Report on Quarterly Air Monitoring, Area IV, First Quarter 2022

Santa Susana Field Laboratory Ventura County, California

Prepared for:
United States Department of Energy

Prepared by:
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Santa Susana Field Laboratory
Ventura County, CA

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EXECUTIVE SUMMARY

This report summarizes the United States Department of Energy (DOE) air monitoring activities conducted during the first quarter of 2022, which is the sixteenth quarter (Q16) of the monitoring period (January 1, 2022, to March 31, 2022) 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. Year 4 consisted of Quarter 12 through Quarter 15. The program is continuing for a fifth year, which consists of Quarter 16 through Quarter 19.

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 2022, Q1, 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 Q16. The seventeenth quarter of the Air Monitoring Program will continue, beginning April 1, 2022.

The following site activities were conducted during Q16 by DOE within Area IV:

- Quarterly site-wide groundwater level monitoring
- Annual site-wide groundwater sampling event
- Demolition of contract line item number (CLIN) 0008 facilities
- CDM Smith conducted groundwater sampling activities at the Former Sodium Disposal Facility as a part of groundwater interim measures
- Surveillance and maintenance

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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
MDL	method detection limit
NAAQS	National Ambient Air Quality Standards
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
Q16	sixteenth quarter
QA	quality assurance
QC	quality control
RAWS	Remote Automatic Weather Stations
RPD	relative percent difference
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 was 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 is 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 first quarter in 2022, which is the sixteenth quarter (Q16) quarterly results and quality assurance (QA) activities performed between January 1, 2022, and March 31, 2022.

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.

Through the first quarter in 2022, the Simi Valley received approximately 1.42 inches of rainfall.

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 Q16 reporting period (January 1, 2022, through March 31, 2022).

Quality objectives and data completeness were met for all meteorological, PM_{10}, VOC, and radionuclide data for Q16 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 Q16 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 did not exceed the California Ambient Air Quality Standard (CAAQS; 50 micrograms per cubic meter [$\mu g/m^3$]) during Q16. During Q16 DOE-1 repeatedly experienced sensor failure between the hours of 1 a.m. and 6 a.m. Although DOE-1 was experiencing this issue, North Wind Portage was still able to use the available data to get valid readings for the daily hourly average on these days (as noted in Appendix A). DOE-4 experienced a sensor failure starting January 30, 2022, and was out of commission until March 15, 2022.

During Q16, two VOC analytes were detected above the EPA regional screening level (RSL). Naphthalene was detected at DOE-1 and Methylene chloride was detected at DOE-2. Naphthalene is made from crude oil or coal tar. It is produced during cigarette smoke, car exhaust and smoke from forest fires. Methylene chloride is a solvent used in a variety of industries and applications, such as adhesives, paint and coating products, pharmaceuticals, metal cleaning, chemical processing, and aerosols.

Data collected during Q16 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 April 1, 2022, for the seventeenth quarter of the Air Monitoring Program.

Site activities during Q16 included quarterly site-wide groundwater level monitoring, annual site-wide groundwater sampling event, demolition of contract line item number (CLIN) 8 facilities, 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) in 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 seven VOC sampling events in this reporting period with seven field duplicate samples collected during this reporting period.

During Q16, 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 100 airborne radioactivity filter samples collected in Q16 — 25 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 Q16 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 90 days in this reporting period (Q16), which covers January 1, 2022, to March 31, 2022, with a total of 8,640 possible 15-minute observations. This is the first quarter in Year 5 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 5 of the Air Monitoring Program 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 Q16. 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 Q16 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 Q16, data capture for wind speed and direction at DOE-4 was 99.99%. The average and maximum wind speeds were 5.37 m/sec and 18.3 m/s, respectively. The maximum recorded wind gust was 26.6 m/sec. The predominant wind directions were from the north (N) to the northeast (NE).

Table 2. Data screening summary for monitored meteorological parameters.

Meteorological Parameter	Screening Criteria [1] (for valid sensor responses)	Data Completeness Percent (%) [2]		
		Q16	Year 5 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	99.99	99.99	93.71
Wind Direction	between 0 and 360 degrees > 1 degree variation over 3 hours > 10 degree variation over 12 hours	99.99	99.99	94.55
Standard Deviation of Wind Direction	Inherits the completeness stats of Wind Direction	99.99	99.99	94.55
Temperature @ 2 m	≤ local record high (monthly basis) ≥ local record low (monthly basis) > 0.5 degrees Celsius (°C) variation over 12 hours	99.99	99.99	94.55
Temperature @ 10 m	≤ local record high (monthly basis) ≥ local record low (monthly basis) > 0.5°C variation over 12 hours	99.99	99.99	94.55
Delta Temperature	≤ 0.1°C during daytime ≥ -0.1°C during nighttime between -3.0 and 5.0°C	99.99	99.99	94.55
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	99.99	99.99	88.35
Precipitation	≤ 1 inch in 1 hour ≤ 4 inches in 24 hours ≥ 2 inches in 3 months	99.99	99.99	94.54
Barometric Pressure	between 871 and 982 millibar (mb) (local) (i.e., between 940 and 1060 mb sea level) ≤ 6 mb variation over 3 hours	99.99	99.99	94.54
Solar Radiation	> 0 at night ≤ maximum possible for date and latitude	99.90	99.90	94.53

(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
- Year One = 35,040
- Q5 = 8,736
- Q6 = 8,832
- Q7 = 7,488 (only 3 quarters)
- Year Two = 25,056 (abbreviated)
- Q8 = 8,736
- Q9 = 8,736
- Q10 = 8,832
- Q11 = 8,832
- Year Three = 35,136
- Q12 = 8,640
- Q13 = 8,736
- Q14 = 8,832
- Q15 = 8,832
- Year Four = 35,040
- Q16 = 8,640
- Year Five = 8,640 (to-date)
- Project = 138,912 (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 90 days in this reporting period.

- DOE-1 had valid readings all 90 days
- DOE-2 had valid readings all 90 days
- DOE-3 had valid readings all 90 days
- DOE-4 had valid readings 48 out of 90 days

DOE-1, DOE-2, and DOE-3 had 100% data completeness for PM_{10} in Q16. DOE-4 had a completeness of 53.33%, for a total data completeness of 88.33%, 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. During Q16, the E-BAM unit located at DOE-1 (W23314) had problems with the sample nozzle getting stuck in the up position when the nozzle would lift up for tape advancement between the hours of 0100 and 0600 hours. When this occurred a technician would clean the nozzle and the unit would be turn back on and would operate correctly for a few days. Although this happened on multiple occasions, as noted in Appendix A, we were still able to achieve 100% data completeness at DOE-1. The unit at DOE-4 (X16067) stopped working on January 30, 2022, due to failed seals on the air pump and had to be repaired. Neither W23314 nor X16067 could be immediately replaced since the spare unit was being repaired and was therefore unavailable. DOE-4 was not back up and running until March 15, 2022. DOE-1 had a total of 23 days when a full set of data was not available but a daily average was collected and recorded. DOE-4 had 45 days during which no data was collected.

On March 15, 2022, at DOE-4, the newly repaired unit W23310 was put into service. On March 22, 2022, the unit with the faulty sample nozzle (W23314) at DOE-1 was replaced with the newly repaired unit X16067. From March 22, 2022, through the end of the reporting period, all four E-BAM stations had 100% data completeness.

Table 3. PM_{10} data completeness for January 1, 2022, to March 31, 2022.

Location	Valid Readings (Days)	Possible Readings (Days)	Data Completeness (Percent)
DOE-1	90	90	100%
DOE-2	90	90	100%
DOE-3	90	90	100%
DOE-4	48	90	53.33%
		Average Total Data Completeness	88.33%

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, two were recorded at DOE-2, two at DOE-4, and one at DOE-3. None of the top five values in Q16 were above the CAAQS of 50 µg/m^3 or NAAQS of 150 µg/m^3.

Table 4. Top five PM_{10} 24-hour average concentration days for Q16.

Date	Location	PM_{10} Value (µg/m^3)	CAAQS (µg/m^3)
1/17/2022	DOE-4	44.75	50
1/8/2022	DOE-3	34.041	50
1/8/2022	DOE-4	32.458	50
1/8/2022	DOE-2	29.041	50
3/26/2022	DOE-2	28.66	50

Note: No values were 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 seven 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	7	7	100%
DOE-2	7	7	100%
DOE-3	7	7	100%
DOE-4	7	7	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 40 CFR 136 Appendix D for MDLs. During Q16, two VOC analytes were detected above the EPA regional screening level (RSL). Naphthalene was detected at DOE-1 and Methylene chloride was detected at DOE-2. Naphthalene is made from crude oil or coal tar. It is produced during cigarette smoke, car exhaust and smoke from forest fires. Methylene chloride is a solvent used in a variety of industries and applications, such as adhesives, paint and coating products, pharmaceuticals, metal cleaning, chemical processing, and aerosols.

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 100 airborne radioactivity filter samples collected in Q16 — 25 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 two alpha samples were below the MDC, and these samples were 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 31% of the beta samples were below MDC, and the gross (background radioactive material included) samples exceeded the MDC in 69% 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.

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 Q16. 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 below.

Table 6. Gross alpha and beta-gamma average results for Q16.

Location	Average alpha result (µCi/mL)	Average alpha MDC (µCi/mL)	Average beta result (µCi/mL)	Average beta MDC (µCi/mL)
DOE-1	-1.33E-17	6.12E-15	3.20E-14	2.57E-14
DOE-2	-3.61E-18	6.12E-15	4.40E-14	2.57E-14
DOE-3	2.14E-16	6.16E-15	3.62E-14	2.59E-14
DOE-4	4.05E-16	6.13E-15	3.49E-14	2.58E-14
Average	1.51E-16	6.13E-15	3.68E-14	2.58E-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 Q16 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 Q16 audit results for the four DOE sites showed bias percentages that ranged from -1.92 to 0.86%. None of the results exceeded the flow rate measurement quality objective of +/- 4%.

