MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

AQDM-07

Air Quality Dispersion Modeling (AQDM) results review form

(Previously AQDMRRF-01)

Doc Type: Air Dispersion Modeling

Acronym information on page 5

Instructions: This form is used for Minnesota Pollution Control Agency (MPCA) internal use by Air Dispersion Modelers, Permit Engineers, and Risk Assessors to review modeling results.

Note: If results are marked not approved, please use the *AQDM-06* form to resubmit. Updated *AQDM-06* forms and updated attachments should be emailed to: AirModeling.PCA@state.mn.us. If files are too large to email, please mail a CD with the files to:

Air Quality Permit Document Coordinator
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Facility information

Tempo AI ID number: 213111 AQ facility/permit ID number: 13700345 Submittal date (mm/dd/yyyy): 12/01/2017

Three-letter modeling facility ID (ex., XEK = Xcel Energy Allen S. King, MEC = Mankato Energy Center, etc.): PMM

Facility name: PolyMet Mining Inc.

Facility street address: 6500 County Road 666

City: Hoyt Lakes County: St. Louis State: MN Zip Code: 55750

Facility contact: Kevin Pylka Report prepared by: Jennifer Koenen (Barr Engineering Co)

Facility contact phone: (218) 471-2162 Preparer phone: (952) 832-2682

Facility contact email: kpylka@polymetmining.com Preparer email: jkoenen@barr.com

UTM coordinates of facility (NAD83, zone 15 extended **only**): x = 564,719.00 m East, y = 5,271,989.00 m North

MPCA Air Dispersion Modeler: Jim Sullivan MPCA Air Permit Engineer: Hassan Bouchareb

MPCA Air Risk Assessor: Kristie Ellickson

List of files with names/descriptions submitted with modeling results

1. ☒ AERMOD input files (*.inp, *.adi, *.ami)
   ☒ AERMOD output files (*.out, *.ado, *.amo)
   ☒ AERMOD plot files (*.plt)
   ☒ AERMOD post files (*.pst) – If applicable
   ☐ AERMOD event files (*.evi, *.evo) – If applicable
   ☒ AERMOD miscellaneous/other files (MAXDCONT, SUMTABLE, etc.) – If applicable

2. ☒ AERMOD meteorological surface files (*.sfc)
   ☒ AERMOD meteorological upper air/profile files (*.pfl)

3. ☒ BPIP-PRIME input files (*.bpi, *.pip)
   ☒ BPIP-PRIME output files (*.bpo, *.sum)

4. ☒ Terrain file(s) for AERMAP(*.dem, *.tif)
   ☐ AERMAP input files (*.ami)
   ☐ AERMAP output files (*.rou, *.sou, etc.)

5. ☒ Background data files/background concentrations for applicable pollutants (seasonal, monthly, daily, hourly, etc.)

6. ☒ Figures for modeling results (*.jpeg, *.bmp, *.pdf)

   ☒ GIS maps for modeling results (*.shp)

7. ☒ *AQDM-02* form – if applicable (not applicable if changes were not made)
8. ☐ Paved Roads Results – If applicable
9. ☐ SIL Analysis and Results – If applicable
10. ☒ Hourly O_3 File – If applicable
11. ☒ AERA forms – If applicable
12. ☒ Other files and supporting documents (hourly ozone, background files, supplements, etc.):

    PM10 Plume depletion files for both Year 8 and Year 13 scenarios.

