September 30, 2021

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Mr. Renante Marante
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City of Chicago
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RE: 3900 South Normal Avenue
Emissions and Air Dispersion Modeling Study
Response to Comments

Dear Mr. Marante,

The purpose of this letter is to provide a response to comments presented in your letter dated August 19, 2021, regarding the Emissions and Air Dispersion Modeling Study for the above referenced site. Below, we have listed your request for additional information, followed by our response.

Comment:

> ***Meteorology Data –The use of the July meteorological data is appropriate for MOVES modeling. However, one month of data is insufficient for NAAQS comparison and is not enough to determine impacts on local air quality. Please provide additional Aermod modeling incorporating recent five-year meteorological data. We recommend using data from Midway Airport located relatively nearby the site.***

Response:

As we discussed with the City during a meeting on August 26, 2021, Midway Airport is located 8.3 miles from Lake Michigan, while the project site is located 1.9 miles from Lake Michigan. Proximity to Lake Michigan has a substantial effect on meteorological conditions, such as wind, humidity, precipitation, and atmospheric pressure, that play a key role in local air quality. Therefore, we have used a meteorological data set generated from the Weather Research Forecasting (WRF) model and processed using the Mesoscale Model Interface Program (MMIF). The resulting hourly prognostic meteorological data is more representative of meteorological conditions at the Project site than NWS data from Midway Airport.

Pursuant to the August meeting with the City, and in the interest of moving the project forward, Missner directed Cardno to revise the Emissions and Air Dispersion Modeling Study using five years of prognostic meteorological data, per the City's request. The revised modeling study for the South Normal Avenue site is attached.

While we understand the rationale behind using five years of NWS meteorological data, we recommend the City also allow future applicants to select the most representative meteorological data in accordance with the US EPA's *Guideline on Air Quality Models* (EPA 2017)[1]. US EPA accepts using one year of site-specific meteorological data or three years of prognostic meteorological data to model a reasonable worst-case scenario.

> ***EPA 40 CFR Part 51 Sec 8.4.4.1.e.*** *The model user should acquire enough meteorological data to ensure that worst-case meteorological conditions are adequately represented in the model results. The use of 5 years of adequately representative NWS or comparable meteorological data, at least 1 year of site-specific, or at least 3 years of prognostic meteorological data, are required. If 1 year or more, up to 5 years, of site-specific data are available, these data are preferred for use in air quality analyses. Depending on completeness of the data record, consecutive years of NWS, site specific, or prognostic data are preferred.*

[1] EPA 40 CFR Part 51, Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter Final Rule, January 2017

If you'd like to further discuss, or have questions or comments, please feel free to reach out to us and we would be glad to meet with you at your convenience.

Sincerely,

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Revised Emissions and Air Dispersion Modeling Study

3900 South Normal Avenue, Chicago, Illinois

September 30, 2021

821AR00918

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1 Introduction

1.1 Purpose of this Analysis

This revised Emissions and Air Dispersion Modeling Study (EADMS) has been prepared to review potential impacts from a proposed multi-tenant industrial building project located at 3900 South Normal Avenue in Chicago, Illinois (Project). The Chicago Air Quality Ordinance Municipal Code Section 17-9-0117-G.1 (March 2021) requires an EADMS to be submitted and approved by City agencies, the Department of Planning and Development (DPD), and the Chicago Department of Public Health (CDPH). This revised EADMS is an update to the report prepared by Cardno (Cardno 2021) to account for City comments on that report, and to account for new draft guidance on mobile source emission factors provided by the Chicago Department of Public Health (CDPH).

This analysis addresses Project operational impacts at off-site receptor locations from on-site mobile and stationary source NO_X, $PM_{2.5}$, and PM_{10} emissions, as well as off-site mobile source emissions of these pollutants. Air quality impacts were reviewed for NO_2, $PM_{2.5}$, and PM_{10}. Off-site mobile sources at nearby roads and intersections were identified from a Traffic Study prepared by Kenig, Lindgren, O'Hara, Aboona, Inc. (KLOA 2021). Modeled impacts were assessed to determine if the Project would be expected to cause or contribute to an exceedance of the National Ambient Air Quality Standards (NAAQS).

In accordance with the Chicago Air Quality Ordinance, emissions from mobile sources associated with the Project were modeled using output from the US Environmental Protection Agency (USEPA) MOtor Vehicle Emission Simulator (MOVES) emission modeling system (USEPA 2021a). Vehicle emissions from MOVES were provided in an Excel lookup table by the City of Chicago (Chicago DPH 2021) for NO_X, $PM_{2.5}$, and PM_{10}. Vehicle emissions calculated from MOVES were utilized to model air quality impacts with USEPA's air dispersion modeling AERMOD software (USEPA 2021b).

1.2 Proposed Project

The Project consists of the construction of a 170,262 square foot multi-tenant industrial building with loading docks and car/trailer parking lots on an 8.23-acre site. The Project site, located at 3900 South Normal Avenue in Chicago, Illinois, is currently a vacant lot. The Project site is situated adjacent to West Pershing Road to the north, South Wallace Street to the west, a rail line to the south, and South Normal Avenue to the east. This Project site is in a commercial and industrial area of Chicago.

2 Methodology and Assumptions

2.1 Models Used

Pursuant to the Chicago Air Quality Ordinance, the USEPA AERMOD atmospheric and air dispersion software was selected for modeling the air quality impacts from on- and off-site emissions (USEPA 2021b) associated with the Project. Impacts of NO_X, $PM_{2.5}$, and PM_{10} emissions from Project-related mobile sources travelling on-site and on off-site roads surrounding the property were analyzed. Emissions from the USEPA MOVES modeling system were selected to calculate the NO_X, $PM_{2.5}$, and PM_{10} emissions from cars and trucks due to traffic generated by Project operations (USEPA 2021a).

2.2 Air Pollutants Evaluated

The Project is the development of a multi-tenant industrial building with loading docks and parking lots for employees, customers, and truck trailers. The main pollutants of concern are NO_2, $PM_{2.5}$, and PM_{10} from Project-generated traffic and from building heaters. The NO_X emissions include NO emissions that are converted to NO_2 in the atmosphere, as well as directly-emitted NO_2.

2.3 Assumptions

The following assumptions were made in the modeling and analysis of air quality impacts due to the operation of the Project.

2.3.1 Facility and Equipment Operating Hours

The operating hours of the facility were assumed to be 6 AM – 6 PM. While a few vehicle trips could occur outside this period, this is the period during each day that most mobile source emissions will occur. On-site combustion emissions from natural gas sources could occur at any time during a 24-hour day.

2.3.2 On-site Equipment Assumptions:

- All forklifts proposed to be used on-site will be electrically powered and will generate no on-site emissions.
- The building heating, ventilation, and air-conditioning (HVAC) units will be natural gas-fired and will generate on-site emissions due to the burning of natural gas.
- Water heaters proposed to be used on-site will be natural gas-powered and will generate on-site emissions due to the burning of natural gas.

2.3.3 Emissions Assumptions:

- MOVES source types “Passenger Car” and “Combination Short-haul Truck” accurately represent Project passenger car and truck sources, respectively.
- MOVES default fuel inputs represent Project passenger car and truck fuels.
- Workers and visitors were assumed to drive gasoline-powered passenger cars traveling on unrestricted urban roads in Project year 2022 and later.
- Trucks were assumed to be diesel-powered Combination Short-haul Trucks traveling on unrestricted urban roads in Project year 2022 and later.
- Heater emissions during all hours of the 24-hour day will occur up to the full MMBtu/hr rating assumed for emissions (6 MMBtu/hr). This assumption is very conservative because comfort heaters and water heaters will not be operating at full rating all of the time.

2.3.4 AERMOD Assumptions:

- On-site travel of trucks will occur over the full north-south length of the east side of the property.
- On-site travel of passenger vehicles will occur over the full north-south length of the west side of the property, and over approximately two-thirds of the full length of the south side of the property.
- Roadway link lengths were based on distances in the Traffic Study (KLOA 2021) and Google Earth.
- Project-generated vehicle trips to and from each of four intersections (West Pershing Road and South Wallace Street, South Wallace Street and West Root Street, West Root Street and South Normal Avenue, and South Normal Avenue and West Pershing Road) were assumed to model off-site vehicle emissions.
- Project-generated traffic was assumed to operate from 6 AM – 6 PM.
- Peak volumes from the traffic study (KLOA 2021) were modeled between the hours of 7 – 8 AM and 3 – 4 PM, with lower traffic volumes assumed for the rest of the 12-hour day.
- Off-site Project-generated traffic was split between West Pershing Road, South Wallace Street, West Root Street, and South Normal Avenue as per Figures 7, 8, and 9 in the Traffic Study (KLOA 2021).
- The average passenger vehicle height will be 1.53 meters and truck vehicle height will be 4.0 meters.
- Off-site mobile vehicle emissions during travel were modeled as Line-Volume sources in AERMOD.

- On-site passenger vehicle emissions during travel were modeled as a Line-Area source and on-site truck travel was modeled as a Line-Volume source.
- Mobile vehicle emissions while idling were modeled as Area sources in AERMOD.
- Multiple comfort and water heater sources for the multi-tenant building were modeled as an elevated Area source in AERMOD.

2.4 Background Concentrations

The Illinois Environmental Protection Agency (IEPA) operates a network of ambient air monitoring stations throughout Illinois (see Figure 1). The purpose of the monitoring stations is to measure ambient concentrations of pollutants, including criteria pollutants, to determine whether or not the NAAQS are met or exceeded. Monitors within the "Chicago-Naperville-Elgin, IL-IN-WI" Core Based Statistical Areas (CBSA) were evaluated to find a station that best represents the background concentrations for the Project site. Factors considered in selecting the best representative background station for the Project site included distance to the Project, and the similarity of the monitor setting to the Project site, in terms of land use, meteorological conditions, and the mix of nearby emission sources. The surface characteristics at the monitoring stations reviewed were judged to be similar to that at the Project site. Land use distribution indicates that most of the monitoring stations can be described as residential communities of high and low intensity combined with moderate commercial, industrial, and transportation facilities. Without a clear distinction in the topologic and meteorological conditions among these sites, the most representative single monitoring station was selected based on (1) data completeness and (2) the shortest distance to the Project site.

Ambient data for NO_2 was obtained from the IEPA Trailer monitoring station (4743 Mannheim Road, approximately 15.6 miles northwest of the Project site); and ambient data for PM_{10} was obtained from the Northbrook Water Plant monitoring station (750 Dundee Road, approximately 23.1 miles north of the Project site). $PM_{2.5}$ ambient data was obtained from the ComEd Maintenance Bldg. (170310076) monitoring station (7801 Lawndale, approximately 6.4 miles Southwest of the Project site). Ambient concentrations over the most recent three monitoring years, 2018 through 2020, are presented in Table 2-1.