Complete audit reports and flow verification results for Q16 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 seven SDGs, P2200062 and P2201179, 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.

Each location had valid readings on the seven sample days for a sample completeness of 100%. Data completeness goals for VOCs exceeded the project goal of 85%.

5.1.3 Field Duplicates

Seven field duplicates were collected during this reporting period, one per sampling event. Ethyl acetate in SDG P2201179 was detected in one field duplicates pair that exceeded the quality objective of +/- 15% relative percent difference (RPD). For SDG P2200062 the analyte ethyl acetate and for SDG P2201179 the analyte 2-propanol 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. Sixteen 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 -4 inches mercury (Hg) to -1 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.

Since Q13, 100% of the radiological analytical results have undergone Level IV, third-party 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.

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. Issues and corrective actions regarding the E-BAM monitors are noted in Section 4.2. 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 Q16 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 continued to display an upward bias drift in the raw data observations.
- Corrective Actions:
    - Bias Removal – In the quarterly report for Quarter 14, details of the bias and correction were first presented. Quarterly adjustment factors have been developed and applied to the project datasets starting with the first quarter of 2020 based on a statistical trend analysis. A “bias removal” adjustment factor was also developed and applied to the Q16 solar radiometer. All validated project meteorological datasets to-date now include “unbiased” solar radiometer observations.
    - Resolutions – The unbiased observations are in line with the baseline year observations and theoretical values. The sensor drift bias will continue to be evaluated and correction factors applied during upcoming quarters. The following table presents the quarterly adjustment factors that have been applied to the solar radiometer raw data. In addition, replacement of the solar radiometer is being considered.

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

MON	2018	2019	2020	2021	2022
1	No Adj Factor for Baseline Qtrs	1.000	0.946	0.894	0.859
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	0.849	-
11					
12					

(2) Wind Speed Sensor

- Data Quality Issue:
  - Near the end of Quarter 15 the wind speed sensor failed and then began working again after an 11-day period. For Q16, to avoid having the same failure, the data was closely monitored to verify that this was no longer a problem. This issue was not present during Q16.
- Corrective Action:
  - Resolution – The wind speed sensor observations will continue to be monitored for unusual or unacceptable response. Replacement of the sensor or bearings will be performed if needed.

(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 35 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 seven SDGs by the laboratory. All seven 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 January through March. No flow rate comparisons exceeded the project's acceptance criterion of +/- 4; however, on February 21, 2022, no sensor was available at DOE-4 as X16067 had a seal failure, preventing collection of data. The sample nozzles and support vanes were cleaned as needed. Complete audit reports are presented in Appendix D.

Table 8. PM_{10} audit completeness.

Location	Met One E-BAM Serial Number	Parameter	Date
DOE-1	W23314	PM_{10}	01/13/2022
DOE-2	Y12096	PM_{10}	01/13/2022
DOE-3	W23313	PM_{10}	01/13/2022
DOE-4	X16067	PM_{10}	01/13/2022
DOE-1	W23314	PM_{10}	02/21/2022
DOE-2	Y12096	PM_{10}	02/21/2022
DOE-3	W23313	PM_{10}	02/21/2022
DOE-4	No Unit Available	No Unit Available	02/21/2022
DOE-1	W23314 & X16067	PM_{10}	03/22/2022
DOE-2	Y12096	PM_{10}	03/23/2022
DOE-3	W23313	PM_{10}	03/23/2022
DOE-4	W23310	PM_{10}	03/23/2022

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.

40 CFR 136, Appendix B – Definition and Procedure for the Determination of the Method Detection Limit.

California Environmental Protection Agency, Department of Toxic Substances Control (DTSC). 2018. *Approval of the Final Air Monitoring Station Locations for the Santa Susana Field Laboratory, Ventura County, California.* January.

California Environmental Protection Agency, DTSC. 2019. Human and Ecological Risk Office Human Health Risk Assessment Note Number 3, DTSC-modified Screening Levels. April. https://www.dtsc.ca.gov/AssessingRisk/upload/HHRA-Note-3-April-2019.pdf.

National Aeronautics and Space Administration (NASA). 2017. *Santa Susana Field Laboratory Baseline Air Monitoring Report Work Plan Report.* Prepared for California Department of Toxic Substances Control. Prepared on behalf of National Aeronautics and Space Administration, George C. Marshall Space Flight Center, The Boeing Company, and Department of Energy, Energy Technology and Engineering Center. September. Available online at:https://www.dtsc-ssfl.com/files/lib_air_monitor/work_plan/67496_SSFL_AirMonitoringWorkPlan_Final.pdf

U.S. Environmental Protection Agency (EPA). 1999. *Air Method, Toxic Organics-15 (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 625/R-96/010b. January. Available online at: https://www.epa.gov/homeland-security-research/epa-air-method-toxic-organics-15-15-determination-volatile-organic

U.S. Environmental Protection Agency (EPA). 2000. *Meteorological Monitoring Guidance for Regulatory Modeling Applications, United State Environmental Protection Agency, Office of Air Quality Planning and Standards*. EPA-454/R-99-005. February.

U.S. Environmental Protection Agency (EPA). 2007. *Guideline on the Meaning and the Use of Precision and Bias Data Required by 40 CFR Part 58 Appendix A, Version 1.1*. EPA-454/B-07-001. October 2007.

U.S. Environmental Protection Agency (EPA). 2017. *Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II, Ambient Air Monitoring Program*. EPA-454/B-17-001. January.

