MEMORANDUM

To: Deborah Hays, Metal Management Midwest

cc:

From: Tony Schroeder, Trinity Consultants

Date: May 14, 2024

RE: Metal Management Midwest Updated Modeling and Emission Controls Modeling

At the request of Metal Management Midwest, Inc. (Metal Management), Trinity Consultants (Trinity) refreshed the air dispersion modeling for 24-hour PM_{10} NAAQS and metal hazardous air pollutants (HAPs), using the most recent meteorological data, for the facility located at 2500 S. Paulina Street in Chicago, IL (Paulina Facility). Trinity also performed air dispersion modeling for 24-hour PM_{10} NAAQS and metal HAPs for the future emission control system for the existing Hammermill Shredder permitted through Illinois Environmental Protection Agency (Illinois EPA) construction permit No. 21120017. The control system, which is currently being installed, includes a cyclone, venturi scrubber, a natural gas-fired valveless regenerative thermal oxidizer (VRTO), and a dry sorbent injection (DSI) scrubber equipped with a sorbent collection fabric filter baghouse.

Modeling Methodology and Results

Consistent with the previous air dispersion modeling analysis submitted for the Paulina Facility in 2021, the current U.S. EPA regulatory model, AERMOD (version 23132) was used to calculate ground-level concentrations with the regulatory default parameters.

All model input parameters used in this analysis were consistent with those described in the 2021 modeling report, with the exception of the meteorological input data, the terrain elevations, and select emission source inputs.

Meteorological Data

The meteorological data used for this modeling demonstration were obtained from the Chicago Midway International Airport, located in Chicago, IL. The raw meteorological data from 2019 to 2023 were processed for AERMOD using AERMET (version 23132). These meteorological data files were prepared by Illinois EPA and provided by Ms. Cari Rutherford of Illinois EPA on April 29, 2024.

Terrain Elevations

Updated elevations of receptors, buildings, and sources were determined using the AERMOD terrain preprocessor called AERMAP (version 18081), which generates base elevations above mean sea level of sources, buildings, and/or receptors as specified by the user. Terrain elevations from the U.S. Geological Survey (USGS) 1 arc-second National Elevation Dataset (NED) data were used for the AERMAP processing of receptors and inventory sources. The most recent available NED data were obtained in GeoTIFF format in accordance with recent guidance provided by U.S. EPA.

Emission Sources

All emission source modeling inputs were consistent with the previous air dispersion modeling analysis with the exception of the following.

- Sources SH9, SH10, SH11, and SH12 were renamed to be SC9, SC10, SC11, and SC12 to be more consistent with the naming convention of the other emission sources in the model.
- The TRCHCUT PM_{10} emission rate was updated from 4.40E-07 g/s/m^2 to 4.11E-06 g/s/m^2 to account for emissions previously considered from fuel combustion and those emissions physically generated during torch cutting. Metal HAP emission factors were also increased by a proportionate amount.
- The SHREDTOP source exhaust temperature was updated from 298 Kelvin (K) (76.7 degrees F) to 338.7 K (150 degrees F). The source exhaust temperature used in the 2021 modeling was set at a low value to provide conservatively high model results. Metal Management has re-evaluated this assumption and determined that a release temperature of 150 degrees F is still conservatively low (yielding high model results), but is at least closer to the greater than 200 degree F anticipated within the shredder.

Modeling Results

Tables 1 through 4 summarize the results of the updated Paulina Facility modeling analysis. The metal HAPs were compared to the same standards as the previous modeling analysis. Note that the reference threshold used in the 2021 modeling for annual Nickel emissions was updated from 0.09 µg/m^3 to 0.01 µg/m^3 in August of 2023. The predicted impacts are below their respective standards for all pollutants analyzed.

