



Permit No.	Scan Date	DIN
1804-INDUS-1983	January 13, 2016	25492

Environmental, Health & Safety

526 South Church Street  
Mail Code EC13K  
Charlotte, North Carolina 28202  
980-373-5697

RECEIVED  
**December 22, 2015**  
Solid Waste Section  
Asheville Regional Office

December 22, 2015

North Carolina Department of Environmental Quality  
Division of Waste Management  
Solid Waste Section  
2090 U.S. Highway 70  
Swannanoa, North Carolina 28778

Attn: Mr. Larry Frost

Subject: Duke Energy Carolinas, LLC  
Marshall Steam Station Retired Ash Landfill (INDUS-1804)  
Marshall Landfill Vegetation Maintenance Plan

Dear Mr. Frost:

Please find the Marshall Steam Station Landfill Vegetation Maintenance Plan for the Retired Ash Landfill (INDUS-1804) enclosed in this submittal. This maintenance plan includes the Retired Ash Landfill Phase I, and an area between the ash basin and the existing perimeter road in the southwest portion of the Phase II footprint. The management plan is in response to a recommendation from the Department during the 2015 landfill inspection and to Attachment 4, Part IV, Item 3 of the combined Solid Waste Permit for Marshall Steam Station.

If you have any question regarding this report, please contact Tyler Hardin at 980-373-5697 or [Tyler.Hardin@duke-energy.com](mailto:Tyler.Hardin@duke-energy.com).

Sincerely,

Tyler Hardin  
Groundwater and Water Programs

cc (via e-mail): Ed Mussler, NCDEQ  
Shawn McKee, NCDEQ  
Kyle Baucom, Duke Energy  
Chris Randazzo, Duke Energy  
Tim Russell, Duke Energy  
Kim Hutchinson, Duke Energy  
Ed Sullivan, Duke Energy

November 20, 2015 **REV 1 December 22, 2015**

Dale Smith, P.E.  
Al Dahrouge, P.E.  
Duke Energy  
400 South Tryon Street  
Charlotte, NC 28202

**RE: Vegetation Management and Inspection Plan REV 1 – South Ash Landfill  
(Issue MAR-320)  
Duke Energy – Marshall Steam Station  
Catawba County, North Carolina**

Gentlemen:

As authorized by Duke Energy under PO # 1275070 dated July 8, 2015, AECOM is pleased to provide this REV 1 Vegetation Management and Inspection Plan for the South Ash Landfill and portions of the Ash Landfill currently covered with trees and heavy brush.

This Plan is in response to a Phase 3 issue provided to AECOM by Duke Energy. A description of the issue is provided below.

- **MAR-320:** *(Ash Landfill, FGD Landfill, Industrial Landfill, South Ash Landfill, and Structural Fill) Dense vegetation and brush exists at multiple locations across the facilities. The vegetation and brush impact drainage performance and/or inhibit visual observations. **Recommended Action:** Remove and/or mow vegetation and brush that inhibit visual observations and/or impact drainage performance.*

This Plan focuses on the South Ash Landfill where localized mitigation is not practical. Duke Energy has undertaken the recommended action on the other disposal facilities identified in MAR-320.

Please do not hesitate to call the undersigned at 919-461-1335 (office)/919-478-7765 (mobile) for John, or 919-461-1344 (office)/919-868-2363 (mobile) for Gabe, if you have any questions or comments on our proposal.

Sincerely,

**AECOM**



John A. Bove, PE  
Project Manager



Gabriel W. Lang, PE  
Program Manager



**COAL COMBUSTION PRODUCT DISPOSAL PROGRAM  
MARSHALL STATION**

VEGETATION MANAGEMENT AND INSPECTION PLAN

SOUTH ASH LANDFILL PERMIT NO. 1804  
DUKE ENERGY MARSHALL STATION  
CATAWBA COUNTY, NORTH CAROLINA

Prepared for

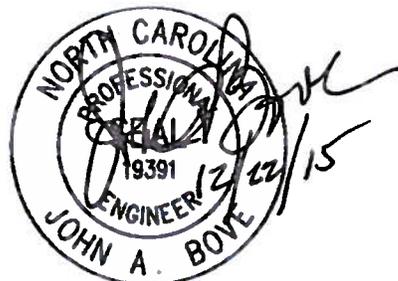


**REV 1 December 22, 2015**

Prepared by



1600 Perimeter Park Drive, Suite 400  
Morrisville, NC 27560-8421  
919-461-1100



## 1.0 BACKGROUND

### 1.1 FACILITY DESCRIPTION

The South Ash Landfill is part of the Marshall Dry Ash Landfill permitted in 1983 by the North Carolina Department of Environment and Natural Resources (NCDEQ) under Solid Waste Permit No. 1804. NCDEQ classifies this facility as an inactive/closed Industrial Landfill. The South Ash Landfill, approximately 14-acres in size, was constructed as "Phase I" of the Marshall Dry Ash Landfill by placement of approximately 280,000 tons of flyash generated at the Marshall Station between 1984 and 1986.

