79 lpm	as left:	16.7 lpm	16.79 lpm
14.0 lpm Flow Rate	as found:	~~16.7~~ 14.0 lpm	14.09 lpm	as left:	14.0 lpm	14.09 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.59 lpm	as left:	17.5 lpm	17.59 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	
Expected Span Mass (mg/cm2) :	0.891
Measured Span Mass (mg/cm2) :	0.901
Difference (mg/cm2) :	0.01
% Difference / ~~Pass~~ or Fail:	1.12%

Pump Test		
Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.8	420.7	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0820	0820	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	2	2	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	8/19/21	0930	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DoE-2 Serial # Y12096

Audit Date: 9/24/2021 Audited By : T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	26.8 °C	25.7 °C	as left:	26.8 °C	25.7 °C
Barometric Pressure:	as found:	708.6 mmHg	709.0 mmHg	as left:	708.6 mmHg	709.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.78 lpm	as left:	16.7 lpm	16.78 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.08 lpm	as left:	14.0 lpm	14.08 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.61 lpm	as left:	17.5 lpm	17.61 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.891	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.900			
Difference (mg/cm2) :	~~0.9%~~ 0.009			
% Difference / (Pass) or Fail:	1.0%	14.8	422.5	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1200	1200	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	2	2	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	9/24/21	1308	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23313

Audit Date: 7/26/2021 Audited By : T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	31.8 °C	29.9 °C	as left:	31.8 °C	29.9 °C
Barometric Pressure:	as found:	710.6 mmHg	710.5 mmHg	as left:	710.6 mmHg	710.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.75 lpm	as left:	16.7 lpm	16.75 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.21 lpm	as left:	14.0 lpm	14.21 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.52 lpm	as left:	17.5 lpm	17.52 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	
Expected Span Mass (mg/cm2) :	0.885
Measured Span Mass (mg/cm2) :	0.890
Difference (mg/cm2) :	0.005
% Difference / Pass or Fail:	0.56%

Pump Test		
Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.3	406.2	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0657	0657	Analog Mode	Hourly	Hourly	Flow Type	Actual	iAct
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	7/6/21	0806	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23313

Audit Date: 8/19/21 Audited By : TS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	26.3 °C	27.3 °C	as left:	26.3 °C	27.3 °C
Barometric Pressure:	as found:	708.6 mmHg	708.0 mmHg	as left:	708.6 mmHg	708.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.79 lpm	as left:	16.7 lpm	16.79 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.19 lpm	as left:	14.0 lpm	14.19 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.49 lpm	as left:	17.5 lpm	17.49 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	
Expected Span Mass (mg/cm2) :	0.885
Measured Span Mass (mg/cm2) :	0.882
Difference (mg/cm2) :	0.003
% Difference / Pass or Fail:	0.34%

Pump Test		
Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.2	398.6	Good

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0926	0926	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	8/19/21	1035	4		
2			5		
3			6		

Audit Notes:

NORTHWIND

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W23313

Audit Date: 9/24/2021 Audited By : TS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	27.7 °C	26.8 °C	as left:	27.7 °C	26.8 °C
Barometric Pressure:	as found:	710.6 mmHg	710.0 mmHg	as left:	710.6 mmHg	710.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.85 lpm	as left:	16.7 lpm	16.85 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.21 lpm	as left:	14.0 lpm	14.21 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.52 lpm	as left:	17.5 lpm	17.52 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.885	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.879			
Difference (mg/cm2) :	0.006			
% Difference / Pass or Fail:	0.68%	14.0	407.6	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1258	1258	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0v	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	9/24/21	1410	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # X16067

Audit Date: 7/26/2021 Audited By : T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	33.0 °C	31.7 °C	as left:	33.0 °C	31.7 °C
Barometric Pressure:	as found:	704.0 mmHg	703.0 mmHg	as left:	704.0 mmHg	703.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	17.19 lpm	as left:	16.7 lpm	17.19 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.31 lpm	as left:	14.0 lpm	14.31 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.90 lpm	as left:	17.5 lpm	17.90 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	Pump Test		
Expected Span Mass (mg/cm2) : 0.914	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) : 0.931			
Difference (mg/cm2) : ~~0.071~~ 0.017			
% Difference / (Pass) or Fail: 1.84%	14.0	404.3	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0814	0814	Analog Mode	Hourly	Hourly	Flow Type	Actual	ACT
Location	4	4	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5V
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0V
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0V	Flow Setpoint	16.7	16.7	Pump Protect	Off	Off

Last 6 Errors in E-BAM Error Log

	Error	Date	Time		Error	Date	Time
1	No New Messages	0923	7/26/21	4			
2				5			
3				6			

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # X-16067

Audit Date: 8/19/21 Audited By : TSwilliford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	27.5 °C	27.7 °C	as left:	27.5 °C	27.7 °C
Barometric Pressure:	as found:	700.0 mmHg	702.0 mmHg	as left:	700.0 mmHg	702.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	17.09 lpm	as left:	16.7 lpm	17.09 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.29 lpm	as left:	14.0 lpm	14.29 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.86 lpm	as left:	17.5 lpm	17.86 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test	Pump Test		
Expected Span Mass (mg/cm2) : 0.914	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) : 0.918			
Difference (mg/cm2) : 0.004			
% Difference (Pass) or Fail: 0.44%	15.0	426.8	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1038	1038	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	4	4	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hrs	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	No
Analog FS	1.0 v	1.0 v	Flow Setpoint	16.7	16.7	Pump Protect	Off	off

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1 No New Messages	8/19/21	1145	4		
2			5		
3			6		

Audit Notes:

TW
~~0.43~~

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # X16067

Audit Date: 9/24/21 Audited By : TS Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 158047 Calibration Date: 2/25/2021

Leak Check Value: as found: 0.4 as left: 0.4

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	27.1 °C	26.3 °C	as left:	27.7 °C	26.3 °C
Barometric Pressure:	as found:	704.0 mmHg	702.0 mmHg	as left:	704.0 mmHg	702.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	17.13 lpm	as left:	16.7 lpm	17.13 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.36 lpm	as left:	14.0 lpm	14.36 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.93 lpm	as left:	17.5 lpm	17.93 lpm

Mechanical Audits (Y = Yes N = No)

Sample nozzle clean:	as found	Y	as left	Y
Tape support vane clean:	as found	Y	as left	Y
Tape spool covers tight:	as found	Y	as left	Y
PM10 particle trap clean:	as found	Y	as left	Y
PM10 drip jar empty:	as found	Y	as left	Y
PM10 bug screen clear:	as found	Y	as left	Y

Manual Span Membrane Test		Pump Test		
Expected Span Mass (mg/cm2) :	0.914	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) :	0.913			
Difference (mg/cm2) :	0.001			
% Difference / Pass or Fail:	0.11%	15.0	431.2	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1400	1400	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	4	4	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5v
Tape Advance	24 hrs	24hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25C
Realtime Avg	60 mins	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0v
Machine Type	PM-10	PM-10	RH Control	On	On	RH Connect	No	NO
Analog FS	1.0 v	1.0v	Flow Setpoint	16.7	16.7	Pump Protect	Off	Off

Last 6 Errors in E-BAM Error Log

	Error	Date	Time		Error	Date	Time
1	No new Messages	9/24/21	1510	4			
2				5			
3				6			

Audit Notes: