AIR PERMIT APPLICATION FOR THE DUKE ENERGY

CAPE FEAR STAR® FACILITY

JULY 2018

Prepared for:

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1.0 INTRODUCTION

Duke Energy Progress, LLC (Duke Energy) proposes to construct a fly ash beneficiation process at the site of the former Cape Fear Steam Electric Plant in Moncure, Chatham County, North Carolina. The facility will be owned by Duke Energy and operated by a third party. The beneficiation process is a staged turbulent air reactor (STAR®) which will process fly ash (wet or dry) into a variety of commercial products, such as for use in the concrete market. The process will use propane for start-up. Once the reactor reaches a certain temperature, the reaction is self-sustaining. The reactor will have emissions controls for the reduction of particulate matter and sulfur dioxide. Excess heat from the reactor will be used to dry the ash from the ponds. Auxiliary operations will include material handling, storage, and load out operations.

The Cape Fear Plant began operation in 1923 and was retired in March 2013. The facility's Title V air permit was rescinded later that year, and as a result, this application is submitted for a new facility (the Cape Fear STAR® facility).

1.1 Technical Conclusions

The following is a summary of the technical and regulatory conclusions in this permit application:

- Potential emissions of particulate matter, nitrogen oxides, carbon monoxide and sulfur dioxide will each be greater than 100 tons per year; therefore, the Cape Fear STAR® facility is a "major facility" as defined in 40 CFR 70.2 and must obtain a permit under Title V and 40 CFR Part 70.
- In accordance with NCDAQ regulations governing the Prevention of Significant Deterioration (PSD) of Air Quality and other applicable State and Federal regulations, major New Source Review (NSR) is not required for any compound. Appendix B contains project emissions calculations.
- A facility-wide air toxics analysis is included with this application.

1.2 Permit Request

Duke Energy is requesting that the Cape Fear STAR® facility be permitted using the procedures outlined in 15A NCAC 2Q.0501(c)(2) and .0504. Under these regulations, the project would be permitted using the two-step permitting process. Initially, a construction permit would be issued to Duke Energy to begin construction of the proposed facility. Within twelve months after the initial start-up of the facility, Duke Energy is required to apply for an operating permit. The required permit application forms are included in Appendix A.

The following information is included in this application as required under 15A NCAC 2Q.0305 for the permit review:

1. Completed permit application forms for the proposed project (Appendix A);
2. Emissions calculations (Appendix B);
3. Zoning consistency determination (Appendix H); and
4. The required application fee of $9,751 per 15A NCAC 2Q .0200

1.3 Contact Information

Should NCDAQ have any questions or comments regarding this application, please contact Ms. Ann Quillian of Duke Energy Progress, LLC at (919) 546-6610 or Ms. Amy Marshall of AECOM at (919) 461-1251.

1.4 Report Organization

The remainder of this report is divided into the following sections:

Section 2.0:	Facility Information and Project Description
Section 3.0:	Project Emissions
Section 4.0:	Regulatory Analysis
Section 5.0:	Air Quality Modeling Analysis

The table of contents contains a detailed listing of tables, figures, and appendices.

2.0 FACILITY INFORMATION AND PROJECT DESCRIPTION

2.1 Site Location

The proposed Cape Fear STAR® facility will be located at the site of the former Cape Fear Steam Electric Plant in Moncure, Chatham County, North Carolina. The plant site is approximately two miles southeast of Moncure. The approximate UTM coordinates are Zone 17, 678.183 km east and 3940.022 km north at an elevation of approximately 193 feet above mean sea level. The largest city near the site is Sanford, North Carolina. The site is located in the Piedmont region of North Carolina and the terrain surrounding the site can be considered gently rolling. Figure 2-1 shows the site location and Figure 2-2 presents the surrounding topography.

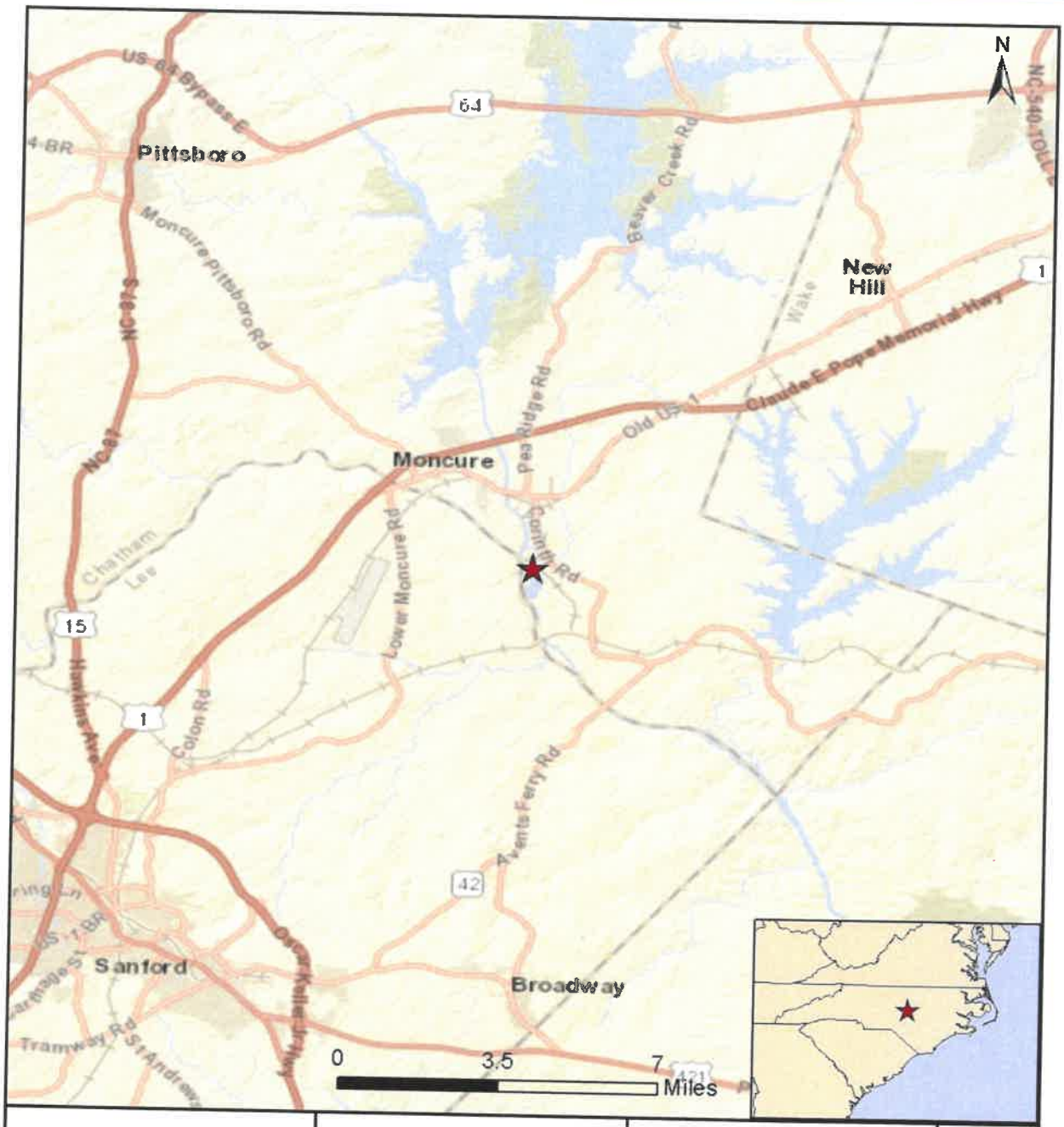
2.1.1 Climatology and Meteorology

The site lies within a general climatic region known as Humid Subtropical. Temperatures are moderate with long summers and brief winters. An extended summer drought may result from dominance of the Bermuda high pressure off the east coast. Warm, moist air from the tropics dominates summer conditions while cooler, drier continental polar air controls winter weather.

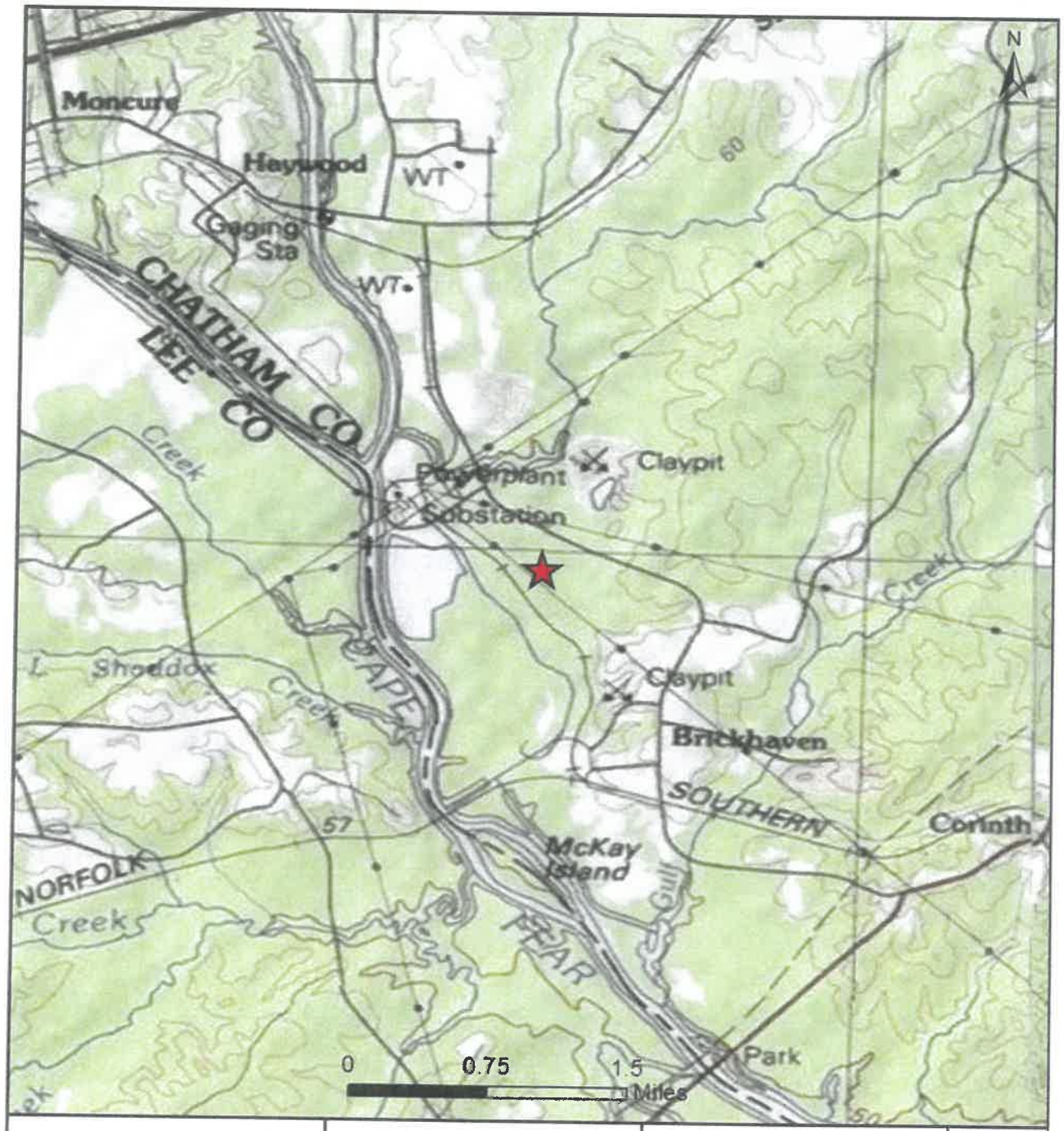
Daily mean air temperatures over most of North Carolina range between 5°C and 10°C in January, the coldest month, and between 24°C and 27°C in July, the warmest month. Annual precipitation averages about 127 cm/year throughout the region.

2.1.2 Attainment Status of Area

The current Section 107 attainment status designations for areas within the state of North Carolina are summarized in 40 CFR 81.334. Chatham County is classified as "better than national standards" for total suspended particulates (TSP, also referred to as Particulate Matter, PM, which includes particulate matter less than 10 microns, PM_{10}) and for sulfur dioxide (SO_2). Chatham County is designated as "unclassifiable/attainment" for carbon monoxide (CO), $PM_{2.5}$, Lead, 2015 8-hour standard for ozone, 1-hour standard for ozone, and 1-hour nitrogen dioxide (NO_2), is designated as "cannot be classified or better than national standards" for the annual NO_2 standard, and is designated as "attainment" for the 1997 8-hour standard for ozone.



DUKE ENERGY PROGRESS, LLC CAPE FEAR STAR® FACILITY MONCURE, NORTH CAROLINA	AECOM *1600 Perimeter Park Drive, Suite 400* *Morrisville, North Carolina 27560* *Telephone 919-461-1100*	**SITE LOCATION**	PROJECT NO. 60563150 FIG. NO. 2-1



DUKE ENERGY PROGRESS, LLC CAPE FEAR STAR® FACILITY MONCURE, NORTH CAROLINA	AECOM *1600 Perimeter Park Drive, Suite 400* *Morrisville, North Carolina 27560* *Telephone 919-461-1100*	SURROUNDING TOPOGRAPHY	PROJECT NO. 60563150 FIG. NO. 2-2

2.2 Proposed Project and Project Schedule

Duke Energy proposes to construct the Cape Fear STAR® facility at the site of the former Cape Fear Steam Electric Plant in Moncure, Chatham County, North Carolina. The facility will reduce the carbon content of fly ash to a level acceptable for use in the concrete market. Duke Energy plans to begin construction in 2019. Operation of the facility is expected to begin in 2020.

The STAR® system is a patented technology developed by The SEFA Group Inc. (SEFA) to process feedstock (of any carbon content) like fly ash (wet or dry) along with other ingredient materials into a variety of commercial products including a partial cement replacement. The following is a description of the STAR® process. Figure 2-3 illustrates a general process flow diagram for the proposed facility. Emissions from the process are described in Section 3.0 of this Application.

First, fly ash is excavated and staged for dewatering. Dewatered fly ash is then screened and crushed to remove contaminants and produce a consistent chemical composition and a finely divided free-flowing ash. Excavation and processing of materials from the ash ponds to meet the STAR® system fly ash (ingredient) specifications will be under the control of the Duke Energy. All fly ash reclaimed from an ash pond delivered for use as an ingredient in the STAR® system must first undergo processing by the owner to be:

- Free of all but minimal contaminants (e.g., organic debris, slag);
- Finely-divided and free-flowing,
- Have consistent moisture content of less than or equal to 25 percent; and
- Have a consistent chemical composition, including organic content measured by loss on ignition.

Processed fly ash is then delivered to the beneficiation process via trucks. The wet fly ash can be unloaded from the trucks into the storage shed or unloaded from the trucks to a pile that is then transferred to a storage shed by a front-end loader. The wet fly ash in the shed is transferred via front-end loader to a hopper at up to 70 wet tons per hour (tph). The fly ash is conveyed from the hopper to a de-lumper unit to reduce the "overs" material. The material is gravity discharged from the de-lumper into a fluidized external heat exchanger (EHE) which uses both pre-heated air and hot water to dry the fly ash.

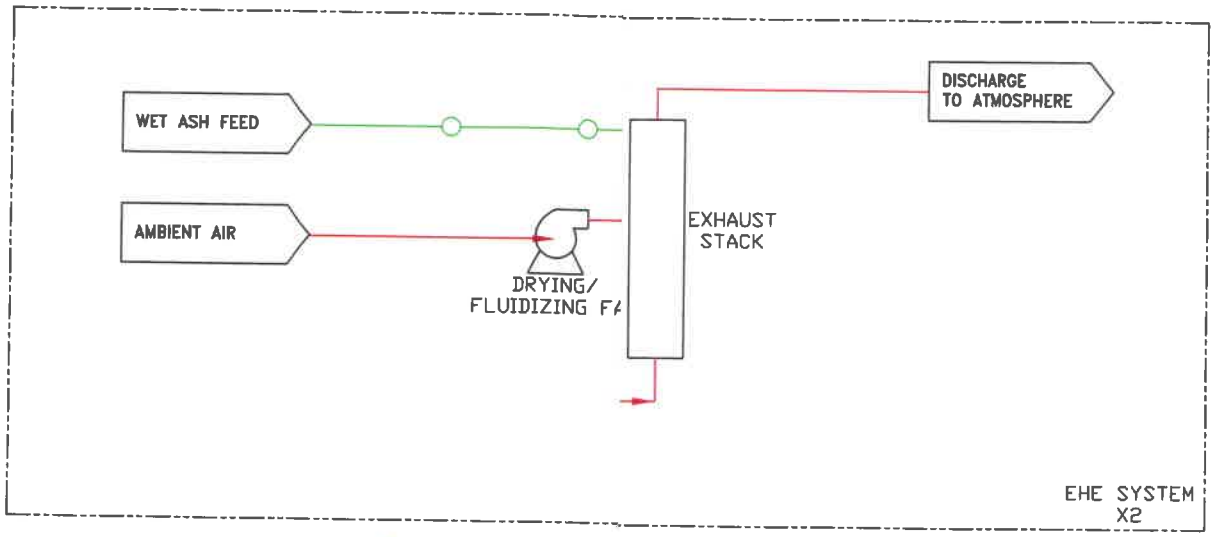
Dried fly ash is discharged from the EHE either through a fixed height overflow weir or underflow discharge screw or rotary valves. Exhaust air from the EHE is routed to a high-efficiency bag filter for feedstock recovery and PM control. The fly ash is discharged to the EHE transfer silo prior to being sent to the feed silo. From the feed silo, the fly ash is introduced into the STAR® reactor where it is physically and chemically converted into a high-quality class F fly ash for beneficial use in ready mix concrete or other specialty products.

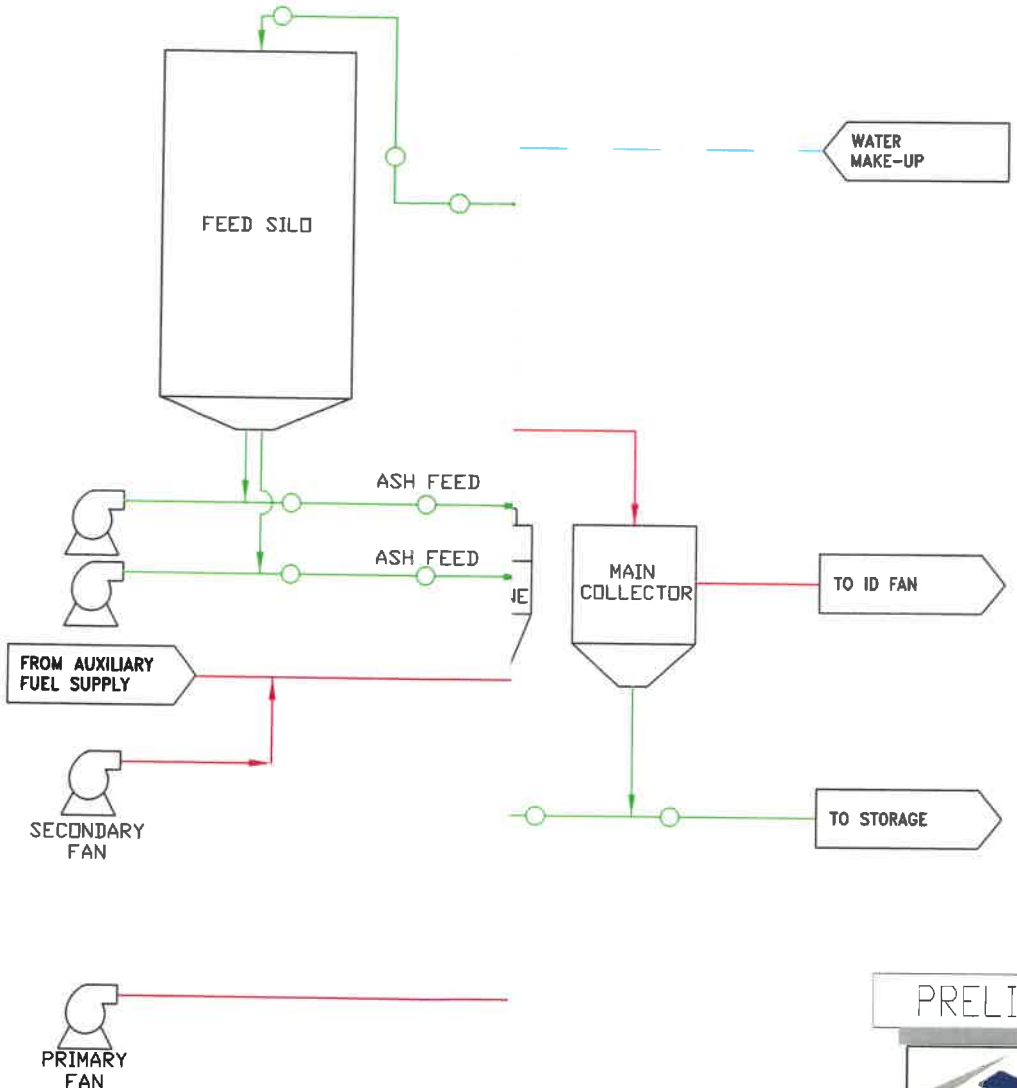
During startup of the STAR® reactor, the combustion air is pre-heated via propane-fired auxiliary burners with a rated heat input of 60 million British thermal units per hour (MMBtu/hr). Once the reactor reaches auto-ignition temperatures, the reaction is self-sustaining; however, under certain conditions auxiliary firing may be needed to maintain proper operating temperature.

After exiting the reactor, the fly ash entrained in the flue gas passes through a hot cyclone where solids are returned to the reactor for temperature control. The fly ash and flue gas leaving the hot cyclone is conveyed to the air preheater and then passes through a gas cooler. The cooled flue gas and ash passes through a fabric filter baghouse, which is an integral part of the process for product capture, and then exhausts to a dry flue gas desulfurization (FGD) system. The FGD exhaust is vented to the atmosphere through a stand-alone stack.

The FGD system consists of a circulating dry scrubbing system (CDS) and a fabric filter baghouse. Flue gas, hydrated lime and water are mixed in the CDS to absorb SO_2. Particulate from the process is collected in the baghouse. The byproduct solids are discharged from the baghouse into a byproduct storage silo. The system is comprised of a three day storage silo with vent filter, fluidizing air stones and dry unloading spouts. Dry dust unloading spouts are telescoping spouts equipped with small ventilation fans that recirculate displaced air back to the top of the byproduct storage silo. Each spout also has a compact filter module.

Once the ash leaves the reactor, it is collected in the product recovery baghouse and pneumatically transferred to either the storage dome or the loadout silo, each equipped with a bin vent. The truck loadout station uses telescoping chutes and a negative pressure ventilation system to reduce fugitive emissions.





PRELIMINARY

SEFA GROUP
ENGINEERING & CONSTRUCTION

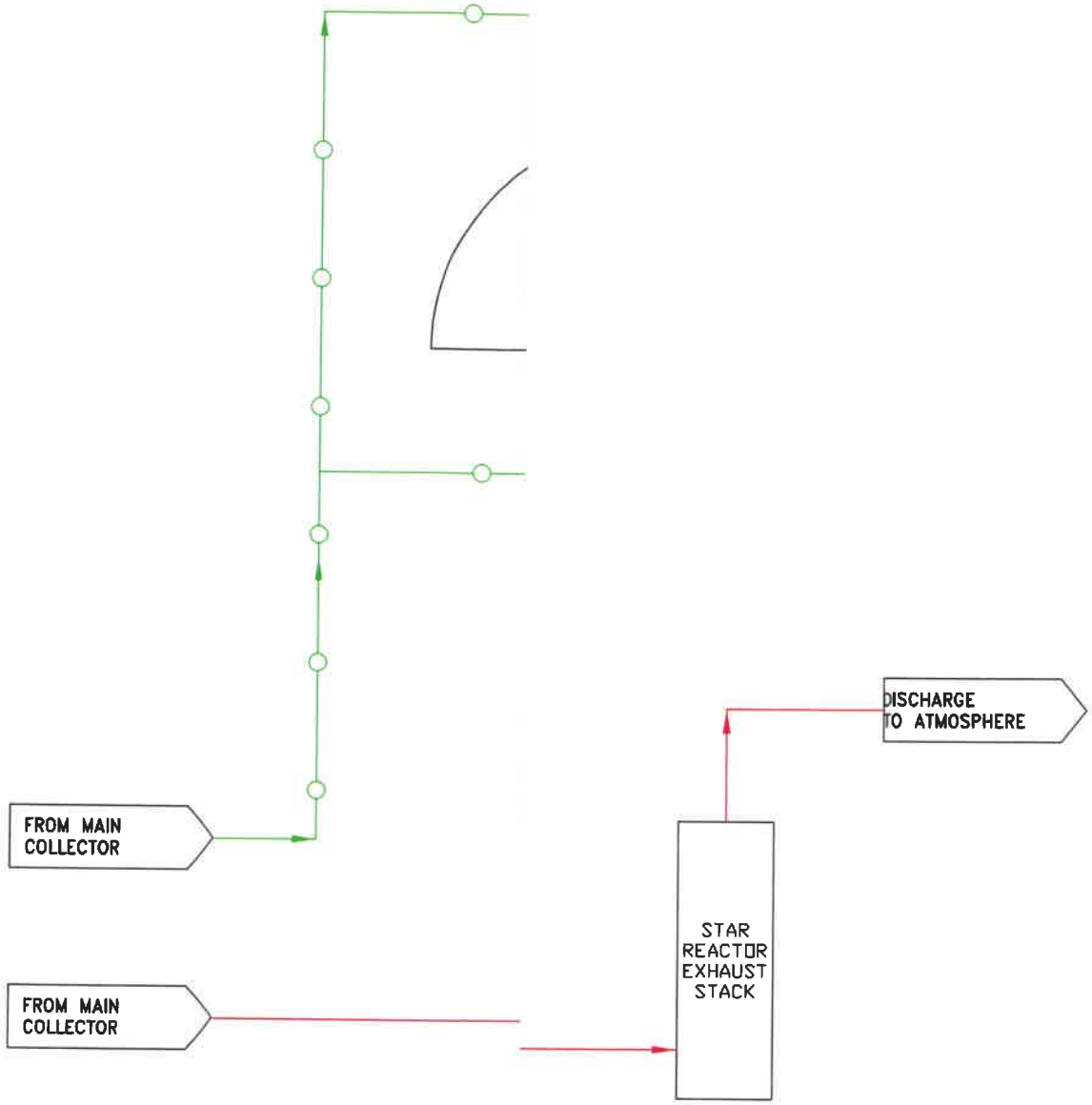
UNLESS OTHERWISE SPECIFIED:		NAME	DATE
DIMENSIONS ARE IN INCHES	DRAWN	BMK	04/19/17
TOLERANCES: 1/8	CHECKED	TW	04/19/17
X BEND ± .01	ENG APPR.	ADS	04/19/17
.001	MFG APPR.		
PROPRIETARY AND CONFIDENTIAL	Q.A.		
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF THE SEFA GROUP. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF THE SEFA GROUP IS PROHIBITED.	COMMENTS:		

HK. DATE

TITLE:
DUKE STAR II
SIMPLIFIED
PROCESS FLOW DIAGRAM

SIZE	DWG. NO.	REV
D	LAB-17027-00-PFD-108	A

SCALE: NTS | WT: N/A | SHEET 1 OF 1



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SIMPLIFIED
PROCESS FLOW DIAGRAM

SIZE	DWG. NO.	REV
D	LAB-17027-00-PFD-109	A

SCALE: NTS | WT: N/A | SHEET 1 OF 1

3.0 PROJECT EMISSIONS

To determine the appropriate permitting path for the Cape Fear STAR® facility, it was necessary to calculate the emissions expected to occur as a result of the proposed project. Project emissions for the new equipment are represented as potential emissions to provide the most conservative analysis of project emission impacts. This section provides a discussion of potential project emissions followed by a discussion of regulatory applicability in Section 4 of this permit application. Detailed emissions calculations are presented in Appendix B.

3.1 Material Handling Emissions

The material handling system includes one wet ash raw feed unloading pile, one wet ash storage shed, one wet ash EHE feed hopper, two EHE's, raw feed silos, one loadout silo, two loadout chutes, transfer silos, a product storage dome, FGD byproduct silo, FGD absorbent silo, screener, crusher, an ash basin, and haul roads.

Fugitive PM and metals emissions were calculated for the ash basin, unloading pile, haul roads, ash storage shed, EHE feed hopper, screener, and crusher. The emissions were calculated using the appropriate emissions factors from EPA's Compilation of Air Pollutant Emissions Factors, AP-42. Fly ash may contain trace quantities of heavy metals. Duke Energy performed a site-specific ash analysis; data obtained was used to calculate the emission rates for each metal. Appendix B contains detailed spreadsheets and example calculations.

Both the screener and the crusher will be driven by separate, diesel-fired internal combustion engines. Emissions of criteria pollutants and HAPs were calculated using a combination of New Source Performance Standards emission limits and AP-42 emission factors for diesel industrial engines. Greenhouse gas emissions were calculated using emissions factors from Tables C-1 and C-2 of 40 CFR 98, Subpart C.

PM emissions for the EHE's are based on the baghouse manufacturer's guaranteed outlet loading and anticipated volumetric flow rates.

Each silo is equipped with a bin vent product capture device to minimize product losses associated with the pneumatic transfer process. The truck loadout station uses telescoping chutes and a negative pressure ventilation system to reduce fugitive emissions.

Particulate emissions from the silos and product storage dome were estimated using the bin vent manufacturer's guaranteed outlet loading rate in conjunction with anticipated volumetric flow rates.

Trace metal concentration data discussed previously for the fugitive emissions were used in conjunction with the calculated PM emissions rates from the EHE's, silos, and product storage dome to estimate emissions of trace metal from the material handling activities. Appendix B contains detailed spreadsheets and example calculations.

3.2 Emissions from the STAR® System

Emissions from the STAR® system include PM, PM_{10}, $PM_{2.5}$, SO_2, nitrogen oxides (NOx), CO, volatile organic compounds (VOC), and greenhouse gases (GHG) from the auxiliary fuel and residual carbon in the fly ash. Emissions from the auxiliary fuel were estimated using the most recent emissions factors for propane-fired boilers contained in AP-42. The auxiliary fuel burners are a low-NOx design intended to comply with North Carolina NOx control regulations.

Factors for heavy metals emissions resulting from lime use in the dry scrubbing system are based on trace composition analyses for lime.

Emissions of NOx, CO, and sulfuric acid (H_2SO_4) mist from the processing of the residual carbon in the fly ash were estimated based on emissions estimates from other existing STAR® units. PM emissions from the STAR® are based on the baghouse manufacturer's guaranteed outlet loading and an anticipated volumetric flow rate.

Emissions of SO_2 are a function of the amount of fly ash processed through the reactor, the sulfur content of the ash, the amount of sulfur remaining in the product ash exiting the STAR® reactor, and the SO_2 air pollution control equipment removal efficiency, in this case the dry scrubber. Assuming ash sulfur content of 0.10 percent and 100 percent oxidation of the sulfur, the dry scrubber will be designed to provide 100 percent capture and can be operated with an SO_2 control efficiency of 95 percent.

The STAR® system will normally fire auxiliary fuel during system startup and will cut back on auxiliary fuel feed as the reactor reaches self-sustaining conditions. A conservative emissions calculation was performed by selecting the emissions for the highest emitting fuel on a pollutant by pollutant basis.

GHG emissions were also calculated from the STAR® reactor. GHG emissions were based on the annual propane usages and emissions factors from Table C-1 of 40 CFR 98, Subpart C, along with the loss on ignition of the ash. Appendix B provides detailed spreadsheets and example calculations.

3.3 Summary of Project Emissions

As presented in Table 3-1, the calculations demonstrate that emissions of all PSD-regulated pollutants (other than GHG) from the Cape Fear STAR® facility are below the new major source threshold. Appendix B contains detailed emissions calculations.

Table 3-1

PSD Applicability Summary

	Emissions, tpy									
	CO	NOx	SO_2	PM[1]	PM10[2]	PM2.5[3]	VOC	Pb	H_2SO4	CO2e
Potential Emissions	112	222	112	144	131	75	14.1	1.28E-03	4.38E-01	156,869
New Major Stationary Source Threshold	250	250	250	250	250	250	250	250	250	NA[4]
PSD Review Required	NO	NO	NO	NO	NO	NO	NO	NO	No	NA[4]

1. PM = PM (filterable)
2. PM_{10} (total) =PM(condensable) + PM_{10} (filterable)
3. $PM_{2.5}$ (total) =PM(condensable) + $PM_{2.5}$ (filterable)
4. Per the June 23, 2014 Supreme Court decision in Utility Air Regulatory Group v. EPA, EPA may not treat GHGs as an air pollutant for the specific purpose of determining whether a source is required to obtain a PSD permit.

4.0 REGULATORY APPLICABILITY

This section summarizes all federally-enforceable and state-enforceable air regulations that are potentially applicable to the Cape Fear STAR® facility. Both applicable and important non-applicable regulations are addressed. Supporting information for the proposed project is provided in the application forms contained in Appendix A. Information contained on the application forms is provided for determining regulatory applicability and demonstrating compliance with applicable requirements, and should not be considered proposed permit terms, limits, or conditions. Discussions pertaining to applicable regulatory requirements are separated into two categories: 1) Federal Air Quality Regulations and 2) North Carolina Air Quality Regulations.

4.1 Federal Air Quality Regulations

The federal regulations potentially applicable to the Cape Fear STAR® facility are Prevention of Significant Deterioration (PSD) regulations in 40 CFR 51.166; New Source Performance Standards (NSPS) in 40 CFR 60; National Emission Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR 63; Compliance Assurance Monitoring (CAM) in 40 CFR 64; and Title V Operating Permit regulations in 40 CFR 70. A discussion of these regulations is provided in the following subsections.

4.1.1 40 CFR 51 – New Source Review (NSR)/Prevention of Significant Deterioration (PSD)

The PSD regulations apply to all new major stationary sources and major modifications to existing major stationary sources. Those sources are considered to belong to any one of the 28 source categories identified in 40 CFR 51.166 that has the potential to emit more than 100 tons per year of any PSD-regulated compound, or any other source which has the potential to emit more than 250 tons per year of any PSD compound.

As described in Section 1.0, Duke Energy proposes to construct the Cape Fear STAR® facility at the site of the former Cape Fear Plant for which the Title V air permit was rescinded in 2013. As a result, this application is submitted for the construction of a new facility. Because the Cape Fear STAR® facility is not one of the 28 source categories identified in 40 CFR 51.166, the project is considered a new major stationary source if it has the potential to emit more than 250 tons per year of any PSD compound.

The project emissions were evaluated to determine whether PSD permitting is required for the applicable PSD-regulated air pollutants, including CO, NOx, SO_2, PM, PM_{10}, $PM_{2.5}$, ozone, and Pb. The emission calculation methodology used to determine baseline emissions and potential project emissions was described in Section 3. Potential emissions from the project are less than 250 tons per year for each PSD-regulated air pollutants. Therefore, PSD review is not required for this project. Detailed emission calculations are presented in Appendix B.

4.1.2 40 CFR 60 - New Source Performance Standards (NSPS)

NSPS apply to any stationary source for which the standards are promulgated, and which is constructed, reconstructed or modified after the effective date of the applicable standard to the affected facility.

Standards of Performance for Commercial And Industrial Solid Waste Incineration Units (CISWI) (40 CFR 60, Subpart CCCC) applies to units that commenced construction after June 4, 2010 at any commercial or industrial facility, that combusts, or has combusted in the preceding 6 months, any solid waste as defined in 40 CFR part 241. In accordance with 40 CFR 241.3(b)(3), "non-hazardous secondary materials used as an ingredient in a combustion unit that meet the legitimacy criteria..." are not solid wastes. Additionally, in accordance with 40 CFR 241.3(b)(4), "...ingredient products that are used in a combustion unit and are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria" are not solid wastes. As defined in 40 CFR 241, fly ash is not a waste but an ingredient; therefore, the fly ash beneficiation process is not subject to CISWI.

The NSPS for Large Municipal Waste Combustors (40 CFR 60, Subpart Eb) apply to large municipal waste combustor units with a combustion capacity greater than 250 tons per day of municipal solid waste that initiated construction after September 20, 1994. According to 40 CFR 60.51b, a municipal waste combustor means "any equipment that combusts solid, liquid, or gasified municipal solid waste." Municipal solid waste means household, commercial, retail, or institutional waste and specifically excludes "industrial process or manufacturing wastes." Even if the raw fly ash were considered a solid waste, it does not meet the definition of municipal solid waste. The proposed fly ash beneficiation process, therefore, is not subject to 40 CFR 60, Subpart Eb.

Standards of Performance for Stationary Compression Ignition Internal Combustion Engines (40 CFR 60, Subpart IIII) applies to owners and operators of stationary compression ignition (CI) internal combustion engines (ICE) that commence construction after July 11, 2005, where the stationary CI ICE are:

(i) Manufactured after April 1, 2006, and are not fire pump engines, or

(ii) Manufactured as a certified National Fire Protection Association fire pump engine after July 1, 2006."

The crusher and screener are both powered by diesel-fired CI ICE. The engines will commence construction (be ordered) after July 11, 2005, and be manufactured after April 1, 2006 and therefore, will be subject to Subpart IIII. Per 40 CFR 60.4201(a), Stationary CI ICE manufacturers must certify their 2007 model year and later non-emergency stationary CI ICE with a maximum engine power less than or equal to 2,237 kilowatt (KW) (3,000 horsepower (HP)) and a displacement of less than 10 liters per cylinder to the certification emission standards for new non-road CI engines in 40 CFR 89.112, 40 CFR 89.113, 40 CFR 1039.101, 40 CFR 1039.102, 40 CFR 1039.104, 40 CFR 1039.105, 40 CFR 1039.107, and 40 CFR 1039.115, as applicable, for all pollutants, for the same model year and maximum engine power. The crusher and screener engines both have a displacement less than 10 liters per cylinder and engine power less than 3000 HP; therefore, the emissions standards under Subpart IIII apply.

4.1.3 40 CFR 63 – National Emission Standards for Hazardous Air Pollutants (NESHAP)

The NESHAP for Stationary Reciprocating Internal Combustion Engines, or RICE MACT (40 CFR 63, Subpart ZZZZ), applies to new and existing ICEs located at major and area sources. The engines associated with the screening and crushing are subject to Subpart ZZZZ. However as per §63.6590(c), by

meeting the requirements of NSPS Subpart IIII for compression ignition engines, the affected source meets the requirements of Subpart ZZZZ.

The NESHAP for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters (40 CFR 63, Subpart DDDDD), establishes national emission limitations and work practice standards for HAP emitted from industrial, commercial, and institutional boilers and process heaters located at major sources of HAP. A major source of HAP is any facility that has the potential to emit 10 tons per year or more of any single HAP, or 25 tons per year or more of any combination of HAP. The proposed facility will be an area source of HAP; therefore Subpart DDDDD would not apply.

The NESHAP for Industrial, Commercial, and Institutional Boilers Area sources (40 CFR 63, Subpart JJJJJJ) applies to industrial, commercial, and institutional boilers at an area source of HAP. An area source of HAP emissions is any source of HAP that is not a major source. Because none of the proposed emission units for the fly ash beneficiation process meet the definition of a boiler under 40 CFR 63.11237, Subpart JJJJJJ would not apply.

4.1.4 40 CFR 64 – The Compliance Assurance Monitoring Rule (CAM)

The CAM Rule (40 CFR Part 64) applies to pollutant-specific emissions units (PSEU) that are pre-control major sources and use a control device to comply with an emissions limit. For the CAM Rule to apply to a specific emission unit/pollutant, the following four criteria must be met:

1. The emission unit must be located at a major source for which a Part 70 or Part 71 permit is required.
2. The emission unit must be subject to an emission limitation or standard.
3. The emission unit must use a control device to achieve compliance with the emission limitation or standard.
4. The emission unit must have potential, pre-controlled emissions of the pollutant of at least 100 percent of the major source threshold.

Part 64 does not apply to emission limitations or standards proposed after November 15, 1990 pursuant to section 111 or 112 of the Clean Air Act (e.g., post-1990 NSPS or NESHAP) or where a continuous compliance determination method (e.g., CEMS) is used.

As discussed in Section 4.2, emissions of SO_2 from the STAR® reactor are subject to 15A NCAC 2D .0516 and potential pre-controlled emissions of SO_2 are greater than 250 tons per year; therefore, CAM applies. A CAM plan will be submitted with the application for an initial Title V operating permit twelve months after the initial start-up of the facility.

PM emissions from the proposed EHE's, STAR® reactor, and storage silos will be controlled by baghouses and bin vent filters. However, the equipment does not meet the CAM Rule control device definition as shown below:

Control device means equipment, other than inherent process equipment, that is used to destroy or remove air pollutant(s) prior to discharge to the atmosphere. The types of equipment that may commonly be used as control devices include, but are not limited to, fabric filters, mechanical collectors, electrostatic precipitators, inertial separators, afterburners, thermal or catalytic incinerators, adsorption devices (such as carbon beds), condensers, scrubbers (such as wet collection and gas absorption devices), selective catalytic or non-catalytic reduction systems, flue gas recirculation systems, spray dryers, spray towers, mist eliminators, acid plants, sulfur recovery plants, injection systems (such as water, steam, ammonia, sorbent or limestone injection), and combustion devices independent of the particular process being conducted at an emissions unit (e.g., the destruction of emissions achieved by venting process emission streams to flares, boilers or process heaters). For purposes of this part, a control device does not include passive control measures that act to prevent pollutants from forming, such as the use of seals, lids, or roofs to prevent the release of pollutants, use of low-polluting fuel or feedstocks, or the use of combustion or other process design features or characteristics. If an applicable requirement establishes that particular equipment which otherwise meets this definition of a control device does not constitute a control device as applied to a particular pollutant-specific emissions unit, then that definition shall be binding for purposes of this part.

Inherent process equipment means equipment that is necessary for the proper or safe functioning of the process, or material recovery equipment that the owner or operator documents is installed and operated primarily for purposes other than compliance with air pollution regulations. Equipment that must be operated at an efficiency higher than that achieved during normal process operations in order to comply with the applicable emission limitation or standard is not inherent process equipment. For the purposes of this part, inherent process equipment is not considered a control device.

The baghouses and bin vent filters are material recovery equipment and the Cape Fear STAR® facility would not be operated without the use of these control devices. Therefore, these devices can be considered inherent process equipment, and CAM does not apply.

4.1.5 40 CFR 70 – Title V Operating Permits

Title V of the Clean Air Act Amendments of 1990 (CAAA) outlines requirements for operating permit programs for major stationary sources of air pollution. According to 40 CFR 70.2, a major stationary source of air pollution for the purposes of Title V includes a source that emits, or has the potential to emit 100 tons per year or more of any regulated pollutant.

As presented in Section 1.1 and Table 3-1 of this application, potential emissions of PM_{10}, NOx, CO, and SO_2 will each be greater than 100 tons per year; therefore, the proposed facility is a "major facility" as defined in 40 CFR 70.2 and must obtain a permit under Title V and 40 CFR Part 70. Duke Energy requests approval to proceed with this project as a two-step permit modification using the procedures outlined in 15A NCAC 2Q.0501(c)(2) and .0504.

4.2 North Carolina Air Quality Regulations

The NCDAQ has promulgated air pollution control requirements under Subchapter 2D and 2Q of Title 15A, North Carolina Administrative Code. Most of these regulations are part of the North Carolina State Implementation Plan (SIP) for compliance with the Clean Air Act and most SIP regulations are federally enforceable. Generally, applicability requirements, such as those pertaining to requirements to obtain air quality permits and SIP compliance, are not discussed because these requirements are widely recognized as being applicable to sources of air pollution.

4.2.1 2D .0515 – Particulates from Miscellaneous Industrial Processes

This standard applies to any industrial process for which no other PM emission control standards are applicable. Allowable emissions rates are determined by the following equations:

$$E = 4.10 \times P^{0.67} \; for \; P \leq 30 \; tons \; per \; hour$$

$$E = 55.0 \times P^{0.11} - 40 \; for \; P > 30 \; tons \; per \; hour$$

Where: E = allowable emission rate in pounds per hour
P = process weight in tons per hour

The following proposed equipment will be subject to 15A NCAC 2D .0515:

- EHE (Units 1 and 2)
- Feed silo
- FGD byproduct silo
- FGD absorbent silo
- STAR® reactor
- Storage Dome
- Transfer silo
- Loadout
- Loadout chute 1A
- Loadout chute 1B
- Screener
- Crusher

Compliance with this requirement is expected and appropriate monitoring and recordkeeping will be performed to verify this expectation. PM emissions from each silo and the storage dome will be controlled with bin vent filters. PM from the EHE's and STAR® reactor will be controlled using baghouses. All required inspections and maintenance on each bin vent filter and baghouse will be performed as recommended by the manufacturer. At a minimum, the following will be performed:

- Monthly external inspections of the ductwork, bin vents, and baghouses noting structural integrity;
- Monthly reading of the pressure gauges on the baghouses; and,
- Annual internal inspections of the bagfilters, noting the structural integrity and the condition of the filters.

Results of the inspections and maintenance will be recorded in an on-site logbook and a summary report of all monitoring and recordkeeping activities will be submitted every six months.

4.2.2 2D .0516 – Sulfur Dioxide Emissions from Combustion Sources

This rule limits emissions of SO_2 from any combustion source discharged through a vent, stack, or chimney to 2.3 pounds of SO_2 per million British thermal unit (MMBtu) input, unless the combustion source is subject to an SO_2 standard in 2D .0524, 0.527, .1110, .1111, .1205, .1206, .1210, or .1211.

The STAR® reactor is not subject to one of the aforementioned rules and is therefore subject to 2D .0516. Compliance with the standard is expected based on the conceptual design of the FGD control device.

To demonstrate compliance, testing shall be performed no later than 180 operating days after the STAR® reactor is placed into operation. These tests shall be performed separately to demonstrate compliance when processing low, medium, and high sulfur content fly ash.

During the performance tests, a minimum lime to sulfur ratio for each of the three sulfur content scenarios will be established. During normal operation, the lime to sulfur ratio will be monitored and recorded every fifteen minutes. Any three-hour rolling average of the lime to sulfur ratios measured during normal operation that fall below the minimum established value for the sulfur content range of the fly ash being processed will be considered an excursion. When an excursion occurs, the monitoring system will first be evaluated for proper operation. If the monitoring system is functioning properly, the cause of the excursion shall be determined and corrective measures shall be taken to reduce the potential for similar excursions. A summary report of all monitoring activities will be submitted to the NCDAQ every six months.

The diesel-fired engines associated with the screener and crusher are subject to 2D .0524 (NSPS Subpart IIII) and, as a result, are not subject to 2D .0516.

4.2.3 2D .0521 - Control of Visible Emissions

This rule applies to all fuel burning sources and other processes that may have visible emissions. For sources manufactured after July 1, 1971, visible emissions shall not be more than 20% opacity averaged over a six minute period. Opacity may exceed 20% one time in an hour, but not more than 4 times in 24 hours. Opacity may never exceed 87%. This limit applies to all equipment associated with the fly ash beneficiation process. Compliance will be achieved through the use of the proposed emission control equipment.

To assure compliance, Duke Energy will observe the STAR® reactor, each silo, the storage dome, the EHE's, the truck loadout chutes, the screener, and the crusher for any emissions above normal. Duke Energy will observe the STAR® reactor once a month, and all other sources once every six months. If emissions from these sources are observed to be above normal, Duke Energy will either:

- Take action to correct the above-normal emissions; or,
- Demonstrate the opacity is in compliance with 15A NCAC 2D .0521 using Method 9.

Duke Energy will record the results of the inspections and any maintenance in an on-site logbook and submit a summary report of all monitoring and recordkeeping activities every six months.

4.2.4 2D .0524 - New Source Performance Standards

NSPS applicability was addressed in Section 4.1.2 above.

4.2.5 2D .0530 - Prevention of Significant Deterioration

PSD applicability was addressed in Section 4.1.1 above.

4.2.6 2D .0540 – Particulates from Fugitive Dust Emission Sources

This rule requires that fugitive dust emissions not cause or contribute to substantive complaints, excessive fugitive dust emissions at the property boundary, or NAAQS violations. Dust emissions from the ash handling and loading/unloading sources are expected to be in compliance.

If substantive complaints or excessive fugitive dust emissions from the facility are observed beyond the property boundaries for six minutes in any one hour, using Reference Method 22 in 40 CFR, Appendix A, Duke Energy may be required to submit a fugitive dust plan as described in 15A 2D .0540(f).

4.2.7 2D .1100 and 2Q .0700 - Control of Toxic Air Pollutants

15A NCAC 2Q .0700 requires facilities that emit toxic air pollutants (TAPs) for which they are required to have a permit under 15A NCAC 2D .1100 to demonstrate compliance with the Acceptable Ambient Levels (AAL). TAP emissions from the Cape Fear STAR® facility are expected to exceed the levels contained in 2Q .0700; therefore, the facility is required to comply with 2D .1100. A detailed explanation of the toxic modeling analyses is presented in Section 5 of this application.

4.2.8 2D .1111 - Maximum Achievable Control Technology

Applicability of MACT standards was discussed in Section 4.1.3 of this report.

4.2.9 2D .1200 – Control of Emissions from Incinerators

Fly ash is not a waste material; instead, it is a feedstock (or an ingredient) for the Cape Fear STAR® facility. The fly ash is a raw material for the proposed Cape Fear STAR® facility. It is required to produce beneficiated product as per the standards of American Society for Testing and Materials (ASTM) Standard C618, and American Association of State Highway and Transportation Officials (AASHTO) Standard M 295 for pozzolan-grade fly ash.

Based on the determination that fly ash, as proposed to be used, is not a waste material, the Cape Fear STAR® facility is not subject to this requirement. NC DEQ's concurrence with this conclusion is supported by the documentation included in Appendix G.

4.2.10 2D .1400 – Nitrogen Oxides

Rules .1407 through .1409(b) and .1413 apply to facilities with potential emissions of NOx equal to or greater than 100 tons per year or 560 pounds per calendar day beginning May 1 through September 30 of any year in the following areas: (1) Cabarrus County; (2) Gaston County; (3) Lincoln County; (4) Mecklenburg County; (5) Rowan County; (6) Union County; and (7) Davidson Township and Coddle Creek Township in Iredell County. The Cape Fear STAR® facility is in Chatham County so this rule does not apply.

Rules .1416 through .1423 apply statewide and Rule .1409(c) applies to Gas Pipeline Stations. Rule .2400 has expired and is no longer valid. Rules .1416, .1417, .1419, .1420, .1421 and .1422 have been repealed and the Cape Fear STAR® facility does not fall under the category of a Gas Pipeline Station so this section does not apply.

Rule .1418 applies to any fossil fuel-fired stationary boiler, combustion turbine, or combined cycle system having a maximum design heat input greater than 250 million Btu per hour and large RICE rated at equal to or greater than 2,400 brake horsepower. The Cape Fear STAR® facility is not proposing any boiler or turbine or large IC engine which will meet the definition above so Rule .1418 does not apply.

Rule .1400 is not applicable to an incinerator or thermal or catalytic oxidizer used primarily for the control of air pollution, emergency generator, emergency use internal combustion engine and stationary ICE less than 2400 brake horsepower that operates no more than the following hours between May 1 and September 30:

(A) for diesel engines:
$t = 833{,}333 / ES$

(B) for natural gas-fired engines:
$t = 700{,}280 / ES$

where t equals time in hours and ES equals engine size in horsepower.

There are two stationary ICE proposed at the site:

- Screener Engine – 91 hp, 2,600 hr/yr
- Crusher Engine – 300 hp; 365 hr/yr.

Based on the equation provide above the diesel engines will be exempt if they operate less than the following hours:

- Screener Engine – 9,157 hours
- Crusher Engine – 2,777 hours

The diesel engines will operate less than the allowable hours; therefore, they are exempt.

The STAR® process does not meet the definition of a fuel-burning operation or meet the definition of any such unit mentioned previously. The combustion of natural gas or propane during startup is direct-fired with all of the STAR® ingredients, including fly ash. As described above, rule .1400 is not applicable to the STAR® unit or any other units at the Cape Fear STAR® facility.

4.2.11 Zoning Consistency Determination

In accordance with §143-215.108(f) of the North Carolina General Statutes, a request for a zoning consistency determination was submitted to the Chatham County Planning and Zoning Director (Mr. Jason Sullivan). The Chatham County Planning and Zoning Department is the only local government having jurisdiction over any part of the land on which the facility and its appurtenances are located. A copy of the zoning consistency determination request is located in Appendix H.

5.0 AIR QUALITY MODELING ANALYSIS

5.1 Introduction

Duke Energy proposes to construct the Cape Fear STAR® facility at the site of the former Cape Fear Steam Electric Plant in Moncure, Chatham County, North Carolina. The facility will reduce the carbon content of fly ash to a level acceptable for use in the concrete market. The STAR® system is a patented technology developed by The SEFA Group Inc. (SEFA) to process feedstock (of any carbon content) like fly ash (wet or dry) along with other ingredient materials into a variety of commercial products including a partial cement replacement. Certain TAP emissions from the Cape Fear STAR® facility are expected to exceed the 15A NCAC 2Q .0711 emission rates requiring a permit; therefore, a facility-wide air toxics analysis was performed.

