September 30, 2024 Verdantas Project 22015

Chase Davis
Executive Assistant
Quincy Shipyard, LLC
549 South Street
Quincy, MA

RE: Air Emissions Modeling Results
Gales Ferry Intermodal
1737 and 1761 Route 12, Ledyard, Connecticut (the "Property")

Dear Mr. Davis

Verdantas performed air emissions modeling for Gales Ferry Intermodal (the Owner) for a proposed surficial material and stone extraction and processing operation (the Facility), which will include blasting/drilling, materials processing, and materials management and movement (i.e., transport). As part of the proposed development, the Owner will be clearing and extracting structural material from portions of the 40-acre wooded southern area of the Property in a phased approach to re-grade the area for future development.

Earth product extraction operations generate particulate matter (PM), which is a criteria pollutant that has an established National Ambient Air Quality Standard (NAAQS) promulgated by the USEPA to protect human health and welfare, including sensitive populations (https://www.epa.gov/criteria-air-pollutants/naaqs-table). The purpose of this modeling exercise was to obtain a better understanding of the potential PM emissions from the proposed extraction operations and evaluate if the operations would exceed the NAAQS at the property boundary. The NAAQS for PM10 and PM2.5 are designated for "primary" and "secondary" protective factors. As described by the EPA: "Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings". Results from the model were compared to Primary standards, which are either equal to or more protective than secondary standards.

This air emissions model was designed to evaluate the anticipated locations of the equipment, storage piles, blasting areas, and truck routes in several phases of the operation. Three scenarios were run: Scenario 1 represents the initial phase of the extraction operations, Scenario 2 represents the later phases of the extraction operations with blasting/drilling occurring to the southwest, and Scenario 3 representing the later phases of the extraction operations with blasting/drilling occurring to the east. Refer to Figure 1, Figure 2, and Figure 3 for the proposed equipment layout, blasting/drilling locations, materials management and movement locations, and receptor locations for

Scenario 1, 2, and 3 respectively. Refer to Attachment A for supporting technical information describing the proposed equipment emissions.

**METHODOLOGY**

The earth product extraction operation was modeled using USEPA's American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) and was performed according to the USEPA "Guideline on Air Quality Models". Verdantas modeled emissions of particulate matter less than 10 microns ($PM_{10}$) and particulate matter less than 2.5 microns ($PM_{2.5}$) from the emission sources. A worst-case scenario was estimated by adding the modeled concentrations from the sources operating at 100 percent of the operating capacity to existing ambient concentrations (the "background concentrations") of the same pollutants. The estimated worst-case scenario concentration for each pollutant was then compared with its corresponding NAAQS.

**EMISSION SOURCES**

The particulate emissions originate from the following source groups:

- crushing and screening of aggregate material;
- conveyor transfer points;
- roadway emissions from vehicle travel around the Facility
- drilling and blasting; and
- drop operations onto stockpiles by the stackers.

Since line power will supply electricity to run the equipment, there will be no on-site stationary equipment engine emissions (i.e. diesel exhaust).

The primary jaw crusher (VCRUSH1) has a maximum planned throughput of 560 tons per hour (TPH) and 750,000 tons per year (TPY). The secondary (VCRUSH2) and tertiary (VCRUSH3) cone crushers each have planned maximum throughputs of 466 TPH, and 624,107 TPY.

The planned hourly and annual throughputs of the screen decks (VSCREEN1, VSCREEN2, VSCREEN3) and the six conveyor transfer points (CON1 thru CON6) are summarized in Table 1 (Scenario 1) and Table 8 (Scenarios 2 and 3), and account for materials leaving the production line to be stored in stockpiles. Following stockpile storage, additional conveyor transfer points (CON7 through CON11) account for material being transferred from the stockpile storage area to the barge dock. Particulate emissions from truck traffic are described as PATH1 through PATH6, depending on the Scenario run, with truck movement on paved roads identified as PATH_PAVED.

To calculate maximum production rates, the model assumes that the Facility will be operating 7:00 am to 5:30 pm Monday through Friday, and Saturday 7:00 am to 1:00 pm on Saturday throughout the entire year. Crushing and screening operations, roadway emissions, and conveyor transfer points were modeled as operating 3,120 hours per year to reflect the Facility operating schedule. The method for calculating drop operations onto stockpiles were modeled as operating 8,760 hours per year, as the method for calculating stockpiles includes estimating emissions from strong winds. Maximum drilling and blasting operations were modeled assuming they occurred two times a day for two back-to-back days of the week, 52 weeks per year. A detailed discussion of each source group is as follows.

**CRUSHING, SCREENING, AND TRANSFER POINTS**

Emissions for the screening, crushing, truck unloading, and conveyor transfer points were calculated by using their respective emissions factor from the USEPA AP-42 Section 11.19.2 tables for crushed stone processing. All crushing, screening, and conveyor transfer points were assumed to be operating with emissions control (i.e. wetting). AP-42 does not have primary and secondary crushing emission factors available, so the emission factors for tertiary crushing were used to estimate a conservative upper limit for primary and secondary crushing emissions. The emission rates per ton of material processed are shown in Table 1 for Scenario 1, and Table 8 for Scenario 2 and Scenario 3.

Crushing, screening, truck unloading, and conveyor transfer points were modeled as volume sources, and were all assumed to be approximately 15 feet tall above surface elevation. The initial dimensions of the source plumes were assumed to be 3 feet in both the vertical and horizontal, leading to the initial sigma-y and sigma-z values of approximately 0.2 meters.

**ROADWAY EMISSIONS**

In Scenario 1, the Facility has approximately 1 mile of paved roadways, and 0.5 miles of unpaved roadways anticipated to be used by operations-related traffic. In Scenario 2 and Scenario 3, the Facility has approximately 1 mile of paved roadways, and 3 miles of unpaved roadways anticipated to be used by operations-related traffic. Roadway emissions calculations were designed to include travel between the quarrying location and processing equipment, movement of processed materials to storage piles, transfer from storage piles to pier loading for barges, and traffic entering and leaving the property via Route 12.

Emissions for the paved roadways were calculated by using the emission factor from the USEPA AP-42 Section 13.2.1 table for paved roads. Emissions for the unpaved roadways were calculated by using the emission factor from the USEPA AP-42 Section 13.2.2 table for unpaved roads and were assumed to be maintained with emissions control (i.e. wetting) and/or periodic applications of calcium chloride. All roadway sources were modeled as line volume sources and the average vehicle dimensions were set to 11.5 ft tall by 8.5 feet wide. The initial plume height and plume width for the roadways were calculated using AERMOD View's Haul Road calculator, leading to the initial sigma-y value of 4.0 meters and sigma-z value of 2.77 meters. The emission rates per ton of material processed are shown in Table 1 for Scenario 1, and Table 8 for Scenario 2 and Scenario 3.

**DRILLING AND BLASTINGS**

Emissions for drilling were calculated by using the wet drilling of unfragmented stone emission factor from AP-42 Section 11.19.2 for crushed stone processing. Emissions for blasting were calculated by using the total suspended particulate calculations as described in the background document for AP-42 Section 11.9 Western Surface Coal Mining, in addition to the scaling factor described in Table 11.9-1. The emissions estimate equation used was initially intended for the crushed stone industry, however it was developed using surface coal mining data obtained by the USEPA. While AP-42 Section 11.19.2 Crushed Stone Processing and Pulverized Mineral Processing indicates that the emissions factors listed in 11.19.2 should not be directly applied to stone quarry blasting, we used the equations themselves to develop the Facility emissions factors based upon blasting information obtained from other stone quarries.

Drilling and blasting operations are planned to occur approximately as often as twice per week during the summer, and once per month during the winter. A drilling and blasting frequency of twice per week on back-to-back days was modeled to estimate conservative emission upper limits. The largest area estimated to be blasted at one time was assumed to be 500 feet by 30 feet. Drilling and blasting emissions were modeled together as two area sources located at base elevation on the northwest edge of the planned quarry site to describe likely operational scenarios during initial quarrying operations, and two area sources adjacent to the southeast wall of the cut terrain and again on the northeast edge of the planned cut to describe likely operations later in the timeline. The emission rates for the drilling and blasting are shown in Table 1 for Scenario 1, and Table 8 for Scenario 2 and Scenario 3.

**STOCKPILES**

Emissions for the stockpiles were calculated by using their respective emission factors from the USEPA AP-42, Section 13.2.4 for aggregate handling and storage piles. The average windspeed was taken from AP 42 Chapter 7, Table 7.1-7 for Providence Rhode Island, which is approximately 45 miles from the site. This represents the 20-year average windspeed from 1991 to 2010. The moisture content was assumed to be 2.1% to represent stone quarrying and processing for various limestone products. Stockpiles were modeled as area sources and were all assumed to be approximately 30 feet tall for initial storage piles, and 50 feet tall for larger storage piles. The emission rates per ton of material processed is shown in Table 1 for Scenario 1, and Table 8 for Scenario 2 and Scenario 3.

**DATA SOURCES**

AERMOD incorporates meteorology, land use, terrain, building geometry, stack parameters (location, height, diameter, exhaust flow rate, and exhaust temperature), and pollutant emission rates. The following data sources were used to parameterize the Model:

- five years of hourly meteorological data measured at Fort Griswold in Groton, Connecticut;
- land use data from National Land Cover Data;

- terrain data from the United States Geological Survey (USGS) and Google Earth;
- Modified terrain data simulating cuts into Allyn Mountain for Scenario 2;
- Owner provided data on production values; and
- USEPA AP-42 and other USEPA emission factors.

**EMISSIONS ESTIMATE**

Emissions were estimated for short-term (24-hour) and annual time periods. The short-term emission estimate for $PM_{2.5}$ and $PM_{10}$ reflect the Facility operating during normal operating hours. Emission rates are provided in Table 1 for Scenario 1, and Table 8 for Scenario 2 and Scenario 3.

**MODEL SELECTION**

The American Meteorological Society and the Environmental Protection Agency Regulatory Model Improvement Committee (AERMIC) was formed to introduce state-of-the-art modeling concepts into the USEPA's air quality models. Through AERMIC, AERMOD was introduced to incorporate planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated emission sources, and both simple and complex terrain. Lakes Environmental's AERMOD View (Version 12.0.0) was used to develop the AERMOD input files used for this modeling study. The latest version of AERMOD (Version 23132) was utilized to process the modeling files.

**METEOROLOGICAL AND LAND USE DATA**

The Guideline on Air Quality Models, located in Title 40, Part 51, Appendix W of the Code of Federal Regulations (40 CFR 51, Appendix W), recommends one year of on-site data or five years of off-site representative data for modeling conducted on refined meteorological data (refined modeling). AERMET is the meteorological pre-processor for AERMOD. The AERMOD Meteorological Processer (AERMET, Version 23132) was used in this modeling analysis. AERMET processes raw meteorological data and processes it to generate the input files required for AERMOD. For this evaluation, five years of raw meteorological data (2017 through 2021) was obtained from the Connecticut Department of Energy & Environmental Protection (CTDEEP). The hourly surface meteorological data (surface data) was measured at the National Weather Service Station (NWS) at Fort Griswold in Groton, CT. The hourly upper air meteorological data (upper air data) was measured at the NWS Station in Brookhaven, New York. The raw surface meteorological data was processed using the "Adjusted U*" setting in AERMET.

Land use data, such as surface roughness, albedo, and Bowen ratio are required inputs to AERMET. The surface roughness length is related to the height of obstacles to wind flow. The albedo is the fraction of total incident solar radiation reflected by the surface back to space without absorption. The daytime Bowen ratio, an indicator of surface moisture, is the ratio of sensible heat flux to latent heat flux. AERSURFACE (Version 20060) was used to generate the land use parameters required by AERMET. The land use data used for the model was representative of the area within a 1-kilometer radius of the surface air station at Fort Griswold (the nearest data point to the Facility).

## RECEPTORS

Three sets of receptors were developed for the model.

1. Multi-tiered Cartesian Receptor Grid. A Cartesian receptor grid was created by placing receptors at 50-meter intervals to a distance of 1,000 meters, and at 100-meter intervals to a distance of 3,000 meters from the approximate Facility center.
2. Fenceline Grid. Receptors were placed along the eastern fence line of the Facility at 20 meters to a distance of 80 meters.
3. Nearby Properties. Ground level receptors were placed at several properties immediately surrounding the Facility, including properties located across the Thames River. Receptor locations are shown in Figures 1, 2 and 3.

A 1/3 arc-second National Elevation Dataset (NED) Geotiff file for the model was obtained from WebGIS to calculate receptor base elevations. The Geotiff file was imported into AERMAP (Version 18081), which used the Geotiff file to calculate receptor and building ground level elevations. For Scenario 1, the raw Geotiff file was imported into AERMAP to obtain receptor elevations representing the terrain before alterations are made due to earth product extraction. For Scenario 2 and Scenario 3, terrain data representing the Property after product extraction was inserted into the raw NED Geotiff, which was then processed through AERMAP to obtain receptor elevations representing the terrain after alterations are made.

## BUILDING DOWNWASH

AERMOD requires nearby building dimension information for emission point sources that are shorter than Good Engineering Practice (GEP). USEPA's Building Profile Input Program, BPIP-PRIME, uses building and structure dimensions to simulate the effects of building wakes on plume dispersion. The Facility is not operating point sources, therefore BPIP-PRIME was not run and building downwash calculations were not performed. For the sake of consistency, nearby onsite buildings and tanks were included in the model inputs to aid in orientation.

## AMBIENT AIR QUALITY DATA

Existing background concentrations were obtained from the CTDEEP's air monitoring sites for Criteria Pollutant Background Air Quality. The PM2.5 24-hour and annual values are the 3-year average values taken from the Fort Griswold Ambient Air Quality Monitoring Station, which is approximately 5 miles from the Facility. The Fort Griswold Station did not have the most recent three years of PM10 data; therefore, PM10 background concentration were taken from the most recent three years of available data measured at the Criscuolo Ambient Air Quality Monitoring Station in New Haven, which is approximately 45 miles from the Facility.

**RESULTS**

The values listed as "Maximum Impact at Property Boundary" in Tables 7, 14, and 16 represent the maximum particulate concentration that computed from the model at any of the property boundaries. The model results demonstrate that the Facility particulate concentrations at the property boundary would comply with the NAAQS.

If you have questions regarding this Modeling Report please feel free to contact us.

