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March 31st, 2026

Susan Nash
Air Quality Permits Program
Air and Radiation Administration
Maryland Department of the Environment
1800 Washington Blvd, Suite 720
Baltimore, MD, 21230-1720

Re: ICO and MAG/MGX Expansion Projects PTC Application Addendum

Dear Ms. Nash,

W.R. Grace & Co-Conn. (Grace) is providing an addendum to the Permit to Construct application submitted June 25th, 2025, for the installation of a new production line at the Industrial Catalyst Operations Plant (ICO) as well as the modification of the existing expansion side of the Magnapore Catalyst Plant (MAG/MGX) at our Curtis Bay facility. Please find attached a public version of the addendum; confidential business information has been redacted, e.g., proprietary process data, unique production figures, and other business sensitive information. A confidential version of the addendum was submitted via hard copy to the Department on March 25th, 2026. The addendum includes responses to two question sets requested by MDE via email; an explanation of the methods used for calculating process related emissions; an explanation of the methods used for allocating natural gas usage to the boilers for steam generated to supply MAG/MGX; a revised Form 5 with an explanation of changes; a revised Form 5T with an explanation of changes; revised TAP demonstration reports with associated supporting calculations for ammonia, hexanol, and chromium; and a summary of Title V equipment changes.

If you need any additional information or have any questions, you can contact me at (443) 509-5415 or at madison.smith@grace.com.

Sincerely,

Madison Smith
Environmental Manager

Contents

1 MDE Question Sets and Responses

1.1 Question Set - August 6th, 2025

Outlook

[INTERNET] 2025 August 6 Question Set

From Susan Nash -MDE- <susan.nash@maryland.gov>
Date Wed 8/6/2025 2:31 PM
To Smith, Madison <Madison.Smith@grace.com>

Madison,

For the MAG/MGX expansion project (addition of four new washpots), I have some preliminary questions:

1. The addition of the four new washpots will not change the MAG/MGX throughput, but it will increase the operating hours (uptime) of that plant - is that correct?

2. On the MAG/MGX Form 5 submitted:
a. Block 9 - the 21 baghouses and 2 thermal oxidizers are existing equipment, correct?
b. Block 10 - the fuel usage shown only includes increases in MAG/MGX; it does not include fuel usage increases in POW, correct?
c. Block 15 - Are the fines from the MGX classifier (after the calciner) the "catalyst waste"? Is the used DI Water from the washpots that goes to the WWTP the "suspended solids"? Where are the "nitrates" from and where do they go?

3. I need stack parameters for all the stacks that have an increase in emissions due to the four new washpots:
stack height (in feet or meters)
stack inner diameter at the top of the stack (in feet or meters)
stack exit velocity (in feet per second or meters per second) OR flow rate (acfm or m3 per second)
Exit Temperature (F or K)
Shortest distance from stack to property line (meters)

4. Please explain why the increase in treatment of ammonium sulfate and ammonium hydroxide at the FCC Catalyst Plant will not result in an increase in emissions from that plant, at least due to more uptime.

5. The MAG/MGX process includes some grinding/ screening/ clarifying steps. Will there be an increase in particulate matter emissions due to the four new washpots? If yes - were these emissions increases included in the current estimates. If no - why not - please explain.

Thanks,
Sue

1.1.1 Response to Question Set – August 6th, 2025

For the MAG/MGX expansion project (addition of four new washpots), I have some preliminary questions:

1. The addition of the four new washpots will not change the MAG/MGX throughput, but it will increase the operating hours (uptime) of that plant - is that correct?

> **Response**: Correct, the addition of the four new washpots will not increase the maximum hourly throughput, but it will increase actual annual production due to an increase in the availability (uptime) of the plant. The theoretical maximum production capacity of the MAG/MGX facilities will increase by approximately 364 metric tons (mT) per year, assuming no downtime and 8,760 operating hours annually. The emissions associated with this project were conservatively evaluated using the maximum theoretical production capacity and no downtime to reflect worst-case emissions.

2. On the MAG/MGX Form 5 submitted:

a. Block 9 - the 21 baghouses and 2 thermal oxidizers are existing equipment, correct?

b. Block 10 - the fuel usage shown only includes increases in MAG/MGX; it does not include fuel usage increases in POW, correct?

c. Block 15 - Are the fines from the MGX classifier (after the calciner) the "catalyst waste"? Is the used DI Water from the washpots that goes to the WWTP the "suspended solids"? Where are the "nitrates" from and where do they go?

> **Response**:
>
> a. Block 9 – Yes, the 21 baghouses and 2 thermal oxidizers are existing equipment.
> b. Block 10 – Yes, the fuel usage shown reflects the maximum burner capacities and natural gas usage in MAG/MGX. The increase in fuel usage at POW was not included on the Form 5 but was included in the overall project emissions calculations as well as the NSR analysis.
> c. Block 15 – The “catalyst waste” reflects the total amount of fines recovered during multiple steps in the process. The “suspended solids” are from the washpot effluent that is routed to the Water Reclamation Plant on site for treatment. The “nitrates” line was incorrectly included; the source was originally ammonium nitrate from the washpot effluent, but this material was replaced with ammonium sulfate. A revised Form 5 can be found in **Appendix A**.

3. I need stack parameters for all the stacks that have an increase in emissions due to the four new washpots:

stack height (in feet or meters)

stack inner diameter at the top of the stack (in feet or meters)

stack exit velocity (in feet per second or meters per second) OR flow rate (acfm or m3 per second)

Exit Temperature (F or K)

Shortest distance from stack to property line (meters)

Response: A table summarizing stack parameters is provided below.

Form 5 MAG/MGX
Section 10. MAG/MGX Stack Information

Stack ID	Height Above Ground	Inside Diameter at Top	Flow Rate	Exit Temperature	Distance to Property Line
	(ft)	(ft)	(acfm)	(°F)	(m)
MAG-03	81	0.33	1.1	45	88.39
MAG-04	83.5	2.0	3,660	1,400	88.39
MAG-05	30	0.25	250	70	91.44
MAG-06	20	0.46	1	45	76.20
MAG-07	6	0.33	195	70	106.68
MAG-13	40	0.33	4	70	97.54
MAG-15	110	0.33	60	70	100.58
MGX-10	90	0.25	5	70	118.87
MGX-12	121	2.0	3,660	1,400	137.16
MGX-22	6	0.33	160	70	106.68
MGX-23	70	0.25	6	70	115.82

4. Please explain why the increase in treatment of ammonium sulfate and ammonium hydroxide at the FCC Catalyst Plant will not result in an increase in emissions from that plant, at least due to more uptime.

Response: There are two ammonia recovery units on site, one at the FCC Catalyst Plant and one at the FCC Additives Plant, both of which are closed-loop systems and do not have any direct emissions. The current quantity of ammonium sulfate recovered exceeds the quantity that is used in other production processes on site. The excess recovered material is sent off site for recycling or disposal. The availability of ammonium sulfate is not a rate-limiting step in existing production processes and will not result in increased uptime for those plants.

5. The MAG/MGX process includes some grinding/ screening/ clarifying steps. Will there be an increase in particulate matter emissions due to the four new washpots? If yes - were these emissions increases included in the current estimates. If no - why not - please explain.

Response: Yes, the increase in production capacity resulting from the addition of four new washpots has the potential to increase particulate matter emissions on an annual basis due to an increase in operating days. However, particulate matter emissions were quantified on a potential-to-emit basis according to the maximum hourly throughput rate, filter efficiency, maximum airflow rating of the equipment, and assumed 8,760 operating hours per year. The existing equipment utilized in the grinding, screening, and classifying steps of the process are routed to existing baghouses and bin vents to manage particulate matter emissions. An increase in hourly production rates is not anticipated, and as such, particulate matter emissions on a short-term basis will not increase. The washpots do not have any direct particulate matter emissions.

1.2 Question Set - August 13th, 2025

Outlook

[INTERNET] 2025 August 13 Question Set

From Susan Nash -MDE- <susan.nash@maryland.gov>
Date Wed 8/13/2025 10:35 AM
To Smith, Madison <Madison.Smith@grace.com>

1 attachment (271 KB)
MAG MGX Emission Point List.pdf;

Madison,

I have the following preliminary questions regarding emissions increases due to the proposed four (4) new washpots,

1. See the attached MAG/MGX emission point list - highlight which emissions points will have emissions increases, for any and all pollutants including Maryland Air Toxics, due to the proposed four (4) new washpots.
2. For any MAG/MGX emission points that will not have an increase in emissions for any pollutant, including on an annual basis, please explain why there will be no increase.
3. On August 6, 2025 when I was on site, it was said that there were no increases in chromium emissions due to the proposed four (4) new washpots. Looking at the 2024 revised ECR, the following emissions points have emissions of both chromium compounds and chrome +3:
a. MAG-04
b. MAG-05
c. MAG-07
d. MAG-13
e. MAG-15
f. MGX-12
g. MGX-22
h. MGX-28
Please explain why the emissions of chromium compounds and chrome +3 will not increase, at least on an annual basis, from these emission points.
4. Please list which MAG and MGX emission points will have increases in hexanol emissions due to the proposed four (4) new washpots. Please explain how the hexanol emissions are calculated – methodology, how the emission factors are developed, what data is used & the source of that data, what assumptions are made, etc...
5. Looking at the ECRs, MAG/MGX has emissions of CO, NOx, VOC, PM, PM10, PM2.5, PM condensables, Ammonia, Cadmium, Chromium Compounds, and Chrome +3 [greenhouse gas pollutants omitted]. I need to review and understand these calculaitons:
a. Methodology
b. Emission Factor development for non-combustion source pollutants [assuming combustion sources

use AP-42 emission factors]
c. Data and sources of the data [for example baghouse gr/dscf specifications, flow rates]
d. Assumptions
e. Any other information relevant to the calculations
6. Please list which POW emission points will have increased emissions due to the proposed four (4) new washpots.
7. I understand that the 2021 – 2024 ECRs have been modified because a new way to determine natural gas fuel usage was found, and used as the basis for the calculations. Please detail what the old method was and what the new method is.
8. I need Grace to develop a PUBLIC document to explain how emission calculations are done for all pollutants. This will need to show the method, explain data, explain assumptions, etc. This will likely be an iterative process.

Thanks,
Sue

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1.2.1 Response to Question Set – August 13th, 2025

I have the following preliminary questions regarding emissions increases due to the proposed four (4) new washpots,

1. See the attached MAG/MGX emission point list - highlight which emissions points will have emissions increases, for any and all pollutants including Maryland Air Toxics, due to the proposed four (4) new washpots.

Response: The following emission points will have particulate matter emission increases on an annual basis: MAG-04, MAG-05, MAG-07, MAG-13, MAG-15, MGX-12, and MGX-22. These points are also sources of chromium III emissions (a Class II TAP) which have the potential to increase on an annual basis due to an increase in operating days. The refined air dispersion model completed to demonstrate compliance with MDE's 8-hr screening level for chromium III utilized hourly potential-to-emit emission rates. The following emission points are sources of hexanol emissions (also a Class II TAP) and have the potential to increase emissions on an annual basis due to an increase in operating days: MAG-03, MAG-04, MAG-06, MGX-10, MGX-12, and MGX-23. Similar to chromium III, hourly hexanol emission rates were modeled at maximum potential rates. The complete modeling reports for chromium III and hexanol are included in **Appendix D**. See **Section 2** for a detailed explanation of emissions calculations.

2. For any MAG/MGX emission points that will not have an increase in emissions for any pollutant, including on an annual basis, please explain why there will be no increase.

Response: Emission points that will not have an increase in emissions for any pollutant, including on an annual basis, are as follows:

MAG-01 corresponds to the K-854 calciner combustion vent and emissions will not increase as there will be no change in how the calciner is operated. The hourly throughput will not increase, and emissions were calculated according to maximum burner capacity.

MAG-22 corresponds to a chilled water condenser for recovering hexanol vapors from two tanks where the condensed hexanol is returned to the tanks, there are no direct emissions from the condenser as the equipment was not constructed with an outlet for vapors.

MAG-24 corresponds to an eight-horsepower emergency generator and is included under the Insignificant Activities section of the site's Title V Operating Permit. An increase in generator operating hours is not expected.

MGX-28 corresponds to a pneumatic transfer system which emits indoors. Fugitive building emissions were already quantified on a potential-to-emit basis.

3. On August 6, 2025 when I was on site, it was said that there were no increases in chromium emissions due to the proposed four (4) new washpots. Looking at the 2024 revised ECR, the following emissions points have emissions of both chromium compounds and chrome +3:
a. MAG-04
b. MAG-05
c. MAG-07
d. MAG-13
e. MAG-15
f. MGX-12
g. MGX-22
h. MGX-28
Please explain why the emissions of chromium compounds and chrome +3 will not increase, at least on an annual basis, from these emission points.

> **Response:** The statement that there would be no increase in chromium emissions due to the proposed four new washpots was regarding an increase on a short-term basis (pounds/hour) since the maximum hourly throughput will not increase, however there is the potential for an increase in emissions on an annual basis assuming 8,760 operating hours per year. ***[Redacted projected actual annual operating hours; reflects expected maintenance downtime]***. Chromium III is a Class II Toxic Air Pollutant, as such, worst-case hourly emissions were modeled using AERMOD to demonstrate compliance with MDE's 8-hour screening level. The complete modeling report can be found in **Appendix D**. Emission point MGX-28 corresponds to a pneumatic transfer system and emits indoors, however it is subject to 40 CFR 63 Subpart VVVVVV. The emissions associated with MGX-28 were included in the Emission Certification Report for completeness.

4. Please list which MAG and MGX emission points will have increases in hexanol emissions due to the proposed four (4) new washpots. Please explain how the hexanol emissions are calculated – methodology, how the emission factors are developed, what data is used & the source of that data, what assumptions are made, etc…

> **Response:** Hexanol emissions due to the proposed four new washpots will not increase on a short-term basis as the hourly throughput will not increase. Hexanol emissions from the four existing condensers (MAG-03, MAG-06, MGX-10, and MGX-23) are calculated according to the equipment design and vapor pressure of hexanol. Hexanol emissions from the two existing thermal oxidizers (MAG-04 and MGX-12) are calculated based on the maximum hourly throughput of the respective calciner, hexanol content of the feed material, and control efficiency of the thermal oxidizer. The emission factors are calculated as a pound per day rate and actual hexanol emissions have the potential to increase on an annual basis due to an increase in operating days. Hexanol is a Class II Toxic Air Pollutant, as such, worst-case hourly emissions were modeled using AERMOD to demonstrate compliance with MDE's 8-hour screening level. The complete modeling report can be found in **Appendix D**.
>
> See **Section 2.4** for additional information on how hexanol emissions were calculated.

5. Looking at the ECRs, MAG/MGX has emissions of CO, NOx, VOC, PM, PM10, PM2.5, PM condensables, Ammonia, Cadmium, Chromium Compounds, and Chrome +3 [greenhouse gas pollutants omitted]. I need to review and understand these calculations:
a. Methodology
b. Emission Factor development for non-combustion source pollutants [assuming combustion sources use AP-42 emission factors]
c. Data and sources of the data [for example baghouse gr/dscf specifications, flow rates]
d. Assumptions
e. Any other information relevant to the calculations

Response: Combustion related emissions of CO, NOx, VOC, PM, PM_{10}, $PM_{2.5}$, PM condensables, and Cadmium utilize AP-42 emission factors and annual natural gas usage of the fuel burning equipment. A description of how natural gas usage is calculated can be found in **Section 3**.

There are also process related emissions of VOC (hexanol), PM, PM_{10}, $PM_{2.5}$, Ammonia, Chromium Compounds and Chrome +3. The methodology, emission factor development, data sources, and assumptions for process emissions are described in **Section 2** of this document.

6. Please list which POW emission points will have increased emissions due to the proposed four (4) new washpots.

Response: POW-01 (510-0076-5-0294) will be the primary emission point with increased emissions due to the increased steam demand to support the additional production capacity at MAG/MGX. POW-06 (510-0075-5-1679) has the potential for an increase in emissions; however, this unit serves as a backup for POW-01, and they are not permitted to be operated simultaneously except under start-up and shut-down conditions. Actual emissions are reported annually in the Emissions Certification Report.

7. I understand that the 2021 – 2024 ECRs have been modified because a new way to determine natural gas fuel usage was found and used as the basis for the calculations. Please detail what the old method was and what the new method is.

Response: See **Section 3** for a detailed description of how natural gas fuel usage is determined and utilized as the basis for combustion-related emissions.

8. I need Grace to develop a PUBLIC document to explain how emission calculations are done for all pollutants. This will need to show the method, explain data, explain assumptions, etc. This will likely be an iterative process.

Response: See **Section 2** for a description of the methods and data used for calculating all process-related emissions at both ICO and MAG/MGX.

2 Process Related Emissions

2.1 Particulate Matter

Both the ICO and MAG/MGX processes emit particulate matter during various production steps. These emissions are captured by bin vents and baghouses that serve as product recovery equipment. Stack emission rates were calculated according to equipment specifications including the maximum designed airflow, control efficiency of the filter media, and maximum input rate of particulate.

Sample calculation:

$$Short\ Term\ PM\ and\ PM_{10}\ Emissions\ \left(\frac{lb}{day}\right)$$
$$= Design\ Air\ Flowrate\ (acfm) \times Outlet\ Grain\ Loading\ \left(\frac{grains}{acfm}\right) \times \frac{1 lb}{7{,}000 grains} \times \frac{60\ minutes}{1\ hour} \times \frac{24\ hours}{1\ day}$$

Fugitive particulate matter emissions were calculated using industrial hygiene air monitoring results and airflow rating of the building exhaust fans.

$$\text{lb/hr} = \frac{C_{\text{mg/m}^3} \times \text{SCFM} \times 1.699}{453,592.37}$$

2.2 Chromium Compounds and Trivalent Chromium

Both the ICO and MAG/MGX processes utilize chromium compounds as raw materials. Trivalent chromium is a Class II toxic air pollutant (TAP) and emissions were quantified and modeled as part of the permit application to demonstrate compliance with MDE's 8-hr screening level. The complete refined air dispersion model report is in **Appendix D**. It is important to note that the proposed ICO Line 3 process will not utilize chromium. Chromium emissions from stacks were calculated as a fraction of the particulate matter emission rates according to measured chromium concentrations of the products; ***[Redacted specific percentages of chromium III concentrations; proprietary product composition data]***. Fugitive chromium emissions were calculated using industrial hygiene air monitoring results and airflow rating of the building exhaust fans.