Figure 1 Chicago Area Air Quality Monitor Sites

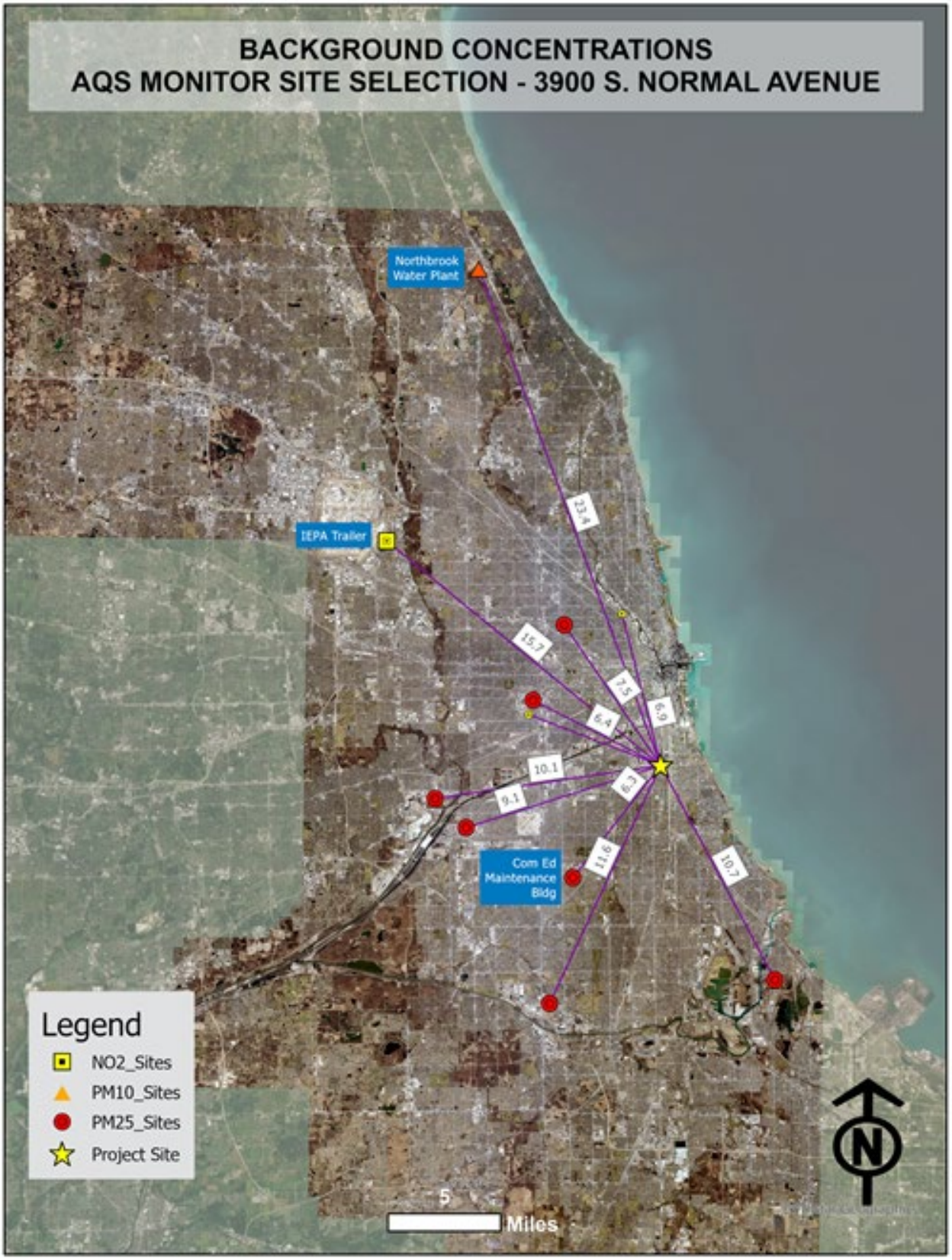


Table 2-1 Ambient Air Background Pollutant Concentration/Standards

Pollutant	2018	2019	2020	Fed Design Value for Modeling (µg/m^3)
Nitrogen Dioxide (NO_2)*				
National 1-hour statistical concentration (ppb)[1]	61.0	54.1	50.2	104
National 1-hour statistical concentration (µg/m^3)	114.8	101.8	94.5	104
Annual Average (ppb) [2]	17.91	17.43	15.19	33.7
NAAQS 1-hour (>100 ppb)/Annual (>53 ppb)	0 / No	0 / No	0 / No	--
Fine Particulate Matter ($PM_{2.5}$)**				
Maximum 24-hour concentration (µg/m^3) [1]	17.8	24.9	14.5	19.1
Annual average concentration (µg/m^3) [1]	9.025	8.317	8.339	8.6
NAAQS 24-hour (>35 µg/m^3)/Annual (>12.0 µg/m^3)	0 / No	0 / No	0 / No	--
Respirable Particulate Matter (PM_{10})***				
National maximum 24-hour concentration – H4H (µg/m^3) [3]	35	26	45	45
NAAQS 24-hour (>150 µg/m^3)	0	0	0	--

Notes:
- µg/m^3 = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million; N/A = Not available.
- NAAQS = National Ambient Air Quality Standard.
- * NO_2 measured at the IEPA Trailer monitoring station (4743 Mannheim Rd., approximately 15.6 miles northwest of the project site), Com Ed Maintenance Bldg (170310076), Kennedy Near Road 2 (170310219), and Cook County Trailer (170314002) were also evaluated but did not meet data completeness criteria for 1-hour NO_2.
- ** $PM_{2.5}$ measured at Com Ed Maintenance Bldg (170310076) monitoring station (7801 Lawndale, approximately 6.4 miles Southwest of the Project site).
- *** PM_{10} measured at the Northbrook Water Plant (AQS:170314201) monitoring station (750 Dundee Road, approximately 23.1 miles north of the Project site). Washington HS (170310022) and Village Hall (170311016) stations were also evaluated but did not meet data completeness criteria of 4 complete quarters for three most recent years.

Sources:
- [1] USEPA 2020.
- [2] USEPA 2021c.
- [3] USEPA 2021d.

2.5 Model Inputs

Emissions of NO_2, $PM_{2.5}$, and PM_{10} were calculated for each source modeled in AERMOD. The source emission calculations are provided in Attachment A. The MOVES emissions calculations from vehicular traffic and the AERMOD air dispersion modeling were set up and completed using the following inputs:

2.5.1 Emissions Input Summary:

- All trip rates of Project-generated traffic use peak hourly traffic for year 2027 (peak AM traffic, as listed in traffic study) to generate emissions for modeling each hour. These maximum hourly emissions were applied to all operating hours for daily and annual emissions, accounting for morning and evening peak hour volumes during the 12-hour day.
- Emission rates for year 2022 were used, providing a conservative emission rate with full projected 2027 traffic volumes.
- Vehicles will travel off-site at approximately 15 miles per hour (mph) in links approaching entryways, and 25 mph beyond the four intersections bordering the Project site.

- Vehicles will travel on-site at approximately 5 mph.
- No idling of passenger vehicles will occur on-site.
- Trucks will idle for a maximum of 5 minutes on-site.
- All passenger vehicles and trucks were assumed to idle at the four offsite intersections for the amount of time-delay listed in the traffic report.

2.5.2 AERMOD Input Summary

- Dimensions / locations of the building, parking lots, loading docks, property fence line, and surrounding area streets were obtained from the Project proposed facility drawing, the Traffic Study, and Google Earth.
- Off-site and most on-site roads were modeled as Line-Volume sources. Emissions from each road segment were equally distributed between the volume sources in each segment's Line-Volume source. Passenger vehicle parking lot travel was modeled as a Line-Area source in AERMOD, to ensure that receptors in the adjacent parking lot area were not in a volume source exclusion zone, per USEPA guidance (USEPA 2011).
- Idling vehicles at the four off-site intersections and in the on-site dock area of the Project site were modeled as Area sources.
- Comfort heaters and water heaters were modeled as one Area source covering the entire footprint of the building. Emissions from these sources were equally distributed across the source's area.
- For NO_2 modeling, the ARM2 option was chosen with a default NO2/NOX in-stack ratio (ISR) of minimum 0.5 and maximum 0.9 following USEPA guidance (USEPA 2017).
- Urban dispersion coefficient with a population of 2,700,000 was chosen (US Census 2019).
- For all roadway Line-Volume / Line-Area and vehicle idling Area sources, emissions were modeled during the hours of 6 AM – 6 PM, seven days/week.
- For the Area source representing the heaters, emissions were modeled for 24 hrs/day, 365 days/yr.
- Five years (2016-2020) of hourly prognostic meteorological data were generated from the Weather Research Forecasting (WRF) model and processed into AERMOD-ready format using the Mesoscale Model Interface Program (MMIF) (Ramboll 2021) for coordinates 41.822628 N, -87.639815 W, which is on-site at the 3900 South Normal Avenue Project site. The meteorological data are representative of meteorological conditions at the Project site. See Figure 2 in Section 4.3 for the meteorological data wind rose.

3 Emission Sources and Factors

3.1 Emission Sources

The following emissions sources were modeled using parameters provided by the Applicant, the 2021 KLOA Inc. Traffic Impact Study, and Google Earth.

Emission sources were modeled as Line-Volume and Line-Area sources in AERMOD:

On-site:

- Line-Volume sources plume width = 9 meters (29.5 ft).
- Line-Area source release height = 1.3 meters (4.27 ft).
- West and south employee drive areas to enter/exit/reach parking spots = 271 meters (889 ft) long and 6.1 meters (20 ft) wide.

- East truck drive area to enter/exit/reach docking bays = 176.5 meters (579 ft) long with a 27.5-meter (90.2 ft) plume width.
- East Truck Loading Bays = 113.6 meters (372.7 ft) long and 18.3 meters (60.0 ft) wide.

Off-site:

- Line-Volume sources plume width = 13.83 meters (45.4 ft).
- W. Pershing Rd. going east/west between S. Normal Ave. and S. Wallace St. (667 ft).
- W. Root St. going east/west between S. Normal Ave. and S. Wallace St. (667 ft).
- S. Wallace St. going north/south between W. Pershing Rd. and W. Root St. (1,635 ft. in three segments).
- S. Normal St. going north/south between W. Pershing Rd. and W. Root St. (1,635 ft in three segments).
- W. Pershing Rd. continuing to the east ¼ mile from site boundary.
- W. Pershing Rd. continuing to the west ¼ mile from site boundary.
- W. Root St. continuing to the east ¼ mile from S. Normal St.
- W. Root St. continuing to the west ¼ mile from S. Wallace St.

3.2 Emission sources modeled as Area sources in AERMOD

On-site:

- Comfort heating and water heater 15,809.5 m^2 (170,172 ft^2).

Off-site:

- Area sources cover the roadways approximately 25 meters (82 ft) from the center point of the intersections and a roadway width equal to the width of 1- or 2-lanes of one-way traffic approaching each intersection (4.5 to 9 meters or 14.8 to 29.5 ft).
- Idling areas at West Pershing Road and South Wallace Street.
- Idling areas at West Pershing Road and South Normal Avenue.
- Idling areas at West Root Street and South Wallace Street.
- Idling areas at West Root Street and South Normal Avenue.

3.3 Source-Specific Emission Factors

Table 3-1 shows the emission factors that were used to calculate emissions from on-site and off-site vehicular traffic due to the project. These emission factors were provided by the Chicago Department of Public Health.

Table 3-1 Emission Factors – On-Site and Off-Site Vehicles

Vehicle Type / Speed Bin	NO_x EF (g/mi)	$PM_{2.5}$ EF (g/mi)	PM_{10} EF (g/mi)
Passenger Car 2.5 <= speed < 7.5 mph	0.09	0.004	0.005
Passenger Car 12.5 <= speed < 17.5 mph	0.08	0.002	0.003
Passenger Car 22.5 <= speed < 27.5 mph	0.07	0.002	0.002
Truck 2.5 <= speed < 7.5 mph	26.0	0.54	0.59
Truck 12.5 <= speed < 17.5 mph	12.6	0.31	0.34
Truck 22.5 <= speed < 27.5 mph	9.40	0.26	0.28
Vehicle Type - Idling	(g/hr)	(g/hr)	(g/hr)
Passenger Car Idling	0.24	0.02	0.02
Truck Idling	59.4	1.74	1.89

In addition to emissions from on- and off-site traffic, emissions due to on-site comfort heating and water heaters in the building were calculated using emission factors from AP-42 Section 1.4 Natural Gas Combustion, Table 1.4-1 (NO_X) and Table 1.4-2 (PM – Total) (USEPA 1998). The calculated emissions were spread over the entire area of the building footprint and were calculated with the assumption that all heaters add up to 6.0 MMBtu/hr in rating. The emission factors used are shown in Table 3-2.

Table 3-2 Emission Factors – On-Site Comfort Heating and Water Heaters

Pollutant	Emission Factor (lb/MMscf)
NO_X	100
$PM_{2.5}$	7.6
PM_{10}	7.6

4 Model Inputs and Parameters

4.1 Mobile Emission Source Inputs

Estimating Top of Plume Height

- Passenger Vehicles = 1.53 x 1.7 = 2.6 m
- Trucks = 4.0 x 1.7 = 6.8 m
- Weighted = (0.9 x 2.6) + (0.1 x 6.8) = 3.02 m

Estimating Release Height

- Passenger Vehicles = 2.6 x 0.5 = 1.3 m
- Trucks = 6.8 x 0.5 = 3.4 m
- Weighted = 3.02 x 0.5 = 1.51 m

Estimating Initial Vertical Dimensions (σ_{zo})

- Passenger Vehicles = 2.6 / 2.15 = 1.2 m
- Trucks = 6.8 / 2.15 = 3.2 m
- Weighted = 3.02 / 2.15 = 1.4 m

4.2 Heater Emission Source Inputs

One Area source was used to represent comfort heating and water heating emissions. The building height is projected to be 36 ft, so a release height of half of the building height (18 ft) was assumed. An initial vertical dimension of 16.7 ft (building height divided by 2.15 for a surface-based source) was assumed. Heater emissions were spread out evenly across the total area of the Area source.

Source Input parameters for NO_X, $PM_{2.5}$, and PM_{10} model runs are listed in Table 4-1 below.

