NORTH CAROLINA DIVISION OF AIR QUALITY

Application Review

Issue Date: April /xx/2022

Region: Raleigh Regional Office
County: Wake
NC Facility ID: 9200820
Inspector's Name: Maureen Conner
Date of Last Inspection: 12/23/2020
Compliance Code: 3 / Compliance - inspection

Facility Data

Applicant (Facility's Name): South Wake Landfill

Facility Address:
South Wake Landfill
6300 Old Smithfield Road
Apex, NC 27539

SIC: 4953 / Refuse Systems
NAICS: 562212 / Solid Waste Landfill

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 .0516, .0521, .0524, .1111, .1700, and .1806
NSPS: Subpart IIII
NESHAP: 40 CFR 63 Subparts AAAA and ZZZZ
PSD: N/A
PSD Avoidance: N/A
NC Toxics: N/A
112(r): N/A
Other: N/A

Note: This landfill facility is considered an existing source subject to the State landfill regulations.

Contact Data

Facility Contact	Authorized Contact	Technical Contact
Lee Squires Facilities Manager (919) 856-6199 PO Box 550 Raleigh, NC 27602 lee.squires@wake.gov.com	John Roberson Solid Waste Management Director (919) 856-6365 PO Box 550 Raleigh, NC 27602 John.roberson@wake.gov.com	Lee Squires Facilities Manager (919) 856-6199 PO Box 550 Raleigh, NC 27602 lee.squires@wake.gov.com

Application Data

Application Numbers: 9200820.15A and .18A
Date Received: 08/06/2015 and 04/25/2018
Application Type: Renewal/Modification
Application Schedule: TV-Renewal

Existing Permit Data
Existing Permit Number: 10114/T01
Existing Permit Issue Date: 02/11/2014
Existing Permit Expiration Date: 01/31/2019

Total Actual emissions in TONS/YEAR:

CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2019	1.0000	4.51	0.1000	13.10	1.10	1.33	0.3643 [Hydrogen chloride (hydrochlori]
2018	1.0000	4.52	1.10	13.31	1.10	0.8253	0.3683 [Hydrogen chloride (hydrochlori]
2017	0.1800	0.8400	4.02	2.41	0.2000	3.10	1.07 [Toluene]
2016	0.2700	1.30	1.52	3.52	0.2900	1.23	0.3887 [Toluene]
2015	0.4600	2.20	3.14	6.12	0.5000	2.55	0.8217 [Toluene]

Consultant: SCS Engineers **Contact:** Bob Dick, PE **Email:** bdick@scsengineers.com **Phone:** 804.378.7440

Review Engineer: Joshua L. Harris/Booker T. Pullen

Review Engineer's Signature: **Date:** April xx, 2022

Comments / Recommendations:
Issue: 10114T02
Permit Issue Date: xx/xx/2022
Permit Expiration Date: xx/xx/2027

1. Purpose of Application

The South Wake Landfill is an active municipal solid waste (MSW) landfill located in Apex, Wake County, North Carolina. The landfill has submitted the following applications:

- Application No. 9200820.15A – submitted for a "State Only" modification to remove the 02D .1100 and 02Q .0711 toxics conditions from the permit.
- Application No. 9200820.18A – submitted for renewal with modifications requested to include revisions to permit conditions regarding gas collection and control system (GCCS) requirements.

  Addition of the State Regulations (15A NCAC 02D .1700) for existing municipal solid waste landfills to be added to the permit to replace Subpart WWW regulations.

Application No. 9200820.15A has been consolidated and processed under Application No. 9200820.18A. The application will go through the 30-day public notice and 45-day EPA review periods prior to issuance.

The facility contact for this application is Lee Squires, Facilities Manager, (phone: 919-856-6199). A consultant, SCS Engineers, PC (SCS), prepared the application. The contact at SCS is Robert "Bob" Dick, Project Director, (phone: 804-378-7440).

2. Facility Description

The South Wake Landfill is an active MSW landfill and is owned by Wake County, but is operated by Wake County Disposal, LLC, which is a subsidiary of GFL Environmental, Inc. The landfill operates under Solid Waste Permit Number 9222 and is actively placing waste in Phases 1A, 1B, and 2A. Phase 2B has been permitted by the Division of Waste Management (DWM) Solid Waste Section (SWS) for construction, and the remaining Phases 3, 4A, 4B, 5A, and 5B are planned for future expansion. Phase 2 was initially permitted for construction as a whole and construction on that project commenced prior to July 17, 2014. The landfill will trigger NSPS XXX applicability upon commencement of construction of the next expansion permitted for construction by the Solid Waste Section.

The landfill has a permitted design capacity greater than 2.5 million Mg and 2.5 million m^3 and has demonstrated an annual NMOC emission rate greater than 50 Mg per year. The landfill has installed and operates a landfill gas collection and control system (ID No. GCCS-1), and the collected gas is mostly routed to a third-party landfill gas-to-energy (LFGTE) facility, INGENCO Wholesale Power, LLC – Apex (Facility ID 9200830) where the gas is treated (ID No. CD-Treatment) by filtration, dewatering, and compression, and is then combusted in LFG-fired engines for electricity generation. Excess gas is routed to the landfill's candlestick flare (ID No. CD-1) as a backup. The treatment system (ID No. CD-Treatment) is owned by INGENCO, and South Wake Landfill does not exercise operational control over the treatment system or the LFGTE facility, however the burden of compliance with the MACT AAAA requirements for the treatment system lies solely with the landfill.

3. Permit History

Revision No.	Issue Date	Description
R00	11/22/2010	Initial permit issued.
T01	02/11/2014	1st-Time Title V permit issued, triggered by NSPS WWW mass and volume threshold.

4. Application Chronology

08/06/15	The Division of Air Quality (DAQ), Raleigh Central Office (RCO), received Application No. 9200820.15A, for a State-Only modification to remove the toxics conditions from the permit. RCO forwarded a copy to the Raleigh Regional Office (RRO). There was no request for confidentiality. No fees were required for this application. No toxic modeling demonstration was included with the application.
08/07/15	RCO sent the facility a letter acknowledging receipt of the application.
04/25/18	The DAQ RCO, received Application No. 9200820.18A, submitted for renewal with modifications. The application contained the required forms, and there was no request for confidentiality. No fees were required for this application.
06/05/18	RCO sent the facility a letter acknowledging receipt of the application.
06/07/18	Application No. 9200820.15A consolidated to be processed under Application No. 9200820.18A.
02/19/20	Application Nos. 9200820.15A and 9200820.18A reassigned to Joshua Harris.
02/25/20 and 02/26/20	Joshua Harris sent an email to Bob Dick requesting that the toxics modeling demonstration be resubmitted using the appropriate modeling software and that the emission rates associated with the flare be included. Mr. Harris followed up with a second email the next day with a question regarding the landfill's emergency generators.
03/16/20	Joshua Harris received an email from Bob Dick with responses to the previously discussed questions. Mr. Harris replied with questions regarding the submitted modeling that was conducted using SCREEN3 instead of AERMOD.
06/02/20	Joshua Harris received an email from Derek Schauss, SCS Engineers, regarding modeling. Mr. Schauss requested a conference call to discuss DAQ's requirements for submitting updated modeling.
06/03/20	A conference call was held to discuss requirements for the facility to submit updated modeling. Present were Joshua Harris, Tom Anderson and Dena Pittman from DAQ. Attending on behalf of the facility were Bob Dick, Derek Schauss and John Roberson. There was a discussion on the need for modeling to be updated to reflect more recent emission projections, and also that the modeling would need to be run in AERMOD as opposed to SCREEN3.
02/02/21 through 08/03/21	Multiple emails were exchanged between Joshua Harris and Bob Dick regarding the status of toxics modeling submittal.
08/04/21	Bob Dick provided a copy of dispersion modeling via email. Joshua Harris replied requesting electronic files for the modeling; text files were provided by Victoria Essex the same day.
09/10/21	Joshua Harris sent Victoria Essex an email requesting specific input files for modeling as requested by Nancy Jones, AQAB

09/13/21 Nancy Jones requested additional information from Bob Dick in order to complete her review of the submitted dispersion modeling, stating that the submitted electronic files were not sufficient.

09/27/21 Bob Dick replied to the September 13 email, requesting guidance on the necessary documents. Nancy Jones replied with an example of the documents typically required to review the modeling.

10/06/21 through 10/11/21 Multiple emails were exchanged between Nancy Jones and Victoria Essex regarding the necessary modeling files. Victoria Essex provided additional information required to complete the modeling review.

10/14/21 Nancy Jones completed the review of the submitted modeling.

10/20/21 Joshua Harris sent electronic copies of the draft permit and review documents to Booker Pullen, Samir Parekh, and Taylor Hartsfield for comments.

10/28/21 Supervisor (Booker Pullen) replied with minor editorial comments.

10/29/21 Samir Parekh replied with no comments.

03/3/22 Booker Pullen sent draft permit and engineering review to the Raleigh Regional Office again due to the revision of the permit shell and minor changes in the engineering review since the first submission to the Region. Minor comments received.

03/16/22 Booker Pullen sent electronic copies of the draft permit and review documents to John Roberson, Lee Squires, and Bob Dick for comments.

04/14/22 30-day public notice and 45-day EPA review periods begin.

Xx/xx/22 Public notice period ends; [comments received].

Xx/xx/22 EPA review period ends; [comments received].

Xx/xx/22 Air Quality Permit Revision No. 10114T02 issued.

5. Table of Changes to Existing Permit No. 10114T01

Page No.	Section	Description of Changes
Cover letter and throughout	Cover letter and throughout	● Updated letterhead and permit using new permit shell. ● Updated Responsible Official. ● Updated permit revision numbers and dates throughout. ● Reorganized order of permit conditions by regulatory citation.
Cover letter	Notice regarding the right to contest permit	● Added new section to permit.
Cover letter	Summary of changes to permit	● Revised the changes to the permit per this modification.
Page 3	List of acronyms	● Moved this list from the end of the permit to the front of the permit.

Page No.	Section	Description of Changes
Page 4	Section 1.0 (Table)	● Removed ES-EG1 from the permitted equipment list as this source was relisted as an insignificant activity. ● Removed citation for NSPS WWW as applicable to ES-1. ● Added citation for MACT AAAA as applicable to ES-1. ● Updated table note.
Page 5	Section 2.1 A. (Table)	● Removed NSPS WWW citation for NMOC row and replaced with requirements for 15A NCAC 02D .1700. ● Removed row for toxic air pollutants. ● Inserted row for HAPs with MACT AAAA requirements.
Page 5	Section 2.1 A.1.	● Removed 02D .0524 conditions for NSPS WWW, reordered and renumbered 02D .0516 and 02D .0521 conditions.
Pages 6-19	Section 2.1 A.3.	● Inserted requirements for MACT AAAA.
Pages 19-21	Section 2.1 A.4.	● Removed 02D .1100 toxics conditions and replaced with 02D .1700 requirements for existing landfills.
Page 21	Section 2.1 A.5.	● Removed 02D .1100 and renumbered 02D .1806 conditions.
--	Section 2.1 B.	● Section removed.
Page 22	Section 3.0	● Added one diesel-fired emergency generator at Radio Tower South as an insignificant source (ID No. IES-EG1). ● Added one diesel-fired emergency generator at the Scale House as an insignificant source (ID No. IES-EG2). ● Updated URL for the DAQ regulatory guidance website.
Pages 23-31	Section 4.0	● Added General Conditions (version 6.0, 01/07/2022)

Changes in Equipment

- Relisted the Scale House emergency generator as an insignificant source, ID No. IES-EG2, and removed ES-EG1 from the permitted equipment list.
- Added radio tower emergency generator as an insignificant source, ID No. IES-EG1.
- Added one landfill gas treatment system as a control device, ID No. CD-Treatment.

The facility's permitted emission sources are as follows:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
ES-1 **MACT AAAA**	One municipal solid waste landfill	GCCS-1 CD-1 CD-Treatment	Gas collection and control system Candle stick type flare (3,500 scfm, 106.3 million Btu per hour heat input at 506 Btu per cubic foot heat rate of landfill gas) One landfill gas treatment system

The facility's insignificant/exempt activities are as follows:

Emission Source ID No.	Emission Source Description
IES-01	One leachate storage tank (500,000 gallon capacity)
IES-02	One condensate storage tank (3,000 gallon capacity)
IES-EG1 **NSPS IIII, GACT ZZZZ**	Diesel fuel-fired emergency generator (130 kW, 243 hp) located at Radio Tower South
IES-EG2 **NSPS IIII, GACT ZZZZ**	Diesel fuel-fired emergency generator (55 kW, 99 hp) located at the Scale House

6. NSPS, NESHAP, PSD, 112(r), CAM & Attainment Status

- **NSPS** –

  - ✓ The MSW landfill (ID No. ES-1) is NOT subject to 40 CFR 60, Subpart WWW "Municipal Solid Waste Landfills" since the facility is now considered as an existing source, and NSPS WWW is superseded by Emission Guidelines Cf.

  - ✓ The MSW landfill (ID No. ES-1) is NOT subject to 40 CFR 60, Subpart XXX "Municipal Solid Waste Landfills the Commenced Construction, Reconstruction, or Modification After July 17, 2014" since the landfill has not been modified after July 17, 2014. The landfill's Solid Waste permit indicates that there are a number of expansions, Phases 3, 4A, 4B, 5A, and 5B, planned for future construction.

  - ✓ The MSW landfill (ID No. ES-1) is subject to 40 CFR 60 Subpart Cf, "Emission Guidelines and Compliance Times for Municipal Solid Waste Landfills," since the landfill has accepted waste after November 8, 1987, and was constructed before, but has not been modified after, July 17, 2014. Therefore, the State regulations for existing landfills will be placed into the permit in accordance with 15A NCAC 02D .1700.

  - ✓ The diesel-fired emergency generators (ID Nos. IES-EG1 and IES-EG2) are subject to 40 CFR 60, Subpart IIII "Stationary Compression Ignition Internal Combustion Engines" because engines were manufactured after the applicability date of the NSPS regulation.

- **NESHAP** –

  - ✓ The MSW landfill (ID No. ES-1) is subject to 40 CFR 63, Subpart AAAA "Municipal Solid Waste Landfills" since the facility has accepted waste since November 8, 1987, has a design capacity greater than 2.5 million Mg and 2.5 million m^3, and has demonstrated an annual NMOC emission rate greater than 50 Mg/yr.

  - ✓ The MSW landfill (ID No. ES-1) is NOT subject to 40 CFR 61, Subpart M "National Emission Standard for Asbestos," since the landfill does not accept asbestos-containing wastes.

  - ✓ The diesel-fired emergency generators (ID Nos. IES-EG1 and IES-EG2) are subject to 40 CFR 63, Subpart ZZZZ "Reciprocating Internal Combustion Engines" and is considered new emergency engines under this regulation. The landfill complies with the requirements of this Subpart by complying with NSPS Subpart IIII.

- **PSD –** The facility's potential emissions of criteria pollutants do not exceed PSD permitting thresholds.

  - ✓ Wake County has triggered increment tracking under PSD for SO_2. The inclusion of the emergency generator, IES-EG1, results in an increase in SO_2 emissions at 0.003 pounds per hour.

- **112(r) –** The facility does not store any of the listed 112(r) chemicals in amounts that exceed the threshold quantities. Therefore, the facility is not required to maintain a written Risk Management Plan (RMP).

- **CAM –** CAM does not apply since the facility is regulated by NSPS and MACT regulations that were promulgated after 1990 and control the pollutants that would be subject to CAM.

- **Attainment status** – Wake County is in attainment for all criteria pollutants.

7. Regulatory Review

The facility is subject to the following air quality regulations in addition to the General Conditions:

- 15A NCAC 02D .0516: Sulfur Dioxide Emissions from Combustion Sources
- 15A NCAC 02D .0521: Control of Visible Emissions
- 15A NCAC 02D .1111: Maximum Achievable Control Technology, 40 CFR 63, Subpart AAAA
- 15A NCAC 02D .1700: Municipal Solid Waste Landfills
- 15A NCAC 02D .1806: Control and Prohibition of Odorous Emissions

The following permit conditions are being removed as part of the permit because the engines will be placed on the insignificant activities list instead of in the body of the permit:

- 15A NCAC 02D .0524: New Source Performance Standards, 40 CFR 60, Subpart WWW
- 15A NCAC 02D .0524: New Source Performance Standards, 40 CFR 60, Subpart IIII
- 15A NCAC 02D .1111: Maximum Achievable Control Technology, 40 CFR 63, Subpart ZZZZ
- 15A NCAC 02D .0544: Prevention of Significant Deterioration Requirements for Greenhouse Gases (GHGs)
- 15A NCAC 02D .1100: Control of Toxic Air Pollutants
- 15A NCAC 02Q .0711: Emission Rates Requiring a Permit

15A NCAC 02D .0516: Sulfur Dioxide Emissions from Combustion Sources
Sulfur dioxide emissions from the facility's combustion sources shall be no more than 2.3 pounds per million Btu heat input. For LFG combustion in the flare (ID No. CD-1), using AP-42 Ch. 2.4, Equations 3, 4, and 7, the SO_2 emission rate was determined to be 0.0152 pounds per million Btu at the flare's total maximum capacity of 106.3 mmBtu/hr, assuming a heat value of 506 Btu per ft^3 of LFG combusted. The AP-42 emission factor for SO_2 emissions associated with combustion of diesel fuel in the facility's emergency generators (ID Nos. IES-EG1 and IES-EG2) is 0.29 pounds per million Btu. Continued compliance is expected.

