Closure and Post-Closure Plan

Halifax County Landfill Facility
Halifax County, North Carolina

Prepared for:

Halifax County Department of Public Utilities
Halifax, North Carolina

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Halifax County Landfill Facility
Halifax County, North Carolina

Closure and Post-Closure Plan

Table of Contents

Table of Contents (Continued)

TABLES

APPENDIX

1.0 CLOSURE PLAN

This Closure Plan has been prepared to provide information related to closure of the active landfill units at the Halifax County Landfill facility. This information includes the following:

- An estimate of the maximum closure area and waste capacity;
- A description of the final cover system and related features;
- A schedule for completion of closure activities;
- Procedures necessary for verifying closure activities; and
- A cost estimate for closure activities (see **Section 3.0**).

Note that construction plans for closure of each landfill unit (or incremental portion thereof) will be submitted to the North Carolina Department of Environmental Quality Division of Waste Management (DWM) for approval prior to beginning closure construction.

1.1 Maximum Closure Area and Waste Capacity

The following are the estimated areas and capacity for each landfill unit to be closed under this plan.

Table 1.1 Closure Areas and Capacity Summary

Landfill Unit	Closure Area (Acres)	Gross Capacity (CY)[1]	Net (Waste) Capacity (Tons)[1]
Ash Monofill			
Cells 1 & 2	20.8	1,016,288	811,229
Total (Ash Monofill):	20.8	1,016,288	811,229
C&D Units			
Area 1	6.5	131,267	89,458
Area 2	5.7	266,268	119,341
Total (C&D):	12.2	397,535	208,799

Note:
1. The capacity figures shown for each C&D landfill unit are based on the site's Facility Plan. Refer to Section 2.0 (Facility Report) of the Facility and Engineering Plan (**Attachment B**).
2. The capacity figures shown for the ash monofill were determined based on the permitted fill grades for Cells 1 & 2. Note that some additional capacity remains in Cells 1 & 2 on the south side should the future Cell 3 not be developed.

1.2 Final Cover Systems

Final cover systems for the various landfill units will consist of the following components (top-down):

Ash Monofill:

- a 24-inch thick vegetative soil layer (including 6 inches of topsoil);
- a drainage geocomposite (with drainage breaks);
- a 40-mil textured LLDPE geomembrane; and
- a 12-inch thick intermediate cover layer.

Area 1 C&D Landfill Unit:

Top Slopes (Typically 5 to 10%):

- an 18-inch thick vegetative soil layer;
- a drainage geocomposite (with drainage breaks);
- a 30-mil textured LLDPE geomembrane or geosynthetic clay liner (GCL); and
- a 12-inch thick intermediate cover layer.

Side Slopes (Typically 4H:1V):

- a 24-inch thick vegetative soil layer.

Area 2 C&D Landfill Unit:

- an 18-inch thick vegetative soil layer; and
- an 18-inch thick soil liner with a hydraulic conductivity of no more than 1×10^{-5} cm/sec ("compacted soil barrier").

The final cover system will be placed on prepared intermediate cover at a maximum slope of 4H:1V. Surface water control devices will also be incorporated into the final cover of each landfill unit and some units will have a landfill gas (LFG) control system. The final cover surface will be vegetated upon completion of the final cover installation according to the project seeding specifications.

Where applicable, placement of the vegetative soil layer over the cover geosynthetics must be done with care to avoid damage to these materials. This soil layer should be placed from the bottom up using a small dozer equipped with low ground contact pressure (6 psi or less) tracks. A minimum of 12 inches of soil should be maintained between the dozer tracks and the underlying geosynthetics. The soil buffer should receive no compaction other than that provided by the dozer tracks. Pans or other heavy equipment should not operate on the vegetative soil layer.

Refer to the appropriate permit application for a detailed discussion and details related to the design of the final cover system for each landfill unit.

1.3 Landfill Gas System

For the C&D landfill units, a landfill gas system is provided in the final cover design. This system includes a system of collection wells or vents placed within the waste to capture the gas and either passively vent or flare the gas via utility flares or, as required, actively collect and flare the gas via header piping and a blower/flare system. The collection wells should be placed before any geosynthetics are placed.