Phase II of the Marshall Dry Ash Landfill (under the same Solid Waste Permit as Phase I) was filled after completion of Phase I until 1999.

A general site plan outlining the approximate limits of the Marshall Dry Ash Landfill covered under this plan is provided on Figure 1. The approximate limits of Coal Combustion Residuals (CCR) waste shown on Figure 1 are based upon information provided by Duke Energy. Edge of waste markers are in place along the approximate perimeter of the disposal area. These are to be considered approximate since the limits were never established by survey methods.

The western limits of the South Ash Landfill are inferred to the edge of the Ash Basin. The eastern limits are near the existing access roadway that extends around the northern and eastern perimeter of the Ash Basin.

The South Ash Landfill was closed by placement of 2-ft of compacted soil. The surface of the landfill is currently covered with dense trees and brush. Duke Energy wishes to facilitate visual inspection of the surface of the final cover and to make repairs as needed to maintain the effectiveness of the final cover.

Phase II of the Marshall Dry Ash Landfill is covered with well-maintained grass, with the exception of an approximate 6-acre portion of the facility located to the west of the main access road (Figure 1) which is covered by dense brush and trees.

This document covers the entire 14-acre South Ash Landfill and the 6-acre portion of Phase II 1804 Ash Landfill that is currently tree and brush covered.

### 1.2 SCOPE OF PLAN

The intent of this Vegetation Management and Inspection Plan is to outline requirements for clearing and maintaining portions of the final cover areas to facilitate visual inspection of the final cover surface. Duke Energy intends to remove brush and trees up to 2-inches in diameter for better access to obscured areas of the final cover surface of the South Ash Landfill and identified portions of the Phase II 1804 Ash Landfill. In order to access existing obscured areas for brush removal and maintenance, larger trees may have to be removed.

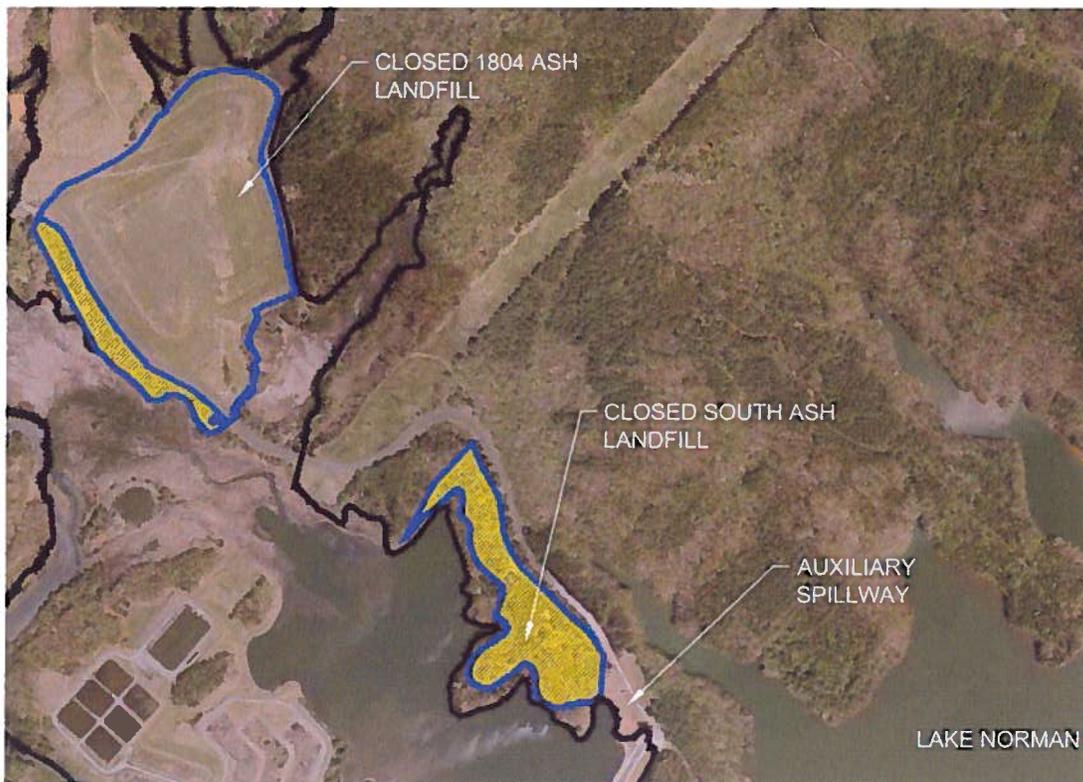
This Plan provides guidance on vegetation removal from brush to large trees with the intent of maintaining the function of the final cover. Removal of trees will be completed as directed by the System Owner.

