NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date:

Region: Raleigh Regional Office
County: Person
NC Facility ID: 7300029
Inspector's Name: Matthew Mahler
Date of Last Inspection: 02/07/2018
Compliance Code: 3 / Compliance - inspection

Facility Data

Applicant (Facility's Name): Duke Energy Progress, LLC - Roxboro Steam Electric Plant

Facility Address:
Duke Energy Progress, LLC - Roxboro Steam Electric Plant
1700 Dunnaway Road
Semora, NC 27343

SIC: 4911 / Electric Services
NAICS: 221112 / Fossil Fuel Electric Power Generation

Facility Classification: Before: Title V **After:** Title V
Fee Classification: Before: Title V **After:** Title V

Permit Applicability (this application only)

SIP: 15A NCAC 02D .0510, 02D .0521
NSPS: NA
NESHAP: NA
PSD: NA
PSD Avoidance: NA
NC Toxics: 15A NCAC 02Q .0709, 02D .1111
112(r): NA
Other: NA

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Robert Howard Lead EHS Professional (336) 598-4077 1700 Dunnaway Road Semora, NC 27343	Jason Haynes Plant Manager (336) 597-6101 1700 Dunnaway Road Semora, NC 27343	Erin Wallace Sr. Environmental Specialist (919) 546-5797 410 South Wilmington Street Raleigh, NC 27601

Application Data

Application Numbers: 7300029.18A and 7300029.17C
Date Received: 03/16/2018 (.18A) and 11/29/2017 (.17C)
Application Type: Modification
Application Schedule: TV-Significant

Existing Permit Data

Existing Permit Number: 01001/T53
Existing Permit Issue Date: 05/03/2018
Existing Permit Expiration Date: 01/31/2019

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2016	8052.62	5480.98	96.28	806.85	460.94	20.21	9.41 [Hydrogen chloride (hydrochlori]
2015	10544.03	7120.18	104.26	883.20	528.85	27.12	11.59 [Hydrogen chloride (hydrochlori]
2014	15647.03	9569.75	148.23	1235.49	731.18	24.00	6.15 [Cyanide & compounds (see also]
2013	12642.21	10060.78	117.27	26960.69	484.71	17.31	4.93 [Cyanide & compounds (see also]
2012	13372.01	13064.42	175.62	25999.17	748.65	24.70	7.27 [Cyanide & compounds (see also]

Review Engineer: Ed Martin

Review Engineer's Signature: **Date:**

Comments / Recommendations:
Issue 01001/T55
Permit Issue Date:
Permit Expiration Date:

Note: These permit changes will be incorporated into permit T54, which is currently at public notice, after that permit is issued and after T55 goes through public notice and EPA review.

Chronology

March 1, 2018	A Zoning Consistency Determination form signed by the Person County Planning Department was received.
March 16, 2018	Application received.
July 19, 2018	Email to Erin Wallace at Duke requesting information regarding the Sulfate Reduction Delta of 16.7 mg/L as used to calculate the hydrogen sulfide emissions in Appendix B.
July 24, 2018	Email to Erin Wallace at Duke requesting: (1) Duke's toxics optimized emission rates as used to model along with the source ID number listed in Table D-12 of the application and the corresponding D number in the Appendix D Table of Contents, (2) how Duke wanted to handle the fact that the bio-reactor hydrogen sulfide emissions exceed the PSD significant emission rate of 10 tpy for PSD applicability, and (3) asked what "Including voluntary scrubber no control efficiency claimed" means in Table 1-1 for IS-HCl that reads "Insignificant Activity: Wastewater treatment facility hydrochloric acid storage tank (10,000 gallon capacity) Including voluntary scrubber no control efficiency claimed."
July 25, 2018	Email to Erin Wallace at Duke requesting additional information regarding the Sulfate Reduction Delta of 16.7 mg/L as used to calculate the hydrogen sulfide emissions in Appendix B.
August 17, 2018	Duke sent information on the Sulfate Reduction Delta of 16.7 mg/L as used to calculate the hydrogen sulfide emissions in Appendix B (see Section V.B under Emissions from Bio-Reactor).
August 24, 2018	Duke provided the information requested on July 24, 2018.
September 19, 2018	Received modeling memo from Alex Zarnowski, Air Quality Analysis Branch.
September 20, 2018	Sent draft permit to Erin Wallace at Duke, Matthew Mahler at Raleigh Regional Office, and Samir Parekh with Stationary Source Compliance Branch for review.
September 20, 2018	Duke had no comments on the draft permit. Duke requested one additional insignificant activity (Sodium Carbonate Addition to Bottom Ash, IS-SA) be added to the permit.
September 27, 2018	Email from Matthew Mahler stating RRO had no comments on the draft permit. No comments received from Samir Parekh with SSCB.

I. Purpose of Applications

The following applications are covered by this review:

Application 7300029.18A

Duke has applied to retire the current wastewater treatment bioreactor (WWTBR) and replace it with a new wastewater treatment bioreactor (WWTBR) to comply with the North Carolina Coal Ash Management Act (NC-CAMA) and EPA's Coal Combustion Residual (CCR) regulations. Sulfur dioxide (SO_2) is generated from the combustion of coal, and is controlled with wet flue gas desulfurization (FGD) scrubbers on each of the four units. The purpose of the bioreactor is to treat the scrubber blowdown before the wastewater is released to surface water. The wastewater must be treated because of the high concentrations of total dissolved solids, total suspended solids, sulfates, organic matter, ammonia and heavy metals. Wastewater generated by the scrubbers is currently directed to the existing wastewater settling basin and bio-reactor located on top of the West Ash Basin, which will be closed. The new FGD WWT system will consist of physical, chemical, and biological treatment. Additionally, to comply with the CCR regulations under

Subtitle D of the Resource Conservation and Recovery Act (RCRA), all inflow streams to the wastewater settling and auxiliary ponds must be eliminated. Other equipment to be added includes a wastewater treatment facility lime storage silo (ES-WWTF Silo), and two insignificant activities: a wastewater treatment facility hydrochloric acid storage tank and Sodium Carbonate Addition to Bottom Ash.

