Prevention of Significant Air Quality Deterioration Review

Preliminary Determination

November 2012

Facility Name: PyraMax Ceramics, LLC – King's Mill Facility
City: Wrens
County: Jefferson
AIRS Number: 04-13-163-00035
Application Number: 21371
Date Application Received: August 17, 2012

Review Conducted by:
State of Georgia - Department of Natural Resources
Environmental Protection Division - Air Protection Branch
Stationary Source Permitting Program

Prepared by: Claudette Ayanaba-Clarke – Minerals Unit
Modeling Approved by: Yan Huang - Data and Modeling Unit
Reviewed and Approved by: Susan Jenkins – PSD Coordinator Hamid Yavari – Minerals Permitting Unit Coordinator Eric Cornwell – Stationary Source Permitting Program Manager James Capp – Chief, Air Protection Branch

SUMMARY

The Environmental Protection Division (EPD) has reviewed Georgia Air Quality Application No. 21371 submitted by PyraMax Ceramics, LLC - King's Mill Facility for a permit to construct and operate two new production lines at a ceramic proppant manufacturing facility in Wrens, Jefferson County, Georgia in addition to the two already permitted production lines. PyraMax has already been permitted for the construction of Lines 1 and 2 in Permit No. 3295-163-0035-P-01-1 issued on January 27, 2012. This Application No. 21371 is for the construction of Lines 3 and 4. With this modification, the facility will have four parallel process/kiln lines. The products will be used in the oil and natural gas industry. Each line consists of material handling, milling, slurry preparing, spray drying/pelletizing, green pellet screening, calcining/sintering, finishing, and packaging and shipping operations. Supporting operations at the facility include boilers, emergency generators, R&D and QA/QC labs, fuel and chemical storage tanks. In addition to the two process lines, this modification will only include supplemental equipment which includes emergency generator and a propane flare.

The proposed addition of two new production lines will result in emissions of carbon monoxide (CO), fluorides (mostly hydrogen fluoride, i.e. HF), greenhouse gases (GHG), nitrogen oxides (NO_x), particulate matter (PM)/particulate matter of 10 micrometers or less (PM10)/particulate matter of 2.5 micrometers or less ($PM_{2.5}$), sulfur dioxide (SO_2), and volatile organic compounds (VOC). These are pollutants regulated under the Clean Air Act (CAA). A Prevention of Significant Deterioration (PSD) analysis was performed for the facility for these pollutants to determine if any potential emissions of such pollutants were above the corresponding "major source" or "significance increase" threshold/rate under Federal "New Source Review"/"Prevention of Significant Deterioration" (NSR/PSD) rules. The annual potential emissions of CO, GHG and NO_x from the facility were above their corresponding "major source" thresholds/rates under NSR/PSD rules; while the emissions of PM_{10}, $PM_{2.5}$, SO_2 and VOC exceeded the corresponding "significant increase" thresholds under NSR/PSD rules. Consequently, these emissions are subject to Best Available Control Technology (BACT) Review/Determination under NSR/PSD rule.

This facility will also emit ammonia (NH3), hydrogen fluoride (HF), methanol, chlorides (mostly hydrogen chloride, i.e., HCl) and methyl acetate. Ammonia and methyl acetate are not considered VOCs; and they are not listed "Hazardous Air Pollutants" (HAPs). Both are regulated under Georgia Rules for Air Quality Control 391-3-1-.02(2)(a)3(ii) which authorizes a program to determine if the ambient impact of the emissions of toxic air pollutant (TAP) involved is acceptable, as discussed in Section 7 of the Preliminary Determination. Section 112(g) of the 1990 Clean Air Act (CAA) is the leading rule that regulates the HCl, HF and methanol emissions via a case-by-case Maximum Achievable Control Technology (MACT) Determination included as a supporting document, Notice of MACT Approval.

PyraMax Ceramics, LLC - King's Mill Facility is located in Jefferson County, which is classified as "attainment" or "unclassifiable" for SO_2, $PM_{2.5}$ and PM_{10}, NO_x, CO, and ozone (VOC).

The EPD review of the data submitted by PyraMax Ceramics, LLC – King's Mill Facility related to the proposed two new lines indicates that the project will be in compliance with all applicable state and federal air quality regulations.

It is the preliminary determination of the EPD that the proposal provides for the application of BACT for the control of CO, GHG, NO_x, PM, PM_{10}, VOC, and SO_2 emissions, as required by NSR/PSD regulation 40 CFR 52.21(j).

It has been determined through approved modeling techniques that the estimated emissions will not cause or contribute to a violation of any ambient air standard or allowable PSD increment in the area surrounding the facility or in Class I areas located within 300 km of the facility. It has further been determined that the proposal will not cause impairment of visibility or detrimental effects on soils or vegetation. Any air quality impacts produced by project-related growth should be inconsequential.

This Preliminary Determination concludes that an Air Quality Permit amendment should be issued to PyraMax Ceramics, LLC - King's Mill Facility for the construction and operation of two new production lines at the ceramic proppant manufacturing facility. The modified permit conditions have been incorporated into the proposed air quality permit amendment to ensure and confirm compliance with all applicable air quality regulations. A copy of the draft permit amendment is included in Appendix A.

1.0 INTRODUCTION – FACILITY INFORMATION AND EMISSIONS DATA

On August 17, 2012, PyraMax Ceramics, LLC (hereafter PyraMax Ceramics) submitted an application (No. 21371) for an air quality permit to construct and operate two additional process lines at a ceramic proppant manufacturing facility. The facility is located on County Road 291, Wrens, Jefferson County, Georgia.

Table 1-1: Title V Major Source Status

Pollutant	Is the Pollutant Emitted?	If emitted, what is the facility's Title V status for the Pollutant?		
		Major Source Status	Major Source Requesting SM Status	Non-Major Source Status
PM	√	√		
PM_{10}	√	√		
$PM_{2.5}$	√	√		
SO_2	√	√		
VOC	√	√		
NO_x	√	√		
CO	√	√		
TRS	N/A			
H_2S	N/A			
Individual HAP	√	√		
Total HAPs	√	√		
Total GHGs	√	√		

Table 1-2 below lists the current permit issued to the facility, based on a review of the "Permit" file(s) on the facility found in the Air Branch office.

Table 1-2: List of Current Permits, Amendments, and Off-Permit Changes

Permit Number and/or Off-Permit Change	Date of Issuance/ Effectiveness	Purpose of Issuance
3295-163-0035-P-01-0	January 27, 2012	Proposal to construct Lines 1 and 2.

Since the issuance of Permit No. 3295-163-0035-P-01-0 there have been changes made to the expected potential emissions from Lines 1 and 2. Column 2 in Table 1-3 displays the proposed PE from Application No. 20584. In Column 3 are the new calculated PE for Lines 1 and 2. Lines 3 and 4 emissions from Application No. 21371 are stated in Column 4. Based on the proposed project description and data provided in the permit application, the estimated incremental increases of regulated pollutants from the facility are listed in Table 1-3 below:

Table 1-3: Emissions Increases from the Project

Pollutant	Proposed Application #20584 Lines 1 & 2 PE (tpy)	Actual Construction Lines 1 & 2 PE (tpy))	Proposed Application #21371 Lines 3 & 4 PE (tpy))	PSD Major Source Emission Threshold (tpy)	PSD Significant Emission Rate (tpy)	Subject to PSD Review
PM	157	132.53	132.63	250	25	Yes
PM_{10}	157[1]	132.53	132.63	250	15	Yes
$PM_{2.5}$	107	89.15	89.12	250	10	Yes
VOC	130	111.54	109.65	250	40	Yes
NO_X	351	341.10	337.93	250	40	Yes
CO	608	409.04	408.76	250	100	Yes
SO_2	103	102.47	102.45	250	40	Yes
TRS	N/A	N/A	N/A	250	10	N/A
Pb	<0.6	<0.6	<0.6	250	0.6	N/A
GHG	167,570 (as CO_2e)	177,421	174,446	100,000/250[2]	75,000[3]	Yes
Non-HF Fluorides	0.19	0.19	0.19	250	3	No
H_2S	N/A	N/A	N/A	250	10	N/A
Sulfuric Acidic Mist (SAM)	N/A	N/A	N/A	250	7	N/A

[1] All PM were assumed as PM_{10}.
[2] 100,000 tpy on a CO_2e basis and 250 tpy on a mass basis.
[3] CO_2e basis.

Based on the information presented in Table 1-3 above, PyraMax Ceramics' proposed facility, as specified per Georgia Air Quality Application No. 21371, is classified as a major source under NSR/PSD rules because of the annual potential emissions of CO, GHG and NO_x exceed the major sources threshold. Therefore, this project is required to undergo PSD review.

Through its new source review procedure, EPD has evaluated PyraMax Ceramics' proposal for compliance with State and Federal requirements. The findings of EPD have been assembled in this Preliminary Determination.

This facility will be a major source for HAPs, having emissions of more than 10 tons per year of a single HAP and 25 tons per year of a combination of HAPs. Therefore, it is subject to a case-by-case MACT evaluation because there is no NESHAP Part 63 MACT standard for the ceramic proppant manufacturing facilities. A "Notice of MACT" Approval has been drafted as a separate document. A list of the HAPs emitted under MACT review is displayed in the following Table 1-4:

Table 1-4 Individual HAP emissions.

Individual HAPs	Proposed Application #20584 Lines 1 & 2 PE (tpy)	Actual Construction Lines 1 & 2 PE (tpy))	Application #21371 Lines 3 & 4 PE (tpy))
Methane	53.51	53.51	53.51
n-Hexane	2.11	2.11	2.11
Hydrogen Fluoride	9.04	9.04	9.04
Hydrogen Chloride	5.89	5.89	5.89

2.0 PROCESS DESCRIPTION

PyraMax Ceramics submitted Georgia Air Quality Application No. 21371 proposing to add two lines, Lines 3 and 4, to a newly permitted major source ceramic proppant manufacturing facility in Wrens, Jefferson County, Georgia. After construction of the new proposed lines, the facility will have four similar process/kiln lines which can be operated independently, two of which are already under construction. PyraMax has already been permitted for the construction of Lines 1 and 2 in permit #3295-163-0035-P-01-0 issued on January 27, 2012. The manufacturing processes along the production/kiln lines for Lines 3 and 4 are described below. For more details and process diagrams, please refer to Application No. 21371.

Raw Material Handling
The facility will receive locally mined raw clay as feedstock via trucks to a number of covered storage bays for Lines 3 and 4. Expected emissions from this operation are particulate matter as fugitive clay particles scattering from the working area. Such emissions are insignificant due to the high moisture content of the clay (approximately 20% by weight), and, to the use of appropriate control measures, including paving facility roads, timely cleaning of roads and working areas, enclosing clay handling and storage areas and restricting clay delivery trucks access to facility roads.

Slurry Preparation
Front-end loaders will move the received clay from storage bays to a cage mill which breaks the clay into a fine powder. The fine clay powder is then moved by conveyor to a feeder which transfers the clay powder into a mixer. The mixer than converts the clay powder into a stable suspended mixture/slurry by mixing the clay with water and a small amount of a dispersant. At this point some recycled slurry and dust are added into the mixer. The slurry is agitated and then pH balanced using aqueous ammonia, then stored in tanks. The slurry is then wet screened before addition of a binder agent. Expected emissions from slurry preparation include VOC (impurity in the additive) PM, PM_{10}, and $PM_{2.5}$. Particulate emissions will be negligible due to the high moisture content and moisture content of the material.

Pelletization/Spray Drying
Pelletization of the slurry feed from the storage tanks takes place in spray dryers/pelletizers. These units are heated by burning natural gas with propane as backup fuel. Green clay pellets form from spraying the slurry into the dryers/pelletizers, dry under the heat, then are coated by fresh incoming slurry, and dried again. The process continues until desired bead size is achieved. Each process/kiln line has one spray dryer/pelletizer heated to a desirable temperature by direct-fired low NOx natural gas burners with maximum heat input capacity of 75 MMBtu/hr.

Expected emissions from this process include PM, PM_{10}, and $PM_{2.5}$, combustion byproducts (CO, NO_x, SO_2, PM, PM_{10} and $PM_{2.5}$, VOC and GHG/CO_2), and VOC when volatile organics in the additives are evaporated (mostly methanol and methyl acetate). All the emissions will be carried by exhaust gas through a baghouse for removal of PM, PM_{10}, and $PM_{2.5}$, and then discharged into the atmosphere via a stack. The emission of methanol is regulated via a case-by-case MACT Determination as presented in separate document entitled "Notice of MACT Approval." Methyl acetate is one of the exempt compounds by EPA and not considered as VOC. It is not a HAP compound either.

Green Pellet Screening
In this process two multiple-stack screens will separate green pellets conveyed from spray dryers/pelletizers according to their sizes. On-sized pellets are conveyed to calciners/kilns for further processing. Oversized pellets are diverted to a cage mill for size reduction and then re-fed to the pelletizer feed bin for reprocessing; while undersized pellets are sent directly back to the pelletizer feed bin. Only PM, PM_{10} and $PM_{2.5}$ are emitted from this process, and controlled by baghouses and bin vent filters depending on the operation involved.

Calcining/Sintering

Green pellets are conveyed to the calciner/kiln bins via conveyors and bucket elevators, and metered into the charging end of each counter flow dry-process rotary calciner/kiln where they are slowly heated, dried and then calcined/sintered, releasing moisture and other impurities in the process. The calciner/kiln rotates as heated by a low NO_x burner fired by natural gas with propane as backup fuel. The burner fires directly onto the kiln feed/green pellets streaming in so that hot exhaust gases travel counter flow to the incoming green proppant pellets/beads. The capacity of the kiln burner is 65 MMBtu/hr and can heat the calciner/kiln up to 3,000°F.

Each rotary kiln/calciner is closely followed by a separate rotary cooler which introduces cooling air in the discharge end of the cooler.

Expected emissions from the calciner/kiln include criteria pollutants (CO, NO_x, PM, PM_{10} and $PM_{2.5}$, SO_2 and VOC), greenhouse gas (GHG), and HAPs. Majority of the HAPs emissions are HCl and HF converted from chlorides and fluorides naturally existing in the clay at high temperature. Almost all the SO_2 emissions are from the conversion of elemental sulfur and sulfur compounds contained naturally in the clay, which could vary significantly among different mining sites or even geographical locations/formations with the same mining site. Part of the particulate matter emissions are from tumbling action of the clay pellets inside the calciner/kiln and the rest from fuel combustion. The other part are condensable particulate matter (CPM) formed by certain gaseous compounds in exhaust gas at the stack exits, including mainly acids and ammonia salts. Fuel combustion generates almost all the CO and NO_x emissions. The majority of the NO_x formation is due to thermal NO_x generation. Due to the use of clean fuels, particulate matter, SO_2, and VOC emissions from fuel combustion are insignificant. VOC emissions from conversion of naturally occurring carbon compounds in kiln feedstock/green clay pellets are at a minimum because the clay pellets contain little such compounds. Kiln and cooler exhaust gas streams carrying these emissions are routed to a "catalytic baghouse" for multi-pollutant control.

The "catalytic baghouse" itself utilizes, instead of fabric filter bags, an array of rigid porous ceramic tube filters to capture the particulate matter. In addition, nano catalysts are impregnated across the wall of the ceramic tube filters to facilitate the reduction of NO_x to nitrogen (N_2) in the presence of appropriate reducing agents such as ammonia, which is injected into the exhaust gas strategically upstream of the "catalytic baghouse". Consequently, the ceramic tube filters will function collectively as a "selective catalytic reactor" (SCR) to abate NO_x emissions. To reduce acid gas emissions, predominantly SO_2, HCl and HF, calcium or sodium based powdery alkaline sorbents such as sodium bicarbonate ($NaHCO_3$) are injected strategically into the kiln exhaust air upstream of the "catalytic baghouse" to neutralize the gaseous acids by forming sodium salts such as Na_2SO_4, NaCl and NaF. These fine solids are then captured along with other dust by the "catalytic baghouse"/ceramic tube filters downstream.