Figure 1 – SSFL Air Monitoring Locations

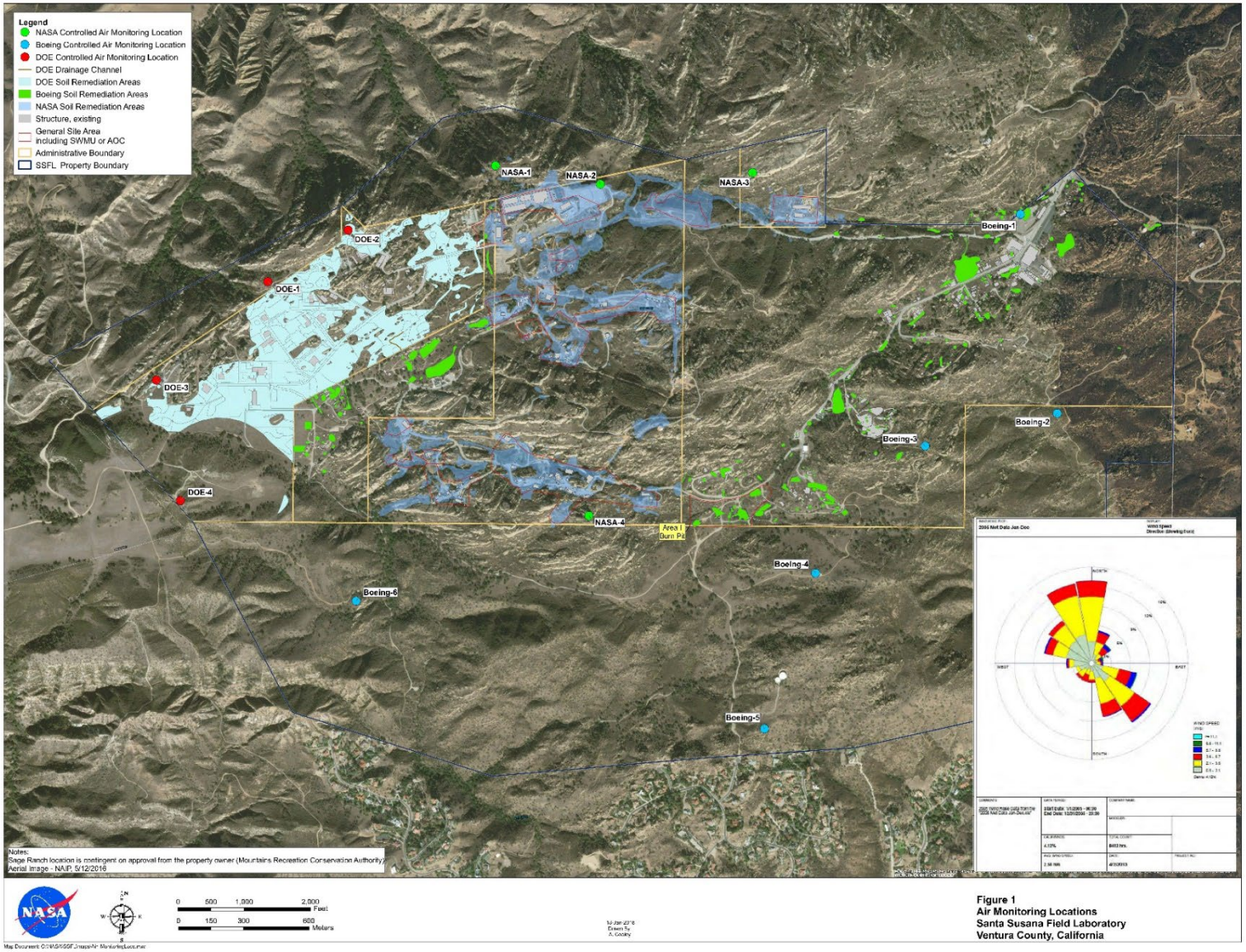


Figure 2 – DOE Air Monitoring Locations

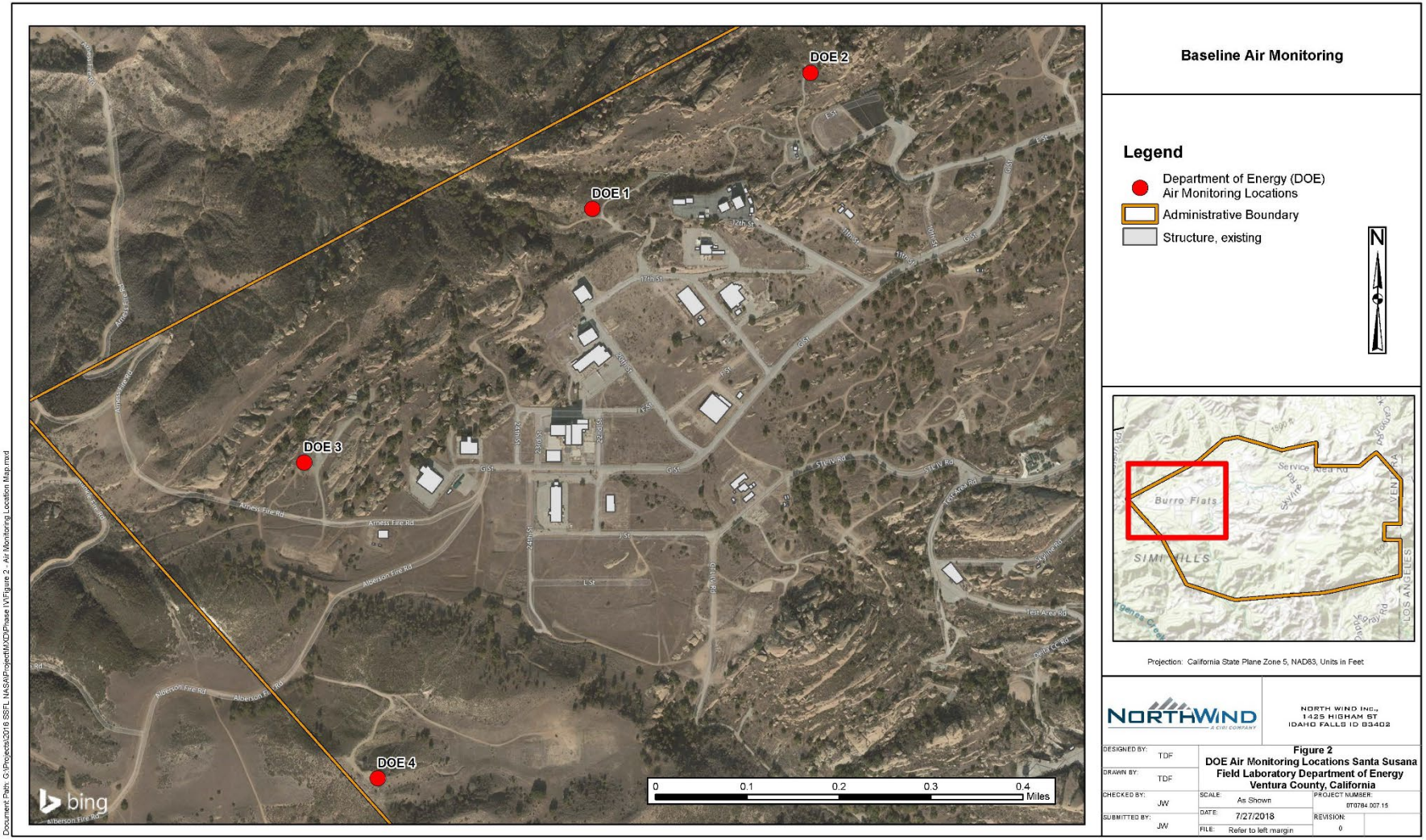
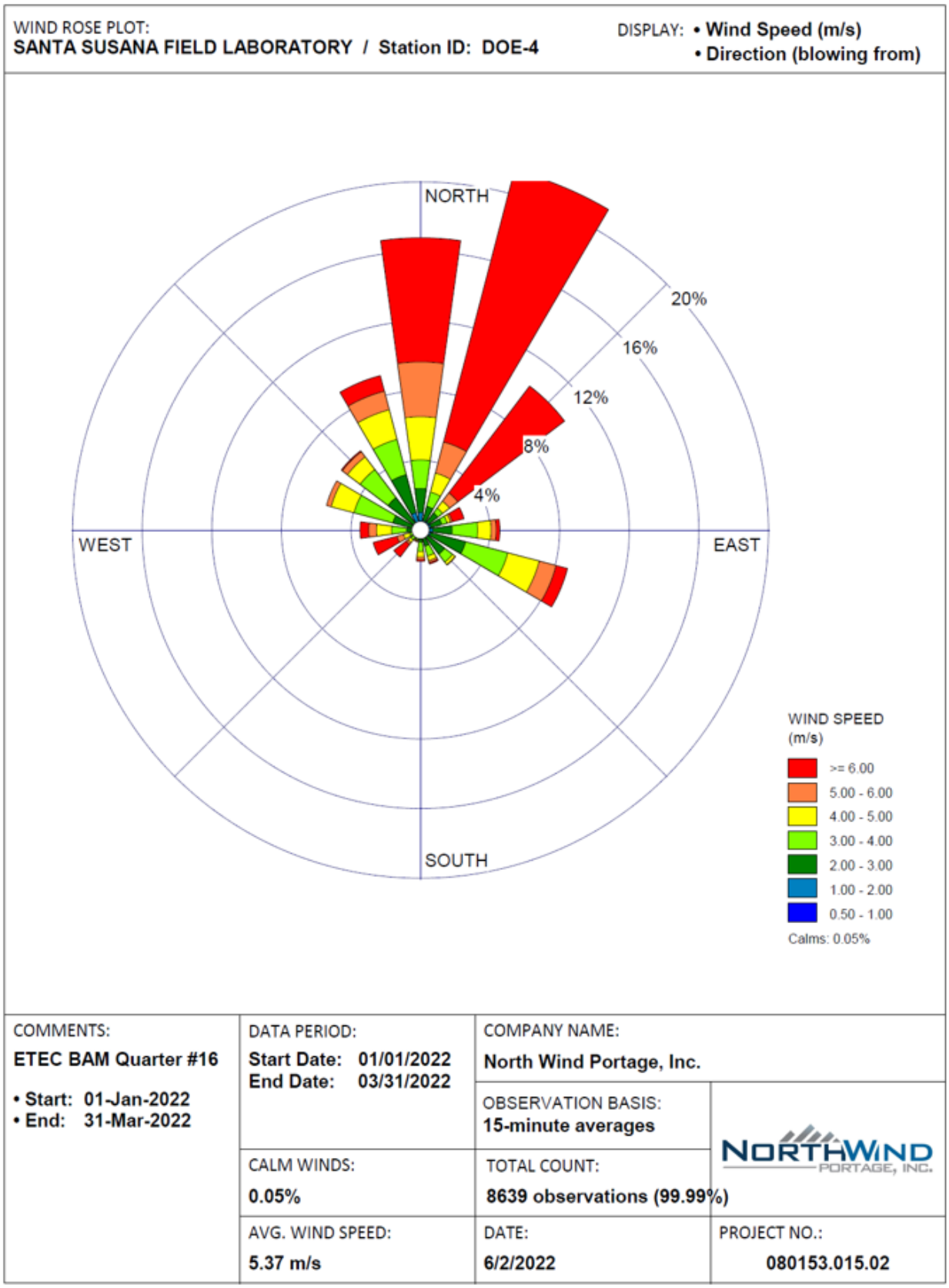


Figure 3 – DOE Quarterly Wind Rose



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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} (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)
01/01/22	5	-3	-5	2
01/02/22	0.708	0.791	0.875	2.583
01/03/22	2.625	4.541	6.958	6
01/04/22	3.958	19.416	10.708	7.25
01/05/22	0.708	1.875	1.166	2.25
01/06/22	3.291	6.333	3.541	8.791
01/07/22	19.791	26.333	28.166	22.833
01/08/22	15.5	29.041	34.041	32.458
01/09/22	3.583	7.041	1.75	5.791
01/10/22	1.188*	1.708	1	2.625
01/11/22	1.708	2.541	1.958	4.541
01/12/22	0.75	0.916	0.833	2.041
01/13/22	7*	4.25	5.125	5.625
01/14/22	5.5	5.958	10.041	7.333
01/15/22	4.125	11.583	4.166	9.125
01/16/22	-3	3.416	4.75	6.375
01/17/22	17.467*	23.791	11.833	44.75
01/18/22	18.666	18.125	19.25	27
01/19/22	10.291	8.291	7.333	12.458
01/20/22	3.313*	2.75	2.458	4.708
01/21/22	15.958	12.458	13.833	15.75
01/22/22	24	8.416	10.416	12.708
01/23/22	24	1.208	1.791	2.375
01/24/22	9.5*	8.166	6.916	19.083
01/25/22	8.867*	8.458	8.625	15.708
01/26/22	2.188*	1.541	3.125	3.541
01/27/22	2.833	2.375	2.666	3.958
01/28/22	6.429*	5.625	6.083	8.125
01/29/22	1.916	2.166	1.833	3.875
01/30/22	4.708	4.666	4.541	0.75
01/31/22	25.416	19.708	24.958	30.458
02/01/22	25.041	25.125	24.875	--
02/02/22	12.125	11.25	11	--
02/03/22	7.458	6.583	8.25	--
02/04/22	5.541	5.375	5.5	--

