



March 28, 2022

Mr. Andrew Drury
EGLE, Air Quality Division
Constitution Hall, 2nd Floor South
525 W. Allegan Street
Lansing, Michigan 48933-1502

RE: ADDITIONAL INFORMATION SUPPORTING PERMIT TO INSTALL APPLICATION NO. APP-2022-0004 (SRN A9831)

Dear Mr. Drury:

On March 14, 2022, the Michigan Department of Environment, Great Lakes, and Energy, Air Quality Division (AQD) asked Marathon Petroleum Company LP (Marathon) to provide the following additional information in support of Permit to Install Application No. APP-2022-0004:

1. Please provide PM₁₀ and PM_{2.5} modeling for this project. This can be a SIL analysis, as was done for SO₂.
2. Please provide the total reduced sulfur (TRS) compounds other than H₂S that are emitted. The application provides an estimate of TRS that is slightly higher than H₂S and indicates there are non-H₂S TRS compounds as well. These compounds need to be evaluated for Rule 225 compliance.
3. Please provide an explanation for why the North Plant H₂S emissions from loading (15 ppm) are lower than the East Plant emissions (300 ppm).
4. Please provide information comparing the SO₂ ppm emission limits in the permit conditions to the SO₂ emission rates used in the dispersion modeling.

The above-requested information is provided in this submittal.

PM₁₀ and PM_{2.5} Dispersion Modeling Analyses

Dispersion modeling analyses of potential PM₁₀ and PM_{2.5} emissions from the currently allowed operation of the North Plant (Unit 72) and East Plant (Unit 42) sulfur recovery units (SRUs), as well as the proposed operation of the North Plant SRU, have been conducted utilizing a dispersion model (AERMOD) and

modeling databases (e.g., receptor points, terrain, meteorological data) consistent with the SO₂ modeling submitted as part of the Permit to Install (PTI) application. Hourly PM₁₀ emission limits for both emission units are stipulated in Renewable Operating Permit No. MI-ROP-A9831-2012c (the ROP). For purposes of this modeling demonstration: 1) Annual emissions were conservatively based on continuous operation (8,760 hours) at the hourly potential to emit; and 2) PM_{2.5} emissions were considered equivalent to PM₁₀ emissions. Increases to the current permit-allowable emission limits are not proposed. Modeled hourly and annual emission rates are summarized in **Table 1**.

Resultant impacts from the existing and proposed operating scenarios were compared against the PM₁₀ and PM_{2.5} significant impact levels (SILs). As shown in **Table 2**, modeled impacts are less than the SILs under both operating conditions. The dispersion modeling input and output files are being provided in electronic format as part of this submittal.

Evaluation of Total Reduced Sulfur Compounds

The small difference in TRS emissions and H₂S emissions reflects a conservative assumption that dates back to the 2008 permitting of the Detroit Heavy Oil Upgrade Project (DHOUP). However, the Claus process for treating off-gas provides enough heat and hydrogen that the following reactions should favor a shift of TRS to H₂S:

- $\text{SO}_2 + 3\text{H}_2 \rightarrow 3\text{H}_2\text{O} + \text{H}_2\text{S}$
- $\text{S}_8 + 8\text{H}_2 \rightarrow 8\text{H}_2\text{S}$
- $\text{COS} + \text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{H}_2\text{S}$
- $\text{CS}_2 + 2\text{H}_2\text{O} \rightarrow \text{CO}_2 + \text{H}_2\text{S}$

The kinetics of the (shift reaction) to drive any CO in the tail gas to CO₂ is very quick and consequently is strongly favored over the production of COS.

This is also addressed in the AP-42 Final Background Document for Sulfur Recovery which states that “all sulfur compounds in the Claus reactors including sulfur vapor (S), CS₂, and COS are reduced to H₂S”.

Accordingly, Marathon does not expect measurable quantities of non-H₂S TRS compounds in the rail/truck loading operation.

Emissions Associated with North Plant and East Plant SRU Loading Operations

The North Plant SRU sulfur pits are equipped with stripping pumps that agitate/liberate H₂S from the liquid stream. Pit sweeping operations return the liberated H₂S to the front end of the SRU, where it is reintroduced to the process. This operation results in a higher level of H₂S control and reduces the H₂S concentration at the loading operation to no greater than 15 ppmw. The North Plant SRU H₂S control operation was determined to be T-BACT under Rule 336.1224 during permitting of DHOUP.