Table 4-1 3900 S. Normal Ave. Project AERMOD Model Parameters

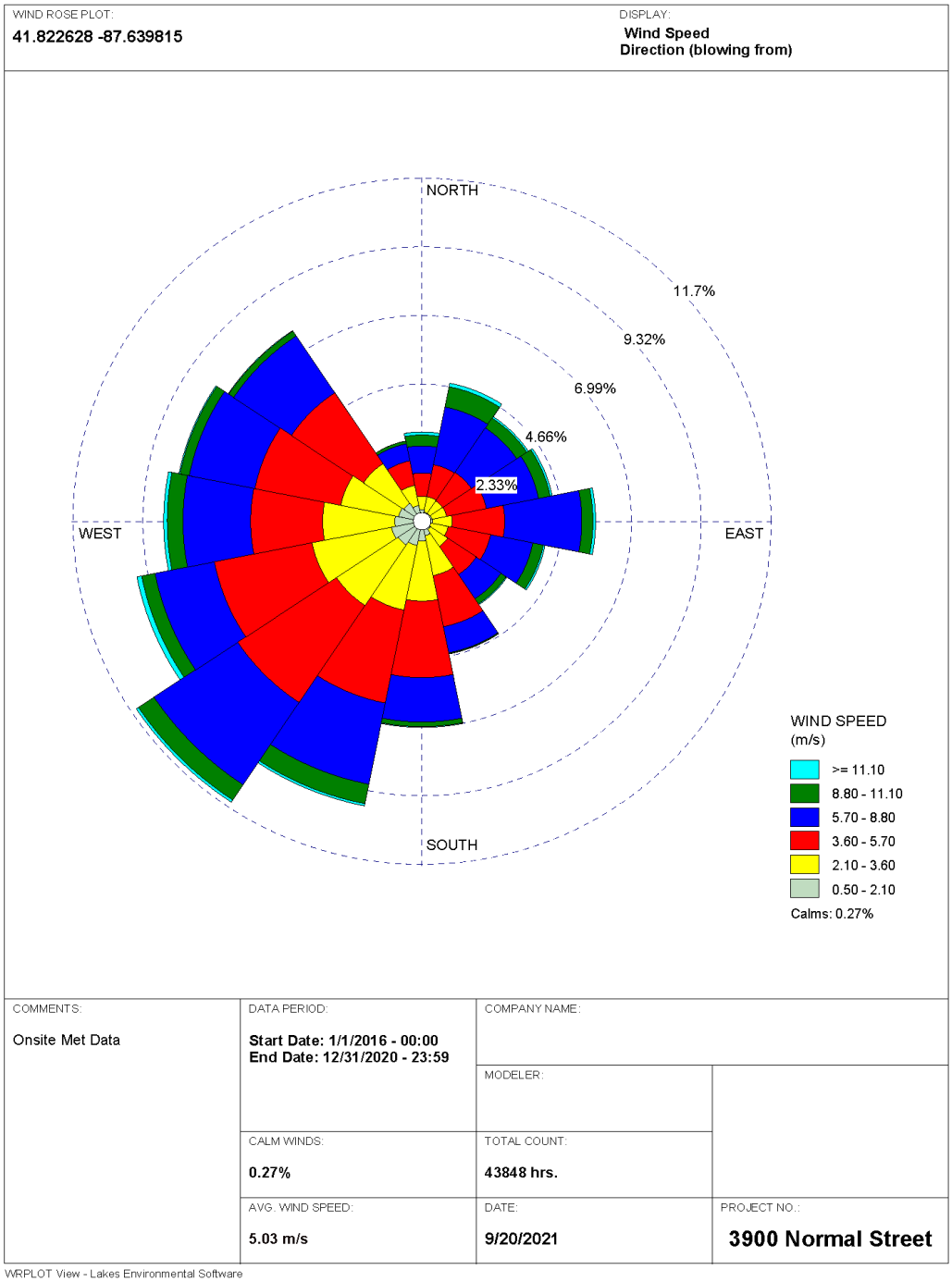
Source ID	Description	Type	Release Height (m)	σ_z (m)	Plume Width (m)	σ_y (m)	Area (m^2)	Max Hourly Emission Rate		
								NO_x (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
PEREBWST	W Pershing Road - West - Eastbound (2 lanes of 4)	LINE_VOLUME	1.51	1.41	13.83	6.43	--	2.74E-03	8.16E-05	7.48E-05
PERWBWST	W Pershing Road - West - Westbound (2 lanes of 4)	LINE_VOLUME	1.51	1.41	13.83	6.43	--	6.61E-04	1.96E-05	1.80E-05
PEREBSIT	W Pershing Road - Site - Eastbound (2 lanes of 4)	LINE_VOLUME	1.51	1.41	13.83	6.43	--	1.50E-03	4.30E-05	3.95E-05
PERWBSIT	W Pershing Road - Site - Westbound (2 lanes of 4)	LINE_VOLUME	1.51	1.41	13.83	6.43	--	4.49E-04	1.29E-05	1.18E-05
PEREBEST	W Pershing Road - East - Eastbound (2 lanes of 4)	LINE_VOLUME	1.51	1.41	13.83	6.43	--	2.40E-05	6.04E-07	5.35E-07
PERWBEST	W Pershing Road - East - Westbound (2 lanes of 4)	LINE_VOLUME	1.51	1.41	13.83	6.43	--	3.58E-03	9.68E-05	8.88E-05
WALSITN	S Wallace Avenue - Site - North	LINE_VOLUME	1.51	1.41	13.83	6.43	--	8.42E-05	2.88E-06	2.55E-06
WALSITS	S Wallace Avenue - Site - South	LINE_VOLUME	1.51	1.41	13.83	6.43	--	2.47E-05	8.45E-07	7.47E-07
WLSTHTRK	S Wallace Avenue - South of RR tracks	LINE_VOLUME	1.51	1.41	13.83	6.43	--	6.73E-05	1.70E-06	1.50E-06
NRMSITS	Normal Avenue - Site - North	LINE_VOLUME	1.51	1.41	13.83	6.43	--	8.18E-04	2.20E-05	2.02E-05
NRSTHTRK	Normal Avenue - Site - South	LINE_VOLUME	1.51	1.41	13.83	6.43	--	1.99E-03	5.34E-05	4.91E-05
NRMSTH	Normal Avenue - South of RR Tracks	LINE_VOLUME	1.51	1.41	13.83	6.43	--	0.00E+00	0.00E+00	0.00E+00
ROOTWEST	W Root Street - West	LINE_VOLUME	1.51	1.41	13.83	6.43	--	9.26E-04	2.65E-05	2.43E-05
ROOTWN	W Root Street - between Wallace and Normal	LINE_VOLUME	1.51	1.41	13.83	6.43	--	9.06E-04	2.45E-05	2.25E-05
ROOTEAST	W Root Street - East	LINE_VOLUME	1.51	1.41	13.83	6.43	--	5.57E-04	1. 52E-05	1.39E-05
DOCKTRAV	On-site travel by trucks	LINE_VOLUME	3.4	3.16	27.5	12.8	--	9.52E-03	2.16E-04	1.99E-04
PASSPARK	On-site travel by cars	Line-Area	1.3	1.21	--	--	1653.1	2.71E-07	1.39E-08	1.23E-08
DOCKIDLE	Truck idling docks	Area	3.4	3.16	--	--	2078.9	7.94E-06	2.52E-07	2.32E-07
NWIDLECOMB1	NW intersection combined idling - Area 1	Area-Poly	1.51	1.41	--	--	217.7	1.35E-06	4.65E-08	4.26E-08

Source ID	Description	Type	Release Height (m)	σ_z (m)	Plume Width (m)	σ_y (m)	Area (m^2)	Max Hourly Emission Rate		
								NO_x (g/s)	PM_{10} (g/s)	$PM_{2.5}$ (g/s)
NEIDLECOMB1	NE intersection combined idling - Area 1	Area-Poly	1.51	1.41	--	--	217.7	1.27E-06	4.14E-08	3.80E-08
NWIDLECOMB2	NW intersection combined idling - Area 2	Area-Poly	1.51	1.41	--	--	213.2	1.38E-06	4.75E-08	4.35E-08
NEIDLECOMB2	NE intersection combined idling - Area 2	Area-Poly	1.51	1.41	--	--	213.2	1.29E-06	4.23E-08	3.88E-08
SWIDLECOMB2	SW intersection combined idling - Area 2	Area-Poly	1.51	1.41	--	--	106.7	6.07E-07	2.03E-08	1.86E-08
SWIDLECOMB1	SW intersection combined idling - Area 1	Area-Poly	1.51	1.41	--	--	106.7	6.07E-07	2.03E-08	1.86E-08
SEIDLECOMB1	SE intersection combined idling - Area 1	Area-Poly	1.51	1.41	--	--	106.7	7.52E-07	2.43E-08	2.24E-08
SEIDLECOMB2	SE intersection combined idling - Area 2	Area-Poly	1.51	1.41	--	--	106.7	7.52E-07	2.43E-08	2.24E-08
NWIDLECOMB3	NW intersection combined idling - Area 3	Area-Poly	1.51	1.41	--	--	108.3	2.72E-06	9.35E-08	8.56E-08
NEIDLECOMB3	NE intersection combined idling - Area 3	Area-Poly	1.51	1.41	--	--	108.3	2.55E-06	8.32E-08	7.64E-08
SWIDLECOMB3	SW intersection combined idling - Area 3	Area-Poly	1.51	1.41	--	--	108.3	5.98E-07	2.00E-08	1.83E-08
SEIDLECOMB3	SE intersection combined idling - Area 3	Area-Poly	1.51	1.41	--	--	108.3	7.40E-07	2.40E-08	2.20E-08
HTRS	Facility heaters	Area	5.49	5.10	--	--	15810	4.69E-06	3.56E-07	3.56E-07

4.3 Meteorological Data Set Used

Meteorological data was generated from Weather Research and Forecasting Model (WRF) and processed into AERMOD-ready format using the Mesoscale Model Interface Program (MMIF). The WRF data was obtained from the National Center for Atmospheric Research utilizing the Nested Regional Climate Model (NRCM). Five years of hourly on-site and upper air data from January 01, 2016, through December 31, 2020, were obtained and processed to generate surface and profile data ready for input into AERMOD. See Figure 2 for the five-year meteorological data wind rose.

Figure 2 Normal Avenue On-Site Wind Rose (2016-2020)



4.4 Terrain

Flat terrain was assumed for the AERMOD modeling analysis. This is because the terrain elevations for several kilometers around the Facility are at nearly the same elevation as the facility. The base elevation of the project site is 179.8 meters above mean sea level (MSL).

4.5 Modeling Receptors

Grid receptors surrounding the roadway Line-Volume sources were placed at a spacing of 10 meters, out to approximately 50 meters from the center of the roadways. Some on-site grid receptors were placed in the parking lot areas to the west and south of the building at a spacing of 10 meters. The rest of the grid receptors were placed in off-site areas approximately 1,000 meters from the center of the Project site at a spacing of 50 meters. Fence line receptors were spaced at 10 meters.

4.6 Operating Schedule

All of the sources, except for the building heater source, were modeled to operate for 12 hours each day (including weekends), 6 AM to 6 PM. Although a 5 day/week work schedule is the assumed operations schedule for this Project, all 7 days of the week were included in the modeling in order to capture each day's meteorological conditions in the five years of met data. Because maximum hourly operations were used for all averaging periods, a variable emissions scenario was used in the model with factors entered for each hour of operation based on expected hourly and peak traffic volumes from the traffic study (KLOA 2021).

4.7 Building Downwash

There is no building downwash considered in this model as there are only Line-Volume, Line-Area, and Area sources considered and no point sources.

5 Results

5.1 National Ambient Air Quality Standards (NAAQS)

The National Ambient Air Quality Standards (NAAQS) are set by USEPA to help protect the public health and the environment from the impacts of criteria air pollutants. Table 5 below shows the NAAQS thresholds (or design values) and the design value basis for NO_2, $PM_{2.5}$, and PM_{10}.

Table 5-1 NAAQS Threshold Limits and Design Values

Pollutant	Averaging Time	Threshold	Design Value Basis
NO_2[1]	1-hour	188 µg/m^3	98th Percentile (H8H) Max. Daily Values Avg. over 5 years[2]
	Annual	100 µg/m^3	Highest Annual over 5 years
$PM_{2.5}$	1-hour	35 µg/m^3	98th Percentile (H8H) Avg. over 5 years[2]
	24-hour	12.0 µg/m^3	Annual Avg. over 5 years[2]
PM_{10}	24-hour	150 µg/m^3	High-4th-High over 5 years[2]

- 1. USEPA presents the NO_2 limits in units of ppb. These values have been converted to units of µg/m^3 using USEPA's conversion factor of 1 ppm volume = 1,880 µg/m^3.
- 2. Design values set by USEPA are based on 3-year periods. However, because five years of meteorological data are modeled for the revised EADMS, the design values for these results are obtained over 5 years.

