Evaluation of
Particulate Ambient Air Monitoring Program
Delaware Recyclable Products, Inc. Landfill

Prepared by
CPF Associates, LLC
Bethesda, MD

Prepared for
Waste Management

August 25, 2021

CPF Associates, LLC

Environmental and Public Health Sciences

TABLE OF CONTENTS

APPENDICES

FIGURES

TABLES (located at end of text)

ACRONYMS

AQI	=	Air quality index
DNREC	=	Delaware Department of Natural Resources and Environmental Control
FEM	=	USEPA federal equivalent method
NAAQS	=	National Ambient Air Quality Standard
NOx	=	Nitrogen oxides
PM	=	Particulate matter
PM10	=	Particles less than 10 microns (10 µm) in diameter
PM2.5	=	Particles less than 2.5 microns (10 µm) in diameter
ProUCL	=	USEPA-developed software package with statistical methods and graphic tools for environmental data analysis
SLAMS	=	State and Local Air Monitoring Stations
SO2	=	Sulfur dioxide
TSP	=	Total suspended particulates
USEPA	=	US Environmental Protection Agency
WMW	=	Wilcoxon-Mann-Whitney statistical test

UNITS OF MEASURE

Measures of mass or weight

mg = Milligrams

µg = Micrograms (1,000 µg = 1 mg)

Measures of air concentration

mg/m^3 = Milligrams of airborne particulate matter per cubic meter of air

$\mu g/m^3$ = Micrograms of airborne particulate matter per cubic meter of air (1,000 $\mu g/m^3$ = 1 mg/m^3)

EXECUTIVE SUMMARY

At the request of several elected officials and representatives of New Castle County, the DRPI Landfill conducted a four-quarter pilot ambient air monitoring program from May 2020 through February 2021 to assess the potential impact of the landfill on particulate air quality. The monitoring program was implemented by Earthres Group, Inc. (Earthres). The monitoring data were evaluated by CPF Associates, LLC in coordination with Earthres.

The monitoring program measured two types of respirable particulate matter in outdoor air: PM2.5 and PM10.[1] The concentrations were measured every hour at seven monitoring stations using USEPA-approved particle monitoring equipment. Five stations were on the landfill property, around its perimeter road. Two stations were off site, one adjacent to the County Police Station and the other on the east side of West Minquadale. An on-site weather station measured meteorological conditions every five minutes. Site activity information including heavy-duty vehicle counts, dust control activities and waste disposal locations, were provided by DRPI.

This report presents an assessment of the more than 7,200 hourly air concentrations measured on 25 sampling days during four quarters of monitoring. All the hourly air concentrations were compiled and classified as downwind, upwind or neither based on the monitoring station location relative to the landfill and concurrent wind direction. In addition, daily 24-hour average air concentrations were calculated from the hourly data for comparison to 24-hour national ambient air quality standards (NAAQS) used by the US Environmental Protection Agency (USEPA) and Delaware. The NAAQS for PM2.5 and PM10 have been set at levels intended to protect public health with an adequate margin of safety, including sensitive subpopulations.

All of the 24-hour average air concentrations for PM2.5 and PM10 were below the 24-hour average NAAQS developed to be protective of public health, with one exception on a sampling day when the landfill was closed and an unusual regional air quality event occurred. Based on these observations, and excluding the one regional air quality event, PM2.5 and PM10 concentrations measured at and in the vicinity of the landfill do not indicate a concern to public health.

No consistent pattern of landfill-related impacts on PM air quality was found based on detailed statistical and graphical analyses although some impacts on PM air concentrations were occasionally observed. Most on-site downwind concentrations were statistically similar to on-site upwind concentrations. Where differences were observed, the locations and dates of higher downwind versus upwind concentrations varied greatly. PM10 concentrations were statistically higher when the landfill was open versus when it was closed, but no statistical relationship was found between the hourly number of waste delivery vehicles and hourly on-site PM10 air concentrations. At the two off-site stations, the downwind concentrations were almost always statistically similar to upwind concentrations.

The assessment indicated that both landfill-related activities, and also local and regional sources of PM other than the landfill, are likely affecting PM2.5 and PM10 air concentrations, and that the causes, dates and locations of impacts vary. The monitoring results suggest that on a few dates, and for some hours, the landfill likely influenced on-site air concentrations but rarely influenced off-site

[1] Particles less than 2.5 microns and less than 10 microns in diameter, respectively.

concentrations. Possible landfill-related causes for PM air quality changes include vehicles moving over paved and unpaved surfaces, and earth- and waste-moving activities. Emissions of PM from these activities are mitigated by dust control measures regularly used at the landfill including road sweeping and cleaning and watering of roadways and landfill areas. Local and regional sources, including construction, industrial and institutional facilities and their activities, and traffic on Interstate Routes 495 and 295 and State Route 13 are also likely affecting PM2.5 and PM10 air concentrations.

INTRODUCTION

The Delaware Recyclable Products, Inc. (DRPI) Landfill is a permitted industrial waste disposal facility located in New Castle, Delaware. At the request of New Castle County at a meeting held on July 12, 2019 in connection with a then-pending permit modification application submitted by DRPI to the Delaware Department of Natural Resources and Environmental Control (DNREC), the DRPI Landfill began a four-quarter pilot particulate ambient air monitoring program in May 2020 to assess the potential impact of the landfill on particulate air quality. The monitoring program was implemented by Earthres Group, Inc. (Earthres). Data collected from this program were evaluated by CPF Associates, LLC in coordination with Earthres.

This report presents and evaluates measurements collected during four quarterly monitoring events conducted from May 2020 through February 2021. Information relied on in this report was provided to CPF by Earthres, DRPI and DNREC, or was obtained from publicly available online sources such as the US Environmental Protection Agency (USEPA) and DNREC. The main body of this report includes text and figures, followed by a section with tables and then several appendices.

Topics covered in this report include the following:

- Description of the landfill and its vicinity;
- Overview of the particulate matter monitoring program;
- Data analysis methods;
- Evaluation of monitoring results;
- Discussion of uncertainties; and
- Conclusions.

DRPI LANDFILL AND VICINITY

The DRPI Landfill is located in New Castle County, Delaware at 246 Marsh Lane in New Castle (Figure 1). DRPI owns and operates the DRPI Landfill as a subsidiary to its parent corporation, Waste Management (WM). The facility is bounded on the north by Interstate 495, Marsh Lane on the east, the Delaware Health and Human Services Campus and State Route 13 on the south, and a marsh and the Jack A. Markell Greenway Trail on the west. Beyond the marsh west of the facility are several major interstate highways and highway interchanges, including Interstate Routes 495 and 295. Across Marsh Lane, east of the landfill, is the Corrado Construction Company and the New Castle County Public Safety Building. The nearest residential areas to the landfill are located in West Minquadale, east of the Corrado Construction Company and north of the police department, and two small residential areas south of the facility and just north of State Route 13. Beyond West Minquadale, further east of the landfill, are several commercial and governmental buildings including the Saf-Gard Safety Shoe Company, a Ford truck dealership, a large Lowe's Home Improvement center and a Delaware Division of Motor Vehicles facility.

The landfill was initially permitted as an industrial waste landfill in 1982 and began disposal operations in 1985. The landfill is permitted to accept construction/demolition (C&D) waste, vegetative wastes from land clearing and landscaping, and dry wastes. Some examples of acceptable wastes include wood, brick, concrete, asphalt, carpet and rugs, furniture and mattresses. The landfill is not permitted to accept municipal garbage or household waste, putrescible wastes, liquid wastes, or wastes that are categorized as "hazardous wastes" by the United States Environmental Protection Agency (USEPA) or DNREC.

Figure 1
DRPI Landfill Location

Imagery ©2020 Maxar Technologies, U.S. Geological Survey, USDA Farm Service Agency, Map data ©2020

Over the past five years, from 2016 through 2020, the landfill accepted on average 1,440 tons/day of industrial waste based on 265 operating days each year. The amounts accepted in 2019 and 2020 were 1,894 and 1,293 tons/day, respectively. The permitted maximum daily tonnage limit is 2,400 tons/day.

The landfill was developed in six phases, identified as Cells 1 through 6, for a total landfill footprint of about 146 acres. Figure 2 shows the numbering system for the cell disposal areas. Over the past year, disposal operations have been mainly within the Cells 1-3 overlay liner area. The active waste disposal areas during the four air monitoring events are shown in Figure 2.

The DRPI Landfill gate is permitted to be open for waste deliveries Monday through Friday, between 6:30 AM and 4:00 PM. As a result of the COVID pandemic, and throughout most of the data collection periods in the field, these hours were reduced to 7:00 AM to 3:00 PM. DRPI continues to receive waste during these operating hours. Waste trucks access the facility from Route 13, entering via Marsh Lane which runs along the east side of the landfill. Upon arrival, waste trucks are first inspected and weighed at the scale house, at the northwest corner of the facility, and are then directed to the active working face area where waste loads are deposited. The trucks then return to the scale house and exit via Marsh Lane.

In addition to receiving waste, many other activities related to operating the landfill are conducted on site. These include: waste spreading and compaction at the active working face area; cover placement and compaction over deposited waste; construction and maintenance of landfill waste cells and side slopes; operation of surface water, groundwater and landfill gas management and monitoring systems; and control of litter and dust. The facility maintains two compactors and one bulldozer on site at all times to help conduct these activities.

Figure 2
DRPI Landfill and Active Disposal Areas During May 2020 – March 2021

LEGEND

- PROPERTY LINE
- DISPOSAL AREA FOOTPRINT
- DISPOSAL AREA BOUNDARIES
- LIMIT OF ENVIRONMENTAL CAP
- LIMIT OF WETLANDS
- APPROXIMATE MAY FILL AREA (5/12/20 TO 6/9/20)
- APPROXIMATE JUNE FILL AREA (6/9/20 TO 7/13/20)
- APPROXIMATE JULY FILL AREA (7/13/20 TO 8/11/20)
- APPROXIMATE AUGUST FILL AREA (8/11/20 TO 9/11/20)
- APPROXIMATE SEPTEMBER FILL AREA (9/11/20 TO 10/13/20)
- APPROXIMATE OCTOBER FILL AREA (10/13/20 TO 11/10/20)
- APPROXIMATE NOVEMBER FILL AREA (11/10/20 TO 12/11/20)
- APPROXIMATE DECEMBER FILL AREA (12/11/20 TO 1/12/21)
- APPROXIMATE JANUARY FILL AREA (1/12/21 TO 2/9/21)
- APPROXIMATE FEBRUARY FILL AREA (2/9/21 TO 3/12/21)
- APPROXIMATE MARCH FILL AREA (3/12/21 TO 4/16/21)

GRAPHIC SCALE

MP #1 PARTICULATE MONITORING STATION

WEATHER STATION

PARTICULATE MONITORING PILOT STUDY	PREPARED BY: EARTHRES ENGINEERING FOR SUCCESS™ www.earthres.com	PREPARED FOR: WM WASTE MANAGEMENT
WASTE MANAGEMENT DELAWARE RECYCLABLE PRODUCTS, INC. WILMINGTON DELAWARE		

Cover materials are regularly placed on top of the waste and then compacted to help control potential emissions of odors and dust, limit rainwater infiltration and control runoff, prevent litter and reduce the risk of fires. In general, there are three different types of cover at the landfill: operational cover, intermediate cover and final cover. A six-inch layer of operational cover is placed over the surface of exposed compacted waste daily. For areas that will not be accessed for long periods of time, an additional six-inch layer of intermediate compacted cover is applied. Final cover is placed over areas that have reached capacity. Operational cover material is either soil or an alternative material, such as wood chips, that has been specifically approved for this use by DNREC. Intermediate cover is six inches of soil. The final cover is comprised of several layers including, from bottom to top, a six-inch grading layer of soil (or DNREC-approved alternative cover), a high-density polyethylene (HDPE) geomembrane (or other DNREC-approved synthetic layers), an 18-inch thick vegetative rooting layer and lastly, another six-inch final topsoil layer. The final cover, in addition to the purposes noted above, is further designed to be able to support vegetation, minimize maintenance requirements, and ensure stability of landfill slopes.

The landfill uses several methods to minimize and control dust that may be generated during site operations. These include periodic sweeping and cleaning of paved surfaces and watering of roadway surfaces and active landfill areas. The paved site entrance at Route 13 (N. Dupont Highway), entrance road, access roads, and portions of Route 13 are cleaned with typical street cleaning equipment. Paved areas adjacent to the scale house and scales are also cleaned by hand, if necessary. On gravel and other unpaved roads, at the working face area and on potentially dusty waste loads, dust is controlled with water sprayed from a water truck multiple times a day depending on rainfall and ground conditions.

PARTICULATE MATTER MONITORING PROGRAM

Particulate Matter Introduction

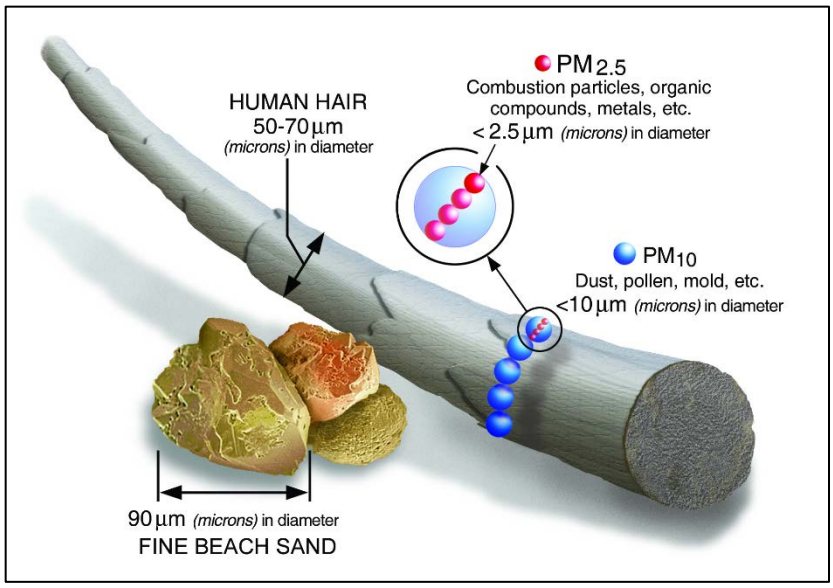
Particulate matter (PM) is the technical term used for particles found in the air. PM is emitted from many manmade and natural sources and is formed from other compounds in the air. Exposure to PM can occur both indoors where people spend most of their time (e.g., due to cooking, cigarette smoke, and cleaning) and outdoors (e.g., due to local and regional sources of PM including emissions from vehicles and industrial facilities, suspended soils and agricultural activities, and air transport of PM from distant areas).

The DRPI monitoring program measures two types of respirable PM in outdoor air: PM2.5 which refers to particles less than 2.5 microns (μm) in diameter and PM10 which refers to particles less than 10 μm in diameter. Figure 3 shows how PM2.5 and PM10 compare in size to a human hair and fine beach sand.

PM2.5 primarily comes from combustion sources, including emissions from vehicles (cars, trucks, buses), power plants, residential fireplaces and wood stoves. PM2.5 can also be created from gas compounds that react through various processes in the air, such as sulfur dioxide (SO2) and nitrogen oxides (NOx). In contrast, PM10 mainly results from dust from paved and unpaved roads, tire and asphalt wear, construction and earth-moving operations, and crushing or grinding operations. Total particulate matter (TSP) covers all particle sizes, including particles greater than 10 μm in diameter. In general, the amount of time a particle stays airborne decreases as the particle size gets bigger. This means that larger particles, both PM10 and particularly TSP, deposit on the ground more rapidly than

PM2.5 and are more likely to reflect impacts from local sources. PM2.5 particles can stay airborne for long times and thus travel hundreds of miles, so they are more likely to reflect regional rather than local sources (USEPA 2019).

Figure 3
Size Comparison for PM2.5 and PM10



Source: US Environmental Protection Agency

Both PM2.5 and PM10 can be inhaled into the lung and have been associated with a variety of adverse health effects especially to the respiratory and cardiovascular systems. Because of their health concerns, national ambient air quality standards (NAAQS) have been set by USEPA for PM2.5 and PM10 at levels intended to protect public health with an adequate margin of safety, including sensitive subpopulations such as children and the elderly. The 24-hour daily average NAAQS for PM2.5 and PM10 are 35 micrograms per cubic meter (µg/m^3) and 150 µg/m^3, respectively. These air quality standards are also used by Delaware for assessing daily PM levels in air.

DRPI Monitoring Program Overview

The DRPI monitoring program measured outdoor air concentrations of PM2.5 and PM10 on the landfill and off site. The concentrations were measured every hour over a 24-hour period, on at least five (5) days each calendar quarter. Sampling dates during each calendar quarter were intended to include approximately three weekdays and at least one weekend day and, as possible, to avoid days with major storm events. The concentrations were measured at seven monitoring stations (see Figure 2). Five stations (MP-1 through MP-5) were within the site boundary around the landfill's internal on-site perimeter road. Two stations were off site. Location MP-6 was off site, in a parking lot adjacent to the New Castle County Police Department building about 500 feet east of the landfill. The last station, MP-7, was located about 1,500 feet east-northeast of the landfill, just beyond the residential community of West Minquadale and adjacent to the Saf-Gard Safety Shoe Company building located at 2220 Hessler Boulevard. Two separate monitoring units, one each for PM2.5 and PM10, were located at each of the seven monitoring stations.

The PM10 and PM2.5 monitoring was conducted using USEPA-approved BAM-1020 Continuous Particulate Monitors from Met One Instruments. This instrument is classified as a USEPA federal equivalent method (FEM). The PM air concentration data were recorded every hour and then downloaded from each BAM-1020 instrument following each 24-hour monitoring event. A description of the field monitoring program and the BAM-1020 instrument is provided in Appendix A.

An on-site weather station located near the southeastern corner of the landfill measures wind speed, wind direction, air temperature, precipitation and several other parameters every five minutes. Wind roses, which are diagrams showing the relative frequency of wind directions and wind speed, are created for each day as well. This information is available for observation and download at http://www.drpilandfillwx.com/. Wind roses for the sampling dates covered in this report are provided in Appendix B. Site activity information was also provided by DRPI, including vehicle counts per day, road sweeping and watering activities per day, and areas on site where active waste disposal occurred over the course of each month.

Over 7,200 hourly measurements of PM2.5 and PM10 were recorded during the four quarters of monitoring. The sampling periods and total number of hourly samples were as follows:

- First Quarter: May 24 – June 26, 2020 (2,459 hourly samples)
- Second Quarter: August 19 – August 31, 2020 (1,589 hourly samples)
- Third Quarter: November 5 – November 17, 2020 (1,536 hourly samples)
- Fourth Quarter: February 6 – February 21, 2021 (1,684 hourly samples)

Table 1 (see tables after the References Section) summarizes a variety of data by date including the number of hourly air concentrations, whether the landfill was open or closed, the number of heavy-duty vehicles entering and exiting the landfill (i.e., waste vehicles plus other heavy-duty vehicles), the number of road sweeping trips and surface watering trips (day before and day of sampling), precipitation (day before and day of sampling) and average wind speed. Figure 4 presents the total number of hourly concentrations available by sampling date.

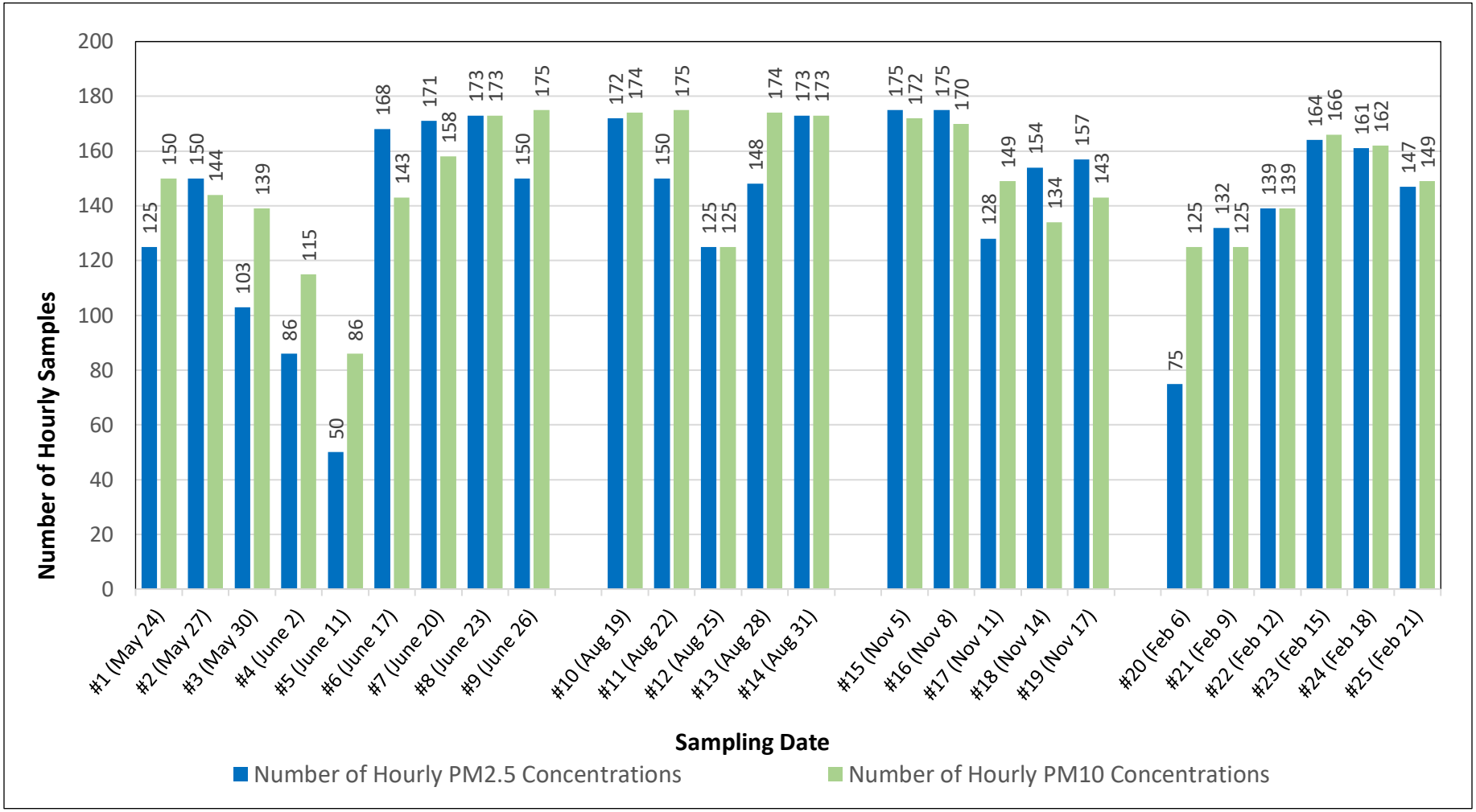
Data Compilation and Statistical Analysis Methods

In order to investigate potential landfill-related impacts on PM air quality, the hourly air concentration data, weather station data, site activity data and regional background data from Delaware ambient air monitoring stations were compiled. In addition, these data were analyzed using statistical and graphical approaches. The methods used to compile and analyze these data are briefly summarized below and presented in more detail in Appendix C.

Hourly Air Concentrations at DRPI

Hourly air concentrations for PM2.5 and PM10 were downloaded by Earthres from each BAM instrument after every 24-hour sampling event and tabulated with relevant meteorological data from the landfill's on-site weather station (wind direction and wind speed). Each hourly air concentration was then classified as downwind, upwind or neither, based on the monitoring station's location relative to the landfill and the concurrent wind direction recorded. Detailed hourly air concentrations and wind classifications for each hour and date are provided in Appendix D.

Figure 4
Number of Hourly Air Concentration Measurements by Sampling Event
(All seven monitoring locations combined)



Note: During the first-quarter, longer than expected sampling breaks occurred between June 2 and June 17. The break between June 2 - June 11 was due to planned BLM protests at the township building. The break between June 11 - June 17 was due to an on-site power failure on the originally planned day of sampling (June 14).

The hourly results were further compiled across all on-site stations (MP-1 to MP-5) to produce one on-site downwind and one on-site upwind air concentration for every hour of sampling. These on-site concentrations were calculated by averaging all concentrations across the on-site stations classified as downwind (or upwind) on an hour-by-hour basis.

Hourly Air Concentrations at DNREC Ambient Air Monitoring Stations

Air concentrations measured at DNREC monitoring stations were obtained for comparison to the DRPI monitoring program results. Hourly air concentrations of PM2.5 and PM10 are measured at the MLK site and the Route 9 site, the two closest Delaware stations to DRPI. These two stations are shown in Figure 5. The hourly data from these two stations were obtained from DNREC's Division of Air Quality for each of the four quarterly sampling dates.[2] While the DNREC monitors used to measure PM are not identical to those used at DRPI, both methods are classified by USEPA as Federal Equivalent Methods appropriate for measuring PM2.5 and PM10 in ambient air and they are expected to provide generally comparable results.[3] The hourly DNREC data are provided in Appendix E.

Land uses at and near to the MLK and Route 9 stations are not identical to those near the DRPI facility, but they nonetheless provide some basis of comparison relative to measurements collected at the landfill. The MLK site is in the City of Wilmington, at the corner of Justison St. and MLK Blvd about two miles to the north-north-east of the DRPI facility. It is a major state sampling site and DNREC describes it as an urban location with monitoring objectives of "population exposure, maximum concentration, NAAQS compliance, NCore[4], and trends." [4] The Rt 9 site is in Delaware City at a location along Route 9 that is about 9 miles south of the landfill. This site is between the Delaware City industrial complex and the nearest populated area (which is Delaware City) and is described as a source-impacted site for sulfur dioxide monitoring (due to the Delaware industrial complex). It's DNREC monitoring objectives are "population exposure, compliance with the NAAQS, and trends." [5]

24-Hour Average Air Concentrations

In order to assess whether the data indicate a public health concern, the hourly air concentrations were further compiled to produce 24-hour average concentrations directly comparable to the 24-hour average NAAQS. For each DRPI monitoring location and sampling date, a 24-hour average air concentration was calculated as the arithmetic average of the 24 individual hourly measurements. Each 24-hour average concentration was also classified as predominantly downwind of the landfill, predominantly upwind or neither, based on the cumulative hourly wind classifications on each sampling day. The hourly DNREC concentrations were also averaged to obtain 24-hour average concentrations for each sampling date.

Appendix F presents the 24-hour averages for every sampling date and monitoring location for PM2.5 and PM10, along with each location's daily designation as predominantly downwind, predominantly upwind or neither. The DNREC stations' 24-hour averages are provided in Appendix E.

---

[2] Personal communication, C. Sarnoski, DNREC and S. Foster, CPF Associates LLC, July 2020 through April 2021.
[3] At DRPI, the BAM-1020 monitors use beta ray attenuation to measure particles in the air. The DNREC monitors use light scattering to measure particles in air.
[4] NCORE refers to a National Core monitoring station which is part of an enhanced USEPA monitoring program conducted nationwide that uses advanced air measurement systems.
[5] See http://www.dnrec.delaware.gov/Air/Documents/2019-delaware-aq-monitoring-network-description.pdf.

Figure 5
DNREC Ambient Air Monitoring Sites

The last compilation step involved calculating one on-site 24-hour average air concentration that collectively reflects all on-site measurements from MP-1 through MP-5. To accomplish this, for each sampling date, all predominantly downwind on-site 24-hour average concentrations were averaged across sampling stations, as were all predominantly upwind on-site concentrations.

Table 2 summarizes the 24-hour average air concentrations by date on-site (MP-1 through MP-5), off-site (MP-6 and MP-7) and at the DNREC stations. These results help in the investigation of the potential for landfill-related impacts by differentiating between on-site, off-site air and regional concentrations.

Statistical and Graphical Analysis Methods

Statistical tests and visual charts were used to examine the datasets described above to help evaluate whether the landfill may have measurable impacts on air quality. Appendix C provides a description of these methods and a brief summary is provided below.

The statistical tests were conducted using a publicly-available statistical software package developed by USEPA called ProUCL. This software package provides numerous statistical methods and graphic tools to address environmental sampling and statistical issues. It is widely relied upon for evaluating environmental data sets like those collected at DRPI (USEPA 2015).
ProUCL was used to conduct the following tests in this report:

- Wilcoxon-Mann-Whitney (WMW) test. The WMW statistical test was used to determine whether a difference exists between downwind air concentrations versus upwind air concentrations. This test helps assess the potential impact of the landfill on air quality by answering the question: Are downwind PM concentrations statistically significantly higher than upwind concentrations?

- Regression analysis. Regression analysis was used to assess the likelihood that there is or is not a linear relationship (or correlation) between on-site downwind air concentrations and the number of heavy-duty vehicles at the facility. Specifically, the regression analysis was used to answer the question: As the hourly number of heavy-duty vehicles arriving at the facility increases, do the concurrent hourly PM air concentrations on site also increase?

Charts were prepared using both the ProUCL software and excel files to help better understand the air monitoring results and provide additional insight that might not otherwise be revealed by the statistical tests (i.e., bar charts and box plots). See Appendix C for more information about charts.

EVALUATION OF MONITORING RESULTS

This section evaluates the PM2.5 and PM10 air concentrations, along with other facility-related information, to help address two key questions:

- Do the measured air concentrations indicate a public health concern based on comparison to ambient air quality standards?
- Is there evidence of a consistent landfill-related impact on measured air concentrations and, if so, what facility-related factors may be important?

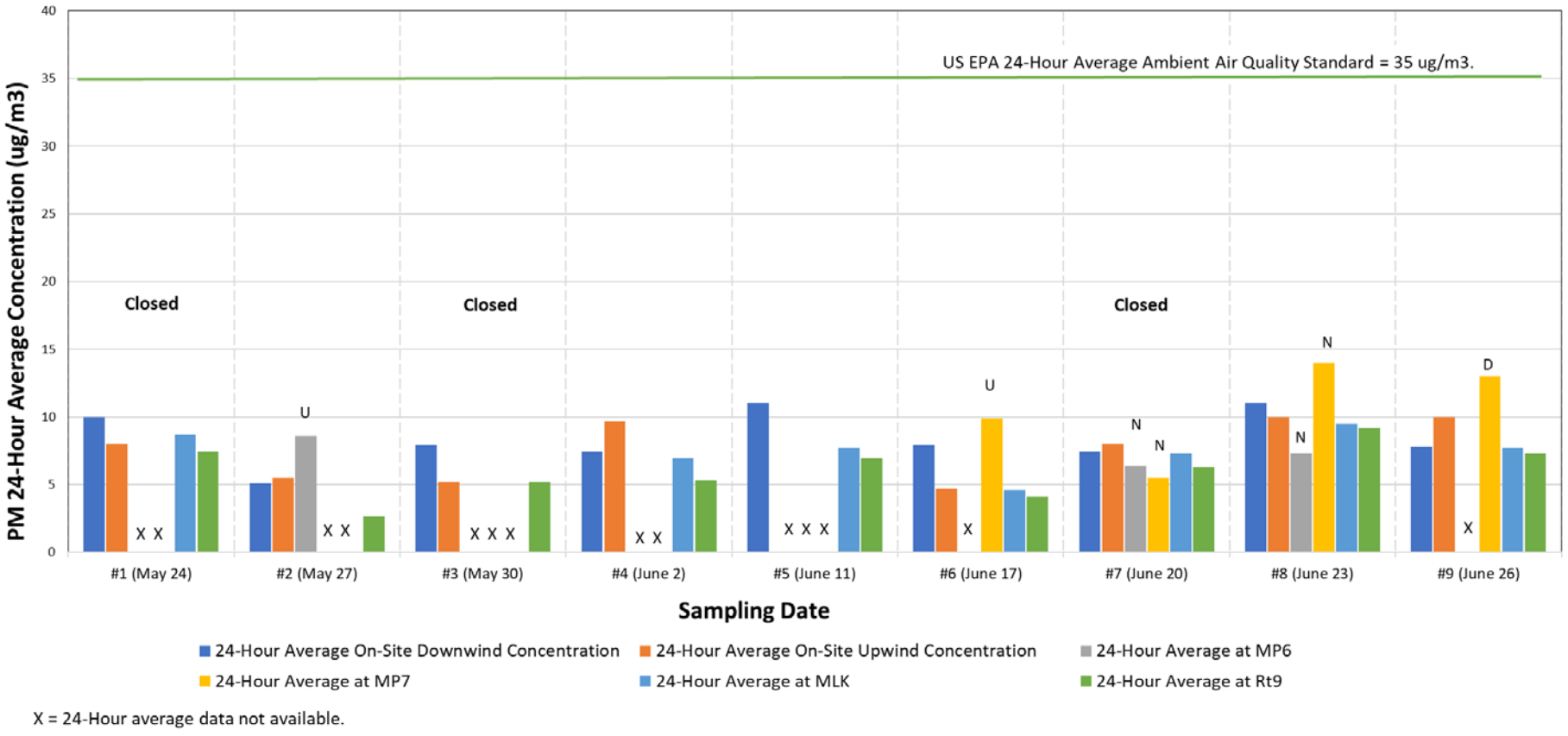
Comparison to Ambient Air Quality Standards

The 24-hour average air concentrations are illustrated in Figure 6 for PM2.5 and Figure 7 for PM10. These figures display the 24-hour average air concentrations on site (downwind and upwind), at the two off-site stations (MP6 and MP7) and at the two DNREC stations (MLK and Rt9). Separate charts are provided for each sampling quarter (e.g., Figures 6a, 6b, 6c and 6d correspond to sampling quarters one, two, three and four, respectively).

A comparison of the 24-hour average air concentrations to ambient air quality standards shows that PM2.5 and PM10 concentrations measured at and in the vicinity of the landfill during the four quarterly monitoring events do not pose a concern to public health, with one exception described below unrelated to the landfill (on November 8, 2020). All of the 24-hour average PM2.5 and PM10 air concentrations were below 24-hour average national ambient air quality standards (NAAQS) for protection of public health (excluding the November 8 data). The 24-hour averages ranged from 4.0 - 25 $\mu g/m^3$ for PM2.5 (versus the 35 $\mu g/m^3$ NAAQS) and from 6.8 - 37 $\mu g/m^3$ for PM10 (versus the 150 $\mu g/m^3$ NAAQS). The USEPA NAAQS have been developed to be protective of public health, including for sensitive subpopulations such as people with heart disease, children and older adults.

Figure 6 – PM2.5 24-Hour Average Air Concentrations by Quarter

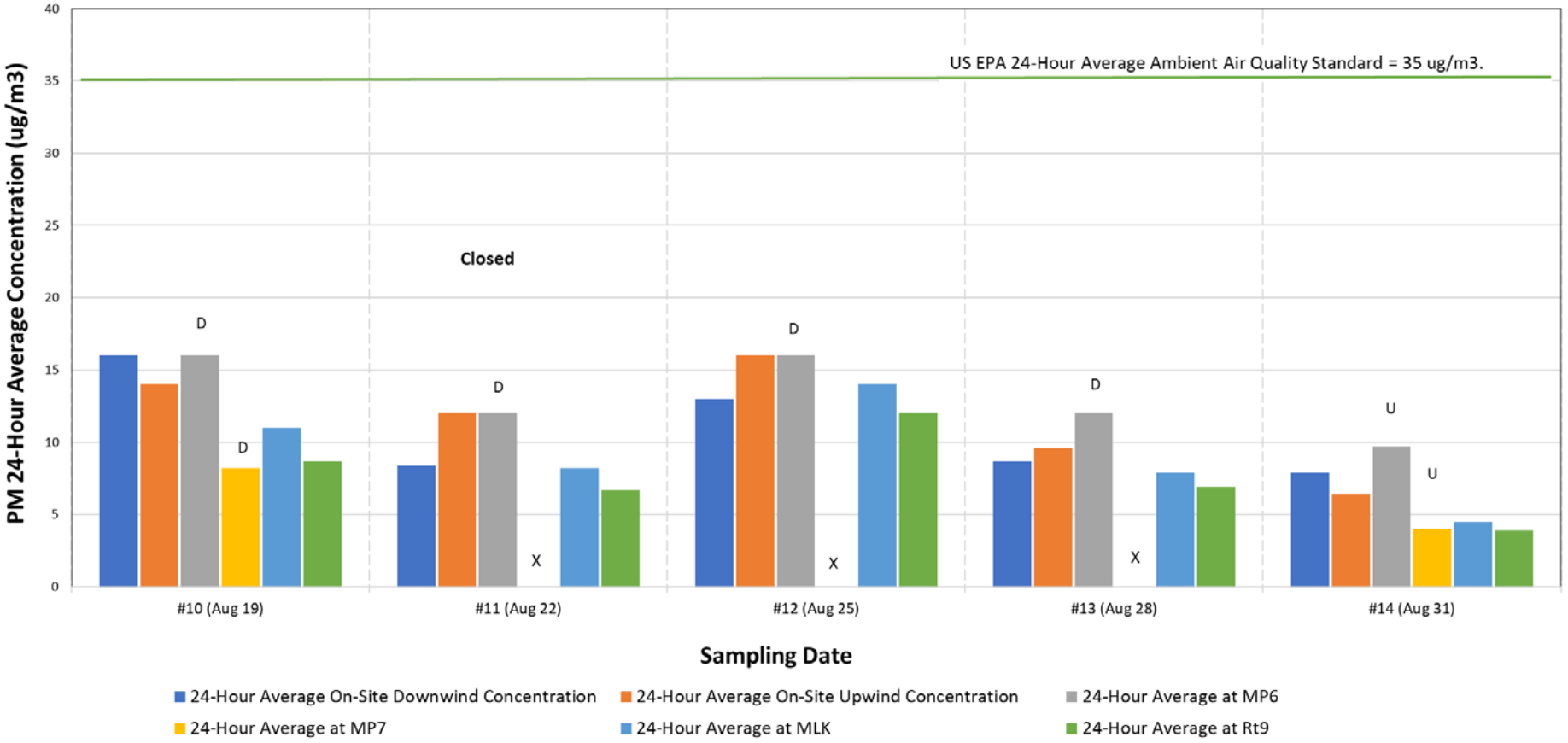
Figure 6a: First Quarter



X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 6 – PM2.5 24-Hour Average Air Concentrations by Quarter

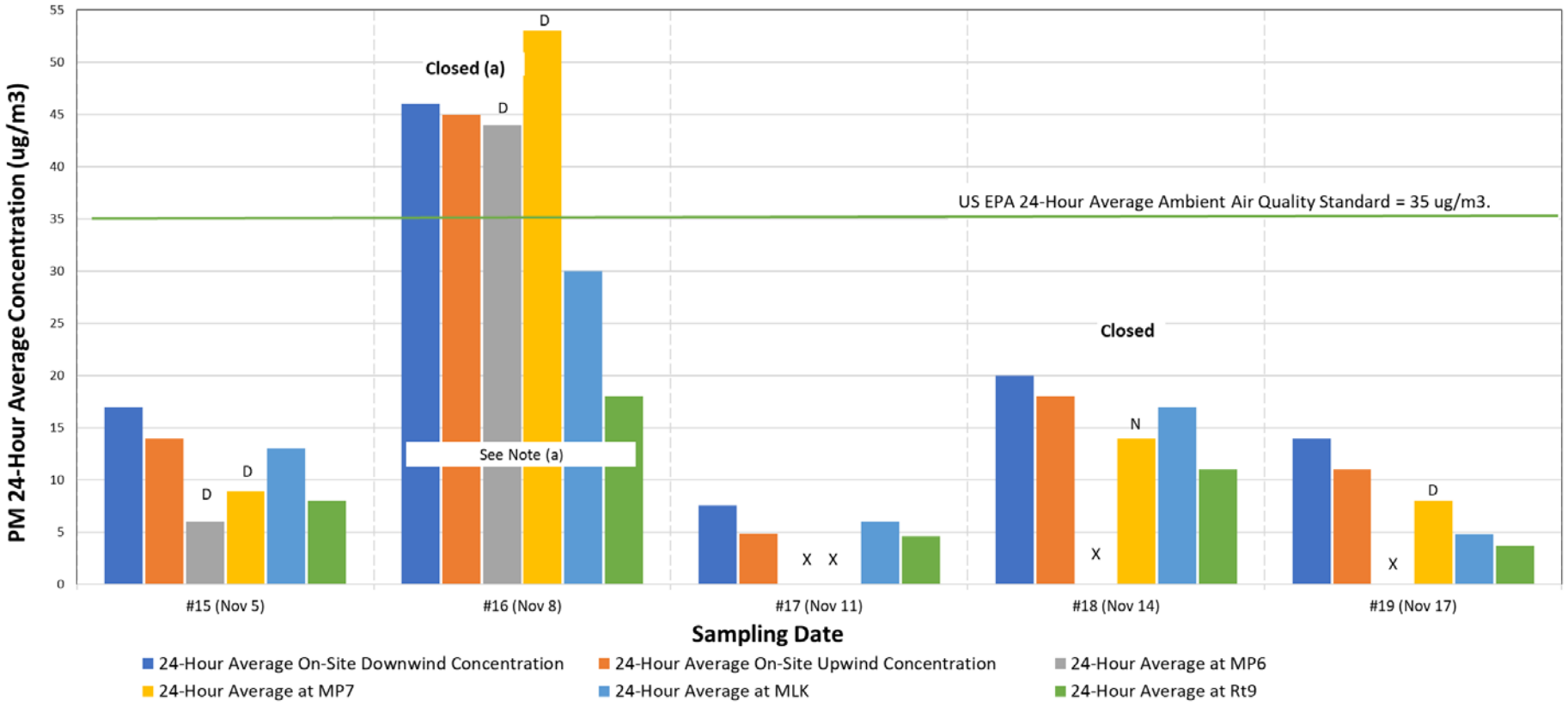
Figure 6b: Second Quarter



X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 6 – PM2.5 24-Hour Average Air Concentrations by Quarter

Figure 6c: Third Quarter

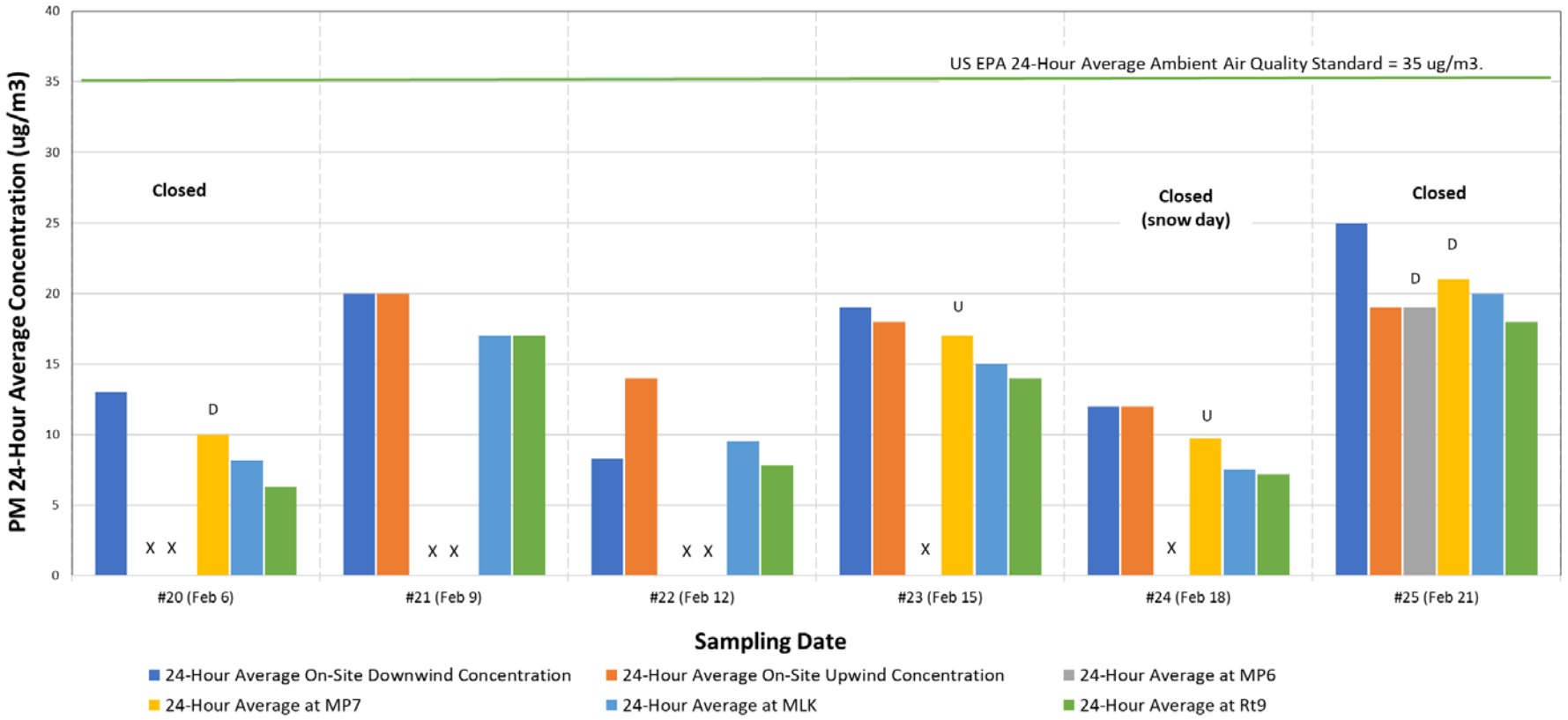


(a) On November 8, 2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE, including the DRPI location, which resulted in elevated regional PM concentrations. The landfill was closed on this date.

X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 6 – PM2.5 24-Hour Average Air Concentrations by Quarter

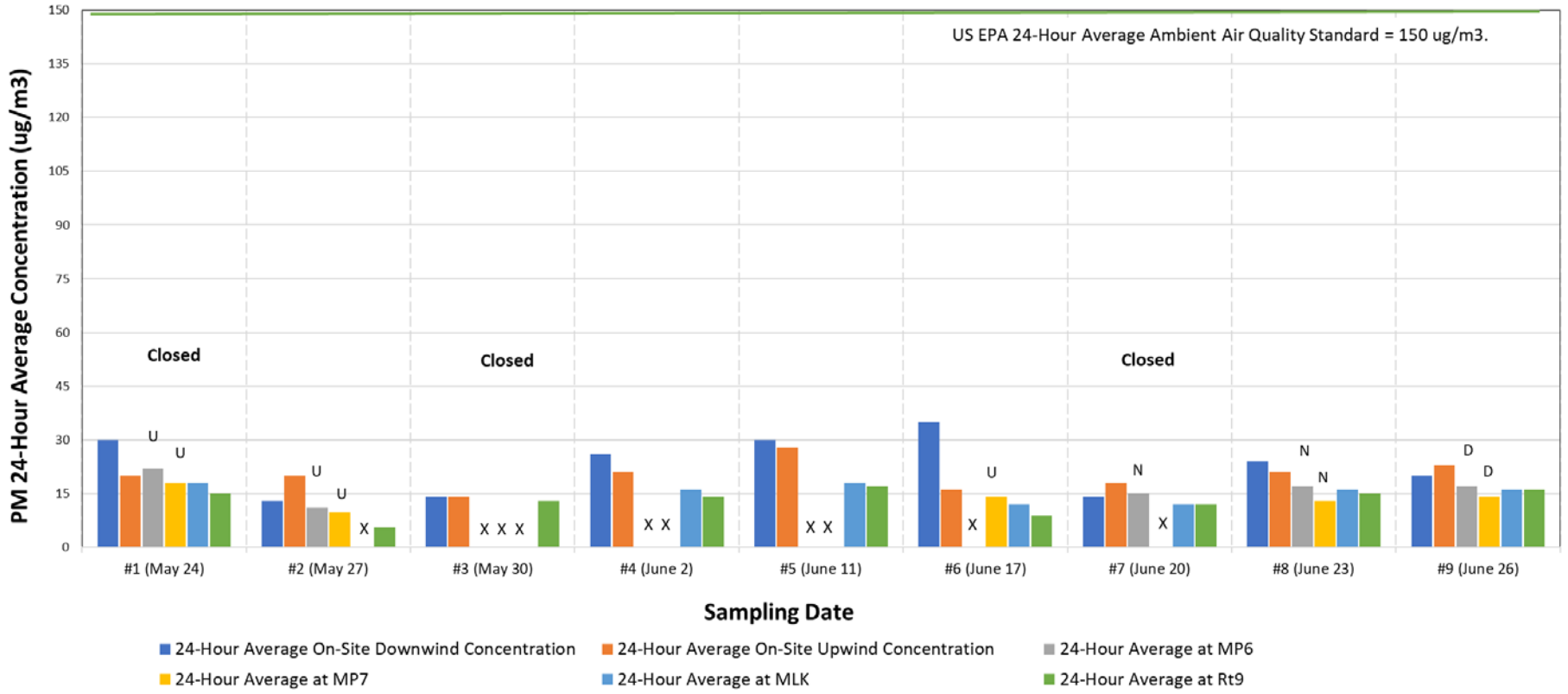
Figure 6d: Fourth Quarter



X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 7 – PM10 24-Hour Average Air Concentrations by Quarter

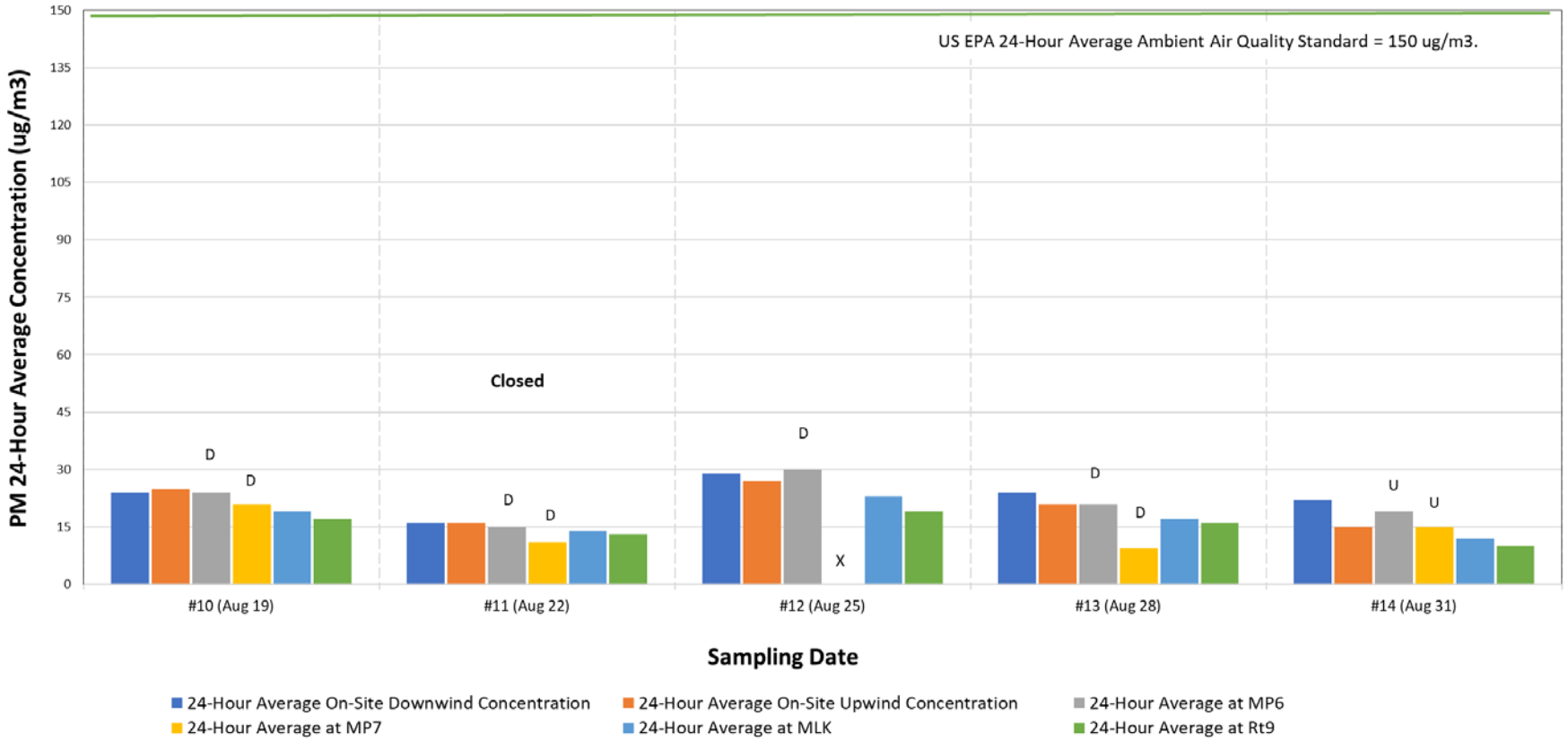
Figure 7a: First Quarter



X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 7 – PM10 24-Hour Average Air Concentrations by Quarter

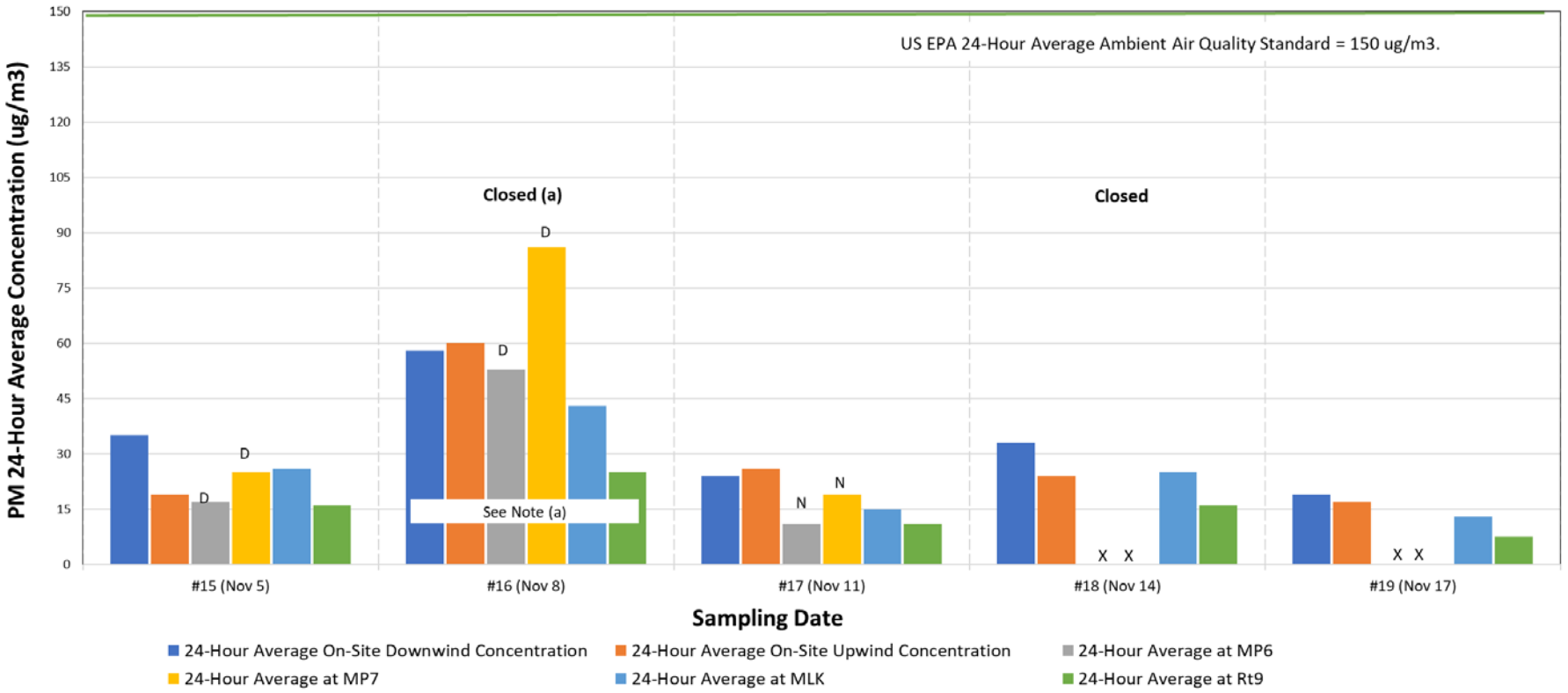
Figure 7b: Second Quarter



X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 7 – PM10 24-Hour Average Air Concentrations by Quarter

Figure 7c: Third Quarter

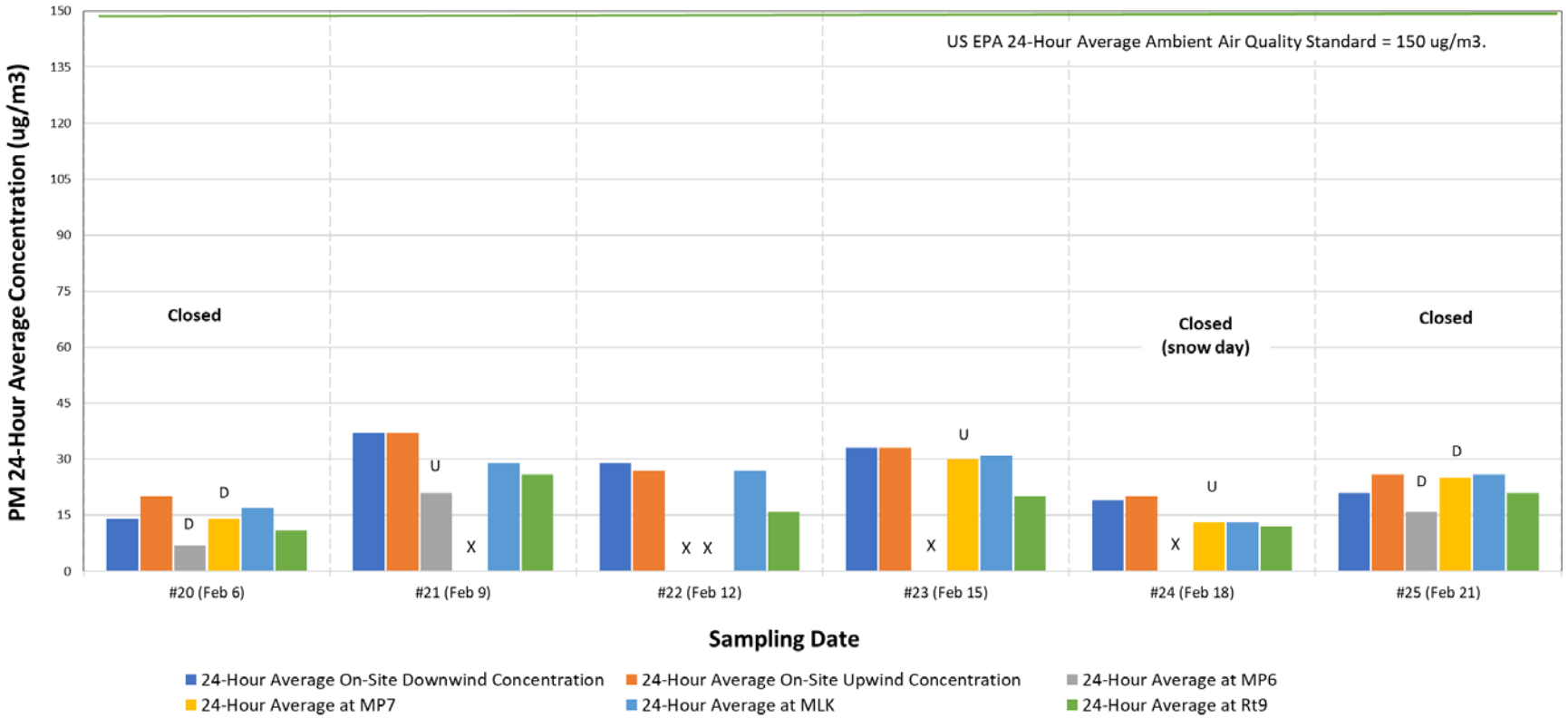


(a) On November 8, 2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE, including the DRPI location, which resulted in elevated regional PM concentrations. The landfill was closed on this date.
X = 24-Hour average data not available.

X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

Figure 7 – PM10 24-Hour Average Air Concentrations by Quarter

Figure 7d: Fourth Quarter



X = 24-hour average data not available.
D = downwind of DRPI.
U = upwind of DRPI.
N = neither upwind nor downwind of DRPI.
Closed = landfill was closed on this date.