Refer to the appropriate permit application for a detailed discussion and details related to the design of the landfill gas system for each landfill unit.

1.4 Surface Water Systems

Precipitation falling on the cover will infiltrate into the cover or run off the cover. Short-term the run-off runs down the surface of the intermediate cover. Long-term the run off is collected in a series of drainage breaks built into the areas covered by final cover. These drainage breaks are provided along side slopes (rain gutters and/or diversion berms). Water captured by rain gutters or diversion berms is routed toward one of the down pipes. Flow in the down pipes is routed to the base of the landfill and to one of the site sediment basins.

Refer to the appropriate permit application for a detailed discussion and details related to the design of surface water systems for each landfill unit.

1.4.1 Incremental Operation

During much of the life of the landfill, surface run off will be handled by the intermediate cover system. Operations must strive to provide operational grading that encourages run off from the intermediate cover to drain to the perimeter channels along the perimeter berms or to areas covered by final cover. Corrugated polyethylene (CPE) piping and temporary soil berms must be installed if required to accomplish this run off routing.

1.4.2 Required Maintenance

The surface water systems must be inspected annually and immediately after every major storm. Sediment build up in the drainage features/devices must be cleaned out on a regular basis to promote run off. Sediments removed can be used as daily or intermediate cover.

1.5 Closure Schedule

In general, closure activities will occur on the following schedule:

Ash Monofill:

- No later than 30 days after the date on which the ash monofill receives the known final receipt of wastes; or

- If the ash monofill has remaining capacity and there is a reasonable likelihood that the MSWLF unit will receive additional wastes, no later than one year after the most recent receipt of wastes.

C&D Landfill Units (15A NCAC 13B.0543(c)(5)):

- No later than 30 days after the date on which the C&DLF unit receives the known final receipt of wastes;

- No later than 30 days after the date that a 10 acre or greater area of waste, is within in 15 feet of final design grades; or

- No later than one year after the most recent receipt of wastes, if the C&DLF unit has remaining capacity.

Prior to beginning closure of any landfill unit, the County with notify the DWM that a notice of the intent to close the unit has been placed in the operating record.

All closure activities shall be completed within 180 days. Exemptions and extensions may be approved by the DWM.

1.6 Closure Verification

The following procedures will be implemented following closure:

- A Construction Quality Assurance (CQA) report will be submitted to the DWM. This report will describe the observations and tests used before, during, and upon completion of construction to ensure that the construction materials meet the final cover design specifications and the construction and certification requirements. The CQA report will contain as-built drawings.

- A signed certification from a registered Professional Engineer verifying that closure has been completed in accordance with the closure plan will be submitted to the DWM.

- At least one sign notifying all persons of the closing of the landfill (or incremental portions thereof) and that wastes are no longer accepted will be posted. Suitable barriers will be installed as necessary at former access points to prevent new waste from being deposited.

- Within 90 days, a survey plat, prepared by a registered Professional Land Surveyor, indicating the location and dimensions of landfill disposal areas, will be prepared.

- A notation will be recorded on the deed (through the County Register of Deed's Office) notifying any potential purchaser of the property that the land has been used as a landfill facility and that future use is restricted under the approved closure plan. A copy of the deed notation as recorded will be filed with the operating record and notification will be provided to the DWM.

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2.0 POST-CLOSURE PLAN

This Post-Closure Plan has been prepared to provide information related to post-closure care of the landfill units at the Halifax County Landfill facility. This information includes the following:

- Contact information for the person or office responsible for the facility during the post-closure period;
- A description of the planned use(s) of the property during the post-closure period;
- A description of the monitoring and maintenance activities required for each landfill unit and the frequency at which these activities are to occur; and
- A cost estimate for post-closure activities (see Section 3.0).

The post-closure care period will last 30 years after final closure (unless increased or decreased by the DWM).

2.1 Post-Closure Contact

All correspondence and questions concerning the post-closure care of the landfill should be directed to:

Halifax County Department of Public Utilities
Attn: Greg Griffin, Director
26 N. King Street (Public Works Building)
P.O. Box 70
Halifax, NC 27839
Phone: (252) 583-1451
Fax: (252) 593-5014.

