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PERMIT RENEWAL APPLICATION AND
FACILITY PLAN UPDATE RUTHERFORD
CENTRAL MSW FACILITY WITH C&D
LANDFILL (PERMIT #81-03)

Rutherford County, North Carolina

Prepared for

Rutherford County

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November 2012
Revised April 2013

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DRAWINGS Refer to the rolled drawing set that accompanies this report

APPENDICES

A	Waste Screening Form
B	Hazardous Waste Responders
C	Useful Agencies and Contacts
D	Fire Notification Form (NC DENR Division of Solid Waste)

REFERENCE DOCUMENTS	DATE
1 Rutherford County MSW Facility Plan Amendment	July 2007
2 Permit to Operate Application for CDLF Phase 1A	November 2008
3 Final Closure Plan Update for CDLF Phase 1A	January 2009

REVISION	DATE
0 Permit Renewal Application and Facility Plan Update	November 28, 2012
1 <i>Revision</i> Permit Renewal Application and Facility Plan Update	April 22, 2013

FOREWORD

This update of the Facility Plan and Operations Plan was prepared in support of a renewal of the Permit to Operate, including Phase 1A of the C&D landfill unit (CDLF), which was originally permitted in February 2009 and last modified to document construction progress in April 2011. The solid waste management facility encompasses approximately 240 acres, permitted under Solid Waste Permit #81-03, which contains the following units and activities:

- CDLF Phase 1A (active)
- CDLF Phase 1 (inactive)
- Closed MSWLF
- Future lined MSWLF (site reserved)
- Landfill gas extraction and electrical generation (gas-to-green project)
- Animal carcass disposal site
- Future small Type I composting operation (sustainable agriculture project).

The County made application for and was granted a Site Suitability Determination for a future lined MSWLF. In a letter dated November 11, 2007 to Ed Mussler, PE, Solid Waste Section Chief, it was stated that “the County’s July 2007 application asked that the facility be known as a ‘MSW Facility with a CDLF unit and a Transfer Station.’ This designation is desired to preserve the County’s right to develop a future MSW disposal unit in accordance with the Site Suitability determination given by the Division in 2004.”

The Permit to Construct for the planned Phase 1A CDLF expansion was issued in February 2009 with this designation. At present the County has not announced plans to build the MSWLF, but again the County desires to preserve this option for future consideration.

This Permit to Operate focuses on the operations and maintenance of the CDLF and animal carcass disposal site, as well as the maintenance of the inactive facilities. The document was prepared in accordance with 15A NCAC 13B .0500, et seq., and includes:

- 1) An updated engineering plan prepared in accordance with Rule .0539;
- 2) An updated construction quality assurance plan prepared in accordance with Rule .0541;
- 3) An updated operation plan prepared in accordance with Rule .0542;
- 4) An updated closure and post-closure plan prepared in accordance with Rule .0543; and
- 5) An updated monitoring plan prepared in accordance with Rule .0544.

1.1 GENERAL DESCRIPTION

The following is an update of the Facility Plan for the Central MSW Facility and includes a comprehensive summary of the various permitted solid waste activities at the site. This document was prepared in response to comments from the NC DENR Division of Waste Management, Solid Waste Section, in keeping with current SWS policy and pursuant to a Permit to Operate application for the CDLF Phase 1A. Active permits are renewable on a 5-year operating cycle. Permitted activities conducted within the 240-acre facility boundary, shown on Drawing S1, include the following:

Activities conducted under Permit #81-03 (permanent disposal and support):

- CDLF (Phase 1A)
- Animal carcass burial area
- Inactive MSW and C&D sites
- Active landfill gas extraction

Activities conducted under Permit #81-04T (temporary storage and transfer):

- MSW Transfer Station
- White Goods collection area
- Tire collection area (cover stockpile)
- Wood Waste Treatment and Processing

The site is accessible via a single gate and is secure after hours. The facility maintains full-time electronic surveillance; a sheriff's deputy is detailed to the facility as litter control officer.

1.2 CONTACT INFORMATION

1.2.1 Emergencies

For fire, police, or medical/accident emergencies dial 911.

Hazardous Waste responders and disposal contacts are listed in Appendix 2.

1.2.2 Rutherford County Solid Waste Department

656 Laurel Ridge Road
P.O. Box 1957
Rutherfordton, NC 28139
Mr. James Kilgo – Director

Tel. 828-287-6125
Fax: 828-287-6312

1.2.3 North Carolina Department of Environment and Natural Resources

Asheville Regional Office
2090 US Highway 70
Swannanoa, NC 28778

Tel. 828-296-4500
Fax: 828-299-7043

1.3 INSPECTION AND MAINTENANCE

1.3.1 Routine Inspection

Routine facility inspection and maintenance is required to maintain orderly operations and regulatory compliance. Beyond normal operational requirements, i.e., waste coverage in the CDLF and daily clearing the tipping floor of the Transfer Station, and continuous waste inspection in both facilities, the following O&M requirements shall be observed with minimum recommended frequencies:

Daily inspection and potential action items include:

- Collection of trash and windblown debris,
- Detection of spills or fluid leakage in heavy equipment traffic areas, i.e., driveways near the transfer station, shop and fueling areas,*
- Make sure access roads are passable and free of obstructions,
- Look for smoke, dust, runoff around the CDLF and all buildings,
- Check stockpiles for inappropriate materials (remove as needed).

Weekly inspection and potential action items include:

- Check the security of gates, doors, locks and fences,
- Check operation of electronic surveillance and communication equipment,
- Check fire alarms, extinguishers, smoke detectors, and gas detection devices,
- Inspect soil coverage on inactive disposal areas
- Inspect drainage conveyances for excess erosion or sediment build up.

Monthly inspection and potential action items include:

- Check closed slopes for cracking, sloughing, bulging, distressed vegetation,
- Check slopes for obvious signs of erosion, basins for excess sedimentation,**
- Inspect the quality of vegetation on closed slopes.

Semi-Annual action items include:

- Mow slopes, shoulders, ditches (all disposal units and grounds),
- Clear paths to monitoring locations (wells and surface sampling stations),

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- Remove and distribute any remaining mulch,
- Inspect/clean sediment basins.

Annual action items include:

- Topographic survey of active phase of CDLF,
- Remove white goods,
- Calibrate scales,
- Staff training.

*All spills or leaks shall be cleaned up promptly, and if a reportable quantity of material is spilt or leaked, regulatory authorities may need to be notified, e.g., NC DENR Division of Water Quality.

**Slopes, channels, and erosion/sedimentation control measures also shall be checked within a 24-hour period following any rainfall event exceeding one-half inch; damage to slopes or measures shall be promptly repaired.

1.3.2 Equipment Maintenance

A maintenance schedule for the facility equipment is beyond the scope of this Operations Plan. The Operator (or his designee) should develop a routine equipment maintenance program to assure reliable operation and to lessen the likelihood of fluid spills or leaks. Fuel and lubricants shall be stored under covers and/or with secondary containment systems that are separate from the principle storm water drainage systems at all times. Care shall be taken when servicing or fueling equipment to prevent spills.

Driveways, shop areas and all operations areas where heavy equipment is working shall be inspected daily for signs of spills and leaks. Equipment should be parked overnight and serviced in designated areas with separate berms and/or runoff controls that will not discharge to the facility storm water management systems or into the environment. Care shall be taken not to allow any hazardous substance to enter the surface water or ground water, including (but not limited to) fuel, oil, hydraulic fluid, pesticides, and herbicides.

1.3.3 Storm Water and S&EC Requirements

The facility is covered by various short-term (i.e., construction stage) and long-term (operations stage) permits for Storm Water (issued by NC DENR Division of Water Quality) and Sediment & Erosion Control (issued by NC DENR Division of Land Resources). Adherence to the plans is mandatory to maintain full compliance. Both plans have specific monitoring, maintenance, and reporting requirements, which are covered in respective separate documents. The site is subject to periodic inspections by these agencies, in addition to notation by Solid Waste inspectors.

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1.3.4 Air Quality Requirements

The active gas recovery system is covered by an Air Quality permit (issued by NC DENR Division of Air Quality). The equipment has specific maintenance and monitoring requirements, some of which is subject to documentation for the AQ permit, which is covered in a respective document. Other monitoring required for carbon credit eligibility and potentially other environmental credits is detailed in equipment-specific documents.

1.3.5 Staff Responsibilities

Every staff member shall receive instruction on “preventative maintenance” pertaining to ground water and surface water quality, and how to protect these features, in addition to waste acceptance criteria and operational requirements that pertain to each individual’s specific duties. The critical importance of preserving environmental quality and maintaining operational compliance should be a topic for discussion at regular staff meetings, along with issues concerning safety and efficient operation of the facility.

Each worker should understand that the overall compliance of the facility affects not only their position at the facility but the future ability to continue operations beyond the next 5-year permit review. All staff should be vigilant about enforcing the waste acceptance policy and to make sure that all aspects of the operation, from mowing the grass to the daily transfer or disposal of waste, are conducted in an environmentally sound manner. All training should be documented and Operator’s certifications shall be kept current.

1.4 PERMITTED ACTIVITIES

1.4.1 MSW Transfer Station

The MSW Transfer Station became operational ca. 1997 with the closing of the old Central MSW landfill. The tipping and loading areas are fully enclosed in a steel building with concrete floors and runoff controls – floor drains are gravity drained to a sanitary sewer system (POTW) operated by the Town of Spindale. Daily waste hauling is provided by a private firm in conjunction with the off-site disposal contract. The County is responsible for operation and maintenance of the transfer station, including policing the surrounding area for windblown debris and periodic wash-down of the tipping area.

The approved Operation Plan for the Transfer Station can be found in the November 2012 plan revision that supports the Permit to Operate application (Permit #81-04T).

1.4.2 CDLF (Phase 1A)

Phase 1A is a contiguous vertical and lateral expansion of the Central C&D Landfill, approved ca. July 2008 and constructed during the latter half of 2008. This facility was originally expected to last 5+ years depending on waste stream characteristics and compaction, coinciding with the 5-year renewal cycle of the Permit to Operate. The Phase 1A footprint covers approximately 4 acres of new ground on the north side of the closed Phase 1 land occupies two cells, Cell A (to the west, in the lower elevations) and Cell B (to the east, in the higher elevations). The limits of Phase 1A are clearly staked in the field with permanent markers. Runoff from the completed slopes, and diverted runoff from areas uphill of Phase 1A, is directed to a large sedimentation basin (SB-2).

Documentation of the construction for Phase 1A and the new sedimentation pond has been submitted to the SWS in previous reports (approved February 2009 and April 2011). Based on recent waste intake (now lower than expected in 2008), Phase 1A is expected to last through at least one 5-year permitting cycle. Inactive portions of the CDLF (Phase 1) that reached approved final grades were closed prior to June 30, 2008 in accordance with SWS rules, for which separate documentation has been submitted to the Solid Waste Section by the County. The closure requirements for Phase 1A are different from those for Phase 1.

1.4.3 Wood Waste Treatment and Processing Area

This facility accepts tree trimmings, brush, and woody vegetative debris from the public and local transportation departments. No “yard waste” as defined by SWS regulations is accepted. The debris is stockpiled in the designated area located between the closed MSWLF and the closed south slope of Phase 1 of the CDLF (Drawings S1 through S4). The limits of the T&P area are clearly staked in the field with permanent markers. Stockpiles of non-ground material are limited in height to 25 feet and pathways are kept clear to allow access for fire-fighting, if necessary. The debris and the ground material is stockpiled in a manner that prevents deep accumulations of material.

A strict screening and waste acceptance policy is enforced, and the stockpiles are policed regularly by the staff – unacceptable materials are turned away or (if discovered after unloading) promptly removed and taken to the transfer station. Wood debris is ground on a minimum quarterly basis into mulch – not compost – and the material may be used on-site or distributed off-site with no claim of providing nutrient value. On-site, the mulch may be used for erosion control material outside the C&D disposal area. The mulch products may be used on the exterior slopes of landfill units for erosion control at application depths not exceeding 2 inches. Stockpiled finished mulch must be removed at least twice per year.

1.4.4 Animal Carcass Burial Area

The animal disposal area is operated for the benefit of the Rutherford County animal shelter. The facility is operated in a trench and fill manner within an area designated on Drawings S1 and S2. The limits of the Animal Carcass Burial area are clearly staked in the field with permanent markers. Burials are pre-arranged between the County agencies and all carcasses are buried promptly upon receipt. Carcass burial depths are beneath a minimum of 4 feet of soil cover. The animal disposal area is benched into an adjacent hillside, with excavations for soil cover conducted uphill of the burial area.

Burial sites are sequential, i.e., adjacent plots are placed side to side in an orderly manner. Soil cover is tamped with a backhoe bucket and mounded to prevent infiltration by surface water. Drainage is directed toward an existing approved sediment trap. Earlier site investigations indicate that the excavations will be at least 4 feet above the seasonal high water table, per the regulations. Ongoing maintenance requirements include frequent inspection to ensure the carcasses stay covered and the vegetation is healthy. Periodic inspection of the sediment trap is required, with maintenance as needed consisting of sediment removal when the trap is half-full and repair of erosion as needed.

1.4.5 White Goods Collection Area

The white goods stockpile is located between the MSW Transfer Station and the CDLF (Drawings S1 and S2). The stockpile area is paved with runoff control directed toward an approved sediment basin (SB-1) – in the future to be directed to the newer basin (SB-2) upon the completion of planned drainage improvements that were approved with the Permit to Construct for CDLF Phase 1A. White goods are collected by a private hauler and removed from the site on a periodic basis (typically, at least quarterly). Stockpiled goods must be removed at least once per year. No grinding, crushing, or dismantling of the white goods is conducted on the site. Refrigerants are reclaimed at the site and documentation is placed in the Operations Record. The Operator shall thoroughly clean accumulated dirt and debris, to allow for inspection for oils or leaked liquids that might enter the storm water system, each time the materials are hauled off. The concrete pad has positive drainage, so pools of standing water are not anticipated.

1.4.6 Tire Collection Area

The Tire Collection area is located on an unpaved lot to the north of the scale house (Drawings S1 and S2). A private tire disposal firm has one or two enclosed trailers for the collection and storage of used tires. Typically, the tires are placed into the trailers by landfill customers (with instructions from the gate staff on proper stacking), and the trailers are removed when full (typically at least once per month). Tires are not stored on

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the ground, except temporarily when the trailers are full. The Operator may, at his discretion, relocate the tire collection trailers within the site boundary. Maintenance of the area shall consist of period inspection for trash or illicit debris and removal as needed. The area is flat and has not historically experienced erosion. Drainage flows to sediment basin SB-2.

1.4.7 Closed Central MSW Landfill

The closed MSW landfill has completed the first 10 years of a 30-year monitoring and maintenance program. The boundaries of the closed landfill (Drawing S1) are clearly marked in the field with white poles. The final cover installed in 1998 has performed well and required little maintenance other than mowing and occasional minor erosion repair and reseeded – much as anticipated at the time of closure. Maintenance of vegetation is the key to continued final cover performance. The closed facility shall be inspected at least monthly to detect early signs of erosion or other problems, including an inspection of the vegetation – especially during periods of drought.

The Operator shall continue to monitor the final cover and slopes for signs of erosion, settlement, cracking, or other indicators of excess settlement or a stability problem (no stability problems are known or anticipated). The limit markers shall be maintained, and the entire cap and its perimeter shall be mowed twice per year to discourage tree growth. Hand removal of vegetation may be required next to gas vents, rock-lined ditches and boundary markers. Gas vents shall be maintained and/or replaced as needed.

Erosion rills shall be filled and reseeded as needed. Grass shall continue to be mowed at least twice per year. These guidelines are not intended to supplant the post-closure care provisions of the Closure/Post-Closure Plan (2009 Update) – the Operator should consult the earlier documents for additional post-closure care requirements.

1.4.8 Ground Water Monitoring

A facility monitoring program is conducted on a regular schedule by a third-party, including (at the present time) assessment monitoring of the closed MSW landfill and detection stage monitoring for the C&D landfill. The most recent amendments to the ground water monitoring program for the C&D landfill – approved ca. July 2008 with the Permit to Construct for Phase 1A – have been implemented and require no adjustment. The layout of the ground water monitoring network is shown on Figure 1.

The approved plan is presented in this document for completeness. Future monitoring plan amendments may be required – the Operator is required to consult the relevant documents pertaining to the monitoring of the closed MSW and the C&D facilities.

1.4.9 Landfill Gas Monitoring

Monitoring of landfill gas is required for the closed MSW landfill and the CDLF. Solid Waste regulations are specific on thresholds for safeguarding persons and for implementing corrective action. Those thresholds are 25% of the Lower Explosive Limit (LEL) within occupied structures and 100% of the LEL (5% methane by volume in air). Typically, ambient monitoring is conducted in enclosed structures (buildings, manholes), which may be facilitated by continuous explosive gas detectors with alarms.

In the field, a number of methane monitoring wells located around the perimeter of the disposal units is required to be monitored with a specialty gas detection meter. The facility staff performs this monitoring using a MSA Gascope Model 62S meter. The staff is familiar with the meter calibration, data collection, and reporting requirements. To date, no gas migration approaching the regulatory thresholds is known. The layout of the gas monitoring network is shown on Figure 2.

1.4.10 Active Landfill Gas Extraction

A number of deep vents (approximately 50 feet in depth) were installed in the old MSW landfill during closure in 1998. These wells were connected via buried piping to a gas extraction system, consisting of a 150 cfm blower and flare; then to a 135 kW generator and switchgear that allows power transfer to the electrical grid. A preliminary plan was submitted to the Solid Waste Section, which was approved in March 2012. An Air Quality permit has been obtained, and as of November 2012, the system was ready to go online. The layout of the gas extraction system is shown on Drawing S4. The County has indicated a desire to utilize trained staff members and outside consultants to operate the equipment. Detailed operating and maintenance plans, covered in separate documents, will be made available at a future time.

1.4.11 Future Small Type I Composting

A composting facility has been planned in conjunction with a future Sustained Agriculture Demonstration project, shown on Drawing S2, mentioned for completeness.

1.4.12 Future Lined MSWLF

A portion of the 240-acre site is reserved for a potential future MSWLF facility, shown on Drawing S1 (see Foreword). The Facility Plan prepared for the July 2007 Permit to Construct application showed an adjusted waste boundary on the future MSWLF, which provides a 300 foot separation between the CDLF and MSWLF footprints. The volume estimate for the MSWLF shown on the drawing was adjusted accordingly.

2.1 ENGINEERING REPORT

This plan describes the physical aspects of the CDLF Phase 1A, with emphasis on waste containment and environmental control systems, based on the original hydrogeologic studies. This plan is updated from Section 5 of the July 2007 Permit to Construct application, prepared by a qualified Professional Engineer, who is licensed to practice in North Carolina and is familiar with the requirements of the North Carolina Division of Waste Management (Division) rules. The approved design for CDLF Phase 1A is expected to provide at least one 5-year permitting cycle of capacity.

In keeping with the 2006 C&D Rules, there is no liner or leachate collection system, since the site meets the requirements for soil types present within two feet below planned base grades, and there is at least 4 feet of vertical separation between the waste and seasonal high ground water and/or bedrock. The planned overlap above a portion of Phase 1 will raise the top of the CDLF to approximately El. 994, approximately 20 feet higher than the ground surface at the maintenance shop. All planned base grades and outer slopes will have maximum slope ratios of 3H:1V, which have been demonstrated to be stable per the July 2007 Permit to Construct application.

2.1.1 Analytical Methods

The facility design incorporates elements that are consistent with Division rules and guidelines, as well as sound engineering practice. Various analyses used in the design of the facility include evaluations of soil conditions, i.e., the consistency of subgrade soils and the availability of suitable soils for constructing stable embankments and other earthen structures (discussed below), and ground water characteristics, i.e., flow directions and seasonal water depth fluctuations. Soil properties testing used to facilitate these evaluations included grain size analyses, shear strength, consolidation, and compaction characteristics. Stability and settlement of foundation soils were considered in setting base grades, as was outer slope stability for the final cover system. Other analyses included a detailed evaluation of S&EC and storm water management systems.

2.1.2 Critical Site Conditions

Based on the nature of the soils within the Phase 1A footprint and the understanding of geologic conditions within the region (and the site), no inherent foundation stability or long-term settlement problems are anticipated. Some considerations that are both generic

to landfills and specific to the on-site soils, learned through practical experience with the closure of the old Central MSW landfill, are discussed below.

- The abundant less clayey, micaceous silts exhibit low cohesion and can become slick when wet. This is a concern for embankment and final cover construction, which is counteracted with good compaction. Properly compacted embankments are expected to be stable. Outer slope stability (relative to final cover) will also rely on adequate compaction and observation of proper slope ratios, due to the strength considerations.
- Compaction is dependent on both compaction effort (i.e., the right equipment) and working within a relatively narrow range of near-optimum moisture.
- Another consideration is significant soil erosivity, which is counteracted with good cover construction practices and vegetative cover. These soils also have low field capacity and poor nutrient value, which may require additional effort to establish vegetation. These conditions pose operational considerations but require no special design accommodations.

2.1.3 Technical References

Calculations found in Appendix 7 of the July 2007 Permit to Construct application (not replicated in this renewal application) are referenced within the various analyses.

2.1.4 Location Restriction Demonstrations

The site was granted a Site Suitability determination in accordance with 15A NCAC 13B .1600 et seq. in 2004, i.e., the site characteristics were determined suitable for a lined landfill. Relative to Rule .0536 pertaining to C&D landfills, the site has no conditions that will affect continued operations with respect to zoning, setbacks from residences or potable wells, historic or cultural sites, state or nature preserves, 100-year floodplains, wetlands, water supply watersheds, or endangered species. Documentation pertaining to these site selection criteria is found in Appendix B of the 2001 Site Suitability Report.

2.2 CONSTRUCTION MATERIALS AND PRACTICES

Based on the Design Hydrogeologic investigation, on-site foundation soils exhibit adequate consolidation characteristics and shear strength such that embankments will be

2.0 ENGINEERING PLAN (15A NCAC 13B .0539)

stable and subgrades that will not undergo excessive settlement. Based on the construction CQA documents presented in support of the February 2009 and April 2011 Permit to Operate approvals, the construction is fully expected to perform within the expectations stated in the July 2007 Permit to Construct application.

For future final cover construction, the key to compaction of the on-site soils is moisture control within a relatively narrow range near optimum (plus or minus 3%), based on the laboratory data. Most of on-site soils are sand-silt materials (SM, SM-ML, and ML classifications), some of which are micaceous, which tend to be elastic or powdery when dry, making them difficult to compact on the dry side of optimum; the more micaceous clayey soils become slick or “greasy” on the wet side of optimum – these soils typically exhibit USCS classifications of MH and CH.

The targeted compaction criterion is 95% of standard Proctor maximum dry density (ASTM D-698) is considered appropriate. The maximum permeability requirement for the compacted soil barrier portion of the final cover is 1.0×10^{-5} cm/sec. The red clayey soils found near the surface within the northern portions of the site met these requirements for closure of the old MSW landfill. Test boring data indicate a considerable quantity of these soils exist beneath the future Sustainable Agriculture Demonstration site. Incremental closure of the CDLF side slopes, which is recommended, will require a staged excavation of the borrow soils.

2.3 DESIGN HYDROGEOLOGIC REPORT

Refer to Section 4.0 of this 2007 Permit to Construct application for CDLF Phase 1A.

2.4 ENGINEERING DRAWINGS

Refer to the rolled plan set that accompanies this report. All relevant criteria required by the rules (except as noted) are depicted on the plans.

2.4.1 Existing Conditions

See Drawings S2 – S4.

2.4.2 Base Grading Plan

See Drawing E1 – all base grading work is complete.

2.4.3 Stormwater Segregation

See Drawing E2 –good practices for water management include maintaining slopes with positive drainage (always directed toward approved storm water control measures), facilitated by an orderly waste placement sequence.

2.4.4 Final Cap System

See Drawings EC1 through EC6 for final contours and cap details.

2.4.5 Temporary and Permanent S&EC

See Drawing E1 for temporary sedimentation and erosion control (S&EC) measures (already finished) and Drawing EC1 for final measures. The S&EC plan approved by NC DENR Division of Land Quality should also be consulted.

2.4.6 Vertical Separation

See Drawing E1 for approved base grades that meet ground water and bedrock separation requirements, respectively; also see cross section Drawing X1.

2.5 SPECIFIC ENGINEERING CALCULATIONS AND RESULTS

Calculations for settlement and slope stability were performed using site specific data. The calculations can be found in Appendix 7 of the 2007 Permit to Construct application. Geotechnical lab data are found in Appendix 5 of that document. The following is brief description of the analyses and results.

2.5.1 Settlement

Settlement is a concern at unlined landfills for maintaining vertical separation between the base of the waste and the maximum long-term seasonal high water table. Settlements of foundation soils result from time-dependent strain, i.e., a change in thickness within the various soil layers due to the vertical stress (weight of the landfill) applied at the surface, accompanied by internal drainage. Vertical stress beneath landfills gradually increases with the waste thickness. Strain-induced settlement within sands and/or well drained silts and clays is relatively short-term; based on the soil profile present at the subject landfill, long-term settlement is not a concern.

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Within residual soils of the Piedmont, built-in stresses relict of the original rock are typically higher than either existing overburden pressure of future vertical pressures associated with the landfill – in effect, the soils are heavily over-consolidated and will typically not settle appreciably under the weight of the landfill. Care has been taken to identify anomalies (e.g., pockets of unconsolidated alluvial soils) and new fill sections that could produce differential settlements, although this neither is typically a concern for unlined C&D landfills because of the small magnitude of anticipated settlement.

Settlements were calculated using elastic methods adapted from the US Federal Highway Administration (FHWA) for highway embankments. Ostensibly, a landfill is a large flexible embankment with the highest stresses impinging on the foundation soils near the center. The FHWA settlement calculation is based on the work of Hough (1959) and others, which considers both the material type and overburden depth for determining a “correction factor” for standard penetration test (SPT) values, from which the compressibility and load-induced strain of each soil layer can be evaluated. For sandy soils conventional sampling via Shelby tubes and laboratory consolidation testing is infeasible. For clayey soils, representative Shelby tube samples were acquired and laboratory consolidation tests were performed, and the consolidation data were substituted into the calculations for appropriate soil layers.

The settlement calculation considers a “worst case” scenario near the construction of the underdrain in the lowest elevations of Phase 1A (Cell 1). The initial vertical stress conditions and the stress increase resulting from the final embankment height were calculated using appropriate units weights for the soil and an average unit weight of 1000 pounds per cubic yard (37 pcf) for the waste, then applying a depth-related “influence factor” based on elastic stress distribution theory. Next a subsurface stress distribution was developed for original and post-construction (final height) conditions, based on the depth and average unit weight of the soil layers, plus the added vertical stresses. The SPT correction factor was applied to determine the compressibility factor and strain within each sand layer. For the clays, consolidation theory was applied to determine the strain in those layers, which was added to the strain in the sand layers to estimate total settlement under a given load. Time-dependent settlement was not considered due to the well-drained conditions indicated by the subsurface data.

This “worst case” subsurface profile was used to estimate the maximum settlements beneath the landfill (at the center), with the assumption that the settlements will be less toward the edges of the landfill footprint, where lower stresses will occur, i.e., beneath the side slopes. Based on a conservative allowance for vertical separation in the base

grading plan (well over 5 feet), it was determined that the base grades are sufficient to accommodate the anticipated settlement while maintaining the required minimum vertical separation. For this project, the maximum estimated foundation settlement at the center of the landfill is 0.61 feet. This excludes settlement within the waste itself.

2.5.2 Slope Stability

Two primary concerns exist for landfills with respect to slope stability: deep-seated or global stability involving a deep layer in the foundation or along the base of the landfill, which could potentially result in catastrophic slope failure, and veneer stability (sliding of the cover), which can expose the waste but is typically more of a maintenance issue relative to repairs in the event of a failure (veneer stability can also be catastrophic). A third (and more rare) stability consideration pertains to failure within the waste itself, not necessarily involving the foundation, but often involving a wetter layer near the base of the waste – often the base liner (if one is present) or fine-grained subgrade.

Either condition can be affected by slope ratio (steepness) and the height of the waste, so these factors are critical to the design of a stable landfill. The two primary mode of failure (defined above) were examined for this project. Subsurface conditions identified at this site are relatively sandy silt (high strength residual soils) with interspersed thin clay layers and sand seams that are expected to drain readily under the applied embankment loads – thus only “effective” stresses and strength conditions (i.e., drained conditions) were considered. The site is not earthquake prone, so liquefaction is not a concern. No soft layers that would pose stability concerns were identified by the SPT testing, and the foundation is expected to undergo a strain-hardening strength increase as settlement occurs, i.e., the foundation soils will become even more stable with time.

2.5.2.1 Deep-seated stability – Limit-equilibrium methods, i.e., the STABL-5M model used for this project, evaluate the balance of forces driving a slide (weight of the porous material and contained water) against the forces resisting a slide (shear strength, expressed as cohesion and friction) along a theoretical failure surface, which can be either a circular surface or a series of intersecting planar surfaces. A “static” analysis considers just the weight of the materials and the shear strength (tie-back loads may be considered for reinforced embankments).

A “dynamic” analysis might consider external loads, such as linear loads at the top of the embankment (i.e., traffic forces); additional horizontal loads to represent earthquakes (expressed as a fraction of the normal gravity field, specific to the region of interest). In

2.0 ENGINEERING PLAN (15A NCAC 13B .0539)

more advanced routines, the mass above the failure surface is divided into many slices, the driving and resisting forces for each of which are calculated and summed up. This “method of slices” expresses the ratio of resisting forces to driving forces as a ratio, e.g., 1.5:1, or simply 1.5, which is termed the “safety factor.” Ratios less than unity (safety factor <1) indicate unstable conditions. Typical minimum safety factors for maintaining stable embankment conditions throughout the life of a project are 1.5 for static conditions, 1.2 for seismic conditions.

Shear strength inputs to the STABL-5M model were developed from the drilling and laboratory data (see Section 4.1 of the July 2007 Permit to Construct application). A circular failure surface was used with a Janbu method of slices analysis. A representative soil profile was developed from the drilling data. Side slope ratios of 3H:1V were modeled with the landfill constructed to full height (long-term conditions). A water mound within the waste mass was assumed to represent worst-case conditions – the presence of water adds weight (increases the driving forces) and decreases available strength (reduces the resisting forces). The following summarizes the stability safety factors determined for the specific input conditions:

Case 1	Final waste profile, water mounded, no earthquake	FS = 2.3
Case 2	Final waste profile, water mounded, equake = 0.05g	FS = 1.5
Case 3	Final waste profile, water mounded, equake = 0.10g	FS = 1.3

Based on the foregoing discussion (originally presented in Appendix 7 of the July 2007 Permit to Construct application), slopes built to a 3H:1V ratio are expected to be stable from a deep-seated (i.e., global) stability perspective.

2.5.2.2 Veneer Stability – Sliding of the final cover (or veneer failure) is dependent on slope angle, material strength, i.e., the interface friction angle and cohesion within the soils and between the soils and synthetic components (if any), and the degree of saturation. Veneer failure occurs when the pore pressures build up along a critical interface in excess of available shear strength. The severity of failure can range from minor sloughing of small areas (maintenance nuisances) to large-scale slides requiring complete replacement of large sections – this type of failure is expensive to repair, especially when synthetic components are involved. The analysis is typically performed for preliminary design conditions to anticipate (and try to avoid) the large-scale failures.

A worse-case scenario involves little (or no) cohesion, as in a geotextile-geomembrane interface, and complete saturation of the soils overlying that interface. Good engineering

2.0 ENGINEERING PLAN (15A NCAC 13B .0539)

practice requires a drainage layer (typically a synthetic geonet) whenever a flexible membrane barrier is used, e.g., an alternative final cover that might be considered. The regulatory minimum cover includes 18 inches of vegetative support soil overlying a compacted soil barrier. Given the soils available in the region, the upper 18 inches could include a high permeability sandy silt layer near the base; soils resources are available for the compacted soil barrier (maximum 1×10^{-5} cm/sec permeability).

North Carolina Solid Waste regulations allow alternative final covers, subject to approval by the Solid Waste Section, but specific interface testing will be required to verify future designs. Drainage is still important relative to veneer stability, so a final cover section should include higher permeability sand layer next to the barrier to prevent the soils above the barrier from becoming saturated. Assuming a regulatory minimum cover soil profile is used, the critical interface for veneer stability exists within a low-cohesion sand layer overlying the compacted soil barrier at full saturation on a 3H:1V slope. While a minimum cohesion could be assumed along the sand layer and the compacted soil barrier, the stresses near the base of the sand layer would control stability.

A veneer stability analysis adapted from Matasovic (1991) was performed to evaluate four conditions: static unsaturated and saturated conditions (with a required safety factor of 1.5) and seismic unsaturated and saturated conditions (with a safety factor of 1.1). For this site, the static (non-seismic) saturated case is the critical condition for design because of the higher required safety factor. The calculations start with the given slope geometry and saturation state, then for a given safety factor the required friction (with or without cohesion) is back-calculated to provide the desired safety factor. The laboratory data indicate whether the required strength is available.

The analysis assumed full saturation of the vegetation support layer (upper cover soil is at field capacity) with a 1-year, 60-minute design storm impinging, resulting in a head of just over 12 inches acting on the base of the upper soil layer. Assuming the deeper compacted soil layer is stronger (due to cohesion) a minimum friction angle of 31 degrees is required within the upper soil layer. Based on Table 2 presented in Appendix 5 of the July 2007 Permit to Construct application, select soils available in the region (including the borrow sites on the premises) are capable of providing this minimum friction angle, combined with the required high permeability for drainage. The CQA program for the final closure should verify the available friction angles for the actual cover components (including alternative cover designs, if these are to be used).

2.5.3 Slope Ratios

Both the deep-seated stability analysis (Section 2.5.2.1) and the veneer stability analysis (Section 2.5.2.2) assumed a 3H:1V slope ratio. These analyses demonstrate that stability safety factors meet the minimum acceptable requirement of 1.5 for static (non-seismic) conditions. The use of 3H:1V slope ratios will result in stable slopes, providing that the drainage requirements are accommodated, and assuming proper vegetation maintenance.

3.0 CONSTRUCTION PLAN REQUIREMENTS (15A NCAC 13B .0540)

This section demonstrates compliance of the facility design for CDLF Phase 1A with the requirements of the 2006 C&D Rules, 15A NCAC 13B .0531 et seq. Reference is made to various appendices within the July 2007 Permit to Construct application, in which the calculations are presented.

3.1 HORIZONTAL SEPARATION

The following regulatory criteria are addressed in project drawings specified below. Refer to the rolled plan set that accompanies this report.

3.1.1 Property Lines

The minimum property line setback for the MSWLF is 300 feet (Drawings S1).

3.1.2 Residences and Wells

The minimum setback to residences and wells is 500 feet (Drawings S1 – S3).

3.1.3 Surface Waters

The minimum setback to surface waters is 50 feet (Drawings S1 and S2).

3.1.4 Existing Landfill Units

The minimum setback to the closed MSW landfill is 100 feet (Drawing S1). Typically, the Division requests that relevant buffer requirements be observed, i.e., 200 feet for C&D units, but these landfills were established prior to the implementation of the regulatory setback requirement. It should be noted that the closest portions of the CDLF (Phase 1) to the closed MSW landfill are inactive and scheduled for final closure. The planned expansion (Phase1A) is further away (to the north and upgradient) from the closed MSW unit. The closed unit(s) is not expected to impact operations or monitoring of Phase 1A, nor vice-versa.

Relative to the future lined MSWLF, a 300-foot minimum buffer is required, which was reflected in the July 2007 Permit to Construct. Future expansion of the CDLF may require further adjustment of the MSWLF footprint to maintain the minimum separation – depending on the subsequent volume change, a substantial permit amendment may be required.

3.0 CONSTRUCTION PLAN REQUIREMENTS
(15A NCAC 13B .0540)

3.2 VERTICAL SEPARATION

3.2.1 Settlement

Maximum planned waste thicknesses in Phase 1A are approximately 70 feet; the waste density is approximately 0.5 tons/cubic yard. Foundation soils are very stiff residual sandy silt and/or compacted fill. Settlement calculations (see Appendix 7 of the July 2007 Permit to Construct application) indicate maximum post-construction settlements on the order of 8 inches, or less. Based on the grading plan (see Drawing E1 and X1), settlements of this magnitude will not decrease the vertical separation to less than 4 feet, nor will strains adversely affect the engineered subgrade.

3.2.2 Soil Consistency

Based on the laboratory data, a majority of the on-site soils generally classify as silty sands (SM), silt (ML) or dual classify as sand-silt (SM-ML). A relatively small fraction of the near surface soils consist of low plasticity silty clay (CL), and there are minor high plasticity silty clay (MH-CH) soil types present. These soil types will be present either in-situ or within compacted subgrades, meeting the requirements of Rule .0540 (2) (b) for the upper two feet beneath the subgrade. No modification of the soils, i.e., admixtures, will be required to meet this rule requirement, but reworking to blend the soils to a more uniform consistency and proper compaction may be required to mitigate isolated pockets of highly granular soils and/or micaceous soils.

