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| Minnesota Pollution Control Agency (MPCA), 520 Lafayette Road North, St. Paul, MN 55155-4194 | Air quality dispersion  modeling (AQDM) analysis form  AERA-03  Air Emissions Risk Analysis (AERA)  *Doc Type: Air Emissions Risk Assessment – External Documentation* |

**Purpose:** This form describes the air dispersion modeling configurations, inputs, and methods used in an AERA. The following information can be found on the Minnesota Pollution Control Agency’s (MPCA) websites:

* AQDM forms, practices, and policies: <https://www.pca.state.mn.us/business-with-us/air-quality-modeling>
* AERA guidance: <https://www.pca.state.mn.us/sites/default/files/aq9-18.pdf>

Applicable U.S. Environmental Protection Agency (EPA) air dispersion modeling guidance may be found on the following websites:

* Appendix W to 40 CFR Part 51: <https://www.epa.gov/scram/2017-appendix-w-final-rule>
* AMS/EPA Regulatory Model (AERMOD) Implementation Guide: <https://www.epa.gov/scram/air-quality-dispersion-modeling-preferred-and-recommended-models>

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| --- | --- |
| **Contents:**  Information requested for all AERAs  General information  Detailed modeling descriptions  Aera emissions source summary | **Additional information for projects without criteria pollutant modeling**  Meteorological data summary  Terrain and geospatial summary  Building summary  Non-point sources |

**Instructions*:***Check appropriate box by clicking on it. Response areas may be expanded as needed. All AERA documents must be submitted electronically. Spreadsheets should not be submitted in PDF format. The AERA will be deemed incomplete if all requested forms and support documents are not included.

**This form is submitted as part of a:**

Protocol/workplan

Completed AERA

Facility information

|  |  |  |  |
| --- | --- | --- | --- |
| Facility name: |  | TEMPO AI number: |  |

General information

*Check appropriate box by clicking on it. Response areas may be expanded as needed.*

**Select all of the modeling methods used.**

Risk Assessment Screening Spreadsheet (RASS) "look-up" table dispersion factors

AERMOD to generate dispersion factors for the RASS (using 1 g/sec emission rates)

AERMOD to generate individual pollutant concentrations for the RASS

AERMOD to generate risk estimates by modeling Q/CHI sums instead of emission rates

AERMOD to conduct deposition modeling for input into a HHRAP-based analysis (e.g., IRAP)

AERMOD to generate unitized dispersion factors for MMREM

AERMOD to generate mercury air concentrations for MMREM

|  |  |  |
| --- | --- | --- |
|  | Other (explain): |  |

**Indicate why the specified modeling method is selected.**

AERMOD modeling is not done because RASS lookup tables showed results below risk guidelines

AERMOD modeling is done after conservative screening modeling results were submitted

AERMOD modeling is done without submitting conservative screening modeling results

|  |  |
| --- | --- |
| Other (explain): |  |

**Indicate what support documents are being submitted.** If this form is being submitted as a protocol, include at least one sample of each of the appropriate files listed below. A sample represents the framework of how the model will generally be set up and may not include facility specific source inputs. If this form is being submitted to describe results, submit all of the following files used in the analysis:

AERMOD input:  sample  complete set (\*.inp, \*.adi, \*.ami)

*(Input file should include downwash parameters and receptor grid(s))*

AERMOD output:  sample  complete set (\*.out, \*.ado, \*.plt)

BPIP-PRIME files:  sample  complete set (\*.bpi)

AERMAP files:  sample  complete set (\*.api, \*.sou, \*.rou, \*.out)

Terrain files:  sample  complete set (\*.tif, \*dem)

Meteorological files:  sample  complete set (\*.pfl, \*.sfc)

Q/CHI plot files if using Q/CHI method:  sample  complete set

Modeled emissions files  sample  complete set (\*.txt, \*.xls)

Other:  sample  complete set

**How are the above supporting files (AERMOD, BPIP-PRIME, AERMAP files) submitted?**

e-Services

Included with AERA submittal

E-mailed separately

FTP site

|  |  |
| --- | --- |
| Other (explain): |  |

**Additional information for the General Information section (e.g., hourly and annual modeling were conducted differently):**

Detailed modeling descriptions

1. **Criteria Air Pollutant (CAP) modeling summary:** Identify how the CAPs are modeled.

National Ambient Air Quality Standard/Minnesota Ambient Air Quality Standard (NAAQS/MAAQS) air dispersion modeling is conducted for the following pollutants

NO2  PM10  PM2.5  SO2  CO  Pb  H2S  O3

|  |  |
| --- | --- |
| Other (explain): |  |

The remaining CAPs are compared to NAAQS/MAAQS in the RASS using high-first-high (H1H) modeled concentrations as a screening step.

All CAPs are compared to NAAQS/MAAQS in the RASS using high-first-high (H1H) modeled concentrations as a screening step.

CAPs with health benchmarks are also included in the summation of hazard indices and cancer risks (e.g., NO2 and lead).

