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SOLID WASTE SECTION  
ASHEVILLE REGIONAL OFFICE

May 6, 2014

Mr. Allen Gaither  
Environmental Engineer  
North Carolina Department of Environment and Natural Resources  
Division of Waste Management  
Solid Waste Section  
2090 US Highway 70  
Swannanoa, North Carolina 28778

Subject: Buncombe County Solid Waste Management Facility  
Buncombe County, North Carolina  
Permit No. 11-07  
Subtitle D Landfill - Phase IV (Cell 7) - Revised Closure/Post-closure Section

Dear Mr. Gaither:

On behalf of Buncombe County, Camp Dresser McKee & Smith (CDM Smith) is pleased to submit the revised closure/post-closure section of the Permit to Construct Application for Phase IV (Cell 7) of the Buncombe County Subtitle D Landfill. As discussed, the revised potential assessment and corrective action amount requirement was not addressed in the submittal dated April 28, 2014. Please replace the original closure/post-closure section with the attached hard copy. A DVD of the entire permit application with the revised Closure/Post-closure Section is also attached to replace the current DVD found in the front cover of the permit application.

If you have any questions or comments, or need any additional information during your review, please do not hesitate to contact me at (919) 325-3574.

Very truly yours,

Kenton J. Yang, P.E.  
CDM Smith

cc: J. Creighton/D. Cottrell/K. Smith/S.Hunter, Buncombe County  
J. Wiseman, PETRA Engineering  
C. Gabel, CDM Smith

Attachments: Closure/Post Closure Section hard copy - Gaither, Smith (2x), Wiseman  
Revised Permit Application DVD - Gaither, Smith (2x), Wiseman



# **Buncombe County, North Carolina**

## **Buncombe County Solid Waste Management Facility Subtitle D Landfill Phase IV (Cell 7) Permit to Construct Application**

### **Part 6 – Closure/Post-Closure Plan**



**Original Submittal Date:  
April 2014**

**Revised: May 2014**

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# Section 1

## Closure Plan

Rule .1617 (a)(1)(E) of the North Carolina Solid Waste Regulation Section 15A NCAC 13B .1600, requires municipal solid waste landfill (MSWLF) owners/operators to prepare a closure plan that describes the steps necessary to partially close a MSWLF at any point during its active life as well as the steps necessary to facilitate final closure. Partial closure refers to the closure of a landfill phase, while final closure is the closure of an entire landfill. In providing this information, the closure plan will assist the County towards achieving the goals of closure implementation, which are: to prevent exposure of the disposed solid waste, minimize leachate generation, and control landfill gas in order to protect public health and the environment. Specifically, this closure plan establishes: design criteria for the closure cap system and the landfill gas collection system, a closure sequence and construction schedule, construction cost estimates, and other important information relating to closure. This plan was prepared in accordance with Rule .1629.

### 1.1 Final Cover System

In accordance with Rule .1629 (b)(1)(A), the final cover system has been designed to minimize the amount of storm water infiltration into the landfill and to resist erosive forces. The final cover system consists of an erosion layer, protective soil layer, drainage layer, barrier layer, and gas venting layer. The multi-layered cap system will provide a permeability less than or equal to the bottom liner system of the landfill.

The cap system will consist of the following layers (listed from top to bottom):

- A six-inch Erosion (Vegetative Soil) Layer consisting of soil capable of supporting native plant growth;
- An 18-inch Protective Soil Layer to prevent damage due to freezing or puncture to the Drainage and Barrier Layers;
- A Drainage Layer consisting of a geocomposite. The geocomposite is designed to horizontally drain storm water that has percolated through the Erosion and Protective Soil Layers in order to prevent the build-up of water over the Barrier Layer (thus minimizing infiltration);
- A Barrier Layer consisting of a geomembrane; and
- A Gas Venting Layer placed over a compacted soil subgrade.