As shown in Appendix D, a toxic pollutant emission rate (TPER) analysis indicates the following:

- Arsenic and Inorganic Arsenic Compounds (ASC) – Annual TPER exceeded;
- Benzene (71-43-2) – Annual TPER exceeded;
- Beryllium (7440-41-7) – Annual TPER exceeded; and,
- Sulfuric Acid (7664-93-9) – Daily and hourly TPER exceeded.

Facility-wide modeling was conducted for the compounds listed above and the resulting modeled concentrations were compared to the applicable Acceptable Ambient Levels (AAL). The modeling methodology and assumptions are provided in the following sections.

5.2 Background

The Environmental Management Commission (EMC) instituted a health-based toxic air pollutant control program on May 1, 1990. NCDAQ implements this program that regulates emissions of 105 toxic air pollutants. Under this program, facilities must demonstrate compliance with 15A NCAC 2D .1104, "Toxic Air Pollutant Guidelines."

5.3 Area Description

The proposed Cape Fear STAR® facility will be located at the site of the former Cape Fear Steam Electric Plant in Moncure, Chatham County, North Carolina. The plant site is approximately two miles southeast of Moncure. The approximate UTM coordinates are Zone 17, 678.183 km east and 3940.022 km north at an elevation of approximately 193 feet above mean sea level. The largest city near the site is Sanford, North Carolina. The site is located in the Piedmont region of North Carolina and the terrain surrounding the site can be considered gently rolling.

5.4 Air Quality Analysis Approach

The analysis was based on requirements and recommendations contained in the NCDAQ's *Guidelines for Evaluating the Air Quality Impacts of Toxic Pollutants in North Carolina*. A modeling protocol checklist is contained in Appendix C.

The following sections describe in detail the dispersion model selection, the meteorological data, the GEP building wake effect/downwash analysis, the modeling receptor grids, the emission sources, and the results of the modeling analysis.

5.4.1 Air Dispersion Model Selection

AERMOD Modeling System (version 15181)

Air emissions from the Cape Fear STAR® facility will occur from multiple source locations; thus, the modeling analysis was performed using the AERMOD computer dispersion model. The AERMOD model was used to model the separated sources and predict maximum ambient concentrations. The AERMOD modeling was conducted using regulatory default options.

5.4.2 Meteorological Data

A five-year meteorological data set (2013-2017) of surface meteorological data from the Chapel Hill-Horace Williams Airport (Station No. 93785) and upper-air sounding data also recorded at the Piedmont Triad International Airport in Greensboro, NC (Station No. 13723) were used in the modeling analysis. The meteorological data files were obtained from the NCDAQ.

The meteorological data set consisted of 8,760 hourly observations (8,784 hourly observations in 2012 and 2016) of the following parameters:

- wind speed;
- wind direction;
- ambient temperature;
- atmospheric stability; and
- mixing heights.

These data were used to calculate hourly plume rise and concentrations at downwind receptor locations for a period up to a year. Each year was processed individually and maximum predicted concentrations for the worst-case year are reported in the modeling results for comparison to the North Carolina toxic air pollutant AAL's.

5.4.3 Good Engineering Practice (GEP) Stack Height Analysis

A Good Engineering Practice (GEP) stack height analysis was performed for all emission sources subject to a modeling analysis in order to determine if wake effects and downwash options need to be selected in the computer model. The GEP analysis was performed following the procedures outlined in the EPA documents *Guideline For Determination of Good Engineering Practice Stack Height (Technical Support Document For the Stack Height Regulations)* Revised (EPA-450/4-80-023R), the *User's Guide to the Building Profile Input Program* (October 1993), and the most recent version of the Oris Solutions "GEP-BPIP Prime" program.

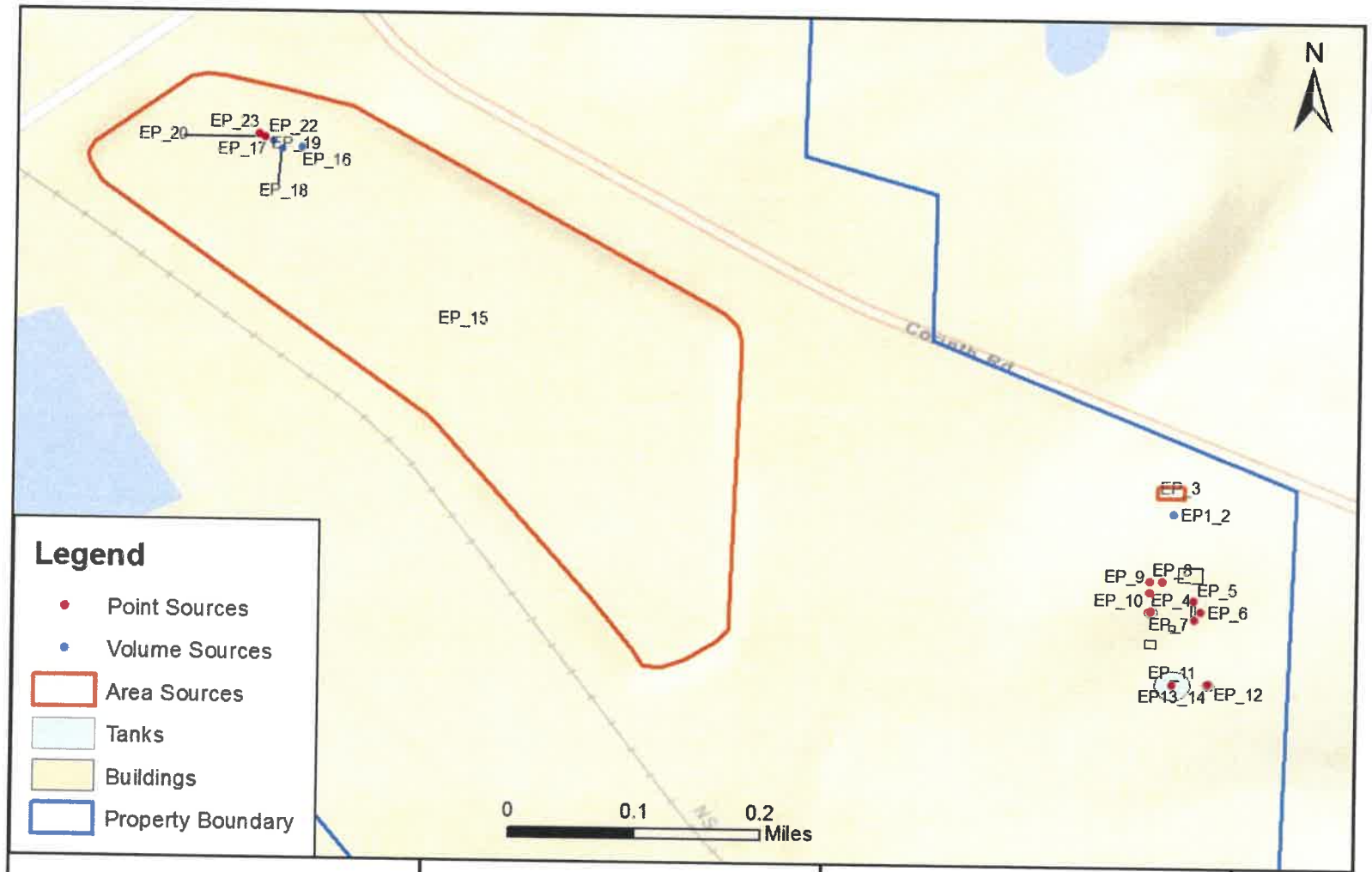
The building wake and downwash effect analysis was applied to each emission source. For each building, an area of wake and downwash effects extends outward to a distance of five times "L" (the

lesser of the maximum projected width or height of the building) directly downwind from the leeward side of the building. Wake effects were assumed to occur if the emission source is located within a rectangle composed of two lines perpendicular to the wind direction, one at 5L downwind of the building and the other at 2L upwind of the building, and by two lines parallel to the wind direction, each at 0.5L away from each side of the building.

As the wind direction rotates, the wake and downwash effect region of influence changes and is combined to form a GEP 5L region of influence in all wind directions. Any emission source within the region of influence is affected by wake and downwash effects. For buildings close to an emission source, wake and downwash effects were considered where the distance between the emission source and the nearest part of the building is less than or equal to 5L. Wake and downwash effects from buildings that are closer than the greater of either building's maximum projected width or height are considered to have one region of influence.

When an emission source height is less than the GEP height and is located within the region of influence, direction-specific building dimensions are included in the modeling analysis and either the Schulman-Scire or the Huber-Snyder equations are used for calculating the wake and downwash concentrations.

The GEP analysis was performed for proposed Cape Fear STAR® facility using the latest version of the Oris Solutions GEP program to demonstrate compliance with stack height regulations (40 CFR Part 51) and to determine which emission sources are impacted by building wake and downwash effects. The building heights and projected widths were input into the model for each ten degrees of wind direction. These building heights and projected widths are the same as are used for the GEP stack height calculation. Figure 5-1 presents the proposed Cape Fear STAR® facility layout.

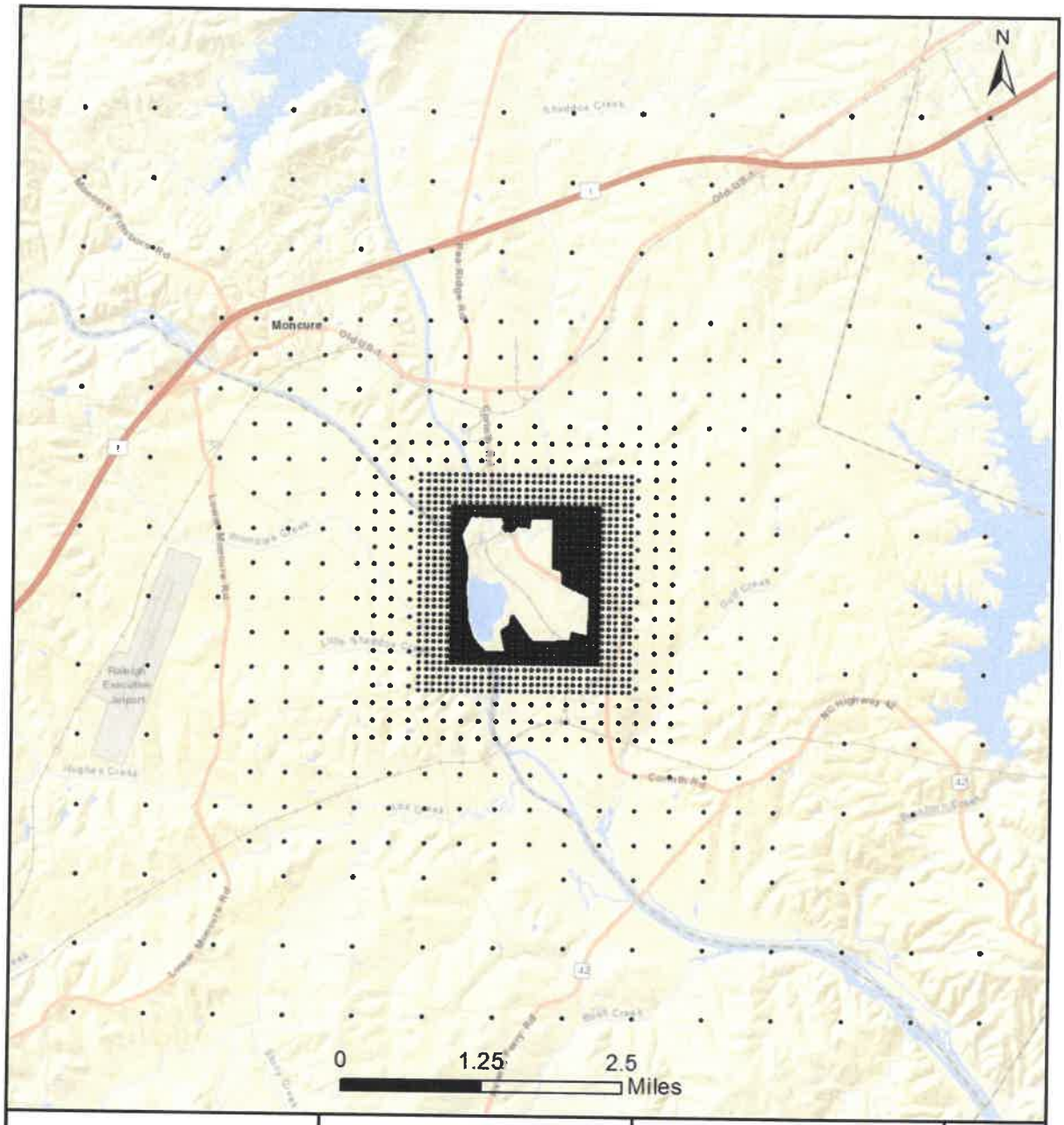


DUKE ENERGY PROGRESS, LLC CAPE FEAR STAR® FACILITY MONCURE, NORTH CAROLINA	**AECOM** *1600 Perimeter Park Drive, Suite 400* *Morrisville, North Carolina 27560* *Telephone 919-461-1100*	**EMISSION SOURCES AND BUILDING LAYOUT**	PROJECT NO. 60563150 FIG. NO. 5-1

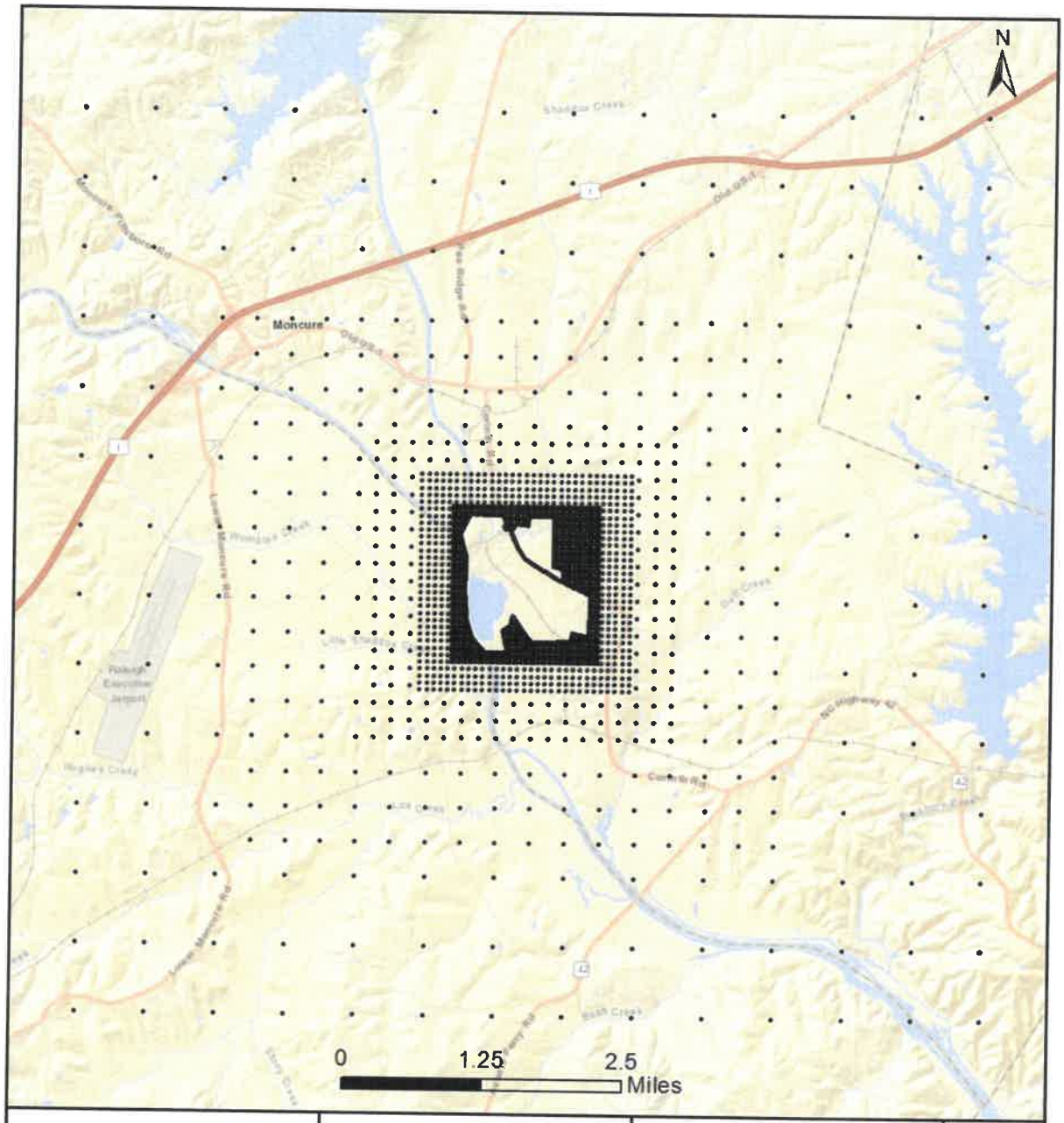
5.4.4 Receptors

The dispersion modeling receptor grids were developed following procedures outlined in the *New Source Review Workshop Manual* (October 1990) and the revised *North Carolina Air Toxics Modeling Guidelines* (February 2014). A detailed discrete receptor grid system was created to assess air quality impacts in all directions to a distance of up to 4 km from the Cape Fear STAR® facility emission sources.

Discrete receptors were placed along the property line at 25-meter intervals. A 50-meter grid spacing was used from the property line out to a distance of approximately 100 meters. Receptors with an increasing grid spacing of 100, 250, 500 and 1,000 meters extend out to a distance of approximately 5,000 meters. Receptors were also place along Corinth Road for the short-term modeling grid. Figures 5-2 and 5-3 present the long-term and short- term modeling receptor grids. All receptor coordinates are expressed in UTM coordinates.



DUKE ENERGY PROGRESS, LLC CAPE FEAR STAR® FACILITY MONCURE, NORTH CAROLINA	AECOM *1600 Perimeter Park Drive, Suite 400* *Morrisville, North Carolina 27560* *Telephone 919-461-1100*	**LONG-TERM MODELING RECEPTOR GRID**	PROJECT NO. 60563150 FIG. NO. 5-2



DUKE ENERGY PROGRESS, LLC CAPE FEAR STAR® FACILITY MONCURE, NORTH CAROLINA	AECOM *1600 Perimeter Park Drive, Suite 400* *Morrisville, North Carolina 27560* *Telephone 919-461-1100*	**SHORT-TERM MODELING RECEPTOR GRID**	PROJECT NO. 60563150 FIG. NO. 5-3

5.4.5 Sources

The Cape Fear STAR® facility will have multiple emission sources. The following sections describe the sources modeled.

5.4.5.1 Point Sources

The AERMOD model uses a steady-state Gaussian plume equation to model emissions from point sources such as stacks and vents. All point sources were modeled using nominal stack exhaust parameters. The following parameters were used for modeling the point sources: emission rates (grams/sec), stack height (m), stack diameter (m), stack exit velocity (m/sec), stack exhaust temperature (K), and direction-specific building dimensions (m). All point sources with rain caps or horizontal stacks were modeled with a default exit velocity of 0.01 m/s. Point sources include the EHE dust collector stacks, EHE transfer silo, reactor feed silo, product loadout silo, FGD absorbent silo, FGD byproduct silo, and the STAR® reactor exhaust stack.

5.4.5.2 Area Sources

The AERMOD model was used to simulate the effects of emissions from the ash basin as an area source. Modeling was performed by spreading emissions (grams per second) equally over the entire surface of the ash basin. Appendix D contains the area source parameters associated with the ash basin.

5.4.5.3 Volume Sources

The AERMOD model was used to simulate the effects of emissions from various volume sources including the unloading pile, wet ash handling and transfer, the screener, and the crusher. For each volume source modeled, an initial lateral (σ_{y0}) and vertical (σ_{z0}) dimension was calculated based on the physical dimensions of the source. As an example, the volume source parameters for the wet ash transfer were calculated as follows:

Fugitive Emissions from Wet Ash Transfer

Release Height = 1.5 m (X.X ft)
σ_{y0} = length of side/4.3 = 3.05 m/4.3 = 0.71 m (10 ft)
σ_{z0} = vertical dimension of source/2.15 = 3.08 m/2.15 = 1.43 m (10 ft)

5.4.6 Modeling Results

The modeling analysis followed the NCDAQ's *Guideline on Air Toxics Modeling* (as a default in lieu of county-specific guidelines); a copy of the modeling protocol checklist is included in Appendix C. Potential emissions were modeled for comparison to the respective AALs. Emission rates for all the potential model runs were multiplied by 1,000 to ensure a non-zero modeling concentration was obtained. Based on the resulting concentrations from the potential model run, the emission rates were then increased to an optimized rate such that modeled allowable emission rates result in ambient concentrations that are 98 percent of the AAL. Optimizing the emission rates provides the Cape Fear STAR® facility with additional operational flexibility, and should reduce the need for future TAP modeling analyses for these sources at the facility. Appendix D presents a summary of the maximum modeling results

for arsenic, benzene, beryllium, and sulfuric acid. A complete listing of all modeled emission rates is provided in Appendix D.

The TAP modeling analysis demonstrates that the maximum optimized TAP emissions of arsenic, benzene, beryllium, and sulfuric acid from the facility do not result in predicted ambient concentrations that exceed the respective AALs.

Appendix A

Permit Application Forms

FORM A

GENERAL FACILITY INFORMATION

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **A**

NOTE- APPLICATION WILL NOT BE PROCESSED WITHOUT THE FOLLOWING:

- ☑ Local Zoning Consistency Determination (new or modification only)
- ☑ Appropriate Number of Copies of Application
- ☑ Application Fee (if required)
- ☑ Responsible Official/Authorized Contact Signature
- ☑ P.E. Seal (if required)

GENERAL INFORMATION

Legal Corporate/Owner Name: Duke Energy Progress LLC

Site Name: Cape Fear STAR® Ash Beneficiation Process

Site Address (911 Address) Line 1: 500 C P and L Road

Site Address Line 2:

City: Moncure | State: NC

Zip Code: 27559 | County: Chatham

CONTACT INFORMATION

Responsible Official/Authorized Contact:	***Invoice Contact:***
Name/Title: Jon Kerin / VP CCP Governance & Operational Support	Name/Title: Cynthia Winston / Manager - Permitting and Compliance
Mailing Address Line 1: 410 S. Wilmington Street	Mailing Address Line 1: 410 S. Wilmington Street
Mailing Address Line 2:	Mailing Address Line 2
City: Raleigh State: NC Zip Code: 27601	City: Raleigh State: NC Zip Code: 27601
Primary Phone No.: (919) 546-6760 Fax No.:	Primary Phone No.: (919) 546-5538 Fax No.: (919) 546-6302
Secondary Phone No.:	Secondary Phone No:
Email Address: Jon.Kerin@duke-energy.com	Email Address: Cynthia.Winston@duke-energy.com
Facility/Inspection Contact:	***Permit/Technical Contact:***
Name/Title: Steven Conner/Manager Environmental Services	Name/Title: Ann Quillian/Lead Environmental Specialist
Mailing Address Line 1: Duke Energy Progress, 1700 Dunnaway Road	Mailing Address Line 1: 410 S. Wilmington Street
Mailing Address Line 2:	Mailing Address Line 2.
City: Semora State: NC Zip Code 27343	City: Raleigh State: NC Zip Code: 27601
Primary Phone No.: (336) 597-6213 Fax No.:	Primary Phone No: (919) 546-6610 Fax No.: (919) 546-6302
Secondary Phone No.:	Secondary Phone No:
Email Address: Steven.Conner@duke-energy.com	Email Address: Ann.Quillian@duke-energy.com

APPLICATION IS BEING MADE FOR

- ☑ New Non-permitted Facility/Greenfield
- ☐ Modification of Facility (permitted)
- ☐ Renewal Title V
- ☐ Renewal Non-Title V
- ☐ Name Change
- ☐ Ownership Change
- ☐ Administrative Amendment
- ☐ Renewal with Modification

FACILITY CLASSIFICATION AFTER APPLICATION (Check Only One)

- ☐ General
- ☐ Small
- ☐ Prohibitory Small
- ☐ Synthetic Minor
- ☑ Title V

FACILITY (Plant Site) INFORMATION

Describe nature of (plant site) operation(s): Coal ash beneficiation process

Facility ID No. - NA: New Facility

Primary SIC/NAICS Code: 4911 | Current/Previous Air Permit No. NA | Expiration Date: NA

Facility Coordinates: Latitude 35.587899 | Longitude: -79.033311

Does this application contain confidential data? ☐ YES ☑ NO — ***If yes, please contact the DAQ Regional Office prior to submitting this application.*** **(See Instructions)**

PERSON OR FIRM THAT PREPARED APPLICATION

Person Name: Amy M. Marshall, PE | Firm Name: AECOM Technical Services of North Carolina

Mailing Address Line 1: 1600 Perimeter Park Drive | Mailing Address Line 2: Suite 400

City: Morrisville | State: NC | Zip Code: 27560 | County: Wake

Phone No.: (919) 461-1251 | Fax No.: (919) 461-1415 | Email Address: Amy.Marshall@aecom.com

SIGNATURE OF RESPONSIBLE OFFICIAL/AUTHORIZED CONTACT

Name (typed): Jon Kerin | Title: VP CCP Governance & Operational Support

X Signature(Blue Ink): | Date: 20 July 2018

Attach Additional Sheets As Necessary — Page 1 of 2

Received
JUL 24 2018
Air Permits Section

FORMs A2, A3

EMISSION SOURCE LISTING FOR THIS APPLICATION - A2

112r APPLICABILITY INFORMATION - A3

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **A2**

EMISSION SOURCE LISTING: New, Modified, Previously Unpermitted, Replaced, Deleted

EMISSION SOURCE ID NO.	EMISSION SOURCE DESCRIPTION	CONTROL DEVICE ID NO.	CONTROL DEVICE DESCRIPTION
Equipment To Be ADDED By This Application (New, Previously Unpermitted, or Replacement)			
ES-1	Wet Ash Receiving (Transfer to Shed and Hopper)	NA	NA
ES-3	Unloading Pile	NA	NA
ES-4	Feed Silo	CD-4	Bin Vent Filter
ES-5	STAR® Ash Beneficiation	CD-5A & CD-5B	Flue Gas Desulfurization Scrubber and Baghouse
ES-6	FGD Byproduct Silo	CD-6	Bin Vent Filter
ES-7	FGD Hydrated Lime Silo	CD-7	Bin Vent Filter
ES-8	EHE - External Heat Exchanger A	CD-8	Baghouse
ES-9	EHE - External Heat Exchanger B	CD-9	Baghouse
ES-10	EHE Silo	CD-10	Bin Vent Filter
ES-11	Product Storage Dome	CD-11	Bin Vent Filter
ES-12	Loadout Silo	CD-12	Bin Vent Filter
ES-15	Ash Basin	NA	NA
ES-16	Ash Handling	NA	NA
ES-19	Screener	NA	NA
ES-20	Crusher	NA	NA
ES-21	Haul Roads	NA	NA
ES-22	Screener Diesel Engine	NA	NA
ES-23	Crusher Diesel Engine	NA	NA
Existing Permitted Equipment To Be MODIFIED By This Application			
NA - New Facility			
Equipment To Be DELETED By This Application			
NA - New Facility			

112(r) APPLICABILITY INFORMATION — **A 3**

Is your facility subject to 40 CFR Part 68 "Prevention of Accidental Releases" - Section 112(r) of the Federal Clean Air Act? ☐ Yes ☑ No

If No, please specify in detail how your facility avoided applicability: Facility does not use, store or handle any regulated substances above their respective threshold quantity.

If your facility is Subject to 112(r), please complete the following:

A. Have you already submitted a Risk Management Plan (RMP) to EPA Pursuant to 40 CFR Part 68.10 or Part 68.150?

☐ Yes ☐ No Specify required RMP submittal date: _____ If submitted, RMP submittal date: _____

B. Are you using administrative controls to subject your facility to a lesser 112(r) program standard?

☐ Yes ☐ No If yes, please specify: _____

C. List the processes subject to 112(r) at your facility:

PROCESS DESCRIPTION	PROCESS LEVEL (1, 2, or 3)	HAZARDOUS CHEMICAL	MAXIMUM INTENDED INVENTORY (LBS)

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Wet Ash Receiving (Transfer to Shed and Hopper)	EMISSION SOURCE ID NO: ES-1
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-1 & EP-2

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Transfer of ash to storage shed (EP-1) and hopper (EP-2)

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019 DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: NA EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	AP-42	1.42E-02	4.07E-02	N/A	N/A	1.42E-02	4.07E-02
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	6.73E-03	1.92E-02	N/A	N/A	6.73E-03	1.92E-02
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	1.02E-03	2.91E-03	N/A	N/A	1.02E-03	2.91E-03
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	2.28E-07	6.51E-07	N/A	N/A	2.28E-07	6.51E-07
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	1.11E-07	3.17E-07	N/A	N/A	1.11E-07	3.17E-07
Arsenic	7440-38-2		8.50E-07	2.43E-06	N/A	N/A	8.50E-07	2.43E-06
Beryllium	7440-41-7		4.43E-08	1.26E-07	N/A	N/A	4.43E-08	1.26E-07
Cadmium	7440-43-9		6.83E-09	1.95E-08	N/A	N/A	6.83E-09	1.95E-08
Chromium	7440-47-3		2.70E-07	7.71E-07	N/A	N/A	2.70E-07	7.71E-07
Chromium VI	SolCR6		1.41E-08	4.03E-08	N/A	N/A	1.41E-08	4.03E-08
Cobalt	7440-48-4		1.53E-07	4.38E-07	N/A	N/A	1.53E-07	4.38E-07
Lead	7439-92-1		2.28E-07	6.51E-07	N/A	N/A	2.28E-07	6.51E-07
Manganese	7439-96-5		1.11E-06	3.17E-06	N/A	N/A	1.11E-06	3.17E-06
Mercury	7439-97-6		3.56E-09	1.02E-08	N/A	N/A	3.56E-09	1.02E-08
Nickel	7440-02-0		3.04E-07	8.69E-07	N/A	N/A	3.04E-07	8.69E-07
Selenium	7782-49-2		2.00E-07	5.72E-07	N/A	N/A	2.00E-07	5.72E-07

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	8.50E-07	2.04E-05	4.86E-03
Beryllium	7440-41-7		4.43E-08	1.06E-06	2.53E-04
Cadmium	7440-43-9		6.83E-09	1.64E-07	3.90E-05
Chromium VI	SolCR6		1.41E-08	3.38E-07	8.05E-05
Manganese	7439-96-5		1.11E-06	2.66E-05	6.34E-03
Mercury	7439-97-6		3.56E-09	8.54E-08	2.03E-05
Nickel	7440-02-0		3.04E-07	7.30E-06	1.74E-03

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Wet Ash Receiving (Transfer to Shed and Hopper)	EMISSION SOURCE ID NO: ES-1
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-1 & EP-2

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Transfer of ash to storage shed and hopper

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Wet Ash Throughput	Tons	70.0	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Unloading Pile	EMISSION SOURCE ID NO: ES-3
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-3

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Unloading pile windblown fugitive dust emissions

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	AP-42	1.68E-04	7.35E-04	N/A	N/A	1.68E-04	7.35E-04
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	8.39E-05	3.67E-04	N/A	N/A	8.39E-05	3.67E-04
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	1.26E-05	5.51E-05	N/A	N/A	1.26E-05	5.51E-05
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	2.69E-09	1.18E-08	N/A	N/A	2.69E-09	1.18E-08
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Antimony	7440-36-0	Ash Analysis	1.31E-09	5.73E-09	N/A	N/A	1.31E-09	5.73E-09
Arsenic	7440-38-2		1.00E-08	4.39E-08	N/A	N/A	1.00E-08	4.39E-08
Beryllium	7440-41-7		5.22E-10	2.28E-09	N/A	N/A	5.22E-10	2.28E-09
Cadmium	7440-43-9		8.05E-11	3.53E-10	N/A	N/A	8.05E-11	3.53E-10
Chromium	7440-47-3		3.18E-09	1.39E-08	N/A	N/A	3.18E-09	1.39E-08
Chromium VI	SolCR6		1.66E-10	7.27E-10	N/A	N/A	1.66E-10	7.27E-10
Cobalt	7440-48-4		1.81E-09	7.91E-09	N/A	N/A	1.81E-09	7.91E-09
Lead	7439-92-1		2.69E-09	1.18E-08	N/A	N/A	2.69E-09	1.18E-08
Manganese	7439-96-5		1.31E-08	5.73E-08	N/A	N/A	1.31E-08	5.73E-08
Mercury	7439-97-6		4.19E-11	1.84E-10	N/A	N/A	4.19E-11	1.84E-10
Nickel	7440-02-0		3.58E-09	1.57E-08	N/A	N/A	3.58E-09	1.57E-08
Selenium	7782-49-2		2.36E-09	1.03E-08	N/A	N/A	2.36E-09	1.03E-08

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	1.00E-08	2.40E-07	8.77E-05
Beryllium	7440-41-7		5.22E-10	1.25E-08	4.57E-06
Cadmium	7440-43-9		8.05E-11	1.93E-09	7.05E-07
Chromium VI	SolCR6		1.66E-10	3.99E-09	1.45E-06
Manganese	7439-96-5		1.31E-08	3.14E-07	1.15E-04
Mercury	7439-97-6		4.19E-11	1.01E-09	3.67E-07
Nickel	7440-02-0		3.58E-09	8.60E-08	3.14E-05

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Unloading Pile	EMISSION SOURCE ID NO: ES-3
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-3

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Unloading pile windblown fugitive dust emissions

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Area	Acres	0.33 Acres	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS: Unloading pile is not expected to be utilized; however, including as a permitted source for conservatism and flexibility in operations.

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Feed Silo	EMISSION SOURCE ID NO: ES-4
	CONTROL DEVICE ID NO(S): CD-4
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-4

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Ash feed silo is filled pneumatically and equipped with a bin vent filter capture device.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☑ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: TBD	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	2.83E-01	1.24E+00	N/A	N/A	2.83E-01	1.24E+00
PARTICULATE MATTER<10 MICRONS (PM_{10})		2.60E-01	1.14E+00	N/A	N/A	2.60E-01	1.14E+00
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		1.50E-01	6.57E-01	N/A	N/A	1.50E-01	6.57E-01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	4.53E-06	1.98E-05	N/A	N/A	4.53E-06	1.98E-05
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Antimony	7440-36-0	Ash Analysis	2.21E-06	9.66E-06	N/A	N/A	2.21E-06	9.66E-06
Arsenic	7440-38-2		1.69E-05	7.40E-05	N/A	N/A	1.69E-05	7.40E-05
Beryllium	7440-41-7		8.80E-07	3.85E-06	N/A	N/A	8.80E-07	3.85E-06
Cadmium	7440-43-9		1.36E-07	5.95E-07	N/A	N/A	1.36E-07	5.95E-07
Chromium	7440-47-3		5.36E-06	2.35E-05	N/A	N/A	5.36E-06	2.35E-05
Chromium VI	SolCR6		2.80E-07	1.23E-06	N/A	N/A	2.80E-07	1.23E-06
Cobalt	7440-48-4		3.05E-06	1.33E-05	N/A	N/A	3.05E-06	1.33E-05
Lead	7439-92-1		4.53E-06	1.98E-05	N/A	N/A	4.53E-06	1.98E-05
Manganese	7439-96-5		2.21E-05	9.66E-05	N/A	N/A	2.21E-05	9.66E-05
Mercury	7439-97-6		7.07E-08	3.10E-07	N/A	N/A	7.07E-08	3.10E-07
Nickel	7440-02-0		6.04E-06	2.65E-05	N/A	N/A	6.04E-06	2.65E-05
Selenium	7782-49-2		3.98E-06	1.74E-05	N/A	N/A	3.98E-06	1.74E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	1.69E-05	4.05E-04	1.48E-01
Beryllium	7440-41-7		8.80E-07	2.11E-05	7.71E-03
Cadmium	7440-43-9		1.36E-07	3.26E-06	1.19E-03
Chromium VI	SolCR6		2.80E-07	6.72E-06	2.45E-03
Manganese	7439-96-5		2.21E-05	5.29E-04	1.93E-01
Mercury	7439-97-6		7.07E-08	1.70E-06	6.19E-04
Nickel	7440-02-0		6.04E-06	1.45E-04	5.29E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6
EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B6**

EMISSION SOURCE DESCRIPTION: Feed Silo	EMISSION SOURCE ID NO: ES-4
	CONTROL DEVICE ID NO(S): CD-4
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-4

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Ash feed silo is filled pneumatically and equipped with a bin vent filter capture device.

MATERIAL STORED: Fly Ash				DENSITY OF MATERIAL (LB/FT3): 60 (Bulk) 90 (Structural)	
CAPACITY	CUBIC FEET: 76,000			TONS: 1,500	
DIMENSIONS (FEET)	HEIGHT: 97	DIAMETER: 41	***(OR)***	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)		ACTUAL: 400,000		MAXIMUM DESIGN CAPACITY: 400,000	

PNEUMATICALLY FILLED	MECHANICALLY FILLED	FILLED FROM
[✓] BLOWER	[ ] SCREW CONVEYOR	[ ] RAILCAR
[ ] COMPRESSOR	[ ] BELT CONVEYOR	[ ] TRUCK
[ ] OTHER:	[ ] BUCKET ELEVATOR	[ ] STORAGE PILE
	[ ] OTHER:	[✓] OTHER: EHE Silo

NO. FILL TUBES: 3
MAXIMUM ACFM: 6,600 SCFM

MATERIAL IS UNLOADED TO: STAR® Ash Beneficiation Process

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?
Gravity

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): 125
MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): 75

COMMENTS:

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-4	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-4
EMISSION POINT (STACK) ID NO(S): EP-4	POSITION IN SERIES OF CONTROLS — NO. 1 OF 1 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? ☐ YES ☑ NO

DESCRIBE CONTROL SYSTEM:
Bin vent filter for particulate control on the feed silo.

Note: Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	NA %	NA %	NA %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.005 gr/dscf %	<=0.005 gr/dscf %	<=0.005 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	2.83E-01	2.60E-01	1.50E-01	

PRESSURE DROP (IN H_2O): MIN: 10 MAX: 15	GAUGE? ☑ YES ☐ NO		
BULK PARTICLE DENSITY (LB/FT^3): 25	INLET TEMPERATURE (°F):	MIN: 200	MAX: 350
POLLUTANT LOADING RATE: NA ☐ LB/HR ☐ GR/FT^3	OUTLET TEMPERATURE (°F)	MIN: 200	MAX: 350
INLET AIR FLOW RATE (ACFM): 6,600 SCFM	FILTER OPERATING TEMP (°F): 350		
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 144	LENGTH OF BAG (IN.): 120	
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2): 259	DIAMETER OF BAG (IN.): 6	
TOTAL FILTER SURFACE AREA (FT^2): 2,260	AIR TO CLOTH RATIO: 3:1		
DRAFT TYPE: ☐ INDUCED/NEGATIVE ☑ FORCED/POSITIVE	FILTER MATERIAL: ☐ WOVEN ☑ FELTED		

DESCRIBE CLEANING PROCEDURES:

- ☑ AIR PULSE
- ☐ REVERSE FLOW
- ☐ MECHANICAL/SHAKER
- ☐ OTHER:
- ☐ SONIC
- ☐ SIMPLE BAG COLLAPSE
- ☐ RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain fly ash.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Supplier specific, 80% (average size) passing 325 mesh

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: STAR® Ash Beneficiation	EMISSION SOURCE ID NO: ES-5
	CONTROL DEVICE ID NO(S): CD-5A & CD-5B
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-5

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
The STAR® Ash Beneficiation Process will process feedstock (of any carbon content) like flyash (wet or dry) along with other ingredient materials into a variety of commercial products.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019 DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Worst Case: Propane Firing (AP-42) & Fly Ash (Manufacturer)	1.61E+01	7.04E+01	NA	NA	1.61E+01	7.04E+01
PARTICULATE MATTER<10 MICRONS (PM_{10})		1.48E+01	6.48E+01	NA	NA	1.48E+01	6.48E+01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		8.52E+00	3.73E+01	NA	NA	8.52E+00	3.73E+01
SULFUR DIOXIDE (SO2)		2.57E+01	1.12E+02	5.14E+02	2.25E+03	2.57E+01	1.12E+02
NITROGEN OXIDES (NOx)		4.76E+01	2.08E+02	NA	NA	4.76E+01	2.08E+02
CARBON MONOXIDE (CO)		2.24E+01	9.81E+01	NA	NA	2.24E+01	9.81E+01
VOLATILE ORGANIC COMPOUNDS (VOC)		2.24E+00	9.81E+00	NA	NA	2.24E+00	9.81E+00
LEAD		1.93E-06	8.45E-06	NA	NA	1.93E-06	8.45E-06
H2SO4		1.00E-01	4.38E-01	NA	NA	1.00E-01	4.38E-01
CO2e		3.54E+04	1.55E+05	NA	NA	3.54E+04	1.55E+05

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Manufacturer Estimates and Compositional Analysis	5.46E-07	2.39E-06	NA	NA	5.46E-07	2.39E-06
Arsenic	7440-38-2		3.05E-06	1.34E-05	NA	NA	3.05E-06	1.34E-05
Beryllium	7440-41-7		4.34E-07	1.90E-06	NA	NA	4.34E-07	1.90E-06
Cadmium	7440-43-9		6.59E-07	2.89E-06	NA	NA	6.59E-07	2.89E-06
Chromium	7440-47-3		1.22E-05	5.35E-05	NA	NA	1.22E-05	5.35E-05
Cobalt	7440-48-4		3.21E-06	1.41E-05	NA	NA	3.21E-06	1.41E-05
Lead	7439-92-1		1.93E-06	8.45E-06	NA	NA	1.93E-06	8.45E-06
Manganese	7439-96-5		8.52E-05	3.73E-04	NA	NA	8.52E-05	3.73E-04
Mercury	7439-97-6		1.61E-08	7.04E-08	NA	NA	1.61E-08	7.04E-08
Nickel	7440-02-0		7.71E-06	3.38E-05	NA	NA	7.71E-06	3.38E-05
Selenium	7782-49-2		2.09E-06	9.15E-06	NA	NA	2.09E-06	9.15E-06

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
H2SO4	7664-93-9	Manufacturer Estimates and Compositional Analysis	1.00E-01	2.40E+00	8.76E+02
Arsenic	7440-38-2		3.05E-06	7.33E-05	2.67E-02
Beryllium	7440-41-7		4.34E-07	1.04E-05	3.80E-03
Cadmium	7440-43-9		6.59E-07	1.58E-05	5.77E-03
Manganese	7439-96-5		8.52E-05	2.04E-03	7.46E-01
Mercury	7439-97-6		1.61E-08	3.86E-07	1.41E-04
Nickel	7440-02-0		7.71E-06	1.85E-04	6.76E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: STAR® Ash Beneficiation	EMISSION SOURCE ID NO: ES-5
	CONTROL DEVICE ID NO(S): CD-5A & CD-5B
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-5

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): The STAR® Ash Beneficiation Process will process feedstock (of any carbon content) like flyash (wet or dry) along with other ingredient materials into a variety of commercial products. The fly ash is not a fuel and does not undergo combustion. The propane burners are only used for startup or to maintain temperature in the reactor should the fly ash not contain enough carbon to be self-sustaining. These startup burners have a combined heating capacity of 60 million British thermal units per hour and are low-NOx burners.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Reactor - Feed Ash	MMBtu	140.0	NA
Propane	MMBtu	60	NA

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: Propane	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): 140
MAX. CAPACITY HOURLY FUEL USE: 663 gal/hr	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM C9
CONTROL DEVICE (OTHER)

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | **C9**

CONTROL DEVICE ID NO: CD-5A	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-5
EMISSION POINT (STACK) ID NO(S): EP-5	POSITION IN SERIES OF CONTROLS: NO. 1 OF 2 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2Q .0112)? ☑ YES ☐ NO

DESCRIBE CONTROL SYSTEM: Dry scrubber for SO2 removal

POLLUTANT(S) COLLECTED:	SO2			
BEFORE CONTROL EMISSION RATE (LB/HR):	513.6			
CAPTURE EFFICIENCY:	NA %	%	%	%
CONTROL DEVICE EFFICIENCY:	95 %	%	%	%
CORRESPONDING OVERALL EFFICIENCY:	NA %	%	%	%
EFFICIENCY DETERMINATION CODE:	2			
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	25.68			

PRESSURE DROP (IN. H_20): 4 MIN 10 MAX	BULK PARTICLE DENSITY (LB/FT^3): 150
INLET TEMPERATURE (°F): 300 MIN 400 MAX	OUTLET TEMPERATURE (°F): 150 MIN 225 MAX
INLET AIR FLOW RATE (ACFM): 68,000 acfm op. (90,000 acfm design)	OUTLET AIR FLOW RATE (ACFM): 61,500 acfm op. (77,000 acfm design)
INLET AIR FLOW VELOCITY (FT/SEC):	OUTLET AIR FLOW VELOCITY (FT/SEC):
INLET MOISTURE CONTENT (%): 28.2% op. (25% design)	☑ FORCED AIR ☐ INDUCED AIR
COLLECTION SURFACE AREA (FT^2): NA	FUEL USED: NA / FUEL USAGE RATE: NA

DESCRIBE MAINTENANCE PROCEDURES: Maintenance to be performed as per manufacturing guidelines.

DESCRIBE ANY AUXILIARY MATERIALS INTRODUCED INTO THE CONTROL SYSTEM: None

DESCRIBE ANY MONITORING DEVICES, GAUGES, TEST PORTS, ETC: Typical for this type of installation.

ATTACH A DIAGRAM OF THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach manufacturer's specifications, schematics, and all other drawings necessary to describe this control.

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-5B	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-5
EMISSION POINT (STACK) ID NO(S): EP-5	POSITION IN SERIES OF CONTROLS NO. 2 OF 2 UNITS
OPERATING SCENARIO: 1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? |✓| YES | |NO

DESCRIBE CONTROL SYSTEM:
A baghouse for particulate control on the STAR® Ash Beneficiation Process.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	100 %	100 %	100 %	%
CONTROL DEVICE EFFICIENCY:	>99.9 %	>99.9 %	>99.9 %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.025 gr/acf %	<=0.025 gr/acf %	<=0.025 gr/acf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	1.61E+01	1.48E+01	8.52E+00	

PRESSURE DROP (IN H_2O): MIN:	MAX: Avg: 4-12 wc	GAUGE? |✓|YES | | NO	
BULK PARTICLE DENSITY (LB/FT^3): 30		INLET TEMPERATURE (°F):	MIN: 180 MAX: 200 (400 design excursion)
POLLUTANT LOADING RATE: ! ! LB/HR	|✓ GR/FT^3 371 (design)	OUTLET TEMPERATURE (°F)	MIN: 175 MAX: 195 (400 design excursion)
INLET AIR FLOW RATE (ACFM): 76,915		FILTER OPERATING TEMP (°F): 191	
NO. OF COMPARTMENTS: 4	NO. OF BAGS PER COMPARTMENT: 169		LENGTH OF BAG (IN.): 315
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):		DIAMETER OF BAG (IN.): 6
TOTAL FILTER SURFACE AREA (FT^2): 26,790	AIR TO CLOTH RATIO: 2.87		
DRAFT TYPE: |✓| INDUCED/NEGATIVE	|✓| FORCED/POSITIVE	FILTER MATERIAL:	! | WOVEN |✓! FELTED

DESCRIBE CLEANING PROCEDURES:

\|✓\|AIR PULSE — \| \|SONIC
\| \| REVERSE FLOW — \| \|SIMPLE BAG COLLAPSE
! \| MECHANICAL/SHAKER — ! \|RING BAG COLLAPSE
\| \| OTHER:

DESCRIBE INCOMING AIR STREAM: The FGD byproduct entrained in the flue gas passes through baghouse for particulate control

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

See attached jpeg.

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

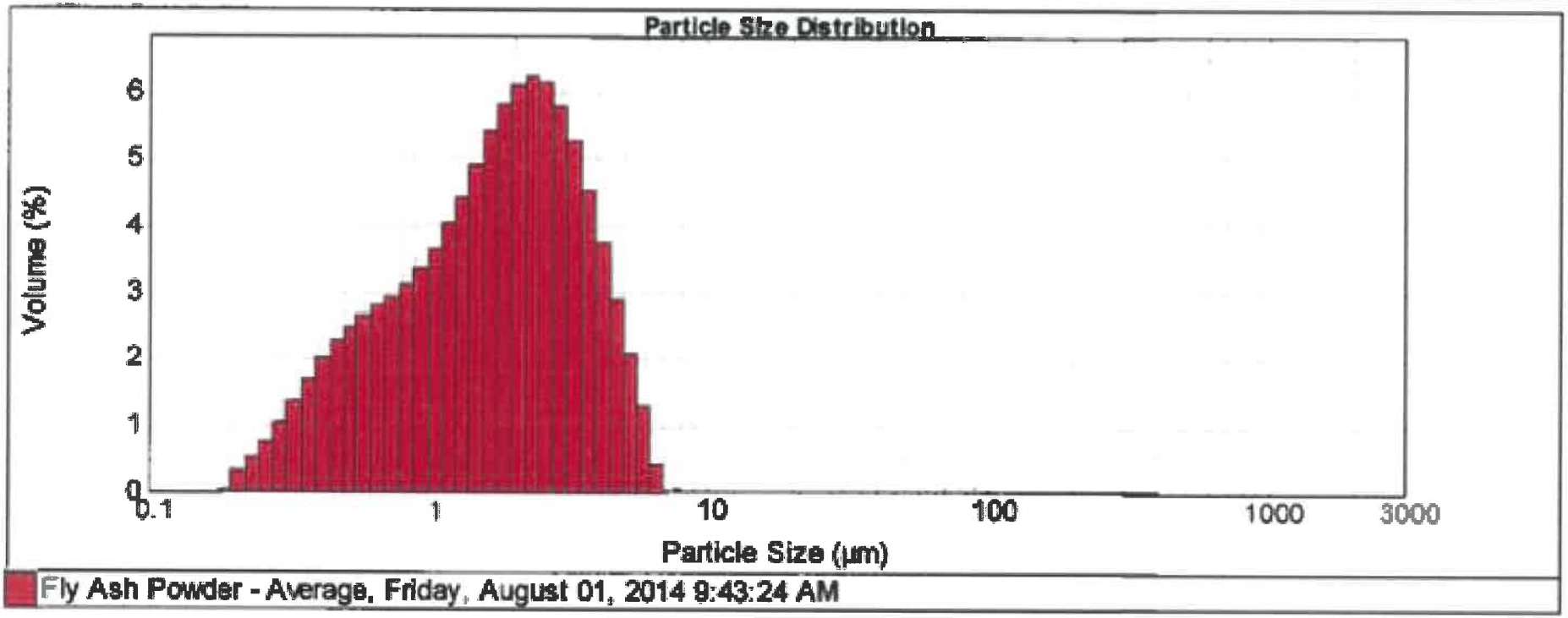
COMMENTS:

Operating pollutant loading rate: 330 gr/ft^3

Attach Additional Sheets As Necessary

Specific Surface Area:	Surface Weighted Mean D[3,2]:	Vol. Weighted Mean D[4,3]:
5.34 m²/g	1.123 um	2.060 um

d(0.1):	d(0.5):	d(0.9):
0.502 um	1.795 um	4.041 um



Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.020	0.00	0.142	0.00	1.002	27.29	7.096	99.98	50.238	100.00	355.656	100.00
0.022	0.00	0.159	0.00	1.125	30.92	7.962	100.00	56.368	100.00	399.052	100.00
0.025	0.00	0.178	0.00	1.262	34.91	8.934	100.00	63.246	100.00	447.744	100.00
0.028	0.00	0.200	0.02	1.416	39.35	10.000	100.00	70.963	100.00	502.377	100.00
0.032	0.00	0.224	0.33	1.589	44.27	11.247	100.00	79.621	100.00	563.877	100.00
0.036	0.00	0.252	0.85	1.783	49.67	12.619	100.00	89.337	100.00	632.456	100.00
0.040	0.00	0.283	1.60	2.000	55.49	14.159	100.00	100.237	100.00	709.627	100.00
0.045	0.00	0.317	2.63	2.244	61.62	15.887	100.00	112.468	100.00	796.214	100.00
0.050	0.00	0.356	3.98	2.518	67.86	17.825	100.00	126.191	100.00	893.387	100.00
0.056	0.00	0.399	5.69	2.825	73.99	20.000	100.00	141.589	100.00	1002.374	100.00
0.063	0.00	0.448	7.72	3.170	79.78	22.440	100.00	158.866	100.00	1124.683	100.00
0.071	0.00	0.502	10.02	3.557	85.03	25.179	100.00	178.250	100.00	1261.915	100.00
0.080	0.00	0.564	12.51	3.991	89.55	28.251	100.00	200.000	100.00	1415.892	100.00
0.089	0.00	0.632	15.16	4.477	93.27	31.698	100.00	224.404	100.00	1588.656	100.00
0.100	0.00	0.710	17.94	5.024	96.16	35.566	100.00	251.785	100.00	1782.502	100.00
0.112	0.00	0.796	20.87	5.637	98.26	39.905	100.00	282.508	100.00	2000.000	100.00
0.126	0.00	0.893	23.97	6.325	99.55	44.774	100.00	316.979	100.00		

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: FGD Byproduct Silo	EMISSION SOURCE ID NO: ES-6
	CONTROL DEVICE ID NO(S): CD-6
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-6

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):

The byproduct solids from the dry FGD system are discharged from the fabric filter baghouse (CD-2B) into a byproduct storage silo.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☑ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: TBD	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	1.61E+01	7.04E+01	N/A	N/A	1.61E+01	7.04E+01
PARTICULATE MATTER<10 MICRONS (PM_{10})		1.48E+01	6.48E+01	N/A	N/A	1.48E+01	6.48E+01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		8.52E+00	3.73E+01	N/A	N/A	8.52E+00	3.73E+01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Lime Analysis	1.93E-06	8.45E-06	N/A	N/A	1.93E-06	8.45E-06
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Lime Analysis	5.46E-07	2.39E-06	N/A	N/A	5.46E-07	2.39E-06
Arsenic	7440-38-2		3.05E-06	1.34E-05	N/A	N/A	3.05E-06	1.34E-05
Beryllium	7440-41-7		4.34E-07	1.90E-06	N/A	N/A	4.34E-07	1.90E-06
Cadmium	7440-43-9		6.59E-07	2.89E-06	N/A	N/A	6.59E-07	2.89E-06
Chromium	7440-47-3		1.22E-05	5.35E-05	N/A	N/A	1.22E-05	5.35E-05
Cobalt	7440-48-4		3.21E-06	1.41E-05	N/A	N/A	3.21E-06	1.41E-05
Lead	7439-92-1		1.93E-06	8.45E-06	N/A	N/A	1.93E-06	8.45E-06
Manganese	7439-96-5		8.52E-05	3.73E-04	N/A	N/A	8.52E-05	3.73E-04
Mercury	7439-97-6		1.61E-08	7.04E-08	N/A	N/A	1.61E-08	7.04E-08
Nickel	7440-02-0		7.71E-06	3.38E-05	N/A	N/A	7.71E-06	3.38E-05
Selenium	7782-49-2		2.09E-06	9.15E-06	N/A	N/A	2.09E-06	9.15E-06

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Lime Analysis	3.05E-06	7.33E-05	2.67E-02
Beryllium	7440-41-7		4.34E-07	1.04E-05	3.80E-03
Cadmium	7440-43-9		6.59E-07	1.58E-05	5.77E-03
Manganese	7439-96-5		8.52E-05	2.04E-03	7.46E-01
Mercury	7439-97-6		1.61E-08	3.86E-07	1.41E-04
Nickel	7440-02-0		7.71E-06	1.85E-04	6.76E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6
EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | **B6**

EMISSION SOURCE DESCRIPTION: FGD Byproduct Silo	EMISSION SOURCE ID NO: ES-6
	CONTROL DEVICE ID NO(S): CD-6
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-6

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
The byproduct solids from the dry FGD system are discharged from the fabric filter baghouse (CD-2B) into a byproduct storage silo.