2.3 Ammonia

Both ICO and MAG/MGX operations are sources of ammonia emissions. Ammonia is a Class II toxic air pollutant (TAP) and emissions were quantified and modeled as part of the permit application to demonstrate compliance with MDE's screening levels. The complete refined air dispersion model report can be found in **Appendix D**. The calculation basis for stack ammonia emissions from ICO and fugitive ammonia emissions from MAG/MGX are explained separately below.

2.3.1 ICO Process

In the ICO process, ammonia is present in silica gel, a raw material, and subsequently driven off during the drying process. Worst-case ammonia emissions were quantified using the maximum hourly spray dryer feed rate and product grade with the highest ammonia content that can be run on the corresponding production line; ICO East, ICO West, ICO Line 3. The concentration of ammonia present in the feed material was assumed to be completely emitted from the spray dryer stack. These worst-case hourly emissions were used in the air dispersion model to demonstrate compliance with MDE's 1-hr and 8-hr screening levels for ammonia.

Actual hourly ammonia emissions will be lower due to the average feed rate being approximately ***[Redacted percentage; reflects operational data]*** lower than the maximum rate used in the model calculations as well as variability in the material grade being produced; the volume of "high ammonia" material expected to be produced is less than ***[Redacted percentage of total annual production; reflects market and product mix information]***.

2.3.2 MAG/MGX Process

Ammonia is used as a raw material during the gel production process. This is done in open-top containers resulting in fugitive ammonia emissions from multiple building ventilation points. Emissions were calculated using measured airborne concentrations near the various exhaust locations and the exhaust airflow to determine a pound per hour emission rate.

$$\text{lb/hr} = \frac{C_{\text{mg/m}^3} \times \text{SCFM} \times 1.699}{453,592.37}$$

2.4 Hexanol

The MAG/MGX process utilizes hexanol which is emitted from multiple condensers and two thermal oxidizers, as well as fugitive emissions from building ventilation. Condenser emissions were calculated using the equipment design, airflow and operating temperature, and the vapor pressure of hexanol at that temperature. Vapor pressure was calculated using the equation below from *Perry's Chemical Engineers Manual 8th Edition* where T is temperature in Kelvin and C_1 through C_5 are substance-specific constants for 1-Hexanol.

$$\ln P = C_1 + \frac{C_2}{T} + C_3 \ln T + C_4 T^{C_5}$$

Thermal oxidizer emissions were calculated using the maximum hourly calciner throughput, hexanol content of the material ***[Redacted percentage of hexanol; reflects process and material composition details]***, and removal efficiency of the thermal oxidizer (99.9%). Fugitive hexanol emissions were calculated using industrial hygiene sampling results and maximum airflow at various exhaust sources.

$$\text{lb/hr} = \frac{C_{\text{mg/m}^3} \times \text{SCFM} \times 1.699}{453,592.37}$$

2.5 Carbon Dioxide

The two thermal oxidizers at MAG/MGX are control devices for volatile organic compounds, specifically hexanol. The thermal destruction process of hexanol generates carbon dioxide (CO_2). Since CO_2 is regulated as a greenhouse gas under EPA, the emissions were quantified as part of the permit application. Carbon dioxide emissions were conservatively calculated using the maximum theoretical production capacity, hexanol content of the material ***[Redacted percentage of hexanol; reflects process and material composition details]*** and assumed complete combustion of hexanol by converting the full quantity of hexanol emitted to CO_2 based on the following mass balance equation.

$$C_6H_{14}O + 9O_2 \rightarrow 6CO_2 + 7H_2O \qquad \textbf{Mass Ratio: } \frac{264.06\ g\ (CO_2)}{102.18\ g\ (\text{Hexanol})} \approx \mathbf{2.584}$$

3 Natural Gas Allocation

3.1 Original Method

Historically, actual meter readings were taken across the site each month, and the natural gas usage was calculated for each plant. However, in recent years there have been concerns with the accuracy of the meters and inconsistencies in the frequency of readings.

To better approximate actual gas usage by plant, representative values from years with consistent readings were evaluated to determine a ratio of usage by plant meter divided by the total of all meter readings on site for each month. This ratio was then applied to the actual gas delivered provided on monthly BGE invoices. Once the annual gas usage was calculated for each plant, usage by emission point was calculated as a ratio of the emission point's equipment burner rating(s) out of the total burner ratings for that plant.

This method was used in the original ECR submittals for 2021-2023.

3.2 Revised Method

In 2025, while preparing the 2024 ECR, it was identified that more detailed usage reports are available through the site's BGE accounts. These "Imbalance Reports" break down gas usage by account and meter at the site; a monthly therm factor (therm/ccf) is also included. There are a total of three accounts and eight meters owned by BGE that are covered by the reports.

The Imbalance Reports are intended to cover one calendar month, but occasionally the date range covered extends into another month. To account for this, the total actual therm usage is pulled from the BGE gas delivery invoices which do cover the entire calendar month and is converted to MMscf using the provided therm factor.

Each of the three account's usages must be evaluated slightly differently, due to differences in meter coverage.

1. CHP Units – Shared meter on one account. The total usage is pulled from the BGE delivery invoice and converted to MMscf using the therm factor provided on the Imbalance Report. Allocating gas to each unit is done by multiplying the ratio of operating days between the two units since the capacities are equivalent. The annual total for each unit is used for calculating combustion related emissions.
2. FCC Catalyst and Powerhouse Boilers – Independent meters on one account. To split the total monthly usage between FCC and POW, the Imbalance Report is used to determine the usage ratio between the two meters and is applied to the total usage listed on the BGE delivery invoice and converted to MMscf using the provided therm factor.

Allocating gas usage to the specific emission points at FCC is done by multiplying the burner rating ratio (equipment rating/total plant rating) and total annual gas usage. The approach for POW is modified to utilize a weighted average of burner capacity and operating days since each unit is reported separately under its own registration number.

3. AEO, ICO, SGO, MAG/MGX, and SCP - One meter covers AEO, one meter for ICO, two meters for SGO, and one shared meter for MAG/MGX and SCP. The first step is to determine actual monthly gas usage by meter. This is done using the same method as FCC and POW, utilizing the Imbalance Report for the meter usage ratios, BGE delivery invoice for the total monthly usage and the provided therm factor to convert therms to MMscf.

   The second step is to determine the total annual usage by plant. AEO and ICO are each covered by a single meter, the sum of monthly values is taken with no further adjustment needed. While SGO is covered by two meters, the annual total for each meter is evaluated separately to allocate usage by emission point, opposed to the total sum for SGO. Like the CHP units, MAG/MGX and SCP share one meter and the total burner ratings for each plant are equivalent, so a ratio of annual operating days is used to split gas usage between the two plants.

   The final step is to allocate gas usage to specific emission points. Since the emission points at SGO are split between two meters, each meter's connections to specific equipment were determined from plant utility distribution drawings. With the distribution loads known, allocating each meter's usage to its corresponding emission points is calculated utilizing the burner rating ratio (equipment rating/total plant rating) and total annual usage for that meter. This same allocation is used for the remaining plants.

This revised method was used in the original 2024 ECR submittal and 2021-2023 ECR resubmittals. Minor changes to the 2024 gas usage at MAG/MGX and SCP were made due to an update in annual operating days. Revised reports covering 2021 through 2024 emissions were provided to the Department in July 2025

3.3 MAG/MGX Expansion – Boiler Emissions

The Magnapore process requires steam during the gel washing steps. This steam is generated by existing process boilers; POW-01 (510-0076-5-0294), POW-02 (510-0076-5-0016), and POW-06 (510-0076-5-1679). The combustion related emissions from the boilers to support the increased steam demand at Magnapore were accounted for in the permit-to-construct application. This was done in four steps.

<u>Step 1: Projected Steam Usage at Magnapore</u>

Average annual steam usage at Magnapore for 2021 and 2022 was divided by the average annual production at Magnapore for the same period. The resulting ratio, steam usage (1,000 lbs) per production (lbs), was applied to the maximum annual production capacity (post-project) to calculate the projected steam demand at Magnapore.

<u>Step 2: POW Natural Gas Usage</u>

Average annual natural gas usage and steam production at POW for 2021 and 2022 was evaluated. The ratio of gas usage (Mcf) to steam production (1,000 lbs) at POW was multiplied by the projected steam demand at Magnapore from Step 1 to calculate the projected amount of natural gas used at POW to supply Magnapore post-project.

<u>Step 3: POW Fuel Oil Usage</u>

Since POW-01 is permitted to burn fuel oil (typically only done during a natural gas curtailment or required burner tune-ups), potential emissions from fuel oil usage were also estimated. Using data from 2021 through 2022, average total annual usage of fuel oil was multiplied by the ratio of annual steam usage at Magnapore to annual steam production at POW to calculate the amount of fuel oil usage attributable to supplying steam to Magnapore.

<u>Step 4: Total POW Emissions</u>

Combustion-related emissions at POW from natural gas (Step 2) were calculated using AP-42 emission factors and assumed 8,760 annual operating hours. Combustion-related emissions from fuel oil (Step 3) were calculated using 2024 stack test results for NOx and AP-42 emission factors for the remaining pollutants. The annual operating hours were assumed as 120 hours (average annual operating days on fuel oil in 2021 and 2022 multiplied by 24 hr/day).

4 Magnapore Form 5 Updates

During the revision process for the 2021-2024 ECRs, hexanol emission factors for the Magnapore (MAG/MGX) plant were refined to more accurately account for equipment design and operating conditions. The revised reports were submitted to the Department on July 14th, 2025. Sections 16 and 17 (Stack and Fugitive Emissions) of the Form 5 that was submitted for MAG/MGX with the permit-to-construct application for the ICO and MAG/MGX Expansion Projects on June 25th, 2025, did not capture the revised emission factors.

In the question set provided by Susan Nash on August 6th, 2025, clarification on Sections 9, 10, and 15 of the submitted Form 5 was requested. Upon Grace's review, an error was identified in Section 15 which outlines the process's waste streams. Nitrates (as N) were included on line 3 and are not a waste stream resulting from current operations nor the operating conditions resulting from the four proposed new washpots. A full response to this question set is in **Section 1.1.1**.

Upon further review of the Form 5 submitted in June 2025, it was discovered that the basis for the production capacity calculation post-expansion needed to be corrected. In the latest permit-to-construct issued in 2012, for the addition of two washpots and other equipment changes, the capacity calculations assumed a yield ***[Redacted specific yield; reflects process/operational data]*** of finished product per washpot batch. In the June 25th, 2025, permit-to-construct application for four additional washpots, the capacity calculations assumed a yield of ***[Redacted specific yield; reflects process/operational data]*** of finished product per washpot batch based on recent actual operations.

Included in this addendum are revised calculations to reflect a change in the capacity calculation basis ***[Redacted yield information]*** to align with the maximum production capacity assumptions used in the 2012 permit-to-construct. Revised capacity assumptions and emissions tables from the June 2025 permit application are included in **Appendix B**. In addition, the input material, output material, and waste stream rates were updated to reflect the increase in production capacity from ***[Redacted capacity values; reflects operational data]***. Note that one input material, sodium hydroxide, was removed. Sodium hydroxide was used in the deionized water system in MAG/MGX; however, this system was replaced by a reverse osmosis unit at the end of 2025 and does not require the use of sodium hydroxide.

An updated Form 5, using the Department's new format, is included in **Appendix A**. The updates cover Section 14 Input Materials and Usage Rates, Section 15 Output Materials and Production Rates, Section 16 Waste Streams, Section 17 Total Stack Emissions, and Section 18 Total Fugitive Emissions. An up-to-date certificate of liability insurance is also included.

5 Toxic Air Pollutant Compliance Demonstrations

5.1 Ammonia TAP Model Revisions

A TAP analysis for ammonia emissions was originally completed April 30th, 2025, and the report was submitted with the permit-to-construct application June 25th, 2025. This analysis was revised March 2026 and can be found in **Appendix D**. The primary changes were to the calculation basis for the three ICO emission points, the fugitive ammonia emissions from MAG/MGX, and the removal of one emission point from AEO. The changes are explained in more detail by operating area below.

5.1.1 Ammonia TAP Revisions - ICO

The ICO ammonia emissions were originally calculated according to projected production volumes and ammonia content for the specific product grades. The revised calculations utilized the maximum hourly throughput for each spray dryer and the product grade with the highest ammonia content that can be produced by that line to more accurately reflect worst-case hourly emissions. Total hourly ammonia emissions for the three ICO emission points (ICO_20, ICO_105, and ICO_PL3), increased from 6.37 lb/hr to 28.74 lb/hr.

5.1.2 Ammonia TAP Revisions – MAG/MGX

Fugitive ammonia emissions from the MAG/MGX process were refined in the revised model to more accurately reflect the fugitive source characteristics at the Magnapore plant (point sources instead of volume sources). The calculation basis for hourly ammonia emission rates used measured ambient ammonia concentrations from air sampling events and building exhaust airflow rates. The total hourly fugitive ammonia emissions from the MAG and MGX buildings increased from 0.43 lb/hr to 0.58 lb/hr.

5.1.3 Ammonia TAP Revisions – AEO

In the most recent TAP demonstration, AEO_11 emissions were set to zero (previously modeled at 36.98 lb/hr). This change is to reflect the future removal of AEO_11 and associated equipment from service as well as from the site's Title V Operating Permit (See **Section 6.1**). Prior to startup of the proposed ICO Line 3 process, AEO-11 (CAMET) and associated equipment would be removed from service. The reduction in ammonia associated with this emission point more than fully offsets the increase in ammonia emissions that can be attributed to the ICO Line 3 project (24.23 lb/hr). As the MAG/MGX washpot addition will not significantly increase the site's ammonia emissions, 0.15 lb/hr increase, Grace is requesting that the washpot addition may be completed prior to the removal of AEO-11 equipment from service.

5.2 Hexanol TAP Model Revisions

A TAP analysis for hexanol emissions was originally completed April 30th, 2025, and the report was submitted with the permit-to-construct application June 25th, 2025. This analysis was revised March 2026 and can be found in **Appendix D**. The changes included updates to the stack emission rates to reflect the ECR revisions that were submitted to the Department in July 2025 and to revise the source characteristics used for modeling fugitive hexanol emissions from volume sources to point sources to more accurately represent the air dispersion dynamics. Total stack emissions of hexanol decreased from 16.48 lb/day to 6.18 lb/day, largely due to changes in emissions from one of the existing thermal oxidizers (MAG-04) based on a correction in the removal efficiency. Total fugitive emissions of hexanol increased from 0.68 lb/day to 10.66 lb/day, resulting from updates to the data source, industrial hygiene sampling results, used to calculate hourly hexanol emissions.

5.3 Chromium III TAP Model Revisions

A TAP analysis report for chromium III emissions was not originally submitted with the permit-to-construct application. Instead, the estimated premises-wide emissions and prior ISCST3 model results were reported on Form 5T which was included in the June 2025 application. This analysis was updated March 2026 and can be found in **Appendix D**. The purpose of this update was to utilize the refined air dispersion modeling analysis that was completed for both the ammonia and hexanol compliance demonstrations. Emission rates and source characteristics were also updated to better reflect current operations.

6 Title V Equipment Updates

6.1 AEO Registration No. 510-0076-7-1077

Grace plans to decommission the Spheres process, registered under the AEO plant in the site's Title V Operating Permit. This would include all equipment that is currently associated with emission point AEO-11 and the CAMET control device. A list of the equipment is provided below as shown in the current Title V permit.

Equipment ID	Equipment Description
K-720	Spheres Dryer (direct fired)
FC-710A, B, C & D	Alumina Spheres Columns
F-706	Separator
CN-001	Centrifuge
T-710A, B, C & D	Holding Tanks
T-707	Filtrate Tank
T-601A&B	Solids Tanks
T-711A&B	Centrifuge Tanks
T-713	SBA Reactor
T-607*	Sodium Aluminate Storage Tank (No NH_3)
CC-720	CAMET Catalytic Converter to control NH_3

In addition to the reduction of ammonia emissions associated with AEO-11, the removal of the spheres dryer (K-720) and CAMET burner (CC-720) will result in a reduction of 6.53 tons per year NOx and 1.69 tons per year particulate matter on a potential-to-emit basis.

During a review of this equipment list, it was noted that a sodium aluminate storage tank (T-607) is shown associated with emission point AEO-11 and subsequently the CAMET, used to control ammonia emissions. This storage tank is not a source of ammonia emissions and appears to have been included in error under the AEO-11 emission point designation. Grace is requesting tank T-607 be removed from the AEO equipment list, as it is a raw material storage tank and not associated with any of the permitted AEO emission points.

6.2 CAO Registration No. 510-0076-7-1076

Grace also requests that multiple pieces of equipment registered under the CAO plant be removed from the site's Title V permit, as these units have been out of service for an extended period and will not be brought back online in the foreseeable future. A list of the equipment is provided below.

Emission Point ID	Equipment Description and ID
CAO-12 & CAO-13	Calciner 806 combustion flue gas vents
CAO-14A	Calciner 806 and 806A Baghouses 606 and 606A Packed Tower Absorber 686
CAO-15 & CAO-16	Calciner 806A combustion flue gas vents
CAO-17A	Calciner 806B Baghouse 606B Packed Tower Absorber 687
CAO-18, 19, 20 & 21	Calciner 806B combustion flue gas vents
CAO-43	Dryer 811 Baghouses 616, 616A, and 616B
CAO-44	Airveyor 498 from calciner to silo Baghouse 698
CAO-82	Calciner feed silo 199C Cartridge 699C

Due to this equipment having been out of service since approximately 2018, Grace does not intend to take credit for a reduction in NOx or particulate matter emissions associated with this change.

