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May 25, 2012

Transmitted by Email
Ethan.Brown@ncdenr.gov

Mr. Ethan Brown
North Carolina Department of Environment and Natural Resources
Division of Waste Management - Solid Waste Section
217 West Jones Street
Raleigh, North Carolina 27603

Subject: Ten-Year Solid Waste Management Plan
Marshall Steam Station, Duke Energy Carolinas, LLC
Industrial Landfill No. 1, Permit No. 1812
Catawba County, North Carolina

Dear Mr. Brown,

On behalf of Duke Energy Carolinas, Altamont Environmental, Inc. submits this Ten-Year Solid Waste Management Plan for the Industrial Landfill No. 1, Permit No. 1812, as required by GS 130A-309.09D.

Please feel free to call or respond with any questions or comments related to this project.

Sincerely,

ALTAMONT ENVIRONMENTAL, INC.



Stuart A. Ryman, P.G.

Enclosures: Ten-Year Solid Waste Management Plan, Years 2011 to 2021, Marshall Steam Station
Industrial Landfill No. 1, Permit No. 1812, May 25, 2012.

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Ten-Year Solid Waste Management Plan

Years 2011 to 2021

Marshall Steam Station

Industrial Landfill No. 1

Permit No. 1812

May 25, 2012

Prepared for



Prepared by

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1.0 Background

North Carolina requires each generator of industrial solid waste that owns and operates an industrial solid waste facility to establish a Ten-Year Solid Waste Management Plan and update the plan every three years. This Ten-Year Solid Waste Management Plan pertains to the Marshall Steam Station Industrial Landfill No. 1 (Marshall Industrial Landfill No. 1).

The Marshall Steam Station (Marshall) is a four-unit, coal-fired electric generating facility located in Terrell, Catawba County, North Carolina. Marshall is owned by Duke Energy Carolinas, LLC (Duke) and has a generating capacity of 2070 megawatts (MW). The Marshall Industrial Landfill No. 1 is located on the Marshall site and only accepts waste generated at Marshall Steam Station.

The permit to operate the Marshall Industrial Landfill No. 1, Phase 1, Cells 1 and 2, Permit No. 1812, was initially issued by the North Carolina Department of Environment and Natural Resources (DENR) Division of Waste Management (DWM) on March 7, 2011 and is subject to review every five years. The original Industrial Landfill No. 1 Operations Plan was modified and submitted to DENR DWM on August 3, 2011. The modified Operations Plan was approved by DENR DWM on August 9, 2011 and is considered the Approved Plan. A Permit to Construct for Phase 1, Cells 3 and 4 was also issued on March 7, 2011.

This Ten-Year Solid Waste Management Plan is for the period of July 1, 2011 until June 30, 2021.

The Marshall site has two landfills currently in use: the Marshall Flue Gas Desulfurization (FGD) Residue Landfill, Phase 1, Cell 1 (Permit No. 1809) and the Marshall Industrial Landfill No. 1, Phase 1, Cells 1 and 2 (Permit No. 1812). This plan applies only to the Marshall Industrial Landfill No. 1.

2.0 Landfill Description

The Marshall Industrial Landfill No. 1 is located north of the Marshall plant and the Marshall ash basin. Phase 1 of the Marshall Industrial Landfill No. 1 consists of Cells 1 through 4 and has a footprint of approximately 35.5 acres. The Marshall Industrial Landfill No. 1 is permitted to receive the following types of waste generated at the Marshall Steam Station:¹

- Fly ash
- Bottom ash
- Flue gas desulfurization (FGD) gypsum
- FGD clarifier sludge
- Asbestos material
- Land clearing and inert debris
- Coal mill rejects
- Waste limestone material
- Boiler slag
- Construction and demolition waste
- Sand blast material
- Ball mill rejects
- Coal waste
- Pyrites

The landfill was constructed with a leachate collection and removal system and a three-component liner system consisting of a primary geomembrane, secondary geomembrane (with a leak detection system between them), and soil liner. The soil liner consists of a geosynthetic clay liner placed above a compacted soil layer.