3.3 SURVEY CONTROL BENCHMARKS

A permanent benchmark has been established at the base of background well MW-2, north of the CDLF by Professional Surveying, P.A., of Rutherfordton. The benchmark is tied into the North Carolina State Plan (NCSP) coordinate system. The NCSP coordinates of the benchmark are as follows:

N 596,356.5642 E 1,119,904.2133
El. 955.43

3.4 SITE LOCATION COORDINATES

The latitude and longitude coordinates of the center of the site are approximately:

N 35.3477 E -81.9504

3.0 CONSTRUCTION PLAN REQUIREMENTS
(15A NCAC 13B .0540)

3.5 LANDFILL SUBGRADE

3.5.1 Subgrade Inspection Requirement

The Phase 1A subgrade was inspected by a qualified engineer or geologist upon completion of the construction, in accordance with Rule .0534 (b) and Rule .0539. Said inspection was documented in reports submitted to the Division in support of the February 2009 and April 2011 Permit to Operate authorizations.

3.5.2 Division Notification

The Owner did notify the Division at least 24 hours in advance of the subgrade inspection.

3.5.3 Vertical Separation Compliance

The subgrade inspection did verify to the Division that the minimum vertical separation requirements are met and that required subgrade soil types are present.

3.6 SPECIAL ENGINEERING FEATURES

This section of the rules generally pertains to liners and leachate collection systems, if any are present (none will be). The construction of the underdrain for the seasonal conveyance was addressed in the documentation leading to the February 2009 Permit to Operate authorization.

3.7 SEDIMENTATION AND EROSION CONTROL

Sedimentation and erosion control structures described in Appendix 8 of the 2007 Permit to Construct application were designed to accommodate the 25-year, 24-hour storm event, per the North Carolina Sedimentation Pollution Control Law (15A NCAC 04). A separate plan approved by the NC DENR Division of Land Resources, Land Quality Section, is depicted in the operations plan set (see Drawings E1 and EC1 – EC5). Existing sediment basins (SB-1 and SB-2) shall be cleaned out and maintained periodically during operation of CDLF Phase 1A.

4.0 CONSTRUCTION QUALITY ASSURANCE
(15A NCAC 13B .0541)

4.1 GENERAL PROVISIONS

This Construction Quality Assurance (CQA) Plan has been prepared to provide the Owner, Engineer, and CQA Testing Firm – operating as a coordinated team – the means to govern the construction quality and to satisfy landfill certification requirements under current solid waste management regulations. The CQA program includes both a quantitative testing program (by a third-party) and qualitative evaluation of construction materials to assure that the construction meets the desired performance criteria, i.e., sufficient strength and permeability. Early stages of the construction will require more attention by the CQA team, i.e., the Contractor, Engineer, Owner and CQA Testing Firm.

The following plan includes revisions made in February 2009 in response to the request of the NC DENR Division of Waste Management Solid Waste Section, in conjunction with the opening of Phase 1A. Said revisions are specific to Rule 15A NCAC 13B .0543 (b) (1), which address the CQA requirements for closure of a CDLF unit (or portion thereof), with respect to scheduling and documentation of closure activities and design of the cap system. That Rule references a requirement to incorporate pertinent elements from Rule 0.540 and Rule .0541.

The requirements of the CQA program (construction oversight and testing) apply to the preparation of the base grades, embankments, and engineered subgrade, as well as the final cover installation. All lines, grades, and layer thicknesses shall be confirmed by topographic surveys performed under the supervision of the Engineer of Record or the CQA Testing Firm, and as built drawings of the base grades and final cover shall be made part of the construction records. Once the final cover construction is completed, the Engineer shall verify that all surfaces are vegetated within 7 days following completion of final grades. The Engineer shall also verify that interior slopes and base grades of new cells are protected until waste is placed.

Rule 0.540 (5) discusses surveying standards and geologist's certification requirements intended to assure that new cell construction meets the horizontal and vertical buffer and base subgrade soil requirements; Rule 0.540 (6) discusses special engineering structures, including the cap system, and the requirement for compliance with the approved design documents pertaining to materials, construction, and certification requirements set forth on the Permit to Construct application; Rule 0.540 (7) discusses the need for adherence to the approved Sedimentation and Erosion Control Plan; and Rule 0.540 (8) discusses the need for submittal of a CQA report (in accordance with Rule .0541) upon completion of each portion of base grade construction – typically completed in cells or sub-phases – and incremental portions of the cap.

4.0 CONSTRUCTION QUALITY ASSURANCE (15A NCAC 13B .0541)

4.1.1 Definitions

4.1.1.1 Construction Quality Assurance (CQA) – In the context of this CQA Plan, Construction Quality Assurance is defined as a planned and systematic program employed by the Owner to assure conformity of the final cover system installation with the project drawings and the project specifications. CQA is provided by the CQA Testing Firm as a representative of the Owner and is independent from the Contractor and all manufacturers. The CQA program is designed to provide confidence that the items or services brought to the job meet contractual and regulatory requirements and that the final cover will perform satisfactorily in service.

4.1.1.2 Construction Quality Control (CQC) – Construction Quality Control refers to actions taken by manufacturers, fabricators, installers, and/or the Contractor to ensure that the materials and the workmanship meet the requirements of the project drawings and the project specifications. The manufacturer's specifications and quality control (QC) requirements are included in this CQA Manual by reference only. A complete updated version of each manufacturer's QC Plan for any Contractor-supplied components shall be incorporated as part of the Contractor's CQC submittal. The Owner and/or the Engineer shall approve the Contractor's QC submittal prior to initial construction. Contractor submittals may be (but are not required to be) incorporated into the final CQA certification document at the Owner's discretion.

4.1.1.3 CQA Certification Document – The Owner and/or the Engineer will prepare a certification document upon completion of construction, or phases of construction. The Owner will submit these documents to the State Solid Waste Regulators (SC DHEC). The CQA certification report will include relevant testing performed by the CQA Testing Firm, including field testing used to verify preliminary test results and/or design assumptions, records of field observations, and documentation of any modifications to the design and/or testing program. An “as-built” drawing (prepared by/for the Owner), showing completed contours, shall be included. The Certification Document may be completed in increments, i.e., as several documents, as respective portions of the final cover are completed. Section 4.2 discusses the documentation requirements.

4.1.1.4 Discrepancies Between Documents – The Contractor shall be instructed to bring discrepancies to the attention of the CQA Testing Firm who shall then notify the Owner for resolution. The Owner has the sole authority to determine resolution of discrepancies existing within the Contract Documents (this may also require the approval of State Solid Waste Regulators). Unless otherwise determined by the Owner, the more stringent requirement shall be the controlling resolution.

4.0 CONSTRUCTION QUALITY ASSURANCE (15A NCAC 13B .0541)

4.1.2 Responsibilities and Authorities

The parties to Construction Quality Assurance and Quality Control include the Owner, Engineer, Contractor, CQA Testing Firm (i.e., a qualified Soils Laboratory).

4.1.2.1 Owner – The Owner is Rutherford County Solid Waste Department, who operates and is responsible for the facility. The Director or his designee is responsible for the project and will serve as liaison between the various parties.

4.1.2.2 Engineer – The Engineer (a.k.a. the “Design Engineer”) is responsible for the engineering design, drawings, and project specifications, regulatory affairs, and communications coordinator for the project for the final cover system. The Engineer represents the Owner and coordinates communications and meetings as outlined in Section 4.3. The Engineer shall also be responsible for proper resolution of all quality issues that arise during construction. The Engineer shall prepare the CQA certification documents, with input from the Owner, the CQA Testing Firm and the Owner’s Surveyor. The Engineer shall be registered in the State of North Carolina.

4.1.2.3 Contractor – The Contractor is responsible for the construction of the subgrade, earthwork, and final cover system. The Contractor is responsible for the overall CQC on the project and coordination of submittals to the Engineer. Additional responsibilities of the Contractor include compliance with North Carolina S&EC rules.

Qualifications – The Contractor qualifications are specific to the construction contract documents and are independent of this CQA Manual.

4.1.2.4 CQA Testing Firm – The CQA Testing Firm (a.k.a. Soils Laboratory) is a representative of the Owner, independent from the Contractor, and is responsible for conducting geotechnical tests on conformance samples of soils, paper mill residuals, and aggregates used in structural fills and the final cover system. Periodic site visits by the CQA firm shall be coordinated with the Contractor.

Qualifications – The CQA Testing Firm (Soils Laboratory) will have experience in the CQA aspects of the construction and testing of landfill final cover systems, and be familiar with ASTM and other related industry standards. The Soils CQA Laboratory will be capable of providing test results within 24 hours or a reasonable time after receipt of samples, depending on the test(s) to be conducted, as agreed to at the outset of the project by affected parties, and will maintain that standard throughout the construction.

4.0 CONSTRUCTION QUALITY ASSURANCE (15A NCAC 13B .0541)

4.1.3 Control vs. Records Testing

4.1.3.1 Control Testing – In the context of this CQA plan, Control Tests are those tests performed on a material prior to its actual use in construction to demonstrate that it can meet the requirements of the project plans and specifications. Control Test data may be used by the Engineer as the basis for approving alternative material sources.

4.1.3.2 Record Testing – Record Tests are those tests performed during or after the actual placement of a material to demonstrate that its in-place properties meet or exceed the requirements of the project drawings and specifications.

4.1.4 Modifications and Amendment

This document was prepared by the Engineer to communicate the basic intentions and expectations regarding the quality of materials and workmanship. Certain articles in this document may be revised with input from all parties, if so warranted based on project specific conditions. No modifications will be made without the Engineer's approval.

4.1.5 Miscellaneous

4.1.5.1 Units – In this CQA Plan, and through the plans and specifications for this project, all properties and dimensions are expressed in U.S. units.

4.1.5.2 References – This CQA Plan includes references to the most recent version of the test procedures of the American Society of Testing and Materials (ASTM).

4.1.6 Standards for Scheduling and Documentation

It is likely that this facility will be built in large increments (sub-phases or cells comprising several acres) and closed incrementally as exterior slopes come to final grade (e.g., in one to two-acre areas). For new cell construction the Division shall be notified of new construction within an approved area, i.e., those areas covered by the Permit to Construct. Rule .0540 (5) (a) requires that subgrades shall be inspected by a qualified engineer or geologist upon completion of base grade construction, and the Division hydrogeologist shall be given 24-hour's notice before a subgrade inspection is made.

For cap construction Rule 15A NCAC 13B .0543 (b) (1) requires the establishment of standards for scheduling and documenting closure activities of the CDLF unit or portions

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thereof. Rule 15A NCAC 13B .0543 (b) (5) establishes the following thresholds that trigger the need to initiate cap construction unless the Division grants a time extension:

- (A) No later than 30 days after the date on which the C&DLF unit receives the known final receipt of wastes;
- (B) No later than 30 days after the date that a 10 acre or greater area of waste, is within 15 feet of final design grades; or
- (C) No later than one year after the most recent receipt of wastes, if the CDLF unit has remaining capacity.

Prior to beginning closure of each CDLF unit the owner/operator must notify the Division that a notice of the intent to close the unit has been placed in the operating record. The Owner/Operator and Engineer (and/or CQA firm) shall communicate closely in order to adhere to the schedule requirements and in keeping the Division informed. Standards for documentation of construction and closure activities are established within the text of this plan. Users of this plan are referred to Sections 4.4 and 4.5.

4.2 INSPECTION, SAMPLING AND TESTING

The requirements of the General Earthwork (perimeter embankments and subgrade) and Final Cover Systems (soil barrier, vegetative cover, storm water management devices) differ with respect to continuous or intermittent testing and oversight. The following two sections are devoted to the specific requirements of each work task.

4.2.1 General Earthwork

This section outlines the CQA program for structural fill associated with perimeter embankments, including sedimentation basins, and general grading of the subgrade. Issues to be addressed include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.1.1 Compaction Criteria – All final cover soil shall be compacted to a minimum of 95% of the Standard Proctor Maximum Dry Density (ASTM D-698), or as approved by the Engineer or designated QC/QA personnel. Approval is based on visual evaluation for consistency with project specifications. Such material evaluations may be performed either during material handling, i.e., delivery to or upon receipt at the landfill, or from existing stockpiles and/or the soil borrow site. Borrow soils shall be evaluated by and QC/QA personnel prior to placement on the work site.

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4.2.1.2 Testing Criteria – Periodic compaction (moisture-density) testing requirements are imposed on the structural fill, although compaction and testing requirements may not be as stringent as that required for the final cover construction. Initial compaction testing shall be in accordance with the project specifications. The Engineer may recommend alternative compaction testing requirements based on field performance. Additional qualitative evaluations shall be made by the Contractor Superintendent and the Engineer to satisfy the performance criteria for placement of these materials.

CQA monitoring and testing will not be “full-time” on this project. Rather, the CQA Testing Firm will test completed portions of the work at the Contractor’s or Owner’s request. The CQA Testing Firm may be called upon to test final cover and/or compacted structural fill at any time, ideally scheduling site visits to optimize his efforts. The Engineer will make an inspection at least monthly, more often as needed (anticipated more often in the initial stages of new construction).

4.2.1.3 Material Evaluation – Each load of soil will be examined either at the source, at the stockpile area, or on the working face prior to placement and compaction. Any unsuitable material, i.e., that which contains excess moisture, insufficient moisture, debris or other deleterious material, will be rejected from the working face and routed to another disposal area consistent with its end use. Materials of a marginal natural, i.e., too dry or too wet, may be stockpiled temporarily near the working face for further evaluation by designated QC/QA personnel. The Contractor may blend such materials with other materials (in the event of dryness) or dry the materials (in the event of excess moisture).

4.2.1.4 Subgrade Approval – Designated QC/QA personnel shall verify that the compacted embankment and/or subgrade are constructed in accordance with the project specifications prior to placing subsequent or overlying materials.

4.2.2 General Earthwork Construction

4.2.2.1 Construction Monitoring – The following criteria apply:

- A. Earthwork shall be performed as described in the project specifications. The Construction Superintendent has the responsibility of assuring that only select materials are used in the construction, discussed above.
- B. Only materials previously approved by the Engineer or his designee shall be used in construction of the compacted embankment. Unsuitable material will be removed and replaced followed by retesting.

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- C. All required field density and moisture content tests shall be completed before the overlying lift of soil is placed – as applicable. The surface preparation (e.g. wetting, drying, scarification, compaction etc.) shall be completed before placement of subsequent lifts.

- D. The CQA Testing Firm and/or the Engineer shall monitor protection of the earthwork, i.e., from erosion or desiccation during and after construction.

4.2.2.2 Control Tests – The control tests, as shown on Table 4A, will be performed by the CQA Testing Firm prior to placement of additional compacted embankment.

4.2.2.3 Record Tests – The record tests, as shown on Table 4A, will be performed by the CQA Testing Firm during placement of compacted embankment. The CQA Testing Firm may propose and the Engineer may approve an alternative testing frequency. Alternatively, the Engineer may amend the testing frequency, without further approval from the regulatory agency, based on consistent and satisfactory field performance of the materials and the construction techniques.

4.2.2.4 Record Test Failure – Failed tests shall be noted in the construction report, followed by documentation of mitigation. Soils with failing tests shall be evaluated by the Engineer (or his designee), and the soils shall either be recompacted or replaced, based on the Engineer’s judgment. Recomposition of the failed area shall be performed and retested until the area meets or exceeds requirements outlined in the specifications.

4.2.2.5 Judgment Testing – During construction, the frequency of control and/or record testing may be increased at the discretion of the CQA Testing Firm when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas will be considered when:

- Rollers slip during rolling operation;
- Lift thickness is greater than specified;
- Fill material is at an improper moisture content;
- Fewer than the specified number of roller passes is made;
- Dirt-clogged rollers are used to compact the material;
- Rollers may not have used optimum ballast;
- Fill materials differ substantially from those specified; or
- Degree of compaction is doubtful.

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4.2.2.6 Deficiencies – The CQA Testing Firm will immediately determine the extent and nature of all defects and deficiencies and report them to the Owner and Engineer. The CQA Testing Firm shall properly document all defects and deficiencies – this shall be more critical on the final cover construction, although this applies to structural fill, as well. The Contractor will correct defects and deficiencies to the satisfaction of the Owner and Engineer. The CQA Testing Firm shall perform retests on repaired defects.

4.2.3 Final Cover Systems

This section outlines the CQA program for piping, drainage aggregate, geotextiles, compacted soil barrier layer, and the vegetative soil layer of the final cover system, as well as the related erosion and sedimentation control activities. Issues to be addressed include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.3.1 Material Approval – The Engineer and/or the CQA Testing Firm shall verify that the following materials (as applicable) are provided and installed in accordance with the project drawings, specifications, and this CQA Manual. In general, the Contractor shall furnish material specification sheets to the Engineer for review and approval. In certain cases, materials furnished by the Contractor may need to meet the Owner's requirements, in which case the Owner shall approve of the materials with the Engineer's concurrence. The materials approval process may involve the submittals furnished by the Owner in the event that the Owner decides to furnish certain materials.

- A. High Density Polyethylene (HDPE) Pipe
 - (1) Receipt of Contractor's submittals on HDPE pipe.
 - (2) Review of submittals for conformity to the project specifications.

- B. Corrugated Polyethylene (CPE) Pipe
 - (1) Receipt of Contractor's submittals on CPE pipe.
 - (2) Review of submittals for CPE pipe for conformity to the project specifications.

- C. Aggregates (Verify for each type of aggregate)
 - (1) Receipt of Contractor's submittals on aggregates.
 - (2) Verify that aggregates in stockpiles or at borrow sources conform to the project specifications.
 - (3) A quarry testing certification will be sufficient.
 - (4) Perform material evaluations in accordance with Table 4B.

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- D. Vegetative Soil Layer
- (1) Review the proposed source of vegetative soil layer for conformance with the project specifications.
 - (2) Perform material evaluations in accordance with Table 4C.
- E. Compacted Barrier Layer
- (1) Review the proposed source material for compacted barrier layer for conformance with the project specifications.
 - (2) Conduct material control tests in accordance with Table 4C.
- F. Erosion and Sedimentation Control
- (1) Receipt of Contractor's submittals on erosion and sedimentation control items (rolled erosion control products and revegetation).
 - (2) Review of submittals for erosion and sedimentation control items for conformity to the project specifications.

4.2.3.2 Final Cover Systems Installation – The CQA Testing Firm, in conjunction with the Engineer, will monitor and document the construction of all final cover system components for compliance with the project specifications. Monitoring for the components of the final cover system includes the following:

- Verify location of all piping;
- Observing minimum vertical buffer between field equipment and piping;
- Monitoring thickness and moisture-density of the final cover layers and verification that equipment does not damage the compacted barrier layer;
- Observing proper installation of erosion and sedimentation control items.