Appendix A – MDE Form 5

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AIR QUALITY PERMIT TO CONSTRUCT APPLICATION CHECKLIST

OWNER OF EQUIPMENT/PROCESS	
COMPANY NAME:	W.R. Grace & Co.-Conn.
COMPANY ADDRESS:	7500 Grace Drive, Columbia, MD 21044
LOCATION OF EQUIPMENT/PROCESS	
PREMISES NAME:	W.R. Grace & Co. - Curtis Bay
PREMISES ADDRESS:	5500 Chemical Road, Baltimore, MD 21226
CONTACT INFORMATION FOR THIS PERMIT APPLICATION	
CONTACT NAME:	Madison Smith
JOB TITLE:	Environmental Manager
PHONE NUMBER:	(443) 509-5415
EMAIL ADDRESS:	madison.smith@grace.com
DESCRIPTION OF EQUIPMENT OR PROCESS	
Addition of four new washpots at the Magnapore Expansion Plant	

Application is hereby made to the Department of the Environment for a Permit to Construct for the following equipment or process as required by the State of Maryland Air Quality Regulation, COMAR 26.11.02.09.

Check each item that you have submitted as part of your application package.

- ☒ Application package cover letter describing the proposed project
- ☒ Complete application forms (Note the number of forms included or NA if not applicable.)

  No. 1 Form 5
  No. 1 Form 5T
  No. NA Form 5EP
  No. NA Form 6
  No. NA Form 10
  No. NA Form 11
  No. NA Form 41
  No. NA Form 42
  No. NA Form 44

- ☐ Vendor/manufacturer specifications/guarantees
- ☒ Evidence of Workman's Compensation Insurance
- ☐ Process flow diagrams with emission points
- ☐ Site plan including the location of the proposed source and property boundary
- ☒ Material balance data and all emissions calculations
- ☐ Material Safety Data Sheets (MSDS) or equivalent information for materials processed and manufactured.
- ☐ Certificate of Public Convenience and Necessity (CPCN) waiver documentation from the Public Service Commission (1)
- ☐ Documentation that the proposed installation complies with local zoning and land use requirements (2)

(1) Required for emergency and non-emergency generators installed on or after October 1, 2001 and rated at 2001 kW or more.

(2) Required for applications subject to Expanded Public Participation Requirements.

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MARYLAND DEPARTMENT OF THE ENVIRONMENT

Air and Radiation Administration • Air Quality Permits Program
1800 Washington Boulevard • Baltimore, Maryland 21230
(410) 537-3230 • 1-800-633-6101• www.mde.maryland.gov

FORM 5
APPLICATION FOR
PROCESSING OR MANUFACTURING EQUIPMENT/PROCESS

☑ Permit to Construct ☑ Registration Update ☐ Initial Registration

1. Owner Information

Owner Name: W.R. Grace & Co.-Conn.
Owner Street Address: 7500 Grace Drive
City/State/Zip Code: Columbia Maryland 21044

2. Location of Equipment/Process

☑ Check if different from above. If checked, complete the following:
Premises Name: W.R. Grace & Co. - Curtis Bay
Premises Street Address: 5500 Chemical Road
City/State/Zip Code: Baltimore Maryland 21226

3. Contact Information

Contact Name: Madison Smith
Job Title: Environmental Manager
Phone Number: (443) 509-5415
Email Address: madison.smith@grace.com

4. Workers' Compensation Coverage Information

Before a Permit to Construct may be issued by the Department, the applicant must provide the Department with proof of worker's compensation coverage as required under Section 1-202 of the Workers' Compensation Act.

Company Name: American Zurich Insurance Company
Binder/Policy Number: WC792878906 Expiration Date: 11/15/2026

5. Person Installing Equipment/Process (if different from 1 above)

Installer Name and Title:
Installer Company Name:
Installer Street Address:
City/State/Zip Code:
Phone Number:

6. Description of Major Activity, Product, or Service of Company at this Location (include applicable SIC code)

Multi-product specialty inorganic chemicals manufacturing facility (SIC code 2819)

7. Installation Type

☐ New Equipment/Process
☑ Modification to Existing Equipment/Process
☐ Existing Equipment/Process

8. Projected Construction/Existing Operation Dates

Projected Construction Start Date: 09/2026
Projected Construction End Date: 09/2026
Projected Operating Date of New/Modified Equipment/Process: 10/2026
Existing Equipment/Process Initial Operating Date: 1980

9. Description of the Equipment/Process (include make, model, manufacturer, rated capacity, as applicable)

Addition of four new washpots at the Magnapore Expansion (MAG/MGX) Plant

10. Supplemental Equipment/Process Information

Number of Pieces of Identical Equipment Units to be Registered/Permitted at this Time: 4

Number of Stack/Emission Points Associated with the Equipment/Process: See Attached List

Fugitive Emissions Source? ☑ Yes ☐ No

Note: Complete a Form 5EP for each stack/emission point or fugitive discharge area.

11. Control Devices Associated with this Equipment/Process

Note: Complete a Form 6 for each control device.

☐ None ☑ Baghouse/Fabric Filter ☐ Cyclone ☐ Electrostatic Precipitator
☐ Dust Suppression ☐ Venturi Scrubber ☐ Adsorption System ☐ Spray Tower/Packed Bed
☑ Oxidizer ☐ Nitrogen Oxides Reduction ☐ Other, specify:

12. Fuel Consumption for this Equipment/Process

☑ Natural Gas 31,776 1000 cubic feet/year
☐ Propane/LP Gas ____ 100 gallons/year
☐ Distillate Fuel Oil ____ 1000 gallons/year
☐ Residual Fuel Oil ____ 1000 gallons/year
☐ Coal (attach fuel specifications) ____ tons/year
☐ Wood (attach fuel specifications) ____ tons/year
☐ Other (describe): ____ (specify units)

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13. Operating Schedule for this Equipment/Process

☑ Continuous Operation
☐ Batch Process
_____ hours/batch _____ batches/week
24 operating hours/day
7 operating days/week
365 operating days/year

Seasonal Variation? ☐ Yes ☑ No
If yes, complete the following:
_____ Winter Percent _____ Spring Percent
_____ Summer Percent _____ Fall Percent
Total Seasons = 100% operating time

14. Input Materials and Usage Rates (attach additional materials as necessary)

Name of Input Material	CAS No. (if applicable)	Input Rate Per Hour	Identify Unit of Measure	Input Rate Per Year	Identify Unit of Measure
See attached list					

15. Output Materials and Production Rates (attach additional materials as necessary)

Name of Output Material or Product	CAS No. (if applicable)	Output Rate Per Hour	Identify Unit of Measure	Output Rate Per Year	Identify Unit of Measure
Magnapore Catalyst		421	pounds	1,846	tons

16. Waste Streams - Solid and Liquid (attach additional materials as necessary)

Name of Waste Material or Waste Product	CAS No. (if applicable)	Waste Generation Rate Per Hour	Identify Unit of Measure	Waste Generation Rate Per Year	Identify Unit of Measure
Catalyst Waste		181	pounds	791	tons
Suspended Solids		30	pounds	133	tons

17. Total Stack Emissions for this Equipment/Process

Pollutant	Amount	Unit
Nitrogen Oxides	4.42	lbs/operating day
Carbon Monoxide	7.31	lbs/operating day
Sulfur Oxides	0.05	lbs/operating day
Particulate Matter (PM-10)	2.51	lbs/operating day
Particulate Matter (PM-2.5)	2.41	lbs/operating day
Volatile Organic Compounds	6.66	lbs/operating day
Greenhouse Gases (CO_{2e})	8,421	lbs/operating day

18. Total Fugitive Emissions for this Equipment/Process

Pollutant	Amount	Unit
Nitrogen Oxides	0	lbs/operating day
Carbon Monoxide	0	lbs/operating day
Sulfur Oxides	0	lbs/operating day
Particulate Matter (PM-10)	2.78	lbs/operating day
Particulate Matter (PM-2.5)	2.64	lbs/operating day
Volatile Organic Compounds	10.66	lbs/operating day
Greenhouse Gases (CO_{2e})	0	lbs/operating day

19. Required Documents

☑ Air Quality Permit to Construct Application Checklist - Include all required items on the checklist with the Form 5 application

☑ Check this box if this application includes confidential information and submit one confidential copy of the application and one copy with all confidential information removed.

20. Responsible Party Certification Statement

"I CERTIFY UNDER PENALTY OF LAW THAT THE INFORMATION SUBMITTED IN THIS REQUEST FOR COVERAGE IS, TO THE BEST OF MY KNOWLEDGE AND BELIEF, TRUE, ACCURATE, AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT FOR KNOWING VIOLATIONS."

Responsible Party Signature [signature] **Date** 3/20/2026

Printed Name and Title Jeff Lukowski Sr. ~~Operations~~ SITE Director

For ARA Use Only

Date Received:	
Date Reviewed:	
Reviewed By:	
ARA Premises Number:	
Associated ARA Registration Number or Numbers:	

Public File

Form 5 MAG/MGX Plant
Section 14. MAG/MGX Input Materials and Rates

Name	CAS No.	Code Letter	Per Hour	Units	Per Year	Units
[redacted]		A	172	LBS.	755	TONS
		B	2,163	LBS.	9,476	TONS
		C	61	LBS.	268	TONS
		D	270	LBS.	1,183	TONS
		E	31	LBS.	135	TONS
		F	250	LBS.	1,094	TONS
		G	1,234	LBS.	5,407	TONS

Redacted raw material identification; proprietary product information.

PUBLIC COPY

CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY) 11/20/2025

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

Holder Identifier :

PRODUCER
Aon Risk Services South, Inc.
Atlanta GA Office
Three Ravina Drive
22nd Floor
Atlanta GA 30346 USA

CONTACT NAME:
PHONE (A/C. No. Ext): (866) 283-7122 FAX (A/C. No.): (800) 363-0105
E-MAIL ADDRESS:

INSURED
W.R. Grace
7500 Grace Drive
Columbia MD 21044 USA

INSURER(S) AFFORDING COVERAGE		NAIC #
INSURER A:	Zurich American Ins Co	16535
INSURER B:	American Zurich Ins Co	40142
INSURER C:	Illinois Union Insurance Company	27960
INSURER D:		
INSURER E:		
INSURER F:		

COVERAGES **CERTIFICATE NUMBER:** 570116773034 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

Limits shown are as requested

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	COMMERCIAL GENERAL LIABILITY						EACH OCCURRENCE	
	CLAIMS-MADE / OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	
							MED EXP (Any one person)	
							PERSONAL & ADV INJURY	
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	
	POLICY / PRO-JECT / LOC						PRODUCTS - COMP/OP AGG	
	OTHER:							
A	AUTOMOBILE LIABILITY			BAP 7900598 06	11/15/2025	11/15/2026	COMBINED SINGLE LIMIT (Ea accident)	$2,000,000
	X ANY AUTO						BODILY INJURY (Per person)	
	OWNED AUTOS ONLY / SCHEDULED AUTOS						BODILY INJURY (Per accident)	
	HIRED AUTOS ONLY / NON-OWNED AUTOS ONLY						PROPERTY DAMAGE (Per accident)	
C	X UMBRELLA LIAB / X OCCUR			XCEG71204455008	11/15/2025	11/15/2026	EACH OCCURRENCE	$10,000,000
	EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$10,000,000
	DED / X RETENTION $25,000,000							
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			WC792878906 Workers Comp. AOS	11/15/2025	11/15/2026	X PER STATUTE / OTH-ER	
	ANY PROPRIETOR / PARTNER / EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N: Y	N / A					E.L. EACH ACCIDENT	$2,000,000
	(Mandatory in NH)						E.L. DISEASE-EA EMPLOYEE	$2,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE-POLICY LIMIT	$2,000,000

Certificate No : 570116773034

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

W.R. Grace & Co. and their subsidiaries worldwide. Evidence of Insurance.

CERTIFICATE HOLDER

W. R. Grace & Co.
7500 Grace Drive
Columbia MD 21044 USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Aon Risk Services South Inc.

Appendix B – Revised Permit Application Tables

- one (1) coarse classifier feed hopper (EV-35114), with a bin vent (EBV-35614), and
- one (1) fines classifier feed hopper (EV-35115), with a bin vent (EBV-35615).

Existing emission units and controls units, which include the hydrogel hopper (V-1101) with two (2) cartridge collectors (BH2209N, BH2209S) and hammer mill slurry tank (T-1102) which will be shared across all the ICO lines, and the classifier (M-716) with a classifier ultra fine cyclone (C-216) and a cartridge collector (BH-216), both truck silos (T-184, T-185) with their respective bin vents (BV-284, BV-285), and the Bulk Truck Portable Fugitive Product Collector with its cartridge collector (BH-218) will be shared between the ICO West Line and the new ICO Line 3. The increase in production from ICO Line 3 is anticipated to lead to a slight increase in actual emissions from these existing units but will not affect the potential emissions from them. Accordingly, due to the increased uptime, projected actual emissions across the shared equipment in the ICO lines have been calculated based on a maximum of 365 operational days per year.

2.2 MAGNAPORE® Catalyst Plant (MAG / MGX) Modifications

The existing MAGNAPORE® Catalyst Plant currently uses a total of nineteen (19) washpots which are allocated between MAG and MGX, to complete the gel washing step that is integral to production of the MAGNAPORE® catalyst. This MGX Plant modification will install four (4) new washpots and their associated wash solution, and utility supply and return manifolds in the MGX gel washing area. This modification also installs support infrastructure in the MGX gel washing area to accommodate the storage of 12-16 more wash baskets. These changes will increase production capacity of the MAG / MGX facilities by approximately 364 metric tons (mT) per year.

3.4 Site-Wide Emissions Summary

A detailed project netting analysis, including potential emissions for the new units, baseline actual emissions, and projected actual emissions for existing units, is provided in **Appendix 3**. A summary comparing the project's emission increases to the Major Modification SER is presented in **Table 1**.

Table 1. Project Emissions Increases Compared with PSD Significant Emission Rates

Pollutant	Step 1- Project Emission Increases (tpy)	Major Modification Significant Emission Rate (tpy)	Major Permitting Triggered (tpy)	Step 2- Project Netting (tpy)	Major Permitting Triggered (tpy)
NO_X	4.20	25	**No**	2.14	**No**
CO	10.01	100	**No**	6.58	**No**
PM	8.83	25	**No**	2.52	**No**
PM_{10}	8.83	15	**No**	2.52	**No**
$PM_{2.5}$	8.43	10	**No**	2.42	**No**
SO_2	0.07	40	**No**	0.05	**No**
VOC	3.73	25	**No**	0.54	**No**
Pb	5.98E-05	0.6	**No**	3.92E-05	**No**
CO_2e	15,834	-	**N/A**	10,159	**N/A**

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W.R. Grace Co.-Conn.
5500 Chemical Rd, Baltimore, MD 21226
Project Netting

STEP 1 - Project Emission Increases		NO_x	CO	PM	PM_{10}	$PM_{2.5}$	SO_2	VOC	Pb	CO_2e
		(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)
Project Potenital to Emit (PTE)	ICO Line 3	0.59	3.97	1.99	1.99	1.91	0.03	0.26	2.36E-05	5,642
	Magnapore Expansion									
	Total	**0.59**	**3.97**	**1.99**	**1.99**	**1.91**	**0.03**	**0.26**	**2.36E-05**	**5,642**
Project Increases - Projected Actuals	Increased utilization of existing ICO West assets	0.00	0.00	5.44	5.44	5.17	0.00	0.00	0.00	0
	Increased throughput at Magnapore	0.81	1.33	0.96	0.96	0.92	0.01	3.16	7.94E-06	3,447
	Increased steam production at Powerhouse	2.81	4.71	0.43	0.43	0.43	0.03	0.31	2.82E-05	6,745
	Total	**3.61**	**6.04**	**6.83**	**6.83**	**6.52**	**0.04**	**3.47**	**3.61E-05**	**10,192**
	Total PTE + PAE	**4.20**	**10.01**	**8.83**	**8.83**	**8.43**	**0.07**	**3.73**	**5.98E-05**	**15,834**
	Major Modification SER	**25**	**100**	**25**	**15**	**10**	**40**	**25**	**0.6**	**-**
	Major Permitting Triggered?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

STEP 2 - Project Netting		NO_x	CO	PM	PM_{10}	$PM_{2.5}$	SO_x	VOC	Pb	CO_2e
		(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)	(TPY)
Project Past Actuals (BAE)	Existing ICO assets emissions	0.00	0.00	5.18	5.18	4.92	0.00	0.00	0.00	0
	Magnapore	0.62	1.02	0.91	0.91	0.87	0.01	3.03	6.09E-06	2,228
	Magnapore - Powerhouse contributions	1.43	2.41	0.22	0.22	0.22	0.02	0.16	1.45E-05	3,448
	Total BAE	**2.05**	**3.43**	**6.31**	**6.31**	**6.01**	**0.02**	**3.19**	**2.06E-05**	**5,675**
Project Netting (Increases and Decreases)	**Total PTE + PAE - Project Decreases - BAE**	**2.14**	**6.58**	**2.52**	**2.52**	**2.42**	**0.05**	**0.54**	**3.92E-05**	**10,159**
	Major Modification SER	**25**	**100**	**25**	**15**	**10**	**40**	**25**	**0.6**	**-**
	Major Permitting Triggered?	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

Magnapore Expansion Projected Actual Emissions (PAE)

	PM	PM_{10}	$PM_{2.5}$[3]	SO_2[4]	NO_x[5]	VOC[6]	CO[7]	Pb[8]	CO_2e[9]
PAE (tpy)[1,2]	1.39	1.39	1.35	0.04	3.61	3.47	6.04	0.00	10,192
Significant Emissions (tpy)[10]	25	15	10	40	25[11]	25[11]	100	0.6	75,000[12]

1. Emissions from increased natural gas usage at Magnapore as well as POW to support additional steam demand.
2. Conservatively assuming hourly production related emissions at 8,760 hours/year.
3. Assume $PM_{2.5} = 0.95 * PM_{10}$
4. AP-42 Table 1.4-2; 0.6 lb/MMscf
5. AP-42 Table 1.4-1; 50 lb/MMscf
6. AP-42 Table 1.4-2; 5.5 lb/MMscf
7. AP-42 Table 1.4-1; 84 lb/MMscf
8. AP-42 Table 1.4-2; 0.0005 lb/MMscf
9. AP-42 Table 1.4-2; 120,000 lb/MMscf CO_2, 0.64 lb/MMscf N_2O, 2.3 lb/MMscf CH_4
10. 40 CFR §52.21(b)(23)(i)
11. COMAR 26.11.17.01 B(26)(a)
12. 40 CFR §52.21(b)(49)(iv)(B)

	PM	PM_{10}	$PM_{2.5}$	SO_2	NO_x	VOC	CO	Pb	CO_2e
Projected Actuals	1.39	1.39	1.35	0.043	3.61	3.47	6.04	0.00	10,192
Baseline Emissions	1.12	1.12	1.08	0.025	2.05	3.19	3.43	0.00	5,675
Project Increases	0.27	0.27	0.27	0.019	1.56	0.28	2.61	0.00	4,517

MAG/MGX Expansion Project Emissions

Post-Expansion Production Capacity	
23	Number of Washpots
100	% Availability/OEE
[redacted]	Batches/Washpot per day
	Lbs FP/batch
10,120	Lbs FP/day
3,693,800	Lbs FP/year
1,675	**MT FP/Year**

Redacted production information.