15A NCAC 02D .0521: Control of Visible Emissions
Visible emissions from the facility's LFG-fired utility flares (ID No. CD-1) shall not exceed 20% opacity when averaged over a six-minute period. Properly maintained and operated flares typically have no trouble meeting this requirement. The initial performance test conducted on the flare on October 31, 2018 indicated compliance, additionally DAQ inspectors have not observed visible emissions from this source during any site visit. Continued compliance is expected.

15A NCAC 02D .1111: Maximum Achievable Control Technology, 40 CFR 63, Subpart AAAA
The MSW landfill (ID No. ES-1) is the subject source. The condition has been updated to include the requirements promulgated on March 26, 2020.

This permit condition contains the updated operational standards, compliance provisions, and monitoring requirements of §§63.1958, 63.1960, and 63.1961, as well as the recordkeeping and reporting requirements of MACT AAAA. These conditions also include requirements for enhanced monitoring of elevated temperature wells. The landfill is required to continue wellhead monitoring and surface emissions monitoring, as well as continue to keep records and make periodic reports, some of which are required to be submitted electronically via EPA's electronic reporting tool in CDX.

For reports previously submitted, the Permittee is required to submit a statement with the first semi-annual report certifying that the listed reports were previously submitted to include the dates of submittal. As part of the updated requirements, the landfill is required to develop a site-specific treatment monitoring plan for the LFG treatment system (ID No. CD-Treatment).

The landfill's GCCS design plan was previously reviewed and approved by DAQ. The following approved alternatives were included in this permitting action:

- The landfill may shut down a wellhead or consider a wellhead a non-MACT wellhead if the collector is equipped with more than one wellhead. As long as landfill gas extraction is continued in compliance with the MACT standards, this landfill may do so, and shall document any shut-down wellheads in the semi-annual reports.
- Operate the collection and control system with a pressure at each wellhead of up to 5 inches of water column in areas that have a geomembrane or synthetic cover.
- After approval of a written request made to the Raleigh Regional Office, the landfill may exclude surface monitoring of dangerous areas. When the landfill deviates from the surface monitoring route in the design plan due to the dangerous area, the deviation shall be documented in the semi-annual reports.

Compliance is expected.

15A NCAC 02D .1700: Municipal Solid Waste Landfills

The MSW landfill (ID No. ES-1) is considered as an existing MSW landfill and is subject to Emission Guidelines Cf, as implemented in 15A NCAC 02D .1700. The permit conditions for NSPS WWW have been removed and replaced with conditions for 02D .1700. These conditions require the landfill to install and operate a GCCS, and to route the collected gas to a control device.

The conditions include cross references to corresponding requirements of MACT AAAA. Specifically, compliance with §§63.1958, 63.1960, and 63.1961 of MACT AAAA is used to demonstrate compliance with 02D .1705, .1706, and .1707. In addition, recordkeeping and reporting requirements that have an equivalent requirement in MACT AAAA, but are not directly cited within 02D .1700 rules, have been cross referenced to allow the MACT requirement to satisfy 02D .1700 rules where appropriate in order to minimize duplicate requirements. Those recordkeeping and reporting requirements that do not appear to have sufficient overlap with the MACT requirements have been retained and have stand-alone provisions within the permit conditions.

Compliance is expected.

15A NCAC 02D .1806: Control and Prohibition of Odorous Emissions

This is a "State-Only" requirement that applies facility wide. The Permittee shall not operate the facility without implementing management practices or installing and operating odor control equipment sufficient to prevent odorous emissions from the facility from causing or contributing to objectionable odors beyond the facility's boundary.

The landfill has routinely received complaints, sometimes multiple complaints per day, regarding odorous emissions from nearby residents of neighborhoods that have been developed since the landfill began operating. Additionally, DAQ has conducted investigations of complaints citing odors from the landfill. The landfill initially installed the GCCS and flare voluntarily for odor control prior to being required by NSPS WWW and MACT AAAA, however the odor issues continued. An electronic complaint system was implemented through Wake County's website and the landfill also installed a waterless vapor distribution system for odor control in 2017. The proprietary system emits deodorizers and operates continuously, however DAQ inspectors have noted mixed results.

A class-action lawsuit was filed in 2018 citing "airborne emissions of pollutants, air contaminants, and noxious odors." A settlement agreement was recently reached in 2020 regarding the complaints. In the settlement, Wake County Disposal, LLC is proposed to pay $950,000 to the plaintiffs, and install/implement additional odor-reducing equipment and measures expected to cost approximately $1.2 million.

The landfill continues to make changes to try to mitigate odorous emissions, and the Wake County Board of Commissioners continues to engage with the local community on the issue.

DAQ will continue to investigate complaints that are received and evaluate compliance during regular inspections.