4.2.3.3 Deficiencies – The CQA Testing Firm will immediately determine the extent and nature of all defects and deficiencies and report them to the Owner. The CQA Testing Firm and/or the Engineer shall properly document all defects and deficiencies. The Contractor will correct defects and deficiencies to the satisfaction of the Engineer. The CQA Testing Firm and/or the Engineer shall observe all retests on repaired defects.

4.3 CQA MEETINGS

Effective communication is critical toward all parties' understanding of the objectives of the CQA program and in resolving problems that may arise that could compromise the ability to meet those objectives. Frequent CQA meetings are essential.

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4.3.1 Project Initiation CQA Meeting

A CQA Meeting will be held at the site prior to placement of the compacted barrier layer. At a minimum, the Engineer, the Contractor, and representatives of the CQA Testing Firm and of the Owner will attend the meeting. The purpose of this meeting is to begin planning for coordination of tasks, anticipate problems that might cause difficulties or delays in construction and, above all, review the CQA Manual to all of the parties.

During this meeting, the results of a prior compaction test pad will be reviewed, and the project specific moisture-density relationships and it is very important that the rules regarding testing, repair, etc., be known and accepted by all. This meeting should include all of the activities referenced in the project specifications. The Engineer shall document the meeting and minutes will be transmitted to all parties.

4.3.2 CQA Progress Meetings

Progress meetings will be held between the Engineer, the Contractor, a representative of the CQA Testing Firm, and representatives from any other involved parties. Meeting frequency will be, at a minimum, once per month during active construction or more often if necessary during critical stages of construction (i.e., initial stages of final cover). These meetings will discuss current progress, planned activities for the next week, and any new business or revisions to the work. The Engineer will log any problems, decisions, or questions arising at this meeting in his periodic reports. Any matter requiring action, which is raised in this meeting, will be reported to the appropriate parties. The Engineer will document these meetings and minutes will be transmitted to affected parties.

4.3.3 Problem or Work Deficiency Meetings

A special meeting will be held when and if a problem or deficiency is present or likely to occur. At a minimum, the Engineer, the Contractor, the CQA Testing Firm, and representatives will attend the meeting from any other involved parties. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:

- Define and discuss the problem or deficiency;
- Review alternative solutions; and
- Implement an action plan to resolve the problem or deficiency.

The Engineer will document the meeting; minutes will be transmitted to all parties.

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4.4 DOCUMENTATION AND REPORTING

An effective CQA plan depends largely on recognition of which construction activities should be monitored and on assigning responsibilities for the monitoring of each required activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Testing Firm will provide documentation to address quality assurance requirements. Monitoring will not be continuous and full-time, although the CQA Testing Firm representative (typically this is a Soil Technician) and the Engineer will make frequent and periodic visits to inspect and/or test the work. Both parties shall keep records of their visits and observations. The Soils Technician will visit the site periodically (at least once per week) to document activities during placement of the structural fill and during final cover construction. Site visits by the CQA Testing Firm shall be coordinated between the Contractor and the CQA Testing Firm. The Engineer will make monthly site visits during these critical stages to review the work.

The Construction Superintendent or his representative shall be present on-site daily and shall keep a record of the general construction progress, noting specifically any problems or inconsistencies that need to be brought to the Owner's attention. The specifics of the Contractor's records will not be spelled out, but at a minimum, daily or weekly progress records shall be kept and made available to the Owner upon request.

The CQA Testing Firm will provide the Owner (or his designee) with periodic progress reports including signed descriptive remarks, data sheets, and logs to verify that required CQA activities have been carried out. These reports shall also identify potential quality assurance problems. The CQA Testing Firm will also maintain at the job site a complete file of project drawings, reports, project specifications, the CQA Plan, periodic reports, test results and other pertinent documents. The Owner shall furnish a location to keep this record file. Occasional documentation by the Contractor and the Engineer will be kept in the record file.

4.4.1 Periodic CQA Reports

The CQA Testing Firm representative's reporting procedures will include preparation of a periodic report that, at a minimum, will include the following information:

- A unique sheet number for cross referencing and document control;
- Date, project name, location, and other identification;
- Data on weather conditions;
- A Site Plan showing all proposed work areas and test locations;
- Descriptions and locations of ongoing construction;

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- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;
- Locations where tests and samples were taken;
- A summary of test results (as they become available, in the case of laboratory tests);
- Calibration or recalibration of test equipment, and actions taken as a result of recalibration;
- Off-site materials received, including quality verification documentation;
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality;
- Summaries of pertinent discussions with the Contractor and/or Engineer;
- The Technician's signature.

The periodic report must be completed by the end of each Technician's visit, prior to leaving the site. This information will keep at the Contractor's office and reviewed periodically by the Owner and Engineer. The CQA Testing Firm on a weekly basis should forward copies of the Periodic CQA Reports electronically to the Engineer. Periodic CQA Reports shall be due to the Engineer no later than Noon on the next working day (typically Monday) following the end of a work week (typically Friday). If a periodic visit is postponed or cancelled, that fact should be documented by the CQA Testing Firm and noted in the next periodic report.

4.4.2 CQA Progress Reports

The Engineer will prepare a summary progress report each month, or at time intervals established at the pre-construction meeting. As a minimum, this report will include the following information, where applicable:

- Date, project name, location, and other information;
- A summary of work activities during the progress reporting period;
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period;
- A summary of all test results, failures and retests, and
- The signature of the Engineer.

The Engineer's progress reports must summarize the major events that occurred during that week. This report shall include input from the Contractor and the CQA Testing Firm. Critical problems that occur shall be communicated verbally to the Engineer immediately (or as appropriate, depending on the nature of the concern) as well as being included in the Periodic CQA Reports.

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4.4.3 CQA Photographic Reporting

Photographs shall be taken by the CQA Testing Firm at regular intervals during the construction process and in all areas deemed critical by the CQA Testing Firm. These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. These records will be presented to the Engineer upon completion of the project. Electronic photographs are preferred, in which case the electronic photos should be forwarded to the Engineer (the CQA Testing Firm shall keep copies, as well). In lieu of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities. The Engineer may require that a portion of the documentation be recorded by photographic means in conjunction with videotaping.

4.4.4 Documentation of Deficiencies

The Owner and Engineer will be made aware of any significant recurring nonconformance with the project specifications. The Engineer will then determine the cause of the non-conformance and recommend appropriate changes in procedures or specification. When this type of evaluation is made, the results will be documented, and the Owner and Engineer will approve any revision to procedures or specifications.

4.4.5 Design and/or Technical Specification Changes

Design and/or project specification changes may be required during construction. In such cases, the Contractor will notify the Engineer and/or the Owner. The Owner will then notify the appropriate agency, if necessary. Design and/or project specification changes will be made only with the written agreement of the Engineer and the Owner, and will take the form of an addendum to the project specifications. All design changes shall include a detail (if necessary) and state which detail it replaces in the plans.

4.5 FINAL CQA REPORT

At the completion of each major construction activity at the landfill unit, or at periodic intervals, the CQA Testing Firm will provide final copies of all required forms, observation logs, field and laboratory testing data sheets, sample location plans, etc., in a certified report. Said report shall include summaries of all the data listed above. The Engineer will provide one or more final reports, pertinent to each portion of completed work, which will certify that the work has been performed in compliance with the plans and project technical specifications, and that the supporting documents provide the necessary information.

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The Engineer will provide Record Drawings, prepared with input from the Owner's Surveyor, which will include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.). At a minimum, the items shown below shall be included in the Final CQA Report(s). Note that some items may not be applicable to all stages of the project.

FINAL CQA REPORT GENERAL OUTLINE (FINAL COVER SYSTEM)

- 1.0 Introduction
- 2.0 Project Description
- 3.0 CQA Program
 - 3.1 Scope of Services
 - 3.2 Personnel
- 4.0 Earthwork CQA
- 5.0 Final Cover System CQA
- 6.0 Summary and Conclusions
- 7.0 Project Certification

Appendices

- A Design Clarifications/Modifications
- B Photographic Documentation
- C CQA Reporting
 - C1. CQA Reports
 - C2. CQA Meeting Minutes
- D Earthwork CQA Data
 - D1. CQA Test Results - Control Tests
 - D2. CQA Test Results - Record Tests
- E Final Cover System CQA Data
 - E1. Manufacturer's Product Data and QC Certificates
 - E2. CQA Test Results - Drainage Aggregate
 - E3. CQA Test Results - Vegetative Soil Layer
 - E4. CQC Test Results - Pressure Testing of HDPE Piping
- F Record Drawings
 - F1. Subgrade As Built
 - F2. Vegetative Soil Layer As Built

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4.6 STORAGE OF RECORDS

All handwritten data sheet originals, especially those containing signatures, will be stored in a secure location on site. Other reports may be stored by any standard method, which will allow for easy access. All written documents will become property of the Owner.

4.7 PROTECTION OF FINISHED SURFACES

At the end of construction of a cell the finished slopes, including both interior and exterior slopes, various drainage systems, and the subgrade must be protected from erosion. Ground cover shall be established on all finished surfaces, i.e., seeding of the finished surfaces within 7 days, or other measures for preventing erosion (e.g., mulch, rain sheets). Maintenance of finished slopes and subgrade until waste is placed is required. All exterior slopes shall be vegetated in accordance with applicable sediment and erosion control regulations.

The Owner/Operator shall be responsible for maintaining the finished surfaces, including exterior slope vegetation and drainage conveyances, along with the interior slopes and subgrades. If finished surfaces within the waste disposal area will be required to sit completed for more than 30 days following completion, the Engineer shall examine the finished surfaces prior to waste disposal and the Owner shall be responsible for any necessary repairs, e.g., erosion that might affect embankment integrity or vertical separation. The Engineer shall document any required maintenance or repairs prior to commencing disposal activities, placing said documentation into the Operating Record.

TABLE 4A
CQA TESTING SCHEDULE FOR GENERAL EARTHWORK

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
CONTROL TESTS:		
Consistency Evaluation	ASTM D 2488 (visual) ¹	Each Material
RECORD TESTS:		
Lift Thickness	Direct Measure	Each compacted lift

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In-Place Density	ASTM D 2922 ²	20,000 ft ² per lift
Moisture Content	ASTM D 3017 ³	20,000 ft ² per lift
Subgrade Consistency within the upper 24 inches ⁴	Visual	4 tests per acre
Subgrade Consistency within the upper 24 inches ⁴	ASTM D 422 ASTM D 4138	1 test per acre

Notes:

1. To be performed by Contractor Superintendent, Engineer, or CQA Testing Firm. Direct measure shall be facilitated with hand auger borings.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device.
3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every 10 nuclear density-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Subgrade evaluation shall be conducted via continuous inspection with the indicated testing frequency, in order to evaluate the full 24 inch depth, of an intrusive investigation (e.g., hand auger borings) may be performed after portions of the subgrade are completed with the indicated testing frequency – all testing locations, testing types and test results shall be recorded on a site map and made part of the construction record

TABLE 4B
CQA TESTING SCHEDULE FOR DRAINAGE AND FINAL COVER SOIL

COMPONENT	PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
RECORD TESTS:			
Coarse Aggregate:	Confirm Gradation	Visual	5,000 CY ¹
Vegetative Soil Layer: (In-Situ Verification)	Visual Classification	ASTM D 2488	1 per acre
	Layer Thickness	Direct measure	Survey ⁴

Notes:

1. A quarry certification is acceptable for aggregate from a commercial quarry. If a byproduct is used, i.e., crushed concrete aggregate, the gradation test frequency may be adjusted based on project specific conditions. The Engineer shall approve all materials and alternative test frequencies.

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TABLE 4C
CQA TESTING SCHEDULE FOR FINAL COVER COMPACTED SOIL BARRIER

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
RECORD TESTS:		
Lift Thickness	Direct measure	Survey ⁴
Permeability	ASTM D5084 ¹	1 per acre per lift
In-Place Density	ASTM D 2922 ²	4 per acre per lift
Moisture Content	ASTM D 3017 ³	4 per acre per lift

Notes:

1. Optionally use ASTM D6391.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device.
3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every ten nuclear-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Topographic graphic survey by licensed surveyor

5.1 GENERAL CONDITIONS

This Operations Plan was prepared for the Rutherford County C&D Landfill to provide landfill personnel with an understanding of relevant rules and how the Design Engineer assumed that the facility would be operated. While deviations from the operation plan outlined here may be acceptable, significant changes should be reviewed and approved by the Engineer and/or regulatory personnel.

5.1.1 Facility Description

The landfill entrance is located at 656 Laurel Hill Drive, accessed from US 74 Business (Charlotte Street). The scales and office are located near the front gate, which is the only means of accessing the site by the public. After crossing the scales, incoming loads are directed either to the Transfer Station or to the working face of the C&D disposal unit. No recycling activities currently take place at either area. Tires and LCID are recycled in specific areas shown on the Facility Plan Maps (see Operations Drawings).

5.1.2 Geographic Service Area

The current service area authorized by the Rutherford County Commissioners includes the entire political boundary of Rutherford County – the Commissioners have authorized no waste from outside the County. Should this condition change at some future time, per further authorization of the Commissioners, a revision to this plan will be issued. The facility receives C&D from commercial haulers, contractors, and private individuals. The operator will be responsible for knowing his customer base and waste stream characteristics, such that the approved service area is observed.

5.1.3 Hours of Operation

The landfill is open to the public from 7:30 AM to 4:00 PM on Monday – Friday and 7:30 AM to 12:30 PM on Saturday. All current operations for the C&D landfill are within those hours.

5.1.4 Personnel Training and Certification

NC DENR Division of Waste Management rules require that a certified Operator be present on-site at all times during operations. As many of the facility staff as practical will receive Operations Specialist training from a credible organization, e.g., SWANA. Certificates will be posted prominently in the scale house, and certifications will be kept up-to-date.

5.1.5 Utilities

Electrical power, water, telephone, and restrooms are provided at the scale house.

5.1.6 Equipment Requirements

The Facility will maintain on-site equipment required to perform the necessary landfill activities. Periodic maintenance of all landfill equipment and minor and major repair work will be performed at designated maintenance zones outside of the landfill.

5.1.7 Safety

All aspects of the Rutherford County C&D Landfill operation were developed with the health and safety of the landfill's operating staff, customers, and neighbors in mind. The Director of the Solid Waste Department is the designated Site Safety Officer and is responsible for the safe operation of the facility in keeping with Occupational Safety and Health Administration (OSHA) requirements. Regular safety meetings with staff (minimum one per month) shall be conducted.

Safety equipment to be provided includes (at a minimum) equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Landfill personnel will be encouraged to complete the American Red Cross Basic First Aid Course with CPR. Safety for customers will be promoted by the Operator and his staff knowing where the equipment and customer vehicles are moving at all times. Radio communications between the scale house and the field staff will help keep track of the location and movement of customers.

5.2 FACILITY OPERATION DRAWINGS

A copy of the approved Facility Plan and construction drawings must be kept on-site at all times. The fill progression drawing (see Drawing E2) shows the waste placement sequence within the Phase 1A footprint. The Owner/Operator shall note the location of the active working area on a copy of the drawing, noting areas that have come to final grade and area that are closed – the map shall be updated continuously and filed with the Operating Record. The drawings show special waste areas (asbestos, animal carcasses) and the locations of soil borrow and stockpile areas.

5.3 WASTE ACCEPTANCE CRITERIA

5.3.1 Permitted Wastes

The Rutherford County C&D Landfill shall only accept (for disposal) the following wastes generated within approved areas of service:

- Construction and Demolition Debris Waste: (Waste or debris from construction, remodeling, repair, or demolition operations on pavement or other structures);
- Land Clearing and Inert Debris Waste: (yard waste, stumps, trees, limbs, brush, grass, concrete, brick, concrete block, uncontaminated soils and rock, untreated and unpainted wood, etc.);
- Other Wastes as approved by the NC DENR Solid Waste Section.

In addition, the special wastes, i.e., asbestos (see Section 5.3.2) may also be accepted at this facility. Municipal solid waste (MSW) will be routed to the on-site transfer station. Animal carcasses will be disposed in the Animal Carcass Burial Area (see Section 1.4.4)

5.3.2 Asbestos

Rutherford County may dispose of asbestos within the C&D landfill, or within a special designated area, only if the asbestos has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Handling asbestos requires advance arrangements between the waste hauler and the landfill, as well as special placement techniques (see Section 3.5.3.3).

5.3.3 Wastewater Treatment Sludge

WWTP sludge may not be disposed in the C&D Landfill, per Division rules. WWTP sludge may be used as a soil conditioner to enhance the final cover, upon receipt of permission from the Division, to be applied at agronomic rates.

5.4 WASTE EXCLUSIONS

No municipal solid waste (MSW), hazardous waste as defined by 15A NCAC 13A .0102, or hazardous waste from conditionally exempt small quantity generators (CESQG waste),

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or liquid waste will be accepted. No drums or industrial wastes shall be accepted. No tires, batteries, polychlorinated biphenyl (PCB), electronic devices (computer monitors), medical wastes, radioactive wastes, septage, white goods, yard trash, fluorescent lamps, mercury switches, lead roofing materials, transformers, or CCA treated wood shall be disposed. No pulverized or shredded C&D wastes may be accepted.

Sludge residuals from water treatment shall no longer be accepted at the CDLF.

The Facility will implement a waste-screening program, described in Section 5.5 below, to control these types of waste. The reader is directed to Solid Waste Rule .0542 (e) for further exclusions (see Appendix 4).

5.5 WASTE HANDLING PROCEDURES

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the landfill. Waste received at both the scale house entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placards or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and "chemical" odors. **The specific training is from SWANA and directly from the District Inspector.** Screening programs for visual and olfactory characteristics are an ongoing part of the landfill operation.

5.5.1 Waste Receiving and Inspection

All incoming vehicles must stop at the scale house located near the entrance of the facility, and visitors are required to sign-in. All waste transportation vehicles shall be uncovered prior to entering the scales to facilitate inspection; all incoming loads shall be weighed and the content of the load assessed. The scale attendant shall request from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill.

Signs informing users of the acceptable and unacceptable types of waste shall be posted at the entrance near the scale house. **SWANA trained individuals shall inspect the load as it is being unloaded to ensure it is consistent with the customer disclosure and directed to the proper unloading area.** Loads with unacceptable materials will be required to be recovered (with a tarp) and turned away from the facility. Wastes generated from outside of the service area will be turned away.