2.2 Post-Closure Use

After filling operations cease at the landfill and the landfill is officially closed in accordance with the Closure Plan, each landfill unit will be maintained as a grassy hill. Halifax County will maintain control of the property and prevent public access to it during the post-closure period.

There may be (an) access road(s) on the final cover to allow proper maintenance during post-closure. Precise location of the access road(s) will be determined as a part of operations. Low ground pressure and rubber tire vehicles will be used for maintenance. Additionally, the County will maintain access to all site monitoring locations through the post-closure period.

2.3 Maintenance

2.3.1 Repair of Security Control Devices

All security control devices will be inspected and maintained as necessary to ensure access to the site is controlled. Locks, vehicular gates, and fencing will be replaced if functioning improperly. Warning signs will be kept legible at all times and will be replaced if damaged by inclement weather or vandalism.

2.3.2 Erosion Damage Repair and Vegetation

If erosion of the final cover occurs during post-closure, the affected area will be repaired and revegetated as necessary. If necessary, rolled erosion control products (RECPs) will be used to expedite rapid revegetation of slopes and to secure topsoil in place. Revegetation (including fertilization and seeding) will be performed in accordance with the most recently approved erosion and sedimentation control plan and the North Carolina Erosion and Sediment Control Planning and Design Manual.

Mowing of the final cover surfaces will occur approximately once per year in order to help maintain a healthy stand of grasses and to cut down saplings and woody-stemmed plants.

2.3.3 Correction of Settlement, Subsidence, and Displacement

Minimum slopes of 5 percent will be maintained after settlement in order to prevent ponding and allow for proper drainage without infiltration. If vertical or horizontal displacement occurs due to differential settlement, cracks will be filled with appropriate material and final cover will be reestablished. Excessive vertical displacement is not anticipated.

2.3.4 Leachate Management System (Ash Monofill)

In order to maintain the free flow in leachate collection piping, piping will be cleared of debris using the manholes or cleanout locations for access. If pipes should crush or buckle within the landfill, leachate will flow through the gravel columns. The leachate collection system (LCS) includes a continuous blanket drain on the base of the landfill which will allow drainage of leachate even in the very unlikely event of total failure of the leachate collection pipes.

2.3.5 Leachate Seeps

If evidence of leachate seeps is observed, the County will take the following actions. Depending on the circumstances, various combinations of actions may be appropriate.

1. If leachate is observed outside of the limits of waste disposal areas, notify the DWM.
2. Contain the flow of leachate using soil berms and/or excavation.
3. Excavate the area of seepage to attempt to allow flow into the underlying waste (i.e. break-up soil layers that may be causing the seep.).
4. For contained leachate that will not flow into underlying waste, a pump may be required to route the leachate to an existing leachate collection system cleanout pipe (ash monofill) or to a tanker truck.
5. For the ash monofill, French drains may be utilized for routing the seepage to the leachate collection system (via cleanout pipes).
6. The use of soil (particularly clay) to plug the seepage may also be successful in the case where flows are minor.
7. Remove and dispose of impacted cover soils accordingly.
8. Repair landfill cover as necessary.

2.3.6 Closure of Storage Pond

After closure of the ash monofill has been achieved, the generation of leachate is expected to curtail quickly and will eventually approach zero, at which time the storage pond will not be required. The following procedures will be followed to properly close the leachate storage pond:

- Completely drain and remove all liquids, sludges, sediments, etc. from the storage pond.

- Deconstruct the pond, piping, and appurtenances and dispose of the contents in a manner approved by the DWM.

- Sample and analyze the underlying soil for appropriate constituents inherent to leachate. Assess the results for evidence of contaminant migration.

- If contamination of underlying soils is exhibited, perform an assessment as to the degree of contamination and develop remedial actions.

- Obtain approval of the DWM for the assessment and associated remedial measures.

- Perform the remedial actions as necessary to limit any threats to public health and the environment.