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)
02/05/22	1.458	2.375	1.916	--
02/06/22	1.708	2.083	2.166	--
02/07/22	2.875*	1.666	2.125	--
02/08/22	2.125	1.5	2.291	--
02/09/22	2.833	2.166	1.708	--
02/10/22	4.958	5.541	5.458	--
02/11/22	2.541	1.833	2	--
02/12/22	3.333	2.958	3.291	--
02/13/22	5.166	4.333	4.333	--
02/14/22	-3	8.5	8.166	--
02/15/22	-3	10	11.5	--
02/16/22	12.333*	8.166	8.291	--
02/17/22	10.791	9.375	10.291	--
02/18/22	4.416	3.791	19.666	--
02/19/22	6	4.291	4.583	--
02/20/22	6	13.375	13.75	--
02/21/22	13.067*	11.25	12.333	--
02/22/22	9.291	9.458	12.625	--
02/23/22	-5	2.583	3.083	--
02/24/22	4.938*	2.958	4.708	--
02/25/22	5.75	4.416	4.458	--
02/26/22	4.625	3.416	3.958	--
02/27/22	3.708	3	2.958	--
02/28/22	4.958	3.625	2.958	--
03/01/22	2.958	1.958	3.041	--
03/02/22	9.625	7.541	7.75	--
03/03/22	12.875	11.875	14.083	--
03/04/22	7.125	6.333	7.416	--
03/05/22	10.916	11.708	13.291	--
03/06/22	5.291	4.875	6.333	--
03/07/22	3	5.208	6.583	--
03/08/22	5.933*	3.916	4.875	--
03/09/22	11	9.541	10.708	--
03/10/22	12.375	11.416	11.75	--
03/11/22	8.458	6.708	7.333	--
03/12/22	-5	5.25	5.666	--

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)
03/13/22	-5	9.833	10.625	--
03/14/22	4.5	6.291	7.083	--
03/15/22	9.541	7.625	7.791	15.214*
03/16/22	8.938*	6.625	6.5	10.291
03/17/22	9.471*	6.958	8.458	11.666
03/18/22	9.923*	7.208	6.875	8.208
03/19/22	11.958	10.041	12.666	13.25
03/20/22	5.041	4.625	5.333	6.125
03/21/22	8.5	6.375	6.875	8.041
03/22/22	6	5.5	6.041	6.791
03/23/22	7.125	5.583	8.166	5.875
03/24/22	7.458	5.875	6.5	6.541
03/25/22	5.583	4.583	4.083	4.863
03/26/22	10.875	28.666	12.125	10.083
03/27/22	14.791	12.083	13	13.958
03/28/22	4.083	8.208	4.708	3.666
03/29/22	3.375	4.458	6.666	5.375
03/30/22	11.083	10.625	11.875	9.958
03/31/22	11.304	12.608	13.695	14.043

Note: * indicates the average is only for a partial day worth of readings due to sensor failure

PM_{10} Monthly Statistics

Location ID	January 2022			February 2022			March 2022		
	PM_{10}			PM_{10}			PM_{10}		
	High	Low	95th PCTL	High	Low	95th PCTL	High	Low	95th PCTL
DOE-1	19.79100	0.70800	19.39725	25.04100	1.45800	13.01900	14.79100	3.37500	12.31245
DOE-2	29.04100	0.79100	25.06200	25.12500	1.50000	12.62500	28.66600	3.91600	12.42425
DOE-3	34.04100	0.83300	26.56200	24.87500	1.70800	16.87450	13.69500	4.08300	13.18915
DOE-4	44.75000	2.04100	30.27480	--	--	--	15.21400	3.66600	14.27720

Note: DOE-4 had no valid readings in February 2022.

PCTL = percentile

APPENDIX B

Analytical Results for Ambient Air VOCs

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

Location ID	Sample Date	Analyte	Method Detection Limit	Result	Screening Level Value	SL Source
DOE-1	01/06/2022	Dichlorodifluoromethane	0.13	2.4	100	US EPA RSL
DOE-1	01/06/2022	Ethyl acetate	0.42	17	73	US EPA RSL
DOE-1	01/06/2022	Trichlorofluoromethane	0.12	1.1	1300	DTSC HHRA NOTE 3
DOE-2	01/06/2022	Dichlorodifluoromethane	0.14	2.4	100	US EPA RSL
DOE-2	01/06/2022	Ethyl acetate	0.44	3.4	73	US EPA RSL
DOE-2	01/06/2022	Trichlorofluoromethane	0.13	1.2	1300	DTSC HHRA NOTE 3
DOE-3	01/06/2022	Dichlorodifluoromethane	0.13	2.5	100	US EPA RSL
DOE-3	01/06/2022	Trichlorofluoromethane	0.12	1.2	1300	DTSC HHRA NOTE 3
DOE-4	01/06/2022	Dichlorodifluoromethane	0.13	2.5	100	US EPA RSL
DOE-4	01/06/2022	Trichlorofluoromethane	0.12	1.2	1300	DTSC HHRA NOTE 3
DOE-1	01/21/2022	Dichlorodifluoromethane	0.14	2.6	100	US EPA RSL
DOE-1	01/21/2022	Trichlorofluoromethane	0.13	1.4	1300	DTSC HHRA NOTE 3
DOE-2	01/21/2022	Dichlorodifluoromethane	0.12	2.7	100	US EPA RSL
DOE-2	01/21/2022	Trichlorofluoromethane	0.11	1.4	1300	DTSC HHRA NOTE 3
DOE-3	01/21/2022	Dichlorodifluoromethane	0.14	2.6	100	US EPA RSL
DOE-3	01/21/2022	Trichlorofluoromethane	0.13	1.4	1300	DTSC HHRA NOTE 3
DOE-4	01/21/2022	Dichlorodifluoromethane	0.13	2.7	100	US EPA RSL
DOE-4	01/21/2022	Trichlorofluoromethane	0.12	1.4	1300	DTSC HHRA NOTE 3
DOE-1	02/04/2022	Dichlorodifluoromethane	0.12	2.2	100	US EPA RSL
DOE-1	02/04/2022	Ethyl acetate	0.39	8.8	73	US EPA RSL
DOE-1	02/04/2022	Trichlorofluoromethane	0.11	1.1	1300	DTSC HHRA NOTE 3
DOE-2	02/04/2022	Dichlorodifluoromethane	0.12	2.2	100	US EPA RSL
DOE-2	02/04/2022	Ethyl acetate	0.40	5.3	73	US EPA RSL
DOE-2	02/04/2022	Trichlorofluoromethane	0.12	1.1	1300	DTSC HHRA NOTE 3
DOE-3	02/04/2022	Dichlorodifluoromethane	0.13	2.3	100	US EPA RSL
DOE-3	02/04/2022	Trichlorofluoromethane	0.12	1.1	1300	DTSC HHRA NOTE 3
DOE-4	02/04/2022	Dichlorodifluoromethane	0.14	2.1	100	US EPA RSL
DOE-4	02/04/2022	Ethyl acetate	0.46	3.8	73	US EPA RSL
DOE-4	02/04/2022	Trichlorofluoromethane	0.13	1.1	1300	DTSC HHRA NOTE 3
DOE-1	02/17/2022	Dichlorodifluoromethane	0.12	1.9	100	US EPA RSL
DOE-1	02/17/2022	Trichlorofluoromethane	0.11	1.0	1300	DTSC HHRA NOTE 3
DOE-2	02/17/2022	Dichlorodifluoromethane	0.13	1.9	100	US EPA RSL
DOE-2	02/17/2022	Trichlorofluoromethane	0.12	1.0	1300	DTSC HHRA NOTE 3
DOE-3	02/17/2022	Dichlorodifluoromethane	0.13	1.9	100	US EPA RSL
DOE-3	02/17/2022	Trichlorofluoromethane	0.12	1.0	1300	DTSC HHRA NOTE 3
DOE-4	02/17/2022	Dichlorodifluoromethane	0.12	1.9	100	US EPA RSL
DOE-4	02/17/2022	Trichlorofluoromethane	0.12	1.0	1300	DTSC HHRA NOTE 3
DOE-1	03/02/2022	Dichlorodifluoromethane	0.12	2.1	100	US EPA RSL
DOE-1	03/02/2022	Trichlorofluoromethane	0.11	1.0	1300	DTSC HHRA NOTE 3
DOE-2	03/02/2022	Dichlorodifluoromethane	0.13	2.1	100	US EPA RSL
DOE-2	03/02/2022	Trichlorofluoromethane	0.12	1.0	1300	DTSC HHRA NOTE 3
DOE-3	03/02/2022	Dichlorodifluoromethane	0.12	2.0	100	US EPA RSL