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Once passing the scales, the vehicles containing C&D wastes are routed to the working face. Vehicles shall be selected for random screening a minimum of three times per week. The selection of vehicles for screening might be based on unfamiliarity with the vehicle/driver or based on the driver's responses to interrogation about the load content. The Operator shall use the Waste Screening Form (see Appendix 3) to document the waste screening activities.

Selected vehicles shall be directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded and the waste shall be carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill shall inspect the waste discharged at the screening site. If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell.

- If unacceptable wastes that are non-hazardous are found, the load will be reloaded onto the delivery vehicle and directed to the Transfer Station.
- For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in Section 5.7.2 will be followed.

The hauler is responsible for removing unacceptable waste from the landfill property. The rejection of the load shall be noted on the Waste Screening Form, along with the identification of the driver and vehicle. A responsible party to the load generator or hauler shall be notified that the load was rejected. The generator or hauler may be targeted for more frequent waste screening and/or banished from delivering to the facility, depending on the nature of the violation of the waste acceptance policy. If the violation is repetitive or severe enough, State and/or County authorities may be notified.

5.5.2 Disposal of Rejected Wastes

Attempts will be made to inspect waste as soon as it arrives in order to identify the waste hauler; ideally, the hauler can be stopped from leaving the site and the rejected materials reloaded onto the delivery vehicle. Non-allowed materials that are found in the waste during sorting or placement, i.e., after the delivery vehicle has left the site, shall be taken to the on-site Transfer Station. Small quantities of garbage (chiefly food containers) will inevitably wind up in the C&D waste stream from job sites. These may be disposed with the C&D wastes as long as the materials are non-liquid and non-hazardous. If large quantities of garbage, "black bags" or any prohibited wastes are detected, the Operator shall be responsible for removing these materials and placing them into the Transfer Station at the earliest practical time.

5.5.3 Waste Disposal Procedures

5.5.3.1 Access – The location of access roads during waste placement will be determined by operations personnel in order to reflect waste placement strategy.

5.5.3.2 General Procedures – Waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, only a certain number of vehicles will be allowed on the working face at a time. The superintendent and/or equipment operator(s), who will serve as ‘spotters’, will determine the actual number. **The superintendent shall be appointed by the Solid Waste Director and shall be an individual with experience and SWANA training. He shall direct the day to day activities of the Solid Waste staff and be responsible for proper waste disposal and tracking.** This procedure will be used in order to minimize the potential of unloading unacceptable waste and to control disposal activity.

Operations at the working face will be conducted in a manner that will encourage the efficient movement of transportation vehicles to and from the working face, and to expedite the unloading of waste. At no time during normal business hours will the working face be left unattended. Scale house and field staff shall be in constant communication regarding incoming loads and the movement of vehicles on the site, irrespective of facility vehicles or private vehicles. It is the responsibility of the working face superintendent to know where each vehicle in the facility is located and what they are doing at all times.

The use of portable signs with directional arrows and portable traffic barricades will facilitate the unloading of wastes to the designated disposal locations. These signs and barricades will be placed along the access route to the working face of the landfill or other designated disposal areas that may be established. The approaches to the working face will be maintained such that two or more vehicles may safely unload side by side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed will be provided adjacent to the unloading area. The vehicles will back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles will immediately leave the working face. Personnel will direct traffic as necessary to expedite safe movement of vehicles.

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and

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length of the working face will be maintained as small as practical to control windblown waste, preserve aesthetics, and minimize the amount of required periodic cover.

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The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e., 5H: IV max.) using a minimum number of three full passes. Depending on the nature of the wastes, the waste placement geometry and compaction procedures may require adjustment to optimize airspace.

5.5.3.3 Special Wastes: Asbestos Management – Asbestos will arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator. Once the hauler brings the asbestos to the landfill, operations personnel will direct the hauler to the designated asbestos disposal area. Operations personnel will prepare the designated disposal area by leveling a small area using a dozer or loader. Prior to disposal, the landfill operators will stockpile cover soil near the designated asbestos disposal area. The volume of soil stockpiled will be sufficient to cover the waste and to provide any berms, etc. to maintain temporary separation from other landfill traffic.

Once placed in the prepared area, the asbestos waste will be covered with a minimum of 18 inches of daily cover soil placed in a single lift. The surface of the cover soil will be compacted and graded using a tracked dozer or loader. The landfill compactor will be prohibited from operating over asbestos disposal areas until at least 18 inches of cover are in-place. The landfill staff will record the approximate location and elevation of the asbestos waste once cover is in-place. The Solid Waste Director will then review pertinent disposal and location information to assure compliance with regulatory requirements and enter the information into the Operating Record. Once disposal and recording for asbestos waste is completed, the disposal area may be covered with waste. No excavation into designated asbestos disposal areas will be permitted.

5.6 COVER MATERIAL

5.6.1 Periodic Cover

The working face of the CDLF shall be covered at least once every seven (7) calendar days, or sooner if the area of exposed waste exceeds one-half acre in size. Periodic cover shall consist of a 6 inch layer of earthen material that completely covers the waste to control vectors, fire, odors, and blowing debris. Alternative periodic cover may be considered, subject to a demonstration project with prior approval from the Division. Placement of periodic cover shall be documented (when and where) on a copy of the facility map – these items shall be filed with the Operating Record.

5.6.2 Final Cover

Exterior slopes shall be closed upon reaching final grades in increments throughout the operation of the facility. Placement of final cover shall conform to the design and CQA requirement presented in the Closure and Post-Closure Plan (January 2009 Update), replicated in Section 6.0 of this work. The permitted final cover for Phase 1A consists of a minimum of 18 inches of compacted soil cover (minimum 10^{-5} cm/sec permeability requirement), overlain by 18 inches of vegetation support soil. Areas which will not have additional wastes placed on them for three months or more, but where final termination of disposal operations has not occurred, must be covered and stabilized with vegetative ground cover or other stabilizing material. Placement of interim cover shall be documented on a copy of the facility map, and this data shall be filed with the Operating Record along with the CQA test results.

In general, the final soil cover shall be spread in at least two uniform lifts (maximum of 12 inches before compaction), and soils shall be compacted by “tracking” with dozers or other equipment. North Carolina Solid Waste regulations require a maximum permeability, achieved through proper material selection and compaction criteria, confirmed by the testing program outlined in the CQA section of the Closure and Post-Closure Plan. All disturbed soils shall be vegetated with a seed mix that is suitable to climatic conditions (see construction plans) within 20 days following completion of the grading. All seeded areas should be provided with lime, fertilizer and straw mulch. An emulsified tack may be required to prevent wind damage. Other stabilization treatments, e.g., curled wood matting of synthetic slope stabilization blankets may be employed.

At the operator’s discretion, wood mulch may be spread evenly over the final surfaces to help retain moisture and retard erosion while the vegetation develops. By SWS definition this material is not recognized to provide nutrient value but the partial decomposition of the wood mulch over time does introduce organic content to the soils, which were typically derived from deep within the borrow pit. Typically, the mulch takes about a year to break down and does benefit the effort of establishing vegetation, as long as the mulch is not applied too thick. This allows the operator some flexibility in establishing vegetation at optimum times of the year, i.e. a nurse crop of seasonal vegetation can be sown at the time the slopes are finished – the S&EC rules require seeding within 7 days following completion of the grading – and a permanent crop can be sown later, typically requiring manual sowing (refer to the Seeding Schedule in the Closure Plan construction drawings). All protective measures must be maintained until permanent ground cover is established and is sufficient to restrain erosion on site.

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If settlement occurs after the cover is placed, the cover shall be fortified with additional soil. In the case of extreme settlement (defined as greater than 1 foot), the old cover can be stripped and the affected area built up with waste prior to replacing the cover. The sedimentation and erosion control criteria governing the final closure of this facility are performance-based; some trial and error may be required, but the goal is to protect the adjacent water bodies and buffers throughout the operational and post-closure periods.

5.7 CONTINGENCY PLAN

5.7.1 Hot Loads Contingency Plan – In the event of a "hot" load attempting to enter the landfill, the scale house staff will turn away all trucks containing waste that is suspected to be hot, unless there is imminent danger to the driver. The vehicle will be isolated away from structures and other traffic and the fire department will be called. The vehicle will not be allowed to unload until the fire is out. If a hot load is detected on the working face, then the load will be treated as a fire condition (see Section 5.10.2), whereas the load will be spread as thin as possible and cover soil will be immediately placed on the waste to extinguish the fire. Traffic will be redirected to another tipping area (away from the fire), or other waste deliveries may be suspended until the fire is out. The fire will be monitored to prevent spreading. If the fire cannot be controlled, the area cleared of non-essential personnel and the fire department will be called.

5.7.2 Hazardous Waste Contingency Plan – In the event that identifiable hazardous waste or waste of questionable character is detected at the scales or in the landfill, appropriate protective equipment, personnel, and materials will be employed as necessary to protect the staff and public. Hazardous waste identification may be based on (but not limited to) strong odors, fumes or vapors, unusual colors or appearance (e.g., liquids), smoke, flame, or excess dust. The fire department will be called immediately in the event a hazardous material is detected. An attempt will be made to isolate the wastes in a designated area where runoff is controlled, preferably prior to unloading, and the vicinity will be cleared of personnel until trained emergency personnel (fire or haz-mat) take control of the scene. A partial listing of regional Hazardous Waste Responders and disposal firms is found in Appendix 2B.

The Operator will notify the Division (see Section 1.2.3) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, attempts will be made to prevent that vehicle from leaving the site until it is identified (license tag, truck number driver and/or company information) or, if the vehicle leaves the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

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The landfill staff will assist the Division as necessary and appropriate in the removal and disposition of the hazardous waste (acting under qualified supervision) and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with on-site soils, tarps, or other covering until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved.

Any vehicle owner or operator who knowingly dumps (or attempts to dump) hazardous waste in the landfill may be barred from using the landfill and reported to law enforcement. Any hazardous waste found at the scales or in the landfill that requires mitigation under this plan shall be documented by staff using the Waste Screening Form provided in Appendix 4. Records of information gathered as part of the waste screening programs will be placed in the Operating Record and maintained throughout the operational life of the facility.

5.7.3 Severe Weather Contingency

Unusual weather conditions can directly affect the operation of the landfill. Some of these weather conditions and recommended operational responses are as follows.

5.7.3.1 Ice Storms – An ice storm can hinder access to the landfill safe equipment operation, which may require closure of the landfill until the ice is removed or has melted and the access roads are passable without risk to personnel of the side slopes cover.

5.7.3.2 Heavy Rains – Exposed soil surfaces can become unsafe during rainy periods. The control of drainage and use of crushed stone (or recycled aggregates) on unpaved roads should provide all-weather access for the site and promote drainage away from critical areas. Intense rains can damage newly constructed slopes drainage structures such as swales, diversions, cover soils, and vegetation. After such a rain event, landfill staff shall inspect perform corrective measures before the next rainfall.

5.7.3.3 Electrical Storms – The open area of a landfill is susceptible to the hazards of an electrical storm. If necessary, landfill activities will be temporarily suspended during such an event. To promote the safety of field personnel, refuge will be taken in buildings.

5.7.3.4 Windy Conditions – High winds can create windblown wastes, typically paper and plastic, but larger objects have been known to blow in extreme circumstances. Operations should be suspended if blowing debris becomes a danger to staff, after the working face is secured. The proposed operational sequence minimizes the occurrence of

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unsheltered operations relative to prevailing winds. If this is not adequate during a particularly windy period, work will be temporarily shifted to a more sheltered area.

When this is done, the previously exposed face will be immediately covered with daily cover. Soil cover shall be applied whenever windblown wastes become a problem. Staff shall patrol the perimeter of the landfill periodically, especially on windy days, to remove windblown litter from tress and adjacent areas. Windscreens of various sorts have been used with mixed success at other facilities in the region. A number of facilities use manufactured movable fence sections, but simple and effective windscreens can be constructed with plastic nets suspended from poles or ropes. Good planning is essential on the operator's part to be prepared for windy conditions.

5.7.3.5 Violent Storms – In the event of a tornado or severe winter storm warning issued by the National Weather Service, landfill operations should be temporarily suspended until the warning is lifted. Daily cover will be placed on exposed waste and buildings and equipment will be properly secured. In the event of eminent danger to staff, personal safety shall take precedence over concerns regarding the waste or equipment.

5.8 SPREADING AND COMPACTION OF WASTE

The working face shall be restricted to the smallest possible area; ideally, the maximum working face area with exposed waste shall be one-quarter to one-half acre. Wastes shall be compacted as densely as practical. Appropriate methods shall be employed to reduced wind-blown debris including (but not limited to) the use of wind fences, screens, temporary soil berms, and periodic cover. Any wind-blown debris shall be recovered and placed back in the landfill and covered at the end of each working day.

5.9 VECTOR CONTROL

Steps shall be employed to minimize the risk of disease carrying vectors associated with the landfill (e.g., birds, rodents, dogs, mosquitoes). The C&D wastes should be mostly inert, subject to the waste screening procedures, and not attractive to animals. Operations should be conducted to avoid pools of standing water in and around the disposal area.

5.10 AIR QUALITY CRITERIA AND FIRE CONTROL

5.10.1 Air Quality Criteria

Appropriate measures will be taken to control fugitive emissions (dust) that might be generated during dry seasons. Water shall be sprinkled on roads and other exposed soil surfaces as needed to control dust. No open burning of any waste shall be allowed.

5.10.2 Fire Control

The possibility of fire within the landfill or a piece of equipment must be anticipated in the daily operation of the landfill. A combination of factory installed fire suppression systems and/or portable fire extinguishers shall be operational on all heavy pieces of equipment at all times. Brush fires of within the waste may be smothered with soil, if combating the fire poses no danger to the staff. The use of water to combat the fire is allowable, but soil is preferable. For larger or more serious fire outbreaks, the local fire department will respond. In the event of any size fire at the facility, the Owner shall contact NC DENR Division Waste Management personnel immediately and complete a Fire Notification Form (see Appendix 3) with a copy to the Operating Record.

5.11 ACCESS AND SAFETY

5.11.1 Access Control

Controlled access to the C&D Landfill is required for the following reasons:

1. Prevention of unauthorized and illegal dumping of waste materials,
2. Trespassing, and possible injury resulting from such, is discouraged,
3. The risk of equipment theft or vandalism is greatly reduced.

Access to active areas of the landfill will be controlled by a combination of fences and natural barriers, such as the creeks, and strictly enforced during operating hours. A landfill attendant will be on duty at all times when the facility gate is open to enforce access restrictions.

5.11.1.1 Physical Restraints – The site is accessible by the single entrance gate. All customers and visitors shall check upon arrival; all incoming waste-hauling vehicles shall cross the scales. The entrance gates will be securely locked during non-operating hours.

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5.11.1.2 Security – Frequent inspections of gates and fences will be performed by landfill personnel. Evidence of trespassing, vandalism, or illegal operation will be reported to the Owner.

5.11.1.3 All-Weather Access – The on-site roads will be paved or otherwise hardened and maintained for all-weather access.

5.11.1.4 Traffic – The Operator shall direct traffic to a waiting area, if needed, and onto the working face with safe access to an unloading site is available. Once a load is emptied, the delivery vehicle will leave the working face immediately.

5.11.1.5 Anti-Scavenging Policy – The removal of previously deposited waste by members of the public (or the landfill staff) is strictly prohibited by the Division for safety reasons. The Operator shall enforce this mandate and discourage loitering after a vehicle is unloaded. No persons that are not affiliated with the landfill or having business at the facility (i.e., customers) shall be allowed onto or near the working face.

5.11.2 SIGNAGE

A prominent sign containing the information required by the Division shall be placed just inside the main gate. This sign will provide information on operating hours, operating procedures, and acceptable wastes. Additional signage will be provided within the landfill complex to distinctly distinguish access routes. Restricted access areas will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be used.

5.11.3 COMMUNICATIONS

Visual and radio communications will be maintained between the C&D landfill and the landfill scale house and field operators. The scale house has telephones in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house.

5.12 SEDIMENTATION AND EROSION CONTROL

All aspects of the facility operation are subject to the requirements of 15A NCAC 4, the Sedimentation and Erosion Control rules. Approved S&EC measures shall be installed and maintained throughout the operational life of the facility and into the post-closure period (see Closure/Post Closure Plan, Section 9.0 of the 2007 Permit to Operate

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application and Final Closure Plan (January 2009 Update). Measures to curtail erosion include vegetative cover and woody mulch as ground cover (which may only be used as a temporary ground cover).

Measures to control sedimentation include stone check dams in surface ditches, sediment traps and basins. The key to compliance with S&EC rules is vegetative cover – all exposed soils, regardless of whether they are inside or outside the disposal area, should have a vegetative cover installed as soon as possible, not to exceed 7 days after any given area is brought to final grade. Traps and basins should be cleaned out as needed to remove sediment.

5.13 DRAINAGE CONTROL AND WATER PROTECTION

Coupled with the measures and practices intended to comply with the S&EC rules, steps to protect water quality include diverting surface water (“run-on”) away from the disposal area, allowing no impounded water inside the disposal area, and avoiding the placement of solid waste into standing water. The facility is obligated by law not to discharge pollutants into the waters of the United States (i.e. surface streams and wetlands). Any conditions the Operator suspects might constitute a discharge should be corrected and/or may need to contact proper regulatory authorities.

5.14 SURVEY FOR COMPLIANCE

5.14.1 Height Monitoring

The landfill staff will monitor landfill top and side slope elevations on a weekly basis or as needed to ensure proper slope ratios, in accordance with the approved grading plan, and to ensure the facility is not over-filled. This shall be accomplished by use of a surveyor’s level and a grade rod. When such elevations approach the grades shown on the Final Cover Grading Plan, the final top-of-waste grades will be staked by a licensed surveyor to limit over-placement of waste.

5.14.2 Annual Survey

The working face shall be surveyed on an annual basis to verify slope grades and to track the fill progression. In the event of problems (slope stability, suspected over-filling), more frequent surveys may be required at the request of the Division.

5.15 OPERATING RECORD

The Operating Record shall consist of one or more files, notebooks, or computerized records and associated maps that document the day-to-day facility operations, including the waste intake and sources, transfer records, routine waste placement, cover, and closure activities (for the CDLF), and routine or special maintenance requirements and follow up activities. The following shall be maintained in the Operating Record:

- A Daily tonnage records - including source of generation
- B Operation and Maintenance Checklist (completed forms)
- C Copies of the facility map, tracking the location of waste placement activities, interim closure and completed final closure activities
- D Waste inspection records (on designated forms); fire notification forms;
- E Quantity, location of disposal, generator, and special handling procedures employed for all special wastes disposed of at the site
- F List of generators/haulers that attempt to dispose of restricted wastes
- G Employee training procedures and records of training completed
- H Ground water quality monitoring information including:
 - 1. Monitoring well construction records
 - 2. Sampling dates and results
 - 3. Statistical analyses
 - 4. Results of inspections, repairs, etc.
- I All closure and post-closure information, where applicable, including:
 - 1. Testing
 - 2. Certification
 - 3. Completion records
- J Cost estimates for financial assurance documentation
- K Annual topographic survey of the active disposal phase intended to determine volume consumption
- L Records of operational problems or repairs needed at the facility, e.g., slope maintenance, upkeep of SE&C measures, other structures
- M Equipment maintenance
- N Annual topographic surveys
- O Daily rainfall records (via on-site rain gauge).