15A NCAC 02D .0524: New Source Performance Standards, 40 CFR 60, Subpart IIII, and
15A NCAC 02D .1111: Maximum Achievable Control Technology, 40 CFR 63, Subpart ZZZZ

These permit conditions are being removed even though the landfill's emergency generators (ID Nos. IES-EG1 and IES-EG2) are subject to these requirements. Since these sources are being removed as permitted sources and relisted on the permit attachment as insignificant/exempt activities pursuant to 15A NCAC 02Q .0503(8), specific conditions for these regulations will no longer appear in the permit. The landfill is still required to comply with these Federal Regulations, and applicability of these regulations will be annotated on the permit attachment. Continued compliance is expected

15A NCAC 02D .0544: Prevention of Significant Deterioration Requirements for Greenhouse Gases (GHGs)

This permit condition is being removed since it is no longer relevant. The condition was initially included due to the uncertainty of pending litigation regarding permitting requirements for GHGs at the time the last permit revision was issued. Since then, on June 23, 2015, the Supreme Court of the United States (SCOTUS) issued a decision in *Utility Air Regulatory Group v. EPA*, in which the SCOTUS held that EPA cannot treat GHGs as an air pollutant for the purposes of determining whether a source is a major source required to obtain Title V or PSD permits, and that BACT limitations for GHG emissions may continue to be required for facilities which are otherwise required to hold PSD permits based on emissions of other pollutants. In the wake of the SCOTUS decision, on April 10, 2015, in an amended judgement in *Coalition for Responsible Regulation, Inc. v. EPA*, the District of Columbia Circuit Court vacated the Title V and PSD regulations being reviewed to the extent that they require a source to obtain a Title V or PSD permit solely due to GHG emissions above the respective permitting thresholds when permitting thresholds have not been triggered by another regulated pollutant.

15A NCAC 02D .1100: Control of Toxic Air Pollutants, and
15A NCAC 02Q .0711: Emission Rates Requiring a Permit

The facility has requested that the 02D .1100 and 02Q .0711 permit conditions be removed pursuant to 15A NCAC 02Q .0702(a)(27)(B) since the facility is subject to MACT requirements. Although the landfill is not subject to permitting for toxics, toxic emissions are still required to be evaluated to ensure that there is not an unnecessary risk to human health. The landfill utilized LandGEM to project LFG generation rate through the end of construction of Phase 2B, which is expected to occur in CY2025. The LFG generation rate was projected to be 64,087,638.1 m^3/yr under these conditions.

Waste Industry Air Coalition (WIAC) concentrations were used in place of AP-42 to calculate emission rates from the landfill surface and flare. The landfill assumed that the collection efficiency of the GCCS is 60%, which is a more conservative estimate than the generally accepted 75% collection rate. Rather than calculate emission rates based on the maximum capacity of the flare, the landfill calculated flare emissions based on the flow of LFG to the flare, based on the projected LFG generation rate and the assumed 60% collection efficiency of the GCCS.

The following example calculation is for the emission of hydrochloric acid (HCl) created from the combustion of the chlorine compounds in the landfill gas-fired flares. The best methods to estimate emission are mass balance methods using site specific data on total chloride [expressed in ppmv as the chloride ion (Cl^-)].

- Flare Flow Rate = 3,500 ft^3/minute (or 99.11 m^3/min = 5,946.6 m^3/hour)
- Methane is only 50% of this gas stream (2,973.3 m^3/hour)
- Q_{Cl^-} = Emission rate of chloride ions, m^3/hour
- C_{Cl^-} = Concentration of chloride ions (30.18 ppmv, WIAC)

- Multiplication factor for 50% methane concentration in landfill gas = 2.0
- Molecular weight of chloride ions = 35.45 g/mole

$$Q_{Cl^-} = 2.0 \times Q_{CH_4} \times \left(\frac{C_{Cl^-}}{1\times10^6}\right) \text{ (AP-42, Equation 3)}$$

$$Q_{Cl^-} = 2.0 \times 2{,}973.3\ \frac{m^3}{hour} \times \left(\frac{30.18\ parts}{1\times10^6}\right) = 0.179\ \frac{m^3}{hour}$$

The mass of the pre-combustion chloride ions present in the methane were found using Equation 4 of AP-42, Section 2.4.4.2:

$$UM_{Cl^-} = 0.179\ \frac{m^3}{hour} \times \left[\frac{35.45\ g/gmol \times 1\ atm}{8.205 \times 10^{-5}\ \frac{m^3-atm}{gmol-K} \times 1000\ \frac{g}{kg} \times (273+25℃)\ K}\right] \times 2.205\ \frac{lb}{kg}$$

$$UM_{Cl^-} = 0.574\ \frac{lb\ Cl^-}{hour}$$

To calculate the HCl generated from the chloride ions, Equation 10 of Section 2.4-8 was used.

$$HCl_{emissions} = UM_{Cl^-} \times \frac{\eta_{col}}{100} \times 1.03 \times \frac{\eta_{cnt}}{100}$$

Where:
UM_{cl} = Uncontrolled mass emission of Cl^- ions (0.574 lb Cl^- ions/hour)
η_{col} = Collection efficiency of the landfill gas collection system, percent*
η_{cnt} = Control efficiency of the landfill gas control flares*
* To calculate worst-case HCl emissions, the facility assumes that 100% of the generated Cl^- ions are collected and converted to HCl.

$$HCl_{emissions} = 0.574\frac{lb\ Cl^-}{hour} \times \frac{100}{100} \times 1.03 \times \frac{100}{100} = 0.591\ \frac{lb\ HCl}{hour}$$

HCl emissions from the flare were previously evaluated and modeled using an emission rate of 0.82 lb/hr.

Emissions of other toxic air pollutants emitted from the flares were calculated using the same methods and assume a 98% control efficiency for halogenated species, and 99.7% for non-halogenated species. The uncontrolled volume emissions from the landfill's surface were calculated using the same methods in Equations 3 and 4 above, assuming the previously mentioned LFG generation rates from LandGEM. Using benzene as an example, the uncontrolled emission rate of benzene was calculated to be 437.8 lb/yr in CY2025.