Location ID	Sample Date	Analyte	Method Detection Limit	Result	Screening Level Value	SL Source
DOE-3	03/02/2022	Ethyl acetate	0.38	4.0	73	US EPA RSL
DOE-3	03/02/2022	Trichlorofluoromethane	0.11	0.99	1300	DTSC HHRA NOTE 3
DOE-4	03/02/2022	Dichlorodifluoromethane	0.13	2.1	100	US EPA RSL
DOE-4	03/02/2022	Ethyl acetate	0.41	18	73	US EPA RSL
DOE-4	03/02/2022	Trichlorofluoromethane	0.12	1.0	1300	DTSC HHRA NOTE 3
DOE-1	03/15/2022	Dichlorodifluoromethane	0.11	2.2	100	US EPA RSL
DOE-1	03/15/2022	Ethyl acetate	0.36	2.9	73	US EPA RSL
DOE-1	03/15/2022	Trichlorofluoromethane	0.1	1.1	1300	DTSC HHRA NOTE 3
DOE-2	03/15/2022	Dichlorodifluoromethane	0.13	2.2	100	US EPA RSL
DOE-2	03/15/2022	Ethyl acetate	0.41	28 (;J)	73	US EPA RSL
DOE-2	03/15/2022	Trichlorofluoromethane	0.12	1.1	1300	DTSC HHRA NOTE 3
DOE-3	03/15/2022	Dichlorodifluoromethane	0.13	2.2	100	US EPA RSL
DOE-3	03/15/2022	Trichlorofluoromethane	0.12	1.1	1300	DTSC HHRA NOTE 3
DOE-4	03/15/2022	Dichlorodifluoromethane	0.13	2.2	100	US EPA RSL
DOE-4	03/15/2022	Ethyl acetate	0.41	6.4	73	US EPA RSL
DOE-4	03/15/2022	Trichlorofluoromethane	0.12	1.1	1300	DTSC HHRA NOTE 3
DOE-1	03/29/2022	Dichlorodifluoromethane	0.12	2.1	100	US EPA RSL
DOE-1	03/29/2022	Ethyl acetate	0.40	3.9	73	US EPA RSL
DOE-1	03/29/2022	Naphthalene	0.11	**1.2**	0.083	US EPA RSL
DOE-1	03/29/2022	Trichlorofluoromethane	0.12	1.0	1300	DTSC HHRA NOTE 3
DOE-2	03/29/2022	Dichlorodifluoromethane	2.2	2.2	100	US EPA RSL
DOE-2	03/29/2022	Ethyl acetate	17	17	73	US EPA RSL
DOE-2	03/29/2022	Methylene chloride	0.23	**1.3**	1	DTSC HHRA NOTE 3
DOE-2	03/29/2022	Trichlorofluoromethane	1.1	1.1	1300	DTSC HHRA NOTE 3
DOE-3	03/29/2022	Dichlorodifluoromethane	0.12	2.0	100	US EPA RSL
DOE-3	03/29/2022	Ethyl acetate	0.38	3.0	73	US EPA RSL
DOE-3	03/29/2022	Trichlorofluoromethane	0.11	1.0	1300	DTSC HHRA NOTE 3
DOE-4	03/29/2022	Dichlorodifluoromethane	0.12	2.3	100	US EPA RSL
DOE-4	03/29/2022	Ethyl acetate	0.39	5.3	73	US EPA RSL
DOE-4	03/29/2022	Trichlorofluoromethane	0.11	1.1	1300	DTSC HHRA NOTE 3

Notes: The bold numbers / highlighted cells are above the screening levels.
J = estimated value

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 (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-1				
1/4/2022	-1.18E-15	5.24E-15	1.80E-14	2.18E-14
1/7/2022	-1.58E-15	7.06E-15	1.02E-14	2.94E-14
1/10/2022	-2.55E-15	6.95E-15	2.19E-14	2.90E-14
1/14/2022	-1.48E-15	5.45E-15	3.26E-14	2.27E-14
1/18/2022	-1.21E-15	5.40E-15	5.72E-14	2.25E-14
1/21/2022	4.33E-16	7.11E-15	7.18E-14	2.96E-14
1/24/2022	-9.07E-16	7.02E-15	3.89E-14	2.93E-14
1/27/2022	4.29E-16	7.06E-15	6.21E-14	2.94E-14
1/31/2022	-2.17E-15	5.24E-15	3.22E-14	2.18E-14
2/4/2022	2.27E-15	5.27E-15	4.92E-14	2.28E-14
2/7/2022	-2.30E-15	6.60E-15	3.43E-15	2.85E-14
2/10/2022	1.60E-15	6.80E-15	4.94E-14	2.93E-14
2/14/2022	4.86E-16	5.42E-15	2.18E-14	2.34E-14
2/18/2022	-1.26E-15	5.01E-15	1.55E-14	2.16E-14
2/21/2022	-4.08E-16	7.22E-15	4.24E-14	3.12E-14
2/25/2022	-7.84E-16	5.09E-15	8.94E-15	2.20E-14
2/28/2022	-2.19E-15	7.29E-15	5.15E-14	3.15E-14
3/3/2022	4.69E-15	7.06E-15	5.70E-14	2.92E-14
3/7/2022	1.95E-15	5.13E-15	1.32E-14	2.12E-14
3/11/2022	3.51E-15	5.28E-15	3.80E-14	2.19E-14
3/14/2022	-6.67E-16	7.19E-15	1.05E-14	2.98E-14
3/18/2022	2.37E-15	5.54E-15	2.53E-14	2.29E-14
3/21/2022	3.48E-16	7.07E-15	1.03E-14	2.93E-14
3/24/2022	1.01E-17	5.33E-15	1.70E-14	2.21E-14
3/29/2022	2.55E-16	5.18E-15	4.26E-14	2.15E-14

Sample Collection Date	Result Alpha (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-2				
1/4/2022	-1.42E-15	5.24E-15	1.07E-14	2.18E-14
1/7/2022	-3.93E-15	7.05E-15	1.62E-14	2.94E-14
1/10/2022	-2.22E-15	6.96E-15	5.12E-14	2.90E-14
1/14/2022	-1.99E-15	5.44E-15	5.87E-14	2.27E-14
1/18/2022	2.39E-15	5.41E-15	6.90E-14	2.26E-14
1/21/2022	7.71E-16	7.11E-15	9.35E-14	2.96E-14
1/24/2022	4.27E-16	7.02E-15	4.84E-14	2.93E-14
1/27/2022	4.29E-16	7.06E-15	5.15E-14	2.94E-14
1/31/2022	-1.79E-16	5.24E-15	5.57E-14	2.18E-14
2/4/2022	1.24E-15	5.27E-15	5.49E-14	2.27E-14
2/7/2022	2.71E-16	6.61E-15	3.27E-14	2.85E-14
2/10/2022	6.10E-16	6.80E-15	2.88E-14	2.94E-14
2/14/2022	4.86E-16	5.42E-15	5.11E-14	2.34E-14
2/18/2022	9.37E-16	5.01E-15	3.20E-14	2.16E-14
2/21/2022	-2.17E-15	7.23E-15	4.96E-14	3.12E-14
2/25/2022	-1.53E-15	5.09E-15	3.41E-14	2.20E-14
2/28/2022	-3.60E-15	7.28E-15	4.43E-14	3.14E-14
3/3/2022	4.70E-15	7.07E-15	3.94E-14	2.93E-14
3/7/2022	7.38E-16	5.13E-15	3.83E-14	2.12E-14
3/11/2022	3.76E-15	5.28E-15	4.16E-14	2.19E-14
3/14/2022	1.36E-17	7.19E-15	5.18E-14	2.98E-14
3/18/2022	5.35E-16	5.54E-15	5.28E-14	2.29E-14
3/21/2022	3.48E-16	7.06E-15	3.11E-14	2.92E-14
3/24/2022	7.69E-16	5.34E-15	5.02E-14	2.21E-14
3/29/2022	-1.46E-15	5.18E-15	1.34E-14	2.15E-14

Sample Collection Date	Result Alpha (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-3				
1/4/2022	1.31E-15	5.23E-15	1.59E-14	2.18E-14
1/7/2022	-5.76E-16	7.04E-15	5.49E-14	2.93E-14
1/10/2022	4.24E-16	6.98E-15	4.50E-14	2.91E-14
1/14/2022	8.46E-16	5.43E-15	5.02E-14	2.26E-14
1/18/2022	-1.47E-15	5.42E-15	4.58E-14	2.26E-14
1/21/2022	-8.71E-16	6.73E-15	6.53E-14	2.81E-14
1/24/2022	-3.24E-15	7.02E-15	1.47E-14	2.93E-14
1/27/2022	-5.77E-16	7.06E-15	5.36E-14	2.94E-14
1/31/2022	6.87E-17	5.16E-15	6.01E-14	2.15E-14
2/4/2022	1.01E-14	5.34E-15	6.45E-14	2.31E-14
2/7/2022	-1.34E-15	6.61E-15	1.33E-14	2.85E-14
2/10/2022	-2.03E-15	6.77E-15	2.45E-14	2.92E-14
2/14/2022	-8.38E-16	5.44E-15	3.81E-14	2.35E-14
2/18/2022	-1.02E-15	5.01E-15	3.64E-14	2.16E-14
2/21/2022	-2.87E-15	7.23E-15	3.06E-14	3.12E-14
2/25/2022	-2.52E-15	5.09E-15	-8.11E-15	2.20E-14
2/28/2022	-4.67E-15	7.28E-15	2.55E-14	3.14E-14
3/3/2022	1.04E-14	7.07E-15	5.81E-14	2.93E-14
3/7/2022	2.43E-15	5.11E-15	2.80E-14	2.12E-14
3/11/2022	3.02E-15	5.29E-15	5.43E-14	2.19E-14
3/14/2022	-2.03E-15	7.19E-15	5.88E-14	2.98E-14
3/18/2022	2.72E-16	5.53E-15	4.30E-14	2.29E-14
3/21/2022	1.02E-15	7.07E-15	3.83E-15	2.93E-14
3/24/2022	7.69E-16	5.34E-15	2.14E-14	2.21E-14
3/29/2022	-1.24E-15	6.60E-15	7.27E-15	2.73E-14