5.2 Results

The AERMOD runs estimated impacts from NO_2, $PM_{2.5}$, and PM_{10} emissions from Project-generated passenger vehicle and truck emissions both on- and off-site. The modeled concentration impacts were added to the background values discussed in Section 2.4, then compared to the NAAQS threshold limits discussed in Section 5.1. Table 5-2 shows the modeled impacts for on- and off-site emission sources, and then added to the background values, for comparison to the NAAQS. Attachment B shows the modeled concentration isopleths for each pollutant / averaging time. Attachment C includes the electronic AERMOD modeling files.

Table 5-2 3900 S. Normal Ave. Project Modeled Impacts + Background

Pollutant	Averaging Period	Modeled Impact Conc.[1] ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total Conc. ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Exceed NAAQS?
Impacts from On-Site Sources						
NO_2[4]	1-hour[2]	69.2	104	173.2	188	No
	Annual[2]	8.75	33.7	42.5	100	No
$PM_{2.5}$	24-hour[3]	1.86	19.1	21.0	35	No
	Annual	0.67	8.6	9.27	12	No
PM_{10}	24-hour	2.80	45	47.8	150	No
Impacts from Off-Site Sources						
NO_2[4]	1-hour[2]	5.82	104	109.8	188	No
	Annual[2]	0.46	33.7	34.2	100	No
$PM_{2.5}$	24-hour[3]	0.04	19.1	19.1	35	No
	Annual	0.02	8.6	8.62	12	No
PM_{10}	24-hour	0.06	45	45.1	150	No
Impacts from All Sources						
NO_2[4]	1-hour[2]	70.1	104	174.1	188	No
	Annual[2]	8.90	33.7	42.6	100	No
$PM_{2.5}$	24-hour[3]	1.87	19.1	21.0	35	No
	Annual	0.68	8.6	9.28	12	No
PM_{10}	24-hour	2.81	45	47.8	150	No

- [1] Unless otherwise noted, all values reported are the 1st Highest High.
- [2] Annual NO_2 concentration is reported as the highest annual concentration among the 5 years of modeled Met data. 1-hour NO_2 concentration is reported as the 8th Highest High (i.e., the 98th percentile, five-year average) for the NAAQS analysis.
- [3] The 24-hour PM2.5 concentration is reported as the 8th Highest High (i.e., the 98th percentile, five-year average).
- [4] The 1-hour and annual NO2 concentrations were determined using the Tier 2 ARM2 method.

The highest modeled concentrations of 1-hr and annual NO_2 were seen on the northern fence line of the Project site, just south of West Pershing Road.

The highest modeled concentrations of 24-hr and annual $PM_{2.5}$ were seen on the northern fence line of the Project site, just south of West Pershing Road.

The highest modeled concentrations of 24-hr PM_{10} were seen on the northern fence line of the Project site, just south of West Pershing Road.

6 Conclusions

The revised EADMS reviewed the modeled concentration impacts of NO_2, $PM_{2.5}$, and PM_{10} due to emissions from Project-generated passenger vehicle and truck emissions both on- and off-site, as well as on-site stationary sources. Modeled concentrations from Project-related sources were added to background concentrations in the Project site vicinity. When compared to the applicable NAAQS standards, total concentrations are below the NAAQS thresholds. Therefore, the 3900 South Normal Avenue Project is not expected to cause or contribute to an exceedance of the NAAQS.

7 References

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ATTACHMENT A

SOURCE EMISSION CALCULATIONS

3900 S. Normal Avenue, Chicago, IL

Roadway Emissions by Link

September 28, 2021

Mobile Emissions

Type/Size	Weekday Morning Peak Hour		
	In	Out	Total
General Light Industrial	105	14	119
Passenger Vehicles (90%)	94	13	107
Trucks (10%)	11	1	12
Type/Size	**Weekday Evening Peak Hour**		
	In	**Out**	**Total**
General Light Industrial	14	93	107
Passenger Vehicles (90%)	13	83	96
Trucks (10%)	1	10	11
Type/Size	**Daily Two-Way Trips**		
	In and Out		
General Light Industrial	844		
Passenger Vehicles (90%)	760		
Trucks (10%)	84		

Information from Table 1 of KLOA traffic report

Peak Vehicles (am or pm)	Hourly	Daily
Total	119	844
Passenger Vehicles (90%)	107	760
Trucks (10%)	12	84

3900 S. Normal Avenue, Chicago, IL
Roadway Emissions by Link
September 28, 2021

Offsite Travel

Passenger Cars

Link	Distance (ft)	Volume peak hour	Miles per peak hour	Year	Vehicle Type	Fuel	Speed Bin	NO_x EF (g/mi)	PM_{10} EF (g/mi)	$PM_{2.5}$ EF (g/mi)	Hourly NO_x rate (g/hr)	Hourly PM_{10} rate (g/hr)	Hourly $PM_{2.5}$ rate (g/hr)	Hourly NO_x rate (g/s)	Hourly PM_{10} rate (g/s)	Hourly $PM_{2.5}$ rate (g/s)
PEREBWST	1289	38	9.27	2022	Passenger Car	Gasoline	17.5 <= speed < 22.5 mph	0.074	0.002	0.002	0.684	0.021	0.018	1.90E-04	5.73E-06	5.07E-06
PERWBWST	1289	5	1.22	2022	Passenger Car	Gasoline	22.5 <= speed < 27.5 mph	0.071	0.002	0.002	0.087	0.002	0.002	2.41E-05	6.08E-07	5.38E-07
PEREBSIT	666	8	1.01	2022	Passenger Car	Gasoline	17.5 <= speed < 22.5 mph	0.074	0.002	0.002	0.074	0.002	0.002	2.07E-05	6.24E-07	5.52E-07
PERWBSIT	667	30	3.79	2022	Passenger Car	Gasoline	17.5 <= speed < 22.5 mph	0.074	0.002	0.002	0.279	0.008	0.007	7.76E-05	2.34E-06	2.07E-06
PEREBEST	1281	5	1.21	2022	Passenger Car	Gasoline	22.5 <= speed < 27.5 mph	0.071	0.002	0.002	0.086	0.002	0.002	2.40E-05	6.04E-07	5.35E-07
PERWBEST	1281	38	9.22	2022	Passenger Car	Gasoline	17.5 <= speed < 22.5 mph	0.074	0.002	0.002	0.680	0.021	0.018	1.89E-04	5.70E-06	5.04E-06
WALSITN	290	73	4.01	2022	Passenger Car	Gasoline	12.5 <= speed < 17.5 mph	0.076	0.003	0.002	0.303	0.010	0.009	8.42E-05	2.88E-06	2.55E-06
WALSITS	345	18	1.18	2022	Passenger Car	Gasoline	12.5 <= speed < 17.5 mph	0.076	0.003	0.002	0.089	0.003	0.003	2.47E-05	8.45E-07	7.47E-07
WLSTHTRK	1000	18	3.41	2022	Passenger Car	Gasoline	22.5 <= speed < 27.5 mph	0.071	0.002	0.002	0.242	0.006	0.005	6.73E-05	1.70E-06	1.50E-06
ROOTWEST	801	11	1.67	2022	Passenger Car	Gasoline	17.5 <= speed < 22.5 mph	0.074	0.002	0.002	0.123	0.004	0.003	3.42E-05	1.03E-06	9.13E-07
ROOTWN	666	9	1.14	2022	Passenger Car	Gasoline	12.5 <= speed < 17.5 mph	0.076	0.003	0.002	0.086	0.003	0.003	2.38E-05	8.15E-07	7.21E-07
ROOTEAST	798	9	1.36	2022	Passenger Car	Gasoline	12.5 <= speed < 17.5 mph	0.076	0.003	0.002	0.103	0.004	0.003	2.86E-05	9.76E-07	8.63E-07
NRMSITN	253	13	0.62	2022	Passenger Car	Gasoline	12.5 <= speed < 17.5 mph	0.076	0.003	0.002	0.047	0.002	0.001	1.31E-05	4.47E-07	3.95E-07
NRMSITS	409	3	0.23	2022	Passenger Car	Gasoline	17.5 <= speed < 22.5 mph	0.074	0.002	0.002	0.017	0.001	0.0005	4.76E-06	1.44E-07	1.27E-07
NRSTHTRK	995	3	0.57	2022	Passenger Car	Gasoline	22.5 <= speed < 27.5 mph	0.071	0.002	0.002	0.040	0.001	0.001	1.12E-05	2.82E-07	2.49E-07

Information from Figure 8 of KLOA traffic report

Trucks

Link	Distance (ft)	Volume peak hour	Miles per peak hour	Year	Vehicle Type	Fuel	Speed Bin	NO_x EF (g/mi)	PM_{10} EF (g/mi)	$PM_{2.5}$ EF (g/mi)	Hourly NO_x rate (g/hr)	Hourly PM_{10} rate (g/hr)	Hourly $PM_{2.5}$ rate (g/hr)	Hourly NO_x rate (g/s)	Hourly PM_{10} rate (g/s)	Hourly $PM_{2.5}$ rate (g/s)
PEREBWST	1289	4	0.98	2022	Combination Short-haul Truck	Diesel Fuel	22.5 <= speed < 27.5 mph	9.40	0.28	0.26	9.18	0.27	0.25	2.55E-03	7.58E-05	6.98E-05
PERWBWST	1289	1	0.24	2022	Combination Short-haul Truck	Diesel Fuel	22.5 <= speed < 27.5 mph	9.40	0.28	0.26	2.29	0.07	0.06	6.37E-04	1.90E-05	1.74E-05
PEREBSIT	666	4	0.50	2022	Combination Short-haul Truck	Diesel Fuel	17.5 <= speed < 22.5 mph	10.6	0.30	0.28	5.34	0.15	0.14	1.48E-03	4.23E-05	3.90E-05
PERWBSIT	667	1	0.13	2022	Combination Short-haul Truck	Diesel Fuel	17.5 <= speed < 22.5 mph	10.6	0.30	0.28	1.34	0.04	0.04	3.71E-04	1.06E-05	9.75E-06
PEREBEST	1281	0	0	2022	Combination Short-haul Truck	Diesel Fuel	7.5 <= speed < 12.5 mph	15.7	0.37	0.34	0	0	0	0	0	0
PERWBEST	1281	4	0.97	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	12.2	0.33	0.30	3.39E-03	9.11E-05	8.38E-05
WALSITN	290	0	0	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	0	0	0	0	0	0
WALSITS	345	0	0	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	0	0	0	0	0	0
WLSTHTRK	1000	0	0	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	0	0	0	0	0	0
ROOTWEST	801	2	0.30	2022	Combination Short-haul Truck	Diesel Fuel	17.5 <= speed < 22.5 mph	10.6	0.30	0.28	3.21	0.09	0.08	8.92E-04	2.55E-05	2.34E-05
ROOTWN	666	2	0.25	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	3.18	0.09	0.08	8.83E-04	2.37E-05	2.18E-05
ROOTEAST	798	1	0.15	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	1.90	0.05	0.05	5.29E-04	1.42E-05	1.31E-05
NRMSITN	253	9	0.43	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	5.43	0.15	0.13	1.51E-03	4.05E-05	3.72E-05
NRMSITS	409	3	0.23	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	2.93	0.08	0.07	8.13E-04	2.18E-05	2.01E-05
NRSTHTRK	995	3	0.57	2022	Combination Short-haul Truck	Diesel Fuel	12.5 <= speed < 17.5 mph	12.6	0.34	0.31	7.12	0.19	0.18	1.98E-03	5.31E-05	4.88E-05

Information from Figure 9 of KLOA traffic report

Onsite Travel

All Vehicles

Link	Distance (ft)	Volume peak hour	Miles per peak hour	Year	Vehicle Type	Fuel	Speed Bin	NO_x EF (g/hr)	PM_{10} EF (g/hr)	$PM_{2.5}$ EF (g/hr)	Hourly NO_x rate (g/hr)	Hourly PM_{10} rate (g/hr)	Hourly $PM_{2.5}$ rate (g/hr)	Hourly NO_x rate (g/s)	Hourly PM_{10} rate (g/s)	Hourly $PM_{2.5}$ rate (g/s)
PASSPARK	889	107	18.0	2022	Passenger Car	Gasoline	2.5 <= speed < 7.5 mph	0.09	0.005	0.004	1.61	0.08	0.07	4.49E-04	2.29E-05	2.03E-05
DOCKTRAV	579	12	1.32	2022	Combination Short-haul Truck	Diesel Fuel	2.5 <= speed < 7.5 mph	26.0	0.59	0.54	34.3	0.78	0.72	9.52E-03	2.16E-04	1.99E-04

Note: Assume no idling for this portion - idling covered below

3900 S. Normal Avenue, Chicago, IL
Roadway Emissions by Link
September 28, 2021

Idling Times (min) - Use LOS delay

Pershing/Wallace	
AM EB	9.5
PM EB	9.3
AM WB	24.1
PM WB	25.7
AM NB	19.7
PM NB	21.4
AM SB	16.9
PM SB	18.6
Average	**18.2**