- Restore the area(s) to closely match pre-existing conditions in the vicinity of the containment area(s). Activities may include: filling, grading, topsoiling, and seeding.

2.3.7 Repair of Run-On/Run-Off Control Structures

All drainage swales, ditches, and perimeter channels will be repaired, cleaned, or realigned in order to maintain their original condition. Any culverts that are damaged will be repaired or replaced. Sediment basins/ponds will be cleaned out when sediment has reached design cleanout levels.

2.3.8 Landfill Gas System

The landfill gas system will be maintained by the County and operated in accordance with any site air quality permits. Proper operation of the system is verified through testing at the landfill gas monitoring wells.

If gas wells/vents do not function as a result of irregular settlement, accumulation of liquids (condensate, leachate, and/or water), binding or corrosion, additional and/or replacement wells/vents can be installed if necessary in accordance with the current Landfill Gas Management Plan (if applicable).

2.3.9 Groundwater Monitoring Wells

Procedures outlined in the current Water Quality Monitoring (WQM) Plan or subsequent revision will take precedence; however, a brief description follows. All groundwater monitoring wells have been installed with concrete pads and protective casings to prevent accidental damage by vehicles and equipment. The wells are also equipped with a locking cap to discourage vandalism. Groundwater wells will be inspected regularly (at the time of sampling) to ensure integrity. Persons inspecting a well should look at the overall condition of the well, for signs of well tampering, and cracking or degradation of the concrete pad. Should a well require replacement, the defective well should be abandoned in accordance with specifications provided in the WQM Plan and a new well installed at a location that is approved by the DWM.

2.4 Monitoring Plan

The closed units will be monitored for a minimum of 30 years. Inspections of the closed landfill will be scheduled to ensure the integrity and effectiveness of the final cover system, surface water systems, groundwater monitoring system, landfill gas system, and to protect human health and the environment.

2.4.1 Inspection Frequencies

Inspections to be conducted by the County during the post-closure care period will occur regularly as shown in **Table 2.1**.

2.4.2 Inspection Activities

Inspections will include examination of the security control devices for signs of deterioration or vandalism to ensure access to the site is limited to authorized persons. Each disposal area will be checked to ensure the integrity of the final cover system is maintained, erosion damage is repaired, vegetative cover persists, and that cover settlement, subsidence, and displacement are minimal. Additionally, the condition of the groundwater and gas monitoring systems and permanent benchmarks will be checked.

A report of findings will be made to the responsible party, including recommendations for actions deemed necessary to ensure the site continues to meet the closure performance standard.

2.4.3 Record Keeping

Records of inspections and repairs will be kept on file by the County throughout the post-closure period.

2.5 Engineering Certification

Following completion of the post-closure care period for each landfill unit, the County will notify the DWM that a certification, signed by a registered professional engineer, verifying that post-closure care has been completed in accordance with the post-closure plan, has been placed in the operating record.

Table 2.1 Post-Closure Inspection Frequencies

Inspection Activity	Year 1	Years 2-30
Security Control Devices	Quarterly	Quarterly
Vegetative Cover Condition	Quarterly[1]	Quarterly
Surface Water Systems	Quarterly[1]	Quarterly
Erosion Damage	Quarterly[1]	Quarterly
Cover Drainage System	Quarterly[1]	Semi-Annually
Cover Settlement, Subsidence, and Displacement	Quarterly[1]	Semi-Annually
Leachate Management System (Ash Monofill)	Quarterly	Semi-Annually
Landfill Gas System	Quarterly[2]	Semi-Annually[2]
Water Quality Monitoring	Semi-Annually[3]	Semi-Annually[3]
LFG Monitoring System	Quarterly[4]	Quarterly[4]
Benchmark Integrity	Annually	Annually
Leachate Collection Pipe Inspection/Cleanout (Ash Monofill)	See Note 5	

Notes:

1. These items will be inspected after each large storm event (i.e. $\geq$ 1 inch in any 24 hours).
2. Or in accordance with the current Landfill Gas Management Plan or air quality permit(s).
3. Or in accordance with groundwater monitoring schedule described in the current Water Quality Monitoring Plan.
4. Or in accordance with the current LFG Monitoring Plan.
5. Remote camera inspection and flushing (if necessary) of leachate collection piping (portion that can be inspected and cleaned) will be performed every 5 years.