Finishing

The calcined/sintered ceramic proppants are conveyed from the kiln cooler to the final product screens. On-sized proppants are transferred to quality control bins and off-sized proppant recycled back to the kiln for further processing. On-size ceramic proppants are tested for quality and those passing the testing are sent to storage silos waiting for shipping. Dust collection will occur at transfer points pneumatically and diverted to a common baghouse. Each storage silo and bin is equipped with a vent filter to control particulate matter emissions. Finished proppants are conveyed to a rail car loading spout and into railcars for delivery to customers. Dust generated during railcar loading is controlled via pneumatic collection at transfer points and then a common baghouse.

Supporting operations

The proposed ceramic proppant manufacturing plant will have the following supporting operations/equipment:

- On-site research and development and QA/QC labs;
- Four (4) 30,000 gallon propane storage tanks providing backup fuel for all natural gas fired units;
- One (1) diesel engine powered emergency generator
- One (1) 322 gallon storage tanks for the emergency engines;
- One (1) 15,000 gallon diesel fuel storage tank for facility equipment;
- One (1) 33,000 gallon aqueous ammonia storage tanks for process pH control and control device operation.

Emission Control

The facility-wide potential emissions of criteria pollutants (CO, NO_x, PM, PM_{10} and $PM_{2.5}$, SO_2 and VOC) and GHG will exceed either the corresponding major source thresholds or significant increase levels under NSR/PSD regulations under CAA. As required by NSR/PSD regulations, BACT is required to control these emissions.

Because the facility-wide potential HAP emissions such as methanol, HF and HCl exceed the major source thresholds under Section 112 of CAA of 1990, Case-By-Cases MACT as determined per Section 112(g) of CAA is used to control the HAP emissions and will be explained in the "Notice of MACT Approval" Document.

Supporting emission control equipment includes a propane vaporizer flare. This equipment is exempt from permitting per State Rule 391-3-1-.03.03(6)b(1).

PyraMax Ceramics' permit application and supporting documentation are included in Appendix B of this Preliminary Determination and can be found online at www.georgiaair.org/airpermit.

3.0 REVIEW OF APPLICABLE RULES AND REGULATIONS

3.1 State Rules

Georgia Rule for Air Quality Control (Georgia Rules) 391-3-1-.03(1) requires that any person prior to beginning the construction or modification of any facility which may result in an increase in air pollution shall obtain a permit for the construction or modification of such facility from the Director upon a determination by the Director that the facility can reasonably be expected to comply with all the provisions of the Act and the rules and regulations promulgated thereunder. Georgia Rule 391-3-1-.03(8)(b) continues that no permit to construct a new stationary source or modify an existing stationary source shall be issued unless such proposed source meets all the requirements for review and for obtaining a permit prescribed in Title I, Part C of the Federal Act [i.e., Prevention of Significant Deterioration of Air Quality (PSD)], and Section 391-3-1-.02(7) of the Georgia Rules (i.e., PSD).

- Georgia Rule (b) [391-3-1-.02(2)(b) - *Visible Emissions* is a general rule limiting the opacity of stack visible emissions from a source to less than 40%. This regulation applies to any source with stack visible emissions but is not subject to other more restrictive source specific limit for the same visible emissions. The provisions of Georgia Rule (b) apply only to facilities or sources subject to some emission limitation under subsection 391-3-1-.02(2).

- Georgia Rule (p) [391-3-1-.02(2)(p) - *Particulate Emissions from Kaolin and Fuller's Earth Processes*], which uses process input rate based equations similar to the process weight rule to set PM emission limits, depending on if the sources were constructed or extensively modified before or after January 1, 1972. The applicable stack PM emission rate is determined using either one of four equations, depending on the process input rate and age of the equipment.

- Georgia Rule (g) [391-3-1-.02(2)(g) - *Sulfur Dioxide*] limits the sulfur content of liquid or solid fossil fuel(s) or wood residue burned by a new fuel-burning source constructed or extensively modified after January 1, 1972. The limitation is based on the type of the fossil fuel(s) (liquid, solid or wood residue) and the heat input rate of the source. Since none of the fuel burning sources at this facility has a heat input rate greater than 100 MM BTU/hr, the sulfur content of fuel(s) used for these sources shall not exceed 2.5% by weight. Firing these sources with only natural gas and propane, PyraMax Ceramics will comply with this limit because the sulfur content of commercial available natural gas and propane in Georgia is substantially below this limit.

- Georgia Rule (n) [391-3-1-.02(2)(n) - *Fugitive Dust*] commonly known as the fugitive dust rule, requires PyraMax Ceramics to take all reasonable precautions to prevent fugitive dust emissions from any operation, process, handling, transportation or storage facility prone to such emissions, and lists a number of such precautions. In addition, Georgia Rule (n) limits the opacity of such fugitive emissions to less than 20%.

Because the emission standards/limits under pertinent New Source Performance Standard (NSPS), National Emission Standards for Hazardous Air Pollutants (NESHAP)/ MACT or PSD/NSR rules are more stringent than those in the aforementioned rules, these SIP rules are subsumed by the pertinent federal rules.

3.2 Federal Rule - PSD

The regulations for PSD in 40 CFR 52.21 require that any new major source or modification of an existing major source be reviewed to determine the potential emissions of all pollutants subject to regulations under the Clean Air Act. The PSD review requirements apply to any new or modified source which belongs to one of 28 specific source categories having potential emissions of 100 tons per year or more of any regulated pollutant, or to all other sources having potential emissions of 250 tons per year or more of any regulated pollutant. They also apply to any modification of a major stationary source which results in a significant net emission increase of any regulated pollutant.

Georgia has adopted a regulatory program for PSD permits, which the United States Environmental Protection Agency (EPA) has approved as part of Georgia's State Implementation Plan (SIP). This regulatory program is located in the Georgia Rules at 391-3-1-.02(7). This means that Georgia EPD issues PSD permits for new major sources pursuant to the requirements of Georgia's regulations. It also means that Georgia EPD considers, but is not legally bound to accept, EPA comments or guidance. A commonly used source of EPA guidance on PSD permitting is EPA's Draft October 1990 New Source Review Workshop Manual for Prevention of Significant Deterioration and Nonattainment Area Permitting (NSR Workshop Manual). The NSR Workshop Manual is a comprehensive guidance document on the entire PSD permitting process.

The PSD regulations require that any major stationary source or major modification subject to the regulations meet the following requirements:

- Application of BACT for each regulated pollutant that would be emitted in significant amounts;
- Analysis of the ambient air impact;
- Analysis of the impact on soils, vegetation, and visibility;
- Analysis of the impact on Class I areas; and
- Public notification of the proposed plant in a newspaper of general circulation

Definition of BACT

The PSD regulation requires that BACT be applied to all regulated air pollutants emitted in significant amounts. Section 169 of the Clean Air Act defines BACT as an emission limitation reflecting the maximum degree of reduction that the permitting authority (in this case, EPD), on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such a facility through application of production processes and available methods, systems, and techniques. In all cases BACT must establish emission limitations or specific design characteristics at least as stringent as applicable New Source Performance Standards (NSPS). In addition, if EPD determines that there is no economically reasonable or technologically feasible way to measure the emissions, and hence to impose and enforceable emissions standard, it may require the source to use a design, equipment, work practice or operations standard or combination thereof, to reduce emissions of the pollutant to the maximum extent practicable.

EPA's NSR Workshop Manual includes guidance on the 5-step top-down process for determining BACT. In general, Georgia EPD requires PSD permit applicants to use the top-down process in the BACT analysis, which EPA reviews. The five steps of a top-down BACT review procedure identified by EPA per BACT guidelines are listed below:

Step 1: Identification of all control technologies;
Step 2: Elimination of technically infeasible options;
Step 3: Ranking of remaining control technologies by control effectiveness;
Step 4: Evaluation of the most effective controls and documentation of results; and
Step 5: Selection of BACT.

The following is a discussion of the applicable federal rules and regulations pertaining to the equipment that is the subject of this preliminary determination, which is then followed by the top-down BACT analysis in Chapter 4.

3.3 New Source Performance Standard (NSPS)

40 CFR Part 60, Subpart A - *General Provisions*, imposes generally applicable provisions for initial notifications, initial compliance testing, monitoring, and recordkeeping requirements for equipment at the facility subject to a specific NSPS standard, as indicated by the pertinent NSPS standard.

40 CFR Part 60, Subpart OOO – *Standards of Performance for Nonmetallic Mineral Processing Plants* applies to each of the conveyors, bins, bucket elevators, screens, crushers, and mills associated with each of the new ceramic proppant production lines. Subpart OOO establishes process/source specific PM, visible and fugitive emissions limits, and record keeping, testing, compliance demonstration and reporting requirements for each of the affected sources. Subpart OOO limits are summarized below:

a. No greater than 7% opacity for fugitive emissions (including those escaping capture systems) except for any crusher that does not use a capture system, which shall not exhibit fugitive emissions greater than 12% opacity.

b. No greater than 0.014 gr./dscf for stack PM emissions from capture systems feeding a dry control device except for individually enclosed storage bins.

c. For any transfer point on a conveyor belt or any other affected facility enclosed in a building, each enclosed affected facility shall comply with the emission limits in paragraphs (a) and (b) noted above, or the building shall comply with the following emission limits:

- Fugitive emissions from the building openings (except vents with mechanically induced air flow for exhausting PM emissions from the building) shall not exceed 7% opacity.
- PM emissions from any building vent with mechanically induced air flow for exhausting PM emissions shall exceed 0.014 gr./dscf).

40 CFR Part 60, Subpart UUU – *Standards of Performance for Calciners and Dryers in Mineral Industries* applies to each of the spray dryers/pelletizers and rotary kilns (also referred to as calciners on in the application). Subpart UUU establishes source specific PM and visible emissions limits, and record keeping, testing, compliance demonstration and reporting requirements for each of the affected sources. Subpart UUU limits are summarized below

a. Emissions of particulate matter from calciners and dryers installed in series shall not exceed 0.04 gr./dscf.

b. Emissions of particulate matter from dryers shall not exceed 0.025 gr./dscf

c. Visible emissions shall not exceed 10% percent opacity.

40 CFR Part 60, Subpart IIII - *Standards of Performance for Stationary Compression Ignition Internal Combustion Engines* applies to the new 350 kW stationary emergency diesel generator which will commence construction after July 11, 2005. The diesel generator must meet the applicable Tier III emissions limits (as certified by EPA) for the same model year and capacity and burn fuel oil that meets the specifications under NSPS Subpart IIII. Subpart IIII also limits the maintenance check and readiness testing time for each emergency diesel generator to 100 hours per year.

For each established limit under the above NSPS standards, please refer to conditions in Section 3.0 of Permit No. 3295-163-0035-P-01-0 and proposed Permit Amendment No. 3295-163-0035-P-01-1(included in Appendix A.)

The facility contains heat generating units, such as the kiln and pelletizer, but not steam generating units as applicable to the requirements under 40 CFR 60, Subpart Dc - *Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units.* It is therefore exempt from this provision. The facility proposes to add new fuel storage tanks that are exempt from 40 CFR 60, Subpart Kb – *Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels) for which Construction, Reconstruction or Modification, Commenced After July 23, 1984*.

3.4 National Emissions Standards For Hazardous Air Pollutants

40 CFR Part 63, Subpart A, *General Provisions*, imposes general requirements for initial notifications, initial compliance testing, monitoring, and recordkeeping. PyraMax Ceramics' new emergency stationary diesel generator with a 350 kW diesel engine - are considered as "new stationary sources" by 40 CFR Part 63, Subpart ZZZZ - *National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines,* and subject to the MACT standard. As an emergency stationary diesel generator rated less than 500 brake horsepower located at a major stationary source for HAPs emissions, the diesel generator must comply with NSPS IIII and is not subject to the requirements of Subpart ZZZZ. The Permittee is only required to submit an initial notification and a statement that the generator is for emergency use only. This permit establishes conditions to limit the use of the diesel generator to emergency situations only. Subpart ZZZZ also contains tables listing the applicable provisions of 40 CFR Part 63, Subpart A.

3.5 Section of 112(g)(2)(B) of the Clean Air Act (CAA) Amendment of 1990

PyraMax Ceramics will use an additive/chemical compound as disperser during the clay slurry preparation. This additive contains less than 1% by weight of methanol (an EPA listed HAP) as an impurity which will eventually evaporate into the air during spray drying of the clay slurry, resulting in approximately 48 tons per year of methanol emissions, which exceed the 10-ton per year major source threshold for single HAP emissions under 40 CFR Part 63 Subpart B. In addition, HF and HCl are emitted from calciners/kilns as naturally occurring fluorides and chlorides in clay which are converted into gaseous HF and HCl at high temperature. These HAP emissions combined will exceed the 25-ton per year major source threshold for combined HAP emissions under 40 CFR Part 63 Subpart B. Because there is no NESHAP Part 63 MACT standard for the ceramic proppant manufacturing facilities like PyraMax Ceramics', these HAP emissions are subject to a Case-by-Case MACT Determination under 112(g) of CAA Amendment of 1990.

A "Notice of MACT" Approval per 112(g) of 1990 CAA for the HAP emissions from the new process lines has been written and included as a supporting document.

3.6 State and Federal – Startup and Shutdown and Excess Emissions

Excess emission provisions for startup, shutdown, and malfunction are provided in Georgia Rule 391-3-1-.02(2)(a)7. Excess emissions from various process units along the proposed new ceramic proppant manufacturing lines, as listed in Section 3.1 of draft Air Quality Permit No. 3295-163-0035-P-01-1, would most likely result from a malfunction of the associated control equipment. The facility cannot anticipate or predict malfunctions. However, the facility is required to minimize emissions during periods of startup, shutdown, and malfunction.

3.7 Federal Rule – 40 CFR 64 – Compliance Assurance Monitoring

As a green-field source/site, PyraMax Ceramics, LLC – King's Mill Facility is required to prepare and submit monitoring plans for emission units/sources subject to the CAM requirements with the initial Title V operating permit application within 12 months of the startup of the facility. This SIP/PSD construction permit, as issued under the authority of Georgia Rules 391-3-1-.02(7), *"Prevention of Significant Deterioration of Air Quality"* and 391-3-1-.03(1), *"Construction (SIP) Permit"*, is not required to incorporate the applicable CAM requirements.

4.0 CONTROL TECHNOLOGY REVIEW

The proposed project will result in emissions that are significant enough to trigger PSD/BACT review for the following pollutants: CO, GHG, NO_x, PM, PM_{10}, $PM_{2.5}$, SO_2 and VOC. This section describes in details each piece of equipment with associated emissions, possible control technologies for the pollutants involved, and determines source and emission-specific BACT.

4.1 Calciners/Kilns - Background

The following is a Best Available Control Technologies (BACT) analysis of the Ceramic Kilns 3 and 4 (Source Code KLN3 and KLN4) used to calcine the kaolin clay. The direct fired kilns are fueled by natural gas with propane as a backup. The kilns emit NO_x and VOC from incomplete combustion. SO_2 and CO derive from the actual clay material and a little from incomplete combustion. $PM/PM_{10}/PM_{2.5}$ develop from the calcining of the clay and from fuel combustion. The control technologies selected for the permitted Ceramic Kilns 1 and 2 (Source Code KLN1 and KLN2) are the same as the following conclusions for the proposed Ceramic Kilns 3 and 4 (Source Code KLN3 and KLN4).