This application includes a facility-wide toxics modeling analysis that is triggered by adding new toxics emitting sources (see Section V.C below).

A notice of intent to construct for the sources being added was approved by NCDAQ on October 19, 2017. The application was received on March 16, 2018.

This is a significant permit modification pursuant to rule 15A NCAC 02Q .0501(b)(1). Public notice of the draft permit is required.

Application7300029.17C (consolidated into application 7300029.18A)
This application is the second step of the 02Q .0501(b)(2) permitting process for the following sources and control devices added to Permit No. 7300029T51 issued on October 21, 2016 pursuant to application 7300029.16B: ID Nos. ES-FA Handling 1, ES-FA Handling 3A, ES-FA Handling 3B, ES-FA Handling 3C, ES-FA Handling 4A, ES-FA Handling 4B, ES-FA Handling 4C, ES-FA Silo 5 and ES-S-5) and control devices (ID Nos. CD-BF14, CD-FS-1A, CD-FS-1B, CD-FS-3A, CD-FS-3B, CD-FS-3C, CD-FS-4A, CD-FS-4B, CD-FS-4C, CD-BF9, CD-BF10, CD-WS6 and CD-WS7.

As stated above, this is the second step of a significant permit modification pursuant to rule 15A NCAC 02Q .0501(b)(2). Public notice of the draft permit is required.

II. Permit Changes

The following changes were made to the Progress Energy - Roxboro Plant Air Permit No. 01001T53:

Page	Section	Description of Change(s)
Cover	--	Amended permit numbers and dates.
--	Insignificant Activities list	Added wastewater treatment facility hydrochloric acid storage tank IS-HCl and sodium carbonate (soda ash) addition to bottom ash IS-SA.
7	1, table of permitted emission sources	Removed wastewater treatment bioreactor ES-WWTBR.
8		Added wastewater treatment facility ES-WWTBR (bio-reactor) and wastewater treatment facility lime storage silo ES-WWTF Silo.
8		Removed footnote j for the requirement to file a Title V Air Quality Permit Application for emission sources (ID Nos. ES-FA Handling 1, ES-FA Handling 3A, ES-FA Handling 3B, ES-FA Handling 3C, ES-FA Handling 4A, ES-FA Handling 4B, ES-FA Handling 4C, ES-FA Silo 5 and ES-S-5) and control devices (ID Nos. CD-BF14, CD-FS-1A, CD-FS-1B, CD-FS-3A, CD-FS-3B, CD-FS-3C, CD-FS-4A, CD-FS-4B, CD-FS-4C, CD-BF9, CD-BF10, CD-WS6 and CD-WS7).
21	2.1.C equipment description	Removed note * to make conditions shielded for emission sources (ID Nos. ES-FA Handling 1, ES-FA Handling 3A, ES-FA Handling 3B, ES-FA Handling 3C, ES-FA Handling 4A, ES-FA Handling 4B, ES-FA Handling 4C and ES-FA Silo 5) and control devices (ID Nos. CD-BF14, CD-FS-1A, CD-FS-1B, CD-FS-3A, CD-FS-3B, CD-FS-3C, CD-FS-4A, CD-FS-4B, CD-FS-4C, CD-BF9 and CD-BF10).
23	2.1.C.2.b	Added noncompliance statement for 02D .0521.

24	2.1.C.3.a	Removed requirement to file an amended application. following the procedures of Section 15A NCAC 02Q .0500 within one year from the date of beginning operation for sources (ID Nos. ES-FA Handling 1, ES-FA Handling 3A, ES-FA Handling 3B, ES-FA Handling 3C, ES-FA Handling 4A, ES-FA Handling 4B, ES-FA Handling 4C and ES-FA Silo 5) and associated air pollution control devices (ID Nos. CD-FS-1A, CD-FS-1B, CD-FS-3A, CD-FS-3B, CD-FS-3C, CD-FS-4A, CD-FS-4B, CD-FS-4C, CD-BF9 and CD-BF10).
24	2.1.D equipment description	Removed note * to make conditions shielded for emission sources (ID No. ES-S-5) and control devices (CD-WS6 and CD-WS7).
25	2.1.D.2.b	Added noncompliance statement for 02D .0521.
25	2.1.D.3.a	Removed requirement to file an amended application.
46	2.1.P	Added condition for wastewater treatment facility lime storage silo ES-WWTF Silo.
48-53	2.2.A.1.b	Replaced wastewater treatment bioreactor ES-WWTBR with new wastewater treatment facility (bio-reactor) ES-WWTBR. Added wastewater treatment facility lime storage silo ES-WWTF Silo. Updated toxic permit limits.
62-70	3	Updated General Conditions to version 5.3, 08/21/2018.
--	List of Acronyms	Corrected definition of AOS to Alternative Operating Scenario.

III. Facility Description

Progress Energy's Roxboro Plant is the second-largest coal-fired electrical generating facility in North Carolina (based on MW output). The facility produces steam in four coal-fired combustion units (Units 1-4) and one No. 2 fuel oil-fired combustion turbine. The steam from the combustion units is routed to steam turbines that produce electricity to sell to residential or industrial consumers. The coal-fired units are permitted to operate electrostatic precipitators for particulate emissions control, low-NOx burner systems combined with selective catalytic reduction (SCR) systems for nitrogen oxides (NOx) emissions control, and wet limestone scrubbers for sulfur dioxide (SO_2) control. Wet scrubbers have been installed and are in operation on all four units. The SCR systems are used on an as needed basis during ozone season to control NOx emissions. The facility has a total of six coal/recycled No. 2 fuel oil-fired electric utility boilers (Units 3 and 4 have two boilers each); one No. 2 fuel oil-fired internal combustion turbine (being removed with this application); flyash conveyance, handling and storage equipment; coal conveyance and storage equipment; limestone conveyance and storage equipment associated with the Units 1-4 scrubbers; and dry sorbent (limestone) injection systems to control corrosion in the flue gas ducts, reduce PM emissions and reduce limestone consumed in the scrubbers.