3.0 CLOSURE/POST-CLOSURE COST ANALYSIS

This section of the Closure and Post-Closure Plan has been prepared to provide cost estimates for closure, post-closure, and assessment and corrective action activities at the Halifax County Landfill facility and to identify the mechanism to be used by the County in demonstrating financial assurance.

3.1 Estimated Closure Costs

Cost estimates for complete closure of the ash monofill (Cells 1-3), C&D Area 1, and the C&D Area 2 landfill units (the maximum area to be closed) are provided in Appendix A. Table 3.1 includes a summary of the total estimated closure costs for each landfill unit. The cost estimate for each unit is based on a third party providing the necessary services and includes labor in the unit prices given. The estimated closure costs will be reviewed and updated as required to reflect adjustments for inflation, increased costs in construction or materials, or any other adjustments to the Closure Plan.

3.2 Estimated Post-Closure Costs

Cost estimates for post-closure care activities are provided in Appendix A and are summarized in Table 3.1 for each landfill unit. The cost estimate for each unit is based on a third party providing the necessary services and includes labor in the unit prices given. The estimated post-closure costs will be reviewed and updated as required to reflect adjustments for inflation, rising costs of anticipated post-closure care, or any other adjustments to the Post-Closure Plan.

3.3 Estimated Assessment and Corrective Action Costs

A cost estimate for current potential assessment and corrective (remedial) action at the landfill facility is provided in Appendix A. The total cost is summarized in Table 3.1. This cost includes actual additional monitoring costs as well as the required minimum potential assessment and corrective action costs ($2,000,000) per NCGS 130A 295.2(h) (as modified by Session Law 2011-262).

3.4 Financial Assurance Mechanism

Halifax County intends to continue to use the Local Government Financial Test (15A NCAC 13B.1628(e)(1)(f)) to demonstrate financial assurance for this facility.

Table 3.1 Summary of Cost Estimates

Activity	Total
C&D Landfill - Area 1 – Closure	$315,292
C&D Landfill - Area 2 – Closure	$299,396
C&D Landfill - Areas 1 & 2 - Post-Closure (30 Year)	$1,237,500
Ash Monofill - Cells 1 & 2 – Closure	$2,129,189
Ash Monofill - Cells 1 & 2 - Post-Closure (30 Year)	$1,461,900
Assessment and Corrective Action	$2,636,735
Total:	**$8,080,012**

Appendix A

Closure, Post-Closure, and Assessment/Corrective Action Cost Estimates

Closure and Post-Closure Plan
Halifax County Landfill Facility
Halifax County, North Carolina

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SHEET: 1/7
JOB #: HALIFAX-12-1
DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 1: Summary

Item No.	Description	Total
1.0	C&D Landfill - Area 1 - Estimated Closure Cost (See Table 2)	$315,292
2.0	C&D Landfill - Area 2 - Estimated Closure Cost (See Table 3)	$299,396
3.0	C&D Landfill - Areas 1 & 2 - Estimated Post-Closure Cost (30-Year) (See Table 4)	$1,237,500
4.0	Ash Monofill - Cells 1 & 2 - Estimated Closure Cost (See Table 5)	$2,129,189
5.0	Ash Monofill - Cells 1 & 2 - Estimated Post-Closure Cost (30-Year) (See Table 6)	$1,461,900
6.0	Assessment & Corrective Action Cost (See Table 7)	$2,636,735
	TOTAL =	$8,080,012

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.