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The Owner or his designee will keep the Operating Record up to date. Daily logbooks or computerized files may be used for some items. Records shall be presented upon request to DWM for inspection. A copy of this Operations Plan and the Closure/Post-Closure Plan shall be kept at the landfill and will be available for use at all times.

5.16 ANNUAL REPORT

Reporting requirements for the C&D Landfill include a summary of waste intake by type and tonnage, and disposal practice. The Division requires an Annual Report be submitted, detailing the waste intake in tonnage. New rules for C&D landfills require an annual survey to determine slope, height, and volume (see Section 3.14). The reporting requirement includes an annual topographic map prepared by a licensed surveyor.

6.0 CLOSURE AND POST-CLOSURE (15A NCAC 13B .0543)

The following plan reflects the most recent revisions prepared for the 2009 Permit to Operate for CDLF Phase 1A, which reflect the 2006 CDLF rules.

6.1 SUMMARY OF REGULATORY REQUIREMENTS

6.1.1 Final Cap

The final cap design for Phase 1 shall conform to the minimum requirements of Solid Waste Rule 15A NCAC 13B .0543 (“regulatory minimum cover section”), i.e., the compacted soil barrier layer shall exhibit a thickness of 18 inches and a field permeability of not more than 1.0×10^{-5} cm/sec. The overlying vegetative support layer shall exhibit a thickness of 18 inches. See Drawings EC1 and E2 for final contours and interim contours, respectively. Construction details are shown on Drawings EC2 – EC6.

6.1.2 Construction Requirements

Final cap installation shall conform to the approved plans (see accompanying plan set), inclusive of a Sedimentation and Erosion Control Plan. The CQA plan must be followed (see Section 3.0) and all CQA documentation must be submitted to the Division. Post-settlement surface slopes must not be flatter than 5% (on the upper cap) and not steeper than 25% (on the side slopes), unless justified with engineered stability calculations.

Per the 2006 C&D Rules, a gas venting system is required for the cap. A passive venting system will be specified, which will consist of a perforated pipe in crushed stone-filled trench – installed just below the final cap soil barrier layer – with a tentative minimum vent spacing of three vents per acre. Drawing EC4 shows the gas vent system details.

6.1.3 Alternative Cap Design

The 2006 C&D Rules make a provision for an alternative cap design, to be used in the event that the permeability requirements for the compacted soil barrier layer cannot be met. Past experience indicates that on-site soils may not meet the required field permeability, not more than 1.0×10^{-5} cm/sec, in sufficient quantities for building the entire final cover. An alternative cap design consisting of a 40-mil LDPE or HDPE barrier, overlain by a single-bonded geonet drainage layer and 24 inches of vegetative support soil is under consideration. A hybrid cover design utilizing geosynthetics on the cap and compacted soil on the sides may prove to be cost effective. This design was used on the closed MSW landfill. Only the regulatory minimum final cover profile incorporating a compacted soil barrier is shown on Drawing EC3.

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6.1.4 Division Notifications

The Operator shall notify the Division prior to beginning closure of any final closure activities. The Operator shall place documentation in the Operating Record pertaining to the closure, including the CQA requirements and location and date of cover placement.

6.1.5 Required Closure Schedule

The Operator shall close the landfill in increments as various areas are brought to final grade. The final cap shall be placed on such areas subject to the following:

- No later than 30 days following last receipt of waste;
- No later than 30 days following the date that an area of 10 acres or greater is within 15 feet of final grades;
- No later than one year following the most recent receipt of waste if there is remaining capacity.

Final closure activities shall be completed within 180 days following commencement of the closure, unless the Division grants extensions. Upon completion of closure activities for each area (or unit) the Owner shall notify the Division in writing with a certification by the Engineer that the closure has been completed in accordance with the approved closure plan and that said documentation has been placed in the operating record.

6.1.6 Recordation

The Owner shall record on the title deed to the subject property that a CDLF has been operated on the property and file said documentation with the Register of Deeds. Said recordation shall include a notation that the future use of the property is restricted under the provision of the approved closure plan.

6.2 CLOSURE PLAN

The following is a tentative closure plan for CDLF Phase 1, based on the prescribed operational sequence and anticipated conditions at the time of closure.

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6.2.1 Final Cap Installation

6.2.1.1 Final Elevations – Final elevation of the landfill shall not exceed those depicted on Drawing C1 when it is closed. The elevations shown include the final cover. A periodic topographic survey shall be performed to verify elevations.

6.2.1.2 Final Slope Ratios – All upper surfaces shall have at least a 5 percent slope, but not greater than a 10 percent slope. The cover shall be graded to promote positive drainage. Side slope ratios shall not exceed 3H:1V. A periodic topographic survey shall be performed to verify slope ratios.

6.2.1.3 Final Cover Section – The terms “final cap” and “final cover” are used interchangeably. The final cover will subscribe to the regulatory minimum requirement for C&D landfills:

- An 18-inch compacted soil barrier layer (CSB), i.e., the “infiltration layer,” with a hydraulic conductivity not exceeding 1×10^{-5} cm/sec, overlain by
- An 18-inch “topsoil” or vegetated surface layer (VSL), i.e., the “erosion layer.”

Alternate final cover designs may be considered, but the regulatory minimum is specified.

6.2.1.4 Final Cover Installation – All soils shall be graded to provide positive drainage away from the landfill area and compacted to meet applicable permeability requirements. Suitable materials for final cover soil shall meet the requirements defined above. Care shall be taken to exclude rocks and debris that would hinder compaction efforts. The surface will then be seeded in order to establish a good stand of vegetation.

Test Pad – Whereas the lab data indicate that the required permeability is attainable, the ability to compact the materials in the field to achieve the required strength and permeability values shall be verified with a field trial involving a test pad, to be sampled with drive tubes and laboratory density and/or permeability testing, prior to full-scale construction. The materials, equipment, and testing procedures should be representative of the anticipated actual final cover construction. The test pad may be strategically located such that the test pad may be incorporated into the final cover.

Compacted Barrier – Materials shall be blended to a uniform consistency and placed in two loose lifts no thicker than 12 inches and compacted by tamping, rolling, or other suitable method – the targeted final thickness is 18 inches minimum. A thicker compacted barrier is acceptable. The cover shall be

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constructed in sufficiently small areas that can be completed in a single day (to avoid desiccation, erosion, or other damage), but large enough to allow ample time for testing without hindering production. The Contractor shall take care not to over-roll the cover such that the underlying waste materials would pump or rut, causing the overlying soil layers to crack – adequate subgrade compaction within the upper 36 inches of waste materials and/or the intermediate cover soil underlying the final cover is critical. All final cover soils shall be thoroughly compacted through the full depth to achieve the required maximum permeability required by Division regulations of 1.0×10^{-5} cm/sec, based on site-specific test criteria (see below). Compaction moisture control is essential for achieving adequate strength and permeability.

Vegetated Surface Layer – Materials shall be blended and placed in two loose lifts no thicker than 12 inches and compacted by tamping, rolling, or other suitable method – the targeted final layer thickness is 18 inches minimum per the design criteria. A thicker soil layer is acceptable. A relatively high organic content is also desirable. The incorporation of decayed wood mulch or other organic admixtures (WWTP sludge, with advance permission from the Division) is encouraged to provide nutrient and enhanced field capacity. These surface materials are not subject to a permeability requirement, thus no testing will be specified. Care should be taken to compact the materials sufficiently to promote stability and minimize erosion susceptibility, but not to over-compact the materials such that vegetation would be hindered. Following placement and inspection of the surface layer, seed bed preparation, seeding and mulching should follow immediately. The work should be scheduled for optimal weather conditions.

Inspection and Testing – Soils for the barrier layer are subject to the testing schedule outlined in the Construction Quality Assurance plan. The proposed testing program includes a minimum of one permeability test per lift per acre and four nuclear density gauge tests per lift per acre, to verify compaction of the compacted barrier layer. The moisture-density-permeability relationship of the materials has been established by the laboratory testing (discussed elsewhere in this report). The Contractor shall proof roll final cover subgrade materials (i.e., intermediate cover), which consist of essentially the same materials as the compacted barrier layer (without the permeability requirements), to assure that these materials will support the final cover.

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6.2.1.5 Final Cover Vegetation – Seedbed preparation, seeding, and mulching shall be performed accordance the specifications provided in the Construction Plans (see Drawing EC2), unless approved otherwise (in advance) by the Engineer. In areas to be seeded, fertilizer and lime typically should be distributed uniformly at a rate of 1,000 pounds per acre for fertilizer and 2,000 pounds per acre for lime, and incorporated into the soil to a depth of at least 3 inches by disking and harrowing. The incorporation of the fertilizer and lime may be a part of the cover placement operation specified above. Distribution by means of an approved seed drill or hydro seeder equipped to sow seed and distribute lime and fertilizer at the same time will be acceptable. Please note that the seeding schedule varies by season.

All vegetated surfaces shall be mulched with wheat straw and a bituminous tack. Areas identified as prone to erosion mat be secured with curled-wood excelsior, installed and pinned in accordance with the manufacturer's recommendations. Certain perimeter channels will require excelsior or turf-reinforcement mat (TRM), as specified in the Channel Schedule. Alternative erosion control products may be substituted with the project engineer's prior consent. All rolled erosion control materials should be installed according to the generalized layout and staking plan found in the Construction Plans or the manufacturer's recommendations.

Irrigation for landfill covers is not a typical procedure, but consideration to temporary irrigation may be considered if dry weather conditions prevail during or after the planting. Care should be taken not to over-irrigate in order to prevent erosion. Collected storm water will be suitable for irrigation water. Maintenance of the final cover vegetation, described in the Post-Closure Plan (see below), is critical to the overall performance of the landfill cover system.

6.2.1.6 Documentation – The Owner shall complete an “as-built” survey to depict final elevations and to document any problems, amendments or deviations from the Construction Plan drawings. Records of all testing, including maps with test locations, shall be prepared by the third-party CQA testing firm. All materials pertaining to the closure shall be placed in the Operational Record for the facility. Whereas the closure will be incremental, special attention shall be given to keeping the closure records separate from the normal operational records.

6.2.2 Maximum Area/Volume Subject to Closure

The largest anticipated area that will require final closure at any one time is 2 acres – the total area of Phase 1A is approximately 7.2 acres, including the vertical expansion over a

6.0 CLOSURE AND POST-CLOSURE
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portion of the existing C&D landfill (Phase 1). Intermediate cover shall be used on areas that have achieved final elevations until the final cover is installed – it will be more cost effective to close the landfill in 2 to 3 increments. Based on the volumetric analysis (Appendix 3 of the July 2007 Permit to Construct application), the planned volume of Phase 1A is 263,000 cubic yards, excluding the volume of Phase 1, estimated to be 299,000 cubic yards, for a total of 562,000 cubic yards. Please note that portions of Phase 1 have been closed (under Solid Waste Rule 0.510).

6.2.3 Closure Schedule

Refer to the requirements outlined in Section 6.1.5 (above).

6.2.4 Closure Cost Estimate

The following cost estimate is based on current Section closure requirements and is considered suitable for the Financial Assurance requirements (see Section 6.4).

TABLE 6A
ESTIMATED FINAL CLOSURE COSTS FOR PHASE 1 (2012 dollars) ¹

VSL (topsoil) ² – 7.2 acres	17,424 c.y.	@	\$4 / cubic yard	\$ 69,696
CSB (barrier) ² – 7.2 acres	17,424 c.y.	@	\$10 / cubic yard	\$ 174,240
Establish Vegetation	7.2 acres	@	\$1,800 per acre	\$ 12,960
Storm Water Piping ³	650 LF	@	\$35.00 / LF	\$ 22,750
Erosion Control Stone ³	40 tons	@	\$40.00 / ton	\$ 1,600
Cap Gas Vents (3/acre)	21	@	\$100 ea	\$ 2,100
Testing and Surveying ⁴	Estimated 15 percent of above			\$ 42,502
Contingency	Estimated 10 percent of above			\$ 28,335
Total Construction Cost (if contracted out)				\$ 354,183

Notes:

- 1 Intended to represent likely third-party construction costs (hired contractor, not the Owner/Operator), based on knowledge of local construction costs for similar projects – these estimates provided to meet NC DENR Division of Waste Management financial assurance requirements; actual costs may be lower for construction by the Owner/Operator; final closure work will be performed incrementally, spreading out the costs over the life of the project.
- 2 Includes soil work for regulatory requirements of the 2006 C&D Rules, i.e., a minimum of 18 inches of compacted soil barrier (max. permeability of 1×10^{-5} cm/sec) and 18 inches of topsoil (total soil thickness is 36 inches). For the compacted soil barrier, use a shrinkage factor of 15%; costs include surface preparation, soil procurement and transport costs, soil placement and compaction, machine/equipment costs, fuel costs
- 3 Conservative estimate based on similar project history; includes materials and installation.
- 4 Includes Construction document and bidding, construction administrative fee, CQA field monitoring and lab testing, CQA reporting and certification, final survey for as-built drawings, recordation/notation fee.

6.3 POST-CLOSURE PLAN

6.3.1 Monitoring and Maintenance

6.3.1.1 Term of Post-Closure Care – The facility shall conduct post-closure care for a minimum of 30 years after final closure of the landfill. The post-closure care period may be extended by the Division if necessary to protect human health and the environment.

6.3.1.2 Maintenance of Closure Systems – Post-closure care shall be provided in accordance with the Post Closure Monitoring and Maintenance Schedule (below).

6.3.1.3 Landfill Gas Monitoring – Gas migration is not anticipated, due to the inert nature of the wastes. Gas monitoring will be conducted using an explosive gas meter for gas monitoring wells and continual monitoring in on-site buildings via a gas detection meter. If gas is detected above regulatory thresholds, the Division will be notified and an evaluation of protective measures will be performed. The reader is directed to the web site, <http://portal.ncdenr.org/web/wm/sw/envmonitoring>, which provides the Landfill Gas Monitoring Guidance Document at the following link:

http://portal.ncdenr.org/c/document_library/get_file?uuid=da699f7e-8c13-4249-9012-16af8aefdc7b&groupId=38361

6.3.1.4 Ground Water Monitoring – Groundwater monitoring will be conducted under the current version of the approved Sampling and Analysis Plan. This plan will be reviewed periodically and may change in the future. Sampling protocols are provided in the Solid Waste Section guidance document, Groundwater, Surface Water, and Soil Sampling for Landfills, at the following link:

http://portal.ncdenr.org/c/document_library/get_file?uuid=d28d4f91-4b6d-4c9d-afd9-47c9ee93615f&groupId=38361

6.3.1.5 Record Keeping – During the post closure period, maintenance and inspection records shall be kept as a continuation of the Operating Record that was kept during the operational period. The Post Closure Record shall include future inspection and engineering reports, as well as documentation of all routine and non-routine maintenance and/or amendments, ground water and gas monitoring records collected for the facility.

6.3.1.6 Certification of Completion – At the end of the post-closure care period the facility manager shall contact the Division to schedule an inspection. The facility manager shall make the Post Closure Record available for inspection. A certification that

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the post-closure plan has been completed, signed by a North Carolina registered professional engineer, shall be placed in the operating/post closure record. The facility shall maintain these records indefinitely.

TABLE 6B
POST-CLOSURE MONITORING AND MAINTENANCE SCHEDULE

Activity	Frequency Yrs. 1 - 5	Frequency Yrs. 6-15	Frequency Yrs. 16-30
General - Inspect access gates, locks, fences, signs, site security	Quarterly	Quarterly	Quarterly
Maintain access roads, monitoring well access	As needed	As needed	As needed
Final Cover Systems/Stability - Inspect cap and slope cover for erosion, sloughing, bare spots in vegetation, make corrections as needed ¹	Quarterly	Semi-Annually	Annually
Storm Water/Erosion Control Systems - Inspect drainage swales and sediment basin for erosion, excess sedimentation ¹	Quarterly	Semi-Annually	Annually
Mow cover vegetation and remove thatch	Semi-Annually	Annually	None ²
Inspect vegetation cover and remove trees	Annually	Annually	Annually
Landfill Gas Monitoring	Quarterly ³	Quarterly ³	Quarterly ³
Ground Water Monitoring System - Check well head security, visibility	Semi-Annually	Semi-Annually	Semi-Annually
Ground Water Monitoring ⁴	Semi-Annually	Semi-Ann.	Semi-Ann.

Notes:

1. Inspect after every major storm event, i.e., 25-year 24-hour design storm
2. Dependent on vegetation type, periodic mowing may be required
3. The Solid Waste Section may be petitioned for discontinuation of gas monitoring if no detections occur in gas sampling locations or on-site buildings
4. See current Ground Water Sampling and Analysis Plan

6.3.2 Responsible Party Contact

Rutherford County Solid Waste Department

Mr. James Kilgo – Director

656 Laurel Ridge Road

Rutherfordton, NC 28139

Tel. 828-287-6125

Fax: 828-287-6312

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6.3.3 Planned Uses of Property

Currently, there is no planned use for the landfill area following closure. The closed facility will be seeded with grass to prevent erosion. Any post-closure use of the property shall not disturb the integrity of the final cover or the function of the monitoring systems.

6.3.4 Post-Closure Cost Estimate

The following cost estimate is used for the Financial Assurance calculations.

TABLE 6C
ORIGINAL POST-CLOSURE COSTS FOR PHASE 1A (in 2012 dollars)

Annual Events	Units		Unit Cost	Cost/Event	Annual Costs
Reseeding/mulching and erosion repair (Assume 5% cap, once per year)	0.35	ac.	\$1,600	\$560.00	\$560.00
Mow final cap (twice per year)	15	ac.	\$25	\$375.00	\$750.00
Ground Water (semi-annual, 6 wells)	6	ea.	\$400	\$2,000.00	\$4,800.00*
Surface Water (semi-annual, 3 locations)	4	ea.	\$350	\$1,400.00	\$2,800.00*
Water quality analysis and reporting	1	ea.	\$2500	\$2,500.00	\$5,000.00*
Landfill Gas Monitoring (semi-annual)	10	ea.	\$500	\$2000.00	\$5000.00*
Engineering inspection (annual basis)	1	ea.	\$2500	\$2,500.00	\$2,500.00
Maintain storm water conveyances	1	ea.	\$2,000	\$2,000.00	\$2,000.00
Maintain access roads, gates, buildings	1	ea.	\$1,000	\$1,000.00	\$1,000.00
*Deduct from total	Total Cost for One Year				\$6,810.00

Notes:

1. Monitoring and maintenance costs do not include other nearby closed units – some shared facility-wide costs will exist

6.3.5 Closure Cost Estimate

The 2006 C&D Rules require that Owners/Operators demonstrate financial assurance for closure and post-closure activities. Typically, for local government-owned facilities, said demonstration is based on a local government test. For private facilities, the posting of a performance bond or insurance policy is typically acceptable to the Division.