IV. Summary of Changes to Emission Sources and Control Devices

The equipment description changes for the above modifications are as follows (strikeout shows equipment removed and new equipment is shown in bold):

Emission Source I.D. No.	Emission Source Description	Control Device I.D. No.	Control Device Description
~~ES-WWTBR~~	~~wastewater treatment bioreactor~~	~~NA~~	~~NA~~
ES-WWTBR	**wastewater treatment facility (bio-reactor)**	**NA**	**NA**

Emission Source I.D. No.	Emission Source Description	Control Device I.D. No.	Control Device Description
ES-WWTF Silo	**wastewater treatment facility lime storage silo (5,600 cubic feet capacity)**	**CD-WWTF-Silo-BF**	**bin vent filter (295.2 square feet of filter area)**

In addition, and a wastewater treatment facility hydrochloric acid storage tank (10,000 gallon capacity) with HCl scrubber is being added as an insignificant activity.

V. Emissions and Regulatory Evaluation

A. PSD Applicability

The Roxboro Steam Electric Plant is an existing Prevention of Significant Deterioration (PSD) "major stationary source" of criteria air pollutants as defined under PSD, per 40 CFR 51.166(b)(1)(i)(a), and is classified as one of the 28 named source categories under the category of "fossil fuel-fired steam electric plants of more than 250 million Btu per hour heat input," which emits or has a potential to emit (PTE) 100 tons per year of any regulated pollutant.

Because the existing facility is considered a major stationary source, any physical change or a change in the method of operation as calculated pursuant to 40 CFR 51.166(a)(7)(iv) which results in a *net emissions increase* for regulated pollutants in the amounts equal or greater than the significance levels, is subject to PSD review and must meet certain review requirements. Thus, the net emission increase as a result of this modification must be compared to the "significance levels" as listed in 40 CFR 51.166(b)(23)(i) to determine which pollutants must undergo PSD review.

The Permittee has performed a PSD applicability analysis for the project to determine whether the project results in an emission increase of any regulated NSR pollutant above the applicable significance thresholds and therefore whether PSD permitting is required for the applicable PSD-regulated air pollutants being emitted by the new sources: PM, PM_{10}, $PM_{2.5}$, Pb, and H_2S.

B. Project Emissions

Emissions for the new sources are calculated under the "actual-to-potential test" as the difference between the *potential to emit* (post-project) as defined by 40 CFR 51.166(b)(4), and the *baseline actual emissions* (pre-project) as defined by 40 CFR 51.166(b)(47)(iii). Potential to emit means the maximum capacity to emit under its physical and operational design. For a new emissions unit, baseline actual emissions are zero. Duke has calculated the potential emissions increase for the new sources as shown in Table 1 (see Appendix B of the application for calculations). Potential emissions are calculated as follows:

Emissions from Lime Storage Silo

Particulate matter ($PM/PM_{10}/PM_{2.5}$) emissions from the lime storage silo are estimated based on an outlet grain loading manufacturer's guarantee of 0.005 grains of PM per standard cubic feet of exhaust and the maximum air flow through the bin vent filter during filling of 48,000 scf/hr resulting in potential $PM/PM_{10}/PM_{2.5}$ emissions of 0.034 lb/hr or 0.15 tpy. The silo will be filled by truck delivery and empty into slurry tanks located directly below the silo. The silo will be equipped with dual discharge trains. Each train will include an aerator, rotary feeder, volumetric screw feeder with surge hopper, and a slurry tank. Each surge hopper will be equipped with a vent sock that allows displaced air to be evacuated from the hopper during the filling process. PM emissions as a result of discharging lime from the silo to the slurry tanks are expected to be negligible.

Metal emissions from the lime storage silo calculated using Electric Power Research Institute (EPRI) data. The EPRI PISCES Database (February 2003) was used to determine the composition of lime. Metal emissions are derived from the PM estimate and the average trace element analysis of lime.

Emissions from Bio-Reactor

Hydrogen sulfide (H_2S) emissions from the bio-reactor are estimated using emission factors based on manufacturer studies. Anaerobic activity of bacteria converts a small fraction of sulfate salts in the effluent to H_2S. Conservatively, all sulfate reduction is assumed to form H_2S, and 50 percent is assumed to be emitted from solution. The value of the Sulfate Reduction Delta of 16.7 mg/L as used to calculate the H_2S emissions in Appendix B is based on testing that was performed in 2005 at the Red Rock Ranch Pilot site in California on sulfate reduction across the biofilter technology, as provided in an email from Erin Wallace August 17, 2018.

Emissions from Insignificant Activities

Emissions from Hydrochloric Acid Storage Tank (IS-HCl)
Hydrochloric acid (HCl) is used to treat the scrubber blowdown before the wastewater is released to surface water. Duke calculates HCl emissions from the storage tank, using EPA TANKS 4.0.9d, at 304.84 lb/yr. No control efficiency is claimed for the (voluntary) tank scrubber. Emissions of HCl are less than 1000 pounds per year and therefore the tank qualifies as an insignificant activity in accordance with 02Q .053(8).

Inorganic storage tanks with a true vapor pressure less than 1.5 pounds per square inch absolute are exempt from toxics modeling per 02Q .0702(a)(19)(A).