Due to the highly elastic nature of the geomembrane, the final cover system will accommodate the differential settlement during the post-closure period. Detail A on Sheet EP-12 provides a detail of the final cover system.

## 1.2 Landfill Gas Collection System

Per Rule .1627 (c)(3)(B) a gas collection system will be installed to minimize uplift pressure exerted on the final cover system. To prevent uplift of the closure cap, horizontal gas collection trenches and vertical gas wells will be used in conjunction with a gas venting layer below the closure cap geomembrane.

The horizontal gas collection trenches consist of perforated plastic pipe surrounded by a clean gravel backfill. Near the surface of the closure cap, a bentonite seal and synthetic boot will be installed around the pipe to prevent storm water infiltration. The length of the trenches will vary from elevation to elevation with the longest trenches positioned near the bottom of the landfill. **Figure 1-1** provides a section detail of the horizontal collection trench design. Generally, the spacing between trenches will be 100-feet horizontal and 30-feet vertical.

As with the horizontal gas collection trenches, a bentonite seal and synthetic boot will be installed around the vertical gas well to prevent storm water infiltration. The depth of the vertical gas wells will extend from final grade to within 15 feet of the bottom liner. **Figure 1-2** provides a section detail of the vertical gas well design. The exact location of the vertical gas wells will be determined at the time of closure. Generally, one vertical well per acre is anticipated to be installed.

Also, negative pressure will be induced in the leachate collection system to eliminate formation of deep gas pockets. The horizontal gas collection trenches, vertical gas wells, and the leachate collection system will be connected to a gas header that will be installed along the perimeter of the landfill that will deliver the gas to the flare station/LFTE facility where the gas will be combusted.

## 1.3 Estimate of Largest Closure

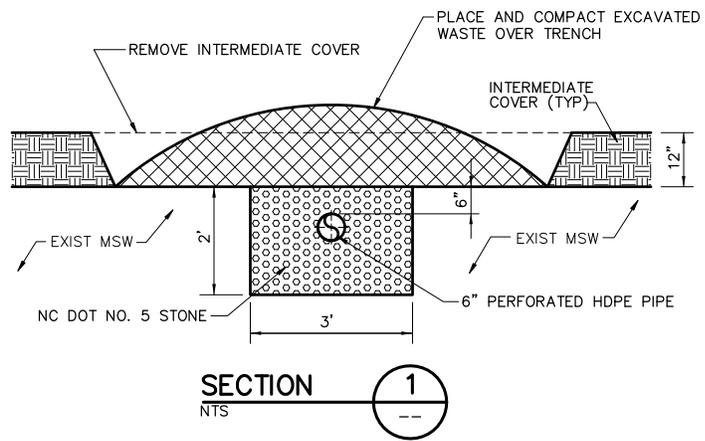
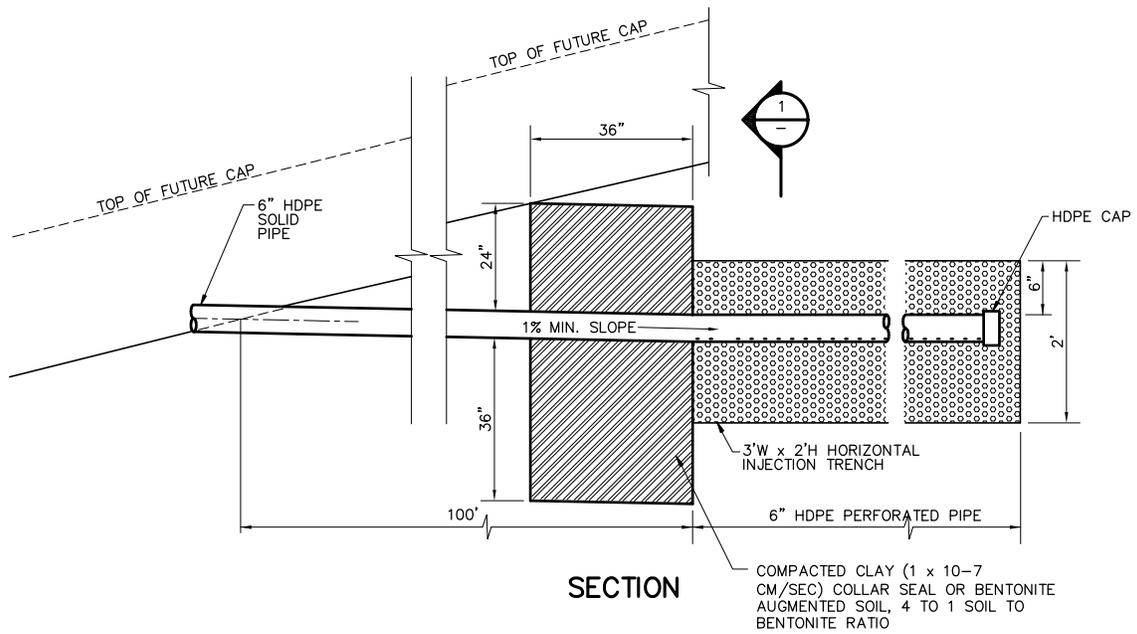
The construction of the landfill will occur in 6 phases, with each phase providing approximately 5 years of capacity. Existing Phases I and III (Cells 1 through 6) are a total of 56 acres, whereas Phase IV (Cell 7) is approximately 13 acres. Thusly, Phases I through IV would be the largest closure to date, covering an area of approximately 69 acres.