4.1.1 Calciners/Kilns – NOx Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on NO_x emissions. An analysis of these technologies can be found on pages 5-9 through 5-11 of Volume I of the application.

- Catalytic Baghouse System (multi-pollutant control)
- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)
- Regenerative Selective Catalytic Reduction (RSCR)
- Good Design and Operating Practices such as low NO_x burners/combustion control

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

All technologies are feasible except for the RSCR system. When research was done by PyraMax on the RSCR system option with the Carbo Ceramics, Inc. Toomsboro Georgia facility Application No. 18293, concerns were raised as to its efficacy. This is an experimental technology and therefore there are some unknowns involved. The applicant's analysis can be found on page 5-11 of the application.

The Division agrees with the applicant that the use of RSCR is technically infeasible.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-11 of the application.

Table 4-1: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Catalytic Baghouse System	up to 95%
2	SCR	70-90%
3	SNCR	65-75%
4	Good Combustion Practices	Base Case

The list also includes "Good design and operating practices such as the use of low NOx burners." The efficiency of this method varies according to industry. The Division agrees with the applicant that the catalytic baghouse is ranked as the most effective control technology to use with the ceramic kilns for NO_x control.

Step 4 – Evaluation of Most Stringent Controls:

The applicant has provided a description of the catalytic baghouse on pages 5-11 and 5-12 of the application. There are currently no available records describing the system being used on a kiln. The Catalytic Baghouse system will also help with the control of $PM/PM_{10}/PM_{2.5}$ and SO_2 emissions. In addition to the Catalytic Baghouse, the applicant plans to use low NOx burners, good combustion practices, and exclusive use of natural gas and propane for fuel.

RACT/BACT/LAER Clearinghouse (RBLC) has been checked and the Division agrees that all possible options have been addressed and analyzed. The technology suggested for permitted Lines 1 and 2, catalytic baghouse, is the same for proposed Lines 3 and 4 and is the most current possible technology.

Step 5 – Selection of BACT:

Applicant NOx BACT Selection:

The applicant has determined BACT as the following.

Table 4-2: BACT Determination

Control Option	NOx Emission/ Operating Limit	Compliance Method
Catalytic Baghouse System	36.30 lb/hr (3-hour average) 80% Control (3-hour average)	EPA Method 7 or 7E

In addition to the "catalytic baghouse", the applicant will use low NOx burners. Pages 5-12 and 5-13 in the application describe the BACT selection.

EPD NO_x BACT Selection:

EPD has determined that the "catalytic baghouse" system plus low NO_x burner and Good Combustion Technology, as proposed by PyraMax Ceramics, are BACT for NO_x emissions from the ceramic calciners/kilns, with a removal efficiency of no less than 80% by weight. Annual NO_x stack testing will be required by EPA Method 7 or 7E. Initially more frequent testing will be required because there is no precedent for this type of technology on a baghouse. That is why a low removal efficiency of 80% has been set without knowing the actual outcome.

4.1.2 Calciners/Kilns – SO2 Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on SO_2 emissions. An analysis of these technologies can be found on pages 5-13 through 5-14 of the application.

- Catalytic Baghouse System (multi-pollutant control)
- Wet Scrubber/Flue Gas Desulfurization (FGD)
- Dry FGD or Semi-Dry Scrubber
- Duct Sorbent Injection (DSI)

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees and would like to add the use of a low sulfur fuel as a possible control technique.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-14 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-15 of the application.

Table 4-3: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Catalytic Baghouse System	90-98%
2	Wet Scrubber	90-98%
3	Dry or Semi-Dry Scrubber	80-90%
4	Sorbent Injection	50-60%

The use of a low sulfur fuel such as natural gas and propane would be ranked with varying efficiency depending on the industry use. The Division agrees with the applicant that the catalytic baghouse is ranked as the most effective control technology to use with the ceramic kilns for SO_2 control.

Step 4 – Evaluation of Most Stringent Controls:

Of the top two most efficient technologies, the wet scrubber and the catalytic baghouse, the latter is found by the applicant to be the most stringent control. As described on page 5-15 of the application, the catalytic baghouse is the most cost effective for SO_2 and has no waste stream like the wet scrubber process.

RBLC has been checked and the Division agrees that all possible options have been addressed and analyzed. The technology suggested for permitted Lines 1 and 2, catalytic baghouse, is the same for proposed Lines 3 and 4 and is the most current possible technology.

Step 5 – Selection of BACT:

Applicant SO_2 BACT Selection:

The applicant has determined BACT as the following.

Table 4-4: BACT Determination

Control Option	SO_2 Emission/ Operating Limit	Compliance Method
Catalytic Baghouse System	11.64 lb/hr (3-hour average) 90% Control (3-hour average)	EPA Method 6 or 6C

Pages 5-15 and 5-16 in the application describe this BACT selection.

EPD SO_2 BACT Selection:

EPD has determined that the proposed catalytic baghouse, in combination of exclusive fuel use of natural gas and propane, is BACT for SO_2 emissions from the ceramic proppant calciners/kilns at PyraMax Ceramics' facility. The applicant proposed an SO_2 BACT limit from the calciners/kilns of 11.64 lb/hr on a 3-hour average during EPA Method 6 or 6C testing, based on no less than 90% reduction of SO_2. Compliance with the mass emission limit will be verified with an initial performance test. Subsequent verification of compliance will be achieved through calculations of 3-hour average pound per hour using the daily analysis of clay sulfur content (24-hour average).

4.1.3 Calciners/Kilns – CO Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on CO emissions. An analysis of these technologies can be found on page 5-16 of the application.

- Regenerative/Non-regenerative Catalytic Oxidizer (RCO)
- Oxidation Catalyst
- Good Combustion Techniques

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-17 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

- The following is a ranking of the control technologies based off of control effectiveness found on page 5-17 of the application. Good combustion techniques include the use of raw materials containing relatively low carbonaceous matter and hydrocarbons has varying efficiency rate that is highly dependent on the material.

Table 4-5: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	RCO/non-RCO	98%
2	Oxidation Catalyst - with reheat	95%
3	Good Combustion Practices	Base Case

The Division agrees with this finding.

Step 4 – Evaluation of Most Stringent Controls:

Using RCO/non-RCO or catalytic oxidizers to reduce CO emissions from ceramic calciner/kiln can become costly as is described by the applicant on page 5-18 and an analysis shown in Appendix D of the application. There are no known examples of the noted technologies used with a kiln and found to be effective. The Division concurs with the applicant that the RCO/non-RCO and oxidation catalyst are not BACT due to the environmental, energy, and economic concerns.

Step 5 – Selection of BACT:

Applicant CO BACT Selection:

The applicant has determined BACT as the following.

Table 4-6: BACT Determination

Control Option	CO Emission/ Operating Limit	Compliance Method
Good Combustion Techniques	33.0 lb/hr (3-hour average)	EPA Method 10 and other approved practices

An analysis of the BACT selection can be found in the application on page 5-19.

EPD CO BACT Selection:

Review of literature, the BACT/LAER Clearinghouse, and permits issued to facilities with similar operations such as structural clay product manufacturing, ceramic product manufacturing and Portland cement manufacturing indicates that proper equipment design and process operation (i.e., good combustion techniques) represents BACT for CO emissions from rotary calciners/kilns. Properly controlled combustion in these calciners/kilns minimizes CO formation by ensuring that temperature profile and O_2 availability are adequate for complete combustion of fuel. Therefore, a properly designed and operated rotary ceramic calciner/kiln acts as a thermal oxidizer, capable of converting majority of the CO generated to CO_2.

EPD has determined that the BACT limit for the CO emissions from each calciner/kiln is not to exceed 33.0 lbs/hr (3-hour average). CO emissions could be effected to certain degree by possible variations in equipment, process parameters and control, clay carbon content, and NO_x emission reduction measures among similar facilities. To account for effects of these variations on the CO emissions, EPD has decided to set this CO BACT emission limit (in lbs. of CO/ton of kiln feed) 15% higher than that established by EPD for Carbo Ceramics – Toomsboro Plant.[1] The decision was based EPD's review of the six CO emission performance tests conducted on three existing ceramic proppant calciners/kilns similar to PyraMax Ceramics', and owned and operated by the Carbo Ceramics – Toomsboro Plant.

In conclusion, a reduction in CO emissions can be achieved by the combination of following approaches:

- Using raw materials containing relatively low carbonaceous matter and hydrocarbons;
- Employing good combustion techniques at the calciner/kiln including:
    - Creating sufficient residence time from proper design of calciner/kiln size and duct lengths to complete fuel burnout.

[1] Testing reports submitted by Georgia Air Quality Permit No. 3295-319-0029-V-02-1

4.1.4 Calciners/Kilns – $PM/PM_{10}/PM_{2.5}$ Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on $PM/PM_{10}/PM_{2.5}$ (noted as PM) emissions. An analysis of these technologies can be found on pages 5-19 through 5-20 of the application.

- Baghouse
- Electrostatic Precipitator (ESP)
- Wet Scrubbing
- Venturi Scrubber

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-20 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-21 of the application.

Table 4-7: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Baghouse and ESP	> 99%
2	Wet Scrubbing	< 99%
3	Venturi Scrubber	< 90%

The Division agrees with the applicant that the baghouse and ESP are ranked as the most effective control technologies to use with the ceramic kilns for PM control.

Step 4 – Evaluation of Most Stringent Controls:

The applicant has already accepted the use of a Catalytic Baghouse (a combination of a baghouse and a wet scrubber) for control of other pollutants. The Catalytic Baghouse will be more effective in controlling PM than a traditional baghouse. The Division agrees that the Catalytic Baghouse is BACT for the control of PM in addition to other emissions from the calciners/kilns.

Step 5 – Selection of BACT:

Applicant $PM/PM_{10}/PM_{2.5}$ BACT Selection:

The applicant has determined the Catalytic Baghouse BACT finding as the following.

Table 4-8: BACT Determination

Pollutant	Control Option	Emission/Operating Limit	Compliance Method
PM/PM_{10}	Baghouse	0.010 gr/dscf (3-hour average) 8.53 lb/hr (filterable +	Method 5 Method 201 or 201A (202 if

		condensable)	necessary)
$PM_{2.5}$	Baghouse	0.006 gr/dscf (3-hour average) 6.98 lb/hr (filterable + condensable)	Method 5 Method 201 or 201A (202 if necessary)
$PM/PM_{10}/PM_{2.5}$	Baghouse	10% opacity (6-minute average)	COMS

A detailed analysis of the BACT selection can be found in the application on page 5-21.

EPD $PM/PM_{10}/PM_{2.5}$ BACT Selection:

Georgia EPD accepts the applicant's proposal for using a Catalytic Baghouse system to control the calciners/kilns particulate matter emissions. The 10% opacity requirement was originally selected by the Division and has already been implemented in the construction permit for the calciners/kilns for Lines 1 and 2.

The particulate matter that is not labeled "filterable + condensable" are assumed to be measuring only the filterable portion. These measurements are taken from the byproducts of combustion from the calciner/kilns. NSPS OOO and NSPS UUU requirements will be absorbed into the BACT requirement. It is good to note that the NSPS regulation does not distinguish the PM diameter when defining PM concentration.

4.1.5 Calciners/Kilns – VOC Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on VOC emissions. An analysis of these technologies can be found on page 5-22 of the application.

- Regenerative Thermal Oxidizer (RTO)
- Oxidation Catalyst
- Good Combustion Techniques

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-22 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-22 of the application.

Table 4-9: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	RTO	98%
2	Oxidation Catalyst - with reheat	95%
3	Good Combustion Practices	Base Case

The Division agrees with the applicant that the RTO is ranked as the most effective control technology to use with the ceramic kilns for VOC control.

Step 4 – Evaluation of Most Stringent Controls:

An analysis of the RTO and oxidation catalyst can be found on page 5-23 of the application. The applicant has performed a cost-analysis of the control technologies and has found them not to be feasible. The cost far exceeds the small amount of VOC emitted from the kiln. Appendix D of the application contains the cost-anlaysis of the RTO and oxidation catalyst.

Step 5 – Selection of BACT:

Applicant VOC BACT Selection:

The applicant has determined BACT as the following.

Table 4-10: BACT Determination

Control Option	VOC Emission/ Operating Limit	Compliance Method
Good Combustion Techniques	0.54 lb/hr (3-hour average)	EPA Method 25A

A detailed analysis of the BACT selection can be found in the application on pages 5-23 through 5-24.

EPD VOC BACT Selection:

EPD has determined that none of the technically feasible add-on VOC emission control technologies identified is economically feasible as BACT. A search through the RBLC Clearinghouse also determines good combustion techniques as the normal control technique for calciners/kilns in the industry.

4.1.6 Calciner/Kilns – GHG Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has proposed the following possible control techniques for Greenhouse Gases (GHG). A description of these techniques is provided on pages 5-44 through 5-55.

CO_2

- Carbon capture and storage (CCS)
- Selection of the most efficient rotary kiln technology
- Selection of the lowest carbon fuel
- Installation of energy efficient options for the rotary kilns
- Good Combustion Techniques

CH_4

- Selection of a high efficiency kiln

- Installation of energy efficient options for the rotary kilns
- Good Combustion Techniques

N_2O

- Catalysts
- Installation of energy efficient options for the rotary kilns
- Energy efficient operating practices
- Good Combustion Techniques

Step 2 – Elimination of Technically Infeasible Control Options:

Due to the infancy of the technology and inability of waste disposal, CCS is not technically feasible for the capture of CO_2. The applicant's proposal for control of carbon dioxide is described on pages 5-48 through 5-51.

There is no data on the effectiveness of N_2O catalysts used on clay processing kilns. As described on page 5-55 of the application, this technique is not technically feasible for control on N_2O.

The applicant states that all options are considered feasible for CH_4 control and can work to control other GHGs and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The Division agrees with the applicant that the available techniques' effectiveness is measured on a case by case basis. This means that there is no real ranking available but they will all be evaluated in the next section.

Step 4 – Evaluation of Most Stringent Controls:

- Good Combustion Techniques include equipment design, maintenance, and combustion process control including appropriate combustion temperature, air to fuel ratio, and air/fuel mixing that can reduce fuel usage by increasing combustion efficiency thus fuel efficiency.
- The low carbon-density fuel used will be natural gas with propane as a backup.
- Energy Efficiency includes kiln features such as monitoring devices, cooler gas heat recovery, and insulation in order to avoid heat loss.

Step 5 – Selection of BACT:

Applicant GHG BACT Selection:

Table 4-11: BACT Determination

Pollutant	Control Technology	Compliance Determination Method
CO_2	Low carbon-density fuel	Natural gas with propane as a backup
CO_2, CH_4, N_2O	Good combustion techniques	Proper maintenance and adjustments made expeditiously.
CO_2, CH_4, N_2O	Improved kiln insulation	Kilns will be insulated according to manufacturer's specification.
CO_2, CH_4, N_2O	Cooler gas heat recovery	The cooler gas is rerouted and used to cool the flue gas.
N_2O, CH_4	High efficiency kiln	Kiln features include monitoring and combustion control devices.

EPD GHG BACT Selection:

The Division agrees that the techniques described in the previous steps are BACT for the kilns. As stated on page 5-53 of the application, EPA has advised that an output-based BACT emissions limit is acceptable in absence of an emissions/operation limit. The Division concurs with the applicants suggested BACT emission limit of 0.218 lb CO_{2e} per lb cooler product (436.0 lb Co_{2e}/ton cooler product) on a 12-month rolling average basis for each kiln.