Emissions from Sodium Carbonate Addition to Bottom Ash (IS-SA)
Bottom ash is being dewatered to be landfilled. The water that is removed from the bottom ash is being recycled to be used back in the bottom ash hopper. Soda ash (sodium carbonate) will be used to control the pH of the recycled water to prevent corrosion and equipment damage. Duke calculates particulate emissions using an emission factor of 5.2 lb PM/ton of soda ash used from AP-42, Table 8.12-3, *Uncontrolled PM from Soda Ash Storage/Loading and Unloading* at 5.2 lb PM/ton with a throughput of 4,000 lb/day of soda ash and a control efficiency of 62% from for a continuous water spray at transfer point, PM-10 control efficiency (WRAP Fugitive Dust Handbook, Table 4-2. *Control Efficiencies for Control Measures for Materials Handling)*. The product particulate distribution indicated that 2% (max) soda ash particles were < 75 µm. Therefore, it was conservatively assumed that 2% of Total PM was PM-10. The resulting emissions are:

Max. Throughput	4,000 lb/day
Uncontrolled PM	1.9 tpy
Uncontrolled PM-10	0.038 tpy
Uncontrolled PM-2.5	0.038 tpy
Controlled PM	0.72 tpy
Controlled PM-10	0.014 tpy
Controlled PM-2.5	0.014 tpy

Since controlled PM emissions are less than 5 tpy, the addition of soda ash qualifies as an insignificant activity.

Table 1 presents a summary of the potential emissions increases for the project based on the baseline and potential (PTE) emissions described above. Since the net increase for each pollutant using PTE minus baseline emissions is below the corresponding PSD significant rates, a PSD review is not required for this project.

Table 1 –Project Potential Emissions Increase, tpy

		$PM/PM_{10}/PM_{2.5}$	**TRS**	**Pb**	**HCl**
Project Potential Emissions	ES-WWTBR		5.85		
	ES-WWTF Silo	0.15		1.8E-07	
	hydrochloric acid storage tank*				0.152
Baseline Actual Emissions		0	0	0	0
Project Net Emissions Increase		0.15	5.85	1.8E-07	0.152
NSR Significant Emissions Rates		25/15/10	10	0.6	NA

NSR Review Required?	No	No	No	NA

* insignificant activity

Detailed emissions calculations are presented in Duke's application Appendix B.

C. Facility-wide Toxics Demonstration (State-only enforceable)

15A NCAC 02Q .0709 DEMONSTRATIONS

As a result of this modification to add new emission sources emitting toxic air pollutants, a facility-wide modeling analysis is triggered.

In accordance with 15A NCAC 02Q .0709(a), the owner or operator of a source who is applying for a permit or permit modification to emit toxic air pollutants shall:

i. demonstrate to the satisfaction of the Director through dispersion modeling that the emissions of toxic air pollutants from the facility will not cause any acceptable ambient level listed in 15A NCAC 02D .1104 to be exceeded beyond the premises (adjacent property boundary); or
ii. demonstrate to the satisfaction of the Commission or its delegate that the ambient concentration beyond the premises (adjacent property boundary) for the subject toxic air pollutant shall not adversely affect human health (e.g., a risk assessment specific to the facility) though the concentration is higher than the acceptable ambient level in 15A NCAC 02D .1104.

As required by NCAC 02Q .0706(b), the owner or operator of the facility shall submit a permit application to comply with 15A NCAC 02D .1100 if the modification results in:

i. a net increase in emissions or ambient concentration of any toxic air pollutant that the facility was emitting before the modification; or
ii. emissions of any toxic air pollutant that the facility was not emitting before the modification if such emissions exceed the levels contained in 15A NCAC 02Q .0711.

As required by NCAC 02Q .0706(c), the permit application shall include an evaluation for all toxic air pollutants covered under 15A NCAC 02D .1104 for which there is:

i. a net increase in emissions of any toxic air pollutant that the facility was emitting before the modification; and
ii. emission of any toxic air pollutant that the facility was not emitting before the modification if such emissions exceed the levels contained in 15A NCAC 02Q .0711.

All sources at the facility, excluding sources exempt from evaluation in 15A NCAC 02Q .0702, emitting these toxic air pollutants shall be included in the evaluation.

Duke performed a facility-wide air toxics analysis, for all sources in the permit, except for the four CBO sources (flyash-fired fluidized bed combustor (ID No. ES-CBO-FBC), CBO feedash silo (ID No. ES-CBO Silo 1), CBO recycle ash silo (ID No. ES-CBO Silo 2), and CBO product dome (ID No. ES-CBO Dome)). Duke did not include these sources because they have not been constructed (even though they have been it the permit since 2004). Duke does not want to remove these sources from the permit at this time and the permit has a condition in Section 2.1.A.1.a where Duke would perform a new facility-wide modeling analysis in the event, and at the time, these sources were built and operated.

Air toxics emissions for the sources in this permit subject to a Part 63 MACT (e.g., electric generating units subject to Subpart UUUUU and the engines subject to Subpart ZZZZ) are exempt from air permitting, pursuant to 02Q .0702(a)(27)(B). Nevertheless, the Permittee has volunteered to include emissions for all such exempt sources in the modeling analysis. However, for the two MACT fire water pump engines (ES-FWP2 and ES-31), Duke inadvertently omitted emissions of soluble chromate (VI) compounds from the modeling. This is discussed below under Health Risk Assessment.

Duke's analysis included the toxics emitted based on the composition of bituminous coal (eastern/eastern interior) from EPRI PISCES Database (version 2005a), except for mercury which is a site-specific weighted average as per the 1999 Mercury Information Collection Request. The concentration of toxics in the flyash was derived from coal toxic concentration and a facility-wide ash content in the coal of 11.5%. It was assumed that 26% of total chromium in the coal is converted to CrVI and therefore carried over to the ash. The arsenic ash concentration of 55.5 ppm in the flyash is the average of 2008 site specific analytical data. For the two engines, toxic emission factors were taken from AP-42, Table 1.3-10, except for chromium as discussed above and below under Health Risk Assessment.