MATERIAL STORED: Byproducts from FGD				DENSITY OF MATERIAL (LB/FT3): 30 (Bulk) 95 (Structural)	
CAPACITY	CUBIC FEET: 3,192			TONS: 47.9 (@ 30lb/ft^3)	
DIMENSIONS (FEET)	HEIGHT: 64	DIAMETER: 13	***(OR)***	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)	ACTUAL: TBD			MAXIMUM DESIGN CAPACITY: 6,000	

PNEUMATICALLY FILLED	**MECHANICALLY FILLED**	**FILLED FROM**
☑ BLOWER	☐ SCREW CONVEYOR	☐ RAILCAR
☐ COMPRESSOR	☐ BELT CONVEYOR	☐ TRUCK
☐ OTHER:	☐ BUCKET ELEVATOR	☐ STORAGE PILE
	☐ OTHER:	☑ OTHER: Dry Scrubber

NO. FILL TUBES: 1
MAXIMUM ACFM: 1,050

MATERIAL IS UNLOADED TO: Trucks

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?
Gravity

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): TBD

MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): TBD

COMMENTS:
Dry dust unloading spouts are telescoping spouts equipped with small ventilation fans that recirculate displaced air back to the top of the byproduct storage silo. Each spout also has it's own compact filter module.

Attach Additional Sheets As Necessary

FORM C1
CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 | NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate | C1

CONTROL DEVICE ID NO: CD-6	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-6
EMISSION POINT (STACK) ID NO(S): EP-6	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO: 1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? | | YES |✓|NO

DESCRIBE CONTROL SYSTEM:
Bin vent filter for particulate control on the FGD byproduct silo.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	NA %	NA %	NA %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.005 gr/dscf %	<=0.005 gr/dscf %	<=0.005 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	4.50E-02	4.14E-02	2.39E-02	

PRESSURE DROP (IN H_20): MIN: 4 MAX: 20	GAUGE? |✓| YES | | NO		
BULK PARTICLE DENSITY (LB/FT^3): 25-30	INLET TEMPERATURE (°F):	MIN: 50	MAX: 250
POLLUTANT LOADING RATE: NA | | LB/HR | | GR/FT^3	OUTLET TEMPERATURE (°F)	MIN: 50	MAX: 250
INLET AIR FLOW RATE (ACFM): 1050 SCFM	FILTER OPERATING TEMP (°F): 50-250		
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 16	LENGTH OF BAG (IN.): 120	
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):	DIAMETER OF BAG (IN.): 6	
TOTAL FILTER SURFACE AREA (FT^2): 259	AIR TO CLOTH RATIO: 4:1		
DRAFT TYPE: | |INDUCED/NEGATIVE |✓| FORCED/POSITIVE	FILTER MATERIAL: | |WOVEN |✓| FELTED		

DESCRIBE CLEANING PROCEDURES:
- |✓| AIR PULSE
- | | REVERSE FLOW
- | |MECHANICAL/SHAKER
- | | OTHER:
- | | SONIC
- | | SIMPLE BAG COLLAPSE
- | | RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain FGD byproducts including calcium sulfites and sulfates, calcium carbonate, lime, and inerts from fresh lime.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Supplier specific, 80% (average size) passing 325 mesh

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: FGD Hydrated Lime Silo	EMISSION SOURCE ID NO: ES-7
	CONTROL DEVICE ID NO(S): CD-7
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-7

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Storage of absorbent (hydrated lime) used in the dry FGD system.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☑ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019 — DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD — EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE **ANNUAL THROUGHPUT (%):** DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	4.50E-02	1.97E-01	N/A	N/A	4.50E-02	1.97E-01
PARTICULATE MATTER<10 MICRONS (PM_{10})		4.14E-02	1.81E-01	N/A	N/A	4.14E-02	1.81E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		2.39E-02	1.04E-01	N/A	N/A	2.39E-02	1.04E-01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Lime Analysis	5.40E-08	2.37E-07	N/A	N/A	5.40E-08	2.37E-07
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Lime Analysis	1.53E-08	6.70E-08	N/A	N/A	1.53E-08	6.70E-08
Arsenic	7440-38-2		8.55E-08	3.74E-07	N/A	N/A	8.55E-08	3.74E-07
Beryllium	7440-41-7		1.22E-08	5.32E-08	N/A	N/A	1.22E-08	5.32E-08
Cadmium	7440-43-9		1.85E-08	8.08E-08	N/A	N/A	1.85E-08	8.08E-08
Chromium	7440-47-3		3.42E-07	1.50E-06	N/A	N/A	3.42E-07	1.50E-06
Cobalt	7440-48-4		9.00E-08	3.94E-07	N/A	N/A	9.00E-08	3.94E-07
Lead	7439-92-1		5.40E-08	2.37E-07	N/A	N/A	5.40E-08	2.37E-07
Manganese	7439-96-5		2.39E-06	1.04E-05	N/A	N/A	2.39E-06	1.04E-05
Mercury	7439-97-6		4.50E-10	1.97E-09	N/A	N/A	4.50E-10	1.97E-09
Nickel	7440-02-0		2.16E-07	9.46E-07	N/A	N/A	2.16E-07	9.46E-07
Selenium	7782-49-2		5.85E-08	2.56E-07	N/A	N/A	5.85E-08	2.56E-07

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Lime Analysis	8.55E-08	2.05E-06	7.49E-04
Beryllium	7440-41-7		1.22E-08	2.92E-07	1.06E-04
Cadmium	7440-43-9		1.85E-08	4.43E-07	1.62E-04
Manganese	7439-96-5		2.39E-06	5.72E-05	2.09E-02
Mercury	7439-97-6		4.50E-10	1.08E-08	3.94E-06
Nickel	7440-02-0		2.16E-07	5.18E-06	1.89E-03

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6
EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B6**

EMISSION SOURCE DESCRIPTION: FGD Hydrated Lime Silo	EMISSION SOURCE ID NO: ES-7
	CONTROL DEVICE ID NO(S): CD-7
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-7

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Storage of absorbent (hydrated lime) used in the dry FGD system.

MATERIAL STORED: Hydrated lime				DENSITY OF MATERIAL (LB/FT3): 30 (bulk), 95 (structural)	
CAPACITY	CUBIC FEET: 6,000			TONS: 75.0	
DIMENSIONS (FEET)	HEIGHT: 65.8	DIAMETER: 15	***(OR)***	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)	ACTUAL: 2,497			MAXIMUM DESIGN CAPACITY: 4,161	

PNEUMATICALLY FILLED	MECHANICALLY FILLED	FILLED FROM
[✓] BLOWER	[ ] SCREW CONVEYOR	[ ] RAILCAR
[ ] COMPRESSOR	[ ] BELT CONVEYOR	[✓] TRUCK
[ ] OTHER:	[ ] BUCKET ELEVATOR	[ ] STORAGE PILE
	[ ] OTHER:	[ ] OTHER:

NO. FILL TUBES: 1
MAXIMUM ACFM: 1,050

MATERIAL IS UNLOADED TO: Material is sent to dry FGD

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?
NA

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): 25
MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): 0.475

COMMENTS:

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **C1**

CONTROL DEVICE ID NO: CD-7	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-7
EMISSION POINT (STACK) ID NO(S): EP-7	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? | | YES |✓| NO

DESCRIBE CONTROL SYSTEM:
Bin vent filter for particulate control on the FGD hydrated lime storage silo.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	NA %	NA %	NA %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.005 gr/dscf %	<=0.005 gr/dscf %	<=0.005 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	4.50E-02	4.14E-02	2.39E-02	

PRESSURE DROP (IN H_2O): MIN: 4 MAX: 20	GAUGE? |✓| YES | | NO	
BULK PARTICLE DENSITY (LB/FT^3): 25-30	INLET TEMPERATURE (°F):	MIN: 50 MAX: 250
POLLUTANT LOADING RATE: NA | | LB/HR | | GR/FT^3	OUTLET TEMPERATURE (°F)	MIN: 50 MAX: 250
INLET AIR FLOW RATE (ACFM): 1,050 SCFM	FILTER OPERATING TEMP (°F): 50-250	
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 16	LENGTH OF BAG (IN.): 120
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):	DIAMETER OF BAG (IN.): 6
TOTAL FILTER SURFACE AREA (FT^2): 259	AIR TO CLOTH RATIO: 4:1	
DRAFT TYPE: |✓|INDUCED/NEGATIVE	|✓|FORCED/POSITIVE	FILTER MATERIAL: | | WOVEN |✓| FELTED

DESCRIBE CLEANING PROCEDURES:

- [x] AIR PULSE
- [ ] REVERSE FLOW
- [ ] MECHANICAL/SHAKER
- [ ] OTHER:
- [ ] SONIC
- [ ] SIMPLE BAG COLLAPSE
- [ ] RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain hydrated lime.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Supplier specific, 80% (average size) passing 325 mesh

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: EHE - External Heat Exchanger A	EMISSION SOURCE ID NO: ES-8
	CONTROL DEVICE ID NO(S): CD-8
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-8

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Process heat exchanger uses preheated air and hot water to dry ash.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	6.86E+00	3.00E+01	N/A	N/A	6.86E+00	3.00E+01
PARTICULATE MATTER<10 MICRONS (PM_{10})		6.31E+00	2.76E+01	N/A	N/A	6.31E+00	2.76E+01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		3.63E+00	1.59E+01	N/A	N/A	3.63E+00	1.59E+01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	1.10E-04	4.81E-04	N/A	N/A	1.10E-04	4.81E-04
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	5.35E-05	2.34E-04	N/A	N/A	5.35E-05	2.34E-04
Arsenic	7440-38-2		4.09E-04	1.79E-03	N/A	N/A	4.09E-04	1.79E-03
Beryllium	7440-41-7		2.13E-05	9.34E-05	N/A	N/A	2.13E-05	9.34E-05
Cadmium	7440-43-9		3.29E-06	1.44E-05	N/A	N/A	3.29E-06	1.44E-05
Chromium	7440-47-3		1.30E-04	5.69E-04	N/A	N/A	1.30E-04	5.69E-04
Chromium VI	SolCR6		6.79E-06	2.97E-05	N/A	N/A	6.79E-06	2.97E-05
Cobalt	7440-48-4		7.39E-05	3.23E-04	N/A	N/A	7.39E-05	3.23E-04
Lead	7439-92-1		1.10E-04	4.81E-04	N/A	N/A	1.10E-04	4.81E-04
Manganese	7439-96-5		5.35E-04	2.34E-03	N/A	N/A	5.35E-04	2.34E-03
Mercury	7439-97-6		1.71E-06	7.51E-06	N/A	N/A	1.71E-06	7.51E-06
Nickel	7440-02-0		1.46E-04	6.42E-04	N/A	N/A	1.46E-04	6.42E-04
Selenium	7782-49-2		9.65E-05	4.23E-04	N/A	N/A	9.65E-05	4.23E-04

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	4.09E-04	9.83E-03	3.59E+00
Beryllium	7440-41-7		2.13E-05	5.12E-04	1.87E-01
Cadmium	7440-43-9		3.29E-06	7.90E-05	2.88E-02
Chromium VI	SolCR6		6.79E-06	1.63E-04	5.95E-02
Manganese	7439-96-5		5.35E-04	1.28E-02	4.68E+00
Mercury	7439-97-6		1.71E-06	4.11E-05	1.50E-02
Nickel	7440-02-0		1.46E-04	3.52E-03	1.28E+00

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: EHE - External Heat Exchanger A	EMISSION SOURCE ID NO: ES-8
	CONTROL DEVICE ID NO(S): CD-8
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-8

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Process heat exchanger uses preheated air and hot water to dry ash.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Fly Ash	Tons	35.0	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-8	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-8
EMISSION POINT (STACK) ID NO(S): EP-8	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? |✓| YES | | NO

DESCRIBE CONTROL SYSTEM:
Baghouse for particulate control on EHE - External Heat Exchanger A.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	99.95 %	99.95 %	99.95 %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.025 gr/dscf %	<=0.025 gr/dscf %	<=0.025 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	6.86E+00	6.31E+00	3.63E+00	

PRESSURE DROP (IN H_2O): MIN:	MAX: 10	GAUGE? |✓| YES | NO	
BULK PARTICLE DENSITY (LB/FT^3): 60		INLET TEMPERATURE (°F):	MIN: 180 MAX: 325
POLLUTANT LOADING RATE: NA ! | LB/HR	| gR/FT^2	OUTLET TEMPERATURE (°F)	MIN: 150 MAX: 300
INLET AIR FLOW RATE (ACFM): 32,000 scfm		FILTER OPERATING TEMP (°F): 250	
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 528		LENGTH OF BAG (IN.): 26.25 Ft
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):		DIAMETER OF BAG (IN.): 6
TOTAL FILTER SURFACE AREA (FT^2): 20,925	AIR TO CLOTH RATIO: 3:1		
DRAFT TYPE: |✓| INDUCED/NEGATIVE ! FORCED/POSITIVE		FILTER MATERIAL:	| |WOVEN |✓| FELTED

DESCRIBE CLEANING PROCEDURES:

- [x] AIR PULSE
- [ ] REVERSE FLOW
- [ ] MECHANICAL/SHAKER
- [ ] OTHER:
- [ ] SONIC
- [ ] SIMPLE BAG COLLAPSE
- [ ] RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain fly ash.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Particle Size Distribution 0-100 micron with an average of 20

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: EHE - External Heat Exchanger B	EMISSION SOURCE ID NO: ES-9
	CONTROL DEVICE ID NO(S): CD-9
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-9

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Process heat exchanger uses preheated air and hot water to dry ash.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	6.86E+00	3.00E+01	N/A	N/A	6.86E+00	3.00E+01
PARTICULATE MATTER<10 MICRONS (PM_{10})		6.31E+00	2.76E+01	N/A	N/A	6.31E+00	2.76E+01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		3.63E+00	1.59E+01	N/A	N/A	3.63E+00	1.59E+01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	1.10E-04	4.81E-04	N/A	N/A	1.10E-04	4.81E-04
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	5.35E-05	2.34E-04	N/A	N/A	5.35E-05	2.34E-04
Arsenic	7440-38-2		4.09E-04	1.79E-03	N/A	N/A	4.09E-04	1.79E-03
Beryllium	7440-41-7		2.13E-05	9.34E-05	N/A	N/A	2.13E-05	9.34E-05
Cadmium	7440-43-9		3.29E-06	1.44E-05	N/A	N/A	3.29E-06	1.44E-05
Chromium	7440-47-3		1.30E-04	5.69E-04	N/A	N/A	1.30E-04	5.69E-04
Chromium VI	SolCR6		6.79E-06	2.97E-05	N/A	N/A	6.79E-06	2.97E-05
Cobalt	7440-48-4		7.39E-05	3.23E-04	N/A	N/A	7.39E-05	3.23E-04
Lead	7439-92-1		1.10E-04	4.81E-04	N/A	N/A	1.10E-04	4.81E-04
Manganese	7439-96-5		5.35E-04	2.34E-03	N/A	N/A	5.35E-04	2.34E-03
Mercury	7439-97-6		1.71E-06	7.51E-06	N/A	N/A	1.71E-06	7.51E-06
Nickel	7440-02-0		1.46E-04	6.42E-04	N/A	N/A	1.46E-04	6.42E-04
Selenium	7782-49-2		9.65E-05	4.23E-04	N/A	N/A	9.65E-05	4.23E-04

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	4.09E-04	9.83E-03	3.59E+00
Beryllium	7440-41-7		2.13E-05	5.12E-04	1.87E-01
Cadmium	7440-43-9		3.29E-06	7.90E-05	2.88E-02
Chromium VI	SolCR6		6.79E-06	1.63E-04	5.95E-02
Manganese	7439-96-5		5.35E-04	1.28E-02	4.68E+00
Mercury	7439-97-6		1.71E-06	4.11E-05	1.50E-02
Nickel	7440-02-0		1.46E-04	3.52E-03	1.28E+00

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: EHE - External Heat Exchanger B	EMISSION SOURCE ID NO: ES-9
	CONTROL DEVICE ID NO(S): CD-9
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-9

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Process heat exchanger uses preheated air and hot water to dry ash.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Fly Ash	Tons	35.0	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-9	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-9
EMISSION POINT (STACK) ID NO(S): EP-9	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? |✓| YES | | NO

DESCRIBE CONTROL SYSTEM:
Baghouse for particulate control on EHE - External Heat Exchanger B.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	99.95 %	99.95 %	99.95 %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.025 gr/dscf %	<=0.025 gr/dscf %	<=0.025 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	6.86E+00	6.31E+00	3.63E+00	

PRESSURE DROP (IN H_20): MIN:	MAX: 10	GAUGE? |✓| YES | | NO	
BULK PARTICLE DENSITY (LB/FT^3): 60		INLET TEMPERATURE (°F):	MIN: 180 MAX: 325
POLLUTANT LOADING RATE: NA LB/HR	GR/FT^3	OUTLET TEMPERATURE (°F)	MIN: 150 MAX: 300
INLET AIR FLOW RATE (ACFM): 32,000 scfm		FILTER OPERATING TEMP (°F): 250	
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 528		LENGTH OF BAG (IN.): 26.25 Ft
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):		DIAMETER OF BAG (IN.): 6
TOTAL FILTER SURFACE AREA (FT^2): 20,925	AIR TO CLOTH RATIO: 3:1		
DRAFT TYPE: |✓| INDUCED/NEGATIVE	| | FORCED/POSITIVE	FILTER MATERIAL:	| | WOVEN |✓| FELTED

DESCRIBE CLEANING PROCEDURES:

\|✓\| AIR PULSE — \| \| SONIC
\| \| REVERSE FLOW — \| \| SIMPLE BAG COLLAPSE
\| \| MECHANICAL/SHAKER — \| \| RING BAG COLLAPSE
\| \| OTHER:

DESCRIBE INCOMING AIR STREAM: Air stream will contain fly ash.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Particle Size Distribution 0-100 micron with an average of 20

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: EHE Silo	EMISSION SOURCE ID NO: ES-10
	CONTROL DEVICE ID NO(S): CD-10
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-10

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Transfer silo equipped with a bin vent product capture device.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☑ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019 DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	1.11E+00	4.88E+00	N/A	N/A	1.11E+00	4.88E+00
PARTICULATE MATTER<10 MICRONS (PM_{10})		1.03E+00	4.49E+00	N/A	N/A	1.03E+00	4.49E+00
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		5.91E-01	2.59E+00	N/A	N/A	5.91E-01	2.59E+00
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	1.78E-05	7.81E-05	N/A	N/A	1.78E-05	7.81E-05
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Antimony	7440-36-0	Ash Analysis	8.69E-06	3.81E-05	N/A	N/A	8.69E-06	3.81E-05
Arsenic	7440-38-2		6.65E-05	2.91E-04	N/A	N/A	6.65E-05	2.91E-04
Beryllium	7440-41-7		3.47E-06	1.52E-05	N/A	N/A	3.47E-06	1.52E-05
Cadmium	7440-43-9		5.35E-07	2.34E-06	N/A	N/A	5.35E-07	2.34E-06
Chromium	7440-47-3		2.11E-05	9.25E-05	N/A	N/A	2.11E-05	9.25E-05
Chromium VI	SolCR6		1.10E-06	4.83E-06	N/A	N/A	1.10E-06	4.83E-06
Cobalt	7440-48-4		1.20E-05	5.26E-05	N/A	N/A	1.20E-05	5.26E-05
Lead	7439-92-1		1.78E-05	7.81E-05	N/A	N/A	1.78E-05	7.81E-05
Manganese	7439-96-5		8.69E-05	3.81E-04	N/A	N/A	8.69E-05	3.81E-04
Mercury	7439-97-6		2.79E-07	1.22E-06	N/A	N/A	2.79E-07	1.22E-06
Nickel	7440-02-0		2.38E-05	1.04E-04	N/A	N/A	2.38E-05	1.04E-04
Selenium	7782-49-2		1.57E-05	6.87E-05	N/A	N/A	1.57E-05	6.87E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	6.65E-05	1.60E-03	5.83E-01
Beryllium	7440-41-7		3.47E-06	8.32E-05	3.04E-02
Cadmium	7440-43-9		5.35E-07	1.28E-05	4.69E-03
Chromium VI	SolCR6		1.10E-06	2.65E-05	9.66E-03
Manganese	7439-96-5		8.69E-05	2.09E-03	7.61E-01
Mercury	7439-97-6		2.79E-07	6.69E-06	2.44E-03
Nickel	7440-02-0		2.38E-05	5.71E-04	2.08E-01

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6
EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B6**

EMISSION SOURCE DESCRIPTION: EHE Silo	EMISSION SOURCE ID NO: ES-10
	CONTROL DEVICE ID NO(S): CD-10
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-10

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Transfer silo equipped with a bin vent product capture device.

MATERIAL STORED: Fly Ash				DENSITY OF MATERIAL (LB/FT3): 60 (bulk) 90 (structural)	
CAPACITY	CUBIC FEET: NA			TONS: 300	
DIMENSIONS (FEET)	HEIGHT: 100	DIAMETER: 41	***(OR)***	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)	ACTUAL: 400,000			MAXIMUM DESIGN CAPACITY: 400,000	

PNEUMATICALLY FILLED	**MECHANICALLY FILLED**	**FILLED FROM**
☑ BLOWER	☐ SCREW CONVEYOR	☐ RAILCAR
☐ COMPRESSOR	☐ BELT CONVEYOR	☐ TRUCK
☐ OTHER:	☐ BUCKET ELEVATOR	☐ STORAGE PILE
	☐ OTHER:	☑ OTHER: EHE A & B (ES-8 & 9)

NO. FILL TUBES: 3
MAXIMUM ACFM: 9,000

MATERIAL IS UNLOADED TO: NA Material is transferred in process to the STAR® Ash Beneficiation Process (ES-2)

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?
Gravity

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): 125

MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): 75

COMMENTS:

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-10	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-10
EMISSION POINT (STACK) ID NO(S): EP-10	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO: 1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? ☐ YES ☑ NO

DESCRIBE CONTROL SYSTEM:
Bin vent filter for particulate control on the EHE Silo.

	PM	PM10	PM2.5	
POLLUTANTS COLLECTED:				
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	NA %	NA %	NA %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.025 gr/dscf %	<=0.025 gr/dscf %	<=0.025 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	1.11E+00	1.03E+00	5.91E-01	

PRESSURE DROP (IN H_2O): MIN:	MAX: Avg: 10-15 wg	GAUGE? ☑ YES ☐ NO	
BULK PARTICLE DENSITY (LB/FT^3): 25		INLET TEMPERATURE (°F):	MIN: 100 MAX: 250
POLLUTANT LOADING RATE: NA ☐ LB/HR ☐ gR/FT^3		OUTLET TEMPERATURE (°F)	MIN: 100 MAX: 250
INLET AIR FLOW RATE (ACFM): 6,500		FILTER OPERATING TEMP (°F): 200	
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 126		LENGTH OF BAG (IN.): 48
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):		DIAMETER OF BAG (IN.): 2.25
TOTAL FILTER SURFACE AREA (FT^2): 1,056	AIR TO CLOTH RATIO: 6.2:1		
DRAFT TYPE: ☑ INDUCED/NEGATIVE	☑ FORCED/POSITIVE	FILTER MATERIAL: ☐ WOVEN	☑ FELTED

DESCRIBE CLEANING PROCEDURES:

- ☑ AIR PULSE
- ☐ REVERSE FLOW
- ☐ MECHANICAL/SHAKER
- ☐ OTHER:
- ☐ SONIC
- ☐ SIMPLE BAG COLLAPSE
- ☐ RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain fly ash.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Supplier specific, 94% passing 325 mesh

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Product Storage Dome	EMISSION SOURCE ID NO: ES-11
	CONTROL DEVICE ID NO(S): CD-11
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-11

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Product storage dome equipped with a bin vent product capture device.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☑ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019 DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	2.57E-01	1.13E+00	N/A	N/A	2.57E-01	1.13E+00
PARTICULATE MATTER<10 MICRONS (PM_{10})		2.37E-01	1.04E+00	N/A	N/A	2.37E-01	1.04E+00
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		1.36E-01	5.97E-01	N/A	N/A	1.36E-01	5.97E-01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	4.12E-06	1.80E-05	N/A	N/A	4.12E-06	1.80E-05
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Antimony	7440-36-0	Ash Analysis	2.01E-06	8.79E-06	N/A	N/A	2.01E-06	8.79E-06
Arsenic	7440-38-2		1.54E-05	6.73E-05	N/A	N/A	1.54E-05	6.73E-05
Beryllium	7440-41-7		8.00E-07	3.50E-06	N/A	N/A	8.00E-07	3.50E-06
Cadmium	7440-43-9		1.23E-07	5.41E-07	N/A	N/A	1.23E-07	5.41E-07
Chromium	7440-47-3		4.87E-06	2.13E-05	N/A	N/A	4.87E-06	2.13E-05
Chromium VI	SolCR6		2.55E-07	1.12E-06	N/A	N/A	2.55E-07	1.12E-06
Cobalt	7440-48-4		2.77E-06	1.21E-05	N/A	N/A	2.77E-06	1.21E-05
Lead	7439-92-1		4.12E-06	1.80E-05	N/A	N/A	4.12E-06	1.80E-05
Manganese	7439-96-5		2.01E-05	8.78E-05	N/A	N/A	2.01E-05	8.78E-05
Mercury	7439-97-6		6.43E-08	2.82E-07	N/A	N/A	6.43E-08	2.82E-07
Nickel	7440-02-0		5.49E-06	2.41E-05	N/A	N/A	5.49E-06	2.41E-05
Selenium	7782-49-2		3.62E-06	1.58E-05	N/A	N/A	3.62E-06	1.58E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	1.54E-05	3.68E-04	1.35E-01
Beryllium	7440-41-7		8.00E-07	1.92E-05	7.01E-03
Cadmium	7440-43-9		1.23E-07	2.96E-06	1.08E-03
Chromium VI	SolCR6		2.55E-07	6.11E-06	2.23E-03
Manganese	7439-96-5		2.01E-05	4.81E-04	1.76E-01
Mercury	7439-97-6		6.43E-08	1.54E-06	5.63E-04
Nickel	7440-02-0		5.49E-06	1.32E-04	4.81E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6
EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B6**

EMISSION SOURCE DESCRIPTION: Product Storage Dome	EMISSION SOURCE ID NO: ES-11
	CONTROL DEVICE ID NO(S): CD-11
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-11

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Product storage dome equipped with a bin vent product capture device.

MATERIAL STORED: Fly Ash				DENSITY OF MATERIAL (LB/FT3): 60 (bulk) 90 (structural)	
CAPACITY	CUBIC FEET: NA			TONS: 30,000	
DIMENSIONS (FEET)	HEIGHT: 125	DIAMETER: 41	***(OR)***	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)	ACTUAL: 400,000			MAXIMUM DESIGN CAPACITY: 400,000	

PNEUMATICALLY FILLED	MECHANICALLY FILLED	FILLED FROM
☐ BLOWER	☐ SCREW CONVEYOR	☐ RAILCAR
☐ COMPRESSOR	☐ BELT CONVEYOR	☐ TRUCK
☐ OTHER:	☐ BUCKET ELEVATOR	☐ STORAGE PILE
	☐ OTHER:	☑ OTHER: STAR® Ash Beneficiation

NO. FILL TUBES: 3
MAXIMUM ACFM: 6,000 SCFM

MATERIAL IS UNLOADED TO: Product loadout silo (ES-8)

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?
pneumatic conveyance

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): 75

MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): 275

COMMENTS:

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-11	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-11
EMISSION POINT (STACK) ID NO(S): EP-11	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? | | YES |✓| NO

DESCRIBE CONTROL SYSTEM:
Bin vent filter for particulate control on the product storage dome.

Note: Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	NA %	NA %	NA %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.005 gr/dscf %	<=0.005 gr/dscf %	<=0.005 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	2.57E-01	2.37E-01	1.36E-01	

PRESSURE DROP (IN H_20): MIN:	MAX: Avg: 10-15 wg	GAUGE? |✓| YES | | NO	
BULK PARTICLE DENSITY (LB/FT^3): 25		INLET TEMPERATURE (°F):	MIN: 200 MAX: 400
POLLUTANT LOADING RATE: NA | | LB/HR | | GR/FT^3		OUTLET TEMPERATURE (°F)	MIN: 200 MAX: 400
INLET AIR FLOW RATE (ACFM): 6,000 scfm		FILTER OPERATING TEMP (°F): 400	
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 144		LENGTH OF BAG (IN.): 120
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):		DIAMETER OF BAG (IN.): 6
TOTAL FILTER SURFACE AREA (FT^2): 2,260	AIR TO CLOTH RATIO: 3:1		
DRAFT TYPE: |✓| INDUCED/NEGATIVE	|✓| FORCED/POSITIVE	FILTER MATERIAL: | | WOVEN	|✓| FELTED

DESCRIBE CLEANING PROCEDURES:

- |✓| AIR PULSE
- \| \| REVERSE FLOW
- \| \| MECHANICAL/SHAKER
- \| \| OTHER:
- \| \| SONIC
- \| \| SIMPLE BAG COLLAPSE
- \| \| RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain fly ash.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Supplier specific, 94% passing 325 mesh

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Loadout Silo	EMISSION SOURCE ID NO: ES-12
	CONTROL DEVICE ID NO(S): CD-12
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-12, EP-13, & EP-14

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Product loadout silo equipped with bin vent filer.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☑ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019 DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	Vendor/ AP-42	2.61E-01	1.14E+00	N/A	N/A	2.61E-01	1.14E+00
PARTICULATE MATTER<10 MICRONS (PM_{10})		2.38E-01	1.04E+00	N/A	N/A	2.38E-01	1.04E+00
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)		1.38E-01	6.02E-01	N/A	N/A	1.38E-01	6.02E-01
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	8.23E-06	3.61E-05	N/A	N/A	8.23E-06	3.61E-05
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
Antimony	7440-36-0	Ash Analysis	4.01E-06	1.76E-05	N/A	N/A	4.01E-06	1.76E-05
Arsenic	7440-38-2		3.07E-05	1.35E-04	N/A	N/A	3.07E-05	1.35E-04
Beryllium	7440-41-7		1.60E-06	7.01E-06	N/A	N/A	1.60E-06	7.01E-06
Cadmium	7440-43-9		2.47E-07	1.08E-06	N/A	N/A	2.47E-07	1.08E-06
Chromium	7440-47-3		9.75E-06	4.27E-05	N/A	N/A	9.75E-06	4.27E-05
Chromium VI	SolCR6		5.09E-07	2.23E-06	N/A	N/A	5.09E-07	2.23E-06
Cobalt	7440-48-4		5.54E-06	2.43E-05	N/A	N/A	5.54E-06	2.43E-05
Lead	7439-92-1		8.23E-06	3.61E-05	N/A	N/A	8.23E-06	3.61E-05
Manganese	7439-96-5		4.01E-05	1.76E-04	N/A	N/A	4.01E-05	1.76E-04
Mercury	7439-97-6		1.29E-07	5.63E-07	N/A	N/A	1.29E-07	5.63E-07
Nickel	7440-02-0		1.10E-05	4.81E-05	N/A	N/A	1.10E-05	4.81E-05
Selenium	7782-49-2		7.24E-06	3.17E-05	N/A	N/A	7.24E-06	3.17E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	3.07E-05	7.37E-04	2.69E-01
Beryllium	7440-41-7		1.60E-06	3.84E-05	1.40E-02
Cadmium	7440-43-9		2.47E-07	5.92E-06	2.16E-03
Chromium VI	SolCR6		5.09E-07	1.22E-05	4.46E-03
Manganese	7439-96-5		4.01E-05	9.63E-04	3.51E-01
Mercury	7439-97-6		1.29E-07	3.09E-06	1.13E-03
Nickel	7440-02-0		1.10E-05	2.64E-04	9.62E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B6
EMISSION SOURCE (STORAGE SILO/BINS)

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | **B6**

EMISSION SOURCE DESCRIPTION: Loadout Silo	EMISSION SOURCE ID NO: ES-12
	CONTROL DEVICE ID NO(S): CD-12
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-12, EP-13, & EP-14

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM):
Product loadout silo equipped with bin vent filer.

MATERIAL STORED: Fly Ash				DENSITY OF MATERIAL (LB/FT3): 60 (bulk) 90 (structural)	
CAPACITY	CUBIC FEET: 48,058			TONS: 1,442	
DIMENSIONS (FEET)	HEIGHT: 35	DIAMETER: 38.6	***(OR)***	LENGTH:	WIDTH: HEIGHT:
ANNUAL PRODUCT THROUGHPUT (TONS)		ACTUAL: 400,000		MAXIMUM DESIGN CAPACITY: 400,000	

PNEUMATICALLY FILLED	**MECHANICALLY FILLED**	**FILLED FROM**
☑ BLOWER	☐ SCREW CONVEYOR	☐ RAILCAR
☐ COMPRESSOR	☐ BELT CONVEYOR	☐ TRUCK
☐ OTHER:	☐ BUCKET ELEVATOR	☐ STORAGE PILE
	☐ OTHER:	☑ OTHER: STAR® Ash Beneficiation

NO. FILL TUBES: 2
MAXIMUM ACFM: 6,000 scfm

MATERIAL IS UNLOADED TO: Trucks

BY WHAT METHOD IS MATERIAL UNLOADED FROM SILO?
Gravity

MAXIMUM DESIGN FILLING RATE OF MATERIAL (TONS/HR): 75

MAXIMUM DESIGN UNLOADING RATE OF MATERIAL (TONS/HR): 100

COMMENTS:
7. B6

Attach Additional Sheets As Necessary

FORM C1

CONTROL DEVICE (FABRIC FILTER)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — C1

CONTROL DEVICE ID NO: CD-12	CONTROLS EMISSIONS FROM WHICH EMISSION SOURCE ID NO(S): ES-12
EMISSION POINT (STACK) ID NO(S): EP-12	POSITION IN SERIES OF CONTROLS NO. 1 OF 1 UNITS
OPERATING SCENARIO:	
1 OF 1	P.E. SEAL REQUIRED (PER 2q .0112)? | | YES |✓| NO

DESCRIBE CONTROL SYSTEM:
Bin vent filter for particulate control on the product loadout silo.

Note: Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.

POLLUTANTS COLLECTED:	PM	PM10	PM2.5	
BEFORE CONTROL EMISSION RATE (LB/HR):	NA	NA	NA	
CAPTURE EFFICIENCY:	NA %	NA %	NA %	%
CONTROL DEVICE EFFICIENCY:	NA %	NA %	NA %	%
CORRESPONDING OVERALL EFFICIENCY:	<=0.005 gr/dscf %	<=0.005 gr/dscf %	<=0.005 gr/dscf %	%
EFFICIENCY DETERMINATION CODE:	2	2	2	
TOTAL AFTER CONTROL EMISSION RATE (LB/HR):	2.61E-01	2.38E-01	1.38E-01	

PRESSURE DROP (IN H_2O): MIN: 4	MAX: 20	GAUGE? |✓| YES | NO	
BULK PARTICLE DENSITY (LB/FT^3): 60		INLET TEMPERATURE (°F): MIN: 70	MAX: 400
POLLUTANT LOADING RATE: NA | | LB/HR | | GR/FT^3		OUTLET TEMPERATURE (°F) MIN: 70	MAX: 400
INLET AIR FLOW RATE (ACFM): 6,000 scfm		FILTER OPERATING TEMP (°F): 70-400	
NO. OF COMPARTMENTS: 1	NO. OF BAGS PER COMPARTMENT: 144		LENGTH OF BAG (IN.): 120
NO. OF CARTRIDGES:	FILTER SURFACE AREA PER CARTRIDGE (FT^2):		DIAMETER OF BAG (IN.): 6
TOTAL FILTER SURFACE AREA (FT^2): 2,260	AIR TO CLOTH RATIO: 2.65:1		
DRAFT TYPE: |✓| INDUCED/NEGATIVE | | FORCED/POSITIVE		FILTER MATERIAL: | | WOVEN	|✓| FELTED

DESCRIBE CLEANING PROCEDURES:

\|✓\| AIR PULSE
\| \| REVERSE FLOW
\| \| MECHANICAL/SHAKER
\| \| OTHER:
\| \| SONIC
\| \| SIMPLE BAG COLLAPSE
\| \| RING BAG COLLAPSE

DESCRIBE INCOMING AIR STREAM: Air stream will contain fly ash.

PARTICLE SIZE DISTRIBUTION

SIZE (MICRONS)	WEIGHT % OF TOTAL	CUMULATIVE %
0-1		
1-10		
10-25		
25-50		
50-100		
>100		
	TOTAL = 100	

Supplier specific, 94% passing 325 mesh

ON A SEPARATE PAGE, ATTACH A DIAGRAM SHOWING THE RELATIONSHIP OF THE CONTROL DEVICE TO ITS EMISSION SOURCE(S):

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Ash Basin	EMISSION SOURCE ID NO: ES-15
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-15

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Dust may be generated by wind erosion of exposed area within the ash basin.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: NA DATE MANUFACTURED: NA

MANUFACTURER / MODEL NO.: NA EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	AP-42	4.78E-02	2.09E-01	N/A	N/A	4.78E-02	2.09E-01
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	2.39E-02	1.05E-01	N/A	N/A	2.39E-02	1.05E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	3.59E-03	1.57E-02	N/A	N/A	3.59E-03	1.57E-02
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	7.66E-07	3.35E-06	N/A	N/A	7.66E-07	3.35E-06
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	3.73E-07	1.63E-06	N/A	N/A	3.73E-07	1.63E-06
Arsenic	7440-38-2		2.86E-06	1.25E-05	N/A	N/A	2.86E-06	1.25E-05
Beryllium	7440-41-7		1.49E-07	6.52E-07	N/A	N/A	1.49E-07	6.52E-07
Cadmium	7440-43-9		2.30E-08	1.01E-07	N/A	N/A	2.30E-08	1.01E-07
Chromium	7440-47-3		9.06E-07	3.97E-06	N/A	N/A	9.06E-07	3.97E-06
Chromium VI	SolCR6		4.74E-08	2.07E-07	N/A	N/A	4.74E-08	2.07E-07
Cobalt	7440-48-4		5.15E-07	2.26E-06	N/A	N/A	5.15E-07	2.26E-06
Lead	7439-92-1		7.66E-07	3.35E-06	N/A	N/A	7.66E-07	3.35E-06
Manganese	7439-96-5		3.73E-06	1.63E-05	N/A	N/A	3.73E-06	1.63E-05
Mercury	7439-97-6		1.20E-08	5.24E-08	N/A	N/A	1.20E-08	5.24E-08
Nickel	7440-02-0		1.02E-06	4.47E-06	N/A	N/A	1.02E-06	4.47E-06
Selenium	7782-49-2		6.73E-07	2.95E-06	N/A	N/A	6.73E-07	2.95E-06

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	2.86E-06	6.85E-05	2.50E-02
Beryllium	7440-41-7		1.49E-07	3.57E-06	1.30E-03
Cadmium	7440-43-9		2.30E-08	5.51E-07	2.01E-04
Chromium VI	SolCR6		4.74E-08	1.14E-06	4.15E-04
Manganese	7439-96-5		3.73E-06	8.95E-05	3.27E-02
Mercury	7439-97-6		1.20E-08	2.87E-07	1.05E-04
Nickel	7440-02-0		1.02E-06	2.45E-05	8.95E-03

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Ash Basin	EMISSION SOURCE ID NO: ES-15
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-15

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Dust may be generated by wind erosion of exposed area within the ash basin.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Active Basin Area	Acres	174 Acres	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS: Maximum ash throughput = 429,000 ton/year

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: Ash Handling	EMISSION SOURCE ID NO: ES-16
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-16, EP-17, & EP-18

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Emission sources (1) Ash is excavated and placed in windrows; (2) Windrowed ash is loaded into screener/crusher; (3) Screened and crushed ash is placed in stockpile within basin.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019 — DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: NA — EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): _____ ☐ NESHAP (SUBPARTS?): _____

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	AP-42	1.99E-02	8.72E-02	N/A	N/A	1.99E-02	8.72E-02
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	9.42E-03	4.13E-02	N/A	N/A	9.42E-03	4.13E-02
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	1.43E-03	6.25E-03	N/A	N/A	1.43E-03	6.25E-03
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	3.19E-07	1.40E-06	N/A	N/A	3.19E-07	1.40E-06
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	1.55E-07	6.80E-07	N/A	N/A	1.55E-07	6.80E-07
Arsenic	7440-38-2		1.19E-06	5.21E-06	N/A	N/A	1.19E-06	5.21E-06
Beryllium	7440-41-7		6.19E-08	2.71E-07	N/A	N/A	6.19E-08	2.71E-07
Cadmium	7440-43-9		9.56E-09	4.19E-08	N/A	N/A	9.56E-09	4.19E-08
Chromium	7440-47-3		3.77E-07	1.65E-06	N/A	N/A	3.77E-07	1.65E-06
Chromium VI	SolCR6		1.97E-08	8.63E-08	N/A	N/A	1.97E-08	8.63E-08
Cobalt	7440-48-4		2.14E-07	9.39E-07	N/A	N/A	2.14E-07	9.39E-07
Lead	7439-92-1		3.19E-07	1.40E-06	N/A	N/A	3.19E-07	1.40E-06
Manganese	7439-96-5		1.55E-06	6.80E-06	N/A	N/A	1.55E-06	6.80E-06
Mercury	7439-97-6		4.98E-09	2.18E-08	N/A	N/A	4.98E-09	2.18E-08
Nickel	7440-02-0		4.25E-07	1.86E-06	N/A	N/A	4.25E-07	1.86E-06
Selenium	7782-49-2		2.80E-07	1.23E-06	N/A	N/A	2.80E-07	1.23E-06

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	1.19E-06	2.85E-05	1.04E-02
Beryllium	7440-41-7		6.19E-08	1.49E-06	5.42E-04
Cadmium	7440-43-9		9.56E-09	2.29E-07	8.37E-05
Chromium VI	SolCR6		1.97E-08	4.73E-07	1.73E-04
Manganese	7439-96-5		1.55E-06	3.73E-05	1.36E-02
Mercury	7439-97-6		4.98E-09	1.19E-07	4.36E-05
Nickel	7440-02-0		4.25E-07	1.02E-05	3.73E-03

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Ash Handling	EMISSION SOURCE ID NO: ES-16
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-16, EP-17, & EP-18

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Emission sources (1) Ash is excavated and placed in windrows (EP-16); (2) Windrowed ash is loaded into screener/crusher (EP-17); (3) Screened and crushed ash is placed in stockpile within basin (EP-18).

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Ash throughput	tons	165.0	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS: Maximum ash throughput = 429,000 ton/year

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Screener	EMISSION SOURCE ID NO: ES-19
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-19

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Ash is screened to produce free flowing feedstock suitable for the STAR® Ash Beneficiation Process.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019 DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD EXPECTED OP. SCHEDULE: 8 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	AP-42	3.63E-01	1.59E+00	N/A	N/A	3.63E-01	1.59E+00
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	1.22E-01	5.35E-01	N/A	N/A	1.22E-01	5.35E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	8.25E-03	3.61E-02	N/A	N/A	8.25E-03	3.61E-02
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	5.81E-06	2.55E-05	N/A	N/A	5.81E-06	2.55E-05
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	2.83E-06	1.24E-05	N/A	N/A	2.83E-06	1.24E-05
Arsenic	7440-38-2		2.17E-05	9.49E-05	N/A	N/A	2.17E-05	9.49E-05
Beryllium	7440-41-7		1.13E-06	4.94E-06	N/A	N/A	1.13E-06	4.94E-06
Cadmium	7440-43-9		1.74E-07	7.63E-07	N/A	N/A	1.74E-07	7.63E-07
Chromium	7440-47-3		6.88E-06	3.01E-05	N/A	N/A	6.88E-06	3.01E-05
Chromium VI	SolCR6		3.59E-07	1.57E-06	N/A	N/A	3.59E-07	1.57E-06
Cobalt	7440-48-4		3.91E-06	1.71E-05	N/A	N/A	3.91E-06	1.71E-05
Lead	7439-92-1		5.81E-06	2.55E-05	N/A	N/A	5.81E-06	2.55E-05
Manganese	7439-96-5		2.83E-05	1.24E-04	N/A	N/A	2.83E-05	1.24E-04
Mercury	7439-97-6		9.08E-08	3.97E-07	N/A	N/A	9.08E-08	3.97E-07
Nickel	7440-02-0		7.75E-06	3.40E-05	N/A	N/A	7.75E-06	3.40E-05
Selenium	7782-49-2		5.11E-06	2.24E-05	N/A	N/A	5.11E-06	2.24E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	2.17E-05	5.20E-04	1.90E-01
Beryllium	7440-41-7		1.13E-06	2.71E-05	9.89E-03
Cadmium	7440-43-9		1.74E-07	4.18E-06	1.53E-03
Chromium VI	SolCR6		3.59E-07	8.62E-06	3.15E-03
Manganese	7439-96-5		2.83E-05	6.79E-04	2.48E-01
Mercury	7439-97-6		9.08E-08	2.18E-06	7.95E-04
Nickel	7440-02-0		7.75E-06	1.86E-04	6.79E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Screener	EMISSION SOURCE ID NO: ES-19
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-19

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Ash is screened to produce free flowing feedstock suitable for the STAR® Ash Beneficiation Process.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Wet Ash Throughput	Tons	165.0	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: Crusher	EMISSION SOURCE ID NO: ES-20
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-20

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Ash is crushed to remove large particles and produce free flowing feedstock suitable for the STAR® Ash Beneficiation Process.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019 — DATE MANUFACTURED: 2019

MANUFACTURER / MODEL NO.: TBD — EXPECTED OP. SCHEDULE: 1 HR/DAY 7 DAY/WK 52 WK/YR

IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?): ☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	AP-42	1.98E-01	8.67E-01	N/A	N/A	1.98E-01	8.67E-01
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	8.91E-02	3.90E-01	N/A	N/A	8.91E-02	3.90E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	1.65E-02	7.23E-02	N/A	N/A	1.65E-02	7.23E-02
SULFUR DIOXIDE (SO2)		N/A	N/A	N/A	N/A	N/A	N/A
NITROGEN OXIDES (NOx)		N/A	N/A	N/A	N/A	N/A	N/A
CARBON MONOXIDE (CO)		N/A	N/A	N/A	N/A	N/A	N/A
VOLATILE ORGANIC COMPOUNDS (VOC)		N/A	N/A	N/A	N/A	N/A	N/A
LEAD	Ash Analysis	3.17E-06	1.39E-05	N/A	N/A	3.17E-06	1.39E-05
OTHER		N/A	N/A	N/A	N/A	N/A	N/A

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
Antimony	7440-36-0	Ash Analysis	1.54E-06	6.76E-06	N/A	N/A	1.54E-06	6.76E-06
Arsenic	7440-38-2		1.18E-05	5.18E-05	N/A	N/A	1.18E-05	5.18E-05
Beryllium	7440-41-7		6.16E-07	2.70E-06	N/A	N/A	6.16E-07	2.70E-06
Cadmium	7440-43-9		9.50E-08	4.16E-07	N/A	N/A	9.50E-08	4.16E-07
Chromium	7440-47-3		3.75E-06	1.64E-05	N/A	N/A	3.75E-06	1.64E-05
Chromium VI	SolCR6		1.96E-07	8.59E-07	N/A	N/A	1.96E-07	8.59E-07
Cobalt	7440-48-4		2.13E-06	9.34E-06	N/A	N/A	2.13E-06	9.34E-06
Lead	7439-92-1		3.17E-06	1.39E-05	N/A	N/A	3.17E-06	1.39E-05
Manganese	7439-96-5		1.54E-05	6.76E-05	N/A	N/A	1.54E-05	6.76E-05
Mercury	7439-97-6		4.95E-08	2.17E-07	N/A	N/A	4.95E-08	2.17E-07
Nickel	7440-02-0		4.23E-06	1.85E-05	N/A	N/A	4.23E-06	1.85E-05
Selenium	7782-49-2		2.79E-06	1.22E-05	N/A	N/A	2.79E-06	1.22E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
Arsenic	7440-38-2	Ash Analysis	1.18E-05	2.84E-04	1.04E-01
Beryllium	7440-41-7		6.16E-07	1.48E-05	5.39E-03
Cadmium	7440-43-9		9.50E-08	2.28E-06	8.33E-04
Chromium VI	SolCR6		1.96E-07	4.70E-06	1.72E-03
Manganese	7439-96-5		1.54E-05	3.71E-04	1.35E-01
Mercury	7439-97-6		4.95E-08	1.19E-06	4.34E-04
Nickel	7440-02-0		4.23E-06	1.02E-04	3.70E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Crusher	EMISSION SOURCE ID NO: ES-20
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-20

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Ash is crushed to remove large particles and produce free flowing feedstock suitable for the STAR® Ash Beneficiation Process.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)
Wet Ash Throughput	Tons	165.0	N/A

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS:

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: Haul Roads	EMISSION SOURCE ID NO: ES-21
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-21

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):

Ash is hauled from the basin to the STAR® Ash Beneficiation Process via trucks. Particulate emissions are generated from the haul roads from the force of the wheels on the road surface. This force causes pulverization of the surface material. The particles are lifted and dropped from the rolling wheels and the road surface is exposed to strong air currents, which generate airborne particulate emissions.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☐ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☑ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: NA
MANUFACTURER / MODEL NO.: NA	EXPECTED OP. SCHEDULE: 24 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☐ NSPS (SUBPARTS?):	☐ NESHAP (SUBPARTS?):

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	AP-42	2.04E-01	8.94E-01	N/A	N/A	2.04E-01	8.94E-01
PARTICULATE MATTER<10 MICRONS (PM_{10})	AP-42	5.26E-02	2.30E-01	N/A	N/A	5.26E-02	2.30E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	AP-42	5.27E-03	2.31E-02	N/A	N/A	5.27E-03	2.31E-02
SULFUR DIOXIDE (SO2)							
NITROGEN OXIDES (NOx)							
CARBON MONOXIDE (CO)							
VOLATILE ORGANIC COMPOUNDS (VOC)							
LEAD							
OTHER							

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
NA								

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
NA					

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B9
EMISSION SOURCE (OTHER)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B9**

EMISSION SOURCE DESCRIPTION: Haul Roads	EMISSION SOURCE ID NO: ES-21
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-21

DESCRIBE IN DETAIL THE PROCESS (ATTACH FLOW DIAGRAM): Ash is hauled from the basin to the STAR® reactor process via trucks. Particulate emissions are generated from the haul roads from the force of the wheels on the road surface. This force causes pulverization of the surface material. The particles are lifted and dropped from the rolling wheels and the road surface is exposed to strong air currents, which generate airborne particulate emissions.