Five phases (Phases 1 through 5) are planned for the Industrial Landfill No. 1, with each phase providing approximately 4.3-5.3 years of capacity. When completed, the Marshall Industrial Landfill No. 1 will provide Marshall with approximately 24.3 years of disposal capacity at an estimated annual disposal rate of 738,000 tons.²

As described in the Permit to Construct Application (Section 7.1.1), the landfill capacity was estimated using the proposed grading and closure plans in conjunction with the anticipated annual disposal rates. The estimated disposal rate for the Marshall Industrial Landfill No. 1 accounts for the potential acceptance of the waste that is currently directed to the Marshall FGD Residue Landfill, as further discussed in Section 3.0.

The approximate volume of the landfill available for waste placement, which consists of the airspace between the protective cover soil and the proposed top of waste, is presented in the table below.³ Using an assumed in-place waste dry density of 75 pounds per cubic foot (1.0 ton per cubic yard), the available dry

¹ Operations Plan Modification. August 4, 2011. Marshall Steam Station Industrial Landfill No. 1. Permit No. 1812

² Permit to Construct Application-Industrial Landfill No. 1, Electronic Version, Duke Energy-Marshall Steam Station, Terrell, North Carolina. Prepared for Duke. Prepared by S&ME. November 2009. DIN 8968

³ Permit to Construct Application-Industrial Landfill No. 1, Electronic Version, Duke Energy-Marshall Steam Station, Terrell, North Carolina. Prepared for Duke. Prepared by S&ME. November 2009. DIN 8968

tonnage of waste to be placed in the landfill was estimated to be approximately 17,928,541 tons and/or cubic yards. Based on the anticipated disposal rate of 738,000 tons per year the estimated Phase 1 lifetime is approximately 5.2 years and the estimated facility lifetime is approximately 24.3 years as shown in table below.

Industrial Landfill No. 1 Waste Capacity

	Waste Capacity (Cubic Yards)	Lifetime (Years)
Phase 1	3,829,020	5.2
Phase 2	3,552,181	4.8
Phase 3	3,910,718	5.3
Phase 4	3,181,038	4.3
Phase 5	3,455,584	4.7
Total	17,928,541	24.3

3.0 Expected Annual Waste Quantities for Ten-Year Period

The expected annual quantity of waste to be placed in the Marshall Industrial Landfill No. 1 is 738,000 tons per year.⁴ The Marshall Industrial Landfill No. 1 has a total available airspace volume of 17,928,541 cubic yards or 17,928,541 tons of capacity based on an assumed in-place waste dry density of 1.0 ton per cubic yard.⁵ A breakdown of the capacity for each phase of the landfill is included in Section 2.0 (Page 3).

As of June 30, 2011, the Marshall Industrial Landfill No. 1 had not received waste material. Waste was placed in the landfill on July 27, 2011.

The Marshall Flue Gas Desulfurization (FGD) Residue Landfill, Phase 1, Cell 1 (Permit No. 1809) is projected to reach final capacity in the 2014-2015 time period. Prior to Cell 1 of the FGD Residue Landfill achieving final capacity, Duke will determine if a permit application to construct Cell 2 of the FGD Residue Landfill will be submitted. If Cell 2 of the FGD Residue Landfill is not permitted, then the wastes generated after the closure of FGD Residue Landfill Cell 1 will be placed in the Marshall Industrial Landfill No. 1. Under this sequence of events, Cell 1 of the Marshall FGD Residue Landfill will be closed when its final capacity is reached.⁶

Each phase of the Marshall Industrial Landfill No. 1 will provide disposal capacity for approximately 4.3-5.3 years. Duke anticipates that permitting will begin on Phase 2 of the landfill prior to Phase 1 reaching final capacity and that construction of the initial cells in Phase 2 would be completed prior to Phase 1 reaching final capacity.

The information below presents the quantities of waste that are expected to be placed in the Marshall Industrial Landfill No. 1 each year for the period 2011-2021.

Expected Annual Waste Quantities for Ten-Year Period

Year	Period ⁷	Phase 1—Expected Annual Quantity (tons)	Phase 2—Expected Annual Quantity (tons)
Year 1	2011-2012	738,000	-
Year 2	2012-2013	738,000	-
Year 3	2013-2014	738,000	-
Year 4	2014-2015	738,000	-
Year 5	2015-2016	738,000	-
Year 6	2016-2017	139,020	598,980
Year 7	2017-2018	Phase 1 closed	738,000
Year 8	2018-2019	Phase 1 closed	738,000
Year 9	2019-2020	Phase 1 closed	738,000
Year 10	2020-2021	Phase 1 closed	738,000

⁴ Landfill Operations Plan—Duke Energy Carolinas, LLC Flue Gas Desulfurization (FGD) Residue Landfill Phase 1, Cell 1.