Pershing/Normal	
AM EB	8.1
PM EB	8.5
AM WB	11.6
PM WB	13
AM NB	8.7
PM NB	9
AM SB	
PM SB	
Average	**9.82**

Root/Wallace	
AM EB	9.6
PM EB	12.4
AM WB	9.5
PM WB	10.4
AM NB	9.4
PM NB	10.1
AM SB	9.1
PM SB	11.2
Average	**10.2**

Root/Normal	
AM EB	8.9
PM EB	9.2
AM WB	8.7
PM WB	8.7
AM NB	8
PM NB	8.2
AM SB	8.8
PM SB	8.5
Average	**8.63**

Idling

Link	Volume peak hour	Idle minutes/hr/veh	Idle minutes/hr	Year	Vehicle Type	Fuel	Speed Bin	NO_x EF (g/hr)	PM_{10} EF (g/hr)	$PM_{2.5}$ EF (g/hr)	Hourly NO_x rate (g/hr)	Hourly PM_{10} rate (g/hr)	Hourly $PM_{2.5}$ rate (g/hr)	Hourly NO_x rate (g/s)	Hourly PM_{10} rate (g/s)	Hourly $PM_{2.5}$ rate (g/s)
DOCK-IDLE	12	5.00	60.0	2022	Combination Short-haul Truck	Diesel Fuel	speed = 0 (idle) (g/hr)	59.4	1.89	1.74	59.4	1.89	1.74	1.65E-02	5.24E-04	4.82E-04
NW-IDLE-PASS	154	0.30	46.6	2022	Passenger Car	Gasoline	speed = 0 (idle) (g/hr)	0.2	0.02	0.02	0.2	0.01	0.01	5.08E-05	3.95E-06	3.49E-06
SW-IDLE-PASS	38	0.17	6.47	2022	Passenger Car	Gasoline	speed = 0 (idle) (g/hr)	0.2	0.02	0.02	0.03	0.00	0.0017	7.05E-06	5.48E-07	4.85E-07
NE-IDLE-PASS	94	0.16	15.4	2022	Passenger Car	Gasoline	speed = 0 (idle) (g/hr)	0.2	0.02	0.02	0.1	0.00	0.0041	1.68E-05	1.30E-06	1.15E-06
SE-IDLE-PASS	21	0.14	3.02	2022	Passenger Car	Gasoline	speed = 0 (idle) (g/hr)	0.24	0.02	0.02	0.01	0.0009	0.0008	3.29E-06	2.56E-07	2.26E-07
NW-IDLE-TRK	10	0.30	3.03	2022	Combination Short-haul Truck	Diesel Fuel	speed = 0 (idle) (g/hr)	59.42	1.89	1.74	3.00	0.0952	0.0875	8.32E-04	2.64E-05	2.43E-05
SW-IDLE-TRK	4	0.17	0.68	2022	Combination Short-haul Truck	Diesel Fuel	speed = 0 (idle) (g/hr)	59.42	1.89	1.74	0.674	0.0214	0.0197	1.87E-04	5.95E-06	5.47E-06
NE-IDLE-TRK	18	0.16	2.95	2022	Combination Short-haul Truck	Diesel Fuel	speed = 0 (idle) (g/hr)	59.42	1.89	1.74	2.92	0.0926	0.0852	8.10E-04	2.57E-05	2.37E-05
SE-IDLE-TRK	6	0.14	0.86	2022	Combination Short-haul Truck	Diesel Fuel	speed = 0 (idle) (g/hr)	59.42	1.89	1.74	0.8542	0.0271	0.0250	2.37E-04	7.54E-06	6.93E-06

3900 S. Normal Avenue, Chicago, IL

Roadway Emissions Links Combined
September 28, 2021

Combined Links for Ease of Modeling

Source Name	Type	Hourly NO_x rate (g/s)	Hourly PM_{10} rate (g/s)	Hourly $PM_{2.5}$ rate (g/s)
PEREBWST	Line Volume	2.74E-03	8.16E-05	7.48E-05
PERWBWST	Line Volume	6.61E-04	1.96E-05	1.80E-05
PEREBSIT	Line Volume	1.50E-03	4.30E-05	3.95E-05
PERWBSIT	Line Volume	4.49E-04	1.29E-05	1.18E-05
PEREBEST	Line Volume	2.40E-05	6.04E-07	5.35E-07
PERWBEST	Line Volume	3.58E-03	9.68E-05	8.88E-05
WALSITN	Line Volume	8.42E-05	2.88E-06	2.55E-06
WALSITS	Line Volume	2.47E-05	8.45E-07	7.47E-07
WLSTHTRK	Line Volume	6.73E-05	1.70E-06	1.50E-06
ROOTWEST	Line Volume	9.26E-04	2.65E-05	2.43E-05
ROOTWN	Line Volume	9.06E-04	2.45E-05	2.25E-05
ROOTEAST	Line Volume	5.57E-04	1.52E-05	1.39E-05
NRMSITN	Line Volume	1.52E-03	4.09E-05	3.76E-05
NRMSITS	Line Volume	8.18E-04	2.20E-05	2.02E-05
NRSTHTRK	Line Volume	1.99E-03	5.34E-05	4.91E-05
PASSPARK-g/s	Line Area	4.49E-04	2.29E-05	2.03E-05
DOCKTRAV	Line Volume	9.52E-03	2.16E-04	1.99E-04
DOCKIDLE-g/s	Area	1.65E-02	5.24E-04	4.82E-04
NWIDLE-g/s	Area	8.83E-04	3.04E-05	2.78E-05
SWIDLE-g/s	Area	1.94E-04	6.50E-06	5.96E-06
NEIDLE-g/s	Area	8.27E-04	2.70E-05	2.48E-05
SEIDLE-g/s	Area	2.41E-04	7.79E-06	7.16E-06
Source Name	**Type**	**(g/s-m^2)**	**(g/s-m^2)**	**(g/s-m^2)**
PASSPARK	Line-Area	2.71E-07	1.39E-08	1.23E-08
DOCKIDLE	Area	7.94E-06	2.52E-07	2.32E-07
NWIDLECOMB1	Area-Poly	1.35E-06	4.65E-08	4.26E-08
NEIDLECOMB1	Area-Poly	1.27E-06	4.14E-08	3.80E-08
NWIDLECOMB2	Area-Poly	1.38E-06	4.75E-08	4.35E-08
NEIDLECOMB2	Area-Poly	1.29E-06	4.23E-08	3.88E-08
SWIDLECOMB2	Area-Poly	6.07E-07	2.03E-08	1.86E-08
SWIDLECOMB1	Area-Poly	6.07E-07	2.03E-08	1.86E-08
SEIDLECOMB1	Area-Poly	7.52E-07	2.43E-08	2.24E-08
SEIDLECOMB2	Area-Poly	7.52E-07	2.43E-08	2.24E-08
NWIDLECOMB3	Area-Poly	2.72E-06	9.35E-08	8.56E-08
NEIDLECOMB3	Area-Poly	2.55E-06	8.32E-08	7.64E-08
SWIDLECOMB3	Area-Poly	5.98E-07	2.00E-08	1.83E-08
SEIDLECOMB3	Area-Poly	7.40E-07	2.40E-08	2.20E-08

Note: vehicle release parameters to be weighted by 90% passenger vehicles and 10% trucks, as in traffic report. See below for parameters.

Hours/day operation	12
Hours/day	24

Vehicle Release Parameters

Parameter	Passenger	Truck	Combined
Percentage	90%	10%	
Vehicle Ht. (m)	1.53	4.00	1.78
Plume Ht. (m)	2.60	6.800	3.02
Release Ht. (m)	1.30	3.40	1.51
Initial Vertical Dimension	1.21	3.16	1.41

3900 S. Normal Avenue, Chicago, IL

Variable Emissions Scenario for NO_X, $PM_{2.5}$, and PM_{10}
September 28, 2021

NOTE: The Peak Hour emissions proportions below apply to <u>all</u> of the pollutants analyzed, even though they are calculated using NO_X emissions.

Hourly Volumes and Percentages

Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
Passenger Car Volume	56	107	56	56	56	56	56	56	56	96	56	56
Percent of Peak	52%	100%	52%	52%	52%	52%	52%	52%	52%	90%	52%	52%
Truck Volume	4	9	6	6	6	7	8	6	7	8	6	7
Percent of Peak	44%	100%	67%	67%	67%	78%	89%	67%	78%	89%	67%	78%

Notes:
Peak AM and PM passenger volumes from "Traffic Impact Study, 3900 South Normal Avenue, Chicago, Illinois". KLOA, May 10, 2021.
Peak AM hour of traffic study, 7:15-8:15. Peak PM hour of traffic 3:15-4:15
Assume lunch rush with average volume of those peaks.
Hourly truck volumes from traffic report response: "3900 Normal Avenue - Response to CDOT Comment - 9-17-2021.docx", provided by Cardno.

Offsite Travel

Passenger Cars

Source Name	Hourly NO_X Emissions Proportioned from Peak (g/s)											
Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
PEREBWST	9.89E-05	1.90E-04	9.89E-05	9.89E-05	9.89E-05	9.89E-05	9.89E-05	9.89E-05	9.89E-05	1.70E-04	9.89E-05	9.89E-05
PERWBWST	1.25E-05	2.41E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	2.16E-05	1.25E-05	1.25E-05
PEREBSIT	1.08E-05	2.07E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.08E-05	1.85E-05	1.08E-05	1.08E-05
PERWBSIT	4.04E-05	7.76E-05	4.04E-05	4.04E-05	4.04E-05	4.04E-05	4.04E-05	4.04E-05	4.04E-05	6.96E-05	4.04E-05	4.04E-05
PEREBEST	1.25E-05	2.40E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	2.15E-05	1.25E-05	1.25E-05
PERWBEST	9.83E-05	1.89E-04	9.83E-05	9.83E-05	9.83E-05	9.83E-05	9.83E-05	9.83E-05	9.83E-05	1.69E-04	9.83E-05	9.83E-05
WALSITN	4.39E-05	8.42E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	7.56E-05	4.39E-05	4.39E-05
WALSITS	1.29E-05	2.47E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	2.22E-05	1.29E-05	1.29E-05
WLSTHTRK	3.50E-05	6.73E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	6.04E-05	3.50E-05	3.50E-05
ROOTWEST	1.78E-05	3.42E-05	1.78E-05	1.78E-05	1.78E-05	1.78E-05	1.78E-05	1.78E-05	1.78E-05	3.07E-05	1.78E-05	1.78E-05
ROOTWN	1.24E-05	2.38E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05	1.24E-05	2.14E-05	1.24E-05	1.24E-05
ROOTEAST	1.49E-05	2.86E-05	1.49E-05	1.49E-05	1.49E-05	1.49E-05	1.49E-05	1.49E-05	1.49E-05	2.56E-05	1.49E-05	1.49E-05
NRMSITN	6.80E-06	1.31E-05	6.80E-06	6.80E-06	6.80E-06	6.80E-06	6.80E-06	6.80E-06	6.80E-06	1.17E-05	6.80E-06	6.80E-06
NRMSITS	2.48E-06	4.76E-06	2.48E-06	2.48E-06	2.48E-06	2.48E-06	2.48E-06	2.48E-06	2.48E-06	4.27E-06	2.48E-06	2.48E-06
NRSTHTRK	5.81E-06	1.12E-05	5.81E-06	5.81E-06	5.81E-06	5.81E-06	5.81E-06	5.81E-06	5.81E-06	1.00E-05	5.81E-06	5.81E-06