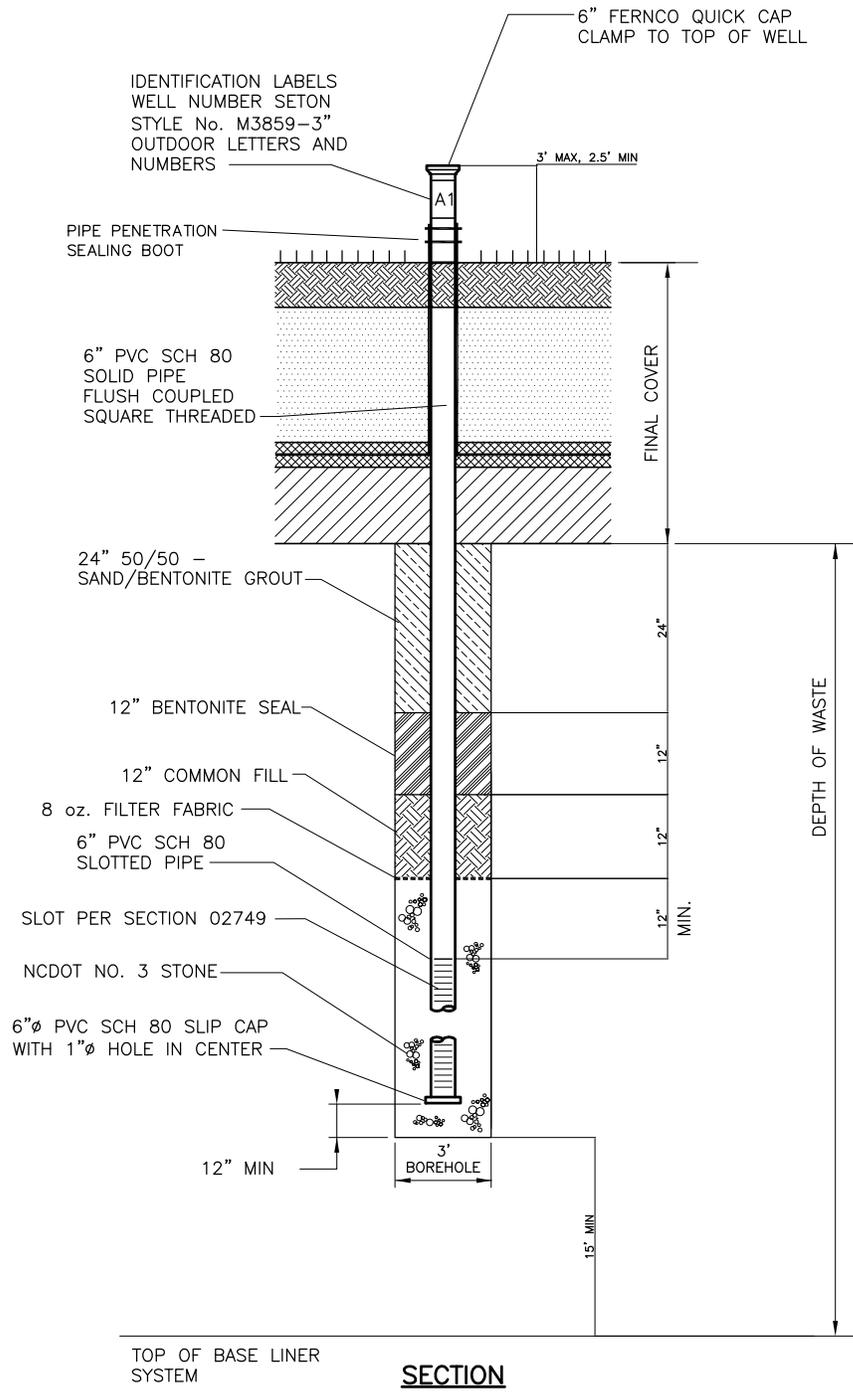
## 1.4 Estimate of Maximum Inventory of Waste On-Site