The one exception not included in the conclusions about 24-hour averages above was on November 8, 2020, a day when the landfill was closed and a large region experienced an air quality event. On this date, a regional high-pressure weather system and strong morning inversions occurred across parts of Pennsylvania and Delaware, including the DRPI location, which resulted in elevated regional PM concentrations that differed substantially from every other sampling date (USEPA 2020, Greater Philadelphia Severe Weather 2020, USEPA 2021).[6] The elevated November 8 concentrations were high enough to overwhelm any potential local effects that might have been present, whether associated with the landfill (which was closed that day) or other nearby sources.

Potential for Landfill-Related Impact on PM Air Concentrations

Evidence for a landfill-related impact on PM2.5 and PM10 air concentrations would be present if downwind concentrations were consistently higher than upwind concentrations. Another indicator would be consistently lower concentrations off site compared to on site, since air concentrations resulting from emissions from a ground-level area source like a landfill generally decrease with distance traveled. Off-site concentrations that are higher than those on site suggest that other local sources such as roadway vehicles or nearby commercial or industrial facilities may be affecting the concentrations. Other findings supportive of a landfill-related impact would be higher concentrations on days with higher vehicle counts and on days when the landfill is open versus closed.

Evaluation of Hourly Air Concentrations

The hourly concentrations were evaluated using charts that display averages of the hourly data by sampling date and by monitoring location. These evaluations compared average downwind to upwind concentrations and DNREC station concentrations to on-site and off-site concentrations.

Downwind Versus Upwind

- *By Monitoring Location*: One set of charts shows average hourly concentrations at each monitoring location, by downwind and upwind wind class, averaged across sampling dates (see Figure 8 for PM2.5 and Figure 9 for PM10).

- *By Sampling Date*: Another set of charts shows on-site average hourly concentrations for each sampling date, by downwind and upwind wind class, averaged across the on-site stations MP-1 to MP-5 (see Figure 10 for PM2.5 and Figure 11 for PM10).

A visual comparison of the downwind and upwind data in Figures 8 through 11 does not provide clear evidence of a consistent landfill-related impact on air quality. When comparing downwind versus upwind average concentrations, sometimes average hourly downwind concentrations were higher than upwind, other times the reverse was seen, and often the results were similar. Notably, with the exception of one anomalous day on November 8, 2020 when the landfill was closed and there was a regional air quality event, all the hourly average concentrations in Figures 8 through 11 were less than the NAAQS.

[6] A high-pressure weather system produced air inversion conditions on November 8, 2020 which led to higher concentrations near the ground due to reduced air mixing with air layers higher up. An inversion occurs when a layer of cooler air is trapped near the ground by a layer of warm air above the surface. This situation occurs most commonly when the sky is clear and winds are light and calm, especially in the early morning hours. When the air cannot rise and mix with higher air layers above, pollution accumulates near the ground and creates higher concentrations than usual.

Figure 8
Average Hourly Downwind and Upwind PM2.5 Concentrations
by Monitoring Station and Sampling Quarter

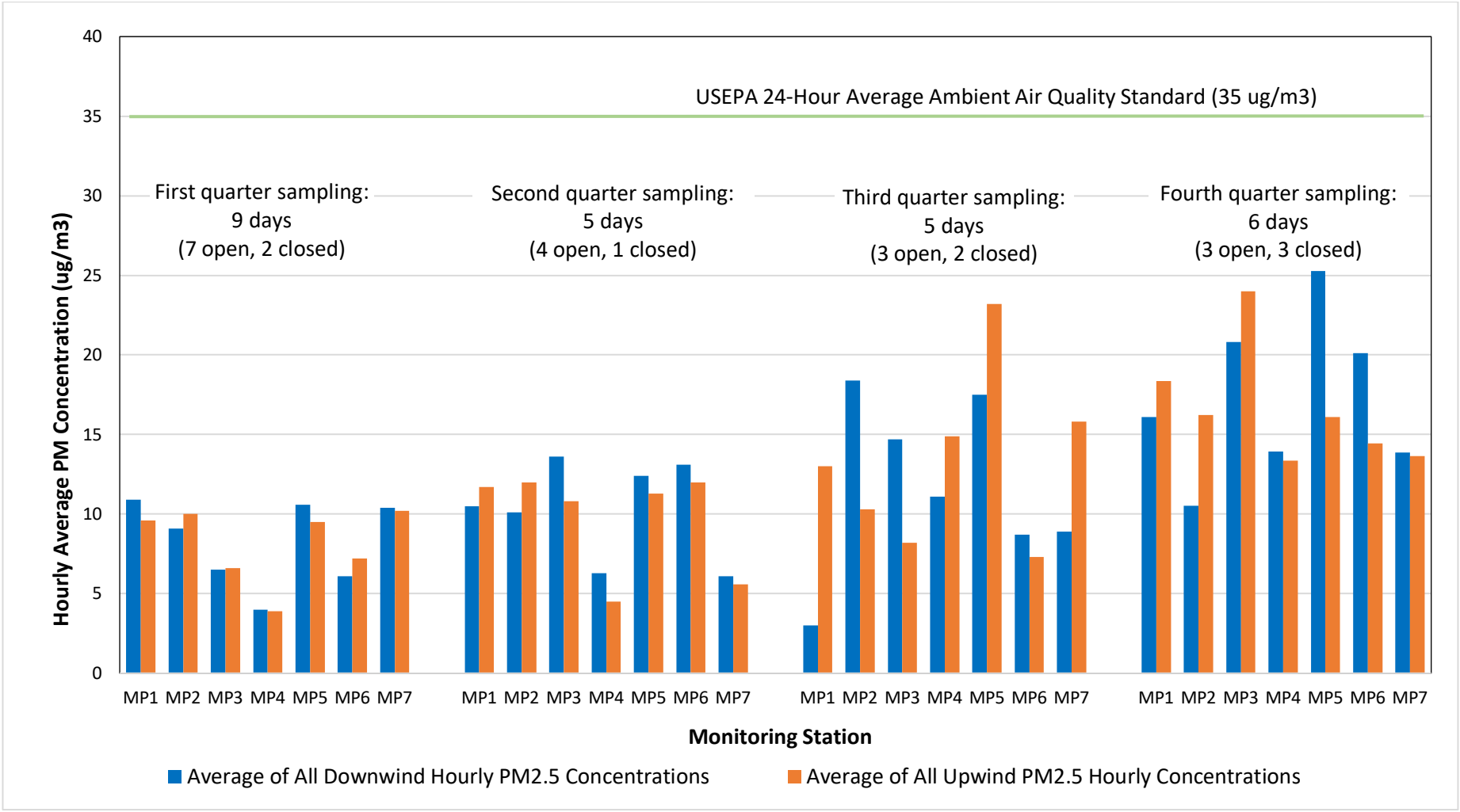


Figure 9
Average Hourly Downwind and Upwind PM10 Concentrations
by Monitoring Station and Sampling Quarter

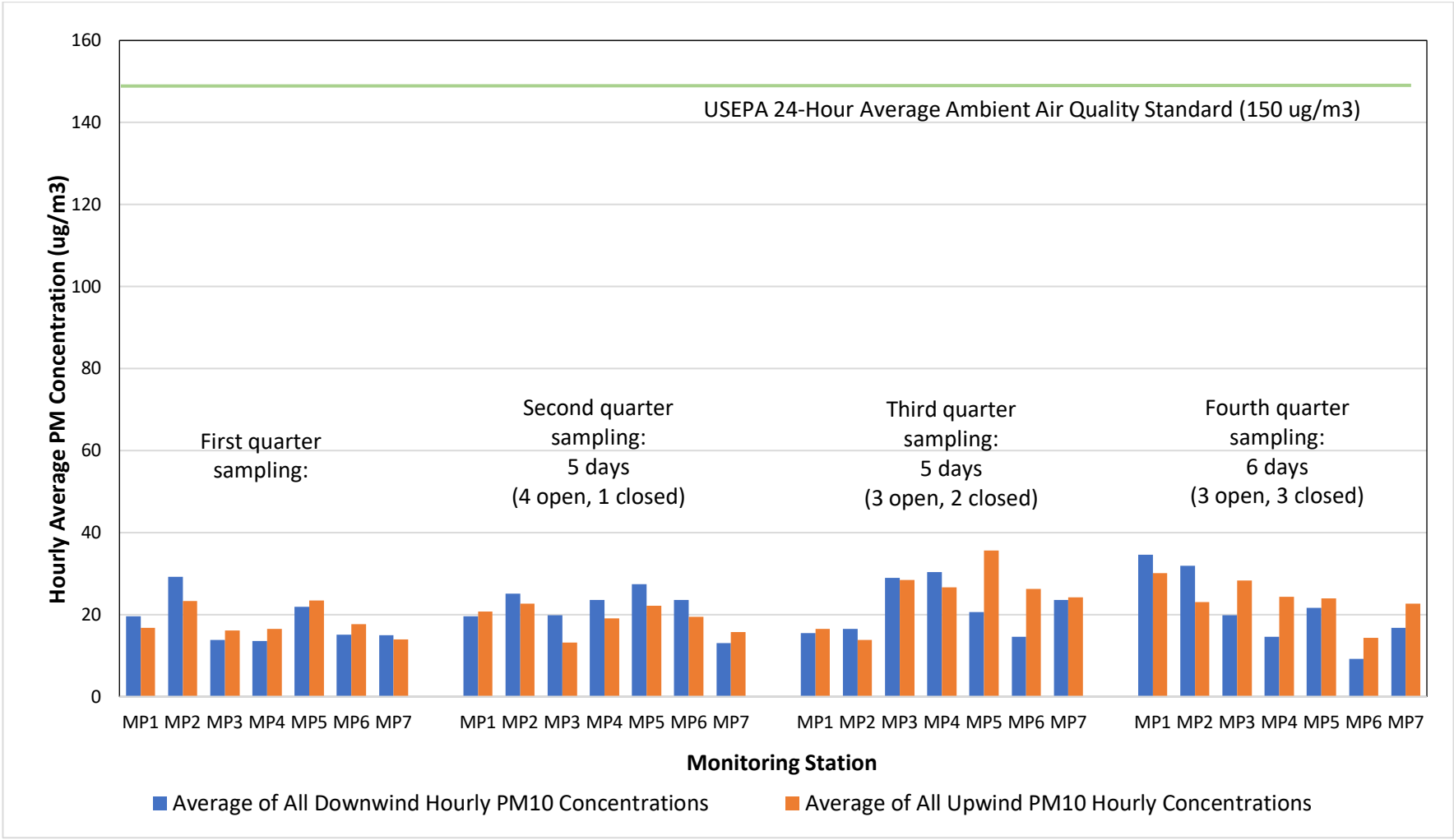
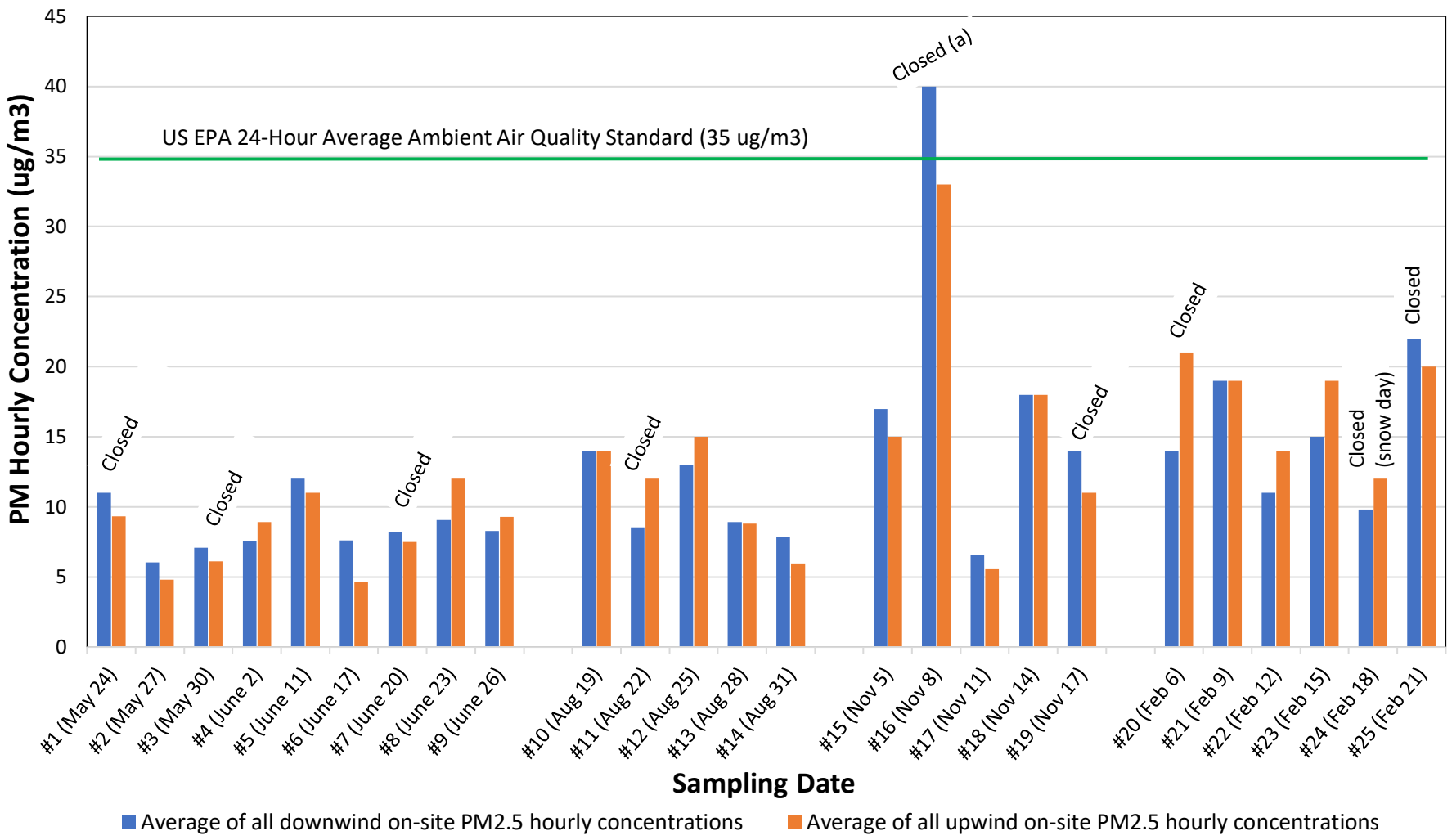


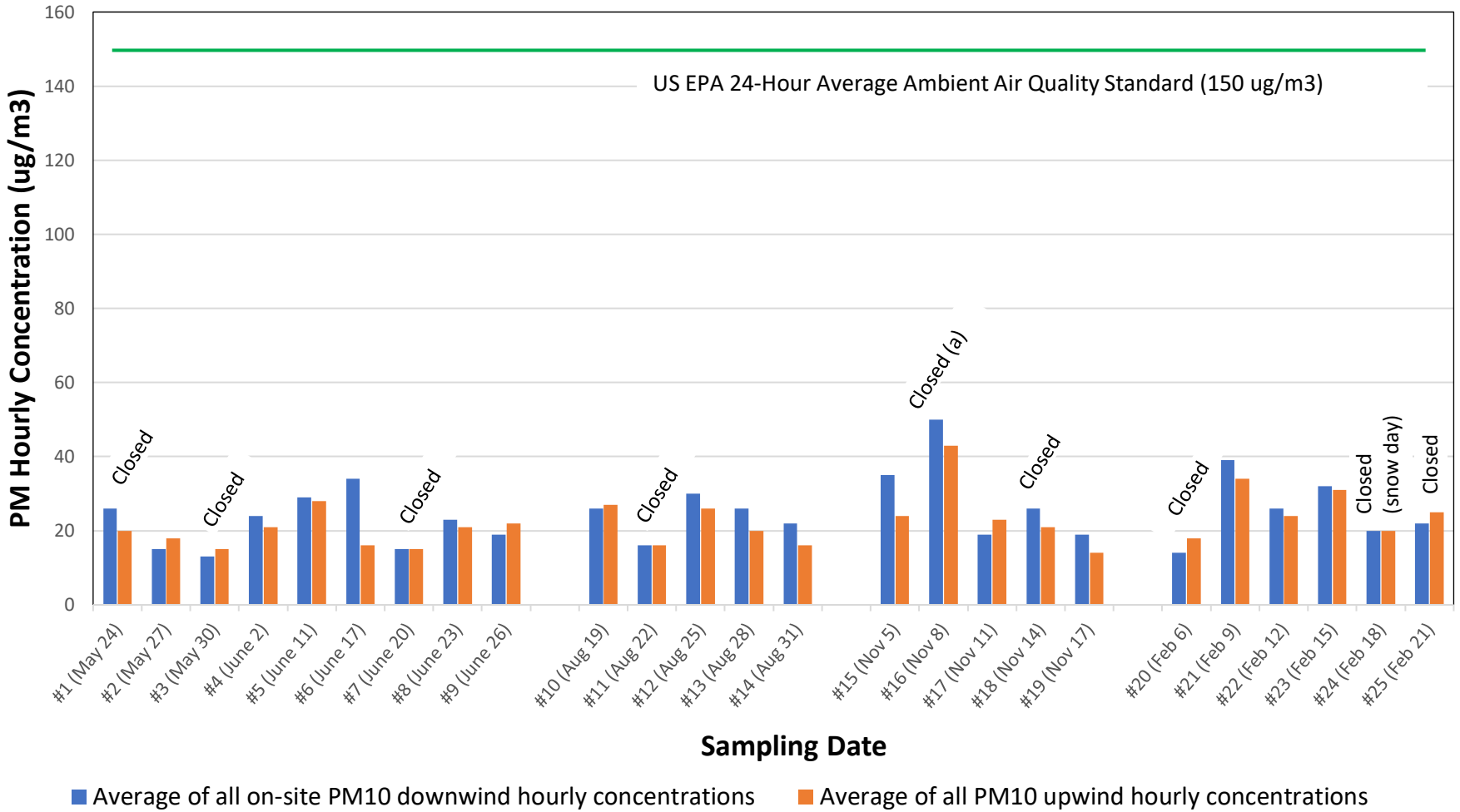
Figure 10
On-Site Average Downwind and Upwind Hourly PM2.5 Concentrations by Date
(Averaged for Each Date Across All Hours and All Five On-Site Stations)



(a) On November 8, 2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE, including the DRPI location, which resulted in elevated regional PM concentrations. The landfill was closed on this date.

Figure 11

On-Site Average Downwind and Upwind Hourly PM10 Concentrations by Date
(Averaged for Each Date Across All Hours and All Five On-Site Stations)



(a) On November 8, 2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE, including the DRPI location, which resulted in elevated regional PM concentrations. The landfill was closed on this date.

Figures 8 through 11 suggest that average PM2.5 concentrations tended to be slightly higher during the last two quarters of sampling versus the first two quarters. The reasons for these differences over time are unclear. One important factor could be increased traffic and industrial and commercial activity as COVID lockdowns waned beginning in the fall of 2020. Input from DRPI and Earthres does not point to any substantial differences in heavy equipment activities, location and size of the active working face, or potential on-site emission sources. There was also no new construction on site that might account for the changes by quarter. Based on a review of Table 1, there was a slight reduction in road wetting trips at DRPI in the last two quarters versus the first two quarters. But it is not clear whether any of these factors played a role, especially since some of the higher measurements occurred on days the landfill was closed and because PM2.5 is known to be strongly affected by regional air quality conditions.

Regional Air Quality

The hourly concentrations on site (MP-1 to MP-5) and off site (MP-6 and MP-7) were also compared to regional air quality measurements collected by DNREC at the MLK and Route 9 ambient air monitoring stations (see Figures 6 and 7 as well as box plots in Appendix G). Overall, average concentrations at MP-1 through MP-7 were often higher than DNREC-measured regional air quality concentrations, even for concentrations classified as upwind of DRPI. Concentrations at the MLK site were also generally higher than at the Route 9 site. The reasons for higher concentrations at most but not all DRPI locations compared to the regional data are not clear, although they suggest that air concentrations in the overall landfill vicinity, including the West Minquadale area, are often higher than at the two DNREC monitoring stations.

Evaluation of 24-Hour Average Air Concentrations

The 24-hour average concentrations in Figure 6 (PM2.5) and Figure 7 (PM10) do not indicate a consistent pattern relative to the landfill. Rather, the results were variable by date. (Note that this conclusion is only based on a comparison of average daily concentrations, not the more robust statistical tests provided below.) Average concentrations were more often higher downwind than upwind but not consistently. When the landfill was closed, concentrations were sometimes higher than when the landfill was open, and off-site concentrations at MP-6 and MP-7 were occasionally higher than on the landfill, indicating that sources other than the site were affecting air concentrations. Across the 25 sampling dates, the on-site 24-hour average PM2.5 air concentrations downwind were higher than upwind concentrations on 52% of the dates, lower for 32% of the dates and similar or not able to be compared on 16% of the dates.[7] For PM10, the corresponding results were 48% (24-hour average downwind higher than upwind), 36% (24-hour average downwind lower than upwind), and 16% (similar or not able to be evaluated).

Statistical Analyses

Statistical tests were used to compare downwind to upwind concentrations both by sampling date and by monitoring location. These were supplemented with box plots which provide more details about the measured concentrations (see Appendix G for box plots). USEPA's ProUCL statistical software package was used to perform the statistical tests and create the box plots.[8]

[7] On some dates, 24-hour averages were not available in a downwind or upwind wind class.
[8] See Appendix C for more information about ProUCL and its use in this report.

On-Site By Sampling Date

The statistical test results for each sampling date are shown in Table 3. These tests compared on-site downwind to on-site upwind hourly air concentrations for each of the 25 sampling dates, combined across the five on-site monitoring locations (MP-1 through MP-5). The table also shows results across all sampling dates combined by quarter. (The corresponding figures with average concentrations by date are Figures 10 and 11.)

The statistical analysis results by sampling date suggest that for about 25% of the time, and for occasional isolated hours, the landfill likely influenced on-site air concentrations. But the majority of time, this was not the case, and there was no consistent landfill-related impact on air quality at the site. The results in Table 3 can be summarized as follows:

- *PM2.5*: The hourly on-site downwind PM2.5 concentrations at the landfill were statistically comparable to upwind concentrations 68% of the time (17 of the 25 sampling dates), statistically significantly higher than upwind 28% of the time (7 of 25 dates), and not evaluated for one date (due to too few samples).

- *PM10*: The hourly on-site downwind PM10 concentrations were statistically comparable to upwind concentrations 76% of the time (19 of 25 dates) and statistically significantly higher 24% of the time (6 of 25 dates).

- *All Sampling Dates Combined*: The combined hourly on-site downwind concentrations by sampling quarter were statistically significantly higher than upwind concentrations for two of the four quarters (first and third quarters for PM2.5 and second and third quarters for PM10). The box plots in Appendix G provide additional insight into the data used in these statistical tests. For example, the box plot for the first quarter PM2.5 results shows only modest differences in PM2.5 concentrations even though a statistically significant difference was observed. The PM10 box plots often include several individual hours with higher concentrations than the bulk of the measured concentrations; these may be outliers (i.e., not representative of the population from which they were drawn) or alternatively short-term peaks associated with vehicles driving by or near a monitoring device or earth- or waste-moving activities both on the landfill site or nearby.

By Monitoring Location

The statistical results for each monitoring location are shown in Table 4. These tests compared downwind to upwind hourly air concentrations by location and quarter, combined across all sampling dates. (Corresponding figures with average concentrations by location are Figures 8 and 9.)

The results by monitoring location indicate that most of the time, no statistically significant landfill-related impact on air quality occurred.[9] Several statistically significant landfill-related impacts were

[9] The statistical analysis by monitoring location does not include the anomalous data from November 8, 2020 when there was a regional air quality event and the landfill was closed. Table 4 includes the November 8 data but as can be seen, the sample sizes were too small to conduct statistical tests.

observed, however, at varying locations across the four quarters of sampling. There were also occasional hours with elevated PM concentrations, downwind and upwind, at both on-site and off-site locations. A summary of the statistical results by monitoring location is as follows:

- *On Site (MP-1 to MP-5)*: Downwind concentrations were similar to upwind most of the time and no single on-site station stood out as being consistently affected by the landfill, as shown in the tabulation below. Out of the total 40 statistical tests (i.e., four quarters, five on-site stations, and PM2.5 and PM10 combined), downwind concentrations were similar to upwind 65% of the time (26 of 40 comparisons), downwind concentrations were significantly higher than upwind 25% of the time (10 of 40), and a statistical evaluation was not conducted in four cases due to small sample sizes (4 of 40).

Sampling quarters with statistically significant higher hourly downwind concentrations versus upwind among on-site stations

PM Size	**PM2.5**				**PM10**			
Quarter	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**
Monitoring Station								
MP-1	X							
MP-2			X		X			X
MP-3		X	X			X		
MP-4		X				X		
MP-5				X				

- *Off Site (MP-6 and MP-7)*: At the two off-site locations, the downwind hourly air concentrations were not statistically elevated compared to upwind except once, at MP-6 during the fourth quarter (see table below). Overall, out of the 16 comparisons (i.e., four quarters, two off-site stations and PM2.5 and PM10 combined), downwind concentrations were similar to upwind 75% of the time (12 of 16 comparisons), downwind concentrations were significantly higher than upwind 6% of the time (1 of 16), and a statistical evaluation was not conducted in three cases due to small sample sizes (3 of 16).

Sampling quarters with statistically significant higher hourly downwind concentrations versus upwind among off-site stations

PM Size	**PM2.5**				**PM10**			
Quarter	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**
Monitoring Station								
MP-6				X				
MP-7								

- *Box Plots*: Appendix G provides box plots for MP-1 and MP-4 to illustrate more information about the hourly air concentrations. Results for other stations are similar to those for MP-1 and MP-4. The box plots for MP-1 during the first quarter show limited visual differences between downwind and upwind PM2.5 concentrations, even though they were statistically significantly different. For the other three quarters, the MP-1 box plots clearly show that downwind concentrations were lower than upwind (indicating no landfill-related impact).

For MP-4, the higher concentrations of PM2.5 and PM10 in the second quarter (when downwind concentrations were statistically elevated above upwind) can be visually confirmed. The box plots also show several individual hourly results, especially for PM10, that were higher than most of the other values. The individual hours with higher concentrations may be outliers or isolated peaks associated with nearby vehicle activity or earth- or waste-moving activities.

Summary by Date and Monitoring Location

The statistical analyses by date and by monitoring location show that landfill-related activities and other local and regional sources are likely affecting PM2.5 and PM10 air concentrations and that the dates and locations of impacts fluctuate. Given the myriad of regional and local sources that can affect PM concentrations, identifying potential landfill-related or other reasons for differences in downwind versus upwind concentrations by location is challenging because many factors can influence air quality. And without a clear landfill-related pattern of impact on air concentrations, as is the case from the DRPI four-quarter sampling program, it is extremely difficult to trace whether any specific on-site or nearby activities were related to elevated daily air concentrations.

Potential landfill-related activities that could affect PM concentrations were examined, including where deliveries of cover materials and stone dust were unloaded and stored at the site, what types of cover materials were used, the frequency of placement of cover on the working face, the working face location relative to the monitoring stations, the routes used by waste delivery vehicles traveling to and from the working face, and the location where DRPI's three heavy-duty vehicles are parked on site. A review of this information suggested possible but only sporadic relationships between on-site activities and measured air concentrations. For example, elevated PM2.5 readings at MP-1 during the first quarter, which is close to the scale house where heavy duty vehicles pass through repeatedly when the landfill is open, could have been related to nearby vehicle activity. But elevated concentrations at MP-1 only occurred during one of four quarters for PM2.5 and none for PM10, thus activity at the scale house did not consistently affect air concentrations. Similarly, elevated concentrations observed at MP-2 (one quarter for PM2.5 and two quarters for PM10) might be associated with the locations in the south-center of the landfill where stone dust and cover materials are stored and the facility's own heavy-duty vehicles are parked. Elevated concentrations at MP-4 (only second quarter for PM2.5 and PM10) might be related to nearby activities occurring close to this monitoring location. No particular activities were identified that might relate to the occasional elevated concentrations at MP-3 which is located at the southeast edge of the landfill, not particularly close to any recurring PM generating activities on site or nearby. Findings at MP-5 may be related to its location next to Marsh Lane which is used by vehicles traveling to and from both Corrado and the landfill. Potential factors accounting for the one elevated result at MP-6 (fourth quarter only for PM2.5) are unknown although this off-site monitoring station is in a parking lot where vehicles are present (and vehicle emissions are well-known sources of PM2.5).

Local sources expected to affect PM air concentrations include construction, industrial and institutional facilities and their activities, and also traffic on Interstate Routes 495 and 295 and State Route 13. In addition, PM2.5 particles can reflect overall regional air quality due to their ability to remain airborne and travel for long distances.

Landfill Activity

The on-site monitoring results were evaluated relative to landfill status (open or closed) and the number of heavy-duty vehicles arriving at the facility to explore evidence for a landfill-related impact on air quality.

Open versus closed status was assessed using statistical tests that compared hourly on-site air concentrations classified as downwind on those hours when the landfill was open versus those hours when it was closed. The results are shown in Table 5. Open hours were assumed to start when the first arriving heavy-duty vehicle was logged into site records (within the 7 AM-8 AM hour during the first two quarters and within the 6 AM-7 AM hour during the last two quarters). Closing was assumed to occur at 5 PM to include the period after waste deliveries were stopped but when on-site activities such as waste spreading and cover placement could still be occurring. Closed hours were all other hours, including all 24 hours on days the landfill was closed. The analysis showed different results for PM2.5 and PM10 (see Table 5). For PM2.5, on-site downwind PM2.5 concentrations were statistically elevated when the landfill was open, versus closed, during one quarter (second) but not the other three quarters. On-site downwind PM10 concentrations were statistically significantly higher when the landfill was open versus closed during all four quarters. This suggests that activities on site are affecting PM10 concentrations within the landfill facility boundary when it is open versus when it is closed. This is not surprising because landfill activities, such as heavy-duty vehicle movement over paved and unpaved surfaces, earth and waste moving, or other on-site activities which may suspend dust into air are not occurring when the facility is closed.

The potential role of heavy-duty vehicles on on-site PM concentrations was explored using regression analysis methods available in USEPA's ProUCL statistical package.[10] This analysis evaluated whether hourly PM10 air concentrations increased as the hourly number of arriving heavy-duty vehicles at the facility increased. The regression focused on PM10 which was the particle size consistently showing a difference between landfill open versus closed periods. The regression included every hour when heavy-duty vehicles were logged into the site's tracking system (i.e., the number of waste vehicles plus other trucks such as those delivering cover materials). The results are displayed in a scatterplot chart showing the PM10 air concentrations (y axis) relative to the number of heavy-duty vehicles arriving at the site (x axis) (Figure 12). The regression indicated there was no statistically significant increase in on-site downwind PM10 air concentrations as the number of heavy-duty vehicles entering the site increased. Thus, a higher number of heavy-duty vehicles entering the facility did not translate to higher air concentrations, even though the WMW test results (above) indicated that on-site hourly downwind air concentrations for PM10 tended to be higher when the landfill was open.

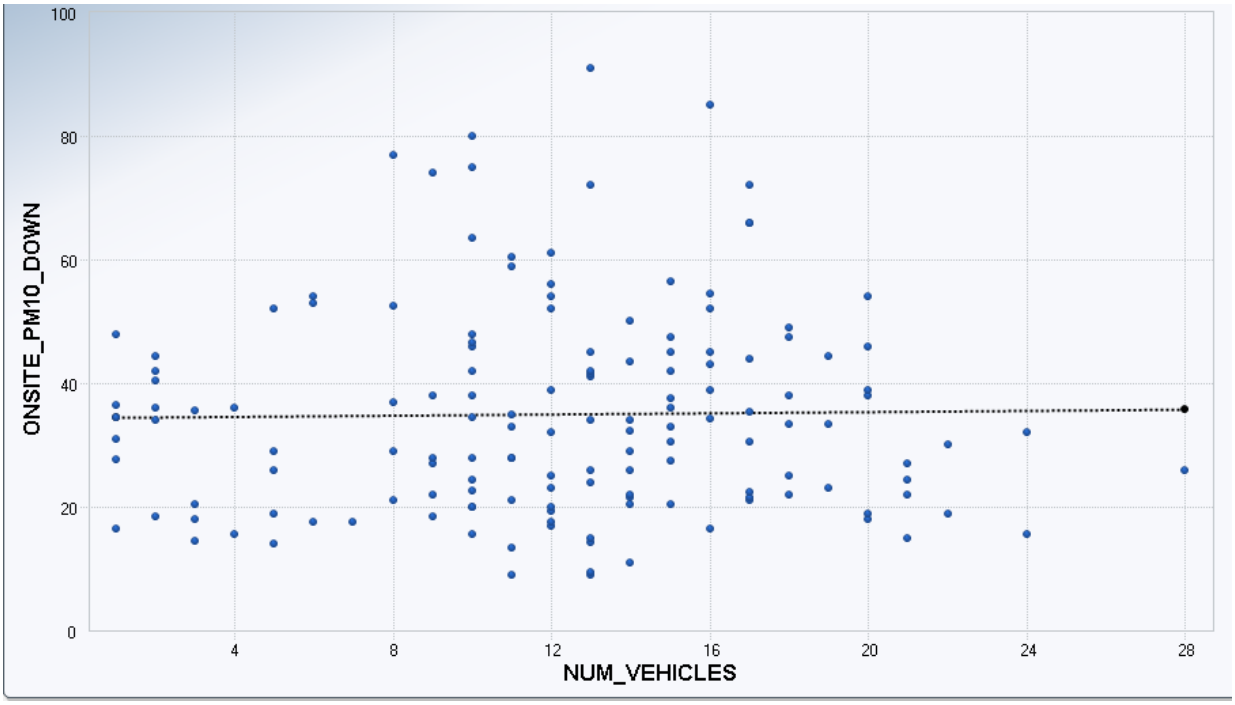
24-Hour Average Air Concentrations

Statistical tests were also conducted on the 24-hour average on-site air concentrations, comparing daily average downwind concentrations to daily average upwind concentrations by sampling quarter and across all four quarters combined. The results, shown in Table 6, indicate no statistically significant difference between predominantly downwind on-site 24-hour average air concentrations versus predominantly upwind 24-hour average air concentrations. Thus, while some differences were observed for hourly concentrations as described above, once averaged to 24-hour concentrations, no statistically significant differences were observed.

[10] See Appendix C for more information about ProUCL and its use in this report.

Figure 12

PM10 Hourly Air Concentrations (Downwind On-Site) Versus Hourly Number of Heavy-Duty Vehicles (a)



Definitions:

ONSITE_PM10_DOWN = Hourly PM10 air concentration on site (averaged across the five on-site stations MP-1 through MP-5) and classified as downwind of the site.

NUM_VEHICLES = Hourly number of heavy-duty vehicles entering the site.

Dashed line = Line describing the linear correlation relationship between the two variables.

(a) The regression analysis produced two statistical measures that describe the relationship between the two variables, a p value and an r value (see Appendix C for more information). The p value was not statistically significant (p value = 0.83; statistical significance is associated with p values less than 0.05) and the correlation was negligible (r value = 0.02; strong relationships are generally associated with r values greater than 0.8.)

DISCUSSION OF UNCERTAINTIES

There are uncertainties in any evaluation of ambient air measurements and, in accordance with standard practice, key uncertainties are discussed here. Elements of this evaluation that may be affected by uncertainty include choosing monitoring locations, measuring air concentrations, classifying hourly and 24-hour average air concentrations as downwind, upwind or neither based on wind direction, calculating on-site air concentrations across all five on-site monitoring stations, performing statistical tests, and comparing air concentrations to air quality standards.

Monitoring locations were selected to encompass the entire landfill area as well as two off-site locations. The placement and number of monitors around the landfill perimeter was intended to capture many hourly concentrations that were downwind and upwind, thereby allowing an evaluation of potential landfill-related impacts on air quality. The off-site locations were placed to address potential concerns about air quality at the nearby police station and a residential neighborhood. As described earlier, the 25 sampling events produced more than 7,200 hourly air concentration measurements.

The ambient air measurements around DRPI were provided to CPF by Earthres. The air concentrations were measured using a USEPA-approved monitoring device called the BAM-1020. Each measurement was an hourly average reported in accordance with standard BAM-1020 operating methods.[11] For some periods of time, concentrations were not able to be measured due to technical equipment and/or power disruption issues. As a result, reduced numbers of samples were available on some sampling days, creating potential uncertainties in the evaluation (see Appendix D for details). Another uncertainty relates to instances where measured concentrations were very small and, in some cases, even negative. Met One Instruments, which developed the monitor, indicates that negative values can occur when the instrument is working properly if the actual air concentration is very low, that is, within the detection limit of the BAM instrument. According to Met One, the hourly concentration detection limit (within the noise range of the instrument) is roughly +/- 4.8 $\mu g/m^3$ for PM2.5 and +/- 7.0 $\mu g/m^3$ for PM10.[12] Met One guidance recommends retaining BAM-1020 negative reported concentrations and including them when calculating 24-hour average air concentrations. They do caution, however, that 24-hour concentrations should always be positive and if not, the data should be revisited (Met One 2010). All of the 24-hour averages in this monitoring program were positive. Uncertainties in measured concentrations can also occur during the first hours that the BAM-1020 is turned on, referred to as cold starts. To help minimize cold start impacts, each monitor was started before the designated sampling day (7 hours before for on-site monitors and 1-1 ½ hours before for off-site monitors). Additionally, there were isolated hours when PM10 concentrations were lower than PM2.5, which is theoretically not possible since PM2.5 is a subset of PM10. This type of

[11] Each BAM-1020 has a standard hourly cycle timeline process for measuring hourly air concentrations in accordance with its designation as a USEPA Federal Equivalent Method. This process includes initial and final 8-minute measurements at the beginning and the end of each hour, with a 42-minute air sampling period in between, for a total of 58 minutes. The last two minutes of the hour are used for the instrument to reset for the next hourly measurement. For example, a 3 PM measurement reflects an air sample collected from 2:08 - 2:50 PM (Met One 2016). When calculating average wind speed and wind direction for each hourly air concentration in this assessment, this sampling process was taken into account by including the five-minute wind measurements that overlapped with the BAM-1020 sample collection period.

[12] Personal communication, R. Fabich, Met One Instruments, and S. Foster, CPF Associates LLC, November 16, 2020.

difference in PM10 versus PM2.5 can occur, however, because different monitors were used for each particle size, each monitor varied by age and its calibration starting point (determined by Met One) and the recording method varied by particle size (standard temperature and pressure for PM10 versus actual for PM2.5).

The hourly DNREC ambient air measurements from the MLK and Route 9 stations were provided to CPF by DNREC. These hourly measurements were raw data that had not gone through the State's QA/QC process.[13] As a result, there may be uncertainty in the reported PM2.5 and PM10 concentrations at these stations. Additionally, the DRPI and DNREC particulate matter air concentrations were measured using different technologies, however, they are both classified by USEPA as Federal Equivalent Methods appropriate for measuring PM2.5 and PM10 in ambient air and are expected to provide generally comparable results. The BAM-1020 technology uses beta ray attenuation to measure particles in the air while DNREC's technology uses light scattering to measures particles in air.[14]

Uncertainty in the downwind and upwind concentration designations can occur if wind directions are highly variable or wind speeds are very low. Each hourly air concentration was classified as downwind, upwind or neither based on concurrent wind directions reported by the on-site weather station. Uncertainties due to low average wind speeds ($\leq$ 1 mph) and highly variable wind directions ($\geq 90^{o}$) were addressed by classifying these hours as "neither" since a reliable downwind or upwind designation could not be made under these conditions. The hourly concentrations were then combined to designate each 24-hour average as predominantly downwind, upwind or neither, based on the percentage of hours falling into each of the three categories. For the 24-hour averages, the majority of sampling days had a clear dominance of hourly wind classification in one of the three categories. The decision rule used to classify each 24-hour average concentration as predominantly downwind, predominantly upwind or neither was biased to capture potential landfill-related impacts.[15] It is possible that slightly different statistical results might occur if the decision rule was stricter (e.g., the 24-hour average was classified as predominantly downwind only if 70% or more of the hourly average wind direction measurements placed the sampling location downwind or upwind of the landfill). But overall, across all sampling events, given the variability in findings, this type of modification is not expected to substantially change the overall findings of this report.

On-site average concentrations by hour, and by 24 hours, were calculated by combining results from the five monitoring stations located near the landfill perimeter road (MP-1 to MP-5). For each

[13] Personal communication, C. Sarnoski, DNREC and S. Foster, CPF Associates LLC, July 2020 through April 2021.
[14] The two monitoring technologies used to measure particles were the BAM-1020 at DRPI and the TAPI monitor at DNREC stations. 1) The Met One Instruments BAM-1020 PM Measurement System utilizes beta ray attenuation mass monitoring technology and is designated as a federal equivalent method (EQPM-0709-0185). The BAM-1020 monitors count the amount of beta rays that pass through a roll of filter tape before and after each sampling interval to determine the particle mass. The mass is used to calculate an air concentration (in mg/m^3) for each sampling interval. 2) The Teledyne Advanced Pollution Instrumentation (TAPI) Model T640 PM Mass Monitor with 640X Option applies scattered light spectrometry and is also designated as a federal equivalent method (EQPM-0516-240). The T640 monitors use a combination of broadband spectroscopy and polychromatic light-emitting diode (LED) technology. The monitors convert optical measurements to mass concentrations using well-understood light scattering theory.
[15] For example, the 24-hour average was classified as predominantly downwind if 50% or more of the hourly average wind direction measurements placed the sampling location downwind of the landfill, or 40% or more of the wind directions placed the sampling location downwind and less than 50% of the wind direction measurements placed the location upwind

sampling hour, the concentrations at all on-site stations classified as downwind were averaged to produce one on-site hourly downwind air concentration. A similar process was used to calculate one on-site hourly upwind concentration. These data were then evaluated using both statistical tests and charts. Because the monitoring stations were located on all sides of the landfill, there was almost always at least one and often two or three hourly concentrations in each wind category for every hour of sampling. Although there is some uncertainty in the average on-site concentrations for each hour due to small sample sizes (i.e., one, two or three), this is compensated for by having hundreds of hourly concentrations from multiple sampling days across the four-quarter monitoring program. The method for calculating a single 24-hour average on-site downwind or on-site upwind concentration was similar, except in this case, the daily 24-hour average concentrations calculated separately for monitoring stations MP-1 through MP-5 were averaged.

Multiple WMW two-sample comparison tests were conducted using ProUCL to help understand what factors might be associated with PM air concentrations. For each monitoring quarter's air dataset, statistical differences in downwind versus upwind concentrations were tested separately for the seven monitoring stations and the 25 different sampling dates, using a p value of 0.05 to conclude whether there was or was not a statistically significant difference (i.e., if $p<0.05$, downwind was concluded to be statistically greater than upwind). When a large number of statistical tests are conducted on the same dataset, however, some p values will be less than 0.05 purely by chance, meaning one could conclude that there is a statistically significant difference between two samples (i.e., downwind greater than upwind) when actually there is not. This is called a Type I error. As a result, in this analysis, it is possible that a few of the results showing statistically significantly higher downwind concentrations than upwind were actually not significantly different (Blakesley et al. 2009, McDonald 2014).

The potential for public health concerns was evaluated using USEPA's 24-hour average NAAQS which have been set at levels intended to protect public health with an adequate margin of safety, including sensitive subpopulations such as children and the elderly. All of the 24-hour average concentrations from the DRPI monitoring program were lower than the NAAQS except on one day when the landfill was closed and there was a regional air quality event.

The USEPA's daily Air Quality Index (AQI) also specifies ranges of PM2.5 and PM10 concentrations related to different levels of health concern ranging from "good" to "hazardous" (USEPA 2012, USEPA 2018):

- Air quality is considered "good" at 24-hour average PM2.5 concentrations up to 12 $\mu g/m^3$ (consistent with the annual average NAAQS) and PM10 concentrations up to 54 $\mu g/m^3$.
- Air quality is considered "moderate" at 24-hour average concentrations from 12.1 - 35.4 $\mu g/m^3$ for PM2.5 and 55 - 154 $\mu g/m^3$ for PM10. Within the moderate range, concentrations are acceptable though there may be a moderate health concern for a very small number of people especially as concentrations approach the high end of the range. In the "moderate" category, USEPA advises unusually sensitive people to consider reducing prolonged or heavy exertion outdoors.
- Concentrations from 35.5 - 55.4 $\mu g/m^3$ for PM2.5 and 155 - 254 $\mu g/m^3$ are classified as "unhealthy for sensitive groups", with the general public not likely to be affected but people with heart and lung disease, older adults and children at greater risk.

Across all four quarters (but excluding the November 8 air quality alert day related to a regional air quality event), 100% of the 24-hour average concentrations were in the "good" AQI range for PM10 and more than 75% were in the "good" AQI range for PM2.5. Most of the remaining 24-hour PM2.5 concentrations were at the low end or in the middle of the "moderate" AQI range. The maximum 24-hour average PM2.5 concentration was 25 $\mu g/m^3$ versus the moderate AQI maximum of 35.4 $\mu g/m^3$. Overall, excluding November 8, the 24-hour average PM concentrations based on comparison to the NAAQS and the AQI ranges are not expected to pose a public health concern, although on occasion 24-hour average PM2.5 concentrations could be within the "moderate" AQI range.

CONCLUSIONS

At the request of New Castle County, the DRPI Landfill conducted a four-quarter pilot ambient air monitoring program from May 2020 through February 2021 to assess the potential impact of the landfill on particulate air quality. The monitoring program was implemented by Earthres Group, Inc. (Earthres). The monitoring data were evaluated by CPF Associates, LLC in coordination with Earthres.

The monitoring program measured two types of respirable particulate matter in outdoor air: PM2.5 and PM10 (particles less than 2.5 microns and less than 10 microns in diameter, respectively). The concentrations were measured every hour during four multi-day quarterly monitoring events at seven stations using USEPA-approved particle monitoring equipment. Five stations (MP-1 through MP-5) were on the landfill property, around its perimeter road. Two stations were off site, one adjacent to the County Police Station (MP-6) and the other on the east side of West Minquadale (MP-7). An on-site weather station measured meteorological conditions such as wind speed and direction every five minutes. Site activity information including heavy-duty vehicle counts, dust control activities and waste disposal locations, were provided by DRPI.

This report presents an assessment of the more than 7,200 hourly air concentrations measured on 25 sampling days during four quarters of monitoring. All the hourly air concentrations were compiled and classified as downwind, upwind or neither based on the monitoring station location relative to the landfill and concurrent wind direction. In addition, daily 24-hour average air concentrations were calculated from the hourly data for comparison to 24-hour national ambient air quality standards (NAAQS) used by the US Environmental Protection Agency (USEPA) and Delaware. The NAAQS for PM2.5 and PM10 have been set at levels intended to protect public health with an adequate margin of safety, including sensitive subpopulations.

A summary of key findings from the four quarters of monitoring is provided below.

First, all of the 24-hour average air concentrations for PM2.5 and PM10 were below the 24-hour average NAAQS developed to be protective of public health, with one exception on a single sampling day (November 8, 2020) when the landfill was closed and an unusual regional air quality event occurred.[16] Based on these observations, and excluding the one regional air quality event, PM2.5 and

[16] A high-pressure weather system produced air inversion conditions on November 8, 2020 which led to higher concentrations near the ground due to reduced air mixing with air layers higher up. An inversion occurs when a layer of cooler air is trapped near the ground by a layer of warm air above the surface. This situation occurs most commonly when the sky is clear and winds are light and calm, especially in the early morning hours. When the air cannot rise and mix with higher air layers above, pollution accumulates near the ground and creates higher concentrations than usual.

PM10 concentrations measured at and in the vicinity of the landfill do not indicate a concern to public health.

Second, no consistent pattern of landfill-related impacts on PM air quality was found based on detailed statistical and graphical analyses of on-site and off-site hourly air concentrations, although some isolated impacts on PM air concentrations were occasionally observed. The majority of on-site downwind hourly concentrations were statistically similar to on-site upwind concentrations. Where differences were observed, the locations and dates of higher downwind versus upwind hourly concentrations varied substantially. Hourly concentrations when the landfill was open versus when it was closed showed limited statistical differences for PM2.5 but consistent differences for PM10. However, no statistical relationship was found between the hourly number of waste delivery vehicles and hourly on-site PM10 air concentrations. The hourly downwind concentrations at off-site locations were statistically comparable to upwind concentrations. During some isolated hours, elevated PM concentrations were observed off site but these occurred when the off-site locations were both upwind and downwind of the landfill which indicates the presence of PM sources other than the landfill. On a 24-hour average basis, on-site downwind air concentrations were statistically similar to those upwind for both PM2.5 and PM10.

The assessment indicated that both landfill-related activities, and also local and regional sources of PM other than the landfill, are likely affecting PM2.5 and PM10 air concentrations, and that the causes, dates and locations of impacts vary. The monitoring results suggest that on a few dates, and for some hours, the landfill likely influenced on-site air concentrations but rarely affected off-site concentrations. Possible landfill-related causes for PM air quality changes include vehicles moving over paved and unpaved surfaces, and earth- and waste-moving activities. Emissions of PM from these activities are mitigated by dust control measures regularly used at the landfill including road sweeping and cleaning and watering of roadways and landfill areas. Local and regional sources other than the landfill are also likely affecting PM2.5 and PM10 air concentrations. These potential sources include construction, industrial and institutional facilities and their activities and also traffic on Interstate Routes 495 and 295 and State Route 13.

REFERENCES

Blakesley, R.E., Mazumdar, S., Dew, M.A. et al. 2009. Comparisons of Methods for Multiple Hypothesis Testing in Neuropsychological Research. Neuropsychology 23(2): 255–264.

Greater Philadelphia Severe Weather. 2020. Air Quality Alert in Effect for Sunday, November 8, 2020. http://greaterphilaseverewx.com/air-quality-alert-in-effect-for-sunday-november-82020/

McDonald, J. 2014. Handbook of Biological Statistics. 3rd Ed. Sparky House Publishing. http://www.biostathandbook.com/HandbookBioStatThird.pdf

Met One Instruments (Met One). 2010. Met One Technical Bulletin, BAM-1020 PM10-2.5 Measurement Resolution: Considerations for Monitoring PM10 and PM2.5 Simultaneously in Low Concentrations.

Met One Instruments (Met One). 2016. BAM 1020 Particulate Monitor Operation Manual. Bam 1020-9800 Rev U. Met One Instruments, Inc., Grants Pass, OR. https://metone.com/wp-content/uploads/2019/04/BAM-1020-9800-Manual-Rev-U.pdf

US Environmental Protection Agency (USEPA). 2012. Revised Air Quality Standards for Particle Pollution and Updates to the Air Quality Index (AQI). https://www.epa.gov/sites/production/files/2016-04/documents/2012_aqi_factsheet.pdf

US Environmental Protection Agency (USEPA). 2015. ProUCL Version 5.1.002 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations). https://www.epa.gov/land-research/proucl-software

US Environmental Protection Agency (USEPA). 2018. Technical Assistance Document for the Reporting of Daily Air Quality – the Air Quality Index (AQI) https://www.airnow.gov/sites/default/files/2020-05/aqi-technical-assistance-document-sept2018.pdf

US Environmental Protection Agency (USEPA). 2019. Integrated Science Assessment for Particulate Matter. Office of Research and Development.

US Environmental Protection Agency (USEPA). 2020. Interactive Maps of Air Quality for PM2.5, 11/7 – 11/11/2020. Gispub.epa.gov/airnow.

US Environmental Protection Agency (USEPA). 2021. Air Quality Index Daily Values Report. https://www.epa.gov/outdoor-air-quality-data/air-quality-index-daily-values-report

TABLES

Table 1
Summary of Hourly Air Concentrations and Site Activity Information

Event #	Sampling Date	Number of Hourly PM Air Concentrations (# samples) (a)		Site Activity Information				Weather Information		
		PM2.5	PM10	Number Heavy-Duty Vehicles on Sampling Date (# Vehicles) (c)	Date	Number Road Sweeping Trips by Date (# Trips) (c)	Number Road Wetting Trips by Date (# Trips) (c)	Precipitation Before and During Sampling Date (inches) (b)	Average Daily Temperature (°F) (d)	Average Wind Speed (mph) (d)
First Quarter Sampling										
1	5/24/2020	125	150	0 (closed)	5/23 5/24	0 0	0 0	0.65 0	60	6.7
2	5/27/2020	150	144	95	5/26 5/27	15 0	18 0	0 0	65	4.1
3	5/30/2020	103	139	0 (closed)	5/29 5/30	0 0	16 15	0 0	73	5.5
4	6/2/2020	86	115	126	6/1 6/2	15 0	8 14	0 0	65	5.1
5	6/11/2020	50	86	107	6/10 6/11	0 0	7 8	0 1.17	75	6.1
6	6/17/2020	168	143	105	6/16 6/17	0 0	5 6	0 0	69	8.9
7	6/20/2020	171	158	0 (closed)	6/19 6/20	0 0	8 0	0.18 0	73	2.6
8	6/23/2020	173	173	115	6/22 6/23	0 0	8 8	0.05 0.57	77	4.1
9	6/26/2020	150	175	112	6/25 6/26	0 0	7 7	0 0	76	5.0
Second Quarter Sampling										
10	8/19/2020	172	174	117	8/18 8/19	0 0	7 4	0 0.07	74	3.3
11	8/22/2020	150	175	0 (closed)	8/21 8/22	0 0	6 0	0 0	77	4.9
12	8/25/2020	125	125	160	8/24 8/25	0 7	6 7	0 0	80	6.0
13	8/28/2020	148	174	121	8/27 8/28	0 0	5 7	0 0.58	76	4.6
14	8/31/2020	173	173	119	8/30 8/31	0 0	0 7	0 0.03	70	3.3

Table 1 (Continued)
Summary of Hourly Air Concentrations and Site Activity Information

Event #	Sampling Date	Number of Hourly PM Air Concentrations (# samples) (a)		Site Activity Information				Weather Information		
		PM2.5	PM10	Number Heavy-Duty Vehicles on Sampling Date (# Vehicles) (c)	Date	Number Road Sweeping Trips by Date (# Trips) (c)	Number Road Wetting Trips by Date (# Trips) (c)	Precipitation Before and During Sampling Date (inches) (b)	Average Daily Temperature (°F) (d)	Average Wind Speed (mph) (d)
Third Quarter Sampling										
15	11/5/2020	175	172	116	11/4 11/5	0 0	3 5	0 0	51	2.9
16	11/8/2020	175	170	0 (closed)	11/7 11/8	0 0	0 0	0 0	~ 60	2.2
17	11/11/2020	107	149	147	11/10 11/11	0 0	6 2	0 0	64	4.0
18	11/14/2020	154	134	0 (closed)	11/13 11/14	0 0	2 0	0.08 0.01	46	3.8
19	11/17/2020	157	143	137	11/16 11/17	0 0	3 3	0.45 0	41	7.6
Fourth Quarter Sampling										
20	2/6/2021	75	125	0 (closed)	2/5 2/6	0 0	0 0	0.03 0.01	39	6.3
21	2/9/2021	132	125	102	2/8 2/9	0 0	1 7	0.49 0	34	4.6
22	2/12/2021	139	139	72	2/11 2/12	0 0	0 0	0.22 0.01	27	5.2
23	2/15/2021	164	166	89	2/14 2/15	0 0	0 3	0.05 0	35	6.4
24	2/18/2021	161	162	0 (closed, snow day)	2/17 2/18	0 0	0 0	0 0.02	28	7.3
25	2/21/2021	147	149	0 (closed)	2/20 2/21	0 0	0 0	0.09 0	28	5.7

PM = particulate matter. PM2.5 = particles less than 2.5 µm in diameter; PM10 = particles less than 10 microns (10 µm) in diameter.

(a) Includes all air concentrations reported during each sampling event from all seven monitoring stations, and excludes measurements that were affected by monitoring equipment technical malfunction or power issues. Although monitoring was aimed to be conducted roughly five days per quarter, four additional days were added to the first quarter schedule to make up for data gaps resulting from technical malfunctions with several BAM-1020 units. Thus, the first quarter had more samples compared to other quarters.

(b) Precipitation data were obtained from DRPI's on-site weather station (http://www.drpilandfillwx.com/) except for November 8 - 17 when data were obtained from the New Castle Airport (2 miles SW of DRPI) because the on-site weather station did not report rainfall data.

(c) Vehicle counts and dust control data obtained from DRPI. Vehicle counts based on the number of heavy-duty vehicles passing through the scale house.

(d) Average daily temperature and wind speed were obtained from the New Castle Airport weather station (2 miles SW of DRPI) except for temperature on November 8 which was not reported at the airport, but which was estimated from DRPI's on-site station temperature graph.

Table 2

24-Hour Average Air Concentrations for PM2.5 and PM10: On Site, Off Site and DNREC Stations

(All Concentrations are 24-Hour Averages in µg/m^3)

Event #	Sampling Date (facility status)	PM2.5						PM10					
		On-Site (MP-1 to MP-5) (a,b)		Off-Site (wind class relative to DRPI) (b)		Delaware Air Quality Station		On-Site (MP-1 to MP-5) (a,b)		Off-Site (wind class relative to DRPI) (b)		Delaware Air Quality Station	
		Downwind	Upwind	MP-6	MP-7	MLK	Rt 9	Downwind	Upwind	MP-6	MP-7	MLK	Rt 9
First Quarter 24-Hour Averages													
1	5/24/2020 (closed)	10	8.0	NA	NA	8.7	7.4	30	20	22 (upwind)	18 (upwind)	18	15
2	5/27/2020 (open)	5.1	5.5	8.6 (upwind)	NA	NA	2.7	13	20	11 (upwind)	9.7 (upwind)	NA	5.6
3	5/30/2020 (closed)	7.9	5.2	NA	NA	NA	5.2	14	14	NA	NA	NA	13
4	6/2/2020 (open)	7.4	9.7	NA	NA	6.9	5.3	26	21	NA	NA	16	14
5	6/11/2020 (open)	11	NA	NA	NA	7.7	6.9	30	28	NA	NA	18	17
6	6/17/2020 (open)	7.9	4.7	NA	9.9 (upwind)	4.6	4.1	35	16	NA	14 (upwind)	12	8.9
7	6/20/2020 (closed)	7.4	8.0	6.4 (neither)	5.5 (neither)	7.3	6.3	14	18	15 (neither)	NA	12	12
8	6/23/2020 (open)	11	10	7.3 (neither)	14 (neither)	9.5	9.2	24	21	17 (neither)	13 (neither)	16	15
9	6/26/2020 (open)	7.8	10	NA	13 (downwind)	7.7	7.3	20	23	17 (downwind)	14 (downwind)	16	16
Second Quarter 24-Hour Averages													
10	8/19/2020 (open)	16	14	16 (downwind)	8.2 (downwind)	11	8.7	24	25	24 (downwind)	21 (downwind)	19	17
11	8/22/2020 (closed)	8.4	12	12 (downwind)	NA	8.2	6.7	16	16	15 (downwind)	11 (downwind)	14	13
12	8/25/2020 (open)	13	16	16 (downwind)	NA	14	12	29	27	30 (downwind)	NA	23	19
13	8/28/2020 (open)	8.7	9.6	12 (downwind)	NA	7.9	6.9	24	21	21 (downwind)	9.4 (downwind)	17	16
14	8/31/2020 (open)	7.9	6.4	9.7 (upwind)	4.0 (upwind)	4.5	3.9	22	15	19 (upwind)	15 (upwind)	12	10

Table 2 (continued)
24-Hour Average Air Concentrations for PM2.5 and PM10: On Site, Off Site and DNREC Stations
(All Concentrations are 24-Hour Averages in µg/m³)

Event #	Sampling Date (facility status)	PM2.5						PM10					
		On-Site (MP-1 to MP-5) (a,b)		Off-Site (wind class relative to DRPI) (b)		Delaware Air Quality Station		On-Site (MP-1 to MP-5) (a,b)		Off-Site (wind class relative to DRPI) (b)		Delaware Air Quality Station	
		Downwind	Upwind	MP-6	MP-7	MLK	Rt 9	Downwind	Upwind	MP-6	MP-7	MLK	Rt 9
Third Quarter 24-Hour Averages													
15	11/5/2020 (open)	17	14	6.0 (downwind)	8.9 (downwind)	13	8.0	35	19	17 (downwind)	25 (downwind)	26	16
16	11/8/2020 (closed) (a)	46	45	44 (downwind)	53 (downwind)	30	18	58	60	53 (downwind)	86 (downwind)	43	25
17	11/11/2020 (open)	7.6	4.9	NA	NA	6.0	4.6	24	26	11 (neither)	19 (downwind)	15	11
18	11/14/2020 (closed)	20	18	NA	14 (neither)	17	11	33	24	NA	NA	25	16
19	11/17/2020 (open)	14	11	NA	8.0 (downwind)	4.8	3.7	19	17	NA	NA	13	7.5
Fourth Quarter 24-Hour Averages													
20	2/6/2021 (closed)	13	NA	NA	10 (downwind)	8.2	6.3	14	20	6.8 (downwind)	14 (downwind)	17	11
21	2/9/2021 (open)	20	20	NA	NA	17	17	37	37	21 (upwind)	NA	29	26
22	2/12/2021 (open)	8.3	14	NA	NA	9.5	7.8	29	27	NA	NA	27	16
23	2/15/2021 (open)	19	18	NA	17 (upwind)	15	14	33	33	NA	30 (upwind)	31	20
24	2/18/2021 (closed)(b)	12	12	NA	9.7 (upwind)	7.5	7.2	19	20	NA	13 (upwind)	13	12
25	2/21/2021 (closed)	25	19	19 (downwind)	21 (downwind)	20	18	21	26	16 (downwind)	25 (downwind)	26	21

NA = Not applicable. For the average across MP-1 to MP-5, data were not available in the listed wind class from any of the five stations. For MP-6 and MP-7, less than 75% of hourly measurements were available, thus no 24-hour average was calculated.