List any differences between the CAP modeling and the modeling for the AERA with the exception of using the H1H concentrations:

Additional information about the CAP modeling (list any deviations from EPA or MPCA guidance).

***STOP HERE if a criteria pollutant modeling protocol has been submitted through e-Services.***

***If criteria pollutant modeling has not been performed, provide the information requested below.***

1. **Air dispersion model specifics** (mark all that apply):

Only high-first-high (H1H) values are specified in the model output setup  Yes  No

If no, explain below:

***Air dispersion model specifics continued*** (mark all that apply):

AERMOD Version       (e.g., 19191) is used

AERMOD Regulatory Default option (DFAULT) is used

AERMOD Concentration option is used

AERMOD Urban Dispersion option (URBANOPT) is used

Non- regulatory AERMOD options are used (cannot be used with DFAULT option, requires MPCA written approval)\*

\*FASTALL, FASTAREA, FLAT, NOSTD

Explain below:

1. **Building summary**

|  |  |
| --- | --- |
| BPIP-Prime version 04274 is used. | |
| If not, explain: |  |
| All buildings are included. | |
| If not, explain: |  |
| **Note:** Tiering of buildings must follow guidance from Section 3.5 of the “MPCA Air Dispersion Modeling Practices Manual.” | |

Additional information for the building summary (list any deviations from EPA or MPCA guidance):

1. **Receptor summary**

Receptor grid dimensions: (ex., radius of 10km, 5km by 5km)

Receptors are placed along the owned and controlled property boundary.

The modeling follows MPCA Modeling Practices for ambient receptors placement

Proposed receptor spacing:

|  |  |  |
| --- | --- | --- |
| Inside the property boundary(s): |  | meters |
| On the fenceline(s): |  | meters |
| On the property line(s): |  | meters |
| Beyond the property line(s): |  | meters |

Additional air dispersion modeling receptors are placed at locations of sensitive receptors.

Describe these receptors below:

Flag pole receptors are included. Describe the flag pole receptors and how/why they were chosen below:

Additional information for the receptor summary (list any deviations from EPA or MPCA guidance) below:

1. **Meteorological data summary:**

What type of surface meteorological station was used (check one):

NWS ASOS/AWOS Meteorological Station

Onsite Meteorological Station

Other

|  |  |  |  |
| --- | --- | --- | --- |
| If other, please explain: |  | | |
| How many consecutive years of data were used? | |  |  |
| What years were used? | | to |  |

What meteorological surface station was proposed? For NWS stations, indicate the three-letter call sign, station name and the state where the station resides (Ex.: MSP, Minneapolis/St. Paul, MN). For on-site stations, indicate the name and location of the station (ex. City and state, coordinates, etc.).

|  |  |  |
| --- | --- | --- |
| Three-letter call sign of the surface station: |  |  |
| Surface station name: |  | |
| State: |  | |

What meteorological upper air station was proposed? Please indicate the three-letter call sign, station name, and the state where the station resides(Ex.: Chanhassen; MN; MPX).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Three-letter call sign: | |  |  | | | |
| Upper air station name: | |  | | | | |
| State: | |  |  | | | |
| Were the proposed AERMET files pre-processed by MPCA staff?  Yes  No | | | | | | |
| If yes, please provide the name of the met data zip file that was received or obtained from the MPCA and the date it was obtained: | | | | | | |
| Name: |  | | | .zip | Date (mm/dd/yyyy): |  |

**Note:** Site-specific meteorological data collected and processed by the Permittee follow EPA guidance for data collection and QA/QC, as specified in section 8.4.4.2 of Appendix W to 40 CFR Part 51.

|  |  |
| --- | --- |
| What version of AERMET was used: |  |

What justification(s) applies for the proposed surface and upper air stations identified above? (Check all that apply)

|  |  |  |
| --- | --- | --- |
| Similar surface characteristics as meteorological tower | | Proximity to surface and/or upper air station(s) |
| Similar land use characteristics | | Similar wind patterns/characteristics |
| Other – describe: |  | |

1. **Will wind speed categories and/or wind speed emission factors be used?**   Yes  No

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| If yes, for which pollutants: | | |  | | | | | | | | | |
| Please specify the wind speed categories (m/s) to be used for the ME WINDCATS keyword: | | | | | | | | | | | | |
|  | User-specified ME WINDCATS: | | | m/s |  | m/s |  | m/s |  | m/s |  | m/s |
|  | Default ME WINDCATS: | | | 1.54 m/s |  | 3.09 m/s |  | 5.14 m/s |  | 8.23 m/s |  | 10.80 m/s |
| Please list the user-specified wind speed emission factors for the SO EMISFACT WSPEED pathway. Include the source ID or range, pollutant, and six wind speed emission factors. This does not need to be an exhaustive list. | | | | | | | | | | | | |
|  | |  | | | | | | | | | | | | |
| Additional information for the Meteorological Data Summary (list any deviations from EPA or MPCA guidance): | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | |

1. **If urban dispersion option (URBANOPT) is selected, indicate:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Population: |  | | Roughness height (meters): | |  |
| Population rationale: | | | | | |
| Full Metropolitan Statistical Area (MSA) | | | | Full Micropolitan Statistical Area (MSA) | | |
| Partial Metropolitan Statistical Area | | | | Partial Micropolitan Statistical Area (MSA) | | |
| Other (specify): | |  | | | | |

1. **Terrain and geospatial summary**

|  |  |  |
| --- | --- | --- |
| AERMAP was used. If not, explain: | |  |
| Select the AERMAP Version used: | | |
| NED 1/3 arc second  NED 1 arc second | | |
| Other (specify): |  | |
| UTM coordinates (Zone 5 extended) are used. | | |
| Note: UTM coordinate projection must use the NAD83 datum, **not** NAD27. | | |
| If other, explain: |  | |

Additional information for the Terrain and Geospatial Summary (list any deviations from EPA or MPCA guidance):

1. **Non-point sources**

**Volume sources**:

Yes  N/A

|  |  |
| --- | --- |
| No – explain: |  |

Refer to the modeling guidance on calculating the lateral and vertical dimensions.

a. Are any volume source(s) overlapping or within 1.0 meters of any receptors?  No  Yes\*

\**Volume source should be converted to an area source of commensurate size (per section 6.2 of the latest AERMOD Implementation Guide (03/19/2009)) or be further refined.*

b. Additional information for this subsection:

**Volume source characteristics**

|  |  |  |
| --- | --- | --- |
| **Height (m)** | **SYINIT** | **SZINIT** |
|  |  |  |
|  |  |  |

**Open pit sources**:

Yes  N/A

|  |  |
| --- | --- |
| No – explain: |  |

**Open pit source characteristics**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Height (m)** | **XINIT** | **YINIT** | **PITVOL** | **ANGLE** |
|  |  |  |  |  |
|  |  |  |  |  |

**Area sources**:

Yes  N/A

|  |  |
| --- | --- |
| No – explain: |  |

**Area source characteristics**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Height (m)** | **XINIT** | **YINIT** | **ANGLE** | **SZINIT** |
|  |  |  |  |  |
|  |  |  |  |  |

**Area circle source characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Height (m)** | **Radius** | **Nvert** | **SZINIT** |
|  |  |  |  |
|  |  |  |  |

**Area poly source characteristics**

|  |  |  |
| --- | --- | --- |
| **Height (m)** | **Nvert** | **SZINIT** |
|  |  |  |
|  |  |  |

AERA emissions source summary

|  |  |  |
| --- | --- | --- |
| What is the minimum stack height modeled (in meters)? | |  |
| What is the maximum stack height modeled (in meters)? | |  |
| Is the shortest modeled stack height equal to the shortest height on Form GI-04?  Yes  No  Are any stacks merged?  Yes  No | | |
| If yes, which stacks? |  | |
| If stacks are merged, are they merged per AERA guidance?  Yes  No  If no explain how the stacks are merged: | | |

**MPCA example of merged stacks**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Model ID & Form GI-04 SV\_ID\_No.** | **RASS Stack ID number** | **Stack Height (meters)** | **Stack Temperature (Kelvin)** | **Stack Velocity (m/sec)** | **Stack Diameter (meters)** |
| 1 (3 merged stacks from Form GI-04):  SV001  SV002  SV003 |  | 10.0 (lowest of 3 values below)  10.0  11.0  12.0 | 293 (lowest of 3 values below)  300  310  293 | 2.5 (lowest of 3 values below)  3.3  2.5  2.7 | 1.0 (lowest of 3 values below)  1.1  1.1  1.0 |
| 2 (SV004 only) |  | 20 | 400 | 3.3 | 1.0 |
| 3 (SV005 only) |  | 15 | 350 | 11.1 | 3.2 |
| 4 (Coal Pile) |  | 1 | 293 | 0.001 | 20 |

An operating scenario of less than 8760 hours per day is used and it is reflected in a permit limit or physical limit.

Are any of the point sources capped and/or have horizontal stacks (see guidance in section 6.1, [AERMOD Implementation Guide](https://gaftp.epa.gov/Air/aqmg/SCRAM/models/preferred/aermod/aermod_implementation_guide.pdf) [October 2023])?  No  Yes

POINTCAP/POINTHOR source types

Exit velocity set to 0.001m/s

Fill out the table below for point sources (modeled values should match Form GI-04 values unless merged)

***or***

Indicate a file where this information can be found. File name:

**Point Source\* Characteristics**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **RASS Stack ID#** | **Source ID** | **Source type** | **Stack height** (meters) | **Stack temperature** (Kelvin) | **Stack exit velocity** (m/sec) | **Stack diameter** (meters) | **Facility descriptions** |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |

*\*Information about “insignificant activity” sources not quantified can be found in the AERA-05 form.*

Additional information for the Emission Source Summary (list any deviations from EPA or MPCA guidance below):