Information from Figure 8 of KLOA traffic report

Trucks

Source Name	Hourly NO_X Emissions Proportioned from Peak (g/s)											
Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
PEREBWST	1.13E-03	2.55E-03	1.70E-03	1.70E-03	1.70E-03	1.98E-03	2.27E-03	1.70E-03	1.98E-03	2.27E-03	1.70E-03	1.98E-03
PERWBWST	2.83E-04	6.37E-04	4.25E-04	4.25E-04	4.25E-04	4.96E-04	5.67E-04	4.25E-04	4.96E-04	5.67E-04	4.25E-04	4.96E-04
PEREBSIT	6.59E-04	1.48E-03	9.88E-04	9.88E-04	9.88E-04	1.15E-03	1.32E-03	9.88E-04	1.15E-03	1.32E-03	9.88E-04	1.15E-03
PERWBSIT	1.65E-04	3.71E-04	2.47E-04	2.47E-04	2.47E-04	2.89E-04	3.30E-04	2.47E-04	2.89E-04	3.30E-04	2.47E-04	2.89E-04
PEREBEST	0	0	0	0	0	0	0	0	0	0	0	0
PERWBEST	1.51E-03	3.39E-03	2.26E-03	2.26E-03	2.26E-03	2.64E-03	3.02E-03	2.26E-03	2.64E-03	3.02E-03	2.26E-03	2.64E-03
WALSITN	0	0	0	0	0	0	0	0	0	0	0	0
WALSITS	0	0	0	0	0	0	0	0	0	0	0	0
WLSTHTRK	0	0	0	0	0	0	0	0	0	0	0	0
ROOTWEST	3.96E-04	8.92E-04	5.94E-04	5.94E-04	5.94E-04	6.93E-04	7.93E-04	5.94E-04	6.93E-04	7.93E-04	5.94E-04	6.93E-04
ROOTWN	3.92E-04	8.83E-04	5.88E-04	5.88E-04	5.88E-04	6.86E-04	7.84E-04	5.88E-04	6.86E-04	7.84E-04	5.88E-04	6.86E-04
ROOTEAST	2.35E-04	5.29E-04	3.52E-04	3.52E-04	3.52E-04	4.11E-04	4.70E-04	3.52E-04	4.11E-04	4.70E-04	3.52E-04	4.11E-04
NRMSITN	6.70E-04	1.51E-03	1.01E-03	1.01E-03	1.01E-03	1.17E-03	1.34E-03	1.01E-03	1.17E-03	1.34E-03	1.01E-03	1.17E-03
NRMSITS	3.61E-04	8.13E-04	5.42E-04	5.42E-04	5.42E-04	6.32E-04	7.23E-04	5.42E-04	6.32E-04	7.23E-04	5.42E-04	6.32E-04
NRSTHTRK	8.79E-04	1.98E-03	1.32E-03	1.32E-03	1.32E-03	1.54E-03	1.76E-03	1.32E-03	1.54E-03	1.76E-03	1.32E-03	1.54E-03

Information from Figure 9 of KLOA traffic report

3900 S. Normal Avenue, Chicago, IL

Variable Emissions Scenario for NO_x, $PM_{2.5}$, and PM_{10}

September 28, 2021

Onsite Travel

All Vehicles

Source Name	Hourly NO_x Emissions Proportioned from Peak (g/s)											
Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
PASSPARK	2.33E-04	4.49E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	4.02E-04	2.33E-04	2.33E-04
DOCKTRAV	4.23E-03	9.52E-03	6.35E-03	6.35E-03	6.35E-03	7.40E-03	8.46E-03	6.35E-03	7.40E-03	8.46E-03	6.35E-03	7.40E-03

Note: Assume no idling for this portion - idling covered below

Idling

Source Name	Hourly NO_x Emissions Proportioned from Peak (g/s)											
Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
DOCK-IDLE	7.34E-03	1.65E-02	1.10E-02	1.10E-02	1.10E-02	1.28E-02	1.47E-02	1.10E-02	1.28E-02	1.47E-02	1.10E-02	1.28E-02
NW-IDLE-PASS	2.64E-05	5.08E-05	2.64E-05	2.64E-05	2.64E-05	2.64E-05	2.64E-05	2.64E-05	2.64E-05	4.56E-05	2.64E-05	2.64E-05
SW-IDLE-PASS	3.67E-06	7.05E-06	3.67E-06	3.67E-06	3.67E-06	3.67E-06	3.67E-06	3.67E-06	3.67E-06	6.33E-06	3.67E-06	3.67E-06
NE-IDLE-PASS	8.73E-06	1.68E-05	8.73E-06	8.73E-06	8.73E-06	8.73E-06	8.73E-06	8.73E-06	8.73E-06	1.50E-05	8.73E-06	8.73E-06
SE-IDLE-PASS	1.71E-06	3.29E-06	1.71E-06	1.71E-06	1.71E-06	1.71E-06	1.71E-06	1.71E-06	1.71E-06	2.95E-06	1.71E-06	1.71E-06
NW-IDLE-TRK	3.70E-04	8.32E-04	5.55E-04	5.55E-04	5.55E-04	6.47E-04	7.40E-04	5.55E-04	6.47E-04	7.40E-04	5.55E-04	6.47E-04
SW-IDLE-TRK	8.32E-05	1.87E-04	1.25E-04	1.25E-04	1.25E-04	1.46E-04	1.66E-04	1.25E-04	1.46E-04	1.66E-04	1.25E-04	1.46E-04
NE-IDLE-TRK	3.60E-04	8.10E-04	5.40E-04	5.40E-04	5.40E-04	6.30E-04	7.20E-04	5.40E-04	6.30E-04	7.20E-04	5.40E-04	6.30E-04
SE-IDLE-TRK	1.05E-04	2.37E-04	1.58E-04	1.58E-04	1.58E-04	1.85E-04	2.11E-04	1.58E-04	1.85E-04	2.11E-04	1.58E-04	1.85E-04

Combined Links for Ease of Modeling

Source Name	Hourly NO_x Emissions Proportioned from Peak (g/s)											
Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
PEREBWST	1.23E-03	2.74E-03	1.80E-03	1.80E-03	1.80E-03	2.08E-03	2.37E-03	1.80E-03	2.08E-03	2.44E-03	1.80E-03	2.08E-03
PERWBWST	2.96E-04	6.61E-04	4.37E-04	4.37E-04	4.37E-04	5.08E-04	5.79E-04	4.37E-04	5.08E-04	5.88E-04	4.37E-04	5.08E-04
PEREBSIT	6.70E-04	1.50E-03	9.99E-04	9.99E-04	9.99E-04	1.16E-03	1.33E-03	9.99E-04	1.16E-03	1.34E-03	9.99E-04	1.16E-03
PERWBSIT	2.05E-04	4.49E-04	2.88E-04	2.88E-04	2.88E-04	3.29E-04	3.70E-04	2.88E-04	3.29E-04	3.99E-04	2.88E-04	3.29E-04
PEREBEST	1.25E-05	2.40E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	1.25E-05	2.15E-05	1.25E-05	1.25E-05
PERWBEST	1.61E-03	3.58E-03	2.36E-03	2.36E-03	2.36E-03	2.74E-03	3.11E-03	2.36E-03	2.74E-03	3.18E-03	2.36E-03	2.74E-03
WALSITN	4.39E-05	8.42E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	4.39E-05	7.56E-05	4.39E-05	4.39E-05
WALSITS	1.29E-05	2.47E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	1.29E-05	2.22E-05	1.29E-05	1.29E-05
WLSTHTRK	3.50E-05	6.73E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	3.50E-05	6.04E-05	3.50E-05	3.50E-05
ROOTWEST	4.14E-04	9.26E-04	6.12E-04	6.12E-04	6.12E-04	7.11E-04	8.10E-04	6.12E-04	7.11E-04	8.23E-04	6.12E-04	7.11E-04
ROOTWN	4.05E-04	9.06E-04	6.01E-04	6.01E-04	6.01E-04	6.99E-04	7.97E-04	6.01E-04	6.99E-04	8.06E-04	6.01E-04	6.99E-04
ROOTEAST	2.50E-04	5.57E-04	3.67E-04	3.67E-04	3.67E-04	4.26E-04	4.85E-04	3.67E-04	4.26E-04	4.96E-04	3.67E-04	4.26E-04
NRMSITN	6.77E-04	1.52E-03	1.01E-03	1.01E-03	1.01E-03	1.18E-03	1.35E-03	1.01E-03	1.18E-03	1.35E-03	1.01E-03	1.18E-03
NRMSITS	3.64E-04	8.18E-04	5.44E-04	5.44E-04	5.44E-04	6.35E-04	7.25E-04	5.44E-04	6.35E-04	7.27E-04	5.44E-04	6.35E-04
NRSTHTRK	8.84E-04	1.99E-03	1.32E-03	1.32E-03	1.32E-03	1.54E-03	1.76E-03	1.32E-03	1.54E-03	1.77E-03	1.32E-03	1.54E-03
PASSPARK-g/s	2.33E-04	4.49E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	2.33E-04	4.02E-04	2.33E-04	2.33E-04
DOCKTRAV	4.23E-03	9.52E-03	6.35E-03	6.35E-03	6.35E-03	7.40E-03	8.46E-03	6.35E-03	7.40E-03	8.46E-03	6.35E-03	7.40E-03
DOCKIDLE-g/s	7.34E-03	1.65E-02	1.10E-02	1.10E-02	1.10E-02	1.28E-02	1.47E-02	1.10E-02	1.28E-02	1.47E-02	1.10E-02	1.28E-02
NWIDLE-g/s	3.96E-04	8.83E-04	5.81E-04	5.81E-04	5.81E-04	6.74E-04	7.66E-04	5.81E-04	6.74E-04	7.85E-04	5.81E-04	6.74E-04
SWIDLE-g/s	8.69E-05	1.94E-04	1.29E-04	1.29E-04	1.29E-04	1.49E-04	1.70E-04	1.29E-04	1.49E-04	1.73E-04	1.29E-04	1.49E-04
NEIDLE-g/s	3.69E-04	8.27E-04	5.49E-04	5.49E-04	5.49E-04	6.39E-04	7.29E-04	5.49E-04	6.39E-04	7.35E-04	5.49E-04	6.39E-04
SEIDLE-g/s	1.07E-04	2.41E-04	1.60E-04	1.60E-04	1.60E-04	1.86E-04	2.13E-04	1.60E-04	1.86E-04	2.14E-04	1.60E-04	1.86E-04

Source Name	Hourly Variable Proportions of Peak Emissions by Link											
Ending Hour	7	8	9	10	11	12	13	14	15	16	17	18
PEREBWST	45%	100%	66%	66%	66%	76%	86%	66%	76%	89%	66%	76%
PERWBWST	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
PEREBSIT	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
PERWBSIT	46%	100%	64%	64%	64%	73%	83%	64%	73%	89%	64%	73%
PEREBEST	52%	100%	52%	52%	52%	52%	52%	52%	52%	90%	52%	52%
PERWBEST	45%	100%	66%	66%	66%	76%	87%	66%	76%	89%	66%	76%
WALSITN	52%	100%	52%	52%	52%	52%	52%	52%	52%	90%	52%	52%
WALSITS	52%	100%	52%	52%	52%	52%	52%	52%	52%	90%	52%	52%
WLSTHTRK	52%	100%	52%	52%	52%	52%	52%	52%	52%	90%	52%	52%
ROOTWEST	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
ROOTWN	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
ROOTEAST	45%	100%	66%	66%	66%	76%	87%	66%	76%	89%	66%	76%
NRMSITN	45%	100%	67%	67%	67%	78%	89%	67%	78%	89%	67%	78%
NRMSITS	44%	100%	67%	67%	67%	78%	89%	67%	78%	89%	67%	78%
NRSTHTRK	44%	100%	67%	67%	67%	78%	89%	67%	78%	89%	67%	78%
PASSPARK	52%	100%	52%	52%	52%	52%	52%	52%	52%	90%	52%	52%
DOCKTRAV	44%	100%	67%	67%	67%	78%	89%	67%	78%	89%	67%	78%
DOCKIDLE	44%	100%	67%	67%	67%	78%	89%	67%	78%	89%	67%	78%
NWIDLE	45%	100%	66%	66%	66%	76%	87%	66%	76%	89%	66%	76%
SWIDLE	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
NEIDLE	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
SEIDLE	45%	100%	66%	66%	66%	77%	88%	66%	77%	89%	66%	77%
Average	**46%**	**100%**	**63%**	**63%**	**63%**	**71%**	**80%**	**63%**	**71%**	**89%**	**63%**	**71%**

3900 S. Normal Avenue, Chicago, IL

Variable Emissions Scenario for NO_X, $PM_{2.5}$, and PM_{10}

September 28, 2021

Averaged Variable Emissions
Trucks & Cars

Hour Ending	Factor
1	0
2	0
3	0
4	0
5	0
6	0
7	0.46385
8	1.00000
9	0.62943
10	0.62943
11	0.62943
12	0.71222
13	0.79501
14	0.62943
15	0.71222
16	0.89101
17	0.62943
18	0.71222
19	0
20	0
21	0
22	0
23	0
24	0

3900 S. Normal Avenue, Chicago, IL

Emissions from Comfort Heaters and Water Heaters - Natural Gas Fueled
September 28, 2021

Comfort Heating/ Hot Water Usage:

Parameter	Value	Units
Heating Requirement for Building	50	BTU/ft2
Square footage of entire building	170,262	ft^2
Square footage of entire building	15809.5	m^2
Heating requirement for space	8,513,100	BTU/hr
Heating Estimate	6,000,000	BTU/hr
NG usage	0.006	MMscf/hr

Notes:

Assume Climate zone 5. https://basc.pnnl.gov/images/iecc-climate-zone-map, https://www.energy.gov/sites/default/files/2015/10/f27/ba_climate_region_guide_7.3.pdf

Square Footage from 3900 Normal Avenue Site drawings

Heating requirement for space estimated. Model conservatively assumes 100% heater rating usage for 24/7, 365 days/yr.