The first step of the modeling analysis was to perform a facility-wide toxic pollutant emission rate (TPER) analysis using potential emissions to determine if the TEPRs in rule 02Q .0711 were exceeded for all toxics emitted.

The TPER analysis indicated that all toxics exceeded their respective TPER as shown in Table 2 below.

Table 2 - Toxic Pollutant Emission Rate (TPER) Analysis

	Toxic Pollutant Emission Rates (TPER)		**Duke Energy Progress Roxboro Plant**			
Compound	**Chronic Toxicants (lb/day)**	**Carcinogens (lb/yr)**	**Chronic Toxicants (lb/day)**	**Exceed TPER?**	**Carcinogens (lb/yr)**	**Exceed TPER?**
HYDROGEN SULFIDE	1.7		32	**yes**		
ARSENIC AND INORGANIC ARSENIC COMPOUNDS		0.053			341	**yes**
BERYLLIUM		0.28			16.46	**yes**
CADMIUM		0.37			27.8	**yes**
MANGANESE AND COMPOUNDS	0.63		20.5	**yes**		
MERCURY, VAPOR	0.013		0.641	**yes**		
NICKEL METAL	0.13		3.8	**yes**		
SOLUBLE CHROMATE COMPOUNDS, AS CHROMIUM (VI) EQUIVALENT	0.013		0.199	**yes**		

Next, potential emissions were modeled for comparison to the respective Acceptable Ambient Levels (AALs). Results for the baseline analysis are shown in Table 2 below. Then, 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. Results for the optimized analysis are shown in Table 3 below. Optimizing the emission rates provides the Roxboro Plant with additional operational flexibility, and should reduce the need for future TAP modeling analyses for these sources at the facility.

Table 2 – Summary of Baseline Modeling Analysis

Compound	**Year**	**Averaging Period**	**Maximum Concentration ($\mu g/m^3$)**	**AAL ($\mu g/m^3$)**	**Percent of AAL (%)**
Arsenic	2012	Annual	0.000610	0.0021	29.05
Beryllium	2012	Annual	0.000118	0.0041	2.88
Cadmium	2012	Annual	0.0000440	0.0055	0.80
Chromium VI	2015	24 hour	0.00532	0.62	0.86
Hydrogen sulfide	2013	24 hour	21.9	120	18.26
Manganese	2013	24 hour	0.0662	31	0.21
Mercury	2013	24 hour	0.00182	0.6	0.30
Nickel	2015	24 hour	0.0194	6	0.32

Table 3 – Summary of Optimized Modeling Analysis

Compound	**Year**	**Averaging Period**	**Maximum Concentration ($\mu g/m^3$)**	**AAL ($\mu g/m^3$)**	**Percent of AAL (%)**
Arsenic	2012	Annual	0.00206	0.0021	98

Beryllium	2012	Annual	0.00402	0.0041	98
Cadmium	2012	Annual	0.00539	0.0055	98
Chromium VI	2015	24 hour	0.610	0.62	98
Hydrogen sulfide	2013	24 hour	117.6	120	98
Manganese	2010	24 hour	30.38	31	98
Mercury	2010	24 hour	0.59	0.6	98
Nickel	2012	24 hour	5.88	6	98

Health Risk Assessment

By including the MACT sources, which are exempt from air permitting as discussed above, along with all other permitted sources in the modeling analysis, it can readily be determined without further analysis that the emissions of toxic air pollutants from the facility, including all exempt sources, would not present an unacceptable risk to human health as long as the modeling demonstrates compliance with the AALs. However, since Duke inadvertently omitted emissions of chromium from the analysis for the two MACT fire water pump engines (ES-FWP2 and ES-31), in order to demonstrate that there is not an unacceptable risk to human health, the following evaluation is made to determine the effect on the facility-wide chromium AAL analysis by using the additional potential chromium emissions from these two engines as compared to the total facility-wide chromium emissions used in the modeling analysis:

From the modeling analysis, the facility-wide baseline (before optimizing) chromium VI concentration is at 0.86% of the AAL (Table 2) without chromium emissions from the two fire water pump engines included. The total potential facility-wide emissions of chromium VI from chromium emitting sources is 1.044-03 g/s (from page D-4 of application at 0.199 lb/day) and the combined potential chromium emissions from the two pump engines 1.22E-06 g/s. This results in an increase in potential emissions due to the pumps of only 0.13% (see Table 4 below).

Table 4 – Effect of Chromium Emissions from Engines ES-FWP2 and ES-31 on AAL

Potential Chromium VI Emissions g/s	
Facility-wide Cr VI without ES-FWP2 and ES-31	1.044-03
From ES-FWP2 and ES-31*	1.22E-06
Emissions increase due to ES-FWP2 and ES-31	0.12%

* using DAQ's small gasoline and diesel spreadsheet

Further, the modeling optimizing factor for chromium to get from 0.86% of the AAL based on potentials to the optimized concentration of 98% of the AAL (as shown in Tables 2 and 3) is approximately 114 (98%/0.86%). Therefore, it can be seen that combining the small percent increase in emissions from the pumps with the wide margin from the potential to optimized AAL values, the effect of the increased chromium emissions is insignificant.

Based on the above, the additional emissions of chromium from the two MACT fire water pump engines does not present an unacceptable risk to human health.

Detailed emissions calculations are presented in Duke's application Appendix D.

The modeling analysis was reviewed by Alex Zarnowski, Air Quality Analysis Branch (see memo to Ed Martin dated September 19, 2018) and, as stated in the memo, the modeling adequately demonstrates compliance with the AALs, on a facility-wide basis, for all toxics modeled.