After control emission rates are calculated using AP-42 Section 2.4-6 Equation 5:

$$CM_P = \left[UM_P \times \left(1 - \frac{\eta_{col}}{100}\right)\right] + \left[UM_P \times \frac{\eta_{col}}{100} \times \left(1 - \frac{\eta_{cnt}}{100}\right)\right]$$

Where:
CM_p = Controlled mass emissions of pollutant
UM_p = Uncontrolled mass emission of pollutant (437.8 lb/yr)
η_{col} = Collection efficiency of the landfill gas collection system, percent (60% assumption)
η_{cnt} = Control efficiency of the landfill gas control flares (99.7% for non-halogenated species)

Therefore:

$$CM_B = \left[437.8 \frac{\text{lb benzene}}{\text{yr}} \times \left(1 - \frac{60}{100}\right)\right] + \left[437.8 \frac{\text{lb benzene}}{\text{yr}} \times \frac{60}{100} \times \left(1 - \frac{99.7}{100}\right)\right]$$

$$CM_B = 175.91 \frac{\text{lb benzene}}{\text{yr}}$$

The projected toxic emissions through CY2025 with comparison to their respective TPERs from 02Q .0711(a) are as follows:

Toxic Air Pollutant	Averaging Period	Landfill Volume Emissions	Flare Emissions	Total	TPER	Modeling Required?
1,1,1-Trichloroethane (methyl chloroform)	lb/day	0.14	4.25×10^{-3}	0.15	250	No
	lb/hr	5.90×10^{-3}	1.77×10^{-4}	6.08×10^{-3}	64	No
1,1,2,2-Tetrechloroethane	lb/yr	27.10	0.81	27.91	430	No
1,1-Dichloroethene (vinylidene chloride)	lb/day	0.056	1.69×10^{-3}	0.058	2.5	No
1,2-Dibromoethane (ethylene dibromide)	lb/yr	19.93	0.60	20.53	27	No
1,2-Dicholoroethane (ethylene dichloride)	lb/yr	27.39	0.82	28.21	260	No
2-Butanone (MEK)	lb/day	4.81	0.022	4.83	78	No
	lb/hr	0.20	9.02×10^{-4}	0.20	22.4	No
4-Methyl-2-pentanone (MIBK)	lb/day	0.47	2.14×10^{-3}	0.47	52	No
	lb/hr	0.020	8.90×10^{-5}	0.020	7.6	No
Acrylonitrile	lb/day	0.012	5.43×10^{-5}	0.012	0.4	No
	lb/hr	5.03×10^{-4}	2.26×10^{-6}	5.05×10^{-4}	0.22	No
Benzene	lb/yr	175.12	0.79	175.91	8.1	**YES**
Carbon disulfide	lb/day	0.15	6.93×10^{-4}	0.15	3.9	No
Carbon tetrachloride	lb/yr	2.48	0.075	2.56	460	No
Chlorobenzene	lb/day	0.16	4.84×10^{-3}	0.16	46	No
Chloroform	lb/yr	5.78	0.17	5.95	290	No
p-Dichlorobenzene	lb/hr	0.062	1.87×10^{-3}	0.064	16.8	No
Dichloromethane (methylene chloride)	lb/yr	665.14	19.95	685.09	1600	No
	lb/hr	0.076	2.28×10^{-3}	0.078	0.39	No
Ethyl mercaptan	lb/hr	0.022	9.98×10^{-5}	0.022	0.025	No
n-Hexane	lb/day	1.27	5.70×10^{-3}	1.28	23	No
Hydrogen Chloride	lb/hr	-----	0.59	0.59	0.18	**YES**
Hydrogen Sulfide	lb/day	5.08	0.023	5.10	1.7	**YES**
Mercury vapor	lb/day	3.70×10^{-4}	5.55×10^{-4}	9.25×10^{-4}	0.013	No
Methanethiol (methyl mercaptan)	lb/hr	0.016	7.37×10^{-5}	0.016	0.013	**YES**
Tetrachloroethylene (Perchloroethylene)	lb/yr	456.32	13.69	470.01	13000	No
Toluene	lb/day	14.79	0.067	14.86	98	No
	lb/hr	0.62	2.77×10^{-3}	0.62	14.4	No
Trichloroethylene	lb/yr	206.40	6.19	212.59	4000	No
Vinyl chloride	lb/yr	155.26	4.66	159.92	26	**YES**
Xylene	lb/day	11.12	0.05	11.17	57	No
	lb/hr	0.46	2.09×10^{-3}	0.46	16.4	No

The landfill submitted updated modeling to support the request to remove toxics conditions from the permit. The modeling demonstration was reviewed by Nancy Jones, AQAB, who determined that the modeling adequately demonstrates compliance for all toxics modeled, assuming the source parameters an emission rates used are correct.

Calculated toxic air pollutant amounts used for the modeling evaluation in lbs per year:
Benzene: 175.91 lbs/yr
Hydrogen Sulfide: 1861.74 lbs/yr
Methyl mercaptan: 144.02 lbs/yr
Vinyl chloride: 159.92 lbs/yr

The dispersion modeling demonstration resulted in the following impacts at the property boundary:

Toxic Air Pollutant	Averaging Period	Modeled Emission Rates		Concentration at Property Boundary ($\mu g/m^3$)	AAL ($\mu g/m^3$)	% AAL
		Landfill	Flare			
Benzene	lb/yr	175.12	0.79	0.00038	0.12	<1%
Hydrogen sulfide	lb/day	5.08	0.023	0.040	120	<1%
Methyl mercaptan	lb/hr	0.016	7.37×10^{-5}	0.044	50	<1%
Vinyl chloride	lb/yr	155.26	4.66	0.048	0.38	13%

Previous modeling conducted in 2010 for HCl emissions from the flare resulted in the following impacts at the property boundary:

Toxic Air Pollutant	Averaging Period	Modeled Emission Rate	Concentration at Property Boundary ($\mu g/m^3$)	AAL ($\mu g/m^3$)	% AAL
Hydrogen chloride	lb/hr	0.82	~35	700	5%

The facility is subject to MACT Subpart AAAA; therefore, it is not subject to permitting for toxics per 15A NCAC 02Q .0702(a)(27)(B). None of the toxic air pollutants evaluated exceed their respective TPER or AAL after the modification; therefore, DAQ has determined that there is NOT an unacceptable risk to human health resulting from this modification. Emissions of toxic air pollutants should continue to be periodically evaluated as the landfill grows.