2021 - 2022 Data				
Area	**Data Type**	**Units**		**Average**
Magnapore	Production	Lbs	Per Year	[redacted]
Magnapore	Natural Gas	Mcf	Per Year	
Magnapore	Steam Use	1,000 Lbs	Per Year	
POW	Natural Gas	Mcf	Per Year	
POW	Steam Production	1,000 Lbs	Per Year	
Magnapore	Nat Gas / Production	Mcf / Lbs	Ratio	
Magnapore	Steam / Production	1,000 Lbs / Lbs	Ratio	
POW	Nat Gas / Steam Produced	Mcf / 1,000 Lbs	Ratio	
Magnapore	Steam Projected Usage	1,000 Lbs	Per Year	
Magnapore	Nat Gas Burner Capacity	Mcf	Per Year	
POW	Nat Gas Projected Usage	Mcf	Per Year	

Redacted actual production volumes and utilities usage.

Criteria Pollutant (tpy)	Source - Magnapore Combustion	Source - POW Steam Production	Source - Magnapore Process	MAG Total (tpy)	Total PAE (tpy)
PM	0.12	0.43	0.84	0.96	1.39
PM_{10}	0.12	0.43	0.84	0.96	1.39
$PM_{2.5}$	0.12	0.43	0.80	0.92	1.35
SO_2	0.01	0.03	-	0.01	0.04
NO_x	0.81	2.81	-	0.81	3.61
VOC	0.09	0.31	3.07	3.16	3.47
CO	1.33	4.71	-	1.33	6.04
Pb	0.00	0.00	-	0.00	0.00
CO_2	1,907	6,731	1,537	3,443	10,175
CH_4	0.04	0.13	-	0.04	0.17
N_2O	0.01	0.04	-	0.01	0.05
CO_2e	1,911	6,745	1,537	3,447	10,192

Appendix C – MDE Form 5T

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MARYLAND DEPARTMENT OF THE ENVIRONMENT

Air and Radiation Management Administration ● Air Quality Permits Program
1800 Washington Boulevard ● Baltimore, Maryland 21230
(410)537-3225 ● 1-800-633-6101● www.mde.maryland.gov

FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration

Applicant Name: W.R. Grace & Co. - Curtis Bay

Step 1: Quantify premises-wide emissions of Toxic Air Pollutants (TAP) from new and existing installations in accordance with COMAR 26.11.15.04. Attach supporting documentation as necessary.

Toxic Air Pollutant (TAP)	CAS Number	Class I or Class II?	Screening Levels (µg/m³)			Estimated Premises Wide Emissions of TAP			
						Actual Total Existing TAP Emissions	Projected TAP Emissions from Proposed Installation	Premises Wide Total TAP Emissions	
			1-hour	8-hour	Annual	(lb/hr)	(lb/hr)	(lb/hr)	(lb/yr)
ex. ethanol	*64175*	*II*	*18843*	*3769*	*N/A*	*0.60*	*0.15*	*0.75*	*1500*
ex. benzene	*71432*	*I*	*80*	*16*	*0.13*	*0.5*	*0.75*	*1.00*	*400*
Chrome +3	16065831	II	NA	5.00	NA	0.053	0.00	0.053	467
Ammonia	7664417	II	243.7832	174.1309	NA	30.57	24.23	54.81	480,101
Hexanol	111273	II	NA	27.30	NA	0.702	0.00	0.702	6,147

(attach additional sheets as necessary.)

Note: Screening levels can be obtained from the Department's website (http://www.mde.maryland.gov) or by calling the Department.

Step 2: Determine which TAPs are exempt from further review. A TAP that meets either of the following Class I or Class II small quantity emitter exemptions is exempt from further TAP compliance demonstration requirements under Step 3 and Step 4.

Class II TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(a))
A Class II TAP is exempt from Step 3 and Step 4 if the Class II TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour, and any applicable 1-hour or 8-hour screening level for the TAP must be greater than 200 µg/m³.

Class I TAP Small Quantity Emitter Exemption Requirements (COMAR 26.11.15.03B(3)(b))
A Class I TAP is exempt from Step 3 and Step 4 if the Class I TAP meets the following requirements: Premises wide emissions of the TAP shall not exceed 0.5 pounds per hour and 350 pounds per year, any applicable 1-hour or 8-hour screening level for the TAP must be greater than 200 µg/m³, and any applicable annual screening level for the TAP must be greater than 1 µg/m³.

If a TAP meets either the Class I or Class II TAP Small Quantity Emitter Exemption Requirements, no further review under Step 3 and Step 4 are required for that specific TAP.

FORM 5T: Toxic Air Pollutant (TAP) Emissions Summary and Compliance Demonstration

Step 3: Best Available Control Technology for Toxics Requirement (T-BACT, COMAR 26.11.15.05)
In the following table, list all TAP emission reduction options considered when determining T-BACT for the proposed installation. The options should be listed in order beginning with the most effective control strategy to the least effective strategy. Attach supporting documentation as necessary.

Target Pollutants	Emission Control Option	% Emission Reduction	Costs		T-BACT Option Selected? (yes/no)
			Capital	Annual Operating	
ex. ethanol and benzene	*Thermal Oxidizer*	*99*	*$50,000*	*$100,000*	*no*
ex. ethanol and benzene	*Low VOC materials*	*80*	*0*	*$100.000*	*yes*
Chrome +3	Filters/Dust Collectors	99	$20,000-300,000	$10,000-$100,000	yes
Ammonia	Absorbers/Scrubbers	95	$500,000	$200,000	yes
Hexanol	Condensers	99	$80,000	$5,000	yes
Hexanol	Thermal Oxidizers/Afterburners	99	$300,000	$100,000	yes

(attach additional sheets as necessary)

Step 4: Demonstrating Compliance with the Ambient Impact Requirement (COMAR 26.11.15.06)
Each TAP not exempt in Step 2 must be individually evaluated to determine that the emissions of the TAP will not adversely impact public health. The evaluation consists of a series of increasingly non-conservative (and increasingly rigorous) tests. Once a TAP passes a test in the evaluation, no further analysis is required for that TAP. "Demonstrating Compliance with the Ambient Impact Requirement under the Toxic Air Pollutant (TAP) Regulations (COMAR 26.11.15.06)" provides guidance on conducting the evaluation. Summarize your results in the following table. Attach supporting documentation as necessary.

Toxic Air Pollutant (TAP)	CAS Number	Screening Levels (μg/m^3)			Premises Wide Total TAP Emissions		Allowable Emissions Rate (AER) per COMAR 26.11.16.02A		Off-site Concentrations per Screening Analysis (μg/m^3)			Compliance Method Used?
		1-hour	8-hour	Annual	(lb/hr)	(lb/yr)	(lb/hr)	(lb/yr)	1-hour	8-hour	Annual	AER or Screen
ex. ethanol	*64175*	*18843*	*3769*	*N/A*	*0.75*	*1500*	*0.89*	*N/A*	*N/A*	*N/A*	*N/A*	*AER*
ex. benzene	*71432*	*80*	*16*	*0.13*	*1.00*	*400*	*0.04*	*36.52*	*1.5*	*1.05*	*0.12*	*Screen*
Chrome +3	16065831	N/A	5.00	N/A	0.053	467	0.0179	N/A	N/A	0.75	N/A	AERMOD
Ammonia	7664417	243.783	174.131	N/A	54.81	480,101	0.6234	N/A	231.0045	159.6849	N/A	AERMOD
Hexanol	111273	N/A	27.30	N/A	0.702	6,147	0.0977	N/A	N/A	25.79	N/A	AERMOD

(attach additional sheets as necessary)

If compliance with the ambient impact requirement cannot be met using the allowable emissions rate method or the screening analysis method, refined dispersion modeling techniques may be required. Please consult with the Department's Air Quality Permit Program prior to conducting dispersion modeling methods to demonstrate compliance.

Appendix D – TAP Ambient Impact Compliance Demonstration Reports

1.0 MARYLAND TAP ANALYSIS FOR AMMONIA

The Project is subject to the Maryland toxic air pollutant (TAP) requirements because TAPs will discharge into the ambient air, and the Project is required to obtain a Permit-to-Construct (PTC) under COMAR 26.11.02.09 (pursuant to COMAR 26.11.15.03(A)(1)).

COMAR 26.11.15.06 requires a demonstration that TAP emissions will not unreasonably endanger human health. Grace is demonstrating compliance with this ambient impact requirement using a screening analysis as specified under COMAR 26.11.15.07. According to COMAR 26.11.16.02(A), such a demonstration is made by showing that TAP emissions from the premises will not cause increases in ambient levels that exceed the applicable TLV- /threshold-based screening level for a Class II TAP (MDE Screening Levels).

1.1 TAP Sources/Ammonia Emissions

The maximum expected premises-wide ammonia emissions were calculated using stack test/monitoring data, process rates, product ammonia content, ammonia usage, tank vapor displacement, mass balance and engineering judgement.

Table 1 identifies the premises-wide ammonia sources along with a description of the source and the calculated ammonia emissions.

TABLE 1 TAP SOURCES AND AMMONIA EMMISIONS

STACK ID	AMMONIA EMISSIONS (G/S)	SOURCE DESCRIPTION	CONTROLS
SGO_21	0.518	A-Mill and Baghouse	
SGO_32	0.115	K-11/Activator and Baghouse	
SGO_56	0.433	Flash Dryer and Baghouse	
SGO_68	0.324	Wash Tanks vent	
SGO_74	0.179	B-Mill and Baghouse	
SAC_111	0.001	Spray Dryer and 8 Cyclones	Venturi Scrubber and Hot Water Generator HCL Scrubber
SAC_115	0.025	Calciner and Cyclone, Dryer and 2 Cyclones	Calciner and 2 Scrubbers, Dryer Scrubber and Ammonia Absorber
SAC_123	0.019	Ammonia Storage Tank	Ammonia Scrubber
AEO_82	0.05	Dryer, Kiln III (exhaust and flue gas), Kiln 1, Kiln I Cooler, Calciner Kiln (exhaust gas) and Baghouse	SCR Reactor
ICO_20	2.42	West Plant Spray Dryer and Baghouse	
ICO_105	0.958	East Plant Spray Dryer and Baghouse	
DCO_01	0.31	Building 317 Fugitives (stack)	
DCO_23	0.003	3 electric Calciners	Venturi Scrubber and 2 Packed Tower Absorbers
AEO_54	0.38	Building 342 Fugitives (stack)	
SGO_84	0.52	Turbo Dryer and Baghouse	
ICO_PL3	0.243	New Line 3 Spray Dryer and Baghouse	

STACK ID	AMMONIA EMISSIONS (G/S)	SOURCE DESCRIPTION	CONTROLS
SGO_33	0.33	Building 111 Fugitives (vents)	
344_1	0.00238	Magnapore Building 344 Fugitives (vent)	
344_2	0.00402	Magnapore Building 344 Fugitives (vent)	
344_3	0.00402	Magnapore Building 344 Fugitives (vent)	
344_4	0.00402	Magnapore Building 344 Fugitives (vent)	
344_5	0.00402	Magnapore Building 344 Fugitives (vent)	
344A_1	0.00171	Magnapore Building 344A Fugitives (vent)	
344A_2	0.00177	Magnapore Building 344A Fugitives (vent)	
344A_3	0.01701	Magnapore Building 344A Fugitives (vent)	
344A_4	0.01701	Magnapore Building 344A Fugitives (vent)	
344A_5	0.01701	Magnapore Building 344A Fugitives (vent)	

1.2 TAPS Compliance Screening Analysis

A refined screening approach is used to demonstrate compliance. In this refined screening, off-site ground-level impacts of maximum expected ammonia emissions (the ammonia Class II TAP is listed under COMAR 26.11.16.07 B) are estimated using refined air quality modeling, consistent with COMAR 26.11.16.02(A)(3) (and COMAR 26.11.16.02(C)(1)), are directly compared to the applicable MDE Screening Levels.

Refined Air Quality Modeling

A more rigorous, refined air quality dispersion modeling analysis, consistent with COMAR 26.11.16.02(A)(3) (and COMAR 26.11.16.02(C)(1)) was performed to predict off-site 1-hr and 8-hr TAP concentrations. The United States Environmental Protection Agency's (USEPA) guidance given in Appendix W to 40 CFR 51 was followed in the performance of this refined air quality modeling for the TAP ammonia.

- Air quality model

The refined modeling was conducted using the USEPA air quality model (AERMOD) (version 24142) using Providence/ORIS BEEST Suite (version 12.13a) as the user interface. The standard regulatory default option was invoked in AERMOD. In addition, the adjusted u* regulatory option was invoked.

- Model receptors

Concentrations were projected at ground-level locations (receptors) on the W.R. Grace Curtis Bay property line and at locations off site (including receptors not on land, to be comprehensive). Model receptors were located to determine the expected highest off-site short-term concentrations. A total of 5683 receptors were used. Receptors were placed along the property line at 25-m spacing. Also, receptors were placed in a grid at 25-m spacing out to 200 m from the property, and at 100-m spacing out to 3 km from the property. Figures 1 and 2 show maps of the closer-in model receptors and the entire receptor grid, respectively.

The Grace facility is isolated within a highly industrial section of Curtis Bay surrounded by other industries and a landfill. No general public reside in the vicinity of the facility. Much of the Grace facility (to the North and West) is surrounded by a large water body. The inaccessibility of the shoreline and inhospitable nature of the industrial facility deters public access. There is fencing along almost all the property to the East and South. In addition, there is a guardhouse at the entrance to the facility, signage, and video surveillance that preclude/deter public access.

Ground elevations (as well as hill-height scaling factors used by AERMOD) of each receptor were obtained using AERMAP (version 24142), AERMOD's terrain preprocessor. United States Geological Survey (USGS) digital elevation data (3DEP data with a resolution of 1 arc-second) for the modeling domain were input to AERMAP.