Sincerely,
VERDANTAS LLC

Emily Cook
Staff Engineer III

Al Parise, CSP, PE
Senior Project Manager

Suzanne Pisano (Savage), P.E., LEED AP
Associate VP/Senior Engineer

**Attachments:**

Figures



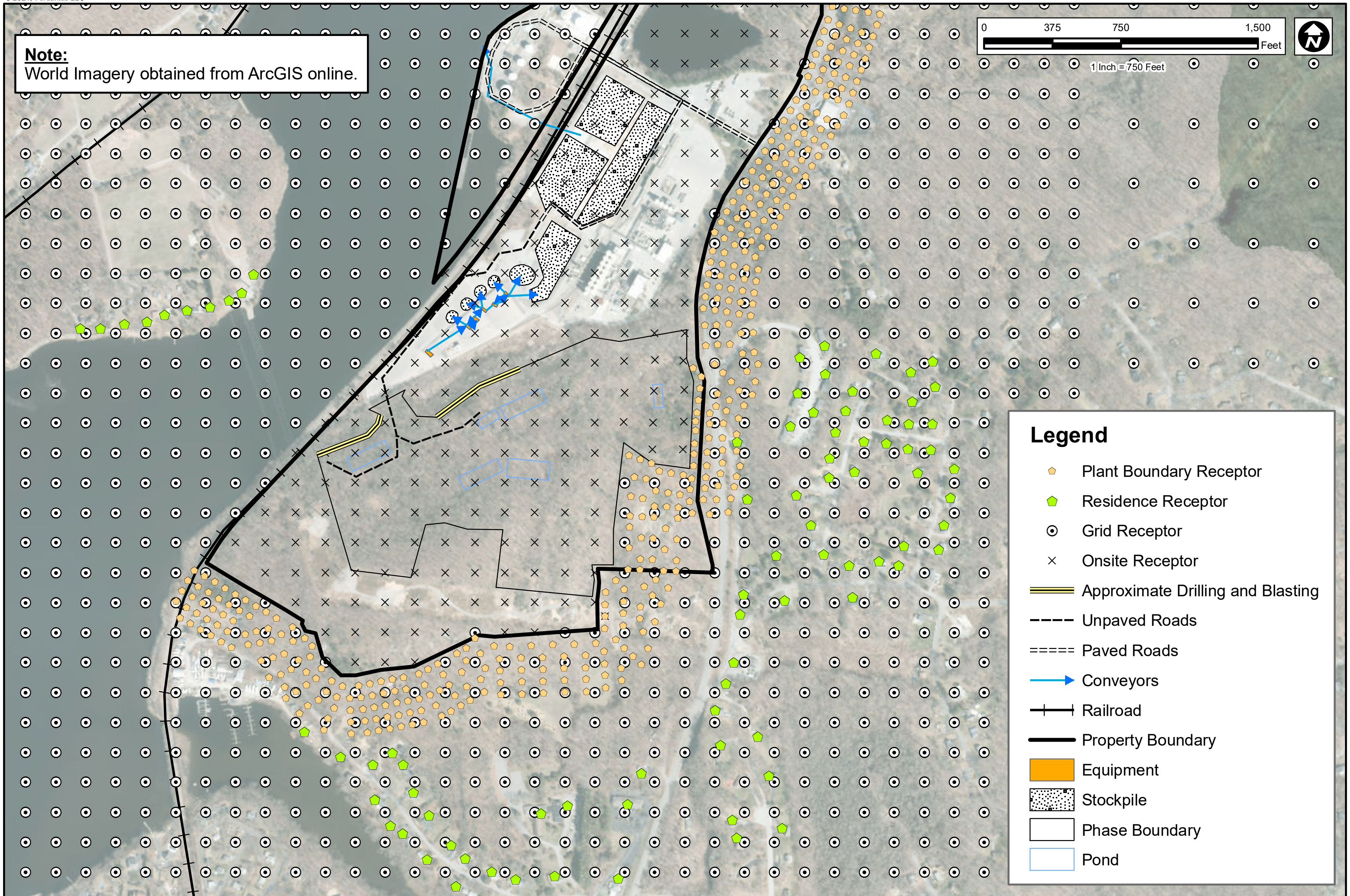
Tables



Attachments



\\verdantas.com\DFS\Project Files\QA-RZ\Quincy\22015 - Cashman Ledyard - Air Modeling\Working\report\1. Modeling_Report-Ledyard Rev.docx

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September 2024

Figure

Gales Ferry Intermodal

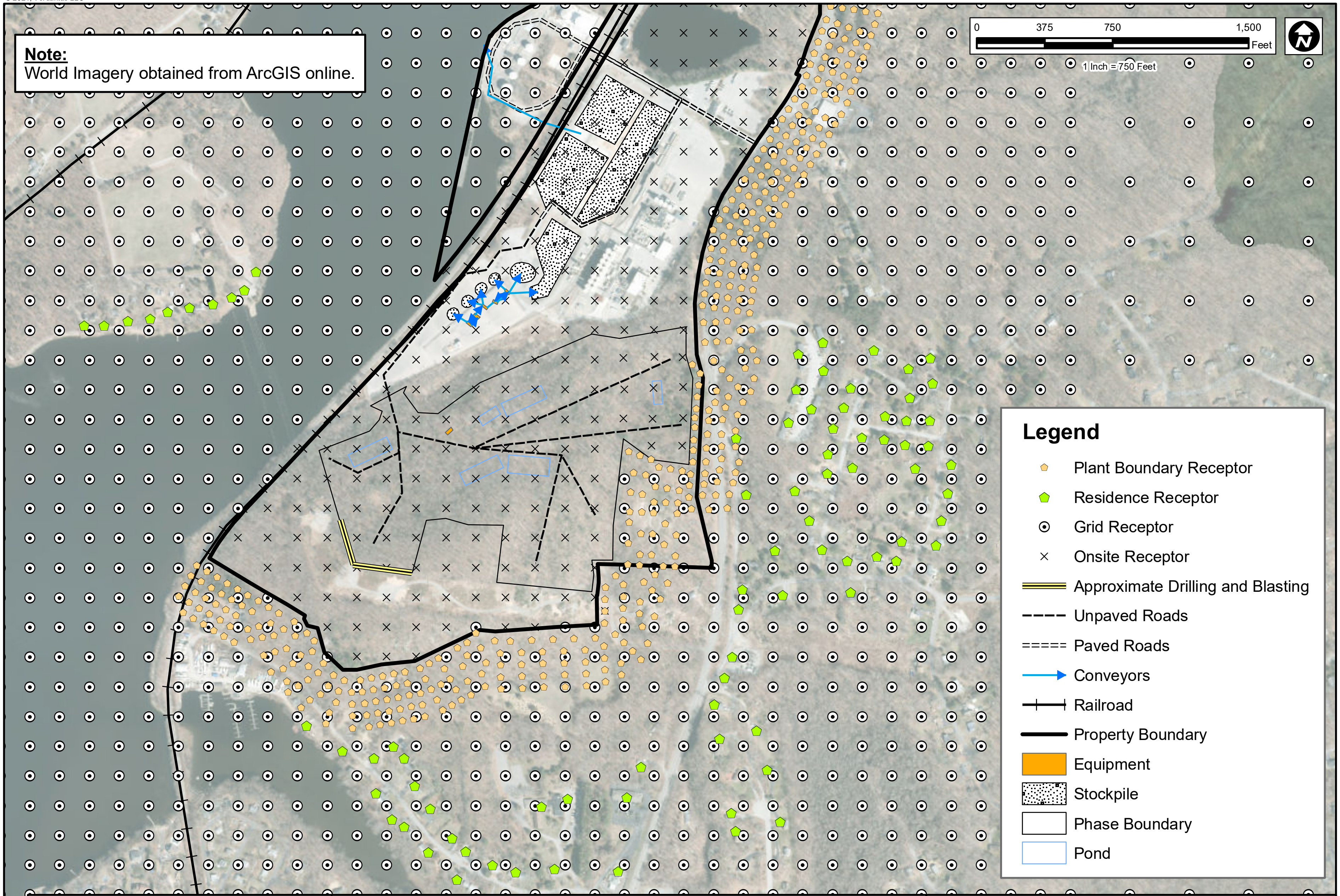
# Site Map- Scenario 1

1761 Route 12
Ledyard, Connecticut

1

Produced Using Esri's ArcGIS Software

File Location: Z:\Project Files\QA-RZ\Quincy\22015 - Cashman Ledyard - Air Modeling\gis\Figure 1 - Site Map- Scenario 1.mxd
Edited: 9/11/2024 User: ercook

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September 2024

Figure

Gales Ferry Intermodal

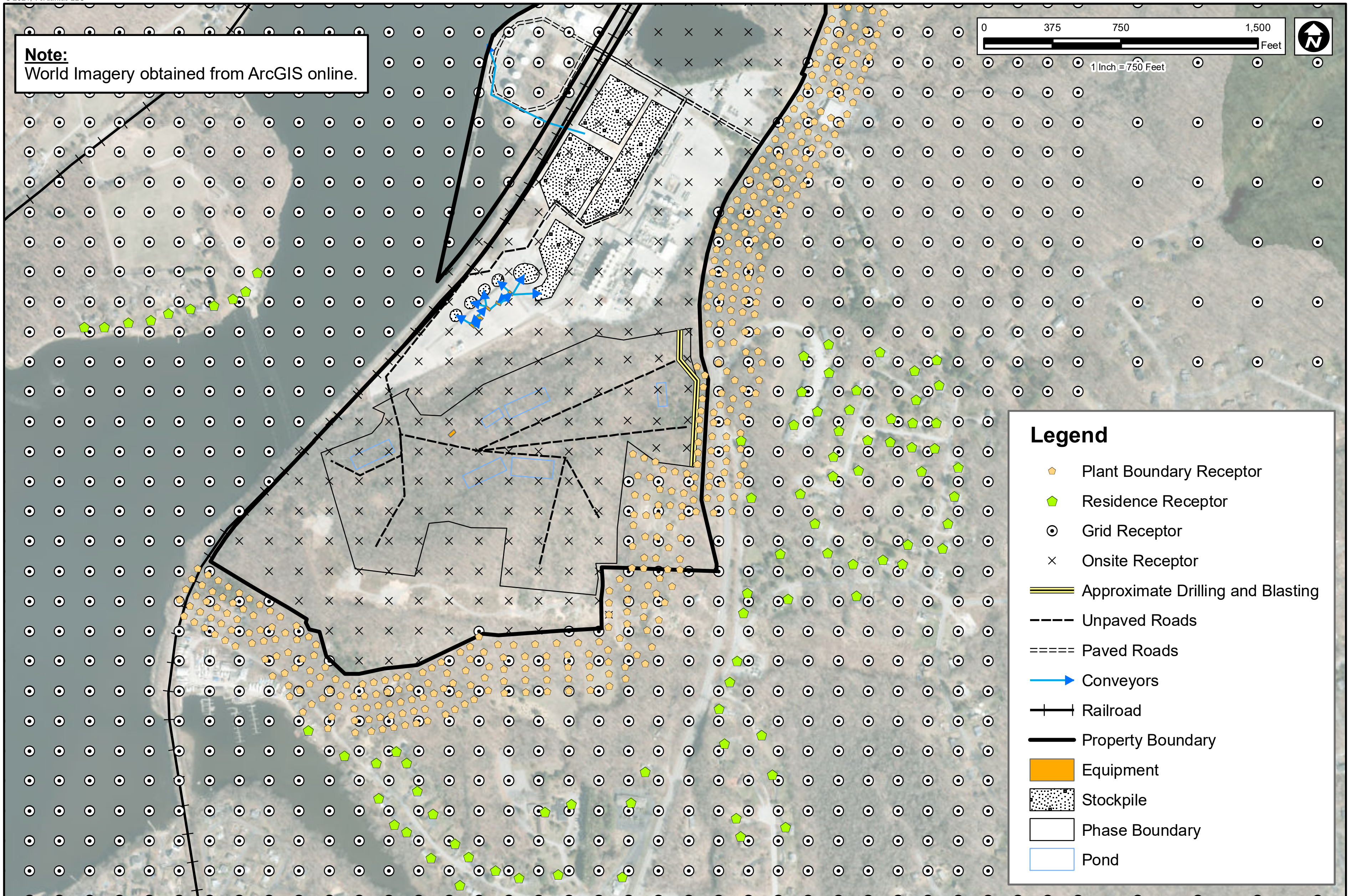
## Site Map- Scenario 2

1761 Route 12
Ledyard, Connecticut

2

Produced Using Esri's ArcGIS Software

File Location: Z:\Project Files\QA-RZ\Quincy\22015 - Cashman Ledyard - Air Modeling\gis\Figure 2- Site Map- Scenario 2.mxd
Edited: 9/11/2024

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September 2024

Figure

Gales Ferry Intermodal

# Site Map- Scenario 3

1761 Route 12
Ledyard, Connecticut

3

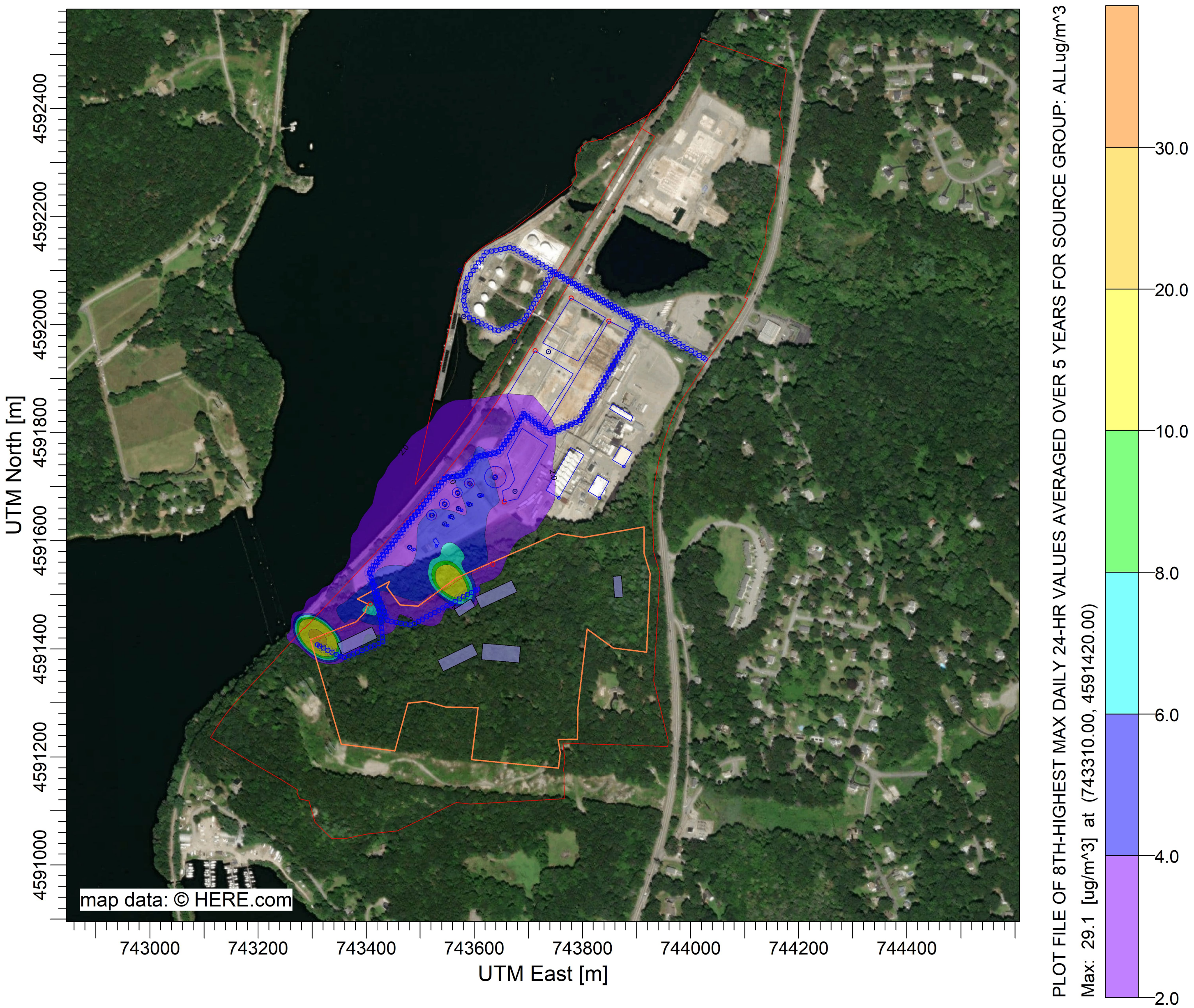
Produced Using Esri's ArcGIS Software

File Location: Z:\Project Files\QA-RZ\Quincy\22015 - Cashman Ledyard - Air Modeling\gis\Figure 3 - Site Map- Scenario 3.mxd