8. Other Regulatory Requirements

- A Zoning Consistency Determination is NOT required for this permit application.
- The application was sealed by Robert Dick, who is a registered Professional Engineer in the State of North Carolina (Seal #022790).
- No application fees were required for these applications.

9. Emissions Review

Pollutant	Potential After Controls / Limitations tons/yr	Potential Before Controls / Limitations tons/yr
PM (TSP)	7.86	0.19
PM_{10}	7.86	0.19
$PM_{2.5}$	7.86	0.19
SO_2	7.25	0.18
NOx	34.31	2.65
CO	93.67	0.57
VOC	23.77	38.71

The facility's actual emissions as reported on the annual AQEI can be seen in the table on page one of this review.

MSW Landfill Emissions:
Landfill volume emissions were calculated using the methane generation rate of 64,087,638.1 m^3/yr as calculated using LandGEM, and AP-42 Chapter 2.4, November 1998. VOC emissions are 39% of NMOC. Post collection and control potential emissions were calculated by applying a collection efficiency of 60% and a destruction efficiency of 98%.

Example:

- CY2025 LFG generation rate from LandGEM = 64,087,638.1 m^3/year (or 7,315.94 m^3/hour)
- Methane is 50% of this gas stream (3,657.97 m^3/hour)
- Q_{NMOC} = Emission rate of NMOCs, m^3/hour
- C_{NMOC} = Concentration of NMOCs (397 ppmv, 2013 Tier 2 sample)
- Multiplication factor for 50% methane concentration in landfill gas = 2.0
- Molecular weight of NMOC (as n-hexane) = 86.18 g/gmol

$$Q_{NMOC} = 2.0 \times Q_{CH_4} \times \left(\frac{C_{NMOC}}{1\times10^6}\right) \text{ (AP-42, Equation 3)}$$

$$Q_{NMOC} = 2.0 \times 3{,}657.97 \frac{m^3}{hour} \times \left(\frac{397 \text{ parts}}{1\times10^6}\right) = 2.90 \frac{m^3}{hour}$$

The uncontrolled mass emission rate of NMOC (UM_{NMOC}) was found using Equation 4 of AP-42, Section 2.4.4.2.

$$UM_{NMOC} = 2.90 \frac{m^3}{hour} \times \left[\frac{86.18 \text{ g/gmol} \times 1 \text{ atm}}{8.205 \times 10^{-5} \frac{m^3 - atm}{gmol - K} \times 1000 \frac{g}{kg} \times (273 + 25℃) \text{ K}}\right] \times 2.205 \frac{lb}{kg}$$

$$UM_{NMOC} = 22.54 \frac{lb \text{ NMOC}}{hour} = 98.72 \frac{tons \text{ NMOC}}{year}$$

To calculate the VOC component of the landfill's uncontrolled surface emissions, AP-42 states in note "c" of Table 2.4-2 that VOC emissions are 39 wt.% of the NMOC emission rate, therefore:

$$UM_{VOC} = 0.39 \times 98.72 \frac{\text{tons NMOC}}{\text{year}} = 38.50 \frac{\text{tons VOC}}{\text{year}}$$

Volume emission of VOC from the landfill surface were calculated using AP-42 Section 2.4-6 Equation 5:

$$CM_P = \left[UM_P \times \left(1 - \frac{\eta_{col}}{100}\right)\right] + \left[UM_P \times \frac{\eta_{col}}{100} \times \left(1 - \frac{\eta_{cnt}}{100}\right)\right]$$

Where:
CM_p = Controlled mass emissions of pollutant
UM_p = Uncontrolled mass emission of pollutant
η_{col} = Collection efficiency of the landfill gas collection system, percent (assumed 60%)
η_{cn} = Control efficiency of the landfill gas control flare (98%)

Only the first term is considered for emissions from the landfill surface, therefore:

$$CM_{VOC} = \left[38.50 \frac{\text{tons}}{\text{year}} \times \left(1 - \frac{60}{100}\right)\right] = 23.10 \frac{\text{tons VOC}}{\text{year}}$$

Flare Emissions:
VOC emissions for the flares were calculated in similar fashion as above but are based on the maximum capacity of the flares, regardless of LFG generation rate from the landfill, and assume a 98% control efficiency for collected gas.

From above, the second term is considered:

$$CM_{VOC} = \left[38.50 \frac{\text{tons}}{\text{year}} \times \frac{60}{100} \times \left(1 - \frac{98}{100}\right)\right] = 0.46 \frac{\text{tons VOC}}{\text{year}}$$

Particulate, NOx, and CO emissions were calculated using the following emission factors:

NOx: 0.068 lb/mmBtu (AP-42 13.5-1)
CO: 0.20 lb/mmBtu (manufacturer emission factor)
PM: 0.001 lb/hr - cfm CH_4 (manufacturer emission factor)

The flare is rated for a total heat input of 106.3 mmBtu/hr at 3,500 cfm flow rate, with a heat value of 506 Btu per cubic foot of landfill gas.

Examples:

$$\frac{106.3 \text{ mmBtu}}{\text{hour}} \times \frac{0.068 \text{ lb NOx}}{\text{mmBtu}} \times \frac{8{,}760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 31.66 \frac{\text{tons NOx}}{\text{year}}$$

$$\frac{106.3 \text{ mmBtu}}{\text{hour}} \times \frac{0.20 \text{ lb CO}}{\text{mmBtu}} \times \frac{8{,}760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 93.1 \frac{\text{tons CO}}{\text{year}}$$

$$\frac{3{,}500 \text{ ft}^3}{\text{min LFG}} \times \frac{0.001 \text{ lb PM}}{\text{hr} - \text{ft}^3/\text{min } CH_4} \times \frac{0.5 \text{ ft}^3/\text{min } CH_4}{1 \text{ ft}^3/\text{min LFG}} \times \frac{8{,}760 \text{ hours}}{\text{year}} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 7.67 \frac{\text{tons PM}}{\text{year}}$$

All particulate emissions from the combustion of landfill gas are considered as $PM_{2.5}$.