The maximum amount of waste that is expected to be landfilled at the Buncombe County Subtitle D Landfill through final build-out was calculated using the Earthworks Module of Softdesk. The total gross airspace available between the top of base liner protective cover to proposed top of intermediate cover is approximately 11,804,000 cubic yards. This volume is available for waste and intermediate and daily cover.

## 1.5 Landfill Closure Sequence

The development of the landfill will be integrated so that one phase will be in operation while another phase is being constructed. Additionally, closure activities may be initiated in phases. Although not mandatory, the County may elect to complete a partial closure for an area or may complete a final closure at the end of operations. The steps for implementing the closure process are described in the following subsections. The steps are the same for partial closure and final closure.





### 1.5.1 Determination of Closure Area

The County will determine the location and acreage of areas to be closed. Closure procedures should not be instituted until an adequate area (approximately 10 acres or more) of the landfill has reached final grade. An estimate of landfill area that has reached final grade should be determined periodically by the surveyor for the site during the active life of the facility.

### 1.5.2 Notification of Intent to Close

Per Rule .1627(c)(4), once the County has determined that an area will be closed, a Notice of Intent to Close must be placed in the operating record and the Solid Waste Section (SWS) must be notified of the action, including location, acreage, and scheduling of the closure activities. The final cover design, area to be closed, and scheduling of closure activities presented in this Permit Application shall be reviewed and updated as necessary.

### 1.5.3 Develop Closure Schedule

The County will prepare a schedule for bidding and construction of the closure activities. Per Rule .1627(c)(6), closure activities must be completed within 180 days of beginning closure activities unless the County gains approval from the SWS by demonstrating that the construction period, by necessity, will require an extended schedule and that measures to protect human health and the environment have been implemented in the interim.

### 1.5.4 Prepare Construction Contract Documents

For the purpose of bidding, construction documents will be prepared for the area to be closed. The bidding documents will allow contractors to estimate the quantity of materials needed to properly implement the closure plan, as well as estimating the construction costs.

### 1.5.5 Develop Closure Schedule

Once the SWS has reviewed and commented on the closure schedule, the County will prepare a final schedule for bidding and construction of the closure activities.

### 1.5.6 Selecting a General Contractor

After receiving sealed bids, a contractor will be awarded the job of constructing the final cover according to the approved closure plan. The contractor will be required to complete all closure activities within 180 days of beginning such activities, or as otherwise approved by the SWS.