(a) On 11/8/2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE, including the DRPI location, which resulted in elevated regional PM concentrations (Greater Philadelphia Severe Weather 2020; USEPA 2020). PM concentrations were significantly different on 11/8/2020 than all other monitoring dates from all quarters and thus were not included in statistical analyses across sampling dates.
(b) Snow day, landfill was closed.

Table 3
Statistical Evaluation by Sampling Date: Downwind Versus Upwind Hourly On-Site Air Concentrations

Sampling Event		PM2.5					PM10				
Number	Date	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
First Quarter											
1 (closed)	5/24/2020	25	25	downwind > upwind	0.006	**Yes**	25	25	downwind > upwind	0.007	**Yes**
2 (open)	5/27/2020	25	25	downwind ≤ upwind	0.21	No	25	20	downwind ≤ upwind	0.92	No
3 (closed)	5/30/2020	25	25	downwind ≤ upwind	0.31	No	25	25	downwind ≤ upwind	0.94	No
4 (open)	6/2/2020	25	20	downwind ≤ upwind	0.87	No	24	25	downwind ≤ upwind	0.92	No
5 (open)	6/11/2020	25	7	NC	NC	NC	25	20	downwind ≤ upwind	0.93	No
6 (open)	6/17/2020	25	25	downwind > upwind	< 0.001	**Yes**	25	25	downwind > upwind	< 0.001	**Yes**
7 (closed)	6/20/2020	23	23	downwind ≤ upwind	0.14	No	23	23	downwind ≤ upwind	0.68	No
8 (open)	6/23/2020	25	25	downwind > upwind	< 0.001	**Yes**	25	25	downwind ≤ upwind	0.42	No
9 (open)	6/26/2020	25	25	downwind ≤ upwind	0.74	No	25	25	downwind ≤ upwind	0.99	No
1 - 9	All nine dates	223	200	downwind > upwind	0.013	**Yes**	222	213	downwind ≤ upwind	0.41	No

Table 3 (continued)

Statistical Evaluation by Sampling Date: Downwind Versus Upwind Hourly On-Site Air Concentrations

Sampling Event		PM2.5					PM10				
Number	Date	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
Second Quarter											
10 (open)	8/19/2020	23	23	downwind ≤ upwind	0.53	No	23	23	downwind ≤ upwind	0.77	No
11 (closed)	8/22/2020	25	25	downwind ≤ upwind	1.0	No	25	25	downwind ≤ upwind	0.42	No
12 (open)	8/25/2020	25	25	downwind ≤ upwind	0.91	No	25	25	downwind ≤ upwind	0.34	No
13 (open)	8/28/2020	25	25	downwind ≤ upwind	0.55	No	25	25	downwind ≤ upwind	0.17	No
14 (open)	8/31/2020	25	25	downwind > upwind	0.003	**Yes**	25	25	downwind > upwind	< 0.001	**Yes**
10 - 14	All five dates	123	123	downwind ≤ upwind	0.77	No	123	123	downwind > upwind	0.037	**Yes**
Third Quarter											
15 (open)	11/5/2020	25	25	downwind > upwind	0.01	**Yes**	25	25	downwind > upwind	0.002	**Yes**
16 (closed)	11/8/2020 (a)	21	21	downwind ≤ upwind	0.20	No	21	21	downwind ≤ upwind	0.42	No
17 (open)	11/11/2020	24	24	downwind ≤ upwind	0.08	No	24	24	downwind ≤ upwind	0.59	No
18 (closed)	11/14/2020	24	24	downwind ≤ upwind	0.22	No	24	24	downwind > upwind	0.047	**Yes**
19 (open)	11/17/2020	24	24	downwind > upwind	0.001	**Yes**	24	24	downwind > upwind	0.001	**Yes**
15, 17-19	Four dates (excludes 11/8) (a)	97	97	downwind > upwind	0.008	**Yes**	97	97	downwind > upwind	0.005	**Yes**

Table 3 (continued)
Statistical Evaluation by Sampling Date: Downwind Versus Upwind Hourly On-Site Air Concentrations

Sampling Event		PM2.5					PM10				
Number	Date	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
Fourth Quarter											
20 (closed)	2/6/2021	23	10	downwind ≤ upwind	0.98	No	24	24	downwind ≤ upwind	0.10	No
21	2/9/2021	25	25	downwind ≤ upwind	0.96	No	25	25	downwind ≤ upwind	0.18	No
22	2/12/2021	25	25	downwind ≤ upwind	1.0	No	25	25	downwind ≤ upwind	0.14	No
23	2/15/2021	25	25	downwind ≤ upwind	1.0	No	25	25	downwind ≤ upwind	0.15	No
24 (closed, snow day)	2/18/2021	25	25	downwind ≤ upwind	1.0	No	25	25	downwind ≤ upwind	0.43	No
25 (closed)	2/21/2021	25	25	downwind > upwind	0.04	**Yes**	25	25	downwind ≤ upwind	0.99	No
20-25	All six dates	148	135	downwind ≤ upwind	1.0	No	149	146	downwind ≤ upwind	0.57	No

WMW = Wilcoxon-Mann-Whitney statistical test comparing whether on-site downwind concentrations are or are not statistically significantly higher than upwind concentrations. The WMW test by event compared on-site downwind PM to on-site upwind PM, with on-site concentrations based on hourly averages calculated across the hourly on-site measurements from MP-1 through MP-5.
NC = Not calculated. Following USEPA's ProUCL guidance, statistical analyses were not conducted if the sample size for any group of data was less than 10 observations due to lack of reliability and instability in results (USEPA 2015).

(a) On 11/8/2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE and resulted in elevated regional PM concentrations (Greater Philadelphia Severe Weather 2020; USEPA 2020). PM concentrations were significantly different on 11/8/2020 than all other sampling dates from all quarters. For statistical analysis across all sampling dates in the 3rd quarter, data from 11/8 were thus were not included.

Table 4

Statistical Evaluation by Monitoring Location: Downwind Versus Upwind Hourly On-Site Air Concentrations

Station Number	PM2.5					PM10				
	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
First Quarter										
MP1 (On Site)	46	96	downwind > upwind	0.016	**Yes**	46	96	downwind ≤ upwind	0.14	No
MP2 (On Site)	67	71	downwind ≤ upwind	0.86	No	74	126	downwind > upwind	0.013	**Yes**
MP3 (On Site)	46	90	downwind ≤ upwind	0.47	No	49	59	downwind ≤ upwind	0.96	No
MP4 (On Site)	92	89	downwind ≤ upwind	0.071	No	69	89	downwind ≤ upwind	0.98	No
MP5 (On Site)	143	62	downwind ≤ upwind	0.073	No	141	37	downwind ≤ upwind	0.97	No
MP6 (Off Site)	16	42	downwind ≤ upwind	0.68	No	39	63	downwind ≤ upwind	0.71	No
MP7 (Off Site)	33	45	downwind ≤ upwind	0.36	No	51	90	downwind ≤ upwind	0.11	No
Second Quarter										
MP1 (On Site)	19	63	downwind ≤ upwind	0.97	No	19	63	downwind ≤ upwind	0.78	No
MP2 (On Site)	33	83	downwind ≤ upwind	0.94	No	33	83	downwind ≤ upwind	0.22	No
MP3 (On Site)	51	46	downwind > upwind	0.002	**Yes**	51	46	downwind > upwind	< 0.001	**Yes**
MP4 (On Site)	70	41	downwind > upwind	0.008	**Yes**	72	41	downwind > upwind	0.036	**Yes**
MP5 (On Site)	89	31	downwind ≤ upwind	0.10	No	89	31	downwind ≤ upwind	0.20	No
MP6 (Off Site)	75	31	downwind ≤ upwind	0.086	No	74	31	downwind ≤ upwind	0.16	No
MP7 (Off Site)	9	31	NC	NC	NC	43	37	downwind ≤ upwind	0.89	No

Table 4 (continued)

Statistical Evaluation by Monitoring Location: Downwind Versus Upwind Hourly On-Site Air Concentrations

Station Number	PM2.5					PM10				
	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
Third Quarter (November 5, 11, 14 and 17, 2020) (a)										
MP1 (On Site)	8	68	NC	--	NC	8	69	NC	--	NC
MP2 (On Site)	14	53	downwind > upwind	0.002	**Yes**	15	49	downwind ≤ upwind	0.058	No
MP3 (On Site)	53	33	downwind > upwind	<0.001	**Yes**	53	33	downwind ≤ upwind	0.56	No
MP4 (On Site)	52	40	downwind ≤ upwind	0.99	No	50	40	downwind ≤ upwind	0.15	No
MP5 (On Site)	69	5	NC	--	NC	57	5	NC	--	NC
MP6 (Off Site)	38	3	NC	--	NC	41	6	NC	--	NC
MP7 (Off Site)	32	15	downwind ≤ upwind	0.99	No	26	13	downwind ≤ upwind	0.49	No
Third Quarter (November 8, 2020) (a)										
MP1 (On Site)	4	11	NC	--	NC	4	11	NC	--	NC
MP2 (On Site)	0	19	NC	--	NC	0	19	NC	--	NC
MP3 (On Site)	1	13	NC	--	NC	1	13	NC	--	NC
MP4 (On Site)	19	0	NC	--	NC	19	0	NC	--	NC
MP5 (On Site)	20	0	NC	--	NC	20	0	NC	--	NC
MP6 (Off Site)	12	2	NC	--	NC	12	2	NC	--	NC
MP7 (Off Site)	11	4	NC	--	NC	11	1	NC	--	NC

Table 4 (continued)

Statistical Evaluation by Monitoring Location: Downwind Versus Upwind Hourly On-Site Air Concentrations

Station Number	PM2.5					PM10				
	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?	Downwind Sample Size	Upwind Sample Size	WMW Test Result	p Value	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
Fourth Quarter										
MP1 (On Site)	10	90	downwind ≤ upwind	0.86	No	10	90	downwind ≤ upwind	0.15	No
MP2 (On Site)	104	13	downwind ≤ upwind	0.99	No	106	34	downwind > upwind	<0.001	**Yes**
MP3 (On Site)	52	26	downwind ≤ upwind	0.98	No	52	26	downwind ≤ upwind	1.0	No
MP4 (On Site)	25	110	downwind ≤ upwind	0.21	No	25	121	downwind ≤ upwind	1.0	No
MP5 (On Site)	23	94	downwind > upwind	<0.001	**Yes**	23	75	downwind ≤ upwind	0.66	No
MP6 (Off Site)	17	58	downwind > upwind	<0.001	**Yes**	38	73	downwind ≤ upwind	0.99	No
MP7 (Off Site)	29	59	downwind ≤ upwind	0.69	No	29	56	downwind ≤ upwind	0.98	No

Notes for Table 4

WMW = Wilcoxon-Mann-Whitney statistical test comparing whether on-site downwind concentrations are or are not statistically significantly higher than upwind concentrations. The WMW test by monitoring location compared downwind concentrations to upwind based on every hourly measurement classified as either downwind or upwind at each monitoring station.
NC = Not calculated. Following USEPA's ProUCL guidance, statistical analyses were not conducted if the sample size for any group of data was less than 10 observations due to lack of reliability and instability in results (USEPA 2015).

(a) On 11/8/2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE and resulted in elevated regional PM2.5 concentrations. PM concentrations on this date were significantly different than all other monitoring dates from all quarters and thus were not included in statistical analyses across sampling dates.

Table 5

Statistical Evaluation by Landfill Status:
Open Versus Closed Downwind Hourly On-Site Air Concentrations

PM Category	Open Hours Sample Size (a)	Closed Hours Sample Size (a)	WMW Statistical Result	P Value of Statistical Test	Were On-Site Downwind Concentrations Statistically Significantly Higher When Landfill is Open vs. Closed?
First Quarter (May 24 – June 26, 2020)					
PM2.5	66	157	open hours ≤ closed hours	p=0.94	No
PM10	65	157	open hours > closed hours	p < 0.001	**Yes**
Second Quarter (August 19 – August 31, 2020)					
PM2.5	44	79	open hours > closed hours	p=0.04	**Yes**
PM10	44	79	open hours > closed hours	p < 0.001	**Yes**
Third Quarter (November 5, 11, 14 and 17, 2020) (b)					
PM2.5	35	62	open hours ≤ closed hours	p = 0.99	No
PM10	35	62	open hours > closed hours	p = 0.004	**Yes**
Fourth Quarter (February 6 – February 21, 2021)					
PM2.5	36	112	open hours ≤ closed hours	p = 0.99	No
PM10	36	113	open hours > closed hours	p <0.001	**Yes**

WMW = Wilcoxon-Mann-Whitney statistical test comparing whether on-site downwind concentrations are or are not statistically significantly higher than upwind concentrations.
(a) Sample sizes reflect all on-site hourly average concentrations (MP1 – MP5 combined) classified as downwind of the landfill for those hours when the landfill was open (assumed to be 7 AM to 5 PM for the 1st and 2nd quarters, and 6 AM – 5 PM for the 3rd and 4th quarters) versus hours when the landfill was not open (all other hours, including all 24 hours on days the landfill was closed).
(b) On 11/8/2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE and resulted in elevated regional PM concentrations (Greater Philadelphia Severe Weather 2020; USEPA 2020). PM concentrations on this date were significantly different from all other sampling dates and thus were not included in this statistical analysis.

Table 6
Statistical Evaluation of Daily 24-Hour Average Concentrations:
Downwind Versus Upwind 24-Hour Average On-Site Air Concentrations

PM Category	Downwind Sample Size (a)	Upwind Sample Size (a)	WMW Statistical Result	P Value of Statistical Test	Were Downwind Concentrations Statistically Significantly Higher Than Upwind Concentrations?
First Quarter (May 24 – June 26, 2020)					
PM2.5	17	16	downwind ≤ upwind	p = 0.53	No
PM10	17	15	downwind ≤ upwind	p = 0.63	No
Second Quarter (August 19 – August 31, 2020)					
PM2.5	12	11	downwind ≤ upwind	p = 0.51	No
PM10	12	11	downwind ≤ upwind	p = 0.10	No
Second Quarter (November 5, 11, 14 and 17, 2020) (b)					
PM2.5	7	8	NC	--	NC
PM10	6	7	NC	--	NC
Fourth Quarter (February 6 – February 21, 2021)					
PM2.5	9	14	NC	--	NC
PM10	9	15	NC	--	NC
All Four Quarters Combined					
PM2.5	45	49	downwind ≤ upwind	p = 0.66	No
PM10	44	48	downwind ≤ upwind	p = 0.28	No

WMW = Wilcoxon-Mann-Whitney statistical test comparing whether downwind concentrations are or are not statistically significantly higher than upwind concentrations.
NC = Not calculated. Following USEPA's ProUCL guidance, statistical analyses were not conducted if the sample size for any group of data was less than 10 observations due to lack of reliability and instability in results (USEPA 2015).

(a) Sample sizes reflect the 24-hour average concentrations from each on-site monitoring location (MP-1 through MP-5) for each sampling date that was classified as predominantly downwind or predominantly upwind.
(b) One date during the third round of sampling, 11/8/2020, was not included in the statistical analysis. On 11/8/2020, a regional air quality event reported to be due to a regional high-pressure weather system and strong morning inversions occurred across parts of PA and DE and resulted in elevated regional PM2.5 concentrations. PM concentrations were significantly different on this date than all other monitoring dates from all quarters and thus were not included in statistical analyses across sampling dates.

APPENDICES

Appendix A

Description of Field Monitoring Program and BAM-1020 Air Monitoring Instrument

Appendix A
Description of Field Monitoring Program and BAM-1020 Air Monitoring Instrument Particulate Matter PM_{10} and $PM_{2.5}$ in Ambient Air
Prepared by Earthres Group Inc.

Introduction

This appendix describes the PM_{10} and $PM_{2.5}$ sampling program for the Delaware Recyclable Products, Inc. (DRPI) facility located in New Castle County, Delaware. PM_{10} and $PM_{2.5}$ sampling refers to the measurement of the mass concentration of particulate matter (PM) with an aerodynamic diameter less than or equal to a nominal 10 and 2.5 micrometers (µm), respectively, in ambient air. PM_{10} and $PM_{2.5}$ monitoring was completed over an approximate 24-hour period a minimum of five days per quarter for four quarters. Data were collected as follows:

Quarterly Monitoring Events at DRPI

Sampling Quarter	Dates Covered	Number of 24-Hour Sampling Days
1	May 24 - June 26, 2020	9
2	August 19 - August 31, 2020	5
3	November 5 - November 17, 2020	5
4	February 6 - February 21, 2021	6

Monitoring was performed in accordance with all applicable provisions of the relevant U.S. Environmental Protection Agency (US EPA) regulatory reference method for PM_{10} and $PM_{2.5}$ testing (i.e., 40 CFR Part 58 Appendix E – "Probe and Monitoring Path Siting Criteria for Ambient Air Quality Monitoring"). This narrative includes information on sampling procedures, and procedures for quality assurance/quality control (QA/QC).

Sampling Technique

Sampling was performed using fourteen (14) Met One BAM 1020 air monitors installed at seven (7) discrete monitoring locations. Each sampling location was supplied with two (2) air monitors: the first to measure PM_{10} concentrations, and the second to measure $PM_{2.5}$ concentrations. The monitors were installed in accordance with the siting criteria as referenced in 40 CFR Part 58 Appendix E and manufacturer's instructions. The samplers are manufactured by Met One and are designated as an EPA Automated Equivalent Method (EQPM-0709-185) for PM_{10} and $PM_{2.5}$ sampling in ambient air.

The PM_{10} and $PM_{2.5}$ monitoring was completed over a 24-hour period, from midnight to midnight. Each monitor was started before the designated 24-hour period (7 hours before for on-site monitors and 1-1 ½ hours before for off-site monitors).

A typical monitoring station is shown in Figure 1.

Figure 1 – Typical Monitoring Station

Data Collection and Retrieval

Each BAM-1020 has a standard hourly cycle timeline process for measuring hourly air concentrations in accordance with its designation as a USEPA Federal Equivalent Method. One (1) PM_{10} and one (1) $PM_{2.5}$ measurement was recorded every hour of the 24-hour sampling period.

The hourly measurement cycle includes initial and final 8-minute measurements at the beginning and the end of each hour, with a 42-minute air sampling period in between, for a total of 58 minutes. The last two minutes of the hour are used for the instrument to reset for the next hourly measurement.

Hourly air concentrations for PM2.5 and PM10 were downloaded by EARTHRES from each BAM instrument on a daily basis following each 24-hour sampling event and tabulated with relevant meteorological data from the landfill's on-site weather station (wind direction and wind speed). A total of 25 hourly concentrations were recorded during each sampling event. The first sample recorded the hourly concentration ending at midnight on the day before sampling and the last sample recorded the hourly concentration ending at midnight on the sampling day.

Data Gaps, and Troubleshooting

Operational errors and malfunctions with the BAM 1020 monitors can result in lost data causing gaps in the data set. These errors are most commonly resolved by replacing malfunctioning parts and restarting the unit. All errors that occurred during the monitoring events were logged after each sampling event. The following list provides an error code, description and corrective action for the operational errors and malfunctions that were encountered throughout the monitoring events:

(T) – Tape/Shuttle Errors:

The tape error usually indicates that the filter tape is has run out or broken. In rarer cases, a tape error may also be generated due to a failure in the tape control electromechanical system. Tape breaks usually result from significant temperature changes or high humidity. This results in the tape separating for its cassette type spooling. The Shuttle errors occur when grit is stuck in the tape rollers which interrupts the unspooling of tape. These tape failures do not allow for the measurement of PM and therefore no data can be recorded.

> Corrective Action: Tape errors were resolved by re-spooling the monitor with new tape. Shuttle errors were resolved by wiping out grit between tape rollers with cotton swabs and isopropyl alcohol.

(F) – Flow Errors:

Occur from malfunctioning vacuum pumps or problematic flow sensors or a fault with the flow controller. Malfunctioning pumps can still operate but are outside of the specified flowrate required for the sampling and therefore no data is recorded.

> Corrective Action: Flow errors were resolved by replacing malfunctioning vacuums and flow sensors as necessary.

(Temp.) – Temperature Errors:

Occur from a malfunctioning Temperature Sensors which provide values that are required for the internal PM calculations and therefore no data is recorded.

> Corrective Action: Temperature sensor errors were resolved by replacing any malfunctioning temperature sensors as necessary.

(P) – Power Errors:

Incoming line power (120 VAC) was interrupted. During these events the monitor cannot operate resulting in no data being collected.

> Corrective Action: Restore incoming line power to the unit.

(I) – Internal Clock Error:

Occurs from the wearing of the CR2032 battery located on the back of the BAM device, which affects the time cycle and causes the device to display inaccurate time stamps resulting in inaccurate flow calculations.

> Corrective Action: Internal clock errors were resolved by replacing CR2032 batteries as necessary. Replacing the battery clears the memory of the device, and previously stored data cannot be retrieved.

(M) – Moisture Error:

Occurs from sudden increases in relative humidity reading in the monitor.

> Corrective Action: N/A

(R) – Reference Errors:

This error indicates that the span reference membrane assembly may not be mechanically extending or withdrawing properly which can prevent valid data collection.

> Corrective Action: N/A

(*) - Abnormal Data Errors:

Abnormal data spikes in consecutive hours, both high/low and low/high concentration fluctuations (e.g., possibly due to quick changes in shelter temperature or moisture on the instrument tape), are not true representatives of actual particulate.[1]

> Corrective Action: N/A

FE - Telemetry/Mechanical Fault Errors:

This error indicates that an external data logger has sent an error signal to the BAM 1020 on the TELEM FAULT input, indicating that the logger unit has encountered a problem. Mechanical faults errors display consecutive negative or zero values that are unrepresentative of actual particulate.

> Corrective Action: N/A

Additional Quality Control Measures

A daily Self-Test was performed for every monitor to ensure that all sensors were functioning properly. Following functional confirmation, the monitors remained operational until the sampling period concluded. Additionally, daily observations of site activities were noted on a designated Site Activity Log. This includes, but is not limited to, daily truck counts, daily water truck counts, grass mowing, construction, etc. Wind speed, wind direction, and precipitation data was also collected from the onsite weather station for each monitoring period.

[1] Personal communication with R. Fabich, Met One Instruments, 3/2/2021.

Appendix B

Wind Roses for the Particulate Monitoring Program Sampling Dates

Windrose Diagrams on Days of Sampling
Waste Management – Delaware Recyclable Products, Inc.

5 Minute Wind Data
5/24/2020, 12:00:00 AM - 5/25/2020, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
5/27/2020, 12:00:00 AM - 5/28/2020, 12:00:00 AM
(Data Range Shown)

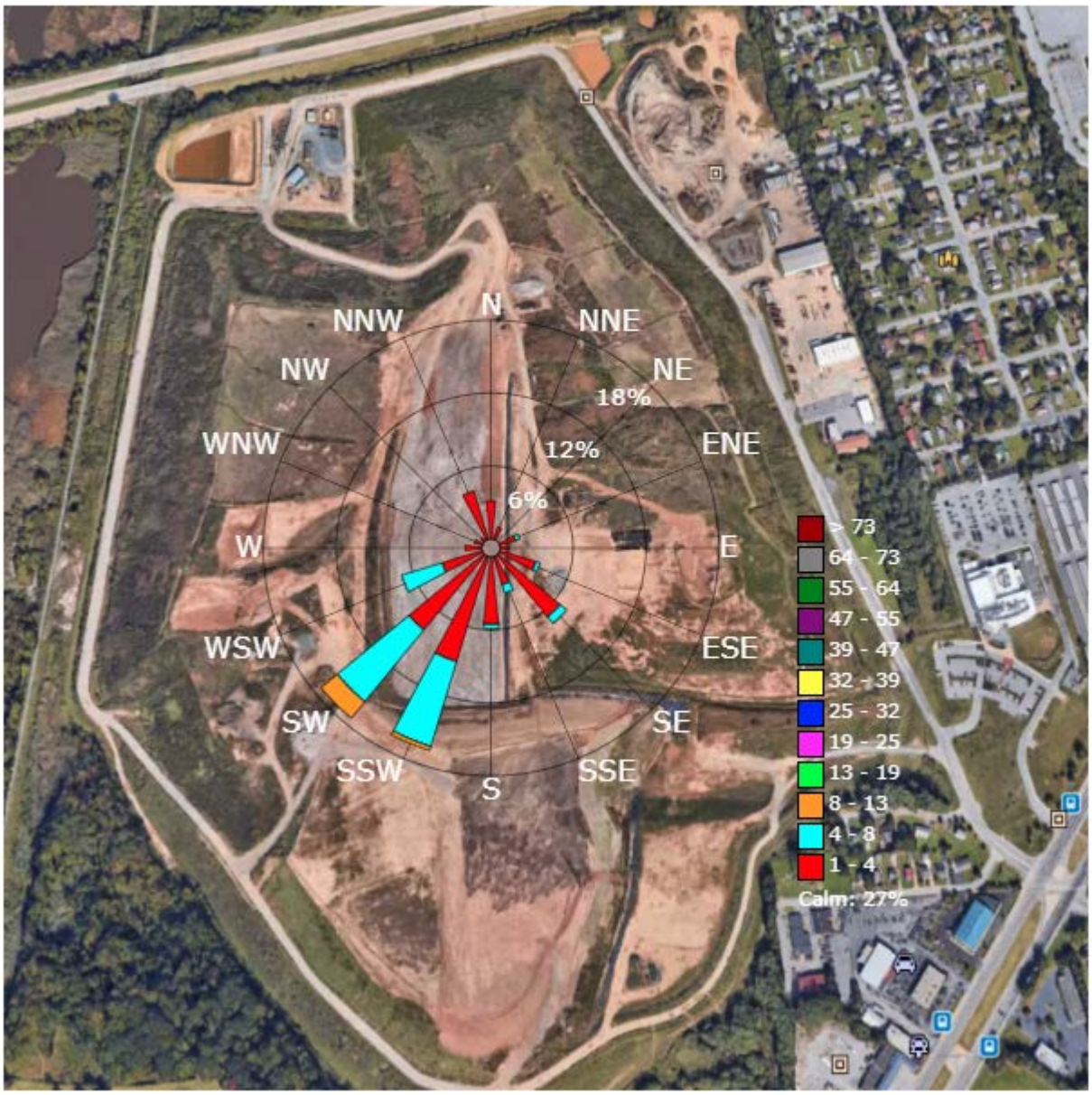
5 Minute Wind Data
5/30/2020, 12:00:00 AM - 5/31/2020, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
6/2/2020, 12:00:00 AM - 6/3/2020, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
6/11/2020, 12:00:00 AM - 6/12/2020, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
6/17/2020, 12:00:00 AM - 6/18/2020, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
6/20/2020, 12:00:00 AM - 6/21/2020, 12:00:00 AM
(Data Range Shown)

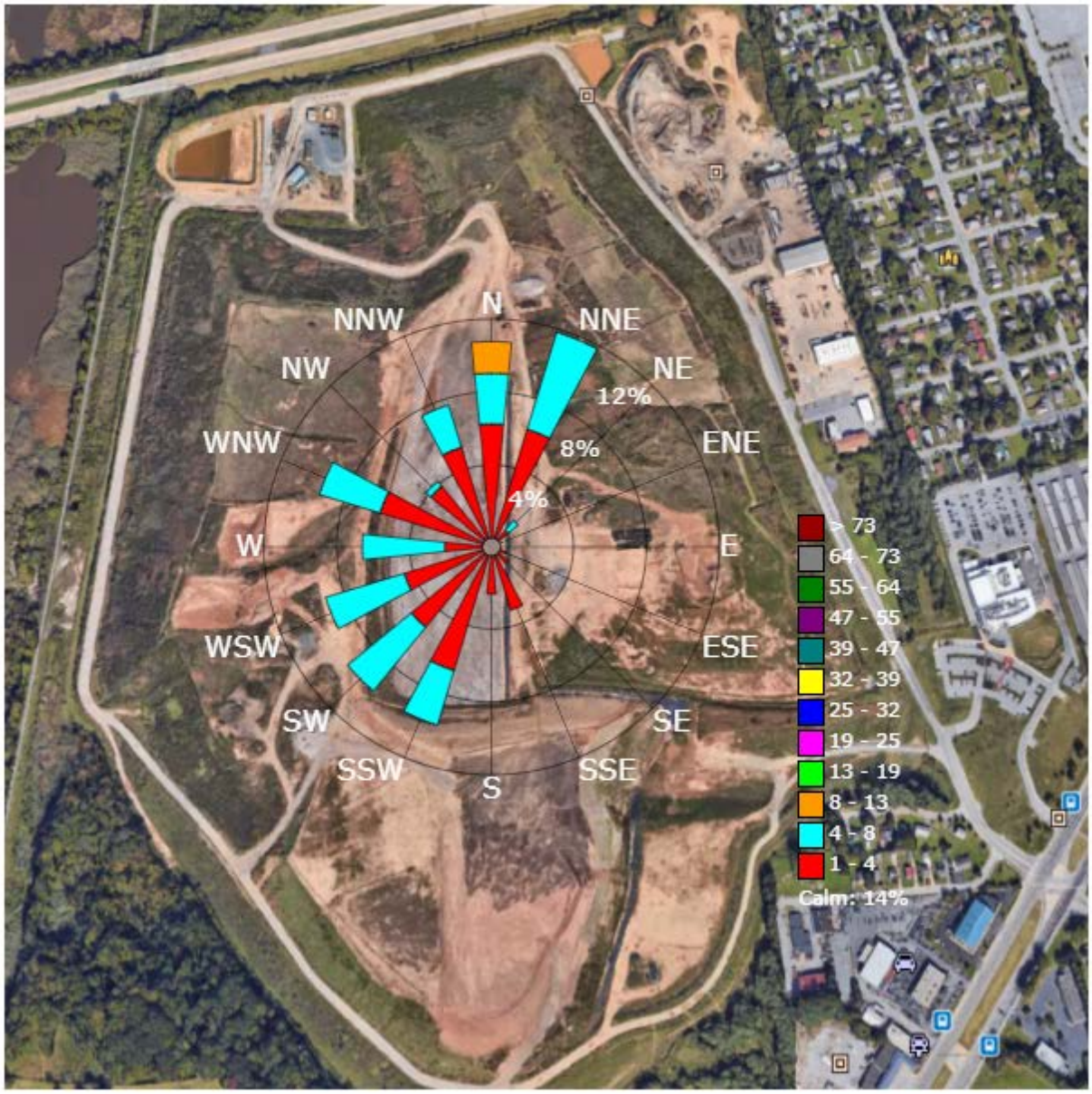


5 Minute Wind Data
6/23/2020, 12:00:00 AM - 6/24/2020, 12:00:00 AM
(Data Range Shown)

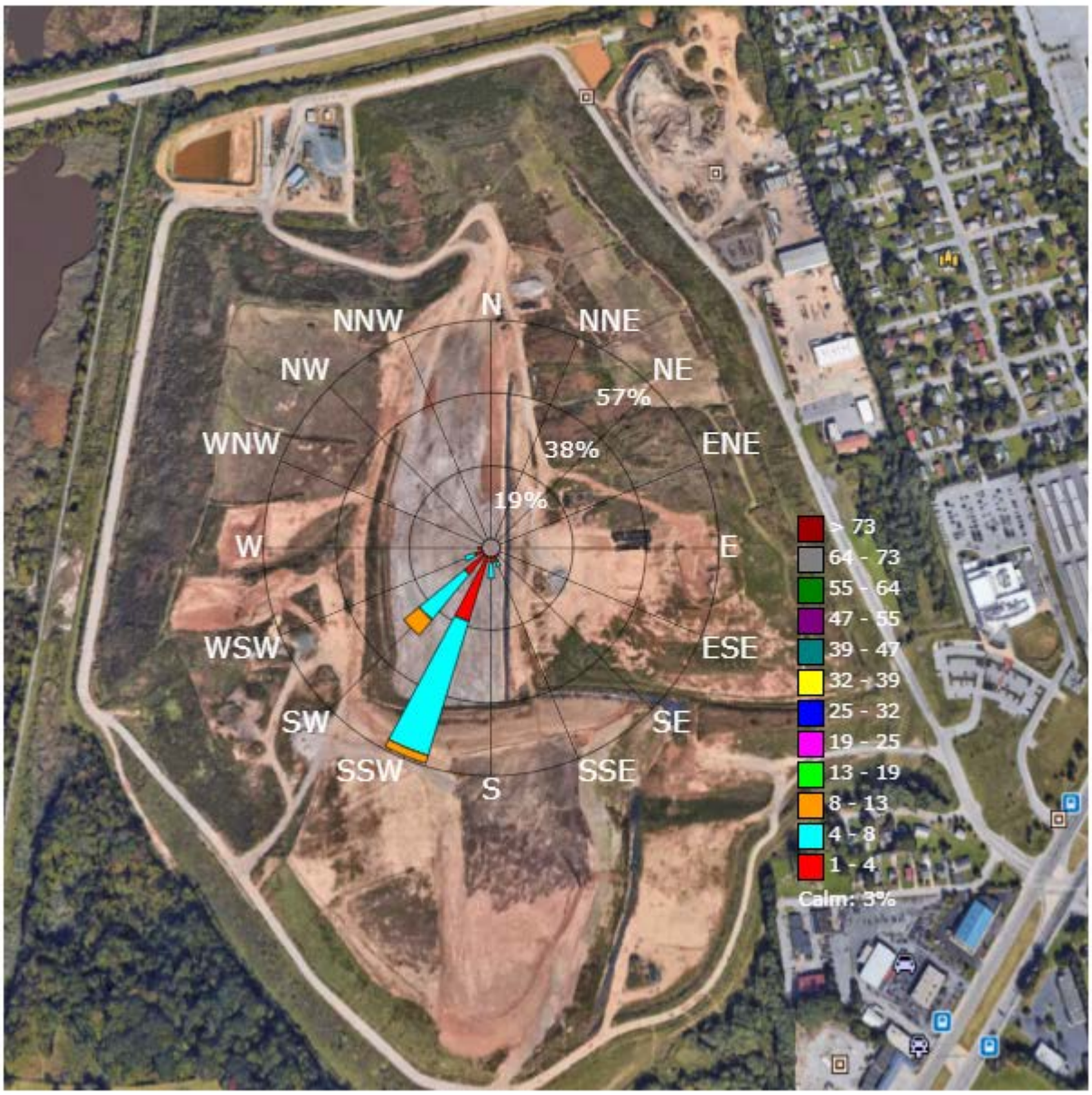
5 Minute Wind Data
6/26/2020, 12:00:00 AM - 6/27/2020, 12:00:00 AM
(Data Range Shown)

* All wind rose diagrams were generated by Waste Management's onsite weather station.

5 Minute Wind Data
8/19/2020, 12:00:00 AM - 8/20/2020, 12:00:00 AM
(Data Range Shown)



5 Minute Wind Data
8/22/2020, 12:00:00 AM - 8/23/2020, 12:00:00 AM
(Data Range Shown)



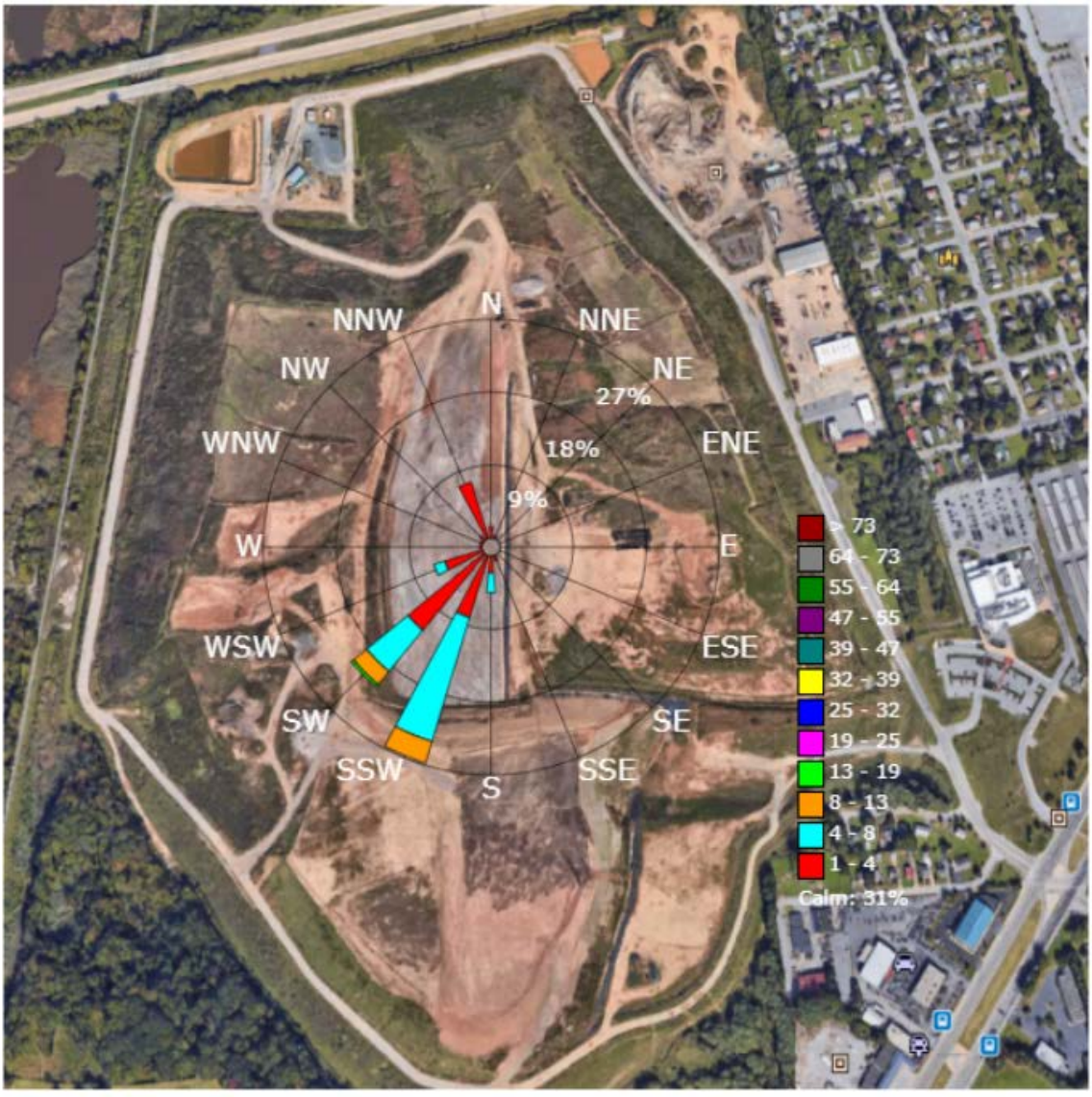
5 Minute Wind Data
8/25/2020, 12:00:00 AM - 8/26/2020, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
8/28/2020, 12:00:00 AM - 8/29/2020, 12:00:00 AM
(Data Range Shown)

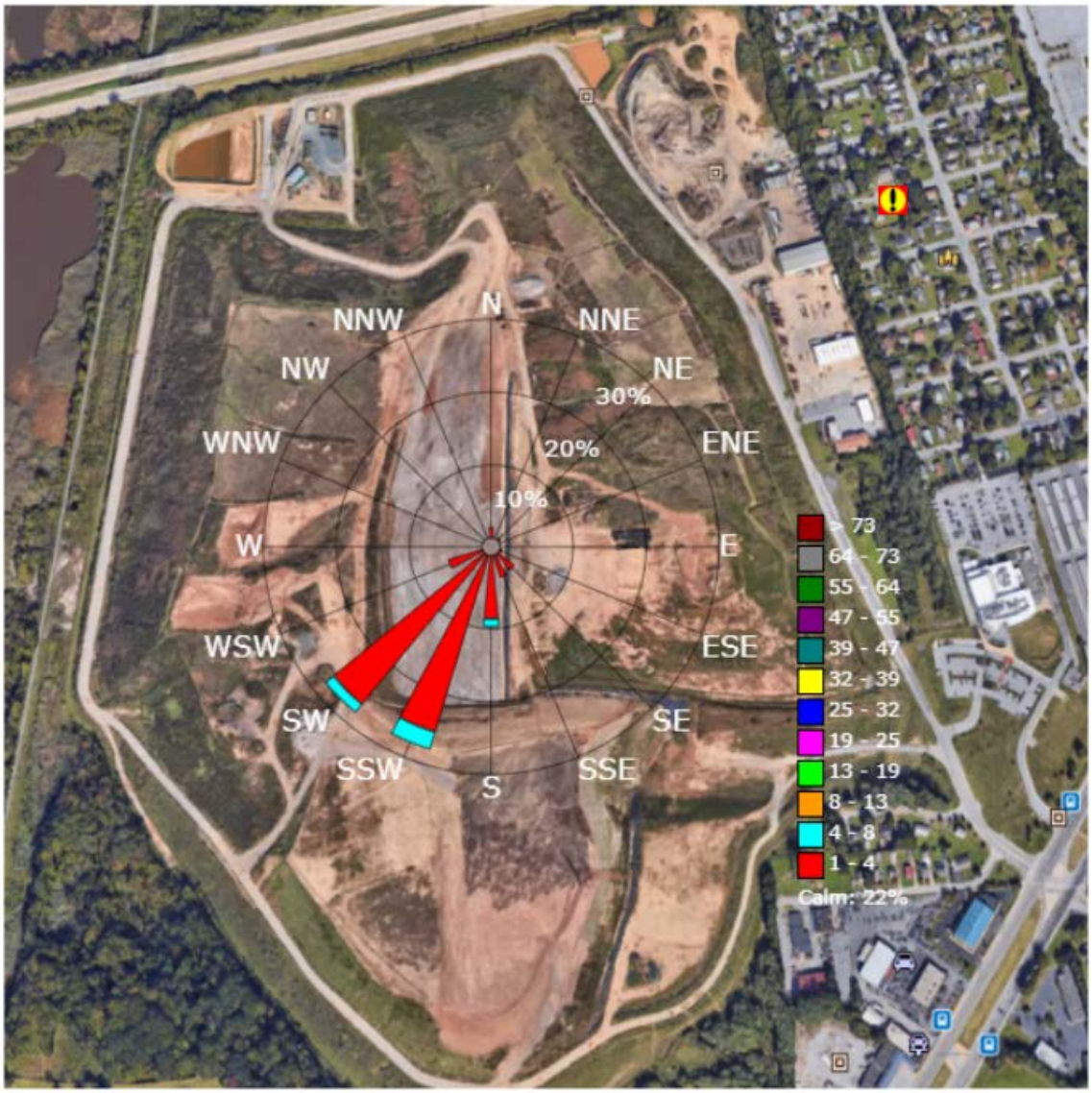
5 Minute Wind Data
8/31/2020, 12:00:00 AM - 9/1/2020, 12:00:00 AM
(Data Range Shown)

* All wind rose diagrams were generated by Waste Management's onsite weather station.

5 Minute Wind Data
11/5/2020, 12:00:00 AM - 11/6/2020, 12:00:00 AM
(Data Range Shown)

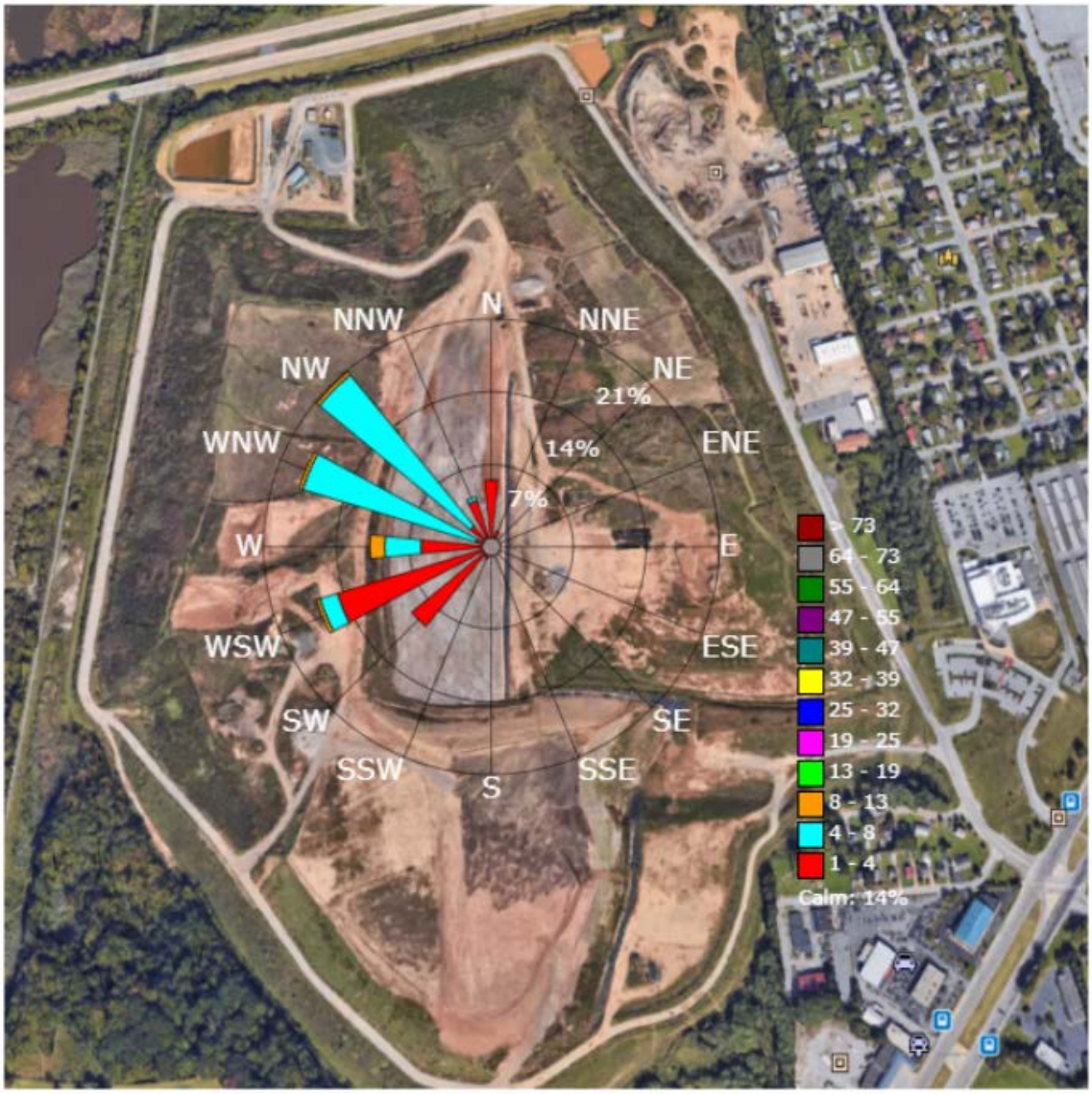


5 Minute Wind Data
11/8/2020, 12:00:00 AM - 11/9/2020, 12:00:00 AM
(Data Range Shown)

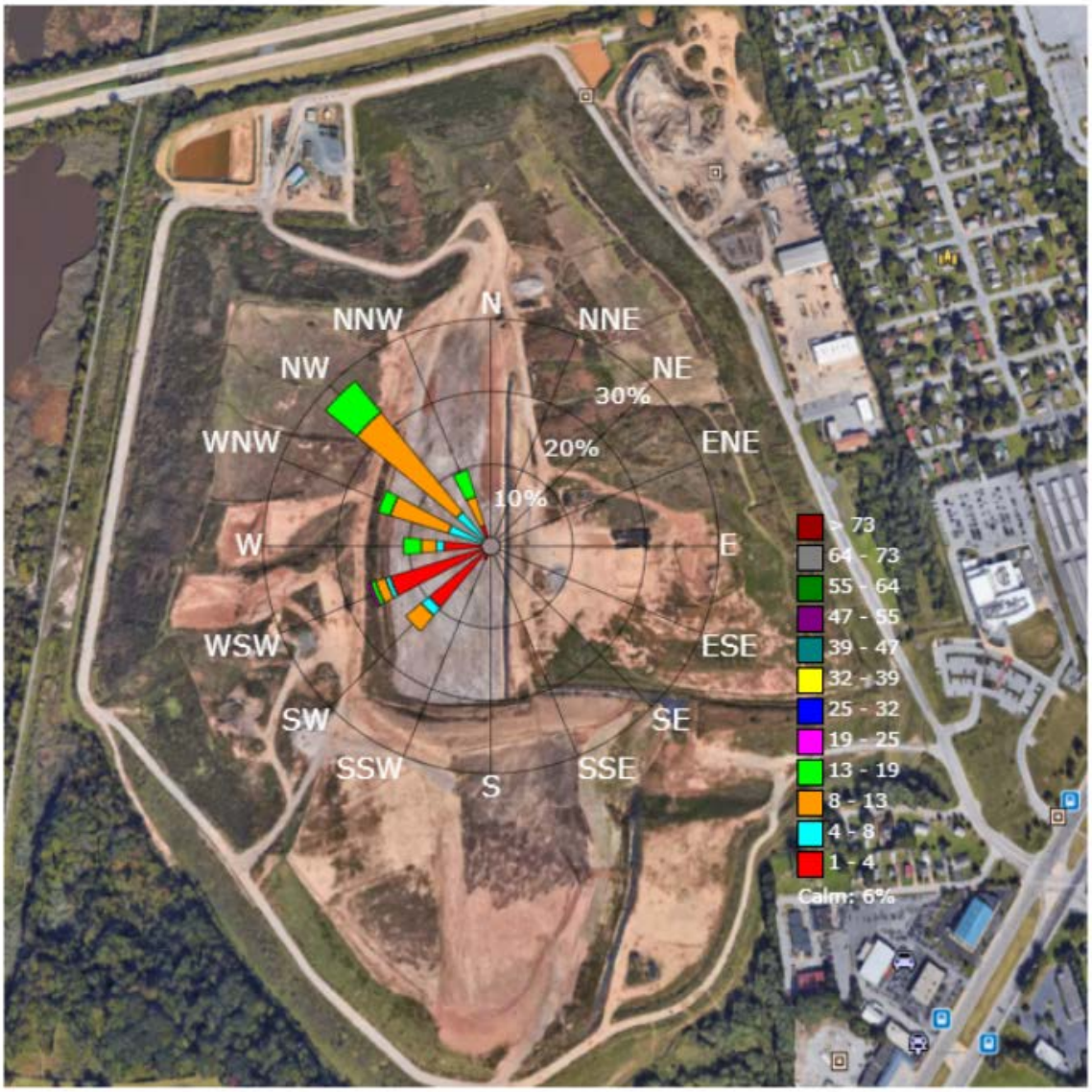


5 Minute Wind Data
11/11/2020, 12:00:00 AM - 11/12/2020, 12:00:00 AM
(Data Range Shown)

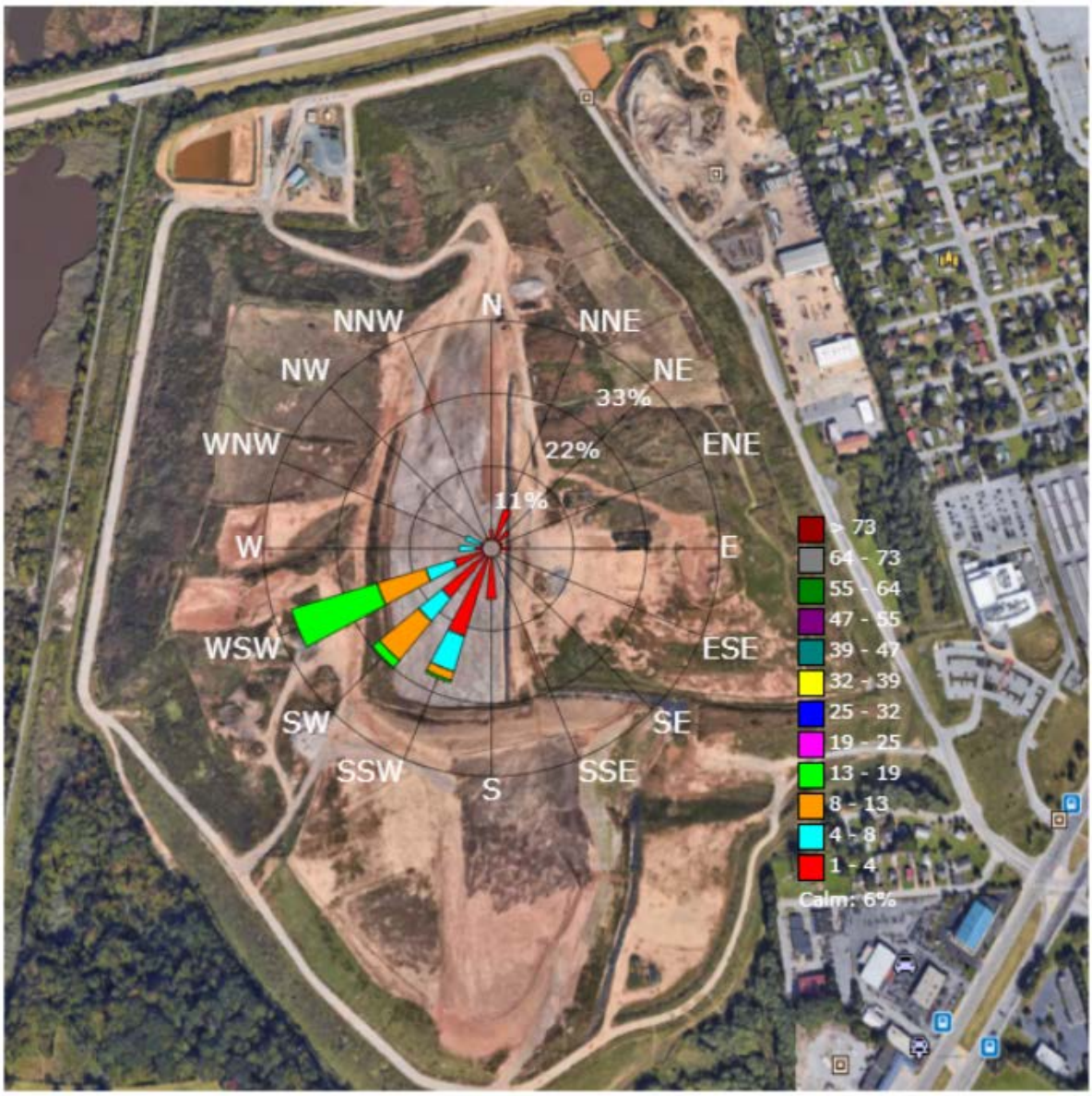
5 Minute Wind Data
11/14/2020, 12:00:00 AM - 11/15/2020, 12:00:00 AM
(Data Range Shown)



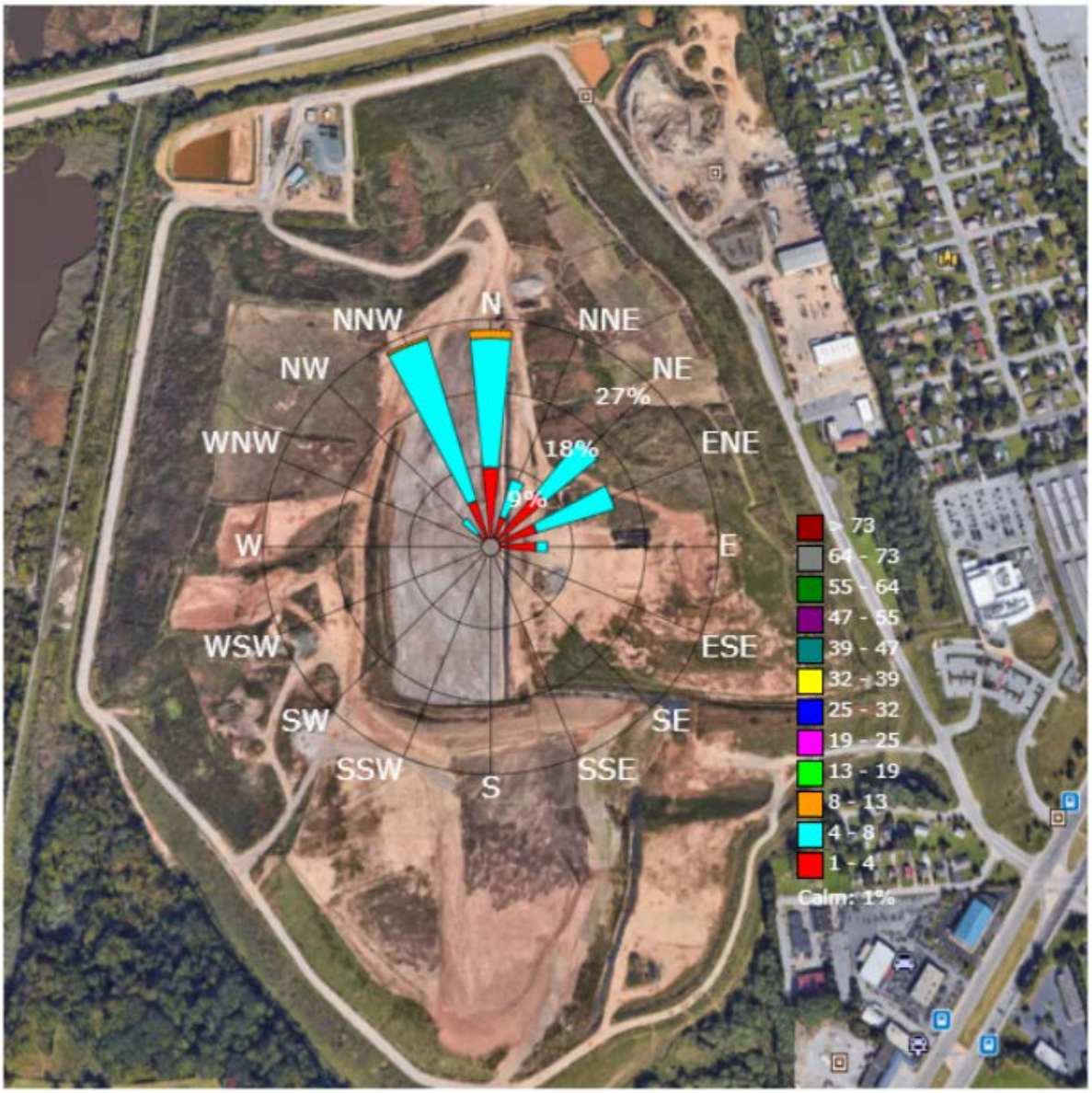
5 Minute Wind Data
11/17/2020, 12:00:00 AM - 11/18/2020, 12:00:00 AM
(Data Range Shown)