4.2 Pelletizer - Background

The following is a BACT analysis of the pelletizers (PEL3 and PEL4). The pelletization process or creating the correct size of ceramic pellets, emits VOC, PM, PM_{10}, $PM_{2.5}$. Emissions associated with combustion in the pelletization equipment include VOC, SO_2, NO_x, CO, GHG, and VOC, PM, PM_{10}, $PM_{2.5}$. The control technologies selected for the permitted Lines 1 and 2 are the same as the following conclusions for the proposed Lines 3 and 4.

4.2.1 Pelletizer – NO_x Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on NOx emissions. An analysis of these technologies can be found on pages 5-9 through 5-11 and page 5-24 of the application.

- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)
- Good Design and Operating Practices such as low NO_x burners/combustion control.
- Exclusive use of natural gas or propane.

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-24 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-21 of the application.

Table 4-12: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	SCR	70-90%
2	SNCR	65-75%
3	Good Combustion Practices	Base Case

As stated previously the exclusive use of natural gas or propane option has varying efficiencies. The Division agrees with the applicant that the SCR is ranked as the most effective control technology to use with the pelletizers for NO_x control.

Step 4 – Evaluation of Most Stringent Controls:

The use of SNCR and the SCR will be expensive and will increase toxic emissions as described on page 5-25 of the application. Based on cost and the emissions associated with the technology, the applicant has found that the add-on control technologies are not BACT for the pelletizer. The Division concurs with this finding.

Step 5 – Selection of BACT:

Applicant NO_x BACT Selection:

The applicant has determined BACT as the following.

Table 4-13: BACT Determination

Control Option	NO_x Emission/ Operating Limit	Compliance Method
Good Combustion Practices	2.25 lb/hr (3-hour average)	EPA Method 7 or 7E

In addition to the technique listed in the table, the applicant will employ low NO_x burners for additional control.

EPD NOx BACT Selection:

Review of literature, the BACT/LAER Clearinghouse, and permits issued to facilities with similar operations indicates that proper equipment design and process operation (i.e., good combustion techniques), exclusive use of natural gas or propane, and low NOx burners represents BACT for NOx emissions from pelletizers. The facility will additionally test to make sure that the NOx emissions are limited to 2.25 lb/hr.

4.2.2 Pelletizers – SO_2 Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control of SO_2 emissions. An analysis of these technologies can be found on pages 5-13 through 5-14 and page 5-26 application.

- Wet Scrubber
- Dry or Semi-Dry Scrubber
- Sorbent Injection

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-26 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-21 of the application.

Table 4-14: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Wet Scrubber	90-98%
2	Dry or Semi-Dry Scrubber	80-90%
3	Sorbent Injection	50-60%

The Division agrees with the applicant that the Wet Scrubber is ranked as the most effective control technology to use.

Step 4 – Evaluation of Most Stringent Controls:

As described on page 5-27 of the application the proposed technologies are found to be economically infeasible. The Division has also determined that none of the add-on control technology is economically feasible. Low loading rates/concentrations of SO_2 in the exhaust/flue gases diminish the amounts of SO_2 available for removal, causing the costs for removing each ton of SO_2 economically infeasible. There is also an issue of the creation of a waste stream which would increase the negative environmental impact.

Step 5 – Selection of BACT:

Applicant SO_2 BACT Selection:

The applicant has chosen the use of natural gas/propane as BACT for the control of SO_2 for the pelletizers. The analysis description is found on page 5-28 of the application.

EPD SO_2BACT Selection:

Division agrees with the exclusive use of natural gas and propane as fuels for all pelletizers for BACT compliance. To ensure the compliance with the BACT operational limit, conditions in this permit will require the Permittee to maintain fuel usage and fuel certification records.

4.2.3 Pelletizer – CO Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on CO emissions. An analysis of these technologies can be found on page 5-16 of the application.

- Regenerative/Non-regenerative Catalytic Oxidizer (RCO)
- Oxidation Catalyst
- Good Combustion Techniques

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-28 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-29 of the application. Good combustion techniques include the use of raw materials containing relatively low carbonaceous matter and hydrocarbons has varying efficiency rate that is highly dependent on the material.

Table 4-15: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	RCO/non-RCO	98%
2	Oxidation Catalyst - with reheat	95%
3	Good Combustion Practices	Base Case

The Division agrees with this finding.

<u>Step 4 – Evaluation of Most Stringent Controls:</u>

Using RCO/non-RCO or catalytic oxidizers to reduce CO emissions from pelletizer can become costly as is described by the applicant on page 5-29 and an analysis included in Appendix D of the application. The Division concurs with the applicant that the RCO/non-RCO and oxidation catalyst are not BACT due to the environmental, energy, and economic concerns.

<u>Step 5 – Selection of BACT:</u>

The applicant has determined BACT as the following.

Applicant CO BACT Selection:

Table 4-16: BACT Determination

Control Option	CO Emission/ Operating Limit	Compliance Method
Good Combustion Techniques	13.73 lb/hr (3-hour average)	EPA Method 10 and other approved practices

An analysis of the BACT selection can be found in the application on page 5-30.

EPD CO BACT Selection:

The Division agrees with the applicant's decision. Similar units at other facilities, as found in the RBLC, utilize Good Combustion Techniques including the use of raw materials containing relatively low carbonaceous matter and hydrocarbons as BACT for CO control.

4.2.4 Pelletizer – PM/PM_{10}/$PM_{2.5}$ Emissions

<u>Step 1 – Identification of Potential Control Techniques:</u>

The applicant has suggested the following BACT for control on PM/PM_{10}/$PM_{2.5}$ (noted as PM) emissions. An analysis of these technologies can be found on page 5-30 of the application.

- Baghouse
- Electrostatic Precipitator (ESP)
- Wet Scrubbing
- Venturi Scrubber

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-30 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-31 of the application.

Table 4-17: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Baghouse and ESP	> 99%
2	Wet Scrubbing	< 99%
3	Venturi Scrubber	< 90%

The Division agrees with the applicant that the baghouse and ESP are ranked as the most effective control technologies to use with the pelletizers for PM control.

Step 4 – Evaluation of Most Stringent Controls:

The applicant has determined that a baghouse will be BACT as opposed to an ESP. The fabric filter baghouse has an added advantage of also controlling condensable PM emissions. The Division agrees with this finding.

Step 5 – Selection of BACT:

The applicant has determined BACT as the following.

Applicant $PM/PM_{10}/PM_{2.5}$ BACT Selection:

Table 4-18: BACT Determination

Pollutant	Control Option	Emission/Operating Limit	Compliance Method
PM/PM_{10}	Baghouse	0.010 gr/dscf (3-hour average) 8.53 lb/hr (filterable + condensable)	Method 5 Method 201 or 201A (202 if necessary)
$PM_{2.5}$	Baghouse	0.006 gr/dscf (3-hour average) 6.98 lb/hr (filterable + condensable)	Method 5 Method 201 or 201A (202 if necessary)
$PM/PM_{10}/PM_{2.5}$	Baghouse	10% opacity (6-minute average)	COMS

The limit represents only filterable PM not condensable PM since the applicant does not predict any condensable emissions from the pelletizers. A detailed analysis of the BACT selection can be found on page 5-31 of the application.

EPD $PM/PM_{10}/PM_{2.5}$ BACT Selection:

The applicant proposed to use a number of fabric baghouses to control the $PM/PM_{10}/PM_{2.5}$ emissions from each ceramic proppant production line wherever feasible. The 10% opacity requirement was originally selected by the Division and has already been implemented in the construction permit for the pelletizers for Lines 1 and 2.

4.2.5 Pelletizers – VOC Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control of VOC emissions. An analysis of these technologies can be found on pages 5-22 and 5-32 of the application.

- Regenerative Thermal Oxidizer (RTO)
- Oxidation Catalyst
- Quencher/Scrubber System (Direct Contact Condensation)
- Carbon Adsorption
- Biofiltration
- Good Combustion Techniques

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The quencher/scrubber system does not qualify as BACT because the methanol concentration of the pelletizer exhaust stream does not meet the system requirements needed of VOC concentration of at least 1000 ppm by volume. The exhaust from the pelletizers is estimated at 100 ppm. The Carbon Adsorption is not a proven technology and does not seem to be cost-effective as evaluated by the applicant in Step 4. A description of why these technologies have been ruled technically infeasible can be found on page 5-33 of the application. The Division concurs with these findings.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-33 of the application.

Table 4-19: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	RTO	98%
2	Oxidation Catalyst - with reheat	95%
3	Biofiltration	90%
4	Good Combustion Practices	Base Case

The Division agrees with the applicant that the RTO is ranked as the most effective control technology to use with the pelletizers for VOC control. As stated previously, good combustion practices can also include the exclusive use of natural gas or propane.

Step 4 – Evaluation of Most Stringent Controls:

An analysis of the RTO, oxidation catalyst, and biofiltration system can be found on page 5-33 of the application. The applicant has performed a cost-analysis of the control technologies and has found them not to be economically feasible. The cost far exceeds the small amount of VOC emitted from the pelletizers. Appendix D of the application contains the cost-analysis for these technologies. The Division concurs that Good Combustion Techniques is the remaining option for BACT.

Step 5 – Selection of BACT:

Applicant VOC BACT Selection:

The applicant has determined BACT as the following.

Table 4-21: BACT Determination

Control Option	VOC Emission/ Operating Limit	Compliance Method
Good Combustion Techniques	11.78 lb/hr (monthly average)	Mass Balance

A detailed analysis of the BACT selection can be found in the application on pages 5-34 through 5-35.

EPD VOC BACT Selection:

EPD has determined that of the technically feasible add-on VOC emission control technologies identified, none of them are economically nor environmentally feasible as BACT. A search through the RBLC Clearinghouse also determines good combustion techniques as the usual control technique for pelletizers in the industry. The applicant would already like to use natural gas with propane as a backup for fuel which will aid in the reduction of VOC emissions.

4.2.6 Pelletizers – GHG Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has proposed the following possible control techniques for Greenhouse Gases (GHG). A description of these techniques is provided on pages 5-56 through 5-60.

CO_2

- Carbon capture and storage (CCS)
- Selection of the most efficient pelletizer technology
- Selection of the lowest carbon fuel
- Installation of energy efficient options for the pelletizer

CH_4

- Selection of a high efficiency kiln
- Installation of energy efficient options for the rotary kilns

N_2O

- Catalysts
- Installation of energy efficient options for the rotary kilns
- Energy efficient operating practices

Step 2 – Elimination of Technically Infeasible Control Options:

Due to the infancy of the technology and inability of waste disposal, CCS is not technically feasible for the capture of CO_2. This process is described on pages 5-48 through 5-51.

There is no data on the effectiveness of N_2O catalysts used on clay processing kilns. As described on pages 5-59 through 5-60 of the application, this technique is not technically feasible for control on N_2O.

The applicant states that all options are considered feasible for CH_4 control and can work to control other GHGs and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The Division agrees with the applicant that the available techniques' effectiveness is measured on a case by case basis. This means that there is no real ranking available but they will all be evaluated in the next section and on page 5-58 of the application.

Step 4 – Evaluation of Most Stringent Controls:

The following are techniques that the applicant chooses to employ to minimize GHG emissions. A detailed explanation can be found on page 5-58.

- Good Combustion Techniques include equipment design, maintenance, and combustion process control including appropriate combustion temperature, air to fuel ratio, and air/fuel mixing that can reduce fuel usage by increasing combustion efficiency thus fuel efficiency.
- The low carbon-density fuel used will be natural gas with propane as a backup.
- The pelletizers have many features such as monitoring devices, cooler gas heat recovery, and insulation in order to avoid heat loss.

The Division concurs with these findings.

Step 5 – Selection of BACT:

Applicant GHG BACT Selection:

The following table details the steps that the applicant will comply with the BACT selections and an explanation can be found on page 5-58 of the application.

Table 4-22: BACT Determination

Pollutant	Control Technology	Compliance Determination Method
CO_2	Low carbon-density fuel	Natural gas with propane as a backup
CO_2, CH_4, N_2O	Good combustion techniques	Proper maintenance and adjustments made expeditiously.
CO_2, CH_4, N_2O	Improved pelletizer insulation	Pelletizers will be insulated according to manufacturer's specification.
CO_2, CH_4, N_2O	Cooler gas heat recovery	The cooler gas is rerouted and used to cool the flue gas.
CO_2, N_2O, CH_4	High efficiency pelletizers	Pelletizer features include monitoring and combustion control devices.

As stated on page 5-53 of the application, EPA has advised that an output-based BACT emissions limit is acceptable in absence of an emissions/operation limit. The Division concurs with the applicants suggested BACT emission limit of 0.218 lb CO_{2e} per lb cooler product (44,446 lb CO_{2e}/ton cooler product) on a 12-month rolling average basis for each kiln.

EPD GHG BACT Selection:

The Division agrees that the techniques described in the previous steps are BACT for the pelletizers.

4.3 Emergency Generator - Background

The following is a BACT analysis of the diesel fired 469 hp Emergency Generator (EG2). The majority of the NO_x is thermal in nature and some is fuel NO_x originating from the nitrogen content in the fuel and oxidizing during combustion. The majority of the emissions are generated from incomplete combustion such as NO_x, SO_2, PM, VOC and CO. EG2 will be subject to Tier III emission standard and 40 CFR Part 60, Subpart IIII standard. Some of the requirements will be determined by these standards as explained in the following sections.

4.3.1 Emergency Generator – NO_x Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on NO_x emissions. An analysis of these technologies can be found on pages 5-9 through 5-11 and page 5-35 of the application.

- Selective Non-Catalytic Reduction (SNCR)
- Selective Catalytic Reduction (SCR)
- Good Design and Operating Practices such as low NO_x burners/combustion control.

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

Although there may be technical issues with start-up and shut down, the applicant states on page 5-35 of the application that all options are considered technically feasible. The Division concurs with these findings.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-36 of the application.

Table 4-23: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	SCR	70-90%
2	SNCR	65-75%
3	Good Combustion Practices	Base Case

The Division agrees with the applicant that the SCR is ranked as the most effective control technology to use with the generator for NO_x control.

Step 4 – Evaluation of Most Stringent Controls:

It has been determined that add-on controls are economically infeasible and this explanation can be found on page 5-36 of the application. As part of the good combustion practices, the diesel generator must meet the applicable Tier III emissions limits (as certified by EPA) for the same model year and capacity and burn fuel oil that meets the specifications under NSPS Subpart IIII. This permit will establish corresponding operational, maintenance and recordkeeping requirements to ensure the compliance with the BACT. Purchase of a Tier III certified generator plus compliance with NSPS Subpart IIII is sufficient as BACT and the Division concurs.

Step 5 – Selection of BACT:

Applicant NO_x BACT Selection:

The applicant has chosen for BACT, certifying that the emergency diesel generator is in compliance with the applicable Tier III NO_x emission standard for non-road compression ignition engines. This standard is equivalent or more stringent than the 40 CFR Part 60, Subpart IIII NO_x standard for the same engines. As stated on page 5-36, the applicant will comply by:

- Purchasing a Tier III certified generator
- 100 hours per year limit for purposes of maintenance checks and readiness testing
- 500 hours per year limit on total hours of operation
- NSPS IIII compliant emission limit of 4.0 g/kW-hr

EPD NO_x BACT Selection:

The Division agrees that the compliance method presented is BACT and has been verified by checking the RBLC. Through good combustion practices, the emission limit will fulfill with the Tier III and NSPS IIII requirements.