### 1.3 REGULATORY CRITERIA

The South Ash Landfill was operated and closed under Solid Waste Permit No. 1804. Regulatory requirements for "Industrial Landfills" did not include base liners or leachate collection systems at the time of permitting, so these systems were not constructed. Final cover requirements included placing "2-ft of compacted earth" over the top of the waste. No regulatory density or hydraulic conductivity criteria are applied to the final cover soil.

The final cover system for waste disposal facilities is required to meet the following general criteria:

- Minimize infiltration of stormwater into the waste, and
- Function with a minimum of maintenance over the post closure period.



**Figure 1 – Approximate Limits of Disposal Areas Included Vegetation Management and Inspection Plan Area Shown in Yellow Shading**

At the time the South Ash Landfill was permitted (1983), the first criteria was generally met by effective grading of the waste surface to minimize ponding of rainfall and placement of the 2-ft of soil. Since compacted CCR was disposed in the South Ash Landfill, establishment of grades to promote runoff could be easily accomplished throughout operations and at the time of final cover placement. Since little settlement of the CCR would be anticipated, once positive drainage was established, little future maintenance to correct settlement and establish positive drainage was likely required.

Current post closure criteria include establishment of grass on the final cover surface and routine mowing to prevent establishment of heavy brush and trees on the landfill surface. Trees and heavy brush obscure visual observation of the condition of the final cover. In addition, when large trees topple or are uprooted, CCR could be exposed and the integrity of the final cover soil could be impacted. Regulatory requirements aimed to prevent tree growth were not in place in the early to mid-1980's in North Carolina. In fact, state regulators and conservation districts encouraged planting of trees on some closed landfills in order to "stabilize" the disposal areas. Allowing establishment of trees on the final cover is consistent with the operational practice at the time of closure. Removal of the trees and brush facilitates final cover inspection and is not a response to regulatory requirements.

## **2.0 MANAGEMENT OF FINAL COVER VEGETATION**

### **2.1 EXISTING CONDITIONS**

The existing vegetation on the final cover includes heavy brush and trees. It is the intent of Duke Energy to remove areas of thick brush to facilitate inspection of the final cover surface. Some of the trees on the final cover may have to be removed to facilitate access or to mitigate potential impacts to the final cover. The procedures used to manage the existing vegetation will be different than the methods for routine upkeep.

The need to remove trees for initial clearing, for maintenance or for final cover inspection purposes will be established by Duke Energy personnel.

### **2.2 CHEMICAL VEGETATION CONTROL**

It is anticipated that the dense vegetation on the South Ash Landfill where access by mowers is limited may be most effectively managed using herbicides. It is critical that chemical treatments be applied by qualified personnel in accordance with manufacturer's directions, Duke Energy safety practices and the Marshall Station NPDES and groundwater subject management expert. This document is not intended to serve as a guide to chemical vegetation management. Refer to literature provided by Duke Energy, State of North Carolina and Catawba County for guidance regarding vegetation control, including the proper methods, application rates, frequency and season of the year for application.

### **2.3 BRUSH**

A significant portion of the South Ash Landfill is covered with dense brush. This obscures visual inspection of the final cover surface and prevents walking or vehicle access to portions of the cover. Where accessible, brush can be managed using mechanical methods, such as mowers and hand held trimmers. For large areas, or areas where access for conventional mowers or bush hogs is not available, specialized forestry management equipment can be used to clear brush and trees. Such equipment must be operated by qualified personnel subject to Duke Energy safety requirements.

It is recommended that brush adjacent to the access roadway be managed initially. These areas are relatively flat, and have good access. Reconnaissance of ground surface conditions adjacent to these areas should be conducted prior to introduction of mowing equipment. Brush covered areas adjacent to monitoring wells, the culvert and waste markers should be managed using hand equipment.

## 2.4 TREES: 2-INCHES OR LESS (DBH)

Trees with a diameter of 2-inches or less (as measured at breast height, or “DBH”) should be removed and not allowed to be re-established on the landfill surface. This is best accomplished by routine mowing. Potential for impact to the final cover is low. In general, trees of this size should be managed the same as brush as described above.