Permit-Allowable SO₂ Emissions

Though the project does not trigger a requirement to conduct an air quality impact analysis, dispersion model simulations were conducted to confirm that shifting sulfur recovery operations from the East Plant SRU to the North Plant SRU will not result in an increase in ambient SO₂ concentrations downwind of the refinery. Modeled emission rates were based on the following:

- Existing operations allowed under the ROP – Actual throughput and emissions from the period 2018 through 2020.
- Future operations – Projected throughput and emissions.

As described in the PTI application, the ROP sets a cap on SO₂ concentration levels (in ppm) from the North Plant SRU and East Plant SRU, which were made enforceable during the permitting of DHOUP. However, PTI No. 88-15 the ROP sets an enforceable SO₂ emissions cap of 88.0 tons per year from the two sulfur plants, the fluidized catalytic cracking unit (FCCU), and two gasoil hydrotreaters (GOHTs), which was made enforceable during the permitting of the Tier 3 fuels project. The Tier 3 fuels emissions cap is effectively more stringent than the direct sulfur plant ROP limits and is consistent with the projected emissions that were modeled as part of the SO₂ impacts analysis.

The impacts analysis confirms that shifting sulfur recovery operations from the East Plant SRU to the North Plant SRU will result in a reduction in SO₂ impacts downwind of the refinery.

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Should you have any questions or need additional information, please contact me at (616) 560-1799 (bleahy@barr.com) or Chris Abshire at (313) 297-6236 (CAbshire@marathonpetroleum.com).

Sincerely,



Brian Leahy
Senior Consultant

Enclosure

C: Jeremy Beasley, Marathon
Chris Abshire, Marathon

TABLE 1
PM10 AND PM2.5 EMISSION RATES - SULFUR CAP OPTIMIZATION PROJECT
MICHIGAN REFINING DIVISION

Emission Unit	ROP Emission Limits		Annual PTE	
	PM10	PM2.5	PM10	PM2.5
	(lb/hr)	(lb/hr)	(tons/yr)	(tons/yr)
EMISSIONS BASED ON ROP OPERATIONAL LIMITS (CURRENT OPERATING SCENARIO)				
Unit 42 SRU Thermal Oxidizer	1.75	1.75	7.7	7.7
Unit 72 SRU Thermal Oxidizer	2.85	2.85	12.5	12.5
Total:	4.60	4.60	20.1	20.1
EMISSIONS BASED ON ROP OPERATIONAL LIMITS (PROPOSED OPERATING SCENARIO)				
Unit 42 SRU Thermal Oxidizer				
Unit 72 SRU Thermal Oxidizer	2.85	2.85	12.5	12.5

Notes:

1. MI-ROP-A9831-2012c limits hourly PM10 emissions from both emission units.
2. For purposes of this modeling demonstration, PM2.5 emissions were considered equivalent to PM10 emissions.
3. Annual PTE based on the assumption that the emission unit will operate 8,760 hours per year.

**TABLE 2
SUMMARY OF MODELED PM10 AND PM2.5 IMPACTS ASSOCIATED WITH THE SULFUR CAP OPTIMIZATION PROJECT
MICHIGAN REFINING DIVISION**

Regulated Pollutant	Modeling Scenario	Averaging Period	Modeled Concentration (ug/m³)	Significant Impact Level (ug/m³)	PSD Increment (ug/m³)	NAAQS (ug/m³)	
PM10	Combined impact of SRU 42 and SRU 72 based on current permit-allowable ROP emission limits	24-Hour	0.43	5	30	150	
		Annual	0.06	1	17	-	
	Impact of SRU 72 based on current permit-allowable ROP emission limits	24-Hour	0.43	5	30	150	
		Annual	0.05	1	17	-	
	Reduction in modeled impact due to the project	24-Hour	0.00				
		Annual	-0.01				
PM2.5	Combined impact of SRU 42 and SRU 72 based on current permit-allowable ROP emission limits	24-Hour	0.43	1.2	9	35	
		Annual	0.06	0.2	4	12	
	Impact of SRU 72 based on current permit-allowable ROP emission limits	24-Hour	0.43	1.2	9	35	
		Annual	0.05	0.2	4	12	
	Reduction in modeled impact due to the project	24-Hour	0.00				
		Annual	-0.01				

Notes

1. Model runs conducted using AERMOD (Version 21112) over a five year meteorological database (Detroit City Airport, 2016 - 2020).