Edited: 9/11/2024

PROJECT TITLE:

**Scenario 1: PM2.5 24-hr**




COMMENTS:

SOURCES:

**31**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**29.1 ug/m^3**

COMPANY NAME:

**Verdantas**

DATE:

**9/11/2024**

SCALE: 1:11,500

0 0.3 km

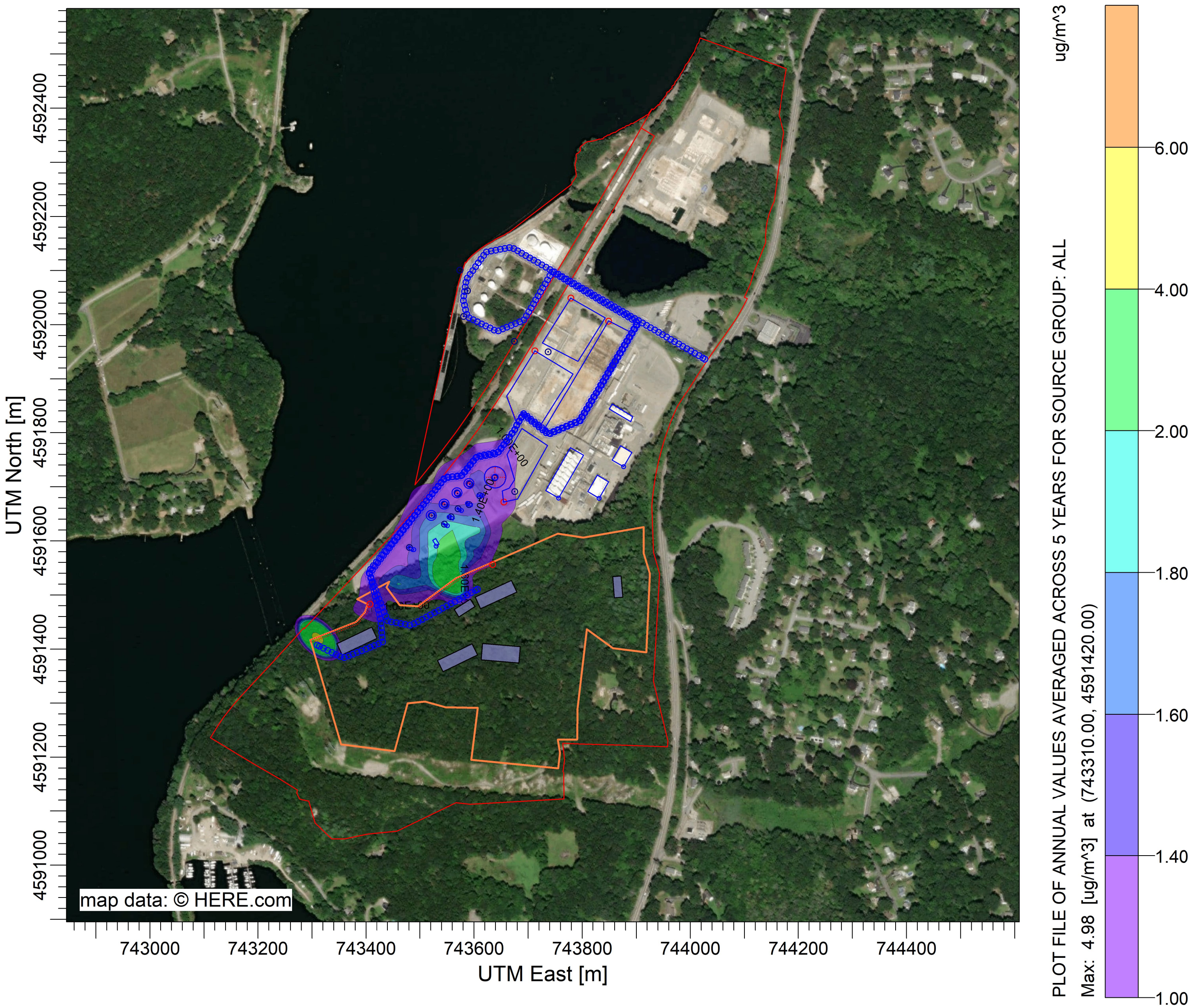
PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\Lakes\AERMOD View\Ledyard\Ledyard_PM25_S1\Ledyard_PM25_S1.isc

PROJECT TITLE:

**Scenario 1: PM2.5 Annual**




COMMENTS:

SOURCES:

**31**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**4.98 ug/m^3**

COMPANY NAME:

**Verdantas**

DATE:

**9/26/2024**

SCALE: 1:11,500

0 0.3 km

PROJECT NO.:

AERMOD View - Lakes Environmental Software

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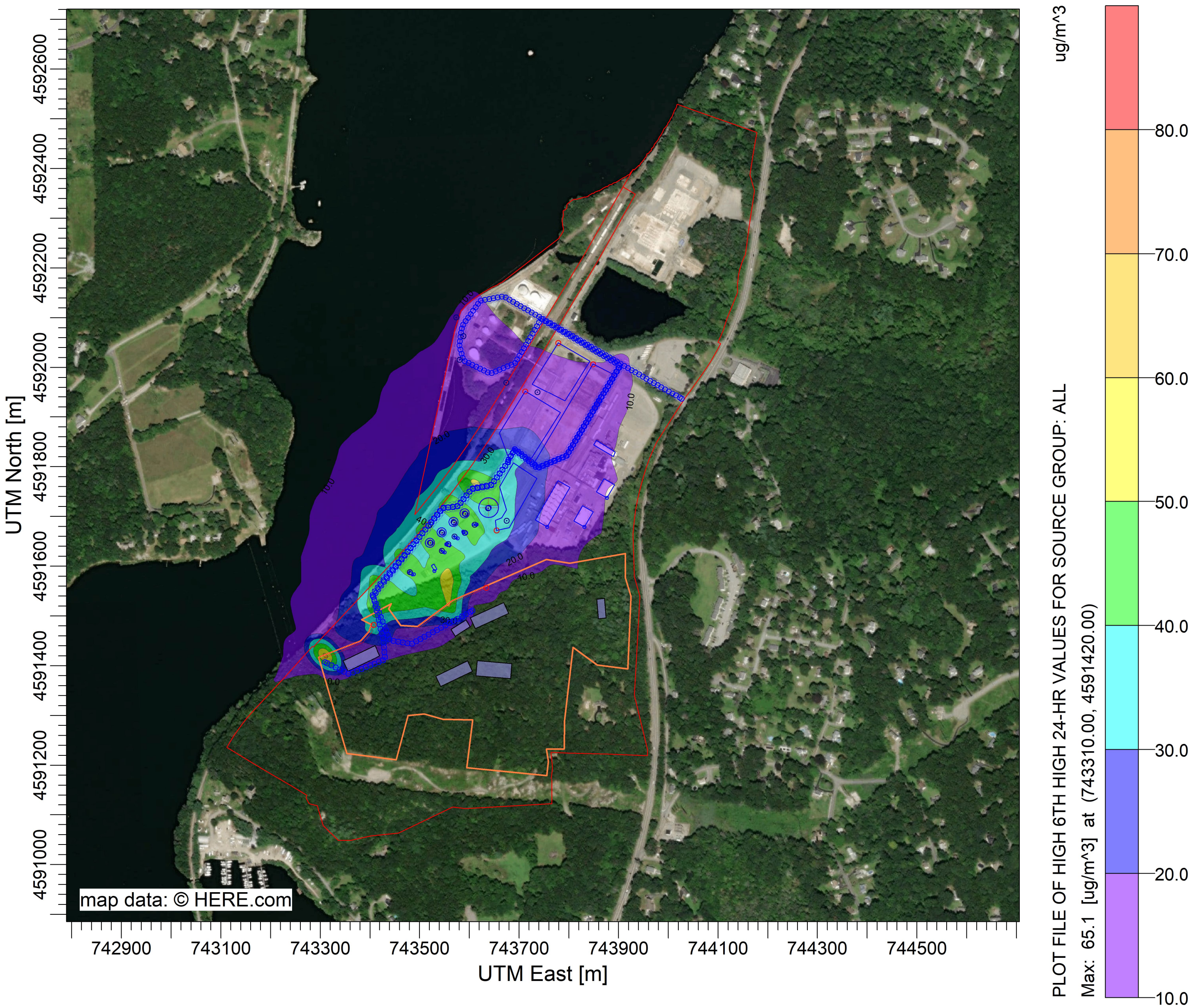
PROJECT TITLE:

**Scenario1: PM10 24-hr**




COMMENTS:

SOURCES:

**31**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**65.1 ug/m^3**

COMPANY NAME:

MODELER:

DATE:

**9/11/2024**

SCALE: 1:12,500

0 0.3 km

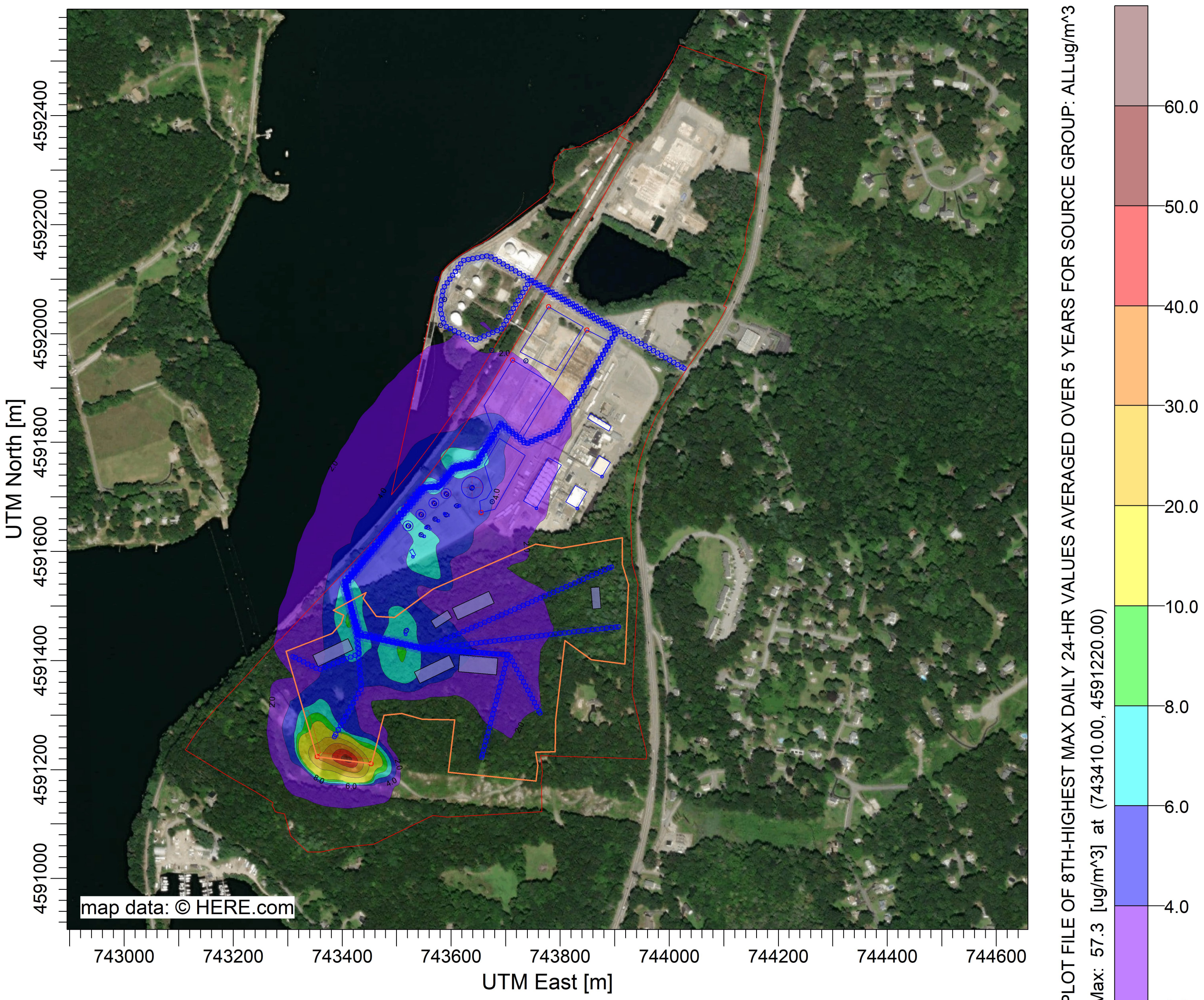
PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\Lakes\AERMOD View\Ledyard_PM10_S1\Ledyard_PM10_S1.isc

PROJECT TITLE:

**Scenario 2: PM2.5 24-hr**




COMMENTS:

SOURCES:

**35**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**57.3 ug/m^3**

COMPANY NAME:

MODELER:

DATE:

**9/11/2024**

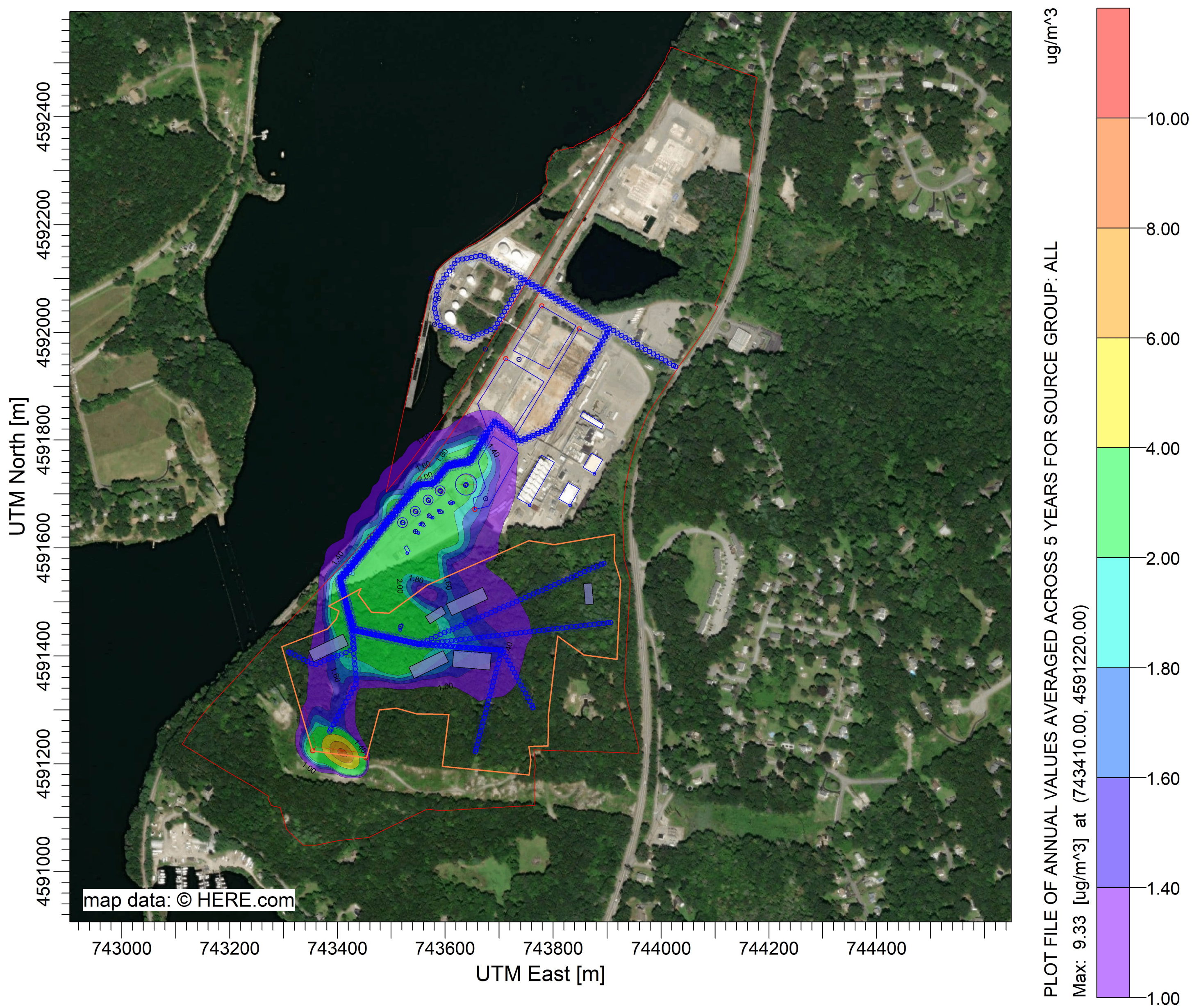
SCALE: 1:11,500

0 0.3 km

PROJECT NO.:

PROJECT TITLE:

**Scenario 2: PM2.5 Annual**




COMMENTS:

SOURCES:

**35**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**9.33 ug/m^3**

COMPANY NAME:

MODELER:

DATE:

**9/11/2024**

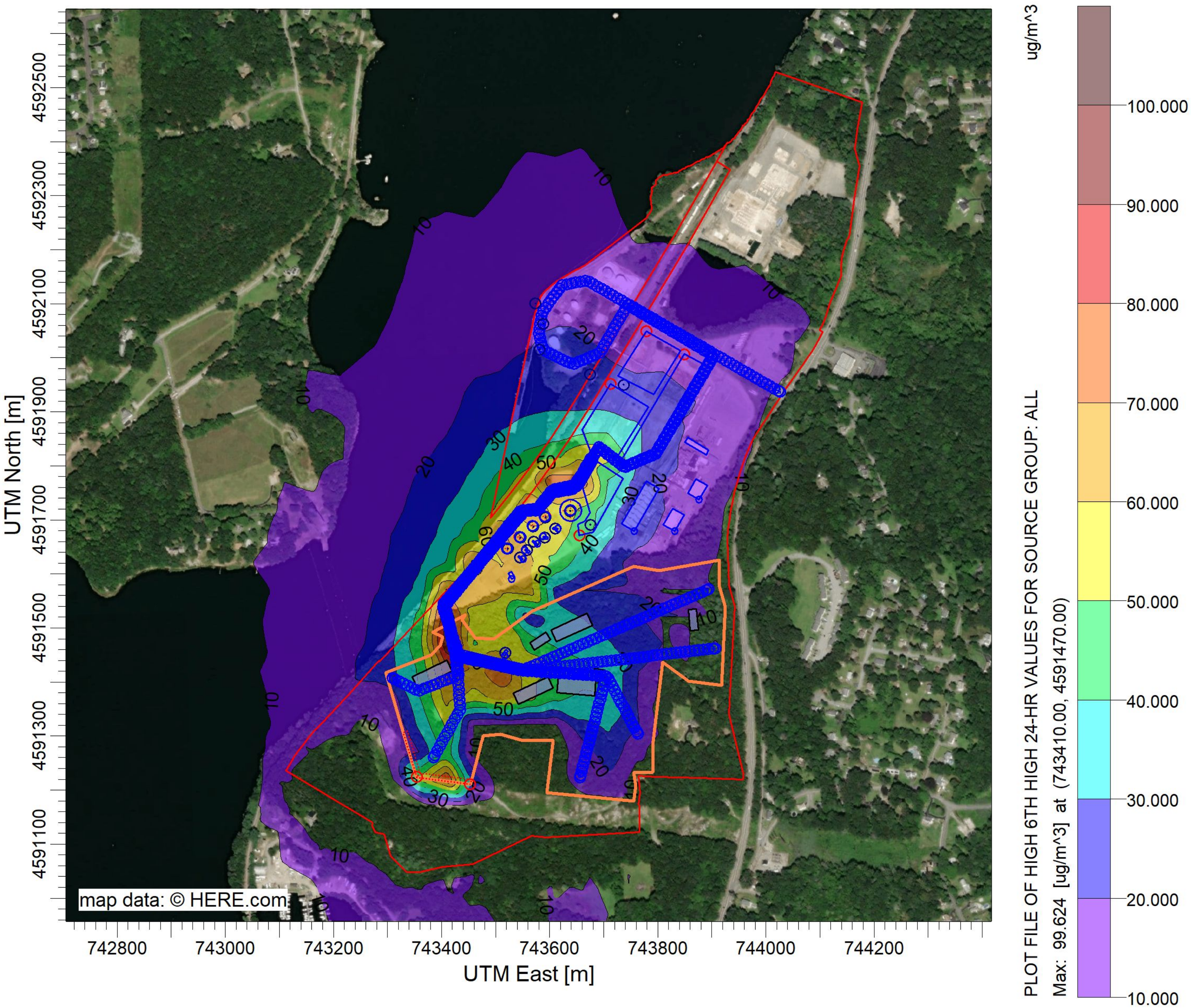
SCALE: 1:11,500

0 0.3 km

PROJECT NO.:

PROJECT TITLE:

**Scenario 2: PM10 24-hr**




COMMENTS:

SOURCES:

**35**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**99.624 ug/m^3**

COMPANY NAME:

MODELER:

DATE:

**9/11/2024**

SCALE: 1:11,500

0 0.3 km

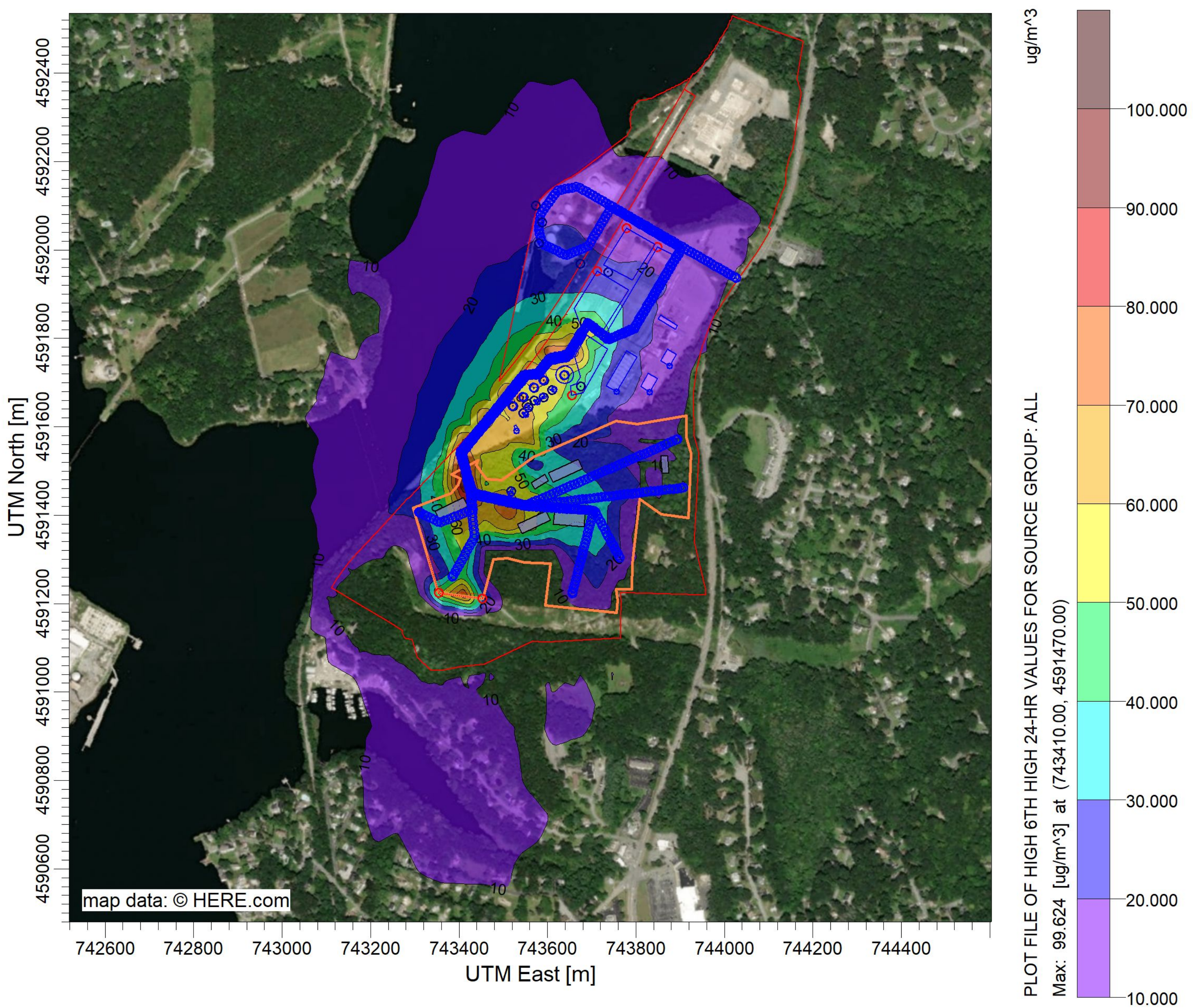
PROJECT NO.:

AERMOD View - Lakes Environmental Software

C:\Lakes\AERMOD View\Ledyard_PM10_S2v2\Ledyard_PM10_S2.isc

PROJECT TITLE:

**Scenario 2: PM10 Annual**




COMMENTS:

SOURCES:
**35**

RECEPTORS:
**5619**

OUTPUT TYPE:
**Concentration**

MAX:
**99.624 ug/m^3**

COMPANY NAME:

MODELER:

DATE:
**9/11/2024**

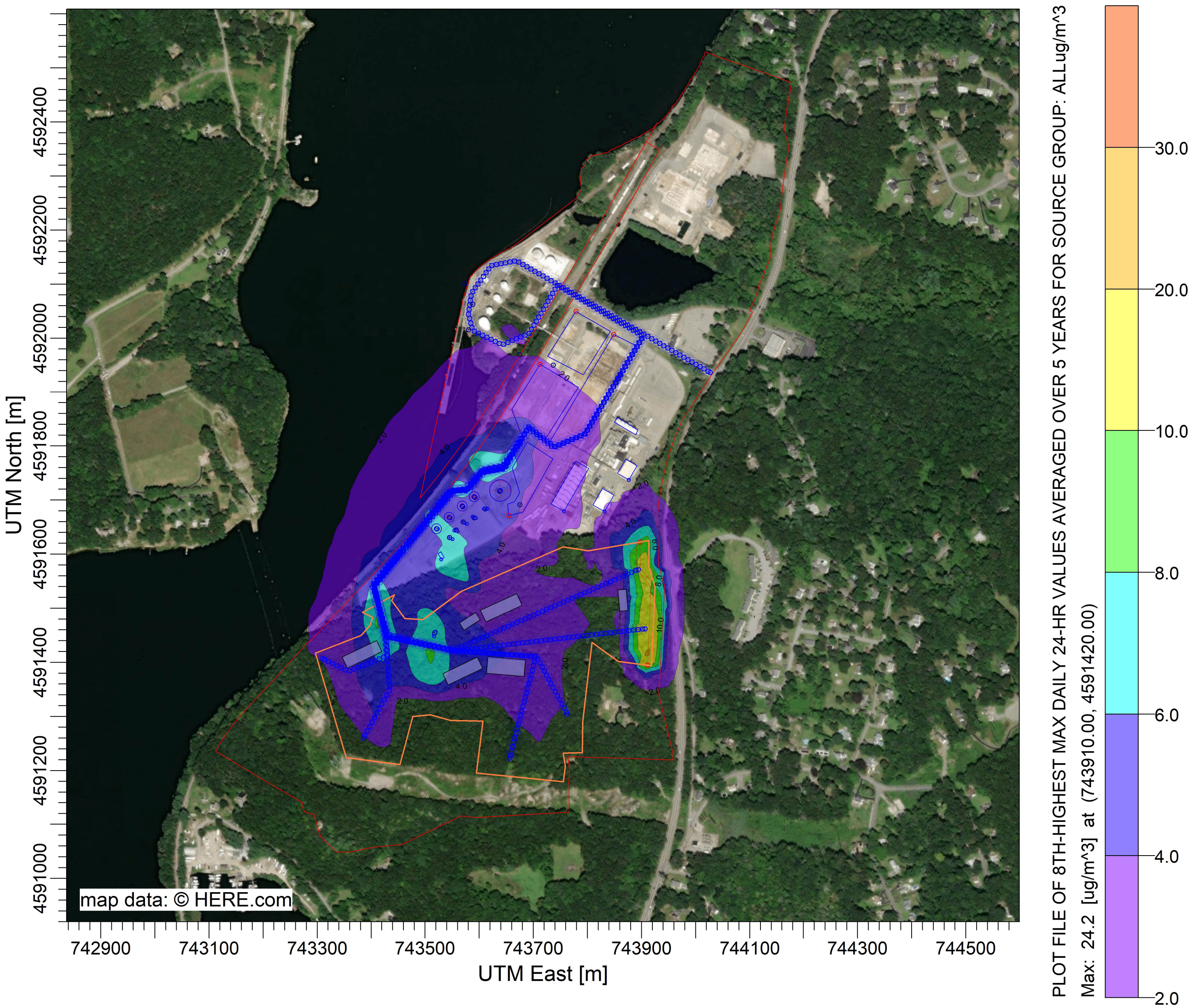
SCALE: 1:14,000

0 — 0.4 km

PROJECT NO.:

PROJECT TITLE:

**Scenario 3: PM2.5 24-hr**




COMMENTS:

SOURCES:

**35**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**24.2 ug/m^3**

COMPANY NAME:

**Verdantas**

DATE:

**9/11/2024**

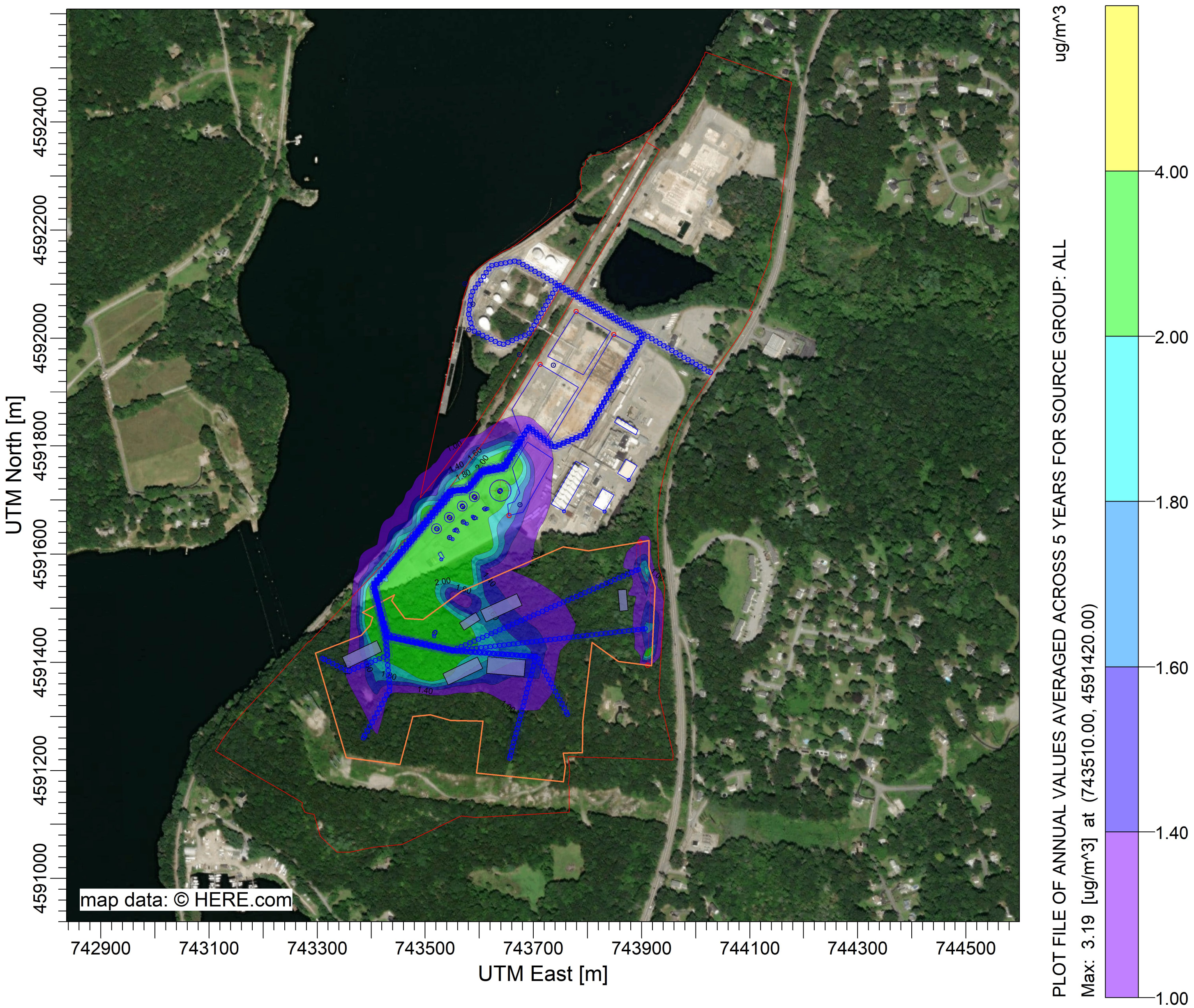
SCALE: 1:11,500

0 0.3 km

PROJECT NO.:

PROJECT TITLE:

**Scenario 3: PM2.5 Annual**




COMMENTS:

SOURCES:

**35**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**3.19 ug/m^3**

COMPANY NAME:

**Verdantas**

DATE:

**9/11/2024**

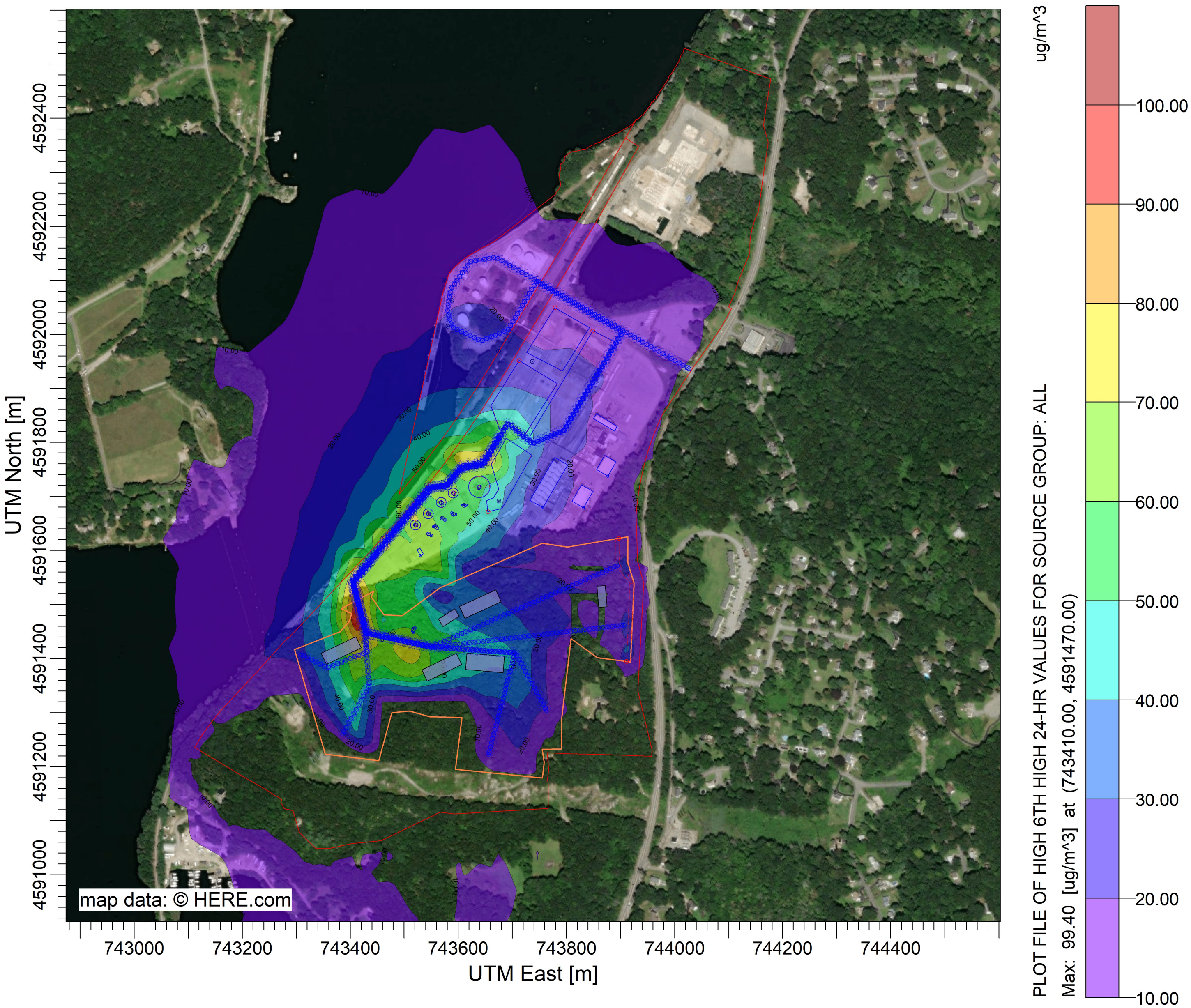
SCALE: 1:11,500

0 0.3 km

PROJECT NO.:

PROJECT TITLE:

**Scenario 3: PM10 24-hour**




COMMENTS:

SOURCES:

**35**

RECEPTORS:

**5619**

OUTPUT TYPE:

**Concentration**

MAX:

**99.40 ug/m^3**

COMPANY NAME:

MODELER:

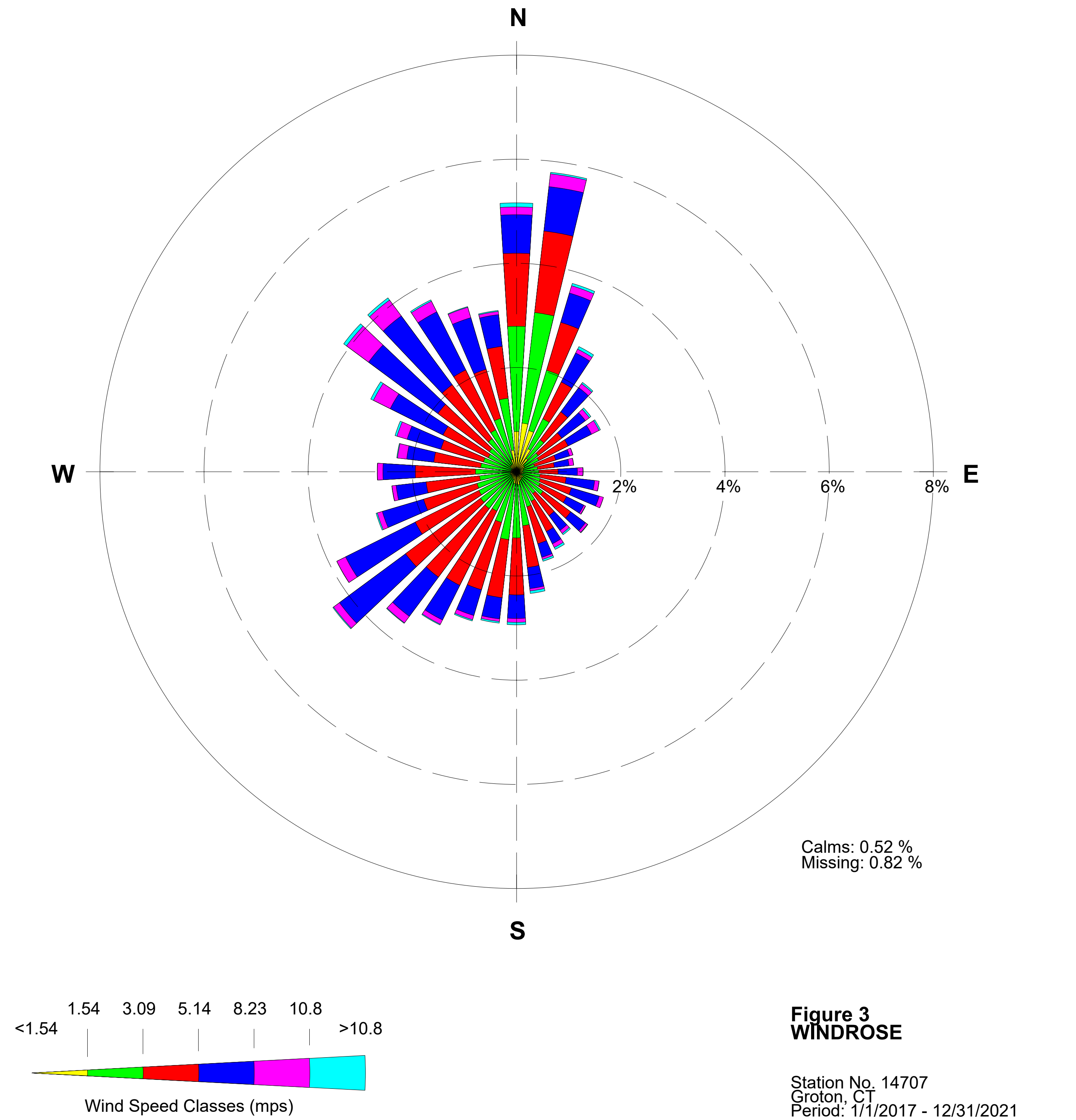
DATE:

**9/13/2024**

SCALE: 1:11,500

0 0.3 km

PROJECT NO.:




Note: Diagram of the frequency of occurrence of each wind direction.

Met File Type: AERMET SFC
File: GON_2017_2021.SFC

**Figure 3**
**WINDROSE**

Station No. 14707
Groton, CT
Period: 1/1/2017 - 12/31/2021

Met data sourced from Fort Griswold Station in Groton, CT

# TABLE 1
# PROCESS EMISSIONS
# SCENARIO 1

| ID | EU Name | Release Height (ft) | Source Type | Air Pollution Control Device | Raw Material | Max Material Process Rate tons/hr | Proposed Production (Tons) | Hours of Operation | Activity Points: Controlled | PM 10 (lb/hr) | PM 2.5 (lb/hr) | Actual Emissions PM 10 (tpy) | Actual Emissions PM 2.5 (tpy) | Description |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VBLAST** | Blasting 1 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | 30,000 | 750,000 | 1 hr/day, 2 days/wk, 52 wks/yr | -- | 0.774298 | 0.774298 | 0.0403 | 0.0403 | Blasting sources modeled as area sources, and include emissions from blasting and drilling operations based upon proposed production. Blasting sources modeled as occuring twice per day at 10am and 2pm on weekdays simultaneously, with each blast taking approximately 15 minutes. Emissions divided amongst 8 sources along pit perimeter during final phase buildout. Release heights are heights of pit edges. |
| **VBLAST** | Blasting 2 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | 30,000 | | | | 0.774298 | 0.774298 | 0.0403 | 0.0403 | |
| **VBLAST** | Blasting 3 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 4 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 5 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 6 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 7 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 8 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VCRUSH1** | Primary Jaw Crusher | 15 | Volume | Water hose dust surpression | Raw Blast Material | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 2 | 0.151923 | 0.030288 | 0.237 | 0.047 | Equipment and conveyor sources modeled as volume sources operating 3,120 hours per year (60hrs/week). Production values calculated by subtracting quantity removed to piles during each step. Activity control points represent instances of material transfers (ie, dropping material into a pile or machine) and material processing (ie crushing, screening). Initial plume dimensions were based upon Kimball Sand and Gravel's AQM report, with the initial dimensions being 3 feet in both the vertical and horizontal. |
| **VCRUSH2** | Secondary Cone Crusher | 15 | Volume | Water hose dust surpression | Material from jaw crusher | 466 | 624,107 | 60 hrs/wk, 52 wks/yr | 2 | 0.126422 | 0.025204 | 0.197 | 0.039 | |
| **VCRUSH3** | Tertiary Cone Crusher | 15 | Volume | Water hose dust surpression | Material from 2nd crusher | 466 | 624,107 | 60 hrs/wk, 52 wks/yr | 2 | 0.126422 | 0.025204 | 0.197 | 0.039 | |
| **VSCREEN1** | Screen Deck 1 | 15 | Volume | Water hose dust surpression | Material from 3rd crusher | 326 | 436,607 | 60 hrs/wk, 52 wks/yr | 1 | 0.109991 | 0.008816 | 0.172 | 0.014 | |
| **VSCREEN2** | Screen Deck 2 | 15 | Volume | Water hose dust surpression | Screened from Deck 1 | 220 | 294,643 | 60 hrs/wk, 52 wks/yr | 1 | 0.074227 | 0.005950 | 0.116 | 0.009 | |
| **VSCREEN3** | Screen Deck 3 | 15 | Volume | Water hose dust surpression | Screened from Deck 2 | 127 | 170,089 | 60 hrs/wk, 52 wks/yr | 2 | 0.045357 | 0.004143 | 0.071 | 0.006 | |
| **CON1** | Conveyor- Pile 1 (from Primary Jaw) | 15 | Volume | Water hose dust surpression | Varies | 94 | 125,893 | 60 hrs/wk, 52 wks/yr | 1 | 0.001856 | 0.000525 | 0.003 | 0.001 | |
| **CON2** | Conveyor- Pile 2 (From Tertiary Cone) | 15 | Volume | Water hose dust surpression | Varies | 140 | 187,500 | 60 hrs/wk, 52 wks/yr | 1 | 0.002764 | 0.000781 | 0.004 | 0.001 | |
| **CON3** | Conveyor- Pile 3 (from Deck 1 overs) | 15 | Volume | Water hose dust surpression | Varies | 106 | 141,964 | 60 hrs/wk, 52 wks/yr | 1 | 0.002093 | 0.000592 | 0.003 | 0.001 | |
| **CON4** | Conveyor- Pile 4 (from Deck 2 overs) | 15 | Volume | Water hose dust surpression | Varies | 93 | 124,554 | 60 hrs/wk, 52 wks/yr | 1 | 0.001836 | 0.000519 | 0.003 | 0.001 | |
| **CON5** | Conveyor- Pile 5 (from Deck 3 overs) | 15 | Volume | Water hose dust surpression | Varies | 77 | 103,125 | 60 hrs/wk, 52 wks/yr | 1 | 0.001520 | 0.000430 | 0.002 | 0.001 | |
| **CON6** | Conveyor- Pile 6 (Deck 3 unders) | 15 | Volume | Water hose dust surpression | Varies | 49 | 65,625 | 60 hrs/wk, 52 wks/yr | 1 | 0.000968 | 0.000273 | 0.002 | 0.000 | |
| **CON7** | Conveyor- Ship Transport 7 | 50 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON8** | Conveyor- Ship Transport 8 | 50 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON9** | Conveyor- Ship Transport 9 | 50 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON10** | Conveyor- Ship Transport 10 | 50 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON11** | Conveyor- Ship Transport 11 | 50 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **PILE-1** | Stock Pile 1 (9 total) | 30 | Area | NA | Varies | -- | 750,000 | 24 hrs/day, 7 days/wk, 52 wks/yr | -- | 0.019670 | 0.002979 | 0.09 | 0.013 | Stock Piles modeled as area sources operating 8,760 hours per year Production values calculated by subtracting quantity removed to piles during each step. |
| **PILE-2** | Stock Pile 2 (9 total) | 30 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-3** | Stock Pile 3 (9 total) | 30 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-4** | Stock Pile 4 (9 total) | 30 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-5** | Stock Pile 5 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-6** | Stock Pile 6 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-7** | Stock Pile 7 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-8** | Stock Pile 8 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-9** | Stock Pile 9 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PATH1** | | BE- assumed standard truck dimensions of 13ft x 8.5ft | Line-Volume | NA | Varies | | | 60 hrs/wk, 52 wks/yr | -- | 0.000000 | 0.000000 | 0.00 | 0.000 | |
| **PATH2** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.000000 | 0.000000 | 0.00 | 0.000 | |
| **PATH3** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.000000 | 0.000000 | 0.00 | 0.000 | |
| **PATH4** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.000000 | 0.000000 | 0.00 | 0.000 | |
| **PATH5** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.252534 | 0.025253 | 0.39 | 0.039 | |
| **PATH6** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.252534 | 0.025253 | 0.39 | 0.039 | |
| **PATH_PAVED** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.064419 | 0.015812 | 0.10 | 0.025 | |