The hydrogen sulfide toxics limit for the wastewater treatment facility bio-reactor (ES-WWTBR) in Table 5 below is based on keeping the potential emissions below 10 tpy, which is the PSD significant rate for reduced sulfur compounds (including H_2S), to avoid PSD. In the application, the emissions rate of H_2S for the bio-reactor were calculated at 32.0 lb/day or 5.85 tpy (application page D-41). For modeling purposes, emissions were increased from a potential rate of 1.68E-01 g/s (application page D-45), to an optimized rate of 9.03E-01 g/s (application page D-57). However, the optimized rate results in an emissions rate of 31.39 tpy, which exceeds the PSD significant rate of 10 tpy as follows:

$$(0.903\ \text{g/s})\left(\frac{(60\ s/min)(60\ min/hr)}{453.6\ g/lb}\right)\left(\frac{8760\ hr/yr}{2000\ lb/ton}\right) = 31.39\ tpy$$

Therefore, in order to stay below 10 tpy, the emission limit is reduced to 5.42E+01 lb/day using an emission rate set to 9.9 tpy as follows:

$$Emission\ limit = (9.9\ tons/yr)\left(\frac{2000\ lb/ton}{8760\ hr/yr}\right)(24\ hr/day) = 54.2\ lb/day$$

$$= \left(\frac{54.2\ lb/day}{24\ hr/day}\right)\left(\frac{453.6\ g/lb}{(60\ s/min)(60\ min/hr)}\right) = 0.284\frac{g}{s}$$

Since the bio-reactor is the only source of H_2S emissions at the plant, and since the AERMOD model is a linear model, Duke agreed (see email Erin Wallace dated August 24, 2018) to the above change to limit emissions to 9.9 tpy.

The following toxic limits are being placed in the permit Section 2.2.A.1.b:

Table 5 – Permit Toxic Emission Limits

Emission Source	**Toxic Air Pollutant**	**Emission Limit**		
		(lb/yr)	**(lb/day)**	**(lb/hr)**
wastewater treatment facility (bio-reactor) ES-WWTBR	hydrogen sulfide		5.42E+01	
wastewater treatment facility lime storage silo ES-WWTF Silo	Arsenic and inorganic arsenic compounds	1.93E-03		
	Beryllium	2.77E-03		
	Cadmium	1.52E-02		
	Manganese and compounds		2.00E-02	
	Mercury Vapor		2.66E-06	
	Nickel Metal		1.20E-03	
Unit 1 dry flyash pneumatic transfer system ES-FA Handling 1	Arsenic and inorganic arsenic compounds	7.95E-01		
	Beryllium	1.64E+00		
	Cadmium	1.47E+00		
	Manganese and compounds		1.06E+00	
	Mercury Vapor		3.27E-03	
	Nickel Metal		4.36E-01	
	Soluble Chromate Compounds as Chromium VI Equivalent		4.51E-02	
Unit 3 dry flyash pneumatic transfer systems ES-FA Handling 3A ES-FA Handling 3B ES-FA Handling 3C	Arsenic and inorganic arsenic compounds	3.01E-01		
	Beryllium	3.72E+00		
	Cadmium	3.33E+00		
	Manganese and compounds		4.01E-01	
	Mercury Vapor		1.24E-03	

	Nickel Metal		1.65E-01	
	Soluble Chromate Compounds as Chromium VI Equivalent		1.70E-02	
Unit 4 dry flyash pneumatic transfer systems ES-FA Handling 4A ES-FA Handling 4B ES-FA Handling 4C	Arsenic and inorganic arsenic compounds	3.01E-01		
	Beryllium	3.72E+00		
	Cadmium	3.33E+00		
	Manganese and compounds		4.01E-01	
	Mercury Vapor		1.24E-03	
	Nickel Metal		1.65E-01	
	Soluble Chromate Compounds as Chromium VI Equivalent		1.70E-02	
flyash conveying system storage and handling silos ES-FA Silo 1 ES-FA Silo 2 ES-FA Silo 4	Arsenic and inorganic arsenic compounds	4.48E+01		
	Beryllium	9.23E+01		
	Cadmium	8.27E+01		
	Manganese and compounds		5.96E+01	
	Mercury Vapor		1.84E-01	
	Nickel Metal		2.45E+01	
	Soluble Chromate Compounds as Chromium VI Equivalent		2.54E+00	
flyash conveying system storage and handling silo ES-FA Silo 5	Arsenic and inorganic arsenic compounds	1.49E+01		
	Beryllium	3.08E+01		
	Cadmium	2.76E+01		
	Manganese and compounds		1.99E+01	
	Mercury Vapor		6.13E-02	
	Nickel Metal		8.17E+00	
	Soluble Chromate Compounds as Chromium VI Equivalent		8.46E-01	
No. 1 flyash conveying system storage and handling silo and load-out stations ES-S-1	Arsenic and inorganic arsenic compounds	5.03E-02		
	Beryllium	1.04E-01		
	Cadmium	9.30E-02		
	Manganese and compounds		6.70E-02	
	Mercury Vapor		2.07E-04	
	Nickel Metal		2.76E-02	
	Soluble Chromate Compounds as Chromium VI Equivalent		2.85E-03	
No. 4 flyash conveying system storage and handling silo and load-out stations ES-S-4	Arsenic and inorganic arsenic compounds	5.03E-02		
	Beryllium	1.04E-01		
	Cadmium	9.30E-02		
	Manganese and compounds		6.70E-02	
	Mercury Vapor		2.07E-04	
	Nickel Metal		2.76E-02	