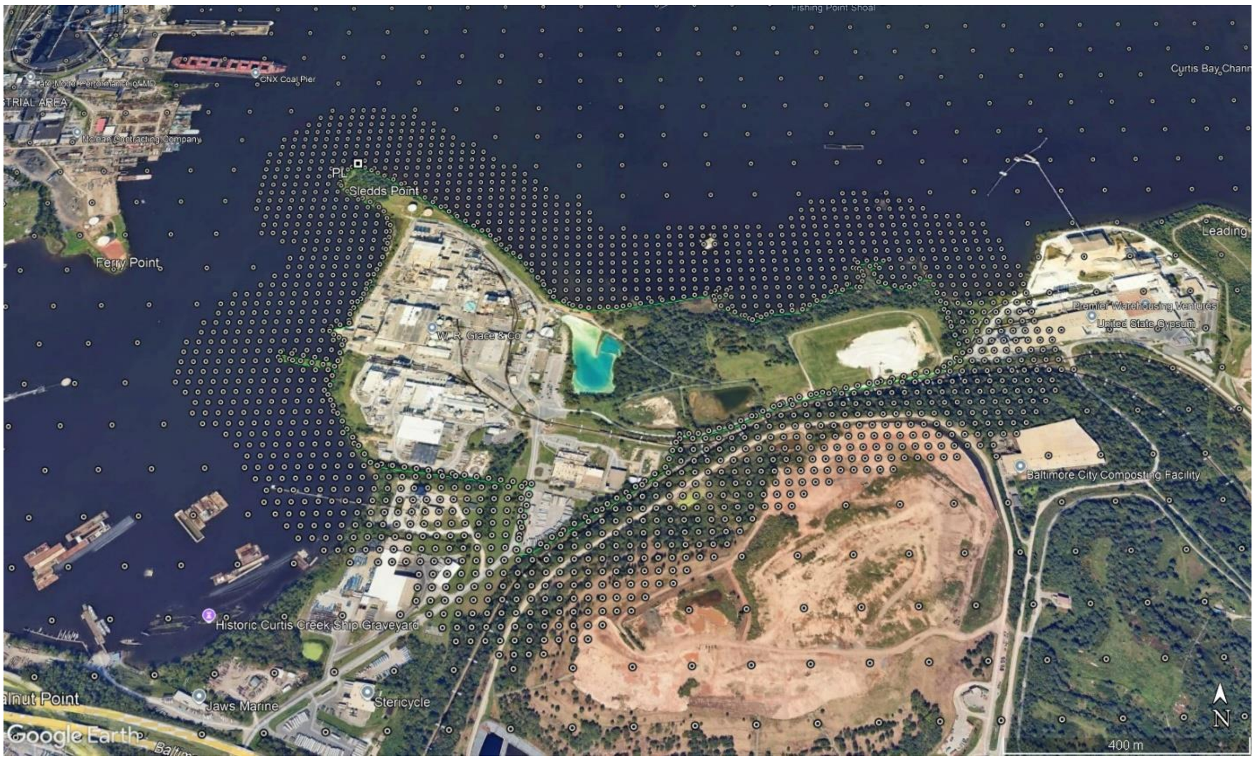

FIGURE 1 RECEPTOR MAP – CLOSE-IN RECEPTORS

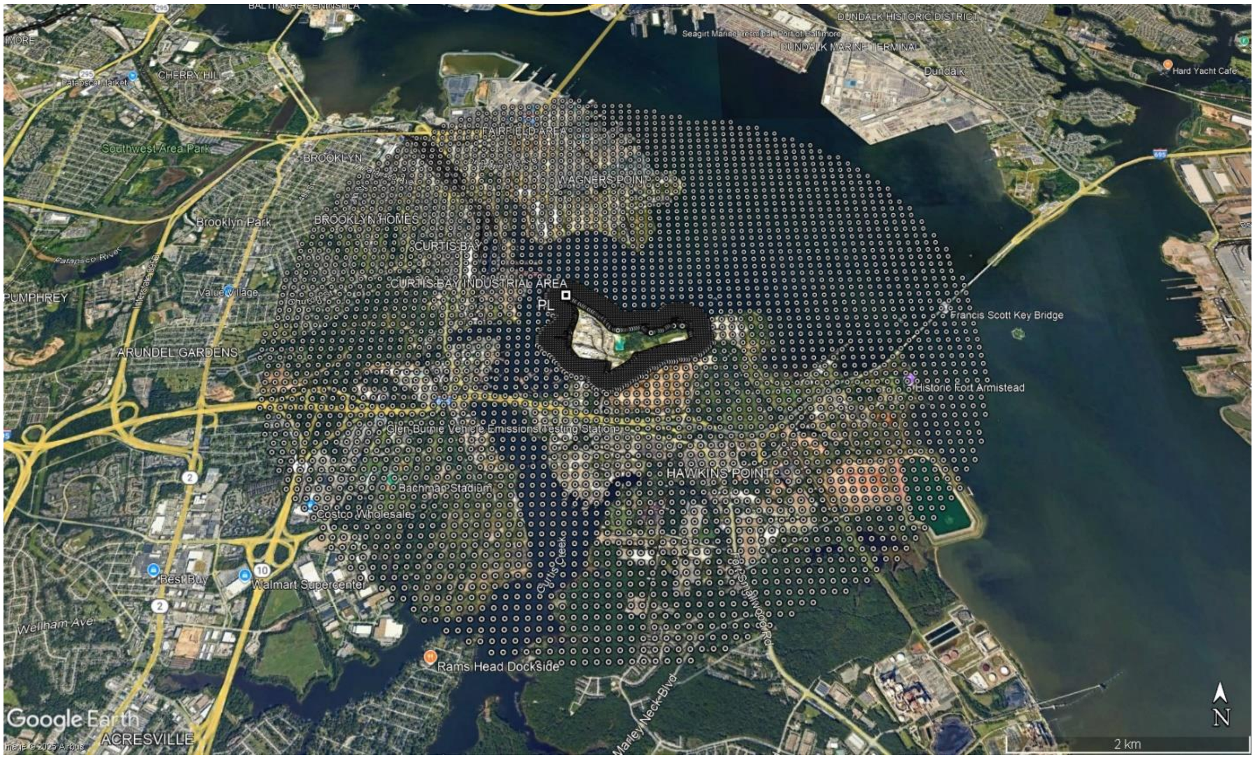

FIGURE 2 RECEPTOR MAP – ENTIRE RECEPTOR GRID

- Rural/urban classification

The Land Use Procedure given in USEPA Appendix W to 40 CFR 51 section 7.2.1.1(b)(i) was used to determine the urban/rural status for the dispersion modeling. The Project sources are located within an urban area (Baltimore urban area), but located close enough to a body of water (Patapsco River and Curtis Creek) or other non-urban land use categories to result in a predominantly rural land use classification within 3 km of the source. Section 5.1 of the AERMOD Implementation Guide (EPA-450/B-24-009, November 2024) cautions users against applying the Land Use Procedure on a source-by-source basis but should also consider the potential for urban heat island influences across the full modeling domain. Following Maryland Department of the Environment's (MDE) suggestion (in comments from LiAn Zhuang by email dated 4/23/25), the Land Use Procedure was used to determine the urban/rural status but disregarding the area of water within 3 km of the source. After removing the area covered by water (32%), 68% of the 3-km radius area is land. GoogleEarth images and US Geological Survey National Land Cover Database (NLCD) data for the area of interest were reviewed. Approximately 70% of the relevant land area is comprised of urban land use types as proposed by Auer (J. Appl. Meteor., 17, 636-643, May 1978). As a result, AERMOD was run in the urban mode. The April 2020 census population of nearby Baltimore City (585708) and the default surface roughness length were input to AERMOD to run the urban mode.

- Meteorological data

The recent five consecutive years (2019 through 2023) of AERMOD-ready representative meteorological input data were obtained from MDE (specifically, the SFC and PFL files provided by MDE's LiAn Zhuang (email dated 9/30/24)). The surface meteorological data (Automated Surface Observing System data) were collected at Baltimore/Washington International

Thurgood Marshall Airport, Anne Arundel County, Maryland (WBAN 93721), and the upper air meteorological data were collected at Sterling, Virginia (Dulles International Airport) (WBAN 93734). MDE used AERSURFACE (version 20060) to determine representative surface characteristics and AERMET (version 23132) to process the meteorological data. The adjusted u* regulatory option was invoked in AERMET.

- Structure downwash

Direction-specific building dimensions of nearby/adjacent buildings/structures/tanks on the premises were generated using BPIPPRM (version 04274) and input to AERMOD to address the potential structure wake effects on stack plumes. Premise wide, 177 buildings/structures/tanks were included in the structure downwash analysis.

- Stack characteristics

Two types of sources were modeled: point sources and volume sources. Point sources were used to represent emissions from stacks and distinct vents, while volume sources were used to represent building fugitive emissions from a line source roof vent. Note that after further assessment of sources, it was decided that point sources (at different locations), rather than volume sources (used in the ammonia modeling performed in April 2025), would be more representative of the fugitive building emissions vents at the Magnapore Plant.

Regarding point sources, stacks were represented in different ways in AERMOD depending on their release characteristics. Stacks/vents with horizontal releases were represented as POINTHOR stacks. Note that the building fugitive emissions point sources in Table 2 (sources 344 and 344A) were given an exit temperature of 0 K, which AERMOD interprets as ambient temperature.

The USEPA User's Guide for the Industrial Source Complex (ISC3) Dispersion Models (EPA-454/B-95-003a) was followed in developing the source characteristics of the volume sources.

The SGO_33 source is a roof line source and was represented by 42 separated volume sources. The separation distance between the volume sources is two times the width, W, of the source (W is 3 ft). The Syinit (initial $SIGMA_y$) is calculated as 2W/2.15 [2*3/2.15=2.79 ft]. The Szinit (initial $SIGMA_z$) is calculated as Hb/2.15 [40/2.15=18.60 ft], where Hb is the average building roof height (40 ft).

Tables 2 and 3 present characteristics of modeled sources, input to AERMOD, for ammonia.

TABLE 2 CHARACTERISTICS OF MODELED POINT SOURCES

STACK ID	LOCATION		BASE ELEV.	STACK HEIGHT	STACK DIAMETER	STACK EXIT VELOCITY	STACK EXIT TEMP.	RELEASE TYPE
	UTM E (m)	UTM N (m)	(m)	(m)	(m)	(m/s)	(K)	
SGO_21	364407.0	4341540.7	6.5	24.08	0.46	22.94	421.89	
SGO_32	364468.9	4341582.5	6.9	9.14	0.71	5.94	349.67	
SGO_56	364413.9	4341526.6	6.7	32.00	0.25	26.08	394.11	
SGO_68	364495.8	4341520.9	7.1	23.77	0.51	18.63	310.78	
SGO_74	364446.7	4341527.0	6.4	16.76	0.46	10.22	421.89	
SAC_111	364323.0	4341583.8	6.4	60.96	1.68	16.04	343.00	
SAC_115	364281.7	4341624.8	6.2	45.72	1.37	14.21	327.44	
SAC_123	364295.0	4341519.3	6.3	9.14	0.15	5.17	310.78	
AEO_82	364375.8	4341879.5	4.5	48.77	1.52	18.33	483.56	
ICO_20	364313.9	4341774.3	4.7	26.14	0.61	21.67	435.93	
ICO_105	364364.4	4341767.3	4.8	27.74	0.61	22.64	435.93	
DCO_01	364697.6	4341370.1	11.0	14.63	0.42	10.16	324.67	
DCO_23	364734.7	4341393.2	10.0	15.24	0.2	5.82	333.00	
AEO_54	364392.8	4341853.4	4.8	16.76	3.51	12.67	293.15	
SGO_84	364451.8	4341607.8	6.3	12.19	0.61	14.34	422.04	
ICO_PL3	364305.7	4341779.3	4.7	28.42	0.61	21.67	435.93	
344_1	364538.2	4341810.0	5.6	3.96	1.61	2.68	0	POINTHOR
344_2	364530.7	4341811.5	5.6	10.67	1.46	2.95	0	POINTHOR
344_3	364531.9	4341811.2	5.6	10.67	1.46	2.95	0	POINTHOR
344_4	364534.5	4341810.7	5.6	9.14	1.46	2.95	0	POINTHOR
344_5	364538.2	4341810.0	5.6	12.19	1.46	2.95	0	POINTHOR
344A_1	364524.8	4341812.7	5.6	3.96	1.61	1.92	0	POINTHOR
344A_2	364522.2	4341813.2	5.5	3.96	1.61	1.99	0	POINTHOR
344A_3	364503.7	4341819.6	5.2	7.62	1.62	5.75	0	POINTHOR
344A_4	364512.6	4341814.9	5.4	7.62	1.62	5.75	0	POINTHOR
344A_5	364519.4	4341813.7	5.5	9.14	1.62	5.75	0	POINTHOR

TABLE 3 CHARACTERISTICS OF MODELED VOLUME SOURCES

SOURCE ID	LOCATION		BASE ELEV.	RELEASE HEIGHT	INITIAL SIGMAY	INITIAL SIGMAZ
	UTM E (m)	UTM N (m)	(m)	(m)	(m)	(m)
S33_0001	364520.8	4341535.7	7.4	12.19	0.85	5.67
S33_0002	364519.0	4341536.1	7.4	12.19	0.85	5.67
S33_0003	364517.2	4341536.4	7.4	12.19	0.85	5.67
S33_0004	364515.4	4341536.8	7.4	12.19	0.85	5.67

SOURCE ID	LOCATION		BASE ELEV.	RELEASE HEIGHT	INITIAL SIGMAY	INITIAL SIGMAZ
	UTM E (m)	UTM N (m)	(m)	(m)	(m)	(m)
S33_0005	364513.6	4341537.1	7.3	12.19	0.85	5.67
S33_0006	364511.8	4341537.5	7.3	12.19	0.85	5.67
S33_0007	364510.0	4341537.8	7.3	12.19	0.85	5.67
S33_0008	364508.2	4341538.2	7.3	12.19	0.85	5.67
S33_0009	364506.4	4341538.6	7.3	12.19	0.85	5.67
S33_0010	364504.6	4341538.9	7.3	12.19	0.85	5.67
S33_0011	364502.8	4341539.3	7.3	12.19	0.85	5.67
S33_0012	364501.0	4341539.6	7.3	12.19	0.85	5.67
S33_0013	364499.2	4341540.0	7.3	12.19	0.85	5.67
S33_0014	364497.4	4341540.4	7.3	12.19	0.85	5.67
S33_0015	364495.7	4341540.7	7.3	12.19	0.85	5.67
S33_0016	364493.9	4341541.1	7.3	12.19	0.85	5.67
S33_0017	364492.1	4341541.4	7.3	12.19	0.85	5.67
S33_0018	364490.3	4341541.8	7.3	12.19	0.85	5.67
S33_0019	364488.5	4341542.1	7.2	12.19	0.85	5.67
S33_0020	364486.7	4341542.5	7.2	12.19	0.85	5.67
S33_0021	364484.9	4341542.9	7.2	12.19	0.85	5.67
S33_0022	364483.1	4341543.2	7.2	12.19	0.85	5.67
S33_0023	364481.3	4341543.6	7.1	12.19	0.85	5.67
S33_0024	364479.5	4341543.9	7.1	12.19	0.85	5.67
S33_0025	364477.7	4341544.3	7.1	12.19	0.85	5.67
S33_0026	364475.9	4341544.7	7.1	12.19	0.85	5.67
S33_0027	364474.1	4341545.0	7.0	12.19	0.85	5.67
S33_0028	364472.3	4341545.4	7.0	12.19	0.85	5.67
S33_0029	364470.5	4341545.7	7.0	12.19	0.85	5.67
S33_0030	364468.8	4341546.1	7.0	12.19	0.85	5.67
S33_0031	364467.0	4341546.5	7.0	12.19	0.85	5.67
S33_0032	364465.2	4341546.8	7.0	12.19	0.85	5.67
S33_0033	364463.4	4341547.2	7.0	12.19	0.85	5.67
S33_0034	364461.6	4341547.5	7.0	12.19	0.85	5.67
S33_0035	364459.8	4341547.9	7.0	12.19	0.85	5.67
S33_0036	364453.5	4341549.1	6.9	12.19	0.85	5.67
S33_0037	364451.7	4341549.5	6.9	12.19	0.85	5.67
S33_0038	364449.9	4341549.8	6.9	12.19	0.85	5.67
S33_0039	364448.1	4341550.2	6.9	12.19	0.85	5.67
S33_0040	364446.3	4341550.6	6.9	12.19	0.85	5.67
S33_0041	364435.3	4341552.8	6.8	12.19	0.85	5.67
S33_0042	364433.5	4341553.1	6.8	12.19	0.85	5.67

Refined Screening Compliance Demonstration

Table 4 presents the refined modeling results (projected maximum off-site concentrations and locations) for the premises-wide, multi-stack analysis. Table 5 compares the projected maximum off-site ammonia impacts with the applicable MDE Screening Levels and demonstrates compliance (i.e., maximum off-site concentrations do not exceed MDE Screening Levels).

TABLE 4 REFINED MODELING RESULTS FOR AMMONIA

TAP	MAXIMUM MODELED IMPACT					
	1-hr			8-hr		
	Conc.	Location		Conc.	Location	
		E UTM	N UTM		E UTM	N UTM
	(µg/m³)	(m)	(m)	(µg/m³)	(m)	(m)
Ammonia	231.0045	364226.69	4341743.81	159.6849	364759.64	4341310.51

TABLE 5 REFINED MODELING TAP COMPLIANCE - COMPARISON BETWEEN MAXIMUM MODELED AMMONIA CONCENTRATIONS AND MDE SCREENING LEVELS

TAP	CAS #	MAXIMUM MODELED CONCENTRATION		MDE SCREENING LEVEL		COMPLIANCE	
		1-hr	8-hr	1-hr	8-hr	1-hr	8-hr
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)		
Ammonia	7664-41-7	231.0045	159.6849	243.7832	174.1309	Yes	Yes

1.0 MARYLAND TAP ANALYSIS FOR HEXANOL

The Project is subject to the Maryland toxic air pollutant (TAP) requirements because TAPs will discharge into the ambient air, and the Project is required to obtain a Permit-to-Construct (PTC) under COMAR 26.11.02.09 (pursuant to COMAR 26.11.15.03(A)(1)).

COMAR 26.11.15.06 requires a demonstration that TAP emissions will not unreasonably endanger human health. Grace is demonstrating compliance with this ambient impact requirement using a screening analysis as specified under COMAR 26.11.15.07. According to COMAR 26.11.16.02(A), such a demonstration is made by showing that TAP emissions from the premises will not cause increases in ambient levels that exceed the applicable TLV- /threshold-based screening level for a Class II TAP (MDE Screening Levels).

1.1 TAP Sources/Hexanol Emissions

The maximum expected premises-wide hexanol emissions were calculated using condenser vapor pressure, process rates, mass balance, control efficiencies, monitoring data, and engineering judgement.

Table 1 identifies the premises-wide hexanol sources along with a description of the source and the calculated hexanol emissions.

TABLE 1 TAP SOURCES AND HEXANOL EMMISIONS

STACK ID	HEXANOL EMISSIONS (G/S)	SOURCE DESCRIPTION	CONTROLS
MAG_03	0.00056	3 Tanks, 3 Reactors and Condenser	
MAG_04	0.00756	Calciner and Filters	Thermal Oxidizer
MAG_06	0.00051	Dryer, Tower Water Condenser and Chilled Water Condenser	
MGX_10	0.00602	7 Tanks, 2 Reactors and Chilled Water Condenser	
MGX_12	0.01058	Electric Calciner and Filters	Thermal Oxidizer
MGX_23	0.00723	Dryer, Tower Water Condenser and Chilled Water Condenser	
EXFAN_A	0.00239	Magnapore Building 344 Fugitives (vent)	
EXFAN_05	0.00479	Magnapore Building 344 Fugitives (vent)	
EXFAN_B	0.00416	Magnapore Building 344 Fugitives (vent)	
EXFAN_06	0.00819	Magnapore Building 344 Fugitives (vent)	
MGX56	0.00265	Magnapore Building 391 Fugitives (vent)	
MGX57	0.00428	Magnapore Building 391 Fugitives (vent)	
MGX62	0.00819	Magnapore Building 391 Fugitives (vent)	
MGX63	0.00517	Magnapore Building 391 Fugitives (vent)	
MGX64	0.00731	Magnapore Building 391 Fugitives (vent)	
MGX65	0.00466	Magnapore Building 391 Fugitives (vent)	
MGX66	0.00416	Magnapore Building 391 Fugitives (vent)	

1.2 TAPS Compliance Screening Analysis

A refined screening approach is used to demonstrate compliance. In this refined screening, off-site ground-level impacts of maximum expected hexanol emissions are estimated using refined air quality modeling, consistent with COMAR 26.11.16.02(A)(3) (and COMAR 26.11.16.02(C)(1)), are directly compared to the applicable MDE Screening Levels.