Sample Collection Date	Result Alpha (mCi/mL)	MDC – Alpha (mCi/mL)	Result Beta (mCi/mL)	MDC – Beta (mCi/mL)
Sample location DOE-4				
1/4/2022	-1.79E-16	5.24E-15	3.01E-14	2.18E-14
1/7/2022	-1.91E-15	7.01E-15	2.62E-14	2.92E-14
1/10/2022	-2.23E-15	6.98E-15	2.93E-14	2.91E-14
1/14/2022	5.89E-16	5.44E-15	3.72E-14	2.27E-14
1/18/2022	-4.44E-16	5.43E-15	6.43E-14	2.26E-14
1/21/2022	2.12E-15	7.11E-15	7.32E-14	2.96E-14
1/24/2022	-5.74E-16	7.02E-15	4.66E-14	2.93E-14
1/27/2022	-1.25E-15	7.06E-15	3.28E-14	2.94E-14
1/31/2022	-9.12E-16	5.16E-15	4.49E-14	2.15E-14
2/4/2022	4.91E-15	5.34E-15	4.19E-14	2.31E-14
2/7/2022	-3.91E-15	6.60E-15	2.39E-14	2.85E-14
2/10/2022	9.42E-16	6.80E-15	2.04E-14	2.94E-14
2/14/2022	2.09E-15	5.48E-15	3.19E-14	2.37E-14
2/18/2022	-3.90E-17	5.00E-15	2.58E-14	2.16E-14
2/21/2022	-2.52E-15	7.23E-15	1.12E-14	3.12E-14
2/25/2022	-1.30E-15	5.17E-15	1.63E-14	2.23E-14
2/28/2022	-2.19E-15	7.28E-15	5.52E-14	3.14E-14
3/3/2022	2.69E-15	7.07E-15	3.98E-14	2.93E-14
3/7/2022	7.36E-16	5.11E-15	4.26E-14	2.12E-14
3/11/2022	4.02E-15	5.29E-15	4.41E-14	2.19E-14
3/14/2022	3.76E-15	7.19E-15	4.08E-14	2.98E-14
3/18/2022	2.11E-15	5.54E-15	3.32E-14	2.29E-14
3/21/2022	3.48E-16	7.06E-15	6.70E-15	2.92E-14
3/24/2022	2.03E-15	5.34E-15	2.27E-14	2.21E-14
3/29/2022	1.24E-15	5.18E-15	3.15E-14	2.14E-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 = 9.54E+08				
Cesium-137	0.815	7.05	U U	8.543E-16
Strontium-90	-0.230	2.29	U U	-2.411E-16
Cobalt-60	-0.757	7.20	U U	-7.935E-16
Potassium-40	10.1	108	U U	1.059E-14
Beryllium-7	239	80.6		2.505E-13
Plutonium-238	-0.0464	0.529	U U	-4.864E-17
Polonium-210	14.0	0.769		1.468E-14
Plutonium-241	26.9	40.2	U U	2.820E-14
Thorium-230	1.22	1.25	U U	1.279E-15
Thorium-228	0.586	1.37	U U	6.143E-16
Actinium-228	9.81	38.0	U U	4.361E-15
Americium-241	-0.193	1.39	U U	1.028E-14
Plutonium-239	-0.0490	0.416	U U	-2.023E-16
Ra-228 – total	4.84	6.89	U UJ	-5.136E-17
Radium-226, -228 combined	9.94	7.61	UJ	5.073E-15
Thorium-232	0.656	0.617	U	1.042E-14
Uranium-238	0.621	0.497	UJ	6.876E-16
Uranium-233/234	1.30	0.557	UJ	6.509E-16
Uranium-235/236	0.0396	0.422	U U	1.363E-15
Location DOE-2 – Air volume/sample =9.54E+08				
Cesium-137	1.39	6.66	U U	1.457E-15
Strontium-90	2.28	2.73	U U	2.390E-15
Cobalt-60	-1.95	5.25	U U	-2.044E-15
Potassium-40	39	55.9	U U	4.088E-14
Beryllium-7	163	98.1		1.709E-13
Plutonium-238	0.0731	0.349	U UJ	7.662E-17
Polonium-210	12.3	1.09		1.289E-14
Plutonium-241	18.5	33.1	U UJ	1.939E-14
Thorium-230	0.901	0.466	UJ	9.444E-16
Thorium-228	0.524	0.608	U U	5.493E-16
Actinium-228	3.22	30.1	U U	3.375E-15
Americium-241	0.108	1.19	U UJ	1.132E-16
Plutonium-239	-0.151	0.51	U UJ	-1.583E-16
Ra-228 – total	7.36	5.55	J	7.715E-15
Radium-226, -228 combined	3.42	11.3	U U	3.585E-15
Thorium-232	0.344	0.425	U U	3.606E-16
Uranium-238	0.813	0.44	UJ	8.522E-16

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Uranium-233/234	0.629	0.572	UJ	6.593E-16
Uranium-235/236	0.177	0.389	U U	1.855E-16
Location DOE-3 – Air volume/sample = 9.46E+08				
Cesium-137	0.908	8.27	U U	1.457E-15
Strontium-90	-1.3	2.24	U U	2.390E-15
Cobalt-60	-0.524	7.19	U U	-2.044E-15
Potassium-40	127	65.4		4.088E-14
Beryllium-7	113	108		1.709E-13
Plutonium-238	0.0614	0.184	U U	7.662E-17
Polonium-210	13.6	0.818		1.289E-14
Plutonium-241	-5.43	40.9	U U	1.939E-14
Thorium-230	1.46	0.692	UJ	9.444E-16
Thorium-228	0.845	0.545		5.493E-16
Actinium-228	-9.47	36.4	U U	3.375E-15
Americium-241	0.113	1.09	U UJ	1.132E-16
Plutonium-239	0.0956	0.453	U U	-1.583E-16
Ra-228 – total	9.57	4.8	J	7.715E-15
Radium-226, -228 combined	6.7	6.88	U U	3.585E-15
Thorium-232	0.681	0.475	UJ	3.606E-16
Uranium-238	0.738	0.482	UJ	8.522E-16
Uranium-233/234	0.265	0.604	U U	6.593E-16
Uranium-235/236	-0.0142	0.498	U U	1.855E-16
Location DOE-4 – Air volume/sample = 9.53E+08				
Cesium-137	4.09	9.69	U U	1.457E-15
Strontium-90	0.0165	2.68	U U	2.390E-15
Cobalt-60	-5.46	7.7	U U	-2.044E-15
Potassium-40	-16.8	159	U U	4.088E-14
Beryllium-7	118	130	U U	1.709E-13
Plutonium-238	0.0524	0.332	U U	7.662E-17
Polonium-210	15.8	0.831		1.289E-14
Plutonium-241	18.1	31	U U	1.939E-14
Thorium-230	0.62	0.609	UJ	9.444E-16
Thorium-228	0.781	0.586		5.493E-16
Actinium-228	-2.31	49.1	U U	3.375E-15
Americium-241	-0.194	1.48	U UJ	1.132E-16
Plutonium-239	-0.0101	0.353	U U	-1.583E-16
Ra-228 – total	4.83	5.88	U UJ	7.715E-15
Radium-226, -228 combined	1.92	12.6	U U	3.585E-15
Thorium-232	0.559	0.451	UJ	3.606E-16

Radionuclide	Result (pCi/sample)	MDC (pCi/sample)	Data Qualifier	Airborne Concentration (µCi/mL)
Uranium-238	0.616	0.462	UJ	8.522E-16
Uranium-233/234	0.511	0.506	UJ	6.593E-16
Uranium-235/236	0.056	0.354	U U	1.855E-16

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

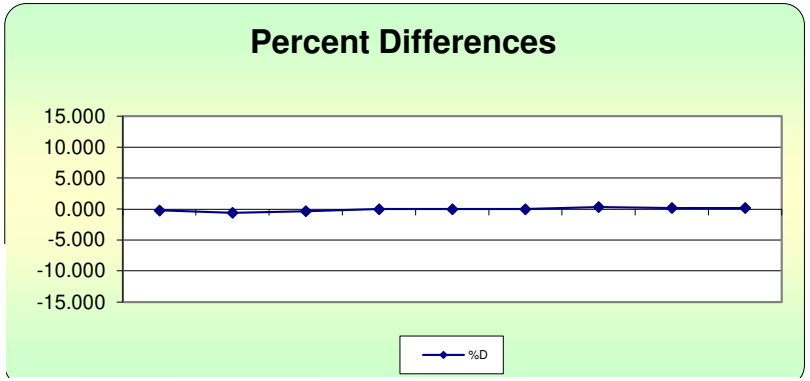
ETEC Site: DOE-1	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
16	W23314	1/13/2022	14.00	14.03	-0.214		0.046	0.214	0.046
			16.70	16.80	-0.595	**25th**	0.354	0.595	0.354
			17.50	17.56	-0.342	-0.455	0.117	0.342	0.117
16	W23314	2/21/2022	(see note)						
						75th			
						0.172			
16	W23314	3/22/2022	14.00	13.95	0.358		0.128	0.358	0.128
			16.70	16.67	0.180		0.032	0.180	0.032
			17.50	17.47	0.172		0.029	0.172	0.029
16	X16067	3/22/2022	14.00	14.10	-0.709		0.503	0.709	0.503
			16.70	16.74	-0.239		0.057	0.239	0.057
			17.50	17.58	-0.455		0.207	0.455	0.207

n	$\sum\|d\|$	"AB" (Eqn 4)
9	3.264	0.363
n-1	$\sum\|d\|^2$	**"AS" (Eqn 5)**
8	1.474	0.191

Bias (%) (Eqn 3)	Both Signs Positive
0.48	FALSE
Signed Bias (%)	Both Signs Negative
+/-0.48	FALSE

Note: Feb 2022 audit not performed. BGI Deltacal calibrator needed for flow rate checks was being recalibrated. Also, E-BAM unit was replaced during the Mar 2022 audit due to Nozzle Failed errors. Both E-BAM units audit results are included for completeness.