### 1.5.7 Securing Borrow Material for Landfill Cover

The material to be used for construction of the closure cap system will be obtained from on-site sources. Once usable on-site material has been exhausted, borrow material will be obtained from off-site sources.

### 1.5.8 Certification of Closure Construction

Per Rule .1627(c)(7), the project engineer shall provide certification at the completion of construction to verify that closure has been completed in accordance with the closure CQA plan. The County shall place the certification in the operating record and forward a copy of the certification to the SWS.

### 1.5.9 Record Notation to Deed

Per Rule .1627(c)(8), after final closure of the property, a notation will be placed on the deed to the property stating that the property was used as a landfill facility, and its use is restricted under the closure plan approved by the SWS.

Closure Sequence	
Activity	Process Date
Determination of Closure Area and Initiate Closure Process	No later than 30 Days after the final receipt of waste
Notification of Intent to Close	Once an area has been determined to be closed
Develop Closure Schedule for Closure Activities	-
Prepare Construction Contract Documents	-
Develop Closure Schedule	Once the SWS has commented on the closure schedule
Select a General Contractor	After receiving sealed bids
Closure Construction	Closure activities must be completed within 180 Days of beginning closure activities or as otherwise approved
Certification of Closure Construction	At completion of construction
Record Notation to Deed	After final closure of property

### 1.6 Financial Assurance

Per Rule .1629 (b)(3), a detailed cost estimate based on current costs has been prepared for closure of the largest active area of the landfill facility at any time during the life of the facility and is provided in **Table 1-1**. A copy of the cost estimate has been placed in the operating record. The cost estimate will be annually adjusted to account for inflation and any changes in conditions at the facility or in the design. If conditions call for a reduction in the amount to be financially assured, approval of the SWS must be obtained prior to officially reducing the amount.

**Table 1-1**  
**Closure Cost Estimate**  
**Buncombe County Subtitle D Landfill**  
**Buncombe County, North Carolina**  
**May 2014**

	Quantity	Unit	Cost	Total
<b>Final Cover System (Phases I through IV)</b>				
Grade Intermediate Cover	69	ac	\$ 2,000.00	\$ 138,000
Cap System Components (top to bottom):				
a. 6-inch Thick Vegetative Layer	55,660	cy	\$ 20.00	\$ 1,113,200
b. 18-inch Thick Protective Cover	166,980	cy	\$ 17.00	\$ 2,838,660
c. Stormwater Geocomposite Drainage Net	333,960	sy	\$ 7.00	\$ 2,337,720
d. 40-mil Textured LLDPE Geomembrane	333,960	sy	\$ 6.00	\$ 2,003,760
e. Gas Venting Geocomposite Drainage Net (13 acres only, Cell 7 at 3:1)	62,920	sy	\$ 7.00	\$ 440,440
<b>Temporary Erosion Control</b>				
	69	ac	\$ 1,000.00	\$ 69,000
<b>Permanent Erosion Control</b>				
Diversion Berms/Downdrains	69	ac	\$ 35,000.00	\$ 2,415,000
<b>Landfill Gas Management</b>				
Vertical Gas Wells (69 @ Avg. Depth of 75')	5,175	vf	\$ 125.00	\$ 646,875
Horizontal Gas Collection Trenches	6	ea	\$ 50,000.00	\$ 300,000
<b>Surveys</b>				
	69	ac	\$ 500.00	\$ 34,500
<b>Final Landscaping</b>				
Seeding, Fertilizing & Mulching	69	ac	\$ 3,000.00	\$ 207,000
<b>Subtotal</b>				<b>\$ 12,544,155</b>
<b>Bonds and Mobilization/Demobilization (5% of Subtotal)</b>				<b>\$ 627,208</b>
<b>Engineering Services, CQA/CQC (12% of Subtotal)</b>				<b>\$ 1,505,299</b>
<b>Contingency (25% of Subtotal)</b>				<b>\$ 3,136,039</b>