Refined Air Quality Modeling

A more rigorous, refined air quality dispersion modeling analysis, consistent with COMAR 26.11.16.02(A)(3) (and COMAR 26.11.16.02(C)(1)) was performed to predict off-site 1-hr and 8-hr TAP concentrations. The United States Environmental Protection Agency's (USEPA) guidance given in Appendix W to 40 CFR 51 was followed in the performance of this refined air quality modeling for the TAP hexanol.

- Air quality model

The refined modeling was conducted using the USEPA air quality model (AERMOD) (version 24142) using Providence/ORIS BEEST Suite (version 12.13a) as the user interface. The standard regulatory default option was invoked in AERMOD. In addition, the adjusted u* regulatory option was invoked.

- Model receptors

Concentrations were projected at ground-level locations (receptors) on the W.R. Grace Curtis Bay property line and at locations off site (including receptors not on land, to be comprehensive). Model receptors were located to determine the expected highest off-site short-term concentrations. A total of 5683 receptors were used. Receptors were placed along the property line at 25-m spacing. Also, receptors were placed in a grid at 25-m spacing out to 200 m from the property, and at 100-m spacing out to 3 km from the property. Figures 1 and 2 show maps of the closer-in model receptors and the entire receptor grid, respectively.

The Grace facility is isolated within a highly industrial section of Curtis Bay surrounded by other industries and a landfill. No general public reside in the vicinity of the facility. Much of the Grace facility (to the North and West) is surrounded by a large water body. The inaccessibility of the shoreline and inhospitable nature of the industrial facility deters public access. There is fencing along almost all the property to the East and South. In addition, there is a guardhouse at the entrance to the facility, signage, and video surveillance that preclude/deter public access.

Ground elevations (as well as hill-height scaling factors used by AERMOD) of each receptor were obtained using AERMAP (version 24142), AERMOD's terrain preprocessor. United States Geological Survey (USGS) digital elevation data (3DEP data with a resolution of 1 arc-second) for the modeling domain were input to AERMAP.

FIGURE 1 RECEPTOR MAP – CLOSE-IN RECEPTORS

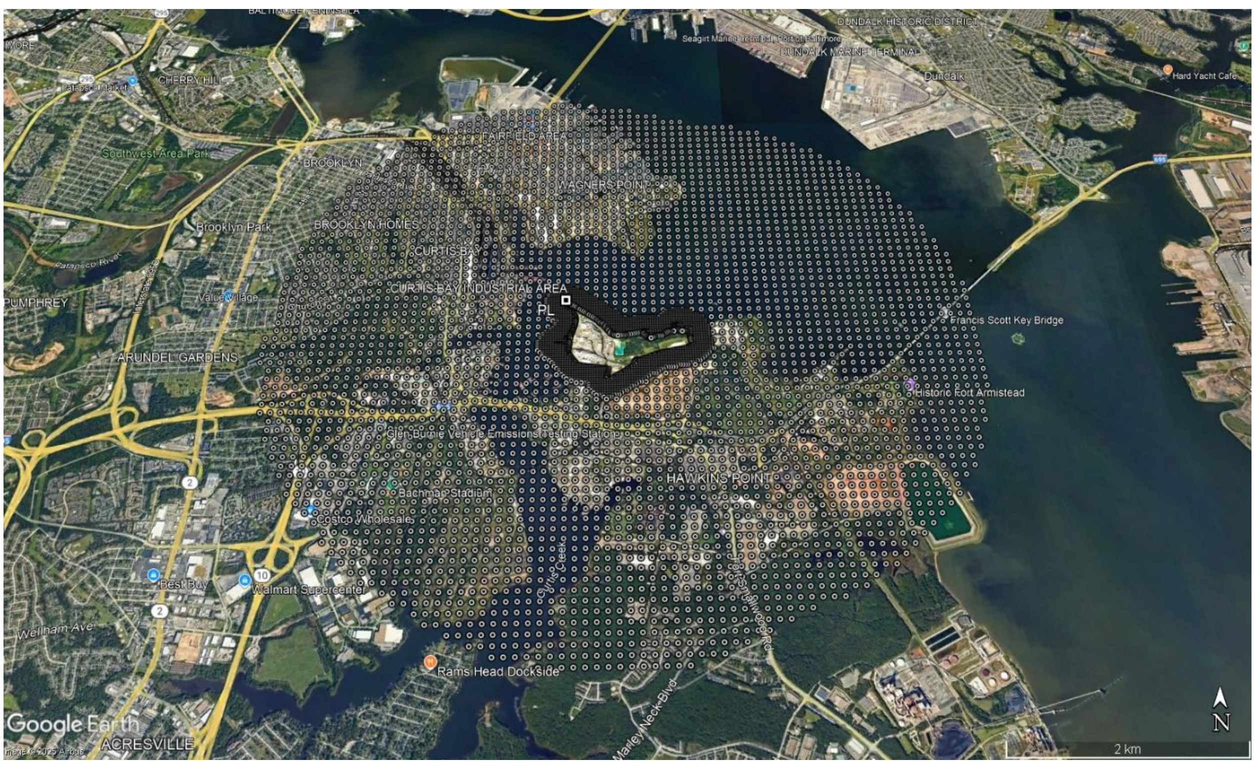

FIGURE 2 RECEPTOR MAP – ENTIRE RECEPTOR GRID

- Rural/urban classification

The Land Use Procedure given in USEPA Appendix W to 40 CFR 51 section 7.2.1.1(b)(i) was used to determine the urban/rural status for the dispersion modeling. The Project sources are located within an urban area (Baltimore urban area), but located close enough to a body of water (Patapsco River and Curtis Creek) or other non-urban land use categories to result in a predominantly rural land use classification within 3 km of the source. Section 5.1 of the AERMOD Implementation Guide (EPA-450/B-24-009, November 2024) cautions users against applying the Land Use Procedure on a source-by-source basis but should also consider the potential for urban heat island influences across the full modeling domain. Following Maryland Department of the Environment's (MDE) suggestion (in comments from LiAn Zhuang by email dated 4/23/25), the Land Use Procedure was used to determine the urban/rural status but disregarding the area of water within 3 km of the source. After removing the area covered by water (32%), 68% of the 3-km radius area is land. GoogleEarth images and US Geological Survey National Land Cover Database (NLCD) data for the area of interest were reviewed. Approximately 70% of the relevant land area is comprised of urban land use types as proposed by Auer (J. Appl. Meteor., 17, 636-643, May 1978). As a result, AERMOD was run in the urban mode. The April 2020 census population of nearby Baltimore City (585708) and the default surface roughness length were input to AERMOD to run the urban mode.

- Meteorological data

The recent five consecutive years (2019 through 2023) of AERMOD-ready representative meteorological input data were obtained from MDE (specifically, the SFC and PFL files provided by MDE's LiAn Zhuang (email dated 9/30/24)). The surface meteorological data (Automated Surface Observing System data) were collected at Baltimore/Washington International Thurgood Marshall Airport, Anne Arundel County, Maryland (WBAN 93721), and the upper air meteorological data were collected at Sterling, Virginia (Dulles International Airport) (WBAN 93734). MDE used AERSURFACE (version 20060) to determine representative surface characteristics and AERMET (version 23132) to process the meteorological data. The adjusted u* regulatory option was invoked in AERMET.

- Structure downwash

Direction-specific building dimensions of nearby/adjacent buildings/structures/tanks on the premises were generated using BPIPPRM (version 04274) and input to AERMOD to address the potential structure wake effects on stack plumes. Premise wide, 177 buildings/structures/tanks were included in the structure downwash analysis.

- Stack characteristics

Point sources were used to represent emissions from stacks and distinct vents. Note that after further assessment of sources, it was decided that point sources (at different locations), rather than volume sources (used in the hexanol modeling performed in April 2025), would be more representative of the fugitive building emissions vents at the Magnapore Plant.

Stacks were represented in different ways in AERMOD depending on their release characteristics. Stacks with rain caps and stack-top-mounted flame arresters were represented as POINTCAP stacks. Stacks/vents with horizontal releases were represented as POINTHOR stacks. Stacks with downward releases were represented as default point source stacks but with an exit velocity set to a nominally low value of 0.001 m/s to suppress momentum plume rise.

Table 2 presents characteristics of modeled sources, input to AERMOD, for hexanol.

TABLE 2 CHARACTERISTICS OF MODELED POINT SOURCES

STACK ID	LOCATION		BASE ELEV.	STACK HEIGHT	STACK DIAMETER	STACK EXIT VELOCITY	STACK EXIT TEMP.	RELEASE TYPE
	UTM E (m)	UTM N (m)	(m)	(m)	(m)	(m/s)	(K)	
MAG03	364544.3	4341807.0	5.7	24.69	0.10	0.06	280.37	POINTCAP
MAG04	364558.2	4341795.7	5.5	25.45	0.61	5.92	1033.15	POINTCAP
MAG06	364556.9	4341810.5	5.5	6.10	0.14	0.03	280.37	POINTHOR
MGX10	364526.3	4341794.0	5.9	27.43	0.08	0.001	294.26	Downward
MGX12	364503.7	4341785.2	5.8	36.88	0.61	5.92	1033.15	POINTCAP
MGX23	364526.4	4341787.3	5.9	21.34	0.08	0.62	294.26	POINTHOR
EXFAN_A	364556.6	4341810.8	5.5	8.23	0.91	2.62	294.26	POINTHOR
EXFAN_05	364555.2	4341798.2	5.5	10.67	0.91	5.27	294.26	POINTHOR
EXFAN_B	364555.6	4341804.7	5.5	19.51	0.91	2.62	294.26	POINTHOR
EXFAN_06	364556.3	4341811.5	5.5	19.51	0.91	5.27	294.26	POINTHOR
MGX56	364511.8	4341781.0	5.9	1.83	0.63	6.52	294.26	POINTHOR
MGX57	364520.1	4341779.4	5.9	9.14	0.63	5.76	294.26	POINTHOR
MGX62	364525.7	4341788.5	5.9	15.24	0.77	7.22	294.26	POINTHOR
MGX63	364512.0	4341781.0	5.9	15.54	0.80	4.21	294.26	POINTHOR
MGX64	364526.2	4341790.9	5.9	22.25	0.77	6.42	294.26	POINTHOR
MGX65	364525.1	4341785.7	5.9	28.35	0.77	7.22	294.26	POINTHOR
MGX66	364517.8	4341779.9	5.9	27.74	0.77	6.42	294.26	POINTHOR

Refined Screening Compliance Demonstration

Table 3 presents the refined modeling results (projected maximum off-site concentrations and locations) for the premises-wide, multi-stack analysis. Table 4 compares the projected maximum off-site hexanol impact with the applicable MDE Screening Level and demonstrates compliance (i.e., maximum off-site concentration does not exceed MDE Screening Level).

TABLE 3 REFINED MODELING RESULTS FOR HEXANOL

TAP	MAXIMUM MODELED IMPACT		
	8-hr		
	Conc.	Location	
		UTM E	UTM N
	(µg/m³)	(m)	(m)
Hexanol	25.79	364649.18	4341807.05

TABLE 4 REFINED MODELING TAP COMPLIANCE - COMPARISON BETWEEN MAXIMUM MODELED HEXANOL CONCENTRATIONS AND THE MDE SCREENING LEVEL

TAP	CAS #	MAXIMUM MODELED CONCENTRATION	MDE SCREENING LEVEL	COMPLIANCE
		8-hr (µg/m³)	8-hr (µg/m³)	8-hr
Hexanol	111-27-3	25.79	27.30	Yes

1.0 MARYLAND TAP ANALYSIS FOR CHROMIUM III

The Project is subject to the Maryland toxic air pollutant (TAP) requirements because TAPs will discharge into the ambient air, and the Project is required to obtain a Permit-to-Construct (PTC) under COMAR 26.11.02.09 (pursuant to COMAR 26.11.15.03(A)(1)).

COMAR 26.11.15.06 requires a demonstration that TAP emissions will not unreasonably endanger human health. Grace is demonstrating compliance with this ambient impact requirement using a screening analysis as specified under COMAR 26.11.15.07. According to COMAR 26.11.16.02(A), such a demonstration is made by showing that TAP emissions from the premises will not cause increases in ambient levels that exceed the applicable TLV- /threshold-based screening level for a Class II TAP (MDE Screening Levels).

1.1 TAP Sources/Chromium III Emissions

The maximum expected premises-wide chromium III emissions were calculated using equipment design, process rates, product chromium content, monitoring data, and engineering judgement.

Table 1 identifies the premises-wide chromium III sources along with a description of the source and the calculated chromium III emissions.

TABLE 1 TAP SOURCES AND CHROMIUM III EMMISIONS

STACK ID	CHROMIUM III EMISSIONS (G/S)	SOURCE DESCRIPTION	CONTROLS
MAG-04	0.000002	Calciner and Filters	Thermal Oxidizer
MAG-05	0.00002	Blender and Baghouse	
MAG-13	0.000001	Calciner Feed Hopper and Cartridge	
MAG-15	0.00001	Multiple Hoppers and Bins to Cartridges	
MGX-12	0.000003	Electric Calciner and Filters	Thermal Oxidizer
MGX_22	0.00006	Central Vacuum Systems	
EXFAN_A	0.00002	Magnapore Building 344 Fugitives (vent)	
EXFAN_05	0.00002	Magnapore Building 344 Fugitives (vent)	
EXFAN_B	0.00001	Magnapore Building 344 Fugitives (vent)	
EXFAN_06	0.00002	Magnapore Building 344 Fugitives (vent)	
MGX-56	0.00001	Magnapore Building 391 Fugitives (vent)	
MGX-57	0.00001	Magnapore Building 391 Fugitives (vent)	
MGX-62	0.000004	Magnapore Building 391 Fugitives (vent)	
MGX-63	0.00001	Magnapore Building 391 Fugitives (vent)	
MGX-64	0.00001	Magnapore Building 391 Fugitives (vent)	
MGX-65	0.00002	Magnapore Building 391 Fugitives (vent)	
MGX-66	0.00001	Magnapore Building 391 Fugitives (vent)	
ICO-20	0.00164	West Plant Spray Dryer and Baghouse	
ICO-22	0.00040	Classifier and Baghouse	
ICO-46	0.00048	Fugitive Dust System	Baghouse

STACK ID	CHROMIUM III EMISSIONS (G/S)	SOURCE DESCRIPTION	CONTROLS
ICO-50	0.00003	Central Vacuum System	Baghouse
ICO-52	0.00017	Vessel and Baghouse	
ICO-53	0.00016	Screener and Cartridge	
ICO-54	0.00016	Screener and Cartridge	
ICO-59	0.00017	Drum Filling Station and Baghouse	
ICO-68	0.00002	Sack Filling Hopper and Bin Vent	
ICO-72	0.00026	Classifier, Cyclone, and Cartridge	
ICO-73	0.00026	Classifier, Cyclone, and Cartridge	
ICO-105	0.00055	East Plant Spray Dryer and Baghouse	
ICO-106	0.000001	Surge Bin and Hoppers with Cartridge	
ICO-108	0.00043	Classifier	Cyclone and Cartridge
ICO-110	0.00027	Screener and Cartridge	
ICO-111	0.00027	Screener and Cartridge	
ICO-112	0.0000001	Coarse Sack Hopper and Bin Vent	
ICO-113	0.00001	Drum Station Vessel and Bin Vent	
ICO-115	0.00035	Drum Filling Station and Baghouse	
ICO-116	0.0000001	Classifier	Bin Vent
ICO-117	0.00013	Classifier, Cyclone, and Cartridge	
ICO-122	0.000003	Screening Vessel and Cartridge	
ICO-123	0.000003	Classifier Feed Vessel and Cartridge	
ICO-125	0.000004	Receiving Hopper and Cartridge	
DCO-16	0.00006	Environmental Booth	Cartridge
DCO-17	0.00009	Environmental Booth	Cartridge
DCO-18	0.00019	Environmental Booth	Cartridge
DCO-35	0.00004	Spray Dryer	Cartridge
DCO-42	0.00005	Environmental Booth	Cartridge
DCO-46	0.00013	South Fugitive System	Baghouse
DCO-47	0.00009	North Fugitive System	Baghouse
ICO-47	0.00006	Building 23 Vent, Poly West Fugitives	
ICO-119	0.00001	Building 23 South Vent, Poly East Fugitives	
ICO-120	0.00001	Building 23 North Vent, Poly East Fugitives	

1.2 TAPS Compliance Screening Analysis

A refined screening approach is used to demonstrate compliance. In this refined screening, off-site ground-level impacts of maximum expected chromium III emissions (the chromium III Class II TAP is listed under COMAR 26.11.16.07 B) are estimated using refined air quality modeling, consistent with COMAR 26.11.16.02(A)(3) (and COMAR 26.11.16.02(C)(1)), are directly compared to the applicable MDE Screening Levels.

Refined Air Quality Modeling

A more rigorous, refined air quality dispersion modeling analysis, consistent with COMAR 26.11.16.02(A)(3) (and COMAR 26.11.16.02(C)(1)) was performed to predict off-site 8-hr TAP concentrations. The United States Environmental Protection Agency's (USEPA) guidance given in Appendix W to 40 CFR 51 was followed in the performance of this refined air quality modeling for the TAP chromium III.

- Air quality model

The refined modeling was conducted using the USEPA air quality model (AERMOD) (version 24142) using Providence/ORIS BEEST Suite (version 12.13a) as the user interface. The standard regulatory default option was invoked in AERMOD. In addition, the adjusted u* regulatory option was invoked.