	Soluble Chromate Compounds as Chromium VI Equivalent		2.85E-03	
No. 5 flyash conveying system storage and handling silo and load-out stations ES-S-5	Arsenic and inorganic arsenic compounds	5.03E-02		
	Beryllium	1.04E-01		
	Cadmium	9.30E-02		
	Manganese and compounds		6.70E-02	
	Mercury Vapor		2.07E-04	
	Nickel Metal		2.76E-02	
	Soluble Chromate Compounds as Chromium VI Equivalent		2.85E-03	
electrostatic flyash separation system and mineral-rich product load-out silo ES-S-3L	Arsenic and inorganic arsenic compounds	1.01E+00		
	Beryllium	2.08E+00		
	Cadmium	1.87E+00		
	Manganese and compounds		1.35E+00	
	Mercury Vapor		4.15E-03	
	Nickel Metal		5.53E-01	
	Soluble Chromate Compounds as Chromium VI Equivalent		5.73E-02	
two electrostatic flyash separation systems and associated conveying systems ES-EFSS1 ES-EFSS2	Arsenic and inorganic arsenic compounds	1.01E+00		
	Beryllium	2.08E+00		
	Cadmium	1.87E+00		
	Manganese and compounds		1.35E+00	
	Mercury Vapor		4.15E-03	
	Nickel Metal		5.53E-01	
	Soluble Chromate Compounds as Chromium VI Equivalent		5.73E-02	
six coal storage silos ES-Coal Silos 1-6 four coal conveyors ES-37A, ES-37B, ES-39A, ES-39B	Arsenic and inorganic arsenic compounds	4.20		
	Beryllium	6.51		
	Cadmium	5.83		
	Manganese and compounds		4.20	
	Mercury Vapor		0.01	
	Nickel Metal		1.73	
stationary vacuum system for housekeeping ES-SVS1	Arsenic and inorganic arsenic compounds	4.92E-02		
	Beryllium	1.01E-01		
	Cadmium	9.09E-02		
	Manganese and compounds		2.39E+01	
	Mercury Vapor		7.38E-02	
	Nickel Metal		9.84E+00	
	Soluble Chromate Compounds as Chromium VI Equivalent		1.02E+00	

flyash conveying system storage and handling silo ES-FA Silo 3 mineral-rich flyash loadout system ES-S-3L2	Arsenic and inorganic arsenic compounds	1.49E+01		
	Beryllium	3.08E+01		
	Cadmium	2.76E+01		
	Manganese and compounds		1.99E+01	
	Mercury Vapor		6.13E-02	
	Nickel Metal		8.17E+00	
	Soluble Chromate Compounds as Chromium VI Equivalent		8.46E-01	
coal unloading hopper ES-Coal Hopper	Arsenic and inorganic arsenic compounds	1.93E+00		
	Beryllium	2.99E+00		
	Cadmium	2.68E+00		
	Manganese and compounds		1.93E+00	
	Mercury Vapor		5.96E-03	
	Nickel Metal		7.94E-01	
coal conveyor ES-Coal Conv 1	Arsenic and inorganic arsenic compounds	1.69E-01		
	Beryllium	2.62E-01		
	Cadmium	2.35E-01		
	Manganese and compounds		1.69E-01	
	Mercury Vapor		5.22E-04	
	Nickel Metal		6.96E-02	
coal conveyor ES-Coal Conv 2	Arsenic and inorganic arsenic compounds	1.69E-01		
	Beryllium	2.62E-01		
	Cadmium	2.35E-01		
	Manganese and compounds		1.69E-01	
	Mercury Vapor		5.22E-04	
	Nickel Metal		6.96E-02	
limestone rail unloading station ES-LS Rail two limestone unloading hoppers ES-LS Unload A ES-LS Unload B	Arsenic and inorganic arsenic compounds	2.66E-02		
	Beryllium	5.20E-02		
	Cadmium	1.40E-01		
	Manganese and compounds		3.86E-01	
	Mercury Vapor		9.37E-05	
	Nickel Metal		1.38E-02	
belt feeder ES-LS Feeder 1 limestone conveyor ES-LS Convey 2 ES-LS Convey 4A ES-LS Convey 4B ES-LS Convey 5 ES-LS Convey 6 ES-LS Convey 7	Arsenic and inorganic arsenic compounds	1.33E-01		
	Beryllium	2.60E-01		
	Cadmium	7.02E-01		
	Manganese and compounds		1.93E+00	
	Mercury Vapor		4.69E-04	
	Nickel Metal		6.88E-02	

two limestone reclaim hoppers ES-LS Reclaim A ES-LS Reclaim B two belt feeders ES-LS Feeder 3A ES-LS Feeder 3B				
three limestone silos ES-LS Silo A ES-LS Silo B ES-LS Silo C limestone silo storing material for Mayo plant ES-LS Mayo Silo truck loading spout from Mayo limestone silo ES-Truck Spout three wet limestone grinders ES-LS Grinder 1 ES-LS Grinder 2 ES-LS Grinder 3	Arsenic and inorganic arsenic compounds	1.43E-01		
	Beryllium	2.80E-01		
	Cadmium	7.57E-01		
	Manganese and compounds		2.08E+00	
	Mercury Vapor		5.05E-04	
	Nickel Metal		7.42E-02	
Fugitive emissions from coal pile including ash landfill and (ID No. IS-36)	Arsenic and inorganic arsenic compounds	12.95		
	Beryllium	25.93		
	Cadmium	23.22		
	Manganese and compounds		16.74	
	Mercury Vapor		0.05	
	Nickel Metal		6.88	
	Soluble Chromate Compounds as Chromium VI Equivalent		0.65	

Gypsum emergency conveyor (ID No. IS-38) Emergency gypsum pile (ID No. IS-40) Mayo gypsum rotary feeder (ID No. IS-41) Gypsum conveyor 3 (includes 3a and 3b) (ID No. IS-44) Landfill gypsum loading hopper (ID No. IS-48) Landfill gypsum reclaim belt feeder (ID No. IS-49)	Arsenic and inorganic arsenic compounds	6.80E-02		
	Cadmium	6.21E-01		
	Manganese and compounds		2.54E+00	
	Mercury Vapor		1.49E-03	
	Nickel Metal		2.79E-02	
Off-specification gypsum pile (ID No. IS-45) On-specification gypsum pile (ID No. IS-46)	Arsenic and inorganic arsenic compounds	6.18E-02		
	Cadmium	5.64E-01		
	Manganese and compounds		2.30E+00	
	Mercury Vapor		1.35E-03	
	Nickel Metal		2.53E-02	