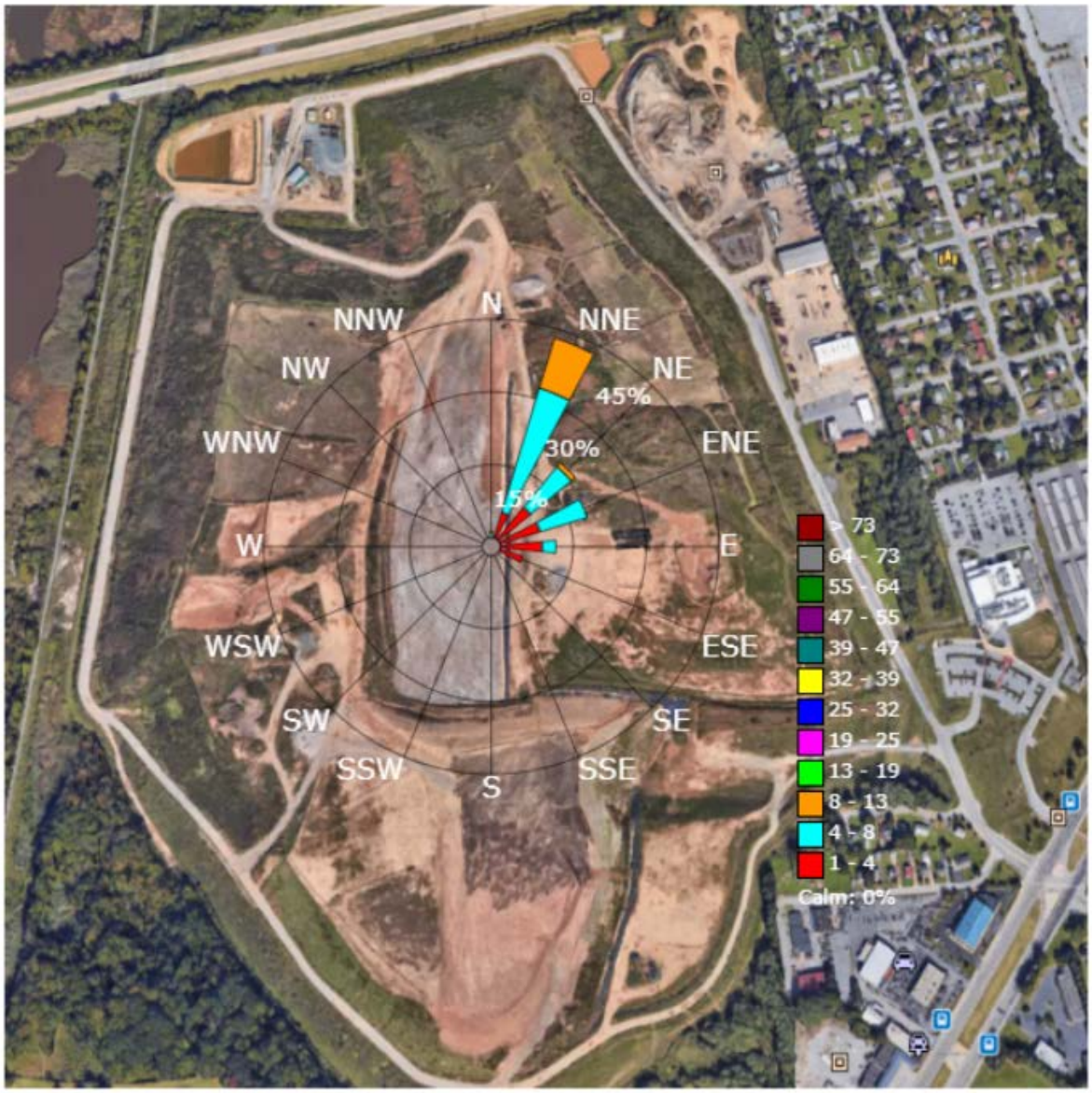
5 Minute Wind Data
2/6/2021, 12:00:00 AM - 2/7/2021, 12:00:00 AM
(Data Range Shown)



5 Minute Wind Data
2/9/2021, 12:00:00 AM - 2/10/2021, 12:00:00 AM
(Data Range Shown)



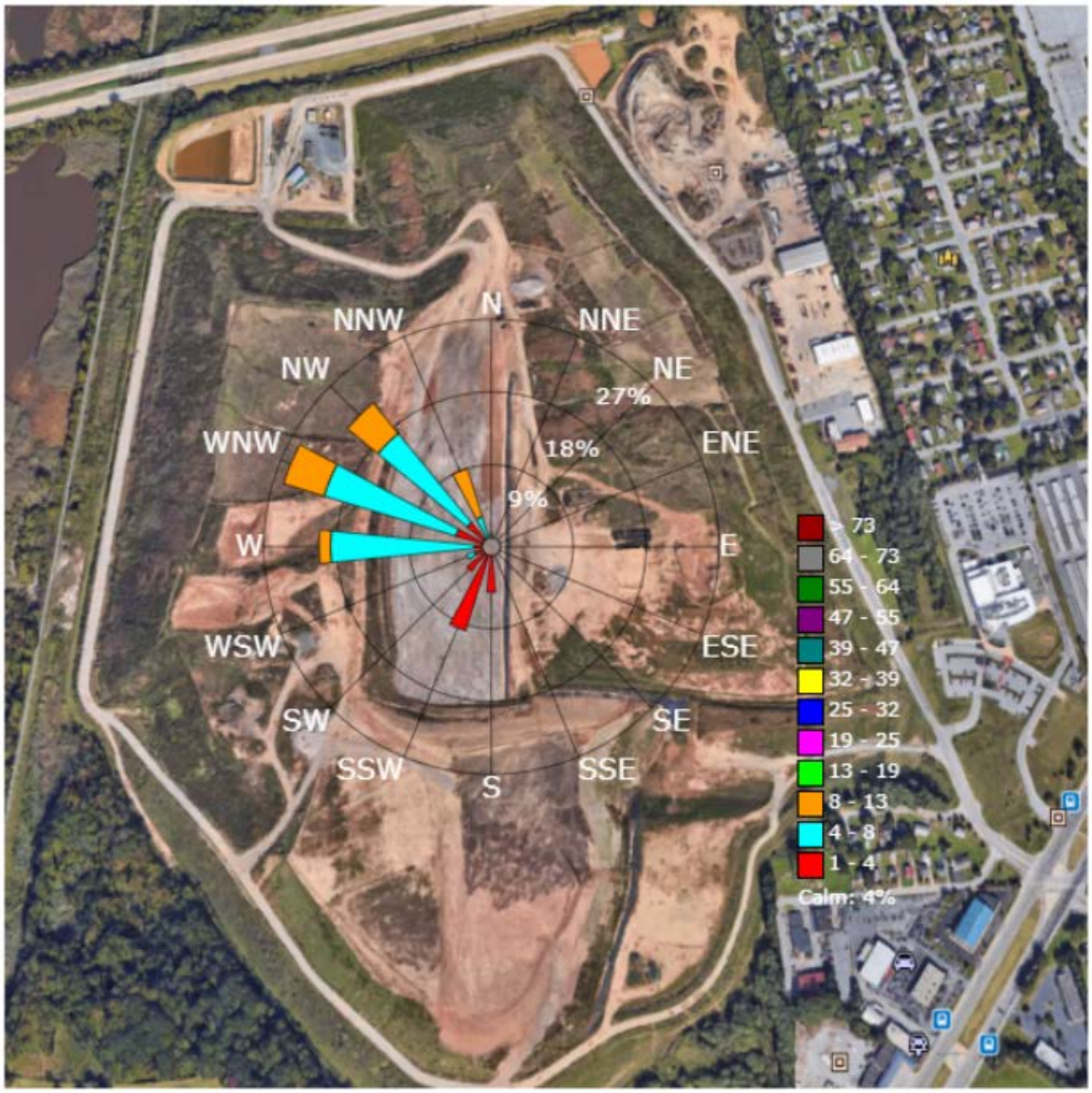
5 Minute Wind Data
2/12/2021, 12:00:00 AM - 2/13/2021, 12:00:00 AM
(Data Range Shown)



5 Minute Wind Data
2/15/2021, 12:00:00 AM - 2/16/2021, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
2/18/2021, 12:00:00 AM - 2/19/2021, 12:00:00 AM
(Data Range Shown)

5 Minute Wind Data
2/21/2021, 12:00:00 AM - 2/22/2021, 12:00:00 AM
(Data Range Shown)



Appendix C

Data Compilation and Statistical Analysis Methods

APPENDIX C

DATA COMPILATION AND STATISTICAL ANALYSIS METHODS

This appendix describes the methods used to compile the air concentration data and to conduct statistical analyses of the measurements. The topics covered here are as follows:

Data Compilation
- Hourly Air Concentrations
- 24-Hour Air Concentrations

Statistical Analysis Methods
- Wilcoxon-Mann-Whitney Test
- Regression Analysis

DATA COMPILATION

Hourly Air Concentrations

Hourly air concentrations for PM2.5 and PM10 were downloaded by Earthres from each BAM instrument on a daily basis following each 24-hour sampling event and tabulated with relevant meteorological data from the landfill's on-site weather station (wind direction and wind speed). A total of 25 hourly concentrations were recorded during each sampling event. The first sample recorded the hourly concentration ending at midnight on the day before sampling and the last sample recorded the hourly concentration ending at midnight on the sampling day. For example, for sampling day May 24, the first sample reflected the hourly concentration from 11 PM – midnight on May 23, while the last sample reflected the hourly concentration from 11 PM – midnight on May 24. The hourly air concentrations for every sampling event and every monitoring station are provided in Appendix D.

Each hourly air concentration was classified as downwind, upwind or neither, based on the monitoring station's location relative to the landfill and the concurrent wind direction recorded at the on-site weather station. Wind directions are recorded every five minutes by the weather station in one-degree increments from 0 to 359, indicating the direction the wind is blowing from. For example, a degree direction of 0 reflects wind from the north, 45 (from the northeast), 90 (from the east), 180 (from the south), and 270 (from the west). The five-minute readings were averaged for each sampled hour, to produce an average hourly wind direction concurrent with the hourly air concentration. The ranges of hourly wind directions that would place the monitoring location downwind, upwind or neither were then identified for each monitoring station and used to classify each hourly measured concentration. Any hour with very low wind speed and highly variable wind directions was classified as "neither" because under these conditions, a monitoring station could not be reliably classified as downwind or upwind (i.e., an hourly average wind speed $\leq$ 1 mph and concurrent wind directions which varied by $\geq 90^{o}$). Table C-1 presents an example of this classification process for the hourly results at MP-2 on June 23, 2020. The wind classifications for all hourly air concentrations are provided in Appendix D.

Table C-1
Method for Wind Classifications: Example for MP-2 on June 23, 2020 (a)

Hour	PM2.5 Air Concentration (mg/m^3)	PM10 Air Concentration (mg/m^3)	Wind Classification (b)	Average Wind Direction (degrees) (c)	Wind Rose from On-Site Weather Station
12:00 AM	0.006	0.014	Upwind	217	
1:00 AM	0.008	0.014	Upwind	196	
2:00 AM	0.007	0.014	Upwind	201	
3:00 AM	0.009	0.028	Upwind	228	
4:00 AM	0.011	0.028	Upwind	200	
5:00 AM	0.015	0.031	Upwind	239	
6:00 AM	0.011	0.025	Upwind	196	
7:00 AM	0.009	0.029	Upwind	189	
8:00 AM	0.006	0.016	Upwind	187	
9:00 AM	0.008	0.013	Upwind	222	
10:00 AM	0.013	0.021	Upwind	176	
11:00 AM	0.009	0.014	Neither	173	
12:00 PM	0.009	0.016	Upwind	187	
1:00 PM	0.008	0.024	Upwind	181	
2:00 PM	0.018	0.017	Upwind	190	
3:00 PM	0.013	0.021	Upwind	176	
4:00 PM	0.013	0.032	Upwind	204	
5:00 PM	0.010	0.024	Upwind	191	
6:00 PM	0.016	0.023	Upwind	206	
7:00 PM	0.016	0.039	Upwind	281	
8:00 PM	0.011	0.036	Upwind	205	
9:00 PM	0.015	0.041	Neither	153	
10:00 PM	0.018	0.036	Upwind	178	
11:00 PM	0.015	0.020	Upwind	203	
12:00 AM	0.016	0.018	Upwind	207	
24-hour average (d)	0.012	0.024	Upwind		

June 23, 2020
Weather Station Data

This wind rose is a diagram showing the relative frequency of wind directions and wind speeds for the day of June 23. Wind roses for the sampling dates covered in this report are provided in Appendix B and are also available at http://www.drpilandfillwx.com/.

(a) Wind classifications for each hourly air concentration are provided in Appendix D.
(b) For MP-2, hourly average wind directions from 315 degrees to 145 degrees (in clockwise direction) were classified as downwind, from 175 degrees to 290 degrees were upwind, and all other directions were neither.
(c) Wind direction was the average for the sampling period (i.e., hourly) and reflects direction wind is blowing from.
(d) The 24-hour average was calculated from the hourly measurements from 1 AM to 12 AM on the sampling date. The wind classification for the 24-hour average was based on a cumulative analysis of all 24 hourly classifications.

The hourly results were further compiled to produce a single on-site downwind and upwind air concentration for every hour of sampling across the five on-site stations (MP-1 to MP-5). This was done by averaging the hourly concentrations for those on-site stations classified as downwind on an hour-by-hour basis. A similar process was used to calculate a single on-site hourly upwind concentration for each hour.

In the main body of this report, the average of all the hourly air concentrations classified as either downwind or upwind are summarized in a series of bar charts, one set by monitoring location and another by sampling date.

24-Hour Average Concentrations

The hourly air concentrations were further compiled to produce 24-hour average concentrations (i.e., directly comparable to the 24-hour average National Ambient Air Quality Standard (NAAQS).

For each monitoring location and sampling date, a 24-hour average air concentration was calculated as the average of the 24 individual hourly results measured from 1 AM (reflecting the midnight - 1 AM hour) through 12 AM (reflecting the 11 PM - midnight hour). A 24-hour average was calculated only if 75% or more of the hourly readings over the 24-hour sampling period were available, in accordance with guidance for calculating valid 24-hour average concentrations from DNREC's Air Quality Division.[1] Table C-1 also shows this 24-hour average concentration calculation.

Each 24-hour average concentration was classified as predominantly downwind of the landfill, predominantly upwind or neither, based on the cumulative hourly wind classifications across each 24-hour sampling period. When classifying each 24-hour period as either predominantly downwind, upwind or neither, the overall goal was to err on the side of classifying results as potentially downwind rather than not, so as not to miss observing potential landfill-related impacts on air quality. For example, a 24-hour average sample was classified as predominantly downwind if the hourly average wind direction measurements during the 24-hour sampling period met one of two conditions: 50% or more of the hourly wind directions placed the sampling location downwind of the landfill, or 40% or more of the wind directions placed the sampling location downwind and less than 50% of the wind direction measurements placed the location upwind. A sample was classified as predominantly upwind if 50% or more of the wind directions placed the sampling location upwind of the landfill. If none of these conditions was met, the sample was classified as neither. For the example shown in Table C-1, 8.3% of the 24 individual hourly concentrations were classified as neither, 91.7% as upwind and 0.0% as downwind. Accordingly, the 24-hour average concentration for MP-2 on June 23, 2020 was classified as predominantly upwind of the landfill. Appendix D presents these data compilation steps for every sampling date and monitoring location.

The last compilation step calculated one on-site 24-hour average air concentration that collectively reflects all on-site measurements from MP-1 through MP-5. This helps investigate the potential for landfill-related impacts by differentiating between on-site versus off-site air concentrations. To accomplish this, all predominantly downwind on-site 24-hour average concentrations were averaged across on-site sampling stations, as were all predominantly upwind on-site concentrations. If only one station was classified as downwind or upwind, that one value was used

[1] Personal communication, C. Sarnoski, DNREC and S. Foster, CPF Associates LLC, July 27, 2020.

to represent the on-site 24-hour average air concentration. If multiple stations were classified in the same wind category, the average across these 24-hour average concentrations was calculated.

STATISTICAL ANALYSIS METHODS

Statistical tests and visual charts were used in this assessment to help evaluate the potential for landfill-related impacts on air quality. The statistical tests were conducted using a publicly-available statistical software package developed by USEPA called ProUCL (USEPA 2015). This software package provides numerous statistical methods and graphic tools to address environmental sampling and statistical issues. It is widely relied upon for evaluating environmental data sets like those collected at DRPI was used to conduct several statistical tests in this report.

Wilcoxon-Mann-Whitney Test

One type of statistical test was used to determine whether a difference exists between two sets of data, such as downwind air concentrations versus upwind air concentrations. This test is called the Wilcoxon-Mann-Whitney (WMW) test which is appropriate for datasets like those collected at DRPI.[2] The WMW test can help assess the potential impact of the landfill on air quality by answering the question: Are downwind PM concentrations statistically significantly higher than upwind concentrations? Statistical significance is measured in the WMW test by a "p value" which helps indicate the extent of differences between two groups of data. The smaller the p value, the more likely that there are statistically significant differences between the two groups of data. For this assessment, consistent with generally recognized practice, p values less than 0.05 were interpreted as being statistically significant.[3] At a p value of <0.05, there is a high probability that one group of data is different than another. A p-value greater than 0.05 suggests, in contrast, that no statistically significant difference between the data groups is present and that the values are comparable. For example, in a WMW test comparing downwind to upwind concentrations, a p value of <0.05 indicates that downwind concentrations are statistically greater than upwind concentrations. Explained differently, at a p value of 0.05, the likelihood that downwind concentrations are less than or equal to upwind concentrations is only 5%, whereas the likelihood that downwind concentrations are greater than or comparable to upwind is 95%.

Regression Analysis

Another type of test, called a regression analysis, was used to assess the likelihood that there is or is not a linear relationship (or correlation) between two variables such as downwind air concentrations and the number of heavy-duty vehicles at the facility (i.e., waste trucks plus other heavy-duty vehicles). Specifically, the regression analysis was used to answer the question: As the

[2] The Mann-Whitney test is a nonparametric test used to determine whether or not measurements from one group of data tend to be larger (or smaller) than those from another group of data. It can be used for data that have any type of probability distribution, which is relevant for DRPI since analyses using ProUCL showed that the data were not found to have consistent data distributions.

[3] The smaller the p value, the more likely that downwind concentrations are statistically greater than upwind concentrations. Common values used to assess statistical significance include $p<0.05$, $p<0.01$, and $p<0.001$. For example, a value of $p<0.001$ indicates a very strong statistically significant finding while $p<0.05$ indicates a moderate statistically significant finding. Generally, p values less than 0.05 are interpreted as being statistically significant.

hourly number of heavy-duty vehicles increases, do the concurrent hourly PM air concentrations also increase? Like the WMW test, the statistical significance of the regression analysis is measured by a p value. The smaller the p value, the more likely that the tested variables are correlated. As noted above, p values less than 0.05 suggest correlations that are statistically significant, whereas p values greater than 0.05 suggest correlations that are not statistically significant. The two variable analysis also produces another statistical measure called the correlation coefficient (or r-value). The r-value can be positive or negative, with the sign of the r-value representing the direction of the association. For positive associations, when one variable increases (e.g., number of heavy-duty vehicles), the other variable increases as well (e.g., on-site air concentrations). For negative, or inverse, associations, when one variable increases, the other variable decreases. The magnitude of the r-value indicates the strength of the relationship, with larger r-values indicating a stronger relationship. For example, r-values of 0.8 and higher indicate a strong linear relationship between the tested variables.

In accordance with ProUCL guidance, charts were prepared using both the ProUCL software and excel files of the air data to help better understand the air monitoring results and to provide additional insight that might not otherwise be revealed by the statistical tests. Bar charts compare average concentrations across different sets of data. Box plots are useful for visually exploring more information about a data set (not just averages), comparing concentrations of two or more groups, and identifying potential outliers. Outliers are concentrations (usually larger or smaller than the majority of the data values in a sample) that are not representative of the population from which they were drawn. The presence of outliers can distort most statistics although, according to ProUCL guidance, they may have minimal influence on WMW statistical tests (USEPA 2015). Box plots of the air concentrations are provided in Appendix G.

Appendix D

Hourly Air Concentrations by Monitoring Location and Sampling Date

APPENDIX D
HOURLY AIR CONCENTRATIONS BY MONITORING LOCATION AND SAMPLING DATE

Introduction

This appendix presents the hourly PM2.5 and PM10 concentrations by date for all four quarterly monitoring periods. Table D-1 summarizes information for each quarter of monitoring.

Table D-1
Four Quarterly Monitoring Events at DRPI

Sampling Quarter	*Dates Covered*	*Number of 24-Hour Sampling Days*
1	*May 24 - June 26, 2020*	*9*
2	*August 19 - August 31, 2020*	*5*
3	*November 5 - November 17, 2020*	*5*
4	*February 6 - February 21, 2021*	*6*

The monitoring program measured two types of respirable particulate matter (PM) in outdoor air: PM2.5 which refers to particles less than 2.5 µm in diameter and PM10 which refers to particles less than 10 microns (10 µm) in diameter. The hourly PM2.5 and PM10 concentrations were measured at seven monitoring stations (MP-1 through MP-7). Stations MP-1 through MP-5 were within the site boundary around the landfill's on-site perimeter road. Two other stations, MP-6 and MP-7, were off site. Two separate monitoring units, one each for PM2.5 and PM10, were located at each of the seven monitoring stations.

BAM-1020 Information

The monitoring was conducted using USEPA-approved BAM-1020 Continuous Particulate Monitors from Met One Instruments. This instrument is classified as a USEPA federal equivalent method (FEM). It records a measurement of the particulate matter concentration in the air every hour. See Appendix A for additional information.

On occasion, there are equipment or other failures that can cause the BAM-1020 instrument to report an error instead of a concentration or to report a concentration that is not representative of actual particulate levels. Definitions are provided in Table D-2 for error notations in the BAM-1020 readings provided in this appendix, based on information in the BAM-1020 Operation Manual and input from Met One Instruments.[1]

In some cases, the BAM-1020 concentration readings are small negative values. Met One Instruments indicates that negative values can occur when the instrument is working properly if the actual air concentration is very low (i.e., below the detection limit of the BAM instrument). In accordance with Met One guidance, the BAM-1020 negative reported concentrations were retained

[1] Met One Instruments, Inc. 2020. BAM 1020 Particulate Monitor Operation Manual. BAM 1020-9805 REV A. https://metone.com/wp-content/uploads/2020/06/BAM-1020-9805-Manual-Rev-A.pdf; Personal communication with R. Fabich, Met One Instruments, 3/2/2021.

for the data analysis and included when calculating 24- hour average air concentrations. As Met One states “Because the noise band in the BAM-1020 is statistically random, small negative hourly PM10 or PM2.5 data points are usually not removed from the daily average calculations, because this would result in an artificial positive bias in the resulting average.” Met One does caution, however, that 24-hour concentrations should always be positive and if not, the data should be revisited. All of the 24-hour averages in this monitoring program were positive. (Met One technical bulletin 2010).

Table D-2
BAM-1020 Data Error Code Definitions

Error Code	Description
T – Tape/Shuttle Errors	The tape error usually indicates that the filter tape is has run out or broken. In rarer cases, a tape error may also be generated due to a failure in the tape control electromechanical system. Tape breaks usually result from significant temperature changes or high humidity. This results in the tape separating for its cassette type spooling. The shuttle errors occur when grit is stuck in the tape rollers which interrupts the unspooling of tape. These tape failures do not allow for the measurement of PM and therefor no data can be recorded.
F – Flow Errors	Flow errors can occur due to a fault with the flow controller, the flow sensor, or the vacuum pump. Malfunctioning pumps can still operate but are outside of the specified flowrate required for the sampling and therefore no data is recorded.
Temp. – Temperature Errors	Temperature errors occur from a malfunctioning temperature sensor which provides values that are required for the internal PM calculations and therefore no data is recorded.
P – Power Errors	Incoming line power (120 VAC) is interrupted and therefore the monitor cannot operate.
I – Internal Clock Errors	Occurs from the wearing of the CR2032 battery located on the back of the BAM device, which affects the time cycle and causes the device to display inaccurate time stamps resulting in inaccurate flow calculations.
M – Moisture Errors	Moisture error due to sudden increased relative humidity reading in the monitor.
R – Reference Errors	This error indicates that the span reference membrane assembly may not be mechanically extending or withdrawing properly which can prevent valid data collection.
* - Abnormal Data Errors	Abnormal data spikes in consecutive hours, both high/low and low/high concentration fluctuations (e.g., possibly due to quick changes in shelter temperature or moisture on the instrument tape), are not true representatives of actual particulate.[1]
FE - Telemetry/ Mechanical Fault Errors	This error indicates that an external data logger has sent an error signal to the BAM 1020 on the TELEM FAULT input, indicating that the logger unit has encountered a problem. Mechanical faults errors display consecutive negative or zero values that are unrepresentative of the actual particulate.

Air Concentration Data

The following tables, one for each sampling date, present the following information:

- Sampling hour (e.g., 1:00 AM refers to the hour from midnight to 1 AM)
- Hourly PM2.5 concentration measured by the BAM 1020 monitoring device
- Hourly PM10 concentration measured by the BAM 1020 monitoring device
- Hourly wind position relative to the landfill (downwind, upwind or neither, based on the monitoring station's location relative to the landfill and the concurrent wind direction recorded at the on-site weather station)
- Hourly wind speed (miles per hour) from the on-site weather station
- Hourly wind direction (degrees) from the on-site weather station (wind directions that varied by more than 90^{o} over a single hour are denoted with a "*")
- 24-hour average concentration (the average of the 24 hourly concentrations from 1:00 AM to 12:00 AM)[2]
- Percent (%) valid hourly samples (based on 24 hourly samples from 1:00 AM to 12:00 AM)
- Percent (%) of hours classified as downwind, upwind or neither (based on 24 hourly samples from 1:00 AM to 12:00 AM)

[2] The 24-hour average was denoted as NA = not applicable, if less 75% of the 24 hourly samples had valid hourly concentrations.

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

May 24, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.013	0.015	Neither	0.015	0.018	Downwind	0.008	Temp	Upwind	0.006	0.023	Upwind	0.007	0.031	Upwind	T	0.018	Upwind	F	0.022	Upwind	7.6	63.7
1:00 AM	0.01	0.028	Neither	0.01	0.038	Downwind	0.006	Temp	Neither	0.008	0.023	Upwind	0.011	0.03	Upwind	T	0.011	Upwind	F	0.018	Upwind	8.5	51.8
2:00 AM	0.012	0.021	Neither	0.007	0.029	Downwind	0.008	Temp	Neither	0.006	0.012	Upwind	0.008	0.017	Upwind	T	0.023	Upwind	F	0.008	Upwind	9.0	54.0
3:00 AM	0.009	0.011	Neither	0.01	0.023	Downwind	0.006	Temp	Neither	0.003	0.008	Upwind	0.007	0.011	Upwind	T	0.017	Upwind	F	0.009	Upwind	8.9	59.4
4:00 AM	0.009	0.022	Neither	0.006	0.02	Downwind	0.006	Temp	Neither	0	0.013	Upwind	0.007	0.02	Upwind	T	0.009	Upwind	F	0.012	Upwind	8.2	58.7
5:00 AM	0.012	0.012	Neither	0.009	0.043	Downwind	0.007	Temp	Neither	0.004	0.019	Upwind	0.007	0.025	Upwind	T	0.019	Upwind	F	0.021	Upwind	9.2	51.9
6:00 AM	0.012	0.014	Neither	0.011	0.029	Downwind	0.005	Temp	Neither	0.003	0.016	Upwind	0.009	0.022	Upwind	T	0.024	Upwind	F	0.02	Upwind	9.0	55.7
7:00 AM	0.009	0.019	Neither	0.008	0.032	Downwind	0.01	Temp	Neither	0.005	0.015	Upwind	0.009	0.029	Upwind	T	0.016	Upwind	F	0.021	Upwind	9.2	53.4
8:00 AM	0.013	0.026	Upwind	0.014	0.041	Downwind	0.016	Temp	Neither	0.008	0.03	Upwind	0.015	0.028	Upwind	T	0.04	Upwind	F	0.034	Upwind	6.3	49.8
9:00 AM	0.016	0.031	Upwind	0.01	0.05	Downwind	0.013	Temp	Downwind	0.009	0.032	Upwind	0.013	0.041	Upwind	T	0.041	Upwind	F	0.034	Upwind	5.9	25.9
10:00 AM	0.017	0.024	Neither	0.01	0.039	Downwind	0.009	Temp	Upwind	0.005	0.024	Upwind	0.015	0.026	Upwind	T	0.037	Upwind	F	0.029	Upwind	8.4	62.8
11:00 AM	0.012	0.025	Neither	0.017	0.037	Downwind	0.016	Temp	Neither	0.007	0.021	Upwind	0.013	0.03	Upwind	T	0.033	Upwind	F	0.031	Upwind	8.7	58.6
12:00 PM	0.011	0.022	Neither	0.009	0.066	Downwind	0.004	Temp	Upwind	0.008	0.013	Upwind	0.011	0.045	Upwind	T	0.025	Upwind	F	0.032	Upwind	8.3	68.7
1:00 PM	0.025	0.025	Neither	0.013	0.019	Downwind	0.007	Temp	Upwind	0.005	0.02	Upwind	0.014	0.019	Upwind	T	0.033	Upwind	F	0.02	Upwind	6.6	68.6
2:00 PM	0.017	0.024	Neither	0.013	0.025	Downwind	0.013	Temp	Neither	0.003	0.013	Upwind	0.012	0.018	Upwind	T	0.036	Upwind	F	0.023	Upwind	5.2	57.0
3:00 PM	0.015	0.022	Neither	0.01	0.016	Downwind	0.011	Temp	Neither	0.005	0.016	Upwind	0.012	0.019	Upwind	T	0.019	Upwind	F	0.017	Upwind	4.2	56.3
4:00 PM	0.016	0.025	Downwind	0.011	0.023	Downwind	0.011	Temp	Upwind	0.005	0.014	Upwind	0.012	0.02	Upwind	T	0.02	Upwind	F	0.017	Upwind	5.3	83.2
5:00 PM	0.013	0.017	Downwind	0.012	0.03	Downwind	0.014	Temp	Upwind	0.004	0.02	Upwind	0.014	0.011	Upwind	T	0.022	Upwind	F	0.01	Upwind	7.0	97.6
6:00 PM	0.011	0.011	Downwind	0.011	0.016	Downwind	0.009	Temp	Upwind	0.007	0.008	Upwind	0.012	0.009	Upwind	T	0.006	Upwind	F	0.007	Upwind	7.7	92.1
7:00 PM	0.012	0.017	Downwind	0.016	0.021	Downwind	0.016	Temp	Upwind	0.007	0.012	Upwind	0.019	0.009	Upwind	T	0.007	Upwind	F	0.006	Upwind	7.4	92.0
8:00 PM	0.012	0.015	Downwind	0.01	0.007	Downwind	0.018	Temp	Upwind	0.007	0.013	Upwind	0.013	0.004	Upwind	T	0.01	Upwind	F	0.007	Upwind	7.4	79.4
9:00 PM	0.012	0.017	Downwind	0.007	0.005	Downwind	0.008	Temp	Upwind	0.013	0.019	Upwind	0.013	0.006	Upwind	T	0.011	Upwind	F	0.011	Upwind	4.5	84.2
10:00 PM	0.011	0.018	Downwind	0.01	0.032	Downwind	0.011	Temp	Upwind	0.009	0.023	Upwind	0.011	0.029	Upwind	T	0.01	Upwind	F	0.016	Upwind	2.5	90.8
11:00 PM	0.011	0.021	Downwind	0.006	0.031	Downwind	0.009	Temp	Upwind	0.009	0.025	Upwind	0.011	0.024	Upwind	T	0.025	Upwind	F	0.007	Upwind	4.0	80.8
12:00 AM	0.012	0.017	Neither	0.012	0.039	Downwind	0.007	Temp	Upwind	0.006	0.023	Upwind	0.018	0.026	Upwind	T	0.021	Upwind	F	0.01	Upwind	5.6	68.2
24 - AVERAGE	0.012875	0.020167		0.0105	0.029625		0.01	NA		0.006083	0.018		0.011917	0.021583		NA	0.021458		NA	0.0175			

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	0.0%		100.0%	100.0%		100.0%	100.0%		0.0%	100.0%		0.0%	100.0%			
neither			58.3%			0.0%			45.8%			0.0%			0.0%			0.0%			0.0%		
upwind			8.3%			0.0%			50.0%			100.0%			100.0%			100.0%			100.0%		
downwind			33.3%			100.0%			4.2%			0.0%			0.0%			0.0%			0.0%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

May 27, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.005	0.004	Downwind	0.004	0.008	Neither	0	Temp.	Upwind	-0.003	0.002	Neither	0.006	0.009	Neither	0.021	0.004	Upwind	F	0.006	Upwind	2.3	160
1:00 AM	0.004	0.004	Downwind	0.008	0.02	Upwind	0.001	Temp.	Upwind	-0.003	0.001	Downwind	0.011	0.011	Downwind	0.006	0.001	Neither	F	0.008	Upwind	3.3	186
2:00 AM	0.006	0.003	Neither	0.009	0.025	Upwind	0.002	Temp.	Upwind	-0.005	0	Downwind	0.007	0.005	Downwind	0.001	0.003	Neither	F	0.011	Neither	3.3	201
3:00 AM	0.007	0.001	Neither	0.009	0.014	Upwind	0.003	Temp.	Upwind	-0.002	-0.002	Downwind	0.006	0	Downwind	0.006	0.003	Neither	F	0.011	Neither	2.4	197
4:00 AM	0.007	0.001	Upwind	0.003	0.014	Upwind	0.005	Temp.	Upwind	-0.001	-0.001	Downwind	0.007	0.003	Downwind	0.006	0.003	Downwind	F	0.006	Downwind	1.1	216
5:00 AM	0.008	0.002	Downwind	0.002	0.016	Neither	0.005	Temp.	Upwind	-0.005	0.002	Neither	0.005	0.008	Neither	0.007	0.008	Upwind	F	0.004	Upwind	1.4	158
6:00 AM	0.007	0.001	Downwind	0.005	0.017	Downwind	0.005	Temp.	Upwind	-0.004	0.001	Upwind	0.002	0.009	Neither	0.008	0.01	Upwind	F	0.006	Upwind	1.2	141
7:00 AM	0.004	0.002	Neither	0.004	0.021	Downwind	0	Temp.	Upwind	-0.006	-0.001	Upwind	0.002	0.01	Upwind	0.01	0.009	Upwind	F	0.007	Upwind	2.0	65
8:00 AM	0.003	0.011	Upwind	0.003	0.015	Downwind	0.001	Temp.	Neither	-0.003	0.004	Upwind	0.003	0.023	Upwind	0.009	0.013	Upwind	F	0.008	Upwind	1.4	48
9:00 AM	0.007	0.014	Neither	0.004	0.053	Downwind	0.005	Temp.	Upwind	0	0.011	Upwind	0.006	0.03	Upwind	0.01	0.021	Upwind	F	0.023	Upwind	2.7	57
10:00 AM	0.021	0.046	Downwind	0.015	0.052	Downwind	0.017	Temp.	Upwind	0.011	0.045	Upwind	0.012	0.061	Upwind	0.022	0.069	Upwind	F	0.052	Upwind	3.3	84
11:00 AM	0.018	0.085	Downwind	0.011	0.027	Downwind	0.015	Temp.	Upwind	0.009	0.027	Upwind	0.01	0.054	Upwind	0.016	0.03	Upwind	F	0.023	Upwind	3.2	91
12:00 PM	0.009	0.023	Downwind	0.006	0.012	Downwind	0.003	Temp.	Upwind	0.004	0.01	Upwind	0.008	0.023	Upwind	0.01	0.015	Upwind	F	0.008	Upwind	4.2	135
1:00 PM	0.006	0.028	Neither	0.004	0.016	Upwind	0.003	Temp.	Upwind	0	0.01	Downwind	0.006	0.009	Downwind	0.008	0.009	Neither	F	0.005	Neither	4.8	192
2:00 PM	0.003	0.017	Neither	0.005	0.009	Upwind	0.005	Temp.	Upwind	0.001	0.009	Downwind	0.005	0.026	Downwind	0.006	0.006	Neither	F	0.001	Neither	8.7	199
3:00 PM	0.003	0.006	Neither	0.005	0.023	Upwind	0.008	Temp.	Upwind	0	0.009	Downwind	0.012	0.072	Downwind	0.006	0	Neither	F	0.002	Neither	8.2	198
4:00 PM	0.003	0.006	Neither	0.008	0.017	Upwind	0.004	Temp.	Upwind	0	0.006	Downwind	0.009	0.003	Downwind	0.005	-0.002	Neither	F	0.002	Neither	8.4	200
5:00 PM	0.003	0.008	Neither	0.005	0.011	Upwind	-0.001	Temp.	Upwind	0	0.004	Downwind	0.007	0.006	Downwind	0.006	-0.001	Neither	F	0.002	Neither	9.9	198
6:00 PM	0.006	0.007	Neither	0.005	0.018	Upwind	0.006	Temp.	Upwind	0.001	0.01	Downwind	0.008	0.008	Downwind	0.007	0.004	Neither	F	0.005	Neither	7.8	200
7:00 PM	0.007	0.011	Neither	0.005	0.024	Upwind	0.004	Temp.	Upwind	0.002	0.008	Downwind	0.011	0.009	Downwind	0.007	T	Neither	F	0.005	Neither	5.5	197
8:00 PM	0.011	0.009	Downwind	0.01	0.007	Upwind	0.003	Temp.	Upwind	0.002	0.006	Downwind	0.011	0.01	Downwind	0.013	T	Neither	F	0.005	Upwind	2.8	184
9:00 PM	0.013	0.011	Downwind	0.007	0.018	Neither	0.005	Temp.	Upwind	0.004	0.011	Neither	0.011	0.009	Neither	0.012	T	Upwind	F	0.009	Upwind	3.3	152
10:00 PM	0.008	0.011	Downwind	0.006	0.02	Neither	0.007	Temp.	Upwind	0.003	0.012	Neither	0.008	0.009	Neither	0.01	T	Upwind	F	0.013	Upwind	3.3	150
11:00 PM	0.007	0.009	Downwind	0.006	0.015	Neither	0.007	Temp.	Upwind	0.001	0.007	Neither	0.006	0.006	Neither	0.007	T	Upwind	F	0.01	Upwind	2.5	152
12:00 AM	0.007	0.007	Downwind	0.004	0.019	Downwind	0.002	Temp.	Upwind	-0.002	0.008	Upwind	0.008	0.002	Neither	0.008	T	Upwind	F	0.007	Upwind	3.2	142
24 - AVERAGE	0.007417	0.013458		0.006208	0.020125		0.004792	NA		0.000292	0.008208		0.007542	0.016917		0.008583	0.011167		NA	0.009708			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	75.0%	0.0%	100.0%
neither	45.8%		16.7%		4.2%		16.7%		25.0%		45.8%		37.5%	
upwind	8.3%		50.0%		95.8%		33.3%		25.0%		50.0%		58.3%	
downwind	45.8%		33.3%		0.0%		50.0%		50.0%		4.2%		4.2%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

May 30, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.009	0.014	Downwind	F	0.02	Upwind	0.012	0.007	Upwind	0.003	0.007	Downwind	0.005	0.007	Downwind	P	P	Neither	P	0.004	Neither	3.2	199
1:00 AM	0.009	0.013	Upwind	F	0.024	Upwind	0.007	0.005	Neither	0.004	0.006	Downwind	0.007	0.008	Downwind	P	P	Downwind	P	0.007	Downwind	2.5	220
2:00 AM	0.01	0.014	Upwind	F	0.019	Downwind	0.005	0.008	Downwind	0.004	0.008	Upwind	0.011	0.011	Neither	P	P	Neither	P	0.01	Upwind	2.5	326
3:00 AM	0.009	0.011	Upwind	F	0.018	Upwind	0.007	0.015	Downwind	0.002	0.007	Downwind	0.008	0.012	Downwind	P	P	Downwind	P	0.008	Downwind	2.7	254
4:00 AM	0.008	0.014	Upwind	F	0.016	Upwind	0.004	0.003	Downwind	0.001	0.007	Downwind	0.008	0.016	Downwind	P	P	Downwind	P	0.01	Downwind	3.1	250
5:00 AM	0.007	0.013	Upwind	F	0.01	Upwind	0.008	0.007	Downwind	0	0.011	Downwind	0.006	0.009	Downwind	P	P	Downwind	P	0.011	Downwind	3.3	250
6:00 AM	0.005	0.011	Upwind	F	0.012	Upwind	0.009	0.01	Downwind	0.001	0.008	Downwind	0.008	0.009	Downwind	P	P	Downwind	P	0.01	Downwind	3.2	259
7:00 AM	0.004	0.009	Upwind	F	0.017	Upwind	0.005	0.011	Downwind	-0.001	0.009	Neither	0.007	0.012	Downwind	P	P	Downwind	P	0.011	Downwind	3.8	266
8:00 AM	0.004	0.013	Upwind	F	0.015	Neither	0.005	0.009	Downwind	-0.003	0.004	Upwind	0.005	0.006	Downwind	P	P	Neither	P	0.013	Upwind	5.2	311
9:00 AM	0.006	0.011	Upwind	F	0.015	Neither	0.005	0.008	Downwind	-0.001	0.003	Upwind	0.009	0.016	Downwind	P	P	Neither	P	P	Upwind	7.9	313
10:00 AM	0.004	0.015	Upwind	F	0.014	Downwind	0.004	0.006	Downwind	-0.004	0.008	Upwind	0.007	0.016	Neither	P	P	Upwind	P	0.008	Upwind	8.4	342
11:00 AM	0.006	0.011	Upwind	F	0.016	Downwind	0.002	0.004	Downwind	-0.004	0.009	Upwind	0.007	0.006	Neither	P	P	Upwind	P	0.006	Upwind	6.2	342
12:00 PM	0.005	0.013	Upwind	F	0.018	Downwind	0.002	0.006	Downwind	-0.001	0.009	Upwind	0.008	0.009	Neither	P	P	Neither	P	0.006	Upwind	7.0	329
1:00 PM	0.004	0.016	Upwind	F	0.009	Downwind	0.003	0.004	Downwind	-0.004	0.009	Upwind	0.008	0.009	Downwind	P	P	Neither	P	0.008	Upwind	6.5	324
2:00 PM	0.004	0.014	Upwind	F	0.02	Downwind	0.004	0.015	Downwind	-0.004	0.01	Upwind	0.006	0.01	Neither	0	0.002	Upwind	P	0.009	Upwind	7.0	338
3:00 PM	0.005	0.016	Upwind	F	0.009	Downwind	0.004	0.007	Downwind	-0.002	0.012	Upwind	0.006	0.014	Downwind	0.001	0.001	Neither	P	0.001	Upwind	6.5	318
4:00 PM	0.006	0.018	Upwind	F	0.017	Neither	0.003	0.01	Downwind	-0.001	0.011	Upwind	0.009	0.012	Downwind	0.002	0.001	Downwind	P	P	Neither	9.1	303
5:00 PM	0.006	0.021	Upwind	F	0.019	Neither	0.003	0.01	Downwind	0	0.012	Upwind	0.009	0.023	Downwind	P	P	Downwind	P	P	Neither	7.3	299
6:00 PM	0.007	0.019	Upwind	F	0.011	Upwind	0.005	0.01	Downwind	0.001	0.011	Neither	0.011	0.009	Downwind	P	P	Downwind	P	P	Downwind	7.2	265
7:00 PM	0.012	0.013	Upwind	F	0.015	Upwind	0.007	0.02	Downwind	0.003	0.014	Downwind	0.01	0.01	Downwind	P	P	Downwind	P	P	Downwind	4.7	255
8:00 PM	0.016	0.012	Upwind	F	0.019	Upwind	0.008	0.027	Downwind	0.004	0.02	Upwind	0.015	0.016	Downwind	P	P	Downwind	P	P	Downwind	2.5	278
9:00 PM	0.018	0.011	Upwind	F	T	Neither	0.011	0.03	Downwind	0.008	0.022	Upwind	0.019	0.015	Downwind	P	P	Downwind	P	P	Neither	3.7	307
10:00 PM	0.023	0.027	Upwind	F	T	Downwind	0.013	0.032	Downwind	0.016	0.028	Upwind	0.021	0.019	Downwind	P	P	Neither	P	P	Upwind	6.6	323
11:00 PM	0.016	0.027	Upwind	F	T	Downwind	0.014	0.025	Downwind	0.015	0.025	Upwind	0.013	0.028	Downwind	P	P	Neither	P	P	Upwind	7.9	324
12:00 AM	0.014	0.024	Upwind	F	T	Downwind	0.013	0.026	Downwind	0.007	0.021	Upwind	0.011	0.019	Downwind	P	P	Neither	P	P	Upwind	7.8	322
24 - AVERAGE	0.008667	0.01525		NA	0.01565		0.006292	0.012833		0.001708	0.011833		0.009542	0.013083		NA	NA		NA	NA			

% valid samples	100.0%	100.0%		0.0%	83.3%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		12.5%	12.5%		0.0%	41.6%			
neither			0.0%			20.8%			4.2%			8.3%			20.8%			37.5%			12.5%		
upwind			100.0%			37.5%			0.0%			66.7%			0.0%			12.5%			50.0%		
downwind			0.0%			41.7%			95.8%			25.0%			79.2%			50.0%			37.5%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

June 2, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.009	0.014	Upwind	F	0.03	Upwind	0.01	0.014	Neither	0.004	F	Downwind	0.007	0.016	Downwind	P	P	Downwind	F	0.009	Downwind	5.1	231
1:00 AM	0.009	0.02	Upwind	F	0.022	Upwind	0.011	0.015	Neither	-0.001	F	Downwind	0.009	0.016	Downwind	P	P	Downwind	F	0.015	Downwind	4.2	228
2:00 AM	0.008	0.015	Upwind	F	0.035	Upwind	0.012	0.014	Neither	0.004	F	Downwind	0.015	0.018	Downwind	P	P	Downwind	F	0.02	Downwind	4.8	233
3:00 AM	0.01	0.014	Upwind	F	0.032	Upwind	0.011	0.019	Neither	0.008	F	Downwind	0.013	0.02	Downwind	P	P	Downwind	F	0.014	Downwind	3.0	236
4:00 AM	0.013	0.017	Upwind	F	0.03	Upwind	0.011	0.019	Neither	0.007	F	Downwind	0.013	0.019	Downwind	P	P	Downwind	F	0.019	Downwind	2.5	221
5:00 AM	0.016	0.018	Upwind	F	0.029	Upwind	0.01	0.013	Downwind	0.006	F	Downwind	0.009	0.015	Downwind	P	P	Downwind	F	0.02	Downwind	3.4	246
6:00 AM	0.007	0.025	Upwind	F	0.027	Upwind	0.016	0.021	Neither	0.003	F	Downwind	0.011	0.016	Downwind	P	P	Downwind	F	0.018	Downwind	2.9	236
7:00 AM	0.01	0.017	Upwind	F	0.033	Upwind	0.015	0.028	Neither	0.006	F	Downwind	0.013	0.018	Downwind	P	P	Downwind	F	0.02	Downwind	3.1	239
8:00 AM	0.008	0.021	Upwind	F	0.019	Upwind	0.016	0.024	Neither	0.007	F	Downwind	0.012	0.021	Downwind	P	P	Downwind	F	0.038	Downwind	4.3	237
9:00 AM	0.012	0.029	Upwind	F	0.036	Upwind	0.015	0.016	Neither	0.006	F	Downwind	0.008	0.043	Downwind	P	P	Downwind	F	0.045	Downwind	4.2	231
10:00 AM	0.01	0.015	Upwind	F	0.054	Upwind	0.011	0.09	Neither	0.003	F	Downwind	0.008	F	Downwind	P	P	Downwind	F	0.038	Downwind	6.7	239
11:00 AM	0.008	0.016	Upwind	F	0.03	Upwind	F	0.005	Downwind	0.003	F	Neither	0.01	0.038	Downwind	P	P	Downwind	F	0.028	Downwind	6.1	265
12:00 PM	0.005	0.016	Upwind	F	0.02	Upwind	F	0.011	Downwind	0.002	F	Downwind	0.007	F	Downwind	P	P	Downwind	F	0.013	Downwind	6.1	281
1:00 PM	0.005	0.016	Upwind	F	0.016	Upwind	F	0.011	Downwind	0.002	F	Neither	0.004	0.084	Downwind	P	P	Downwind	F	0.015	Downwind	4.8	265
2:00 PM	0.006	0.017	Upwind	F	0.028	Upwind	F	0.018	Downwind	0.004	F	Downwind	0.008	0.075	Downwind	P	P	Downwind	F	0.02	Downwind	6.4	252
3:00 PM	0.004	0.015	Upwind	F	0.019	Upwind	F	0.003	Neither	0.002	F	Downwind	0.007	0.052	Downwind	P	P	Downwind	F	0.014	Downwind	8.3	229
4:00 PM	0.005	0.02	Upwind	F	0.021	Upwind	F	0.016	Neither	0.005	F	Downwind	0.007	0.03	Downwind	P	P	Downwind	F	P	Downwind	9.0	226
5:00 PM	0.008	0.014	Upwind	F	0.013	Upwind	F	0.011	Neither	0.004	F	Downwind	0.007	0.029	Downwind	P	P	Downwind	F	P	Downwind	8.2	221
6:00 PM	0.009	0.012	Upwind	F	0.013	Upwind	F	0.012	Neither	0.001	F	Downwind	0.013	0.012	Downwind	P	P	Downwind	F	P	Downwind	7.1	229
7:00 PM	0.016	0.008	Upwind	F	0.012	Upwind	F	0.015	Upwind	0.002	F	Downwind	0.012	0.008	Downwind	P	P	Downwind	F	P	Downwind	7.1	214
8:00 PM	0.012	0.014	Neither	F	0.017	Upwind	F	0.016	Upwind	0.003	F	Downwind	0.013	0.009	Downwind	P	P	Downwind	F	0.004	Neither	5.4	208
9:00 PM	0.013	0.016	Neither	F	0.025	Upwind	F	0.025	Upwind	0.01	F	Downwind	0.011	0.02	Downwind	P	P	Downwind	F	P	Neither	4.3	206
10:00 PM	0.011	0.019	Neither	F	0.032	Upwind	F	0.014	Upwind	0.009	F	Downwind	0.01	0.019	Downwind	P	P	Downwind	F	P	Neither	3.7	208
11:00 PM	0.012	0.014	Neither	F	0.022	Upwind	F	0.014	Upwind	0.007	F	Downwind	0.013	0.011	Downwind	P	P	Neither	F	P	Neither	2.9	204
12:00 AM	0.015	0.016	Neither	F	0.027	Upwind	F	0.023	Upwind	0.006	F	Downwind	0.011	0.01	Downwind	P	P	Downwind	F	P	Neither	4.2	208
24 - AVERAGE	0.009667	0.016833		NA	0.0255		NA	0.018875		0.004542	NA		0.010167	0.0265		NA	NA		NA	NA			

% valid samples	100.0%	100.0%		0.0%	100.0%		41.6%	100.0%		100.0%	0.0%		100.0%	91.6%		0.0%	0.0%		0.0%	66.6%			
neither			20.8%			0.0%			54.2%			8.3%			0.0%			4.2%			20.8%	
upwind			79.2%			100.0%			25.0%			0.0%			0.0%			0.0%			0.0%	
downwind			0.0%			0.0%			20.8%			91.7%			100.0%			95.8%			79.2%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

June 11, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.011	0.026	Neither	T/F	0.03	Upwind	*	*	Upwind	*	*	Downwind	0.014	0.017	Downwind	T	*	Neither	*	0.013	Neither	8.0	199
1:00 AM	0.008	0.021	Neither	T/F	0.034	Upwind	*	*	Upwind	*	*	Downwind	0.01	0.022	Downwind	T	*	Neither	*	0.024	Neither	9.4	201
2:00 AM	0.012	0.021	Neither	T/F	0.034	Upwind	*	*	Upwind	*	*	Downwind	0.008	0.015	Downwind	T	*	Neither	*	0.015	Neither	9.6	203
3:00 AM	0.009	0.021	Neither	T/F	0.03	Upwind	*	*	Upwind	*	*	Downwind	0.009	0.02	Downwind	T	*	Neither	*	0.012	Neither	9.4	204
4:00 AM	0.01	0.016	Neither	T/F	0.027	Upwind	*	*	Upwind	*	*	Downwind	0.011	0.017	Downwind	T	*	Neither	*	0.019	Neither	7.7	200
5:00 AM	0.01	0.021	Neither	T/F	0.038	Upwind	*	*	Upwind	*	*	Downwind	0.007	0.024	Downwind	T	*	Neither	*	0.02	Neither	9.9	199
6:00 AM	0.008	0.017	Neither	T/F	0.028	Upwind	*	*	Upwind	*	*	Downwind	0.009	0.025	Downwind	T	*	Neither	*	0.022	Neither	9.6	201
7:00 AM	0.012	0.013	Neither	T/F	0.027	Upwind	*	*	Upwind	*	*	Downwind	0.012	0.03	Downwind	T	*	Neither	*	0.029	Neither	10.9	203
8:00 AM	0.008	0.017	Neither	T/F	0.027	Upwind	*	*	Upwind	*	*	Downwind	0.013	0.08	Downwind	T	*	Downwind	*	0.025	Neither	11.0	208
9:00 AM	0.008	0.02	Upwind	T/F	0.032	Upwind	*	*	Upwind	*	*	Downwind	0.014	0.091	Downwind	T	*	Downwind	*	0.03	Downwind	12.1	212
10:00 AM	0.007	0.017	Upwind	T/F	0.029	Upwind	*	*	Neither	*	*	Downwind	0.01	0.085	Downwind	T	*	Downwind	*	0.022	Downwind	9.3	226
11:00 AM	0.013	0.019	Upwind	T/F	0.019	Upwind	*	*	Neither	*	*	Downwind	0.01	0.039	Downwind	T	*	Downwind	*	T	Downwind	3.8	226
12:00 PM	0.01	0.021	Upwind	T/F	0.021	Upwind	*	*	Downwind	*	*	Downwind	0.011	0.048	Downwind	T	*	Downwind	*	T	Downwind	8.0	258
1:00 PM	0.009	0.022	Upwind	T/F	0.038	Upwind	*	*	Upwind	*	*	Downwind	0.017	0.035	Downwind	T	*	Downwind	*	T	Downwind	3.3	220
2:00 PM	0.011	0.017	Neither	T/F	0.039	Upwind	*	*	Upwind	*	*	Downwind	0.006	0.022	Downwind	T	*	Neither	*	T	Neither	4.7	201
3:00 PM	0.01	0.025	Downwind	T/F	-0.002	Neither	*	*	Upwind	*	*	Downwind	0.013	0.007	Neither	T	*	Upwind	*	T	Upwind	3.9	153
4:00 PM	0.011	0.028	Downwind	T/F	0.004	Neither	*	*	Upwind	*	*	Neither	0.008	0.01	Neither	T	*	Upwind	*	T	Upwind	3.9	156
5:00 PM	0.012	0.019	Downwind	T/F	0.017	Neither	*	*	Upwind	*	*	Neither	0.01	0.012	Downwind	T	*	Upwind	*	T	Upwind	3.6	160
6:00 PM	0.015	0.021	Neither	T/F	0.02	Upwind	*	*	Upwind	*	*	Downwind	0.01	0.018	Downwind	T	*	Neither	*	T	Neither	3.9	196
7:00 PM	0.012	0.019	Downwind	T/F	0.02	Upwind	*	*	Upwind	*	*	Downwind	0.013	0.011	Downwind	T	*	Neither	*	T	Upwind	3.7	178
8:00 PM	0.013	0.02	Downwind	T/F	0.025	Upwind	*	*	Upwind	*	*	Downwind	0.012	0.016	Downwind	T	*	Neither	*	T	Upwind	3.0	185
9:00 PM	0.012	0.022	Downwind	T/F	0.022	Neither	*	*	Upwind	*	*	Downwind	0.015	0.016	Downwind	T	*	Neither	*	T	Upwind	2.1	170
10:00 PM	0.016	0.026	Downwind	T/F	0.058	Neither	*	*	Upwind	*	*	Downwind	0.016	0.022	Downwind	T	*	Upwind	*	T	Upwind	1.2	165
11:00 PM	0.014	0.024	Upwind	T/F	0.051	Upwind	*	*	Upwind	*	*	Downwind	0.016	0.02	Downwind	T	*	Downwind	*	T	Downwind	1.2	217
12:00 AM	0.018	0.015	Upwind	T/F	0.035	Upwind	*	*	Downwind	*	*	Upwind	0.013	0.027	Downwind	T	*	Downwind	*	T	Downwind	1.9	287
24 - AVERAGE	0.011167	0.020083		NA	0.02535		NA	NA		NA	NA		0.011375	0.029667		NA	NA		NA	NA			

% valid samples	100.0%	100.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	0.0%	0.0%	0.0%	41.6%
neither	41.7%		20.8%		8.3%		8.3%		8.3%		50.0%		41.7%	
upwind	29.2%		79.2%		83.3%		4.2%		0.0%		16.7%		29.2%	
downwind	29.2%		0.0%		8.3%		87.5%		91.7%		33.3%		29.2%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