⁵ Permit to Construct Application-Industrial Landfill No. 1, Electronic Version, Duke Energy-Marshall Steam Station, Terrell, North Carolina. Prepared for Duke. Prepared by S&ME. November 2009. DIN 8968

⁶ Ten-Year Solid Waste Management Plan Years 2011 to 2021 Marshall Steam Station Flue Gas Desulfurization (FGD) Residue Landfill, Phase 1, Cell 1 Permit No. 1809 March 27, 2012, Altamont Environmental, Inc.

⁷ The period is from July 1 to June 30 of the following year.

4.0 Years of Disposal Capacity Remaining

4.1 Phase 1

As of June 30, 2011, the Marshall Industrial Landfill No. 1, Phase 1 had not received any waste.

Based on the design capacity of Phase 1 and the design disposal rate, the estimated years of disposal capacity remaining as of June 30, 2011 are calculated:

$$\frac{3,829,020 \text{ Tons Initial Capacity}}{738,000 \text{ Tons/Year Expected Annual Quantity}} = 5.2 \text{ Years of Disposal Capacity Remaining in Phase 1}$$

4.2 Phase 2

The projected disposal rate for Phase 2 is 738,000 tons per year. The estimated capacity for Phase 2 will be 3,552,181 cubic yards (approximately 3,552,181 tons of capacity based on an assumed in-place waste dry density of 1.0 ton per cubic yard). Phase 2 of the landfill is projected to begin receiving waste in (approximately) 2016-2017 when Phase 1 reaches its capacity. Phase 2 is estimated to have approximately 4.8 years of disposal capacity. See Section 3.0 for anticipated disposal tonnages for the period from 2011 through 2021.

4.3 Phases 3 through 5

Based on a projected disposal rate of 738,000 tons per year, Phases 3, 4, and 5 will provide an estimated additional 14.3 years of capacity. Phases 3 through 5 are not anticipated to begin receiving waste until after the 2011-2021 period covered by this report.

5.0 Waste Management Strategy—Plans for Waste Reduction

Marshall generates electric power by combustion of coal and produces fly ash, FGD residue (gypsum), and other coal combustion residuals (CCR) on an operational basis. Marshall provides electricity to the Duke electric system, along with other electrical-generating stations. Since Marshall is part of a system, the operation of the station and the quantity of CCR produced depends on the operation of the system as a whole.

The quantity of fly ash and FGD residue (gypsum) generated at Marshall depends on factors such as the heat content (British Thermal Units or BTUs) of the coal, the ash content of the coal burned, the quantity of coal burned, and in the case of FGD, the sulfur content of the coal. These factors typically will vary over the course of a single year, causing the quantity of fly ash and FGD residue produced to vary.

Duke's Byproducts Management Group was developed to seek markets and applications for the beneficial use of coal combustion byproducts. This group continuously works toward maximizing the use of coal combustion byproducts. The marketing of combustion byproducts for beneficial use is the primary waste reduction effort.

The FGD system at Marshall was designed to produce wallboard-quality gypsum so that the material could be beneficially used as a byproduct. As with other materials typically utilized in construction applications, the regional economic downturn led to a decrease in beneficial use of FGD residue during the 2009-2010 period. During the 2010-2011 period, approximately 335,355 tons of gypsum were produced at Marshall. Approximately 251,324 tons were beneficially used in the manufacturing of gypsum wallboard. In addition, approximately 2,629 tons of gypsum were beneficially used in agricultural applications.

At the present time, none of the fly ash produced by Marshall is used beneficially off-site as a byproduct. However, fly ash is being used on-site as structural fill for the subgrade preparation for Industrial Landfill No. 1, Phase 1, Cells 3 and 4.

The Duke Byproduct Management Group is continuing to pursue the beneficial use of the ash and FGD residue produced at Marshall. Duke believes that an improving regional economy will increase the demand for beneficial use, resulting in a decrease in the quantity of material disposed in the landfill.