To calculate potential SO_2 emissions, AP-42 Chapter 2.4 was used along with information submitted by the facility in the application:

- Flare design rating = 3,500 ft^3/minute (or 99.11 m^3/min = 5,946.6 m^3/hour)
- Methane is only 50% of this gas stream (2,973.3 m^3/hour)
- Q_S = Emission rate of reduced sulfur compounds, m^3/hour
- C_S = Concentration of reduced sulfur compounds (46.9 ppmv, AP-42)
- Multiplication factor for 50% methane concentration in landfill gas = 2.0
- Molecular weight of sulfur = 32.06 g/mole

$$Q_S = 2.0 \times Q_{CH_4} \times \left(\frac{C_S}{1\times10^6}\right) \text{ (AP-42, Equation 3)}$$

$$Q_S = 2.0 \times 2{,}973.3 \frac{m^3}{hour} \times \left(\frac{46.9 \text{ parts}}{1\times10^6}\right) = 0.279 \frac{m^3}{hour}$$

The mass of the pre-combustion sulfur present in the methane was found using Equation 4 of AP-42, Section 2.4.4.2.:

$$UM_s = 0.279 \frac{m^3}{hour} \times \left[\frac{32.06 \text{ g/gmol} \times 1 \text{ atm}}{8.205 \times 10^{-5} \frac{m^3 - atm}{gmol - K} \times 1000 \frac{g}{kg} \times (273 + 25°C)\text{ K}}\right] \times 2.205 \frac{pounds}{kg}$$

$$UM_s = 0.807 \frac{pounds}{hour}$$

To calculate SO_2 emitted from the combustion of sulfur, Equation 10 of Section 2.4-8 was used.

$$SO_2 \text{ emitted} = UM_s \times \frac{\eta_{col}}{100} \times 2.0$$

Where:
UM_S = Uncontrolled mass emission rate of sulfur compounds (0.807 lb sulfur/hour)
η_{col} = Collection efficiency of the landfill gas collection system, percent (assumed 100% for these purposes)
2.0 = Ratio of the molecular weight of SO_2 to the molecular weight of Sulfur

$$SO_2 \text{ emitted} = 0.807 \frac{lb}{hour} \times \frac{100}{100} \times 2.0 \times 8{,}760 \frac{hours}{year} \times \frac{1 \text{ ton}}{2{,}000 \text{ lb}} = 7.07 \frac{\text{tons } SO_2}{year}$$

Emergency Generator Emission Rates:
The potential emissions from the uncontrolled diesel-fired emergency generators (ID Nos. IES-EG1 and IES-EG2) were calculated using emission factors for diesel fuel combustion in stationary reciprocating internal combustion engines found in AP-42 Chapter 3.3. The number of operating hours for the purposes of calculating potential emissions is limited to 500 hours per year for emergency engines in keeping with EPA guidance.

The following emission factors were used:

PM: 2.20 x 10^{-3} lb/hp-hr (all particulate matter emitted is assumed to be as $PM_{2.5}$)
SO_2: 2.05 x 10^{-3} lb/hp-hr
NOx: 0.031 lb/hp-hr
CO: 6.68 x 10^{-3} lb/hp-hr
VOC: 2.51 x 10^{-3} lb/hp-hr (as TOC exhaust + crankcase)

The following are example calculations for emissions from the engines based on the total power rating of 342 horsepower:

PM:

$$342\ \text{hp} \times \frac{2.20 \times 10^{-3}\ \text{lb PM}}{\text{hp} - \text{hr}} \times \frac{500\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = 0.19\ \frac{\text{tons PM}}{\text{year}}$$

SO_2:

$$342\ \text{hp} \times \frac{2.05 \times 10^{-3}\ \text{lb SO}_2}{\text{hp} - \text{hr}} \times \frac{500\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = 0.18\ \frac{\text{tons SO}_2}{\text{year}}$$

NOx:

$$342\ \text{hp} \times \frac{0.031\ \text{lb NOx}}{\text{hp} - \text{hr}} \times \frac{500\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = 2.65\ \frac{\text{tons NOx}}{\text{year}}$$

CO:

$$342\ \text{hp} \times \frac{6.68 \times 10^{-3}\ \text{lb CO}}{\text{hp} - \text{hr}} \times \frac{500\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = 0.57\ \frac{\text{tons CO}}{\text{year}}$$

VOC:

$$342\ \text{hp} \times \frac{2.51 \times 10^{-3}\ \text{lb VOC}}{\text{hp} - \text{hr}} \times \frac{500\ \text{hours}}{\text{year}} \times \frac{\text{ton}}{2{,}000\ \text{lb}} = 0.21\ \frac{\text{tons VOC}}{\text{year}}$$

10. Statement of Compliance

The latest compliance inspection was conducted by Maureen Conner, RRO DAQ, on December 23, 2020. The facility was found to be in operating in apparent compliance at that time. The landfill has no negative compliance history over the last five years.

11. Public Notice Review

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 shall be provided to EPA.

The 30-day public notice period was from April 14, 2022 through MONTH XX, 2022.

The EPA 45-day review period was from MONTH XX, 2021 through MONTH XX, 2022.

[Number of] comments were received during the public notice period and the EPA review period.

12. Comments and Recommendations

The permit renewal and modification applications for the South Wake Landfill located in Apex, Wake County, NC has been reviewed by DAQ to determine compliance with all procedures and requirements. DAQ has determined that this facility is complying or will achieve compliance, as specified in the permit, with all requirements that are applicable to the affected sources. The DAQ recommends the issuance of Air Permit No. 10114T02.