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Cost estimates for closure of CDLF Phase 1A and post-closure activities for the entire C&D landfill are presented in Sections 6.2 and 6.3, respectively. The following presents a summation of the closure and post closure costs, in 2012 dollars, projected over the anticipated life of the landfill (Phase 1A) and 30 years of post-closure care. The closure costs will be realized far enough into the future that these costs may be recalculated to account for inflation on a periodic basis (which has not been done here).

A local government test was provided by the County for the amount of \$1,890,014, which was approved by the Division of Waste Management, dated April 1, 2008. This amount evidently included more than the calculated costs for Phase 1A. The present analysis only includes Phase 1A.

Since 2008 NCDENR Division of Waste Management rules require a \$2M additional financial assurance mechanism (to be implemented upon renewal) to cover Potential Assessment and Corrective Measures. Local governments are eligible to apply the same mechanism as used for the closure and post-closure obligations. In addition, certain post-closure costs may be deducted from the closure and post-closure portion of the obligation, specifically ground water and landfill gas monitoring and reporting costs.

Periodically, the Division will contact the facility to verify and update the financial assurance allocation. The local government test will need to be repeated as a result of this update of the financial assurance obligation. Maximum post-closure cost liabilities are realized at the time of closure. After closure, or incremental closure, and for each year of post-closure care the financial assurance obligation should be reduced. Ideally, the whole financial assurance obligation should be recalculated on an annual basis.

SUMMARY OF CLOSURE AND POST-CLOSURE COST

1.	Final Closure Construction (see Table 6A)	\$ 354,183
2.	Projected Post-Closure Costs (see Table 6C * 30)	\$ 204,300
3.	Potential Assessment and Corrective Measures	\$2,000,000
	TOTAL CLOSURE/POST-CLOSURE COST	\$2,558,483

The foregoing values are in 2012 dollars.

7.1 SUMMARY OF REGULATORY REQUIREMENTS

North Carolina Solid Waste regulations require that C&D landfills implement a detection phase monitoring program for ground water and surface water. Normally, this includes an up gradient background well and several down gradient (or cross gradient) compliance wells, along with several strategically placed surface water sampling locations with up gradient and down gradient coverage. Well placement is based on the hydraulic and topographic characteristics of the site, determined in the Site Suitability and Design Hydrogeologic investigations. Compliance wells are placed at a “review boundary” located approximately half the distance to the “compliance boundary,” which is normally established 50 feet inside the facility boundary, or 150 feet from the waste boundary.

Detection phase monitoring includes semi-annual sampling and analysis for compliance with North Carolina ground water standards, i.e., 15A NCAC 2L .0300 (the “2L rules”). The detection phase sampling list includes organic constituents on the Appendix I list¹ (i.e., volatiles and semi-volatiles that are analyzed by US-EPA Method 8260 and the RCRA metals), key indicator parameters (measured in the field), and – new for the 2006 C&D Rules – several additional constituents (mercury, manganese, sulfate, iron, alkalinity, and total dissolved solids). As of June 2010 monitoring of tetrahydrofurans (TFC’s) are required at CDLFs. A number of other changes in the monitoring requirements have occurred since the subject facility was permitted in 2009, including:

[.0600Rules](#) - Applicable to all Facilities permitted under the .0500 Rules.

[October2006Memo»](#)

[AddendumtotheOct2006Memo»](#)

[October2007Memo»](#)

[ElectronicDataDeliverable\(EDD\)Template](#) (Last updated: May 5, 2010)

[SolidWasteEnvironmentalMonitoringDataForm](#) (Last updated: June 10, 2009)

The Solid Waste Section web site, <http://portal.ncdenr.org/web/wm/sw/envmonitoring>, provides comprehensive environmental monitoring requirements for landfills, including a standardized Sampling and Analysis Plan (SAP), [Groundwater, Surface Water, and Soil Sampling for Landfills](#), which is not replicated in this document.

Assuming no detects of ground water constituents that exceed a 2L standard, the term of detection phase monitoring runs for the operational life of the facility plus the post-

¹ 40 CFR Part 258

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closure period (minimum of 30 years beyond closure). Should one or more detected constituents exceed a 2L standard, the facility must undergo an expanded assessment monitoring program to determine the source, extent, and rate of contaminant migration, plus an evaluation of potential human receptors and/or other environmental impacts.

The subject facility contains a closed MSW landfill unit, which is undergoing assessment monitoring in accordance with NC DENR Division of Waste Management rules, due to prior detections of certain constituents at levels that exceed the 2L standards in certain compliance wells – this condition is not unusual at closed, unlined MSW landfills. The assessment sampling program, conducted (by others) concurrent with the detection phase monitoring for the C&D landfill, shares the background well and several surface water sampling locations. At the present time, no detects have been attributed to the C&D landfill. Ongoing assessment monitoring activities will likely continue to focus on areas south of the cross-country power line (which delineates the C&D unit from the closed MSW unit), within areas that are down gradient of the C&D unit.

7.2 GROUND WATER MONITORING

The following discusses the rationale behind planned amendments to the detection phase monitoring program for the C&D landfill, reflected in the Sampling and Analysis Plan. The format of the SAP is consistent with that used for numerous Division-accepted landfill monitoring programs.

7.2.1 Monitoring System Requirements

The Design Hydrogeologic study for CDLF Phase 1A indicates a radial ground water flow pattern toward the south, southwest, and southeast. This flow pattern reflects surface topography along a sharp ridge, surrounded on three sides by surface streams (i.e., ground water receptors). The CDLF is situated on the west side of the ridge, with the predominant ground water flow direction to the west and southwest, toward a receptor stream and/or the closed MSWLF. No ground water users are located between the CDLF unit and the receptor stream. The stream provides on-site discharge for the upper aquifer.

Ground water typically occurs within the dense saprolite mantle, with relatively dry soil existing above the water-bearing zones, but water levels frequently stabilize at higher elevations than first encountered (during drilling) due to topography-induced hydrostatic pressure. Differential weathering results in a gradational boundary between the dense, unconfined to partly confined, porous-flow saprolite (Unit 1 with $N < 100$ bpf and Unit 2 with $N = 100+$ bpf) and the predominantly confined fracture-flow bedrock (Unit 3).

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The placement of wells for the CDLF focuses on the saprolite (Units 1 and 2) and/or upper bedrock (Unit 3) on the west and southwest sides of the unit, with minor emphasis on the east and north (cross-gradient) directions. Based on these conditions, the detection phase monitoring program for the CDLF unit includes 6 wells: one facility background well (MW-2) and five compliance wells (MW-4, MW-12, MW-13, MW-14 and MW-15).

Well depths determined from the subsurface data reflect the position of the saprolite (Units 1 and 2) as the uppermost aquifer. Table 7A following this section shows the well construction data. Figure 1 shows the locations of the monitoring well network.

7.2.2 Background Water Quality

Low concentrations of metals also have been detected on occasion at the facility background well, MW-2, including cadmium, lead, and zinc.

7.2.3 Point of Compliance Water Quality

The 2L ground water standards are applicable for the compliance boundary, tempered with background water quality data.

7.2.4 Sampling and Analysis Procedures

Industry accepted protocols (also consistent with Division guidelines) are discussed in the Sampling and Analysis Plan.

7.2.5 Detection-phase Monitoring Parameters

The sampling parameters consist of the EPA Appendix I list of organic constituents and metals, modified by the 2006 C&D Rules.

7.2.6 Sampling Frequency

The detection phase sampling frequency shall be semi-annually.

7.2.7 Water Level Elevations

During each sampling event, water levels shall be measured from the top-of-casing at each monitoring well.

7.2.8 Reporting

Data analysis and reporting, consistent with Division requirements, are described in the Sampling and Analysis Plan.

7.2.9 Source Demonstration

In the event of the detection of a ground water constituent that exceeds a 2L standard, an evaluation may be made in accordance with Division policy to determine the source, e.g., sampling error, laboratory contamination, extenuating circumstances (improper repairs to a well or incidental spill near a well). Typically, re-sampling is performed

7.2.10 Monitoring Well Design

Wells shall be (and currently are) designed in accordance with 15A NCAC 2C.

7.2.11 Monitoring Well Layout

The layout takes advantage of topographic features (as indicators of fracture patterns that influence ground water flow) and access considerations within the generally steep terrain.

7.2.12 Alternative Monitoring Systems

No alternative sampling points have been specified.

7.2.13 Assessment Monitoring

Assessment monitoring requirements are outlined in Rule .0545 of the 2006 C&D Rules. If conditions require assessment monitoring, a plan will be prepared for review by the Division. It is anticipated that any future assessment of the CDLF will be tied into the ongoing assessment of the closed MSWLF. At present, no such conditions are known.

The foregoing discussion is presented for information purposes and is not intended to alter the ongoing assessment monitoring program, with the possible exception of bringing the more recent NC DENR requirements to light. The monitoring program for the closed MSWLF has been in effect for more than 15 years (by others) and has been conducted to the general satisfaction of the regulators. Assessment monitoring for the closed MSWLF is conducted under different rules. Changes effected by this plan update are limited to the CDLF, but may be adapted to the assessment work.

7.3 SURFACE WATER MONITORING

Surface water monitoring should (and does) focus on the unnamed tributary shown to be a ground water discharge feature west of the CDLF, including a new sampling station (SW-5) shall be established below the underdrain (beneath the west toe of the Phase 1A footprint). Refer to the site plan depicting existing and planned surface water sampling locations, presented in the Sampling and Analysis Plan.

7.4 GAS CONTROL AND MONITORING

7.4.1 Regulatory Limits

Division rules specify an explosive gas limit of 25% of the Lower Explosive Limit (LEL) (5% methane in standard atmosphere) within occupied structures and 100% LEL at the facility boundary. Figure 2 shows the locations of the gas monitoring wells.

7.4.2 Monitoring Program

Conditions at the C&D landfill are not conducive to extensive migration of explosive gases at concentrations that would approach the regulatory thresholds for action, C&D wastes are typically non-putrescible and the facility boundary is downhill and along a water course. There is a possibility that landfill gas from the closed MSWLF unit could migrate beneath the CDLF unit and become indistinguishable from gas generated by the CDLF unit. An evaluation of existing methane monitoring is beyond the scope of this report, but gas detectors are located within the buildings.

7.4.3 Corrective Action

Corrective action to control gas migration, if any is required, might consist of additional passive venting and/or active gas recovery. The likelihood of such measures ever being required is remote – this issue is addressed in the interest of compliance with the rules.

7.5 WASTE ACCEPTANCE POLICY

Monitoring of the waste intake is addressed in the Operations Plan, which calls for routine waste screening and record keeping with respect to waste types, sources, and haulers. Adherence to these criteria will reduce the likelihood of developing a ground water impact in the future.

7.6 PLAN PREPARATION AND CERTIFICATION

This monitoring plan for the Rutherford County MSW Facility (including the CDLF) has been prepared by, or under the responsible charge of, one or more North Carolina Licensed Geologists or Professional Engineers. The individual signature and seal below attests to compliance with this rule requirement.

Signed 

Printed G. David Garrett, PG, PE

Date November 28, 2012



Not valid unless this document bears the seal of the above-named licensed professional.

Table 7**Monitoring Well and Surface Water Sampling Location Data**

Rutherford County MSW Facility – CDLF Unit
 Permit No. 81-03, Rutherford County, North Carolina

Monitoring Wells:

Monitoring Location	Installation Date	Top of Casing (TOC) Elevation	Casing Diameter (inches)	Depth of Well (bgs)	Screened Interval (bgs)	Monitored Unit
MW-2 ¹	Unknown	995.17	2	60.0	50.0 - 60.0	Soil/PWR
MW-3 ¹	Unknown	860.04	2	47.0	37.0 - 47.0	Soil/PWR
MW-12	6/14/02	875.33	2	50.0	35.0 - 50.0	Rock
MW-13	5/24/00	962.90	2	88.0	73.0 - 88.0	Rock
MW-14 ²	TBD	TBD	2	20	5.0 - 20.0	Soil/PWR
MW-15 ²	TBD	TBD	2	25	10.0 - 25.0	Soil/PWR

1. Construction details are unknown – data from old monitoring reports
2. Proposed well – Table will be updated when details of installation are known

Surface Water Stations:

Monitoring Location	Description of Monitoring Station
SW-2 ¹	Downgradient of CDLF on first-order tributary to Cleghorn Creek
SW-3	Downgradient of closed MSWLF on Stonecutter Creek
SW-4 ²	Proposed upgradient of CDLF on first-order tributary to Cleghorn Creek
SW-5 ²	Proposed downgradient of CDLF on second-order tributary to Cleghorn Creek

1. There is no SW-1 sampled at this facility per groundwater consultant Wes Scarlett, P.G.
2. Proposed location has been coordinated with others performing assessment monitoring for closed MSWLF

Appendix A
Waste Screening Form

WASTE SCREENING FORM

Facility I.D.
Permit No.

Day _____ / _____ Date: _____ Time _____ Weighed _____ in:
Truck _____ Owner: _____ Driver _____ Name:
Truck Type: _____ Vehicle ID/Tag No: _____
Weight: _____ Tare: _____

Waste Generator / Source: _____

Inspection Location: _____

Reason Load Inspected: Random Inspection _____ Staff Initials _____
Detained at Scales _____ Staff Initials _____
Detained by Field Staff _____ Staff Initials _____

Description of Load: _____

Approved Waste Determination Form Present? (Check one) Yes _____ No _____ N/A _____

Load Accepted (signature) _____ Date _____

Load Not Accepted (signature) _____ Date _____

Reason Load Not Accepted (complete below only if load not accepted) _____

Description of Suspicious Contents: Color _____ Haz. Waste Markings _____
Texture _____ Odor/Fumes _____
Drums Present _____ Other _____
(describe) _____

Est. Cu. Yds. Present in Load _____

Est. Tons Present in Load _____

Identified Hazardous Materials Present: _____

County Emergency Management Authority Contacted? Yes _____ No _____

Generator Authority Contacted? _____

Hauler Notified (check if waste not accepted)? _____ Phone _____ Time Contacted _____

Final Disposition of Load _____

Signed _____ Date _____
Solid Waste Director

Attach related correspondence to this form. File completed form in Operating Record.

Appendix B
Hazardous Waste Responders

HAZARDOUS WASTE CONTACTS

The following contacts were taken from the NC DENR Division of Waste Management web site in early 2007; the availability and local phone numbers should be verified before a emergency, or modify this list as needed. For more information see <http://www.wastenot.org/hwhome>.

EMERGENCY RESPONSE

Clean Harbours	Reidsville, NC	336-342-6106
GARCO, Inc.	Asheboro, NC	336-683-0911
Safety-Kleen	Reidsville, NC	800-334-5953

TRANSPORTERS

ECOFLO	Greensboro, NC	336-855-7925
GARCO, Inc.	Asheboro, NC	336-683-0911
Zebra Environmental Services	High Point, NC	336-841-5276

DISPOSAL AND LANDFILLS

ECOFLO	Greensboro, NC	336-855-7925
Safety-Kleen	Reidsville, NC	800-334-5953
Zebra Environmental Services	High Point, NC	336-841-5276

USED OIL AND ANTIFREEZE

3RC Resource Recovery	Winston-Salem, NC	336-784-4300
Carolina Environmental Associates	Burlington, NC	336-299-0058
Environmental Recycling Alternatives	High Point, NC	336-869-8785

FLUORESCENT HANDLERS

3RC Resource Recovery	Winston-Salem, NC	336-784-4300
Carolina Environmental Associates	Burlington, NC	336-299-0058
ECOFLO	Greensboro, NC	336-855-7925
GARCO, Inc.	Asheboro, NC	336-683-0911
Safety-Kleen	Reidsville, NC	800-334-5953

PCB DISPOSAL

ECOFLO	Greensboro, NC	336-855-7925
GARCO, Inc.	Asheboro, NC	336-683-0911
Zebra Environmental Services	High Point, NC	336-841-5276

Appendix C
Useful Agencies and Contacts

USEFUL AGENCIES and CONTACTS

<p><u>Air Permits</u> NC Div. of Air Quality 919-733-3340</p>	<p>Indoor <u>Air Quality</u>, US EPA Info Hotline 1-800-438-4318</p>	<p><u>Asbestos</u> Environmental Epidemiology Mary Giguere 919-707-5950</p>	<p><u>Customer Call Center</u> DENR 1-877-623-6748</p>
<p><u>Drinking Water</u> Environmental Health Jessica Miles 919-715-3232</p>	<p>Safe <u>Drinking Water</u> US EPA 1-800-426-4791</p>	<p>Emergencies 24 hours <u>Emergency Management</u> 919-733-3300 919-733-9070 1-800-858-0368</p>	<p>Energy Division Hotline NC Commerce Dept. 1-800-662-7131</p>
<p><u>Environmental Education</u> Office of Env. Education 1-800-482-8724</p>	<p><u>Environmental Education</u> NC Cooperative Ext. Service NCSU 919-515-2770</p>	<p><u>Federal Register</u> RCRA/Superfund/UST 1-800-424-9346</p>	<p>Fluorescent Lights Green lights Hotline 202-775-6650 EPA Energy Star 1-888-782-7937</p>
<p>Freon US EPA Region 4 Pam McIlvane 404-562-9197</p>	<p><u>Groundwater</u> Division of Water Quality None Dedicated Soil Disposal Ted Bush 919-733-3221</p>	<p><u>Hazardous Waste</u> Hazardous Waste Section 919-508-8400</p>	<p><u>Household Hazardous Waste</u> Solid Waste Section Bill Patrakis 336-771-5091</p>
<p><u>Lab Certification</u> Water Quality Jim Meyer 919-733-3908 ext. 207</p>	<p>Land Farm Division of Water Quality David Goodrich 919-715-6162</p>	<p><u>Landfills</u> Solid Waste Section Division of Waste Management 919-508-8400</p>	<p>Lead Abatement Division of Public Health Jeff Dellinger 919-733-0668</p>
<p>Childhood <u>Lead Poisoning</u> Environmental Health Ed Norman 919-715-3293</p>	<p>National Lead Info. Center 1-800-LEAD-FYI 1-800-532-3394</p>	<p>Medical Waste Solid Waste Section Bill Patrakis 919-508-8512</p>	<p>Oil Pollution Aquifer Protection Section Debra Watts 919-715-6699</p>
<p>OSHA-Health Consultations NC Dept of Labor Roedreick Wilce 919-852-4379</p>	<p>OSHA Training & Outreach NC Dept. of Labor Joe Bailey 919-807-2891</p>	<p>Stratosphere <u>Ozone</u> US EPA Information Hot Line 1-800-296-1996</p>	<p>PCBs TSCA, EPA Region 4 Craig Brown 404-562-8980 TSCA Assistance Info. 202-554-1404</p>
<p><u>Pesticides Disposal</u> Assistance Program NC Dept. of Agriculture Hazardous Waste Royce Batts 919-715-9023</p>	<p>Pesticide Info. Hotline 1-800-858-7378</p>	<p>Petroleum Product Soil Disposal, UST Scott Ryals 919-733-8486</p>	<p><u>Pollution Prevention</u> & Environmental Assistance 919-715-6500 1-800-763-0136</p>