**TOTAL** \$ 17,812,700

**COST PER ACRE** \$ 258,155

## Section 2

# Post-Closure Plan

Rule .1617(a)(1)(E), of the North Carolina Solid Waste Regulation Section 15A NCAC 13B .1600, requires owners/operators of municipal solid waste landfill (MSWLF) units to prepare a post-closure plan. The purpose of the plan is to provide the necessary information for preserving the integrity of the landfill facility in its post-closure life. This post-closure plan specifically addresses maintenance activities for the closure cap, landfill gas control system, leachate collection system, groundwater monitoring wells, and erosion and sedimentation control system. This plan also addresses certification and financial assurance requirements.

Post-closure care will begin immediately following final closure of the landfill. Post-closure care may be decreased from the minimum time period of 30 years specified in the regulations if the County can demonstrate that the reduced period will pose no threat to human health or the environment. However, the Solid Waste Section (SWS) reserves the right to increase the post-closure care period if it is deemed necessary to protect human health and the environment.

## 2.1 Maintenance and Monitoring Activities

Per Rule .1629 (c)(1), post-closure maintenance and monitoring activities for the Subtitle D Landfill will include the activities discussed in the following sections.

### 2.1.1 Final Cover System

Per Rule .1627 (d)(1)(A), maintaining the integrity and effectiveness of the cap system is required. Inspection of the final cover system will take place quarterly and encompass the entire landfill. Items of concern to be noted by the inspector include but are not limited to: signs of erosion (ruts, sediment deposits, etc.), patches of stressed or dead vegetation, animal burrows, recessed areas or ponding, upheaving, leachate seepage stains and/or flowing leachate, cracks in the cap, damaged gas vents and tree saplings (especially species with tap roots). Following each inspection, a summary report of the condition of the cover and the items of concern should be recorded in the post-closure log book of the facility. Areas that require further attention should be photographed and delineated on a map of the facility. These items should also be entered in the log book. Since post-closure inspection personnel will most likely change during the post-closure period, the post-closure log book should be kept in a standardized format that allows for new inspection personnel to easily review the results of past post-closure inspections of the site.

Action should be taken immediately to address any items of concern identified during the inspection. Obvious repair items should be performed under the supervision of the post-closure maintenance manager. If an item of concern requires further study to determine a course of action, the engineer responsible for closure design should be contacted for consultation.

As part of general maintenance, the vegetative cover should be mowed at least twice a year to suppress weed and brush growth. If vegetative cover is not adequate in any particular area, soil amendments should be applied as necessary and the area re-seeded in order to re-establish vegetation. Insecticides may be used to eliminate insect populations that are detrimental to the

vegetation. Animal burrows and eroded or depressed areas should be filled in with compacted soil and reseeded.

### 2.1.2 Leachate Collection System

Per Rule .1627 (d)(1)(B), maintenance of the leachate collection system is required. Inspection of the accessible items of the leachate collection system (ie. clean-outs, pond, and pump stations) will be made on a quarterly basis. Inspection of the collection lines will be performed concurrent with the annual cleaning service. As part of the quarterly inspection the leachate holding pond will be inspected for damage to the liner system. Depending on seasonal conditions, the pond may be drained so that a thorough inspection may be made (a complete inspection should be made at least once a year). The inspector should survey the pond for items of damage such as tears in the protective layer and/or liner, heaving, and exposed liner in the anchor trench. The outside slope of the pond should be inspected for leachate seepage. Signs of leachate seepage may include damage to vegetation, staining of the soil and vegetation, or actual leachate flow.