4.3.2 Emergency Generator – SO_2 Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control of SO_2 emissions. An analysis of these technologies can be found on pages 5-13 through 5-14 and page 5-37 application.

- Wet Scrubber
- Dry or Semi-Dry Scrubber
- Sorbent Injection

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-37 of the application that all options are considered technically feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-38 of the application.

Table 4-24: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Wet Scrubber	90-98%
2	Dry or Semi-Dry Scrubber	80-90%
3	Sorbent Injection	50-60%

The Division agrees with the applicant that the Wet Scrubber is ranked as the most effective control technology to use.

Step 4 – Evaluation of Most Stringent Controls:

It has been determined that add-on controls are economically infeasible and this explanation can be found on page 5-38 of the application. Compliance with NSPS Subpart IIII is a sufficient BACT requirement and the Division concurs.

Step 5 – Selection of BACT:

The applicant has selected good combustion practices which includes using an ultra-low sulfur diesel for the generator SO_2 BACT. The fuel must comply with a sulfur content of 15 ppm. This limit is compliant with the NSPS Subpart IIII requirement to limit SO_2 engine emissions. The Division agrees with this BACT selection and has found this conclusion industry-wide.

4.3.3 Emergency Generator – CO Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on CO emissions. An analysis of these technologies can be found on page 5-16 of the application.

- Regenerative/Non-regenerative Catalytic Oxidizer (RCO)
- Oxidation Catalyst
- Good Combustion Techniques

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-38 of the application that all options are considered technically feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-39 of the application.

Table 4-25: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	RCO/non-RCO	98%
2	Oxidation Catalyst - with reheat	95%
3	Good Combustion Practices	Base Case

The Division agrees with this finding.

Step 4 – Evaluation of Most Stringent Controls:

It has been determined that add-on controls are economically infeasible and this explanation can be found on page 5-39 of the application. Compliance with NSPS Subpart IIII is a sufficient BACT requirement and the Division concurs.

Step 5 – Selection of BACT:

Applicant CO BACT Selection:

Table 4-26: BACT Determination

Control Option	CO Emission/ Operating Limit	Compliance Method
Combustion Design Controls	3.5 g/kW-hr	NSPS Subpart IIII

The applicant proposes the following BACT methods as described on page 5-39 of the application.

- Purchasing a Tier III certified generator
- 100 hours per year limit for purposes of maintenance checks and readiness testing
- 3.5 g/kW-hr emissions limit per NSPS Subpart IIII

EPD CO BACT Selection:

The Division agrees with this BACT selection and has found this conclusion industry-wide.

4.3.4 Emergency Generator – $PM/PM_{10}/PM_{2.5}$ Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control on $PM/PM_{10}/PM_{2.5}$ (noted as PM) emissions. An analysis of these technologies can be found on page 5-30 of the application.

- Baghouse
- Electrostatic Precipitator (ESP)
- Wet Scrubbing
- Good Combustion Techniques including the use of low sulfur diesel fuel

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-40 of the application that all options are considered technically feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-40 of the application.

Table 4-27: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	Baghouse and ESP	> 99%
2	Wet Scrubbing	< 99%

The Division agrees with the applicant that the baghouse and ESP are ranked as the most effective control technologies to use.

Step 4 – Evaluation of Most Stringent Controls:

The Division agrees with the applicant that the technologies presented are not economically feasible for control of the generator. Therefore they are not BACT for PM control.

Step 5 – Selection of BACT:

Applicant PM/PM_{10}/$PM_{2.5}$ BACT Selection:

The applicant proposes the following BACT methods as described on page 5-41 of the application.

- Exclusive use of low sulfur diesel fuel,
- 500 hours per year limit on total hours of operation,
- 0.20 g/kW-hr emissions limit per NSPS Subpart IIII,

EPD PM/PM_{10}/$PM_{2.5}$ BACT Selection:

The Division agrees with this BACT selection and has found this conclusion industry-wide.

4.3.5 Emergency Generator – VOC Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control of VOC emissions. An analysis of these technologies can be found on pages 5-22 and 5-41 of the application.

- Regenerative Thermal Oxidizer (RTO)
- Oxidation Catalyst
- Good Combustion Techniques including the exclusive use of low sulfur diesel fuel

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The RTO and the catalytic oxidizer are both technically feasible. The applicant has found the options to be economically infeasible. The cost exceeds the small amount of VOC emitted from the generator used for emergency purposes only.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-41 of the application.

Table 4-28: Efficiency Ranking of Feasible Control Technologies

Rank	Control Technology	Potential Control Efficiency (%)
1	RTO	98%
2	Oxidation Catalyst - with reheat	95%
3	Good Combustion Practices	Base Case

The Division agrees with the applicant that in terms of efficiency, the RTO is ranked as the most effective control technology to use with the generator for VOC control.

Step 4 – Evaluation of Most Stringent Controls:

It has been determined that add-on controls are economically infeasible and this explanation can be found on page 5-42 of the application. Compliance with NSPS Subpart IIII is a sufficient choice for BACT and the Division concurs.

Step 5 – Selection of BACT:

Applicant VOC BACT Selection:

The applicant proposes the following BACT methods as described on page 5-42 of the application.

- Purchasing an emergency diesel generator which is certified by EPA to the applicable Federal Emission Standards according to 40 CFR Part 60, Subpart IIII or 4 grams/kW-hr,
- 100 hours per year limit for purposes of maintenance checks and readiness testing,
- 500 hours per year limit on total hours of operation,
- Use low sulfur diesel fuel which meets requirements/standards under 40 CFR Part 60, Subpart IIII for the emergency diesel generator.

EPD VOC BACT Selection:

The Division agrees that the compliance method presented is BACT and has been verified by checking the RBLC.

4.3.6 Emergency Generator – Greenhouse Gas Emissions

Step 1 – Identification of Potential Control Techniques:

There are some techniques that can be considered BACT for Greenhouse Gas (GHG) emission control but there are no available technologies. The applicant is concerned with the control of CO_2, CH_4, and N_2O emissions. Carbon Capture and Storage is not available for the emergency use generator. The technology is for equipment that is used consistently. The Division concurs that some options available are limiting the fuel type to low sulfur diesel fuel or low carbon-density fuel such as natural gas.

Step 2 – Elimination of Technically Infeasible Control Options:

Low carbon density fuel i.e. natural gas is not a technically feasible option. The natural gas option will not be useful if during times of power outages the facility doesn't receive any fuel. The Division agrees that the natural gas use option is technically infeasible as explained on page 5-61 of the application.

Step 3 – Rank of Remaining Control Technologies:

The applicant states on page 5-61 that only available options for the engines that run the generator are purchasing the most efficient engine and exclusively using low sulfur diesel fuel. The applicant is currently evaluating engines with the best brake specific fuel consumption (BSFC) which is a way of measuring fuel efficiency for engines.

Step 4 – Evaluation of Most Stringent Controls:

Exclusive use of low sulfur diesel fuel and the most efficient emergency generator that complies with the EPA Tier III standards is BACT for GHG control. The Division agrees that this selection is environmentally and economically feasible.

Step 5 – Selection of BACT:

Applicant GHG BACT Selection:

The applicant proposes the following BACT methods as described on page 5-42 of the application.

- Exclusive use of low sulfur diesel fuel,
- Limit CO_{2e} emissions from the diesel generator to 38 tons per year on a 12-month rolling basis,
- Install and operate emergency diesel generator which is certified by EPA for compliance with the application Tier III standards.

EPD GHG BACT Selection:

The Division agrees that the compliance method presented is BACT and has been verified by checking the RBLC.

4.4 Material Handling - Background

Material handling at the facility is composed of point sources such as bin vent filters for silos, baghouses for silo loadout operations. Fugitive emissions could come from the material shredder, conveyors, truck traffic etc. Handling of the clay material results in PM, PM_{10}, $PM_{2.5}$ (denoted as PM) emissions.

4.4.1 Material Handling – PM, PM_{10}, $PM_{2.5}$ Emissions

Step 1 – Identification of Potential Control Techniques:

The applicant has suggested the following BACT for control of PM emissions. An analysis of the technologies for point source control options can be found on pages 5-19 through 5-20 of the application. A description of the fugitive source control options is found on page 5-43.

Point Sources:

- Baghouse
- Electrostatic Precipitator (ESP)
- Venturi Scrubber

Fugitive Sources:

- Water Application/Sweeping
- Paving Facility Roads with Concrete or Asphalt

- Enclosing Clay handling and Storage Areas
- Restricting Clay Delivery Trucks Access to Facility Roads
- Operating a Truck Tire Washing Station

The Division has reviewed Step 1 of the applicant's analysis and the Division agrees with the findings.

Step 2 – Elimination of Technically Infeasible Control Options:

The applicant states on page 5-43 of the application that all options are considered feasible and the Division concurs.

Step 3 – Rank of Remaining Control Technologies:

The following is a ranking of the control technologies based off of control effectiveness found on page 5-31 of the application.

Table 4-29: Efficiency Ranking of Feasible Control Technologies for Point Sources

Rank	Control Technology	Potential Control Efficiency (%)
1	Baghouse and ESP	> 99%
2	Wet Scrubbing	< 99%
3	Venturi Scrubber	< 90%

The Division agrees with the applicant that the baghouse and ESP are ranked as the most effective control technologies to use for point source PM control. All techniques listed as fugitive source controls are feasible.

Step 4 – Evaluation of Most Stringent Controls:

The Division agrees with the applicant that the baghouses are a feasible choice for controlling point source emissions. Fugitive emissions will be controlled by the appropriate methods listed in Step 1.

Step 5 – Selection of BACT:

Applicant PM, PM_{10}, $PM_{2.5}$ BACT Selection:

Table 4-30: BACT Determination

Control Option	PM, PM_{10}, $PM_{2.5}$ Emission/ Operating Limit	Compliance Method
Baghouse (Point Source Control)	0.005 gr/dscf (3-hour average) 7% (6-minute average)	Method 5 (or Method 201/201A)
Fugitive Control	10% opacity	Method 9/Method 22

Condensable PM emissions from these sources are expected to be insignificant.

EPD PM, PM_{10}, $PM_{2.5}$ BACT Selection:

The Division agrees that the compliance method presented is BACT and has been verified by the RBLC.

5.0 TESTING AND MONITORING REQUIREMENTS

Testing Requirements:

Depending on the regulatory status, PyraMax Ceramics' emission sources will be subject to testing requirements under federal rules including PSD/NSR/BACT, NSPS Subparts OOO and UUU, and 112(g) case-by-case MACT. These testing requirements are emission or source/process specific, and sometimes complementary to each other. The main tests performed for PM concentration will be Method 5 whereas if the company is measuring filterable and condensable PM_{10} or $PM_{2.5}$, Method 202 must be used in addition to Method 5. Fugitive PM emissions will be measured using Method 9 but the company also plans to install a continuous opacity monitor (COMS). See the Table 5.3 for applicable testing for all other pollutants. All of the emission limits for PM and visible emissions (VE) that the facility needs to meet are located in Table 5.1. Table 5.1 is a detailed account of Table 5.2. Table 5.2 outlines the final selection of test method compliance.

Table 5.1 PM & VE Test Requirements

Regulatory Compliance	Pollutant	Equipment	Emission Limit	Test Method
40 CFR 52.21 BACT	PM/PM_{10}	Calciner/Kiln/Spray Dryer/Pelletizer baghouses	0.01 gr/dscf	Method 5 (Method 201/201A)
	PM_{10} (filterable + condensable)	Calciner/Kiln baghouses	8.53 lb/hr	Method 5 & 202 (Method 201/201A and Method 202)
	$PM_{2.5}$ (filterable + condensable)	Calciner/Kiln baghouses	6.98 lb/hr	Method 5 & 202 (Method 201/201A and Method 202)
	$PM_{2.5}$	Spray Dryer/Pelletizer baghouses	0.006 gr/dscf	Method 5 (Method 201/201A)
40 CFR Part 60, Subpart OOO	PM	Stack/building openings	0.014 gr/dscf	Method 5 or 17
40 CFR Part 60, Subpart UUU	PM	Calciner/dryer in series	0.04 gr/dscf	Method 5 or 17
	PM	Dryers	0.025 gr/dscf	Method 5 or 17
40 CFR 52.21 BACT	VE	Calciner/Kiln/Spray Dryer/Pelletizer baghouses	10%	COMS
40 CFR Part 60, Subpart OOO	VE	Crusher w/out a capture system	12%	Method 9
	VE	All other fugitive/building openings	7%	Method 9
40 CFR Part 60, Subpart UUU	VE	Calciners/dryers	10%	Method 9

40 CFR Part 60, Subpart OOO: This NSPS standard requires initial performance tests on the process units/emission sources subject to the applicable PM and visible emissions limits under the Subpart. The tests shall demonstrate compliance with the applicable emission limits using Method 5, Method 9 and/or Method 22, depending on the nature of the source involved. PyraMax Ceramics' shall follow the applicable procedures specified in Subpart OOO to conduct the PM, visible and/or fugitive emission testing. For purposes of NSPS Subpart OOO, the term "particulate matter" refers to particulate matter irrespective of particle size. Alternatives to these methods are allowed and can be found in Condition 4.2.3 of Georgia Air Quality Permit No. 3295-163-0035-P-01-1.

40 CFR Part 60, Subpart UUU: This NSPS standard requires initial performance tests on the spray dryers/pelletizers and calciners/kilns to demonstrate compliance with the applicable PM and visible emission limits using Method 5 and Method 9. PyraMax Ceramics shall follow the applicable procedures specified in Subpart UUU to conduct the PM and visible emission testing. For purposes of NSPS Subpart UUU, the term "particulate matter" refers to particulate matter irrespective of particle size. PyraMax Ceramic is required to use COMS to monitor the visible emissions from the affected sources during the testing.

PSD/NSR/BACT:

PM/PM_{10}/$PM_{2.5}$/VE: All the point and fugitive PM emission sources directly involving the clay processing not only have visible and/or particulate matter emission limits under either Subpart OOO or Subpart UUU, but also are subject to the visible and particulate matter emission limits under PSD/BACT rules. PyraMax Ceramics shall conduct Method 9, Method 22, Method 5, Method 202 and Method 201/201A tests as appropriate on the sources to demonstrate initial compliance with the applicable BACT visible and particulate matter emission limits. The point sources may include, but not to be limited to, baghouse-controlled raw material handling operations, raw or finished product storage bins/silos, material conveying system transfer points, milling, screening, packaging systems, bulk loading or unloading systems, spray dryers/pelletizers and calciners/kilns.

PyraMax Ceramics is required to conduct an initial performance test for PM, PM_{10}, and $PM_{2.5}$ emissions from each calciner/kiln, spray dryer/pelletizer, and applicable material handling equipment stacks. For purposes of PSD, the term "PM_{10} emissions" and "$PM_{2.5}$ emissions" includes filterable plus condensable particulate matter.

To assess periodic compliance with the BACT particulate matter emissions limits, PyraMax Ceramics is required to conduct PM/PM_{10}/$PM_{2.5}$ (filterable plus CPM emissions for PM_{10} and $PM_{2.5}$) performance tests on each calciner/kiln and spray dryer on each process/kiln line every 36 months after the completion of the initial performance tests.

When any source modifications or change in operation(s) that may adversely affect the PM/PM_{10}/$PM_{2.5}$, CPM emissions or visible emissions from any such source, PyraMax Ceramics shall conduct a performance test on the source using Method 5, Method 201/201A, Method 202, Method 9 or Method 22 as appropriate, and establish new operational parameter(s) that could affect the particulate matter emissions.