Table 1. 24-Hour PM_{10} Modeling Results (Highest 6th High Over 5 Years)

Pollutant	AERMOD Predicted Concentration (µg/m^3)	Coordinates	
		East (m)	North (m)
PM_{10}	124.70	444619.2	4633188.9

Table 2. Lead Modeling Results

Metal HAP	Maximum 3-Month Rolling Average Period	Predicted Monthly Average (µg/m^3)	Predicted Maximum 3-Month Rolling Average (µg/m^3)	Pb NAAQS Standard (3-Month Rolling Avg) (µg/m^3)	Predicted Impact Meets Standard (Y/N)?
Lead	December 2022	0.00712	0.00781	0.15	Yes
	January 2023	0.00762			
	February 2023	0.00868			

Table 3. Other Metal HAP Modeling Results

Metal HAP	Averaging Period	Year	Predicted Impact (µg/m³)	Maximum Predicted Impact (µg/m³)	Comparative Level (µg/m³)	Predicted Impact Meets Comparative Level (Y/N)?
Antimony	24-hr	2019	0.00279	0.00344	12.00 (NR 445)	Yes
		2020	0.00280			
		2021	0.00332			
		2022	0.00344			
		2023	0.00254			
	Annual	2019	0.00046	0.00046	0.30 (ATSDR)	Yes
		2020	0.00044			
		2021	0.00044			
		2022	0.00045			
		2023	0.00044			
Arsenic	Annual	2019	0.00041	Unit Risk Factor 0.00430 Inhalation Impact [a] 1.76E-06	1.00E-05 (IRIS)	Yes
		2020	0.00040			
		2021	0.00040			
		2022	0.00040			
		2023	0.00040			
Beryllium	Annual	2019	0.00002	0.00002	0.02 (NR 445)	Yes
		2020	0.00002			
		2021	0.00002	Unit Risk Factor 0.00240 Inhalation Impact [a] 4.80E-08	1.00E-05 (IRIS)	Yes
		2022	0.00002			
		2023	0.00002			
Cadmium	Annual	2019	0.00016	0.00016	0.01 (ATSDR)	Yes
		2020	0.00016			
		2021	0.00016	Unit Risk Factor 0.00180 Inhalation Impact [a] 2.88E-07	1.00E-05 (IRIS)	Yes
		2022	0.00016			
		2023	0.00016			
Chromium	24-hr	2019	0.00831	0.01027	12.00 (NR 445)	Yes
		2020	0.00836			
		2021	0.00989			
		2022	0.01027			
		2023	0.00758			
Cobalt	24-hr	2019	0.00119	0.00147	0.48 (NR 445)	Yes
		2020	0.00120			
		2021	0.00142			
		2022	0.00147			
		2023	0.00109			
	Annual	2019	0.00020	0.00020	0.10 (ATSDR)	Yes
		2020	0.00019			
		2021	0.00019			
		2022	0.00019			
		2023	0.00019			

[a] For IRIS or CARB unit risk impacts, maximum predicted ambient impact is multiplied by the Unit Risk Factor and compared against a unit risk of 1*10^-5. This is consistent with the Alternative Method of Compliance specified in NR 445.08(3) for hazardous air contaminants with unit risk factors established by either EPA or CARB.

Table 4. Other Metal HAP Modeling Results (cont.)

Metal HAP	Averaging Period	Year	Predicted Impact (µg/m³)	Maximum Predicted Impact (µg/m³)	Comparative Level (µg/m³)	Predicted Impact Meets Comparative Level (Y/N)?
Manganese	24-hr	2019	0.02660	0.03286	4.80 (NR 445)	Yes
		2020	0.02675			
		2021	0.03165			
		2022	0.03286			
		2023	0.02424			
	Annual	2019	0.00435	0.00435	0.30 (ATSDR)	Yes
		2020	0.00421			
		2021	0.00425			
		2022	0.00427			
		2023	0.00420			
Nickel	Annual	2019	0.00122	0.00122	0.01 (ATSDR)	Yes
		2020	0.00118			
		2021	0.00119	Unit Risk Factor 0.00026 Inhalation Impact [a] 3.17E-07	1.00E-05 (CARB)	Yes
		2022	0.00119			
		2023	0.00117			
Selenium	24-hr	2019	0.00131	0.00162	4.80 (NR 445)	Yes
		2020	0.00132			
		2021	0.00156			
		2022	0.00162			
		2023	0.00120			