June 17, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.009	0.011	Neither	0	0.026	Downwind	0.005	0.012	Neither	0.002	0.007	Upwind	0.006	T	Upwind	0.004	0.002	Upwind	0.011	0.006	Upwind	6.8	59
1:00 AM	0.007	0.014	Neither	0.008	0.026	Downwind	0.005	0.014	Neither	0.002	0.012	Upwind	0.006	T	Upwind	0.002	-0.003	Upwind	0.013	0.008	Upwind	8.0	55
2:00 AM	0.008	0.015	Neither	0.01	0.026	Downwind	0.003	0.019	Neither	0.002	0.015	Upwind	0.005	T	Upwind	0.002	0.005	Upwind	0.009	0.012	Upwind	8.2	54
3:00 AM	0.008	0.013	Neither	0.011	0.032	Downwind	0.004	0.017	Neither	0.002	0.02	Upwind	0.007	T	Upwind	0.005	0.01	Upwind	0.009	0.016	Upwind	9.0	55
4:00 AM	0.008	0.016	Upwind	0.011	0.026	Downwind	0.003	0.017	Downwind	0.001	0.017	Upwind	0.004	T	Upwind	0.004	0.009	Upwind	0.006	0.013	Upwind	6.2	29
5:00 AM	0.007	0.012	Upwind	0.01	0.033	Downwind	0.001	0.013	Neither	0.001	0.012	Upwind	0.009	T	Upwind	0.004	0.009	Upwind	0.017	0.017	Upwind	7.5	49
6:00 AM	0.006	0.018	Neither	0.007	0.029	Downwind	0.004	0.015	Neither	0	0.015	Upwind	0.01	T	Upwind	0.004	0.016	Upwind	0.014	0.019	Upwind	9.3	60
7:00 AM	0.009	0.026	Neither	0.01	0.032	Downwind	0.007	0.019	Neither	-0.002	0.016	Upwind	0.008	T	Upwind	0.002	0.014	Upwind	0.014	0.017	Upwind	10.3	54
8:00 AM	0.006	0.033	Neither	0.007	0.072	Downwind	0.004	0.019	Neither	0.003	0.025	Upwind	0.01	T	Upwind	0.001	0.015	Upwind	0.014	0.02	Upwind	10.5	52
9:00 AM	0.004	0.046	Neither	0.009	0.074	Downwind	0.005	0.021	Neither	0.004	0.024	Upwind	0.011	T	Upwind	0.005	0.017	Upwind	0.007	0.024	Upwind	9.6	57
10:00 AM	0.008	0.034	Neither	0.005	0.075	Downwind	0.004	0.018	Neither	0.002	0.024	Upwind	0.009	T	Upwind	0.004	0.022	Upwind	0.013	0.03	Upwind	9.3	53
11:00 AM	0.008	0.035	Neither	0.004	0.066	Downwind	0.005	0.015	Neither	-0.001	0.014	Upwind	0.01	T	Upwind	0.004	0.027	Upwind	0.012	0.019	Upwind	9.2	50
12:00 PM	0.007	0.041	Upwind	0.007	0.041	Downwind	0.002	0.026	Neither	-0.002	0.02	Upwind	0.007	T	Upwind	0.004	0.028	Upwind	0.01	0.021	Upwind	10.2	44
1:00 PM	0.005	0.053	Neither	0.007	0.045	Downwind	0.002	0.014	Upwind	-0.001	0.017	Upwind	0.012	T	Upwind	0.01	0.025	Upwind	0.005	0.018	Upwind	10.5	63
2:00 PM	0.013	0.054	Downwind	0.013	0.054	Downwind	0.006	0.021	Upwind	0.003	0.018	Upwind	0.01	T	Upwind	0.006	0.012	Upwind	0.003	0.02	Upwind	7.0	78
3:00 PM	0.011	0.028	Neither	0.009	0.044	Downwind	0.005	0.016	Upwind	0.001	0.027	Upwind	0.009	T	Upwind	0.004	0.01	Upwind	0.01	0.015	Upwind	9.4	67
4:00 PM	0.007	0.022	Neither	0.011	0.022	Downwind	0.003	0.022	Upwind	-0.002	0.02	Upwind	0.008	T	Upwind	0.01	0.008	Upwind	0.007	0.008	Upwind	8.5	66
5:00 PM	0.005	0.022	Neither	0.008	0.028	Downwind	0.006	0.012	Upwind	0.003	0.013	Upwind	0.011	T	Upwind	0.006	0.011	Upwind	0.005	0.009	Upwind	9.1	68
6:00 PM	0.005	0.011	Neither	0.004	0.015	Downwind	0.004	0.015	Neither	0.002	0.012	Upwind	0.008	T	Upwind	P	P	Upwind	0.007	0.008	Upwind	10.4	60
7:00 PM	0.01	0.017	Neither	0.004	0.016	Downwind	0.003	0.012	Upwind	0.003	0.008	Upwind	0.008	T	Upwind	P	P	Upwind	0.008	0.008	Upwind	8.9	63
8:00 PM	0.01	0.011	Neither	0.005	0.023	Downwind	0.005	0.011	Upwind	0.005	0.01	Upwind	0.007	T	Upwind	P	P	Upwind	0.009	0.004	Upwind	8.0	64
9:00 PM	0.008	0.011	Neither	0.007	0.016	Downwind	0.003	0.022	Upwind	0.003	0.015	Upwind	0.004	T	Upwind	P	P	Upwind	0.015	0.003	Upwind	9.2	66
10:00 PM	0.008	0.015	Neither	0.007	0.01	Downwind	0	0.015	Upwind	0.001	0.015	Upwind	0.007	T	Upwind	P	P	Upwind	0.01	0.006	Upwind	8.7	64
11:00 PM	0.008	0.013	Neither	0.005	0.009	Downwind	0.003	0.01	Upwind	0.001	0.014	Upwind	0.008	T	Upwind	P	P	Upwind	0.012	0.008	Upwind	8.2	60
12:00 AM	0.008	0.013	Neither	0.01	0.02	Downwind	0.004	0.014	Neither	0.002	0.011	Upwind	0.006	T	Upwind	P	P	Upwind	0.008	0.011	Upwind	8.8	53
24 - AVERAGE	0.007667	0.023875		0.007875	0.03475		0.003792	0.016542		0.001375	0.016417		0.008083	NA		NA	NA		0.009875	0.013917			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	70.8%	70.8%	100.0%	100.0%
neither	83.3%		0.0%		54.2%		0.0%		0.0%		0.0%		0.0%	
upwind	12.5%		0.0%		41.7%		100.0%		100.0%		100.0%		100.0%	
downwind	4.2%		100.0%		4.2%		0.0%		0.0%		0.0%		0.0%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

June 20, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.016	0.022	Neither	0.012	0.022	neither	0.006	0.016	Neither	0.006	0.018	Neither	0.014	0.016	Neither	P	P	Neither	P	P	Neither	0.7	53*
1:00 AM	0.01	0.017	Downwind	0.014	0.023	Neither	0.004	0.012	Upwind	0.008	0.019	Downwind	0.012	0.017	Downwind	0	0.016	Upwind	-0.001	0.01	Upwind	0.9	166*
2:00 AM	0.013	0.022	Neither	0.01	0.022	Upwind	0.003	0.019	Upwind	0.007	0.016	Downwind	0.006	0.023	Downwind	0	0.02	Neither	0	0.011	Neither	1.1	205
3:00 AM	0.012	0.024	Upwind	0.017	0.016	Downwind	0.004	0.016	Downwind	0.005	0.019	Upwind	0.012	0.02	Neither	0	0.009	Upwind	0.001	0.008	Upwind	1.3	330
4:00 AM	0.011	0.02	Neither	0.012	0.036	Neither	0.007	0.02	Neither	0.008	0.019	Neither	0.015	0.028	Neither	0.005	0.01	Neither	0.004	0.006	Neither	0.4	268*
5:00 AM	0.011	0.02	Downwind	0.017	0.027	Neither	0.008	0.017	Upwind	0.007	0.021	Neither	0.014	0.029	Neither	0.008	0.016	Upwind	0.006	0.007	Upwind	0.6	149
6:00 AM	0.013	0.021	Upwind	0.011	0.026	Downwind	0.009	0.015	Downwind	0.007	0.02	Upwind	0.017	0.024	Neither	0.007	0.012	Upwind	0.006	0.01	Upwind	2.1	343
7:00 AM	0.016	0.02	Upwind	0.013	0.031	Downwind	0.008	0.021	Neither	0.007	0.024	Upwind	0.015	0.032	Upwind	0.008	0.02	Upwind	0.006	0.02	Upwind	1.3	32
8:00 AM	0.011	0.026	Downwind	0.007	0.045	Downwind	0.006	0.01	Upwind	0.006	0.009	Upwind	0.002	0.038	Upwind	0.006	0.029	Upwind	0.012	0.01	Upwind	2.2	134
9:00 AM	0.006	0.022	Downwind	0.005	0.013	Upwind	0.003	0.008	Upwind	0.006	0.006	Downwind	0.004	0.015	Downwind	0.003	0.022	Neither	0.008	0.008	Upwind	3.2	186*
10:00 AM	0.002	0.015	Neither	0.007	0.012	Upwind	0.002	0.005	Upwind	0.005	0.01	Downwind	0.005	0.015	Downwind	0.003	0.02	Neither	0.005	0.006	Neither	3.6	195
11:00 AM	0.004	0.02	Downwind	0.005	0.022	Downwind	0.003	-0.001	Upwind	0.006	0.011	Upwind	0.006	0.01	Upwind	0.009	0.013	Upwind	0.002	P	Upwind	4.3	136*
12:00 PM	0.006	0.01	Upwind	0.009	0.017	Upwind	0.001	0	Upwind	0.005	0.007	Downwind	0.007	0.008	Downwind	0.005	0.02	Downwind	0.003	P	Downwind	4.0	212
1:00 PM	0.009	0.009	Upwind	0.01	0.012	Upwind	0.004	0.007	Upwind	0.003	0.007	Downwind	0.01	0.006	Downwind	0.002	0.008	Downwind	0.005	P	Downwind	3.1	218
2:00 PM	0.011	0.012	Neither	0.012	0.009	Upwind	0.007	0.017	Upwind	0.002	0.012	Downwind	0.011	0.006	Downwind	0.01	0.007	Neither	0.007	P	Neither	6.6	202
3:00 PM	0.011	0.013	Upwind	0.012	0.027	Upwind	0.005	0.014	Neither	0.002	0.01	Downwind	0.016	0.008	Downwind	0.009	0.009	Downwind	0.006	P	Downwind	7.8	233
4:00 PM	0.012	0.009	Upwind	0.011	0.017	Upwind	0.007	0.013	Neither	0.004	0.012	Downwind	0.018	0.008	Downwind	0.009	0.015	Downwind	0.006	P	Downwind	6.1	223
5:00 PM	0.009	0.012	Upwind	0.008	0.02	Upwind	0.006	0.013	Downwind	0.003	0.009	Neither	0.011	0.01	Downwind	0.007	0.019	Downwind	0.004	P	Downwind	3.0	263
6:00 PM	0.008	0.008	Upwind	0.009	0.013	Upwind	0.003	0.009	Upwind	0.001	0.009	Downwind	0.01	0.007	Downwind	0.006	0.009	Downwind	0.002	P	Downwind	2.9	219
7:00 PM	0.015	0.008	Neither	0.01	0.027	Upwind	0.005	0.005	Upwind	0.001	0.006	Downwind	0.009	0.007	Downwind	0.007	0.019	Downwind	0.003	P	Neither	1.7	205
8:00 PM	0.013	0.008	Upwind	0.009	0.013	Upwind	0.007	0.02	Upwind	0.006	0.009	Downwind	0.009	0.009	Downwind	0.011	0.009	Downwind	0.003	P	Downwind	1.2	217
9:00 PM	0.009	0.01	Neither	0.007	0.017	Upwind	0.003	0.019	Upwind	0.005	0.01	Downwind	0.007	0.007	Downwind	0.008	0.011	Neither	0.01	P	Neither	0.7	201
10:00 PM	0.009	0.011	Downwind	0.018	0.032	Downwind	0.006	0.016	Upwind	0.003	0.014	Upwind	0.012	0.01	Upwind	0.006	0.013	Upwind	0.012	P	Upwind	1.4	133
11:00 PM	0.014	0.012	Downwind	0.011	0.027	Downwind	0.012	0.026	Upwind	0.001	0.017	Upwind	0.011	0.02	Upwind	0.017	0.02	Upwind	0.017	P	Upwind	2.2	127
12:00 AM	0.009	0.009	Downwind	0.01	0.021	Downwind	0.008	0.013	Upwind	0	0.009	Upwind	0.009	0.005	Upwind	P	P	Upwind	P	P	Upwind	0.6	131
24 - AVERAGE	0.01017	0.01492		0.01058	0.02188		0.00546	0.01308		0.0045	0.01271		0.01033	0.015083		0.00635	0.01504		0.005522	NA		2.6	199

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	95.8%	95.8%	95.8%	41.7%
neither	25.0%		12.5%		16.7%		12.5%		16.7%		25.0%		25.0%	
upwind	41.7%		54.2%		70.8%		33.3%		25.0%		41.7%		45.8%	
downwind	33.3%		33.3%		12.5%		54.2%		58.3%		33.3%		29.2%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

June 23, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.006	0.013	Upwind	0.006	0.014	Upwind	0.003	0.012	Upwind	0	0.01	Downwind	0.006	0.011	Downwind	0	0.012	Downwind	0.005	0.003	Downwind	2.4	217
1:00 AM	0.005	0.02	Neither	0.008	0.014	Upwind	0.004	0.011	Upwind	0.001	0.013	Downwind	0.008	0.008	Downwind	0	0.01	Neither	0.005	0.004	Neither	1.4	196
2:00 AM	0.005	0.018	Neither	0.007	0.014	Upwind	0.007	0.008	Upwind	0.001	0.013	Downwind	0.008	0.008	Downwind	0	0.01	Neither	0.004	0.002	Neither	3.4	201
3:00 AM	0.007	0.016	Upwind	0.009	0.028	Upwind	0.006	0.01	Neither	0.001	0.01	Downwind	0.008	0.007	Downwind	0.001	0.009	Downwind	0.008	0.001	Downwind	3.2	228
4:00 AM	0.008	0.019	Neither	0.011	0.028	Upwind	0.007	0.017	Upwind	0	0.013	Downwind	0.006	0.011	Downwind	0.002	0.016	Neither	0.009	0.006	Neither	1.3	200
5:00 AM	0.009	0.018	Upwind	0.015	0.031	Upwind	0.006	0.009	Neither	0.001	0.014	Downwind	0.008	0.014	Downwind	0.003	0.017	Downwind	0.012	0.01	Downwind	1.4	239
6:00 AM	0.01	0.026	Neither	0.011	0.025	Upwind	0.003	0.017	Upwind	0.007	0.019	Downwind	0.01	0.025	Downwind	0.004	0.012	Neither	0.007	0.009	Neither	1.8	196
7:00 AM	0.008	0.02	Downwind	0.009	0.029	Upwind	0.003	0.02	Upwind	0.005	0.014	Downwind	0.009	0.023	Downwind	0.006	0.021	Neither	0.01	0.021	Upwind	3.0	189
8:00 AM	0.006	0.015	Downwind	0.006	0.016	Upwind	0.003	0.011	Upwind	0.002	0.011	Downwind	0.006	0.021	Downwind	0.003	0.025	Neither	0.014	0.015	Upwind	4.9	187
9:00 AM	0.01	0.013	Upwind	0.008	0.013	Upwind	0.002	0.005	Neither	0.004	0.013	Downwind	0.01	0.048	Downwind	0.007	0.02	Downwind	0.012	0.015	Downwind	3.9	222
10:00 AM	0.012	0.019	Downwind	0.013	0.021	Upwind	0.006	0.009	Upwind	0.002	0.02	Downwind	0.009	0.029	Downwind	0.008	0.023	Neither	0.014	0.016	Upwind	4.7	176
11:00 AM	0.007	0.019	Downwind	0.009	0.014	Neither	0.006	0.012	Upwind	0.004	0.014	Downwind	0.007	0.033	Downwind	0.01	0.021	Neither	0.01	0.007	Upwind	5.2	173
12:00 PM	0.007	0.016	Downwind	0.009	0.016	Upwind	0.011	0.01	Upwind	0.004	0.017	Downwind	0.009	0.045	Downwind	0.008	0.015	Neither	0.011	0.007	Upwind	6.5	187
1:00 PM	0.01	0.018	Downwind	0.008	0.024	Upwind	0.006	0.011	Upwind	0.007	0.024	Downwind	0.018	0.061	Downwind	0.005	0.017	Neither	0.012	0.015	Upwind	5.7	181
2:00 PM	0.014	0.023	Neither	0.018	0.017	Upwind	0.003	0.022	Upwind	0.01	0.028	Downwind	0.017	0.027	Downwind	0.007	0.02	Neither	0.018	0.012	Neither	6.2	190
3:00 PM	0.016	0.032	Downwind	0.013	0.021	Upwind	0.015	0.018	Upwind	0.008	0.032	Downwind	0.014	0.038	Downwind	0.008	0.017	Neither	0.019	0.011	Upwind	5.4	176
4:00 PM	0.016	0.085	Neither	0.013	0.032	Upwind	0.01	0.019	Upwind	0.009	0.02	Downwind	0.013	0.031	Downwind	0.014	0.018	Neither	0.015	0.011	Neither	6.7	204
5:00 PM	0.013	0.021	Neither	0.01	0.024	Upwind	0.012	0.022	Upwind	0.008	0.025	Downwind	0.012	0.021	Downwind	0.013	0.017	Neither	0.016	0.018	Neither	6.5	191
6:00 PM	0.012	0.021	Neither	0.016	0.023	Upwind	0.011	0.028	Upwind	0.007	0.029	Downwind	0.025	0.078	Downwind	0.01	0.021	Downwind	0.017	0.015	Neither	6.1	206
7:00 PM	0.032	0.022	Upwind	0.016	0.039	Upwind	0.014	0.041	Neither	0.072	0.033	Upwind	0.02	0.039	Downwind	0.012	0.018	Downwind	0.018	0.016	Downwind	4.3	281
8:00 PM	0.016	0.027	Neither	0.011	0.036	Upwind	0.011	0.039	Upwind	0.013	0.023	Upwind	0.015	0.022	Downwind	0.014	0.019	Neither	0.023	0.022	Neither	1.6	205
9:00 PM	0.017	0.018	Downwind	0.015	0.041	Neither	0.016	0.03	Upwind	0.014	0.022	Neither	0.021	0.03	Neither	0.011	0.012	Upwind	0.025	0.021	Upwind	0.9	153
10:00 PM	0.021	0.028	Downwind	0.018	0.036	Upwind	0.018	0.032	Upwind	0.01	0.025	Downwind	0.02	0.043	Downwind	0.014	0.022	Neither	0.019	0.023	Upwind	2.3	178
11:00 PM	0.018	0.018	Neither	0.015	0.02	Upwind	0.014	0.028	Upwind	0.008	0.02	Downwind	0.015	0.018	Downwind	P	P	Neither	0.02	0.016	Neither	5.3	203
12:00 AM	0.011	0.02	Neither	0.016	0.018	Upwind	0.009	0.016	Upwind	0.011	0.014	Downwind	0.012	0.006	Downwind	P	P	Downwind	0.019	0.016	Neither	7.3	207
24 - AVERAGE	0.012083	0.023		0.011833	0.02325		0.008458	0.018542		0.008708	0.019417		0.0125	0.028583		0.007273	0.017273		0.014042	0.012875			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	91.6%	91.6%	100.0%	100.0%
neither	45.8%		8.3%		16.7%		4.2%		4.2%		70.8%		45.8%	
upwind	16.7%		91.7%		83.3%		8.3%		0.0%		4.2%		37.5%	
downwind	37.5%		0.0%		0.0%		87.5%		95.8%		25.0%		16.7%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

June 26, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.011	0.016	Upwind	0.006	0.026	Upwind	0.011	0.02	Neither	0.008	0.015	Downwind	0.012	0.011	Downwind	I	0.018	Downwind	0.015	0.008	Downwind	2.4	230
1:00 AM	0.012	0.021	Upwind	0.009	0.022	Upwind	0.01	0.022	Downwind	0.008	0.02	Neither	0.014	0.015	Downwind	I	0.02	Downwind	0.015	0.011	Downwind	2.7	261
2:00 AM	0.01	0.024	Upwind	0.007	0.022	Upwind	0.015	0.021	Downwind	0.006	0.021	Neither	0.016	0.019	Downwind	I	0.015	Downwind	0.012	0.013	Downwind	2.3	269
3:00 AM	0.014	0.02	Upwind	0.016	0.017	Upwind	0.008	0.017	Downwind	0.004	0.015	Neither	0.007	0.022	Downwind	I	0.009	Downwind	0.016	0.01	Downwind	2.7	261
4:00 AM	0.011	0.017	Upwind	0.012	0.017	Upwind	0.007	0.016	Downwind	0.005	0.019	Downwind	0.009	0.021	Downwind	I	0.008	Downwind	0.016	0.011	Downwind	2.4	250
5:00 AM	0.017	0.02	Upwind	0.017	0.027	Upwind	0.01	0.021	Neither	0.008	0.02	Downwind	0.012	0.022	Downwind	I	0.013	Downwind	0.015	0.013	Downwind	2.7	236
6:00 AM	0.013	0.021	Upwind	0.02	0.037	Upwind	0.01	0.023	Neither	0.005	0.025	Downwind	0.013	0.021	Downwind	I	0.025	Downwind	0.011	0.016	Downwind	2.4	238
7:00 AM	0.01	0.026	Upwind	0.011	0.034	Upwind	0.015	0.017	Downwind	0.002	0.028	Neither	0.011	0.021	Downwind	I	0.023	Downwind	0.012	0.019	Downwind	2.4	261
8:00 AM	0.01	0.027	Upwind	0.009	0.064	Neither	0.006	0.028	Downwind	0.001	0.003	Upwind	0.011	0.041	Downwind	I	0.026	Downwind	0.017	0.033	Neither	3.9	307
9:00 AM	0.006	0.017	Upwind	0.007	0.031	Downwind	0.008	0.018	Downwind	-0.003	0.011	Upwind	0.007	0.018	Downwind	I	0.032	Neither	0.006	0.006	Upwind	4.9	323
10:00 AM	0.002	0.018	Upwind	0.005	0.025	Upwind	0.004	0.007	Downwind	-0.002	0.022	Upwind	0.003	0.02	Downwind	I	0.02	Downwind	0.007	0.006	Downwind	5.6	276
11:00 AM	0.002	0.02	Upwind	0.003	0.021	Upwind	-0.001	0.004	Downwind	0.001	0.02	Downwind	0.006	0.019	Downwind	I	0.013	Downwind	0.015	0.021	Downwind	6.1	242
12:00 PM	0.006	0.016	Upwind	0.004	0.022	Upwind	-0.001	0.002	Downwind	0.002	0.045	Upwind	0.005	0.016	Downwind	I	0.018	Downwind	0.011	0.01	Downwind	6.5	277
1:00 PM	0.005	0.013	Upwind	0.004	0.015	Upwind	0.004	0.016	Downwind	0.004	0.038	Upwind	0.007	0.079	Downwind	I	0.013	Downwind	0.008	0.012	Downwind	8.4	288
2:00 PM	0.006	0.016	Upwind	0.008	0.025	Upwind	0.016	0.015	Downwind	0.022	0.026	Neither	0.012	0.022	Downwind	I	0.021	Downwind	0.01	0.013	Downwind	6.9	272
3:00 PM	0.01	0.012	Upwind	0.014	0.027	Upwind	0.001	0.012	Downwind	0	0.024	Downwind	0.007	0.047	Downwind	I	0.017	Downwind	0.011	0.011	Downwind	10	253
4:00 PM	0.008	0.015	Upwind	0.009	0.021	Upwind	0.001	0.013	Downwind	0.005	0.018	Downwind	0.011	0.016	Downwind	I	0.014	Downwind	0.009	0.01	Downwind	9.1	260
5:00 PM	0.006	0.015	Upwind	0.009	0.031	Upwind	0.004	0.012	Downwind	0.005	0.02	Downwind	0.009	0.008	Downwind	I	0.012	Downwind	0.008	0.012	Downwind	8.9	258
6:00 PM	0.005	0.016	Upwind	0.011	0.04	Upwind	0.005	0.014	Downwind	0.003	0.015	Downwind	0.01	0.015	Downwind	I	0.011	Downwind	0.011	0.009	Downwind	7.8	240
7:00 PM	0.012	0.016	Upwind	0.01	0.029	Upwind	0.006	0.015	Neither	0.007	0.018	Downwind	0.016	0.007	Downwind	I	0.019	Downwind	0.008	0.007	Downwind	6.1	225
8:00 PM	0.013	0.017	Upwind	0.017	0.02	Upwind	0.008	0.028	Upwind	0.004	0.015	Downwind	0.016	0.008	Downwind	I	0.011	Downwind	0.017	0.012	Downwind	6.5	210
9:00 PM	0.015	0.017	Upwind	0.017	0.019	Upwind	0.009	0.022	Downwind	0.007	0.021	Downwind	0.017	0.017	Downwind	I	0.015	Downwind	0.014	0.014	Downwind	4.4	255
10:00 PM	0.012	0.023	Neither	0.011	0.021	Upwind	0.008	0.025	Upwind	0.012	0.017	Downwind	0.015	0.01	Downwind	I	0.018	Downwind	0.017	0.022	Neither	1.5	205
11:00 PM	0.013	0.022	Neither	0.015	0.026	Upwind	0.013	0.021	Upwind	0.008	0.021	Downwind	0.016	0.017	Downwind	I	0.018	Neither	0.032	0.033	Neither	2.5	200
12:00 AM	0.016	0.018	Upwind	0.015	0.027	Upwind	0.01	0.014	Upwind	0.007	0.016	Downwind	0.015	0.014	Downwind	I	0.021	Downwind	0.018	0.02	Downwind	3.5	219
AVERAGE	0.00975	0.018625		0.010833	0.026667		0.007333	0.016792		0.005042	0.02075		0.011042	0.021458		NA	0.0171667		0.0131667	0.0143333		5.0	254

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%
neither	8.3%	4.2%	12.5%	20.8%	0.0%	8.3%	12.5%
upwind	91.7%	91.7%	16.7%	20.8%	0.0%	0.0%	4.2%
downwind	0.0%	4.2%	70.8%	58.3%	100.0%	91.7%	83.3%

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

August 19, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.018	0.036	Downwind	0.013	0.024	Upwind	0.018	0.021	Upwind	0.009	0.027	Downwind	0.017	0.028	Downwind	0.019	0.013	Neither	0.001	0.022	Upwind	0.8	185
1:00 AM	0.014	0.03	Neither	0.019	0.012	Neither	0.021	0.018	Neither	0.009	0.026	Neither	0.021	0.033	Neither	0.019	0.021	Neither	0.002	0.019	Neither	0.3	289.5*
2:00 AM	0.011	0.026	Neither	0.011	0.029	UPwind	0.018	0.017	Upwind	0.008	0.028	Downwind	0.017	0.039	Downwind	0.01	0.024	Neither	0.001	0.012	Neither	1.3	197
3:00 AM	0.014	0.024	Upwind	0.017	0.041	Upwind	0.018	0.012	Downwind	0.009	0.021	Downwind	0.013	0.029	Downwind	0.018	0.021	Downwind	0.002	0.023	Downwind	1.0	247
4:00 AM	0.017	0.032	Upwind	0.014	0.036	Upwind	0.016	0.031	Downwind	0.007	0.026	Downwind	0.016	0.032	Downwind	0.022	0.02	Downwind	0.003	0.027	Downwind	1.6	244
5:00 AM	0.014	0.034	Upwind	0.012	0.038	Upwind	0.01	0.019	Neither	0.007	0.024	Downwind	0.014	0.023	Downwind	0.011	0.02	Downwind	0.005	0.026	Downwind	2.4	225*
6:00 AM	0.013	0.019	Upwind	0.014	0.041	Upwind	0.014	0.019	Neither	0.007	0.023	Downwind	0.012	0.025	Downwind	0.011	0.016	Downwind	0.006	0.019	Downwind	2.3	223
7:00 AM	0.017	0.027	Upwind	0.016	0.029	Neither	0.013	0.024	Downwind	0.009	0.046	Upwind	0.018	0.026	Downwind	0.014	0.036	Downwind	0.007	0.031	Neither	2.8	304
8:00 AM	0.013	0.027	Upwind	0.016	0.037	Upwind	0.017	0.032	Downwind	0.008	0.041	Upwind	0.02	0.081	Downwind	0.019	0.035	Downwind	0.006	0.036	Downwind	3.4	280
9:00 AM	0.021	0.033	Upwind	0.013	0.029	Upwind	0.014	0.027	Downwind	0.012	0.035	Upwind	0.016	0.037	Downwind	0.016	0.039	Downwind	0.004	0.032	Downwind	4.6	288
10:00 AM	0.015	0.043	Upwind	0.012	0.025	Neither	0.013	0.029	Downwind	0.01	0.04	Upwind	0.019	0.043	Downwind	0.02	0.031	Downwind	0.016	0.035	Neither	3.0	303
11:00 AM	0.028	0.052	Upwind	0.016	0.059	Upwind	0.024	0.038	Neither	0.007	0.034	Downwind	0.018	0.07	Downwind	0.018	0.037	Downwind	0.014	0.026	Downwind	4.8	229
12:00 PM	0.017	0.009	Upwind	0.022	0.042	Upwind	0.009	0.002	Neither	0.009	0.01	Downwind	0.013	0.008	Downwind	0.016	0.026	Downwind	0.009	0.04	Downwind	6.6	225
1:00 PM	0.007	0.011	Upwind	0.007	0.003	Upwind	0.007	0.002	Neither	0.004	0.066	Downwind	0.009	0.009	Downwind	0.01	0.022	Downwind	0.006	0.027	Downwind	4.6	227
2:00 PM	0.008	0.014	Upwind	0.006	0.007	Upwind	0.004	0.004	Downwind	0.004	0.05	Downwind	0.008	0.015	Downwind	0.01	0.023	Downwind	P	0.016	Downwind	4.9	257
3:00 PM	0.008	0.013	Upwind	0.006	0.018	Upwind	0.01	0.013	Downwind	0.007	0.025	Neither	0.008	0.016	Downwind	0.015	0.028	Downwind	P	0.016	Downwind	3.6	267
4:00 PM	0.01	0.02	Upwind	0.014	0.009	Downwind	0.017	0.013	Downwind	0.007	0.036	Upwind	0.016	0.01	Upwind	0.014	0.024	Upwind	P	0.015	Upwind	7.5	352
5:00 PM	0.018	0.019	Upwind	0.013	0.022	Downwind	0.026	0.016	Downwind	0.011	0.019	Upwind	0.017	0.016	Upwind	0.012	0.02	Upwind	0.016	0.026	Upwind	6.6	3
6:00 PM	0.014	0.018	Upwind	0.018	0.014	Downwind	0.013	0.018	Downwind	0.008	0.018	Upwind	0.016	0.022	Upwind	0.016	0.013	Upwind	0.004	0.01	Upwind	4.3	20
7:00 PM	0.014	0.017	Upwind	0.007	0.024	Downwind	0.014	0.017	Downwind	0.005	0.012	Upwind	0.012	0.023	Upwind	0.018	0.017	Upwind	0.005	0.02	Upwind	3.7	19
8:00 PM	0.018	0.016	Downwind	0.012	0.008	Neither	0.021	0.022	Upwind	0.012	0.025	Neither	0.018	0.02	Neither	0.015	0.015	Upwind	0.015	0.006	Upwind	2.3	150*
9:00 PM	0.024	0.025	Neither	0.009	0.027	Neither	0.023	0.027	Neither	0.018	0.029	Neither	0.016	0.027	Neither	0.021	0.02	Neither	0.012	0.006	Neither	0.8	237*
10:00 PM	0.02	0.033	Upwind	0.019	0.03	Downwind	0.017	0.021	Downwind	0.012	0.027	Upwind	0.015	0.032	Upwind	0.017	0.021	Upwind	0.01	0.016	Upwind	1.9	348
11:00 PM	0.019	0.028	Upwind	0.016	0.011	Downwind	0.026	0.021	Downwind	0.01	0.029	Upwind	0.018	0.029	Upwind	0.02	0.022	Upwind	0.015	P	Upwind	2.2	356
12:00 AM	0.017	0.03	Upwind	0.014	0.019	Downwind	0.019	0.023	Downwind	0.011	0.024	Upwind	0.021	0.031	Upwind	0.018	0.02	Upwind	0.015	0.008	Upwind	2.6	7
AVERAGE	0.015458	0.025		0.013458	0.025417		0.016	0.019375		0.008792	0.02975		0.015458	0.029		0.0158333	0.0237917		0.0082381	0.0213913		3.3	209

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		87.5%	95.8%			
neither			12.5%			20.8%			29.2%			16.7%			12.5%			12.5%			20.8%		
upwind			83.3%			50.0%			8.3%			45.8%			29.2%			33.3%			33.3%		
downwind			4.2%			29.2%			62.5%			37.5%			58.3%			54.2%			45.8%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

August 22, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.013	0.016	Upwind	0.023	0.013	Upwind	0.007	0.008	Upwind	0.004	0.013	Downwind	0.01	0.016	Downwind	0.006	0.012	Downwind	T/F	0.009	Downwind	6.0	213
1:00 AM	0.012	0.022	Upwind	0.006	0.013	Upwind	0.009	0.012	Upwind	0.006	0.017	Downwind	0.012	0.024	Downwind	0.009	0.017	Downwind	T/F	0.01	Downwind	5.6	211
2:00 AM	0.01	0.02	Neither	0.008	0.017	Upwind	0.013	0.012	Upwind	0.005	0.018	Downwind	0.011	0.016	Downwind	0.008	0.009	Downwind	T/F	0.009	Neither	4.1	207
3:00 AM	0.012	0.02	Neither	0.009	0.019	Upwind	0.015	0.01	Upwind	-0.002	0.013	Downwind	0.015	0.02	Downwind	0.013	0.01	Neither	T/F	0.007	Neither	4.3	204
4:00 AM	0.014	0.018	Upwind	0.016	0.026	Upwind	0.008	0.018	Upwind	-0.001	0.012	Downwind	0.012	0.019	Downwind	0.009	0.01	Downwind	T/F	0.008	Downwind	4.5	217
5:00 AM	0.012	0.02	Upwind	0.009	0.021	Upwind	0.014	0.009	Upwind	0.004	0.015	Downwind	0.012	0.022	Downwind	0.01	0.012	Downwind	T/F	0.009	Downwind	2.7	214
6:00 AM	0.014	0.011	Upwind	0.018	0.024	Upwind	0.01	0.007	Neither	0.003	0.017	Downwind	0.017	0.022	Downwind	0.01	0.01	Downwind	T/F	0.009	Downwind	2.0	230
7:00 AM	0.011	0.021	Neither	0.013	0.025	Upwind	0.011	0.009	Upwind	0.005	0.016	Downwind	0.012	0.023	Downwind	0.018	0.024	Downwind	T/F	0.009	Neither	3.2	209
8:00 AM	0.012	0.014	Upwind	0.011	0.033	Upwind	0.01	0.012	Downwind	0.006	0.015	Downwind	0.01	0.026	Downwind	0.014	0.021	Downwind	T/F	0.017	Downwind	4.0	243
9:00 AM	0.011	0.013	Upwind	0.018	0.024	Upwind	0.009	0.007	Upwind	0.005	0.01	Downwind	0.011	0.029	Downwind	0.012	0.017	Downwind	T/F	0.022	Downwind	7.3	218
10:00 AM	0.01	0.014	Upwind	0.014	0.016	Upwind	0.013	0.008	Upwind	0.007	0.01	Downwind	0.014	0.001	Downwind	0.014	0.022	Downwind	T/F	0.016	Downwind	7.5	220
11:00 AM	0.01	0.018	Upwind	0.018	0.017	Upwind	0.011	0.016	Neither	0.01	0.026	Downwind	0.01	0.005	Downwind	0.012	0.027	Downwind	T/F	0.012	Downwind	7.1	229
12:00 PM	0.009	0.01	Upwind	0.009	0.012	Upwind	0.008	0.016	Upwind	0.008	0.011	Downwind	0.011	0.009	Downwind	0.012	0.023	Downwind	T/F	0.013	Downwind	7.9	213
1:00 PM	0.009	0.01	Upwind	0.005	0.013	Upwind	0.005	0.01	Upwind	0.005	0.011	Downwind	0.008	0.012	Downwind	0.015	0.015	Downwind	T/F	0.018	Downwind	7.2	211
2:00 PM	0.01	0.011	Upwind	0.019	0.017	Upwind	0.01	0.009	Upwind	0.003	0.012	Downwind	0.006	0.011	Downwind	0.012	0.013	Downwind	T/F	0.008	Downwind	7.2	210
3:00 PM	0.011	0.013	Downwind	0.006	0.007	Upwind	0.007	0.013	Upwind	0.007	0.01	Downwind	0.007	0.01	Downwind	0.012	0.013	Neither	T/F	0.01	Upwind	6.4	185
4:00 PM	0.012	0.01	Neither	0.009	0.024	Upwind	0.008	0.008	Upwind	0.005	0.031	Downwind	0.011	0.011	Downwind	0.014	0.012	Neither	T/F	0.011	Neither	6.3	192
5:00 PM	0.012	0.012	Downwind	0.011	0.018	Upwind	0.012	0.01	Upwind	0.004	0.017	Downwind	0.017	0.012	Downwind	0.012	0.013	Neither	T/F	0.01	Upwind	5.2	185
6:00 PM	0.012	0.017	Neither	0.014	0.027	Upwind	0.014	0.01	Upwind	0.006	0.01	Downwind	0.016	0.01	Downwind	0.011	0.013	Neither	T/F	0.006	Neither	5.3	196
7:00 PM	0.01	0.016	Downwind	0.01	0.016	Upwind	0.012	0.015	Upwind	0.005	0.015	Downwind	0.014	0.009	Downwind	0.015	0.013	Neither	T/F	0.021	Upwind	2.9	178
8:00 PM	0.017	0.018	Neither	0.009	0.022	Upwind	0.022	0.016	Upwind	0.005	0.021	Downwind	0.011	0.022	Downwind	0.012	0.014	Neither	T/F	0.008	Neither	1.3	191
9:00 PM	0.016	0.019	Neither	0.011	0.023	Upwind	0.013	0.016	Upwind	0.007	0.017	Downwind	0.015	0.023	Downwind	0.013	0.012	Downwind	T/F	0.008	Neither	2.8	206
10:00 PM	0.017	0.02	Neither	0.012	0.015	Upwind	0.016	0.019	Upwind	0.005	0.019	Downwind	0.014	0.021	Downwind	0.013	0.012	Neither	T/F	0.006	Neither	2.9	200
11:00 PM	0.015	0.021	Neither	0.008	0.017	Upwind	0.011	0.017	Upwind	0.003	0.012	Downwind	0.012	0.02	Downwind	0.013	0.016	Downwind	T/F	0.004	Neither	4.7	205
12:00 AM	0.015	0.018	Upwind	0.012	0.013	Upwind	0.013	0.008	Upwind	0.005	0.011	Downwind	0.011	0.012	Downwind	0.013	0.011	Downwind	T/F	0.006	Downwind	4.2	218
24 - AVERAGE	0.012208	0.016083		0.011458	0.019125		0.011417	NA		0.004833	0.01525		0.012042	0.016208		0.012333	0.014958		NA	0.0107083			

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	0.0%		100.0%	100.0%		100.0%	100.0%		0.0%	100.0%		0.0%	100.0%			
neither			37.5%			0.0%			8.3%			0.0%			0.0%			33.3%			37.5%		
upwind			50.0%			100.0%			87.5%			0.0%			0.0%			0.0%			12.5%		
downwind			12.5%			0.0%			4.2%			100.0%			100.0%			66.7%			50.0%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

August 25, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	P	P	Upwind	0.008	0.025	Upwind	0.011	0.013	Neither	0.008	0.014	Downwind	0.01	0.021	Downwind	-0.003	0.016	Downwind	P	P	Downwind	3.2	235
1:00 AM	P	P	Upwind	0.009	0.023	Upwind	0.011	0.013	Downwind	0.003	0.015	Downwind	0.009	0.028	Downwind	0.004	0.011	Downwind	P	P	Downwind	1.9	241
2:00 AM	P	P	Upwind	0.006	0.02	Upwind	0.016	0.021	Upwind	0.003	0.027	Downwind	0.013	0.027	Downwind	0.008	0.018	Downwind	P	P	Downwind	4.3	219
3:00 AM	P	P	Upwind	0.011	0.034	Upwind	0.015	0.014	Upwind	0.008	0.02	Downwind	0.011	0.028	Downwind	0.01	0.012	Downwind	P	P	Downwind	3.0	220
4:00 AM	P	P	Upwind	0.014	0.022	Upwind	0.013	0.018	Neither	0.007	0.015	Downwind	0.012	0.031	Downwind	0.013	0.011	Downwind	P	P	Downwind	4.0	229
5:00 AM	P	P	Upwind	0.012	0.027	Upwind	0.015	0.021	Neither	0.004	0.022	Downwind	0.011	0.025	Downwind	0.01	0.017	Downwind	P	P	Downwind	3.8	236
6:00 AM	P	P	Upwind	0.013	0.027	Upwind	0.011	0.015	Downwind	0.009	0.022	Downwind	0.012	0.024	Downwind	0.013	0.018	Downwind	P	P	Downwind	3.2	251
7:00 AM	P	P	Upwind	0.007	0.021	Upwind	0.009	0.02	Downwind	0.009	0.03	Downwind	0.013	0.028	Downwind	0.013	0.024	Downwind	P	P	Downwind	3.5	254
8:00 AM	P	P	Upwind	0.007	0.041	Upwind	0.013	0.015	Downwind	0.004	0.052	Downwind	0.009	0.033	Downwind	0.013	0.037	Downwind	P	P	Downwind	5.4	246
9:00 AM	P	P	Upwind	0.008	0.022	Upwind	0.011	0.022	Downwind	0.004	0.021	Neither	0.009	0.008	Downwind	0.013	0.045	Downwind	P	P	Downwind	7.1	267
10:00 AM	P	P	Upwind	0.014	0.013	Upwind	0.014	0.011	Downwind	0.006	0.033	Neither	0.006	0.033	Downwind	0.017	0.033	Downwind	P	P	Downwind	7.9	266
11:00 AM	P	P	Upwind	0.023	0.027	Upwind	0.01	0.011	Downwind	0.013	0.052	Downwind	0.013	0.034	Downwind	0.015	0.042	Downwind	P	P	Downwind	9.2	260
12:00 PM	P	P	Upwind	0.016	0.029	Upwind	0.014	0.015	Downwind	0.008	0.052	Neither	0.014	0.093	Downwind	0.016	0.045	Downwind	P	P	Downwind	8.7	261
1:00 PM	P	P	Upwind	0.02	0.014	Upwind	0.012	0.021	Downwind	0.012	0.062	Downwind	0.019	0.05	Downwind	0.017	0.061	Downwind	P	P	Downwind	10.2	259
2:00 PM	P	P	Upwind	0.021	0.03	Upwind	0.014	0.02	Downwind	0.013	0.061	Downwind	0.02	0.135	Downwind	0.019	0.079	Downwind	P	P	Downwind	11.1	251
3:00 PM	P	P	Upwind	0.024	0.033	Upwind	0.022	0.025	Downwind	0.013	0.047	Downwind	0.015	0.036	Downwind	0.02	0.048	Downwind	P	P	Downwind	10.2	251
4:00 PM	P	P	Upwind	0.023	0.031	Upwind	0.015	0.026	Downwind	0.015	0.028	Neither	0.017	0.038	Downwind	0.022	0.047	Downwind	P	P	Downwind	9.4	260
5:00 PM	P	P	Upwind	0.019	0.033	Upwind	0.014	0.025	Downwind	0.009	0.031	Neither	0.012	0.035	Downwind	0.028	0.03	Downwind	P	P	Downwind	7.3	271
6:00 PM	P	P	Upwind	0.019	0.022	Upwind	0.022	0.023	Downwind	0.013	0.025	Downwind	0.023	0.026	Downwind	0.014	0.028	Downwind	P	P	Downwind	5.5	250
7:00 PM	P	P	Upwind	0.011	0.025	Upwind	0.015	0.023	Neither	0.014	0.021	Downwind	0.018	0.016	Downwind	0.021	0.018	Downwind	P	P	Downwind	6.1	232
8:00 PM	P	P	Upwind	0.021	0.026	Upwind	0.018	0.022	Downwind	0.014	0.034	Downwind	0.019	0.028	Downwind	0.02	0.022	Downwind	P	P	Downwind	2.8	254
9:00 PM	P	P	Upwind	0.018	0.038	Upwind	0.023	0.023	Neither	0.011	0.024	Downwind	0.016	0.033	Downwind	0.018	0.024	Downwind	P	P	Downwind	3.6	233
10:00 PM	P	P	Upwind	0.017	0.029	Upwind	0.021	0.023	Downwind	0.011	0.029	Neither	0.021	0.031	Downwind	0.02	0.021	Downwind	P	P	Downwind	3.5	263
11:00 PM	P	P	Upwind	0.019	0.029	Downwind	0.024	0.026	Downwind	0.014	0.027	Upwind	0.018	0.032	Upwind	0.018	0.021	Upwind	P	P	Upwind	8.2	3
12:00 AM	P	P	Upwind	0.023	0.029	Downwind	0.019	0.017	Downwind	0.014	0.018	Upwind	0.023	0.025	Upwind	0.018	0.021	Upwind	P	P	Upwind	4.5	1
24 - AVERAGE	NA	NA		0.015625	0.026875		0.015458	0.019583		0.009625	0.032		0.014708	0.036542		0.015833	0.030542		NA	NA			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	100.0%	100.0%	100.0%	0.0%	100.0%	0.0%	100.0%
neither	0.0%		0.0%		16.7%		25.0%		0.0%		0.0%		0.0%	
upwind	100.0%		91.7%		8.3%		8.3%		8.3%		8.3%		8.3%	
downwind	0.0%		8.3%		75.0%		66.7%		91.7%		91.7%		91.7%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

August 28, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.005	0.021	Upwind	0.006	0.02	Upwind	0.006	0.012	Downwind	0.001	0.011	Upwind	0.006	0.017	Downwind	0.007	0.014	Downwind	F	0.006	Downwind	6.8	279
1:00 AM	0.009	0.014	Upwind	0.005	0.021	Upwind	0.013	0.015	Downwind	0.003	0.014	Neither	0.011	0.016	Downwind	0.006	0.009	Downwind	F	0.003	Downwind	5.6	265
2:00 AM	0.01	0.014	Upwind	0.004	0.016	Upwind	0.018	0.012	Downwind	0.006	0.012	Downwind	0.009	0.021	Downwind	0.013	0.007	Downwind	F	0.005	Downwind	5.7	247
3:00 AM	0.009	0.019	Upwind	0.005	0.025	Upwind	0.016	0.008	Downwind	0.006	0.012	Downwind	0.018	0.022	Downwind	0.011	0.006	Downwind	F	0.007	Downwind	4.9	241
4:00 AM	0.007	0.023	Upwind	0.012	0.019	Upwind	0.008	0.011	Downwind	0.004	0.015	Downwind	0.014	0.022	Downwind	0.01	0.003	Downwind	F	0.002	Downwind	4.6	241
5:00 AM	0.012	0.025	Upwind	0.014	0.022	Upwind	0.013	0.018	Downwind	0.002	0.021	Downwind	0.011	0.028	Downwind	0.011	0.018	Downwind	F	0.005	Downwind	3.1	248
6:00 AM	0.012	0.026	Upwind	0.012	0.007	Upwind	0.009	0.017	Downwind	0.003	0.021	Downwind	0.012	0.023	Downwind	0.009	0.017	Downwind	F	0.011	Downwind	2.7	250
7:00 AM	0.012	0.02	Upwind	0.01	0.01	Upwind	0.013	0.015	Neither	0.005	0.035	Downwind	0.016	0.041	Downwind	0.01	0.019	Downwind	F	0.011	Downwind	3.2	237
8:00 AM	0.008	0.017	Upwind	0.011	0.039	Neither	0.012	0.014	Downwind	0.009	0.064	Upwind	0.007	0.03	Downwind	0.015	0.064	Downwind	F	0.036	Neither	2.6	305
9:00 AM	0.01	0.024	Upwind	0.011	0.062	Downwind	0.013	0.028	Downwind	0.007	0.023	Upwind	0.006	0.049	Neither	0.015	0.052	Neither	F	0.033	Upwind	4.7	329
10:00 AM	0.005	0.015	Upwind	0.011	0.022	Downwind	0.009	0.032	Downwind	0.003	0.001	Upwind	0.007	0.004	Downwind	0.013	0.02	Neither	F	0.019	Upwind	5.5	316
11:00 AM	0.008	0.017	Upwind	0.009	0.02	Upwind	0.005	0.082	Downwind	0.002	0.021	Upwind	0.01	0.008	Downwind	0.01	0.032	Downwind	F	0.012	Downwind	4.7	280
12:00 PM	0.007	0.018	Upwind	0.007	0.026	Upwind	0.003	0.017	Downwind	0.005	0.031	Neither	0.005	0.018	Downwind	0.008	0.024	Downwind	F	0.007	Downwind	4.2	264
1:00 PM	0.006	0.02	Upwind	0.009	0.019	Upwind	0.004	0.019	Downwind	0.008	0.056	Downwind	0.004	0.031	Downwind	0.011	0.022	Downwind	F	0.004	Downwind	8.2	240
2:00 PM	0.009	0.025	Upwind	0.009	0.021	Upwind	0.007	0.021	Neither	0.013	0.058	Downwind	0.016	0.096	Downwind	0.015	0.049	Downwind	F	0.007	Downwind	6.4	233
3:00 PM	0.013	0.024	Neither	0.019	0.022	Upwind	0.017	0.052	Upwind	0.012	0.032	Downwind	0.019	0.039	Downwind	0.017	0.039	Downwind	F	0.019	Neither	9.6	207
4:00 PM	0.014	0.018	Upwind	0.013	0.02	Upwind	0.012	0.02	Neither	0.01	0.036	Downwind	0.015	0.048	Downwind	0.012	0.027	Downwind	F	0.002	Downwind	6.7	233
5:00 PM	0.028	0.029	Downwind	0.008	0.025	Neither	0.027	0.028	Upwind	0.025	0.032	Downwind	0.011	0.028	Downwind	0.018	0.014	Neither	F	0.006	Upwind	3.8	172
6:00 PM	0.002	0.023	Neither	0.008	0.033	Upwind	-0.003	0.015	Upwind	*	0.018	Downwind	0.006	0.033	Downwind	0.014	0.01	Neither	F	0.004	Neither	4.0	200
7:00 PM	0.004	0.017	Upwind	0.007	0.015	Upwind	0.004	0.01	Neither	*	0.01	Downwind	0.006	0.031	Downwind	0.007	0.006	Downwind	F	0	Downwind	4.5	230
8:00 PM	0.011	0.018	Upwind	0.005	0.004	Upwind	0.012	0.016	Neither	-0.006	0.007	Downwind	0.008	0.028	Downwind	0.011	0.008	Downwind	F	0	Downwind	3.9	240
9:00 PM	0.017	0.03	Upwind	0.011	0.006	Upwind	0.01	0.012	Neither	0.002	0.017	Downwind	0.012	0.011	Downwind	0.009	0.009	Downwind	F	0.003	Downwind	5.1	245
10:00 PM	0.012	0.02	Upwind	0.009	0.007	Upwind	0.01	0.013	Upwind	0.002	0.018	Downwind	0.009	0.012	Downwind	0.016	0.01	Downwind	F	0.005	Downwind	2.0	211
11:00 PM	0.008	0.025	Upwind	0.006	0.041	Upwind	0.008	0.011	Upwind	0.001	0.014	Downwind	0.007	0.034	Downwind	0.012	0.012	Downwind	F	0.009	Downwind	2.4	217
12:00 AM	0.008	0.025	Upwind	0.003	0.014	Upwind	0.013	0.008	Neither	0	0.016	Downwind	0.005	0.021	Downwind	0.018	P	Downwind	F	0.016	Downwind	2.3	225
24 - AVERAGE	0.010042	0.021083		0.009083	0.0215		0.010542	0.020583		0.005545	0.024333		0.010167	0.028917		0.012125	0.020739		NA	0.0094167			

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		91.6%	100.0%		100.0%	100.0%		100.0%	95.8%		0.0%	100.0%			
neither			8.3%			8.3%			29.2%			8.3%			4.2%			16.7%			12.5%	
upwind			87.5%			83.3%			20.8%			16.7%			0.0%			0.0%			12.5%	
downwind			4.2%			8.3%			50.0%			75.0%			95.8%			83.3%			75.0%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

August 31, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.013	0.028	Upwind	0.008	0.036	Neither	0.011	0.019	Downwind	0.001	0.02	Upwind	0.012	0.027	Downwind	0.004	0.021	Downwind	-0.003	0.014	Neither	2.7	294
1:00 AM	0.012	0.022	Upwind	0.008	0.031	Downwind	0.009	0.011	Neither	0.004	0.013	Upwind	0.01	0.027	Upwind	0.006	0.013	Upwind	-0.003	0.013	Upwind	1.2	38
2:00 AM	0.007	0.022	Upwind	0.005	0.023	Downwind	0.009	0.012	Downwind	0.003	0.011	Upwind	0.013	0.027	Upwind	0.008	0.016	Upwind	-0.002	0.012	Upwind	2.3	15
3:00 AM	0.009	0.02	Upwind	0.011	0.035	Downwind	0.013	0.022	Downwind	0.002	0.011	Upwind	0.013	0.03	Upwind	0.012	0.029	Upwind	0	0.021	Upwind	1.3	25
4:00 AM	0.008	0.015	Upwind	0.01	0.028	Downwind	0.011	0.016	Neither	0.004	0.013	Upwind	0.01	0.026	Upwind	0.011	0.016	Upwind	0	0.006	Upwind	2.9	47
5:00 AM	0.01	0.022	Upwind	0.006	0.03	Downwind	0.01	0.013	Neither	0.005	0.013	Upwind	0.014	0.026	Upwind	0.01	0.015	Upwind	0.005	0.01	Upwind	3.7	46
6:00 AM	0.011	0.018	Upwind	0.013	0.035	Downwind	0.01	0.014	Neither	0.004	0.019	Upwind	0.016	0.036	Upwind	0.013	0.029	Upwind	0.008	0.016	Upwind	3.9	42
7:00 AM	0.011	0.026	Neither	0.013	0.042	Downwind	0.009	0.018	Neither	0.002	0.013	Upwind	0.015	0.032	Upwind	0.016	0.032	Upwind	0.009	0.029	Upwind	6.3	58
8:00 AM	0.01	0.035	Neither	0.017	0.024	Downwind	0.008	0.021	Upwind	0.001	0.026	Upwind	0.01	0.03	Upwind	0.012	0.028	Upwind	0.006	0.028	Upwind	4.7	68
9:00 AM	0.008	0.029	Neither	0.015	0.017	Downwind	0.006	0.005	Upwind	0.001	0.003	Upwind	0.006	0.03	Upwind	0.012	0.032	Upwind	0.005	0.032	Upwind	3.4	66
10:00 AM	0.007	0.024	Neither	0.009	0.061	Downwind	0.008	0.006	Neither	0.001	0.007	Upwind	0.008	0.014	Upwind	0.008	0.026	Upwind	0.004	0.057	Upwind	3.4	57
11:00 AM	0.007	0.034	Downwind	0.009	0.033	Downwind	0.007	0.013	Upwind	-0.003	0.019	Upwind	0.007	0.022	Upwind	0.009	0.043	Upwind	0.005	0.031	Upwind	4.3	120
12:00 PM	0.009	0.026	Downwind	0.007	0.014	Downwind	0.006	0.008	Neither	-0.002	0.02	Upwind	0.008	0.023	Upwind	0.008	0.034	Upwind	0.004	0.007	Upwind	4.3	128
1:00 PM	0.008	0.02	Downwind	0.004	0.021	Downwind	0.003	0.003	Upwind	0	0.008	Upwind	0.008	0.027	Upwind	0.009	0.016	Upwind	0.007	0.016	Upwind	5.2	132
2:00 PM	0.007	0.017	Downwind	0.003	0.013	Neither	0.003	0.006	Upwind	0.001	0.016	Downwind	0.006	0.013	Neither	0.008	0.012	Upwind	0.005	0.015	Upwind	4.0	165
3:00 PM	0.007	0.014	Downwind	0	0.017	Downwind	0.006	0.008	Upwind	0.001	0.007	Upwind	0.008	0.009	Upwind	0.007	0.013	Upwind	0.005	0.011	Upwind	4.2	134
4:00 PM	0.007	0.019	Downwind	0	0.015	Downwind	0.01	0.008	Upwind	0.001	0.007	Upwind	0.006	0.006	Upwind	0.008	0.014	Upwind	0.005	0.006	Upwind	3.6	134
5:00 PM	0.009	0.015	Downwind	0.005	0.006	Downwind	0.01	0.013	Upwind	0.002	0.016	Upwind	0.007	0.006	Upwind	0.01	0.012	Upwind	0.005	0.004	Upwind	3.2	138
6:00 PM	0.009	0.016	Downwind	0.007	0.018	Downwind	0.007	0.014	Upwind	0	0.009	Upwind	0.005	0.01	Upwind	0.008	0.008	Upwind	0.005	0.001	Upwind	3.1	103
7:00 PM	0.007	0.012	Downwind	0.004	0.006	Upwind	0.007	0.008	Upwind	0.001	0.014	Downwind	0.006	0.019	Downwind	0.007	0.006	Neither	0.003	0	Neither	2.7	191
8:00 PM	0.008	0.023	Downwind	0.004	0.019	Downwind	0.007	0.01	Upwind	0.001	0.012	Upwind	0.009	0.017	Upwind	0.008	0.004	Upwind	0.002	0	Upwind	1.9	140
9:00 PM	0.009	0.013	Downwind	0.008	0.017	Downwind	0.007	0.007	Upwind	0.002	0.008	Upwind	0.004	0.021	Upwind	0.011	0.006	Upwind	0.004	0.005	Upwind	2.1	124
10:00 PM	0.007	0.011	Upwind	0.006	0.018	Downwind	0.012	0.01	Downwind	0.001	0.009	Upwind	0.003	0.016	Upwind	0.012	0.012	Upwind	0.004	0.013	Upwind	2.5	22
11:00 PM	0.009	0.023	Downwind	0.007	0.027	Downwind	0.008	0.008	Upwind	-0.001	0.017	Upwind	0.007	0.018	Upwind	P	P	Upwind	0.003	0.01	Upwind	2.7	102
12:00 AM	0.007	0.018	Downwind	0.005	0.027	Downwind	0.009	0.011	Upwind	0.002	0.01	Upwind	0.007	0.016	Upwind	P	P	Upwind	0.008	0.016	Upwind	3.2	95
24 - AVERAGE	0.008458	0.020583		0.007333	0.024042		0.008125	0.011042		0.001375	0.012542		0.008583	0.020875		0.009682	0.018909		0.004042	0.0149583			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	91.7%	91.7%	0.0%	100.0%
neither	16.7%		4.2%		29.2%		0.0%		4.2%		4.2%		4.2%	
upwind	29.2%		4.2%		58.3%		91.7%		91.7%		95.8%		95.8%	
downwind	54.2%		91.7%		12.5%		8.3%		4.2%		0.0%		0.0%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

November 5, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.017	0.031	Upwind	0.011	F	Upwind	0.018	0.042	Upwind	0.018	0.033	Downwind	0.017	0.031	Downwind	-0.005	0.02	Downwind	0.002	0.027	Downwind	2.7	214
1:00 AM	0.015	0.023	Upwind	0.012	0.015	Upwind	0.017	0.047	Upwind	0.014	0.034	Downwind	0.021	0.027	Downwind	-0.002	0.017	Downwind	0.004	0.021	Downwind	1.3	219
2:00 AM	0.011	0.02	Upwind	0.018	0.011	Downwind	0.021	0.038	Downwind	0.014	0.032	Upwind	0.021	0.024	Neither	0.003	0.012	Upwind	0.005	0.013	Upwind	1.1	340
3:00 AM	0.013	0.022	Upwind	0.022	0.06	Upwind	0.019	0.042	Downwind	0.013	0.034	Upwind	0.019	0.029	Downwind	0.004	0.013	Downwind	0.009	0.017	Downwind	0.9	278
4:00 AM	0.017	0.023	Upwind	0.022	0.026	Neither	0.016	0.033	Downwind	0.019	0.03	Upwind	0.019	0.025	Downwind	0.002	0.012	Downwind	0.011	0.022	Neither	0.4	309
5:00 AM	0.013	0.027	Upwind	0.011	0.012	Neither	0.017	0.035	Downwind	0.021	0.033	Upwind	0.016	0.024	Downwind	0.003	0.018	Downwind	0.009	0.022	Upwind	0.6	310
6:00 AM	0.018	0.025	Upwind	0.022	0.018	Downwind	0.015	0.04	Downwind	0.018	0.042	Upwind	0.022	0.028	Neither	0.005	0.016	Upwind	0.014	0.032	Upwind	1.0	338
7:00 AM	0.017	0.027	Upwind	0.02	0.016	Upwind	0.019	0.048	Downwind	0.02	0.07	Downwind	0.023	0.038	Downwind	0.009	0.016	Downwind	0.013	0.042	Downwind	0.4	260
8:00 AM	0.014	0.028	Upwind	0.019	0.017	Upwind	0.018	0.061	Downwind	0.022	0.067	Neither	0.027	0.066	Downwind	0.016	0.054	Downwind	0.015	0.068	Downwind	1.0	272
9:00 AM	0.012	0.021	Upwind	0.005	0.009	Upwind	0.005	0.036	Neither	0.015	0.037	Downwind	0.015	0.031	Downwind	0.004	0.017	Downwind	0.002	0.035	Downwind	2.9	230
10:00 AM	0.012	0.019	Upwind	0.013	0.01	Upwind	0.006	0.028	Neither	0.009	0.031	Downwind	0.018	0.021	Downwind	0.006	0.019	Downwind	0	0.029	Downwind	3.3	237
11:00 AM	0.009	0.019	Upwind	0.022	0.008	Upwind	0.012	0.069	Upwind	0.009	0.025	Downwind	0.015	0.024	Downwind	0.008	0.013	Downwind	0.004	0.019	Downwind	5.8	217
12:00 PM	0.007	0.018	Upwind	0.006	0.006	Upwind	0.008	0.033	Neither	0.01	0.063	Downwind	0.016	0.058	Downwind	0.007	0.014	Downwind	0.006	0.015	Downwind	5.1	229
1:00 PM	0.004	0.011	Neither	0.017	0.008	Upwind	0.006	0.021	Upwind	0.009	0.094	Downwind	0.017	0.015	Downwind	0.006	0.016	Neither	0.004	0.015	Neither	6.4	197
2:00 PM	0.007	0.026	Neither	0.013	0.007	Upwind	0.01	0.031	Upwind	0.009	0.079	Downwind	0.017	0.026	Downwind	0.004	0.021	Downwind	0.001	0.015	Neither	9.5	209
3:00 PM	0.009	0.012	Neither	0.015	0.014	Upwind	0.01	0.025	Upwind	0.012	0.054	Downwind	0.011	0.015	Downwind	0.003	0.011	Neither	0.002	0.016	Neither	7.8	203
4:00 PM	0.008	0.016	Neither	0.009	0.012	Upwind	0.013	0.02	Upwind	0.015	*	Downwind	0.02	0.002	Downwind	0.003	0.011	Neither	0.009	0.008	Neither	4.1	190
5:00 PM	0.009	0.023	Neither	0.017	0.03	Upwind	0.015	0.025	Upwind	0.017	*	Downwind	0.021	0	Downwind	0.007	0.01	Neither	0.007	0.016	Neither	5.0	200
6:00 PM	0.01	0.016	Neither	0.014	0.017	Upwind	0.02	-0.005	Upwind	0.02	0.016	Downwind	0.016	0.017	Downwind	0.006	0.01	Neither	0.01	0.019	Neither	4.9	200
7:00 PM	0.01	0.021	Neither	0.017	0.014	Upwind	0.014	0.036	Upwind	0.008	0.023	Downwind	0.016	0.016	Downwind	0.005	0.015	Neither	0.012	0.021	Neither	3.3	199
8:00 PM	0.012	0.019	Upwind	0.015	0.016	Upwind	0.009	0.041	Downwind	0.011	0.028	Downwind	0.017	0.029	Downwind	0.005	0.017	Downwind	0.017	0.022	Downwind	0.5	253
9:00 PM	0.012	0.017	Upwind	0.016	0.02	Upwind	0.022	0.044	Upwind	0.015	0.04	Downwind	0.021	0.027	Downwind	0.008	0.02	Downwind	0.013	0.021	Downwind	1.1	218
10:00 PM	0.01	0.021	Upwind	0.024	0.023	Upwind	0.02	0.045	Neither	0.017	0.04	Downwind	0.022	0.032	Downwind	0.012	0.016	Downwind	0.012	0.031	Downwind	1.3	222
11:00 PM	0.019	0.028	Upwind	0.018	0.017	Downwind	0.022	0.055	Downwind	0.017	0.04	Upwind	0.024	0.038	Downwind	0.01	0.021	Neither	0.019	0.034	Upwind	0.5	325
12:00 AM	0.016	0.025	Upwind	0.016	0.021	Upwind	0.021	0.051	Neither	0.019	0.041	Downwind	0.026	0.036	Downwind	0.009	0.026	Downwind	0.016	0.037	Downwind	1.5	236
24 - AVERAGE	0.011833	0.021125		0.015958	0.016958		0.014792	0.037458		0.014708	0.043318		0.019167	0.027		0.005958	0.017292		0.008917	0.0245833			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	91.7%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
neither	29.2%		8.3%		20.8%		4.2%		8.3%		29.2%		33.3%	
upwind	70.8%		79.2%		41.7%		25.0%		0.0%		8.3%		16.7%	
downwind	0.0%		12.5%		37.5%		70.8%		91.7%		62.5%		50.0%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