- Model receptors

Concentrations were projected at ground-level locations (receptors) on the W.R. Grace Curtis Bay property line and at locations off site (including receptors not on land, to be comprehensive). Model receptors were located to determine the expected highest off-site short-term concentrations. A total of 5683 receptors were used. Receptors were placed along the property line at 25-m spacing. Also, receptors were placed in a grid at 25-m spacing out to 200 m from the property, and at 100-m spacing out to 3 km from the property. Figures 1 and 2 show maps of the closer-in model receptors and the entire receptor grid, respectively.

The Grace facility is isolated within a highly industrial section of Curtis Bay surrounded by other industries and a landfill. No general public reside in the vicinity of the facility. Much of the Grace facility (to the North and West) is surrounded by a large water body. The inaccessibility of the shoreline and inhospitable nature of the industrial facility deters public access. There is fencing along almost all the property to the East and South. In addition, there is a guardhouse at the entrance to the facility, signage, and video surveillance that preclude/deter public access.

Ground elevations (as well as hill-height scaling factors used by AERMOD) of each receptor were obtained using AERMAP (version 24142), AERMOD's terrain preprocessor. United States Geological Survey (USGS) digital elevation data (3DEP data with a resolution of 1 arc-second) for the modeling domain were input to AERMAP.

FIGURE 1 RECEPTOR MAP – CLOSE-IN RECEPTORS

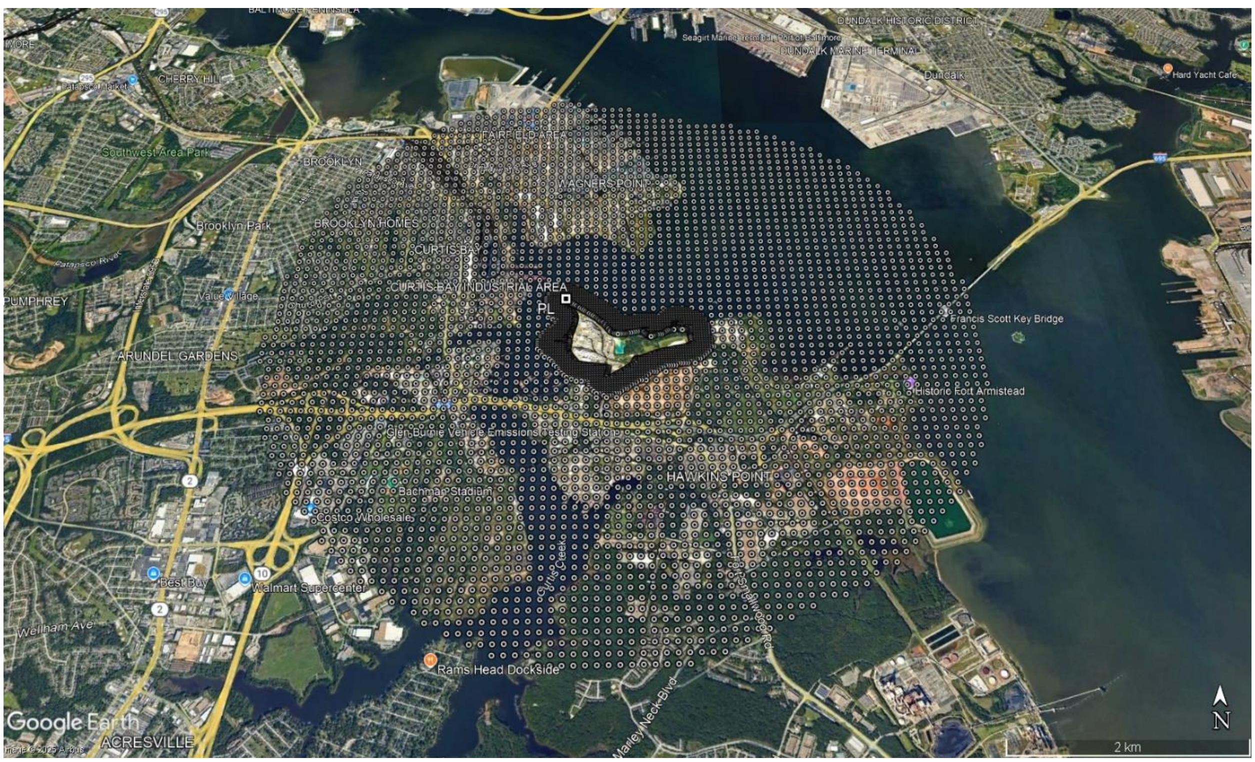

FIGURE 2 RECEPTOR MAP – ENTIRE RECEPTOR GRID

- Rural/urban classification

The Land Use Procedure given in USEPA Appendix W to 40 CFR 51 section 7.2.1.1(b)(i) was used to determine the urban/rural status for the dispersion modeling. The Project sources are located within an urban area (Baltimore urban area), but located close enough to a body of water (Patapsco River and Curtis Creek) or other non-urban land use categories to result in a predominantly rural land use classification within 3 km of the source. Section 5.1 of the AERMOD Implementation Guide (EPA-450/B-24-009, November 2024) cautions users against applying the Land Use Procedure on a source-by-source basis but should also consider the potential for urban heat island influences across the full modeling domain. Following Maryland Department of the Environment's (MDE) suggestion (in comments from LiAn Zhuang by email dated 4/23/25), the Land Use Procedure was used to determine the urban/rural status but disregarding the area of water within 3 km of the source. After removing the area covered by water (32%), 68% of the 3-km radius area is land. GoogleEarth images and US Geological Survey National Land Cover Database (NLCD) data for the area of interest were reviewed. Approximately 70% of the relevant land area is comprised of urban land use types as proposed by Auer (J. Appl. Meteor., 17, 636-643, May 1978). As a result, AERMOD was run in the urban mode. The April 2020 census population of nearby Baltimore City (585708) and the default surface roughness length were input to AERMOD to run the urban mode.

- Meteorological data

The recent five consecutive years (2019 through 2023) of AERMOD-ready representative meteorological input data were obtained from MDE (specifically, the SFC and PFL files provided by MDE's LiAn Zhuang (email dated 9/30/24)). The surface meteorological data (Automated Surface Observing System data) were collected at Baltimore/Washington International Thurgood Marshall Airport, Anne Arundel County, Maryland (WBAN 93721), and the upper air meteorological data were collected at Sterling, Virginia (Dulles International Airport) (WBAN 93734). MDE used AERSURFACE (version 20060) to determine representative surface characteristics and AERMET (version 23132) to process the meteorological data. The adjusted u* regulatory option was invoked in AERMET.

- Structure downwash

Direction-specific building dimensions of nearby/adjacent buildings/structures/tanks on the premises were generated using BPIPPRM (version 04274) and input to AERMOD to address the potential structure wake effects on stack plumes. Premise wide, 177 buildings/structures/tanks were included in the structure downwash analysis.

- Stack characteristics

Point sources were used to represent emissions from stacks and distinct vents.

Stacks were represented in different ways in AERMOD depending on their release characteristics. Stacks with rain caps were represented as POINTCAP stacks. Stacks/vents with horizontal releases were represented as POINTHOR stacks. Stacks with downward releases were represented as default point source stacks but with an exit velocity set to a nominally low value of 0.001 m/s to suppress momentum plume rise.

Table 2 presents characteristics of modeled sources, input to AERMOD, for chromium III.

TABLE 2 CHARACTERISTICS OF MODELED POINT SOURCES

STACK ID	LOCATION		BASE ELEV.	STACK HEIGHT	STACK DIAMETER	STACK EXIT VELOCITY	STACK EXIT TEMP.	RELEASE TYPE
	UTM E (m)	UTM N (m)	(m)	(m)	(m)	(m/s)	(K)	
MAG04	364558.2	4341795.7	5.5	25.45	0.61	5.92	1033.15	POINTCAP
MAG05	364545.6	4341790.8	5.7	9.14	0.08	0.001	294.26	Downward
MAG13	364554.6	4341798.9	5.5	12.19	0.10	0.23	294.26	POINTHOR
MAG15	364521.7	4341781.4	5.9	33.53	0.10	3.49	294.26	
MGX12	364503.7	4341785.2	5.8	36.88	0.61	5.92	1033.15	POINTCAP
MGX22	364552.2	4341773.6	5.5	1.83	0.10	0.001	294.26	Downward
EXFAN_A	364556.6	4341810.8	5.5	8.23	0.91	2.62	294.26	POINTHOR
EXFAN_05	364555.2	4341798.2	5.5	10.67	0.91	5.27	294.26	POINTHOR
EXFAN_B	364555.6	4341804.7	5.5	19.51	0.91	2.62	294.26	POINTHOR
EXFAN_06	364556.3	4341811.5	5.5	19.51	0.91	5.27	294.26	POINTHOR
MGX56	364511.8	4341781.0	5.9	1.83	0.63	6.52	294.26	POINTHOR
MGX57	364520.1	4341779.4	5.9	9.14	0.63	5.76	294.26	POINTHOR
MGX62	364525.7	4341788.5	5.9	15.24	0.77	7.22	294.26	POINTHOR
MGX63	364512.0	4341781.0	5.9	15.54	0.80	4.21	294.26	POINTHOR
MGX64	364526.2	4341790.9	5.9	22.25	0.77	6.42	294.26	POINTHOR
MGX65	364525.1	4341785.7	5.9	28.35	0.77	7.22	294.26	POINTHOR
MGX66	364517.8	4341779.9	5.9	27.74	0.77	6.42	294.26	POINTHOR
ICO20	364313.9	4341774.3	4.7	26.14	0.61	21.67	435.93	
ICO22	364318.0	4341796.7	4.7	18.29	0.30	24.03	294.26	POINTHOR
ICO46	364334.6	4341770.0	4.8	16.76	0.30	14.23	294.26	POINTCAP
ICO50	364339.2	4341795.7	4.8	10.97	0.08	16.56	294.26	POINTHOR
ICO52	364316.3	4341778.5	4.7	16.76	0.10	46.57	294.26	POINTHOR
ICO53	364316.5	4341780.8	4.7	23.77	0.30	11.64	294.26	
ICO54	364314.4	4341781.0	4.7	23.77	0.30	11.64	294.26	
ICO59	364316.6	4341783.6	4.7	23.77	0.20	11.64	294.26	
ICO68	364321.6	4341799.9	4.7	6.71	0.13	5.96	294.26	POINTHOR
ICO72	364316.0	4341780.8	4.7	23.77	0.20	17.46	294.26	
ICO73	364314.2	4341784.2	4.7	23.77	0.20	17.46	294.26	
ICO105	364364.4	4341767.3	4.8	27.74	0.61	22.64	435.93	
ICO106	364363.8	4341764.3	4.8	15.85	0.10	0.001	294.26	Downward
ICO108	364358.3	4341780.1	4.8	18.29	0.30	25.87	294.26	
ICO110	364360.6	4341771.9	4.8	22.86	0.60	4.23	294.26	POINTHOR
ICO111	364360.4	4341771.0	4.8	22.86	0.60	4.23	294.26	POINTHOR
ICO112	364361.1	4341765.0	4.8	14.63	0.08	0.001	294.26	Downward
ICO113	364362.0	4341772.0	4.8	15.85	0.10	0.001	294.26	Downward
ICO115	364361.0	4341772.9	4.8	18.29	0.60	5.42	294.26	POINTHOR
ICO116	364358.4	4341779.2	4.8	15.85	0.08	0.001	294.26	Downward
ICO117	364361.6	4341773.7	4.8	16.46	0.23	13.8	294.26	POINTHOR

STACK ID	LOCATION		BASE ELEV.	STACK HEIGHT	STACK DIAMETER	STACK EXIT VELOCITY	STACK EXIT TEMP.	RELEASE TYPE
	UTM E (m)	UTM N (m)	(m)	(m)	(m)	(m/s)	(K)	
ICO122	364367.8	4341773.6	4.8	15.85	0.10	0.001	294.26	Downward
ICO123	364367.0	4341772.2	4.8	18.29	0.10	1.75	294.26	POINTHOR
ICO125	364358.4	4341778.7	4.8	15.54	0.08	0.001	294.26	Downward
DCO16	364685.0	4341393.4	11.0	10.67	0.51	13.97	294.26	
DCO17	364782.0	4341353.9	11.0	6.10	0.71	10.34	294.26	
DCO18	364690.8	4341403.9	10.6	9.75	0.71	10.34	294.26	POINTHOR
DCO35	364691.0	4341401.3	10.7	12.19	0.20	3.64	394.26	
DCO42	364762.9	4341381.9	10.2	4.57	0.91	11.5	294.26	POINTHOR
DCO46	364711.4	4341362.8	10.9	13.72	0.51	25.61	294.26	
DCO47	364734.9	4341393.5	10.0	13.72	0.51	25.61	294.26	
ICO47	364315.2	4341774.0	4.7	16.76	1.03	16.93	294.26	POINTHOR
ICO119	364362.5	4341775.8	4.8	15.85	0.76	5.17	294.26	POINTCAP
ICO120	364363.9	4341760.0	4.8	15.85	0.76	5.17	294.26	POINTCAP

Refined Screening Compliance Demonstration

Table 3 presents the refined modeling results (projected maximum off-site concentrations and locations) for the premises-wide, multi-stack analysis. Table 4 compares the projected maximum off-site chromium III impact with the applicable MDE Screening Level and demonstrates compliance (i.e., maximum off-site concentration does not exceed the MDE Screening Level).

TABLE 3 REFINED MODELING RESULTS FOR CHROMIUM III

TAP	MAXIMUM MODELED IMPACT 8-hr		
	Conc.	Location UTM E	Location UTM N
	(µg/m³)	(m)	(m)
Chromium III	0.75	364671.02	4341794.98

TABLE 4 REFINED MODELING TAP COMPLIANCE - COMPARISON BETWEEN MAXIMUM MODELED CHROMIUM III CONCENTRATIONS AND THE MDE SCREENING LEVEL

TAP	CAS #	MAXIMUM MODELED CONCENTRATION 8-hr (µg/m³)	MDE SCREENING LEVEL 8-hr (µg/m³)	COMPLIANCE 8-hr
Chromium III	16065-83-1	0.75	5.00	Yes