| Activity | Emission Factor Category | Emission Factor PM10 (lb/ton) | Emission Factor PM2.5 (lb/ton) | Emission Factor Ref | Scope of Emission Factor |
|---|---|---|---|---|---|
| Drilling | Drilling | **0.000080** | **0.000080** | Wet drilling of unfragmented stone emission factor from AP-42 Section 11.19.2 for crushed stone processing. | |
| Blasting | Blasting | **0.000135** | **0.000135** | Emissions for blasting were calculated by using the total suspended particulate calculations as described in the background document for AP-42 Section 11.9 Western Surface Coal Mining, in addition to the scaling factor described in Table 11.9-1 | While AP-42 Section 11. 19.2 Crushed Stone Processing and Pulverized Mineral Processing indicates that the emissions factors listed in 11.19.2 should not be directly applied to stone quarry blasting, we used the equations themselves to develop our own emissions factors based upon blasting information obtained from other stone quarries. |
| Truck unloading to hopper, to Grizzly and rock breaker | Conveyor Transfer Point (controlled) (SCC 3-05-020-06) | **0.000046** | **0.000013** | AP-42 Table 11.19.2-2: Conveyor Transfer Point (Controlled) | These emission factors apply to the truck or front-end loader unloading to hopper, to vibrating or nonvibrating grizzly, to rock breaker |
| Primary crushing and associated transders in or out | Tertiary Crushing (controlled) (SCC 3-05-020-03) | **0.000540** | **0.000100** | AP-42 Table 11.19.2-2: Tertiary Crushing (Controlled) | These emission factors apply to all inputs to the crusher, the crushing itself, and all discharges from the crusher. No factors for primary or secondary in AP42, so tertiary can be used as a conservative value. |
| Screening and associated transfers in or out | Screening (controlled) (SCC 3-05-020-02, 03) | **0.000740** | **0.000050** | AP-42 Table 11.19.2-2: Screening (Controlled) | These emission factors apply to all inputs to the screen, the screening itself, and all discharges from the screen. The emission factor applies to any type of screen (i.e. single deck, double deck, or triple deck). |
| Conveyor Transfer Points | Conveyor Transfer Point (Controlled) (SCC 3-05-020-06) | **0.000046** | **0.000013** | AP-42 Table 11.19.2-2: Conveyor Transfer Points (Controlled) | These emission factors apply to all transfers from conveyors, bucket elevators, feed belts, feed augers, apron feeders, hoppers, and chutes. |

**TABLE 2**
**BLASTING EMISSIONS**
**SCENARIO 1**

| Reference largest blast (tons) | Reference blast area ($m^2$) | Cashman estimated largest blast (tons) | Cashman estimated area ($m^2$) |
|---|---|---|---|
| 25,559 | 530.70 | 30,000 | 622.91 |

| Comment | Process Name | Source Type | Max Material Process Rate tons/hr | Proposed Production (Tons) | Hours of Operation per Year | PM 10 (lb/hr) | PM 2.5 (lb/hr) | PM 10 (tpy) | PM 2.5 (tpy) |
|---|---|---|---|---|---|---|---|---|---|
| **Note: this emission source is divided by the number of blasting sources and added to the blasting emissions for each source.** | Blasthole Drill | Volume | 1,442 | 750,000 | 520 | 0.115385 | 0.115385 | 0.0300 | 0.0300 |

| TSP Emission factor (ton/blast) | TSP Emission factor (lb/blast) | TSP Emission factor (lb/ton blasted material) |
|---|---|---|
| 0.0020 | 4.04 | 0.000135 |

E = 0.0005*A^1.5

Notes: E = TSP emission factor (lb/blast), and A = area blasted.

| Activity | Emission Factor | Emission Factor | |
|---|---|---|---|
| | | PM10 (lb/ton) | PM2.5 (lb/ton) |
| Blasting | Blasting | **0.000080** | **0.000080** |

**TABLE 3**
**ROADWAY EMISSIONS**
**SCENARIO 1**

| | | | | | | Pound per Vehicle Mile Traveled (lb/vmt) Calculations | | | Actual 2023 Emissions (lb/yr) | | Actual 2023 Emissions (lb/hr) | | Actual 2023 Emissions (tpy) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Road Type** | **Path** | **Avg. number of vehicle trips per path (per year)** | **Length of path (mi)** | **Miles per Year** | **Vehicle Average fleet Weight (tons)** | **$PM_{10}$ (lb/vmt)** | **$PM_{2.5}$ (lb/vmt)** | **Control Efficiency** | **$PM_{10}$ (lb/year)** | **$PM_{2.5}$ (lb/year)** | **$PM_{10}$ (lb/hr)** | **$PM_{2.5}$ (lb/hr)** | **PM10 (tpy)** | **PM2.5 (tpy)** |
| UNPAVED | **Path5 (unpaved)** | **8,840.00** | **0.416** | 3680.27 | 29.00 | 3.26 | 0.33 | 90% | 787.907 | 78.791 | 0.25253 | 0.02525 | 0.3940 | 0.0394 |
| UNPAVED | **Path6 (unpaved)** | **8,840.00** | **0.416** | 3680.27 | | 3.26 | 0.33 | 90% | 787.907 | 78.791 | 0.25253 | 0.02525 | 0.3940 | 0.0394 |
| PAVED | **PathA (paved)** | **10,140.00** | **1.069** | 10837.24 | 47.97 | 0.19 | 0.05 | 90% | 200.987 | 49.333 | 0.06442 | 0.01581 | 0.1005 | 0.0247 |

| **Road Type** | **Truck Type** | **Number of Trips per Vehicle Type (per year)** | **Vehicle Individual Weight: full (tons)** | **Vehicle Individual Weight: empty (tons)** | **Vehicle Individual Weight: Average (tons)** | **Dimensions** | **Notes** |
|---|---|---|---|---|---|---|---|
| PAVED | Employee and visitor (Personal) | 14040 | 2 | 2 | 2 | 8.5' x 13.5' | |
| PAVED | 18 Wheeler | 15600 | 40 | 18 | 29 | 8.5' x 13.5' | Material weight of 22 ton provided by client. |
| PAVED | CAT 745 | 31200 | 82 | 37 | 59 | 8.5' x 13.5' | Volume: 32.7 yd3 |
| UNPAVED | 18 Wheeler | 15600 | 40 | 18 | 29 | 8.5' x 13.5' | Material weight of 22 ton provided by client. |
| UNPAVED | CAT 745 | 31200 | 82 | 37 | 59 | 8.5' x 13.5' | Volume: 32.7 yd3 |
| UNPAVED | CAT 980 | 6240 | 43 | 33 | 38 | 8.5' x 13.5' | Volume: 7.1 yd3. Weight calculated as ratio of CAT Truck load over volume. |

| | |
|---|---|
| **Total 2023 Production:** | 750,000 |
| **Operating Days/Year:** | 312 |
| **Tons/Vehicle Load:** | |
| **18 Wheeler** | 22.00 |
| **CAT 980 (Yard Loader)** | 9.81 |
| **CAT 745 (to barge)** | 45.19 |
| **Max Potential Usage:** | 750,000 |
| **Number of Vehicles Per Day** | |
| **18 Wheeler** | 50 |
| **CAT 980 (Yard Loader)** | 20 |
| **CAT 745 (to barge)** | 100 |
| **Tons/Vehicle** | |
| **18 Wheeler** | 1100.00 |
| **CAT 980 (Yard Loader)** | 196.26 |
| **CAT 745 (to barge)** | 4519.45 |
| **Sum:** | 5815.71 |

| **AP-42 Section 13.2.2 Un-paved Roads** | | |
|---|---|---|
| **Constant** | **Value** | **Reference** |
| k (PM) | 4.9 | Table 13.2.2-2 |
| k ($PM_{10}$) | 1.5 | Table 13.2.2-2 |
| k ($PM_{2.5}$) | 0.15 | Table 13.2.2-2 |
| a (PM) | 0.7 | Table 13.2.2-2 |
| a ($PM_{10}$) | 0.9 | Table 13.2.2-2 |
| a ($PM_{2.5}$) | 0.9 | Table 13.2.2-2 |
| b (PM) | 0.45 | Table 13.2.2-2 |
| b ($PM_{10}$) | 0.45 | Table 13.2.2-2 |
| b ($PM_{2.5}$) | 0.45 | Table 13.2.2-2 |
| P | 125 | NOAA Climate data for Providence, RI for mean number of days >=0.01 inches precipitation. |
| $E_{ext}$ | 0.658 | Annual Size specific emission factor extrapolated for natural mtigation, lb/VMT ((365-P)/365) |
| s | 7.1 | % from Table 13.2.2-1 Typical Silt Content Values Surface Material on Industrial Unpaved Roads, data for Sand & Gravel processing |

**$E = k(s/12)^a \times (W/3)^b$**
E = size specific particulate emission factor (Lb/VMT)
k = particle size multiplier
s= surface material silt content (%)
W = Mean vehicle weight weight (tons)
a= constant specified in Table 13.2.2-2
b= Constant specified in Table 13.2.2-2
Source:https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0202.pdf

| **AP-42 Section 13.2.1 Paved Roads** | | |
|---|---|---|
| k (PM) = | 0.011 | lb/VMT |
| k ($PM_{10}$) = | 0.0022 | lb/VMT |
| k ($PM_{2.5}$) = | 0.00054 | lb/VMT |
| sL = | 3 | $g/m^2$ from Hot Mix Asphalt Emissions |

**E= [k(sL)0.91 x (W)1.02]**

E = particulate emission factor (Lb/VMT)
k = particle size multiplier
sL= road surface silt loading ($g/m^2$ )
W = average weight (tons) vehicles travelling the road

**TABLE 4**
**AGGREGATE HANDLING AND PILES EMISSIONS**
**SCENARIO 1**

The emission factors used for particulate emissions from the stockpiles associated with rock crushing and concrete batching are calculated based on the latest version of AP-42, Section 13.2.4 Aggregate Handling and Storage Piles (11/06). Windspeed data was taken from AP 42 Chapter 7, Table 7.1-7, average windspeed for Providence, RI. These emissions are identified as fugitive emissions.

| Providence, RI | |
|---|---|
| **Average Wind Speed (MPH)** | |
| Jan | 9.6 |
| Feb | 10.1 |
| Mar | 10.5 |
| Apr | 10.3 |
| May | 9.4 |
| Jun | 8.7 |
| Jul | 8.5 |
| Aug | 8.1 |
| Sep | 8.1 |
| Oct | 8.5 |
| Nov | 8.7 |
| Dec | 9.4 |

The equation used in stockpiling calculations is:

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}(pound/ton)$$

in which

E = emission factor
k = particle size multiplier
U = mean wind speed (in miles per hour)
M = material moisture content (%)

| Aggregate Handling Fugitive Particulate Emissions | POTENTIAL ANNUAL | |
|---|---|---|
| Annual Production (tons) | 750,000 TPY | |
| Moisture Content (%) | 2.1 % | (1) |
| Average Wind Speed (MPH) | 9.2 MPH | (2) |
| Particulate Matter ($PM_{10}$ Filterable) | 0.0023 lbs./Ton = | **0.8616** TPY |
| Particulate Matter ($PM_{2.5}$ Filterable) | 0.0003 lbs./Ton = | **0.1305** TPY |

**TABLE 5**
**BACKGROUND PARTICULATE LEVELS**
**SCENARIO 1**

| Constituent | Averaging Period | 2018 Concentration | Units | 3-Year Average | Station |
|---|---|---|---|---|---|
| **PM10** | **24-Hour** | 30.00 | ug/m3 | 30 | New Haven, Criscuolo |
| **PM2.5** | **24-Hour** | 15.00 | ug/m3 | 15 | Groton, Fort Griswold |
| | **Annual** | 5.40 | ug/m3 | 5 | Groton, Fort Griswold |

**NOTES:**

1. PM10 is based off the 3-year average of the annual max of the daily PM10 concentrations.
2. PM2.5 is based off the 3-year average of the 98th percentile of the daily PM2.5 concentration.
3. The data for all pollutants was found on:
   https://portal.ct.gov/DEEP/Air/Permits/Air-Quality-Modeling/Criteria-Pollutant-Background-Air-Quality
4. PM10 24-hour data not available for Fort Griswold. PM10 24-hr data is from New Haven, the next nearest site.