November 8, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.033	0.06	Upwind	0.063	0.063	Upwind	0.058	0.103	Neither	0.054	0.097	Downwind	0.063	0.091	Downwind	0.033	0.063	Downwind	0.039	0.0092	Downwind	1.7	233
1:00 AM	0.038	0.056	Upwind	0.066	0.059	Upwind	0.059	0.104	Neither	0.051	0.073	Downwind	0.07	0.087	Downwind	0.054	0.064	Downwind	0.048	0.078	Downwind	2.2	220
2:00 AM	0.044	0.049	Upwind	0.063	0.062	Upwind	0.062	0.116	Upwind	0.057	0.079	Downwind	0.073	0.09	Downwind	0.053	0.063	Downwind	0.068	0.09	Downwind	2.6	213
3:00 AM	0.046	0.057	Neither	0.132	0.126	Neither	0.177	0.228	Neither	0.081	0.105	Neither	0.118	0.156	Neither	0.182	0.186	Neither	0.177	0.184	Neither	0.4	248*
4:00 AM	0.065	0.075	Upwind	0.063	0.063	Upwind	0.071	0.117	Neither	0.087	0.105	Downwind	0.155	0.179	Downwind	0.158	0.154	Downwind	0.07	0.09	Downwind	2.6	228
5:00 AM	0.055	0.056	Neither	0.046	0.044	Upwind	0.05	0.081	Upwind	0.111	0.147	Downwind	0.058	0.078	Downwind	0.043	0.053	Downwind	0.17	0.198	Neither	3.6	207
6:00 AM	0.07	0.078	Neither	0.088	0.092	Neither	0.124	0.168	Neither	0.092	0.124	Neither	0.138	0.223	Neither	0.206	0.216	Neither	0.217	0.242	Neither	1.0	270*
7:00 AM	0.065	0.065	Upwind	0.054	0.049	Upwind	0.069	0.103	Neither	0.096	0.116	Downwind	0.096	0.109	Downwind	0.052	0.068	Downwind	0.135	0.163	Downwind	3.1	228
8:00 AM	0.075	0.087	Neither	0.153	0.137	Neither	0.106	0.152	Neither	0.063	0.097	Neither	0.108	0.121	Neither	0.066	0.071	Neither	0.083	0.126	Neither	0.7	340*
9:00 AM	0.06	0.075	Upwind	0.063	0.067	Upwind	0.069	0.099	Downwind	0.046	0.06	Downwind	0.036	0.032	Downwind	0.031	0.046	Downwind	0.03	0.083	Downwind	1.1	253.556*
10:00 AM	0.025	0.041	Neither	0.024	0.032	Upwind	0.014	0.091	Upwind	0.029	0.042	Downwind	0.029	0.057	Downwind	0.023	0.038	Neither	0.036	0.05	Neither	1.6	204
11:00 AM	0.016	0.027	Neither	0.015	0.018	Neither	0.018	0.03	Neither	0.017	0.049	Neither	0.024	0.038	Neither	0.01	0.026	Neither	0.019	0.029	Neither	0.9	39*
12:00 PM	0.016	0.022	Downwind	0.02	0.008	Upwind	0.009	0.025	Upwind	0.008	0.01	Downwind	0.016	0.02	Downwind	0.007	0.02	Neither	0.009	0.002	Upwind	2.2	175
1:00 PM	0.012	0.022	Downwind	0.019	0.012	Neither	0.014	0.031	Upwind	0.014	0.023	Neither	0.024	0.016	Neither	0.004	0.017	Upwind	0.013	R	Upwind	3.0	158
2:00 PM	0.013	0.015	Downwind	0.009	0.014	Neither	0.015	0.024	Upwind	0.009	0.009	Neither	0.017	0.01	Downwind	0.002	0.011	Upwind	0.008	R	Upwind	3.5	163
3:00 PM	0.013	0.017	Downwind	0.01	0.009	Upwind	0.012	0.01	Upwind	0.012	0.01	Downwind	0.012	0.007	Downwind	0.001	0.011	Neither	0.005	R	Upwind	4.4	188
4:00 PM	0.01	0.014	Neither	0.011	0.01	Upwind	0.012	0.029	Upwind	0.015	0.012	Downwind	0.021	0.005	Downwind	0.007	0.013	Neither	0.011	R	Neither	3.3	191
5:00 PM	0.011	0.019	Neither	0.017	0.017	Upwind	0.019	0.025	Upwind	0.016	0.012	Downwind	0.021	0.002	Downwind	0.009	0.015	Neither	0.013	R	Neither	2.4	193
6:00 PM	0.016	0.018	Neither	0.025	0.023	Upwind	0.024	0.022	Upwind	0.022	0.007	Downwind	0.026	0	Downwind	0.013	0.018	Neither	0.015	0.021	Neither	2.4	196
7:00 PM	0.022	0.027	Neither	0.027	0.021	Upwind	0.026	-0.005	Upwind	0.026	0.016	Downwind	0.02	0.029	Downwind	0.017	0.016	Neither	0.02	0.029	Neither	2.8	199
8:00 PM	0.018	0.027	Upwind	0.032	0.019	Upwind	0.02	0.068	Upwind	0.02	0.034	Downwind	0.028	0.025	Downwind	0.009	0.015	Downwind	0.017	0.029	Downwind	1.2	212
9:00 PM	0.019	0.026	Upwind	0.022	0.024	Upwind	0.025	0.128	Upwind	0.02	0.04	Downwind	0.027	0.049	Downwind	0.017	0.049	Downwind	0.022	0.058	Downwind	1.3	212
10:00 PM	0.017	0.033	Upwind	0.028	0.034	Upwind	0.028	0.065	Neither	0.03	0.05	Downwind	0.037	0.054	Downwind	0.028	0.037	Downwind	0.025	0.054	Downwind	1.4	239
11:00 PM	0.017	0.028	Upwind	0.034	0.037	Upwind	0.034	0.065	Neither	0.03	0.05	Downwind	0.039	0.055	Downwind	0.03	0.036	Downwind	0.038	0.055	Downwind	2.0	231
12:00 AM	0.025	0.031	Upwind	0.032	0.035	Upwind	0.032	0.068	Neither	0.029	0.058	Downwind	0.036	0.036	Downwind	0.021	0.028	Downwind	0.029	0.046	Downwind	2.3	225
24 - AVERAGE	0.032	0.040208		0.043875	0.042167		0.045375	0.076833		0.040875	0.055333		0.051208	0.061583		0.043458	0.052958		0.05325	0.0856316			

% valid samples	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	79.2%
neither	41.7%		25.0%		41.7%		25.0%		20.8%		45.8%	41.7%
upwind	41.7%		75.0%		54.2%		0.0%		0.0%		8.3%	16.7%
downwind	16.7%		0.0%		4.2%		75.0%		79.2%		45.8%	41.7%

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

November 11, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.005	0.014	Neither	0.01	0.004	Upwind	0.008	0.034	Upwind	0.012	0.032	Downwind	0.012	0.019	Downwind	FE	0.008	Neither	FE	0.028	Neither	0.6	200
1:00 AM	0.004	0.014	Neither	0.006	0.006	Upwind	0.005	0.035	Upwind	0.009	0.023	Downwind	0.013	0.022	Downwind	FE	0.004	Neither	FE	0.027	Neither	1.9	204
2:00 AM	0.005	0.013	Neither	0.006	0.007	Upwind	0.005	0.028	Upwind	0.01	0.02	Downwind	0.009	0.019	Downwind	FE	-0.001	Neither	FE	0.025	Neither	2.4	202
3:00 AM	0.007	0.009	Neither	0.006	0.004	Upwind	0.008	0.028	Upwind	0.01	0.029	Downwind	0.007	0.02	Downwind	FE	0	Neither	FE	0.011	Neither	2.5	195
4:00 AM	0.006	0.013	Downwind	0.006	0.005	Upwind	0.014	0.034	Upwind	0.008	0.024	Downwind	0.011	0.019	Downwind	FE	0.002	Neither	FE	0.011	Upwind	1.0	181
5:00 AM	0.008	0.013	Neither	0.006	0.005	Neither	0.009	0.027	Neither	0.01	0.021	Neither	0.009	0.02	Neither	FE	0.003	Neither	FE	0.019	Neither	0.9	231
6:00 AM	0.006	0.026	Upwind	0.007	0.004	Downwind	0.006	0.048	Downwind	0.015	0.033	Upwind	0.014	0.032	Upwind	FE	0.028	Upwind	FE	0.04	Upwind	2.0	2
7:00 AM	0.006	0.024	Downwind	0.005	0.007	Downwind	0.008	0.053	Upwind	0.011	0.075	Upwind	0.016	0.058	Upwind	FE	0.05	Upwind	FE	0.056	Upwind	0.6	128
8:00 AM	0.006	0.028	Downwind	0.005	0.014	Neither	0.005	0.048	Upwind	0.011	0.049	Neither	0.014	0.046	Neither	FE	0.029	Upwind	FE	0.051	Upwind	1.3	147
9:00 AM	0.004	0.014	Downwind	0.009	0.009	Upwind	0.002	0.057	Upwind	0.006	0.044	Downwind	P	P	Downwind	FE	0.024	Neither	FE	0.024	Upwind	3.4	189
10:00 AM	0.002	0.015	Neither	0.005	0.008	Upwind	0.001	0.033	Upwind	0.007	0.038	Downwind	P	P	Downwind	FE	0.022	Neither	FE	0.024	Neither	4.1	196
11:00 AM	0	0.02	Neither	0.007	0.014	Upwind	0.002	0.03	Upwind	0.011	0.044	Downwind	P	P	Downwind	FE	0.027	Neither	FE	0.03	Neither	7.1	198
12:00 PM	0.002	0.017	Neither	0.011	0.012	Upwind	0.004	0.041	Upwind	0.01	0.039	Downwind	P	P	Downwind	FE	0.03	Neither	FE	0.031	Neither	6.6	195
1:00 PM	0.006	0.021	Neither	0.009	0.007	Upwind	0.006	0.055	Upwind	0.008	0.05	Downwind	P	P	Downwind	FE	0.013	Downwind	FE	0.022	Neither	8.9	206
2:00 PM	0.004	0.011	Neither	0.006	0.03	Upwind	0.005	0.037	Upwind	0.006	0.046	Downwind	P	P	Downwind	FE	0.012	Neither	FE	0.009	Neither	6.6	199
3:00 PM	0.001	0.01	Downwind	0.006	*	Upwind	0.005	0.023	Upwind	0.004	0.031	Downwind	P	P	Downwind	FE	0.006	Neither	FE	0.01	Upwind	5.9	188
4:00 PM	0.001	0.011	Downwind	0.003	*	Upwind	0.004	0.023	Upwind	0.007	0.014	Downwind	P	P	Downwind	FE	0.003	Neither	FE	0.009	Upwind	6.0	189
5:00 PM	-0.003	0.011	Downwind	0.001	*	Upwind	0.001	0.026	Upwind	0.007	0.02	Downwind	P	P	Downwind	FE	0	Neither	FE	0.007	Upwind	5.0	185
6:00 PM	0.003	0.013	Downwind	0.001	*	Upwind	0.003	0.016	Upwind	0.004	0.011	Downwind	P	P	Downwind	FE	0.001	Neither	FE	0.006	Upwind	4.1	180*
7:00 PM	0	0.008	Upwind	0.001	*	Upwind	0.007	0.01	Downwind	0.007	0.001	Downwind	P	P	Downwind	FE	0.001	Downwind	FE	0.006	Downwind	6.8	241
8:00 PM	*	0.005	Neither	0.004	*	Upwind	0.006	0.002	Upwind	0.006	-0.005	Downwind	P	P	Downwind	FE	-0.001	Neither	FE	0.006	Neither	2.2	191
9:00 PM	*	0.006	Upwind	0.004	*	Upwind	0.004	-0.005	Upwind	0.004	-0.005	Downwind	P	P	Downwind	FE	0.002	Downwind	FE	0.004	Downwind	5.0	215
10:00 PM	-0.001	0.008	Neither	0.001	*	Upwind	0.009	-0.005	Upwind	0.007	-0.005	Downwind	P	P	Downwind	FE	0.001	Neither	FE	0.004	Neither	3.2	196
11:00 PM	0.002	0.005	Neither	-0.002	*	Upwind	0.006	-0.005	Upwind	0.004	-0.005	Downwind	P	P	Downwind	FE	-0.001	Neither	FE	0.008	Neither	5.7	192
12:00 AM	0.032	0.007	Neither	-0.002	*	Upwind	0.001	-0.005	Upwind	0.001	-0.005	Downwind	P	P	Downwind	FE	0.002	Neither	FE	0.006	Neither	2.8	191
24 - AVERAGE	0.004591	0.013417		0.004625	*		0.00525	0.026417		0.007625	0.024458		NA	NA		NA	0.010708		NA	0.0185833			

% valid samples	91.7%	100.0%	100.0%	58.3%	100.0%	100.0%	100.0%	100.0%	33.3%	33.3%	0.0%	100.0%	0.0%	100.0%
neither	54.2%		8.3%		4.2%		8.3%		8.3%		75.0%		54.2%	
upwind	12.5%		83.3%		87.5%		8.3%		8.3%		12.5%		37.5%	
downwind	33.3%		8.3%		8.3%		83.3%		83.3%		12.5%		8.3%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

November 14, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.017	0.025	Upwind	0.02	0.013	Neither	0.019	0.04	Downwind	0.026	0.027	Upwind	0.027	MF	Downwind	-0.001	0.015	Downwind	-0.008	0.027	Neither	5.0	298
1:00 AM	0.02	0.021	Upwind	0.019	0.02	Neither	0.019	0.034	Downwind	0.017	0.021	Upwind	0.024	MF	Downwind	0.005	0.006	Downwind	0.001	0.022	Neither	5.4	295
2:00 AM	0.017	0.023	Upwind	T	0.014	Upwind	0.015	0.037	Downwind	0.019	0.021	Neither	0.021	MF	Downwind	0.011	0.007	Downwind	0.02	0.032	Downwind	2.1	270
3:00 AM	0.015	0.017	Upwind	T	0.016	Upwind	0.015	0.039	Neither	0.015	0.048	Downwind	0.017	MF	Downwind	0.012	0.007	Downwind	0.007	0.017	Downwind	2.0	228
4:00 AM	0.012	0.017	Upwind	T	0.008	Upwind	0.015	0.045	Neither	0.017	0.031	Downwind	0.018	MF	Downwind	0.012	0.009	Downwind	0.01	0.022	Downwind	1.8	232
5:00 AM	0.017	0.017	Upwind	T	0.015	Upwind	0.014	0.038	Neither	0.011	0.025	Downwind	0.02	MF	Downwind	0.012	0.008	Downwind	0.013	0.017	Downwind	2.6	229
6:00 AM	0.015	0.018	Upwind	T	0.013	Upwind	0.018	0.03	Downwind	0.011	0.027	Downwind	0.017	MF	Downwind	0.014	0.014	Downwind	0.009	0.021	Downwind	4.0	247
7:00 AM	0.016	0.018	Upwind	T	0.018	Upwind	0.017	0.036	Downwind	0.02	0.027	Downwind	0.018	MF	Downwind	0.018	0.017	Downwind	0.01	0.029	Downwind	3.5	254
8:00 AM	0.016	0.026	Upwind	T	0.02	Upwind	0.017	0.046	Downwind	0.02	0.036	Downwind	0.026	MF	Downwind	0.021	0.018	Downwind	0.016	0.038	Downwind	2.4	255
9:00 AM	0.029	0.025	Upwind	0.012	0.015	Neither	0.008	0.001	Downwind	0.021	0.005	Upwind	0.015	MF	Downwind	0.021	0.025	Downwind	0.023	FE	Neither	5.0	296
10:00 AM	0.01	0.018	Upwind	0.006	0.011	Downwind	0.01	0.017	Downwind	0.011	0.022	Upwind	0.016	MF	Downwind	0.022	0.02	Neither	0.011	FE	Upwind	7.1	315
11:00 AM	0.008	0.021	Upwind	0.017	0.005	Neither	0.009	0.062	Downwind	0.008	0.016	Upwind	0.017	MF	Downwind	0.018	0.01	Downwind	0.007	FE	Neither	7.0	307
12:00 PM	0.007	0.009	Upwind	0.009	0.003	Neither	0.008	0.032	Downwind	0.01	0.021	Upwind	0.011	0.006	Downwind	P	P	Downwind	0.004	FE	Neither	6.6	296
1:00 PM	0.007	0.013	Upwind	0.006	0.003	Neither	0.008	0.018	Downwind	0.009	0.031	Upwind	0.014	0.011	Downwind	P	P	Downwind	0.002	FE	Neither	7.0	292
2:00 PM	0.006	0.013	Upwind	0.01	0.011	Neither	0.008	0.008	Downwind	0.008	0.02	Upwind	0.012	0.01	Downwind	P	P	Downwind	0.001	FE	Neither	7.0	291
3:00 PM	0.008	0.013	Upwind	0.016	0.008	Upwind	0.012	0.02	Downwind	0.009	0.011	Upwind	0.01	0.004	Downwind	P	P	Downwind	0	FE	Downwind	7.3	288
4:00 PM	0.007	0.016	Upwind	0.012	0.011	Neither	0.013	-0.004	Downwind	0.009	0.004	Upwind	0.019	0.006	Downwind	P	P	Downwind	0.004	FE	Neither	6.7	306
5:00 PM	0.008	0.009	Upwind	0.013	0.014	Neither	0.015	-0.005	Downwind	0.016	-0.003	Upwind	0.021	0.011	Downwind	P	P	Downwind	0.013	FE	Neither	4.8	310
6:00 PM	0.025	0.022	Upwind	0.022	0.026	Downwind	0.022	0.036	Downwind	0.022	0.032	Upwind	0.02	0.011	Downwind	P	P	Neither	0.017	FE	Upwind	2.7	323
7:00 PM	0.021	0.024	Upwind	0.023	0.017	Downwind	0.024	0.041	Downwind	0.021	0.03	Upwind	0.029	0.021	Upwind	P	P	Upwind	0.017	FE	Upwind	0.1	1
8:00 PM	0.019	0.025	Upwind	0.03	0.025	Downwind	0.018	0.038	Downwind	0.024	0.037	Upwind	0.027	0.029	Neither	P	P	Upwind	0.024	FE	Upwind	1.4	331
9:00 PM	0.027	0.032	Upwind	0.033	0.028	Downwind	0.027	0.049	Downwind	0.029	0.052	Upwind	0.034	0.035	Upwind	P	P	Upwind	0.036	FE	Upwind	1.3	359
10:00 PM	0.021	0.026	Upwind	0.034	0.03	Downwind	0.031	0.06	Downwind	0.03	0.047	Upwind	0.035	0.045	Neither	P	P	Upwind	0.034	FE	Upwind	1.1	337.222*
11:00 PM	0.036	0.04	Upwind	0.046	0.04	Neither	0.038	0.059	Downwind	0.039	0.047	Upwind	0.04	0.04	Downwind	P	P	Downwind	0.039	FE	Neither	1.8	301
12:00 AM	0.04	0.04	Neither	0.042	0.036	Neither	0.039	0.063	Neither	0.037	0.046	Neither	0.049	0.048	Neither	P	P	Neither	P	P	Neither	0.7	303.4*
24 - AVERAGE	0.016958	0.020958		0.020588	0.016958		0.0175	0.033333		0.018042	0.02725		0.022083	NA		NA	NA		0.013826	NA			

% valid samples	100.0%	100.0%		70.8%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	54.2%		45.8%	45.9%		95.8%	28.6%			
neither			4.2%			41.7%			16.7%			8.3%			12.5%			12.5%			41.7%		
upwind			95.8%			33.3%			0.0%			66.7%			8.3%			16.7%			25.0%		
downwind			0.0%			25.0%			83.3%			25.0%			79.2%			70.8%			33.3%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

November 17, 2020	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed (mph)	Wind Direction (degrees)
12:00 AM	0.008	0.009	Upwind	0.011	0.015	Upwind	0.014	0.022	Downwind	0.016	0.016	Downwind	0.017	0.005	Downwind	0.001	0	Downwind	0.007	0.014	Downwind	2.8	245
1:00 AM	0.019	0.009	Upwind	0.019	0.01	Upwind	0.013	0.013	Downwind	0.009	0.014	Upwind	0.017	0.006	Downwind	0.007	0	Downwind	0.007	0.011	Downwind	4.0	276
2:00 AM	0.008	0.007	Upwind	0.015	0.012	Upwind	0.014	0.019	Downwind	0.009	0.014	Downwind	0.018	0.006	Downwind	0.005	-0.002	Downwind	0.005	0.008	Downwind	2.4	255
3:00 AM	0.013	0.014	Upwind	0.014	0.01	Upwind	0.012	0.025	Downwind	0.016	0.013	Downwind	0.019	0.006	Downwind	0.004	-0.003	Downwind	0.005	0.008	Downwind	3.3	250
4:00 AM	0.012	0.011	Upwind	0.014	0.016	Upwind	0.009	0.029	Downwind	0.005	0.017	Downwind	0.015	0.007	Downwind	0.009	0.001	Downwind	0.013	FE	Downwind	2.7	245
5:00 AM	0.012	0.007	Upwind	0.01	0.01	Upwind	0.01	0.02	Neither	0.013	0.022	Downwind	0.016	0.008	Downwind	0.007	0.005	Downwind	0.007	FE	Downwind	2.3	237
6:00 AM	0.01	0.012	Neither	0.021	0.022	Neither	0.01	0.035	Neither	0.015	0.028	Neither	0.019	0.016	Neither	0.006	0.009	Neither	0.01	FE	Neither	1.0	235
7:00 AM	0.016	0.015	Upwind	0.016	0.015	Downwind	0.02	0.031	Downwind	0.018	0.05	Upwind	0.023	0.032	Upwind	0.014	0.022	Upwind	0.021	FE	Upwind	0.6	345
8:00 AM	0.018	0.015	Upwind	0.014	0.018	Upwind	0.015	0.035	Neither	0.019	0.034	Downwind	0.016	0.015	Downwind	0.017	0.019	Downwind	0.018	FE	Downwind	1.6	232
9:00 AM	0.012	0.015	Upwind	0.008	0.014	Upwind	0.009	0.024	Downwind	0.009	0.028	Neither	0.017	0.03	Downwind	0.017	0.023	Downwind	0.011	FE	Downwind	1.6	263
10:00 AM	0.008	0.007	Upwind	0.003	0.01	Upwind	0.008	0.022	Neither	0.011	0.058	Downwind	0.007	0.02	Downwind	0.009	0.015	Downwind	0.006	FE	Downwind	8.4	229
11:00 AM	0.006	-0.001	Upwind	0.002	0.013	Upwind	0.007	0.059	Downwind	0.006	0.054	Neither	0.007	0.073	Downwind	0.009	0.024	Downwind	0	FE	Downwind	11.7	266
12:00 PM	0.009	0.016	Upwind	0.007	0.013	Neither	0.013	-0.002	Downwind	0.009	0.072	Upwind	0.012	0.043	Downwind	0.012	0.052	Downwind	0	FE	Neither	12.5	293
1:00 PM	0.009	0.012	Upwind	0.016	0.032	Neither	0.013	0.006	Downwind	0.015	0.035	Upwind	0.019	0.037	Downwind	0.012	0.038	Neither	0.003	FE	Upwind	13.0	311
2:00 PM	0.009	0.02	Upwind	0.021	0.006	Upwind	0.013	0.029	Downwind	0.015	0.053	Upwind	0.024	0.032	Downwind	P	P	Downwind	0.009	FE	Downwind	13.4	282
3:00 PM	0.007	0.008	Upwind	0.009	0.015	Downwind	0.014	0.018	Downwind	0.01	0.02	Upwind	0.015	0.019	Neither	P	P	Neither	0.009	FE	Upwind	15.0	327
4:00 PM	0.007	0.004	Upwind	0.015	0.016	Downwind	0.013	0.024	Downwind	0.01	0.009	Upwind	0.018	0.007	Downwind	P	P	Neither	0.007	FE	Upwind	10.6	324
5:00 PM	0.009	0.001	Upwind	0.016	0.012	Neither	0.013	0.014	Downwind	0.009	0.011	Upwind	0.016	0.016	Downwind	P	P	Downwind	0.007	FE	Neither	9.8	303
6:00 PM	0.012	0.006	Upwind	0.019	0.006	Neither	0.011	0.021	Downwind	0.008	0.01	Upwind	0.015	0.011	Downwind	P	P	Downwind	0.006	FE	Neither	9.9	305
7:00 PM	0.009	0.004	Upwind	0.008	0.007	Neither	0.013	0.016	Downwind	0.009	0.009	Upwind	0.018	0.011	Downwind	P	P	Downwind	0.004	FE	Neither	11.4	307
8:00 PM	0.007	0.008	Upwind	T	0.007	Neither	0.011	0.02	Downwind	0.015	0.009	Upwind	0.018	0.007	Downwind	P	P	Downwind	0.008	FE	Neither	9.4	295
9:00 PM	0.009	0.005	Upwind	T	0.008	Neither	0.013	0.014	Downwind	0.009	0.006	Upwind	0.017	0.004	Downwind	P	P	Neither	0.011	FE	Upwind	11.0	313
10:00 PM	0.011	0.002	Upwind	T	0.002	Neither	0.01	0.014	Downwind	0.007	0.01	Upwind	0.02	0.004	Downwind	P	P	Downwind	0.008	FE	Neither	6.9	296
11:00 PM	0.008	0.003	Upwind	T	-0.001	Neither	0.008	0.017	Downwind	0.009	0.013	Upwind	0.014	0.001	Downwind	P	P	Neither	P	P	Upwind	8.8	314
12:00 AM	0.009	0.002	Upwind	T	0.008	Downwind	0.009	0.017	Downwind	0.006	0.007	Upwind	0.014	0.001	Neither	P	P	Neither	P	P	Upwind	11.9	327
24 - AVERAGE	0.010375	0.008417		0.013	0.011708		0.011708	0.021667		0.010875	0.024833		0.016417	0.017167		NA	NA		0.007955	NA			

% valid samples	100.0%	100.0%	79.2%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	54.2%	54.2%	91.7%	12.5%
neither	4.2%		41.7%		16.7%		12.5%		12.5%		29.2%		29.2%	
upwind	95.8%		41.7%		0.0%		62.5%		4.2%		4.2%		29.2%	
downwind	0.0%		16.7%		83.3%		25.0%		83.3%		66.7%		41.7%	

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

February 6, 2021	MP-1			MP-2			MP-3				MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	Wind Position Corrado	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	T	T	Upwind	F	0.020	Neither	0.018	0.008	Downwind		0.008	0.009	Upwind	T	Temp	Downwind	T	0.005	Downwind	0.001	0.004	Neither	7.9	297
1:00 AM	T	T	Upwind	F	0.015	Upwind	0.019	0.010	Downwind		0.009	0.009	Upwind	T	Temp	Downwind	T	0.001	Downwind	0.004	0.003	Downwind	5.4	282
2:00 AM	T	T	Neither	F	0.015	Upwind	0.022	0.009	Upwind		0.013	0.009	Downwind	T	Temp	Downwind	T	-0.001	Downwind	0.004	0.003	Downwind	1.6	208
3:00 AM	T	T	Neither	F	0.015	Upwind	0.019	0.011	Upwind		0.016	0.011	Downwind	T	Temp	Downwind	T	0.002	Neither	0.008	0.004	Neither	2.6	191
4:00 AM	T	T	Upwind	F	0.020	Upwind	0.015	0.011	Upwind		0.012	0.014	Downwind	T	Temp	Downwind	T	0.004	Downwind	0.005	0.006	Downwind	2.7	213
5:00 AM	T	T	Upwind	F	0.022	Upwind	0.019	0.011	Neither		0.012	0.009	Downwind	T	Temp	Downwind	T	0.003	Downwind	0.006	0.017	Downwind	1.9	223
6:00 AM	T	T	Upwind	F	0.012	Upwind	0.017	0.011	Neither		0.014	0.014	Downwind	T	Temp	Downwind	T	0.004	Downwind	0.006	0.011	Downwind	3.0	229
7:00 AM	T	T	Upwind	F	0.022	Upwind	0.018	0.015	Neither		0.015	0.016	Downwind	T	Temp	Downwind	T	0.003	Downwind	0.008	0.015	Downwind	3.2	239
8:00 AM	T	T	Upwind	F	0.014	Upwind	0.014	0.008	Upwind		0.013	0.012	Downwind	T	Temp	Downwind	T	0.002	Downwind	0.013	0.011	Downwind	6.3	212
9:00 AM	T	T	Upwind	F	0.016	Upwind	0.011	0.010	Neither		0.010	0.018	Downwind	T	Temp	Downwind	T	0.005	Downwind	0.010	0.017	Downwind	5.1	220
10:00 AM	T	T	Upwind	F	0.019	Upwind	0.019	0.023	Upwind		0.009	0.010	Downwind	T	Temp	Downwind	T	0.005	Downwind	0.008	0.010	Downwind	10.3	217
11:00 AM	T	T	Upwind	F	0.019	Upwind	0.016	0.016	Neither		0.012	0.010	Downwind	T	Temp	Downwind	T	0.002	Downwind	0.009	0.007	Downwind	11.2	223
12:00 PM	T	T	Upwind	F	0.026	Upwind	0.013	0.014	Neither		0.009	0.008	Downwind	T	Temp	Downwind	T	0	Downwind	0.005	0.010	Downwind	12.2	237
1:00 PM	T	T	Upwind	F	0.013	Upwind	0.014	0.011	Downwind		0.010	0.011	Downwind	T	Temp	Downwind	T	0	Downwind	0.005	0.012	Downwind	14.3	243
2:00 PM	T	T	Upwind	F	0.016	Upwind	0.015	0.011	Downwind		0.011	0.011	Downwind	T	Temp	Downwind	T	0.004	Downwind	0.008	0.009	Downwind	15.0	249
3:00 PM	T	T	Upwind	F	0.017	Upwind	0.014	0.011	Downwind		0.011	0.013	Downwind	T	Temp	Downwind	T	0.004	Downwind	0.009	0.006	Downwind	15.4	244
4:00 PM	T	T	Upwind	F	0.020	Upwind	0.015	0.007	Downwind		0.012	0.012	Downwind	T	Temp	Downwind	T	0.002	Downwind	0.011	0.008	Downwind	12.7	240
5:00 PM	T	T	Upwind	F	0.003	Upwind	0.017	0.006	Downwind		0.010	0.013	Downwind	T	Temp	Downwind	T	0.005	Downwind	0.012	0.008	Downwind	10.0	245
6:00 PM	T	T	Upwind	F	0.022	Upwind	0.023	0.006	Neither		0.012	0.013	Downwind	T	Temp	Downwind	T	0.008	Downwind	0.013	0.013	Downwind	5.8	235
7:00 PM	T	T	Upwind	F	0.017	Upwind	0.018	0.015	Downwind		0.009	0.010	Downwind	T	Temp	Downwind	T	0.006	Downwind	0.011	0.012	Downwind	4.0	246
8:00 PM	T	T	Downwind	F	0.025	Upwind	0.028	0.032	Upwind		0.015	0.015	Downwind	T	Temp	Downwind	T	0.020	Neither	0.016	0.018	Upwind	1.2	176
9:00 PM	T	T	Upwind	F	0.019	Upwind	0.027	0.031	Neither		0.017	0.023	Downwind	T	Temp	Downwind	T	0.015	Downwind	0.017	0.032	Downwind	1.9	228
10:00 PM	T	T	Neither	F	0.028	Neither	0.028	0.016	Neither		0.020	0.032	Neither	T	Temp	Neither	T	0.021	Neither	0.026	0.030	Neither	0.8	64*
11:00 PM	T	T	Upwind	F	0.043	Downwind	0.030	0.033	Downwind		0.020	0.032	Upwind	T	Temp	Upwind	T	0.028	Upwind	0.018	0.042	Upwind	2.6	19
12:00 AM	T	T	Neither	F	0.032	Downwind	0.057	0.057	Upwind		0.022	0.022	Upwind	T	Temp	Upwind	T	0.021	Upwind	0.018	0.023	Upwind	2.0	60
24 - AVERAGE	NA	NA		NA	0.0196		0.0203	0.0160			0.0130	0.0145		NA	NA		NA	0.0068		0.0104	0.0136		6.3	

% valid samples	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%
neither		16.7%		4.2%		37.5%		4.2%		4.2%		12.5%		8.3%
upwind		79.2%		87.5%		29.2%		12.5%		8.3%		8.3%		12.5%
downwind		4.2%		8.3%		33.3%		83.3%		87.5%		79.2%		79.2%

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

February 9, 2021	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.012	0.025	Downwind	0.008	0.018	Downwind	0.014	0.017	Upwind	0.014	0.015	Upwind	0.015	Temp.	Upwind	P	0.004	Upwind	P	T	Upwind	2.6	110
1:00 AM	0.013	0.026	Upwind	0.007	0.031	Downwind	0.015	0.028	Downwind	0.011	0.022	Upwind	0.016	Temp.	Upwind	P	0.006	Upwind	0.005	T	Upwind	3.7	2
2:00 AM	0.014	0.028	Upwind	0.006	0.022	Downwind	0.023	0.029	Neither	0.021	0.017	Upwind	0.014	Temp.	Upwind	P	0.008	Upwind	0.008	T	Upwind	2.4	47
3:00 AM	0.015	0.021	Neither	0.006	0.022	Downwind	0.020	0.016	Upwind	0.014	0.020	Upwind	0.014	Temp.	Upwind	P	0.006	Upwind	0.007	T	Upwind	2.7	67
4:00 AM	0.012	0.022	Downwind	0.006	0.024	Downwind	0.022	0.025	Upwind	0.013	0.014	Upwind	0.015	Temp.	Upwind	P	0.002	Upwind	0.011	T	Upwind	3.6	70
5:00 AM	0.017	0.050	Neither	0.007	0.037	Downwind	0.018	0.019	Neither	0.015	0.046	Upwind	0.016	Temp.	Upwind	P	0.004	Upwind	T	T	Upwind	4.5	53
6:00 AM	0.014	0.041	Upwind	0.010	0.036	Downwind	0.021	0.024	Neither	0.016	0.015	Upwind	0.016	Temp.	Upwind	P	0.012	Upwind	T	T	Upwind	5.2	39
7:00 AM	0.014	0.050	Neither	0.008	0.034	Downwind	0.024	0.025	Upwind	0.014	0.024	Upwind	0.016	Temp.	Upwind	P	0.010	Upwind	T	T	Upwind	5.6	69
8:00 AM	0.015	0.042	Neither	0.009	0.033	Downwind	0.021	0.033	Neither	0.012	0.027	Upwind	0.016	Temp.	Upwind	P	0.012	Upwind	T	T	Upwind	5.0	55
9:00 AM	0.019	0.048	Upwind	0.008	0.046	Downwind	0.022	0.032	Neither	0.017	0.027	Upwind	0.014	Temp.	Upwind	P	0.026	Upwind	T	T	Upwind	4.4	43
10:00 AM	0.009	0.039	Neither	0.006	0.038	Downwind	0.024	0.031	Upwind	0.015	0.028	Upwind	0.017	Temp.	Upwind	P	0.019	Upwind	T	T	Upwind	4.3	64
11:00 AM	0.012	0.062	Downwind	0.010	0.056	Downwind	0.024	0.037	Upwind	0.012	0.039	Upwind	0.013	Temp.	Upwind	0.010	0.030	Upwind	T	T	Upwind	3.7	77
12:00 PM	0.017	0.048	Upwind	0.009	0.054	Downwind	0.018	0.038	Neither	0.018	0.042	Upwind	0.017	Temp.	Upwind	0.013	0.031	Upwind	T	T	Upwind	2.4	32*
1:00 PM	0.010	0.050	Upwind	0.010	0.045	Downwind	0.011	0.042	Downwind	0.011	0.037	Upwind	0.012	Temp.	Neither	0.012	0.030	Upwind	T	T	Upwind	5.2	344
2:00 PM	0.021	0.051	Upwind	0.011	0.045	Downwind	0.027	0.038	Downwind	F	0.042	Upwind	0.018	Temp.	Upwind	0.021	0.028	Upwind	T	T	Upwind	7.8	359
3:00 PM	0.022	0.045	Upwind	0.019	0.041	Downwind	0.023	0.032	Downwind	F	0.031	Upwind	0.025	Temp.	Neither	0.024	0.026	Upwind	T	T	Upwind	3.1	344
4:00 PM	0.028	0.055	Upwind	0.022	0.055	Downwind	0.033	0.048	Downwind	F	0.045	Upwind	0.025	Temp.	Neither	0.028	0.033	Upwind	T	T	Upwind	6.1	336
5:00 PM	0.027	0.059	Upwind	0.019	0.070	Downwind	0.032	0.051	Downwind	F	0.044	Upwind	0.029	Temp.	Neither	0.028	0.046	Upwind	T	T	Upwind	6.7	335
6:00 PM	0.026	0.038	Upwind	0.022	0.039	Downwind	0.032	0.037	Downwind	F	0.031	Upwind	0.023	Temp.	Upwind	0.023	0.026	Upwind	T	T	Upwind	6.7	360
7:00 PM	0.023	0.024	Upwind	0.020	0.031	Downwind	0.034	0.037	Downwind	F	0.028	Upwind	0.020	Temp.	Upwind	0.022	0.017	Upwind	T	T	Upwind	5.9	352
8:00 PM	0.022	0.032	Upwind	0.027	0.037	Downwind	0.031	0.031	Downwind	F	0.028	Upwind	0.021	Temp.	Upwind	0.025	0.023	Upwind	T	T	Upwind	6.2	5
9:00 PM	0.027	0.041	Upwind	0.026	0.039	Downwind	0.030	0.033	Downwind	F	0.032	Upwind	0.023	Temp.	Upwind	0.030	0.023	Upwind	T	T	Upwind	3.7	350
10:00 PM	0.034	0.047	Upwind	0.027	0.049	Downwind	0.034	0.035	Downwind	F	0.038	Upwind	0.031	Temp.	Upwind	0.031	0.027	Upwind	T	T	Upwind	3.1	348
11:00 PM	0.035	0.045	Upwind	0.030	0.056	Downwind	0.038	0.039	Downwind	F	0.039	Upwind	0.031	Temp.	Neither	0.035	0.031	Upwind	T	T	Upwind	4.8	334
12:00 AM	0.031	0.052	Upwind	0.023	0.049	Downwind	0.039	0.042	Downwind	F	0.040	Upwind	0.030	Temp.	Neither	0.031	0.028	Upwind	T	T	Upwind	5.1	342
AVERAGE	0.0199	0.0423		0.0145	0.0412		0.0257	0.0334		NA	0.0315		0.0197	NA		NA	0.0210		NA	NA		4.7	191

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		54.2%	100.0%		100.0%	0.0%		58.3%	100.0%		16.7%	0.0%			
neither			20.8%			0.0%			25.0%			0.0%			25.0%			0.0%			0.0%		
upwind			70.8%			0.0%			20.8%			100.0%			75.0%			100.0%			100.0%		
downwind			8.3%			100.0%			54.2%			0.0%			0.0%			0.0%			0.0%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

February 12, 2021	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.016	0.014	Upwind	0.010	0.027	Downwind	0.018	0.012	Downwind	0.008	0.012	Upwind	0.012	0.015	Upwind	*	*	Upwind	P	P	Upwind	6.6	11
1:00 AM	0.017	0.021	Upwind	0.010	0.023	Downwind	0.015	0.009	Downwind	0.011	0.013	Upwind	0.016	0.014	Upwind	*	*	Upwind	P	P	Upwind	6.0	20
2:00 AM	0.017	0.013	Upwind	0.008	0.022	Downwind	0.021	0.010	Downwind	0.010	0.015	Upwind	0.015	0.012	Upwind	0.003	0.003	Upwind	P	P	Upwind	6.0	24
3:00 AM	0.018	0.018	Upwind	0.013	0.024	Downwind	0.019	0.012	Downwind	0.008	0.013	Upwind	0.014	0.011	Upwind	0.009	0.004	Upwind	P	P	Upwind	5.9	19
4:00 AM	0.018	0.022	Upwind	0.009	0.019	Downwind	0.016	0.017	Downwind	0.011	0.012	Upwind	0.015	0.011	Upwind	0.010	0.001	Upwind	P	P	Upwind	9.0	16
5:00 AM	0.013	0.014	Upwind	0.009	0.020	Downwind	0.016	0.010	Downwind	0.009	0.012	Upwind	0.016	0.015	Upwind	0.008	0.003	Upwind	P	P	Upwind	7.3	23
6:00 AM	0.018	0.023	Upwind	0.006	0.020	Downwind	0.009	0.016	Downwind	0.008	0.015	Upwind	0.012	0.016	Upwind	0.006	0.006	Upwind	P	P	Upwind	8.5	22
7:00 AM	0.006	0.015	Upwind	0.004	0.020	Downwind	0.016	0.008	Downwind	0.006	0.013	Upwind	0.012	0.018	Upwind	0.006	0.007	Upwind	P	P	Upwind	8.3	26
8:00 AM	0.007	0.017	Upwind	0.003	0.021	Downwind	0.012	0.017	Downwind	0.005	0.017	Upwind	0.013	0.023	Upwind	0.006	0.011	Upwind	P	P	Upwind	7.9	27
9:00 AM	0.008	0.024	Upwind	0.003	0.021	Downwind	0.011	0.015	Neither	0.008	0.016	Upwind	0.011	0.030	Upwind	0.007	0.011	Upwind	P	P	Upwind	6.4	34
10:00 AM	0.008	0.022	Upwind	0.007	0.027	Downwind	0.009	0.018	Neither	0.005	0.020	Upwind	0.013	0.035	Upwind	0.009	0.013	Upwind	P	P	Upwind	5.8	33
11:00 AM	0.015	0.044	Upwind	0.004	0.029	Downwind	0.013	0.030	Neither	0.004	0.023	Upwind	0.011	0.044	Upwind	0.010	0.015	Upwind	P	P	Upwind	5.9	46
12:00 PM	0.016	0.037	Neither	0.007	0.025	Downwind	0.018	0.024	Neither	0.009	0.016	Upwind	0.012	0.045	Upwind	0.009	0.016	Upwind	P	P	Upwind	5.0	55
1:00 PM	0.012	0.047	Neither	0.007	0.037	Downwind	0.014	0.027	Neither	0.009	0.023	Upwind	0.011	0.044	Upwind	0.008	0.018	Upwind	P	P	Upwind	4.8	52
2:00 PM	0.017	0.036	Neither	0.005	0.028	Downwind	0.023	0.019	Upwind	0.007	0.023	Upwind	0.014	0.045	Upwind	0.009	0.016	Upwind	P	P	Upwind	3.4	69
3:00 PM	0.014	0.055	Downwind	0.007	0.034	Downwind	0.016	0.024	Upwind	0.008	0.025	Upwind	0.014	0.045	Upwind	0.011	0.017	Upwind	P	P	Upwind	3.2	87
4:00 PM	0.016	0.028	Downwind	0.008	0.034	Downwind	0.023	0.028	Upwind	0.011	0.022	Upwind	0.018	0.057	Upwind	P	P	Upwind	P	P	Upwind	2.4	104
5:00 PM	0.016	0.027	Downwind	0.010	0.036	Downwind	0.023	0.027	Upwind	0.017	0.025	Upwind	0.016	0.024	Upwind	P	P	Upwind	P	P	Upwind	2.7	97
6:00 PM	0.014	0.029	Downwind	0.012	0.030	Downwind	0.022	0.024	Upwind	0.012	0.025	Upwind	0.013	0.026	Upwind	P	P	Upwind	P	P	Upwind	3.9	63
7:00 PM	0.021	0.034	Downwind	0.011	0.042	Downwind	0.019	0.034	Upwind	0.014	0.028	Upwind	0.019	0.031	Upwind	P	P	Upwind	P	P	Upwind	4.5	76
8:00 PM	0.022	0.032	Neither	0.007	0.032	Downwind	0.025	0.024	Neither	0.015	0.023	Upwind	0.018	0.029	Upwind	P	P	Upwind	P	P	Upwind	3.8	59
9:00 PM	0.020	0.037	Upwind	0.009	0.038	Downwind	0.020	0.030	Neither	0.016	0.031	Upwind	0.019	0.026	Upwind	P	P	Upwind	P	P	Upwind	3.8	46
10:00 PM	0.014	0.034	Neither	0.012	0.037	Downwind	0.021	0.027	Neither	0.015	0.027	Upwind	0.020	0.031	Upwind	P	P	Upwind	P	P	Upwind	3.5	60
11:00 PM	0.016	0.035	Neither	0.016	0.037	Downwind	0.020	0.030	Neither	0.013	0.033	Upwind	0.017	0.035	Upwind	P	P	Upwind	P	P	Upwind	3.3	52
12:00 AM	0.019	0.045	Upwind	0.012	0.039	Downwind	0.020	0.034	Neither	0.017	0.034	Upwind	0.021	0.034	Upwind	P	P	Upwind	P	P	Upwind	2.7	30
24 - AVERAGE	0.0151	0.0295		0.0083	0.0290		0.0175	0.0214		0.0103	0.0210		0.0150	0.0292		NA	NA		NA	NA		5.2	48

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		58.3%	58.3%		0.0%	0.0%			
neither			25.0%			0.0%			41.7%			0.0%			0.0%			0.0%			0.0%		
upwind			54.2%			0.0%			25.0%			100.0%			100.0%			100.0%			100.0%		
downwind			20.8%			100.0%			33.3%			0.0%			0.0%			0.0%			0.0%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

February 15, 2021	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.023	0.032	Upwind	0.013	0.035	Downwind	0.028	0.028	Downwind	0.024	0.031	Upwind	0.022	0.026	Upwind	*	0.017	Upwind	*	0.024	Upwind	4.8	26
1:00 AM	0.022	0.029	Upwind	0.010	0.034	Downwind	0.029	0.024	Downwind	0.017	0.028	Upwind	0.022	0.048	Upwind	0.001	0.010	Upwind	0.013	0.015	Upwind	5.6	24
2:00 AM	0.018	0.017	Upwind	0.006	0.029	Downwind	0.023	0.020	Downwind	0.019	0.016	Upwind	0.019	0.015	Upwind	0.016	0.005	Upwind	0.010	0.010	Upwind	6.6	15
3:00 AM	0.013	0.016	Upwind	0.008	0.021	Downwind	0.021	0.009	Downwind	0.014	0.010	Upwind	0.012	0.013	Upwind	0.015	0.001	Upwind	0.009	0.009	Upwind	6.3	22
4:00 AM	0.014	0.016	Upwind	0.008	0.017	Downwind	0.017	0.015	Downwind	0.013	0.011	Upwind	0.014	0.010	Upwind	0.010	0.001	Upwind	0.007	0.008	Upwind	6.0	25
5:00 AM	0.018	0.019	Upwind	0.007	0.029	Downwind	0.023	0.011	Downwind	0.016	0.023	Upwind	0.022	0.009	Upwind	0.009	0.006	Upwind	0.010	0.012	Upwind	4.8	22
6:00 AM	0.015	0.048	Upwind	0.010	0.024	Downwind	0.024	0.013	Downwind	0.006	0.035	Upwind	0.014	0.021	Upwind	0.016	0.009	Upwind	0.012	0.022	Upwind	5.4	29
7:00 AM	0.017	0.048	Upwind	0.007	0.035	Downwind	0.020	0.021	Downwind	0.012	0.036	Upwind	0.015	0.019	Upwind	0.011	0.009	Upwind	0.011	0.024	Upwind	5.9	18
8:00 AM	0.015	0.041	Upwind	0.008	0.026	Downwind	0.015	0.014	Downwind	0.012	0.035	Upwind	0.013	0.023	Upwind	0.011	0.008	Upwind	0.015	0.023	Upwind	5.3	25
9:00 AM	0.021	0.036	Upwind	0.007	0.024	Downwind	0.017	0.016	Downwind	0.012	0.026	Upwind	0.014	0.026	Upwind	0.014	0.011	Upwind	0.016	0.021	Upwind	6.8	24
10:00 AM	0.019	0.033	Upwind	0.009	0.036	Downwind	0.025	0.020	Downwind	0.014	0.024	Upwind	0.014	0.015	Upwind	0.021	0.024	Upwind	0.019	0.034	Upwind	5.9	26
11:00 AM	0.019	0.031	Upwind	0.010	0.042	Downwind	0.023	0.024	Neither	0.012	0.029	Upwind	0.018	0.027	Upwind	0.018	0.027	Upwind	0.015	0.039	Upwind	5.5	38
12:00 PM	0.024	0.040	Neither	0.010	0.038	Downwind	0.024	0.034	Neither	0.016	0.032	Upwind	0.023	0.024	Upwind	0.017	0.028	Upwind	0.015	0.050	Upwind	5.1	59
1:00 PM	0.018	0.037	Upwind	0.012	0.042	Downwind	0.023	0.037	Neither	0.015	0.031	Upwind	0.023	0.023	Upwind	0.023	0.031	Upwind	0.019	0.049	Upwind	4.0	37
2:00 PM	0.014	0.031	Upwind	0.017	0.033	Downwind	0.025	0.027	Neither	0.017	0.031	Upwind	0.019	0.028	Upwind	0.020	0.024	Upwind	0.013	0.037	Upwind	4.6	36
3:00 PM	0.023	0.041	Meither	0.021	0.042	Downwind	0.025	0.040	Upwind	0.016	0.035	Upwind	0.018	0.029	Upwind	0.018	0.030	Upwind	0.022	0.047	Upwind	6.2	62
4:00 PM	0.023	0.040	Neither	0.024	0.048	Downwind	0.025	0.037	Upwind	0.023	0.036	Upwind	0.020	0.035	Upwind	P	P	Upwind	0.023	0.042	Upwind	7.1	67
5:00 PM	0.020	0.037	Neither	0.015	0.053	Downwind	0.031	0.045	Neither	0.020	0.043	Upwind	0.022	0.038	Upwind	P	P	Upwind	0.022	0.045	Upwind	6.2	57
6:00 PM	0.019	0.044	Upwind	0.017	0.040	Downwind	0.032	0.040	Neither	0.023	0.041	Upwind	0.018	0.038	Upwind	P	P	Upwind	0.023	0.042	Upwind	6.0	45
7:00 PM	0.024	0.053	Upwind	0.018	0.052	Downwind	0.026	0.036	Neither	0.025	0.041	Upwind	0.016	0.043	Upwind	P	P	Upwind	0.020	0.037	Upwind	7.9	40
8:00 PM	0.027	0.052	Neither	0.024	0.052	Downwind	0.034	0.039	Upwind	0.022	0.046	Upwind	0.023	0.040	Upwind	P	P	Upwind	0.024	0.042	Upwind	8.1	61
9:00 PM	0.025	0.051	Neither	0.018	0.058	Downwind	0.031	0.046	Upwind	0.020	0.037	Upwind	0.031	0.043	Upwind	P	P	Upwind	0.022	0.040	Upwind	9.0	61
10:00 PM	0.017	0.068	Neither	0.011	0.056	Downwind	0.032	0.042	Upwind	0.023	0.037	Upwind	0.022	0.034	Upwind	P	P	Upwind	0.027	0.031	Upwind	9.1	64
11:00 PM	0.023	0.065	Neither	0.013	0.053	Downwind	0.030	0.036	Upwind	0.016	0.028	Upwind	0.017	0.036	Upwind	P	P	Upwind	0.022	0.027	Upwind	8.9	63
12:00 AM	0.013	0.054	Neither	0.009	0.033	Downwind	0.019	0.037	Upwind	0.013	0.027	Upwind	0.015	0.024	Upwind	P	P	Upwind	0.013	0.016	Upwind	7.6	70
24 - AVERAGE	0.0192	0.0395		0.0125	0.0382		0.0248	0.0285		0.0165	0.0308		0.0185	0.0275		NA	NA		0.0168	0.0301		6.4	41

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		62.5%	62.5%		100.0%	100.0%			
neither			33.3%			0.0%			29.2%			0.0%			0.0%			0.0%			0.0%		
upwind			62.5%			0.0%			29.2%			100.0%			100.0%			100.0%			100.0%		
downwind			0.0%			100.0%			41.7%			0.0%			0.0%			0.0%			0.0%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

February 18, 2021	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.014	0.027	Upwind	0.006	0.030	Downwind	0.017	0.019	Neither	0.012	0.021	Upwind	0.017	0.017	Upwind	*	0.006	Upwind	-0.002	0.012	Upwind	2.7	39
1:00 AM	0.014	0.024	Upwind	0.007	0.025	Downwind	0.013	0.016	Downwind	0.010	0.014	Upwind	0.016	0.019	Upwind	0.035	0.003	Upwind	0.002	0.009	Upwind	3.1	26
2:00 AM	0.014	0.020	Upwind	0.007	0.017	Downwind	0.014	0.010	Downwind	0.007	0.016	Upwind	0.016	0.008	Upwind	0.013	0.002	Upwind	0.004	0.006	Upwind	2.1	18
3:00 AM	0.014	0.015	Upwind	0.007	0.026	Downwind	0.018	0.010	Downwind	0.005	0.014	Upwind	0.017	0.015	Upwind	0.010	0.003	Upwind	0.003	0.009	Upwind	3.3	24
4:00 AM	0.015	0.013	Neither	0.006	0.028	Downwind	0.018	0.017	Neither	0.009	0.017	Upwind	0.016	0.015	Upwind	0.011	0.004	Upwind	0.004	0.014	Upwind	4.0	50
5:00 AM	0.016	0.027	Upwind	0.010	0.018	Downwind	0.015	0.018	Neither	0.011	0.016	Upwind	0.017	0.015	Upwind	0.008	0.004	Upwind	0.007	0.022	Upwind	4.5	34
6:00 AM	0.018	0.025	Upwind	0.009	0.022	Downwind	0.020	0.026	Neither	0.009	0.019	Upwind	0.017	0.024	Upwind	0.011	0.008	Upwind	0.011	0.015	Upwind	5.5	33
7:00 AM	0.016	0.043	Upwind	0.009	0.033	Downwind	0.017	0.024	Neither	0.010	0.030	Upwind	0.012	0.024	Upwind	0.008	0.006	Upwind	0.010	0.024	Upwind	8.1	35
8:00 AM	0.020	0.038	Upwind	0.031	0.030	Downwind	0.021	0.019	Neither	0.010	0.027	Upwind	0.015	0.029	Upwind	0.009	0.011	Upwind	0.014	0.022	Upwind	7.0	40
9:00 AM	0.015	0.037	Neither	0.012	0.030	Downwind	0.024	0.025	Neither	0.013	0.024	Upwind	0.016	0.019	Upwind	0.011	0.013	Upwind	0.017	0.023	Upwind	9.3	51
10:00 AM	0.017	0.035	Upwind	0.007	0.029	Downwind	0.022	0.022	Neither	0.013	0.031	Upwind	0.016	0.020	Upwind	0.012	0.008	Upwind	0.019	0.017	Upwind	9.7	38
11:00 AM	0.010	0.021	Upwind	0.001	0.021	Downwind	0.019	0.014	Neither	0.008	0.017	Upwind	0.012	0.011	Upwind	0.008	0.005	Upwind	0.011	0.007	Upwind	9.0	31
12:00 PM	0.011	0.019	Neither	0.001	0.015	Downwind	0.011	0.011	Neither	0.006	0.010	Upwind	0.010	0.012	Upwind	0.005	0.006	Upwind	0.010	0.011	Upwind	7.2	51
1:00 PM	0.007	0.024	Neither	0.009	0.016	Downwind	0.013	0.009	Neither	0.004	0.012	Upwind	0.011	0.017	Upwind	0.008	0.006	Upwind	0.009	0.014	Upwind	11.1	56
2:00 PM	0.008	0.027	Upwind	0.005	0.014	Downwind	0.017	0.009	Neither	0.007	0.027	Upwind	0.015	0.014	Upwind	0.013	0.005	Upwind	0.013	0.018	Upwind	8.7	33
3:00 PM	0.009	0.030	Upwind	0.002	0.021	Downwind	0.015	0.017	Downwind	0.007	0.028	Upwind	0.018	0.013	Upwind	P	P	Upwind	0.009	0.014	Upwind	7.6	19
4:00 PM	0.015	0.031	Upwind	0.006	0.020	Downwind	0.018	0.013	Downwind	0.010	0.025	Upwind	0.009	0.010	Upwind	P	P	Upwind	0.010	0.012	Upwind	8.6	16
5:00 PM	0.012	0.032	Upwind	0.011	0.021	Downwind	0.019	0.011	Downwind	0.008	0.021	Upwind	0.012	0.016	Upwind	P	P	Upwind	0.009	0.009	Upwind	8.0	23
6:00 PM	0.010	0.027	Upwind	0.007	0.019	Downwind	0.018	0.009	Downwind	0.013	0.018	Upwind	0.009	0.014	Upwind	P	P	Upwind	0.009	0.008	Upwind	9.3	24
7:00 PM	0.013	0.026	Upwind	0.003	0.017	Downwind	0.018	0.018	Downwind	0.009	0.017	Upwind	0.013	0.013	Upwind	P	P	Upwind	0.010	0.008	Upwind	8.7	24
8:00 PM	0.012	0.019	Upwind	0.004	0.020	Downwind	0.013	0.013	Downwind	0.010	0.015	Upwind	0.011	0.010	Upwind	P	P	Upwind	0.009	0.009	Upwind	7.8	30
9:00 PM	0.012	0.023	Upwind	0.003	0.021	Downwind	0.013	0.011	Downwind	0.009	0.012	Upwind	0.015	0.007	Upwind	P	P	Upwind	0.013	0.007	Upwind	7.8	25
10:00 PM	0.010	0.020	Upwind	0.009	0.019	Downwind	0.017	0.008	Neither	0.006	0.018	Upwind	0.010	0.018	Upwind	P	P	Upwind	P	P	Upwind	7.6	36
11:00 PM	0.017	0.018	Upwind	0.008	0.017	Downwind	0.017	0.022	Neither	0.009	0.013	Upwind	0.010	0.011	Upwind	P	P	Upwind	P	P	Upwind	8.7	45
12:00 AM	0.012	0.017	Upwind	0.005	0.025	Downwind	0.019	0.019	Neither	0.009	0.016	Upwind	0.009	0.022	Upwind	P	P	Upwind	P	P	Upwind	7.7	31
24 - AVERAGE	0.0132	0.0255		0.0075	0.0218		0.0170	0.0155		0.0088	0.0190		0.0134	0.0157		NA	NA		0.0097	0.0132		7.3	33