Combustor type determination	6.0	MMBTU/hr

Based on Combustor type, assume Small Boilers from AP-42 EF
https://www3.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf

Emission Type	Nox	PM10	PM2.5
EF, Uncontrolled, lb/MMscf	100	7.6	7.6
Emissions, Uncontrolled, lb/hr	0.5882	0.0447	0.0447
Emissions, Uncontrolled, g/s	0.074116	0.005633	0.005633
Emissions, Uncontrolled, g/s-m^2	**4.69E-06**	**3.56E-07**	**3.56E-07**

Conversions:

1,020 BTU/scf

Source Parameters

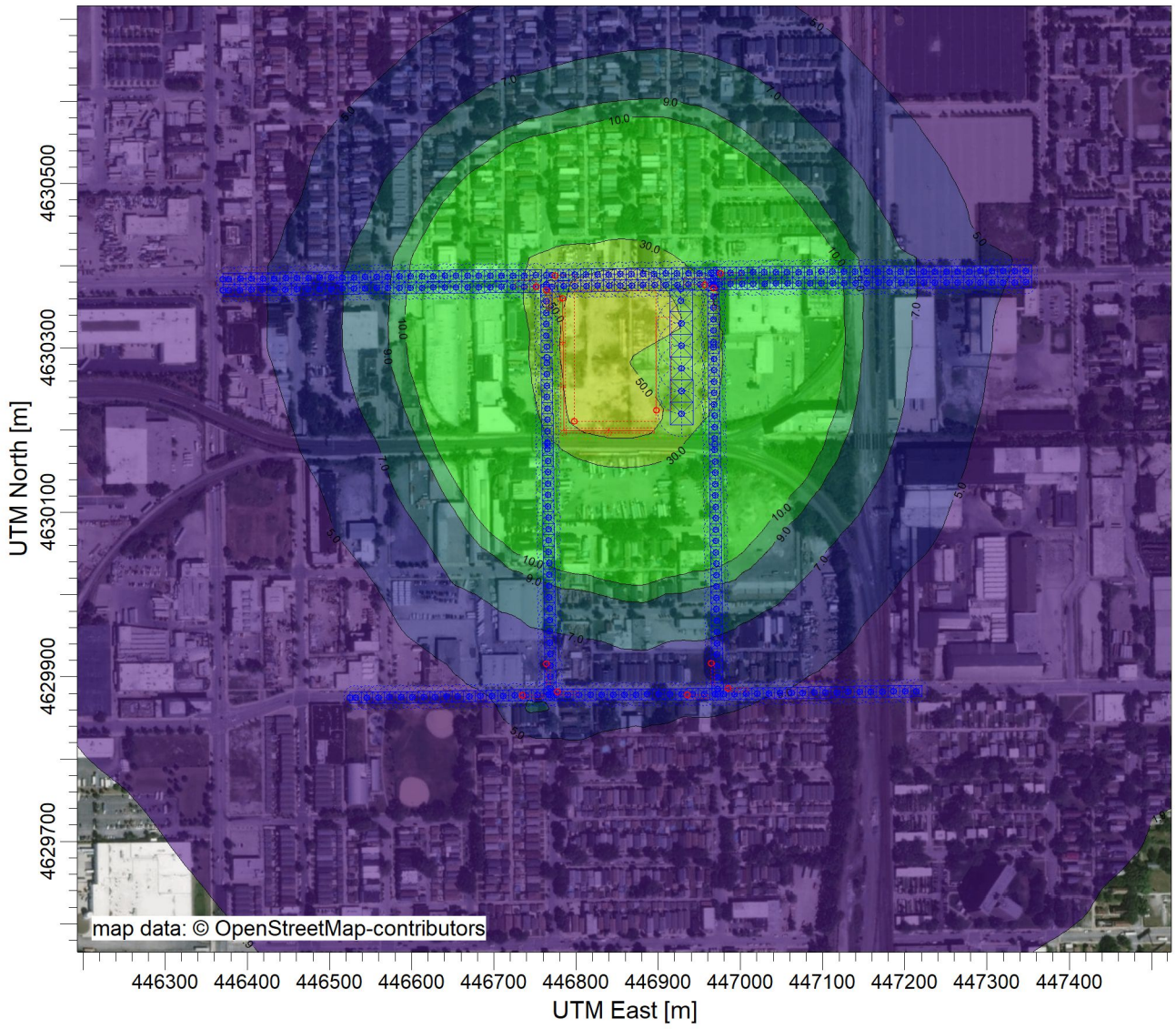
AERMOD ID	HTRS
Source Type	Area
Source Description	Comfort Heaters
# of sources	1
Plume Height (ft)	36.0
Plume Height (m)	11.0
Top of Roof (ft)	36.0
Top of Roof (m)	11.0
Building Edge Height (ft)	36.0
Building Edge Height (m)	11.0
Release Height (ft)	18.0
Release Height (m)	5.49
szinit (ft)	16.7
szinit (m)	5.10

ATTACHMENT B

NO_2, $PM_{2.5}$, AND PM_{10} MODELED CONCENTRATION ISOPLETHS

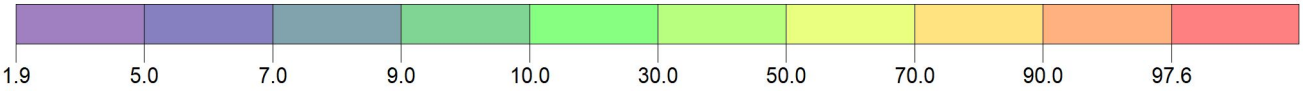
PROJECT TITLE:

3900 S. Normal Avenue AQIA
H8H Annual Max. Daily 1-hr NO2 Averaged Over 5 Years



PLOT FILE OF 8TH-HIGHEST MAX DAILY 1-HR VALUES AVERAGED OVER 5 YEARS FOR SOURCE GROUP: ALL ug/m^3

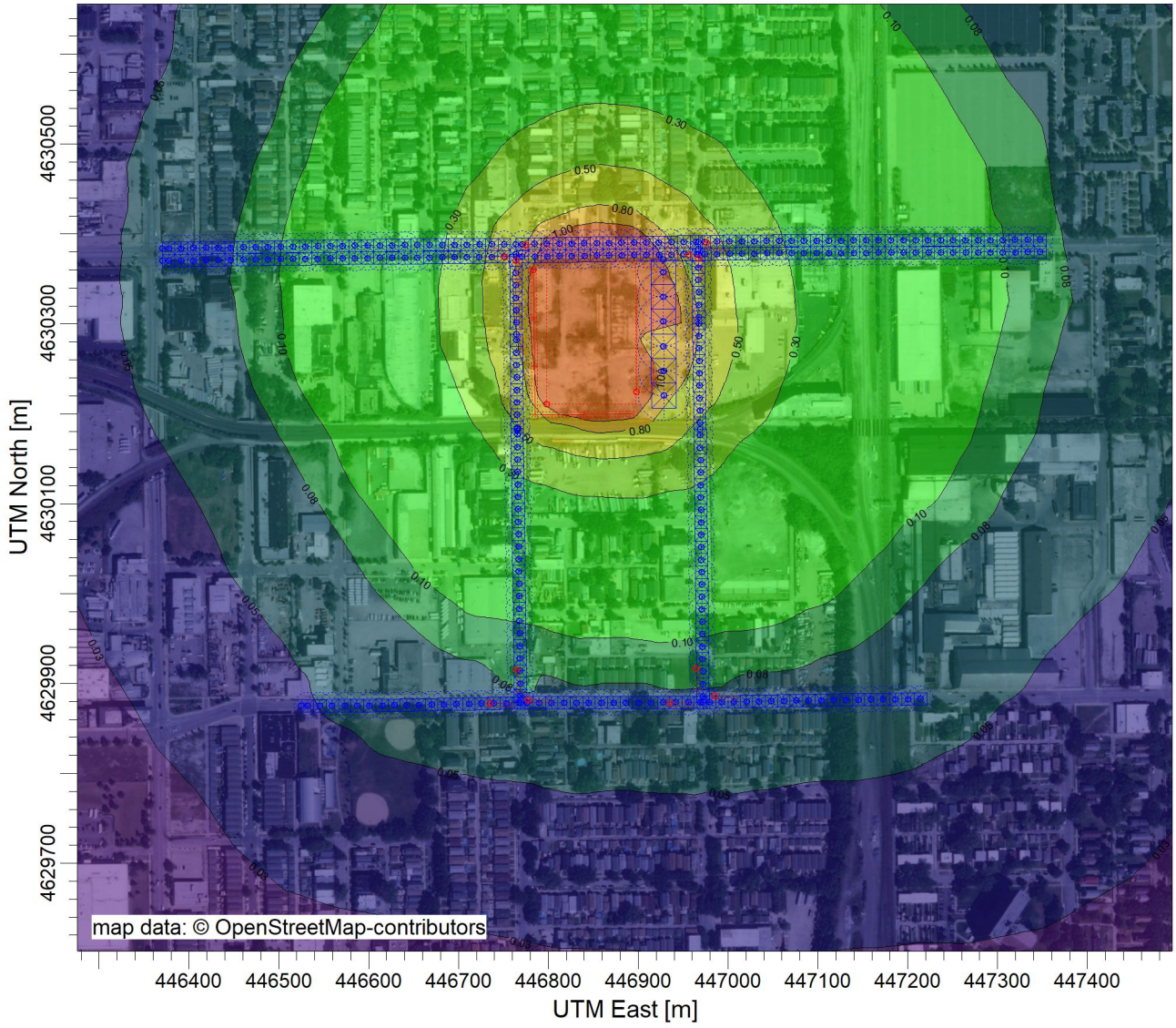
Max: 70.1 [ug/m^3] at (446859.90, 4630372.05)



COMMENTS:	SOURCES: **31**	COMPANY NAME: **BlueScape Environmental**	
	RECEPTORS: **3181**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:8,372 0 0.3 km	
	MAX: **70.1 ug/m^3**	DATE: **9/28/2021**	PROJECT NO.:

PROJECT TITLE:

3900 S. Normal Avenue AQIA
Annual H8H 24-hr Avg. PM2.5 Concentrations Averaged Over 5 Years



PLOT FILE OF 8TH-HIGHEST MAX DAILY 24-HR VALUES AVERAGED OVER 5 YEARS FOR SOURCE GROUP: ALL ug/m^3

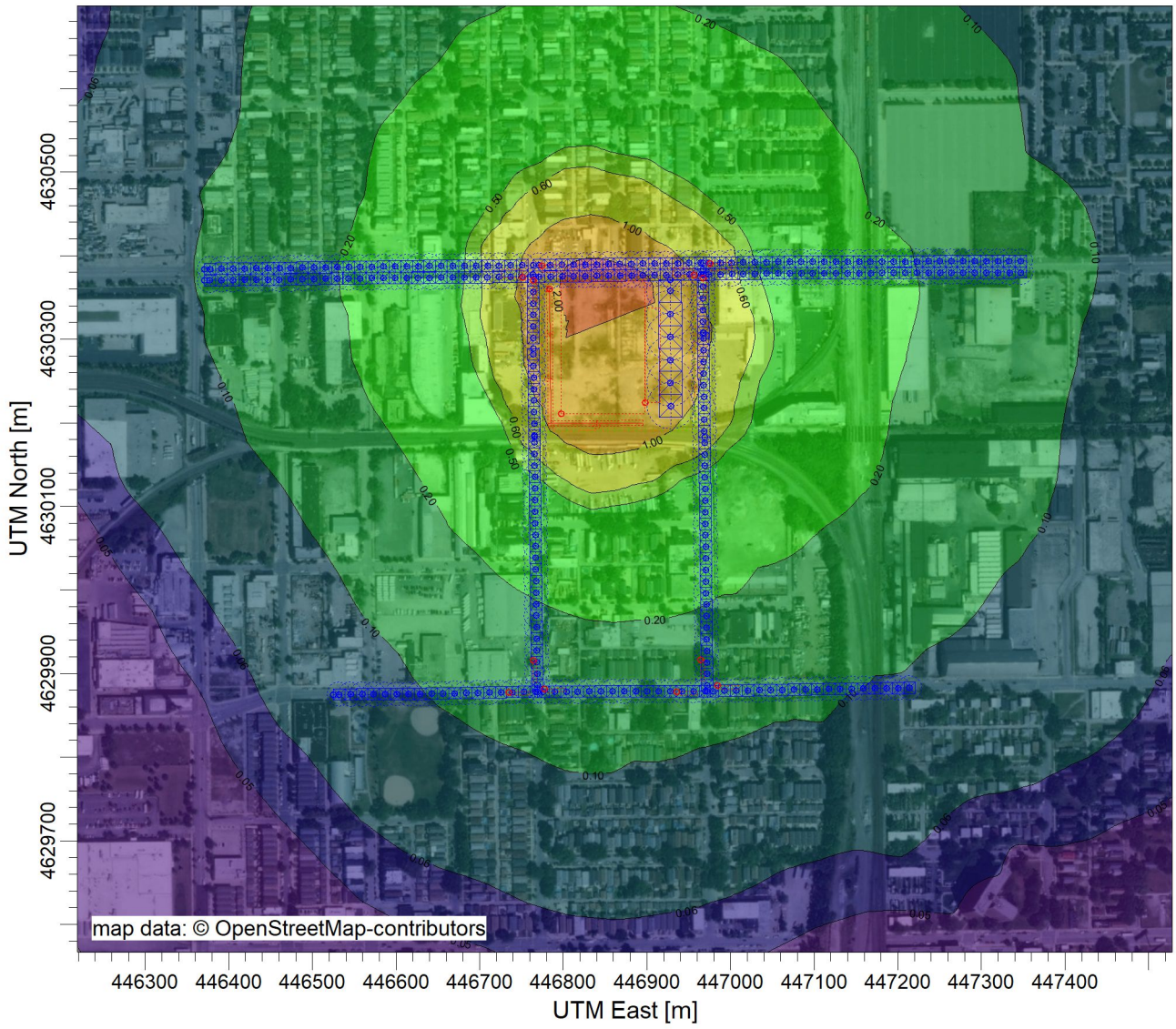
Max: 1.87 [ug/m^3] at (446866.16, 4630372.11)