<p><u>Public Affairs</u>, DENR Diana Kees Acting Director 919-715-4112</p>	<p>Public Right to Know Employee Right to Know OSHA, Dept. of Labor Anthony Bonapart 919-807-2846</p>	<p><u>Radiation Materials</u> Radiation Protection Beverly Hall 919-571-4141</p>	<p><u>Recycling Markets Directory</u> What Can I do with it? 919-715-6500</p>
<p>Toxic Release Reporting Emergency Planning SARA Title III Richard Berman 919-733-1361 1-800-451-1403 (24 hours)</p>	<p><u>Run Off</u> Water Quality 919-733-5083</p>	<p><u>Safety Hotline</u> NC Dept. Of Labor 1-800-LABOR-NC 919-807-2796</p>	<p><u>Septic Tanks</u>, On-site Treatment System Environmental Health Steven Berkowitz 919-733-2895</p>
<p>Sewer Discharges Pre-Treatment Public Owned Treatment (POTW) 919-733-5083</p>	<p><u>Small Business Ombudsman</u> US EPA 1-800-368-5888</p>	<p>Spill Reporting 1-800-858-0368</p>	<p>State Operator 919-733-1110</p>
<p><u>Stormwater</u>, Permits Unit Water Quality 919-733-5083 1-800-858-0368</p>	<p>Superfund Federal Sites Dave Lown 919-508-8464 State Inactive Sites Charlotte Jesneck 919-508-8460</p>	<p><u>Toxicology Env. Epidemiology</u> Occupational Surveillance 919-707-5900</p>	<p>Transport Hazardous Waste Division of Motor Vehicle (NC DOT) Sgt. T.R. Askew 919-715-8683</p>
<p><u>US DOT</u> Regulations Office of Motor Carriers Chris Hartley 919-856-4378</p>	<p><u>Underground Storage Tanks</u> Grover Nicholson 919-733-1300</p>	<p>Waste Minimization Pollution Prevention & Environmental Assistance 919-715-6500 1-800-763-0136</p>	<p><u>Wetlands Info Hotline</u> US EPA 1-800-832-7828</p>
<p>North Carolina Division of Waste Management - 1646 Mail Service Center, Raleigh, NC 27699-1646 - (919) 508-8400</p>			

Appendix D
Fire Notification Form

FIRE OCCURRENCE NOTIFICATION

NC DENR Division of Waste Management Solid Waste Section



The Solid Waste Rules [15A NCAC 13B, Section 1626(5)(d) and Section .0505(10)(c)] require verbal notification within 24 hours and submission of a written notification within 15 days of the occurrence. The completion of this form shall satisfy that requirement. *(If additional space is needed, use back of this form)*

NAME OF FACILITY: _____ PERMIT # _____

DATE AND TIME OF FIRE ____/____/____ @ ____: ____ AM / PM (circle one)

HOW WAS THE FIRE REPORTED AND BY WHOM _____

LIST ACTIONS TAKEN _____

WHAT WAS THE CAUSE OF THE FIRE _____

DESCRIBE AREA, TYPE, AND AMOUNT OF WASTE INVOLVED _____

WHAT COULD HAVE BEEN DONE TO PREVENT THIS FIRE _____

CURRENT STATUS OF FIRE _____

DESCRIBE PLAN OF ACTIONS TO PREVENT FUTURE INCIDENTS: _____

NAME	TITLE	DATE
------	-------	------

THIS SECTION TO BE COMPLETED BY SOLID WASTE SECTION REGIONAL STAFF

DATE RECEIVED _____

List any factors not listed that might have contributed to the fire or that might prevent occurrence of future fires:

FOLLOW-UP REQUIRED:

NO PHONE CALL SUBMITTAL MEETING RETURN VISIT BY: _____ (DATE)

ACTIONS TAKEN OR REQUIRED:

1

! R TREATMENT
f i O \ OF RUTHERFOROTON
WASTEWATE
: FACILITY
\'

ASIO --(UNJND Z n
FOO)FRINE#PANSION.. : : : :
YARDs CM'AQTY)



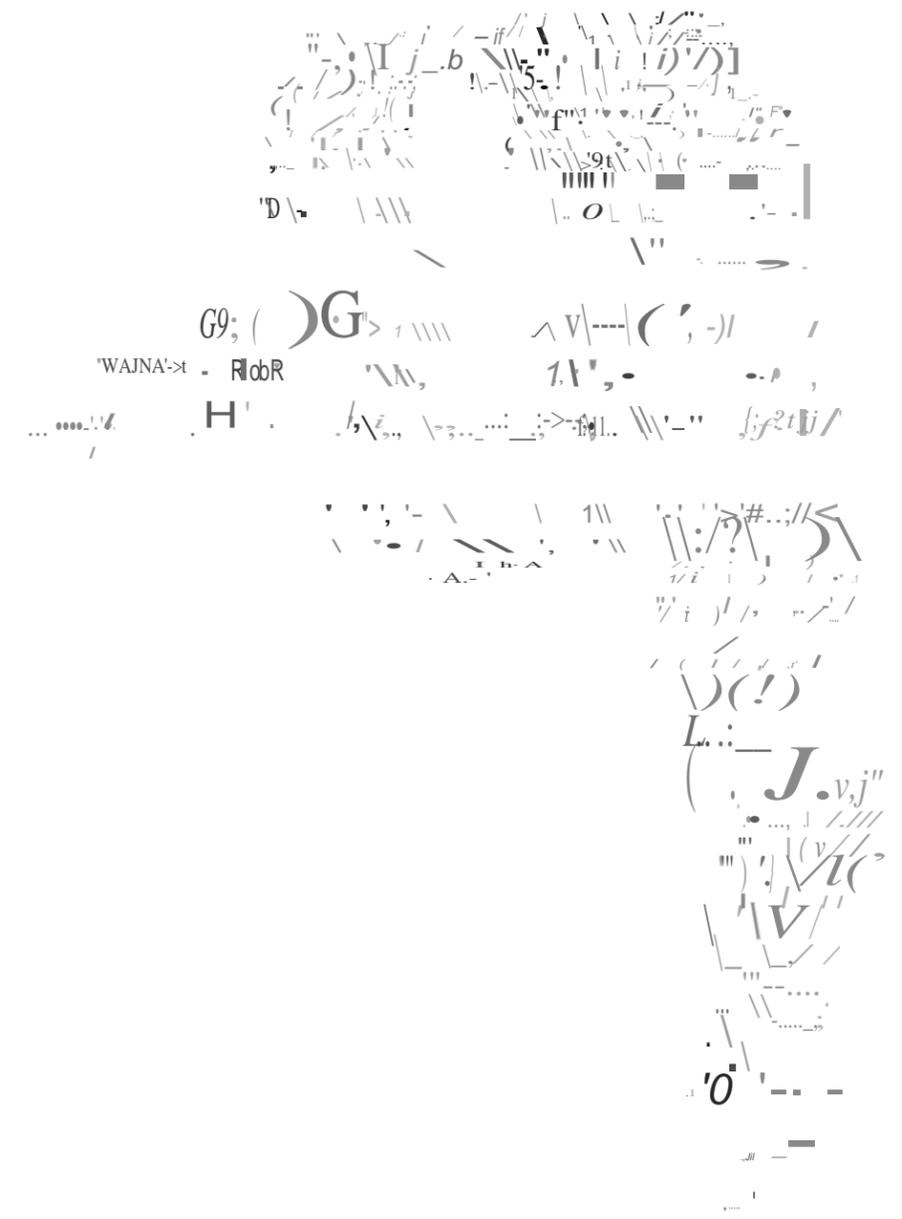
CENTRAL SANITARY LANDFILL
RUTHERFORD COUNTY, NORTH CAROLINA

SCARLETT GEOPHYSICAL CONSC-LTLVG, P.C

GROUNDWATER CONTOUR MAP

APR 25MAY 2, 2011

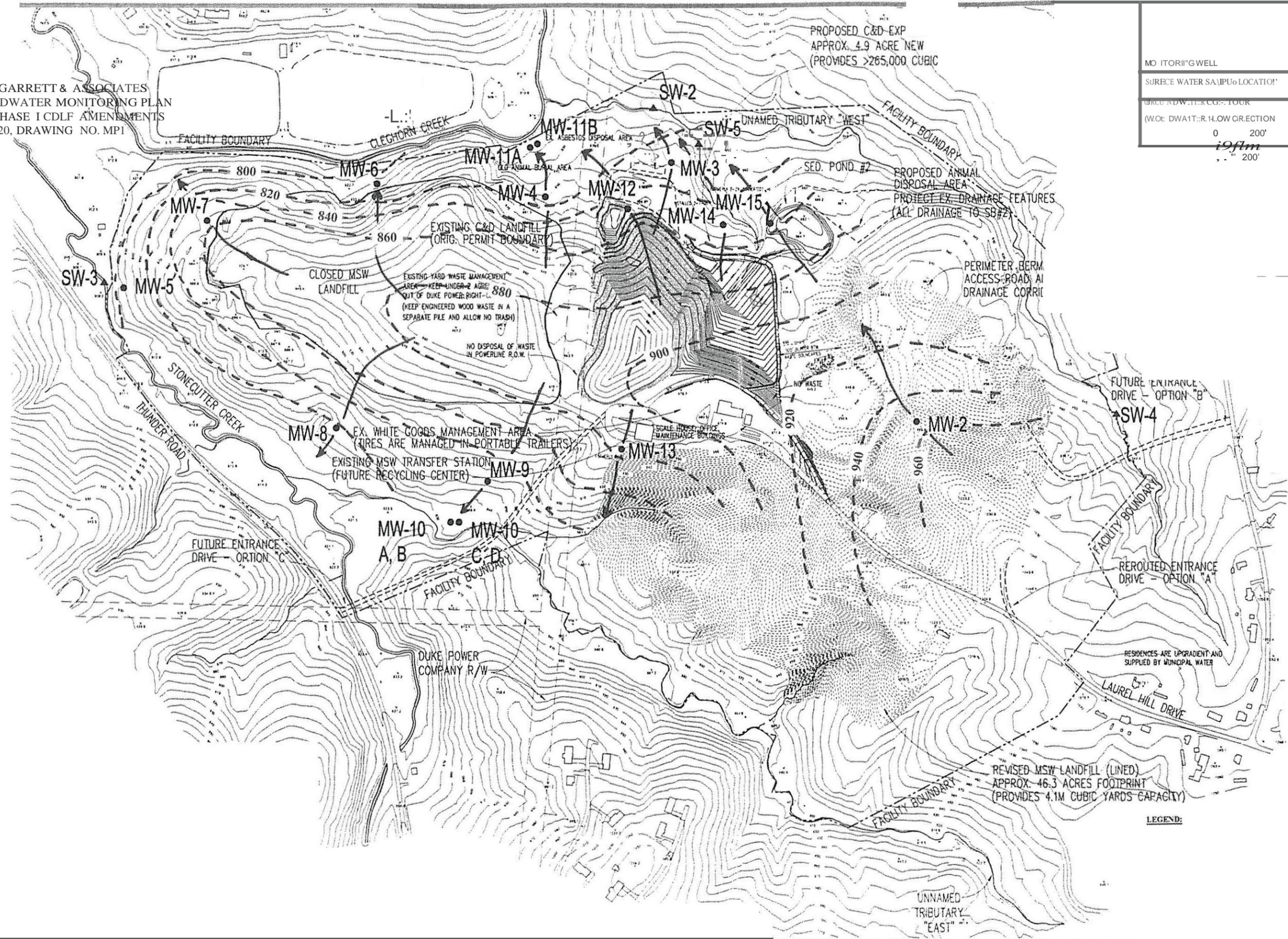
FIGURE 2



T
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C
ro

FROM:
 DAYID GARRETT & ASSOCIATES
 GROUNDWATER MONITORING PLAN
 WITH PHASE I CDLF AMENDMENTS
 SHEET 20, DRAWING NO. MP1

MOITORING WELL	-		
SURFACE WATER SAMPLING LOCATION	A		
GROUNDWATER COLLECTOR	ST		
WELL DIRECTION	---		
0	200'	400'	500'
<i>9ftm</i>			
200'			



LEGEND:

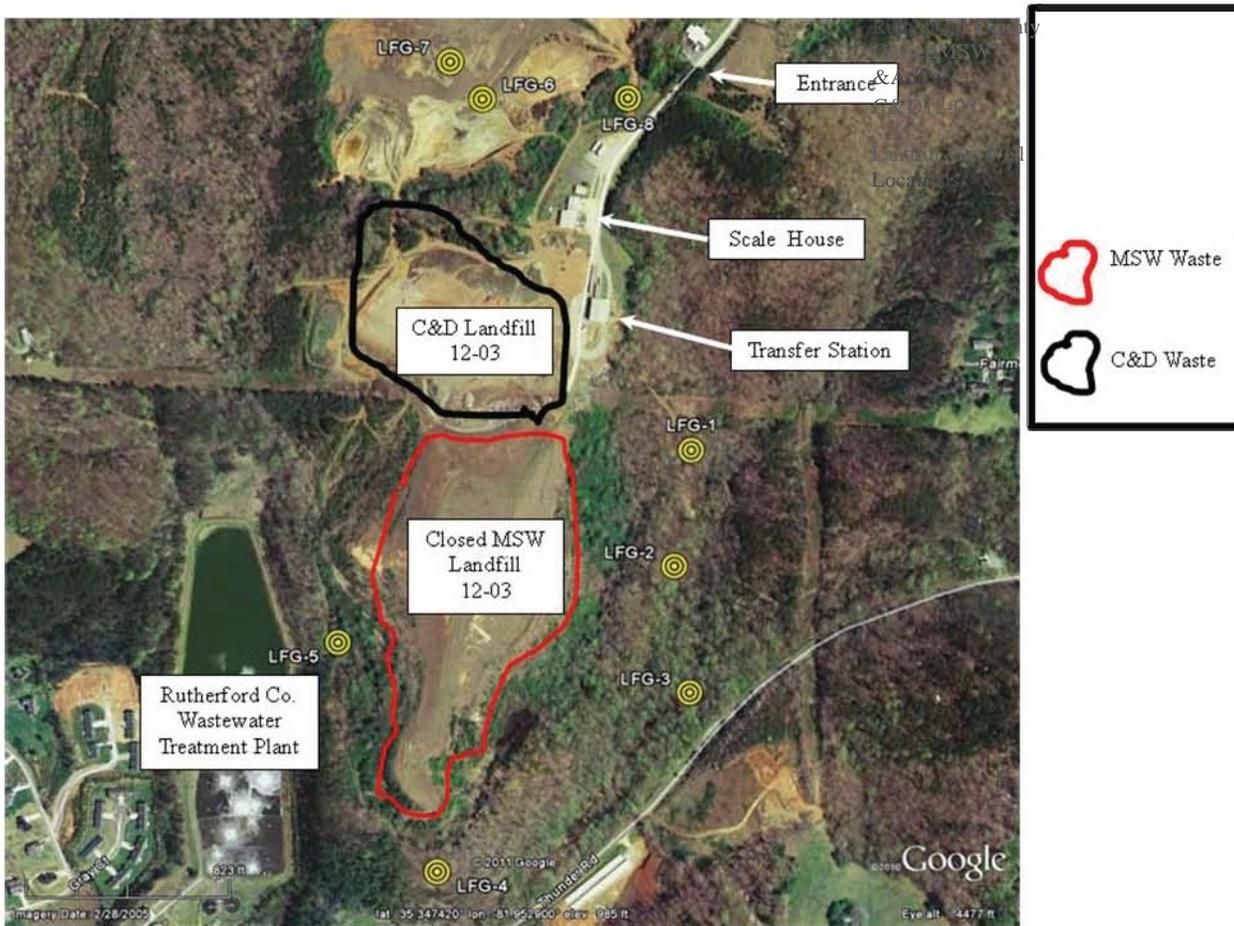


Figure 1. Rutherford Co.
 Central Landfill 12-03
 Active
 C&D
 and
 Closed
 MSW
 Approximate
 Limits
 of
 Waste

Landfill Gas Well Locations: GPS data collected by
 landfill staff on 9/22/10

LANDFILL GAS MONITORING- BACKGROUND:

The Central MSW Landfill (81-03) operated from around 1950 up until its required closure on January 1, 1998. On April 25, 1990 Rutherford Co. submitted a request for the *Proposed Central Landfill Expansion* which included a request for a "...demolition landfill to be operated at the Central Landfill site." On May 3, 1990 Rutherford Co. was issued an approved amendment to Permit No. 81-03, that included a "Demolition Area" for the disposal of "solid waste as defined in 10 NCAC 10G .0101(5): stumps, limbs, leaves, concrete, brick, wood and uncontaminated

earth." On September 20, 1994 the Solid Waste Section approved a *Transition Plan-Lan4fill Gas Monitoring* dated September 5, 1994.

a. The approved Landfill Gas Monitoring Plan (dated 9/5/94) consisted of monitoring wells #1 through

#5 and #7; with the provision to add wells #6 and #8 should gas be detected in any of the first 6 wells. b. The approved Landfill Gas Monitoring Plan also included monthly monitoring of site structures for the presence of landfill gas.

In August of 2000 Rutherford Co. submitted a *Permit Renewal Application-Rutherford Co. Lan4fill*

Expansion. This Application included a November 2, 2001 Memorandum titled *Lan4fill Gas Monitoring Plan for C&D Lan4fill*. Both the Permit Renewal Application and the Landfill Gas Monitoring Plan were approved by the Section on February 15, 2002.

Appendix E
NC DMV Transport Manifest