Duke's goal is to increase beneficial use by two percent each year, which would reduce the amount of waste going to the landfill, assuming production rates remain stable. Duke believes that this goal is attainable at Marshall, but recognizes that uncertainties exist both with beneficial use markets and with generation rates.

Duke continues to diversify the mix of fuels used to generate electricity in its system by making significant investments in renewable energy projects. As part of this diversification, Duke Energy launched its solar power initiative in North Carolina during 2009. The \$42 million, 10-megawatt (MW) program is now among the nation's largest distributed generation demonstrations. With distributed generation, electricity is produced at many micro-generating sites rather than at a large, centralized, traditional power plant.

In December 2010, Duke began operation of a 950-kilowatt solar photo-voltaic system at Marshall. The annual generation capacity of the 3,535 solar panels is 1,557,171 kilowatt-hours. In addition to solar, wind, and other renewable energy sources, Duke is testing the use of biomass mixed with coal at some of its traditional coal-fired power plants. Duke's increased use of renewable energy helps decrease CCR generation resulting from coal-fired generation.

6.0 Applicability with Pending Regulations

In June 2010, the US Environmental Protection Agency (EPA) issued a draft rule⁸ that considers two possible regulatory options for the management of CCR. The EPA definition of CCR includes fly ash, bottom ash, FGD materials (including synthetic gypsum), and boiler slag. Both regulatory options fall under the Resource Conservation and Recovery Act (RCRA). Under the first option, EPA would list these residuals as special wastes subject to regulation under Subtitle C of RCRA when destined for disposal in landfills or surface impoundments. Under the second option, EPA would regulate coal ash under Subtitle D of RCRA, the section for non-hazardous wastes. The proposed regulations have the potential to affect the disposal and the beneficial uses for CCR. In addition to the disposal requirements under the proposed rules, both proposed options may require the removal of solids from the ash basin.

The EPA has solicited public comments on the proposed rule and is in the process of developing a final rule. The EPA issued a Notice of Data Availability (NODA) for the proposed rule on October 12, 2011. The NODA announced additional information and invited comment on additional information obtained by EPA in conjunction with the June 21, 2010 proposed rule.

It is uncertain when a final rule will be issued. The effective dates for the rules will vary from six months after the rule is finalized for the Subtitle D option to one to two years after the rule is finalized for the Subtitle C option.

In the current version of the proposed rule, both the Subtitle C and the Subtitle D versions of the proposed rule may require removal of solids from the existing ash basin located at Marshall. However, there is consideration of ash basin closure with the solids in place. If the final rule requires removal of solids from the ash basin, Duke would perform a hydrographic survey to estimate the volume of solids to be removed and would incorporate this additional volume of material into the planning sequence for additional landfill phases.

If the final rule does not require removal of the solids from the ash basin and requires ash basin closure, then only the quantity of ash that is now sluiced to the ash basin would require disposal in a landfill. This ash would be disposed of in the landfill phase permitted at the time of the effective date of the rule and the quantities would be included in designs for future landfills.

As part of this rulemaking process, the EPA is soliciting comment on uses of CCR and whether they should continue to be exempted from RCRA regulations for the purpose of beneficial uses under the Bevill exemption.⁹ EPA will decide on appropriate regulations for beneficial uses after completion of the rule making. At this time, the proposed rule does not appear to affect the disposal of gypsum in a permitted landfill nor does the proposed rule seem likely to affect the beneficial uses of gypsum. On the EPA webpage entitled *Frequent Questions: Coal Combustion Residues (CCR) - Proposed Rule- Additional Qs & As on Beneficial Uses*¹⁰, the EPA states that: “EPA strongly supports the use of FGD gypsum in wallboard. The proposed rule does not affect this use.”

⁸ Federal Register: June 21, 2010, Volume 75, Number 118, Proposed Rules Page 35127-35264.

⁹ Section 3001(b)(3)(A)(i) of Resource Conservation and Recovery Act (known as the Bevill exclusion or exemption) excluded certain large-volume wastes generated primarily from the combustion of coal or other fossil fuels from being regulated as hazardous waste under subtitle C of RCRA. This amendment also allowed certain beneficial uses of CCRs.

¹⁰ <http://www.epa.gov/wastes/nonhaz/industrial/special/fossil/ccr-rule/ccrfaq.htm#28>