MATERIALS ENTERING PROCESS - CONTINUOUS PROCESS		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/HR)	LIMITATION(UNIT/HR)

MATERIALS ENTERING PROCESS - BATCH OPERATION		MAX. DESIGN	REQUESTED CAPACITY
TYPE	UNITS	CAPACITY (UNIT/BATCH)	LIMITATION (UNIT/BATCH)

MAXIMUM DESIGN (BATCHES / HOUR):	
REQUESTED LIMITATION (BATCHES / HOUR):	(BATCHES/YR):
FUEL USED: NA	TOTAL MAXIMUM FIRING RATE (MILLION BTU/HR): NA
MAX. CAPACITY HOURLY FUEL USE: NA	REQUESTED CAPACITY ANNUAL FUEL USE: NA

COMMENTS: Loaded truck weight = 50 tons. Unloaded truck weight= 25 tons.

Attach Additional Sheets as Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** — **B**

EMISSION SOURCE DESCRIPTION: Screener Diesel Engine	EMISSION SOURCE ID NO: ES-22
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-22

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Diesel-fired screener engine. Expected to operate 2,600 hours per year, however emissions presented below are on 8,760 hour per year operating basis.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: TBD	EXPECTED OP. SCHEDULE: 8 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☑ NSPS (SUBPARTS?): IIII	☑ NESHAP (SUBPARTS?): ZZZZ

PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
PARTICULATE MATTER (PM)	NSPS IIII	5.98E-02	2.62E-01	NA	NA	5.98E-02	2.62E-01
PARTICULATE MATTER<10 MICRONS (PM_{10})	NSPS IIII	5.98E-02	2.62E-01	NA	NA	5.98E-02	2.62E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	NSPS IIII	5.98E-02	2.62E-01	NA	NA	5.98E-02	2.62E-01
SULFUR DIOXIDE (SO2)	AP-42	9.65E-04	4.23E-03	NA	NA	9.65E-04	4.23E-03
NITROGEN OXIDES (NOx)	NSPS IIII	7.03E-01	3.08E+00	NA	NA	7.03E-01	3.08E+00
CARBON MONOXIDE (CO)	NSPS IIII	7.48E-01	3.28E+00	NA	NA	7.48E-01	3.28E+00
VOLATILE ORGANIC COMPOUNDS (VOC)	AP-42	2.29E-01	1.00E+00	NA	NA	2.29E-01	1.00E+00
LEAD	AP-42	5.73E-06	2.51E-05	NA	NA	5.73E-06	2.51E-05
CO2e	GHGRP	1.04E+02	4.56E+02	NA	NA	1.04E+02	4.56E+02

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) lb/hr	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) lb/hr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS) tons/yr
1,3-BUTADIENE	106-99-0	AP-42	2.49E-05	1.09E-04	NA	NA	2.49E-05	1.09E-04
ACETALDEHYDE	75-07-0	AP-42	4.89E-04	2.14E-03	NA	NA	4.89E-04	2.14E-03
ACROLEIN	107-02-8	AP-42	5.89E-05	2.58E-04	NA	NA	5.89E-05	2.58E-04
BENZENE	71-43-2	AP-42	5.94E-04	2.60E-03	NA	NA	5.94E-04	2.60E-03
FORMALDEHYDE	50-00-0	AP-42	7.52E-04	3.29E-03	NA	NA	7.52E-04	3.29E-03
TOLUENE	108-88-3	AP-42	2.61E-04	1.14E-03	NA	NA	2.61E-04	1.14E-03
XYLENE (MIXED ISOMERS)	1330-20-7	AP-42	1.82E-04	7.95E-04	NA	NA	1.82E-04	7.95E-04
ANTHRACENE	120-12-7	AP-42	1.19E-06	5.22E-06	NA	NA	1.19E-06	5.22E-06
ACENAPHTHYLENE	208-96-8	AP-42	3.22E-06	1.41E-05	NA	NA	3.22E-06	1.41E-05
ACENAPHTHENE	83-32-9	AP-42	9.05E-07	3.96E-06	NA	NA	9.05E-07	3.96E-06
FLUORENE	86-73-7	AP-42	1.86E-05	8.15E-05	NA	NA	1.86E-05	8.15E-05
PYRENE	129-00-0	AP-42	3.04E-06	1.33E-05	NA	NA	3.04E-06	1.33E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS lb/hr	lb/day	lb/yr
1,3-BUTADIENE	106-99-0	AP-42	2.49E-05	5.98E-04	2.18E-01
ACETALDEHYDE	75-07-0	AP-42	4.89E-04	1.17E-02	4.28E+00
ACROLEIN	107-02-8	AP-42	5.89E-05	1.41E-03	5.16E-01
BENZENE	71-43-2	AP-42	5.94E-04	1.43E-02	5.21E+00
FORMALDEHYDE	50-00-0	AP-42	7.52E-04	1.80E-02	6.58E+00
TOLUENE	108-88-3	AP-42	2.61E-04	6.25E-03	2.28E+00
XYLENE (MIXED ISOMERS)	1330-20-7	AP-42	1.82E-04	4.36E-03	1.59E+00

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B (Cont.)

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Screener Diesel Engine	EMISSION SOURCE ID NO: ES-22
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-22

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
BENZO(G,H,I)PERYLENE	191-24-2	AP-42	3.11E-07	1.36E-06	NA	NA	3.11E-07	1.36E-06
NAPHTHALENE	91-20-3	AP-42	5.40E-05	2.37E-04	NA	NA	5.40E-05	2.37E-04
PHENANTHRENE	85-01-8	AP-42	1.87E-05	8.20E-05	NA	NA	1.87E-05	8.20E-05
BENZ(A)ANTHRACENE	56-55-3	AP-42	1.07E-06	4.69E-06	NA	NA	1.07E-06	4.69E-06
BENZO(A)PHENANTHRENE (CHRYSENE)	218-01-9	AP-42	2.25E-07	9.85E-07	NA	NA	2.25E-07	9.85E-07
BENZO(A)PYRENE	50-32-8	AP-42	1.20E-07	5.25E-07	NA	NA	1.20E-07	5.25E-07
BENZO(B)FLUORANTHENE	205-99-2	AP-42	6.31E-08	2.76E-07	NA	NA	6.31E-08	2.76E-07
BENZO(J,K)FLUORENE (FLUORANTHENE)	206-44-0	AP-42	4.85E-06	2.12E-05	NA	NA	4.85E-06	2.12E-05
BENZO(K)FLUORANTHENE	207-08-9	AP-42	9.87E-08	4.32E-07	NA	NA	9.87E-08	4.32E-07
DIBENZO(A,H)ANTHRACENE	53-70-3	AP-42	3.71E-07	1.63E-06	NA	NA	3.71E-07	1.63E-06
INDENO(1,2,3-CD)PYRENE	193-39-5	AP-42	2.39E-07	1.05E-06	NA	NA	2.39E-07	1.05E-06
ARSENIC	7440-38-2	AP-42	2.55E-06	1.12E-05	NA	NA	2.55E-06	1.12E-05
BERYLLIUM	7440-41-7	AP-42	1.91E-06	8.37E-06	NA	NA	1.91E-06	8.37E-06
CADMIUM	7440-43-9	AP-42	1.91E-06	8.37E-06	NA	NA	1.91E-06	8.37E-06
CHROMIUM	SolCR6	AP-42	1.91E-06	8.37E-06	NA	NA	1.91E-06	8.37E-06
LEAD	7439-92-1	AP-42	5.73E-06	2.51E-05	NA	NA	5.73E-06	2.51E-05
MANGANESE	7439-96-5	AP-42	3.82E-06	1.67E-05	NA	NA	3.82E-06	1.67E-05
MERCURY	7439-97-6	AP-42	1.91E-06	8.37E-06	NA	NA	1.91E-06	8.37E-06
NICKEL	7440-02-0	AP-42	1.91E-06	8.37E-06	NA	NA	1.91E-06	8.37E-06
SELENIUM	7782-49-2	AP-42	9.56E-06	4.19E-05	NA	NA	9.56E-06	4.19E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
BENZO(A)PYRENE	50-32-8	AP-42	1.20E-07	2.87E-06	1.05E-03
ARSENIC	7440-38-2	AP-42	2.55E-06	6.12E-05	2.23E-02
BERYLLIUM	7440-41-7	AP-42	1.91E-06	4.59E-05	1.67E-02
CADMIUM	7440-43-9	AP-42	1.91E-06	4.59E-05	1.67E-02
CHROMIUM VI	SolCR6	AP-42	1.91E-06	4.59E-05	1.67E-02
MANGANESE	7439-96-5	AP-42	3.82E-06	9.17E-05	3.35E-02
MERCURY	7439-97-6	AP-42	1.91E-06	4.59E-05	1.67E-02
NICKEL	7440-02-0	AP-42	1.91E-06	4.59E-05	1.67E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/TURBINES/GENERATORS)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **B2**

EMISSION SOURCE DESCRIPTION: Screener Diesel Engine	EMISSION SOURCE ID NO: ES-22
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO: 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-22

ENGINE SERVICE (CHECK ALL THAT APPLY): | | EMERGENCY | | SPACE HEAT | | ELECTRICAL GENERATION | | PEAK SHAVER | ✓ | OTHER (DESCRIBE): Screener operation

GENERATOR OUTPUT (KW): | ANTICIPATED ACTUAL HOURS OF OPERATION (HRS/YR): 2,600

ENGINE OUTPUT (HP): 91 bhp

TYPE ICE: | | GASOLINE ENGINE | ✓ | DIESEL ENGINE UP TO 600 HP | | DIESEL ENGINE GREATER THAN 600 HP | | DUAL FUEL ENGINE | | OTHER (DESCRIBE): _____ (complete below)

ENGINE TYPE | | RICH BURN | | LEAN BURN

EMISSION REDUCTION MODIFICATIONS | | INJECTION TIMING RETARD | | PREIGNITION CHAMBER COMBUSTION | | OTHER _____

OR | | STATIONARY GAS TURBINE (complete below) | | NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

FUEL: | | NATURAL GAS | | OIL | | OTHER (DESCRIBE): _____

CYCLE: | | COGENERATION | | SIMPLE | | REGENERATIVE | | COMBINED

CONTROLS: | | WATER-STEAM INJECTION | | UNCONTROLLED | | LEAN-PREMIX | | OTHER (SPECIFY): _____

ENGINE TYPE: | | 2-CYCLE LEAN BURN | | 4-CYCLE LEAN | | TURBINE | | 4-CYCLE RICH BURN | | OTHER (DESCRIBE): _____

CONTROLS: | | COMBUSTION MODIFICATIONS (DESCRIBE): _____ | | NONSELECTIVE CATALYTIC REDUCTION | | SELECTIVE CATALYTIC REDUCTION | | CLEAN BURN AND PRECOMBUSTION CHAMBER | | UNCONTROLLED

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Diesel	gallons		NA

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
Diesel	19,300	pounds	0.0015%

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	OTHER
EMISSION FACTOR LB/UNIT						
UNIT						

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

COMMENTS:

Attach Additional Sheets As Necessary

FORM B

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** **B**

EMISSION SOURCE DESCRIPTION: Crusher Diesel Engine	EMISSION SOURCE ID NO: ES-23
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-23

DESCRIBE IN DETAILTHE EMISSION SOURCE PROCESS (ATTACH FLOW DIAGRAM):
Diesel-fired crusher engine. Expected to operate 365 hours per year, however emissions presented below are on 8,760 hour per year operating basis.

TYPE OF EMISSION SOURCE (CHECK AND COMPLETE APPROPRIATE FORM B1-B9 ON THE FOLLOWING PAGES):

- ☐ Coal,wood,oil, gas, other burner (Form B1)
- ☑ Int.combustion engine/generator (Form B2)
- ☐ Liquid storage tanks (Form B3)
- ☐ Woodworking (Form B4)
- ☐ Coating/finishing/printing (Form B5)
- ☐ Storage silos/bins (Form B6)
- ☐ Manuf. of chemicals/coatings/inks (Form B7)
- ☐ Incineration (Form B8)
- ☐ Other (Form B9)

START CONSTRUCTION DATE: 2019	DATE MANUFACTURED: 2019
MANUFACTURER / MODEL NO.: TBD	EXPECTED OP. SCHEDULE: 1 HR/DAY 7 DAY/WK 52 WK/YR
IS THIS SOURCE SUBJECT TO? ☑ NSPS (SUBPARTS?): IIII	☑ NESHAP (SUBPARTS?): ZZZZ
PERCENTAGE ANNUAL THROUGHPUT (%): DEC-FEB 25 MAR-MAY 25 JUN-AUG 25 SEP-NOV 25	

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

AIR POLLUTANT EMITTED	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
		lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
PARTICULATE MATTER (PM)	NSPS IIII	1.97E-01	8.64E-01	NA	NA	1.97E-01	8.64E-01
PARTICULATE MATTER<10 MICRONS (PM_{10})	NSPS IIII	1.97E-01	8.64E-01	NA	NA	1.97E-01	8.64E-01
PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	NSPS IIII	1.97E-01	8.64E-01	NA	NA	1.97E-01	8.64E-01
SULFUR DIOXIDE (SO2)	AP-42	3.18E-03	1.39E-02	NA	NA	3.18E-03	1.39E-02
NITROGEN OXIDES (NOx)	NSPS IIII	2.32E+00	1.02E+01	NA	NA	2.32E+00	1.02E+01
CARBON MONOXIDE (CO)	NSPS IIII	2.47E+00	1.08E+01	NA	NA	2.47E+00	1.08E+01
VOLATILE ORGANIC COMPOUNDS (VOC)	AP-42	7.54E-01	3.30E+00	NA	NA	7.54E-01	3.30E+00
LEAD	AP-42	1.89E-05	8.28E-05	NA	NA	1.89E-05	8.28E-05
CO2e	GHGRP	3.44E+02	1.50E+03	NA	NA	3.44E+02	1.50E+03

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
1,3-BUTADIENE	106-99-0	AP-42	8.21E-05	3.60E-04	NA	NA	8.21E-05	3.60E-04
ACETALDEHYDE	75-07-0	AP-42	1.61E-03	7.05E-03	NA	NA	1.61E-03	7.05E-03
ACROLEIN	107-02-8	AP-42	1.94E-04	8.51E-04	NA	NA	1.94E-04	8.51E-04
BENZENE	71-43-2	AP-42	1.96E-03	8.58E-03	NA	NA	1.96E-03	8.58E-03
FORMALDEHYDE	50-00-0	AP-42	2.48E-03	1.09E-02	NA	NA	2.48E-03	1.09E-02
TOLUENE	108-88-3	AP-42	8.59E-04	3.76E-03	NA	NA	8.59E-04	3.76E-03
XYLENE (MIXED ISOMERS)	1330-20-7	AP-42	5.99E-04	2.62E-03	NA	NA	5.99E-04	2.62E-03
ANTHRACENE	120-12-7	AP-42	3.93E-06	1.72E-05	NA	NA	3.93E-06	1.72E-05
ACENAPHTHYLENE	208-96-8	AP-42	1.06E-05	4.65E-05	NA	NA	1.06E-05	4.65E-05
ACENAPHTHENE	83-32-9	AP-42	2.98E-06	1.31E-05	NA	NA	2.98E-06	1.31E-05
FLUORENE	86-73-7	AP-42	6.13E-05	2.69E-04	NA	NA	6.13E-05	2.69E-04
PYRENE	129-00-0	AP-42	1.00E-05	4.40E-05	NA	NA	1.00E-05	4.40E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
1,3-BUTADIENE	106-99-0	AP-42	8.21E-05	1.97E-03	7.19E-01
ACETALDEHYDE	75-07-0	AP-42	1.61E-03	3.87E-02	1.41E+01
ACROLEIN	107-02-8	AP-42	1.94E-04	4.66E-03	1.70E+00
BENZENE	71-43-2	AP-42	1.96E-03	4.70E-02	1.72E+01
FORMALDEHYDE	50-00-0	AP-42	2.48E-03	5.95E-02	2.17E+01
TOLUENE	108-88-3	AP-42	8.59E-04	2.06E-02	7.52E+00
XYLENE (MIXED ISOMERS)	1330-20-7	AP-42	5.99E-04	1.44E-02	5.24E+00

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B (Cont.)

SPECIFIC EMISSION SOURCE INFORMATION (REQUIRED FOR ALL SOURCES)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **B**

EMISSION SOURCE DESCRIPTION: Crusher Diesel Engine	EMISSION SOURCE ID NO: ES-23
	CONTROL DEVICE ID NO(S): NA
OPERATING SCENARIO 1 OF 1	EMISSION POINT (STACK) ID NO(S): EP-23

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

HAZARDOUS AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL (AFTER CONTROLS / LIMITS)		POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITS)		(AFTER CONTROLS / LIMITS)	
			lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	tons/yr
BENZO(G,H,I)PERYLENE	191-24-2	AP-42	1.03E-06	4.50E-06	NA	NA	1.03E-06	4.50E-06
NAPHTHALENE	91-20-3	AP-42	1.78E-04	7.80E-04	NA	NA	1.78E-04	7.80E-04
PHENANTHRENE	85-01-8	AP-42	6.17E-05	2.70E-04	NA	NA	6.17E-05	2.70E-04
BENZ(A)ANTHRACENE	56-55-3	AP-42	3.53E-06	1.55E-05	NA	NA	3.53E-06	1.55E-05
BENZO(A)PHENANTHRENE (CHRYSENE)	218-01-9	AP-42	7.41E-07	3.25E-06	NA	NA	7.41E-07	3.25E-06
BENZO(A)PYRENE	50-32-8	AP-42	3.95E-07	1.73E-06	NA	NA	3.95E-07	1.73E-06
BENZO(B)FLUORANTHENE	205-99-2	AP-42	2.08E-07	9.12E-07	NA	NA	2.08E-07	9.12E-07
BENZO(J,K)FLUORENE (FLUORANTHENE)	206-44-0	AP-42	1.60E-05	7.00E-05	NA	NA	1.60E-05	7.00E-05
BENZO(K)FLUORANTHENE	207-08-9	AP-42	3.26E-07	1.43E-06	NA	NA	3.26E-07	1.43E-06
DIBENZO(A,H)ANTHRACENE	53-70-3	AP-42	1.22E-06	5.36E-06	NA	NA	1.22E-06	5.36E-06
INDENO(1,2,3-CD)PYRENE	193-39-5	AP-42	7.88E-07	3.45E-06	NA	NA	7.88E-07	3.45E-06
ARSENIC	7440-38-2	AP-42	8.40E-06	3.68E-05	NA	NA	8.40E-06	3.68E-05
BERYLLIUM	7440-41-7	AP-42	6.30E-06	2.76E-05	NA	NA	6.30E-06	2.76E-05
CADMIUM	7440-43-9	AP-42	6.30E-06	2.76E-05	NA	NA	6.30E-06	2.76E-05
CHROMIUM	SolCR6	AP-42	6.30E-06	2.76E-05	NA	NA	6.30E-06	2.76E-05
LEAD	7439-92-1	AP-42	1.89E-05	8.28E-05	NA	NA	1.89E-05	8.28E-05
MANGANESE	7439-96-5	AP-42	1.26E-05	5.52E-05	NA	NA	1.26E-05	5.52E-05
MERCURY	7439-97-6	AP-42	6.30E-06	2.76E-05	NA	NA	6.30E-06	2.76E-05
NICKEL	7440-02-0	AP-42	6.30E-06	2.76E-05	NA	NA	6.30E-06	2.76E-05
SELENIUM	7782-49-2	AP-42	3.15E-05	1.38E-04	NA	NA	3.15E-05	1.38E-04

TOXIC AIR POLLUTANT EMISSIONS INFORMATION FOR THIS SOURCE

TOXIC AIR POLLUTANT	CAS NO.	SOURCE OF EMISSION FACTOR	EXPECTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS		
			lb/hr	lb/day	lb/yr
BENZO(A)PYRENE	50-32-8	AP-42	3.95E-07	9.48E-06	3.46E-03
ARSENIC	7440-38-2	AP-42	8.40E-06	2.02E-04	7.36E-02
BERYLLIUM	7440-41-7	AP-42	6.30E-06	1.51E-04	5.52E-02
CADMIUM	7440-43-9	AP-42	6.30E-06	1.51E-04	5.52E-02
CHROMIUM VI	SolCR6	AP-42	6.30E-06	1.51E-04	5.52E-02
MANGANESE	7439-96-5	AP-42	1.26E-05	3.02E-04	1.10E-01
MERCURY	7439-97-6	AP-42	6.30E-06	1.51E-04	5.52E-02
NICKEL	7440-02-0	AP-42	6.30E-06	1.51E-04	5.52E-02

Attachments: (1) emissions calculations and supporting documentation; (2) indicate all requested state and federal enforceable permit limits (e.g. hours of operation, emission rates) and describe how these are monitored and with what frequency; and (3) describe any monitoring devices, gauges, or test ports for this source.

COMPLETE THIS FORM AND COMPLETE AND ATTACH APPROPRIATE B1 THROUGH B9 FORM FOR EACH SOURCE

Attach Additional Sheets As Necessary

FORM B2

EMISSION SOURCE (INTERNAL COMBUSTION ENGINES/TURBINES/GENERATORS)

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **B2**

EMISSION SOURCE DESCRIPTION: Crusher Diesel Engine

EMISSION SOURCE ID NO: ES-23

CONTROL DEVICE ID NO(S): NA

OPERATING SCENARIO: 1 OF 1

EMISSION POINT (STACK) ID NO(S): EP-23

ENGINE SERVICE (CHECK ALL THAT APPLY): | | EMERGENCY | | PEAK SHAVER | | SPACE HEAT | | ELECTRICAL GENERATION | [✓] OTHER (DESCRIBE): Crusher operation

GENERATOR OUTPUT (KW):

ANTICIPATED ACTUAL HOURS OF OPERATION (HRS/YR): 365

ENGINE OUTPUT (HP): 300 bhp

TYPE ICE: [ ] GASOLINE ENGINE [✓] DIESEL ENGINE UP TO 600 HP [ ] DIESEL ENGINE GREATER THAN 600 HP [ ] DUAL FUEL ENGINE [ ] OTHER (DESCRIBE): _____ (complete below)

ENGINE TYPE | | RICH BURN | | LEAN BURN

EMISSION REDUCTION MODIFICATIONS | | INJECTION TIMING RETARD | | PREIGNITION CHAMBER COMBUSTION | | OTHER _____

OR [ ] STATIONARY GAS TURBINE (complete below)

FUEL: | | NATURAL GAS [ ] OIL [ ] OTHER (DESCRIBE): _____

CYCLE: | | COGENERATION [ ] SIMPLE [ ] REGENERATIVE [ ] COMBINED

CONTROLS: | | WATER-STEAM INJECTION | | UNCONTROLLED | | LEAN-PREMIX | | OTHER (SPECIFY): _____

[ ] NATURAL GAS PIPELINE COMPRESSOR OR TURBINE (complete below)

ENGINE TYPE: [ ] 2-CYCLE LEAN BURN [ ] 4-CYCLE LEAN [ ] TURBINE [ ] 4-CYCLE RICH BURN [ ] OTHER (DESCRIBE): _____

CONTROLS: [ ] COMBUSTION MODIFICATIONS (DESCRIBE): _____ [ ] NONSELECTIVE CATALYTIC REDUCTION [ ] SELECTIVE CATALYTIC REDUCTION [ ] CLEAN BURN AND PRECOMBUSTION CHAMBER [ ] UNCONTROLLED

FUEL USAGE (INCLUDE STARTUP/BACKUP FUEL)

FUEL TYPE	UNITS	MAXIMUM DESIGN CAPACITY (UNIT/HR)	REQUESTED CAPACITY LIMITATION (UNIT/HR)
Diesel	gallons		NA

FUEL CHARACTERISTICS (COMPLETE ALL THAT ARE APPLICABLE)

FUEL TYPE	BTU/UNIT	UNITS	SULFUR CONTENT (% BY WEIGHT)
Diesel	19,300	pounds	0.0015%

MANUFACTURER'S SPECIFIC EMISSION FACTORS (IF AVAILABLE)

POLLUTANT	NOX	CO	PM	PM10	VOC	OTHER
EMISSION FACTOR LB/UNIT						
UNIT						

DESCRIBE METHODS TO MINIMIZE VISIBLE EMISSIONS DURING IDLING, OR LOW LOAD OPERATIONS:

COMMENTS:

Attach Additional Sheets As Necessary

FORM D1

FACILITY-WIDE EMISSIONS SUMMARY

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — **D1**

CRITERIA AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

AIR POLLUTANT EMITTED	EMISSIONS (AFTER CONTROLS / LIMITATIONS)	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS)	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS)
	tons/yr	tons/yr	tons/yr
PARTICULATE MATTER (PM)	144	NA	144
PARTICULATE MATTER < 10 MICRONS (PM_{10})	131	NA	131
PARTICULATE MATTER < 2.5 MICRONS ($PM_{2.5}$)	75.1	NA	75.1
SULFUR DIOXIDE (SO_2)	112	NA	112
NITROGEN OXIDES (NOx)	222	NA	222
CARBON MONOXIDE (CO)	112	NA	112
VOLATILE ORGANIC COMPOUNDS (VOC)	14.1	NA	14.1
LEAD	1.28E-03	NA	1.28E-03
GREENHOUSE GASES (GHG) (SHORT TONS - CO2e)	156,869	NA	156,869
OTHER (H2SO4)	4.38E-01	NA	4.38E-01

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	EMISSIONS (AFTER CONTROLS / LIMITATIONS)	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS)	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS)
		tons/yr	tons/yr	tons/yr
1,3-Butadiene	106-99-0	4.69E-04	NA	4.69E-04
Acetaldehyde	75-07-0	9.19E-03	NA	9.19E-03
Acrolein	107-02-8	1.11E-03	NA	1.11E-03
Benzene	71-43-2	1.12E-02	NA	1.12E-02
Formaldehyde	50-00-0	1.41E-02	NA	1.41E-02
Toluene	108-88-3	4.90E-03	NA	4.90E-03
Xylene (Mixed Isomers)	1330-20-7	3.42E-03	NA	3.42E-03
Anthracene	120-12-7	2.24E-05	NA	2.24E-05

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Modeling Required ? Yes	Modeling Required ? No
H2SO4	7664-93-9	1.00E-01	2.40E+00	8.76E+02	X	
1,3-Butadiene	106-99-0	1.07E-04	2.57E-03	9.37E-01		X
Acetaldehyde	75-07-0	2.10E-03	5.04E-02	1.84E+01		X
Acrolein	107-02-8	2.53E-04	6.08E-03	2.22E+00		X
Benzene	71-43-2	2.55E-03	6.13E-02	2.24E+01	X	
Formaldehyde	50-00-0	3.23E-03	7.75E-02	2.83E+01		X
Toluene	108-88-3	1.12E-03	2.69E-02	9.81E+00		X
Xylene (Mixed Isomers)	1330-20-7	7.80E-04	1.87E-02	6.83E+00		X
Benzo(a)Pyrene	50-32-8	5.15E-07	1.23E-05	4.51E-03		X

COMMENTS:

Attach Additional Sheets As Necessary

FORM D1 (Cont.)
FACILITY-WIDE EMISSIONS SUMMARY

REVISED 09/22/16 — NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate — D1

HAZARDOUS AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

HAZARDOUS AIR POLLUTANT EMITTED	CAS NO.	EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (BEFORE CONTROLS / LIMITATIONS) tons/yr	POTENTIAL EMISSIONS (AFTER CONTROLS / LIMITATIONS) tons/yr
Acenaphthylene	208-96-8	6.07E-05	NA	6.07E-05
Acenaphthene	83-32-9	1.70E-05	NA	1.70E-05
Fluorene	86-73-7	3.50E-04	NA	3.50E-04
Pyrene	129-00-0	5.73E-05	NA	5.73E-05
Benzo(g,h,i)Perylene	191-24-2	5.86E-06	NA	5.86E-06
Naphthalene	91-20-3	1.02E-03	NA	1.02E-03
Phenanthrene	85-01-8	3.52E-04	NA	3.52E-04
Benz(a)Anthracene	56-55-3	2.01E-05	NA	2.01E-05
Benzo(a)Phenanthrene (Chrysene)	218-01-9	4.23E-06	NA	4.23E-06
Benzo(a)Pyrene	50-32-8	2.25E-06	NA	2.25E-06
Benzo(b)Fluoranthene	205-99-2	1.19E-06	NA	1.19E-06
Benzo(j,k)Fluorene (Fluoranthene)	206-44-0	9.12E-05	NA	9.12E-05
Benzo(k)Fluoranthene	207-08-9	1.86E-06	NA	1.86E-06
Dibenzo(a,h)Anthracene	53-70-3	6.99E-06	NA	6.99E-06
Indeno(1,2,3-CD)Pyrene	193-39-5	4.50E-06	NA	4.50E-06
Antimony	7440-36-0	5.67E-04	NA	5.67E-04
Arsenic	7440-38-2	4.38E-03	NA	4.38E-03
Beryllium	7440-41-7	2.63E-04	NA	2.63E-04
Cadmium	7440-43-9	7.37E-05	NA	7.37E-05
Chromium	7440-47-3	1.46E-03	NA	1.46E-03
Chromium VI	SolCR6	7.16E-05	NA	7.16E-05
Cobalt	7440-48-4	7.94E-04	NA	7.94E-04
Lead	7439-92-1	1.28E-03	NA	1.28E-03
Manganese	7439-96-5	6.10E-03	NA	6.10E-03
Mercury	7439-97-6	5.41E-05	NA	5.41E-05
Nickel	7440-02-0	1.62E-03	NA	1.62E-03
Selenium	7782-49-2	1.21E-03	NA	1.21E-03

TOXIC AIR POLLUTANT EMISSIONS INFORMATION - FACILITY-WIDE

INDICATE REQUESTED ACTUAL EMISSIONS AFTER CONTROLS / LIMITATIONS. EMISSIONS ABOVE THE TOXIC PERMIT EMISSION RATE (TPER) IN 15A NCAC 2Q .0711 MAY REQUIRE AIR DISPERSION MODELING. USE NETTING FORM D2 IF NECESSARY.

TOXIC AIR POLLUTANT EMITTED	CAS NO.	lb/hr	lb/day	lb/year	Modeling Required ? Yes	No
Arsenic	7440-38-2	1.00E-03	2.40E-02	8.76E+00	X	
Beryllium	7440-41-7	6.01E-05	1.44E-03	5.26E-01	X	
Cadmium	7440-43-9	1.68E-05	4.04E-04	1.47E-01		X
Chromium VI	SolCR6	2.46E-05	5.90E-04	2.15E-01		X
Manganese	7439-96-5	1.39E-03	3.34E-02	1.22E+01		X
Mercury	7439-97-6	1.24E-05	2.97E-04	1.08E-01		X
Nickel	7440-02-0	3.69E-04	8.86E-03	3.23E+00		X

COMMENTS:

For the TPER analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Attach Additional Sheets As Necessary

FORM D5
TECHNICAL ANALYSIS TO SUPPORT PERMIT APPLICATION

REVISED 09/22/16 | **NCDEQ/Division of Air Quality - Application for Air Permit to Construct/Operate** | **D5**

PROVIDE DETAILED TECHNICAL CALCULATIONS TO SUPPORT ALL EMISSION, CONTROL, AND REGULATORY DEMONSTRATIONS MADE IN THIS APPLICATION. INCLUDE A COMPREHENSIVE PROCESS FLOW DIAGRAM AS NECESSARY TO SUPPORT AND CLARIFY CALCULATIONS AND ASSUMPTIONS. ADDRESS THE FOLLOWING SPECIFIC ISSUES ON SEPARATE PAGES:

A **SPECIFIC EMISSIONS SOURCE (EMISSION INFORMATION) (FORM B and B1 through B9)** - SHOW CALCULATIONS USED, INCLUDING EMISSION FACTORS, MATERIAL BALANCES, AND/OR OTHER METHODS FROM WHICH THE POLLUTANT EMISSION RATES IN THIS APPLICATION WERE DERIVED. INCLUDE CALCULATION OF POTENTIAL BEFORE AND, WHERE APPLICABLE, AFTER CONTROLS. CLEARLY STATE ANY ASSUMPTIONS MADE AND PROVIDE ANY REFERENCES AS NEEDED TO SUPPORT MATERIAL BALANCE CALCULATIONS.

B **SPECIFIC EMISSION SOURCE (REGULATORY INFORMATION)(FORM E2 - TITLE V ONLY)** - PROVIDE AN ANALYSIS OF ANY REGULATIONS APPLICABLE TO INDIVIDUAL SOURCES AND THE FACILITY AS A WHOLE. INCLUDE A DISCUSSION OUTING METHODS (e.g. FOR TESTING AND/OR MONITORING REQUIREMENTS) FOR COMPLYING WITH APPLICABLE REGULATIONS, PARTICULARLY THOSE REGULATIONS LIMITING EMISSIONS BASED ON PROCESS RATES OR OTHER OPERATIONAL PARAMETERS. PROVIDE JUSTIFICATION FOR AVOIDANCE OF ANY FEDERAL REGULATIONS (PREVENTION OF SIGNIFICANT DETERIORATION (PSD), NEW SOURCE PERFORMANCE STANDARDS (NSPS), NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS), TITLE V), INCLUDING EXEMPTIONS FROM THE FEDERAL REGULATIONS WHICH WOULD OTHERWISE BE APPLICABLE TO THIS FACILITY. SUBMIT ANY REQUIRED INFORMATION TO DOCUMENT COMPLIANCE WITH ANY REGULATIONS. INCLUDE EMISSION RATES CALCULATED IN ITEM "A" ABOVE, DATES OF MANUFACTURE, CONTROL EQUIPMENT, ETC. TO SUPPORT THESE CALCULATIONS.

C **CONTROL DEVICE ANALYSIS (FORM C and C1 through C9)** - PROVIDE A TECHNICAL EVALUATION WITH SUPPORTING REFERENCES FOR ANY CONTROL EFFICIENCIES LISTED ON SECTION C FORMS, OR USED TO REDUCE EMISSION RATES IN CALCULATIONS UNDER ITEM "A" ABOVE. INCLUDE PERTINENT OPERATING PARAMETERS (e.g. OPERATING CONDITIONS, MANUFACTURING RECOMMENDATIONS, AND PARAMETERS AS APPLIED FOR IN THIS APPLICATION) CRITICAL TO ENSURING PROPER PERFORMANCE OF THE CONTROL DEVICES). INCLUDE AND LIMITATIONS OR MALFUNCTION POTENTIAL FOR THE PARTICULAR CONTROL DEVICES AS EMPLOYED AT THIS FACILITY. DETAIL PROCEDURES FOR ASSURING PROPER OPERATION OF THE CONTROL DEVICE INCLUDING MONITORING SYSTEMS AND MAINTENANCE TO BE PERFORMED.

D **PROCESS AND OPERATIONAL COMPLIANCE ANALYSIS - (FORM E3 - TITLE V ONLY)** - SHOWING HOW COMPLIANCE WILL BE ACHIEVED WHEN USING PROCESS, OPERATIONAL, OR OTHER DATA TO DEMONSTRATE COMPLIANCE. REFER TO COMPLIANCE REQUIREMENTS IN THE REGULATORY ANALYSIS IN ITEM "B" WHERE APPROPRIATE. LIST ANY CONDITIONS OR PARAMETERS THAT CAN BE MONITORED AND REPORTED TO DEMONSTRATE COMPLIANCE WITH THE APPLICABLE REGULATIONS.

E **PROFESSIONAL ENGINEERING SEAL** - PURSUANT TO 15A NCAC 2Q .0112 "APPLICATION REQUIRING A PROFESSIONAL ENGINEERING SEAL," A PROFESSIONAL ENGINEER REGISTERED IN NORTH CAROLINA SHALL BE REQUIRED TO SEAL TECHNICAL PORTIONS OF THIS APPLICATION FOR NEW SOURCES AND MODIFICATIONS OF EXISTING SOURCES. (SEE INSTRUCTIONS FOR FURTHER APPLICABILITY).

I, Amy M. Marshall, P.E. *attest that this application for* the Cape Fear STAR® Facility *has been reviewed by me and is accurate, complete and consistent with the information supplied in the engineering plans, calculations, and all other supporting documentation to the best of my knowledge. I further attest that to the best of my knowledge the proposed design has been prepared in accordance with the applicable regulations. Although certain portions of this submittal package may have been developed by other professionals, inclusion of these materials under my seal signifies that I have reviewed this material and have judged it to be consistent with the proposed design. Note: In accordance with NC General Statutes 143-215.6A and 143-215.6B, any person who knowingly makes any false statement, representation, or certification in any application shall be guilty of a Class 2 misdemeanor which may include a fine not to exceed $10,000 as well as civil penalties up to $25,000 per violation.*

(PLEASE USE BLUE INK TO COMPLETE THE FOLLOWING)

NAME:	Amy M. Marshall, P.E.
DATE:	7/25/18
COMPANY:	AECOM Technical Services of NC, Inc.
ADDRESS:	1600 Perimeter Park Dr., Morrisville NC 27560
TELEPHONE:	919-461-1251
SIGNATURE:	Amy M. Marshall
PAGES CERTIFIED:	Appendix A & Appendix B

(IDENTIFY ABOVE EACH PERMIT FORM AND ATTACHMENT THAT IS BEING CERTIFIED BY THIS SEAL)

PLACE NORTH CAROLINA SEAL HERE

Appendix B

Project Emissions Calculations

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Potential Emissions

Pollutant	HAP	TAP	Ash Basin (ES-15, EP-15)				Unloading Pile (ES-3, EP-3)				Screener (ES-19, EP-19)				Screener Diesel Engine[1] (ES-22, EP-22)			
			lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr
Criteria Pollutants																		
PM			4.78E-02	1.15E+00	4.19E+02	2.09E-01	1.68E-04	4.03E-03	1.47E+00	7.35E-04	3.63E-01	8.71E+00	3.18E+03	1.59E+00	5.98E-02	1.44E+00	5.24E+02	2.62E-01
PM10			2.39E-02	5.74E-01	2.09E+02	1.05E-01	8.39E-05	2.01E-03	7.35E-01	3.67E-04	1.22E-01	2.93E+00	1.07E+03	5.35E-01	5.98E-02	1.44E+00	5.24E+02	2.62E-01
PM2.5			3.59E-03	8.61E-02	3.14E+01	1.57E-02	1.26E-05	3.02E-04	1.10E-01	5.51E-05	8.25E-03	1.98E-01	7.23E+01	3.61E-02	5.98E-02	1.44E+00	5.24E+02	2.62E-01
CO															7.48E-01	1.80E+01	6.55E+03	3.28E+00
NOx															7.03E-01	1.69E+01	6.16E+03	3.08E+00
SO2															9.65E-04	2.32E-02	8.45E+00	4.23E-03
Lead	H		7.66E-07	1.84E-05	6.71E-03	3.35E-06	2.69E-09	6.44E-08	2.35E-05	1.18E-08	5.81E-06	1.39E-04	5.09E-02	2.55E-05	5.73E-06	1.38E-04	5.02E-02	2.51E-05
VOC															2.29E-01	5.49E+00	2.00E+03	1.00E+00
Greenhouse Gases																		
CO2															1.04E+02	2.49E+03	9.10E+05	4.55E+02
Methane															4.21E-03	1.01E-01	3.69E+01	1.85E-02
N2O															8.43E-04	2.02E-02	7.38E+00	3.69E-03
CO2e															1.04E+02	2.50E+03	9.13E+05	4.56E+02
Inorganic, Non-metal Compounds																		
H2SO4		T																
Organic Compounds																		
1,3-Butadiene	H	T													2.49E-05	5.98E-04	2.18E-01	1.09E-04
Acetaldehyde	H	T													4.89E-04	1.17E-02	4.28E+00	2.14E-03
Acrolein	H	T													5.89E-05	1.41E-03	5.16E-01	2.58E-04
Benzene	H	T													5.94E-04	1.43E-02	5.21E+00	2.60E-03
Formaldehyde	H	T													7.52E-04	1.80E-02	6.58E+00	3.29E-03
Toluene	H	T													2.61E-04	6.25E-03	2.28E+00	1.14E-03
Xylene (Mixed Isomers)	H	T													1.82E-04	4.36E-03	1.59E+00	7.95E-04
PAH/POM																		
Anthracene	H														1.19E-06	2.86E-05	1.04E-02	5.22E-06
Acenaphthylene	H														3.22E-06	7.74E-05	2.82E-02	1.41E-05
Acenaphthene	H														9.05E-07	2.17E-05	7.92E-03	3.96E-06
Fluorene	H														1.86E-05	4.46E-04	1.63E-01	8.15E-05
Pyrene	H														3.04E-06	7.31E-05	2.67E-02	1.33E-05
Benzo(g,h,i)Perylene	H														3.11E-07	7.48E-06	2.73E-03	1.36E-06
Naphthalene	H														5.40E-05	1.30E-03	4.73E-01	2.37E-04
Phenanthrene	H														1.87E-05	4.49E-04	1.64E-01	8.20E-05
Benz(a)Anthracene	H														1.07E-06	2.57E-05	9.37E-03	4.69E-06
Benzo(a)Phenanthrene (Chrysene)	H														2.25E-07	5.40E-06	1.97E-03	9.85E-07
Benzo(a)Pyrene	H	T													1.20E-07	2.87E-06	1.05E-03	5.25E-07
Benzo(b)Fluoranthene	H														6.31E-08	1.52E-06	5.53E-04	2.76E-07
Benzo(j,k)Fluorene (Fluoranthene)	H														4.85E-06	1.16E-04	4.25E-02	2.12E-05
Benzo(k)Fluoranthene	H														9.87E-08	2.37E-06	8.65E-04	4.32E-07
Dibenzo(a,h)Anthracene	H														3.71E-07	8.91E-06	3.25E-03	1.63E-06
Indeno(1,2,3-CD)Pyrene	H														2.39E-07	5.73E-06	2.09E-03	1.05E-06
Metals																		
Antimony	H		3.73E-07	8.95E-06	3.27E-03	1.63E-06	1.31E-09	3.14E-08	1.15E-05	5.73E-09	2.83E-06	6.80E-05	2.48E-02	1.24E-05				
Arsenic	H	T	2.86E-06	6.85E-05	2.50E-02	1.25E-05	1.00E-08	2.40E-07	8.77E-05	4.39E-08	2.17E-05	5.20E-04	1.90E-01	9.49E-05	2.55E-06	6.12E-05	2.23E-02	1.12E-05
Beryllium	H	T	1.49E-07	3.57E-06	1.30E-03	6.52E-07	5.22E-10	1.25E-08	4.57E-06	2.28E-09	1.13E-06	2.71E-05	9.89E-03	4.94E-06	1.91E-06	4.59E-05	1.67E-02	8.37E-06
Cadmium	H	T	2.30E-08	5.51E-07	2.01E-04	1.01E-07	8.05E-11	1.93E-09	7.05E-07	3.53E-10	1.74E-07	4.18E-06	1.53E-03	7.63E-07	1.91E-06	4.59E-05	1.67E-02	8.37E-06
Chromium	H		9.06E-07	2.18E-05	7.94E-03	3.97E-06	3.18E-09	7.63E-08	2.78E-05	1.39E-08	6.88E-06	1.65E-04	6.03E-02	3.01E-05	1.91E-06	4.59E-05	1.67E-02	8.37E-06
Chromium VI	H	T	4.74E-08	1.14E-06	4.15E-04	2.07E-07	1.66E-10	3.99E-09	1.45E-06	7.27E-10	3.59E-07	8.62E-06	3.15E-03	1.57E-06				
Cobalt	H		5.15E-07	1.24E-05	4.51E-03	2.26E-06	1.81E-09	4.34E-08	1.58E-05	7.91E-09	3.91E-06	9.38E-05	3.42E-02	1.71E-05				
Lead	H		7.66E-07	1.84E-05	6.71E-03	3.35E-06	2.69E-09	6.44E-08	2.35E-05	1.18E-08	5.81E-06	1.39E-04	5.09E-02	2.55E-05	5.73E-06	1.38E-04	5.02E-02	2.51E-05
Manganese	H	T	3.73E-06	8.95E-05	3.27E-02	1.63E-05	1.31E-08	3.14E-07	1.15E-04	5.73E-08	2.83E-05	6.79E-04	2.48E-01	1.24E-04	3.82E-06	9.17E-05	3.35E-02	1.67E-05
Mercury	H	T	1.20E-08	2.87E-07	1.05E-04	5.24E-08	4.19E-11	1.01E-09	3.67E-07	1.84E-10	9.08E-08	2.18E-06	7.95E-04	3.97E-07	1.91E-06	4.59E-05	1.67E-02	8.37E-06
Nickel	H	T	1.02E-06	2.45E-05	8.95E-03	4.47E-06	3.58E-09	8.60E-08	3.14E-05	1.57E-08	7.75E-06	1.86E-04	6.79E-02	3.40E-05	1.91E-06	4.59E-05	1.67E-02	8.37E-06
Selenium	H		6.73E-07	1.62E-05	5.90E-03	2.95E-06	2.36E-09	5.66E-08	2.07E-05	1.03E-08	5.11E-06	1.23E-04	4.47E-02	2.24E-05	9.56E-06	2.29E-04	8.37E-02	4.19E-05
Maximum Individual HAP			3.73E-06	8.95E-05	3.27E-02	1.63E-05	1.31E-08	3.14E-07	1.15E-04	5.73E-08	2.83E-05	6.79E-04	2.48E-01	1.24E-04	7.52E-04	1.80E-02	6.58E+00	3.29E-03
Total HAP Emissions			1.11E-05	2.66E-04	9.70E-02	4.85E-05	3.88E-08	9.32E-07	3.40E-04	1.70E-07	8.40E-05	2.02E-03	7.36E-01	3.68E-04	2.50E-03	6.00E-02	2.19E+01	1.09E-02

1 - In the TPER Analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Potential Emissions

Pollutant	HAP	TAP	Crusher (ES-20, EP-20)				Crusher Diesel Engine[1] (ES-23, EP-23)				Haul Roads (Loaded) (ES-21, EP-21)				Haul Roads (Unloaded) (ES-21, EP-21)			
			lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr
Criteria Pollutants																		
PM			1.98E-01	4.75E+00	1.73E+03	8.67E-01	1.97E-01	4.73E+00	1.73E+03	8.64E-01	1.18E-01	2.83E+00	1.03E+03	5.16E-01	8.62E-02	2.07E+00	7.55E+02	3.78E-01
PM10			8.91E-02	2.14E+00	7.81E+02	3.90E-01	1.97E-01	4.73E+00	1.73E+03	8.64E-01	3.04E-02	7.29E-01	2.66E+02	1.33E-01	2.22E-02	5.34E-01	1.95E+02	9.74E-02
PM2.5			1.65E-02	3.96E-01	1.45E+02	7.23E-02	1.97E-01	4.73E+00	1.73E+03	8.64E-01	3.04E-03	7.30E-02	2.67E+01	1.33E-02	2.23E-03	5.35E-02	1.95E+01	9.76E-03
CO							2.47E+00	5.92E+01	2.16E+04	1.08E+01								
NOx							2.32E+00	5.56E+01	2.03E+04	1.02E+01								
SO2							3.18E-03	7.64E-02	2.79E+01	1.39E-02								
Lead	H		3.17E-06	7.61E-05	2.78E-02	1.39E-05	1.89E-05	4.54E-04	1.66E-01	8.28E-05								
VOC							7.54E-01	1.81E+01	6.61E+03	3.30E+00								
Greenhouse Gases																		
CO2							3.42E+02	8.22E+03	3.00E+06	1.50E+03								
Methane							1.39E-02	3.33E-01	1.22E+02	6.08E-02								
N2O							2.78E-03	6.67E-02	2.43E+01	1.22E-02								
CO2e							3.44E+02	8.25E+03	3.01E+06	1.50E+03								
Inorganic, Non-metal Compounds																		
H2SO4		T																
Organic Compounds																		
1,3-Butadiene	H	T					8.21E-05	1.97E-03	7.19E-01	3.60E-04								
Acetaldehyde	H	T					1.61E-03	3.87E-02	1.41E+01	7.05E-03								
Acrolein	H	T					1.94E-04	4.66E-03	1.70E+00	8.51E-04								
Benzene	H	T					1.96E-03	4.70E-02	1.72E+01	8.58E-03								
Formaldehyde	H	T					2.48E-03	5.95E-02	2.17E+01	1.09E-02								
Toluene	H	T					8.59E-04	2.06E-02	7.52E+00	3.76E-03								
Xylene (Mixed Isomers)	H	T					5.99E-04	1.44E-02	5.24E+00	2.62E-03								
PAH/POM																		
Anthracene	H						3.93E-06	9.42E-05	3.44E-02	1.72E-05								
Acenaphthylene	H						1.06E-05	2.55E-04	9.31E-02	4.65E-05								
Acenaphthene	H						2.98E-06	7.16E-05	2.61E-02	1.31E-05								
Fluorene	H						6.13E-05	1.47E-03	5.37E-01	2.69E-04								
Pyrene	H						1.00E-05	2.41E-04	8.79E-02	4.40E-05								
Benzo(g,h,i)Perylene	H						1.03E-06	2.46E-05	9.00E-03	4.50E-06								
Naphthalene	H						1.78E-04	4.27E-03	1.56E+00	7.80E-04								
Phenanthrene	H						6.17E-05	1.48E-03	5.41E-01	2.70E-04								
Benz(a)Anthracene	H						3.53E-06	8.47E-05	3.09E-02	1.55E-05								
Benzo(a)Phenanthrene (Chrysene)	H						7.41E-07	1.78E-05	6.49E-03	3.25E-06								
Benzo(a)Pyrene	H	T					3.95E-07	9.48E-06	3.46E-03	1.73E-06								
Benzo(b)Fluoranthene	H						2.08E-07	4.99E-06	1.82E-03	9.12E-07								
Benzo(j,k)Fluorene (Fluoranthene)	H						1.60E-05	3.84E-04	1.40E-01	7.00E-05								
Benzo(k)Fluoranthene	H						3.26E-07	7.81E-06	2.85E-03	1.43E-06								
Dibenzo(a,h)Anthracene	H						1.22E-06	2.94E-05	1.07E-02	5.36E-06								
Indeno(1,2,3-CD)Pyrene	H						7.88E-07	1.89E-05	6.90E-03	3.45E-06								
Metals																		
Antimony	H		1.54E-06	3.71E-05	1.35E-02	6.76E-06												
Arsenic	H	T	1.18E-05	2.84E-04	1.04E-01	5.18E-05	8.40E-06	2.02E-04	7.36E-02	3.68E-05								
Beryllium	H	T	6.16E-07	1.48E-05	5.39E-03	2.70E-06	6.30E-06	1.51E-04	5.52E-02	2.76E-05								
Cadmium	H	T	9.50E-08	2.28E-06	8.33E-04	4.16E-07	6.30E-06	1.51E-04	5.52E-02	2.76E-05								
Chromium	H		3.75E-06	9.01E-05	3.29E-02	1.64E-05	6.30E-06	1.51E-04	5.52E-02	2.76E-05								
Chromium VI	H	T	1.96E-07	4.70E-06	1.72E-03	8.59E-07												
Cobalt	H		2.13E-06	5.12E-05	1.87E-02	9.34E-06												
Lead	H		3.17E-06	7.61E-05	2.78E-02	1.39E-05	1.89E-05	4.54E-04	1.66E-01	8.28E-05								
Manganese	H	T	1.54E-05	3.71E-04	1.35E-01	6.76E-05	1.26E-05	3.02E-04	1.10E-01	5.52E-05								
Mercury	H	T	4.95E-08	1.19E-06	4.34E-04	2.17E-07	6.30E-06	1.51E-04	5.52E-02	2.76E-05								
Nickel	H	T	4.23E-06	1.02E-04	3.70E-02	1.85E-05	6.30E-06	1.51E-04	5.52E-02	2.76E-05								
Selenium	H		2.79E-06	6.69E-05	2.44E-02	1.22E-05	3.15E-05	7.56E-04	2.76E-01	1.38E-04								
Maximum Individual HAP			1.54E-05	3.71E-04	1.35E-01	6.76E-05	2.48E-03	5.95E-02	2.17E+01	1.09E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total HAP Emissions			4.58E-05	1.10E-03	4.02E-01	2.01E-04	8.24E-03	1.98E-01	7.22E+01	3.61E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

1 - In the TPER Analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Potential Emissions