Carbon Monoxide Emissions: Carbon monoxide (CO) emissions are generated by each proposed calciner/kiln and dryer/pelletizer. The Permittee will be required to conduct initial performance testing of CO emissions from each proposed calciner/kiln and dryer/pelletizer. The calciner/kiln and dryer/pelletizer must comply with the emission limits of 33 lb/hr and 13.73 lb/hr respectively.

Nitrogen Oxides Emissions: Nitrogen oxides (NO_x) emissions are generated by each proposed calciner/kiln and dryer/pelletizer. The Permittee will be required to conduct initial performance testing of NOx emissions from each proposed calciner/kiln to assess compliance with the applicable NOx BACT emission limits of 36.3 lb/hr. Likewise the Permittee will be required to conduct initial performance testing of NOx emissions from each proposed dryer/pelletizer to assess compliance with the applicable NOx BACT emission limits of 2.25 lb/hr. The Permittee will be required to conduct annual performance testing of NOx from each proposed calciner/kiln which exhausts through a catalytic baghouse. The NOx BACT requirement for the catalytic baghouse (which receives the exhaust from the proposed calciner/kilns) is a minimum of 80% NOx control and verification of compliance with this control efficiency will be assessed through an initial performance and once per calendar year quarter performance tests. The Permittee will be required to monitor and establish the following catalytic baghouse operational parameters (including averaging periods) during the Method 7E or 3A tests.

VOC Emissions: Volatile Organic Compounds (VOC) emissions are generated by each proposed calciner/kiln and dryer/pelletizer. The Permittee will be required to conduct initial performance testing of VOC emissions from each proposed calciner/kiln to assess compliance with the applicable VOC BACT emission limits of 0.54 lb/hr through Method 25/25A testing. More accurate account of VOC emissions is measuring output. The dryer/pelletizers output of VOC is not as significant. Therefore a simple mass balance of material input content is sufficient. The Permittee will be required to conduct initial performance testing of VOC emissions from each proposed dryer/pelletizer to assess compliance with the applicable VOC BACT emission limits of 11.78 lb/hr.

Sulfur Dioxide Emissions: Sulfur dioxide (SO_2) emissions are generated by each proposed calciner/kiln and dryer/pelletizer. The proposed calciners/kilns will exhaust through a catalytic baghouse which in this case acts as a dry scrubber. The Permittee will be required to conduct initial performance testing of the calciner/kiln to verify compliance with the SO_2 BACT limit 11.64 lb/hr. The Permittee will be subject to annual performance testing of SO_2 emissions from each of the proposed calciners/kilns. In addition, the Permittee will be required to conduct an initial performance test to assess compliance with the SO_2 control efficiency of the catalytic baghouse through Method 6 or 6C and measuring the daily sulfur content of the fuel used. The Permittee will be required to monitor and establish the catalytic baghouse operational parameters (including averaging periods) during the performance tests at a minimum of 90% control.

HAP Emissions: PyraMax Ceramics is required to conduct initial and annual HCl and HF emission performance tests on each calciner/kiln to demonstrate compliance with the case-by-case MACT emission limits. During the performance testing, PyraMax Ceramics shall establish the mission rates, operating parameters, and control efficiency of each "catalytic bughouses" serving the calciner/kiln being tested. Details can be found in the "Notice of MACT Approval" document.

Conclusion for Testing Requirements: Appropriate operating parameters that may affect the emissions shall be determined during the tests and utilized/maintained once the results of the tests are approved by EPD. Such parameters include, but not to be limited to, kiln feed rate, exhaust flow rate, temperature profile and burner setting, baghouse pressure drop and inlet temperature, and ammonia and sodium bicarbonate injection rate and/or NH_3/NO_x and $NaHCO_3/NO_x$ molar ratio. Contained in Table 5.2 are the identified BACT testing requirements.

Table 5.2 BACT Testing Requirements

Emission Unit	Pollutant	Test Method	Initial Test	Periodic Testing
Calciner/Kiln No. 3 Calciner/Kiln No. 4	PM/PM_{10}	Method 5 (Method 201/201A)	Within 180 days	Every 36 months

Emission Unit	Pollutant	Test Method	Initial Test	Periodic Testing
	PM_{10} filterable+ condensable combined	Methods 5 & 202 (Method 201/201A and Method 202)	Within 180 days	Every 36 months
	$PM_{2.5}$ filterable+ condensable combined	Methods 5 & 202 (Method 201/201A and Method 202)	Within 180 days	Every 36 months
	CO	Method 10	Within 180 days	Annually
	VOC	Method 25 or 25A	Within 180 days	Annually
	NO_x	Method 7 or 7E	Within 60 days	Once/Calendar Quarter
	SO_2	Method 6 or 6C	Within 180 days	Annually
	CO_{2e}	Mass balance calculation based on Division-approved emission factors	Within 180 days	n/a
Calciner/Kiln No. 3 Calciner/Kiln No. 4 & Spray Dryer/ Pelletizer No. 3 Spray Dryer/ Pelletizer No. 4	Visible	Method 9 or 22[2]	Within 180 days	n/a
Spray Dryer/ Pelletizer No. 3 Spray Dryer/ Pelletizer No. 4	$PM/PM_{10}/PM_{2.5}$	Methods 5 & 202 (Method 201 or 201A in conjunction with Method 202 if necessary)	Within 180 days	Every 36 months
	CO	Method 10	Within 180 days	Annually
	NO_x	Method 7 or 7E	Within 180 days	Annually
	VOC	Mass balance calculation.	Within 180 days	n/a
	CO_{2e}	Mass balance calculation based on Division-approved emission factors	Within 180 days	n/a
Other stack emission sources excluding spray dryers/pelletizers, calciners/kilns and silos with dedicated bin vents. [1]	VE	Method 9	Within 60 days of startup no later than 180 days	New modification/construction.
	PM	Method 5 (Method 201/201A)	Within 60 days of startup no later than 180 days	New modification/construction.
Silos with dedicated bin vents[1]	VE	Method 9	Within 60 days of startup no later than 180 days	New modification/construction.
All other fugitive sources/building openings[1]	VE	Method 22 or Method 9	Within 60 days of startup no later than 180 days	New modification/construction.

Emission Unit	Pollutant	Test Method	Initial Test	Periodic Testing
Emergency Diesel Generator	CO_{2e}	Mass balance calculation based on Division-approved emission factors	Within 180 days	n/a

[1] The selected requirements are pulled from NSPS OOO and UUU.

[2] Continuous Opacity Monitoring can be used in lieu of this test, if applicable.

Monitoring Requirements:

PyraMax Ceramics' ceramic proppant manufacturing operations are subject to the monitoring requirements under PSD/BACT, NSPS (Subpart IIII, Subpart OOO and Subpart UUU), and applicable SIP regulations. These monitoring requirements are emission or source/process specific and, depending on the regulatory status of the source, may be complementary to each other.

Since both spray dryers/pelletizers and calciners/kilns are major sources of PM emissions which contribute to the visible emissions, Subpart UUU and Subpart OOO requires COMS to be used to monitor visible emissions.

Table 5.5 Visible Emissions (VE) Monitoring Requirement

Equipment	VE Limit	Monitoring Requirements	Regulatory Compliance
Calciner/Kiln No. 3 Calciner/Kiln No. 4	10%	A Continuous Opacity Monitoring System (COMS) at the outlet of the Kiln Catalytic Baghouse	BACT
Spray Dryer/Pelletizer No. 3 Spray Dryer/Pelletizer No. 4	10%	A COMS at the outlet of the Process/Kiln Line Baghouse for Pelletization	BACT
Crushers w/ no capture system.	12%	Method 9 or Method 22	NSPS OOO
All other fugitive sources.	7%	Method 9 or Method 22	NSPS OOO
Building outlets	7%	Method 9 or Method 22	NSPS OOO
Calciner/Kiln No. 3 Calciner/Kiln No. 4 & Spray Dryer/ Pelletizer No. 3 Spray Dryer/ Pelletizer No. 4	10%	Method 9 or COMS	NSPS UUU

PM/PM10/PM2.5/Visible Emissions: PyraMax Ceramics is required to install devices to continuously monitor the inlet temperature of baghouses receiving hot gases and to record the time of each incident when the temperature exceeds the filter bag design temperature. This requirement to continuously monitoring the temperature at the inlets of baghouses for the calciner/kilns and spray dryer/pelletizers, prevents the heat damage of the filter bags.

PyraMax Ceramics is required to conduct daily visible emission check (VE) on all baghouses except those having COMS, and retain a record in a daily VE log suitable for inspection or submittal. The daily VE check log shall also include causes of any visible emission and corrective actions taken. The opacity action level for baghouses with an air pollution control device is 5%. Any visible emissions or mechanical failure or malfunction from baghouses without an air pollution control device requires immediate action.

To ensure the proper function of the baghouses controlling particulate matter emission, PyraMax Ceramics is required to record the pressure drop at least on a weekly basis. In addition, a Prevention Maintenance Program (PMP) including scheduled equipment inspection requirements shall be developed for all the baghouses as supplement to the daily VE check.

PyraMax Ceramics is required to perform daily operation and maintenance inspections on the dust/fugitive emissions suppression and cleanup systems, and keep records of the inspection.

Carbon Monoxide Emissions: No monitoring requirements are imposed on the BACT requirements consisting of the employment of "proper combustion techniques".

Nitrogen Oxides Emissions: NOx emissions from the proposed calciners/kilns are controlled by a catalytic baghouse which functions as selective catalytic reduction (SCR) for NOx control. The catalytic baghouse must be operated to maintain a minimum NOx control efficiency of 80% during operation of the calciners/kilns. Verification of compliance with the NOx emission rate in pounds per hour will be accomplished through the use of a hand-held portable NOx analyzer the first measurement taken within 60 days of commencement of operation. Testing must occur on a weekly basis until measurements are within 70% of the BACT limit for three consecutive weeks. After that, testing may occur once per calendar quarter. In order to assess proper operation of the catalytic baghouse to effectively control NOx emissions to BACT levels, the Permittee will be required to continuously monitor the ammonia injection rate and sodium injection rate to the calciner/kiln exhaust stream upstream of each catalytic baghouse; and the inlet temperature of the catalytic baghouse.

Sulfur Dioxide Emissions: No periodic monitoring will be imposed to verify the SO_2 control efficiency of the catalytic baghouse. The SO_2 emissions from each calciner/kiln will be determined daily via analysis of the sulfur content of the raw clay processed by the calciner/kiln and mass balance calculation.

Volatile Organic Compounds: No periodic monitoring will be imposed to verify the VOC control efficiency of the catalytic baghouse. The VOC emissions will be determined via mass balance measurement of VOC in the raw material for the input of the dryer/pelletizers.

Table 5.6 BACT Monitoring Requirements

Equipment	Pollutant	Monitoring Requirements
Baghouses that receive gases at a temperature higher than ambient air.	$PM/PM_{10}/PM_{2.5}$	Continuous Temperature Monitor
All baghouses	$PM/PM_{10}/PM_{2.5}$	Method 9 or COMS
All baghouses	$PM/PM_{10}/PM_{2.5}$	Develop Preventative Maintenance Program
All stack emission points w/out an APCD	Visible Emissions	Walkthrough inspection.
Catalytic Baghouse	NO_x	ASTM D 6522 or EPA/EMC (CTM 30) or Methods 7E and 3A[1]
	$PM/PM_{10}/PM_{2.5}$	Exhaust gas temperature, kiln feed input rate, monthly total output of cooler product.
	SO_2	Daily average of clay sulfur content.
	VOC	Mass balance from all VOC-containing chemicals and fuel usage.

Spray Dryer/Pelletizer No. 3 Spray Dryer/Pelletizer No. 4	$PM/PM_{10}/PM_{2.5}$	Slurry input rate, monthly fuel usage.
Calciner/Kiln No. 3 Calciner/Kiln No. 4 & Spray Dryer/ Pelletizer No. 3 Spray Dryer/ Pelletizer No. 4	CO_{2e}	Monthly Fuel Usage
Stationary Emergency Diesel Generator	$PM/PM_{10}/PM_{2.5}$, NO_x, VOC, CO, $CO2_e$	Monthly fuel usage.

[1] A continuous flow monitor can be used to measure the exhaust flow rate in lieu of Method 2.

Monitoring for compliance with the GHG BACT emission limits consist of mass balance calculations of the GHG emissions from sprays dryers/pelletizers and calciners/kilns based on EPD-approved emission factors and production records. Please refer to Part 6.0 of Georgia Air Quality Permit No. 3295-163-0035-P-01-0 for details.

NSPS Subpart IIII and SIP rules require each stationary emergency diesel generator to be equipped with a non-resettable hour meter to track its operating time. The Permittee shall use the meter to record the time of operation and the nature of the operation. Compliance with the relevant annual operating time limits is a requirement by SIP rule for the generator to remain as an emergency generator and one of the presumptions used in the BACT determination for the generator. This is shown in Table 5.6.

Table 5.7 NSPS IIII Monitoring Requirements

Equipment	Pollutant	Control Method
Emergency Diesel Generator	NMHC + NO_X, CO, PM	Non-resettable hour meter.

CAM Applicability:

As a green-field source/site, PyraMax Ceramics, LLC – King's Mill Facility is required to prepare and submit monitoring plans for emission units/sources subject to the CAM requirements with the initial Title V operating permit application within 12 months of the startup of this new source. This SIP/PSD construction permit, as issued under the authority of Georgia Rules 391-3-1-.02(7), "Prevention of Significant Deterioration of Air Quality" and 391-3-1-.03(1), "Construction (SIP) Permit", is not required to incorporate the applicable CAM requirements.

6.0 AMBIENT AIR QUALITY REVIEW

An air quality analysis is required to determine the ambient impacts associated with the construction and operation of the proposed modifications. The main purpose of the air quality analysis is to demonstrate that emissions emitted from the proposed modifications, in conjunction with other applicable emissions from existing sources (including secondary emissions from growth associated with the new project), will not cause or contribute to a violation of any applicable National Ambient Air Quality Standard (NAAQS) or PSD increment in a Class I or Class II area. NAAQS exist for NO_2, CO, $PM_{2.5,}$ PM_{10}, SO_2, Ozone (O_3), and lead. PSD increments exist for SO_2, NO_2, $PM_{2.5}$, and PM_{10}.

The proposed project at PyraMax Ceramics triggers PSD review for NO_x, CO, VOC, GHGs, PM, $PM_{2.5,}$, and PM_{10}. An air quality analysis was conducted to demonstrate the facility's compliance with the NAAQS and PSD Increment standards for NO_x, CO, SO_2, $PM_{2.5,}$ and $PM_{10.}$ An additional analysis was conducted to demonstrate compliance with the Georgia air toxics program. This section of the application discusses the air quality analysis requirements, methodologies, and results. Supporting documentation may be found in the Air Quality Dispersion Report of the application and in the additional information packages.

Modeling Requirements

The air quality modeling analysis was conducted in accordance with Appendix W of Title 40 of the Code of Federal Regulations (CFR) §51, *Guideline on Air Quality Models*, and Georgia EPD's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions (Revised).*

The proposed project will cause net emission increases of NO_x, CO, VOC, GHGs, PM, $PM_{2.5,}$ and PM_{10} that are greater than the applicable PSD Significant Emission Rates. Therefore, air dispersion modeling analyses are required to demonstrate compliance with the NAAQS and PSD Increment. TRS and VOC do not have established PSD modeling significance levels (MSL) (an ambient concentration expressed in either $\mu g/m^3$ or ppm). While TRS does not have established Significant Impact Levels, it does have an ambient monitoring *de minimis* threshold that is concentration-based. Therefore, TRS modeling was conducted to demonstrate that the project impact is below the ambient monitoring *de minimis* concentration.