Section 1. Modeling review – 30-day substantial completeness determination

Completeness review of modeling report by sections

Section and section name	Substantially complete/incomplete	Deficiencies and/or comments
Files to accompany modeling	Substantially Complete	No comments on this section
Section 1: Modeling protocol	Substantially Complete	The Company provided two separate protocols for the plant and mine sites respectively. The two protocols were reviewed and approved by the MPCA on July 18, 2016, with the condition that a single modeling report would be submitted for the air quality permit.
Section 2: Changes to modeling protocol	Substantially Complete	The Final modeling report provides a complete list of changes since the July 18, 2016, protocol approvals.
Section 3: Paved roads fugitive dust (optional)	Substantially Complete	No comments on this section
Section 4: Modeling results	Substantially Complete	No comments on this section as submitted; however, future cumulative plume-depleted PM10 air quality dispersion modeling will be conditioned on the validation of plume depletion characteristics (particle size, particle density, particle fraction) through field assessment. Details of the field assessment approach will be included in the air quality permit. Additionally, the current nearby source inventory evaluation approach, specific to modeled ambient air quality as presented in the MPCA Modeling Practices Manual (2017) will be required for approval of future cumulative air quality modeling.
Section 5: Discussion	Substantially Complete	The Company offered the following in their discussion of nearby sources: *For all pollutants, cumulative impacts were assessed on all neighboring properties with the impacts due to emissions from each neighboring facility excluded from the receptors within the facility's property boundary. This methodology is consistent with the EPA guidance on ambient air (e.g., Region V Ambient Air Issues - Dec 1986 - EPA SCRAM website Model Clearinghouse,*

		Record No: 87-V-09 which states: "controlled property…is non-ambient air. However, property of one company is ambient air with respect to emissions from its neighbor") and the approved modeling protocol. The appropriate modeled concentration was developed by creating source groups of all sources except the nearby source (e.g., NONSM for all sources except Northshore Mining Sources), and identifying receptors on the nearby source property. For those receptors, the cumulative NAAQS model concentration from source group NONSM (plus background) was used instead of using the model concentration from source group ALL (plus background). This portion of the discussion requires further clarification. See comments in the "Overall Status of the Report" for details.	
Section 6: Modeling results figures/maps	Incomplete	Large Figure Q4-11 Annual PM2.5 NAAQS presents findings for the 24-hour PM2.5 NAAQS rather than the Annual standard. The MPCA has reviewed the PM2.5 Annual NAAQS modeling files and concluded that the proposed facility will comply with the applicable standard; however, this figure should be remedied for the final air quality permit record.	
Modeling results substantially complete?	Substantially Complete	Date (mm/dd/yyyy):	12/14/2017

Section 2. Air dispersion modeler results review

Technical review of final modeling report

Review items	Acceptable/ Unacceptable	Deficiencies and/or comments
Are all changes from the protocol adequately described and addressed?	Acceptable	The Company provided language in their report to narrate how nearby source contributions were removed from the modeling evaluation. The Company followed an approach whereby they subtracted modeled nearby source concentrations from the nearby source property at and up to the property boundary. This practice is no longer observed in Minnesota. MPCA Management allowed the Company to remove modeled nearby source concentrations from the nearby source property in recognition of a historical modeling practice. The MPCA will expect that any future cumulative ambient air quality modeling will follow the current MPCA Modeling Practices Manual (2017) to address modeled nearby source concentrations. In the event that a modeled exceedance is discovered at a nearby source facility, the MPCA has developed processes to evaluate these situations on a case-by-case basis (See Appendix A of the MPCA Modeling Practices Manual (2017)).
Are the model files consistent with the MPCA AQDM-02 spreadsheet accompanying the permit application?	Acceptable	No comments on this section
Modeling demonstrates compliance with applicable NAAQS/MAAQS, SIL's, and PSD increments?	Acceptable	Please see comments in Section 1, (See Section 5) above, regarding the analysis of ambient air quality impacts on nearby sources. Future modeling will be expected to follow the ambient/non-ambient modeling practices for nearby sources as presented in the MPCA Air Dispersion Modeling Practices Manual (See Appenidx D).

This section is:	Acceptable	Date (mm/dd/yyyy):	12/14/2017

Section 3. Permit engineer results review

Has the 150-day completeness requirement been waived? ☐ No ☒ Yes

Technical review of final modeling report

Review items	Acceptable/ Unacceptable	Deficiencies and/or comments	
Are all emissions changes from the protocol adequately described and addressed?	Acceptable	No comments on this section	
Are the emission calculations on the AQDM-02 spreadsheet consistent with permitted emissions?	Acceptable	No comments on this section	
Are the emissions on the Nearby Sources Emission Calculations spreadsheet consistent with permitted emissions for those sources?	Acceptable	No comments on this section	
This section is:	Acceptable	Date (mm/dd/yyyy):	12/14/2017
Recommended permit conditions or related items:	Several restrictions were assumed as part of this modeling analysis. These restrictions will be identified within the permit.		