## 2.5 TREES: 2-INCHES TO 6-INCHES (DBH)

Trees with a diameter of greater than 2-inches DBH but less than 6-inches can be removed as needed by mechanical means using hand held equipment or forestry management equipment. Trees in this size category do not represent a significant risk to the final cover integrity and can be cut off at the ground surface. Routine maintenance of the final cover (i.e., mowing) will prevent establishment of trees of this range of diameter once the initial clearing is completed.

## 2.6 TREES: GREATER THAN 6-INCHES (DBH)

Individual trees greater than 6-inches in diameter DBH that are identified for removal should be marked in the field using surveyor ribbon or similar material. Some trees have the potential to cause damage to the final cover if toppled or uprooted. Individual trees can be cut at the ground surface unless they represent a risk to the integrity of the final cover. Such conditions could include trees located at the crest of a landfill sideslope, located at the edge of an existing erosion rill or an active slough, or any location where the removal of the tree or the eventual breakdown of the root ball would result in degradation of the final cover. The stump and root ball should also be removed at locations where the remaining stump will result in damage to mowing equipment.

Where groups of trees of this size range are identified for removal, the root balls should be removed. The final cover must be restored as outlined in Section 4.

## 2.7 TREES: GREATER THAN 12-INCHES (DBH)

Trees greater than 12-inches in diameter DBH identified for removal should be marked for further examination. These trees will result in damage to the final cover in the event they are toppled or uprooted. Dead or distressed trees of this size category should be cut above ground level as quickly as practical before they have the opportunity to topple. The stumps and root ball could be removed at a later date. At the discretion of the Duke Energy personnel, all such trees identified for removal, should be cut down and the stump and root ball excavated and removed and the final cover restored as outlined in Section 4. Exceptions to the removal of trees in this category include:

- Trees located adjacent to culverts, wells or other structures that would be damaged during stump and root ball removal,
- Trees identified as potential bat habitat outside the authorized time of year for tree removal.
- Other trees designated by the Duke Energy personnel.

Equipment that removes both the tree and root ball, including hydraulic excavators, dozers, etc. can be used effectively, but may result in more extensive repairs to the final cover.

## 2.8 PHASING OF THE CLEARING OPERATIONS

Removal of tree stumps and root ball, where necessary, will require repairs to the final cover soil as outlined in Section 3. This requires additional equipment and the excavation, hauling, removing of downed trees, and grading of final cover soil. During any required clearing operations, removal of large trees and their stumps could be delayed until safe effective access is established by removal of brush, etc. These operations could also be delayed until a more favorable season of the year. It is not the intent of this document that all trees and brush must be removed in a single operation. Duke Energy staff can phase the work as needed to most effectively and safely manage the South Ash Landfill final cover.

Brush can be ground or chipped on site and the resulting light chips can be incorporated onto the final cover surface (above the final cover barrier soil) to provide erosion protection. Large vegetation, including trees, should be removed from the final cover area.

### **3.0 FINAL COVER MAINTENANCE**

#### **3.1 INSPECTION**

Inspection and maintenance of the final cover are to be completed only when conditions are deemed safe for personnel and for the operation of equipment. For the South Ash Landfill and the designated portion of the Phase II disposal area outlined on Figure 1, the minimum frequency of inspection is semi-annually.

It is recommended to conduct annual inspections at the same time of year in order to best document changed conditions between inspections, and to plan and monitor maintenance, etc. Inspection during the winter months provides the best visibility of the cover surface since vegetation is generally dormant. Inspection of vegetation should be completed during the summer months.

An inspection form is attached.

#### **3.2 DRAINAGE AND EROSION**

After removal of woody vegetation and trees, it is anticipated that drainage pattern on the final cover surface could change in some areas. This can result in concentrating more surface water and initiation of erosion. This could require establishment of ditches or swales, including the need to armor the ditches. It is preferable to line the ditches with permanent erosion matting or turf reinforcement matting (TRM) for the relatively small drainage areas on the South Ash Landfill. The intent of installation of any swales or ditches is to assure that the final cover surface is not eroded, surface water is not ponded, and the swale or ditch functions with a minimum of maintenance. Design of ditches, including lining or armoring as required, should be completed by a qualified engineer.