**TABLE 6**
**MODEL OUTPUT**
**SCENARIO 1**

| File | Pollutant | Average | Rank | Conc/Dep | East (X) | North (Y) |
|---|---|---|---|---|---|---|
| 8TH-HIGHEST MAX 24-HR | PM25 | 24-HR | 8th | 36.5469 | 743510.00 | 4591470.00 |
| ANNUAL | PM-25 | ANNUAL | 1st | 6.0282 | 743510.00 | 4591470.00 |
| 6TH-HIGHEST MAX 24-HR | PM10 | 24-HR | 6th | 78.0377 | 743560.00 | 4591570.00 |

**TABLE 7**
**NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) EVALUATION**
**SCENARIO 1**

| Pollutant | Averaging Period | Maximum Onsite Modeled Concentrations ($ug/m^3$) | Maximum Modeled Concentration at Property Boundary ($ug/m^3$) | Background Concentration ($ug/m^3$) | Maximum Total Impact Onsite (ug/m3) | Maximum Total Impact at Property Bounday (ug/m3)[3] | Does Site exceed NAAQS at any Property Boundary? | NAAQS ($ug/m^3$) | Allowable Impact ($ug/m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| **$PM_{10}$** | 24-Hour | 65.13 | 65.0 | 30.0 | 95.1 | 95.0 | No | 150.0 | 120.0 |
| **$PM_{2.5}$** | 24-Hour | 29.11 | 15.80 | 15.0 | 44.1 | 30.8 | No | 35.0 | 20.0 |
| | Annual | 4.98 | 2.70 | 5.4 | 10.4 | 8.1 | No | 9.0 | 3.6 |

**NOTES:**
1. Average background concentrations were obtained from https://portal.ct.gov/DEEP/Air/Permits/Air-Quality-Modeling/Criteria-Pollutant-Background-Air-Quality
2. Particulate matter less than 10 microns = PM10; PM less than 2.5 microns = PM2.5; microgram per cubic meter = µg/m3.
3. Boundary impacts estimated based upon model outputs.
4. Highest Model Concentrations are located on the Property for PM10 24-hour, PM2.5 24-hour, and PM2.5 annual averaging periods.

# TABLE 8
# PROCESS EMISSIONS
# SCENARIO 2 SCENARIO 3

| | | | | | | | | | | | | Actual Emissions | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **ID** | **EU Name** | **Release Height (ft)** | **Source Type** | **Air Pollution Control Device** | **Raw Material** | **Max Material Process Rate tons/hr** | **Proposed Production (Tons)** | **Hours of Operation** | **Activity Points: Controlled** | **PM 10 (lb/hr)** | **PM 2.5 (lb/hr)** | **PM 10 (tpy)** | **PM 2.5 (tpy)** | **Description** |
| **VBLAST** | Blasting 1 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | 30,000 | 750,000 | 1 hr/day, 2 days/wk, 52 wks/yr | -- | 0.774298 | 0.774298 | 0.0403 | 0.0403 | Blasting sources modeled as area sources, and include emissions from blasting and drilling operations based upon proposed production. Blasting sources modeled as occuring twice per day at 10am and 2pm on weekdays simultaneously, with each blast taking approximately 15 minutes. Emissions divided amongst 8 sources along pit perimeter during final phase buildout. Release heights are heights of pit edges. |
| **VBLAST** | Blasting 2 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | 30,000 | | | | 0.774298 | 0.774298 | 0.0403 | 0.0403 | |
| **VBLAST** | Blasting 3 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 4 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 5 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 6 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 7 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VBLAST** | Blasting 8 (+drilling) (8 total) | 0 (base elevation) | Area | -- | -- | -- | | | | 0.000000 | 0.000000 | 0.0000 | 0.0000 | |
| **VCRUSH1** | Primary Jaw Crusher | 15 | Volume | Water hose dust surpression | Raw Blast Material | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 2 | 0.151923 | 0.030288 | 0.237 | 0.047 | Equipment and conveyor sources modeled as volume sources operating 3,120 hours per year (60hrs/week). Production values calculated by subtracting quantity removed to piles during each step. Activity control points represent instances of material transfers (ie, dropping material into a pile or machine) and material processing (ie crushing, screening). Initial plume dimensions were based upon Kimball Sand and Gravel's AQM report, with the initial dimensions being 3 feet in both the vertical and horizontal. |
| **VCRUSH2** | Secondary Cone Crusher | 15 | Volume | Water hose dust surpression | Material from jaw crusher | 466 | 624,107 | 60 hrs/wk, 52 wks/yr | 2 | 0.126422 | 0.025204 | 0.197 | 0.039 | |
| **VCRUSH3** | Tertiary Cone Crusher | 15 | Volume | Water hose dust surpression | Material from 2nd crusher | 466 | 624,107 | 60 hrs/wk, 52 wks/yr | 2 | 0.126422 | 0.025204 | 0.197 | 0.039 | |
| **VSCREEN1** | Screen Deck 1 | 15 | Volume | Water hose dust surpression | Material from 3rd crusher | 326 | 436,607 | 60 hrs/wk, 52 wks/yr | 1 | 0.109991 | 0.008816 | 0.172 | 0.014 | |
| **VSCREEN2** | Screen Deck 2 | 15 | Volume | Water hose dust surpression | Screened from Deck 1 | 220 | 294,643 | 60 hrs/wk, 52 wks/yr | 1 | 0.074227 | 0.005950 | 0.116 | 0.009 | |
| **VSCREEN3** | Screen Deck 3 | 15 | Volume | Water hose dust surpression | Screened from Deck 2 | 127 | 170,089 | 60 hrs/wk, 52 wks/yr | 2 | 0.045357 | 0.004143 | 0.071 | 0.006 | |
| **CON1** | Conveyor- Pile 1 (from Primary Jaw) | 15 | Volume | Water hose dust surpression | Varies | 94 | 125,893 | 60 hrs/wk, 52 wks/yr | 1 | 0.001856 | 0.000525 | 0.003 | 0.001 | |
| **CON2** | Conveyor- Pile 2 (From Tertiary Cone) | 15 | Volume | Water hose dust surpression | Varies | 140 | 187,500 | 60 hrs/wk, 52 wks/yr | 1 | 0.002764 | 0.000781 | 0.004 | 0.001 | |
| **CON3** | Conveyor- Pile 3 (from Deck 1 overs) | 15 | Volume | Water hose dust surpression | Varies | 106 | 141,964 | 60 hrs/wk, 52 wks/yr | 1 | 0.002093 | 0.000592 | 0.003 | 0.001 | |
| **CON4** | Conveyor- Pile 4 (from Deck 2 overs) | 15 | Volume | Water hose dust surpression | Varies | 93 | 124,554 | 60 hrs/wk, 52 wks/yr | 1 | 0.001836 | 0.000519 | 0.003 | 0.001 | |
| **CON5** | Conveyor- Pile 5 (from Deck 3 overs) | 15 | Volume | Water hose dust surpression | Varies | 77 | 103,125 | 60 hrs/wk, 52 wks/yr | 1 | 0.001520 | 0.000430 | 0.002 | 0.001 | |
| **CON6** | Conveyor- Pile 6 (Deck 3 unders) | 15 | Volume | Water hose dust surpression | Varies | 49 | 65,625 | 60 hrs/wk, 52 wks/yr | 1 | 0.000968 | 0.000273 | 0.002 | 0.000 | |
| **CON7** | Conveyor- Ship Transport 7 | 15 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | Stock Piles modeled as area sources operating 8,760 hours per year Production values calculated by subtracting quantity removed to piles during each step. |
| **CON8** | Conveyor- Ship Transport 8 | 15 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON9** | Conveyor- Ship Transport 9 | 15 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON10** | Conveyor- Ship Transport 10 | 15 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **CON11** | Conveyor- Ship Transport 11 | 15 | Volume | Water hose dust surpression | Varies | 560 | 750,000 | 60 hrs/wk, 52 wks/yr | 1 | 0.011058 | 0.003125 | 0.017 | 0.005 | |
| **PILE-1** | Stock Pile 1 (9 total) | 30 | Area | NA | Varies | -- | 750,000 | 24 hrs/day, 7 days/wk, 52 wks/yr | -- | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-2** | Stock Pile 2 (9 total) | 30 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-3** | Stock Pile 3 (9 total) | 30 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-4** | Stock Pile 4 (9 total) | 30 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-5** | Stock Pile 5 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-6** | Stock Pile 6 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-7** | Stock Pile 7 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-8** | Stock Pile 8 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PILE-9** | Stock Pile 9 (9 total) | 50 | | | | | | | | 0.019670 | 0.002979 | 0.09 | 0.013 | |
| **PATH1** | Paved and Unpaved Roadways | BE- assumed standard truck dimensions of 13ft x 8.5ft | Line-Volume | NA | Varies | | | 60 hrs/wk, 52 wks/yr | -- | 0.376917 | 0.037692 | 0.59 | 0.059 | |
| **PATH2** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.369379 | 0.036938 | 0.58 | 0.058 | |
| **PATH3** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.339225 | 0.033923 | 0.53 | 0.053 | |
| **PATH4** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.369379 | 0.036938 | 0.58 | 0.058 | |
| **PATH5** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.263842 | 0.026384 | 0.41 | 0.041 | |
| **PATH6** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.252534 | 0.025253 | 0.39 | 0.039 | |
| **PATH_PAVED** | | | | | | | | 60 hrs/wk, 52 wks/yr | -- | 0.064419 | 0.015812 | 0.10 | 0.025 | |

| **Activity** | **Emission Factor Category** | **Emission Factor** | | **Emission Factor Ref** | **Scope of Emission Factor** |
|---|---|---|---|---|---|
| | | **PM10 (lb/ton)** | **PM2.5 (lb/ton)** | | |
| Drilling | Drilling | **0.000080** | **0.000080** | Wet drilling of unfragmented stone emission factor from AP-42 Section 11.19.2 for crushed stone processing. | |
| Blasting | Blasting | **0.000135** | **0.000135** | Emissions for blasting were calculated by using the total suspended particulate calculations as described in the background document for AP-42 Section 11.9 Western Surface Coal Mining, in addition to the scaling factor described in Table 11.9-1 | While AP-42 Section 11. 19.2 Crushed Stone Processing and Pulverized Mineral Processing indicates that the emissions factors listed in 11.19.2 should not be directly applied to stone quarry blasting, we used the equations themselves to develop our own emissions factors based upon blasting information obtained from other stone quarries. |
| Truck unloading to hopper, to Grizzly and rock breaker | Conveyor Transfer Point (controlled) (SCC 3-05-020-06) | **0.000046** | **0.000013** | AP-42 Table 11.19.2-2: Conveyor Transfer Point (Controlled) | These emission factors apply to the truck or front-end loader unloading to hopper, to vibrating or nonvibrating grizzly, to rock breaker |
| Primary crushing and associated transders in or out | Tertiary Crushing (controlled) (SCC 3-05-020-03) | **0.000540** | **0.000100** | AP-42 Table 11.19.2-2: Tertiary Crushing (Controlled) | These emission factors apply to all inputs to the crusher, the crushing itself, and all discharges from the crusher. No factors for primary or secondary in AP42, so tertiary can be used as a conservative value. |
| Screening and associated transfers in or out | Screening (controlled) (SCC 3-05-020-02, 03) | **0.000740** | **0.000050** | AP-42 Table 11.19.2-2: Screening (Controlled) | These emission factors apply to all inputs to the screen, the screening itself, and all discharges from the screen. The emission factor applies to any type of screen (i.e. single deck, double deck, or triple deck). |
| Conveyor Transfer Points | Conveyor Transfer Point (Controlled) (SCC 3-05-020-06) | **0.000046** | **0.000013** | AP-42 Table 11.19.2-2: Conveyor Transfer Points (Controlled) | These emission factors apply to all transfers from conveyors, bucket elevators, feed belts, feed augers, apron feeders, hoppers, and chutes. |

**TABLE 9**
**BLASTING EMISSIONS**
**SCENARIO 2 SCENARIO 3**

| Reference largest blast (tons) | Reference blast area ($m^2$) | Cashman estimated largest blast (tons) | Cashman estimated area ($m^2$) |
|---|---|---|---|
| 25,559 | 530.70 | 30,000 | 622.91 |

| Comment | Process Name | Source Type | Max Material Process Rate tons/hr | Proposed Production (Tons) | Hours of Operation per Year | PM 10 (lb/hr) | PM 2.5 (lb/hr) | PM 10 (tpy) | PM 2.5 (tpy) |
|---|---|---|---|---|---|---|---|---|---|
| Note: this emission source is divided by the number of blasting sources and added to the blasting emissions for each source. | Blasthole Drill | Volume | 1,442 | 750,000 | 520 | 0.115385 | 0.115385 | 0.0300 | 0.0300 |

| TSP Emission factor (ton/blast) | TSP Emission factor (lb/blast) | TSP Emission factor (lb/ton blasted material) |
|---|---|---|
| 0.0020 | 4.04 | 0.000135 |

E = 0.0005*A^1.5
Notes: E = TSP emission factor (lb/blast), and A = area blasted.

| Activity | Emission Factor | Emission Factor | |
|---|---|---|---|
| | | PM10 (lb/ton) | PM2.5 (lb/ton) |
| Blasting | Blasting | 0.000080 | 0.000080 |