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SHEET: 2/7
JOB #: HALIFAX-12-1
DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 2: C&D Landfill - Area 1 - Estimated Closure Cost

Item No.	Description	Estimated Quantity	Units	Unit Cost	Item Cost
1.0	Site Preparation	6.5	AC	$2,000	$13,000
2.0	Landfill Gas Wells/Vents	6.5	AC	$3,000	$19,500
3.0	30-mil Textured LLDPE Geomembrane or GCL	47,900	SF	$0.45	$21,555
4.0	Drainage Geocomposite	47,900	SF	$0.55	$26,345
5.0	Vegetative Soil Layer (24")	21,000	CY	$4.50	$94,500
6.0	Erosion Control (Diversion Berms, Down Pipes, Etc.)	6.5	AC	$5,000	$32,500
7.0	Revegetation	6.5	AC	$1,500	$9,750
8.0	Surveying	6.5	AC	$2,000	$13,000
				Subtotal (Items 1 - 8) =	$230,150
9.0	Bonds, Mobilization, & Insurance			4% of Subtotal (Items 1 - 8) =	$9,206
				Subtotal (Items 1 - 9) =	$239,356
				Contingency (10%) =	*$23,936*
				Construction Subtotal =	**$263,292**
10.0	Engineering	6.5	AC	$2,000.00	$13,000
11.0	CQA	6.5	AC	$6,000.00	$39,000
				TOTAL =	**$315,292**

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.
2. Unit costs include materials and anticipated labor/installation costs.

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SHEET: 3/7
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DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 3: C&D Landfill - Area 2 - Estimated Closure Cost

Item No.	Description	Estimated Quantity	Units	Unit Cost	Item Cost
1.0	Site Preparation	5.7	AC	$2,000	$11,400
2.0	Landfill Gas Wells/Vents	5.7	AC	$3,000	$17,100
3.0	Compacted Soil Barrier	13,800	CY	$6.00	$82,800
4.0	Vegetative Soil Layer (24")	13,800	CY	$4.50	$62,100
5.0	Erosion Control (Diversion Berms, Down Pipes, Etc.)	5.7	AC	$5,000	$28,500
6.0	Revegetation	5.7	AC	$1,500	$8,550
7.0	Surveying	5.7	AC	$2,000	$11,400
				Subtotal (Items 1 - 7) =	$221,850
8.0	Bonds, Mobilization, & Insurance			4% of Subtotal (Items 1 - 7) =	$8,874
				Subtotal (Items 1 - 8) =	$230,724
				Contingency (10%) =	*$23,072*
				Construction Subtotal =	**$253,796**
10.0	Engineering	5.7	AC	$2,000.00	$11,400
11.0	CQA	5.7	AC	$6,000.00	$34,200
				TOTAL =	**$299,396**

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.
2. Unit costs include materials and anticipated labor/installation costs.

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SHEET: 4/7
JOB #: HALIFAX-12-1
DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 4: C&D Landfill - Areas 1 & 2 - Estimated Post-Closure Cost (30-Year)

Item No.	Description	Estimated Quantity	Units	Unit Cost	Item Cost
1.0	Site Inspection & Record Keeping	80	HR	$75	$6,000
2.0	Revegetation	1	AC	$1,500	$1,500
3.0	Mowing (once per year)	30	AC	$100	$3,000
4.0	Erosion Control	1	LS	$5,000	$5,000
5.0	Gates/Fences/Access	1	LS	$2,000	$2,000
6.0	Water Quality Monitoring & Reporting (See Note 4)	1	LS	$15,000	$15,000
7.0	Landfill Gas Monitoring & Reporting (See Note 5)	1	LS	$5,000	$5,000
				Subtotal (Items 1 - 7) =	$37,500
				Contingency (10%) =	*$3,750*
				Annual Total =	**$41,250**
				30-YEAR TOTAL =	**$1,237,500**

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.
2. Unit costs include materials and anticipated labor/installation costs.
3. Assumes total of 24 acres (Area 1 & closed unlined MSW landfill unit) plus 6 acres (Area 2).
4. The water quality monitoring and reporting cost assumes 17 long-term wells & 3 surface water locations sampled semi-annually @ $7,500 per event (annual cost = $15,000). Note that costs related to assessment and corrective action are included with the costs shown in Table 7.
5. The LFG monitoring and reporting cost assumes quarterly monitoring @ $1,250 per event (annual cost = $5,000).