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

One-Point Flow Rate Bias Estimate

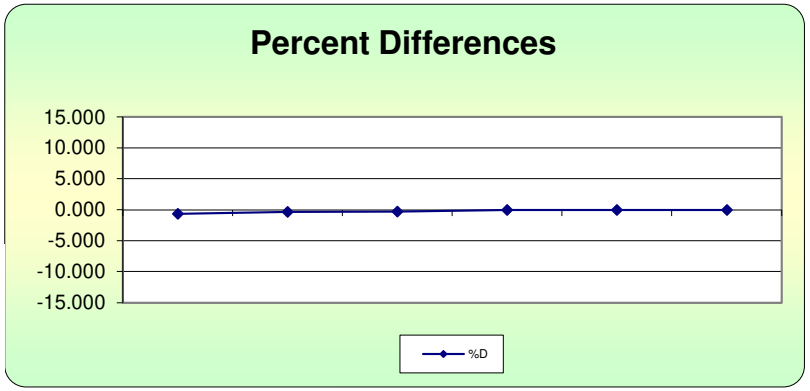
ETEC Site: DOE-2	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
16	Y12096	1/13/2022	14.00	14.09	-0.639		0.408	0.639	0.408
			16.70	16.76	-0.358	**25th**	0.128	0.358	0.128
			17.50	17.55	-0.285	-0.340	0.081	0.285	0.081
16	Y12096	2/21/2022	(see note)						
						75th			
						0.118			
16	Y12096	3/23/2022	14.00	14.03	-0.214		0.046	0.214	0.046
			16.70	16.63	0.421		0.177	0.421	0.177
			17.50	17.46	0.229		0.052	0.229	0.052

n	$\sum\|d\|$	"AB" (Eqn 4)
6	2.145	0.358
n-1	$\sum\|d\|^2$	**"AS" (Eqn 5)**
5	0.893	0.158

Bias (%) (Eqn 3)	Both Signs Positive
0.49	FALSE
Signed Bias (%)	Both Signs Negative
+/-0.49	FALSE

Note: Feb 2022 audit not performed. BGI Deltacal calibrator needed for flow rate checks was being recalibrated.



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

One-Point Flow Rate Bias Estimate

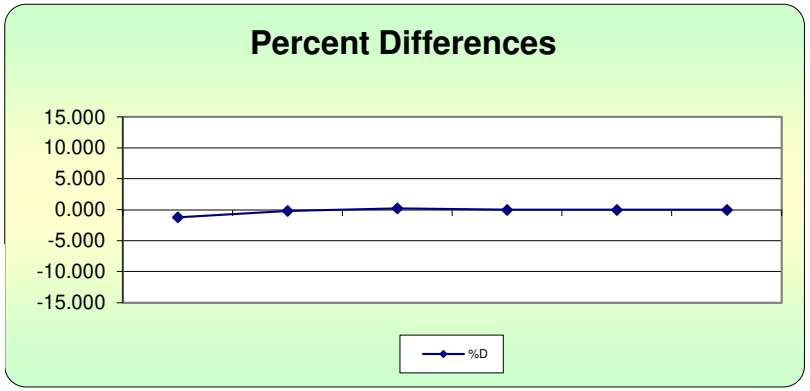
ETEC Site: DOE-3	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
16	W23313	1/13/2022	14.00	14.17	-1.200		1.439	1.200	1.439
			16.70	16.73	-0.179	**25th**	0.032	0.179	0.032
			17.50	17.46	0.229	-0.735	0.052	0.229	0.052
16	W23313	2/21/2022	(see note)						
						75th			
						0.084			
16	W23313	3/23/2022	14.00	14.13	-0.920		0.846	0.920	0.846
			16.70	16.73	-0.179		0.032	0.179	0.032
			17.50	17.47	0.172		0.029	0.172	0.029

n	$\sum\|d\|$	"AB" (Eqn 4)
6	2.879	0.480
n-1	$\sum\|d\|^2$	**"AS" (Eqn 5)**
5	2.432	0.458

Bias (%) (Eqn 3)	Both Signs Positive
0.86	FALSE
Signed Bias (%)	Both Signs Negative
+/-0.86	FALSE

Note: Feb 2022 audit not performed. BGI Deltacal calibrator needed for flow rate checks was being recalibrated.



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

One-Point Flow Rate Bias Estimate

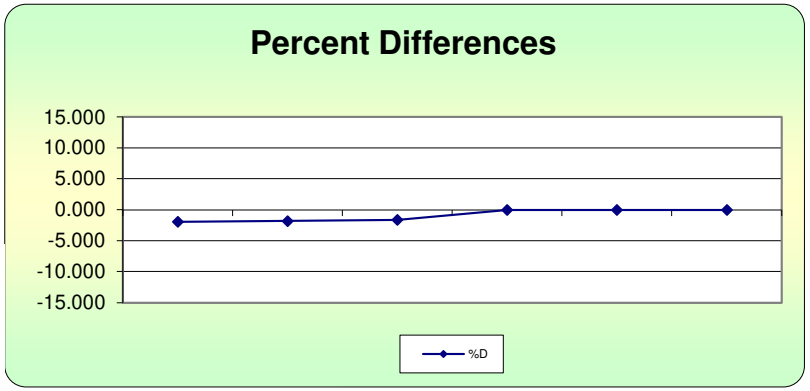
ETEC Site: DOE-4	Pollutant type: PM10	Bias (%)

Quarter	E-BAM	Date	Meas Val (Y)	Audit Val (X)	d (Eqn. 1)	Percentile	d^2	$\|d\|$	$\|d\|^2$
16	X16067	1/13/2022	14.00	14.28	-1.961		3.845	1.961	3.845
			16.70	17.01	-1.822	**25th**	3.321	1.822	3.321
			17.50	17.79	-1.630	-1.774	2.657	1.630	2.657
16	X16067	(see note)	14.00						
			16.70			**75th**			
			17.50			-1.029			
16	W23310	3/23/2022	14.00	14.18	-1.269		1.611	1.269	1.611
			16.70	16.86	-0.949		0.901	0.949	0.901
			17.50	17.66	-0.906		0.821	0.906	0.821

n	$\sum\|d\|$	"AB" (Eqn 4)
9	8.538	1.423
n-1	$\sum\|d\|^2$	"AS" (Eqn 5)
8	13.156	0.795

Bias (%) (Eqn 3)	Both Signs Positive
1.92	FALSE
Signed Bias (%)	Both Signs Negative
-1.92	TRUE

Note: Feb 2022 audit not performed. E-BAM unit was not operational. Plus, BGI Deltacal calibrator needed for flow rate checks was being recalibrated.



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

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 1/13/2022 Audited By: JSWilliford

Flow Audit

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

Leak Check Value: as found: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	18.9 °C	19.0 °C	as left:	18.9 °C	19.0 °C
Barometric Pressure:	as found:	717.0 mmHg	717.8 mmHg	as left:	717.0 mmHg	717.8 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.80 lpm	as left:	16.7 lpm	16.80 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	17.56 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): 0.916			
Difference (mg/cm2): 0.003			
% Difference / (Pass) or Fail: 0.33%	14.7	425.8	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1212	1212	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	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	PM10	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 Nozzle failed up	10 Jan 22	0109	4			
*	2 Nozzle failed up	13 Jan 22	0115	5			
	3			6			

Audit Notes:

* Cleaned the sample vane and unit started back up both times.

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 2/21/2022 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: _____ as left: _____

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	10.3 °C	NA °C	as left:	10.3 °C	NA °C
Barometric Pressure:	as found:	715.8 mmHg	NA mmHg	as left:	715.8 mmHg	NA mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	NA lpm	as left:	16.7 lpm	NA lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	NA lpm	as left:	14.0 lpm	NA lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	NA lpm	as left:	17.5 lpm	NA 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) : 0.918			
Difference (mg/cm2) : 0.001			
% Difference / (Pass) or Fail: 0.11%	14.6	419.3	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0921	0921	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	Nozzle Failed up	2/7/22	0001	4	Nozzle Failed up	2/19/22	0001
2	Nozzle Failed up	2/14/22	0001	5	Nozzle Failed up	2/21/22	0001
3	Nozzle Failed up	2/15/22	0001	6			

Audit Notes:

NA: BGI Deltacal calibrator was in the shop getting recalibrated so I could not check the flow rates.

Nozzle Failed up error getting worse but I have no unit to replace it. Cleaned sample vane and got unit started each time it ~~happened~~ happened. TSW

NORTHWIND

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # W23314

Audit Date: 3/22/2022 Audited By: T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: ~~158047~~ 1444 (TSW) Calibration Date: ~~2/25/2021~~ 6/11/2021 TSW

Leak Check Value: as found: 0.5 as left: 0.5

		E-BAM		Ref. Std.			E-BAM		Ref. Std.	
Ambient Temperature:	as found:	29.2	°C	28.4	°C	as left:	29.2	°C	28.4	°C
Barometric Pressure:	as found:	716.0	mmHg	715.5	mmHg	as left:	716.0	mmHg	~~715.5~~ RK	mmHg
16.7 lpm Flow Rate	as found:	16.7	lpm	16.67	lpm	as left:	16.7	lpm	16.67	lpm
14.0 lpm Flow Rate	as found:	14.0	lpm	13.95	lpm	as left:	14.0	lpm	13.95	lpm
17.5 lpm Flow Rate	as found:	17.5	lpm	17.47	lpm	as left:	17.5	lpm	17.47	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) : 0.919			
Difference (mg/cm2) : 0.0			
% Difference / (Pass) or Fail: 0%	14.2	403.8	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1253	1253	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	25 C°
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 Nozzle Failed up	3/7/22	0001	4 Nozzle Failed up	3/17/22	0001
2 Nozzle Failed up	3/12/22	0001	5 Nozzle Failed up	3/18/22	0001
3 Nozzle Failed up	3/16/22	0001	6 Nozzle Failed up	3/22/22	0001

Audit Notes:

Nozzle Failed up error kept occurring but I didn't have an extra unit to replace it with so I cleaned the sample vane and got the unit running again until it shut off again.