% valid samples	100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		100.0%	100.0%		58.3%	58.3%		87.5%	87.5%			
neither			16.7%			0.0%			58.3%			0.0%			0.0%			0.0%			0.0%		
upwind			83.3%			0.0%			0.0%			100.0%			100.0%			100.0%			100.0%		
downwind			0.0%			100.0%			41.7%			0.0%			0.0%			0.0%			0.0%		

Appendix D
Hourly Concentrations of Particulate Matter
PM_{10} and $PM_{2.5}$ in Ambient Air

February 21, 2021	MP-1			MP-2			MP-3			MP-4			MP-5			MP-6			MP-7			Weather Station	
TIME:	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m^3)	PM 10 (mg/m3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	PM 2.5 (mg/m3)	PM 10 (mg/m^3)	Wind Position	Wind Speed	Wind Direction
12:00 AM	0.029	0.032	Upwind	0.018	0.037	Neither	P	P	Downwind	0.019	0.023	Upwind	0.028	0.023	Downwind	*	0.013	Downwind	*	0.019	Neither	9.9	302
1:00 AM	0.026	0.028	Upwind	0.021	0.033	Neither	P	P	Downwind	0.029	0.023	Upwind	0.027	0.024	Downwind	0.020	0.012	Downwind	0.015	0.024	Neither	10.1	303
2:00 AM	0.026	0.028	Upwind	0.017	0.032	Neither	P	P	Downwind	0.025	0.024	Upwind	0.033	0.030	Downwind	0.022	0.015	Downwind	0.023	0.019	Neither	8.7	297
3:00 AM	0.031	0.035	Upwind	0.024	0.032	Upwind	P	P	Downwind	0.029	0.025	Neither	0.026	0.023	Downwind	0.023	0.012	Downwind	0.020	0.019	Downwind	7.5	273
4:00 AM	0.030	0.032	Upwind	0.025	0.040	Upwind	P	P	Downwind	0.029	0.027	Neither	0.030	0.025	Downwind	0.022	0.014	Downwind	0.023	0.030	Downwind	7.7	271
5:00 AM	0.033	0.033	Upwind	0.020	0.041	Neither	P	P	Downwind	0.025	0.022	Upwind	0.036	0.039	Downwind	0.023	0.018	Downwind	0.024	0.028	Neither	7.3	302
6:00 AM	0.028	0.032	Upwind	0.017	0.043	Neither	P	P	Downwind	0.026	0.028	Upwind	0.028	0.025	Downwind	0.020	0.013	Downwind	0.022	0.030	Neither	6.0	309
7:00 AM	0.026	0.041	Upwind	0.021	0.037	Upwind	P	P	Downwind	0.023	0.031	Upwind	0.026	0.030	Downwind	0.022	0.018	Downwind	0.019	0.030	Downwind	4.9	282
8:00 AM	0.024	0.028	Upwind	0.015	0.032	Upwind	P	P	Downwind	0.023	0.024	Upwind	0.028	0.025	Downwind	0.020	0.014	Downwind	0.024	0.027	Downwind	5.8	280
9:00 AM	0.020	0.016	Upwind	0.010	0.020	Downwind	P	P	Downwind	0.016	0.015	Upwind	0.022	0.020	Downwind	0.015	0.020	Neither	0.022	0.034	Upwind	8.5	321
10:00 AM	0.016	0.014	Upwind	0.007	0.019	Downwind	P	P	Downwind	0.009	0.010	Upwind	0.015	0.014	Neither	0.011	0.018	Upwind	0.016	0.025	Upwind	8.4	338
11:00 AM	0.017	0.012	Upwind	0.005	0.017	Downwind	P	P	Downwind	0.009	0.008	Upwind	0.023	0.014	Neither	0.012	0.011	Neither	0.015	0.023	Upwind	9.2	330
12:00 PM	0.014	0.032	Upwind	0.009	0.021	Downwind	P	P	Downwind	0.005	0.012	Upwind	0.018	0.014	Downwind	0.010	0.013	Neither	0.015	0.019	Upwind	6.5	317
1:00 PM	0.014	0.016	Upwind	0.012	0.027	Upwind	P	P	Downwind	0.010	0.018	Upwind	0.019	0.014	Downwind	0.012	0.011	Downwind	0.019	0.026	Downwind	7.3	290
2:00 PM	0.013	0.023	Upwind	0.009	0.020	Upwind	P	P	Downwind	0.010	0.016	Upwind	0.016	0.017	Downwind	0.019	0.014	Downwind	0.017	0.027	Downwind	7.2	289
3:00 PM	0.015	0.020	Upwind	0.006	0.023	Upwind	P	P	Downwind	0.010	0.017	Neither	0.021	0.014	Downwind	0.018	0.014	Downwind	0.020	0.021	Downwind	6.2	272
4:00 PM	0.013	0.022	Upwind	0.010	0.020	Neither	P	P	Downwind	0.009	0.016	Upwind	0.019	0.014	Downwind	0.014	0.010	Downwind	0.011	0.018	Neither	5.8	293
5:00 PM	0.015	0.025	Upwind	0.016	0.023	Neither	P	P	Downwind	0.017	0.016	Upwind	0.023	0.013	Downwind	0.017	0.014	Downwind	0.015	0.016	Neither	4.0	293
6:00 PM	0.028	0.037	Upwind	0.017	0.034	Neither	P	P	Downwind	0.024	0.018	Upwind	0.025	0.019	Downwind	0.018	0.011	Downwind	0.021	0.018	Neither	4.2	301
7:00 PM	0.028	0.015	Upwind	0.020	0.035	Upwind	P	P	Downwind	0.027	0.027	Upwind	0.029	0.021	Downwind	0.021	0.014	Downwind	0.030	0.028	Downwind	3.2	284
8:00 PM	0.023	0.027	Upwind	0.021	0.032	Upwind	P	P	Neither	0.028	0.022	Downwind	0.021	0.022	Downwind	0.024	0.023	Downwind	0.030	0.028	Downwind	1.4	223
9:00 PM	0.028	0.028	Upwind	0.020	0.042	Upwind	P	P	Neither	0.024	0.027	Downwind	0.026	0.027	Downwind	0.027	0.030	Downwind	0.036	0.039	Downwind	1.5	226
10:00 PM	0.023	0.032	Downwind	0.019	0.034	Upwind	P	P	Upwind	0.023	0.030	Downwind	0.033	0.027	Downwind	0.028	0.025	Neither	0.031	0.034	Upwind	1.2	182
11:00 PM	0.027	0.032	Neither	0.011	0.033	Upwind	P	P	Upwind	0.017	0.017	Downwind	0.024	0.022	Downwind	0.022	0.020	Neither	0.025	0.027	Neither	1.9	192
12:00 AM	0.021	0.032	Downwind	0.008	0.029	Upwind	P	P	Upwind	0.014	0.018	Downwind	0.023	0.010	Downwind	P	P	Neither	0.020	0.016	Upwind	2.0	189
24 - AVERAGE	0.0225	0.0267		0.0150	0.0300		NA	NA		0.0192	0.0205		0.0246	0.0210		0.0191	0.0158		0.0214	0.0253		5.7	277

% valid samples	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	95.8%	95.8%	100.0%	100.0%
neither	4.2%		29.2%		8.3%		12.5%		8.3%		25.0%		33.3%	
upwind	87.5%		54.2%		12.5%		66.7%		0.0%		4.2%		25.0%	
downwind	8.3%		16.7%		79.2%		20.8%		91.7%		70.8%		41.7%	

Appendix E

Ambient Air Concentrations from Delaware Division of Air Quality Air Monitoring Stations

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
05/24/2020	00:00	0.009	0.0166	0.0068	0.0135
05/24/2020	01:00	0.0054	0.0095	0.0056	0.0121
05/24/2020	02:00	0.0067	0.0124	0.0053	0.0111
05/24/2020	03:00	0.0092	0.0163	0.0057	0.0109
05/24/2020	04:00	0.0086	0.0159	0.0062	0.0124
05/24/2020	05:00	0.0076	0.0148	0.0049	0.009
05/24/2020	06:00	0.0104	0.0203	0.0064	0.0114
05/24/2020	07:00	0.0119	0.0249	0.0092	0.018
05/24/2020	08:00	0.0115	0.025	0.0098	0.0208
05/24/2020	09:00	0.0104	0.0233	0.0104	0.0221
05/24/2020	10:00	0.0106	0.0228	0.01	0.0204
05/24/2020	11:00	0.0107	0.0231	0.0099	0.0205
05/24/2020	12:00	0.0109	0.0225	0.009	0.0183
05/24/2020	13:00	0.0109	0.0224	0.009	0.0182
05/24/2020	14:00	0.0104	0.0223	0.0083	0.0174
05/24/2020	15:00	0.0088	0.0182	0.0085	0.0184
05/24/2020	16:00	0.0051	0.0099	0.007	0.0148
05/24/2020	17:00	0.0066	0.0126	0.0061	0.013
05/24/2020	18:00	0.0063	0.0121	0.006	0.0123
05/24/2020	19:00	0.0059	0.012	0.0051	0.0099
05/24/2020	20:00	0.0082	0.016	0.0065	0.0133
05/24/2020	21:00	0.0086	0.0174	0.0073	0.0147
05/24/2020	22:00	0.0088	0.0175	0.0074	0.0156
05/24/2020	23:00	0.0085	0.0171	0.0062	0.0122
05/25/2020	00:00	0.0063	0.0119	0.0042	0.008
	24-hr Avg	0.0087	0.018	0.0073	0.015

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
05/27/2020	00:00	Down	Down	0.0013	0.0026
05/27/2020	01:00	Down	Down	0.001	0.0024
05/27/2020	02:00	Down	Down	0.001	0.0024
05/27/2020	03:00	Down	Down	0.0009	0.0024
05/27/2020	04:00	Down	Down	0.0006	0.0012
05/27/2020	05:00	Down	Down	0.0011	0.0018
05/27/2020	06:00	Down	Down	0.0015	0.0026
05/27/2020	07:00	<Samp	<Samp	0.0016	0.0025
05/27/2020	08:00	Down	Down	0.0034	0.0051
05/27/2020	09:00	0.0135	0.0443	0.0042	0.0065
05/27/2020	10:00	0.0113	0.0448	0.0043	0.0083
05/27/2020	11:00	0.0078	0.0248	0.0047	0.0091
05/27/2020	12:00	0.0054	0.0106	0.0037	0.0067
05/27/2020	13:00	0.0057	0.0094	0.0026	0.0063
05/27/2020	14:00	0.0038	0.0073	0.0027	0.0072
05/27/2020	15:00	0.0037	0.0074	0.0031	0.0082
05/27/2020	16:00	0.004	0.0081	0.0031	0.007
05/27/2020	17:00	0.0047	0.0085	0.0032	0.0077
05/27/2020	18:00	0.0051	0.0093	0.0033	0.0081
05/27/2020	19:00	0.0056	0.0095	0.0034	0.007
05/27/2020	20:00	0.0057	0.01	0.0035	0.0081
05/27/2020	21:00	0.0061	0.0113	0.0037	0.008
05/27/2020	22:00	0.0055	0.0092	0.004	0.0077
05/27/2020	23:00	0.0046	0.008	0.0028	0.0047
05/28/2020	00:00	0.0045	0.0077	0.0022	0.0037
	24-hr Avg	0.0061	0.014	0.0027	0.0056

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
05/30/2020	00:00	NoData	NoData	0.0049	0.0099
05/30/2020	01:00	NoData	NoData	0.0055	0.0107
05/30/2020	02:00	NoData	NoData	0.0054	0.012
05/30/2020	03:00	NoData	NoData	0.0043	0.0109
05/30/2020	04:00	NoData	NoData	0.0042	0.0113
05/30/2020	05:00	NoData	NoData	0.0044	0.0121
05/30/2020	06:00	NoData	NoData	0.0044	0.0103
05/30/2020	07:00	NoData	NoData	0.0045	0.0115
05/30/2020	08:00	NoData	NoData	0.0045	0.0108
05/30/2020	09:00	NoData	NoData	0.0041	0.012
05/30/2020	10:00	NoData	NoData	0.0039	0.0122
05/30/2020	11:00	NoData	NoData	0.0041	0.0119
05/30/2020	12:00	NoData	NoData	0.0041	0.012
05/30/2020	13:00	NoData	NoData	0.0041	0.0117
05/30/2020	14:00	NoData	NoData	0.0041	0.0121
05/30/2020	15:00	NoData	NoData	0.0045	0.0113
05/30/2020	16:00	NoData	NoData	0.0049	0.013
05/30/2020	17:00	NoData	NoData	0.0051	0.0127
05/30/2020	18:00	NoData	NoData	0.0053	0.0134
05/30/2020	19:00	NoData	NoData	0.0063	0.0141
05/30/2020	20:00	NoData	NoData	0.007	0.0158
05/30/2020	21:00	NoData	NoData	0.0085	0.0181
05/30/2020	22:00	NoData	NoData	0.0085	0.0176
05/30/2020	23:00	NoData	NoData	0.0071	0.0159
05/31/2020	00:00	NoData	NoData	0.0065	0.015
	24-hr Avg	NoData	NoData	0.0052	0.013

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
06/02/2020	00:00	0.0074	0.0126	0.0044	0.0101
06/02/2020	01:00	0.0077	0.0128	0.0046	0.0106
06/02/2020	02:00	0.0068	0.0119	0.005	0.0108
06/02/2020	03:00	0.0064	0.0114	0.0056	0.0118
06/02/2020	04:00	0.0067	0.013	0.0059	0.013
06/02/2020	05:00	0.0069	0.0127	0.0058	0.012
06/02/2020	06:00	0.0076	0.0158	0.0053	0.0129
06/02/2020	07:00	0.0076	0.0165	0.0052	0.0129
06/02/2020	08:00	0.0081	0.0183	0.0051	0.012
06/02/2020	09:00	0.0081	0.0161	0.0055	0.0142
06/02/2020	10:00	0.0071	0.0149	0.0056	0.0153
06/02/2020	11:00	0.0066	0.0144	0.0056	0.0198
06/02/2020	12:00	0.0057	0.0123	0.0059	0.017
06/02/2020	13:00	0.0053	0.0116	0.0056	0.019
06/02/2020	14:00	0.0055	0.0126	0.0046	0.0189
06/02/2020	15:00	-	-	0.0041	0.013
06/02/2020	16:00	0.005	0.0173	0.0043	0.0126
06/02/2020	17:00	0.0049	0.0147	0.0043	0.0131
06/02/2020	18:00	0.0057	0.0168	0.0049	0.0138
06/02/2020	19:00	0.0073	0.0175	0.0056	0.015
06/02/2020	20:00	0.0077	0.0194	0.0056	0.0136
06/02/2020	21:00	0.0079	0.019	0.0059	0.014
06/02/2020	22:00	0.0082	0.0185	0.0065	0.0156
06/02/2020	23:00	0.0105	0.0228	0.0068	0.0147
06/03/2020	00:00	0.0108	0.0227	0.0077	0.0154
	24-hr Avg	0.0071	0.016	0.0055	0.014

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
06/11/2020	00:00	0.0078	0.0185	0.0067	0.0151
06/11/2020	01:00	0.0074	0.0174	0.0066	0.014
06/11/2020	02:00	0.0072	0.0154	0.0064	0.0147
06/11/2020	03:00	0.007	0.0154	0.0062	0.0143
06/11/2020	04:00	0.0068	0.0143	0.0062	0.0133
06/11/2020	05:00	0.0069	0.0157	0.0061	0.0127
06/11/2020	06:00	0.0071	0.0178	0.0064	0.014
06/11/2020	07:00	0.0077	0.0194	0.0067	0.0159
06/11/2020	08:00	0.0079	0.0179	0.007	0.017
06/11/2020	09:00	0.0084	0.0201	0.0075	0.0168
06/11/2020	10:00	0.0076	0.0217	0.0079	0.0161
06/11/2020	11:00	0.0083	0.0198	0.0077	0.0175
06/11/2020	12:00	0.0078	0.0176	0.0076	0.0235
06/11/2020	13:00	0.0078	0.0189	0.0067	0.0176
06/11/2020	14:00	0.0089	0.02	0.0059	0.0156
06/11/2020	15:00	0.008	0.0194	0.0062	0.0181
06/11/2020	16:00	0.0071	0.0172	0.0061	0.0164
06/11/2020	17:00	0.0069	0.0163	0.0064	0.018
06/11/2020	18:00	0.0073	0.0185	0.0064	0.0165
06/11/2020	19:00	0.0076	0.0188	0.0067	0.0206
06/11/2020	20:00	0.0077	0.0176	0.0078	0.019
06/11/2020	21:00	0.0088	0.0212	0.0077	0.0202
06/11/2020	22:00	0.0091	0.0216	0.008	0.0214
06/11/2020	23:00	0.0097	0.0223	0.0085	0.0216
06/12/2020	00:00	0.0085	0.0178	0.0084	0.0201
	24-hr Avg	0.0078	0.018	0.0070	0.017

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
06/17/2020	00:00	0.0048	0.0105	0.0048	0.0098
06/17/2020	01:00	0.0044	0.0107	0.0049	0.0094
06/17/2020	02:00	0.0049	0.0115	0.0049	0.0112
06/17/2020	03:00	0.0049	0.011	0.0049	0.0111
06/17/2020	04:00	0.0052	0.0118	0.0049	0.0112
06/17/2020	05:00	0.0049	0.0128	0.0049	0.0104
06/17/2020	06:00	0.0048	0.0113	0.0048	0.0104
06/17/2020	07:00	0.0048	0.0129	0.0045	0.01
06/17/2020	08:00	0.0052	0.0175	0.0043	0.0094
06/17/2020	09:00	0.0051	0.0149	0.0043	0.0096
06/17/2020	10:00	0.0052	0.0157	0.0045	0.0107
06/17/2020	11:00	0.0053	0.0163	0.004	0.0083
06/17/2020	12:00	0.0049	0.0155	0.0044	0.0105
06/17/2020	13:00	0.0048	0.0163	0.0039	0.0083
06/17/2020	14:00	0.0043	0.0146	0.0038	0.0091
06/17/2020	15:00	0.004	0.0124	0.0036	0.0094
06/17/2020	16:00	0.0037	0.0113	0.0031	0.0078
06/17/2020	17:00	0.0039	0.0107	0.0028	0.0057
06/17/2020	18:00	0.004	0.0101	0.0033	0.0061
06/17/2020	19:00	0.0046	0.0121	0.0034	0.0074
06/17/2020	20:00	0.0042	0.0101	0.0035	0.0071
06/17/2020	21:00	0.0042	0.0092	0.0039	0.0081
06/17/2020	22:00	0.0046	0.0094	0.0042	0.0084
06/17/2020	23:00	0.0044	0.0085	0.0037	0.0066
06/18/2020	00:00	0.0047	0.0085	0.0038	0.0074
	24-hr Avg	0.0046	0.012	0.0041	0.0089

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
06/20/2020	00:00	0.0096	0.0165	0.0074	0.0129
06/20/2020	01:00	0.0087	0.0155	0.0073	0.0125
06/20/2020	02:00	0.0088	0.0149	0.0076	0.0132
06/20/2020	03:00	0.0103	0.017	0.0077	0.0135
06/20/2020	04:00	0.0101	0.0164	0.0075	0.0147
06/20/2020	05:00	0.0094	0.0164	0.0074	0.0134
06/20/2020	06:00	0.0095	0.0161	0.0078	0.0127
06/20/2020	07:00	0.0087	0.0167	0.0072	0.0114
06/20/2020	08:00	0.008	0.0155	0.0072	0.0116
06/20/2020	09:00	0.0072	0.0108	0.007	0.0116
06/20/2020	10:00	0.0076	0.0112	0.0072	0.0125
06/20/2020	11:00	0.0068	0.0105	0.0067	0.0114
06/20/2020	12:00	0.0076	0.0128	0.0066	0.0115
06/20/2020	13:00	0.0068	0.0107	0.006	0.0112
06/20/2020	14:00	0.0066	0.0119	0.0053	0.0111
06/20/2020	15:00	0.0055	0.0102	0.0048	0.0097
06/20/2020	16:00	0.0053	0.0091	0.0043	0.0086
06/20/2020	17:00	0.0056	0.01	0.0046	0.0204
06/20/2020	18:00	0.0055	0.01	0.0047	0.0108
06/20/2020	19:00	0.0059	0.011	0.005	0.0103
06/20/2020	20:00	0.0067	0.012	0.0053	0.0111
06/20/2020	21:00	0.0061	0.0111	0.0054	0.0107
06/20/2020	22:00	0.0058	0.0104	0.0054	0.0106
06/20/2020	23:00	0.0054	0.0098	0.0052	0.0103
06/21/2020	00:00	0.0057	0.0111	0.0062	0.0115
	24-hr Avg	0.0072	0.013	0.0062	0.012

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
06/23/2020	00:00	0.0074	0.0141	0.0065	0.0105
06/23/2020	01:00	0.0074	0.013	0.0069	0.0105
06/23/2020	02:00	0.0078	0.0119	0.0068	0.011
06/23/2020	03:00	0.0081	0.0131	0.0074	0.0125
06/23/2020	04:00	0.0086	0.0144	0.0071	0.0122
06/23/2020	05:00	0.0085	0.0155	0.0074	0.0136
06/23/2020	06:00	0.0085	0.0196	0.008	0.0147
06/23/2020	07:00	0.0086	0.0149	0.0084	0.0145
06/23/2020	08:00	0.0097	0.0181	0.0087	0.0157
06/23/2020	09:00	0.009	0.0171	0.0087	0.0144
06/23/2020	10:00	0.0087	0.015	0.0086	0.0138
06/23/2020	11:00	0.0096	0.0155	0.0091	0.014
06/23/2020	12:00	0.0105	0.0169	0.0101	0.0162
06/23/2020	13:00	0.0111	0.0177	0.0096	0.0176
06/23/2020	14:00	0.0108	0.018	0.0099	0.0169
06/23/2020	15:00	0.0108	0.0173	0.0106	0.0193
06/23/2020	16:00	0.0112	0.0178	0.0113	0.019
06/23/2020	17:00	0.012	0.0212	0.0125	0.021
06/23/2020	18:00	0.0097	0.0156	0.0134	0.0219
06/23/2020	19:00	0.01	0.0169	0.0128	0.0206
06/23/2020	20:00	0.012	0.023	0.0112	0.0172
06/23/2020	21:00	0.0121	0.0206	0.0094	0.0139
06/23/2020	22:00	0.0096	0.0149	0.0085	0.0138
06/23/2020	23:00	0.0084	0.0141	0.0073	0.0119
06/24/2020	00:00	0.0082	0.0135	0.0068	0.0118
	24-hr Avg	0.0096	0.016	0.0092	0.015

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
06/26/2020	00:00	0.0104	0.0169	0.0084	0.0144
06/26/2020	01:00	0.0095	0.0143	0.0087	0.015
06/26/2020	02:00	0.0106	0.0172	0.0091	0.0152
06/26/2020	03:00	0.0117	0.0177	0.0097	0.0155
06/26/2020	04:00	0.0113	0.0172	0.0095	0.0166
06/26/2020	05:00	0.0096	0.0152	0.0086	0.0145
06/26/2020	06:00	0.0068	0.0188	0.0076	0.015
06/26/2020	07:00	0.0062	0.0182	0.0074	0.0194
06/26/2020	08:00	0.0057	0.0145	0.0069	0.019
06/26/2020	09:00	0.0062	0.0142	0.0064	0.0164
06/26/2020	10:00	0.0067	0.0154	0.0065	0.0175
06/26/2020	11:00	0.0064	0.0155	0.0064	0.0167
06/26/2020	12:00	0.0065	0.0144	0.0072	0.0228
06/26/2020	13:00	0.0061	0.0123	0.0066	0.0168
06/26/2020	14:00	0.0061	0.0167	0.0062	0.0163
06/26/2020	15:00	0.0063	0.0161	0.006	0.0125
06/26/2020	16:00	0.0063	0.0151	0.0061	0.0142
06/26/2020	17:00	0.0065	0.0152	0.006	0.0139
06/26/2020	18:00	0.0066	0.0151	0.0063	0.0154
06/26/2020	19:00	0.007	0.0158	0.0068	0.0159
06/26/2020	20:00	0.0085	0.0205	0.0068	0.0152
06/26/2020	21:00	0.0087	0.0185	0.007	0.0154
06/26/2020	22:00	0.0086	0.0185	0.0077	0.0164
06/26/2020	23:00	0.0085	0.0179	0.0077	0.0149
06/27/2020	00:00	0.0087	0.0171	0.0072	0.0139
	24-hr Avg	0.0077	0.016	0.0073	0.016

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
8/19/2020	00:00	0.0113	0.0199	0.0083	0.0169
8/19/2020	01:00	0.0106	0.0182	0.0084	0.0158
8/19/2020	02:00	0.0108	0.0185	0.0085	0.0168
8/19/2020	03:00	0.0108	0.0196	0.0089	0.0177
8/19/2020	04:00	0.0106	0.0202	0.0086	0.0178
8/19/2020	05:00	0.0108	0.0204	0.0087	0.0192
8/19/2020	06:00	0.0118	0.0254	0.0086	0.0173
8/19/2020	07:00	0.0111	0.0222	0.0088	0.0169
8/19/2020	08:00	0.0114	0.0298	0.0098	0.0195
8/19/2020	09:00	0.0124	0.0227	0.0095	0.0179
8/19/2020	10:00	0.0108	0.0177	0.0088	0.0151
8/19/2020	11:00	0.01	0.0177	0.0076	0.0146
8/19/2020	12:00	0.0081	0.0139	0.0063	0.0104
8/19/2020	13:00	0.0092	0.0151	0.0064	0.0104
8/19/2020	14:00	0.0111	0.0176	0.0067	0.0111
8/19/2020	15:00	0.012	0.0194	0.0066	0.0112
8/19/2020	16:00	0.0106	0.0178	0.0075	0.0132
8/19/2020	17:00	0.0109	0.0174	0.0078	0.0136
8/19/2020	18:00	0.0101	0.0168	0.0087	0.0156
8/19/2020	19:00	0.011	0.0181	0.0098	0.0189
8/19/2020	20:00	0.0113	0.0189	0.0106	0.0224
8/19/2020	21:00	0.012	0.0202	0.0101	0.0229
8/19/2020	22:00	0.0127	0.023	0.0093	0.0198
8/19/2020	23:00	0.0103	0.0184	0.0103	0.0242
8/19/2020	00:00	0.0064	0.0126	0.0114	0.0243
	24-hr Avg	0.011	0.019	0.0087	0.017

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
8/22/2020	00:00	0.0087	0.0172	0.0073	0.0132
8/22/2020	01:00	0.0092	0.0223	0.0069	0.0138
8/22/2020	02:00	0.0083	0.0136	0.0071	0.014
8/22/2020	03:00	0.0085	0.0142	0.0072	0.0146
8/22/2020	04:00	0.0087	0.0147	0.0077	0.0156
8/22/2020	05:00	0.0093	0.0176	0.0073	0.015
8/22/2020	06:00	0.0092	0.0169	0.0073	0.0159
8/22/2020	07:00	0.0102	0.0207	0.0072	0.014
8/22/2020	08:00	0.0093	0.0166	0.0075	0.0128
8/22/2020	09:00	0.0088	0.0138	0.0075	0.0134
8/22/2020	10:00	0.0094	0.0136	0.0072	0.0126
8/22/2020	11:00	0.0092	0.0135	0.0068	0.0119
8/22/2020	12:00	0.0081	0.0122	0.0063	0.0102
8/22/2020	13:00	0.0076	0.0114	0.006	0.0101
8/22/2020	14:00	0.0071	0.0116	0.006	0.0109
8/22/2020	15:00	0.0072	0.0123	0.0064	0.0107
8/22/2020	16:00	0.0074	0.0113	0.0068	0.0118
8/22/2020	17:00	0.0076	0.0136	0.0062	0.0109
8/22/2020	18:00	0.0072	0.0134	0.0062	0.0116
8/22/2020	19:00	0.0072	0.0116	0.007	0.0132
8/22/2020	20:00	0.0075	0.0124	0.0062	0.0134
8/22/2020	21:00	0.0073	0.0139	0.006	0.0125
8/22/2020	22:00	0.0073	0.0152	0.0066	0.0136
8/22/2020	23:00	0.0074	0.0134	0.0064	0.014
8/22/2020	00:00	0.007	0.0121	0.0058	0.0128
	24-hr Avg	0.0082	0.014	0.0067	0.013

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
8/25/2020	00:00	0.0102	0.0179	0.0074	0.0153
8/25/2020	01:00	0.0106	0.0193	0.0071	0.014
8/25/2020	02:00	0.0111	0.0193	0.007	0.0145
8/25/2020	03:00	0.0109	0.0197	0.0069	0.0139
8/25/2020	04:00	0.0107	0.0199	0.007	0.0158
8/25/2020	05:00	0.0094	0.0187	0.0073	0.0158
8/25/2020	06:00	0.0099	0.0217	0.0078	0.0162
8/25/2020	07:00	0.0109	0.0218	0.0091	0.0163
8/25/2020	08:00	0.0133	0.0243	0.0112	0.0182
8/25/2020	09:00	0.015	0.0256	0.0127	0.0186
8/25/2020	10:00	0.0154	0.028	0.014	0.0231
8/25/2020	11:00	0.0159	0.023	0.0141	0.0208
8/25/2020	12:00	0.0165	0.0284	0.0148	0.0208
8/25/2020	13:00	0.017	0.0269	0.0154	0.0231
8/25/2020	14:00	0.0175	0.0292	0.015	0.0224
8/25/2020	15:00	0.0166	0.0257	0.015	0.0245
8/25/2020	16:00	0.0165	0.0272	0.015	0.0248
8/25/2020	17:00	0.0158	0.0243	0.0144	0.0228
8/25/2020	18:00	0.0148	0.0214	0.0113	0.0184
8/25/2020	19:00	0.0145	0.0219	0.0123	0.0207
8/25/2020	20:00	0.0158	0.0241	0.0132	0.0211
8/25/2020	21:00	0.0166	0.0252	0.014	0.0214
8/25/2020	22:00	0.0133	0.0211	0.0141	0.022
8/25/2020	23:00	0.0088	0.0169	0.0108	0.0192
8/25/2020	00:00	0.0083	0.0151	0.0078	0.0161
	24-hr Avg	0.014	0.023	0.012	0.019

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
8/28/2020	00:00	0.0082	0.0147	0.0071	0.0132
8/28/2020	01:00	0.0084	0.0145	0.0077	0.0126
8/28/2020	02:00	0.0094	0.0167	0.0082	0.0143
8/28/2020	03:00	0.0098	0.0192	0.0083	0.0146
8/28/2020	04:00	0.0101	0.0241	0.0082	0.0146
8/28/2020	05:00	0.0093	0.0188	0.0082	0.0148
8/28/2020	06:00	0.0094	0.0235	0.0078	0.0144
8/28/2020	07:00	0.01	0.0252	0.0074	0.0134
8/28/2020	08:00	0.0091	0.018	0.0078	0.0152
8/28/2020	09:00	0.0087	0.0169	0.0081	0.0256
8/28/2020	10:00	0.0093	0.0175	0.0081	0.0149
8/28/2020	11:00	0.0113	0.0202	0.009	0.0175
8/28/2020	12:00	0.0119	0.0229	0.0095	0.0172
8/28/2020	13:00	0.0126	0.0252	0.0101	0.0193
8/28/2020	14:00	0.0104	0.0192	0.0098	0.0185
8/28/2020	15:00	0.0089	0.0162	0.0061	0.0182
8/28/2020	16:00	0.0064	0.0134	0.0032	0.0093
8/28/2020	17:00	0.0045	0.0101	0.0031	0.0097
8/28/2020	18:00	0.0041	0.0107	0.0031	0.0105
8/28/2020	19:00	0.0042	0.0109	0.0039	0.0146
8/28/2020	20:00	0.0042	0.0106	0.0042	0.0159
8/28/2020	21:00	0.0041	0.0106	0.0051	0.0249
8/28/2020	22:00	0.0043	0.013	0.0055	0.0192
8/28/2020	23:00	0.0047	0.0136	0.0062	0.0199
8/28/2020	00:00	0.0056	0.0156	0.0074	0.0213
	24-hr Avg	0.0079	0.017	0.0069	0.016

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
8/31/2020	00:00	0.0042	0.0095	0.007	0.015
8/31/2020	01:00	0.0043	0.0094	0.0069	0.0158
8/31/2020	02:00	0.0055	0.0107	0.0063	0.0168
8/31/2020	03:00	0.0062	0.0122	0.0053	0.0121
8/31/2020	04:00	0.0064	0.0121	0.0042	0.0097
8/31/2020	05:00	0.0054	0.0113	0.0045	0.0104
8/31/2020	06:00	0.0046	0.0113	0.0048	0.0116
8/31/2020	07:00	0.0048	0.0124	0.0043	0.0114
8/31/2020	08:00	0.0049	0.014	0.004	0.0106
8/31/2020	09:00	0.0061	0.0215	0.0038	0.0108
8/31/2020	10:00	0.0054	0.0217	0.0034	0.0092
8/31/2020	11:00	0.0042	0.0134	0.0033	0.0085
8/31/2020	12:00	0.004	0.0102	0.0032	0.0084
8/31/2020	13:00	0.004	0.0103	0.0033	0.0097
8/31/2020	14:00	0.0039	0.011	0.0033	0.0088
8/31/2020	15:00	0.0039	0.0093	0.0032	0.0081
8/31/2020	16:00	0.0039	0.0101	0.0029	0.0071
8/31/2020	17:00	0.0039	0.01	0.003	0.008
8/31/2020	18:00	0.0039	0.0102	0.0029	0.0081
8/31/2020	19:00	0.0041	0.011	0.0033	0.0098
8/31/2020	20:00	0.0038	0.0093	0.0032	0.0096
8/31/2020	21:00	0.0037	0.0085	0.0037	0.0105
8/31/2020	22:00	0.0039	0.0091	0.003	0.0077
8/31/2020	23:00	0.0038	0.0084	0.0028	0.0078
8/31/2020	00:00	No Data	No Data	No Data	No Data
	24-hr Avg	0.0045	0.012	0.0039	0.010

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
11/5/2020	00:00	0.0127	0.0288	0.0088	0.0155
11/5/2020	01:00	0.0154	0.0323	0.0079	0.014
11/5/2020	02:00	0.0151	0.0318	0.0062	0.0096
11/5/2020	03:00	0.0129	0.0266	0.0081	0.0113
11/5/2020	04:00	0.0122	0.0219	0.01	0.0154
11/5/2020	05:00	0.012	0.0249	0.0105	0.0149
11/5/2020	06:00	0.0121	0.0264	0.0113	0.0166
11/5/2020	07:00	0.0151	0.0355	0.0123	0.0203
11/5/2020	08:00	0.0137	0.024	0.0081	0.0125
11/5/2020	09:00	0.0143	0.0216	0.0077	0.0133
11/5/2020	10:00	0.015	0.0221	0.0075	0.0149
11/5/2020	11:00	0.0104	0.0196	0.0086	0.0439
11/5/2020	12:00	0.0088	0.0179	0.0075	0.017
11/5/2020	13:00	0.0082	0.0174	0.0068	0.0157
11/5/2020	14:00	0.0073	0.0155	0.0064	0.0158
11/5/2020	15:00	0.0068	0.0173	0.0064	0.0152
11/5/2020	16:00	0.0066	0.0164	0.0064	0.0143
11/5/2020	17:00	0.0076	0.0176	0.0065	0.0161
11/5/2020	18:00	0.0083	0.0167	0.0075	0.0165
11/5/2020	19:00	0.0114	0.0216	0.0077	0.0148
11/5/2020	20:00	0.0156	0.032	0.0078	0.0146
11/5/2020	21:00	0.0172	0.0326	0.0071	0.0147
11/5/2020	22:00	0.018	0.0419	0.0077	0.013
11/5/2020	23:00	0.0184	0.0404	0.0073	0.0136
11/6/2020	00:00	0.0217	0.0423	0.0075	0.0129
	24-hr Avg	0.013	0.026	0.0080	0.016

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
11/8/2020	00:00	0.0586	0.0781	0.0204	0.0284
11/8/2020	01:00	0.0573	0.0756	0.0237	0.0298
11/8/2020	02:00	0.0492	0.0676	0.0222	0.0295
11/8/2020	03:00	0.048	0.0645	0.0259	0.0332
11/8/2020	04:00	0.0354	0.047	0.0257	0.0311
11/8/2020	05:00	0.0378	0.0494	0.0259	0.0309
11/8/2020	06:00	0.0442	0.06	0.0266	0.0323
11/8/2020	07:00	0.039	0.0527	0.0264	0.0317
11/8/2020	08:00	0.0359	0.0479	0.0265	0.0329
11/8/2020	09:00	0.0377	0.0516	0.0253	0.0321
11/8/2020	10:00	0.0343	0.0539	0.0201	0.0274
11/8/2020	11:00	0.0321	0.0449	0.014	0.0199
11/8/2020	12:00	0.0195	0.0309	0.012	0.0192
11/8/2020	13:00	0.0156	0.0239	0.0093	0.0161
11/8/2020	14:00	0.0121	0.019	0.0085	0.0144
11/8/2020	15:00	0.0109	0.0188	0.0091	0.0172
11/8/2020	16:00	0.0112	0.0203	0.01	0.0201
11/8/2020	17:00	0.0135	0.0233	0.0132	0.0227
11/8/2020	18:00	0.0163	0.0279	0.0142	0.0272
11/8/2020	19:00	0.0209	0.0323	0.0142	0.0212
11/8/2020	20:00	0.0238	0.04	0.0134	0.021
11/8/2020	21:00	0.0278	0.0466	0.014	0.02
11/8/2020	22:00	0.0323	0.0492	0.0133	0.0198
11/8/2020	23:00	0.0322	0.048	0.0158	0.0206
11/9/2020	00:00	0.0301	0.0451	0.0157	0.0229
	24-hr Avg	0.030	0.043	0.018	0.025

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
11/11/2020	00:00	0.0064	0.0146	0.005	0.0107
11/11/2020	01:00	0.0067	0.0139	0.0049	0.0105
11/11/2020	02:00	0.0068	0.0137	0.0047	0.0104
11/11/2020	03:00	0.0065	0.0143	0.0045	0.009
11/11/2020	04:00	0.0072	0.0155	0.0041	0.0076
11/11/2020	05:00	0.0094	0.022	0.0048	0.0093
11/11/2020	06:00	0.0107	0.0301	0.0055	0.0108
11/11/2020	07:00	0.0129	0.0344	0.005	0.0116
11/11/2020	08:00	0.0105	0.0341	0.0053	0.0135
11/11/2020	09:00	0.0067	0.0192	0.0062	0.0157
11/11/2020	10:00	0.0075	0.0225	0.0068	0.0171
11/11/2020	11:00	0.0074	0.0189	0.0069	0.018
11/11/2020	12:00	0.0072	0.017	0.0064	0.0157
11/11/2020	13:00	0.0059	0.0124	0.0057	0.0133
11/11/2020	14:00	0.0056	0.0111	0.0055	0.0131
11/11/2020	15:00	0.0053	0.0115	0.0048	0.0111
11/11/2020	16:00	0.0048	0.0106	0.0043	0.0106
11/11/2020	17:00	0.0042	0.0092	0.0046	0.0109
11/11/2020	18:00	0.0033	0.0068	0.005	0.0119
11/11/2020	19:00	0.003	0.0056	0.0031	0.0077
11/11/2020	20:00	0.0034	0.0075	0.0024	0.0073
11/11/2020	21:00	0.003	0.0087	0.0031	0.0101
11/11/2020	22:00	0.0026	0.007	0.0027	0.0101
11/11/2020	23:00	0.0021	0.0052	0.0025	0.0088
11/12/2020	00:00	0.0021	0.0042	0.0022	0.0077
	24-hr Avg	0.0060	0.015	0.0046	0.011

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
11/14/2020	00:00	0.014	0.0207	0.0108	0.0156
11/14/2020	01:00	0.0145	0.0214	0.0095	0.0142
11/14/2020	02:00	0.0178	0.0276	0.0102	0.0145
11/14/2020	03:00	0.0188	0.0288	0.0108	0.0156
11/14/2020	04:00	0.0176	0.0259	0.0117	0.0174
11/14/2020	05:00	0.0157	0.0237	0.0113	0.0156
11/14/2020	06:00	0.0147	0.0218	0.0126	0.0195
11/14/2020	07:00	0.0152	0.0231	0.0142	0.0201
11/14/2020	08:00	0.0141	0.021	0.0157	0.0209
11/14/2020	09:00	0.0116	0.0165	0.012	0.0163
11/14/2020	10:00	0.0106	0.0175	0.0101	0.0139
11/14/2020	11:00	0.0099	0.0172	0.0088	0.0127
11/14/2020	12:00	0.0099	0.0153	0.0082	0.012
11/14/2020	13:00	0.0099	0.0142	0.0082	0.0122
11/14/2020	14:00	0.0097	0.015	0.0073	0.0109
11/14/2020	15:00	0.0091	0.0144	0.0068	0.0109
11/14/2020	16:00	0.0097	0.0151	0.007	0.0118
11/14/2020	17:00	0.0127	0.0197	0.0086	0.0136
11/14/2020	18:00	0.0166	0.0258	0.0106	0.0152
11/14/2020	19:00	0.0244	0.0367	0.0123	0.0168
11/14/2020	20:00	0.0288	0.0387	0.0134	0.0192
11/14/2020	21:00	0.0346	0.0449	0.0121	0.0179
11/14/2020	22:00	0.032	0.0444	0.0132	0.0181
11/14/2020	23:00	0.0244	0.0329	0.014	0.019
11/15/2020	00:00	0.0287	0.0379	0.0167	0.0225
	24-hr Avg	0.017	0.025	0.011	0.016

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
11/17/2020	00:00	0.0046	0.0119	0.0036	0.0076
11/17/2020	01:00	0.0044	0.0112	0.0037	0.0078
11/17/2020	02:00	0.0046	0.0097	0.0038	0.0085
11/17/2020	03:00	0.0052	0.0139	0.0037	0.0097
11/17/2020	04:00	0.0069	0.0224	0.0036	0.0076
11/17/2020	05:00	0.0073	0.0215	0.0035	0.0077
11/17/2020	06:00	0.0075	0.0222	0.0039	0.0104
11/17/2020	07:00	0.0058	0.0156	0.0036	0.0114
11/17/2020	08:00	0.0068	0.0297	0.0032	0.0075
11/17/2020	09:00	0.0058	0.0162	0.0031	0.008
11/17/2020	10:00	0.0044	0.0132	0.0037	0.0091
11/17/2020	11:00	0.0059	0.0145	0.0057	0.0101
11/17/2020	12:00	0.0069	0.0157	0.0066	0.0116
11/17/2020	13:00	0.008	0.0166	0.0066	0.0113
11/17/2020	14:00	0.0048	0.0123	0.0046	0.0082
11/17/2020	15:00	0.0037	0.0095	0.0034	0.0059
11/17/2020	16:00	0.0031	0.0079	0.0029	0.0045
11/17/2020	17:00	0.0031	0.0085	0.0029	0.0055
11/17/2020	18:00	0.0029	0.009	0.0026	0.0047
11/17/2020	19:00	0.0032	0.0072	0.0028	0.0052
11/17/2020	20:00	0.0025	0.0075	0.0026	0.0046
11/17/2020	21:00	0.0027	0.0071	0.0027	0.0039
11/17/2020	22:00	0.0028	0.0062	0.003	0.0045
11/17/2020	23:00	0.002	0.0048	0.0032	0.005
11/18/2020	00:00	0.002	0.004	0.0034	0.0056
	24-hr Avg	0.0048	0.013	0.0037	0.0075

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
2/6/2021	00:00	0.0073	0.0119	0.0058	0.0089
2/6/2021	01:00	0.0088	0.0143	0.0058	0.0091
2/6/2021	02:00	0.0078	0.0125	0.0075	0.0122
2/6/2021	03:00	0.0080	0.0140	0.0136	0.0206
2/6/2021	04:00	0.0082	0.0145	0.0086	0.0129
2/6/2021	05:00	0.0086	0.0154	0.0059	0.0091
2/6/2021	06:00	0.0084	0.0149	0.0064	0.0102
2/6/2021	07:00	0.0082	0.0162	0.0063	0.0106
2/6/2021	08:00	0.0082	0.0376	0.0059	0.0103
2/6/2021	09:00	0.0068	0.0222	0.0061	0.0124
2/6/2021	10:00	0.0055	0.0114	0.0054	0.0126
2/6/2021	11:00	0.0049	0.0105	0.0042	0.0082
2/6/2021	12:00	0.0050	0.0108	0.0045	0.0082
2/6/2021	13:00	0.0050	0.0103	0.0046	0.0091
2/6/2021	14:00	0.0048	0.0109	0.0045	0.0089
2/6/2021	15:00	0.0049	0.0091	0.0045	0.0092
2/6/2021	16:00	0.0051	0.0106	0.0044	0.0092
2/6/2021	17:00	0.0056	0.0123	0.0043	0.0094
2/6/2021	18:00	0.0068	0.0137	0.0048	0.0125
2/6/2021	19:00	0.0104	0.0202	0.0051	0.0113
2/6/2021	20:00	0.0139	0.0300	0.0066	0.0128
2/6/2021	21:00	0.0124	0.0277	0.0082	0.0145
2/6/2021	22:00	0.0128	0.0256	0.0074	0.0123
2/6/2021	23:00	0.0137	0.0241	0.0089	0.0135
2/6/2021	00:00	0.0133	0.0207	0.0087	0.0127
	24-hr Avg	0.0082	0.017	0.0063	0.011

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
2/9/2021	00:00	0.0109	0.0222	0.0062	0.0101
2/9/2021	01:00	0.0092	0.0156	0.0067	0.0109
2/9/2021	02:00	0.0079	0.0140	0.0071	0.0114
2/9/2021	03:00	0.0076	0.0132	0.0068	0.0106
2/9/2021	04:00	0.0071	0.0126	0.0068	0.0110
2/9/2021	05:00	0.0072	0.0155	0.0073	0.0112
2/9/2021	06:00	0.0091	0.0184	0.0080	0.0127
2/9/2021	07:00	0.0087	0.0172	0.0081	0.0137
2/9/2021	08:00	0.0091	0.0214	0.0079	0.0124
2/9/2021	09:00	0.0129	0.0360	0.0082	0.0162
2/9/2021	10:00	0.0140	0.0406	0.0084	0.0233
2/9/2021	11:00	0.0134	0.0312	0.0105	0.0227
2/9/2021	12:00	0.0145	0.0279	0.0143	0.0275
2/9/2021	13:00	0.0196	0.0311	0.0194	0.0371
2/9/2021	14:00	0.0237	0.0417	0.0233	0.0377
2/9/2021	15:00	0.0254	0.0469	0.0220	0.0354
2/9/2021	16:00	0.0254	0.0483	0.0222	0.0344
2/9/2021	17:00	0.0188	0.0343	0.0218	0.0323
2/9/2021	18:00	0.0182	0.0296	0.0255	0.0374
2/9/2021	19:00	0.0208	0.0326	0.0243	0.0314
2/9/2021	20:00	0.0238	0.0341	0.0277	0.0345
2/9/2021	21:00	0.0273	0.0344	0.0322	0.0382
2/9/2021	22:00	0.0300	0.0368	0.0324	0.0376
2/9/2021	23:00	0.0292	0.0353	0.0328	0.0376
2/9/2021	00:00	0.0270	0.0327	0.0316	0.0360
	24-hr Avg	0.017	0.029	0.017	0.026

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
2/12/2021	00:00	0.0109	0.0249	0.0099	0.0144
2/12/2021	01:00	0.0109	0.0202	0.0101	0.0149
2/12/2021	02:00	0.0110	0.0210	0.0099	0.0139
2/12/2021	03:00	0.0109	0.0190	0.0104	0.0145
2/12/2021	04:00	0.0087	0.0195	0.0101	0.0146
2/12/2021	05:00	0.0092	0.0302	0.0066	0.0108
2/12/2021	06:00	0.0076	0.0298	0.0058	0.0096
2/12/2021	07:00	0.0063	0.0313	0.0050	0.0091
2/12/2021	08:00	0.0069	0.0370	0.0058	0.0110
2/12/2021	09:00	0.0076	0.0303	0.0065	0.0131
2/12/2021	10:00	0.0079	0.0296	0.0062	0.0138
2/12/2021	11:00	0.0081	0.0264	0.0066	0.0137
2/12/2021	12:00	0.0081	0.0252	0.0063	0.0148
2/12/2021	13:00	0.0084	0.0238	0.0064	0.0149
2/12/2021	14:00	0.0083	0.0244	0.0067	0.0152
2/12/2021	15:00	0.0081	0.0223	0.0068	0.0164
2/12/2021	16:00	0.0081	0.0224	0.0067	0.0141
2/12/2021	17:00	0.0099	0.0284	0.0068	0.0147
2/12/2021	18:00	0.0103	0.0296	0.0074	0.0156
2/12/2021	19:00	0.0104	0.0291	0.0078	0.0176
2/12/2021	20:00	0.0114	0.0292	0.0088	0.0194
2/12/2021	21:00	0.0117	0.0336	0.0093	0.0227
2/12/2021	22:00	0.0123	0.0325	0.0102	0.0247
2/12/2021	23:00	0.0139	0.0357	0.0104	0.0235
2/12/2021	00:00	0.0119	0.0282	0.0110	0.0269
	24-hr Avg	0.0095	0.027	0.0078	0.016

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)

(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
2/15/2021	00:00	0.0149	0.0193	0.0196	0.0248
2/15/2021	01:00	0.0125	0.0164	0.0152	0.0194
2/15/2021	02:00	0.0104	0.0138	0.0114	0.0147
2/15/2021	03:00	0.0103	0.0139	0.0106	0.0144
2/15/2021	04:00	0.0106	0.0141	0.0106	0.0142
2/15/2021	05:00	0.0105	0.0149	0.0110	0.0152
2/15/2021	06:00	0.0109	0.0209	0.0107	0.0155
2/15/2021	07:00	0.0109	0.0268	0.0113	0.0170
2/15/2021	08:00	0.0124	0.0500	0.0109	0.0157
2/15/2021	09:00	0.0130	0.0574	0.0120	0.0173
2/15/2021	10:00	0.0133	0.0371	0.0130	0.0189
2/15/2021	11:00	0.0159	0.0567	0.0139	0.0198
2/15/2021	12:00	0.0160	0.0481	0.0146	0.0215
2/15/2021	13:00	0.0160	0.0474	0.0161	0.0233
2/15/2021	14:00	0.0170	0.0403	0.0166	0.0243
2/15/2021	15:00	0.0177	0.0362	0.0154	0.0219
2/15/2021	16:00	0.0183	0.0340	0.0152	0.0238
2/15/2021	17:00	0.0182	0.0343	0.0159	0.0235
2/15/2021	18:00	0.0200	0.0329	0.0172	0.0243
2/15/2021	19:00	0.0229	0.0329	0.0192	0.0265
2/15/2021	20:00	0.0257	0.0316	0.0213	0.0281
2/15/2021	21:00	0.0239	0.0281	0.0193	0.0251
2/15/2021	22:00	0.0191	0.0222	0.0184	0.0222
2/15/2021	23:00	0.0153	0.0182	0.0140	0.0163
2/15/2021	00:00	0.0097	0.0127	0.0098	0.0118
	24-hr Avg	0.015	0.031	0.014	0.020

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
2/18/2021	00:00	0.0070	0.0144	0.0080	0.0154
2/18/2021	01:00	0.0068	0.0143	0.0086	0.0182
2/18/2021	02:00	0.0067	0.0143	0.0087	0.0167
2/18/2021	03:00	0.0066	0.0135	0.0085	0.0162
2/18/2021	04:00	0.0076	0.0146	0.0077	0.0150
2/18/2021	05:00	0.0083	0.0168	0.0084	0.0158
2/18/2021	06:00	0.0080	0.0146	0.0070	0.0149
2/18/2021	07:00	0.0073	0.0114	0.0069	0.0118
2/18/2021	08:00	0.0081	0.0145	0.0074	0.0115
2/18/2021	09:00	0.0082	0.0133	0.0058	0.0092
2/18/2021	10:00	0.0069	0.0111	0.0057	0.0093
2/18/2021	11:00	0.0061	0.0100	0.0054	0.0092
2/18/2021	12:00	0.0070	0.0105	0.0047	0.0075
2/18/2021	13:00	0.0064	0.0112	0.0044	0.0071
2/18/2021	14:00	0.0075	0.0129	0.0062	0.0103
2/18/2021	15:00	0.0077	0.0129	0.0066	0.0102
2/18/2021	16:00	0.0077	0.0127	0.0075	0.0109
2/18/2021	17:00	0.0077	0.0121	0.0077	0.0117
2/18/2021	18:00	0.0077	0.0116	0.0083	0.0117
2/18/2021	19:00	0.0080	0.0115	0.0084	0.0116
2/18/2021	20:00	0.0082	0.0115	0.0076	0.0105
2/18/2021	21:00	0.0077	0.0107	0.0073	0.0103
2/18/2021	22:00	0.0085	0.0118	0.0082	0.0115
2/18/2021	23:00	0.0088	0.0122	0.0090	0.0121
2/18/2021	00:00	0.0087	0.0117	0.0094	0.0124
	24-hr Avg	0.0075	0.013	0.0072	0.012

Appendix E

Delaware Ambient Air Monitoring Stations: MLK and Rt 9

Hourly PM2.5 and PM10 Concentrations for Each Sampling Date

Data received from C. Sarnoski, DNREC (received 7/27/2020, 9/14/2020, 1/19/2021 and 4/12/2021)
(All concentrations in mg/m3)

		MLK		Rt #9	
Date	Time	PM 2.5 (mg/m3)	PM 10 (mg/m3)	PM 2.5 (mg/m3)	PM 10 (mg/m3)
2/21/2021	00:00	0.0249	0.0290	0.0240	0.0278
2/21/2021	01:00	0.0255	0.0286	0.0251	0.0285
2/21/2021	02:00	0.0256	0.0277	0.0259	0.0293
2/21/2021	03:00	0.0267	0.0289	0.0257	0.0283
2/21/2021	04:00	0.0263	0.0295	0.0248	0.0268
2/21/2021	05:00	0.0245	0.0279	0.0245	0.0268
2/21/2021	06:00	0.0226	0.0288	0.0246	0.0275
2/21/2021	07:00	0.0220	0.0257	0.0246	0.0279
2/21/2021	08:00	0.0209	0.0247	0.0222	0.0253
2/21/2021	09:00	0.0184	0.0217	0.0183	0.0205
2/21/2021	10:00	0.0165	0.0213	0.0144	0.0166
2/21/2021	11:00	0.0157	0.0197	0.0129	0.0153
2/21/2021	12:00	0.0175	0.0209	0.0151	0.0173
2/21/2021	13:00	0.0173	0.0208	0.0156	0.0179
2/21/2021	14:00	0.0164	0.0201	0.0134	0.0161
2/21/2021	15:00	0.0150	0.0191	0.0107	0.0138
2/21/2021	16:00	0.0156	0.0185	0.0120	0.0160
2/21/2021	17:00	0.0157	0.0199	0.0115	0.0165
2/21/2021	18:00	0.0175	0.0254	0.0121	0.0202
2/21/2021	19:00	0.0203	0.0291	0.0129	0.0198
2/21/2021	20:00	0.0222	0.0332	0.0129	0.0182
2/21/2021	21:00	0.0241	0.0337	0.0133	0.0168
2/21/2021	22:00	0.0240	0.0333	0.0176	0.0232
2/21/2021	23:00	0.0207	0.0314	0.0149	0.0189
2/21/2021	00:00	No Data	No Data	No Data	No Data
	24-hr Avg	0.020	0.026	0.018	0.021

Appendix F

24-Hour Average Concentrations for PM2.5 and PM10 by Monitoring Location

Appendix F

24-Hour Average Air Concentrations and Predominant Wind Classifications by Sampling Date and Monitoring Location (a)

(All concentrations in mg/m3) (Note: 1 mg/m3 = 1,000 µg/m3)

Table F-1
PM2.5 (mg/m3)

Date	MP-1	Wind Class (b)	MP-2	Wind Class (b)	MP-3	Wind Class (b)	MP-4	Wind Class (b)	MP-5	Wind Class (b)	MP-6 (off site)	Wind Class (b)	MP-7 (off site)	Wind Class (b)
First Quarter														
5/24/2020	0.013	Neither	0.011	Downwind	0.010	Upwind	0.0061	Upwind	0.012	Upwind	T	Upwind	F	Upwind
5/27/2020	0.0074	Downwind	0.0062	Upwind	0.0048	Upwind	0.00029	Downwind	0.0075	Downwind	0.0086	Upwind	F	Upwind
5/30/2020	0.0087	Upwind	F	Downwind	0.0063	Downwind	0.0017	Upwind	0.010	Downwind	P	Downwind	P	Upwind
6/2/2020	0.010	Upwind	F	Upwind	F	Neither	0.0045	Downwind	0.010	Downwind	P	Downwind	F	Downwind
6/11/2020	0.011	Neither	T/F	Upwind	T/F	Upwind	T/F	Downwind	0.011	Downwind	T	Neither	T/F	Neither
6/17/2020	0.0077	Neither	0.0079	Downwind	0.0038	Neither	0.0014	Upwind	0.0081	Upwind	P	Upwind	0.010	Upwind
6/20/2020	0.010	Neither	0.011	Upwind	0.0055	Upwind	0.0045	Downwind	0.010	Downwind	0.0063	Neither	0.0055	Neither
6/23/2020	0.012	Neither	0.012	Upwind	0.0085	Upwind	0.0087	Downwind	0.013	Downwind	0.0073	Neither	0.014	Neither
6/26/2020	0.010	Upwind	0.011	Upwind	0.0073	Downwind	0.0050	Downwind	0.011	Downwind	E	Downwind	0.013	Downwind
Second Quarter														
8/19/2020	0.015	Upwind	0.013	Upwind	0.016	Downwind	0.0088	Neither	0.015	Downwind	0.016	Downwind	0.0082	Downwind
8/22/2020	0.012	Upwind	0.011	Upwind	0.011	Upwind	0.0048	Downwind	0.012	Downwind	0.012	Downwind	T/F	Downwind
8/25/2020	P	Upwind	0.016	Upwind	0.015	Downwind	0.010	Downwind	0.015	Downwind	0.016	Downwind	P	Downwind
8/28/2020	0.010	Upwind	0.0091	Upwind	0.011	Downwind	0.0055	Downwind	0.010	Downwind	0.012	Downwind	F	Downwind
8/31/2020	0.0085	Downwind	0.0073	Downwind	0.0081	Upwind	0.0014	Upwind	0.0086	Upwind	0.010	Upwind	0.0040	Upwind
Third Quarter														
11/5/2020	0.012	Upwind	0.016	Upwind	0.015	Neither	0.015	Downwind	0.019	Downwind	0.0060	Downwind	0.0089	Downwind
11/8/2020	0.032	Neither	0.044	Upwind	0.045	Upwind	0.041	Downwind	0.051	Downwind	0.043	Downwind	0.053	Downwind
11/11/2020	0.0046	Neither	0.0046	Upwind	0.0053	Upwind	0.0076	Downwind	P	Downwind	FE	Neither	FE	Neither
11/14/2020	0.017	Upwind	0.021	Neither	0.018	Downwind	0.018	Upwind	0.022	Downwind	P	Downwind	0.014	Neither
11/17/2020	0.010	Upwind	0.013	Neither	0.012	Downwind	0.011	Upwind	0.016	Downwind	P	Downwind	0.0080	Downwind
Fourth Quarter														
2/6/2021	T	Upwind	F	Upwind	0.020	Neither	0.013	Downwind	T	Downwind	T	Downwind	0.010	Downwind
2/9/2021	0.020	Upwind	0.015	Downwind	0.026	Downwind	F	Upwind	0.020	Upwind	P	Upwind	T	Upwind
2/12/2021	0.015	Upwind	0.0083	Downwind	0.018	Neither	0.010	Upwind	0.015	Upwind	P	Upwind	P	Upwind
2/15/2021	0.019	Upwind	0.013	Downwind	0.025	Downwind	0.017	Upwind	0.019	Upwind	P	Upwind	0.017	Upwind
2/18/2021	0.013	Upwind	0.0075	Downwind	0.017	Downwind	0.0086	Upwind	0.013	Upwind	P	Upwind	0.010	Upwind
2/21/2021	0.022	Upwind	0.015	Upwind	P	Downwind	0.019	Upwind	0.025	Downwind	0.019	Downwind	0.021	Downwind

Table F-1 Notes

(a) In some cases, insufficient hourly measurements were available to calculate a 24-hour average. According to DNREC, 75% or more hourly samples over a 24-hour sampling period are needed to calculate a valid 24-hour average concentration (personal communication, C. Sarnoski, DNREC and S. Foster, CPF Associates LLC, July 27, 2020). In these cases, the reasons for the insufficient data are noted by an error code (e.g., T, P, Temp, etc). Definitions for error codes are provided in Appendix A and Table D-2 in Appendix D.