0.02 0.03 0.05 0.08 0.10 0.30 0.50 0.80 1.00 1.87

COMMENTS:	SOURCES: **31**	COMPANY NAME: **BlueScape Environmental**	
	RECEPTORS: **3181**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:7,665 — 0 — 0.2 km	
	MAX: **1.87 ug/m^3**	DATE: **9/28/2021**	PROJECT NO.:

PROJECT TITLE:

3900 S. Normal Avenue AQIA
Maximum H4H 24-hr Avg. PM10 Concentrations Over 5 Years



PLOT FILE OF HIGH 4TH HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

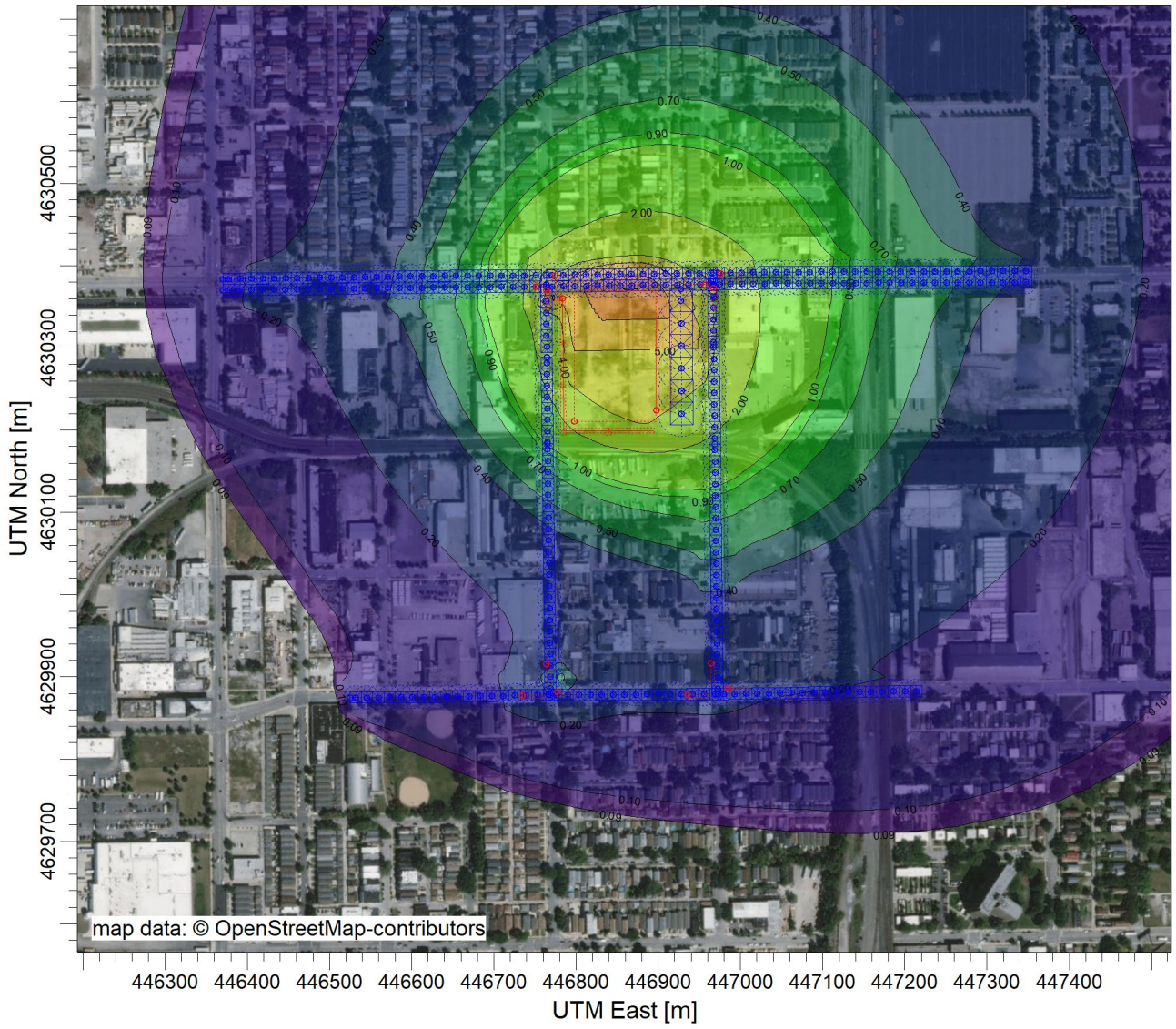
Max: 2.81 [ug/m^3] at (446832.48, 4630371.78)

0.03 0.05 0.06 0.10 0.20 0.50 0.60 1.00 2.00 2.81

COMMENTS:	SOURCES: **31**	COMPANY NAME: **BlueScape Environmental**	
	RECEPTORS: **3181**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:8,236 — 0 — 0.3 km	
	MAX: **2.81 ug/m^3**	DATE: **9/28/2021**	PROJECT NO.:

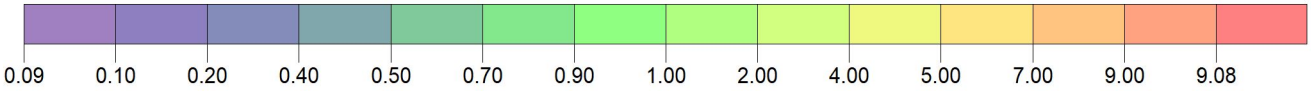
PROJECT TITLE:

3900 S. Normal Avenue AQIA
Highest Annual Avg. NO2 Concentrations Over 5 Years (2016)



POST/PLOT FILE OF ANNUAL VALUES FOR YEAR 1 FOR SOURCE GROUP: ALL ug/m^3

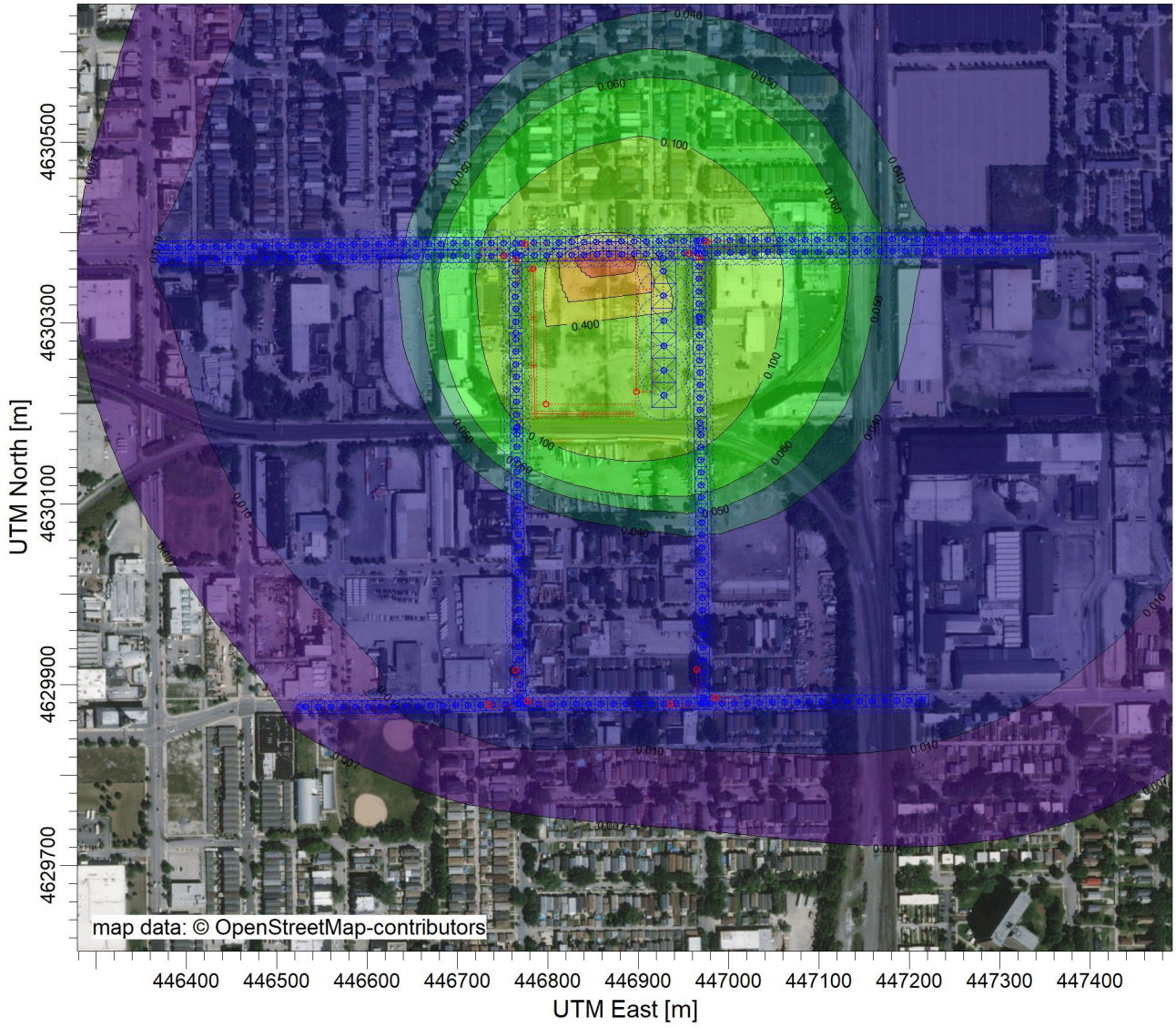
Max: 9.08 [ug/m^3] at (446866.16, 4630372.11)



COMMENTS:	SOURCES: **31**	COMPANY NAME: **BlueScape Environmental**	
	RECEPTORS: **3181**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:8,372 0 0.3 km	
	MAX: **9.08 ug/m^3**	DATE: **9/28/2021**	PROJECT NO.:

PROJECT TITLE:

3900 S. Normal Avenue AQIA
Average Annual PM2.5 Concentrations Over 5 Years



PLOT FILE OF ANNUAL VALUES AVERAGED ACROSS 5 YEARS FOR SOURCE GROUP: ALL ug/m^3

Max: 0.682 [ug/m^3] at (446866.16, 4630372.11)

0.007 0.010 0.040 0.050 0.060 0.100 0.400 0.500 0.600 0.682

COMMENTS:	SOURCES: **31**	COMPANY NAME: **BlueScape Environmental**	
	RECEPTORS: **3181**	MODELER:	
	OUTPUT TYPE: **Concentration**	SCALE: 1:7,624 — 0 — 0.2 km	
	MAX: **0.682 ug/m^3**	DATE: **9/28/2021**	PROJECT NO.:

ATTACHMENT C

AERMOD MODELING FILES (ELECTRONIC FORMAT)

Please Respect the Environment

About Cardno

Cardno is an ASX-200 professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage, and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD].

Cardno Zero Harm

Cardno ZERO HARM EVERY JOB. EVERY DAY.

At Cardno, our primary concern is to develop and maintain safe and healthy conditions for anyone involved at our project worksites. We require full compliance with our Health and Safety Policy Manual and established work procedures and expect the same protocol from our subcontractors. We are committed to achieving our Zero Harm goal by continually improving our safety systems, education, and vigilance at the workplace and in the field. Safety is a Cardno core value and through strong leadership and active employee participation, we seek to implement and reinforce these leading actions on every job, every day.

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