#### **3.3 EARTHEN COVER**

The regulatory requirements for final cover at the South Ash Landfill are to be re-established as part of any repair or maintenance to the final cover. Maintenance of vegetation, repairs to or installation of ditches, swales or repairs to eroded areas require placement of a minimum of 2-ft of compacted soil over the top of the CCR. For purposes of this document, soils used for repairs of the South Ash Landfill final cover should meet the following requirements:

- Cohesive soils consisting of clean natural soil classified as SM, SC, ML, or CL-ML, MH, CH using the Unified Soil Classification System (USCS) containing no topsoil or other deleterious material,
- Rock fragments, cobbles and boulders not exceeding 4 inches in size,
- Moisture content should be such that effective compaction to at least 93% of the Maximum Standard dry density (ASTM D698) can be attained using hand operated or mechanized equipment.

The entire stump and root ball should be removed, including roots in excess of 2-inches in diameter. This may require excavation into CCR. If CCR is exposed and excavated, it should be stockpiled and managed separately from cover soil and vegetation. At the discretion of the Duke Energy personnel and in compliance with Station procedures, CCR removed from the South Ash Landfill as part of final cover maintenance can be placed back into the excavation providing the original final cover surface elevations are generally maintained. All such areas must be covered by a minimum of 2-ft of final cover soil. Alternately, CCR can be removed from the area and disposed in an active permitted landfill facility on the Marshall Station facility.

If practical, segregate and stockpile available topsoil for later reuse.

Excavations through the final cover should be prepared for final cover placement by stepping or benching the sides of the excavation to allow effective blending of the new and in-place final cover soils. Loose materials at the base of the excavation, including CCR should be graded and compacted as needed before placement of the cover soil. Cover soil should be placed in thin lifts. Lift thickness is dependent of the size of the repair area, the type of soil used for cover and the type of grading and compaction equipment used. As a guideline, a maximum loose lift thickness of 8-inches is suitable for lightweight compaction equipment. Lift thickness can be increased or decreased depending on the equipment available and the geometry of the repair area.

Monitoring of the repair by a qualified engineer or technician is recommended. The following activities are recommended:

- Documentation of the location of the repair, and the nature of the repair,
- Size and depth of the excavation,
- The presence of CCR in the excavation and the fate of any CCR removed from the excavation as part of the repair,
- The conditions of the base and sides of the excavation prior to backfill (i.e., loose materials, preparation of slopes by benching, etc.),
- Source and classification of final cover soils used in the repair (include available field or laboratory Proctor data, etc.),
- Lift thickness, compaction methods and equipment, number of passes,
- Density testing (if completed),
- Surface restoration, including topsoil, mulching, seeding.
- The total thickness of the final cover soil should be measured and recorded to document compliance with regulatory criteria,
- Follow-up inspections to monitor establish of vegetation, erosion, etc.



It is recommended that filling of excavations associated with root ball removal and other repair areas where CCR is exposed be completed as quickly as possible after establishment of the excavation. Place topsoil, if available, over the surface of the completed repair.

Grade the surface of the repair into the adjacent final cover areas in a way that does not result in erosion or trapped surface water runoff. This may require placement of final cover soils in areas outside of the original repair area. If this is the case, it is recommended that the vegetation and topsoil be removed before placement of the final cover soil.

Once repairs are completed, place topsoil (if available), and seed the surface.

Monitor repair areas as required to document establishment of suitable vegetation, erosion issues, and other items impacting the monitoring and maintenance of the final cover.



# LANDFILL COVER INSPECTION

Issue Date:  
December 31, 2014  
Revision 0

<b>NAME OF STATION:</b>		<b>COUNTY, STATE:</b>	
<b>INSPECTION DATE:</b>		<b>AREA INSPECTED:</b>	
<b>WEATHER:</b>		<b>INSPECTOR:</b>	
<b>AMT OF RAINFALL IN LAST 24 HOURS:</b>	<b>Monthly</b>	<input type="checkbox"/>	Reason:
	<b>Special</b>	<input type="checkbox"/>	
	<b>Annual</b>	<input type="checkbox"/>	
<b>Photo Log Attached</b>	Yes <input type="checkbox"/> No <input type="checkbox"/>		

Replace with Feature ID					
Observation	Issues?		Location	Repair Needed	Comments
	Yes	No			
Burrowing Animals	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Weeds and Brush	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Surface Cracks	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Vegetative Growth	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Settlement	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Erosion	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Slope Stability (Slides, sloughs, etc.)	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Seepage	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Vandalism	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Vegetation Islands	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Erosion/Sediment Control Structures	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Working Face Soil Cover	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Stormwater System	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Sedimentation Ponds	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Ash Stack/Landfill Cover	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	
Comments:					

**SIGNATURE** \_\_\_\_\_ **DATE** \_\_\_\_\_  
Inspector

**PRINTED NAME** \_\_\_\_\_