[a] For IRIS or CARB unit risk impacts, maximum predicted ambient impact is multiplied by the Unit Risk Factor and compared against a unit risk of 1*10^-5. This is consistent with the Alternative Method of Compliance specified in NR 445.08(3) for hazardous air contaminants with unit risk factors established by either EPA or CARB.

Emission Controls Modeling Methodology and Results

Modeling was also completed to represent the scenario that will exist after emission controls on the Hammermill Shredder are fully installed and in operation. The current U.S. EPA regulatory model, AERMOD (version 23132) was used to calculate ground-level concentrations with the regulatory default parameters.

All model input parameters used in this analysis were consistent with the pre-control scenario modeling described above, with the exception of select emission source inputs and downwash structure inputs.

Emission Sources

All emission source modeling inputs were consistent with the above air dispersion modeling analysis with the exception of the following:

- Sources SHREDTOP and SHREDBOT (representing uncontrolled shredder emissions) were removed.
- Source RTO was added to represent the stack that will be present at the end of the control train. Modeling inputs are in **Tables 5 and 6** below.
- Source LIMESILO was added to represent emissions from the lime silo that will be used to store sorbent that will be used in the DSI system. Note LIMESILO only has emissions of PM_{10} as seen in **Table 5** below. Please also note that the LIMESILO will not emit continuously. The silo will only have emissions during infrequent silo filling with new lime.

Table 5. Modeling Parameters and PM_{10} Emission Rate

Model ID	UTM East (m)	UTM North (m)	Elevation[a] (m)	24-Hour PM_{10} Emission Rate (g/s)	Stack Height (m)	Stack Temperature (K)	Exit Velocity (m/s)	Stack Diameter (m)
RTO	444564.1	4633142.8	179.36	1.70E-02	18.59	394.26	14.78	1.83
LIMESILO	444552.7	4633159.2	179.31	4.56E-05	7.54	0.00	0.45	1.03

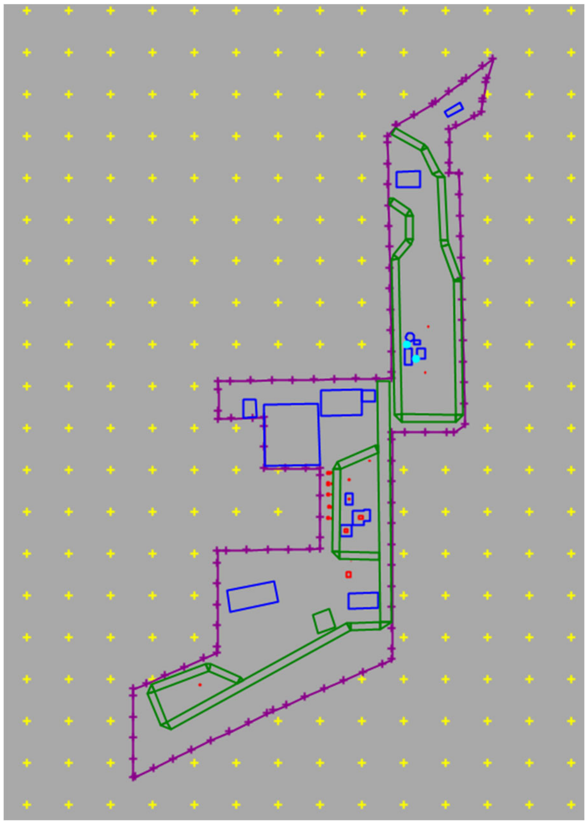
a. Elevation determined using AERMAP.