**TABLE 10**
**ROADWAY EMISSIONS**
**SCENARIO 2 SCENARIO 3**

| Road Type | Path | Avg. number of vehicle trips per path (per year) | Length of path (mi) | Miles per Year | Vehicle Average fleet Weight (tons) | Pound per Vehicle Mile Traveled (lb/vmt) Calculations | | | Actual 2023 Emissions (lb/yr) | | Actual 2023 Emissions (lb/hr) | | Actual 2023 Emissions (tpy) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | $PM_{10}$ (lb/vmt) | $PM_{2.5}$ (lb/vmt) | Control Efficiency | $PM_{10}$ (lb/year) | $PM_{2.5}$ (lb/year) | $PM_{10}$ (lb/hr) | $PM_{2.5}$ (lb/hr) | PM10 (tpy) | PM2.5 (tpy) |
| UNPAVED | **Path1 (unpaved)** | **8,840.00** | **0.621** | 5492.93 | 29.00 | 3.26 | 0.33 | 90% | 1175.981 | 117.598 | 0.37692 | 0.03769 | 0.5880 | 0.0588 |
| UNPAVED | **Path2 (unpaved)** | **8,840.00** | **0.609** | 5383.08 | | 3.26 | 0.33 | 90% | 1152.461 | 115.246 | 0.36938 | 0.03694 | 0.5762 | 0.0576 |
| UNPAVED | **Path3 (unpaved)** | **8,840.00** | **0.559** | 4943.64 | | 3.26 | 0.33 | 90% | 1058.383 | 105.838 | 0.33923 | 0.03392 | 0.5292 | 0.0529 |
| UNPAVED | **Path4 (unpaved)** | **8,840.00** | **0.609** | 5383.08 | | 3.26 | 0.33 | 90% | 1152.461 | 115.246 | 0.36938 | 0.03694 | 0.5762 | 0.0576 |
| UNPAVED | **Path5 (unpaved)** | **8,840.00** | **0.435** | 3845.05 | | 3.26 | 0.33 | 90% | 823.187 | 82.319 | 0.26384 | 0.02638 | 0.4116 | 0.0412 |
| UNPAVED | **Path6 (unpaved)** | **8,840.00** | **0.416** | 3680.27 | | 3.26 | 0.33 | 90% | 787.907 | 78.791 | 0.25253 | 0.02525 | 0.3940 | 0.0394 |
| PAVED | **PathA (paved)** | **10,140.00** | **1.069** | 10837.24 | 47.97 | 0.19 | 0.05 | 90% | 200.987 | 49.333 | 0.06442 | 0.01581 | 0.1005 | 0.0247 |

| Road Type | Truck Type | Number of Trips per Vehicle Type (per year) | Vehicle Individual Weight: full (tons) | Vehicle Individual Weight: empty (tons) | Vehicle Individual Weight: Average (tons) | Dimensions | Notes |
|---|---|---|---|---|---|---|---|
| PAVED | Employee and visitor (Personal) | 14040 | 2 | 2 | 2 | 8.5' x 13.5' | |
| PAVED | 18 Wheeler | 15600 | 40 | 18 | 29 | 8.5' x 13.5' | Material weight of 22 ton provided by client. |
| PAVED | CAT 745 | 31200 | 82 | 37 | 59 | 8.5' x 13.5' | Volume: 32.7 yd3 |
| UNPAVED | 18 Wheeler | 15600 | 40 | 18 | 29 | 8.5' x 13.5' | Material weight of 22 ton provided by client. |
| UNPAVED | CAT 745 | 31200 | 82 | 37 | 59 | 8.5' x 13.5' | Volume: 32.7 yd3 |
| UNPAVED | CAT 980 | 6240 | 43 | 33 | 38 | 8.5' x 13.5' | Volume: 7.1 yd3. Weight calculated as ratio of CAT Truck load over volum |

| | |
|---|---|
| **Total 2023 Production:** | 750,000 |
| **Operating Days/Year:** | 312 |
| **Tons/Vehicle Load:** | |
| **18 Wheeler** | 22.00 |
| **CAT 980 (Yard Loader)** | 9.81 |
| **CAT 745 (to barge)** | 45.19 |
| **Max Potential Usage:** | 750,000 |
| **Number of Vehicles Per Day** | |
| **18 Wheeler** | 50 |
| **CAT 980 (Yard Loader)** | 20 |
| **CAT 745 (to barge)** | 100 |
| **Tons/Vehicle** | |
| **18 Wheeler** | 1100.00 |
| **CAT 980 (Yard Loader)** | 196.26 |
| **CAT 745 (to barge)** | 4519.45 |
| **Sum:** | 5815.71 |

**AP-42 Section 13.2.2 Un-paved Roads**

| Constant | Value | Reference |
|---|---|---|
| k (PM) | 4.9 | Table 13.2.2-2 |
| k ($PM_{10}$) | 1.5 | Table 13.2.2-2 |
| k ($PM_{2.5}$) | 0.15 | Table 13.2.2-2 |
| a (PM) | 0.7 | Table 13.2.2-2 |
| a ($PM_{10}$) | 0.9 | Table 13.2.2-2 |
| a ($PM_{2.5}$) | 0.9 | Table 13.2.2-2 |
| b (PM) | 0.45 | Table 13.2.2-2 |
| b ($PM_{10}$) | 0.45 | Table 13.2.2-2 |
| b ($PM_{2.5}$) | 0.45 | Table 13.2.2-2 |
| P | 125 | NOAA Climate data for Providence, RI for mean number of days >=0.01 inches precipitation. |
| $E_{ext}$ | 0.658 | Annual Size specific emission factor extrapolated for natural mtigation, lb/VMT ((365-P)/365) |
| s | 7.1 | % from Table 13.2.2-1 Typical Silt Content Values Surface Material on Industrial Unpaved Roads, data for Sand & Gravel processing |

**$E = k(s/12)^a \times (W/3)^b$**

E = size specific particulate emission factor (Lb/VMT)
k = particle size multiplier
s= surface material silt content (%)
W = Mean vehicle weight weight (tons)
a= constant specified in Table 13.2.2-2
b= Constant specified in Table 13.2.2-2
Source:https://www3.epa.gov/ttn/

**AP-42 Section 13.2.1 Paved Roads**

| | | |
|---|---|---|
| k (PM) = | 0.011 | lb/VMT |
| k ($PM_{10}$) = | 0.0022 | lb/VMT |
| k ($PM_{2.5}$) = | 0.00054 | lb/VMT |
| sL = | 3 | $g/m^2$ from Hot Mix Asphalt Emissions Assessment Report - 2000 |

**E= [k(sL)0.91 x (W)1.02]**

E = particulate emission factor (Lb/VMT)
k = particle size multiplier
sL= road surface silt loading ($g/m^2$)
W = average weight (tons) vehicles travelling the road
Source:https://www3.epa.gov/ttn/chief/ap42/ch13/final/c13s0201.pdf

**TABLE 11**
**AGGREGATE HANDLING AND PILES EMISSIONS**
**SCENARIO 2 SCENARIO 3**

The emission factors used for particulate emissions from the stockpiles associated with rock crushing and concrete batching are calculated based on the latest version of AP-42, Section 13.2.4 Aggregate Handling and Storage Piles (11/06). Windspeed data was taken from AP 42 Chapter 7, Table 7.1-7, average windspeed for Providence, RI. These emissions are identified as fugitive emissions.

| Providence, RI | |
|---|---|
| **Average Wind Speed (MPH)** | |
| Jan | 9.6 |
| Feb | 10.1 |
| Mar | 10.5 |
| Apr | 10.3 |
| May | 9.4 |
| Jun | 8.7 |
| Jul | 8.5 |
| Aug | 8.1 |
| Sep | 8.1 |
| Oct | 8.5 |
| Nov | 8.7 |
| Dec | 9.4 |

The equation used in stockpiling calculations is:

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)^{1.3}}{\left(\frac{M}{2}\right)^{1.4}}(pound/ton)$$

in which

E = emission factor
k = particle size multiplier
U = mean wind speed (in miles per hour)
M = material moisture content (%)

| Aggregate Handling Fugitive Particulate Emissions | POTENTIAL ANNUAL | |
|---|---|---|
| Annual Production (tons) | 750,000 TPY | |
| Moisture Content (%) | 2.1 % | (1) |
| Average Wind Speed (MPH) | 9.2 MPH | (2) |
| Particulate Matter ($PM_{10}$ Filterable) | 0.0023 lbs./Ton = | **0.8616** TPY |
| Particulate Matter ($PM_{2.5}$ Filterable) | 0.0003 lbs./Ton = | **0.1305** TPY |

**TABLE 12**
**BACKGROUND PARTICULATE LEVELS**
**SCENARIO 2 SCENARIO 3**

| Constituent | Averaging Period | 2018 Concentration | Units | 3-Year Average | Station |
|---|---|---|---|---|---|
| **PM10** | **24-Hour** | 30.00 | ug/m3 | 30 | New Haven, Criscuolo |
| **PM2.5** | **24-Hour** | 15.00 | ug/m3 | 15 | Groton, Fort Griswold |
| | **Annual** | 5.40 | ug/m3 | 5 | Groton, Fort Griswold |

**NOTES:**

1. PM10 is based off the 3-year average of the annual max of the daily PM10 concentrations.
2. PM2.5 is based off the 3-year average of the 98th percentile of the daily PM2.5 concentration.
3. The data for all pollutants was found on:
   https://portal.ct.gov/DEEP/Air/Permits/Air-Quality-Modeling/Criteria-Pollutant-Background-Air-Quality
4. PM10 24-hour data not available for Fort Griswold. PM10 24-hour data is from New Haven, the next nearest site.

TABLE 13
MODEL OUTPUT
SCENARIO 2

| File | Pollutant | Average | Rank | Conc/Dep | East (X) | North (Y) |
|---|---|---|---|---|---|---|
| 8TH-HIGHEST MAX 24-HR | PM25 | 24-HR | 8th | 57.3354 | 743410.00 | 4591220.00 |
| ANNUAL | PM-25 | ANNUAL | 1st | 9.3276 | 743410.00 | 4591220.00 |
| 6TH-HIGHEST MAX 24-HR | PM10 | 24-HR | 6th | 99.6243 | 743410.00 | 4591470.00 |

**TABLE 14**
**NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) EVALUATION**
**SCENARIO 2**

| Pollutant | Averaging Period | Maximum Onsite Modeled Concentrations ($ug/m^3$) | Maximum Modeled Concentration at Property Boundary ($ug/m^3$) | Background Concentration ($ug/m^3$) | Maximum Total Impact Onsite (ug/m3) | Maximum Total Impact at Property Bounday (ug/m3)[3] | Does Site exceed NAAQS at any Property Boundary? | NAAQS ($ug/m^3$) | Allowable Impact ($ug/m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| $PM_{10}$ | 24-Hour | 99.62 | 70 | 30.0 | 129.6 | 100.0 | No | 150.0 | 120.0 |
| $PM_{2.5}$ | 24-Hour | 57.34 | 4.5 | 15.0 | 72.3 | 19.5 | No | 35.0 | 20.0 |
| | Annual | 9.33 | 2.3 | 5.4 | 14.7 | 7.7 | No | 9.0 | 3.6 |

**NOTES:**

1. Average background concentrations were obtained from https://portal.ct.gov/DEEP/Air/Permits/Air-Quality-Modeling/Criteria-Pollutant-Background-Air-Quality
2. Particulate matter less than 10 microns = PM10; PM less than 2.5 microns = PM2.5; microgram per cubic meter = μg/m3.
3. Boundary impacts estimated based upon model outputs.
4. Highest Model Concentrations are located on the Property for PM10 24-hour, PM2.5 24-hour, and PM2.5 annual averaging periods.

**TABLE 15**
**MODEL OUTPUT**
**SCENARIO 3**

| File | Pollutant | Average | Rank | Conc/Dep | East (X) | North (Y) |
|---|---|---|---|---|---|---|
| 8TH-HIGHEST MAX 24-HR | PM25 | 24-HR | 8th | 24.2071 | 743910.00 | 4591420.00 |
| ANNUAL | PM-25 | ANNUAL | 1st | 3.1862 | 743510.00 | 4591420.00 |
| 6TH-HIGHEST MAX 24-HR | PM10 | 24-HR | 6th | 99.4044 | 743910.00 | 4591620.00 |

**TABLE 16**
**NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) EVALUATION**
**SCENARIO 3**

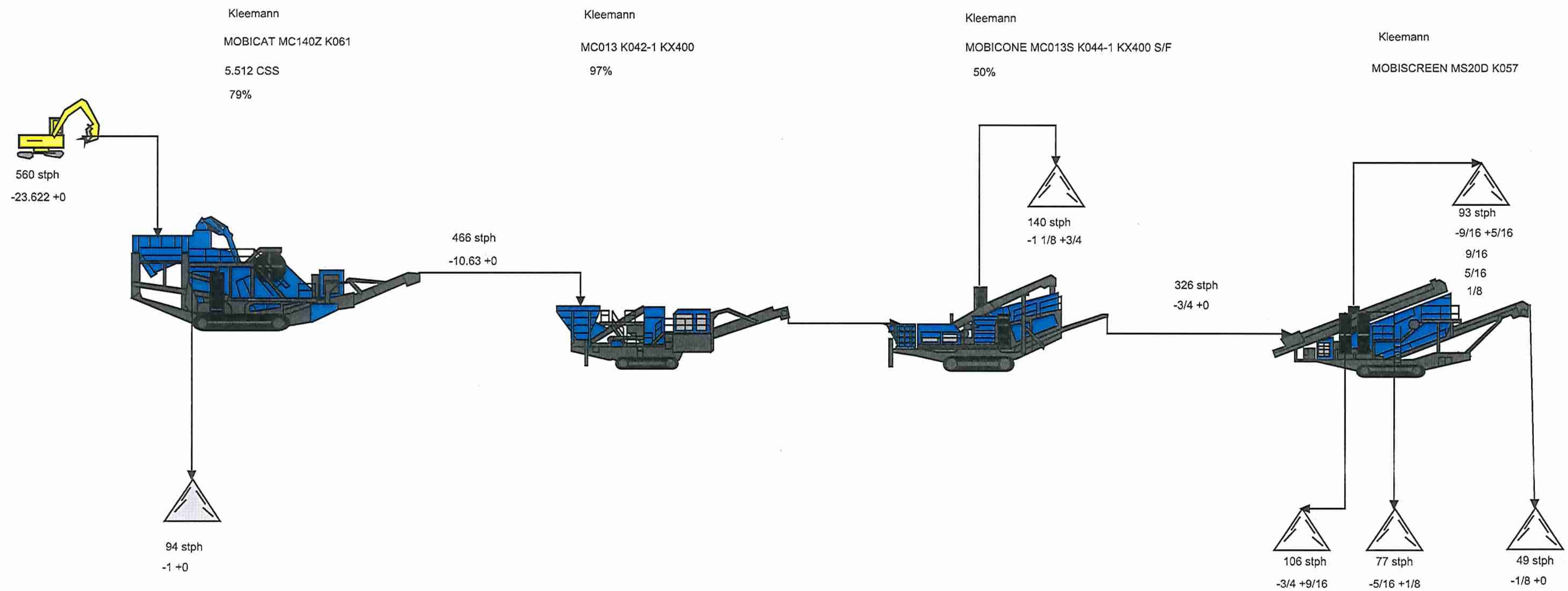
| Pollutant | Averaging Period | Maximum Onsite Modeled Concentrations ($ug/m^3$) | Maximum Modeled Concentration at Property Boundary ($ug/m^3$) | Background Concentration ($ug/m^3$) | Maximum Total Impact (ug/m3) | Maximum Impact at Property Bounday (ug/m3)[3] | Does Site exceed NAAQS at any Property Boundary? | NAAQS ($ug/m^3$) | Allowable Impact ($ug/m^3$) |
|---|---|---|---|---|---|---|---|---|---|
| $PM_{10}$ | 24-Hour | 99.40 | 72.0 | 30.0 | 129.4 | 102.0 | No | 150.0 | 120.0 |
| $PM_{2.5}$ | 24-Hour | 24.21 | 7.50 | 15.0 | 39.2 | 22.5 | No | 35.0 | 20.0 |
| | Annual | 3.19 | 2.10 | 5.4 | 8.6 | 7.5 | No | 9.0 | 3.6 |

**NOTES:**

1. Average background concentrations were obtained from https://portal.ct.gov/DEEP/Air/Permits/Air-Quality-Modeling/Criteria-Pollutant-Background-Air-Quality
2. Particulate matter less than 10 microns = PM10; PM less than 2.5 microns = PM2.5; microgram per cubic meter = µg/m3.
3. Boundary impacts estimated based upon model outputs.
4. Highest Model Concentrations are located on the Property for PM10 24-hour, PM2.5 24-hour, and PM2.5 annual averaging periods.

OPTION 1

Stoney Creek MC140Z MCO13 MCO13S MS20D Option 2




Calculation results may differ due to variations in operating conditions and application of crushing and screening equipment. This information does not constitute an express or implied warranty, but shows results of calculations based on information provided by customers or equipment manufacturers. Use this information for estimating purposes only.

***All calculations performed by AggFlow. http://www.AggFlow.com***

Kleemann
Stoney Creek Option 1 MC140Z MCO13 MCO13S MS20D
Kelly Graves
Plant Stage
Project #: 16027 Revision #: 46193 Date: June/22/2015