Section 4. Air risk assessor results review (If Applicable)

Technical review of final modeling report

Review items	Acceptable/ Unacceptable/ Not applicable	Deficiencies and/or comments	
Are all changes from the protocol phase adequately described and addressed in the AERA forms?	Acceptable	No comments on this section	
Do the submitted results reflect the methodology described in the AERA forms?	Acceptable	No comments on this section	
This section is:	Acceptable	Date (mm/dd/yyyy):	12/14/2017
Are there any additional recommendations that will be submitted to the MPCA Air Managers?	The MPCA air toxics technical staff recommend adding AERA recalculation language to the Polymet air permit as the AERA results are at guideline levels when rounded. The degree of modeling refinement and related AERA assumptions are relatively high for this project in comparison to other AERA analyses. The highest air toxic contributions to risk estimates are: 1. metals from particulate emissions from the open pits; 2. PAHs and Dioxins from the diesel tail pipe emissions from mining vehicles; and, 3. Hourly emissions of metals (arsenic, nickel) and nitrogen dioxide from the proposed processing plant. Therefore, we would recommend that the AERA be recalculated if throughput or mining vehicle fuel use are increased or if the pit locations are shifted toward the site boundaries.		

Overall status of results

This modeling results are:	**Conditionally Approved; See Comments**
Comments on approvable-status:	***General Comments on Nearby Sources*** **From Section 1 – report discussion section - further clarification is necessary for the air quality permit record. The MPCA notes the following:** **First, while not widely recognized, the EPA has historically allowed the removal of**

nearby source contributions from areas on the nearby source property where public access *is controlled* through a fence or physical barrier. A property boundary is insufficient for controlling access. In the event that there is no fence or physical barrier around a nearby source facility, the nearby source contributions cannot be removed from a modeling demonstration. Complete documentation of this practice is provided in the MPCA Air Quality Dispersion Modeling Practice Manual (In particular, see Appenidx D).

Second, on July 26, 2017, the MPCA Air Managers agreed to allow the Company to remove nearby source contributions from nearby source property, irrespective of whether public access was controlled or not, in recognition of a historical modeling practice. The MPCA Management approval was unique to this situation. The nearby source modeling practice described in this report will not be acceptable for any future cumulative ambient air quality dispersion modeling demonstrations.

Lastly, in the event that a modeled exceedance is discovered on a nearby source property, it should be submitted with the modeling demonstration, along with a contribution analysis to determine if the Company is below the SIL. If the Company is below a SIL value at the receptor(s) that exceed the applicable NAAQS, then the Company may complete their permit action. If the Company has modeled greater than a SIL value at a nearby source receptor where a modeled exceedance exists, controls or limits may be necessary. The nearby source may also have obligations to reduce their contribution to the modeled exceedance. Appendix A of the MPCA Air Quality Dispersion Modeling Practices Manual illustrates MPCA case-by-case review of these situations.

PM10 Daily Diagram

From Section 1 – Section 6 – the see comment regarding figure error and submit corrected diagram.

Ambient Air Boundary

The modeling was conducted using an MPCA approved receptor placement to address the federal definition of ambient air. The Company's Ambient Air Boundary (AAB) will become an enforceable provision of the Air Quality permit. If changes at the facility affect ambient air quality compliance, the AAB may require adjustment. In this situation, new cumulative ambient air quality dispersion modeling will be necessary to justify the new AAB.

Acronyms

AERA	Air Emission Risk Analysis
AERMAP	AERMOD Terrain Preprocessor
AERMOD	AMS/EPA Regulatory Model
AQ	Air Quality
AQDM	Air Quality Dispersion Modeling
AQDMRRF-01	Previous Results Review Form
BPIP-PRIME	Building Profile Input Program for PRIME
GIS	Geographic Information System
MAAQS	Minnesota State Ambient Air Quality Standard
MPCA	Minnesota Pollution Control Agency
NAAQS	National Ambient Air Quality Standard
O_3	Ozone
PSD	Prevention of Significant Deterioration Program
SIL	Significant Impact Level
UTM	Universal Transverse Mercator