VI. Source-by-Source Requirements

A. wastewater treatment facility lime storage silo (ID No. ES-WWTF Silo) with associated bin vent filter (ID No. CD-WWTF-Silo-BF)

This equipment is subject to the following regulations:

1. 15A NCAC 02D .0510: PARTICULATES FROM SAND, GRAVEL, OR CRUSHED STONE OPERATIONS
   a. The Permittee shall not cause, allow, or permit any material to be produced, handled, transported or stockpiled without taking measures to reduce to a minimum any particulate matter from becoming airborne to prevent exceeding the ambient air quality standards beyond the property line for particulate matter, both PM10 and total suspended particulates.
   b. Fugitive non-process dust emissions shall be controlled by 15A NCAC 02D .0540.
   c. The Permittee shall control emissions from conveyors, screens, and transfer points, such that the applicable opacity standards in Section VI.A.2 below are not exceeded.

   Compliance
   Particulate matter emissions from this source (ID No. ES-WWTF Silo) shall be controlled by the associated bin vent filter (ID No. CD-WWTF-Silo-BF). To ensure compliance, the Permittee shall perform inspections and maintenance as recommended by the manufacturer. In addition to the manufacturer's inspection and maintenance recommendations, or if there are no manufacturer's inspection and maintenance recommendations, as a minimum, the inspection and maintenance requirement shall include the following:
   i. A monthly visual inspection of the system ductwork and material collection unit for leaks; and

ii. An annual (for each 12-month period following the initial inspection) internal inspection of the bin vent filter's structural integrity.

The results of the above inspection and maintenance shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:

i. The date and time of each recorded action;
ii. The results of each inspection;
iii. The results of any maintenance performed on the bin vent filter; and
iv. Any variance from manufacturer's recommendations, if any, and corrections made.

<u>Reporting</u>
The Permittee shall submit a summary report of the monitoring and recordkeeping activities by January 30 of each calendar year for the preceding six-month period between July and December and July 30 of each calendar year for the preceding six-month period between January and June.

2. <u>15A NCAC 02D .0521: CONTROL OF VISIBLE EMISSIONS</u>
Visible emissions from this source shall not be more than 20 percent opacity (except during startups, shutdowns, and malfunctions) when averaged over a six-minute period. However, six-minute averaging periods may exceed 20 percent not more than once in any hour and not more than four times in any 24-hour period. In no event shall the six-minute average exceed 87 percent opacity.

<u>Compliance</u>
To assure compliance, once a month the Permittee shall observe the emission points of this source (ID No. ES-WWTF Silo) for any visible emissions above normal. The Permittee shall establish "normal" for the source in the first 30 days following start-up of the sources. If visible emissions from this source are observed to be above normal, the Permittee shall either: (a) immediately shutdown the source and repair the malfunction, (b) be deemed to be in noncompliance with 15A NCAC 02D .0521 or (c) demonstrate that the percent opacity from the emission points of the emission sources in accordance with 15A NCAC 02D .2601 for 30 minutes is below the emission limit.

The results of the monitoring shall be maintained in a logbook (written or electronic format) on-site and made available to an authorized representative upon request. The logbook shall record the following:

i. the date and time of each recorded action;
ii. the results of each observation and/or test noting those sources with emissions that were observed to be in noncompliance along with any corrective actions taken to reduce visible emissions; and
iii. the results of any corrective actions performed.

<u>Reporting</u>
The Permittee shall submit a summary report of the observations postmarked on or before January 30 of each calendar year for the preceding six-month period between July and December and July 30 of each calendar year for the preceding six-month period between January and June.

3. <u>15A NCAC 02D .1100: CONTROL OF TOXIC AIR POLLUTANTS (State-Only Requirement)</u>
See Section V.C above.

VII. Public Notice

A notice of the DRAFT Title V Permit shall be made pursuant to 15A NCAC 02Q .0521. The notice will provide for a 30-day comment period, with an opportunity for a public hearing. Consistent with 15A NCAC 02Q .0525, the EPA will have a concurrent 45-day review period. Copies of the public notice shall be sent to persons on the Title V mailing list and EPA. Pursuant to 15A NCAC 02Q .0522, a copy of each permit application, each proposed permit and each final permit pursuant shall be provided to EPA. Also, pursuant to 02Q .0522, a notice of the DRAFT Title V Permit shall be provided to each affected State at or before the time notice is provided to the public under 02Q .0521 above.

VIII. Other Requirements

PE Seal
The C1 form for the lime storage silo bin vent filter was sealed by Claire A. Galie, PE, with AECOM at 1600 Perimeter Park, Suite 400, Morrisville, NC on February 15, 2018.

Zoning
A Zoning Consistency Determination form dated March 1, 2018 was received from the Person County Planning Department, signed by Lori Oakley, Planning Director, stating that the application had been received and that the proposed operation is consistent with applicable zoning ordinances.

Fee Classification
The facility fee classification before and after this modification will remain as "Title V".

Increment Tracking
The PSD Minor Baseline Date for Person County for PM-10 and SO_2 is December 30, 1985. This modification will result in an increase of 0.034 lb/hr of PM-10 from the lime storage silo (ES-WWTF Silo) and an increase of 0.014 tpy PM-10 from sodium carbonate addition to bottom ash (IS-SA) as shown in Section V.B above for a total increase of 0.048 tpy of PM-10. This permit modification does not consume or expand the increment for SO_2.

IX. Recommendations

later