Pollutant	HAP	TAP	Ash Handling (ES-16, EP-16, 17, 18)				Wet Ash Receiving (Transfer to Shed and Hopper) (ES-1, EP-1 & EP-2)				Feed Silo (ES-4, EP-4)				STAR® Propane Firing[1] (ES-5, EP-5)			
			lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr
Criteria Pollutants																		
PM			1.99E-02	4.78E-01	1.74E+02	8.72E-02	1.42E-02	3.42E-01	8.13E+01	4.07E-02	2.83E-01	6.79E+00	2.48E+03	1.24E+00	4.64E-01	1.11E+01	4.07E+03	2.03E+00
PM10			9.42E-03	2.26E-01	8.25E+01	4.13E-02	6.73E-03	1.62E-01	3.85E+01	1.92E-02	2.60E-01	6.25E+00	2.28E+03	1.14E+00	4.64E-01	1.11E+01	4.07E+03	2.03E+00
PM2.5			1.43E-03	3.42E-02	1.25E+01	6.25E-03	1.02E-03	2.45E-02	5.82E+00	2.91E-03	1.50E-01	3.60E+00	1.31E+03	6.57E-01	4.64E-01	1.11E+01	4.07E+03	2.03E+00
CO															4.97E+00	1.19E+02	4.36E+04	2.18E+01
NOx															8.62E+00	2.07E+02	7.55E+04	3.78E+01
SO2															6.63E-03	1.59E-01	5.81E+01	2.90E-02
Lead	H		3.19E-07	7.65E-06	2.79E-03	1.40E-06	2.28E-07	5.47E-06	1.30E-03	6.51E-07	4.53E-06	1.09E-04	3.97E-02	1.98E-05				
VOC															5.30E-01	1.27E+01	4.65E+03	2.32E+00
Greenhouse Gases																		
CO2															8.32E+03	2.00E+05	7.29E+07	3.64E+04
Methane															3.97E-01	9.52E+00	3.48E+03	1.74E+00
N2O															7.94E-02	1.90E+00	6.95E+02	3.48E-01
CO2e															8.35E+03	2.00E+05	7.31E+07	3.66E+04
Inorganic, Non-metal Compounds																		
H2SO4		T																
Organic Compounds																		
1,3-Butadiene	H	T																
Acetaldehyde	H	T																
Acrolein	H	T																
Benzene	H	T																
Formaldehyde	H	T																
Toluene	H	T																
Xylene (Mixed Isomers)	H	T																
PAH/POM																		
Anthracene	H																	
Acenaphthylene	H																	
Acenaphthene	H																	
Fluorene	H																	
Pyrene	H																	
Benzo(g,h,i)Perylene	H																	
Naphthalene	H																	
Phenanthrene	H																	
Benz(a)Anthracene	H																	
Benzo(a)Phenanthrene (Chrysene)	H																	
Benzo(a)Pyrene	H	T																
Benzo(b)Fluoranthene	H																	
Benzo(j,k)Fluorene (Fluoranthene)	H																	
Benzo(k)Fluoranthene	H																	
Dibenzo(a,h)Anthracene	H																	
Indeno(1,2,3-CD)Pyrene	H																	
Metals																		
Antimony	H		1.55E-07	3.73E-06	1.36E-03	6.80E-07	1.11E-07	2.66E-06	6.34E-04	3.17E-07	2.21E-06	5.30E-05	1.93E-02	9.66E-06				
Arsenic	H	T	1.19E-06	2.85E-05	1.04E-02	5.21E-06	8.50E-07	2.04E-05	4.86E-03	2.43E-06	1.69E-05	4.05E-04	1.48E-01	7.40E-05				
Beryllium	H	T	6.19E-08	1.49E-06	5.42E-04	2.71E-07	4.43E-08	1.06E-06	2.53E-04	1.26E-07	8.80E-07	2.11E-05	7.71E-03	3.85E-06				
Cadmium	H	T	9.56E-09	2.29E-07	8.37E-05	4.19E-08	6.83E-09	1.64E-07	3.90E-05	1.95E-08	1.36E-07	3.26E-06	1.19E-03	5.95E-07				
Chromium	H		3.77E-07	9.06E-06	3.31E-03	1.65E-06	2.70E-07	6.47E-06	1.54E-03	7.71E-07	5.36E-06	1.29E-04	4.70E-02	2.35E-05				
Chromium VI	H	T	1.97E-08	4.73E-07	1.73E-04	8.63E-08	1.41E-08	3.38E-07	8.05E-05	4.03E-08	2.80E-07	6.72E-06	2.45E-03	1.23E-06				
Cobalt	H		2.14E-07	5.15E-06	1.88E-03	9.39E-07	1.53E-07	3.68E-06	8.76E-04	4.38E-07	3.05E-06	7.31E-05	2.67E-02	1.33E-05				
Lead	H		3.19E-07	7.65E-06	2.79E-03	1.40E-06	2.28E-07	5.47E-06	1.30E-03	6.51E-07	4.53E-06	1.09E-04	3.97E-02	1.98E-05				
Manganese	H	T	1.55E-06	3.73E-05	1.36E-02	6.80E-06	1.11E-06	2.66E-05	6.34E-03	3.17E-06	2.21E-05	5.29E-04	1.93E-01	9.66E-05				
Mercury	H	T	4.98E-09	1.19E-07	4.36E-05	2.18E-08	3.56E-09	8.54E-08	2.03E-05	1.02E-08	7.07E-08	1.70E-06	6.19E-04	3.10E-07				
Nickel	H	T	4.25E-07	1.02E-05	3.73E-03	1.86E-06	3.04E-07	7.30E-06	1.74E-03	8.69E-07	6.04E-06	1.45E-04	5.29E-02	2.65E-05				
Selenium	H		2.80E-07	6.72E-06	2.45E-03	1.23E-06	2.00E-07	4.81E-06	1.14E-03	5.72E-07	3.98E-06	9.55E-05	3.49E-02	1.74E-05				
Maximum Individual HAP			1.55E-06	3.73E-05	1.36E-02	6.80E-06	1.11E-06	2.66E-05	6.34E-03	3.17E-06	2.21E-05	5.29E-04	1.93E-01	9.66E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total HAP Emissions			4.61E-06	1.11E-04	4.04E-02	2.02E-05	3.29E-06	7.91E-05	1.88E-02	9.41E-06	6.55E-05	1.57E-03	5.74E-01	2.87E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00

1 - In the TPER Analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Potential Emissions

Pollutant	HAP	TAP	STAR® Ash Beneficiation (ES-5, EP-5)				STAR® Worst Case (Ash Beneficiation and Propane Firing) (ES-5, EP-5)				FGD Byproduct Silo (ES-6, EP-6)				FGD Hydrated Lime (ES-7, EP-7)			
			lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr
Criteria Pollutants																		
PM			1.61E+01	3.86E+02	1.41E+05	7.04E+01	1.61E+01	3.86E+02	1.41E+05	7.04E+01	4.50E-02	1.08E+00	3.94E+02	1.97E-01	4.50E-02	1.08E+00	3.94E+02	1.97E-01
PM10			1.48E+01	3.55E+02	1.30E+05	6.48E+01	1.48E+01	3.55E+02	1.30E+05	6.48E+01	4.14E-02	9.94E-01	3.63E+02	1.81E-01	4.14E-02	9.94E-01	3.63E+02	1.81E-01
PM2.5			8.52E+00	2.04E+02	7.46E+04	3.73E+01	8.52E+00	2.04E+02	7.46E+04	3.73E+01	2.39E-02	5.72E-01	2.09E+02	1.04E-01	2.39E-02	5.72E-01	2.09E+02	1.04E-01
CO			2.24E+01	5.38E+02	1.96E+05	9.81E+01	2.24E+01	5.38E+02	1.96E+05	9.81E+01								
NOx			4.76E+01	1.14E+03	4.17E+05	2.08E+02	4.76E+01	1.14E+03	4.17E+05	2.08E+02								
SO2			2.57E+01	6.16E+02	2.25E+05	1.12E+02	2.57E+01	6.16E+02	2.25E+05	1.12E+02								
Lead	H		1.93E-06	4.63E-05	1.69E-02	8.45E-06	1.93E-06	4.63E-05	1.69E-02	8.45E-06	5.40E-09	1.30E-07	4.73E-05	2.37E-08	5.40E-08	1.30E-06	4.73E-04	2.37E-07
VOC			2.24E+00	5.38E+01	1.96E+04	9.81E+00	2.24E+00	5.38E+01	1.96E+04	9.81E+00								
Greenhouse Gases																		
CO2			3.54E+04	8.49E+05	3.10E+08	1.55E+05	3.54E+04	8.49E+05	3.10E+08	1.55E+05								
Methane							3.97E-01	9.52E+00	3.48E+03	1.74E+00								
N2O							7.94E-02	1.90E+00	6.95E+02	3.48E-01								
CO2e			3.54E+04	8.49E+05	3.10E+08	1.55E+05	3.54E+04	8.49E+05	3.10E+08	1.55E+05								
Inorganic, Non-metal Compounds																		
H2SO4		T	1.00E-01	2.40E+00	8.76E+02	4.38E-01	1.00E-01	2.40E+00	8.76E+02	4.38E-01								
Organic Compounds																		
1,3-Butadiene	H	T																
Acetaldehyde	H	T																
Acrolein	H	T																
Benzene	H	T																
Formaldehyde	H	T																
Toluene	H	T																
Xylene (Mixed Isomers)	H	T																
PAH/POM																		
Anthracene	H																	
Acenaphthylene	H																	
Acenaphthene	H																	
Fluorene	H																	
Pyrene	H																	
Benzo(g,h,i)Perylene	H																	
Naphthalene	H																	
Phenanthrene	H																	
Benz(a)Anthracene	H																	
Benzo(a)Phenanthrene (Chrysene)	H																	
Benzo(a)Pyrene	H	T																
Benzo(b)Fluoranthene	H																	
Benzo(j,k)Fluorene (Fluoranthene)	H																	
Benzo(k)Fluoranthene	H																	
Dibenzo(a,h)Anthracene	H																	
Indeno(1,2,3-CD)Pyrene	H																	
Metals																		
Antimony	H		5.46E-07	1.31E-05	4.79E-03	2.39E-06	5.46E-07	1.31E-05	4.79E-03	2.39E-06	1.53E-09	3.67E-08	1.34E-05	6.70E-09	1.53E-08	3.67E-07	1.34E-04	6.70E-08
Arsenic	H	T	3.05E-06	7.33E-05	2.67E-02	1.34E-05	3.05E-06	7.33E-05	2.67E-02	1.34E-05	8.55E-09	2.05E-07	7.49E-05	3.74E-08	8.55E-08	2.05E-06	7.49E-04	3.74E-07
Beryllium	H	T	4.34E-07	1.04E-05	3.80E-03	1.90E-06	4.34E-07	1.04E-05	3.80E-03	1.90E-06	1.22E-09	2.92E-08	1.06E-05	5.32E-09	1.22E-08	2.92E-07	1.06E-04	5.32E-08
Cadmium	H	T	6.59E-07	1.58E-05	5.77E-03	2.89E-06	6.59E-07	1.58E-05	5.77E-03	2.89E-06	1.85E-09	4.43E-08	1.62E-05	8.08E-09	1.85E-08	4.43E-07	1.62E-04	8.08E-08
Chromium	H		1.22E-05	2.93E-04	1.07E-01	5.35E-05	1.22E-05	2.93E-04	1.07E-01	5.35E-05	3.42E-08	8.21E-07	3.00E-04	1.50E-07	3.42E-07	8.21E-06	3.00E-03	1.50E-06
Chromium VI	H	T																
Cobalt	H		3.21E-06	7.71E-05	2.82E-02	1.41E-05	3.21E-06	7.71E-05	2.82E-02	1.41E-05	9.00E-09	2.16E-07	7.88E-05	3.94E-08	9.00E-08	2.16E-06	7.88E-04	3.94E-07
Lead	H		1.93E-06	4.63E-05	1.69E-02	8.45E-06	1.93E-06	4.63E-05	1.69E-02	8.45E-06	5.40E-09	1.30E-07	4.73E-05	2.37E-08	5.40E-08	1.30E-06	4.73E-04	2.37E-07
Manganese	H	T	8.52E-05	2.04E-03	7.46E-01	3.73E-04	8.52E-05	2.04E-03	7.46E-01	3.73E-04	2.39E-07	5.72E-06	2.09E-03	1.04E-06	2.39E-06	5.72E-05	2.09E-02	1.04E-05
Mercury	H	T	1.61E-08	3.86E-07	1.41E-04	7.04E-08	1.61E-08	3.86E-07	1.41E-04	7.04E-08	4.50E-11	1.08E-09	3.94E-07	1.97E-10	4.50E-10	1.08E-08	3.94E-06	1.97E-09
Nickel	H	T	7.71E-06	1.85E-04	6.76E-02	3.38E-05	7.71E-06	1.85E-04	6.76E-02	3.38E-05	2.16E-08	5.18E-07	1.89E-04	9.46E-08	2.16E-07	5.18E-06	1.89E-03	9.46E-07
Selenium	H		2.09E-06	5.01E-05	1.83E-02	9.15E-06	2.09E-06	5.01E-05	1.83E-02	9.15E-06	5.85E-09	1.40E-07	5.12E-05	2.56E-08	5.85E-08	1.40E-06	5.12E-04	2.56E-07
Maximum Individual HAP			8.52E-05	2.04E-03	7.46E-01	3.73E-04	8.52E-05	2.04E-03	7.46E-01	3.73E-04	2.39E-07	5.72E-06	2.09E-03	1.04E-06	2.39E-06	5.72E-05	2.09E-02	1.04E-05
Total HAP Emissions			1.17E-04	2.81E-03	1.03E+00	5.13E-04	1.17E-04	2.81E-03	1.03E+00	5.13E-04	3.28E-07	7.87E-06	2.87E-03	1.44E-06	3.28E-06	7.87E-05	2.87E-02	1.44E-05

1 - In the TPER Analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Potential Emissions

Pollutant	HAP	TAP	EHE - External Heat Exchanger A (ES-8, EP-8)				EHE - External Heat Exchanger B (ES-9, EP-9)				EHE Silo (ES-10, EP-10)				Product Storage Dome (ES-11, EP-11)			
			lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr
Criteria Pollutants																		
PM			6.86E+00	1.65E+02	6.01E+04	3.00E+01	6.86E+00	1.65E+02	6.01E+04	3.00E+01	1.11E+00	2.67E+01	9.76E+03	4.88E+00	2.57E-01	6.17E+00	2.25E+03	1.13E+00
PM10			6.31E+00	1.51E+02	5.53E+04	2.76E+01	6.31E+00	1.51E+02	5.53E+04	2.76E+01	1.03E+00	2.46E+01	8.98E+03	4.49E+00	2.37E-01	5.68E+00	2.07E+03	1.04E+00
PM2.5			3.63E+00	8.72E+01	3.18E+04	1.59E+01	3.63E+00	8.72E+01	3.18E+04	1.59E+01	5.91E-01	1.42E+01	5.17E+03	2.59E+00	1.36E-01	3.27E+00	1.19E+03	5.97E-01
CO																		
NOx																		
SO2																		
Lead	H		1.10E-04	2.63E-03	9.62E-01	4.81E-04	1.10E-04	2.63E-03	9.62E-01	4.81E-04	1.78E-05	4.28E-04	1.56E-01	7.81E-05	4.12E-06	9.88E-05	3.61E-02	1.80E-05
VOC																		
Greenhouse Gases																		
CO2																		
Methane																		
N2O																		
CO2e																		
Inorganic, Non-metal Compounds																		
H2SO4		T																
Organic Compounds																		
1,3-Butadiene	H	T																
Acetaldehyde	H	T																
Acrolein	H	T																
Benzene	H	T																
Formaldehyde	H	T																
Toluene	H	T																
Xylene (Mixed Isomers)	H	T																
PAH/POM																		
Anthracene	H																	
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Acenaphthene	H																	
Fluorene	H																	
Pyrene	H																	
Benzo(g,h,i)Perylene	H																	
Naphthalene	H																	
Phenanthrene	H																	
Benz(a)Anthracene	H																	
Benzo(a)Phenanthrene (Chrysene)	H																	
Benzo(a)Pyrene	H	T																
Benzo(b)Fluoranthene	H																	
Benzo(j,k)Fluorene (Fluoranthene)	H																	
Benzo(k)Fluoranthene	H																	
Dibenzo(a,h)Anthracene	H																	
Indeno(1,2,3-CD)Pyrene	H																	
Metals																		
Antimony	H		5.35E-05	1.28E-03	4.69E-01	2.34E-04	5.35E-05	1.28E-03	4.69E-01	2.34E-04	8.69E-06	2.09E-04	7.61E-02	3.81E-05	2.01E-06	4.81E-05	1.76E-02	8.79E-06
Arsenic	H	T	4.09E-04	9.83E-03	3.59E+00	1.79E-03	4.09E-04	9.83E-03	3.59E+00	1.79E-03	6.65E-05	1.60E-03	5.83E-01	2.91E-04	1.54E-05	3.68E-04	1.35E-01	6.73E-05
Beryllium	H	T	2.13E-05	5.12E-04	1.87E-01	9.34E-05	2.13E-05	5.12E-04	1.87E-01	9.34E-05	3.47E-06	8.32E-05	3.04E-02	1.52E-05	8.00E-07	1.92E-05	7.01E-03	3.50E-06
Cadmium	H	T	3.29E-06	7.90E-05	2.88E-02	1.44E-05	3.29E-06	7.90E-05	2.88E-02	1.44E-05	5.35E-07	1.28E-05	4.69E-03	2.34E-06	1.23E-07	2.96E-06	1.08E-03	5.41E-07
Chromium	H		1.30E-04	3.12E-03	1.14E+00	5.69E-04	1.30E-04	3.12E-03	1.14E+00	5.69E-04	2.11E-05	5.07E-04	1.85E-01	9.25E-05	4.87E-06	1.17E-04	4.27E-02	2.13E-05
Chromium VI	H	T	6.79E-06	1.63E-04	5.95E-02	2.97E-05	6.79E-06	1.63E-04	5.95E-02	2.97E-05	1.10E-06	2.65E-05	9.66E-03	4.83E-06	2.55E-07	6.11E-06	2.23E-03	1.12E-06
Cobalt	H		7.39E-05	1.77E-03	6.47E-01	3.23E-04	7.39E-05	1.77E-03	6.47E-01	3.23E-04	1.20E-05	2.88E-04	1.05E-01	5.26E-05	2.77E-06	6.65E-05	2.43E-02	1.21E-05
Lead	H		1.10E-04	2.63E-03	9.62E-01	4.81E-04	1.10E-04	2.63E-03	9.62E-01	4.81E-04	1.78E-05	4.28E-04	1.56E-01	7.81E-05	4.12E-06	9.88E-05	3.61E-02	1.80E-05
Manganese	H	T	5.35E-04	1.28E-02	4.68E+00	2.34E-03	5.35E-04	1.28E-02	4.68E+00	2.34E-03	8.69E-05	2.09E-03	7.61E-01	3.81E-04	2.01E-05	4.81E-04	1.76E-01	8.78E-05
Mercury	H	T	1.71E-06	4.11E-05	1.50E-02	7.51E-06	1.71E-06	4.11E-05	1.50E-02	7.51E-06	2.79E-07	6.69E-06	2.44E-03	1.22E-06	6.43E-08	1.54E-06	5.63E-04	2.82E-07
Nickel	H	T	1.46E-04	3.52E-03	1.28E+00	6.42E-04	1.46E-04	3.52E-03	1.28E+00	6.42E-04	2.38E-05	5.71E-04	2.08E-01	1.04E-04	5.49E-06	1.32E-04	4.81E-02	2.41E-05
Selenium	H		9.65E-05	2.32E-03	8.45E-01	4.23E-04	9.65E-05	2.32E-03	8.45E-01	4.23E-04	1.57E-05	3.76E-04	1.37E-01	6.87E-05	3.62E-06	8.68E-05	3.17E-02	1.58E-05
Maximum Individual HAP			5.35E-04	1.28E-02	4.68E+00	2.34E-03	5.35E-04	1.28E-02	4.68E+00	2.34E-03	8.69E-05	2.09E-03	7.61E-01	3.81E-04	2.01E-05	4.81E-04	1.76E-01	8.78E-05
Total HAP Emissions			1.59E-03	3.81E-02	1.39E+01	6.95E-03	1.59E-03	3.81E-02	1.39E+01	6.95E-03	2.58E-04	6.19E-03	2.26E+00	1.13E-03	5.95E-05	1.43E-03	5.21E-01	2.61E-04

1 - In the TPER Analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Potential Emissions

Pollutant	HAP	TAP	Loadout Silo (ES-12, EP-12)				Loadout Silo Spouts (ES-12, EP-13 &14)				Facility Total			
			lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr	lb/hr	lb/day	lb/yr	ton/yr
Criteria Pollutants														
PM			2.57E-01	6.17E+00	2.25E+03	1.13E+00	3.66E-03	8.79E-02	1.95E+01	9.76E-03	**32.9**	**789**	**288,105**	**144**
PM10			2.37E-01	5.68E+00	2.07E+03	1.04E+00	1.73E-03	4.16E-02	9.24E+00	4.62E-03	**29.8**	**715**	**261,083**	**131**
PM2.5			1.36E-01	3.27E+00	1.19E+03	5.97E-01	1.73E-03	4.16E-02	9.24E+00	4.62E-03	**17.1**	**411**	**150,156**	**75.1**
CO											**25.6**	**615**	**224,379**	**112.2**
NOx											**50.6**	**1,215**	**443,442**	**222**
SO2											**25.68**	**616**	**224,981**	**112.49**
Lead	H		4.12E-06	9.88E-05	3.61E-02	1.80E-05	4.12E-06	9.88E-05	3.61E-02	1.80E-05	**2.91E-04**	**6.99E-03**	**2.55E+00**	**1.28E-03**
VOC											**3.22**	**77.4**	**28,234**	**14.1**
Greenhouse Gases														
CO2											**35,813**	**859,521**	**313,725,181**	**156,863**
Methane											**4.15E-01**	**9.96**	**3,635**	**1.82**
N2O											**8.30E-02**	**1.99**	**727**	**3.63E-01**
CO2e											**35,815**	**859,558**	**313,738,596**	**156,869**
Inorganic, Non-metal Compounds														
H2SO4		T									**1.00E-01**	**2.40E+00**	**8.76E+02**	**4.38E-01**
Organic Compounds														
1,3-Butadiene	H	T									**1.07E-04**	**2.57E-03**	**9.37E-01**	**4.69E-04**
Acetaldehyde	H	T									**2.10E-03**	**5.04E-02**	**1.84E+01**	**9.19E-03**
Acrolein	H	T									**2.53E-04**	**6.08E-03**	**2.22E+00**	**1.11E-03**
Benzene	H	T									**2.55E-03**	**6.13E-02**	**2.24E+01**	**1.12E-02**
Formaldehyde	H	T									**3.23E-03**	**7.75E-02**	**2.83E+01**	**1.41E-02**
Toluene	H	T									**1.12E-03**	**2.69E-02**	**9.81E+00**	**4.90E-03**
Xylene (Mixed Isomers)	H	T									**7.80E-04**	**1.87E-02**	**6.83E+00**	**3.42E-03**
PAH/POM														
Anthracene	H										**5.12E-06**	**1.23E-04**	**4.48E-02**	**2.24E-05**
Acenaphthylene	H										**1.38E-05**	**3.32E-04**	**1.21E-01**	**6.07E-05**
Acenaphthene	H										**3.89E-06**	**9.33E-05**	**3.40E-02**	**1.70E-05**
Fluorene	H										**7.99E-05**	**1.92E-03**	**7.00E-01**	**3.50E-04**
Pyrene	H										**1.31E-05**	**3.14E-04**	**1.15E-01**	**5.73E-05**
Benzo(g,h,i)Perylene	H										**1.34E-06**	**3.21E-05**	**1.17E-02**	**5.86E-06**
Naphthalene	H										**2.32E-04**	**5.57E-03**	**2.03E+00**	**1.02E-03**
Phenanthrene	H										**8.05E-05**	**1.93E-03**	**7.05E-01**	**3.52E-04**
Benz(a)Anthracene	H										**4.60E-06**	**1.10E-04**	**4.03E-02**	**2.01E-05**
Benzo(a)Phenanthrene (Chrysene)	H										**9.66E-07**	**2.32E-05**	**8.46E-03**	**4.23E-06**
Benzo(a)Pyrene	H	T									**5.15E-07**	**1.23E-05**	**4.51E-03**	**2.25E-06**
Benzo(b)Fluoranthene	H										**2.71E-07**	**6.51E-06**	**2.38E-03**	**1.19E-06**
Benzo(j,k)Fluorene (Fluoranthene)	H										**2.08E-05**	**5.00E-04**	**1.82E-01**	**9.12E-05**
Benzo(k)Fluoranthene	H										**4.24E-07**	**1.02E-05**	**3.72E-03**	**1.86E-06**
Dibenzo(a,h)Anthracene	H										**1.60E-06**	**3.83E-05**	**1.40E-02**	**6.99E-06**
Indeno(1,2,3-CD)Pyrene	H										**1.03E-06**	**2.46E-05**	**8.99E-03**	**4.50E-06**
Metals														
Antimony	H		2.01E-06	4.81E-05	1.76E-02	8.79E-06	2.01E-06	4.81E-05	1.76E-02	8.79E-06	**1.29E-04**	**3.11E-03**	**1.13E+00**	**5.67E-04**
Arsenic	H	T	1.54E-05	3.68E-04	1.35E-01	6.73E-05	1.54E-05	3.68E-04	1.35E-01	6.73E-05	**1.00E-03**	**2.40E-02**	**8.76E+00**	**4.38E-03**
Beryllium	H	T	8.00E-07	1.92E-05	7.01E-03	3.50E-06	8.00E-07	1.92E-05	7.01E-03	3.50E-06	**6.01E-05**	**1.44E-03**	**5.26E-01**	**2.63E-04**
Cadmium	H	T	1.23E-07	2.96E-06	1.08E-03	5.41E-07	1.23E-07	2.96E-06	1.08E-03	5.41E-07	**1.68E-05**	**4.04E-04**	**1.47E-01**	**7.37E-05**
Chromium	H		4.87E-06	1.17E-04	4.27E-02	2.13E-05	4.87E-06	1.17E-04	4.27E-02	2.13E-05	**3.34E-04**	**8.02E-03**	**2.92E+00**	**1.46E-03**
Chromium VI	H	T	2.55E-07	6.11E-06	2.23E-03	1.12E-06	2.55E-07	6.11E-06	2.23E-03	1.12E-06	**1.64E-05**	**3.93E-04**	**1.43E-01**	**7.16E-05**
Cobalt	H		2.77E-06	6.65E-05	2.43E-02	1.21E-05	2.77E-06	6.65E-05	2.43E-02	1.21E-05	**1.81E-04**	**4.35E-03**	**1.59E+00**	**7.94E-04**
Lead	H		4.12E-06	9.88E-05	3.61E-02	1.80E-05	4.12E-06	9.88E-05	3.61E-02	1.80E-05	**2.91E-04**	**6.99E-03**	**2.55E+00**	**1.28E-03**
Manganese	H	T	2.01E-05	4.81E-04	1.76E-01	8.78E-05	2.01E-05	4.81E-04	1.76E-01	8.78E-05	**1.39E-03**	**3.34E-02**	**1.22E+01**	**6.10E-03**
Mercury	H	T	6.43E-08	1.54E-06	5.63E-04	2.82E-07	6.43E-08	1.54E-06	5.63E-04	2.82E-07	**1.24E-05**	**2.97E-04**	**1.08E-01**	**5.41E-05**
Nickel	H	T	5.49E-06	1.32E-04	4.81E-02	2.41E-05	5.49E-06	1.32E-04	4.81E-02	2.41E-05	**3.69E-04**	**8.86E-03**	**3.23E+00**	**1.62E-03**
Selenium	H		3.62E-06	8.68E-05	3.17E-02	1.58E-05	3.62E-06	8.68E-05	3.17E-02	1.58E-05	**2.76E-04**	**6.62E-03**	**2.41E+00**	**1.21E-03**
Maximum Individual HAP			2.01E-05	4.81E-04	1.76E-01	8.78E-05	2.01E-05	4.81E-04	1.76E-01	8.78E-05	***3.23E-03***	***7.75E-02***	***2.83E+01***	***1.41E-02***
Total HAP Emissions			5.95E-05	1.43E-03	5.21E-01	2.61E-04	5.95E-05	1.43E-03	5.21E-01	2.61E-04	***1.47E-02***	***3.52E-01***	***1.29E+02***	***6.43E-02***

1 - In the TPER Analysis, chromium emissions from fuel firing are classified as soluble chromate compounds, as chromium (VI) equivalent.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Criteria Pollutant Potential Emissions

Pollutant	Total Emissions (tpy)	Exceeds 250 tpy?
PM	144	No
PM10	131	No
PM2.5	75	No
SO2	112	No
NOx	222	No
CO	112	No
VOC	14.1	No
Lead	1.28E-03	No
Sulfuric Acid Mist	4.38E-01	No
CO2e[1]	156,869	NA[1]

1 - Per the June 23, 2014 Supreme Court decision in Utility Air Regulatory Group v. EPA, EPA may not treat GHGs as an air pollutant for the specific purpose of determining whether a source is required to obtain a PSD permit.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Facility-Wide Throughputs

Global

8,760	hr/yr, Potential Operating Hours per Year
4.85	mph, Average 2013-2017 wind speed (IGX Chapel Hill)

Ash

429,000	ton/yr, Excavated Ash
15%	Ash Moisture Content (conservative estimate)

Wet Ash Transfer to Shed and Hopper

70	ton/hr
400,000	ton/yr

Feed Silo Bin Vent

125	ton/hr, filling rate
75	ton/hr, unloading rate
400,000	ton/yr
6,600	scfm, air flow rate
0.005	gr/scf, emission loading rate*

STAR Reactor (Exhaust Stack)

140	MMBtu/hr, max heat input
14,500	Btu/lb, heating value of carbon
3.76%	loss on ignition (LOI), min value for conservative overestimate of emissions.
0.10%	feed ash sulfur content, average (0.05%) multiplied by a safety factor of 2.
75,000	acfm, gas flow rate
0.025	gr/acf, emission loading rate

STAR Propane Start-Up Burner

60	MMBtu/hr, max heat input
90,500	Btu/gal, heating value of propane
0.10	gr/100 scf, sulfur content of propane

FGD Byproduct and Hydrated Lime Silos Bin Vents

1,050	acfm, air flow rate
0.005	gr/scf, emission loading rate

EHE A and B Dust Collectors

32,000	scfm, air flow rate, per dust collector
0.025	gr/scf, emission loading rate

EHE Silo Bin Vent

6,500	acfm, air flow rate
0.025	gr/scf, emission loading rate*

Product Storage Dome

6,000	scfm, air flow rate
0.005	gr/scf, emission loading rate*

Loadout Silo Bin Vent

75	ton/hr
400,000	ton/yr
6,000	scfm, air flow rate
0.005	gr/scf, emission loading rate*

Screener Diesel Engine

8,760	Hours of Operation
165	Tons per hour throughput
91	hp, Engine Output
640,000	btu/hr, Max Heat Input

Crusher Diesel Engine

8,760	Hours of Operation
165	Tons per hour throughput
300	hp, Engine Output
2,100,000	btu/hr, Max Heat Input

**Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.*

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Ash Basin

Source ID: ES-15
Emission Point ID: EP-15

Dust may be generated by wind erosion of exposed area within an industrial facility. Section 13.2.5 of the U.S. EPA's AP-42 document was used to estimate emissions.

The first step is to calculate a height-to-base ratio to determine if Equation (4) can be used to determine the friction velocity (u*):

174	acres, Total Area of Ash Basin
4,046.9	m^2/acre, Conversion Factor
704,155.4	m^2, Typical Active Area

Assuming a square area, this active area yields an approximate length as follows:

839.1	m, Linear Dimension of Active Area
3.3	ft/m, Conversion Factor
2753.1	ft, Linear Dimension of Active Area

15	ft, Approximate Mean Elevation of the Active Area (Above Grade)

Per page 13.2.5-5 of AP-42, if the height to base ratio is less than 0.2 then Equation (4) can be used to calculate the friction velocity (u*).

0.005	Calculated Height to Base Ratio

Therefore equation (4) from AP-42 13.2.5 can be used for calculation of the friction velocity.

Per the following website: http://www.nc-climate.ncsu.edu (maintained by the North Carolina State Climate Office), the anemometer height for the fastest mile data is:

10	m, Anemometer Height

Since the reported fastest wind speeds are from an anemometer of height 10 m, using equation (5) on page 13.2.5-6 is not necessary:

When the calculated friction velocity (u*) exceeds the threshold friction velocity (u_t*), emissions from wind erosion occur. As shown in Equation 3 of AP-42, if $u^* \leq u_t^*$, emissions are zero.

From Table 13.2.5-2 threshold friction velocity (ut*) is as follows. The most conservative value presented in AP-42 has been used.

0.43	m/s, u_t* Threshold Friction Velocity

Therefore, in order to generate emissions, the following wind speed must be exceeded.

3,600	sec/hr, Conversion Factor
1,609.3	m/mile, Conversion Factor

18.15	mph, u_{10}^+
8.11	m/s, u_{10}^+
0.43	m/s, u*

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Ash Basin

AERMOD allows users to account for the variability of wind speed when determining offsite impacts. The scalars below are used based on the respective wind speed range. (AERMOD User Guide 3.3.4. Using Variable Emission Rates). There are zero wind based emissions in classes 1 thru 4 because the threshold friction velocity is not exceeded (ut*). The scalar for Class 5 is determined as the ratio of emission factors for Class 5 and Class 6. Emission factor derivation follows.

Wind Speed Range Class	1	2	3	4	5	6
Scalar	0	0	0	0	0.11	1.00

where:

Class 1 = 0 - 3.4 mph
Class 2 = 3.4 - 6.8 mph
Class 3 = 6.8 - 11.3 mph
Class 4 = 11.3 - 18.1 mph
Class 5 = 18.1 - 23.8 mph
Class 6 = greater than 23.8 mph

The emissions rate (which is dependent on the friction velocity (u*)) varies linearly with wind speed. For Class 5, emissions will increase linearly as wind speed increases. AERMOD does not facilitate the variable emission rates based on wind speed. Therefore, the friction velocity for Class 5 is determined using the upper end wind speed of 23.8 mph. Using Equation (4) on page 13.2.5-5, the equivalent friction velocity (u*) may be calculated.

$$u^* = 0.053 u_{10}^+$$

	23.8	mph, u_{10}^+
	10.64	m/s, u_{10}^+
Class 5	0.56	m/s, u*, Class 5 Wind Speed Range

The friction velocity for Class 6 is determined using the average of the maximum daily wind gusts for each month.

	46.00	mph, u_{10}^+	Maximum daily wind gust for IGX April 2014-April 2018. Taken from http://www.nc-climate.ncsu.edu
	20.56	m/s, u_{10}^+	.
Class 6	1.09	m/s, u*, Class 6 Wind Speed Range	

Emission factors for Class 5 and Class 6 are determined using AP-42 Section 13.2.5 Equation (3) which is shown below:

$$PM\left(\frac{g}{m^2}\right) = 58\,(u^* - u_t^*)^2 + 25\,(u^* - u_t^*)$$

Equation (3) from AP-42 13.2.5

Where: u* is the friction velocity (m/s)
u^*_t is the threshold friction velocity (m/s)

Class 5	4.39	g/m^2 (of Disturbed Area), Class 5 Wind Speed Range
Class 6	41.75	g/m^2 (of Disturbed Area), Class 6 Wind Speed Range

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Ash Basin

As stated in AP-42, on page 13.2.5-2, emissions generated by wind erosion are also dependent on the frequency of disturbance of the erodible surface because each time that a surface is disturbed, its erosion potential is restored. A disturbance is defined as an action that results in the exposure of fresh surface material. Only a fraction of the active area is disturbed each day. This disturbed area is used to calculate the potential daily emission rate.

10	acres, Working Area	
6%	Fraction of Active Area Disturbed Daily	
40,468.70	m^2, Average Area Disturbed Daily	
		94% Fraction of Inactive Area
		663,686.68 m^2, Average Inactive Area
453.6	g/lb, Conversion Factor	
		453.6 g/lb, Conversion Factor
Class 5 391.4	lb/day	*Class 5* 6419.2 lb/day
Class 6 3725.1	lb/day	*Class 6* 61091.0 lb/day

The facility will implement mitigation to suppress dust emissions. Control efficiencies are based on engineering judgment and supported by *WRAP Fugitive Dust Handbook, September 7, 2006.* The controlled emission rates for Class 5 and Class 6 emissions are as follows:

61%	Apply Water every 3.2 hours to disturbed areas	80% Inherent Moisture and Watering
*Class 5*** 152.7	lb/day	*Class 5* 1283.8 lb/day
*Class 6*** 1452.8	lb/day	*Class 6* 12218.2 lb/day

For the purposes of determining potential emissions for permitting, wind data has been applied as shown below.

Total Class 5 Emissions	1436.5	lb/day
Total Class 6 Emissions	13671.0	lb/day
Fraction of time in Class 5	0.0008	(approximately 7 hours in Class 5)
Fraction of time in Class 6	0.0000	(0 hours in Class 6)

Time fraction spent in Class 5 and Class 6 determined by analyzing hourly wind speeds for the 5 year period required to be modeled 2013-2017 from DAQ Approved Met Data. The worst case year (year with the most hours) was used to determine the time fraction. For Class 5 it was 2015. No Class 6 hours were identified.

Total emissions per day 1.15 lb/day

Emissions from the ash pond will only occur when Class 5 and Class 6 wind speed conditions are met. AERMOD will utilize meteorological data to determine when these conditions occur. For the purposes of the PSD analysis, permitting, and TPER evaluation, it is conservatively assumed that Class 6 condition occur year round.

Compound	Avg Ash Analysis (ppm)	Emissions lb/hr	Emissions lb/day	Emissions lb/year	Emissions tons/year
PM	1.00 **	4.78E-02	1.15	418.98	2.09E-01
PM10	0.50 **	2.39E-02	5.74E-01	209.49	1.05E-01
PM2.5	0.08 **	3.59E-03	8.61E-02	31.42	1.57E-02
Lead	16.01	7.66E-07	1.84E-05	6.71E-03	3.35E-06
Arsenic	59.71	2.86E-06	6.85E-05	2.50E-02	1.25E-05
Antimony	7.80	3.73E-07	8.95E-06	3.27E-03	1.63E-06
Beryllium	3.11	1.49E-07	3.57E-06	1.30E-03	6.52E-07
Cadmium	0.48	2.30E-08	5.51E-07	2.01E-04	1.01E-07
Chromium	18.95	9.06E-07	2.18E-05	7.94E-03	3.97E-06
Chromium VI	0.99	4.74E-08	1.14E-06	4.15E-04	2.07E-07
Cobalt	10.77	5.15E-07	1.24E-05	4.51E-03	2.26E-06
Manganese	77.99	3.73E-06	8.95E-05	3.27E-02	1.63E-05
Mercury	0.25	1.20E-08	2.87E-07	1.05E-04	5.24E-08
Nickel	21.36	1.02E-06	2.45E-05	8.95E-03	4.47E-06
Selenium	14.07	6.73E-07	1.62E-05	5.90E-03	2.95E-06

HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

** PM distribution factors (k value) taken from AP-42 Page 13.2.5-3 All other values in ppm.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Ash Handling

Source ID: ES-16
Emission Point ID: EP-16, 17, 18

Section 13.2.4 (Aggregate Handling and Storage Piles) of U.S. EPA's AP-42 document is used to estimate emissions from the handling of material at an industrial site. The "Drop Equation" is shown below:

$$E = k\,(0.0032)\frac{(U/5)^{1.3}}{(M/2)^{1.4}}$$

Where:
E is the emission factor in [lb/ton]
K is the particle size multiplier [dimensionless]
U is the average wind speed [mph]
M is the average moisture content [%]

Constant	$PM_{2.5}$	PM_{10}	PM
k	0.053	0.35	0.74

Wind data from IGX Chapel Hill Airport, 2013-2017

4.85	mph, Average Wind Speed
15	%, Moisture

Expected ash moisture: 20% +/- 5%
Expected Drop Points

Drop Point 1 (EP-16) Ash is excavated from it's respective basin and placed in windrows in that basin
Drop Point 2 (EP-17) Windrowed ash is loaded into screener / crusher within it's respective basin
Drop Point 3 (EP-18) Screened and crushed ash is placed in stockpile within it's respective basin

The HAP and TAP emissions are derived from the PM estimate based on the average trace element analysis:
Emissions are calculated assuming a maximum throughput of ash:

429,000	ton/yr, Potential Ash Throughput
3	Number of Drop Points

Ash Trace Element Analysis	Average Ash Concentration (ppm)	Emission Factor (lb/ton)	Emissions			
			lbs/hr	lbs/day	lbs/year	tons/year
PM	--	1.36E-04	1.99E-02	4.78E-01	1.74E+02	8.72E-02
PM10	--	6.41E-05	9.42E-03	2.26E-01	8.25E+01	4.13E-02
PM2.5	--	9.71E-06	1.43E-03	3.42E-02	1.25E+01	6.25E-03
Antimony	7.80	1.06E-09	1.55E-07	3.73E-06	1.36E-03	6.80E-07
Arsenic	59.71	8.09E-09	1.19E-06	2.85E-05	1.04E-02	5.21E-06
Beryllium	3.11	4.22E-10	6.19E-08	1.49E-06	5.42E-04	2.71E-07
Cadmium	0.48	6.51E-11	9.56E-09	2.29E-07	8.37E-05	4.19E-08
Chromium	18.95	2.57E-09	3.77E-07	9.06E-06	3.31E-03	1.65E-06
Chromium VI	0.99	1.34E-10	1.97E-08	4.73E-07	1.73E-04	8.63E-08
Cobalt	10.77	1.46E-09	2.14E-07	5.15E-06	1.88E-03	9.39E-07
Lead	16.01	2.17E-09	3.19E-07	7.65E-06	2.79E-03	1.40E-06
Manganese	77.99	1.06E-08	1.55E-06	3.73E-05	1.36E-02	6.80E-06
Mercury	0.25	3.39E-11	4.98E-09	1.19E-07	4.36E-05	2.18E-08
Nickel	21.36	2.90E-09	4.25E-07	1.02E-05	3.73E-03	1.86E-06
Selenium	14.07	1.91E-09	2.80E-07	6.72E-06	2.45E-03	1.23E-06

Note: HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Unloading Pile

Source ID: ES-3
Emission Point ID: EP-3

Dust may be generated by wind erosion of exposed area within an industrial facility. Section 13.2.5 of the U.S. EPA's AP-42 document was used to estimate emissions.

The first step is to calculate a height-to-base ratio to determine if Equation (4) can be used to determine the friction velocity (u*):

0.33	acres, Total Area of Unloading Pile
4,046.9	m^2/acre, Conversion Factor
1,335.5	m^2, Typical Active Area

Assuming a square area, this active area yields an approximate length as follows:

36.5	m, Linear Dimension of Active Area
3.3	ft/m, Conversion Factor
119.9	ft, Linear Dimension of Active Area

4	ft, Approximate Mean Elevation of the Active Area (Above Grade)

Per page 13.2.5-5 of AP-42, if the height to base ratio is less than 0.2 then Equation (4) can be used to calculate the friction velocity (u*).

0.033	Calculated Height to Base Ratio

Therefore equation (4) from AP-42 13.2.5 can be used for calculation of the friction velocity.

Per the following website: http://www.nc-climate.ncsu.edu (maintained by the North Carolina State Climate Office), the anemometer height for the fastest mile data is:

10	m, Anemometer Height

Since the reported fastest wind speeds are from an anemometer of height 10 m, using equation (5) on page 13.2.5-6 is not necessary:

When the calculated friction velocity (u*) exceeds the threshold friction velocity (u_t*), emissions from wind erosion occur. As shown in Equation 3 of AP-42, if $u^* \leq u_t^*$, emissions are zero.

From Table 13.2.5-2 threshold friction velocity (ut*) is as follows. The most conservative value presented in AP-42 has been used.

0.43	m/s, u_t* Threshold Friction Velocity

Therefore, in order to generate emissions, the following wind speed must be exceeded.

3,600	sec/hr, Conversion Factor
1,609.3	m/mile, Conversion Factor

18.15	mph, u_{10}^+
8.11	m/s, u_{10}^+
0.43	m/s, u*

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Unloading Pile

AERMOD allows users to account for the variability of wind speed when determining offsite impacts. The scalars below are used based on the respective wind speed range. (AERMOD User Guide 3.3.4. Using Variable Emission Rates). There are zero wind based emissions in classes 1 thru 4 because the threshold friction velocity is not exceeded (ut*). The scalar for Class 5 is determined as the ratio of emission factors for Class 5 and Class 6. Emission factor derivation follows.

Wind Speed Range Class	1	2	3	4	5	6
Scalar	0	0	0	0	0.11	1.00

where:

Class 1 = 0 - 3.4 mph
Class 2 = 3.4 - 6.8 mph
Class 3 = 6.8 - 11.3 mph
Class 4 = 11.3 - 18.1 mph
Class 5 = 18.1 - 23.8 mph
Class 6 = greater than 23.8 mph

The emissions rate (which is dependent on the friction velocity (u*)) varies linearly with wind speed. For Class 5, emissions will increase linearly as wind speed increases. AERMOD does not facilitate the variable emission rates based on wind speed. Therefore, the friction velocity for Class 5 is determined using the upper end wind speed of 23.8 mph. Using Equation (4) on page 13.2.5-5, the equivalent friction velocity (u*) may be calculated.

$$u^* = 0.053 u_{10}^+$$

	23.8	mph, u_{10}^+
	10.64	m/s, u_{10}^+
Class 5	0.56	m/s, u*, Class 5 Wind Speed Range

The friction velocity for Class 6 is determined using the average of the maximum daily wind gusts for each month.

	46.00	mph, u_{10}^+	Maximum daily wind gust for IGX April 2014-April 2018. Taken from http://www.nc-climate.ncsu.edu
	20.56	m/s, u_{10}^+	.
Class 6	1.09	m/s, u*, Class 6 Wind Speed Range	

Emission factors for Class 5 and Class 6 are determined using AP-42 Section 13.2.5 Equation (3) which is shown below:

$$PM\left(\frac{g}{m^2}\right) = 58\,(u^* - u_t^*)^2 + 25\,(u^* - u_t^*)$$

Equation (3) from AP-42 13.2.5

Where: u* is the friction velocity (m/s)
u^*_t is the threshold friction velocity (m/s)

Class 5	4.39	g/m^2 (of Disturbed Area), Class 5 Wind Speed Range
Class 6	41.75	g/m^2 (of Disturbed Area), Class 6 Wind Speed Range

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Unloading Pile

As stated in AP-42, on page 13.2.5-2, emissions generated by wind erosion are also dependent on the frequency of disturbance of the erodible surface because each time that a surface is disturbed, its erosion potential is restored. A disturbance is defined as an action that results in the exposure of fresh surface material. Only a fraction of the active area is disturbed each day. This disturbed area is used to calculate the potential daily emission rate.

0.33	acres, Working Area	
100%	Fraction of Active Area Disturbed Daily	
1,335.47	m^2, Average Area Disturbed Daily	
		0% Fraction of Inactive Area
		0.00 m^2, Average Inactive Area
453.6	g/lb, Conversion Factor	
		453.6 g/lb, Conversion Factor
Class 5 12.9	lb/day	*Class 5* 0.0 lb/day
Class 6 122.9	lb/day	*Class 6* 0.0 lb/day

The facility will implement mitigation to suppress dust emissions. Control efficiencies are based on engineering judgment and supported by *WRAP Fugitive Dust Handbook, September 7, 2006.* The controlled emission rates for Class 5 and Class 6 emissions are as follows:

61%	Apply Water every 3.2 hours to disturbed areas	80% Inherent Moisture and Watering
*Class 5*** 5.0	lb/day	*Class 5* 0.0 lb/day
*Class 6*** 47.9	lb/day	*Class 6* 0.0 lb/day

For the purposes of determining potential emissions for permitting, wind data has been applied as shown below.

Total Class 5 Emissions	5.0	lb/day
Total Class 6 Emissions	47.9	lb/day
Fraction of time in Class 5	0.0008	(approximately 7 hours in Class 5)
Fraction of time in Class 6	0.0000	(0 hours in Class 6)

Time fraction spent in Class 5 and Class 6 determined by analyzing hourly wind speeds for the 5 year period required to be modeled 2013-2017 from DAQ Approved Met Data. The worst case year (year with the most hours) was used to determine the time fraction. For Class 5 it was 2015. No Class 6 hours were identified.

Total emissions per day 4.03E-03 lb/day

Emissions from the ash pond will only occur when Class 5 and Class 6 wind speed conditions are met. AERMOD will utilize meteorological data to determine when these conditions occur. For the purposes of the PSD analysis, permitting, and TPER evaluation, it is conservatively assumed that Class 6 condition occur year round.

Compound	Avg Ash Analysis (ppm)	Emissions lb/hr	Emissions lb/day	Emissions lb/year	Emissions tons/year
PM	1.00 **	1.68E-04	4.03E-03	1.47E+00	7.35E-04
PM_{10}	0.50 **	8.39E-05	2.01E-03	7.35E-01	3.67E-04
$PM_{2.5}$	0.08 **	1.26E-05	3.02E-04	1.10E-01	5.51E-05
Antimony	7.80	1.31E-09	3.14E-08	1.15E-05	5.73E-09
Arsenic	59.71	1.00E-08	2.40E-07	8.77E-05	4.39E-08
Beryllium	3.11	5.22E-10	1.25E-08	4.57E-06	2.28E-09
Cadmium	0.48	8.05E-11	1.93E-09	7.05E-07	3.53E-10
Chromium	18.95	3.18E-09	7.63E-08	2.78E-05	1.39E-08
Chromium VI	0.99	1.66E-10	3.99E-09	1.45E-06	7.27E-10
Cobalt	10.77	1.81E-09	4.34E-08	1.58E-05	7.91E-09
Lead	16.01	2.69E-09	6.44E-08	2.35E-05	1.18E-08
Manganese	77.99	1.31E-08	3.14E-07	1.15E-04	5.73E-08
Mercury	0.25	4.19E-11	1.01E-09	3.67E-07	1.84E-10
Nickel	21.36	3.58E-09	8.60E-08	3.14E-05	1.57E-08
Selenium	14.07	2.36E-09	5.66E-08	2.07E-05	1.03E-08

HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

** PM distribution factors (k value) taken from AP-42 Page 13.2.5-3 All other values in ppm.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Wet Ash Receiving (Transfer to Shed and Hopper)

Source ID: ES-1
Emission Point ID: EP-1 & EP-2

Section 13.2.4 (Aggregate Handling and Storage Piles) of U.S. EPA's AP-42 document is used to estimate emissions from the handling of material at an industrial site. The "Drop Equation" is shown below:

$$E = k\,(0.0032)\frac{(U/5)^{1.3}}{(M/2)^{1.4}}$$

Where:
E is the emission factor in [lb/ton]
K is the particle size multiplier [dimensionless]
U is the average wind speed [mph]
M is the average moisture content [%]

Constant	$PM_{2.5}$	PM_{10}	PM
k	0.053	0.35	0.74

Wind data from IGX Chapel Hill Airport, 2013-2017

4.85	mph, Average Wind Speed
15	%, Moisture

Expected ash moisture: 20% +/- 5%
Expected Drop Points

Drop Point 1 — Ash is transported from it's respective basin to the STAR feedstock building
Assumed 50% control as a result of 3-sided enclosure
Drop Point 2 — Ash is loaded into feed hopper.

The HAP and TAP emissions are derived from the PM estimate based on the average trace element analysis:
Emissions are calculated assuming a maximum throughput of ash:

70	ton/hr
400,000	ton/yr, Potential Ash Throughput
1.5	Number of Drop Points

Ash Trace Element Analysis	Average Ash Concentration (ppm)	Emission Factor (lb/ton)	Emissions			
			lbs/hr	lbs/day	lbs/year	tons/year
PM	--	1.36E-04	1.42E-02	3.42E-01	8.13E+01	4.07E-02
PM10	--	6.41E-05	6.73E-03	1.62E-01	3.85E+01	1.92E-02
PM2.5	--	9.71E-06	1.02E-03	2.45E-02	5.82E+00	2.91E-03
Antimony	7.80	1.06E-09	1.11E-07	2.66E-06	6.34E-04	3.17E-07
Arsenic	59.71	8.09E-09	8.50E-07	2.04E-05	4.86E-03	2.43E-06
Beryllium	3.11	4.22E-10	4.43E-08	1.06E-06	2.53E-04	1.26E-07
Cadmium	0.48	6.51E-11	6.83E-09	1.64E-07	3.90E-05	1.95E-08
Chromium	18.95	2.57E-09	2.70E-07	6.47E-06	1.54E-03	7.71E-07
Chromium VI	0.99	1.34E-10	1.41E-08	3.38E-07	8.05E-05	4.03E-08
Cobalt	10.77	1.46E-09	1.53E-07	3.68E-06	8.76E-04	4.38E-07
Lead	16.01	2.17E-09	2.28E-07	5.47E-06	1.30E-03	6.51E-07
Manganese	77.99	1.06E-08	1.11E-06	2.66E-05	6.34E-03	3.17E-06
Mercury	0.25	3.39E-11	3.56E-09	8.54E-08	2.03E-05	1.02E-08
Nickel	21.36	2.90E-09	3.04E-07	7.30E-06	1.74E-03	8.69E-07
Selenium	14.07	1.91E-09	2.00E-07	4.81E-06	1.14E-03	5.72E-07

Note: HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Screener

Source ID: ES-19
Emission Point ID: EP-19

Capacity, ton/yr	429,000
Hours of operation, hr/yr	8,760
Hours of operation, hr/day	24
Capacity, ton/hr	165

Pollutant	Emission Factor [1]	Potential Emission Rates			
	lb/ton	lb/hr	lb/day	lb/year	tons/year
PM	2.20E-03	3.63E-01	8.71E+00	3.18E+03	1.59E+00
PM_{10}	7.40E-04	1.22E-01	2.93E+00	1.07E+03	5.35E-01
$PM_{2.5}$	5.00E-05	8.25E-03	1.98E-01	7.23E+01	3.61E-02

Pollutant	Ash Conc.	Emission Factor [2]	Potential Emission Rates			
	ppm	lb/ton	lb/hr	lb/day	lb/year	tons/year
Antimony	7.80E+00	1.72E-08	2.83E-06	6.80E-05	2.48E-02	1.24E-05
Arsenic	5.97E+01	1.31E-07	2.17E-05	5.20E-04	1.90E-01	9.49E-05
Beryllium	3.11E+00	6.84E-09	1.13E-06	2.71E-05	9.89E-03	4.94E-06
Cadmium	4.80E-01	1.06E-09	1.74E-07	4.18E-06	1.53E-03	7.63E-07
Chromium	1.90E+01	4.17E-08	6.88E-06	1.65E-04	6.03E-02	3.01E-05
Chromium VI	9.90E-01	2.18E-09	3.59E-07	8.62E-06	3.15E-03	1.57E-06
Cobalt	1.08E+01	2.37E-08	3.91E-06	9.38E-05	3.42E-02	1.71E-05
Lead	1.60E+01	3.52E-08	5.81E-06	1.39E-04	5.09E-02	2.55E-05
Manganese	7.80E+01	1.72E-07	2.83E-05	6.79E-04	2.48E-01	1.24E-04
Mercury	2.50E-01	5.50E-10	9.08E-08	2.18E-06	7.95E-04	3.97E-07
Nickel	2.14E+01	4.70E-08	7.75E-06	1.86E-04	6.79E-02	3.40E-05
Selenium	1.41E+01	3.10E-08	5.11E-06	1.23E-04	4.47E-02	2.24E-05

1. Emission Factor for Screening operation from AP-42, Table 11.19.2-2. Factor is based on controlled screening with wet suppression, as ash is screened after dewatering but prior to drying.

2. HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Screener Diesel Engine

Source ID: ES-22
Emission Point ID: EP-22

Potential emissions from diesel-fired engine used to operate screener

Emission Factor Conversions (for emission factors published in only one set of units)

$$EF\ \frac{lb}{hp-hr} = EF\ \frac{lb}{MMBtu} \times \frac{7000\ Btu}{hp-hr} \times \frac{MMBtu}{10^6\ Btu}$$

$$EF\ \frac{lb}{MMBtu} = EF\ \frac{lb}{hp-hr} \times \frac{hp-hr}{7000\ Btu} \times \frac{10^6\ Btu}{MMBtu}$$

Fuel:	*Diesel*	
Unit Rating:	68	kW
	91	bhp
Sulfur Content:	0.0015	%
Operating Hours:	8,760	hr/yr

Emissions Calculations

$$Emissions\ \frac{lb}{hr} = EF\ \frac{lb}{hp-hr} \times \frac{hp-hr}{1\ hr} \qquad Emissions\ \frac{lb}{day} = Emissions\ \frac{lb}{hr} \times \frac{24\ hr}{day}$$

$$Emissions\ \frac{lb}{year} = Emissions\ \frac{lb}{hr} \times \frac{Operating\ hr}{year} \qquad Emissions\ \frac{ton}{year} = Emissions\ \frac{lb}{year} \times \frac{1\ ton}{2000\ lb}$$

CAS #	Compound	TAP	HAP	PAH	POM	Emission Factors (lb/MMBtu)[1] IC Engines (<447 KW, 600 HP) Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr)	Hourly Emissions	Daily Emissions	Annual Emissions		Emission Factor Reference
Greenhouse Gas Pollutants						(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
CO_2	CARBON DIOXIDE					1.63E+02	1.14E+00	1.04E+02	2.49E+03	9.10E+05	**4.55E+02**	2
CH_4	METHANE					6.61E-03	4.63E-05	4.21E-03	1.01E-01	3.69E+01	1.85E-02	3
N_2O	NITROUS OXIDE					1.32E-03	9.26E-06	8.43E-04	2.02E-02	7.38E+00	3.69E-03	3
CO_2e	GREENHOUSE GAS					1.64E+02	1.15E+00	1.04E+02	2.50E+03	9.13E+05	**4.56E+02**	4
Criteria Pollutants						(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
CO	CARBON MONOXIDE (CO)					1.17E+00	8.22E-03	7.48E-01	1.80E+01	6.55E+03	**3.28E+00**	**5**
NO_x	NITROGEN OXIDES (NO_x)					1.10E+00	7.73E-03	7.03E-01	1.69E+01	6.16E+03	3.08E+00	5
PM	PARTICULATE MATTER (PM)					9.39E-02	6.58E-04	5.98E-02	1.44E+00	5.24E+02	2.62E-01	5
PM_{10}	PARTICULATE MATTER<10 MICRONS (PM_{10})					9.39E-02	6.58E-04	5.98E-02	1.44E+00	5.24E+02	2.62E-01	5
$PM_{2.5}$	PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)					9.39E-02	6.58E-04	5.98E-02	1.44E+00	5.24E+02	2.62E-01	5
SO_2	SULFUR DIOXIDE (SO_2)					1.52E-03	1.06E-05	9.65E-04	2.32E-02	8.45E+00	4.23E-03	6
PBC	LEAD					9.00E-06	6.30E-08	5.73E-06	1.38E-04	5.02E-02	2.51E-05	7
VOC	VOLATILE ORGANIC COMPOUNDS (VOC)					3.60E-01	2.51E-03	2.29E-01	5.49E+00	2.00E+03	1.00E+00	8
Organic Compounds		*TAP*	*HAP*	*PAH*	*POM*	(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
106-99-0	1,3-BUTADIENE	Y	Y			3.91E-05	2.74E-07	2.49E-05	5.98E-04	2.18E-01	1.09E-04	9
75-07-0	ACETALDEHYDE	Y	Y			7.67E-04	5.37E-06	4.89E-04	1.17E-02	4.28E+00	2.14E-03	9
107-02-8	ACROLEIN	Y	Y			9.25E-05	6.48E-07	5.89E-05	1.41E-03	5.16E-01	2.58E-04	9
71-43-2	BENZENE	Y	Y			9.33E-04	6.53E-06	5.94E-04	1.43E-02	5.21E+00	2.60E-03	9
50-00-0	FORMALDEHYDE	Y	Y			1.18E-03	8.26E-06	7.52E-04	1.80E-02	6.58E+00	3.29E-03	9
108-88-3	TOLUENE	Y	Y			4.09E-04	2.86E-06	2.61E-04	6.25E-03	2.28E+00	1.14E-03	9
1330-20-7	XYLENE (MIXED ISOMERS)	Y	Y			2.85E-04	2.00E-06	1.82E-04	4.36E-03	1.59E+00	7.95E-04	9
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		*TAP*	*HAP*	*PAH*	*POM*	(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
PAH	TOTAL		Y	Y	Y	1.68E-04	1.18E-06	1.07E-04	2.57E-03	9.37E-01	4.69E-04	9
120-12-7	ANTHRACENE		Y	Y	Y	1.87E-06	1.31E-08	1.19E-06	2.86E-05	1.04E-02	5.22E-06	9
208-96-8	ACENAPHTHYLENE		Y	Y	Y	5.06E-06	3.54E-08	3.22E-06	7.74E-05	2.82E-02	1.41E-05	9
83-32-9	ACENAPHTHENE		Y	Y	Y	1.42E-06	9.94E-09	9.05E-07	2.17E-05	7.92E-03	3.96E-06	9
86-73-7	FLUORENE		Y	Y	Y	2.92E-05	2.04E-07	1.86E-05	4.46E-04	1.63E-01	8.15E-05	9
129-00-0	PYRENE		Y	Y	Y	4.78E-06	3.35E-08	3.04E-06	7.31E-05	2.67E-02	1.33E-05	9
191-24-2	BENZO(G,H,I)PERYLENE		Y	Y	Y	4.89E-07	3.42E-09	3.11E-07	7.48E-06	2.73E-03	1.36E-06	9
91-20-3	NAPHTHALENE		Y	Y	Y	8.48E-05	5.94E-07	5.40E-05	1.30E-03	4.73E-01	2.37E-04	9
85-01-8	PHENANTHRENE		Y	Y	Y	2.94E-05	2.06E-07	1.87E-05	4.49E-04	1.64E-01	8.20E-05	9
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		Y	Y	Y	1.68E-06	1.18E-08	1.07E-06	2.57E-05	9.37E-03	4.69E-06	9
50-32-8	BENZO(A)PYRENE	Y	Y	Y	Y	3.53E-07	2.47E-09	2.25E-07	5.40E-06	1.97E-03	9.85E-07	9
205-99-2	BENZO(B)FLUORANTHENE		Y	Y	Y	1.88E-07	1.32E-09	1.20E-07	2.87E-06	1.05E-03	5.25E-07	9
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		Y	Y	Y	9.91E-08	6.94E-10	6.31E-08	1.52E-06	5.53E-04	2.76E-07	9
207-08-9	BENZO(K)FLUORANTHENE		Y	Y	Y	7.61E-06	5.33E-08	4.85E-06	1.16E-04	4.25E-02	2.12E-05	9
53-70-3	DIBENZO(A,H)ANTHRACENE		Y	Y	Y	1.55E-07	1.09E-09	9.87E-08	2.37E-06	8.65E-04	4.32E-07	9
193-39-5	INDENO(1,2,3-CD)PYRENE		Y	Y	Y	5.83E-07	4.08E-09	3.71E-07	8.91E-06	3.25E-03	1.63E-06	9
Metals		*TAP*	*HAP*	*PAH*	*POM*	3.75E-07	2.63E-09	2.39E-07	5.73E-06	2.09E-03	1.05E-06	9
ASC	ARSENIC	Y	Y			(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
BEC	BERYLLIUM	Y	Y			4.00E-06	2.80E-08	2.55E-06	6.12E-05	2.23E-02	1.12E-05	7
7440-43-9	CADMIUM	Y	Y			3.00E-06	2.10E-08	1.91E-06	4.59E-05	1.67E-02	8.37E-06	7
SolCR6	CHROMIUM	Y	Y			3.00E-06	2.10E-08	1.91E-06	4.59E-05	1.67E-02	8.37E-06	7
PBC	LEAD		Y			3.00E-06	2.10E-08	1.91E-06	4.59E-05	1.67E-02	8.37E-06	7,10
MNC	MANGANESE	Y	Y			9.00E-06	6.30E-08	5.73E-06	1.38E-04	5.02E-02	2.51E-05	7
HGC	MERCURY	Y	Y			6.00E-06	4.20E-08	3.82E-06	9.17E-05	3.35E-02	1.67E-05	**7**
7440-02-0	NICKEL	Y	Y			3.00E-06	2.10E-08	1.91E-06	4.59E-05	1.67E-02	8.37E-06	7
SEC	SELENIUM		Y			3.00E-06	2.10E-08	1.91E-06	4.59E-05	1.67E-02	8.37E-06	7
						1.50E-05	1.05E-07	9.56E-06	2.29E-04	8.37E-02	4.19E-05	7
							Total HAP	2.50E-03	6.00E-02	2.19E+01	1.09E-02	

1. An average brake-specific fuel consumption of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr.
2. Emission factor derived from Table C-1 to 40 CFR Part 98, Subpart C, converted to lb/mmbtu basis using 2.20462 pounds per kilogram.
3. Emission factor derived from Table C-2 to 40 CFR Part 98, Subpart C, converted to lb/mmbtu basis using 2.20462 pounds per kilogram.
4. GWP values from Table A-1 to 40 CFR Part 98, Subpart A
5. Emission factor from NSPS IIII, §89.112(a), Table 1 37<=kW<75, Tier 3. Converted from g/kW-hr to lb/hp-hr using 453.593 grams per pounds and 1.341 hp per kW.
6. US EPA AP-42 Table 3.4-1 (10/96)
7. US EPA AP-42 Table 1.3-10 (5/10).
8. US EPA AP-42 AP-42, Table 3.3-1 (10/96)
9. US EPA AP-42 AP-42, Table 3.3-2 (10/96)
10. Chromium VI equivalents estimated based on Chromium emitted as Chromic Acid (see 1999 NCDENR memo from Lori Cherry RE: Updated Guidelines for Implementing Acceptable Ambient Levels (AALs) for Chromium (VI) Compounds.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Crusher

Source ID: ES-20
Emission Point ID: EP-20

Capacity, ton/yr	1,445,400
Hours of operation, hr/yr	8,760
Hours of operation, hr/day	24
Capacity, ton/hr	165

Pollutant	Emission Factor [1]	Potential Emission Rates			
	lb/ton	lb/hr	lb/day	lb/year	tons/year
PM	1.20E-03	1.98E-01	4.75E+00	1.73E+03	8.67E-01
PM_{10}	5.40E-04	8.91E-02	2.14E+00	7.81E+02	3.90E-01
$PM_{2.5}$	1.00E-04	1.65E-02	3.96E-01	1.45E+02	7.23E-02

Pollutant	Ash Conc.	Emission Factor [2]	Potential Emission Rates			
	ppm	lb/ton	lb/hr	lb/day	lb/year	tons/year
Antimony	7.8	9.36E-09	1.54E-06	3.71E-05	1.35E-02	6.76E-06
Arsenic	59.71	7.17E-08	1.18E-05	2.84E-04	1.04E-01	5.18E-05
Beryllium	3.11	3.73E-09	6.16E-07	1.48E-05	5.39E-03	2.70E-06
Cadmium	0.48	5.76E-10	9.50E-08	2.28E-06	8.33E-04	4.16E-07
Chromium	18.95	2.27E-08	3.75E-06	9.01E-05	3.29E-02	1.64E-05
Chromium VI	0.99	1.19E-09	1.96E-07	4.70E-06	1.72E-03	8.59E-07
Cobalt	10.77	1.29E-08	2.13E-06	5.12E-05	1.87E-02	9.34E-06
Lead	16.01	1.92E-08	3.17E-06	7.61E-05	2.78E-02	1.39E-05
Manganese	77.99	9.36E-08	1.54E-05	3.71E-04	1.35E-01	6.76E-05
Mercury	0.25	3.00E-10	4.95E-08	1.19E-06	4.34E-04	2.17E-07
Nickel	21.36	2.56E-08	4.23E-06	1.02E-04	3.70E-02	1.85E-05
Selenium	14.07	1.69E-08	2.79E-06	6.69E-05	2.44E-02	1.22E-05

1. Emission Factor for Crushing operation from AP-42, Table 11.19.2-2. Factor is based on controlled crushing with wet suppression, as ash is crushed after dewatering but prior to drying.

2. HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Crusher Diesel Engine

Source ID: ES-23
Emission Point ID: EP-23

Potential emissions from diesel-fired engine used to operate screener

Emission Factor Conversions (for emission factors published in only one set of units)

$$EF\,\frac{lb}{hp-hr} = EF\,\frac{lb}{MMbtu} \times \frac{7000\,Btu}{hp-hr} \times \frac{MMBtu}{10^6\,Btu}$$

$$EF\,\frac{lb}{MMBtu} = EF\,\frac{lb}{hp-hr} \times \frac{hp-hr}{7000\,Btu} \times \frac{10^6\,Btu}{MMBtu}$$

Fuel:	Diesel	
Unit Rating:	224	kW
	300	bhp
Sulfur Content:	0.0015	%
Operating Hours:	8,760	hr/yr

Emissions Calculations

$$Emissions\,\frac{lb}{hr} = EF\,\frac{lb}{hp-hr} \times \frac{hp-hr}{1\,hr} \qquad Emissions\,\frac{lb}{day} = Emissions\,\frac{lb}{hr} \times \frac{24\,hr}{day}$$

$$Emissions\,\frac{lb}{year} = Emissions\,\frac{lb}{hr} \times \frac{Operating\,hr}{year} \qquad Emissions\,\frac{ton}{year} = Emissions\,\frac{lb}{year} \times \frac{1\,ton}{2000\,lb}$$

CAS #	Compound	TAP	HAP	PAH	POM	Emission Factors (lb/MMBtu) [1] IC Engines (<447 KW, 600 HP) Emission Factor (lb/MMBtu)	Emission Factor (lb/hp-hr)	Hourly Emissions	Daily Emissions	Annual Emissions		Emission Factor Reference
Greenhouse Gas Pollutants						(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
CO_2	CARBON DIOXIDE					1.63E+02	1.14E+00	3.42E+02	**8.22E+03**	3.00E+06	1.50E+03	2
CH_4	METHANE					6.81E-03	4.63E-05	1.39E-02	3.33E-01	1.22E+02	6.08E-02	3
N_2O	NITROUS OXIDE					1.32E-03	9.26E-06	2.78E-03	6.67E-02	2.43E+01	1.22E-02	3
CO_2e	GREENHOUSE GAS					1.64E+02	1.15E+00	3.44E+02	8.25E+03	3.01E+06	1.50E+03	4
Criteria Pollutants						(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
CO	CARBON MONOXIDE (CO)					1.17E+00	8.22E-03	2.47E+00	5.92E+01	2.16E+04	**1.08E+01**	5
NO_x	NITROGEN OXIDES (NO_x)					1.10E+00	7.73E-03	2.32E+00	5.56E+01	2.03E+04	1.02E+01	5
PM	PARTICULATE MATTER (PM)					9.39E-02	6.58E-04	1.97E-01	4.73E+00	1.73E+03	8.64E-01	5
PM_{10}	PARTICULATE MATTER<10 MICRONS (PM_{10})					9.39E-02	6.58E-04	1.97E-01	4.73E+00	1.73E+03	8.64E-01	5
$PM_{2.5}$	PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)					9.39E-02	6.58E-04	1.97E-01	4.73E+00	1.73E+03	8.64E-01	5
SO_2	SULFUR DIOXIDE (SO_2)					1.52E-03	1.06E-05	3.18E-03	7.64E-02	2.79E+01	1.39E-02	6
PBC	LEAD					9.00E-06	6.30E-08	1.89E-05	4.54E-04	1.66E-01	8.28E-05	7
VOC	VOLATILE ORGANIC COMPOUNDS (VOC)					3.60E-01	2.51E-03	7.54E-01	**1.81E+01**	**6.61E+03**	3.30E+00	8
Organic Compounds		TAP	HAP	PAH	POM	(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
106-99-0	1,3-BUTADIENE	Y	Y			3.91E-05	**2.74E-07**	8.21E-05	**1.97E-03**	**7.19E-01**	3.60E-04	9
75-07-0	ACETALDEHYDE	Y	Y			7.67E-04	5.37E-06	1.61E-03	3.87E-02	1.41E+01	7.05E-03	9
107-02-8	ACROLEIN	Y	Y			9.25E-05	6.48E-07	1.94E-04	4.66E-03	1.70E+00	8.51E-04	9
71-43-2	BENZENE	Y	Y			9.33E-04	6.53E-06	1.96E-03	4.70E-02	1.72E+01	8.58E-03	9
50-00-0	FORMALDEHYDE	Y	Y			1.18E-03	8.26E-06	2.48E-03	5.95E-02	2.17E+01	1.09E-02	9
108-88-3	TOLUENE	Y	Y			4.09E-04	2.86E-06	8.59E-04	2.06E-02	7.52E+00	3.76E-03	9
1330-20-7	XYLENE (MIXED ISOMERS)	Y	Y			2.85E-04	2.00E-06	5.99E-04	1.44E-02	5.24E+00	2.62E-03	9
Polycyclic Aromatic Hydrocarbons (PAH) & Polycyclic Organic Matter (POM)		TAP	HAP	PAH	POM	(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
PAH	**TOTAL**		Y	Y	Y	1.68E-04	1.18E-06	3.53E-04	8.47E-03	3.09E+00	1.55E-03	9
120-12-7	ANTHRACENE		Y	Y	Y	1.87E-06	1.31E-08	3.93E-06	9.42E-05	3.44E-02	1.72E-05	9
208-96-8	ACENAPHTHYLENE		Y	Y	Y	5.06E-06	3.54E-08	1.06E-05	2.55E-04	9.31E-02	4.65E-05	9
83-32-9	ACENAPHTHENE		Y	Y	Y	1.42E-06	9.94E-09	2.98E-06	7.16E-05	2.61E-02	1.31E-05	9
86-73-7	FLUORENE		Y	Y	Y	2.92E-05	2.04E-07	6.13E-05	1.47E-03	5.37E-01	2.69E-04	9
129-00-0	PYRENE		Y	Y	Y	4.78E-06	3.35E-08	1.00E-05	2.41E-04	8.79E-02	4.40E-05	9
191-24-2	BENZO(G,H,I)PERYLENE		Y	Y	Y	4.89E-07	3.42E-09	1.03E-06	2.46E-05	9.00E-03	4.50E-06	9
91-20-3	NAPHTHALENE		Y	Y	Y	8.48E-05	5.94E-07	1.78E-04	4.27E-03	1.56E+00	7.80E-04	9
85-01-8	PHENANTHRENE		Y	Y	Y	2.94E-05	2.06E-07	6.17E-05	1.48E-03	5.41E-01	2.70E-04	9
56-55-3	BENZ(A)ANTHRACENE		Y	Y	Y	1.68E-06	1.18E-08	3.53E-06	8.47E-05	3.09E-02	1.55E-05	9
218-01-9	BENZO(A)PHENANTHRENE (CHRYSENE)		Y	Y	Y	3.53E-07	2.47E-09	7.41E-07	1.78E-05	6.49E-03	3.25E-06	9
50-32-8	BENZO(A)PYRENE	Y	Y	Y	Y	1.88E-07	1.32E-09	3.95E-07	9.48E-06	3.46E-03	1.73E-06	9
205-99-2	BENZO(B)FLUORANTHENE		Y	Y	Y	9.91E-08	6.94E-10	2.08E-07	4.99E-06	1.82E-03	9.12E-07	9
206-44-0	BENZO(J,K)FLUORENE (FLUORANTHENE)		Y	Y	Y	7.61E-06	5.33E-08	1.60E-05	3.84E-04	1.40E-01	7.00E-05	9
207-08-9	BENZO(K)FLUORANTHENE		Y	Y	Y	1.55E-07	1.09E-09	3.26E-07	7.81E-06	2.85E-03	1.43E-06	9
53-70-3	DIBENZO(A,H)ANTHRACENE		Y	Y	Y	5.83E-07	4.08E-09	1.22E-06	2.94E-05	1.07E-02	5.36E-06	9
193-39-5	INDENO(1,2,3-CD)PYRENE		Y	Y	Y	3.75E-07	2.63E-09	7.88E-07	1.89E-05	6.90E-03	3.45E-06	9
Metals		TAP	HAP	PAH	POM	(lb/MMBtu)	(lb/hp-hr)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
ASC	ARSENIC	Y	Y			4.00E-06	2.80E-08	8.40E-06	2.02E-04	7.36E-02	3.68E-05	7
BEC	BERYLLIUM	Y	Y			3.00E-06	2.10E-08	6.30E-06	1.51E-04	5.52E-02	2.76E-05	7
7440-43-9	CADMIUM	Y	Y			3.00E-06	2.10E-08	6.30E-06	1.51E-04	5.52E-02	2.76E-05	7
SolCR6	CHROMIUM	Y	Y			3.00E-06	2.10E-08	6.30E-06	1.51E-04	5.52E-02	2.76E-05	7.10
PBC	LEAD		Y			9.00E-06	6.30E-08	1.89E-05	4.54E-04	1.66E-01	8.28E-05	7
MNC	MANGANESE		Y			6.00E-06	4.20E-08	1.26E-05	3.02E-04	1.10E-01	5.52E-05	**7**
HGC	MERCURY	Y	Y			3.00E-06	2.10E-08	6.30E-06	1.51E-04	5.52E-02	2.76E-05	7
7440-02-0	NICKEL	Y	Y			3.00E-06	2.10E-08	6.30E-06	1.51E-04	5.52E-02	2.76E-05	7
SEC	SELENIUM		Y			1.50E-05	1.05E-07	3.15E-05	7.56E-04	2.76E-01	1.38E-04	7
							Total HAP	8.24E-03	1.98E-01	**7.22E+01**	3.61E-02	

1. An average brake-specific fuel consumption of 7,000 Btu/hp-hr was used to convert from lb/MMBtu to lb/hp-hr.
2. Emission factor derived from Table C-1 to 40 CFR Part 98, Subpart C, converted to lb/mmbtu basis using 2.20462 pounds per kilogram.
3. Emission factor derived from Table C-2 to 40 CFR Part 98, Subpart C, converted to lb/mmbtu basis using 2.20462 pounds per kilogram.
4. GWP values from Table A-1 to 40 CFR Part 98, Subpart A
5. Emission factor from NSPS IIII, §89.112(a), Table 1 37<=kW<75, Tier 3. Converted from g/kW-hr to lb/hp-hr using 453.593 grams per pounds and 1.341 hp per kW.
6. US EPA AP-42 Table 3.4-1 (10/96)
7. US EPA AP-42 Table 1.3-10 (5/10).
8. US EPA AP-42 AP-42, Table 3.3-1 (10/96)
9. US EPA AP-42 AP-42, Table 3.3-2 (10/96)
10. Chromium VI equivalents estimated based on Chromium emitted as Chromic Acid (see 1999 NCDENR memo from Lori Cherry RE: Updated Guidelines for Implementing Acceptable Ambient Levels (AALs) for Chromium (VI) Compounds.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Haul Roads - Loaded

Source ID: ES-21
Emission Point ID: EP-21

Ash is delivered to the process via trucks. Particulate emissions are generated from the haul roads from the force of the wheels on the road surface. This force causes pulverization of the surface material. The particles are lifted and dropped from the rolling wheels and the road surface is exposed to strong air currents, which generate airborne particulate emissions.

The methodology presented below is taken from Section 13.2.2 (Unpaved Roads) of the U.S. EPA's AP-42 document and is based on the vehicle miles traveled (VMT) at the site.

$$E = k\left(\frac{s}{12}\right)^{a}\left(\frac{W}{3}\right)^{b}$$

Equation 1a of AP-42 Section 13.2.2 for vehicles traveling on unpaved surfaces at industrial sites

Where: E is the size-specific emission factor (lb/VMT)
s is the surface material silt content (%)
W is the mean vehicle weight (tons)
k, a, and b are empirical constants

Constant	Industrial Roads		
	$PM_{2.5}$	PM_{10}	PM
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

5.1	%, Average Silt Content of Plant Roads at a Coal Mining Site (Table 13.2.2-1)
50	tons, Mean Vehicle Loaded Weight (Fleet Average)

0.25	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Road Silt Portion)
2.46	lb/VMT, Calculated PM_{10} Emission Factor (Road Silt Portion)
9.55	lb/VMT, Calculated PM Emission Factor (Road Silt Portion)

Emissions associated with the exhaust, brake wear, and tire wear must be added to the values calculated above. The values shown below were taken from Table 13.2.2-4.

Particle Size	$PM_{2.5}$	PM_{10}	PM
lb/VMT "adder"	0.00036	0.00047	0.00047

0.25	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Total, No natural mitigation)
2.46	lb/VMT, Calculated PM_{10} Emission Factor (Total, No natural mitigation)
9.55	lb/VMT, Calculated PM Emission Factor (Total, No natural mitigation)

All roads are subject to natural mitigation because of rainfall and other precipitation. The following equation accounts for reductions in the emission factor due to natural mitigation.

$$E_{EXT} = E\left[\frac{(365 - P)}{365}\right]$$

Where: E_{EXT} is the adjusted emission factor accounting for natural mitigation
E is emission factor from Equation 1a
P is the number of days per year with at least 0.01 inches of precipitation

120	days, Precipitation Greater than 0.01 inches at Plant Location (Figure 13.2.2-1)

0.17	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Total, With natural mitigation)
1.65	lb/VMT, Calculated PM_{10} Emission Factor (Total, With natural mitigation)
6.41	lb/VMT, Calculated PM Emission Factor (Total, With natural mitigation)

In addition to natural mitigation, the following mitigation will be implemented at the site. Control efficiencies taken from the *WRAP Fugitive Dust Handbook, September 7, 2006.*

57%	Limit on-site vehicle speeds (on unpaved roads) to 15 mph.
84%	Application of Gravel on Dirt Surfaces
90%	Implement watering for industrial unpaved road.

0.04	lb/VMT, Calculated PM Emission Factor (Total, With natural mitigation, and water sprays)
0.01	lb/VMT, Calculated PM_{10} Emission Factor (Total, With natural mitigation, and water sprays)
0.001	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Total, With natural mitigation, and water sprays)

23,400	miles/year, "Loaded Truck VMT"
2000	lb/ton, Conversion Factor

5.16E-01	tpy, PM Emissions
1.33E-01	tpy, PM_{10} Emissions
1.33E-02	tpy, $PM_{2.5}$ Emissions

1.18E-01	lb/hr, PM Emissions
3.04E-02	lb/hr, PM_{10} Emissions
3.04E-03	lb/hr, $PM_{2.5}$ Emissions

2.83E+00	lb/day, PM Emissions
7.29E-01	lb/day, PM_{10} Emissions
7.30E-02	lb/day, $PM_{2.5}$ Emissions

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Haul Roads - Unloaded

Source ID: ES-21
Emission Point ID: EP-21

Ash is delivered to the process via trucks. Particulate emissions are generated from the haul roads from the force of the wheels on the road surface. This force causes pulverization of the surface material. The particles are lifted and dropped from the rolling wheels and the road surface is exposed to strong air currents, which generate airborne particulate emissions.

The methodology presented below is taken from Section 13.2.2 (Unpaved Roads) of the U.S. EPA's AP-42 document and is based on the vehicle miles traveled (VMT) at the site.

$$E = k\left(\frac{s}{12}\right)^{a}\left(\frac{W}{3}\right)^{b}$$

Equation 1a of AP-42 Section 13.2.2 for vehicles traveling on unpaved surfaces at industrial sites

Where: E is the size-specific emission factor (lb/VMT)
s is the surface material silt content (%)
W is the mean vehicle weight (tons)
k, a, and b are empirical constants

Constant	Industrial Roads		
	$PM_{2.5}$	PM_{10}	PM
k	0.15	1.5	4.9
a	0.9	0.9	0.7
b	0.45	0.45	0.45

5.1	%, Average Silt Content of Plant Roads at a Coal Mining Site (Table 13.2.2-1)
25	tons, Mean Vehicle Empty Weight (Fleet Average)

0.18	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Road Silt Portion)
1.80	lb/VMT, Calculated PM_{10} Emission Factor (Road Silt Portion)
6.99	lb/VMT, Calculated PM Emission Factor (Road Silt Portion)

Emissions associated with the exhaust, brake wear, and tire wear must be added to the values calculated above. The values shown below were taken from Table 13.2.2-4.

Particle Size	$PM_{2.5}$	PM_{10}	PM
lb/VMT "adder"	0.00036	0.00047	0.00047

0.18	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Total, No natural mitigation)
1.80	lb/VMT, Calculated PM_{10} Emission Factor (Total, No natural mitigation)
6.99	lb/VMT, Calculated PM Emission Factor (Total, No natural mitigation)

All roads are subject to natural mitigation because of rainfall and other precipitation. The following equation accounts for reductions in the emission factor due to natural mitigation.

$$E_{EXT} = E\left[\frac{(365 - P)}{365}\right]$$

Where: E_{EXT} is the adjusted emission factor accounting for natural mitigation
E is emission factor from Equation 1a
P is the number of days per year with at least 0.01 inches of precipitation

120	days, Precipitation Greater than 0.01 inches at Plant Location (Figure 13.2.2-1)

0.12	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Total, With natural mitigation)
1.21	lb/VMT, Calculated PM_{10} Emission Factor (Total, With natural mitigation)
4.69	lb/VMT, Calculated PM Emission Factor (Total, With natural mitigation)

In addition to natural mitigation, the following mitigation will be implemented at the site. Control efficiencies taken from the *WRAP Fugitive Dust Handbook, September 7, 2006.*

57%	Limit on-site vehicle speeds (on unpaved roads) to 15 mph.
84%	Application of Gravel on Dirt Surfaces
90%	Implement watering for industrial unpaved road.

0.03	lb/VMT, Calculated PM Emission Factor (Total, With natural mitigation, and water sprays)
0.008	lb/VMT, Calculated PM_{10} Emission Factor (Total, With natural mitigation, and water sprays)
0.0008	lb/VMT, Calculated $PM_{2.5}$ Emission Factor (Total, With natural mitigation, and water sprays)

23,400	miles/day, One-way Vehicle Distance from Source to Offsite
2000	lb/ton, Conversion Factor

3.78E-01	tpy, PM Emissions
9.74E-02	tpy, PM_{10} Emissions
9.76E-03	tpy, $PM_{2.5}$ Emissions

8.62E-02	lb/hr, PM Emissions
2.22E-02	lb/hr, PM_{10} Emissions
2.23E-03	lb/hr, $PM_{2.5}$ Emissions

2.07E+00	lb/day, PM Emissions
5.34E-01	lb/day, PM_{10} Emissions
5.35E-02	lb/day, $PM_{2.5}$ Emissions

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Haul Roads - Vehicle Miles Traveled

	Ash Trucked (ton/yr)	Truck Capacity (ton/truck)	Truck Loads/Year	Route Distance[1] (miles)	Total Miles Traveled VMT/yr	Total VMT/yr
Empty Trucks to Loading Area	429,000	25.00	17,160	1.36	23,400	46,800
Loaded Trucks to Process				1.36	23,400	

1 - Route distance based on longest potential haul route (7,200 ft).

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Feed Silo

Source ID: ES-4
Emission Point ID: EP-4

The emissions from the bagfilter are estimated based on an outlet grain loading of 0.005 grains of PM per standard cubic feet of exhaust.

A sample calculation for the bagfilter is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.005	gr/scf, Manufacturer's Guaranteed Emission Rate
6,600	scfm, Maximum Air Flow Through Bagfilter
7000	gr/lb, Conversion Factor

**Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.*

2.83E-01	lb PM/hr, Calculated Emission Factor for Bagfilter
2,478	lb PM/yr, Calculated Emission Factor for Bagfilter

Ash Trace Element Analysis	Average Ash Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	2.83E-01	6.79E+00	2.48E+03	1.24E+00
PM10	0.92	2.60E-01	6.25E+00	2.28E+03	1.14E+00
PM2.5	0.53	1.50E-01	3.60E+00	1.31E+03	6.57E-01
Antimony	7.80	2.21E-06	5.30E-05	1.93E-02	9.66E-06
Arsenic	59.71	1.69E-05	4.05E-04	1.48E-01	7.40E-05
Beryllium	3.11	8.80E-07	2.11E-05	7.71E-03	3.85E-06
Cadmium	0.48	1.36E-07	3.26E-06	1.19E-03	5.95E-07
Chromium	18.95	5.36E-06	1.29E-04	4.70E-02	2.35E-05
Chromium VI	0.99	2.80E-07	6.72E-06	2.45E-03	1.23E-06
Cobalt	10.77	3.05E-06	7.31E-05	2.67E-02	1.33E-05
Lead	16.01	4.53E-06	1.09E-04	3.97E-02	1.98E-05
Manganese	77.99	2.21E-05	5.29E-04	1.93E-01	9.66E-05
Mercury	0.25	7.07E-08	1.70E-06	6.19E-04	3.10E-07
Nickel	21.36	6.04E-06	1.45E-04	5.29E-02	2.65E-05
Selenium	14.07	3.98E-06	9.55E-05	3.49E-02	1.74E-05

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: STAR® Propane Start-Up Burner

Source ID: ES-5
Emission Point ID: EP-5

Emission Factor Conversions (for emission factors published in only one set of units)
All HAP & TAP emission factors based on equivalent natural gas firing.

$$EF\,\frac{lb}{MMBtu} = EF\,\frac{lb}{1000\ gal} \times \frac{1000\ gal}{MMBtu\ (Propane)}$$

$$EF\,\frac{lb}{MMBtu} = EF\,\frac{lb}{MMSCF\ (Nat\ Gas)} \times \frac{MMSCF\ (Nat\ Gas)}{MMBtu\ (Nat\ Gas)}$$

Fuel:	*Propane*	
Unit Rating:	60.0	MMBtu/hr
	1020	MMBtu/MMSCF (Nat Gas)
	90.5	MMBtu/10^3 gal (Propane)
	663	gal/hr (Propane)
Sulfur Content:	0.10	gr/100 ft^3 gas
Operating Hours:	8,760	hr/yr
Number of Units in Operation:	1	
Annual Fuel Consumption:	5,807,735	gal/yr
Controls:	LNB	*No control efficiency claimed*

Emissions Calculations

$$Emissions\ \frac{lb}{hr} = EF\,\frac{lb}{MMBtu} \times \frac{MMBtu}{hr}$$

$$Emissions\ \frac{lb}{day} = Emissions\ \frac{lb}{hr} \times \frac{24\ hr}{day}$$

$$Emissions\ \frac{lb}{year} = Emissions\ \frac{lb}{hr} \times \frac{Operating\ hr}{year}$$

$$Emissions\ \frac{ton}{year} = Emissions\ \frac{lb}{year} \times \frac{1\ ton}{2000\ lb}$$

CAS #	Compound	Emission Factors (lb/MMBtu) Propane Fired Boiler		Hourly Emissions	Daily Emissions	Annual Emissions		Emission Factor Reference
		Emission Factor (lb/MMBtu)	Emission Factor					
Greenhouse Gas Pollutants		(lb/MMBtu)	(lb/10^3 gal)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
CO_2	CARBON DIOXIDE	1.39E+02	1.25E+04	8.32E+03	2.00E+05	7.29E+07	3.64E+04	1
CH_4	METHANE	6.61E-03	5.99E-01	3.97E-01	9.52E+00	3.48E+03	1.74E+00	2
N_2O	NITROUS OXIDE	1.32E-03	1.20E-01	7.94E-02	1.90E+00	6.95E+02	3.48E-01	2
CO_2e	GREENHOUSE GAS	1.39E+02	1.26E+04	8.35E+03	2.00E+05	7.31E+07	3.66E+04	3
Criteria Pollutants		(lb/MMBtu)	(lb/10^3 gal)	(lb/hr)	(lb/day)	(lb/yr)	(ton/yr)	
CO	CARBON MONOXIDE (CO)	8.29E-02	7.50E+00	4.97E+00	1.19E+02	4.36E+04	2.18E+01	4
NO_x	NITROGEN OXIDES (NO_x)	1.44E-01	1.30E+01	8.62E+00	2.07E+02	7.55E+04	3.78E+01	4
PM	PARTICULATE MATTER (PM)	7.73E-03	7.00E-01	4.64E-01	1.11E+01	4.07E+03	2.03E+00	4
PM_{10}	PARTICULATE MATTER<10 MICRONS (PM_{10})	7.73E-03	7.00E-01	4.64E-01	1.11E+01	4.07E+03	2.03E+00	4
$PM_{2.5}$	PARTICULATE MATTER<2.5 MICRONS ($PM_{2.5}$)	7.73E-03	7.00E-01	4.64E-01	1.11E+01	4.07E+03	2.03E+00	4
SO_2	SULFUR DIOXIDE (SO_2)	1.10E-04	1.00E-02	6.63E-03	1.59E-01	5.81E+01	2.90E-02	4
VOC	VOLATILE ORGANIC COMPOUNDS (VOC)	8.84E-03	8.00E-01	5.30E-01	1.27E+01	4.65E+03	2.32E+00	4

1. Emission factor derived form Table C-1 to 40 CFR Part 98, Subpart C, converted to lb/mmbtu basis using 2.20462 pounds per kilogram.
2. Emission factor derived form Table C-2 to 40 CFR Part 98, Subpart C, converted to lb/mmbtu basis using 2.20462 pounds per kilogram.
3. GWP values from Table A-1 to 40 CFR Part 98, Subpart A
4. US EPA AP-42, Table 1.5-1 (07/08)

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: STAR® Reactor (exhaust stack) Emissions from Ash Beneficiation

Source ID: ES-5
Emission Point ID: EP-5

Total Potential Operating Hours:	8,760
Maximum Capacity (MMBtu/hr):	140
Loss on Ignition (% LOI):	3.76% *min value for conservative overestimate of emissions.*
Heating Value of Carbon (Btu/lb):	14,500
Feed Ash Sulfur Content (%)	0.10% *average (0.05%) multiplied by a safety factor of 2.*
Inlet Air Flow Rate (acfm):	75,000
Emission Loading Rate (gr/scf):	0.025
Conversion Factor (gr/lb):	7,000
SO_2 Control Efficiency (%):	95%

Example Calculation for SO2 and CO2 Emission Factor

$$SO_2\ EF\ \frac{lb}{hr} = \frac{140\ MMBtu}{hr} \times \frac{10^6 Btu}{MMBtu} \times \frac{1\ lb\ Carbon}{14{,}500\ Btu} \times \frac{100\ lb\ Ash}{9.15\ lb\ Carbon} \times \frac{0.05\ lb\ S}{100\ lb\ Ash} \times \frac{64\ lb\ SO_2}{32\ lb\ S} \times (1 - SO_2CE)$$

$$CO_2\ EF\ \frac{lb}{MMBtu} = \left(\frac{1\ lb\ Carbon}{14{,}500\ Btu} \times \frac{10^6\ Btu}{MMBtu} - \frac{.16\ lb\ CO}{MMBtu} \times \frac{12\ lb\ Carbon}{28\ lb\ CO}\right)$$

Estimated Emissions

Compounds	Emission Factor	Units	Emissions				Reference
			lbs/hr	lb/day	lbs/year	ton/year	
SO2	25.68	lb/hr	25.68	616	224,945	112.5	See Example
NOx	3.40E-01	lb/MMBtu	47.6	1,142	416,976	208.5	Emission Factor based on information provided by the SEFA Group
VOC	1.60E-02	lb/MMBtu	2.24	53.76	19,622	9.81	Emission Factor based on information provided by the SEFA Group
CO	1.60E-01	lb/MMBtu	22.4	538	196,224	98.1	Emission Factor based on information provided by the SEFA Group
H2SO4	1.00E-01	lb/hr	0.10	2	876	0.4	Emission Factor based on information provided by the SEFA Group
CO2	2.53E+02	lb/MMBtu	35,367	848,810	309,815,786	154,908	See Example

1 - Based on SEFA stack test performed September 2016. Sulfuric acid mist was 0.05 lb/hr, doubled for contingency.

A sample calculation for the bagfilter is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.025	gr/acf, Manufacturer's Guaranteed Emission Rate
75,000	acfm, inlet air flow rate
7000	gr/lb, Conversion Factor

16.07	lb PM/hr, Calculated Emission Factor for Bagfilter
140,786	lb PM/yr, Calculated Emission Factor for Bagfilter

Estimated Emissions

Expected By-Product Composition	Average By-Product Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	1.61E+01	3.86E+02	1.41E+05	7.04E+01
PM10	0.92	1.48E+01	3.55E+02	1.30E+05	6.48E+01
PM2.5	0.53	8.52E+00	2.04E+02	7.46E+04	3.73E+01
Antimony	3.40E-02	5.46E-07	1.31E-05	4.79E-03	2.39E-06
Arsenic	1.90E-01	3.05E-06	7.33E-05	2.67E-02	1.34E-05
Beryllium	2.70E-02	4.34E-07	1.04E-05	3.80E-03	1.90E-06
Cadmium	4.10E-02	6.59E-07	1.58E-05	5.77E-03	2.89E-06
Chromium	7.60E-01	1.22E-05	2.93E-04	1.07E-01	5.35E-05
Cobalt	2.00E-01	3.21E-06	7.71E-05	2.82E-02	1.41E-05
Lead	1.20E-01	1.93E-06	4.63E-05	1.69E-02	8.45E-06
Manganese	5.30E+00	8.52E-05	2.04E-03	7.46E-01	3.73E-04
Mercury	1.00E-03	1.61E-08	3.86E-07	1.41E-04	7.04E-08
Nickel	4.80E-01	7.71E-06	1.85E-04	6.76E-02	3.38E-05
Selenium	1.30E-01	2.09E-06	5.01E-05	1.83E-02	9.15E-06

*Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)
Byproduct composition based on 10% inerts from fresh lime.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: FGD Byproduct Silo

Source ID: ES-6
Emission Point ID: EP-6

A sample calculation for the bin vent is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.005	gr/scf, Manufacturer's Guaranteed Emission Rate
1,050	acfm, gas flow rate (*assumes difference between actual and standard conditions is negligible)*
7000	gr/lb, Conversion Factor

4.50E-02	lb PM/hr, Calculated Emission Factor for Bagfilter
394	lb PM/yr, Calculated Emission Factor for Bagfilter

Expected By-Product Composition	Average By-Product Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	4.50E-02	1.08E+00	3.94E+02	1.97E-01
PM10	0.92	4.14E-02	9.94E-01	3.63E+02	1.81E-01
PM2.5	0.53	2.39E-02	5.72E-01	2.09E+02	1.04E-01
Antimony	3.40E-02	1.53E-09	3.67E-08	1.34E-05	6.70E-09
Arsenic	1.90E-01	8.55E-09	2.05E-07	7.49E-05	3.74E-08
Beryllium	2.70E-02	1.22E-09	2.92E-08	1.06E-05	5.32E-09
Cadmium	4.10E-02	1.85E-09	4.43E-08	1.62E-05	8.08E-09
Chromium	7.60E-01	3.42E-08	8.21E-07	3.00E-04	1.50E-07
Cobalt	2.00E-01	9.00E-09	2.16E-07	7.88E-05	3.94E-08
Lead	1.20E-01	5.40E-09	1.30E-07	4.73E-05	2.37E-08
Manganese	5.30	2.39E-07	5.72E-06	2.09E-03	1.04E-06
Mercury	1.00E-03	4.50E-11	1.08E-09	3.94E-07	1.97E-10
Nickel	4.80E-01	2.16E-08	5.18E-07	1.89E-04	9.46E-08
Selenium	1.30E-01	5.85E-09	1.40E-07	5.12E-05	2.56E-08

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
Byproduct composition based on 10% inerts from fresh lime.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: FGD Hydrated Lime Silo

Source ID: ES-7
Emission Point ID: EP-7

A sample calculation for the bin vent is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.005	gr/scf, Manufacturer's Guaranteed Emission Rate
1,050	acfm, gas flow rate (*assumes difference between actual and standard conditions is negligible)*
7000	gr/lb, Conversion Factor

4.50E-02	lb PM/hr, Calculated Emission Factor for Bagfilter
394	lb PM/yr, Calculated Emission Factor for Bagfilter

LimeTrace Element Analysis	Average Lime Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	4.50E-02	1.08E+00	3.94E+02	1.97E-01
PM10	0.92	4.14E-02	9.94E-01	3.63E+02	1.81E-01
PM2.5	0.53	2.39E-02	5.72E-01	2.09E+02	1.04E-01
Antimony	3.40E-01	1.53E-08	3.67E-07	1.34E-04	6.70E-08
Arsenic	1.90	8.55E-08	2.05E-06	7.49E-04	3.74E-07
Beryllium	2.70E-01	1.22E-08	2.92E-07	1.06E-04	5.32E-08
Cadmium	4.10E-01	1.85E-08	4.43E-07	1.62E-04	8.08E-08
Chromium	7.60	3.42E-07	8.21E-06	3.00E-03	1.50E-06
Cobalt	2.00	9.00E-08	2.16E-06	7.88E-04	3.94E-07
Lead	1.20	5.40E-08	1.30E-06	4.73E-04	2.37E-07
Manganese	53.0	2.39E-06	5.72E-05	2.09E-02	1.04E-05
Mercury	1.00E-02	4.50E-10	1.08E-08	3.94E-06	1.97E-09
Nickel	4.80	2.16E-07	5.18E-06	1.89E-03	9.46E-07
Selenium	1.30	5.85E-08	1.40E-06	5.12E-04	2.56E-07

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
Lime composition from EPRI PISCES Database (February, 2003) Composition of Lime, Median Value

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: EHE A External Heat Exchanger A

Source ID: ES-8
Emission Point ID: EP-8

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.025	gr/scf, Manufacturer's Guaranteed Emission Rate
32,000	scfm, inlet air flow rate
7000	gr/lb, Conversion Factor

6.86	lb PM/hr, Calculated Emission Factor for Bagfilter
60,069	lb PM/yr, Calculated Emission Factor for Bagfilter

Ash Trace Element Analysis	Average Ash Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	6.86E+00	1.65E+02	6.01E+04	3.00E+01
PM10	0.92	6.31E+00	1.51E+02	5.53E+04	2.76E+01
PM2.5	0.53	3.63E+00	8.72E+01	3.18E+04	1.59E+01
Antimony	7.80	5.35E-05	1.28E-03	4.69E-01	2.34E-04
Arsenic	59.71	4.09E-04	9.83E-03	3.59E+00	1.79E-03
Beryllium	3.11	2.13E-05	5.12E-04	1.87E-01	9.34E-05
Cadmium	0.48	3.29E-06	7.90E-05	2.88E-02	1.44E-05
Chromium	18.95	1.30E-04	3.12E-03	1.14E+00	5.69E-04
Chromium VI	0.99	6.79E-06	1.63E-04	5.95E-02	2.97E-05
Cobalt	10.77	7.39E-05	1.77E-03	6.47E-01	3.23E-04
Lead	16.01	1.10E-04	2.63E-03	9.62E-01	4.81E-04
Manganese	77.99	5.35E-04	1.28E-02	4.68E+00	2.34E-03
Mercury	0.25	1.71E-06	4.11E-05	1.50E-02	7.51E-06
Nickel	21.36	1.46E-04	3.52E-03	1.28E+00	6.42E-04
Selenium	14.07	9.65E-05	2.32E-03	8.45E-01	4.23E-04

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: EHE B External Heat Exchanger B

Source ID: ES-9
Emission Point ID: EP-9

A sample calculation for the bagfilter is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.025	gr/scf, Manufacturer's Guaranteed Emission Rate
32,000	scfm, inlet air flow rate
7000	gr/lb, Conversion Factor

6.86	lb PM/hr, Calculated Emission Factor for Bagfilter
60,069	lb PM/yr, Calculated Emission Factor for Bagfilter

Ash Trace Element Analysis	Average Ash Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	6.86E+00	1.65E+02	6.01E+04	3.00E+01
PM10	0.92	6.31E+00	1.51E+02	5.53E+04	2.76E+01
PM2.5	0.53	3.63E+00	8.72E+01	3.18E+04	1.59E+01
Antimony	7.80	5.35E-05	1.28E-03	4.69E-01	2.34E-04
Arsenic	59.71	4.09E-04	9.83E-03	3.59E+00	1.79E-03
Beryllium	3.11	2.13E-05	5.12E-04	1.87E-01	9.34E-05
Cadmium	0.48	3.29E-06	7.90E-05	2.88E-02	1.44E-05
Chromium	18.95	1.30E-04	3.12E-03	1.14E+00	5.69E-04
Chromium VI	0.99	6.79E-06	1.63E-04	5.95E-02	2.97E-05
Cobalt	10.77	7.39E-05	1.77E-03	6.47E-01	3.23E-04
Lead	16.01	1.10E-04	2.63E-03	9.62E-01	4.81E-04
Manganese	77.99	5.35E-04	1.28E-02	4.68E+00	2.34E-03
Mercury	0.25	1.71E-06	4.11E-05	1.50E-02	7.51E-06
Nickel	21.36	1.46E-04	3.52E-03	1.28E+00	6.42E-04
Selenium	14.07	9.65E-05	2.32E-03	8.45E-01	4.23E-04

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: EHE Silo

Source ID: ES-10
Emission Point ID: EP-10

A sample calculation for the bagfilter is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.025	gr/scf, Manufacturer's Guaranteed Emission Rate
5,200	scfm, inlet air flow rate
7000	gr/lb, Conversion Factor

1.11E+00	lb PM/hr, Calculated Emission Factor for Bagfilter
9,761	lb PM/yr, Calculated Emission Factor for Bagfilter

Ash Trace Element Analysis	Average Ash Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	1.11E+00	2.67E+01	9.76E+03	4.88E+00
PM10	0.92	1.03E+00	2.46E+01	8.98E+03	4.49E+00
PM2.5	0.53	5.91E-01	1.42E+01	5.17E+03	2.59E+00
Antimony	7.80	8.69E-06	2.09E-04	7.61E-02	3.81E-05
Arsenic	59.71	6.65E-05	1.60E-03	5.83E-01	2.91E-04
Beryllium	3.11	3.47E-06	8.32E-05	3.04E-02	1.52E-05
Cadmium	0.48	5.35E-07	1.28E-05	4.69E-03	2.34E-06
Chromium	18.95	2.11E-05	5.07E-04	1.85E-01	9.25E-05
Chromium VI	0.99	1.10E-06	2.65E-05	9.66E-03	4.83E-06
Cobalt	10.77	1.20E-05	2.88E-04	1.05E-01	5.26E-05
Lead	16.01	1.78E-05	4.28E-04	1.56E-01	7.81E-05
Manganese	77.99	8.69E-05	2.09E-03	7.61E-01	3.81E-04
Mercury	0.25	2.79E-07	6.69E-06	2.44E-03	1.22E-06
Nickel	21.36	2.38E-05	5.71E-04	2.08E-01	1.04E-04
Selenium	14.07	1.57E-05	3.76E-04	1.37E-01	6.87E-05

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Product Storage Dome

Source ID: ES-11
Emission Point ID: EP-11

Once the ash leaves the reactor, it is collected in the product recovery baghouse and pneumatically transferred to either the storage dome or the loadout silo, each equipped with a bin vent. Emissions from the storage dome are calculated using the manufacturer's guaranteed emission rate for the bin vent filter.