(b) Predominant wind direction classifications for the 24-hour sampling period (downwind, upwind or neither) were based on the cumulative wind directions during each hour over the sampling day based on the sampling location's position relative to the site. See Appendix C (Data Compilation and Statistical Analysis Methods) for more information on wind classifications.

Appendix F

24-Hour Average Air Concentrations and Predominant Wind Classifications by Sampling Date and Monitoring Location (a)

(All concentrations in mg/m3) (Note: 1 mg/m3 = 1,000 µg/m3)

Table F-2
PM10 (mg/m3)

Date	MP-1	Wind Class (b)	MP-2	Wind Class (b)	MP-3	Wind Class (b)	MP-4	Wind Class (b)	MP-5	Wind Class (b)	MP-6	Wind Class (b)	MP-7	Wind Class (b)
First Quarter														
5/24/2020	0.020	Neither	0.030	Downwind	Temp	Upwind	0.018	Upwind	0.022	Upwind	0.021	Upwind	0.018	Upwind
5/27/2020	0.013	Downwind	0.020	Upwind	Temp	Upwind	0.0082	Downwind	0.017	Downwind	0.011	Upwind	0.010	Upwind
5/30/2020	0.015	Upwind	0.016	Downwind	0.013	Downwind	0.012	Upwind	0.013	Downwind	P	Downwind	P	Upwind
6/2/2020	0.017	Upwind	0.026	Upwind	0.019	Neither	F	Downwind	0.027	Downwind	P	Downwind	P	Downwind
6/11/2020	0.020	Neither	0.028	Upwind	T/F	Upwind	T/F	Downwind	0.030	Downwind	T/F	Neither	T	Neither
6/17/2020	0.024	Neither	0.035	Downwind	0.017	Neither	0.016	Upwind	T	Upwind	P	Upwind	0.014	Upwind
6/20/2020	0.015	Neither	0.022	Upwind	0.013	Upwind	0.013	Downwind	0.015	Downwind	0.015	Neither	P	Neither
6/23/2020	0.023	Neither	0.024	Upwind	0.019	Upwind	0.019	Downwind	0.029	Downwind	0.017	Neither	0.013	Neither
6/26/2020	0.019	Upwind	0.027	Upwind	0.017	Downwind	0.021	Downwind	0.021	Downwind	0.017	Downwind	0.014	Downwind
Second Quarter														
8/19/2020	0.025	Upwind	0.025	Upwind	0.019	Downwind	0.030	Neither	0.029	Downwind	0.024	Downwind	0.021	Downwind
8/22/2020	0.016	Upwind	0.019	Upwind	0.012	Upwind	0.015	Downwind	0.016	Downwind	0.015	Downwind	0.011	Downwind
8/25/2020	P	Upwind	0.027	Upwind	0.020	Downwind	0.032	Downwind	0.037	Downwind	0.031	Downwind	P	Downwind
8/28/2020	0.021	Upwind	0.022	Upwind	0.021	Downwind	0.024	Downwind	0.029	Downwind	0.021	Downwind	0.0094	Downwind
8/31/2020	0.021	Downwind	0.024	Downwind	0.011	Upwind	0.013	Upwind	0.021	Upwind	0.019	Upwind	0.015	Upwind
Third Quarter														
11/5/2020	0.021	Upwind	0.017	Upwind	0.037	Neither	0.043	Downwind	0.027	Downwind	0.017	Downwind	0.025	Downwind
11/8/2020	0.040	Neither	0.042	Upwind	0.077	Upwind	0.055	Downwind	0.062	Downwind	0.053	Downwind	0.086	Downwind
11/11/2020	0.013	Neither	*	Upwind	0.026	Upwind	0.024	Downwind	P	Downwind	0.011	Neither	0.019	Neither
11/14/2020	0.021	Upwind	0.017	Neither	0.033	Downwind	0.027	Upwind	FE	Downwind	P	Downwind	FE	Neither
11/17/2020	0.0084	Upwind	0.012	Neither	0.022	Downwind	0.025	Upwind	0.017	Downwind	P	Downwind	FE	Downwind
Fourth Quarter														
2/6/2021	T	Upwind	0.020	Upwind	0.016	Neither	0.015	Downwind	Temp	Downwind	0.0068	Downwind	0.014	Downwind
2/9/2021	0.042	Upwind	0.041	Downwind	0.033	Downwind	0.032	Upwind	Temp	Upwind	0.021	Upwind	T	Upwind
2/12/2021	0.030	Upwind	0.029	Downwind	0.021	Neither	0.021	Upwind	0.029	Upwind	P	Upwind	P	Upwind
2/15/2021	0.040	Upwind	0.038	Downwind	0.029	Downwind	0.031	Upwind	0.028	Upwind	P	Upwind	0.030	Upwind
2/18/2021	0.025	Upwind	0.022	Downwind	0.015	Downwind	0.019	Upwind	0.016	Upwind	P	Upwind	0.013	Upwind
2/21/2021	0.027	Upwind	0.030	Upwind	P	Downwind	0.020	Upwind	0.021	Downwind	0.016	Downwind	0.025	Downwind

Table F-2 Notes

(a) In some cases, insufficient hourly measurements were available to calculate a 24-hour average. According to DNREC, 75% or more hourly samples over a 24-hour sampling period are needed to calculate a valid 24-hour average concentration (personal communication, C. Sarnoski, DNREC and S. Foster, CPF Associates LLC, July 27, 2020). In these cases, the reasons for the insufficient data are noted by an error code (e.g., T, P, Temp, etc). Definitions for error codes are provided in Appendix A and Table D-2 in Appendix D.

(b) Predominant wind direction classifications for the 24-hour sampling period (downwind, upwind or neither) were based on the cumulative wind directions during each hour over the sampling day based on the sampling location's position relative to the site. See Appendix C (Data Compilation and Statistical Analysis Methods) for more information on wind classifications.

Appendix G

Box Plots of Hourly Monitoring Data

APPENDIX G
BOX PLOTS OF HOURLY CONCENTRATIONS

1. INTRODUCTION

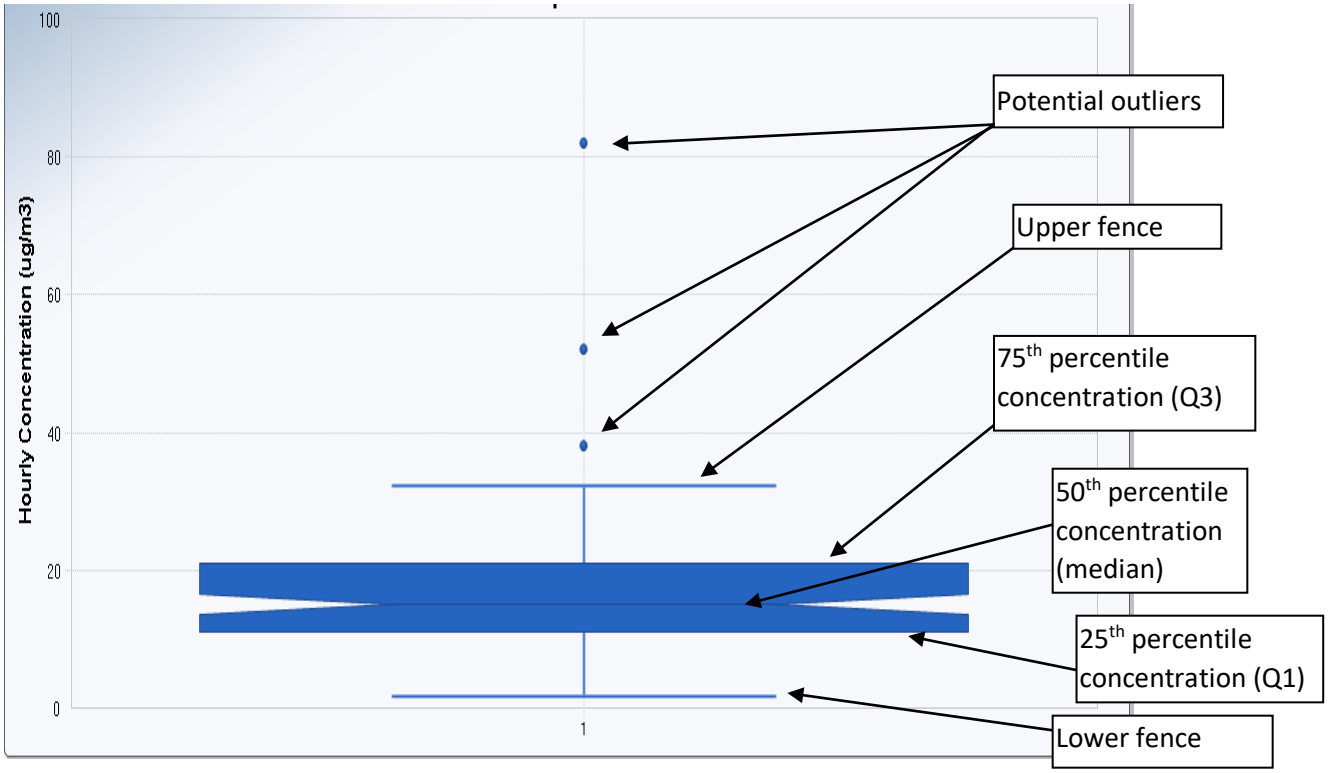
This appendix presents box plots of hourly concentrations for several datasets. Box plots can help better understand air monitoring results and provide additional insight that might not otherwise be revealed by statistical tests. Box plots are useful for exploring data visually, comparing concentrations of two or more groups, and identifying potential outliers. Outliers are concentrations (usually larger or smaller than the majority of the data values in a sample) that are not representative of the population from which they were drawn. The presence of outliers can distort statistics although, according to ProUCL guidance, they may have minimal influence on WMW statistical tests which were the most common type of statistical test used in this report (USEPA 2015). The box plots were created using ProUCL (USEPA 2015). [1]

Two groups of box plots by sampling quarter are provided below.

- The first group of box plots presents hourly air concentrations at on-site and off-site locations: at the two DNREC stations (MLK and RT9), the five on-site stations combined (MP1 – MP5), separately for downwind and upwind, and the two off-site stations (MP6 and MP7).
- The second group of box plots presents hourly air concentrations for two selected on-site stations (MP1 and MP4), with the data divided into three wind classes – downwind, upwind or neither.

An example box plot with definitions is shown in Figure 1.

Figure 1: Example Box Plot



[1] US Environmental Protection Agency (USEPA). 2015. ProUCL Version 5.1.002 Technical Guide: Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations).

Definitions for Figure 1, Example Box Plot:

75th percentile = the value in the sample data set where 75% of the values in that set are less than or equal to it.
50th percentile = the value in the sample data set where 50% of the values in that set are less than or equal to it. This is also referred to as the median value.
25th percentile = the value in the sample data set where 25% of the values in that set are less than or equal to it.
Upper fence = highest observation or (75th percentile + 1.5*interquartile range), whichever is lower.
Lower fence = lowest observation or (25th percentile – 1.5*interquartile range), whichever is higher.
Interquartile range = Q3-Q1

2. BOX PLOTS ACROSS ON-SITE AND OFF-SITE LOCATIONS (FIGURE 2 THROUGH FIGURE 9)
DNREC Stations (MLK & RT9), On-Site (Downwind and Upwind) and Off-Site (MP6 and MP7)

Variable definitions for Figures 2 through 9:

MLK = Martin Luther King DNREC Station (Wilmington)
RT9 = Route 9 DNREC Station (Delaware City)
AVG_ONSITE_DOWN = average of all on-site stations (MP-1 through MP-5) classified as downwind, by hour
AVG_ONSITE_UP = average of all on-site stations (MP-1 through MP-5) classified as upwind, by hour
MP6 = off-site station
MP7 = off-site station

2a. PM2.5 BOX PLOTS

Figure 2
First Quarter Sampling – PM2.5

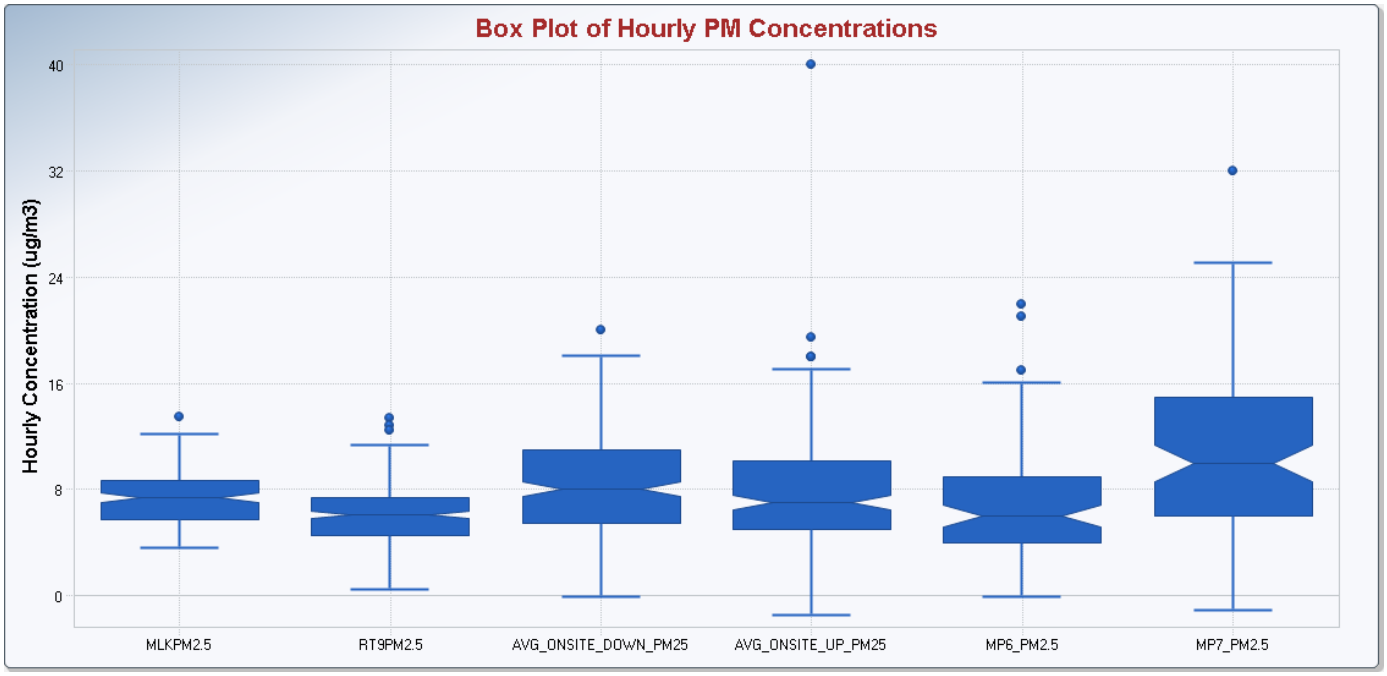


Figure 3
Second Quarter Sampling – PM2.5

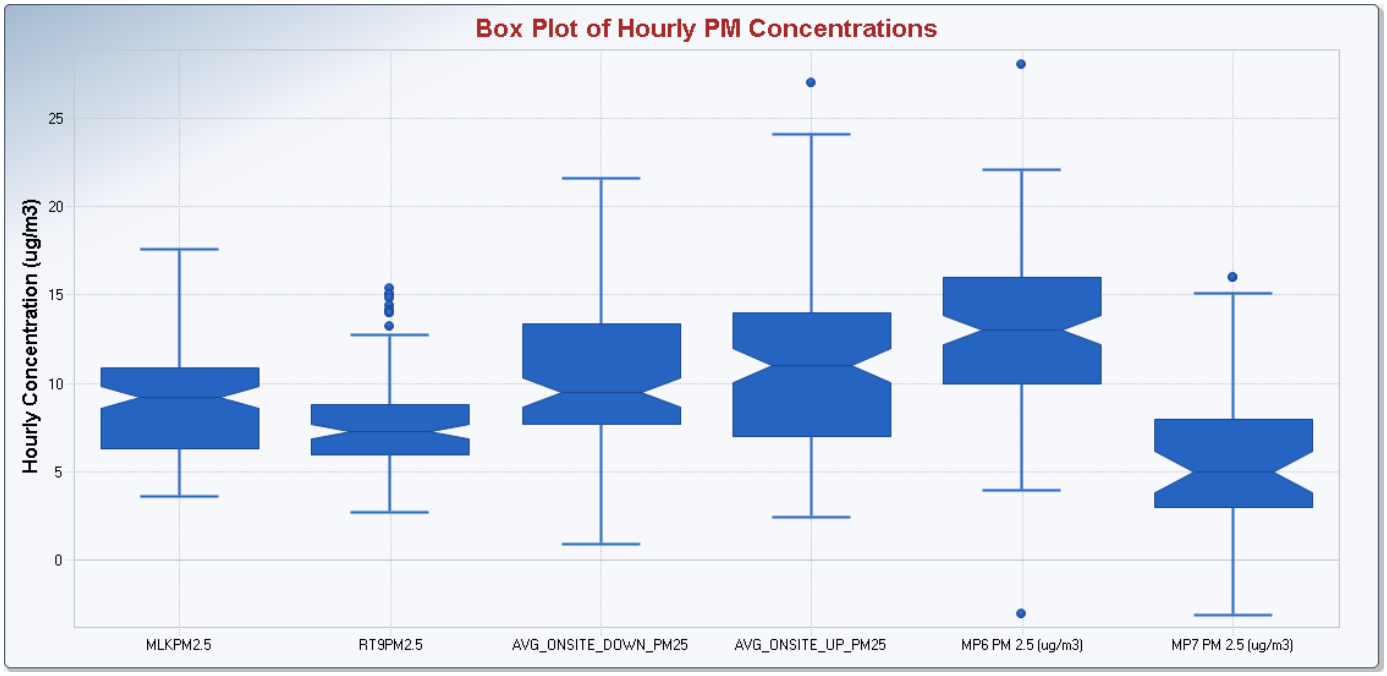


Figure 4
Third Quarter Sampling – PM2.5

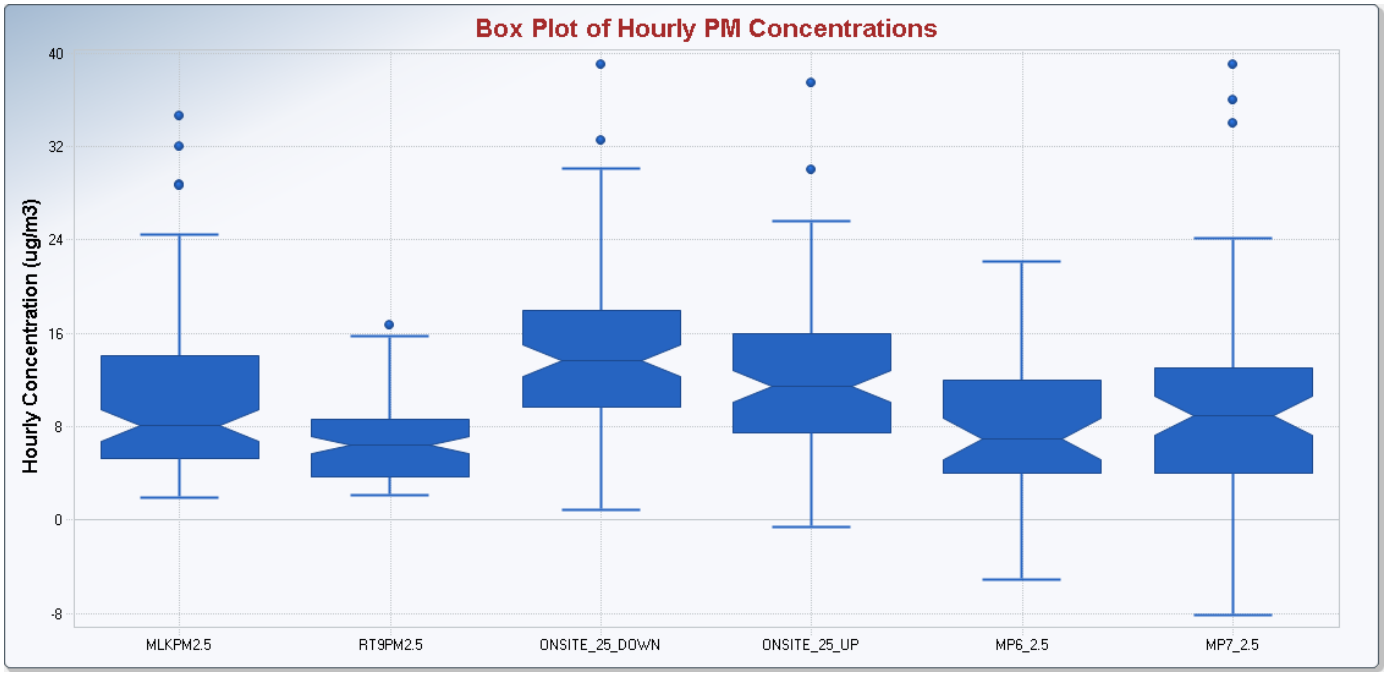
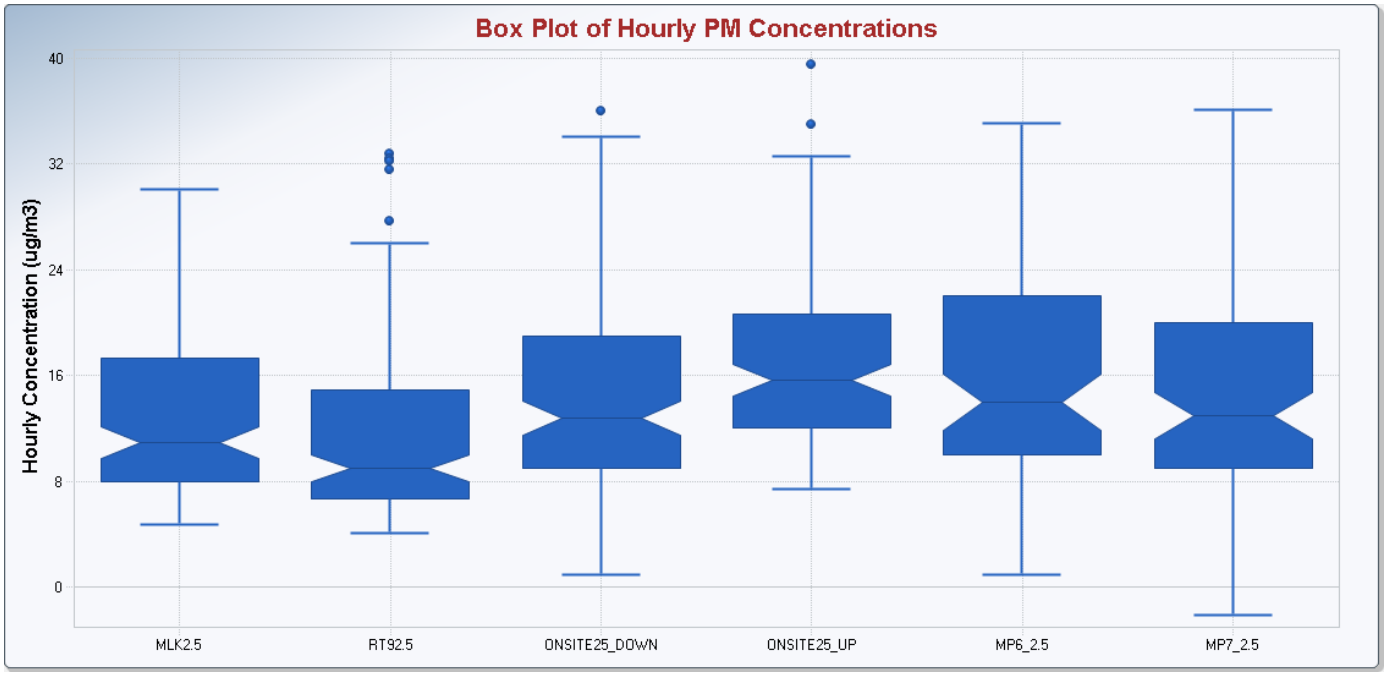


Figure 5
Fourth Quarter Sampling – PM2.5



2b. PM10 BOX PLOTS

Figure 6
First Quarter Sampling – PM10

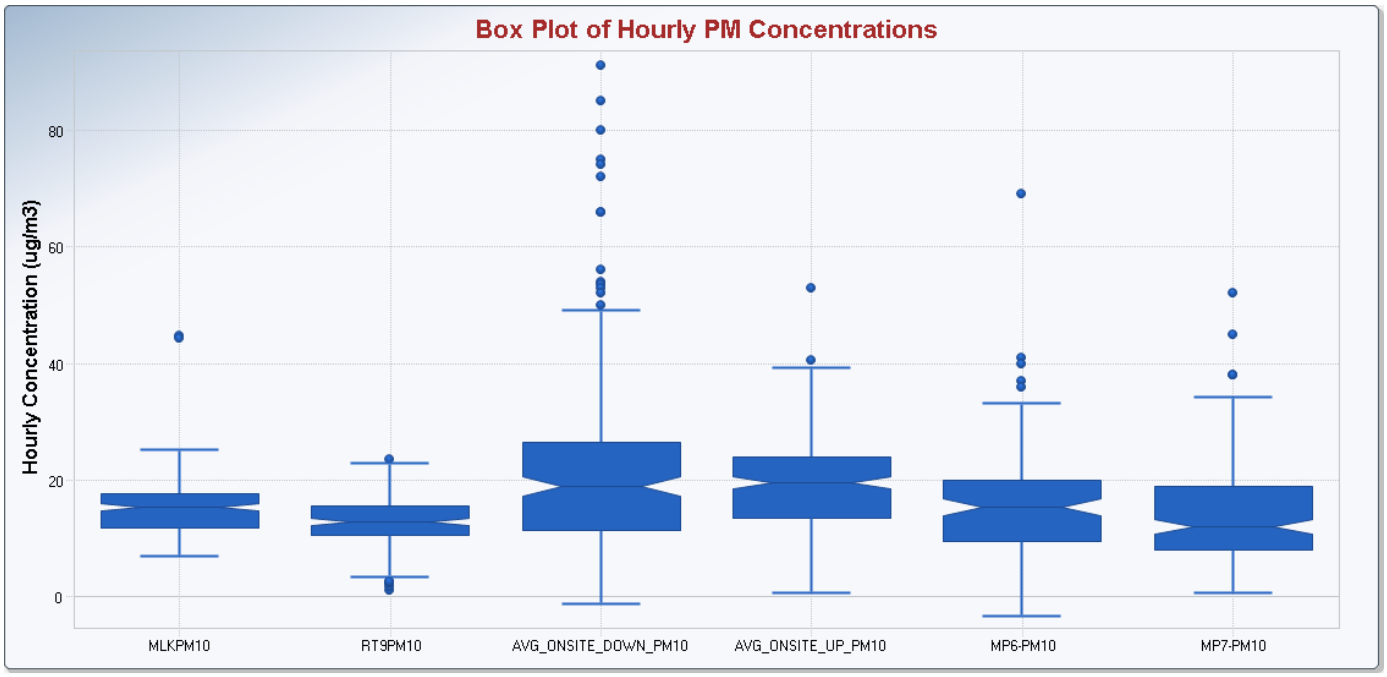


Figure 7
Second Quarter Sampling – PM10

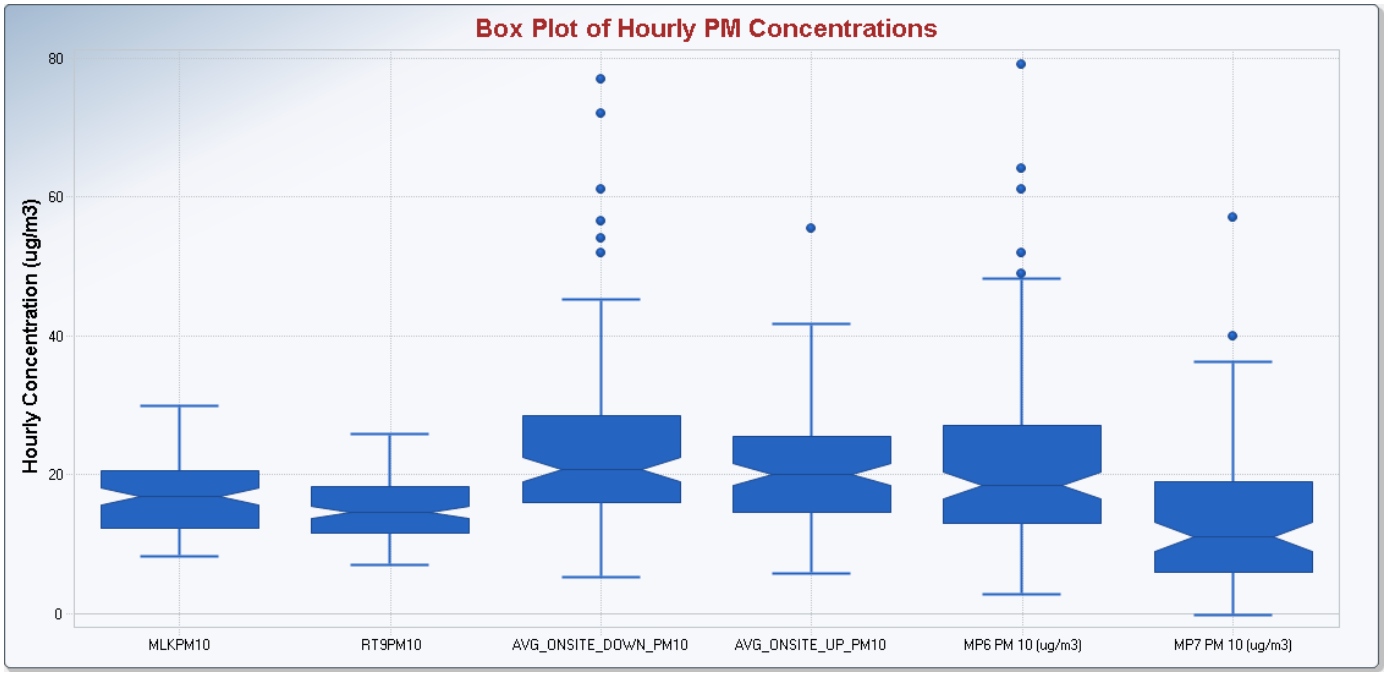


Figure 8
Third Quarter Sampling – PM10

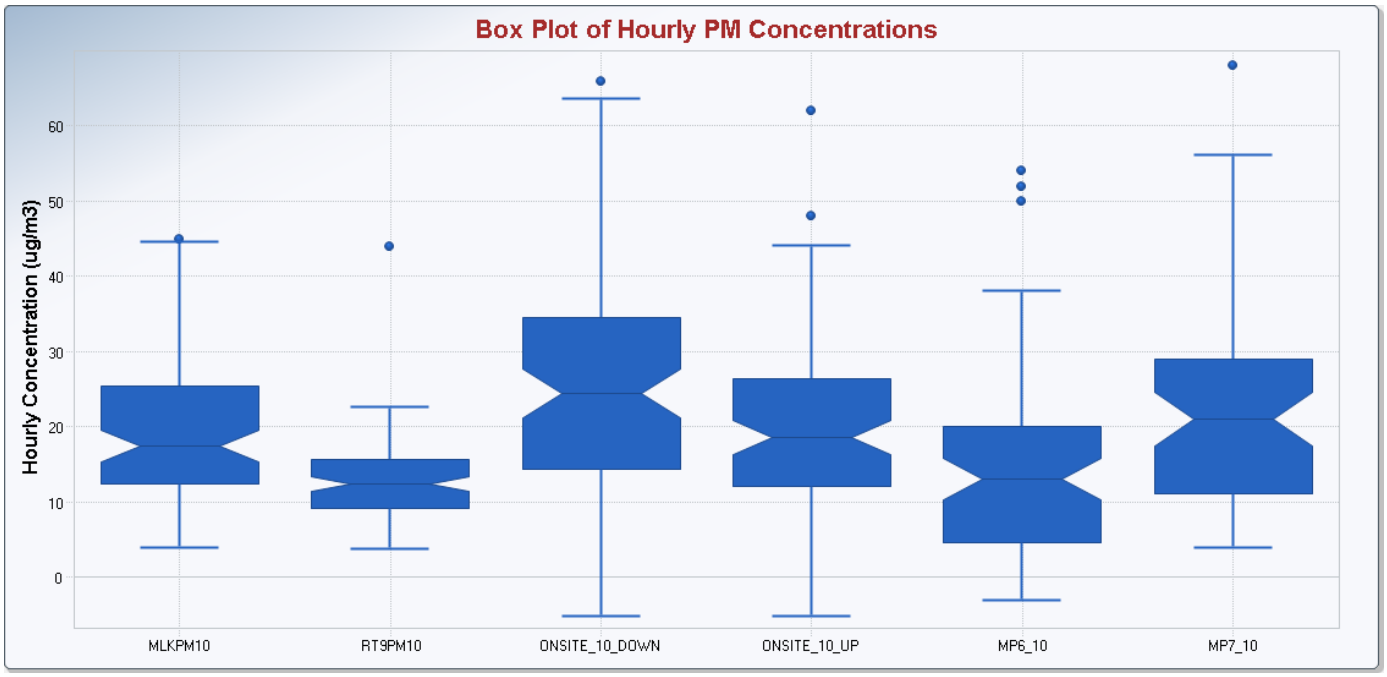
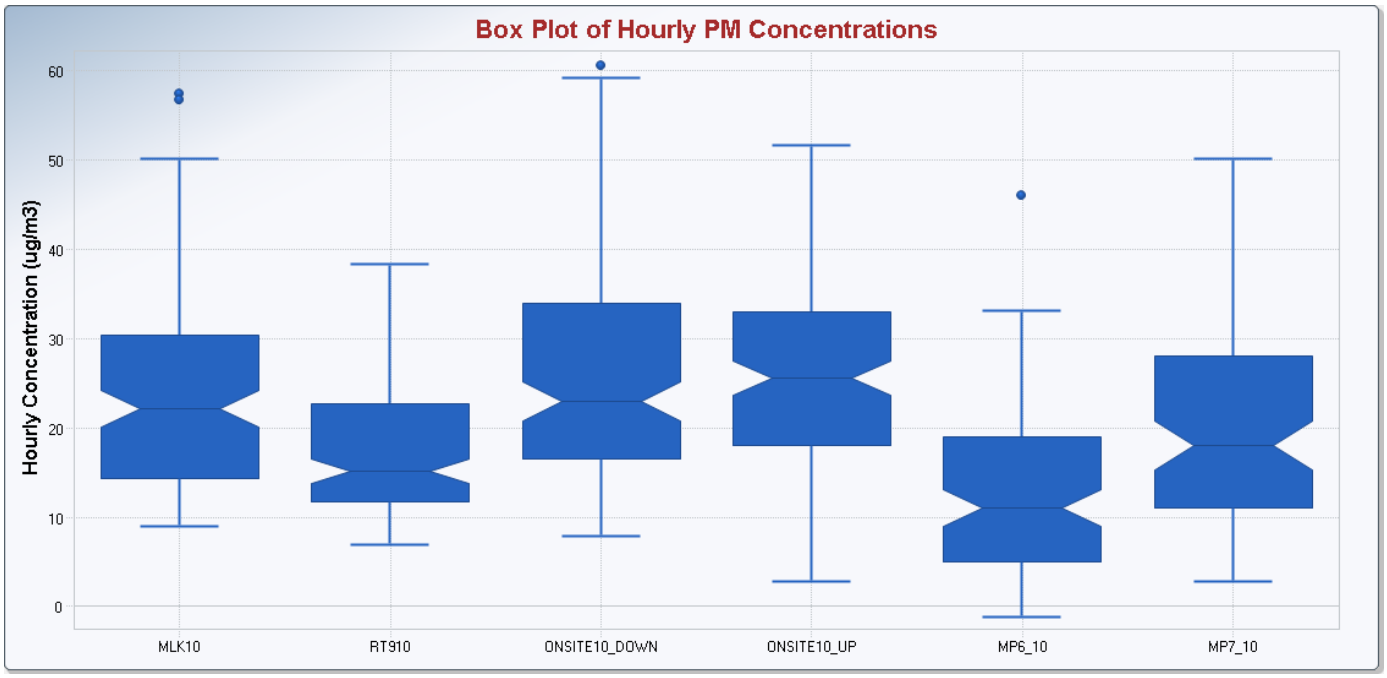


Figure 9
Fourth Quarter Sampling – PM10



3. BOX PLOTS FOR STATIONS MP1 and MP4 BY WIND CLASS (FIGURE 10 THROUGH FIGURE 17)

Variable definitions for Figures 10 through 17:

(1) = downwind of landfill
(2) = upwind of landfill
(3) = neither

3a. MP1 BOX PLOTS

Figure 10
First Quarter Sampling – MP1

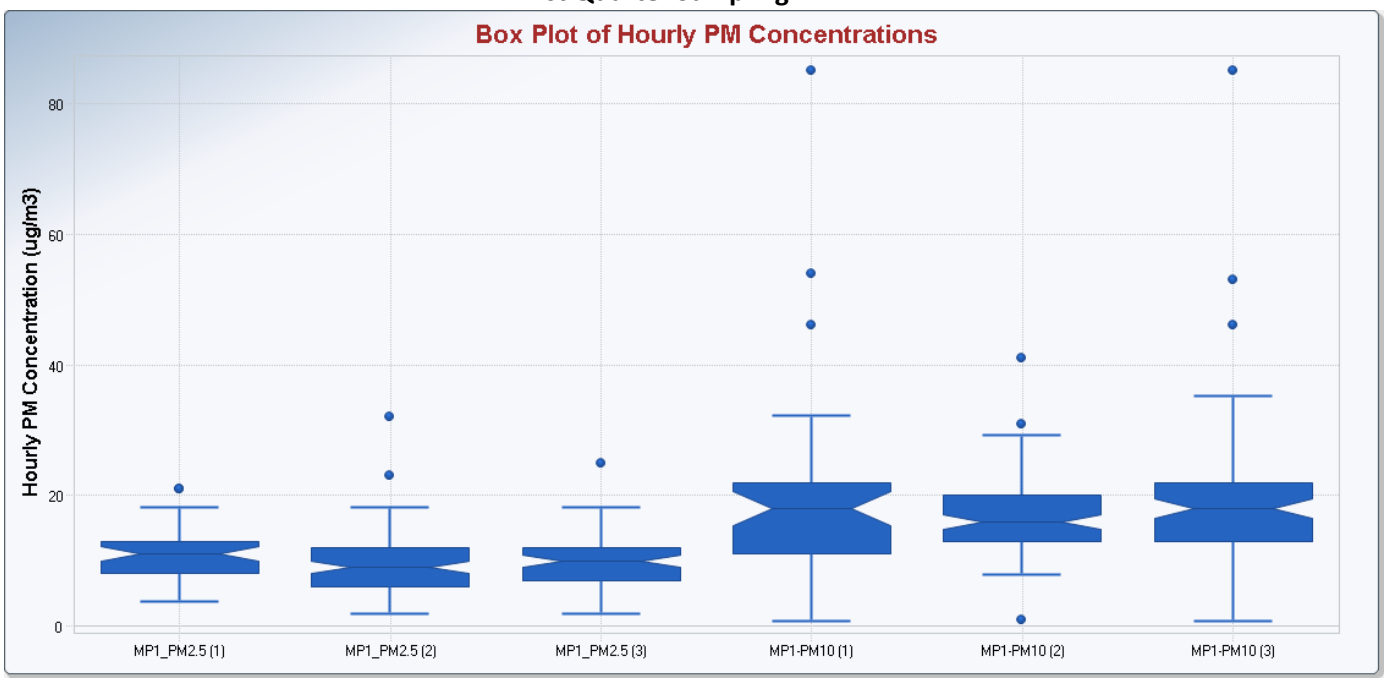


Figure 11
Second Quarter Sampling – MP1

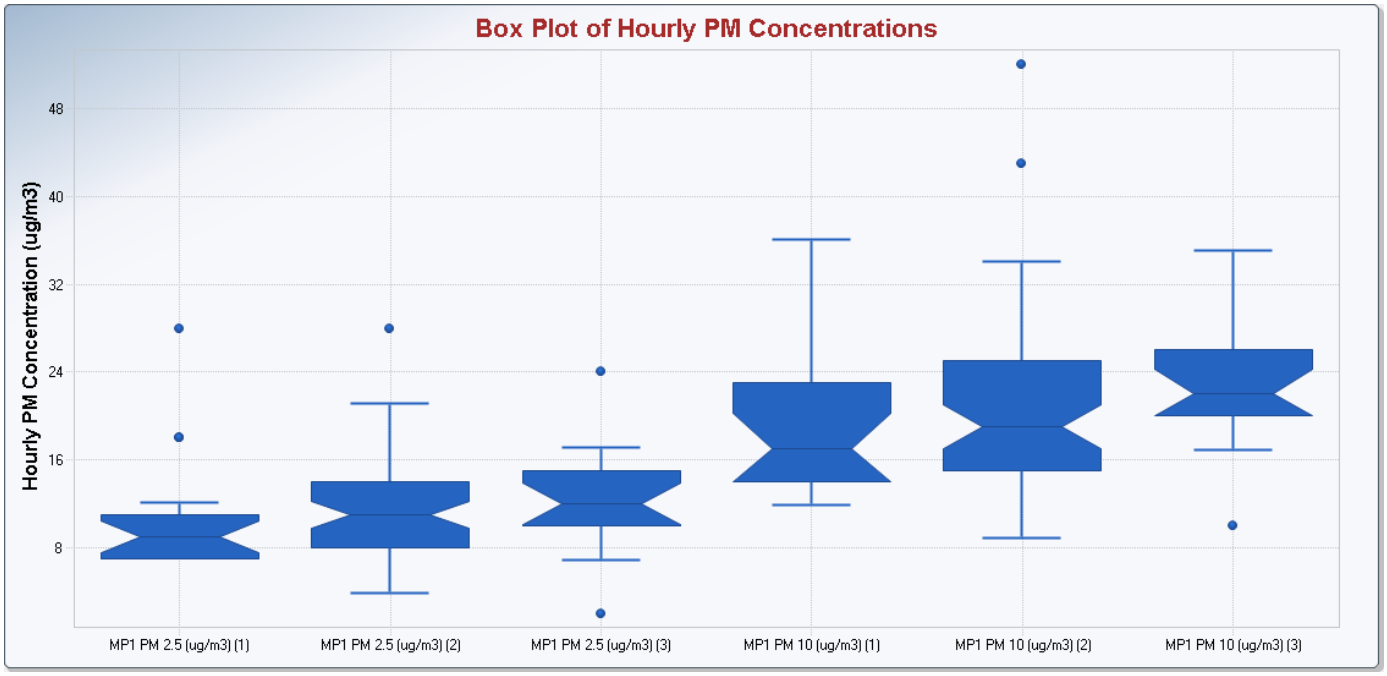


Figure 12
Third Quarter Sampling – MP1

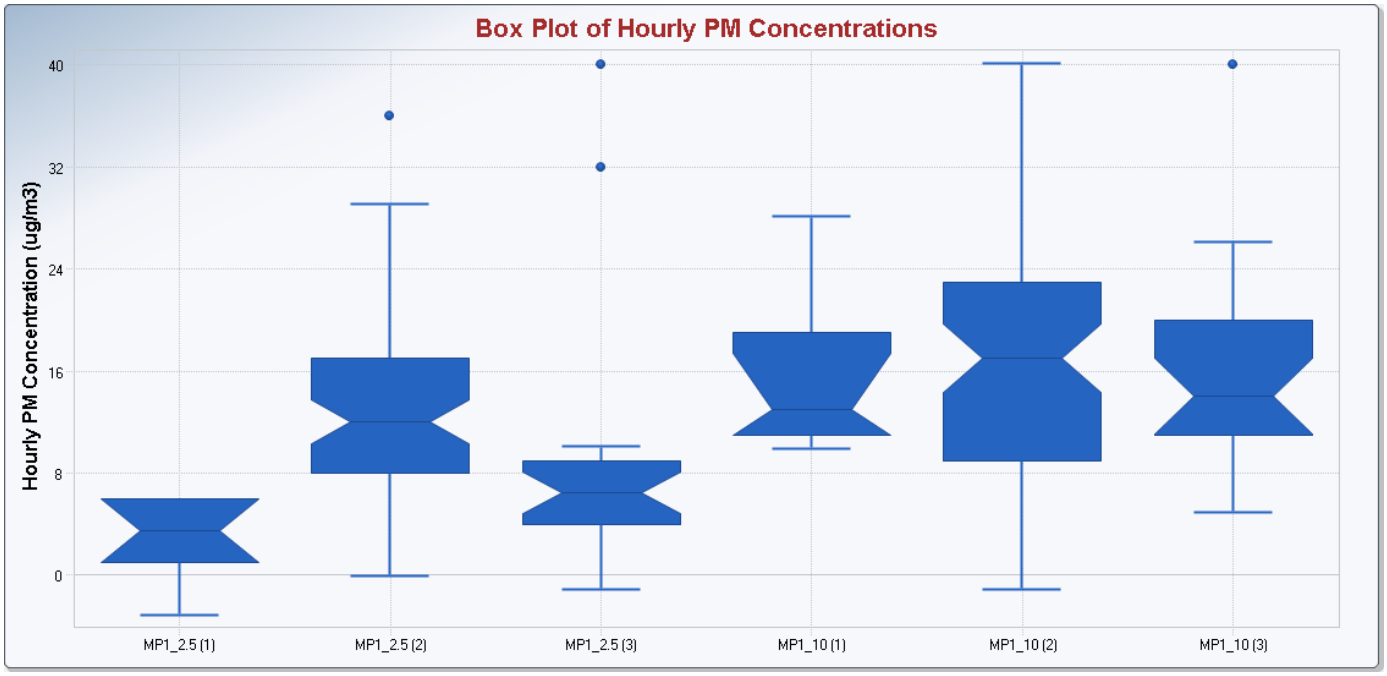
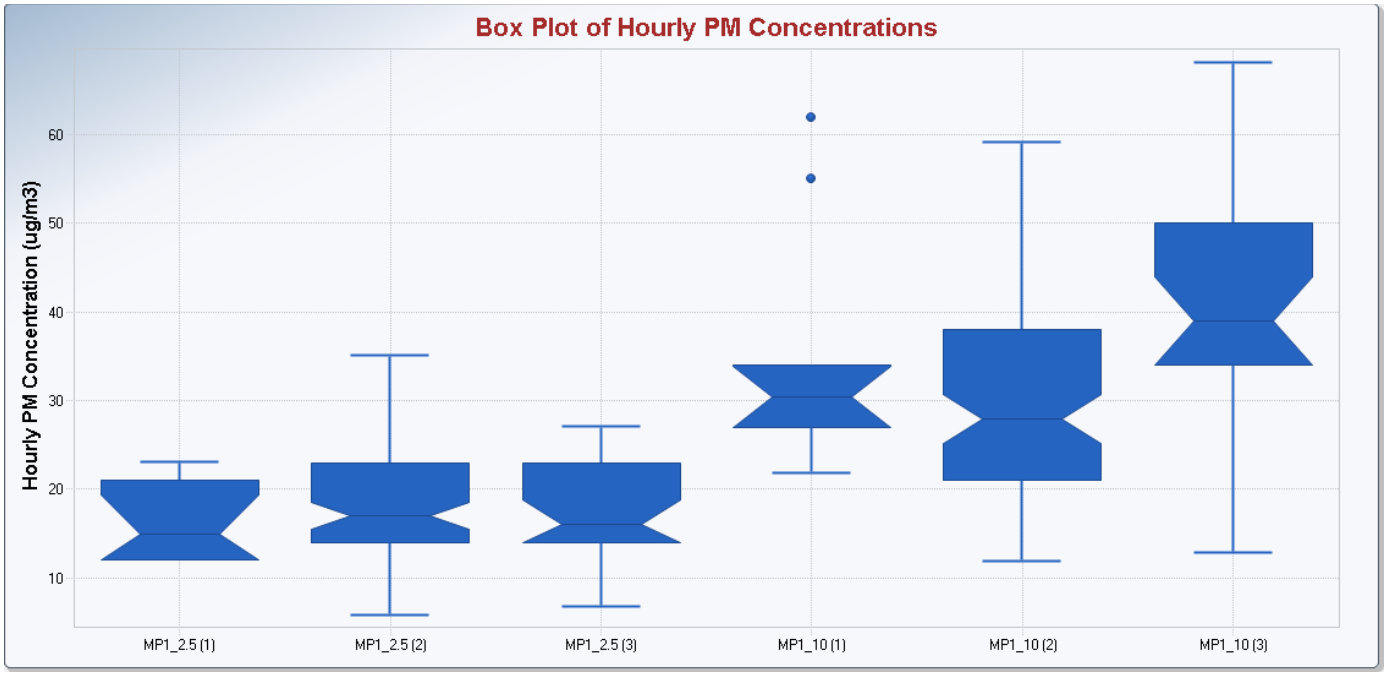


Figure 13
Fourth Quarter Sampling – MP1



3b. MP4 BOX PLOTS

Figure 14
First Quarter Sampling – MP4

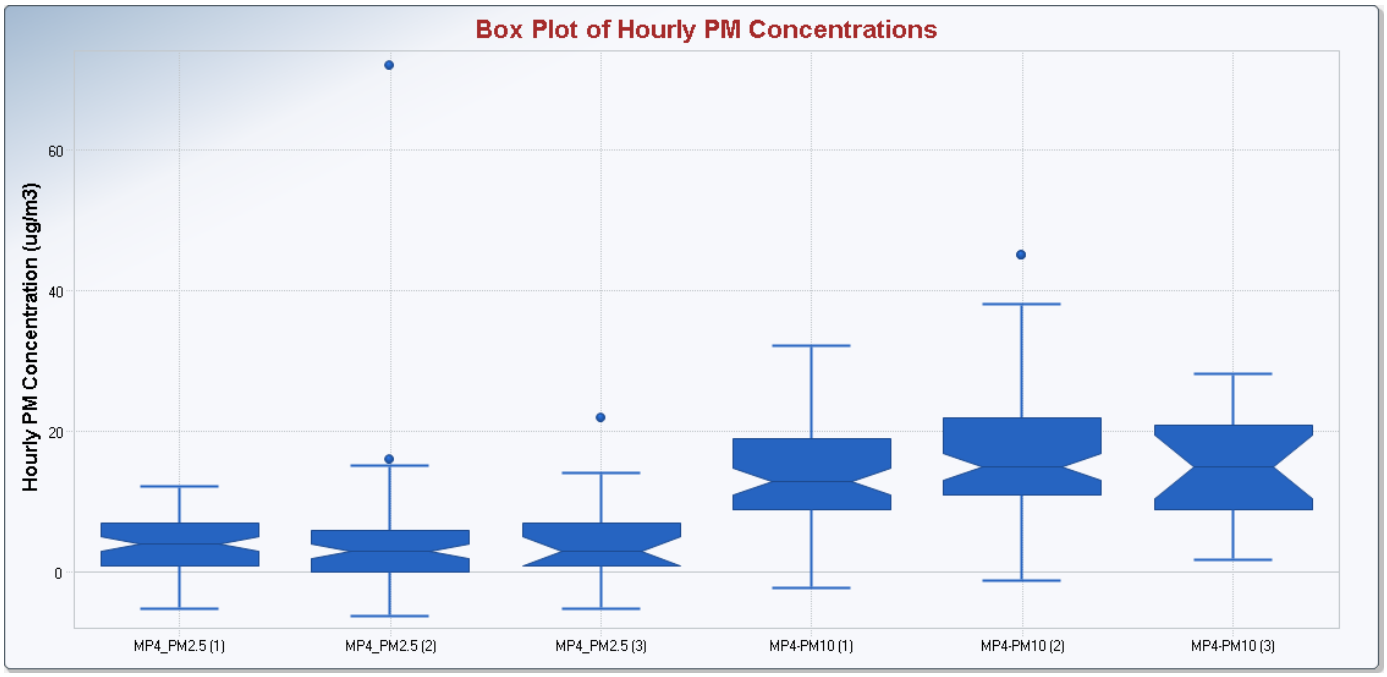


Figure 15
Second Quarter Sampling – MP4

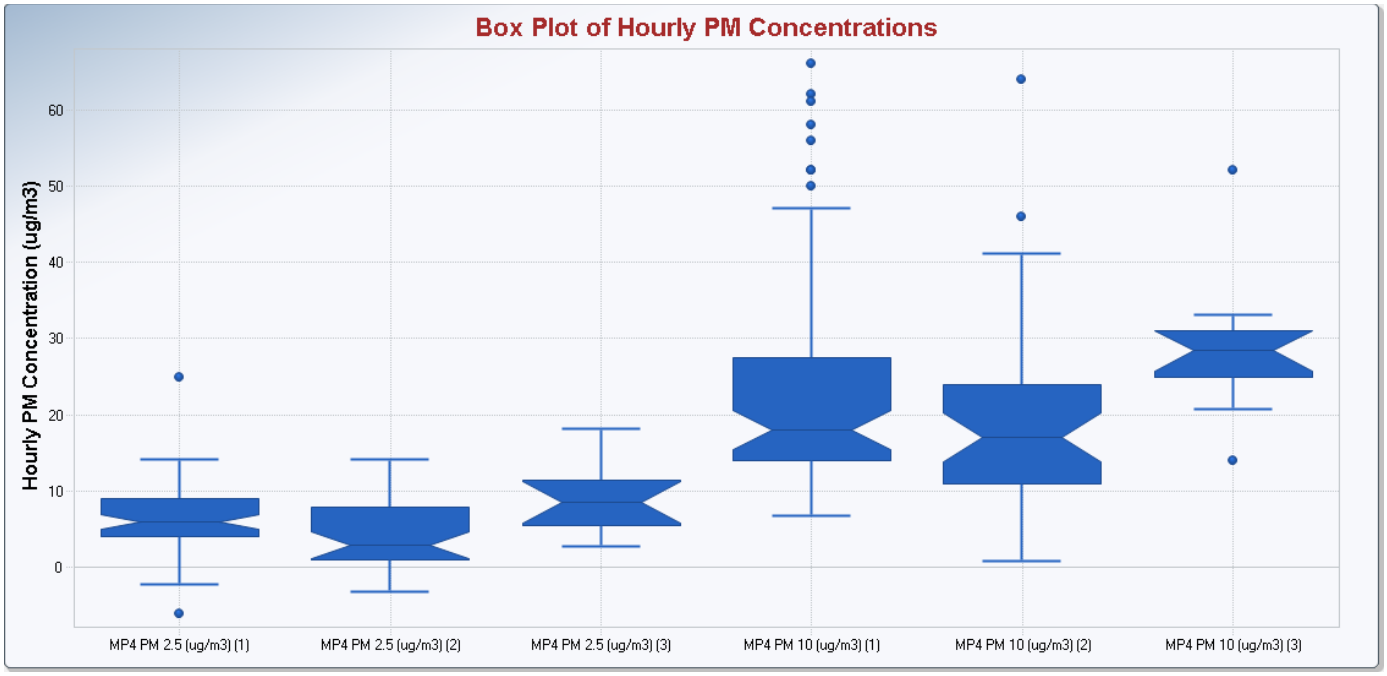


Figure 16
Third Quarter Sampling – MP4

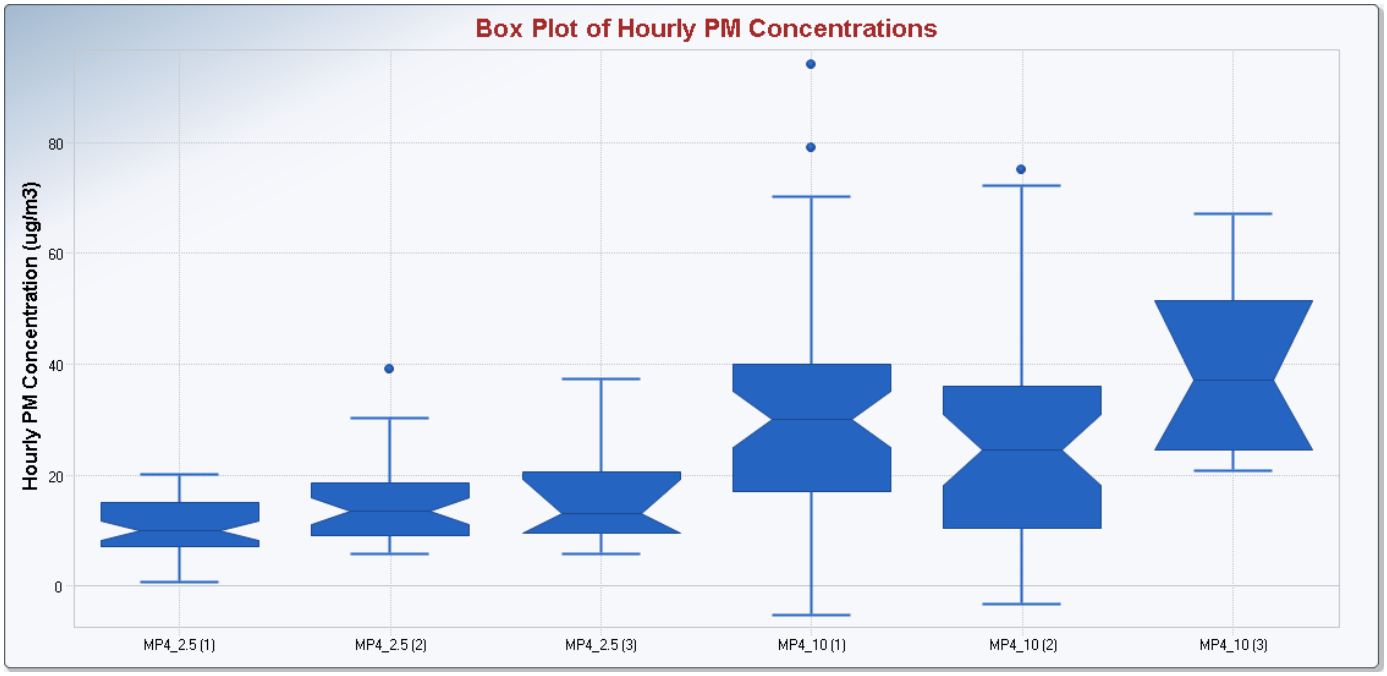


Figure 17
Fourth Quarter Sampling – MP4