Significance Analysis: Ambient Monitoring Requirements and Source Inventories

Initially, a Significance Analysis is conducted to determine if the NO_2 and $PM_{2.5}$ emissions increases at PyraMax Ceramics would significantly impact the area surrounding the facility. Maximum ground-level concentrations are compared to the pollutant-specific U.S. EPA-established Significant Impact Level (SIL). The SIL for the pollutants of concern are summarized in Table 6-1.

If a significant impact (i.e., an ambient impact above the SIL) does not result, no further modeling analyses would be conducted for that pollutant for NAAQS or PSD Increment. If a significant impact does result, further refined modeling would be completed to demonstrate that the proposed project would not cause or contribute to a violation of the NAAQS or consume more than the available Class II Increment.

Under current U.S. EPA policies, the maximum impacts due to the emissions increases from a project are also assessed against monitoring *de minimis* levels to determine whether pre-construction monitoring should be considered. These monitoring *de minimis* levels are also listed in Table 6-1. If either the predicted modeled impact from an emission increase or the existing ambient concentration is less than the monitoring *de minimis* concentration, the permitting agency has the discretionary authority to exempt an applicant from pre-construction ambient monitoring. This evaluation is required for NO_x, CO, SO_2, $PM_{2.5,}$ and PM_{10}.

If any off-site pollutant impacts calculated in the Significance Analysis exceed the SIL, a Significant Impact Area (SIA) would be determined. The SIA encompasses a circle centered on the facility with a radius extending out to (1) the farthest location where the emissions increase of a pollutant from the project causes a significant ambient impact, or (2) a distance of 50 km, whichever is less. All sources within a distance of 50 km of the edge of a SIA are assumed to potentially contribute to ground-level concentrations within the SIA and would be evaluated for possible inclusion in the NAAQS and PSD Increment analyses. EPA promulgated SILs for $PM_{2.5}$ on October 20, 2010 (75 FR 64864-64907). Official SILs for the 1-hour NO_2 and 1-hour SO_2 NAAQS have not been promulgated by EPA.

Table 6-1: Summary of Modeling Significance Levels

Pollutant	Averaging Period	PSD Significant Impact Level (ug/m^3)	PSD Monitoring Deminimis Concentration (ug/m^3)
PM_{10}	Annual	1	--
	24-Hour	5	10
$PM_{2.5}$	Annual	0.3	--
	24-Hour	1.2	4
NO_2	Annual	1	14
	1-Hour	7.5	--
CO	8-Hour	500	575
	1-Hour	2000	--
SO_2	1-Hour	7.8	--
	3-Hour	25	--
	24-Hour	5	13
	Annual	1	--

NAAQS Analysis

The primary NAAQS are the maximum concentration ceilings, measured in terms of total concentration of pollutant in the atmosphere, which define the "levels of air quality which the U.S. EPA judges are necessary, with an adequate margin of safety, to protect the public health." Secondary NAAQS define the levels that "protect the public welfare from any known or anticipated adverse effects of a pollutant." The primary and secondary NAAQS are listed in Table 6-2 below.

Table 6-2: Summary of National Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS	
		Primary / Secondary (ug/m^3)	Primary / Secondary (ppm)
PM_{10}	Annual	*Revoked 12/17/06	*Revoked 12/17/06
	24-Hour	150 / 150	--
$PM_{2.5}$	Annual	15 / 15	--
	24-Hour	35 / 35	--
NO_2	1-Hour	188/188	--/--
	Annual	100 / 100	0.053 / 0.053
CO	8-Hour	10,000 / None	9 / None
	1-Hour	40,000 / None	35 / None
SO_2	1-Hour	196/None	75/None
	3-Hour	None/1300	None/0.5

If the maximum pollutant impact calculated in the Significance Analysis exceeds the SIL at an off-property receptor, a NAAQS analysis is required. The NAAQS analysis would include the potential emissions from all emission units at PyraMax, except for units that are generally exempt from permitting requirements and are normally operated only in emergency situations. The emissions modeled for this analysis would reflect the results of the BACT analysis for the modified emission unit. Facility emissions would then be combined with the allowable emissions of sources included in the regional source inventory. The resulting impacts, added to appropriate background concentrations, would be assessed against the applicable NAAQS to demonstrate compliance. For an annual average NAAQS analysis, the highest modeled concentration among five consecutive years of meteorological data would be assessed, while the highest second-high impact or highest-sixth-high would be assessed for the short-term averaging periods depending on the pollutant.

PSD Increment Analysis

The PSD Increments were established to "prevent deterioration" of air quality in certain areas of the country where air quality was better than the NAAQS. To achieve this goal, U.S. EPA established PSD Increments for certain pollutants. The sum of the PSD Increment concentration and a baseline concentration defines a "reduced" ambient standard, either lower than or equal to the NAAQS that must be met in an attainment area. Significant deterioration is said to have occurred if the change in emissions occurring since the baseline data results in an off-property impact greater than the PSD Increment (i.e., the increased emissions "consume" more that the available PSD Increment).

U.S. EPA has established PSD Increments for NO_X, SO_2, PM_{10}, and $PM_{2.5}$; no increments have been established for CO. The PyraMax Plant is located in a Class II area. Since SO_2 and PM_{10} emissions do not exceed the significant impact levels a PSD increment analysis is not required for these pollutants. The PSD Increments are listed in Table 6-3.

Table 6-3: Summary of PSD Increments

Pollutant	Averaging Period	PSD Increment	
		Class I (ug/m^3)	Class II (ug/m^3)
$PM_{2.5}$	Annual	0.06	4
	24-Hour	0.07	9
NO_2	Annual	0.1	25

Modeling Methodology

Details on the dispersion model, including meteorological data, source data, and receptors can be found in EPD's PSD Dispersion Modeling and Air Toxics Assessment Review in Appendix C of this Preliminary Determination and in Volume 2, Section 4 of the permit application.

Modeling Results

The results of the AERMOD modeling performed by EPD are displayed below in Table 6-4. This is the first step in the ambient air quality analysis. In this table the project impacts are measured against the significance impact level for Class II Areas.

Table 6-4: Class II Significance Analysis Results – Comparison to SILs

Criteria Pollutant	Averaging Period	Significance Level	Maximum Projected Concentration*	Significant?	Receptor UTM Zone: 17	
		(μg/m^3)	(μg/m^3)		(meter East)	(meter North)
CO	8-Hour	500	16.27	No	372187.60	3670076.00
	1-Hour	2000	32.54	No	372787.60	3671976.00
NO_2	Annual	1	0.58	No	373037.60	3670726.00
	1-Hour$^+$	7.5	15.01	Yes	372737.60	3671926.00
SO_2	Annual	1	0.21	No	372987.60	3670776.00
	24-Hour	5	1.75	No	371687.60	3670376.00
	3-Hour	25	4.44	No	372787.60	3671876.00
	1-Hour$^+$	7.8	5.56	No	372787.60	3671976.00
PM10	Annual	1	0.87	No	372839.60	3670920.40
	24-Hour	5	4.95	No	372987.60	3671176.00
PM2.5	Annual$^\#$	0.3	0.41	Yes	372839.60	3670920.40
	24-Hour$^\#$	1.2	2.54	Yes	372887.60	3671076.00

* Highest concentration over all averaging periods, except 1-hour SO_2, NO_2, and annual and 24-hour $PM_{2.5}$

+ Highest of the average individual year's highest 1-hour concentration across all receptors over 5-years modeling
# Highest of the average individual year's highest annual and 24-hour concentration across all receptors over 5-year modeling
- If the maximum projected concentration exceeds the significant level for any averaging period, refined NAAQS/Increment analysis is required for that pollutant.
- Maximum Significant Impact Distances used to define pollutants-specific modeling areas indicated in **bold** font.

As shown in Table 6-4, the NO_2 1-hour and the $PM_{2.5}$ significant impact levels are exceeded. The maximum project concentration for CO, PM_{10}, and SO_2 do not exceed the threshold. Therefore additional modeling is required for the NO_2 and $PM_{2.5}$ exceedances.

Significant Impact Area

For any off-site pollutant impact calculated in the Significance Analysis that exceeds the SIL, a Significant Impact Area (SIA) must be determined. The SIA encompasses a circle centered on the facility being modeled with a radius extending out to the lesser of either: 1) the farthest location where the emissions increase of a pollutant from the proposed project causes a significant ambient impact, or 2) a distance of 50 kilometers. All sources of the pollutants in question within the SIA plus an additional 50 kilometers are assumed to potentially contribute to ground-level concentrations and must be evaluated for possible inclusion in the NAAQS and Increment Analysis.

The farthest location indicating an emissions increase was selected as the SIA. The values for these radii (referred as significant impact distance – SID) are 1.5 km for PM2.5 and 6.77 km for 1-hour NO_2 as stated in the Application 21371 page 3-4. The original SIA was assessed at 6.77 km for the 1-hour NO_2. Since this is rather large area, Georgia EPD recommended using just the total screening area as the maximum 1-hour wind-transport distance from the project site which is at a wind speed of 11.28 m/s in the 2006-2010 Augusta/Daniel Field meteorological data.

NAAQS and Increment Modeling

The next step in completing the NAAQS and Increment analyses was the development of a regional source inventory. Nearby sources that have the potential to contribute significantly within the facility's SIA are ideally included in this regional inventory. The distance from the PyraMax facility of each source listed in the regional inventories was calculated, and all sources located more than 60 kilometers from the plant were excluded from the analysis. Additionally, pursuant to the "20D Rule," facilities outside the SIA were also excluded from the inventory if the entire facility's emissions (expressed in tons per year) were less than 20 times the distance (expressed in kilometers) from the facility to the edge of the SIA. In applying the 20D Rule, facilities in close proximity to each other (within approximately 5 kilometers of each other) were considered as one source. Then, any Increment consumers from the provided inventory were added to the permit application forms or other readily available permitting information.

The regional source inventory used in the analysis is included in the permit application and the attached modeling report.

NAAQS Analysis

In the NAAQS analysis, impacts within the facility's SIA due to the potential emissions from all sources at the facility and those sources included in the regional inventory were calculated. Since the modeled ambient air concentrations only reflect impacts from industrial sources, a "background" concentration was added to the modeled concentrations prior to assessing compliance with the NAAQS.

The results of the NAAQS analysis are shown in Table 6-5. For the short-term averaging periods, the impacts are the highest second-high impacts. For the annual averaging period, the impacts are the highest impact. When the total impact at all significant receptors within the SIA are below the corresponding NAAQS, compliance is demonstrated.

Table 6-5: NAAQS Analysis Results

Pollutant	Averaging Period	Predicted Concentration* (µg/m³)	Background Concentration (µg/m³)	Total Impact** (µg/m³)	NAAQS (µg/m³)	Exceed NAAQS?	Receptor Location UTM Zone 17		Model Met Data Period (yymmddhh)
							(meter East)	(meter North)	
PM2.5	Annual	0.97	12.0	12.97	15	No	372958.40	3670787.70	5-yr average
	24 Hour	5.04	26.0	31.04	35	No	371887.60	3670576.00	5-yr average
NO_2	1-hour	308.8	33.9	342.7	188	Yes	373137.60	3676726.00	5-yr average
	Annual	6.50	5.1	11.60	100	No	367887.60	3675776.00	2010

* Highest concentration for annual averaging periods, and the highest of the average 1st-highest concentration across all receptors over the five modeling years for PM2.5 annual and 24-hour period.

** Total impact is the sum of the predicted concentration plus the background concentration.

+ 1-hour impact calculated as the average 8th-highest daily maximum 1-hour concentration across all receptors over the five modeling years

To assess whether the proposed project caused or contributed to any modeled 1-hour NAAQS exceedances, the applicant used the MAXDCONT option inherent to AERMOD to identify those receptors for which the NO_2 1-hour modeled impacts were in excess for the NAAQS. The applicant examined the impacts ranging from the highest 8th high value to the highest 15th high value, and found PyraMax was not significant at any of those receptors (i.e., the PyraMax impacts were smaller than the SIL). GA EPD reviewed the submitted MAXDCONT output and the NO_2 1-hour NAAQS exceedance still occurs at the 15th rank. After a re-run of the NAAQS 1-hour NO_2 modeling with MAXDCONT option ranging from the 8th rank to the 30th rank, the results show that the NAAQS exceedance occurs from the 8th rank to the 28th rank, but no exceedances afterwards. All NAAQS exceedances were reviewed and the PyraMax project is found not significant at any of those receptors. Therefore, by definition, the PyraMax facility will not cause or contribute a significant impact to NAAQS exceedances at 1-hour NO_2 averaging period.

.

Increment Analysis

The parameters used for the increment analysis is located in the Modeling Memorandum in Appendix C. The following Table 6-6 outlines this analysis and shows that the PSD increment requirements have been met.

Table 6-6: Class II Area PSD Increment Assessment

Pollutant	Averaging Period	Allowable Increment (µg/m³)	Maximum Increment Consumed* (µg/m³)	Receptor Location UTM Zone 17		Model Met Data Period
				(meter East)	(meter North)	(yymmddhh)
PM2.5	Annual	4	0.96	372958.40	3670787.70	2010
	24-Hour	9	4.45	372987.60	3671076.00	06041524
NO_2	Annual	25	6.5	367887.60	3675776.00	2010

* Highest concentration for annual averaging periods, and highest second high concentration for the short-term periods.

Ambient Monitoring Requirements

The impacts for NO_X, CO, $PM_{2.5}$, and PM_{10} quantified in Table 6-4 of the Class I Significance Analysis are compared to the Monitoring *de minimis* concentrations, shown in Table 6-1, to determine if ambient monitoring requirements need to be considered as part of this permit action. Because all maximum modeled impacts are below the corresponding de minimis concentrations, no pre-construction monitoring is required for NO_2, PM_{10}, $PM_{2.5}$, or CO.

Table 6-7: Significance Analysis Results – Comparison to Monitoring *De Minimis* Levels

Criteria Pollutan	Averaging Period	*De Minimus* Concentration (μg/m³)	Maximum Projected Concentration* (μg/m³)	Receptor UTM Zone: 17 (meter East)	(meter North)	Model Met Data Period yymmddhh]	Exceeds *De Minimis*?
CO	8-Hour	575	16.27	372187.60	3670076.00	09111116	No
NO_2	Annual	14	0.58	373037.60	3670726.00	2010	No
SO_2	24-Hour	13	1.75	371687.60	3670376.00	08082224	No
PM_{10}	24-Hour	10	4.95	372987.60	3671176.00	10101724	No
$PM_{2.5}$	24-Hour	4	2.54	372887.60	3671076.00	5-yr Average	No

* Highest concentration over all averaging periods, except 24-hour $PM_{2.5}$, the highest concentration averaged over 5-year modeling individual year's 24-hour H1Hs at the entire receptor grids.

The VOC *de minimis* concentration is mass-based (100 tpy) rather than ambient concentration-based (ppm or μg/m³). Projected VOC and NO_x emissions increases resulting from the proposed modification exceed 100 tpy. There are no existing ozone monitors in Jefferson County that would exhibit compliance of the ozone impact analysis. Current Georgia EPD ozone monitoring network (which includes monitors in the station 130730001 located in Riverside Park, Evans, Columbia County, GA, approximately 50 kilometers from the project site) will provide sufficient ozone data such that no pre-construction or post-construction ozone monitoring is necessary.