A sample calculation for the bagfilter is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.005	gr/scf, Manufacturer's Guaranteed Emission Rate
6,000	scfm, inlet air flow rate
7000	gr/lb, Conversion Factor

**Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.*

2.57E-01	lb PM/hr, Calculated Emission Factor for Bagfilter
2,253	lb PM/yr, Calculated Emission Factor for Bagfilter

Ash Trace Element Analysis	Average Ash Concentration* (ppm)	Emissions			
		lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	2.57E-01	6.17E+00	2.25E+03	1.13E+00
PM10	0.92	2.37E-01	5.68E+00	2.07E+03	1.04E+00
PM2.5	0.53	1.36E-01	3.27E+00	1.19E+03	5.97E-01
Antimony	7.80	2.01E-06	4.81E-05	1.76E-02	8.79E-06
Arsenic	59.71	1.54E-05	3.68E-04	1.35E-01	6.73E-05
Beryllium	3.11	8.00E-07	1.92E-05	7.01E-03	3.50E-06
Cadmium	0.48	1.23E-07	2.96E-06	1.08E-03	5.41E-07
Chromium	18.95	4.87E-06	1.17E-04	4.27E-02	2.13E-05
Chromium VI	0.99	2.55E-07	6.11E-06	2.23E-03	1.12E-06
Cobalt	10.77	2.77E-06	6.65E-05	2.43E-02	1.21E-05
Lead	16.01	4.12E-06	9.88E-05	3.61E-02	1.80E-05
Manganese	77.99	2.01E-05	4.81E-04	1.76E-01	8.78E-05
Mercury	0.25	6.43E-08	1.54E-06	5.63E-04	2.82E-07
Nickel	21.36	5.49E-06	1.32E-04	4.81E-02	2.41E-05
Selenium	14.07	3.62E-06	8.68E-05	3.17E-02	1.58E-05

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Product Loadout Silo

Source ID: ES-12
Emission Point ID: EP-12 (Bin Vent) & EP-13, 14 (Loadout Spouts)

Once the ash leaves the reactor, it is collected in the product recovery baghouse and pneumatically transferred to either the storage dome or the loadout silo, each equipped with a bin vent. The truck loadout station uses telescoping spouts and a negative pressure ventilation system to reduce fugitive emissions. Emissions from the Loadout Silo are calculated using the manufacturer's guaranteed emission rate for the bin vent filter. Emissions from the telescoping spouts are estimated using US EPA AP-42 calculations.

Bin Vent Filter Emissions Estimate

A sample calculation for the bin vent filter is provided below:

$$\frac{grains\ PM}{scf} * \frac{scf}{hour} * \frac{lb}{7000\ grains} = \frac{lb\ PM}{hour}$$

0.005	gr/scf, Manufacturer's Guaranteed Emission Rate*
6,000	scfm, inlet air flow rate
7000	gr/lb, Conversion Factor

**Actual bin vent filter expected outlet loading is 0.001 gr/dscf. A conservative value of 0.005 gr/scf is used to estimate potential emissions.*

0.26	lb PM/hr, Calculated Emission Factor for bin vent filter
2,253	lb PM/yr, Calculated Emission Factor for bin vent filter

Ash Trace Element Analysis	Average Ash Concentration*	Emissions			
	(ppm)	lbs/hr	lbs/day	lbs/year	tons/year
PM	1.00	2.57E-01	6.17E+00	2.25E+03	1.13E+00
PM10	0.92	2.37E-01	5.68E+00	2.07E+03	1.04E+00
PM2.5	0.53	1.36E-01	3.27E+00	1.19E+03	5.97E-01
Antimony	7.80	2.01E-06	4.81E-05	1.76E-02	8.79E-06
Arsenic	59.71	1.54E-05	3.68E-04	1.35E-01	6.73E-05
Beryllium	3.11	8.00E-07	1.92E-05	7.01E-03	3.50E-06
Cadmium	0.48	1.23E-07	2.96E-06	1.08E-03	5.41E-07
Chromium	18.95	4.87E-06	1.17E-04	4.27E-02	2.13E-05
Chromium VI	0.99	2.55E-07	6.11E-06	2.23E-03	1.12E-06
Cobalt	10.77	2.77E-06	6.65E-05	2.43E-02	1.21E-05
Lead	16.01	4.12E-06	9.88E-05	3.61E-02	1.80E-05
Manganese	77.99	2.01E-05	4.81E-04	1.76E-01	8.78E-05
Mercury	0.25	6.43E-08	1.54E-06	5.63E-04	2.82E-07
Nickel	21.36	5.49E-06	1.32E-04	4.81E-02	2.41E-05
Selenium	14.07	3.62E-06	8.68E-05	3.17E-02	1.58E-05

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Product Loadout Silo

Source ID: ES-12
Emission Point ID: EP-12 (Bin Vent) & EP-13, 14 (Loadout Spouts)

Once the ash leaves the reactor, it is collected in the product recovery baghouse and pneumatically transferred to either the storage dome or the loadout silo, each equipped with a bin vent. The truck loadout station uses telescoping spouts and a negative pressure ventilation system to reduce fugitive emissions. Emissions from the Loadout Silo are calculated using the manufacturer's guaranteed emission rate for the bin vent filter. Emissions from the telescoping spouts are estimated using US EPA AP-42 calculations.

Loadout Spout Emissions Estimate

75	ton/hr throughput
400,000	ton/year throughput
4.88E-05	lb PM/ton, see "Loadout Chute Emission Factors"
2.31E-05	lb PM10/ton, see "Loadout Chute Emission Factors"
2.31E-05	lb PM2.5/ton, see "Loadout Chute Emission Factors"

Ash Trace Element Analysis	Average Ash Concentration	Emissions			
	(ppm)	lbs/hr	lbs/day	lbs/year	tons/year
PM	--	3.66E-03	8.79E-02	19.5	9.76E-03
PM10	--	1.73E-03	4.16E-02	9.24	4.62E-03
PM2.5	--	1.73E-03	4.16E-02	9.24	4.62E-03
Antimony	7.80	2.01E-06	4.81E-05	1.76E-02	8.79E-06
Arsenic	59.71	1.54E-05	3.68E-04	1.35E-01	6.73E-05
Beryllium	3.11	8.00E-07	1.92E-05	7.01E-03	3.50E-06
Cadmium	0.48	1.23E-07	2.96E-06	1.08E-03	5.41E-07
Chromium	18.95	4.87E-06	1.17E-04	4.27E-02	2.13E-05
Chromium VI	0.99	2.55E-07	6.11E-06	2.23E-03	1.12E-06
Cobalt	10.77	2.77E-06	6.65E-05	2.43E-02	1.21E-05
Lead	16.01	4.12E-06	9.88E-05	3.61E-02	1.80E-05
Manganese	77.99	2.01E-05	4.81E-04	1.76E-01	8.78E-05
Mercury	0.25	6.43E-08	1.54E-06	5.63E-04	2.82E-07
Nickel	21.36	5.49E-06	1.32E-04	4.81E-02	2.41E-05
Selenium	14.07	3.62E-06	8.68E-05	3.17E-02	1.58E-05

**Cumulative PM mass fractions from AP-42, Table 1.1-6 (09/98)*
HAP/TAP emission factors for the fly ash is based on site-specific ash analysis.

Duke Energy Progress, LLC
Cape Fear STAR® Project

Emissions Estimate: Loadout Spout Emission Factors

Source ID: ES-12
Emission Point ID: EP-13 & EP-14 (Loadout Spouts)

Section 13.2.4 (Aggregate Handling and Storage Piles) is used to estimate emissions from the handling of material at an industrial site. The "Drop Equation" is shown below:

$$E = k\,(0.0032)\,\frac{(U/5)^{1.3}}{(M/2)^{1.4}}$$

Where:

E is the emission factor in [lb/ton]
K is the particle size multiplier [dimensionless]
U is the average wind speed [mph]
M is the average moisture content [%]

Constant	PM2.5	PM10	PM
k	0.053	0.35	0.74

13.5	mph, Average Wind Speed
3	%, Moisture
99%	Control from Bin vent

PM Component	Annual Emission Factor (lb/ton)
PM	4.88E-05
PM10	2.31E-05
PM2.5	2.31E-05

Appendix C

Toxics Modeling Checklist

A.1
North Carolina Modeling Protocol Checklist

The North Carolina Modeling Protocol Checklist may be used in lieu of developing the traditional written modeling plan for North Carolina toxics and criteria pollutant modeling. The protocol checklist is designed to provide the same level of information as requested in a modeling protocol as discussed in Chapter 2 of the *Guideline for Evaluating the Air Quality Impacts of Toxic Pollutants in North Carolina*. The modeling protocol checklist is submitted with the modeling analysis.

Although most of the information requested in the modeling protocol checklist is self explanatory, additional comments are provided, where applicable, and are discussed in greater detail in the toxics modeling guidelines referenced above. References to sections, tables, figures, appendices, etc., in the protocol checklist are found in the toxics modeling guidelines.

INSTRUCTIONS: The modeling report supporting the compliance demonstration should include most of the information listed below. As appropriate, answer the following questions or indicate by check mark the information provided or action taken is reflected in your report.

FACILITY INFORMATION	
Name: Duke Energy Progress, LLC Cape Fear STAR® Ash Beneficiation Process **Facility ID:** NA – New Facility **Address:** 500 CP and L Rd Moncure, NC 27559	**Consultant (if applicable):** **AECOM** 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
Contact Name: Ms. Ann Quillian	**Contact Name:** Mr. Mark Yoder
Phone Number: (919) 546-6610 **Email:** Ann.Quillian@duke-energy.com	**Phone Number:** (919) 461-1441 **Email:** Mark.Yoder@aecom.com

GENERAL

Description of New Source or Source / Process Modification: provide a short description of the new or modified source(s) and a brief discussion of how this change affects facility production or process operation.	✓
Source / Pollutant Identification: provide a table of the affected pollutants, by source, which identifies the source type (point, area, or volume), maximum pollutant emission rates over the applicable averaging period(s), and, for point sources, indicate if the stack is capped or non-vertical (C/N).	✓
Pollutant Emission Rate Calculations: indicate how the pollutant emission rates were derived (e.g., AP-42, mass balance, etc.) and where applicable, provide the calculations.	✓
Site / Facility Diagram: provide a diagram or drawing showing the location of all existing and proposed emission sources, buildings or structures, public right-of-ways, and the facility property (toxics) / fence line (criteria pollutants) boundaries. The diagram should also include a scale, true north indicator, and the UTM or latitude/longitude of at least one point.	✓
Certified Plat or Signed Survey: a certified plat (map) from the County Register of Deeds or a signed survey must be submitted to validate property boundaries modeled.	✓
Topographic Map: A topographic map covering approximately 5km around the facility must be submitted. The facility boundaries should be annotated on the map as accurately as possible.	✓
Cavity Impact Analysis: No cavity analysis is required if using AERMOD. *See Section 4.2*	N/A

Background Concentrations (criteria pollutant analyses only): Background concentrations must be determined for each pollutant for each averaging period evaluated. The averaged background value used (e.g., high, high-second-high, high-third-high, etc.) is based on the pollutant and averaging period evaluated. The background concentrations are added to the modeled concentrations, which are then compared to the applicable air quality standard to determine compliance.	**N/A**
Offsite Source Inventories (criteria pollutant analyses only): Offsite source inventories must be developed and modeled for all pollutants for which onsite sources emissions are modeled in excess of the specific pollutant significant impact levels (SILs) as defined in the PSD New Source Review Workshop Manual. The DAQ AQAB must approve the inventories. An initial working inventory can be requested from the AQAB.	**N/A**

SCREEN LEVEL MODELING

Model: The latest version of the AERSCREEN model must be used. The use of other screening models should be approved by NCDAQ prior to submitting the modeling report.	**N/A**
Source / Source emission parameters: Provide a table listing the sources modeled and the applicable source emission parameters. See NC Form 3 – Appendix A.	**N/A**
Merged Sources: Identify merged sources and show all appropriate calculations. See Section 3.3	**N/A**
GEP Analysis: See Section 3.2 and NC Form 1 – Appendix A	**N/A**
Terrain: Indicate the terrain modeled: simple (Section 4.4), and complex (Section 4.5 and NC Form 4 – Appendix A). If complex terrain is within 5 kilometers of the facility, complex terrain must be evaluated. Simple terrain must include terrain elevations if any terrain is greater than the stack base of any source modeled. Simple: _____ Complex:_____	
Meteorology: Refer to Section 4.1 for AERSCREEN inputs.	**N/A**
Receptors: AERSCREEN – use shortest distance to property boundary for each source modeled and use sufficient range to find maximum (See Section 4.1 (i) and (j)). Terrain above stack base must be evaluated.	**N/A**
Modeling Results: For each affected pollutant, modeling results should be summarized, converted to the applicable averaging period (See Table 3), and presented in tabular format indicating compliance status with the applicable AAL, SIL, or NAAQS. See NC Form S5 – Appendix A.	**N/A**
Modeling Files: Either electronic or hard copies of AERSCREEN output must be submitted.	**N/A**

REFINED LEVEL MODELING

Model: The latest version of AERMOD should be used, and may be found at http://www.epa.gov/scram001/dispersion_prefrec.htm. The use of other refined models must be approved by NCDAQ prior to submitting the modeling report.	✓
Source / Source emission parameters: Provide a table listing the sources modeled and the applicable source emission parameters. See NC Form 3 - Appendix A.	✓
GEP Analysis: Use BPIP-Prime with AERMOD.	✓
Cavity Impact Analysis: No separate cavity analysis is required when using AERMOD as long as receptors are placed in cavity susceptible areas. See Section 4.2 and 5.2.	**N/A**
Terrain: Use digital elevation data from the USGS NED database (http://seamless.usgs.gov/index.php). Use of other sources of terrain elevations or the non-regulatory Flat Terrain option will require prior approval from DAQ AQAB.	✓
Coordinate System: Specify the coordinate system used (e.g., NAD27, NAD83, etc.) to identify the source, building, and receptor locations. Note: Be sure to specify in the AERMAP input file the correct base datum (NADA) to be used for identifying source input data locations. Clearly note in both the protocol checklist and the modeling report which datum was used.	**NAD 83**
Receptors: The receptor grid should be of sufficient size and resolution to identify the maximum pollutant impact. See Section 5.3.	✓

Appendix D

Facility-Wide Toxic Pollutant Emission Rate (TPER) Analysis and Modeling Evaluation Results

Duke Energy Progress, LLC
Cape Fear STAR Project

Toxic Pollutant Emission Rate (TPER) Analysis (In Accordance with 15A NCAC 02Q.0711)

CAS #	Compound	Toxic Pollutant Emission Rates (TPER)				Cape Fear Plant							
		Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute System Toxicants (lb/hr)	Acute Irritants (lb/hr)	Carcinogens (lb/yr)	Exceed TPER	Chronic Toxicants (lb/day)	Exceed TPER	Acute Systemic Toxicants (lb/hr)	Exceed TPER	Acute Irritants (lb/hr)	Exceed TPER
Inorganic, Non-metal Compounds													
7664-93-9	Sulfuric acid		2.50E-01	2.50E-02				2.40	Yes	1.00E-01	Yes		
Organic Compounds													
106-99-0	1,3-Butadiene	11				9.37E-01	No						
75-07-0	Acetaldehyde				6.80							2.10E-03	No
107-02-8	Acrolein				2.00E-02	22.37	Yes					2.53E-04	No
71-43-2	Benzene	8.10											
50-00-0	Formaldehyde				4.00E-02							3.23E-03	No
110-54-3	N-Hexane		23					0.00	No				
108-88-3	Toluene		98		14.4			2.69E-02	No			1.12E-03	No
1330-20-7	Xylene		57		16.4			1.87E-02	No			7.80E-04	No
50-32-8	Benzo(a)Pyrene	2.20				4.51E-03	No						
Metal Compounds													
ASC	Arsenic and Inorganic Arsenic Compounds	5.30E-02				8.8	Yes						
7440-41-7	Beryllium	2.80E-01				5.26E-01	Yes						
7440-43-9	Cadmium	3.70E-01				1.47E-01	No						
SolCR6	Soluble Chromate Compounds, as Chromium (VI) Equivalent		1.30E-02					5.90E-04	No				
MNC	Manganese and Compounds		6.30E-01					3.34E-02	No				
7439-97-6	Mercury, Vapor		1.30E-02					2.97E-04	No				
7440-02-0	Nickel Metal		1.30E-01					8.86E-03	No				

Notes: Per NCDAQ guidance in an email dated June 6, 2005, for emission factors where the exact form of the metal is not specified (including combustion of coal), the following is the preferred way to code metals:

Arsenic - ASC-Other as a component of ASC
Beryllium - Beryllium metal as a component of BEC
Cadmium - Cadmium metal as a component of CDC
Chromium - Chromic Acid (VI) as a component of SolCR6, as Chromium VI equivalents
Manganese - MNC-Other as a component of MNC
Mercury - Mercury, Vapor as a component of HGC
Nickel - Nickel metal as a component of NIC

Duke Energy Progress, LLC
Cape Fear STAR Project

Summary of Facility-Wide Toxic Air Pollutant Potential Emissions (lb/yr)

Toxic Air Pollutant	Ash Basin	Unloading Pile	Screener	Screener Diesel Engine	Crusher	Crusher Diesel Engine	Ash Handling	Wet Ash Receiving	Feed Silo
	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr
Inorganic, Non-metal Compounds									
H2SO4									
Organic Compounds									
1,3-Butadiene				2.18E-01		7.19E-01			
Acetaldehyde				4.28E+00		1.41E+01			
Acrolein				5.16E-01		1.70E+00			
Benzene				5.21E+00		1.72E+01			
Formaldehyde				6.58E+00		2.17E+01			
N-Hexane									
Toluene				2.28E+00		7.52E+00			
Xylene (Mixed Isomers)				1.59E+00		5.24E+00			
Benzo(a)Pyrene				1.05E-03		3.46E-03			
Metal Compounds									
Arsenic	2.50E-02	8.77E-05	1.90E-01	2.23E-02	1.04E-01	7.36E-02	1.04E-02	4.86E-03	1.48E-01
Beryllium	1.30E-03	4.57E-06	9.89E-03	1.67E-02	5.39E-03	5.52E-02	5.42E-04	2.53E-04	7.71E-03
Cadmium	2.01E-04	7.05E-07	1.53E-03	1.67E-02	8.33E-04	5.52E-02	8.37E-05	3.90E-05	1.19E-03
Chromium VI	4.15E-04	1.45E-06	3.15E-03	1.67E-02	1.72E-03	5.52E-02	1.73E-04	8.05E-05	2.45E-03
Manganese	3.27E-02	1.15E-04	2.48E-01	3.35E-02	1.35E-01	1.10E-01	1.36E-02	6.34E-03	1.93E-01
Mercury	1.05E-04	3.67E-07	7.95E-04	1.67E-02	4.34E-04	5.52E-02	4.36E-05	2.03E-05	6.19E-04
Nickel	8.95E-03	3.14E-05	6.79E-02	1.67E-02	3.70E-02	5.52E-02	3.73E-03	1.74E-03	5.29E-02

Duke Energy Progress, LLC
Cape Fear STAR Project

Summary of Facility-Wide Toxic Air Pollutant Potential Emissions (lb/yr)

Toxic Air Pollutant	STAR® Ash Firing	FGD Byproduct Silo	FGD Hydrated Lime Silo	EHE A - External Heat Exchanger A	EHE B - External Heat Exchanger B	EHE Silo	Product Storage Dome	Loadout Silo Bin Vent	Loadout Silo Spouts
	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr
Inorganic, Non-metal Compounds									
H2SO4	8.76E+02								
Organic Compounds									
1,3-Butadiene									
Acetaldehyde									
Acrolein									
Benzene									
Formaldehyde									
N-Hexane									
Toluene									
Xylene (Mixed Isomers)									
Benzo(a)Pyrene									
Metal Compounds									
Arsenic	2.67E-02	7.49E-05	7.49E-04	3.59E+00	3.59E+00	5.83E-01	1.35E-01	1.35E-01	1.35E-01
Beryllium	3.80E-03	1.06E-05	1.06E-04	1.87E-01	1.87E-01	3.04E-02	7.01E-03	7.01E-03	7.01E-03
Cadmium	5.77E-03	1.62E-05	1.62E-04	2.88E-02	2.88E-02	4.69E-03	1.08E-03	1.08E-03	1.08E-03
Chromium VI				5.95E-02	5.95E-02	9.66E-03	2.23E-03	2.23E-03	2.23E-03
Manganese	7.46E-01	2.09E-03	2.09E-02	4.68E+00	4.68E+00	7.61E-01	1.76E-01	1.76E-01	1.76E-01
Mercury	1.41E-04	3.94E-07	3.94E-06	1.50E-02	1.50E-02	2.44E-03	5.63E-04	5.63E-04	5.63E-04
Nickel	6.76E-02	1.89E-04	1.89E-03	1.28E+00	1.28E+00	2.08E-01	4.81E-02	4.81E-02	4.81E-02

Duke Energy Progress, LLC
Cape Fear STAR Project

Summary of Facility-Wide Toxic Air Pollutant Potential Emissions (lb/day)

Toxic Air Pollutant	Ash Basin	Unloading Pile	Screener	Screener Diesel Engine	Crusher	Crusher Diesel Engine	Ash Handling	Wet Ash Receiving	Feed Silo
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
Inorganic, Non-metal Compounds									
H2SO4									
Organic Compounds									
1,3-Butadiene				5.98E-04		1.97E-03			
Acetaldehyde				1.17E-02		3.87E-02			
Acrolein				1.41E-03		4.66E-03			
Benzene				1.43E-02		4.70E-02			
Formaldehyde				1.80E-02		5.95E-02			
N-Hexane									
Toluene				6.25E-03		2.06E-02			
Xylene (Mixed Isomers)				4.36E-03		1.44E-02			
Benzo(a)Pyrene				2.87E-06		9.48E-06			
Metal Compounds									
Arsenic	6.85E-05	2.40E-07	5.20E-04	6.12E-05	2.84E-04	2.02E-04	2.85E-05	2.04E-05	4.05E-04
Beryllium	3.57E-06	1.25E-08	2.71E-05	4.59E-05	1.48E-05	1.51E-04	1.49E-06	1.06E-06	2.11E-05
Cadmium	5.51E-07	1.93E-09	4.18E-06	4.59E-05	2.28E-06	1.51E-04	2.29E-07	1.64E-07	3.26E-06
Chromium VI	1.14E-06	3.99E-09	8.62E-06	4.59E-05	4.70E-06	1.51E-04	4.73E-07	3.38E-07	6.72E-06
Manganese	8.95E-05	3.14E-07	6.79E-04	9.17E-05	3.71E-04	3.02E-04	3.73E-05	2.66E-05	5.29E-04
Mercury	2.87E-07	1.01E-09	2.18E-06	4.59E-05	1.19E-06	1.51E-04	1.19E-07	8.54E-08	1.70E-06
Nickel	2.45E-05	8.60E-08	1.86E-04	4.59E-05	1.02E-04	1.51E-04	1.02E-05	7.30E-06	1.45E-04

Duke Energy Progress, LLC
Cape Fear STAR Project

Summary of Facility-Wide Toxic Air Pollutant Potential Emissions (lb/day)

Toxic Air Pollutant	STAR® Ash Firing	FGD Byproduct Silo	FGD Hydrated Lime Silo	EHE A - External Heat Exchanger A	EHE B - External Heat Exchanger B	EHE Silo	Product Storage Dome	Loadout Silo Bin Vent	Loadout Silo Spouts
	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day	lb/day
Inorganic, Non-metal Compounds									
H2SO4	2.40E+00								
Organic Compounds									
1,3-Butadiene									
Acetaldehyde									
Acrolein									
Benzene									
Formaldehyde									
N-Hexane									
Toluene									
Xylene (Mixed Isomers)									
Benzo(a)Pyrene									
Metal Compounds									
Arsenic	7.33E-05	2.05E-07	2.05E-06	9.83E-03	9.83E-03	1.60E-03	3.68E-04	3.68E-04	3.68E-04
Beryllium	1.04E-05	2.92E-08	2.92E-07	5.12E-04	5.12E-04	8.32E-05	1.92E-05	1.92E-05	1.92E-05
Cadmium	1.58E-05	4.43E-08	4.43E-07	7.90E-05	7.90E-05	1.28E-05	2.96E-06	2.96E-06	2.96E-06
Chromium VI				1.63E-04	1.63E-04	2.65E-05	6.11E-06	6.11E-06	6.11E-06
Manganese	2.04E-03	5.72E-06	5.72E-05	1.28E-02	1.28E-02	2.09E-03	4.81E-04	4.81E-04	4.81E-04
Mercury	3.86E-07	1.08E-09	1.08E-08	4.11E-05	4.11E-05	6.69E-06	1.54E-06	1.54E-06	1.54E-06
Nickel	1.85E-04	5.18E-07	5.18E-06	3.52E-03	3.52E-03	5.71E-04	1.32E-04	1.32E-04	1.32E-04

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Toxic Air Pollutant Potential Emissions (lb/hr)

Toxic Air Pollutant	Ash Basin	Unloading Pile	Screener	Screener Diesel Engine	Crusher	Crusher Diesel Engine	Ash Handling	Wet Ash Receiving	Feed Silo
	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Inorganic, Non-metal Compounds									
H2SO4									
Organic Compounds									
1,3-Butadiene				2.49E-05		8.21E-05			
Acetaldehyde				4.89E-04		1.61E-03			
Acrolein				5.89E-05		1.94E-04			
Benzene				5.94E-04		1.96E-03			
Formaldehyde				7.52E-04		2.48E-03			
N-Hexane									
Toluene				2.61E-04		8.59E-04			
Xylene (Mixed Isomers)				1.82E-04		5.99E-04			
Benzo(a)Pyrene				1.20E-07		3.95E-07			
Metal Compounds									
Arsenic	2.86E-06	1.00E-08	2.17E-05	2.55E-06	1.18E-05	8.40E-06	1.19E-06	8.50E-07	1.69E-05
Beryllium	1.49E-07	5.22E-10	1.13E-06	1.91E-06	6.16E-07	6.30E-06	6.19E-08	4.43E-08	8.80E-07
Cadmium	2.30E-08	8.05E-11	1.74E-07	1.91E-06	9.50E-08	6.30E-06	9.56E-09	6.83E-09	1.36E-07
Chromium VI	4.74E-08	1.66E-10	3.59E-07	1.91E-06	1.96E-07	6.30E-06	1.97E-08	1.41E-08	2.80E-07
Manganese	3.73E-06	1.31E-08	2.83E-05	3.82E-06	1.54E-05	1.26E-05	1.55E-06	1.11E-06	2.21E-05
Mercury	1.20E-08	4.19E-11	9.08E-08	1.91E-06	4.95E-08	6.30E-06	4.98E-09	3.56E-09	7.07E-08
Nickel	1.02E-06	3.58E-09	7.75E-06	1.91E-06	4.23E-06	6.30E-06	4.25E-07	3.04E-07	6.04E-06

Duke Energy Progress, LLC
Cape Fear STAR® Project

Summary of Facility-Wide Toxic Air Pollutant Potential Emissions (lb/hr)

Toxic Air Pollutant	STAR® Ash Firing	FGD Byproduct Silo	FGD Hydrated Lime Silo	EHE A - External Heat Exchanger A	EHE B - External Heat Exchanger B	EHE Silo	Product Storage Dome	Loadout Silo Bin Vent	Loadout Silo Spouts
	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr	lb/hr
Inorganic, Non-metal Compounds									
H2SO4	1.00E-01								
Organic Compounds									
1,3-Butadiene									
Acetaldehyde									
Acrolein									
Benzene									
Formaldehyde									
N-Hexane									
Toluene									
Xylene (Mixed Isomers)									
Benzo(a)Pyrene									
Metal Compounds									
Arsenic	3.05E-06	8.55E-09	8.55E-08	4.09E-04	4.09E-04	6.65E-05	1.54E-05	1.54E-05	1.54E-05
Beryllium	4.34E-07	1.22E-09	1.22E-08	2.13E-05	2.13E-05	3.47E-06	8.00E-07	8.00E-07	8.00E-07
Cadmium	6.59E-07	1.85E-09	1.85E-08	3.29E-06	3.29E-06	5.35E-07	1.23E-07	1.23E-07	1.23E-07
Chromium VI				6.79E-06	6.79E-06	1.10E-06	2.55E-07	2.55E-07	2.55E-07
Manganese	8.52E-05	2.39E-07	2.39E-06	5.35E-04	5.35E-04	8.69E-05	2.01E-05	2.01E-05	2.01E-05
Mercury	1.61E-08	4.50E-11	4.50E-10	1.71E-06	1.71E-06	2.79E-07	6.43E-08	6.43E-08	6.43E-08
Nickel	7.71E-06	2.16E-08	2.16E-07	1.46E-04	1.46E-04	2.38E-05	5.49E-06	5.49E-06	5.49E-06

Source Parameters - Potential
Duke Energy Progress, LLC
Cape Fear STAR® Project

Point Sources

Emission Point ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	H_2SO_4	Benzene	Arsenic	Beryllium
		(m)	(m)	(m)	(m)	(K)	(m/s)	(m)	(g/s)	(g/s)	(g/s)	(g/s)
EP-4	Feed Silo Bin Vent	678183.1	3939922.9	58.8	37.2	366.5	7.62E-01	2.55			2.13E-06	1.11E-07
EP-5	STAR® Reactor Exhaust	678227.9	3939937.9	58.8	42.7	367.6	12.95	1.68	1.26E-02		3.85E-07	5.47E-08
EP-6	FGD Byproduct Silo Bin Vent	678235.4	3939924.8	58.8	22.7	360.9	6.86	0.55			1.08E-09	1.53E-10
EP-7	FGD Hydrated Lime Silo Bin Vent	678229.1	3939914.0	58.8	23.7	0.0	6.86	0.55			1.08E-08	1.53E-09
EP-8	EHE A (Dust Collector)	678193.4	3939961.5	58.8	24.7	394.3	16.80	1.22			5.16E-05	2.69E-06
EP-9	EHE B (Dust Collector)	678181.4	3939961.5	58.8	24.7	394.3	16.80	1.22			5.16E-05	2.69E-06
EP-10	EHE Silo Bin Vent	678181.4	3939947.5	58.8	25.6	366.5	7.62E-01	2.26			8.38E-06	4.37E-07
EP-11	Product Storage Dome Bin Vent	678207.9	3939831.2	58.8	37.5	441.5	7.62E-01	2.67			1.93E-06	1.01E-07
EP-12	Loadout Silo Bin Vent	678245.1	3939832.9	58.8	27.4	441.5	7.62E-01	2.67			1.93E-06	1.01E-07
EP-13, EP-14	Loadout Silo Spouts	678245.1	3939832.9	58.8	27.4	441.5	7.62E-01	2.67			1.93E-06	1.01E-07
EP-22	Screener Diesel Engine	677243.0	3940492.0	51.8	1.22	699.82	41.40	0.08		7.49E-05	3.21E-07	2.41E-07
EP-23	Crusher Diesel Engine	677236.0	3940496.0	51.8	2.29	699.82	41.52	0.15		2.47E-04	1.06E-06	7.94E-07

Volume Sources

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Release Height	Init. Horizontal Dimension	Initial Vert. Dimension	H_2SO_4	Benzene	Arsenic	Beryllium
		(m)	(m)	(m)	(m)	(m)	(m)	(g/s)	(g/s)	(g/s)	(g/s)
EP-16	Ash Handling - Windrows	677281.0	3940481.0	51.8	1.52	0.71	1.43			4.99E-08	2.60E-09
EP-17	Ash Handling - Screener/Crusher Drop	677251.0	3940487.0	51.8	1.52	0.71	1.43			4.99E-08	2.60E-09
EP-18	Ash Handling - Screener/Crusher Stock Pile	677261.0	3940478.0	51.8	1.52	0.71	1.43			4.99E-08	2.60E-09
EP-1, EP-2	Wet Ash Receiving	678204.0	3940046.2	58.8	1.52	0.71	1.43			1.07E-07	5.58E-09
EP-19	Screener	677243.0	3940492.0	51.8	1.52	0.71	1.43			2.73E-06	1.42E-07
EP-20	Crusher	677236.0	3940496.0	51.8	1.52	0.71	1.43			1.49E-06	7.76E-08

Source ID	Source Description	Base Elevation	Release Height	Number of Vertices	H_2SO_4	Benzene	Arsenic	Beryllium
		(m)	(m)		(g/s)	(g/s)	(g/s)	(g/s)
EP-15	Ash Basin	51.8	2.04	23			3.60E-07	1.87E-08
EP-3	Unloading Pile	58.8	1.22	5			1.26E-09	6.57E-11

Summary of Modeling Analysis - Baseline
Duke Energy Progress, LLC
Cape Fear STAR® Project

Compound	Year	Averaging Period	Maximum Concentration (ug/m^3)	AAL (ug/m^3)	Percent of AAL (%)	Opt Factor
Arsenic	2013	Annual	1.34E-04	2.10E-03	6.37%	15.4
Benzene	2016	Annual	1.69E-03	0.12	1.41%	69.5
Beryllium	2013	Annual	8.26E-06	4.10E-03	0.201%	486
Sulfuric Acid	2017	1 - Hour	7.34E-02	100	0.073%	1,334
	2015	24 - Hour	3.35E-02	12	0.279%	351

Summary of Arsenic Modeling Analysis - Baseline
Duke Energy Progress, LLC
Cape Fear STAR® Project

Year	Averaging Period	Maximum Concentration (ug/m^3)	UTM Coordinates		AAL (ug/m^3)	Percent of AAL (%)
			Easting (m)	Northing (m)		
2013	Annual	1.34E-04	678329.80	3940034.00	2.10E-03	6.37%
2014	Annual	1.02E-04	678450.00	3939900.00	2.10E-03	4.86%
2015	Annual	1.31E-04	678329.80	3940034.00	2.10E-03	6.22%
2016	Annual	1.08E-04	678450.00	3939900.00	2.10E-03	5.15%
2017	Annual	1.18E-04	678450.00	3939900.00	2.10E-03	5.62%

Summary of Benzene Modeling Analysis - Baseline
Duke Energy Progress, LLC
Cape Fear STAR® Project

Year	Averaging Period	Maximum Concentration (ug/m^3)	UTM Coordinates		AAL (ug/m^3)	Percent of AAL (%)
			Easting (m)	Northing (m)		
2013	Annual	1.30E-03	677805.70	3940636.00	0.12	1.08%
2014	Annual	1.48E-03	677805.70	3940636.00	0.12	1.23%
2015	Annual	1.43E-03	677805.70	3940636.00	0.12	1.19%
2016	Annual	1.69E-03	677805.70	3940636.00	0.12	1.41%
2017	Annual	1.63E-03	677805.60	3940611.30	0.12	1.36%

Summary of Beryllium Modeling Analysis - Baseline
Duke Energy Progress, LLC
Cape Fear STAR® Project

Year	Averaging Period	Maximum Concentration (ug/m^3)	UTM Coordinates		AAL (ug/m^3)	Percent of AAL (%)
			Easting (m)	Northing (m)		
2013	Annual	8.26E-06	678329.80	3940034.00	4.10E-03	0.20%
2014	Annual	7.45E-06	677805.60	3940586.70	4.10E-03	0.18%
2015	Annual	7.98E-06	678329.80	3940034.00	4.10E-03	0.19%
2016	Annual	8.08E-06	677805.60	3940611.30	4.10E-03	0.20%
2017	Annual	8.09E-06	677805.60	3940586.70	4.10E-03	0.20%

Summary of H2SO4 1-Hour Modeling Analysis - Baseline
Duke Energy Progress, LLC
Cape Fear STAR® Project

Year	Averaging Period	Maximum Concentration (ug/m^3)	UTM Coordinates		AAL (ug/m^3)	Percent of AAL (%)
			Easting (m)	Northing (m)		
2013	1-hour	7.26E-02	678400.00	3939950.00	100	0.07%
2014	1-hour	5.48E-02	678200.00	3940150.00	100	0.05%
2015	1-hour	7.20E-02	678400.00	3940050.00	100	0.07%
2016	1-hour	5.53E-02	678450.00	3939950.00	100	0.06%
2017	1-hour	7.34E-02	678400.00	3940050.00	100	0.07%

Summary of H2SO4 24-Hour Modeling Analysis - Baseline
Duke Energy Progress, LLC
Cape Fear STAR® Project

Year	Averaging Period	Maximum Concentration (ug/m^3)	UTM Coordinates		AAL (ug/m^3)	Percent of AAL (%)
			Easting (m)	Northing (m)		
2013	24-hour	2.35E-02	678150.00	3940350.00	12	0.20%
2014	24-hour	1.96E-02	678800.00	3939800.00	12	0.16%
2015	24-hour	3.35E-02	677954.60	3939400.70	12	0.28%
2016	24-hour	1.82E-02	678100.00	3939500.00	12	0.15%
2017	24-hour	1.92E-02	678450.00	3940100.00	12	0.16%

Source Parameters - Optimized
Duke Energy Progress, LLC
Cape Fear STAR® Project

Point Sources

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Stack Height	Temperature	Exit Velocity	Stack Diameter	1-hr H_2SO_4	24-hr H_2SO_4	Benzene	Arsenic	Beryllium
		(m)	(m)	(m)	(m)	(K)	(m/s)	(m)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
EP-4	Feed Silo Bin Vent	678183.1	3939922.9	58.8	37.2	366.5	7.62E-01	2.55				3.27E-05	5.39E-05
EP-5	STAR® Reactor Exhaust	678227.9	3939937.9	58.8	42.7	367.6	12.95	1.68	1.68E+01	4.42E+00		5.92E-06	2.66E-05
EP-6	FGD Byproduct Silo Bin Vent	678235.4	3939924.8	58.8	22.7	360.9	6.86	0.55				1.66E-08	7.45E-08
EP-7	FGD Hydrated Lime Silo Bin Vent	678229.1	3939914.0	58.8	23.7	0.0	6.86	0.55				1.66E-07	7.45E-07
EP-8	EHE A (Dust Collector)	678193.4	3939961.5	58.8	24.7	394.3	16.80	1.22				7.93E-04	1.31E-03
EP-9	EHE B (Dust Collector)	678181.4	3939961.5	58.8	24.7	394.3	16.80	1.22				7.93E-04	1.31E-03
EP-10	EHE Silo Bin Vent	678181.4	3939947.5	58.8	25.6	366.5	7.62E-01	2.26				1.29E-04	2.12E-04
EP-11	Product Storage Dome Bin Vent	678207.9	3939831.2	58.8	37.5	441.5	7.62E-01	2.67				2.98E-05	4.90E-05
EP-12	Loadout Silo Bin Vent	678245.1	3939832.9	58.8	27.4	441.5	7.62E-01	2.67				2.98E-05	4.90E-05
EP-13, EP-14	Loadout Silo Spouts	678245.1	3939832.9	58.8	27.4	441.5	7.62E-01	2.67				2.98E-05	4.90E-05
EP-22	Screener Diesel Engine	677243.0	3940492.0	51.8	1.22	699.82	41.40	0.08			5.21E-03	4.94E-06	1.17E-04
EP-23	Crusher Diesel Engine	677236.0	3940496.0	51.8	2.29	699.82	41.52	0.15			1.72E-02	1.63E-05	3.86E-04

Volume Sources

Source ID	Source Description	Easting (X)	Northing (Y)	Base Elevation	Release Height	Init. Horizontal Dimension	Initial Vert. Dimension	1-hr H_2SO_4	24-hr H_2SO_4	Benzene	Arsenic	Beryllium
		(m)	(m)	(m)	(m)	(m)	(m)	(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
EP-16	Ash Handling - Windrows	677281.0	3940481.0	51.8	1.52	0.71	1.43				7.68E-07	1.27E-06
EP-17	Ash Handling - Screener/Crusher Drop	677251.0	3940487.0	51.8	1.52	0.71	1.43				7.68E-07	1.27E-06
EP-18	Ash Handling - Screener/Crusher Stock Pile	677261.0	3940478.0	51.8	1.52	0.71	1.43				7.68E-07	1.27E-06
EP-1, EP-2	Wet Ash Receiving	678204.0	3940046.2	58.8	1.52	0.71	1.43				1.65E-06	2.71E-06
EP-19	Screener	677243.0	3940492.0	51.8	1.52	0.71	1.43				4.20E-05	6.92E-05
EP-20	Crusher	677236.0	3940496.0	51.8	1.52	0.71	1.43				2.29E-05	3.77E-05

Source ID	Source Description	Base Elevation	Release Height	Number of Vertices	1-hr H_2SO_4	24-hr H_2SO_4	Benzene	Arsenic	Beryllium
		(m)	(m)		(g/s)	(g/s)	(g/s)	(g/s)	(g/s)
EP-15	Ash Basin	51.8	2.04	23				5.53E-06	9.12E-06
EP-3	Unloading Pile	58.8	1.22	5				1.94E-08	3.20E-08

Summary of Optimized Toxic Air Pollutant Modeling Results
Duke Energy Progress LLC
Cape Fear STAR® Project

TAP	Averaging Period	Maximum Concentration (mg/m3)	Year	AAL (mg/m3)	Percent of AAL (%)
Arsenic	Annual	2.06E-03	2013	2.10E-03	98%
Benzene	Annual	0.118	2016	0.12	98%
Beryllium	Annual	4.02E-03	2017	4.10E-03	98%
Sulfuric Acid	1 - Hour	98.0	2017	100	98%
	24 - Hour	11.7	2015	12	98%

Appendix E

Emissions Calculations Support Documentation

Screener & Crusher Engine Example Specifications

Note: Engines have not been procured – provided specifications are for example only and subject to change.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF TRANSPORTATION AND AIR QUALITY
WASHINGTON, DC 20460

CERTIFICATE OF CONFORMITY
2011 MODEL YEAR

Manufacturer:	**YANMAR CO.,LTD.**			
Engine Family:	**BYDXL3.32M4T**			
Certificate Number:	**YDX-NRCI-11-33**			
Intended Service Class:	**NR 4 (37-75)**			
Fuel Type:	**DIESEL**			
FELs: N/A	NMHC + NOx: **N/A**	NOx: **N/A**	PM: **N/A**	
Effective Date:	**9/8/2010**			
Date Issued:	**9/8/2010**			

Karl J. Simon, Director
Compliance and Innovative Strategies Division
Office of Transportation and Air Quality

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60 and Part 89, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following stationary and nonroad engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and 89, and produced in the stated model year.

This certificate of conformity covers only those new stationary and nonroad compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and 89 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60 and 89.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 89.129-96 and 89.506-96 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to a revocation or suspension of this certificate for reasons specified in 40 CFR Part 89. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void ab initio for other reasons specified in 40 CFR Part 89.

This certificate does not cover stationary and nonroad engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

California Environmental Protection Agency Air Resources Board	YANMAR CO., LTD.	EXECUTIVE ORDER U-R-028-0636 New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-02-003;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment under the flexibility program provisions. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	FLEXIBILITY PROGRAM ENGINE FAMILY NAME(s)
2014	See Attachment

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2423, subpart (d).

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

BE IT FURTHER RESOLVED: Engines certified under this Executive Order shall not be introduced into commerce before January 2, 2014.

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 6th day of November 2013.

Erik White, Chief
Mobile Source Operations Division

ATTACHMENT

U-R-028-0636
12/19/13

Non-Flex Certification Engine Information			Flex Engine Information	
Model Year	Executive Order	Engine Family	Flex Model Year	Power Category (kW)
2007	U-R-028-0349	7YDXL3.32J4N	2014	19≤kW<56
2007	U-R-028-0350	7YDXL3.32J4T	2014	19≤kW<56
2009	U-R-028-0433	9YDXL0.22D1N	2014	kW<19
2011	U-R-028-0536	BYDXL3.32M4T	2014	56≤kW<130
2012	U-R-028-0588	CYDXL0.32F1N	2014	kW<19
2012	U-R-028-0587	CYDXL0.44F1N	2014	kW<19
2012	U-R-028-0556	CYDXL0.57V2N	2014	kW<19
2012	U-R-028-0544	CYDXL0.57W2N	2014	kW<19
2012	U-R-028-0557-1	CYDXL0.78V3N	2014	kW<19
2012	U-R-028-0558-1	CYDXL0.78Y3N	2014	kW<19
2012	U-R-028-0559	CYDXL0.85U3N	2014	kW<19
2012	U-R-028-0560	CYDXL0.85V3N	2014	kW<19
2012	U-R-028-0562	CYDXL0.90U3N	2014	kW<19
2012	U-R-028-0561	CYDXL0.90V3N	2014	kW<19
2012	U-R-028-0564	CYDXL1.11U3N	2014	kW<19
2012	U-R-028-0565	CYDXL1.11V3N	2014	kW<19
2012	U-R-028-0571	CYDXL1.11X3N	2014	19≤kW<56
2012	U-R-028-0572	CYDXL1.11Y3N	2014	19≤kW<56
2012	U-R-028-0566	CYDXL1.33J3N	2014	kW<19
2012	U-R-028-0569	CYDXL1.33K3N	2014	kW<19
2012	U-R-028-0577	CYDXL1.33M3N	2014	19≤kW<56
2012	U-R-028-0567	CYDXL1.50H3T	2014	kW<19
2012	U-R-028-0573	CYDXL1.50K3H	2014	19≤kW<56
2012	U-R-028-0574	CYDXL1.50K3T	2014	19≤kW<56
2012	U-R-028-0568	CYDXL1.64J3N	2014	kW<19
2012	U-R-028-0580-1	CYDXL1.64M3N	2014	19≤kW<56
2012	U-R-028-0575	CYDXL2.00J4T	2014	19≤kW<56
2012	U-R-028-0576	CYDXL2.00K4T	2014	19≤kW<56
2012	U-R-028-0582	CYDXL2.00N4T	2014	19≤kW<56
2012	U-R-028-0548	CYDXL2.09K4N	2014	19≤kW<56
2012	U-R-028-0579	CYDXL2.19J4N	2014	19≤kW<56
2012	U-R-028-0581-1	CYDXL2.19K4N	2014	19≤kW<56
2012	U-R-028-0578-1	CYDXL3.05K4N	2014	19≤kW<56
2012	U-R-028-0583	CYDXL3.32C4N	2014	19≤kW<56
2012	U-R-028-0584	CYDXL3.32C4T	2014	19≤kW<56
2012	U-R-028-0563	CYDXL3.32F4T	2014	19≤kW<56
2012	U-R-028-0585	CYDXL3.32M4N	2014	19≤kW<56
2012	U-R-028-0555	CYDXL0.57U2N	2014	kW<19
2012	U-R-028-0546	CYDXL1.11W3N	2014	kW<19

PERFORMANCE DATA[DM8117]

February 20, 2017

Performance Number: DM8117

Change Level: 03

SALES MODEL:	C9	**COMBUSTION:**	DI
BRAND:	CAT	**ENGINE SPEED (RPM):**	2,200
ENGINE POWER (BHP):	300	**PEAK TORQUE SPEED (RPM):**	1,400
PEAK TORQUE (FT-LB):	987.3	**TORQUE RISE (%):**	37
COMPRESSION RATIO:	16.1	**ASPIRATION:**	TA
RATING LEVEL:	INDUSTRIAL B	**AFTERCOOLER TYPE:**	ATAAC
PUMP QUANTITY:	1	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, ATAAC
FUEL TYPE:	DIESEL	**INLET MANIFOLD AIR TEMP (F):**	120
MANIFOLD TYPE:	DRY	**JACKET WATER TEMP (F):**	192.2
GOVERNOR TYPE:	ELEC	**TURBO CONFIGURATION:**	SINGLE
CAMSHAFT TYPE:	STANDARD	**TURBO QUANTITY:**	1
IGNITION TYPE:	CI	**TURBOCHARGER MODEL:**	S310G-1.10
INJECTOR TYPE:	EUI	**CERTIFICATION YEAR:**	2005
REF EXH STACK DIAMETER (IN):	4	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	2,150.9
MAX OPERATING ALTITUDE (FT):	8,501		

	INDUSTRY	SUBINDUSTRY	APPLICATION
	INDUSTRIAL	MINING	INDUSTRIAL
	INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL
	INDUSTRIAL	CONSTRUCTION	INDUSTRIAL
	OIL AND GAS	LAND PRODUCTION	INDUSTRIAL
	INDUSTRIAL	MATERIAL HANDLING	INDUSTRIAL
	INDUSTRIAL	FORESTRY	INDUSTRIAL
	OIL AND GAS	WELL SERVICING	INDUSTRIAL
	INDUSTRIAL	AGRICULTURE	INDUSTRIAL

General Performance Data

ENGINE SPEED	ENGINE POWER	ENGINE TORQUE	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP
RPM	BHP	LB-FT	PSI	LB/BHP-HR	GAL/HR	IN-HG	DEG F	DEG F	IN-HG	DEG F
2,200	300	717	201	0.368	15.8	46.0	118.6	1,086.8	44.5	862.6
2,100	300	751	211	0.364	15.6	46.2	116.3	1,093.2	42.5	871.8
2,000	300	789	221	0.359	15.4	46.6	115.3	1,106.3	40.5	886.0
1,900	300	830	233	0.355	15.2	47.2	115.5	1,126.5	38.3	911.0
1,800	300	876	246	0.352	15.1	47.8	114.4	1,148.2	36.3	935.3
1,700	293	907	254	0.352	14.8	47.6	111.8	1,166.0	33.8	955.6
1,600	284	933	262	0.353	14.3	46.9	109.3	1,189.3	31.2	981.6
1,500	274	959	269	0.354	13.9	45.8	107.2	1,220.1	28.4	1,015.2
1,400	264	989	277	0.356	13.4	44.7	105.6	1,260.4	25.6	1,058.2
1,300	244	988	277	0.361	12.6	41.1	102.4	1,302.4	22.0	1,111.8
1,200	226	988	277	0.366	11.8	36.7	98.9	1,354.3	18.3	1,177.9
1,100	207	988	277	0.373	11.0	31.6	95.2	1,415.6	14.5	1,256.0

ENGINE SPEED	ENGINE POWER	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
RPM	BHP	IN-HG	DEG F	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
2,200	300	48	329.7	734.7	1,887.9	3,224.6	3,335.2	702.0	645.4
2,100	300	48	327.2	710.2	1,835.8	3,112.8	3,222.1	677.9	622.3
2,000	300	48	326.0	683.7	1,788.9	2,993.4	3,101.4	652.7	598.0
1,900	300	49	326.4	656.5	1,748.0	2,871.5	2,979.6	627.0	573.2
1,800	300	49	327.5	630.7	1,708.4	2,755.3	2,861.1	602.2	549.1
1,700	293	49	326.6	600.6	1,646.1	2,615.5	2,718.6	571.9	520.5
1,600	284	48	325.3	567.2	1,577.8	2,461.7	2,561.9	538.2	488.8
1,500	274	47	323.4	530.2	1,506.6	2,294.5	2,391.5	502.3	454.6
1,400	264	46	320.7	490.0	1,436.0	2,115.7	2,209.7	465.2	419.2
1,300	244	42	308.9	439.1	1,323.3	1,889.5	1,977.8	414.0	371.0
1,200	226	37	294.8	384.8	1,204.9	1,649.1	1,731.8	361.8	321.9
1,100	207	32	278.2	326.9	1,080.0	1,393.9	1,471.0	309.5	273.1

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February 20, 2017

Heat Rejection Data

ENGINE SPEED	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHUAST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
RPM	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
2,200	300	5,271	2,154	13,255	7,215	1,807	2,725	12,739	33,930	36,144
2,100	300	5,220	2,120	12,990	7,105	1,785	2,629	12,739	33,511	35,698
2,000	300	5,177	2,023	12,789	7,066	1,763	2,525	12,739	33,092	35,251
1,900	300	5,102	1,915	12,658	7,097	1,742	2,426	12,739	32,705	34,839
1,800	300	5,056	1,825	12,543	7,130	1,726	2,352	12,739	32,399	34,514
1,700	293	5,171	1,625	12,235	7,028	1,686	2,250	12,443	31,657	33,723
1,600	284	5,131	1,526	11,900	6,929	1,637	2,129	12,056	30,737	32,743
1,500	274	4,905	1,621	11,555	6,838	1,584	1,986	11,618	29,745	31,686
1,400	264	4,663	1,786	11,212	6,761	1,533	1,822	11,175	28,780	30,658
1,300	244	4,454	1,784	10,633	6,550	1,440	1,563	10,367	27,036	28,801
1,200	226	4,350	1,783	9,985	6,282	1,349	1,294	9,571	25,330	26,983
1,100	207	4,401	1,775	9,206	5,900	1,259	1,021	8,775	23,636	25,178

Emissions Data

RATED SPEED POTENTIAL SITE VARIATION: 2200 RPM

ENGINE POWER		BHP	300	225	150	75.1	30.0
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	907	512	305	192	135
TOTAL CO		G/HR	828	903	263	393	381
TOTAL HC		G/HR	93	127	139	193	192
PART MATTER		G/HR	30.7	34.9	47.3	49.0	40.3
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,339.3	933.2	753.5	823.0	977.4
TOTAL CO	(CORR 5% O2)	MG/NM3	1,223.0	1,648.0	657.8	1,691.4	2,759.6
TOTAL HC	(CORR 5% O2)	MG/NM3	119.4	201.7	299.0	718.9	1,205.0
PART MATTER	(CORR 5% O2)	MG/NM3	38.4	54.8	102.4	188.5	268.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	652	455	367	401	476
TOTAL CO	(CORR 5% O2)	PPM	978	1,318	526	1,353	2,208
TOTAL HC	(CORR 5% O2)	PPM	223	376	558	1,342	2,249
TOTAL NOX (AS NO2)		G/HP-HR	3.05	2.29	2.05	2.56	4.52
TOTAL CO		G/HP-HR	2.78	4.04	1.77	5.26	12.74
TOTAL HC		G/HP-HR	0.31	0.57	0.93	2.58	6.44
PART MATTER		G/HP-HR	0.10	0.16	0.32	0.66	1.35
TOTAL NOX (AS NO2)		LB/HR	2.00	1.13	0.67	0.42	0.30
TOTAL CO		LB/HR	1.83	1.99	0.58	0.87	0.84
TOTAL HC		LB/HR	0.21	0.28	0.31	0.42	0.42
PART MATTER		LB/HR	0.07	0.08	0.10	0.11	0.09

RATED SPEED NOMINAL DATA: 2200 RPM

ENGINE POWER		BHP	300	225	150	75.1	30.0
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	840	474	282	177	125
TOTAL CO		G/HR	443	483	141	210	204
TOTAL HC		G/HR	49	67	74	102	102
TOTAL CO2		KG/HR	152	123	92	54	31
PART MATTER		G/HR	15.8	17.9	24.3	25.1	20.7
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,240.1	864.1	697.7	762.1	905.0
TOTAL CO	(CORR 5% O2)	MG/NM3	654.0	881.3	351.8	904.5	1,475.7
TOTAL HC	(CORR 5% O2)	MG/NM3	63.2	106.7	158.2	380.4	637.5
PART MATTER	(CORR 5% O2)	MG/NM3	19.7	28.1	52.5	96.7	137.5
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	604	421	340	371	441
TOTAL CO	(CORR 5% O2)	PPM	523	705	281	724	1,181
TOTAL HC	(CORR 5% O2)	PPM	118	199	295	710	1,190
TOTAL NOX (AS NO2)		G/HP-HR	2.82	2.12	1.89	2.37	4.19
TOTAL CO		G/HP-HR	1.49	2.16	0.94	2.81	6.81
TOTAL HC		G/HP-HR	0.17	0.30	0.49	1.36	3.41
PART MATTER		G/HP-HR	0.05	0.08	0.16	0.34	0.69
TOTAL NOX (AS NO2)		LB/HR	1.85	1.05	0.62	0.39	0.28

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TOTAL CO	LB/HR	0.98	1.06	0.31	0.46	0.45
TOTAL HC	LB/HR	0.11	0.15	0.16	0.22	0.22
TOTAL CO2	LB/HR	336	272	203	118	69
PART MATTER	LB/HR	0.03	0.04	0.05	0.06	0.05
OXYGEN IN EXH	%	11.0	12.2	13.5	15.3	17.0
DRY SMOKE OPACITY	%	0.5	0.6	1.0	1.3	1.1
BOSCH SMOKE NUMBER		0.37	0.54	0.93	1.15	1.00

Regulatory Information

CHINA STAGE II	2010 - ----			
THIS ENGINE HAS BEEN TESTED IN ACCORDANCE WITH THE PROVISIONS OF THE PEOPLE'S REPUBLIC OF CHINA NATIONAL STANDARD #GB 20891-2007, AND COMPLIES WITH THE STATED LIMITS OF CO, HC, NOX, AND PM FOR STAGE II				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
CHINA	CHINA	NON-ROAD	STAGE II	CO: 3.5 NOx: 6.0 HC: 1.0 PM: 0.20

EPA TIER 3	2005 - 2010			
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 89 SUBPART D AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
U.S. (INCL CALIF)	EPA	NON-ROAD	TIER 3	CO: 3.5 NOx + HC: 4.0 PM: 0.20

EU STAGE IIIA	2006 - 2010			
GASEOUS EMISSION DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN EU 97/68/EC, ECE REGULATION NO. 96 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. GASEOUS EMISSION VALUES ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.				
Locality	**Agency**	**Regulation**	**Tier/Stage**	**Max Limits - G/BKW - HR**
EUROPE	EU	NON-ROAD	STAGE IIIA	CO: 3.5 NOx + HC: 4.0 PM: 0.20

IMO II	2011 - ----
GASEOUS EMISSIONS DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN REGULATION 13 OF REVISED ANNEX VI OF MARPOL 73/78 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THIS ENGINE CONFORMS TO INTERNATIONAL MARINE ORGANIZATION'S (IMO) MARINE COMPRESSION-IGNITION EMISSION REGULATIONS.