The pump stations and flow meter vault should be inspected quarterly by a qualified inspector who is knowledgeable in the construction and operation of pump stations and flow meters. The inspector should manually operate each pump to ensure that they are working properly. The high and low level alarms should be checked at this time, and the overall condition of the wiring and support structures should be inspected also. The flow meter calibration shall be checked (and scheduled for recalibration as required) quarterly and flow meter records shall be monitored and placed in the post-closure log book. The pump control panel shall be fully inspected at the same time, to ensure proper alarm operations, reset functions, and normal operations performance. Run time readings shall be recorded for each pump. A summary report of the condition of the leachate pond, pump station and metering facilities should be recorded in the post-closure log book along with photographs of any items of concern.

The clean-outs should be inspected for damage on a quarterly basis. The protruding portion of each clean-out should be checked for damage and the cap should be checked for proper operation.

If problems with the leachate collection system are discovered, or abnormally high or low flows are recorded from the pump station, assessment and/or repairs should begin immediately.

All piping of the leachate collection system will be pressure cleaned and flushed annually to remove the build-up of biological growth and sediments.

### 2.1.3 Groundwater Monitoring Wells

Per Rule .1627 (d)(1)(C), maintenance of the groundwater monitoring wells is required. Inspection of the ground water monitoring wells will take place semi-annually during sampling events. The inspection will consist of verifying the condition of the monitoring wells to ensure that they are providing representative samples of the ground water. The inspector should note the following:

- 1) The total depth of the well should be recorded every time a water sample is collected or a water level reading is taken to check if sediment has accumulated at the bottom. If sediment build-up has occurred, the sediment should be removed by pumping or bailing.
- 2) If turbid samples are collected from a well, redevelopment of the well will be necessary.

- 3) The above-ground protective casing should be inspected for damage. The protective casing should be of good structural integrity and free of any cracks or corrosion. The lockable cover and lock should also be checked at this time.
- 4) The surface seals should be inspected for settling and cracking. If the seal is damaged in any way, the seal should be replaced.
- 5) The well casing and cap should be inspected. The casing and cap should be of good structural integrity and free of any cracks or corrosion. Any debris should be removed from around the cap to prevent it from entering the well.

The condition of the ground water monitoring system should be recorded in the post-closure log book following each sampling event. Monitoring of the groundwater wells shall be conducted as described in the groundwater monitoring plan.

#### 2.1.4 Landfill Gas Monitoring and Control System

Per Rule .1627 (d)(1)(D), maintenance of the landfill gas monitoring system is required. Inspection of the landfill gas monitoring and control system should take place at least quarterly. The inspection should consist of verifying the condition and operation of the vents, collection well, and monitoring wells. The full depth of all vents, collection wells, and monitoring wells should be checked for blockage that may be caused by settlement or cracks in the casing. The summary of each inspection of the landfill gas monitoring and control system should be recorded in the post-closure log book along with photographs of any items of concern.

Testing of the monitoring wells and on-site buildings shall be conducted as described in the monitoring plan provided in the Operation Plan.

If any vents or wells are not properly working, they should be flushed and pressure cleaned. If all attempts to repair a vent or well are unsuccessful, a replacement will be installed.

## 2.2 Erosion and Sedimentation Control System

Inspection of the erosion and sedimentation control system should occur semi-annually and after major storm events. During each inspection, the elements of the system including ditches, pipes, ponds, and inlet/outlet structures should be checked for obstructions and damage. The ditches should be inspected for obstructions, erosion of side slopes, loss of vegetative cover, shifting of riprap, excessive buildup of sediment, or any other item that may prevent the proper functioning of the ditch. Drainage piping should be checked for blockages and the inlets/outlets should be inspected for undercutting and rutting. The sediment level in the detention ponds should be measured to determine if removal is required. The condition of the riser/barrel should be checked to ensure that adequate gravel surrounds the riser and that the barrel is not filled with sediment. The berms of each pond should be inspected for stability. Following each inspection, a summary report should be entered in the post-closure log book along with photographs of any items of concern.

Maintenance and/or repairs should be performed as prescribed by the inspectors review.