Class I Area Analysis

Federal Class I areas are regions of special national or regional value from a natural, scenic, recreational, or historic perspective. Class I areas are afforded the highest degree of protection among the types of areas classified under the PSD regulations. U.S. EPA has established policies and procedures that generally restrict consideration of impacts of a PSD source on Class I Increments to facilities that are located near a federal Class I area. Historically, a distance of 100 km has been used to define "near", but more recently, a distance of 200 kilometers has been used for all facilities that do not combust coal.

There are eight Class I areas within approximately 300 kilometers of PyraMax – Kings Mill facility, these are: Cape Romain Wilderness Area, SC; Okefenokee Fish and Wildlife Refuges, GA; Wolf Island Wildlife Refuges, GA; Shining Rock Wilderness Area, NC; Cohutta Wilderness, GA; Joyce Kilmer – Slick Rock Wilderness, NC/TN; Linville Gorge Wilderness, NC; and Great Smoky Mountains National Park, NC/TN. Among these, Wolf Island Wildlife Refuges is the closest, located approximately 222 km southeast from the proposed facility. The U.S. Forest Service is the designated Federal Land Manager (FLM) responsible for oversight of all eight of these Class I areas.

7.0 ADDITIONAL IMPACT ANALYSES

PSD requires an analysis of impairment to visibility, soils, and vegetation that will occur as a result of a modification to the facility and an analysis of the air quality impact projected for the area as a result of the general commercial, residential, and other growth associated with the proposed project.

Soils and Vegetation

To address the potential soil and vegetation impacts, the applicant adopted the NAAQS results of the NOx at 1-hour and annual period because EPA recently proposed to use the secondary NAAQS standards for such analysis. Note that CO and SO_2 were not significant (the maximum modeling concentration due to the proposed project were less than their respective SILs). Table 7-1 shows the total potential impact of NO_2 is less than its screening threshold levels.

Table 7-1: CLASS I AREA Vegetative Impact Results (AERMOD with downwash)

Pollutant	Averaging Period	All Source Impact * (μg/m³)	Background Concentration (μg/m³)	Total Potential Impact* (μg/m³)	Screening Level⁺ (μg/m³)	Exceed Screening Level?
NO_2^+	1-hour	308.8	33.9	342.7	188	Yes**
	Annual	6.50	5.1	11.60	100	No
CO	No impact area defined					
SO_2	No impact area defined					

* NAAQS results including both project and offsite inventories. Total impact is the sum of the predicted concentration plus the background concentration.
** See discussion in previous NAAQS analysis section.
⁺ Screening levels for NOx are the existing secondary annual and proposed secondary 1-hour NAAQS standards.

Regarding to the Class II visibility analysis, the maximum $PM_{2.5}$, PM_{10} and NO_x significant impact distances are 2.2 km, 1.2 km, and 8.7 km, respectively. There are no potentially sensitive receptors (such as, scenic vistas, airports) within the 8.7 km SIA. For this reason, it was not necessary to conduct an analysis of visible plume impacts.

Growth

The purpose of a growth analysis is to predict how much new growth is likely to occur as a result of the project and the resulting air quality impacts from this growth. No adverse impacts on growth are anticipated from the project since any workforce growth and residential and commercial growth that would be associated with the proposed project (expected to be minimal) would not cause a quantifiable impact on the air quality of the area surrounding the facility.

Class II Area Visibility Analysis

Visibility impairment is any perceptible change in visibility (visual range, contrast, atmospheric color, etc.) from that which would have existed under natural conditions. Poor visibility is caused when fine solid or liquid particles, usually in the form of volatile organics, nitrogen oxides, or sulfur oxides, absorb or scatter light. This light scattering or absorption actually reduces the amount of light received from viewed objects and scatters ambient light in the line of sight. This scattered ambient light appears as haze.

Another form of visibility impairment in the form of plume blight occurs when particles and light-absorbing gases are confined to a single elevated haze layer or coherent plume. Plume blight, a white, gray, or brown plume clearly visible against a background sky or other dark object, usually can be traced to a single source such as a smoke stack.

Georgia's SIP and Georgia *Rules for Air Quality Control* provide no specific prohibitions against visibility impairment other than regulations limiting source opacity and protecting visibility at federally protected Class I areas. To otherwise demonstrate that visibility impairment will not result from continued operation of the plant, the VISCREEN model was used to assess potential impacts on ambient visibility at so-called "sensitive receptors" within the SIA of PyraMax Ceramics. Since there is no ambient visibility protection standard for Class II areas, this analysis is presented for informational purposes only and predicted impacts in excess of screening criteria are not considered "adverse impacts" nor cause further refined analyses to be conducted.

The primary variables that affect whether a plume is visible or not at a certain location are (1) quantity of emissions, (2) types of emissions, (3) relative location of source and observer, and (4) the background visibility range. For this exhaust plume visibility analysis, a Level-1 visibility analysis was performed using the latest version of the EPA VISCREEN model according to the guidelines published in the *Workbook for Plume Visual Impact Screening and Analysis* (EPA-450/4-88-015). The VISCREEN model is designed specifically to determine whether a plume from a facility may be visible from a given vantage point. VISCREEN performs visibility calculations for two assumed plume- viewing backgrounds (horizon sky and a dark terrain object). The model assumes that the terrain object is perfectly black and located adjacent to the plume on the side of the centerline opposite the observer.

In the visibility analysis, the total project NO_X and PM_{10} emissions increases were modeled using the VISCREEN plume visibility model to determine the impacts. For both views inside and outside the Class II area, calculations are performed by the model for the two assumed plume-viewing backgrounds. The VISCREEN model output shows separate tables for inside and outside the Class II area. Each table contains several variables: theta, azi, distance, alpha, critical and actual plume delta E, and critical and actual plume contrast. These variables are defined as:

1. *Theta* – Scattering angle (the angle between direction solar radiation and the line of sight). If the observer is looking directly at the sun, theta equals zero degrees. If the observer is looking away from the sun, theta equals 180 degrees.

2. *Azi* – The azimuthal angle between the line connecting the observer and the line of sight.

3. *Alpha* – The vertical angle between the line of sight and the plume centerline.

4. *delta E* – Used to characterize the perceptibility of a plume on the basis of the color difference between the plume and a viewing background. A delta E of less than 2.0 signifies that the plume is not perceptible.

5. *Contrast* – The contrast at a given wavelength of two colored objects such as plume/sky or plume/terrain.

The analysis is generally considered satisfactory if *delta E* and *Contrast* are less than critical values of 2.0 and 0.05, respectively, both of which are Class I, not Class II, area thresholds. The Division has reviewed the VISCREEN results presented in the permit application and have determined that the visual impact criteria (*delta E* and *Contrast*) at the affected sensitive receptors are not exceeded as a result of the proposed project. Since the project passes the Level-1 analysis for a Class I area for the Class II area of interest, no further analysis of exhaust plume visibility is required as part of this air quality analysis.

As previously stated, the impact on Class II visibility analysis, GA EPD considers this requirement to apply to only those criteria pollutants with deterministic NAAQS (those which are assessed in accordance with the Draft 1990 New Source Review Workshop Manual modeling guidance). Thus, 24-hr $PM_{2.5}$ and the 1-hr NO_2 NAAQS do not apply to this assessment.

<u>Georgia Toxic Air Pollutant Modeling Analysis</u>

Georgia EPD regulates the emissions of toxic air pollutant (TAP) emissions through a program covered by the provisions of *Georgia Rules for Air Quality Control*, 391-3-1-.02(2)(a)3.(ii). A TAP is defined as any substance that may have an adverse effect on public health, excluding any specific substance that is covered by a State or Federal ambient air quality standard. Procedures governing the Georgia EPD's review of TAP emissions as part of air permit reviews are contained in the agency's "*Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions (Revised)*."

Selection of Toxic Air Pollutants for Modeling

For projects with quantifiable increases in TAP emissions, an air dispersion modeling analysis is generally performed to demonstrate that off-property impacts are less than the established Acceptable Ambient Concentration (AAC) values. The TAP evaluated are restricted to those that may increase due to the proposed project. Thus, the TAP analysis would generally be an assessment of off-property impacts due to facility-wide emissions of any TAP emitted by a facility. To conduct a facility-wide TAP impact evaluation for any pollutant that could conceivably be emitted by the facility is impractical. A literature review would suggest that at least one molecule of hundreds of organic and inorganic chemical compounds could be emitted from the various combustion units. This is understandable given the nature of the fuels (natural gas, propane and diesel fuel oil) fed to the combustion sources, and the fact that there are complex chemical reactions and combustion of fuel taking place in some. The vast majority of compounds potentially emitted however are emitted in only trace amounts that are not reasonably quantifiable.

TAP emissions as by-products of fuel combustion in various fuel burning sources (spray dryers/pelletizers, calciners/kilns and the emergency diesel generator) were estimated using applicable AP 42 emission factors and/or manufacturer's data. Emissions of other TAP were estimated based usage rates of the chemicals containing the TAP compounds and available site-testing data from similar sources. Please refer to Appendix C of Volume 1 and Section 6 and Appendix F of Volume 2 of the Georgia Air Quality Permit Application No. 21371 for details.

For each TAP identified for further analysis, both the short-term and long-term AAC were calculated following the procedures given in Georgia EPD's *Guideline*. Figure 8-3 of Georgia EPD's *Guideline* contains a flow chart of the process for determining long-term and short-term ambient thresholds. PyraMax Ceramics referenced the resources previously detailed to determine the long-term (i.e., annual average) and short-term AAC (i.e., 24-hour or 15-minute). The AACs were verified by the EPD.

Determination of Toxic Air Pollutant Impact

The Georgia EPD *Guideline* recommends a tiered approach to model TAP impacts, beginning with screening analyses using SCREEN3, followed by refined modeling, if necessary, with ISCST3 or ISCLT3. For the refined modeling completed, the infrastructure setup for the SIA analyses was relied upon with appropriate sources added for the TAP modeling. Note that per the Georgia EPD's *Guideline*, downwash was not considered in the TAP assessment.

Initial Screening Analysis Technique

Generally, an initial screening analysis is performed in which the total TAP emission rate is modeled from the stack with the lowest effective release height to obtain the maximum ground level concentration (MGLC). Note the MGLC could occur within the facility boundary for this evaluation method. The individual MGLC is obtained and compared to the smallest AAC. Due to the likelihood that this screening would result in the need for further analysis for most TAP, the analyses were initiated with the secondary screening technique.

The proposed facility emits significant amounts of the following six air toxic pollutants (TAPs): HF, HCl, Ammonia, Hexane, Methanol, and Methyl Acetate. The annual, 24-hour and 15-minute AACs of the above six TAPs were reviewed based on U.S. EPA IRIS reference concentration (RfC), OSHA

Permissible Exposure (PEL), etc, according to the Georgia Air Toxics Guideline. The modeled maximum ground-level concentrations (MGLCs) were calculated using the AERMOD dispersion model (version 11103) for 1 hour, 24 hours, and annual averaging periods. Table 7-2 summarizes the AAC levels and MGLCs of the TAPs at the above three averaging periods. Note that the maximum 15-min impact is based on the maximum 1-hour modeled impact multiplied by a factor of 1.32. As shown in the Table 7-2, the modeled MGLCs for all TAPs evaluated by the applicant are well below their respective AAC levels. Therefore, the applicant meets the applicable Georgia Air Toxics Guideline.

Table 7-2. MODELED MGLCS AND THE RESPECTIVE AACS

Pollutant	CAS	Averaging period	MGLC ($\mu g/m^3$)	AAC ($\mu g/m^3$)	Exceed AAC?	Averaging period	MGLC ($\mu g/m^3$)	AAC ($\mu g/m^3$)	Exceed AAC?
HF	7664-390-3	24-hour	0.27	5.84	No	15-min	1.80	245	No
HCl	7647-01-0	Annual	0.02	20	No	15-min	1.17	700	No
Hexane	110-54-3	Annual	0.01	700	No	15-min	0.49	17600	No
NH3	7664-41-7	Annual	7.60	100	No	15-min	270	2450	No
Methanol	67-56-1	24-hour	191	619	No	15-min	3557	32750	No
Methyl Acetate	110-54-3	24-hour	12.07	476	No	15-min	5317	75750	No

8.0 EXPLANATION OF DRAFT PERMIT CONDITIONS

The permit requirements for this proposed facility are included in draft Georgia Air Quality Permit No. 3295-163-0035-P-01-1. Since all of the existing and proposed lines are identical in process, no new requirements will be added to Permit No. 3295-163-0035-P-01-0. Only conditions that need to include the proposed process lines will be changed and included in this amendment. The following narrative describes the modified permit conditions that address the proposed Lines 3 and 4 including the emergency diesel generator.

Section 1.0: Facility Requirements Pertaining to the Entire Facility

PyraMax Ceramics, LLC – King's Mill Facility is a major source under NSR/PSD for emissions of criteria pollutants and under 40 CFR Part 63 Subpart B for HAP emissions. The facility will produce ceramic proppants via four identical process/kiln lines which can be operated independently. Permit No. 3295-163-0035-P-01-1 is a modification for the final two process/kiln lines. Production at the facility consists mainly of material handling, milling, clay slurry preparation, pelletizing/spray drying, green pellet screening, calcining/sintering, finishing and supporting operations such as boilers, emergency diesel generators, storage tanks for fuel and chemicals. A detailed process description is contained in the original Permit No. 3295-163-0035-P-01-0.

In this modification, the Permittee has proposed a change from a kiln burner capacity for each of the Lines 1-4 of 49.3 MMBtu/hr to 65 MMBtu/hr. This and the supporting operations description for Lines 3 and 4 are contained in Condition 1.2.1.

Section 2.0: Requirements Pertaining to the Entire Facility

Condition 2.1.10 applies to this permit amendment and requires a construction commencement deadline. The facility is given 18 months from the effective date of the permit to begin construction.

Section 3.0: Requirements for Emission Units

Table 3.1.1 lists for Lines 3 and 4 all of the process units/emission sources and associated air pollution control devices, and identifies applicable regulations and permit conditions incorporating the corresponding emission limits and other requirements.

Conditions 3.3.9 through 3.3.11, 3.3.12, 3.3.16, 3.3.17, 3.3.20, and 3.3.21 impose the requirements of Subpart IIII of Part 60 on the emergency generator. These conditions have been modified from Permit No. 3295-163-0035-P-01-0 because the identification of the generator was too specific. The rating for the generator has been removed and just the term "stationary emergency diesel generator" is used.

Section 4.0: Requirements for Testing

Conditions 4.2.1 and 4.2.5 were modified to include calciner/kilns 3 and 4 and spray dryers/pelletizers 3 and 4.

Section 5.0: Requirements for Monitoring

Conditions 5.2.1 and 5.2.2 were modified to include calciner/kilns 3 and 4 and spray dryers/pelletizers 3 and 4. The rating for the generator has been removed from Conditions 5.2.6 and 5.2.10.

Section 6.0: Other Specific Requirements

The rating for the generator has been removed from Conditions 6.2.9, 6.2.11, 6.2.20.

APPENDIX A - Draft Revised PSD Permit Amendment

PyraMax Ceramics, LLC – King's Mill Facility
Wrens (Jefferson County), Georgia

APPENDIX B - PyraMax Ceramics, LLC – King's Mill Facility PSD Permit Application and Supporting Data

Contents Include:

1. **PSD Permit Application No. 21371, dated August 17, 2012**
2. **Additional Information Package Dated August 29, 2012 – Electronic Copy of Application**

APPENDIX C - EPD'S PSD Dispersion Modeling and Air Toxics Assessment Review