Altitude Derate Data

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	30	40	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)													
0	300	300	300	300	300	300	300	300	300	300	300	300	300
1,000	300	300	300	300	300	300	300	300	300	300	300	300	300
2,000	300	300	300	300	300	300	300	300	300	300	300	300	300
3,000	300	300	300	300	300	300	300	300	300	300	300	300	300
4,000	300	300	300	300	300	300	300	300	300	300	300	300	300
5,000	300	300	300	300	300	300	300	300	300	300	300	300	300
6,000	300	300	300	300	300	300	300	300	300	300	300	297	300
7,000	300	300	300	300	300	300	300	300	300	295	290	285	300
8,000	300	300	300	300	300	300	299	294	288	283	279	274	300
9,000	300	300	300	300	298	292	287	282	277	272	268	263	300
10,000	300	300	297	291	286	281	276	271	266	261	257	253	300
11,000	297	291	285	280	274	269	264	260	255	251	246	242	291
12,000	285	279	274	268	263	258	254	249	245	241	236	233	281
13,000	273	268	262	257	252	248	243	239	235	231	227	223	272
14,000	262	256	251	247	242	237	233	229	225	221	217	214	262
15,000	251	246	241	236	232	227	223	219	215	212	208	205	253

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
0K4893	PP5337	2446783	E705	-	JSC00001	
0K4893	PP5337	2524430	E705	-	JSC00001	
0K4894	PP5372	2524430	E705	-	MBD00001	
0K4893	PP5337	3271007	E705	-	JSC00001	
0K4893	PP5337	3930595	E705	-	JSC00001	
0K4893	PP5337	3964949	E705	-	JSC00001	

Performance Parameter Reference

Parameters Reference:DM9600-08
PERFORMANCE DEFINITIONS

PERFORMANCE DATA[DM8117]

February 20, 2017

PERFORMANCE DEFINITIONS DM9600

APPLICATION:
Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:

Power	+/- 3%
Torque	+/- 3%
Exhaust stack temperature	+/- 8%
Inlet airflow	+/- 5%
Intake manifold pressure-gage	+/- 10%
Exhaust flow	+/- 6%
Specific fuel consumption	+/- 3%
Fuel rate	+/- 5%
Specific DEF consumption	+/- 3%
DEF rate	+/- 5%
Heat rejection	+/- 5%
Heat rejection exhaust only	+/- 10%
Heat rejection CEM only	+/- 10%

Heat Rejection values based on using treated water.

Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.

On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.

These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS:

Heat rejection	+/- 10%
Heat rejection to Atmosphere	+/- 50%
Heat rejection to Lube Oil	+/- 20%
Heat rejection to Aftercooler	+/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS:

Torque	+/- 0.5%
Speed	+/- 0.2%
Fuel flow	+/- 1.0%
Temperature	+/- 2.0 C degrees
Intake manifold pressure	+/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR
FOR 3500 ENGINES AND SMALLER
SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES
Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE
Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER
The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL
DIESEL
Reference fuel is #2 distillate diesel with a 35API gravity; A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 29 (84.2), where the density is 838.9 G/Liter (7.001 Lbs/Gal).

GAS
Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS EXTERNAL AUXILIARY LOAD
Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel. separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY
Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on TM2001.

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE
TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission requirements need to be verified by your Caterpillar technical representative.

Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

PERFORMANCE DATA[DM8117]

February 20, 2017

EMISSIONS DEFINITIONS:
Emissions : DM1176

HEAT REJECTION DEFINITIONS:
Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS:
3500: EM1500

RATING DEFINITIONS:
Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS:
Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 7/7/15

CATERPILLAR

Engine Emissions Data

For Emissions / Certification feedback and questions, please submit a ticket via our ERC Request Portal

This emission data is Caterpillar's best estimate for this rating. If actual emissions are required then an emission test needs to be run on your engine.

Serial Number (Machine)	
Serial Number (Engine)	**REH07281**
Sales Model	C9
Sales Model	C9
Regulatory Build Date	12/09/2015
Interlock Code Progression	No Interlock Code Progression
As Shipped Data	
Engine Arrangement Number	3930595
Certification Arrangement	3611891
Test Spec Number	4150183
Regulatory Status	EPA / ARB Flex (Part 1039)
Regulatory Status	IMO Compliant
EPA Family Code	ACPXL18.1ESK
EPA Emissions Level	Tier 3
Flash File	3790977
Flash File Progression	5285550
CORR FL Power at RPM	300 HP (224.0 KW) at 2200 RPM
Advertised Power	300 HP 2,200RPM
Total Displacement	8.8

This is not an official emission certificate. This is for emission data information only.

Need emission replacement label? Click here!

California Environmental Protection Agency Air Resources Board	CATERPILLAR INC.	EXECUTIVE ORDER U-R-001-0507 New Off-Road Compression-Ignition Engines

Pursuant to the authority vested in the Air Resources Board by Sections 43013, 43018, 43101, 43102, 43104 and 43105 of the Health and Safety Code; and

Pursuant to the authority vested in the undersigned by Sections 39515 and 39516 of the Health and Safety Code and Executive Order G-14-012;

IT IS ORDERED AND RESOLVED: That the following compression-ignition engines and emission control systems produced by the manufacturer are certified as described below for use in off-road equipment under the flexibility program provisions. Production engines shall be in all material respects the same as those for which certification is granted.

MODEL YEAR	FLEXIBILITY PROGRAM ENGINE FAMILY NAME(s)
2015	Please see attachments

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2423, subpart (d).

BE IT FURTHER RESOLVED: That for the listed engine models, the manufacturer has submitted the information and materials to demonstrate certification compliance with 13 CCR Section 2424 (emission control labels), and 13 CCR Sections 2425 and 2426 (emission control system warranty).

BE IT FURTHER RESOLVED: Engines certified under this Executive Order shall not be introduced into commerce before January 2, 2015.

Engines certified under this Executive Order must conform to all applicable California emission regulations.

This Executive Order is only granted to the engine family and model-year listed above. Engines in this family that are produced for any other model-year are not covered by this Executive Order.

Executed at El Monte, California on this 17th day of December 2014.

M. Tuarte

(for) Annette Hebert, Chief
Emissions Compliance, Automotive Regulations and Science Division

U-R-001-0507 Attachment 1 of 1

Running Change 1/27/2015

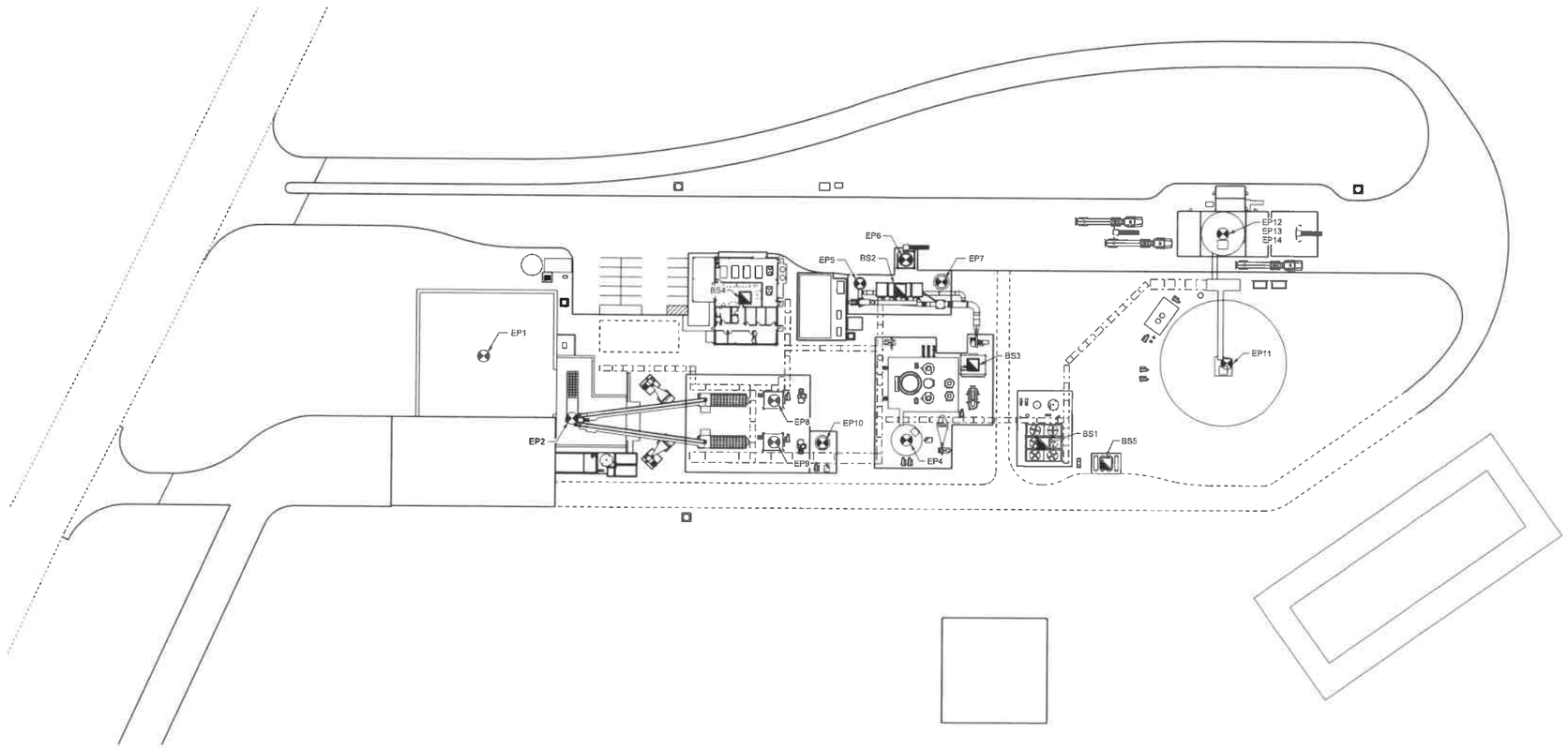
Flex Engine for 2015 Model/ Calendar Year

Executive Order	Engine Family
U-R-001-0391	ACPXL18.1ESK
U-R-001-0377	ACPXL07.2ESL
U-R-001-0373	ACPXL08.8ESX
U-R-001-0399	ACPXL08.8ESK
U-R-001-0378	ACPXL11.1ESK
U-R-001-0395	ACPXL12.5ESX
U-R-001-0390	ACPXL12.5ESK
U-R-001-0374	ACPXL14.6ESK
U-R-001-0394	ACPXL15.2ESW
U-R-001-0375	ACPXL15.2ESX
U-R-001-0408	ACPXL15.2NZV
U-R-001-0382	ACPXL27.0ESK
U-R-001-0452	DCPXL09.3HPA
U-R-001-0453	DCPXL09.3HPB
U-R-001-0454	DCPXL12.5HPA
U-R-001-0455	DCPXL12.5HPB
U-R-001-0458	DCPXL15.2HPA
U-R-001-0460	DCPXL18.1HPA
U-R-001-0469	DCPXL07.2ESJ
U-R-001-0470	DCPXL08.8ESJ
U-R-001-0471	DCPXL11.1ESJ
U-R-001-0472	DCPXL12.5ESJ
U-R-001-0478	DCPXL18.1ESJ
U-R-001-0387	ACPXL106.T2E
U-R-001-0379	ACPXL15.2ELW
U-R-001-0380	ACPXL18.1ESW
U-R-001-0381	ACPXL27.0ESX
U-R-001-0396	ACPXL27.0ESW
U-R-001-0383	ACPXL32.0ESP
U-R-001-0385	ACPXL32.0ESW
U-R-001-0384	ACPXL32.0ESX
U-R-001-0386	ACPXL34.5T2C
U-R-001-0388	ACPXL34.5T2E
U-R-001-0404	ACPXL58.6T2E
U-R-001-0397	ACPXL58.6T2X
U-R-001-0402	ACPXL58.6T2Y
U-R-001-0403	ACPXL78.1E2W
U-R-001-0398	ACPXL78.1T2E
U-R-001-0401	ACPXL78.1T2X
U-R-001-0389	ACPXL78.1T2Y
U-R-001-0376	ACPXL106.T2M
U-R-001-0487	ECPXL15.2HZA
U-R-001-0489	ECPXL18.1HZA
U-R-001-0488	ECPXL27.0HZA
U-R-001-0486	ECPXL27.0HYA
U-R-001-0408	ACPXL15.2NZV
U-R-001-0409	ACPXL15.2NZV
U-R-001-0490	ECPXL32.0HZA *

* add new engine family.

Appendix F

Drawings



PLAN

N TRUE

60 0 30 60 90 120

SCALE
IN FEET

LEGEND

- EMISSION POINT LOCATION
- BUILDINGS AND STRUCTURES LOCATION
- EPXX - EMISSION POINT NUMBER
- BSX - BUILDINGS AND STRUCTURES NUMBER

FUGITIVE EMISSIONS / EMISSIONS POINT LOCATIONS

LOCATION NUMBER	DESCRIPTION	APPROXIMATE DIMENSIONS	ELEVATION	HEIGHT	NAD83 (2011) NORTHING	NAD83 (2011) EASTING
EP1	WET ASH RECEIVING - TRANSFER TO SHED	130' x 120'	198'-0"	5'-0"	N 668973.95	E 1990170.52
EP2	WET ASH RECEIVING - TRANSFER TO HOPPER	36' x 70'	198'-0"	10'-0"	N 668889.96	E 1990112.15
EP3	NOT USED	N/A	N/A	N/A		
EP4	FEED SILO BIN VENT	42' Ø	193'-0"	122'-0"	N 668571.81	E 1990093.43
EP5	STAR REACTOR (EXHAUST STACK)	10' Ø	193'-0"	140'-0"	N 668617.23	E 1990241.99
EP6	FGD BYPRODUCT SILO BIN VENT	13' Ø	193'-0"	74'-6"	N 668573.68	E 1990265.10
EP7	FGD HYDRATED LIME SILO BIN VENT	15' Ø	193'-0"	78'-0"	N 668539.54	E 1990244.17
EP8	EHE A (DUST COLLECTOR)	15' x 18'	193'-0"	81'-0"	N 668697.62	E 1990130.21
EP9	EHE B (DUST COLLECTOR)	15' x 18'	193'-0"	81'-0"	N 668697.44	E 1990090.53
EP10	EHE SILO BIN VENT	14' Ø	193'-0"	84'-0"	N 668651.81	E 1990090.43
EP11	PRODUCT STORAGE DOME BIN VENT	120' Ø	193'-0"	123'-0"	N 668268.44	E 1990168.14
EP12	LOAD OUT SILO BIN VENT	38'-8" Ø	193'-0"	90'-0"	N 668272.81	E 1990291.43
EP13	LOAD OUT SILO SPOUT A	40' x 43' (COMBINED)	193'-0"	90'-0"	N 668272.81	E 1990291.43
EP14	LOAD OUT SILO SPOUT B	40' x 43' (COMBINED)	193'-0"	90'-0"	N 668272.81	E 1990291.43

BUILDINGS AND STRUCTURES

LOCATION NUMBER	DESCRIPTION	APPROXIMATE DIMENSIONS	ELEVATION	HEIGHT	NAD83 (2011) NORTHING	NAD83 (2011) EASTING
BS1	FIN FANS	35' x 35'	193'-0"	19'-0"	N 668441.20	E 1990091.54
BS2	CDS BAG HOUSE	15' x 44'	193'-0"	95'-0"	N 668579.78	E 1990236.42
BS3	BAG HOUSE (MAIN COLLECTOR)	20' x 25'	193'-0"	115'-0"	N 668508.88	E 1990165.44
BS4	ADMIN/CONTROL ROOM	80' x 100'	193'-0"	20'-0"	N 668725.06	E 1990224.68
BS5	PROPANE STATION	30' x 30'	193'-0"	N/A	N 668382.01	E 1990072.37

PRELIMINARY
AS OF 6/12/2018
NOT FOR CONSTRUCTION

NO.	REVISION	DATE	DRAWN	ENGR	TECH	ENGR

DUKE ENERGY®

OWNER'S DRAWING NUMBER | SHEET | REV

ZACHRY

ZACHRY ENGINEERING CORPORATION • 155 EAST HEBRON STREET, CHARLOTTE, NC 28273
NORTH CAROLINA BOARD OF EXAMINERS FOR ENGINEERS LICENSE #C-1171
ZACHRY GROUP • 527 LOGWOOD AVENUE, SAN ANTONIO, TX 78221

DUKE CAPE FEAR BENEFICIAL ASH
EMISSION POINTS SKETCH

DRAWN/DESIGNED	ORIGINATING ENG	TECH SERV CHECKED	SR ENG CHECKED
LEAD DISCIPLINE ENG			
PROJECT MANAGER			

DRAWING NUMBER: SKETCH 6/12/18 | SHEET | REV

Duke Energy Carolinas, LLC
Cape Fear STAR Project

Emissions Estimate: Haul Roads - Vehicle Miles Traveled

July 17, 2018
polylineLayer
Override 1
polygonLayer
Override 1
CCP Site Contacts
NC CCR Boundaries
<all other values>
Active Basin
Currently Being Excavated
Inactive
Lay of Land Area
Unknown, Eng. Wetlands, Landfill, Other
SC CCR Boundaries
<all other values>
Active Basin
Currently Being Excavated
Inactive
Lay of Land Area
Unknown, Eng. Wetlands, Landfill, Other
Duke Service Area
Duke Energy
Piedmont Natural Gas

1:9,028
0 0.1 0.2 0.4 mi
0 0.175 0.35 0.7 km

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Distribution Asset GIS © 2018 HERE

Duke Energy
Copyright: 2015

GIS Mapping Operations

Appendix G

Applicability Determination No. 2501

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

June 10, 2015

Mr. Jim Clayton
The SEFA Group
217 Cedar Road
Lexington, SC 29073

SUBJECT: Applicability Determination No. 2501
The SEFA Group
Lexington, SC

Dear Mr. Clayton:

The North Carolina Division of Air Quality (DAQ) received your letter dated September 5, 2014, requesting the DAQ's concurrence with its determination of regulatory status of certain coal combustion residues, when used in its Staged Turbulent Air Reactor (STAR Reactor), in accordance with 40 CFR 241 "Solid Wastes Used As Fuels or Ingredients in Combustion Units" ("Solid Waste Definition Rule" or "Rule" hereinafter).

Specifically, SEFA Group (SEFA) requests the confirmation that coal ash obtained from the following specific sources meets the requirements in §241: flyash received directly from coal-fired power plant's particulate collection infrastructure (i.e., electrostatic precipitator or baghouse), and processed flyash received from landfills and ash ponds.

Unless exempt, combustion of "non-hazardous secondary material (NHSM), as defined in §241.2 would subject the emissions unit (such as STAR reactor) to requirements in 40 CFR 60 Subpart CCCC "Standards of Performance for Commercial and Industrial Solid Waste Incineration Units" or, Subpart DDDD "Emissions Guidelines and Compliance Times for Commercial and Industrial Solid Waste Incineration Units". These regulations are commonly known as CISWI ("Commercial and Industrial Solid Waste Incineration").

The DAQ has determined that the coal ash received directly from the coal-fired power plant's particulate collection infrastructure (i.e., electrostatic precipitator or baghouse) is a NHSM and an "ingredient", as defined in §241.2. DAQ has further determined that this flyash meets the legitimacy criteria included in §241.3(d)(2) and thus, concludes that it is not a solid waste. Therefore, the STAR Reactor is not subject to the requirements in CISWI.

Moreover, the processed flyash received from landfills or ash ponds is a NHSM and an ingredient, and DAQ has determined that this flyash also meets the legitimacy criteria included in §241.3(d)(2), and thus, concludes that it is not a solid waste. Therefore, the STAR Reactor is not subject to the requirements in CISWI.

The following includes discussion on STAR Reactor, and technical and regulatory analysis supporting these conclusions for each of the above types of flyash:

STAR Reactor

The STAR Reactor is a patented technology developed by SEFA for thermal beneficiation / processing of either a low or high-Btu value fine particulate matter, such as the above described flyash [hereinafter "feedstock"], along with other ingredient materials (gas, solids, and liquids) into a variety of commercial products. These products are used not only for application as a partial cement replacement but for many other commercial and industrial applications. There are several products which SEFA is currently capable of producing because of the flexibility embodied in this reactor. For example, STAR® RP, Ultrix®, Spherix®, Fortimix®, and Permanix™.

The STAR Reactor process is inherently flexible in that operating parameters can be varied and different ingredients can be added to produce a desired product. The primary component of the STAR Reactor is a cylindrical refractory-lined vessel in which the majority of the process reactions take place. These reactions can include a range of both chemical and physical reactions. Air is required for pneumatic uplift of the solids and for the process reactions enters through the floor of the STAR Reactor as well as through the walls at multiple locations. The raw feedstock and any other ingredients are introduced through the walls of the STAR Reactor. All of the solids and gases exit together at the top of the reactor. The gas/solids mixture enters a hot cyclone where the majority of solids are separated from the gas and recycled back to the STAR Reactor. The very high rate of hot recycle solids increases the operating flexibility of the process. The process reactions can occur through this reactor/hot cyclone loop. Due to the high gas velocity, the multiple injection points, and the recycle solids, there is a significant amount of turbulence created which enhances the mixing of the ingredients and optimizes the reactions. The gas and remaining solids not collected by the hot cyclone are passed over a heat exchanger which can be designed to preheat the process air, used in heat recovery, or to simply cool the gas/solids mixture. Once cooled, the solids are separated from the gas in a fabric filter recovery device. Solids can also exit the STAR Reactor at the bottom or from the recycle loop. These solids can be combined with the solids/gas stream before the heat recovery equipment or, since they have different characteristics as compared to the solids exiting the hot cyclone, they can be processed separately for a particular application. By design the STAR Reactor operates under a wide range of process parameters.

Technical and Regulatory Analysis

Flyash Received Directly from Coal-fired Power Plant's Particulate Collection Infrastructure (i.e., Electrostatic precipitator or Baghouse)

As described above, the STAR Reactor is capable of utilizing flyash, received directly from coal-fired power plant's particulate emissions controls, as its primary ingredient along with other select ingredients in order to produce a variety of products for markets.

§241.2(b)(3) of the rule defines NHSM as "a secondary material that, when discarded, would not be identified as a hazardous waste under Part 261 of this chapter". Further the same section defines secondary material as "any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap."

It is indisputable that flyash generated from combustion of coal is not a "primary product of a manufacturing" facility (such as electric generating facility) and this product can be deemed as "post-industrial material". Moreover, coal flyash is not regulated as a hazardous waste as per Part 261 of 40 CFR "Identification and Listing of Hazardous Waste". In fact, EPA has promulgated a rule on April 17, 2015 (80 FR 21302) to regulate disposal of coal combustion residues (fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers) [CCR] as solid waste under Subtitle D "State or Regional Solid Waste Plans" of the Resource Conservation Act (RCRA) [administrative regulations included in 40 CFR 257) and not under the Subtitle C of the RCRA "Hazardous Waste Management" [administrative regulations included in 40 CFR 261]. In addition, the beneficial uses (e.g., use of flyash in concrete manufacturing replacing traditional product cement) of CCR is exempt from this regulation.

Based, on the above discussion, it is concluded that the flyash generated from the coal combustion and received directly from coal-fired power plant's particulate emissions control devices, is a NHSM.

§241.3(b)(3) of the Solid Waste Definition Rule provides that NHSMs are not solid waste when "used as an ingredient in a combustion unit that meet the legitimacy criteria specified in paragraph (d)(2) of this section." §241.2 of the Solid Waste Definition Rule defines "ingredient" as "a non-hazardous secondary material that is a component in a compound, process or product." The feedstock is merely one component among a number of variables which are introduced to the STAR Reactor to produce many different products. Therefore, feedstock processed in the STAR Reactor is an ingredient under the Solid Waste Definition Rule.

Legitimacy Criteria

For a non-hazardous secondary material used as an ingredient to be excluded from the definition of solid waste under §241.3 of the Solid Waste Definition Rule, the material must satisfy the following legitimacy criteria under Subsection (d)(2):

(i) The non-hazardous secondary material must be managed as a valuable commodity;

(ii) The non-hazardous secondary material must provide a useful contribution to the production or manufacturing process.

(iii) The non-hazardous secondary material must be used to produce a valuable product or intermediate.

(iv) The non-hazardous secondary material must result in products that contain contaminants at levels that are comparable in concentration to or lower than those found in traditional products that are manufactured without the non-hazardous secondary material.

Managed as a Valuable Commodity - §241.3(d)(2)(i)

SEFA stores its feedstock in silos and or covered shelters prior to using it as an ingredient in the STAR Reactor and conveys the material to the process equipment pneumatically. As per §241.3(d)(2)(i), the Solid Waste Definition Rule identifies the following three factors to be considered in determining whether a material is managed as a valuable commodity:

(A) The storage of the non-hazardous secondary material prior to use must not exceed reasonable time frames;

(B) Where there is an analogous ingredient, the non-hazardous secondary material must be managed in a manner consistent with the analogous ingredient or otherwise be adequately contained to prevent releases to the environment;

(C) If there is no analogous ingredient, the non-hazardous secondary material must be adequately contained to prevent releases to the environment;

As per SEFA, in a previously permitted design, the storage capacity of the silos and partially enclosed storage bins for incoming feedstock ranges from 800-2000 tons and could accommodate approximately three to ten days of production when the STAR Reactor is operating on SEFA's normal production schedule. As such, under normal operations, the incoming feedstock is typically stored no more than three days prior to introduction into the STAR Reactor process. However, during shutdown of the STAR Reactor or when off-specification feedstock is received from a supplier, the feedstock may be stored for longer periods of time, but usually no more than sixty days. In the past, as per SEFA, shutdown of the STAR Reactor has generally not exceeded twenty days. With respect to the management of off-specification feedstock, SEFA has indicated that if this off-specification material can be blended with other feedstock at ratios which ensure that processing in the STAR Reactor produces an end product which meets SEFA's quality control standards, it will attempt to do so. Depending on the nature and amount of the material's deviation from SEFA's feedstock specifications, if it cannot be blended, the off-specification feedstock will have to be rejected and returned to the supplier. If it is capable of being blended, the blending process may require storage of the off-specification feedstock for as long as 60 days depending upon the quantity involved. Accordingly, even outside of the normal three-day processing scheduling for incoming feedstock, SEFA's storage of incoming feedstock does not exceed a reasonable time frame.

Additionally, SEFA manages the incoming feedstock as a valuable commodity and takes measures to prevent loss of material during off-loading and storage. In the preamble to the rule, EPA explains that "If on the other hand, a company does not manage the non-hazardous secondary material as it would traditional ingredients, that behavior may indicate that the non-

hazardous secondary material is being discarded." Refer to 76 FR 15543. The material must be "stored in a manner that both adequately prevents releases or other hazards to human health and the environment, considering the nature and toxicity of the non-hazardous secondary material." *Id.* In most cases, this requirement is satisfied if the material is in some manner "contained." *Id.* As noted, SEFA stores its feedstock in enclosed silos or covered and partially enclosed storage bins and therefore meets this criterion. Additionally, at all times prior to processing, SEFA handles the material in a manner consistent with this criterion. Feedstock is transferred from its suppliers (typically, coal-fired power plants) to SEFA either (i) directly by pneumatic conveyor into the silos or (ii) by truck to the SEFA facility. All bin vents within the pneumatic conveyer system are equipped with fabric filter recovery devices to minimize loss of this valuable material. Thus, SEFA believes that it unquestionably manages its feedstock as a valuable commodity.

Useful Contribution to the Production or Manufacturing Process - §241.3(d)(2)(ii)

SEFA believes that there is no question that the feedstock processed in the STAR Reactor provides a useful contribution to its production of the various end products marketed by SEFA. In the preamble to the Solid Waste Definition Rule, at 76 FR 15543, EPA explains the rationale behind this criterion for legitimacy:

> A non-hazardous secondary material used as an ingredient in combustion systems provides a useful contribution if it contributes valuable ingredients to the production/manufacturing process or to the product or intermediate of the production/manufacturing process. This criterion is an essential component in the determination of legitimacy because legitimate use is not occurring if the non-hazardous secondary material doesn't add anything to the process, such that the non-hazardous secondary material is basically being disposed of or discarded. This criterion is intended to prevent the practice of "sham" recycling by adding non-hazardous secondary materials to a manufacturing operation simply as a means of disposing of them.

SEFA states that the feedstock processed in the STAR Reactor is clearly not added to dispose of that material and the processing of the feedstock in the STAR Reactor can in no manner be characterized as "sham" recycling. Additionally, the fact that some of the constituents of the feedstock are not needed or desirable for the STAR Process does not affect the status of the "useful contribution" of the feedstock:

> For purposes of satisfying this criterion, not every constituent or component of the non-hazardous secondary material has to make a contribution to the production/manufacturing activity. **For example, non-hazardous secondary materials used as ingredients may contain some constituents that are needed in the manufacturing process, such as, for example, zinc in non-hazardous secondary materials that are used to produce zinc-containing micronutrient fertilizers, while other constituents in the non-hazardous secondary material, such as lead, do not provide a useful contribution.** Provided the zinc is at levels that provides a useful contribution, we believe the non-hazardous

> secondary material would satisfy this criterion, although we would note that the constituents not directly contributing to the manufacturing process could still result in the non-hazardous secondary material not meeting the contaminant part of the legitimacy criteria. The Agency is not quantitatively defining how much of the non-hazardous secondary material needs to provide a useful contribution for this criterion to be met, since we believe that defining such a level would be difficult and is likely to be different, depending on the non-hazardous secondary material. The Agency recognizes that this could be an issue if persons argue that a non-hazardous secondary material is being legitimately used as an ingredient, but in fact, only a small amount or percentage of the non-hazardous secondary material is used.
>
> 76 FR 15543-44 (emphasis added).

The fact that reactions in the STAR Reactor eliminate certain undesirable constituents of the feedstock material does not preclude a determination that the feedstock meets the legitimacy criteria as an ingredient. As described above, the STAR Reactor has the capability to control the chemical and physical reactions in the process to produce marketable materials with a broad range of characteristics. The constituents and characteristics of each STAR Reactor product are tailored to the intended market and vary depending on the needs of that market. The elimination of certain constituents does not affect the determination that the feedstock is an ingredient which makes a useful contribution to the products produced in the STAR Reactor.

Produces a Valuable Product or Intermediate - §241.3(d)(2)(iii)

As per SEFA, it is undisputed that feedstock material is used in the STAR Reactor to make valuable products. "The product or intermediate is valuable if it is (i) sold to a third party or (ii) used as an effective substitute for a commercial product or as an ingredient or intermediate in an industrial process." Refer to 76 FR 15544. Also, as discussed above, the STAR Reactor has the capability to process its fly ash and other materials to produce a broad range of products. All of the products currently produced in the STAR Reactor are sold to third parties. Additionally, the various products produced in the STAR Reactor have application as both substitutes for commercial products and as ingredients in an industrial process. Ultrix® and STAR RP® are sold for use as partial replacement for Portland cement. Fortimix® is sold for use as an additive for rubber compounds. Permanix™ is designed for use as a broad-spectrum UV blocker. Accordingly, in all respects, SEFA's feedstock processed in the STAR Reactor satisfies this criterion for legitimacy as an ingredient.

Comparable Contaminants Concentration of End Product - § 241.3(d)(2)(iv)

Again, as discussed above, the STAR Reactor has the capability to process its feedstock to reduce or eliminate some undesirable constituents and to alter the chemical and physical characteristics of others in its various end products. The Solid Waste Definition Rules provides as follows:

> The non-hazardous secondary material must result in products that contain contaminants at levels that are comparable in concentration to or lower than those found in traditional products that are manufactured without the non-hazardous secondary material.
>
> Refer to §241.3(d)(2)(iv).
>
> The preamble to the Rule includes the following:
>
> The assessment of whether the products produced from the use of nonhazardous secondary materials that have contaminants that are comparable to (or lower) in concentration can be made by a comparison of contaminant levels in the ingredients themselves to the traditional ingredients they are replacing, or by comparing the contaminant levels in the product itself with and without the use of the nonhazardous secondary material.
>
> Refer to 76 FR 15544.

As applied to the use of the feedstock as an ingredient in the STAR Reactor, the relevant comparison is a comparison of the various STAR Reactor end products to comparable products in the industries in which each is used. For example, Ultrix® and STAR RP® are both used as supplementary cementitious materials in concrete, but, due to the unique processing regime of the STAR Reactor, neither has varying quantities of adsorptive unburned carbon, which characterize by-product fly ashes typically used in the marketplace. In fact, the air-entraining characteristics of Ultrix® and STAR RP® are tailored by STAR Reactor to exactly match the air-entraining characteristics of plain cement concrete.

The preamble to the proposed rule for the Solid Waste Definition Rule explains the rationale for and purpose of the comparison of contaminants in the legitimacy criteria for use of a non-hazardous secondary material as an ingredient:

> The Agency recognizes that there may be instances where the contaminant levels in the products manufactured from non-hazardous secondary material ingredients may be somewhat higher than found in the traditional products that are manufactured without the non-hazardous secondary material, but the resulting concentrations would not be an indication of discard and would not pose a risk to human health and the environment.
>
> Refer to 75 FR 31844, 31885 (Jun. 4, 2010).

In addition, EPA has recognized that contaminant levels in the products made from NHSM can have contaminant levels within a "small acceptable range" at 76 FR 15523 (March 21, 2011).

The above discussion clearly provides that it may be allowable under §241.3(d)(2)(iv) for certain contaminants in the end product made with non-hazardous secondary materials ingredients to be "somewhat higher" or within a "small acceptable range" than those in traditional products. Thus, SEFA's fly ash feedstock satisfies the legitimacy criterion in §241.3(d)(2)(iv) despite the slightly higher concentrations of arsenic and beryllium in the STAR RP® as compared to Portland Cement, as included in Attachment A to the SEFA's September 2014 letter. Also, using additional analytical data received from SEFA[1], it can be said that the contaminant levels in the SEFA product are within the range of contaminants levels or within a "small acceptable range" for Portland Cement (traditional product).

Additionally, as stated in the preamble to the proposed rule above, the purpose of the contaminant comparison criterion is to demonstrate that the use of the non-hazardous secondary material ingredient is not indicative of discard and does not pose a risk to human health and the environment. Expanding of the "indication of discard" aspect of this component of the legitimacy criteria, EPA further explains:

> Based on our assessment of all of the comments, we believe it appropriate to include contaminant levels as a legitimacy criterion. Thus, we do not agree with those commenters that assert that contaminant comparisons are not appropriate to require as part of the legitimacy criteria. The Agency believes the criterion is necessary because non-hazardous secondary materials that contain contaminants that are not comparable in concentration to those contained in traditional fuel products or ingredients **would suggest that these contaminants are being combusted as a means of discarding them**, and thus the non-hazardous secondary material should be classified as a solid waste. **In some cases, this can also be an indicator of sham recycling.**
>
> Refer to 75 FR 31871-72 (emphasis added).

As such, the primary purpose of the comparison on contaminants in an end product using the non-hazardous secondary material ingredient to that of traditional products made without the non-hazardous secondary material ingredient is to demonstrate that such use is not a means of discarding the non-hazardous secondary material or indicative of sham recycling.

With respect to the additional industrial uses for products produced by using fly ash feedstock as an ingredient in the STAR Reactor, a direct comparison of SEFA's end product to a traditional product which is manufactured without fly ash feedstock is not feasible for many of the end products produced in the STAR Reactor. However, based on the detailed comparison of the STAR® RP to Portland Cement and the various markets for SEFA's other STAR Reactor products as included in the above referenced submittal, it is clear that SEFA is not processing the fly ash feedstock as a means of discarding the fly ash or any of its constituents.

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[1] Email dated 5/12/2015 from Thomas Pritcher, Environmental Consulting &Technology, Inc., to Rahul Thaker, NCDAQ.

To the extent that the purpose of the contaminant comparison is to demonstrate that these products do not pose a risk to human health and the environment, SEFA has provided additional information as well as copies of the material safety data sheets for these products to demonstrate that no such risk is posed in the various industrial uses of STAR Reactor end products. For example, the material safety data sheets for Spherix® and Fortimix® included in Attachment B to the SEFA's September 2014 letter. As per SEFA, in many cases, the STAR® Reactor end products provide a safe alternative to traditional products which may pose a potential risk to human health and the environment.

Flyash Received from Landfill or Ash Pond

§241.3(b)(4) of the rule provides that NHSMs are not solid waste when "fuel or ingredient products that are used in a combustion unit, and that are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section, with respect to fuels, and paragraph (d)(2) of this section, with respect to ingredients."

As discussed above, the coal flyash disposed off in a landfill or an ash pond can be deemed as a NHSM. Prior to being used as an acceptable ingredient (feedstock) in the STAR Reactor, any flyash received from landfills or ash ponds must be "processed," as that term is defined in the rule. As discussed below, any commercial agreement between a supplier and SEFA will specify the acceptable criteria (i.e., specifications) for a feedstock that can be used in the STAR Reactor as a condition for supplying processed flyash to SEFA.

Pursuant to §241.2, "processing" means any operations that transform discarded non-hazardous secondary material into a non-waste fuel or non-waste ingredient product. Processing includes, but is not limited to, operations necessary to: remove or destroy contaminants; significantly improve fuel characteristics of the material, *e.g.* sizing or drying the material in combination with other operations; or chemically improve the as-fired energy content. Minimal operations that result only in modifying the size of the material by shredding do not constitute processing for purposes of this definition. Under the same section of the Rule, "Secondary material" is defined as any material that is not the primary product of a manufacturing or commercial process, and can include post-consumer material, off-specification commercial chemical products or manufacturing chemical intermediates, post-industrial material, and scrap.

While it is recognized that coal flyash which was initially placed into a landfill may be considered to have been "previously discarded" by custom and practice, coal-fired utilities also collect this coal ash in permitted wastewater treatment ponds. This coal ash has not historically been considered "discarded" as it was merely solids settling within a permitted wastewater unit. SEFA believes that the processing of these materials as required to satisfy SEFA's specifications for its feedstock would meet the requirements for processing of "previously discarded" materials under the Solid Waste Definition Rule as applied to CISWI. As such, the requisite processing of materials to be used as feedstock in the STAR Reactor would be sufficient to transform them to an ingredient.

The Solid Waste Definition Rule provides that a previously discarded material may be processed to transform the waste to a non-waste ingredient. Specifically, §241.3(b)(4) of the Solid Waste Definition Rule provides as follows:

> Fuel or ingredient products that are used in a combustion unit, and are produced from the processing of discarded non-hazardous secondary materials and that meet the legitimacy criteria specified in paragraph (d)(1) of this section, with respect to fuels, and paragraph (d)(2) of this section, with respect to ingredients. The legitimacy criteria apply after the non-hazardous secondary material is processed to produce a fuel or ingredient product. Until the discarded nonhazardous secondary material is processed to produce a non-waste fuel or ingredient, the discarded non-hazardous secondary material is considered a solid waste and would be subject to all appropriate federal, state, and local requirements.

As per SEFA, any processing of materials from landfills or from ash ponds to meet SEFA's feedstock specifications will be undertaken under the control of the supplier prior to being received by SEFA for use an ingredient in its STAR Reactor. Accordingly, this feedstock when received by SEFA or used in the STAR Reactor would meet the legitimacy criteria for direct use as an ingredient and therefore would not be a solid waste under the Solid Waste Definition Rule. All feedstock shipped to SEFA for use as an ingredient in the STAR Reactor will first be required to undergo processing by the supplier to be:

A. Free of all, but minimal contaminants (e.g., organic debris, slag);
B. Finely-divided and free-flowing,
C. Have consistent moisture content of $\leq 25\%$; and
D. Have a consistent chemical composition, including organic content as measured by loss on ignition.

The above are SEFA specifications for acceptance of any coal flyash (discarded in landfills or ash ponds).

As per SEFA, the specific processing steps that may be needed to meet the SEFA specifications (as described above) and produce a suitable feedstock for the STAR Reactor will vary depend upon the specific characteristics of each source of coal flyash. Generally speaking, one or more of the following four processing steps will be necessary to produce a suitable feedstock for the STAR Reactor:

1) Dewatering,
2) Screening/Separation,
3) Milling, and
4) Blending.

For use as a feedstock in the STAR Reactor, coal ash from an ash pond having higher moisture content will likely need to be processed using most, if not all, of these steps. Coal ash

from a landfill may not require every step. For example, it may be unnecessary to dewater coal ash from landfills if the material has consistent and acceptable moisture content.

Depending on the source of the ash, the general steps described above can require sub processes. For example, feedstock appropriate for the STAR Reactor, it may be necessary to remove larger particles or other materials found with the ash. In addition, to meet SEFA's specifications, some coal ash may require further processing through a separate loop that includes equipment (e.g., roll crusher) needed to produce a more finely-divided, free-flowing feedstock. For others, it may be necessary to utilize a magnetic separator to remove metal constituents. Also, materials such as coal, pyrites, or other more coarse materials may need to be screened. The Screening/Separation step will occur routinely to produce a free-flowing, finely-divided feedstock suitable for the STAR Reactor. Depending on the source of coal ash, milling may not be necessary to achieve a finely-divided and free-flowing material.

As emphasized by SEFA, the specific processing steps and the specific processing equipment cited above are typical examples for how these materials might be processed to produce a suitable feedstock. Those performing the actual work (i.e., suppliers) will elect to use different techniques and/or equipment. SEFA states that as long as the processed coal ash conforms to SEFA's general specifications outlined above, the coal flyash received from landfills or ash ponds will have been sufficiently "processed" and will be a suitable feedstock as an ingredient in the STAR Reactor.

It needs to be noted here that the EPA has recognized similar processing steps (similar to SEFA suggested processing steps as above to meet the SEFA specifications) are "likely to meet our definition of processing, as it appears that these processes in fact remove contaminants and improve the ingredient characteristics of these recovered CCRs (**i.e., ash from ponds and landfills**)". Refer to 76 FR 15518, March 21, 2011 (emphasis added).

With respect to the requirement for meeting the legitimacy criteria in §241.3(d)(2), pursuant to §241.3(b)(4), for flyash received from landfill or ash pond, SEFA emphasizes that after completion of "processing", it will become similar to the flyash received directly from coal-fired plant's particulate collection infrastructure (i.e., Electrostatic precipitator or Baghouse), and thus, will meet all legitimacy criteria as discussed above for it.

Finally, with respect to the particular criterion for comparable contaminants concentration of end product (traditional products) in §241.3(d)(2)(iv), SEFA analyzed each of these materials for semi-volatile organic compounds, organo-chlorine pesticides, PCBs, chlorides, metals and sulfur content, during engineering studies to assess the suitability of coal ash previously placed in water treatment ponds (pond ash) or previously placed in landfills (landfill ash). A comparison of the constituents in dry source feedstock, pond ash and landfill ash from SCE&G's[2] Wateree facility is provided in Attachment C to the SEFA's September 2014 submittal. In comparison to the dry collection feedstock, the landfill ash is comparable with slightly higher results for a few constituents. The sampling results on pond ash indicate that all constituents detected were lower

[2] www.sceg.com

than those for the dry collection feedstock and the landfill ash. Despite certain variables in the manner in which coal ash were previously placed in ponds or landfills, as per SEFA, these sampling results are sufficient to demonstrate that contaminants in coal flyash previously placed in ponds and landfills are comparable to or lower than those in dry collection coal flyash processed as feedstock (that is, flyash received directly from the coal-fired power plant's particulate emissions control) for the STAR Reactor. Furthermore, the metals and sulfur levels of the landfill ash are comparable to those of the dry collection feedstock, and the metals and sulfur levels of the pond ash are significantly lower than those of the dry collection feedstock. Finally, more recent sampling data (March-April 2015) for dry ash and pond ash, provided by SEFA, indicates that the contaminants in pond ash as are lower than the dry ash received directly from electric utility plant.[3] Therefore, SEFA concludes that there will be no increase in emissions as a result of the use of pond ash and landfill ash as a feedstock for the STAR Reactor.

Conclusions

In summary, the DAQ has determined that the fly ash received directly from the coal-fired power plant's particulate collection infrastructure (i.e., electrostatic precipitator or baghouse) is a NHSM and an "ingredient", as defined in §241.2. DAQ has further determined that this flyash meets the legitimacy criteria included in §241.3(d)(2). Thus, it concludes that it is not a solid waste and therefore, STAR Reactor is not subject to the requirements in CISWI.

Moreover, the processed flyash received from ash landfills or ash ponds meets the definition of "processing" in §241.2, and is also a NHSM and an ingredient. DAQ has further determined that this flyash also meets the legitimacy criteria included in §241.3(d)(2). Thus, it concludes that it is not a solid waste and therefore, STAR Reactor is not subject to the requirements in CISWI.

It needs to be emphasized here that this letter includes only the "non-waste" determination, which is specific to the materials discussed herein. Further, the determination does not give any permission to SEFA to burn or process flyash in the STAR Reactor. SEFA will need to evaluate and submit a permit application for an air permit, as needed, for burning / processing flyash, as discussed herein, in the STAR Reactor at any location in NC.

If you have any questions regarding this determination, please contact Rahul P. Thaker, P.E., QEP, at (919) 707-8470.

[3] Email dated 5/12/2015 from Thomas Pritcher, Environmental Consulting &Technology, Inc., to Rahul Thaker, NCDAQ.

Sincerely,

William D. Willets, P.E., Chief, Permitting Section
Division of Air Quality, NCDENR

c: Central Files

Appendix H

Zoning Consistency Determination

DUKE ENERGY.

410 South Wilmington Street
Raleigh, NC 27601

Mailing Address:
PO Box 1551
Raleigh, NC 27602-1551

July 20, 2018

Mr. Jason Sullivan, Director
Chatham County Planning Department
P.O. Box 54
Pittsboro, NC 27312

Subject: Zoning Consistency Determination
Duke Energy Progress, LLC
Cape Fear STAR® Ash Beneficiation Process
Moncure, Chatham County, North Carolina

Dear Mr. Sullivan:

On behalf of Duke Energy Progress, LLC, I am writing to inform you that we are submitting an air permit application to construct and operate a Cape Fear STAR® Ash Beneficiation Process at 500 CP and L Road in Moncure, Chatham County. I hereby certify that to the best of my knowledge, Chatham County is the only local government having jurisdiction over any part of the land on which the facility and its appurtenances are to be located.

In accordance with § 143-215.108(f) of the North Carolina General Statutes, we hereby request that you issue a determination as to whether your municipality has in effect a zoning or subdivision ordinance that is applicable to the proposed facility. Additionally, please issue a determination as to whether the proposed use would be consistent with applicable zoning or subdivision ordinances. For your convenience, I have included a form with which you may remit your determination and a copy of the air permit application. As a means of demonstrating proof of transmittal, please sign, title, stamp, and date the enclosed form and mail to the checked air quality offices at your earliest convenience. In addition, please mail (to the address in the letterhead) or email me a copy for our files.

Thank you for your prompt attention to this matter. If you have any questions regarding this request, please contact me at 919-546-6610 or ann.quillian@duke-energy.com.

Sincerely,

Ann Quillian, PE
Lead Environmental Specialist

Enclosures
Zoning Consistency Determination Form
Draft Air Permit Application

Zoning Consistency Determination

Facility Name	Duke Energy Progress, LLC – Cape Fear STAR®
Facility Street Address	500 CP and L Road
Facility City	Moncure
Description of Process	Coal Ash Beneficiation @ Retired Cape Fear Steam Electric Plant
SIC/NAICS Code	4911 / 221112
Facility Contact	Ann Quillian
Phone Number	919-546-6610
Mailing Address	410 S. Wilmington St.
Mailing City, State Zip	Raleigh, NC 27601

Based on the information given above:

- ☐ I have received a copy of the air permit application (draft or final) AND...

- ☐ There are no applicable zoning ordinances for this facility at this time
- ☐ The proposed operation IS consistent with applicable zoning ordinances
- ☐ The proposed operation IS NOT consistent with applicable zoning ordinances (please include a copy of the rules in the package sent to the air quality office)
- ☐ The determination is pending further information and can not be made at this time
- ☐ Other: _____

Agency _____

Name of Designated Official _____

Title of Designated Official _____

Signature _____

Date _____

Please forward to the facility mailing address listed above and the air quality office at the appropriate address as checked on the back of this form.

Courtesy of the Small Business Environmental Assistance Program
sb.ncdenr.gov 877-623-6748

All PSD and Title V Applications

■ Attn: William Willets, PE
DAQ – Permitting Section
1641 Mail Service Center
Raleigh, NC 27699-1641

Local Programs

☐ Attn: David Brigman
Western NC Regional Air Quality Agency
49 Mount Carmel Road
Asheville, NC 28806
(828) 250-6777

☐ Attn: Leslie Rhodes
Mecklenburg County Air Quality
700 N. Tryon Street, Suite 205
Charlotte, NC 28202-2236
(704) 336-5430

☐ Attn: William Minor Barnette
Forsyth County Office of Environmental Assistance and Protection
201 N. Chestnut Street
Winston-Salem, NC 27101-4120
(336) 703-2440

Division of Air Quality Regional Offices

☐ Attn: Brendan Davey
Asheville Regional Office
2090 U.S. Highway 70
Swannanoa, NC 28778
(828) 296-4500

☐ Attn: Steven Vozzo
Fayetteville Regional Office
225 Green Street, Suite 714
Fayetteville, NC 28301
(910) 433-3300

☐ Attn: Bruce Ingle
Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699

■ Attn: T. Ray Stewart, Jr.,PE, CPM
Raleigh Regional Office 1628
Mail Service Center Raleigh, NC
27699-1628
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☐ Attn: Robert Fisher
Washington Regional Office
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481

☐ Attn: Brad Newland
Wilmington Regional Office
127 Cardinal Drive Extension
Wilmington, NC 28405
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☐ Attn: Lisa Edwards, PE
Winston-Salem Regional Office
450 West Hanes Mill Road, Suite 300
Winston-Salem, NC 27105
(336) 776-9800