## 2.3 Certification of Post-Closure

Following completion of the post-closure care period, a certification verifying that post-closure care was performed in accordance with the post-closure plan and signed by a registered professional

engineer will be made part of the operating record. The County will notify the SWS that the certification has been placed in the operating record.

## 2.4 Name of Individual Responsible for Post-Closure Maintenance of the Site

Mr. Jon Creighton of Buncombe County will be responsible for operations and maintenance of the site during the post-closure period. Mr. Creighton can be reached at the following address:

Buncombe County  
Planning and Development  
46 Valley Street  
Asheville, NC 28801  
828-250-4830

Mr. Creighton most likely will not be employed with Buncombe County throughout the entire 30 year post-closure period. A new individual will be appointed at the time Mr. Creighton's employment with the County ends.

## 2.5 Planned Use of Landfill After Closure

There are no planned uses for the landfill site after closure. The property will remain County property, maintained by the County, with public access prohibited.

## 2.6 Financial Assurance

The County will submit a financial assurance package to SWS in accordance with the criteria set forth under Rule .1628. A detailed cost estimate for post-closure care has been prepared and is provided herein (**Table 2-1**) and a copy has been placed in the operating record. The cost estimate is based on 30 years of post-closure care. Each year, the estimate will be adjusted for inflation and any changes to the activities of post-closure care.

In June 2011, Session Law 2011-262 reduced the potential assessment and corrective action (PACA) amount from a minimum of three million dollars to two million dollars. The SWS provided verbal direction stating that post-closure activities as previously included in PACA cost estimates could no longer be included there and had to be included in post-closure cost estimates. In a letter from Ed Mussler dated August 12, 2013 (see attached), PACA amounts do not require a cost estimate but must present a minimum of two million dollars for the facility.

Therefore, PACA equates to \$2,000,000.

Table 2-1

**Post-closure Cost Estimate  
Buncombe County Subtitle D Landfill  
Buncombe County, North Carolina  
May 2014**

	Quantity	Unit	Cost	Total
<b>Administration/Inspection/Recordkeeping</b>				
Project Engineer (84 hrs/yr @ \$100/hr)	30	yr	\$ 8,400	\$ 252,000
Technician (68 hrs/yr @ \$60/hr)	30	yr	\$ 4,080	\$ 122,400
Clerical (48 hrs/yr @ \$50/hr)	30	yr	\$ 2,400	\$ 72,000
<b>Monitoring</b>				
20 Groundwater Monitoring Wells Sampled and Analyzed Semi-Annually for 30 years	1200	events	\$ 750	\$ 900,000
1 Surface Water Locations Sampled and Analyzed Semi-Annually for 30 years	60	events	\$ 750	\$ 45,000
12 Landfill Gas Wells Sampled and Analyzed Quarterly for 30 years	1440	events	\$ 500	\$ 720,000
<b>Maintenance</b>				
Fencing, Gates, Signs, etc.	30	yr	\$ 500	\$ 15,000
Access Roads	30	yr	\$ 2,000	\$ 60,000
Mowing (\$100 per acre, 69 acres)	30	yr	\$ 6,900	\$ 207,000
Stormwater Structures	30	yr	\$ 2,000	\$ 60,000
Leachate Collection and Storage	30	yr	\$ 5,000	\$ 150,000
Final Cover System Maintenance (\$400 per acre, 69 acres)	30	yr	\$ 27,600	\$ 828,000
Groundwater and Gas Monitoring Wells	30	yr	\$ 1,500	\$ 45,000
<b>Leachate Closeout</b>				
Cleanout and Demo Leachate Pond	1	ls	\$ 300,000	\$ 300,000
<b>Fees</b>				
Annual Permit Fee	30	yr	\$ 1,000	\$ 30,000
<b>Subtotal</b>				
				\$ 3,806,400
<b>Contingency (15%)</b>				
				\$ 570,960

**TOTAL** \$ 4,377,360

**ANNUAL COST** \$ 145,912