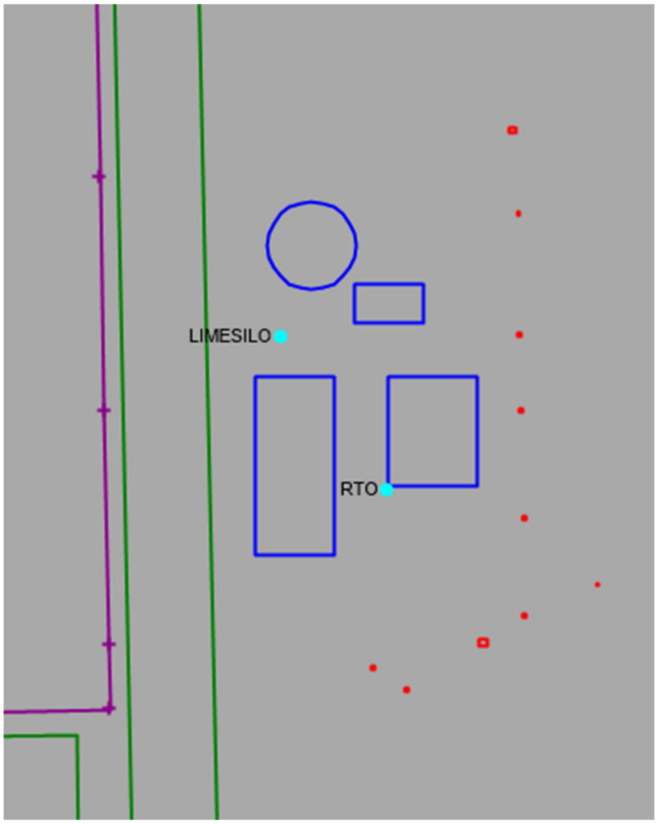
Table 6. Metal HAP Emission Rates

Model ID	Antimony Emission Rate (g/s)	Arsenic Emission Rate (g/s)	Beryllium Emission Rate (g/s)	Cadmium Emission Rate (g/s)	Chromium Emission Rate (g/s)	Cobalt Emission Rate (g/s)	Lead Emission Rate (g/s)	Manganese Emission Rate (g/s)	Nickel Emission Rate (g/s)	Selenium Emission Rate (g/s)
RTO	3.45E-07	3.10E-07	1.68E-08	1.23E-07	1.03E-06	1.48E-07	4.50E-06	3.29E-06	9.22E-07	1.63E-07

The site plan for the emission controls modeling is shown in **Figure 1** below. The zoomed in image on the right shows the emissions sources and downwash structures associated with the proposed control train that have been added to the site plan.

Figure 1. Proposed Controls Modeling Site Plan





Modeling Results

Tables 7 through 10 summarize the results of the emission controls modeling analysis at the Paulina Facility. The predicted impacts are reduced compared with the pre-control scenario and all impacts continue to be below their respective standards for all pollutants analyzed. The controlled PM_{10} model results in Table 7 represent a greater than 65% reduction in the modeling results for the existing, uncontrolled emissions scenario discussed above.

Table 7. 24-Hour PM_{10} Modeling Results (Highest 6th High Over 5 Years)

Pollutant	AERMOD Predicted Concentration (µg/m³)	Coordinates East (m)	Coordinates North (m)
PM_{10}	42.91	444534.5	4633045.5

Table 8. Lead Modeling Results

Metal HAP	Maximum 3-Month Rolling Average Period	Predicted Monthly Average (µg/m³)	Predicted Maximum 3-Month Rolling Average (µg/m³)	Pb NAAQS Standard (3-Month Rolling Avg) (µg/m³)	Predicted Impact Meets Standard (Y/N)?
Lead	November 2019	0.00569	0.00564	0.15	Yes
	December 2019	0.00589			
	January 2020	0.00533			

Table 9. Other Metal HAP Modeling Results

Metal HAP	Averaging Period	Year	Predicted Impact (µg/m³)	Maximum Predicted Impact (µg/m³)	Comparative Level (µg/m³)	Predicted Impact Meets Comparative Level (Y/N)?
Antimony	24-hr	2019	0.00092	0.00106	12.00 (NR 445)	Yes
		2020	0.00094			
		2021	0.00106			
		2022	0.00091			
		2023	0.00093			
	Annual	2019	0.00035	0.00036	0.30 (ATSDR)	Yes
		2020	0.00035			
		2021	0.00036			
		2022	0.00035			
		2023	0.00035			
Arsenic	Annual	2019	0.00032	Unit Risk Factor 0.00430	1.00E-05 (IRIS)	Yes
		2020	0.00032			
		2021	0.00033			
		2022	0.00031	Inhalation Impact [a]		
		2023	0.00031	1.42E-06		

[a] For IRIS or CARB unit risk impacts, maximum predicted ambient impact is multiplied by the Unit Risk Factor and compared against a unit risk of 1*10^-5. This is consistent with the Alternative Method of Compliance specified in NR 445.08(3) for hazardous air contaminants with unit risk factors established by either EPA or CARB.

Table 10. Other Metal HAP Modeling Results (cont.)

Metal HAP	Averaging Period	Year	Predicted Impact (μg/m³)	Maximum Predicted Impact (μg/m³)	Comparative Level (μg/m³)	Predicted Impact Meets Comparative Level (Y/N)?
Beryllium	Annual	2019	0.00002	0.00002	0.02 (NR 445)	Yes
		2020	0.00002			
		2021	0.00002	Unit Risk Factor 0.00240	1.00E-05 (IRIS)	Yes
		2022	0.00002	Inhalation Impact [a]		
		2023	0.00002	4.80E-08		
Cadmium	Annual	2019	0.00013	0.00013	0.01 (ATSDR)	Yes
		2020	0.00012			
		2021	0.00013	Unit Risk Factor 0.00180	1.00E-05 (IRIS)	Yes
		2022	0.00012	Inhalation Impact [a]		
		2023	0.00012	2.34E-07		
Chromium	24-hr	2019	0.00277	0.00316	12.00 (NR 445)	Yes
		2020	0.00281			
		2021	0.00316			
		2022	0.00273			
		2023	0.00279			
Cobalt	24-hr	2019	0.00040	0.00045	0.48 (NR 445)	Yes
		2020	0.00040			
		2021	0.00045			
		2022	0.00039			
		2023	0.00040			
	Annual	2019	0.00015	0.00016	0.10 (ATSDR)	Yes
		2020	0.00015			
		2021	0.00016			
		2022	0.00015			
		2023	0.00015			
Manganese	24-hr	2019	0.00884	0.01011	4.80 (NR 445)	Yes
		2020	0.00897			
		2021	0.01011			
		2022	0.00874			
		2023	0.00891			
	Annual	2019	0.00336	0.00345	0.30 (ATSDR)	Yes
		2020	0.00335			
		2021	0.00345			
		2022	0.00333			
		2023	0.00330			
Nickel	Annual	2019	0.00094	0.00097	0.01 (ATSDR)	Yes
		2020	0.00094			
		2021	0.00097	Unit Risk Factor 0.00026	1.00E-05 (CARB)	Yes
		2022	0.00093	Inhalation Impact [a]		
		2023	0.00092	2.52E-07		
Selenium	24-hr	2019	0.00044	0.00050	4.80 (NR 445)	Yes
		2020	0.00044			
		2021	0.00050			
		2022	0.00043			
		2023	0.00044			

[a] For IRIS or CARB unit risk impacts, maximum predicted ambient impact is multiplied by the Unit Risk Factor and compared against a unit risk of 1*10^-5. This is consistent with the Alternative Method of Compliance specified in NR 445.08(3) for hazardous air contaminants with unit risk factors established by either EPA or CARB.