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SHEET: 5/7
JOB #: HALIFAX-12-1
DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 5: Ash Monofill - Cells 1 & 2 - Estimated Closure Cost

Item No.	Description	Estimated Quantity	Units	Unit Cost	Item Cost
1.0	Site Preparation	20.8	AC	$2,000	$41,600
2.0	40-mil Textured LLDPE Geomembrane	906,500	SF	$0.50	$453,250
3.0	Drainage Geocomposite	906,500	SF	$0.55	$498,575
4.0	Vegetative Soil Layer (24")	67,500	CY	$5.00	$337,500
5.0	Erosion Control (Diversion Berms, Down Pipes, Etc.)	20.8	AC	$15,000	$312,000
6.0	Revegetation	20.8	AC	$1,500	$31,200
7.0	Surveying	20.8	AC	$2,000	$41,600
				Subtotal (Items 1 - 7) =	$1,715,725
8.0	Bonds, Mobilization, & Insurance			4% of Subtotal (Items 1 - 7) =	$68,629
				Subtotal (Items 1 - 8) =	$1,784,354
				Contingency (10%) =	*$178,435*
				Construction Subtotal =	**$1,962,789**
9.0	Engineering	20.8	AC	$2,000.00	$41,600
10.0	CQA	20.8	AC	$6,000.00	$124,800
				TOTAL =	**$2,129,189**

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.
2. Unit costs include materials and anticipated labor/installation costs.

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SHEET: 6/7
JOB #: HALIFAX-12-1
DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 6: Ash Monofill - Cells 1 & 2 - Estimated Post-Closure Cost (30-Year)

Item No.	Description	Estimated Quantity	Units	Unit Cost	Item Cost
1.0	Site Inspection & Record Keeping	80	HR	$75	$6,000
2.0	Revegetation (10% Total Area)	2	AC	$1,500	$3,000
3.0	Mowing (once per year)	21	AC	$100	$2,100
4.0	Erosion Control	1	LS	$5,000	$5,000
5.0	Gates/Fences/Access	1	LS	$2,000	$2,000
6.0	Leachate Management (See Note 4)	1	LS	$20,000	$20,000
7.0	Water Quality Monitoring & Reporting (See Note 5)	1	LS	$6,200	$6,200
				Subtotal (Items 1 - 7) =	$44,300
				Contingency (10%) =	*$4,430*
				Annual Total =	**$48,730**
				30-YEAR TOTAL =	**$1,461,900**

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.
2. Unit costs include materials and anticipated labor/installation costs.
3. Assumes total of 20.8 acres (Cells 1 & 2).
4. Cost is assumed. Annual leachate production is expected to be minimal after closure.
5. The water quality monitoring and reporting cost assumes 6 long-term wells, 2 surface water locations, and 2 sediment sample locations sampled semi-annually @ $3,100 per event (annual cost = $6,200).

SMITH+GARDNER

SHEET: 7/7
JOB #: HALIFAX-12-1
DATE: 2/12/16
BY: PKS

Halifax County Landfill - Financial Assurance
Table 7: Estimated Assessment & Corrective Action Cost

Item No.	Description	Annual Cost	30-Year Total
1.0	Water Quality Assessment Monitoring (C&D/MSW) (See Note 3)	$9,900	$297,000
2.0	Corrective Action Monitoring (C&D/MSW) (See Note 4)	$9,395	$281,850
		Subtotal (Items 1 -2) =	$578,850
		Contingency (10%) =	*$57,885*
		30-YEAR TOTAL =	**$636,735**
		Potential Assessment & Corrective Action (See Note 5) =	**$2,000,000**
		TOTAL =	**$2,636,735**

Notes:

1. All cost projections are presented in 2016 dollars. Appropriate annual escalators should be applied.
2. Unit costs include materials and anticipated labor/installation costs.
3. The water quality assessment monitoring cost assumes 11 long-term wells tested annually for Appendix II parameters (annual cost = $9,900). Note that sampling and reporting costs are included with the routine monitoring costs shown in Table 4.
4. The corrective action monitoring cost assumes current annual costs for Monitored Natural Attenuation.
5. Per NCGS 130A 295.2 (h), a minimum of $2,000,000 is required for potential assessment and corrective action at the facility.

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