Appendix E – Supporting Calculations for TAP Compliance Demonstrations

Toxic Air Pollutant Compliance Demonstration - Ammonia
Supporting Calculations

Registration Number	Plant	Emission Type	Emission ID	Process Equipment / Area	Value	Units	Value	Units	Value	Units	Value	Units	Calculation Basis	Emissions (ton/yr)	Emissions (lb/day)	Emissions (lb/hr)
MAG 510-0076-7-1024	Magnapore and Magnapore Expansion Plant (MAG/MGX)	Fugitive	344_1	Building 344 Ventilation - 1st Floor	0.44	ambient ammonia concentration (mg/m^3)	11,600	exhaust airflow (acfm)	0.02	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.08	0.45	0.02
			344_2	Building 344 Ventilation - 2nd Floor	0.81	ambient ammonia concentration (mg/m^3)	10,470	exhaust airflow (acfm)	0.03	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.14	0.76	0.03
			344_3	Building 344 Ventilation - 2nd Floor	0.81	ambient ammonia concentration (mg/m^3)	10,470	exhaust airflow (acfm)	0.03	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.14	0.76	0.03
			344_4	Building 344 Ventilation - 2nd Floor	0.81	ambient ammonia concentration (mg/m^3)	10,470	exhaust airflow (acfm)	0.03	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.14	0.76	0.03
			344_5	Building 344 Ventilation - 2nd Floor	0.81	ambient ammonia concentration (mg/m^3)	10,470	exhaust airflow (acfm)	0.03	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.14	0.76	0.03
			344A_1	Building 344A Ventilation - 1st Floor	0.44	ambient ammonia concentration (mg/m^3)	8,300	exhaust airflow (acfm)	0.01	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.06	0.32	0.01
			344A_2	Building 344A Ventilation - 1st Floor	0.44	ambient ammonia concentration (mg/m^3)	8,600	exhaust airflow (acfm)	0.01	lb/hr	8,760	operating hours/yr	Indoor Air Sampling and Building Pressure Balance	0.06	0.34	0.01
			344A_3	Building 344A Ventilation - 2nd Floor	1.44	ambient ammonia concentration (mg/m^3)	25,000	exhaust fan rating (acfm)	0.14	lb/hr	8,760	operating hours/yr	Building Ventilation Survey and Equipment Design	0.59	3.2	0.14
			344A_4	Building 344A Ventilation - 2nd Floor	1.44	ambient ammonia concentration (mg/m^3)	25,000	exhaust fan rating (acfm)	0.14	lb/hr	8,760	operating hours/yr	Building Ventilation Survey and Equipment Design	0.59	3.2	0.14
			344A_5	Building 344A Ventilation - 2nd Floor	1.44	ambient ammonia concentration (mg/m^3)	25,000	exhaust fan rating (acfm)	0.14	lb/hr	8,760	operating hours/yr	Building Ventilation Survey and Equipment Design	0.59	3.2	0.14
													MAG/MGX Total Ammonia Emissions	**2.54**	**13.9**	**0.58**
ICO 510-0076-7-1094	Industrial Catalyst Operations (ICO)	Stack	ICO-20	Spray Dryer D-801	[redacted]	hourly feed rate (lb slurry/hr)	[redacted]	max NH_3 content dry basis (lb NH_3/lb slurry)	19.21	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	84.1	461	19.21
			ICO-105	Spray Dryer D-8801	[redacted]	hourly feed rate (lb slurry/hr)	[redacted]	max NH_3 content dry basis (lb NH_3/lb slurry)	7.60	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	33.3	182	7.60
			ICO-130	Spray Dryer EST-35801	[redacted]	hourly feed rate (lb slurry/hr)	[redacted]	max NH_3 content dry basis (lb NH_3/lb slurry)	1.93	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	8.5	46	1.93
													ICO Total Ammonia Emissions	**126**	**690**	**28.74**
DCO 510-0076-7-0951	Technical Development Center Operations (DCO)	Stack	DCO-23	Calciners L-3801, L-3802, L-3804	[redacted]	hourly production rate (lb/hr)	[redacted]	max NH_3 content dry basis (lb NH_3/lb catalyst)	0.02	lb/hr	8,760	operating hours/yr	Maximum Production Rate, Product Composition, Scrubber Eff. 99%	0.09	0.48	0.02
		Fugitive	DCO-01	Building 317 Ventilation	[redacted]	batch length (hrs)	[redacted]	lb NH_3/batch	2.46	lb/hr	8,760	operating hours/yr	Batch Process and Ammonia Usage	11	59	2.46
													DCO Total Ammonia Emissions	**11**	**60**	**2.48**
SGO 510-0076-7-1095	Silica Gel Operations (SGO)	Stack	SGO-21	A-Mill 2770	[redacted]	hourly production rate (lb/hr)	[redacted]	diff. of feed and product ppm (lb NH_3/lb product)	4.11	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	18	99	4.11
			SGO-32	K-11 Dryer/Activator 2840	[redacted]	hourly production rate (lb/hr)	[redacted]	diff. of feed and product ppm (lb NH_3/lb product)	0.91	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	4.0	22	0.91
			SGO-56	Flash Dryer 2832	[redacted]	hourly production rate (lb/hr)	[redacted]	diff. of feed and product ppm (lb NH_3/lb product)	3.44	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	15	83	3.44
			SGO-68	Washline 7 Process Vent	[redacted]	hourly production rate (lb/hr)	[redacted]	diff. of feed and product ppm (lb NH_3/lb product)	2.57	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	11	62	2.57
			SGO-74	B-Mill 4790	[redacted]	hourly production rate (lb/hr)	[redacted]	diff. of feed and product ppm (lb NH_3/lb product)	1.42	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	6.2	34	1.42
			SGO-84	Turbo Dryer D-40824	[redacted]	hourly production rate (lb/hr)	[redacted]	diff. of feed and product ppm (lb NH_3/lb product)	4.13	lb/hr	8,760	operating hours/yr	Maximum Production Rate and Product Composition	18	99	4.13
		Fugitive	SGO-33	Building 111 Ventilation	5.59	ambient ammonia concentration (mg/m^3)	125,540	total exhaust fan rating (acfm)	2.63	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	12	63	2.63
													SGO Total Ammonia Emissions	**84**	**461**	**19.21**
FCC 510-0076-7-1644	Silica Alumina Catalyst Plant (FCC)	Stack	SAC-111	Spray Dryer 53802	0.13	stack exhaust NH_3 (ppmvd)	29,742	stack exhaust flow (dscf/min)	0.01	lb/hr	8,760	operating hours/yr	2015 Stack Test Results	0.04	0.24	0.01
			SAC-115	Calciner 56801 and Flash Dryer 55801	2.61	stack exhaust NH_3 (ppmvd)	29,497	stack exhaust flow (dscf/min)	0.20	lb/hr	8,760	operating hours/yr	2015 Stack Test Results	0.88	4.8	0.20
			SAC-123	Ammonia Storage Tank 50105	708	tank displacement (cf/hr)	0.0416	NH_3 density (lb/cf)	0.147	lb/hr	8,760	operating hours/yr	Tank Displacement and Scrubber Removal Eff. 99.5%	0.65	3.5	0.15
													FCC Total Ammonia Emissions	**1.56**	**8.6**	**0.36**
AEO 510-0076-7-1077	Automobile Emissions Operations (AEO)	Stack	AEO-82	SCR CC5001 - Various Dryers	9.16	stack exhaust NH_3 (ppmvd)	16,507	stack exhaust flow (dscf/min)	0.40	lb/hr	8,760	operating hours/yr	1997 Stack Test Results	1.8	9.6	0.40
		Fugitive	AEO-54	Building 342 Ventilation	3.48	ambient ammonia concentration (mg/m^3)	233,265	total exhaust fan rating (acfm)	3.04	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	13	73	3.04
													AEO Total Ammonia Emissions	**15**	**83**	**3.44**
													Sitewide Total Ammonia Emissions	**240**	**1,315**	**54.81**

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Toxic Air Pollutant Compliance Demonstration - Hexanol
Supporting Calculations

Registration Number	Plant	Emission Type	Emission ID	Process Equipment / Area	Value	Units	Value	Units	Value	Units	Value	Units	Calculation Basis	Emissions (ton/yr)	Emissions (lb/day)	Emissions (lb/hr)
MAG 510-0076-7-1024	Magnapore and Magnapore Expansion Plant (MAG/MGX)	Stack	MAG-03	E-861 Vent Condenser	0.176	vapor pressure of hexanol at 45F (mmHg)	1.1	airflow (acfm)	0.004	lb/hr	8,760	operating hours/yr	Hexanol Vapor Pressure and Equipment Design	0.02	0.11	0.004
			MAG-04	T-657 Afterburner	[redacted]	hourly production rate (lb/hr)	[redacted]	hexanol content of feed material (%)	0.060	lb/hr	8,760	operating hours/yr	Maximum Production Rate, Product Composition, Thermal Oxidizer Destruction Eff. 99.9%	0.26	1.44	0.060
			MAG-06	E-863B Dryer Condenser	0.176	vapor pressure of hexanol at 45F (mmHg)	1.0	airflow (acfm)	0.004	lb/hr	8,760	operating hours/yr	Hexanol Vapor Pressure and Equipment Design	0.02	0.10	0.004
			MGX-10	E-1861 Vent Condenser	0.395	vapor pressure of hexanol at 70F (mmHg)	5.0	airflow (acfm)	0.048	lb/hr	8,760	operating hours/yr	Hexanol Vapor Pressure and Equipment Design	0.21	1.15	0.048
			MGX-12	T-1657 Afterburner	[redacted]	hourly production rate (lb/hr)	[redacted]	hexanol content of feed material (%)	0.084	lb/hr	8,760	operating hours/yr	Maximum Production Rate, Product Composition, Thermal Oxidizer Destruction Eff. 99.9%	0.37	2.02	0.084
			MGX-23	E-1863B Dryer Condenser	0.395	vapor pressure of hexanol at 70F (mmHg)	6.0	airflow (acfm)	0.057	lb/hr	8,760	operating hours/yr	Hexanol Vapor Pressure and Equipment Design	0.25	1.38	0.057
		Fugitive	EXFAN_A	Building 344 Ventilation - 2nd Floor	1.38	ambient hexanol concentration (mg/m^3)	3,650	exhaust fan rating (acfm)	0.019	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.08	0.46	0.019
			EXFAN_05	Building 344 Ventilation - 2nd Floor	1.38	ambient hexanol concentration (mg/m^3)	7,330	exhaust fan rating (acfm)	0.038	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.17	0.91	0.038
			EXFAN_B	Building 344 Ventilation - 3rd Floor	2.38	ambient hexanol concentration (mg/m^3)	3,650	exhaust fan rating (acfm)	0.033	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.14	0.79	0.033
			EXFAN_06	Building 344 Ventilation - 3rd Floor	2.38	ambient hexanol concentration (mg/m^3)	7,330	exhaust fan rating (acfm)	0.065	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.28	1.56	0.065
			MGX-56	Building 391 Ventilation - 1st Floor	1.33	ambient hexanol concentration (mg/m^3)	4,300	exhaust fan rating (acfm)	0.021	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.09	0.50	0.021
			MGX-57	Building 391 Ventilation - 2nd Floor	2.42	ambient hexanol concentration (mg/m^3)	3,800	exhaust fan rating (acfm)	0.034	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.15	0.82	0.034
			MGX-62	Building 391 Ventilation - 3rd Floor	2.42	ambient hexanol concentration (mg/m^3)	7,200	exhaust fan rating (acfm)	0.065	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.28	1.56	0.065
			MGX-63	Building 391 Ventilation - 3rd Floor	2.42	ambient hexanol concentration (mg/m^3)	4,500	exhaust fan rating (acfm)	0.041	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.18	0.98	0.041
			MGX-64	Building 391 Ventilation - 4th Floor	2.42	ambient hexanol concentration (mg/m^3)	6,400	exhaust fan rating (acfm)	0.058	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.25	1.39	0.058
			MGX-65	Building 391 Ventilation - 5th Floor	1.38	ambient hexanol concentration (mg/m^3)	7,200	exhaust fan rating (acfm)	0.037	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.16	0.89	0.037
			MGX-66	Building 391 Ventilation - 5th Floor	1.38	ambient hexanol concentration (mg/m^3)	6,400	exhaust fan rating (acfm)	0.033	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.14	0.79	0.033
													MAG/MGX Total Hexanol Emissions	**3.07**	**16.84**	**0.702**
													Sitewide Total Hexanol Emissions	**3.07**	**16.84**	**0.702**

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Toxic Air Pollutant Compliance Demonstration - Chromium III
Supporting Calculations

Registration Number	Plant	Emission Type	Emission ID	Process Equipment / Area	Value	Units	Value	Units	Value	Units	Value	Units	Value	Units	Calculation Basis	Emissions (ton/yr)	Emissions (lb/day)	Emissions (lb/hr)
MAG 510-0076-7-1024	Magnapore and Magnapore Expansion Plant (MAG/MGX)	Stack	MAG-04	Calciner Filters F-154AB&CD	75	exhaust airflow (acfm)	0.005	outlet grain loading (gr/dscfm)	400	operating temperature (F)	0.00002	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Finished Product	0.0001	0.0004	0.00002
			MAG-05	Air Blender T-467	250	exhaust airflow (acfm)	0.007	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Finished Product	0.0006	0.0034	0.0001
			MAG-13	Calciner Feed Hopper V-169	4	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.00001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Finished Product	0.00004	0.0002	0.00001
			MAG-15	Multiple Hoppers and Bins to F-1153	60	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Finished Product	0.0005	0.0025	0.0001
			MGX-12	Calciner Filters F-1154AB&CD	105	exhaust airflow (acfm)	0.005	outlet grain loading (gr/dscfm)	400	operating temperature (F)	0.00003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Finished Product	0.0001	0.0006	0.00003
			MGX-22	Central Vacuums B-1364 and B-364	275	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0005	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Finished Product	0.0021	0.0113	0.0005
		Fugitive	EXFAN_A	Building 344 Ventilation - 2nd Floor	0.012	ambient chromium concentration (mg/m^3)	3,650	exhaust fan rating (acfm)	70	operating temperature (F)	0.0002	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0007	0.004	0.0002
			EXFAN_05	Building 344 Ventilation - 2nd Floor	0.005	ambient chromium concentration (mg/m^3)	7,330	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0006	0.003	0.0001
			EXFAN_B	Building 344 Ventilation - 3rd Floor	0.005	ambient chromium concentration (mg/m^3)	3,650	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0003	0.002	0.0001
			EXFAN_06	Building 344 Ventilation - 3rd Floor	0.005	ambient chromium concentration (mg/m^3)	7,330	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0006	0.003	0.0001
			MGX-56	Building 391 Ventilation - 1st Floor	0.005	ambient chromium concentration (mg/m^3)	4,300	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0003	0.002	0.0001
			MGX-57	Building 391 Ventilation - 2nd Floor	0.005	ambient chromium concentration (mg/m^3)	3,800	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0003	0.002	0.0001
			MGX-62	Building 391 Ventilation - 3rd Floor	0.012	ambient chromium concentration (mg/m^3)	7,200	exhaust fan rating (acfm)	70	operating temperature (F)	0.0003	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0014	0.008	0.0003
			MGX-63	Building 391 Ventilation - 3rd Floor	0.005	ambient chromium concentration (mg/m^3)	4,500	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0003	0.002	0.0001
			MGX-64	Building 391 Ventilation - 4th Floor	0.005	ambient chromium concentration (mg/m^3)	6,400	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0005	0.003	0.0001
			MGX-65	Building 391 Ventilation - 5th Floor	0.005	ambient chromium concentration (mg/m^3)	7,200	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0005	0.003	0.0001
			MGX-66	Building 391 Ventilation - 5th Floor	0.005	ambient chromium concentration (mg/m^3)	6,400	exhaust fan rating (acfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0005	0.003	0.0001
															MAG/MGX Total Chrome +3 Emissions	**0.0093**	**0.051**	**0.0021**
DCO 510-0076-7-0951	Technical Development Center Operations (DCO)	Stack	DCO-16	Millroom Env. Booth L-0601	6,000	exhaust airflow (acfm)	0.001	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.002	0.012	0.001
			DCO-17	Warehouse Env. Booth L-0604	8,700	exhaust airflow (acfm)	0.001	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.003	0.018	0.001
			DCO-18	Poly Area Env. Booth L-6606	8,700	exhaust airflow (acfm)	0.002	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.007	0.036	0.001
			DCO-35	Poly Spray Dryer L-6804	[redacted]	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	250	operating temperature (F)	0.0003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.001	0.008	0.0003
			DCO-42	SMR Warehouse Env. Booth L-3696	16,000	exhaust airflow (acfm)	0.0003	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0004	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.002	0.010	0.0004
			DCO-46	South Fugitive System L-0606	4,000	exhaust airflow (acfm)	0.003	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.005	0.025	0.001
			DCO-47	North Fugitive System L-0605	2,650	exhaust airflow (acfm)	0.003	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.003	0.016	0.001
															DCO Total Chrome +3 Emissions	**0.023**	**0.124**	**0.005**

Redacted exhaust airflow that identifies equipment design and capacity.

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Toxic Air Pollutant Compliance Demonstration - Chromium III
Supporting Calculations

Registration Number	Plant	Emission Type	Emission ID	Process Equipment / Area	Value	Units	Value	Units	Value	Units	Value	Units	Value	Units	Calculation Basis	Emissons (ton/yr)	Emissions (lb/day)	Emissions (lb/hr)
ICO 510-0076-7-1094	Industrial Catalyst Operations (ICO)	Stack	ICO-20	Spray Dryer D-801	[redacted]	exhaust airflow (acfm)	0.0101	outlet grain loading (gr/acfm)	325	operating temperature (F)	0.013	lb/hr	8,760	operating hours/yr	Stack Test for Particulate Matter and Chrome Content of Material	0.057	0.312	0.013
			ICO-22	Fines Classifier M-705 (BH-203)	[redacted]	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.014	0.076	0.003
			ICO-46	Fugitive Dust System BH-204	2,200	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.004	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.017	0.091	0.004
			ICO-50	Central Vacuum BH-217	160	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.001	0.007	0.0003
			ICO-52	Surge Vessel V-115	800	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.006	0.033	0.001
			ICO-53	Turbo Screen S-704N	[redacted]	exhaust airflow (acfm)	0.008	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.005	0.030	0.001
			ICO-54	Turbo Screen S-704S	[redacted]	exhaust airflow (acfm)	0.008	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.005	0.030	0.001
			ICO-59	Drum Filling S-706N	800	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.006	0.033	0.001
			ICO-68	Sack Filling Hopper V-113 (BH-213)	160	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.0006	0.003	0.0001
			ICO-72	Coarse Classifier M-714	[redacted]	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.002	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.009	0.049	0.002
			ICO-73	Ultra Fines Classifier M-716	[redacted]	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.002	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.009	0.049	0.002
			ICO-105	Spray Dryer D-8801	[redacted]	exhaust airflow (acfm)	0.0046	outlet grain loading (gr/acfm)	325	operating temperature (F)	0.004	lb/hr	8,760	operating hours/yr	Stack Test for Particulate Matter and Chrome Content of Material	0.019	0.104	0.004
			ICO-106	Surge Bin V-1113 / Hoppers V-1103A&B	4	exhaust airflow (acfm)	0.02	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.00001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.00003	0.0002	0.00001
			ICO-108	Classifier CL-7705	[redacted]	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.015	0.081	0.003
			ICO-110	Screener S-7704N	[redacted]	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.002	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.009	0.050	0.002
			ICO-111	Screener S-7704S	[redacted]	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.002	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.009	0.050	0.002
			ICO-112	Coarse Sack Hopper V-1106S	1	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.000001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.000004	0.00002	0.000001
			ICO-113	Drum Station Vessel V-1125	80	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.0003	0.002	0.0001
			ICO-115	Drumming Station S-7706 (BH-2206N)	3,200	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.012	0.065	0.003
			ICO-116	Ultra Fines Sacking V-1103	1	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.000001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.000004	0.00002	0.000001
			ICO-117	Coarse Classifier CL-7714	[redacted]	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.001	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.004	0.024	0.001
			ICO-122	Screening Vessel V-1115	30	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.00003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.0001	0.001	0.00003
			ICO-123	Classifier Feed Vessel V-1115A	30	exhaust airflow (acfm)	0.01	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.00003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.0001	0.001	0.00003
			ICO-125	Receiving Hopper V-1117	80	exhaust airflow (acfm)	0.005	outlet grain loading (gr/dscfm)	70	operating temperature (F)	0.00003	lb/hr	8,760	operating hours/yr	Equipment Design and Chrome Content of Material	0.0001	0.001	0.00003
		Fugitive	ICO-47	Building 23 Ventilation, Poly West	30,000	total exhaust fan rating (acfm)	0.004	ambient chromium concentration (mg/m^3)	70	operating temperature (F)	0.0005	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.002	0.012	0.0005
			ICO-119	Building 23 South Ventilation, Poly East	5,000	total exhaust fan rating (acfm)	0.004	ambient chromium concentration (mg/m^3)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0004	0.002	0.0001
			ICO-120	Building 23 North Ventilation, Poly East	5,000	total exhaust fan rating (acfm)	0.004	ambient chromium concentration (mg/m^3)	70	operating temperature (F)	0.0001	lb/hr	8,760	operating hours/yr	Industrial Hygiene Testing and Equipment Design	0.0004	0.002	0.0001
															ICO Total Chrome +3 Emissions	**0.202**	**1.106**	**0.046**
															Sitewide Total Chrome +3 Emissions	**0.234**	**1.282**	**0.053**

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