NORTHWIND

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-1 Serial # X16067

Audit Date: 3/22/2022 Audited By: T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: ~~158047~~ TSW 1444 Calibration Date: ~~2/25/2021~~ TSW 6/11/2021

Leak Check Value: as found: 0.5 as left: 0.5

		E-BAM		Ref. Std.			E-BAM		Ref. Std.	
Ambient Temperature:	as found:	30.0	°C	28.9	°C	as left:	30.0	°C	28.9	°C
Barometric Pressure:	as found:	717.0	mmHg	715.5	mmHg	as left:	717.0	mmHg	715.5	mmHg
16.7 lpm Flow Rate	as found:	16.7	lpm	16.74	lpm	as left:	16.7	lpm	16.74	lpm
14.0 lpm Flow Rate	as found:	14.0	lpm	14.00	lpm	as left:	14.0	lpm	14.00	lpm
17.5 lpm Flow Rate	as found:	17.5	lpm	17.58	lpm	as left:	17.5	lpm	17.58	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): 0.950

Measured Span Mass (mg/cm2): 0.945

Difference (mg/cm2): 0.005

% Difference / (Pass) or Fail: 0.53%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
15.0	408.7	Good

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1415	1415	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	24 hrs	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 Messages	3/22/22	1423	4		
2			5		
3			6		

Audit Notes:

* This is the intitial Audit for this unit. Replaced unit W23314 due to Nozzle up failures.

NORTHWIND

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-2 Serial # Y12096

Audit Date: 1/13/2022 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: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	18.3 °C	18.4 °C	as left:	18.3 °C	18.4 °C
Barometric Pressure:	as found:	714.1 mmHg	714.0 mmHg	as left:	714.1 mmHg	714.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.76 lpm	as left:	16.7 lpm	16.76 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.09 lpm	as left:	14.0 lpm	14.09 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.55 lpm	as left:	17.5 lpm	17.55 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): 0.902			
Difference (mg/cm2): 0.011			
% Difference / (Pass) or Fail: 1.23%	14.0	401.3	Good / Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1304	1304	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	1/13/22	1310	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: 2/21/2022 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: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	11.2 °C	NA °C	as left:	11.2 °C	NA °C
Barometric Pressure:	as found:	714.0 mmHg	NA mmHg	as left:	714.0 mmHg	NA mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	NA lpm	as left:	16.7 lpm	NA lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	NA lpm	as left:	14.0 lpm	NA lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	NA lpm	as left:	17.5 lpm	NA 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) :	0.904			
Difference (mg/cm2) :	0.013			
% Difference / Pass or Fail:	1.45%	14.1	411.8	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1116	1116	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	2/21/22	1121	4			
2				5			
3				6			

Audit Notes:

NA = BGI Deltacal Calibrator was in the shop getting recalibrated so I could not check flow rates.

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-2 Serial # Y12096

Audit Date: 3/23/2022 Audited By : T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 1444 Calibration Date: 6/11/2021

Leak Check Value: as found: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	23.4 °C	22.5 °C	as left:	23.4 °C	22.5 °C
Barometric Pressure:	as found:	713.5 mmHg	714.5 mmHg	as left:	713.5 mmHg	714.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.63 lpm	as left:	16.7 lpm	16.63 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) : 0.891	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) : 0.018			
% Difference / ~~Pass~~ or Fail: 2.0%	14.6	419.4	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0831	0831	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	60min	Delta T Setpoint	15 C	15C	DAC	8.0 v	8.0 v
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	3/23/22	0837	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: 1/13/2022 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: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	19.1 °C	18.9 °C	as left:	19.1 °C	18.9 °C
Barometric Pressure:	as found:	715.9 mmHg	~~715.0~~ 715.0 mmHg	as left:	715.9 mmHg	715.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.73 lpm	as left:	16.7 lpm	16.73 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.17 lpm	as left:	14.0 lpm	14.17 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) : 0.885	Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
Measured Span Mass (mg/cm2) : 0.880			
Difference (mg/cm2) : 0.005			
% Difference / Pass or Fail: 0.57%	14.0	411.0	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1355	1355	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	1/13/22	1359	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W2 3313

Audit Date: 2/21/2022 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: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	14.0 °C	NA °C	as left:	14.0 °C	NA °C
Barometric Pressure:	as found:	715.3 mmHg	NA mmHg	as left:	715.3 mmHg	NA mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	NA lpm	as left:	16.7 lpm	NA lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	NA lpm	as left:	14.0 lpm	NA lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	NA lpm	as left:	17.5 lpm	NA 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) :	0.882			
Difference (mg/cm2) :	0.003			
% Difference / (Pass) or Fail:	0.34%	14.4	415.3	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1322	1322	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	24 hr	RH Setpoint	45%	45%	Std Cond Temp	25 C	25°C
Realtime Avg	60 mins	60 min	Delta T Setpoint	15 C	15°C	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	2/21/22	1331	4		
2			5		
3			6		

Audit Notes:

NA = BGI Deltacal calibrator is in the Shop So I couldn't check flow rates.

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-3 Serial # W2 3313

Audit Date: 3/23/2022 Audited By : T. S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 1444 Calibration Date: 6/11/2021

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

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	24.2 °C	23.5 °C	as left:	24.2 °C	23.5 °C
Barometric Pressure:	as found:	715.9 mmHg	716.5 mmHg	as left:	715.9 mmHg	716.5 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	16.73 lpm	as left:	16.7 lpm	16.73 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.13 lpm	as left:	14.0 lpm	14.13 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.47 lpm	as left:	17.5 lpm	17.47 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) :	0.886			
Difference (mg/cm2) :	0.001			
% Difference / (Pass) or Fail:	0.11%	14.5	421.8	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	0945	0945	Analog Mode	Hourly	Hourly	Flow Type	Actual	Act
Location	3	3	Baud Rate	9600	9600	Restart Voltage	12.5 v	12.5
Tape Advance	24 hrs	24hrs	RH Setpoint	45%	45%	Std Cond Temp	25 C	25 C
Realtime Avg	60 mins	60mm	Delta T Setpoint	15 C	15 C	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	3/23/22	0949	4			
2				5			
3				6			

Audit Notes:

NORTHWIND

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # X16067

Audit Date: 1/13/2022 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: 0.5 as left: 0.5

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	22.3 °C	20.8 °C	as left:	22.3 °C	20.8 °C
Barometric Pressure:	as found:	708.6 mmHg	706.0 mmHg	as left:	708.6 mmHg	706.0 mmHg
16.7 lpm Flow Rate	as found:	16.7 lpm	17.01 lpm	as left:	16.7 lpm	17.01 lpm
14.0 lpm Flow Rate	as found:	14.0 lpm	14.28 lpm	as left:	14.0 lpm	14.28 lpm
17.5 lpm Flow Rate	as found:	17.5 lpm	17.79 lpm	as left:	17.5 lpm	17.79 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): 0.914

Measured Span Mass (mg/cm2): ~~0.994~~ 0.911 (TSW)

Difference (mg/cm2): 0.003

% Difference / (Pass) or Fail: 0.33%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.0	410.6	Marginal

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1455	1455	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	24 hrs	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	1/13/22	1459	4		
2			5		
3			6		

Audit Notes:

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # NA

Audit Date: 2/21/2022 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: _____ as left: _____

		E-BAM	Ref. Std.		E-BAM	Ref. Std.
Ambient Temperature:	as found:	°C	°C	as left:	°C	°C
Barometric Pressure:	as found:	mmHg	mmHg	as left:	mmHg	mmHg
16.7 lpm Flow Rate	as found:	lpm	lpm	as left:	lpm	lpm
14.0 lpm Flow Rate	as found:	lpm	lpm	as left:	lpm	lpm
17.5 lpm Flow Rate	as found:	lpm	lpm	as left:	lpm	lpm

Mechanical Audits (Y = Yes N = No)

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

TS Williford 2/21/2022

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

Setup and Calibration Values

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

Last 6 Errors in E-BAM Error Log

Error	Date	Time	Error	Date	Time
1			4		
2			5		
3			6		

Audit Notes:

There is no audit data for DOE-4 because no unit is running. Two units are in the shop so no spare is available.

NORTHWIND INC.

Baseline Air Monitoring Program - DOE

E-BAM Monthly Audit and Maintenance

Station # DOE-4 Serial # W23310

Audit Date: 3/23/2022 Audited By : T.S. Williford

Flow Audit

Flow Audit Device Model: BGI Delta Cal DC-1A Serial No: 1444 Calibration Date: 6/11/2021

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	26.2	°C	as left:	27.1	°C	26.2	°C
Barometric Pressure:	as found:	708.7	mmHg	709.5	mmHg	as left:	708.7	mmHg	709.5	mmHg
16.7 lpm Flow Rate	as found:	16.7	lpm	16.86	lpm	as left:	16.7	lpm	16.86	lpm
14.0 lpm Flow Rate	as found:	14.0	lpm	14.18	lpm	as left:	14.0	lpm	14.18	lpm
17.5 lpm Flow Rate	as found:	17.5	lpm	17.66	lpm	as left:	17.5	lpm	17.66	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) : 0.915

Measured Span Mass (mg/cm2) : 0.907

Difference (mg/cm2) ~~0.88%~~ 0.008

% Difference / (Pass) or Fail: 0.88%

Pump Test

Flow Rate 14.0 - 15.0 (lpm)	Vacuum Value (Hg)	Quality Category Good / Marginal / Poor
14.4	398.5	Good

Setup and Calibration Values

Parameter	Expected	Found	Parameter	Expected	Found	Parameter	Expected	Found
Clock	1131	1131	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	3/23/22	1140	4		
2			5		
3			6		

Audit Notes: