

**CLOSURE AND POST-CLOSURE PLAN UPDATE  
WITH FINANCIAL ASSURANCE CALCULATION**

**C&D Landfill, Inc. – Phase 1**

**Pitt County, North Carolina  
NC DENR Solid Waste Permit #74-07**

Prepared for:

C&D Landfill, Inc.  
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To the Attention of:

Mr. Judson Whitehurst

A handwritten signature in black ink, appearing to read "G. David Garrett".

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## EXECUTIVE SUMMARY

C&D Landfill, Inc. is a privately owned and operated disposal facility for Construction and Demolition (C&D) debris, located south of US 264 in eastern Pitt County, within the Pactolus community. Phase 1 commenced operations in 2001 and is the subject of this document, which presents a Closure and Post-Closure Plan for the facility, along with Financial Assurance analysis based on the closure design and post-closure care program. This work was prepared in accordance with solid waste rule **15A NCAC 13B .0547**. The facility is regulated by the North Carolina DENR Division of Waste Management.

The closure plan is based on the regulatory minimum final cover design, although an alternative is under consideration, consisting of a flexible membrane and a drainage layer (in addition to a vegetative support layer). Both final cover designs are described in this document and the supporting drawings. The closure plan makes reference to a CQA plan that will be followed during the final cover installation – this document will be similar to that prepared for other portions of the project (i.e., future Phase 2, which is under permit review). However, the CQA plan is pertinent to a soil cover (regulatory minimum), and should an alternative cover be selected by the Owner/Operator, the CQA plan will be amended accordingly and presented to the Division for review, in advance of the work.

The **Drawings** that accompany this work are collaboration between the author of this document and John A.K. Tucker, P.E, Consulting Engineer, who permitted the original facility with support from the author. The calculated bond amount will reduce upon closure of Phase 1, which is anticipated to occur soon after completion of Phase 2A construction, scheduled for later this year.

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*Refer to the drawing set that accompanies this report*

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

### 1.1 Summary of Regulatory Requirements

#### 1.1.1 Final Cap

The final cap design for all phases (both Phase 1 – none of which was closed prior to June 30, 2008 – and Phase 2) shall conform to the minimum requirements of the Solid Waste Rules, i.e., the compacted soil barrier layer shall exhibit a thickness of 18 inches and a field permeability of not more than  $1.0 \times 10^{-5}$  cm/sec. The overlying vegetative support layer shall exhibit a thickness of 18 inches. See **Drawing E2** for final contours and **Drawing EC2** for final cover cross-section and details.

#### 1.1.2 Construction Requirements

Final cap installation shall conform to the approved plans (see accompanying plan set), inclusive of the approved **Sedimentation and Erosion Control Plan**. The CQA plan must be followed (see **Section 2.0**) 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). 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 EC3** shows the gas vent system details.

#### 1.1.3 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 of not more than  $1.0 \times 10^{-5}$  cm/sec, as supported by the laboratory data for the soils discussed in **Design Hydrogeologic Report**. Tentative final closure plans have assumed that on-site soils will be used for the compacted barrier layer – alternative cap designs may be researched and submitted for Division approval at a future time.

#### 1.1.4 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.

#### 1.1.5 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.

#### 1.1.6 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.

### 1.2 Closure Plan

The following is a tentative closure plan for CDLF Phase 2, based on the prescribed operational sequence and anticipated conditions at the time of closure.

#### 1.2.1 Final Cap Installation

**1.2.1.1 Final Elevations** – Final elevation of the landfill shall not exceed those depicted on **Drawing E2** when it is closed, subject to approval of this closure plan. The elevations shown include the final cover. A periodic topographic survey shall be performed to verify elevations.

**1.2.1.2 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.

**1.2.1.3 Final Cover Section** – The terms “final cap” and “final cover” both apply. The final cover will subscribe to the minimum regulatory requirement for C&D landfills:

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

**1.2.1.4 Final Cover Installation** – All soils shall be graded to provide positive drainage away from the landfill area and compacted to meet applicable permeability requirements (see **Section 2.0**). 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 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 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  $1.0 \times 10^{-5}$  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 to optimize weather conditions, if possible.

**Inspection and Testing** – Soils for the barrier layer are subject to the testing schedule outlined in the Construction Quality Assurance plan (see **Section 2.0**). 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.

**1.2.1.5 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.

**1.2.1.6 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.

**1.2.1.7 Gas Venting System** – Passive gas vents shall be installed incrementally (as portions of the landfill are closed) beneath the final cover as shown in the construction drawings. The vents consist of a slotted pipe embedded in drainage stone, with an inverted slope of approximately 2 to 5 percent (high toward the center), leading to a vertical riser pipe and topped with a vent cap to prevent the entry of water and nesting animals. Vents shall be placed at an average density of three per acre – the field layout will be determined at the time of closure, but typically the vents are arranged in a regular triangular pattern with the trenches oriented parallel to the slope contours.

The slotted pipe is either Schedule 40 PVC or HDPE with cemented slip connections. The pipe is to be installed in a trench excavated through the intermediate cover and/or waste materials to found the trench within the top of the waste. Washed stone with an allowable gradation range of No. 57 to No. 4 shall be placed a minimum of 12 inches thick beneath the pipe to enhance gas transmission and to provide bedding for the pipe. The pipe shall be covered with a minimum of 6 inches of stone prior to placing the final cover soil. An alternative aggregate, such as crushed concrete, may be substituted subject to meeting the gradation requirements.

The depth of the trench shall allow the full-depth of final cover to be placed above the top of the stone. Soil shall be sloped to promote positive drainage away from the vents. Attention shall be paid to compaction of the cover soils to prevent settling and subsequent ponding of surface water. Each vertical riser shall be made at least 8 feet above finished grades to protect breathing space. The vents shall be posted with “No Smoking” warning signs. Maintenance during post-closure shall consist of periodic inspection and repair or replacement of damaged pipe or vent grates as needed.

**1.2.1.8 Slope Drains** – A system of drainage swales and pipes, i.e., “slope drains,” shall be constructed incrementally along exterior slopes as portions of the landfill come to grade and are closed. Drainage swales shall be graded into the final cover, as shown in the construction plans, referred to as “add-on” or “tack-on” swales, whereas they are not typically graded into the waste itself. Compaction criteria appropriate to the final cover shall be observed (refer to the CQA Plan). The swales shall be vegetated immediately upon completion and maintained as needed to protect them from erosion. Refer to maintenance of the final cover and drainage systems on **Table 1B**.

Solid (non-slotted) corrugated drain pipes shall be placed as shown in the construction plans to convey surface runoff collected from the drainage swales to ditches located at the toes of the slopes. The drain pipes shall be secured in trenches within the 18-inch vegetation support layer (topsoil) of the final cover, above the compacted barrier layer, which shall be backfilled and compacted to prevent settlement and to curtail erosion – there is no specific compaction criteria for the vegetation support layer. Pipe bedding shall be tamped soil that is shaped to “cradle” the pipe below the spring line. Inlets and outlets shall be protected with rip-rap aprons, underlain by non-woven geotextile for erosion control; protruding end sections are acceptable but flared-end sections may be used at the Operator’s discretion.

Properly buried pipes should require relatively little maintenance except for possible erosion at the ends. Regular inspection of the pipe ends, aprons, and any diversion berms used to direct water to the inlets, with repairs as may be needed, are the major anticipated maintenance requirements (see **Table 1B**).

### **1.2.2 Maximum Area/Volume Subject to Closure**

The largest anticipated area that will require final closure at any one time within the next 5-year period – including all of Phase 1 (15 acres) and Phase 2A (10 acres) – is 25 acres. Intermediate cover shall be used on areas that have achieved final elevations until the final cover is installed. Based on the original permitting for Phase 1 and the volumetric analysis for Phase 2 (see **Design Hydrogeologic Report**), the combined volumes of Phase 1 and Phase 2A is 1,111,800 cubic yards (see **Section 1.3**).

### **1.2.3 Closure Schedule**

Refer to the requirements outlined in **Section 1.1.5** (above). Phase 1 is nearing the end of its capacity and will be closed within 180 days of the opening of Phase 2A.

### **1.2.4 Closure Cost Estimate**

The foregoing cost estimate is considered suitable for the **Financial Assurance** requirements (see **Section 3.0**).

**TABLE 1A  
ESTIMATED FINAL CLOSURE COSTS FOR PHASES 1 and 2A (2009 dollars) <sup>1</sup>**

VSL (topsoil) <sup>2</sup> – 25 acres	60,500 c.y.	@	\$4 / cubic yard	\$242,000
CSB (barrier) <sup>2</sup> – 25 acres	70,000 c.y.	@	\$10 / cubic yard	\$700,000
Establish Vegetation	25 acres	@	\$1,800 per acre	\$ 45,000
Storm Water Piping <sup>3</sup>	1200 LF	@	\$35.00 / LF	\$ 42,000
Erosion Control Stone <sup>3</sup>	100 tons	@	\$40.00 / ton	\$ 4,000
Gas Vents – 25 ac * 3/ac	75 each	@	\$100 each	\$ 7,500
Testing and Surveying <sup>4</sup>	Estimated 20 percent of above			\$ 208,100
Contingency	Estimated 15 percent of above			\$ 156,075
<b>Total Construction Cost (if contracted out)</b>				<b>\$1,404,675</b>

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 (CSB) with max. permeability of  $1 \times 10^{-5}$  cm/sec and 18 inches of vegetation support layer (VSL), or topsoil, with a total soil thickness of 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

## 1.3 Post-Closure Plan

### 1.3.1 Monitoring and Maintenance

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

**1.3.1.2 Maintenance of Closure Systems** – Inspections of the final cover systems and sediment and erosion control (S&EC) measures shall be conducted quarterly. Maintenance will be provided during post-closure care as needed to protect the integrity and effectiveness of the final cover. The cover will be repaired as necessary to correct the effects of settlement, subsidence, erosion, or other events. Refer to the **Post Closure Monitoring and Maintenance Schedule** (below).

**1.3.1.3 Landfill Gas Monitoring** – Gas monitoring will be conducted during the operational period and the post-closure period via bar-hole punch tests at established locations (**Drawing MP-1**), sampling the head-space in monitoring wells with an Organic Vapor Analyzer (OVA), or similar equipment, during routine sampling events and continual monitoring in on-site buildings via a gas detection meter. Solid Waste regulations require quarterly gas monitoring throughout the operational period and for 30 years of post-closure care. The monitoring plan and financial assurance calculations presented herein are based on this premise. However, if no gas is detected consistently for a period of five years, the permittee may apply to the Solid Waste Section for reducing or discontinuing the landfill gas sampling. If gas is detected the Division will be notified and an evaluation of protective measures will be performed.

**1.3.1.4 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. Approximately one year prior to the landfill reaching permitted capacity, the facility will submit post-closure monitoring and maintenance schedules, specific to the ground water monitoring. Procedures, methods, and frequencies will be included in this plan. This future plan, and all subsequent amendments, will be incorporated by reference to this document.

**1.3.1.5 Record Keeping** – During the post closure period, maintenance and inspection records, i.e., a **Post Closure Record**, 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. The Post Closure Record shall include the ground water and gas monitoring records collected for the facility.

**1.3.1.6 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

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

**TABLE 1B  
POST-CLOSURE MONITORING AND MAINTENANCE SCHEDULE**

<b>Activity</b>	<b>Frequency Yrs. 1 - 5</b>	<b>Frequency Yrs. 6-15</b>	<b>Frequency Yrs. 16-30</b>
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, pipe drains, 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-Annually	Semi-Annually

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

### **1.3.2 Responsible Party Contact**

C&D Landfill, Inc.  
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Mr. Wayne Bell, General Manager  
C&D Landfill, Inc.  
802 Recycling Lane  
Greenville, North Carolina 27834

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### **1.3.3 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 considered in the future will not disturb the integrity of the final cover or the function of the monitoring systems unless necessary (and to be accompanied by repairs or upgrades). Future uses shall not increase the potential threat to human health and the environment.

### **1.3.4 Post-Closure Cost Estimate**

The following cost estimate is considered suitable for the **Financial Assurance** requirements. Refer to the 30-year cost projection (see **Section 3.0**).

**TABLE 1C  
ESTIMATED POST-CLOSURE COSTS FOR PHASES 1 and 2A (in 2009 dollars)**

Annual Events	Units		Unit Cost	Cost/Event	Annual Costs
Reseeding/mulching and erosion repair (Assume 5% of 25 ac., once per year)	1.25	ac.	\$1,600	\$2,000.00	\$2,000.00
Mow final cap (twice per year)	25	ac.	\$25	\$625.00	\$1250.00
Ground Water (semi-annual, 16 wells)*	22	ea.	\$400	\$8800.00	\$17600.00
Surface Water (semi-annual, 3 locations)*	3	ea.	\$350	\$1,050.00	\$2,100.00
Water quality analysis and reporting	1	ea.	\$2500	\$2500.00	\$5000.00
Landfill Gas Monitoring (quarterly)	1	ea.	\$3,500	\$3,500.00	\$7,000.00
Engineering inspection (annual basis)	1	ea.	\$3,500	\$3,500.00	\$3,500.00
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
	<b>Total Estimated Annual Cost</b>				<b>\$41,450.00</b>

\*Appendix I Detection Monitoring (Section 10.0)

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

### 2.1 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. The CQA program includes both a quantitative testing program (by a third-party) and qualitative evaluations (by all parties) to assure that the construction meets the desired criteria for long-term performance. Variations in material properties and working conditions may require minor modification of handling and placement techniques throughout the project. Close communication between the various parties is paramount. It is anticipated that the early stages of the construction activities will require more attention by the CQA team, i.e., the Contractor, Engineer, Owner and CQA Testing Firm.

*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 base grade and final cover construction is completed, the Engineer shall verify that all surfaces are vegetated within 20 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.*

#### 2.1.1 Definitions

**2.1.1.1 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 base grade and embankment construction and the final cover system installation with the project drawings and 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.

**2.1.1.2 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.

**2.1.1.3 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 NC DENR Division of Waste Management Solid Waste Section. 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 2 discusses the documentation requirements.

**2.1.1.4 Discrepancies Between Documents** – The Contractor is 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.

## **2.1.2 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).

**2.1.2.1 Owner** – The Owner is C&D Landfill, Inc., who operates and is responsible for the facility. The Owner or his designee is responsible for the project and will serve as liaison between the various parties.

**2.1.2.2 Engineer** – The Engineer (a.k.a. the “Engineer of Record”) is responsible for the engineering design, drawings, and project specifications, regulatory affairs, and communications coordinator for the construction of the base grades, embankments, engineered subgrade, drainage and final cover systems. The Engineer represents the Owner and coordinates communications and meetings as outlined in **Section 2.3**. 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.

**2.1.2.3 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 15A NCAC 4, i.e., the North Carolina Sedimentation and Erosion Control rules.

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

**2.1.2.4 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 and aggregates used in structural fills and the final cover system. Periodic site visits shall be coordinated with the Engineer of Record and the Contractor.

**Qualifications** – The CQA Testing Firm shall have experience in the CQA aspects of landfill construction 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.

### **2.1.3 Control vs. Records Testing**

**2.1.3.1 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.

**2.1.3.2 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.

### **2.1.4 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.

### **2.1.5 Miscellaneous**

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

**2.1.5.2 References** – This CQA Plan includes references to the most recent version of the test procedures of the American Society of Testing and Materials (ASTM). **Table 2D** at the end of this text contains a list of these procedures.

## **2.2 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.

## 2.2.1 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.

**2.2.1.1 Compaction Criteria** – All material to be used as compacted embankment 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. Specifically, field observation of the response of soils beneath equipment and the use of a probe rod and/or a penetrometer are other means of determining the adequacy of compaction. Skilled soil technicians working under the supervision of an engineer may make this determination, subject to concurrence by the engineer. Approval is based on visual evaluation for consistency with project specification and objectives. 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 the Engineer and QC/QA personnel prior to placement on the work site. All visual inspection and testing shall be documented for the CQA Report.

*Where permeability is the key parameter of interest, field and/or lab tests will be used.*

**2.2.1.2 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).

**2.2.1.3 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). Soils designated for the upper 2 feet of subgrade within the cell shall consist of ML, MH, CL, CH, SM and mixed SM-ML classifications – this shall be confirmed with lab testing.

**2.2.1.4 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. These activities include an inspection of the subgrade by a qualified engineer, geologist, or soil technician working under the supervision of an engineer, which will examine and classify the soils within the upper two feet beneath the finished subgrade. This may consist of continual observation during placement with confirmatory sampling and laboratory gradation testing at specified intervals, or there may be an exploratory sampling program at some time near the completion of the subgrade with confirmatory testing at specified intervals. The frequency of visual inspection and testing shall conform to **Table 2A**.

## **2.2.2 General Earthwork Construction**

**2.2.2.1 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 re-evaluation to the satisfaction of the Engineer and retesting, as may be required.
- 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 the Engineer (or his designate) will allow 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.

**2.2.2.2 Control Tests** – The control tests, as shown on **Table 2A**, will be performed by the CQA Testing Firm prior to placement of additional compacted embankment.

**2.2.2.3 Record Tests** – The record tests, as shown on **Table 2A**, 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.

**2.2.2.4 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.

**2.2.2.5 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.

**2.2.2.6 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.

### **2.2.3 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.

**2.2.3.1 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, (for documentation purposes) 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 manufacturer's submittals for conformity with project specs.

B. Corrugated Polyethylene (CPE) Pipe

- (1) Receipt of Contractor's submittals on CPE pipe.
- (2) Review manufacturer's submittals for conformity with project specs.

C. Aggregates (Verify for each type of aggregate)

- (1) Receipt of Contractor's submittals on aggregates.
- (2) Review manufacturer's submittals for conformity with project specs.
- (3) Verify aggregates in stockpiles or borrow sources conform to project specifications. Certifications from a quarry will be sufficient.
- (4) Perform material evaluations in accordance with **Table 2B**.

D. Vegetative Soil Layer and Drainage Layer

- (1) Review manufacturer's submittals for conformity with project specs.
- (2) Review contractor's submittals on seed specifications.
- (3) Perform material evaluations in accordance with **Table 2C**.

E. Compacted Barrier Layer

- (1) Review manufacturer's submittals for conformity with project specs.
- (2) Conduct material control tests in accordance with **Table 2C**.

F. Erosion and Sedimentation Control

- (1) Review Contractor's submittals on erosion and sedimentation control items (including rolled erosion control products and silt fence).
- (2) Review of submittals for erosion and sedimentation control items for conformity to the project specifications.
- (3) Perform visual examination of materials for signs of age or deterioration.

**2.2.3.2 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;

- Assuring sufficient 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 or other components; and
- Assuring proper installation of sedimentation and erosion control measures.

**2.2.3.3 Deficiencies** – The CQA Testing Firm and/or the Engineer 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.

## **2.3 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. To that end, meetings are essential to establish clear, open channels of communication. The frequency of meetings will be dictated by site conditions and the effectiveness of communication between the parties.

### **2.3.1 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 any problems that might cause difficulties and delays in construction, and, above all, review the CQA Manual to all of the parties involved.

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.

### **2.3.2 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 interested parties and to a record file.

### **2.3.3 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 these meetings and minutes will be transmitted to interested parties and to a record file.

## **2.4 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 (e.g., 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.

#### **2.4.1 Periodic CQA Reports**

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

- 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;
- 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.

#### **2.4.2 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.

### **2.4.3 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.

### **2.4.4 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 nonconformance 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.

### **2.4.5 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.

## **2.5 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.

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.).

All final surveying required for the Record Drawings will be performed by the Owner's Surveyor. 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
- 2.0 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

Each CQA report shall bear the signature and seal of the Engineer (or multiple Engineers as applicable), attesting that the construction was completed in accordance with the CQA plan, the conditions of the permit to construct, the requirements of the North Carolina Solid Waste Rules, and acceptable engineering practice.

## **2.6 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.

## **2.7 PROTECTION OF FINISHED SURFACES**

The only relevant systems exposed after construction will be the finished slopes, including both interior and exterior slopes, various drainage systems, and the subgrade,. Ground cover shall be established on all finished surfaces shall to prevent erosion, i.e., seeding of the finished surfaces within 20 days, per NC DENR Division of Land Quality rules, or other measures for preventing erosion (e.g., mulch, rain sheets). Maintenance of finished slopes and subgrade until waste is placed is required. Exterior slopes shall be vegetated in accordance with application sediment and erosion control regulations. The Engineer shall document that the finished surfaces are adequately protected upon completion, and said documentation shall be recorded in the CQA report.

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 with a subgrade. The Engineer shall document any required maintenance or repairs prior to commencing disposal activities, placing said documentation into the Operating Record.

**TABLE 2A  
CQA TESTING SCHEDULE FOR GENERAL EARTHWORK**

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
<b>CONTROL TESTS:</b>		
Consistency Evaluation	ASTM D 2488 (visual) <sup>1</sup>	Each Material
<b>RECORD TESTS:</b>		
Lift Thickness	Direct Measure	Each compacted lift
In-Place Density	ASTM D 2922 <sup>2</sup>	20,000 ft <sup>2</sup> per lift
Moisture Content	ASTM D 3017 <sup>3</sup>	20,000 ft <sup>2</sup> per lift
Subgrade Consistency within the upper 24 inches <sup>4</sup>	Visual	4 tests per acre
Subgrade Consistency within the upper 24 inches <sup>4</sup>	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. *Minimum required soil density is 95 percent of the standard proctor maximum dry density, which is dependent on the moisture-density characteristic developed for the specific soil during initial construction; lower density or incorrect moisture results in a failed test and the lift must reworked and retested.*
- 2a. *If "beneficial fill" materials are used to construct embankments or structural fill, the Contractor shall spread large particles evenly and fill all voids with finer soil – this is referred to as "choking off" the voids; density testing shall be suspended at the discretion of the Engineer, but judgment testing shall be applied and the use of these materials and evaluation thereof shall be documented as would any other soil placement activity*
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 2B  
CQA TESTING SCHEDULE FOR DRAINAGE AND FINAL COVER SOIL**

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

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. *Materials that do not meet relevant ASTM or ASHTO standard gradation specifications (either may be used at the discretion of the Engineer) shall be rejected.*

**TABLE 2C  
CQA TESTING SCHEDULE FOR FINAL COVER COMPACTED SOIL BARRIER**

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

Notes:

1. Optionally use ASTM D6391. *Maximum allowable soil permeability is  $1 \times 10^{-5}$  cm/sec; higher permeability results in a failed test and the lift must reworked and retested.*
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 device. *Minimum required density is dependent on the moisture-density-permeability characteristic developed for the specific soil during initial construction; lower density or incorrect moisture may result in higher permeability. Permeability criteria shall govern the determination of a passing test.*
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

**TABLE 2D  
REFERENCE LIST OF TEST METHODS**

**American Society American Society of Testing and Materials (ASTM):**

ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Standard Test Method for Particle Size Analysis of Soils.
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft <sup>3</sup> ).
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
ASTM D 2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
ASTM D 2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 2937	Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.
ASTM D 3017	Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
ASTM D 4318	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method.
ASTM D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5993	Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners.
ASTM D6391	Standard Test Method for Field Measurement of Hydraulic Conductivity Limits of Porous Materials Using Two Stages of Infiltration from a Borehole
ASTM D 6768	Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

### 3.0 FINANCIAL ASSURANCE

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.

Cost estimates for closure and post-closure of CDLF Phases 1 and 2A are presented in **Sections 1.2.4** and **1.3.4**, respectively. The following is a detailed analysis of the closure and post closure costs, based on the preceding, all in 2009 dollars, projected over the anticipated life of the landfill (through Phase 2) and 30 years of post-closure care. Maximum post-closure cost liabilities are realized at the time of closure – these liabilities decrease with time and, thus, the amount of the post-closure instrument should be reduced over time. 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). Thus, the whole financial assurance instrument should be recalculated periodically, say every five years at a minimum, or ideally on an annual basis. The posted amount (bond, insurance, etc.) should be adjusted accordingly on a periodic basis.

#### SUMMARY OF CLOSURE AND POST-CLOSURE COST

1.	Final Closure Construction (see <b>Table 1A</b> )	\$1,404,675
2.	Projected Post-Closure Costs (see <b>Table 1C</b> )	
		\$41,450.00 x 30 years = \$1,243,500
	<b>TOTAL CLOSURE/POST-CLOSURE COST</b>	<b>\$2,648,175</b>

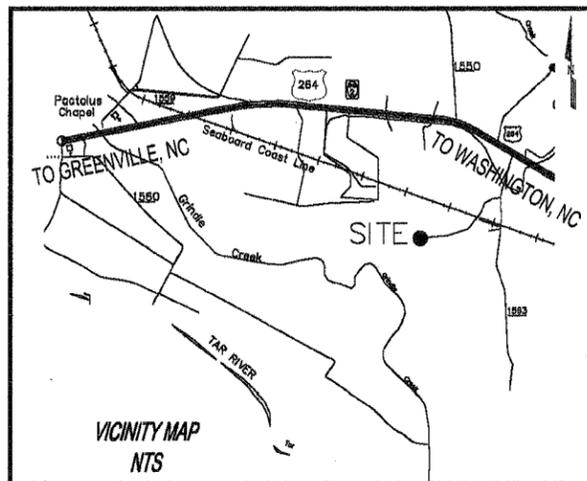
Upon approval of the financial assurance amount (and issuance of the Permit) by NC DENR Division of Waste Management, Owners/Operators must furnish an acceptable financial assurance instrument (e.g., performance bond, irrevocable letter of credit, insurance policy, other fiduciary instrument) within 30 days of notification of approval.

# C&D LANDFILL, INC. CDLF PHASES 1 AND 2 CLOSURE PLAN UPDATE PITT COUNTY (PERMIT #74-07)

JUNE 2008  
MARCH 2009 UPDATE

### LIST OF DRAWINGS

SHEET NO'S	DRAWING NO'S	DRAWING TITLE
1	--	COVER SHEET W/VICINITY MAP
2	C1	CDLF PHASE1 FINAL COVER CONTOURS AND DRAINAGE PLAN
2A	C1A	CDLF PHASE 2 FINAL COVER CONTOURS AND DRAINAGE PLAN
3	EC1	SEDIMENT EROSION CONTROL DETAILS SHEET 1 OF 3
4	EC2	SEDIMENT EROSION CONTROL DETAILS SHEET 2 OF 3
5	EC3	SEDIMENT & EROSION CONTROL SCHEDULES & NARRATIVE (SHEET 3 OF 3)



VICINITY MAP  
N.T.S.

SITE OWNER  
C&D LANDFILL, INC.

SITE ADDRESS  
802 RECYCLING LANE  
GREENVILLE, NC 27834

SITE CONTACT  
JUDSON WHITEHURST  
WAYNE BELL, MANAGER  
TEL. (252)-752-8274

THIS PLAN WAS PREPARED IN  
CONJUNCTION WITH:

JOHN A.K. TUCKER, P.E.  
CONSULTING ENGINEER  
BOX 297  
FUQUAY-VARINA, NC 27526

TEL. (919)-567-0483

## David Garrett & Associates

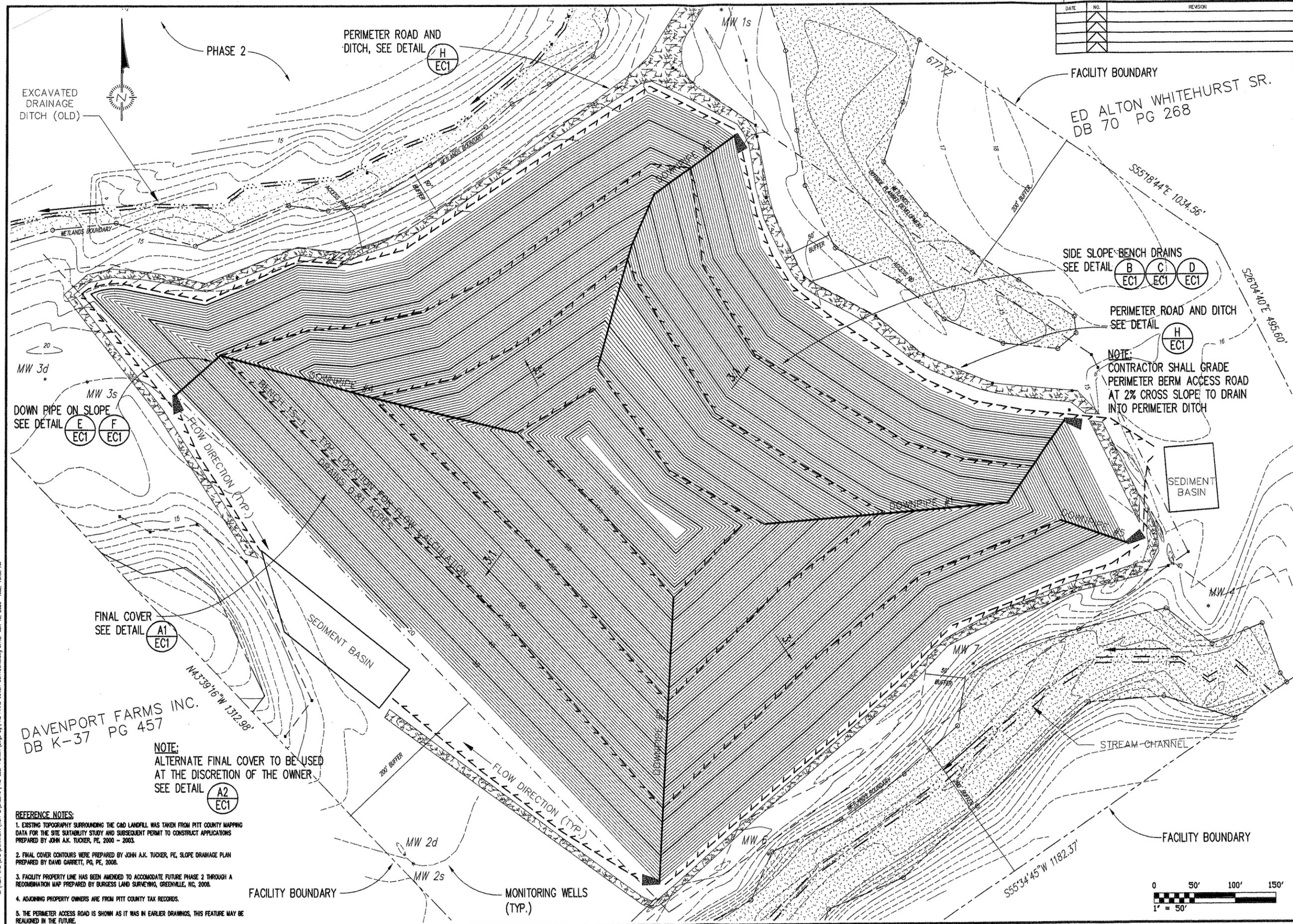
### Engineering and Geology

5105 Harbour Towne Drive, Raleigh, North Carolina 27604

Email: david\_garrett\_pg@mindspring.com    919-231-1818 (Office and Fax)    919-418-4375 (mobile)



DATE	NO.	REVISION



E:\VARI-CAD\CAD\GARRETT\W-2\SHEETS\PH2.CDL.FINAL COVER CONTOURS.dwg DATE: JUN 15, 2008 TIME: 10:59 AM

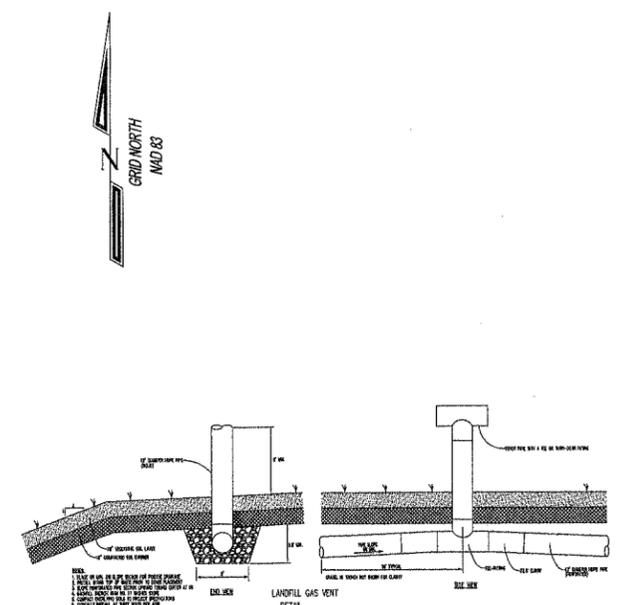
- REFERENCE NOTES:**
- EXISTING TOPOGRAPHY SURROUNDING THE C&D LANDFILL WAS TAKEN FROM PITT COUNTY MAPPING DATA FOR THE SITE SUSTAINABILITY STUDY AND SUBSEQUENT PERMIT TO CONSTRUCT APPLICATIONS PREPARED BY JOHN A.K. TUCKER, PE, 2000 - 2003.
  - FINAL COVER CONTOURS WERE PREPARED BY JOHN A.K. TUCKER, PE, SLOPE DRAINAGE PLAN PREPARED BY DAVID GARRETT, PG, PE, 2006.
  - FACILITY PROPERTY LINE HAS BEEN AMENDED TO ACCOMMODATE FUTURE PHASE 2 THROUGH A RECOMBINATION MAP PREPARED BY BURGESS LAND SURVEYING, GREENVILLE, NC, 2006.
  - ADJOINING PROPERTY OWNERS ARE FROM PITT COUNTY TAX RECORDS.
  - THE PERIMETER ACCESS ROAD IS SHOWN AS IT WAS IN EARLIER DRAWINGS, THIS FEATURE MAY BE REALIGNED IN THE FUTURE.

David Garrett & Associates  
Engineering and Geology  
5102 Heather Towne Drive, Raleigh, North Carolina 27604  
Email: david.garrett@earthlink.net 919-231-1888 (Office and Fax) 919-488-4375 (Mobile)

PROJECT TITLE:  
**C&D LANDFILL, INC.  
CDLF PHASE 1 CLOSURE PLAN  
PITT COUNTY (#74-07)**

DRAWING TITLE:  
**FINAL COVER CONTOURS  
AND  
SIDE SLOPE DRAINAGE**

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: C&D PH 1
SCALE: AS SHOWN	DATE: JUNE 2008
FILE NAME: PH1 FINAL COVER CONTOURS	DRAWING NO.:
2	C1



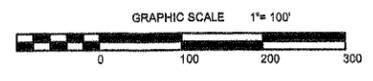
LEGEND

EXIST GROUND	18
GROUND WATER	18
PROPOSED GRADE	18
DIVERSION BERM	<<<
SILT FENCE	X
WETLANDS	[Stippled pattern]
FLOOD ZONE	[White box]

GENERAL NOTES:

- Boundary, topographic and wetland information taken from maps prepared by James A. Burgess, PLS, P.O. Box 881, Greenville, NC 27834, 252-758-4900
- All work shall be in accordance with applicable Federal, State and Local regulations.
- Contractor shall at all times maintain adequate safety measures, activities, and barricades, for the protection of all persons on or about the site. ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH DIVISION OF THE NC DEPARTMENT OF LABOR.

Contractor shall be responsible for the design of adequate shoring and bracing in all trenches and excavations that are a part of the construction operations of this project. Contractor shall be responsible for installation and maintenance of adequate shoring and bracing, and the protection of all persons and property on or about the site.



C2A

  
 February 18, 2006

**John A. K. Tucker, P.E.**  
**Consulting Engineer**  
 P.O. Box 287 Fayetteville, North Carolina 27526  
 (919) 567-0483 Fax: (919) 567-3611  
 Email: johnat@johnatuckerp.com

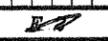
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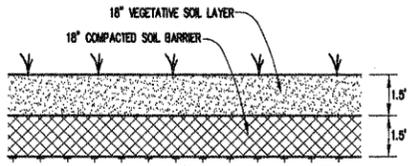
**C & D LANDFILL, INC.**  
 802 Recycling Lane  
 Greenville, NC 27834

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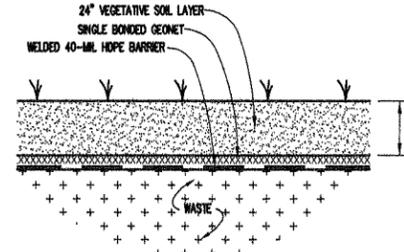
**C&D LANDFILL - PHASE 2**  
**PERMIT TO CONSTRUCT**  
**FINAL COVER CONTOURS**

NO.	REVISION/USER COMMENTS	DATE
1.		02/20/06

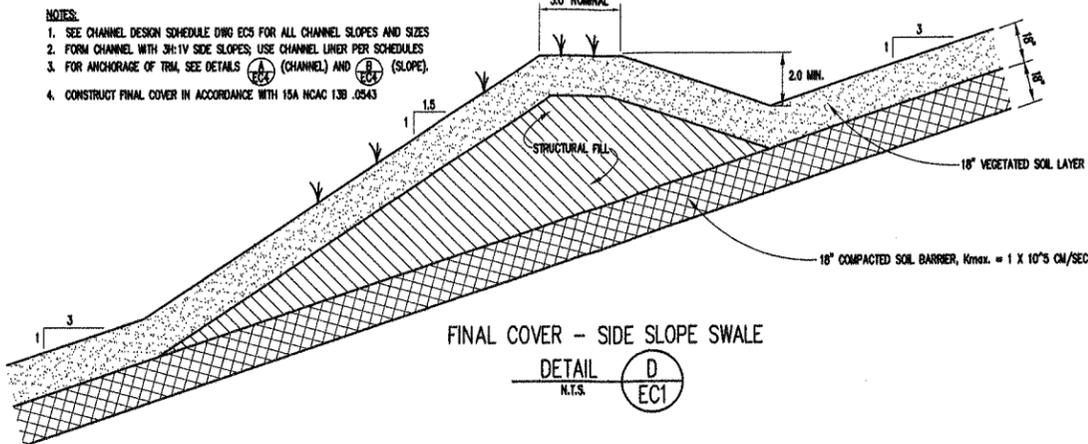




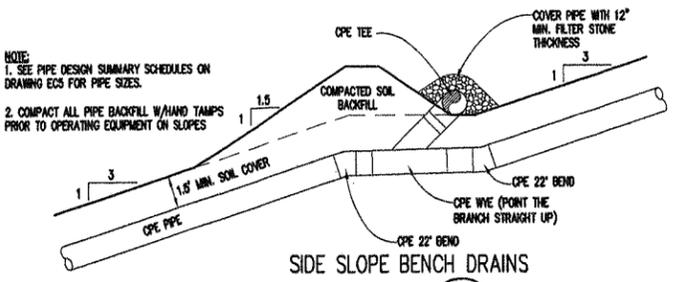
FINAL COVER SOIL DETAIL  
DETAIL A1  
N.T.S. EC1



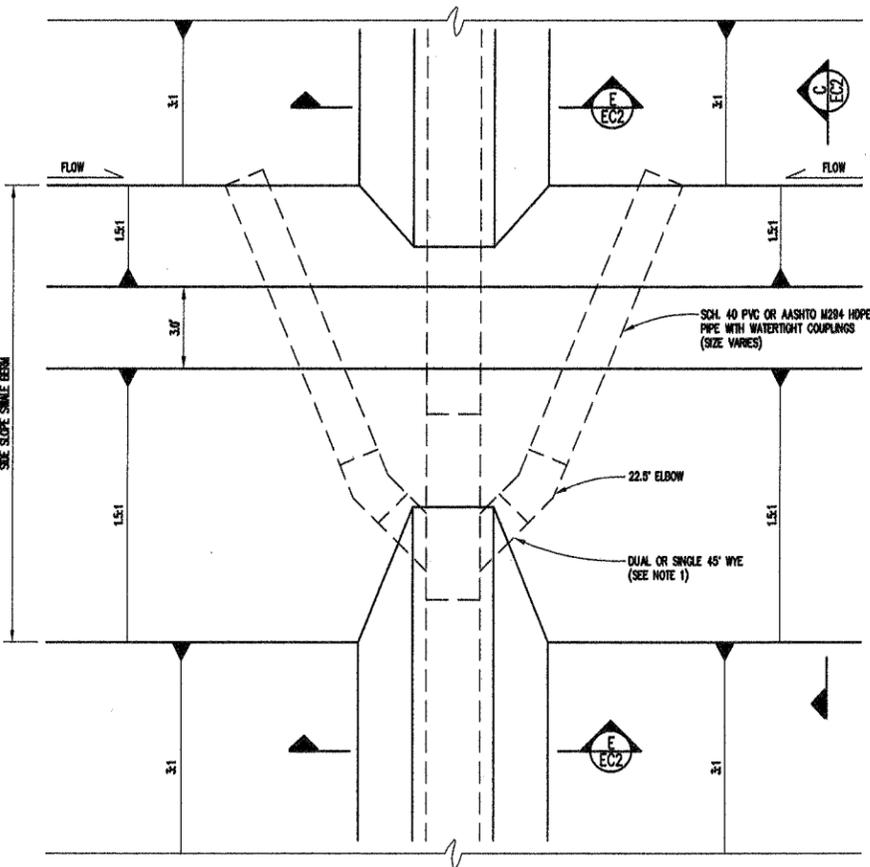
ALTERNATE FINAL COVER SOIL DETAIL  
DETAIL A2  
N.T.S. EC1



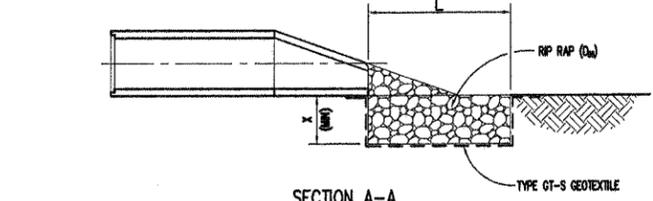
FINAL COVER - SIDE SLOPE SWALE  
DETAIL D  
N.T.S. EC1



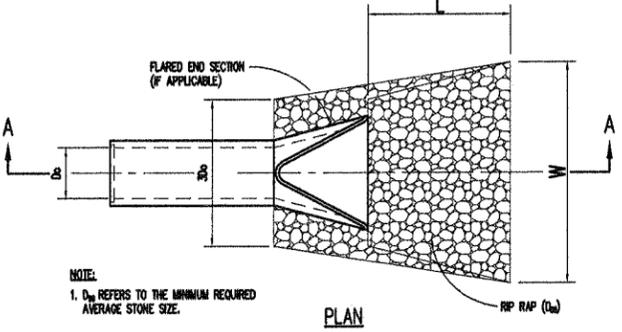
SIDE SLOPE BENCH DRAINS  
DETAIL C  
N.T.S. EC1



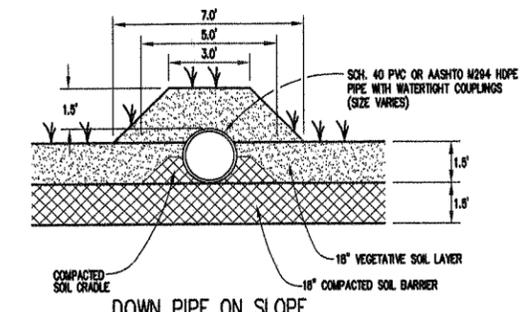
DOWN PIPE  
DETAIL B  
N.T.S. EC1



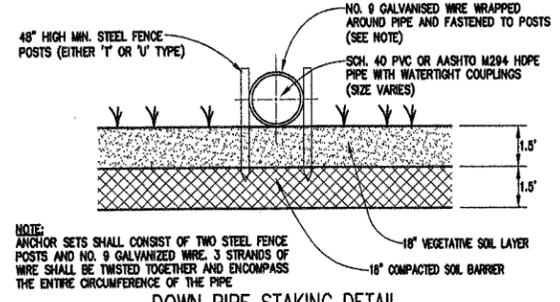
SECTION A-A



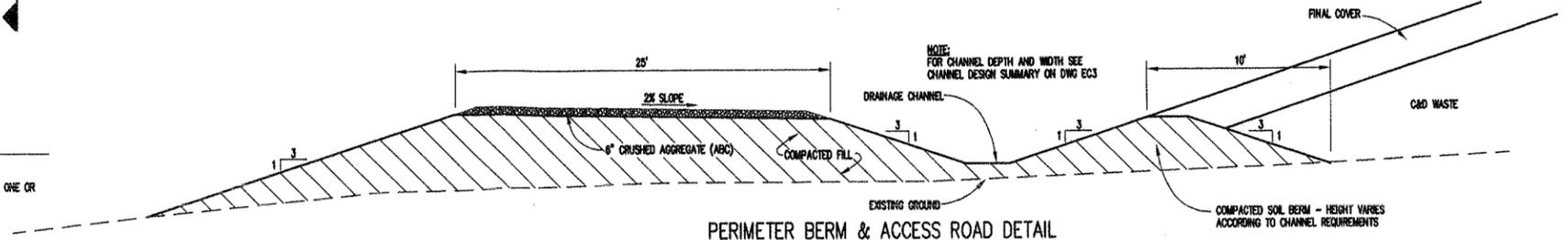
PLAN  
RIP RAP OUTLET PROTECTION  
(OUTLET TO FLAT AREA)  
DETAIL G  
N.T.S. EC1



DOWN PIPE ON SLOPE  
DETAIL E  
N.T.S. EC1



DOWN PIPE STAKING DETAIL  
DETAIL F  
N.T.S. EC1



PERIMETER BERM & ACCESS ROAD DETAIL  
DETAIL H  
N.T.S. EC1

- NOTES:
1. SEE CHANNEL DESIGN SCHEDULE DWG ECG FOR ALL CHANNEL SLOPES AND SIZES
  2. FORM CHANNEL WITH 3H:1V SIDE SLOPES; USE CHANNEL LINER PER SCHEDULES
  3. FOR ANCHORAGE OF TRM, SEE DETAILS (CHANNEL) AND (SLOPE).
  4. CONSTRUCT FINAL COVER IN ACCORDANCE WITH 15A NCAC 13B .0543

- NOTE:
1. SEE PIPE DESIGN SUMMARY SCHEDULES ON DRAWING ECG FOR PIPE SIZES.
  2. COMPACT ALL PIPE BACKFILL W/HAND TAMPS PRIOR TO OPERATING EQUIPMENT ON SLOPES.

- NOTE:
- ANCHOR SETS SHALL CONSIST OF TWO STEEL FENCE POSTS AND NO. 9 GALVANIZED WIRE. 3 STRANDS OF WIRE SHALL BE TWISTED TOGETHER AND ENCOMPASS THE ENTIRE CIRCUMFERENCE OF THE PIPE.

- NOTES:
1. DEPENDING ON LOCATION AND SIZE OF DOWN PIPE, USE ONE OR TWO WIRE PIPES AS APPROPRIATE.

DATE	NO.	REVISION

E:\VARI-CAD\CAD\GARRETT\W3-2\SHEETS\PH2\_CDLF PERMIT\DWG 04\S&C DETAILS SHT 1 OF 3.dwg DATE: JUN 19, 2008 TIME: 11:04 AM

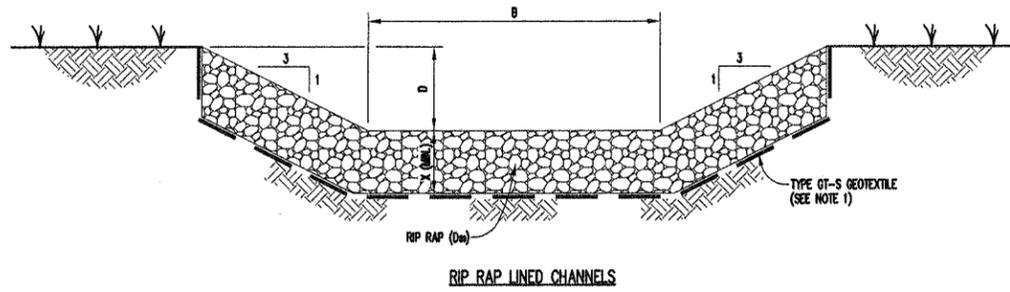
David Garrett & Associates  
Engineering and Geology  
5105 Harbour Towne Drive, Raleigh, North Carolina 27604  
Email: david.garrett@earthlink.net 919-251-1888 (Office and Fax) 919-488-4375 (mobile)

C&D LANDFILL, INC.  
CDLF PHASE 1 CLOSURE PLAN  
PITT COUNTY, NC (#74-07)

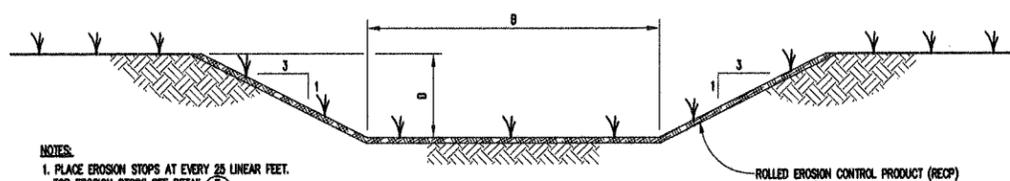
SEDIMENTATION & EROSION  
CONTROL DETAILS  
SHEET 1 OF 3

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO: C&D PH1
SCALE: AS SHOWN	DATE: JUNE 2008
FILE NAME: S&C DETAILS SHT 1 OF 3	DRAWING NO.:
3	EC1

DATE	NO.	REVISION



RIP RAP LINED CHANNELS

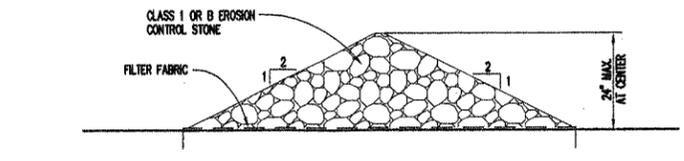


RECP LINED CHANNELS

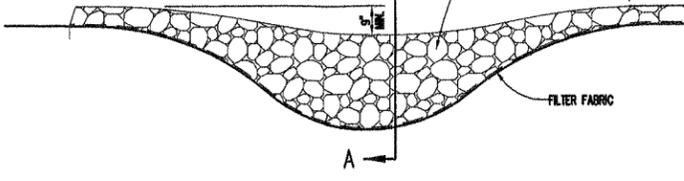
- NOTES:
1. PLACE EROSION STOPS AT EVERY 25 LINEAR FEET. FOR EROSION STOPS SEE DETAIL (A) EC2
  2. FOR ANCHORAGE OF RECP, SEE DETAIL (E) EC2

DRAINAGE CHANNEL DETAILS

DETAIL (A) EC2  
N.T.S.

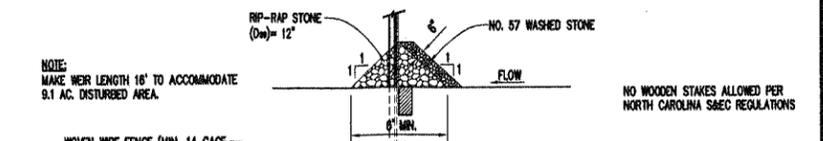


SECTION A-A

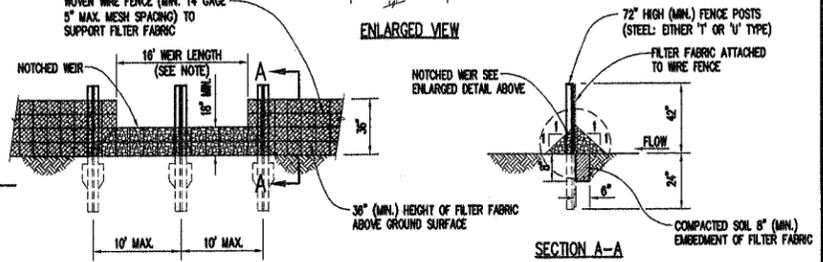


CHECK DAM

DETAIL (C) EC2  
N.T.S.



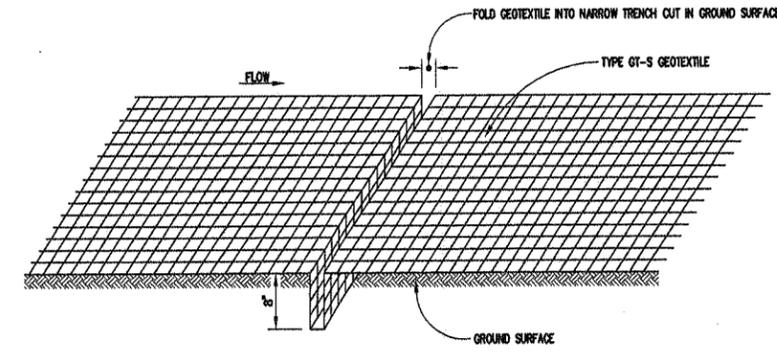
ENLARGED VIEW



ELEVATION

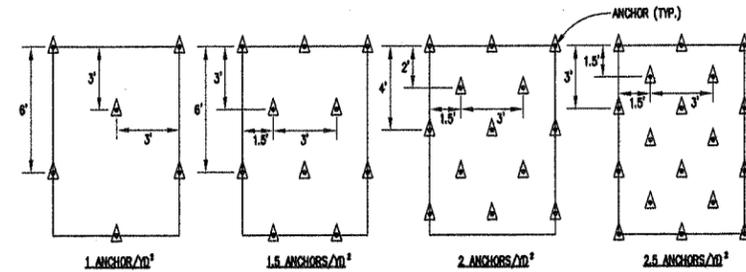
SILT FENCE W/ NOTCHED WEIR

DETAIL (D) EC2  
N.T.S.



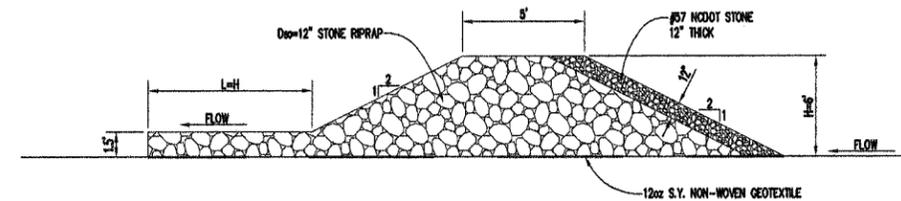
EROSION STOP DETAIL

DETAIL (F) EC2  
N.T.S.

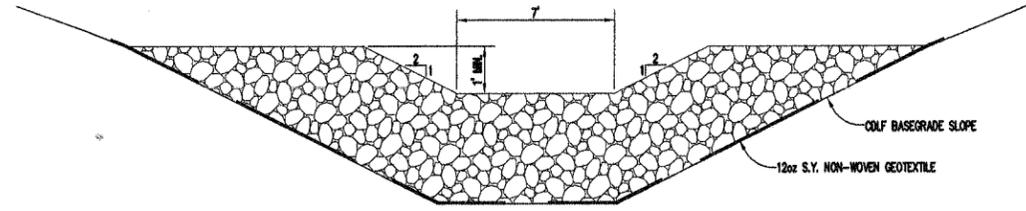


ANCHOR LAYOUT

DETAIL (E) EC2  
N.T.S.

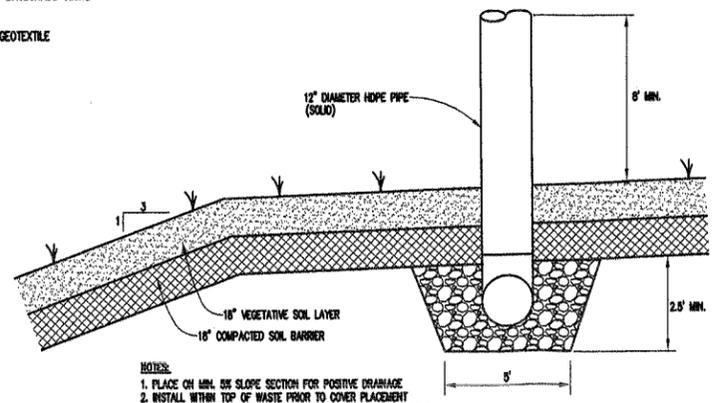


CROSS SECTION



ROCK DAM

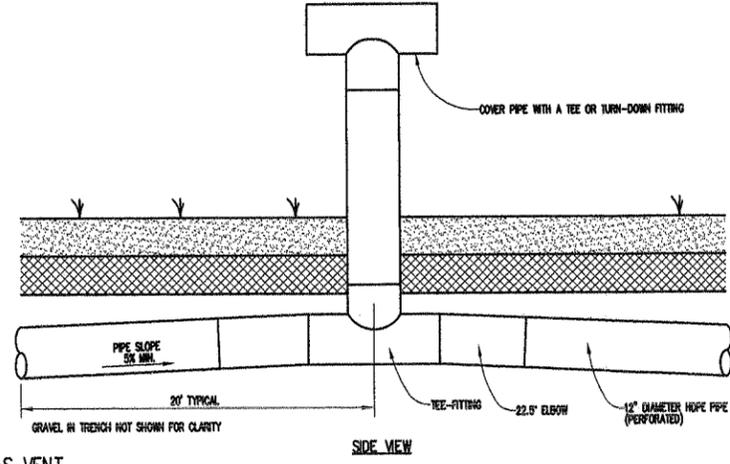
DETAIL (B) EC2  
N.T.S.



END VIEW

LANDFILL GAS VENT

DETAIL (G) EC2  
N.T.S.



SIDE VIEW

- NOTES:
1. PLACE ON MIN. 6% SLOPE SECTION FOR POSITIVE DRAINAGE
  2. INSTALL WITHIN TOP OF WASTE PRIOR TO COVER PLACEMENT
  3. SLOPE PERFORATED PIPE SECTION UPWARD TOWARD CENTER AT 5%
  4. BACKFILL TRENCH WITH NO. 57 WASHED STONE
  5. COMPACT OVERLAPPING SOILS TO PROJECT SPECIFICATIONS
  6. TYPICALLY INSTALL AT THREE VENTS PER ACRE

David Garrett & Associates  
Engineering and Geology  
5105 Inshore Towne Drive, Raleigh, North Carolina 27604  
Phone: 919-231-1688 Fax: 919-418-4375 (mobile)  
Email: david.garrett@pittmail.com



C&D LANDFILL, INC.  
CDLF PHASE 1 CLOSURE PLAN  
PITT COUNTY, NC (#74-07)

SEDIMENTATION & EROSION  
CONTROL DETAILS  
SHEET 2 OF 3

DESIGNED BY: G.D.G.	DRAWN BY: A.W.H.
CHECKED BY: G.D.G.	PROJECT NO.: C&D PH2
SCALE: AS SHOWN	DATE: JUNE 2008
FILE NAME: S&E/C DETAILS SH2 2 OF 3	DRAWING NO.:
SHEET NO.:	4
DRAWING NO.:	EC2

E:\14881-C&D\LANDFILL\WCA-2\SHEETS\PH2 CDLF FROM VADP.dwg 49 S&E/C DETAILS SH2 2 OF 3.dwg DATE: JUN 19, 2008 TIME: 11:05 AM

**PIPE DESIGN SCHEDULE**

Pipe No.	Dim. inches	Type	Length feet	Slope Pct.	QDS #	Inst. Structure	Outlet Structure	Rip-Up Approx.	Pipe End Width, ft.	Blch End Width, ft.
CP-PE #1	12	PVCPE	421	0.71	5	104.0	Projecting	12	3	12
CP-PE #2	12	PVCPE	357	0.71	7	120.0	Projecting	12	3	15
CP-PE #3	12	PVCPE	340	0.77	6	113.0	Projecting	12	3	15
CP-PE #4	12	PVCPE	612	0.20	8	101.0	Projecting	12	3	15

USE SAME PIPE DIAMETER AND MATERIAL FOR SMALLER PIPES

**Notes:**

Lengths and elevations are estimates unless noted otherwise and shall be verified by field measurements. Depth of all structures shall be a minimum of 6 feet below the pipe diameter below finished grade. Invert of all pipe shall be above the minimum of 18 inches above the top of the structure. All structures shall be constructed in accordance with the standards and codes of the North Carolina Department of Transportation. See also NCSDS (08-001) and NCSDS (08-002).

DOUBLE CHECK ALL REQUIRED PIPE LENGTHS AND GRADES BASED ON FIELD INSPECTION PRIOR TO ORDERING MATERIALS.

INSTALL ALL FITTINGS AND JOINTS IN ACCORDANCE WITH THE STANDARDS AND CODES OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION. SEE ALSO NCSDS (08-001) AND NCSDS (08-002).

All notes shall be read in conjunction with the drawings and shall be read in conjunction with the notes on the drawings.

For any structure use Class II pipe with a 0.01" - 0.02" space to lap a minimum thickness of 2 feet in the overlapping layers. Double check the elevation of the structure. If a 1/2" non-vented riser is used, the water table should be at least 2 feet above the structure. All pipe shall be installed in accordance with the standards and codes of the North Carolina Department of Transportation.

All pipes shall be installed in accordance with the standards and codes of the North Carolina Department of Transportation. See also NCSDS (08-001) and NCSDS (08-002).

ALL PIPES SHALL BE INSTALLED IN ACCORDANCE WITH THE STANDARDS AND CODES OF THE NORTH CAROLINA DEPARTMENT OF TRANSPORTATION. SEE ALSO NCSDS (08-001) AND NCSDS (08-002).

**SEEDING SCHEDULE**

Shoulders, Side Ditches, Slopes (Max 3:1)

DATE	TYPE	PLANTING RATE
Aug 15 - Nov 1	Tall Fescue	300 lbs/acre
Nov 1 - Mar 1	Tall Fescue & Abruzzi Rye	300 lbs/acre
Mar 1 - Apr 15	Tall Fescue	300 lbs/acre
Apr 15 - Jun 30	Hulled Common Bermudagrass	25 lbs/acre
Jul 1 - Aug 15	Tall Fescue and ***Bromtop Millet ***or Sorghum-Sudan Hybrids	125 lbs/acre 35 lbs/acre 30 lbs/acre

Shoulders, Side Ditches, Slopes (3:1 to 2:1)

Mar 1 - Jun 1	Sericea Lepeodesa (scarified) & use the following combinations:	50 lbs/acre
(Mar 1 - Apr 15)	Add Tall Fescue	120 lbs/acre
(Mar 1 - Jun 30)	Or Add Weeping Lovegrass	10 lbs/acre
(Mar 1 - Jun 30)	Or Add Hulled Common Bermudagrass	25 lbs/acre
Jun 1 - Sep 1	***Tall Fescue and ***Bromtop Millet ***or Sorghum-Sudan Hybrids	120 lbs/acre 35 lbs/acre 30 lbs/acre
Sep 1 - Mar 1	Sericea Lepeodesa (unhulled-unsarified) and Tall Fescue	70 lbs/acre 120 lbs/acre
(Nov 1 - Mar 1)	Add Abruzzi Rye	25 lbs/acre

Consult Conservation Engineer or Soil Conservation Service for additional information concerning other alternatives for vegetation of denuded areas. The above vegetation rates are those which do well under local conditions; other seeding rate combinations are possible.

\*\*\*Temporary - Reseed according to optimum season for desired permanent vegetation. Do not allow temporary cover to grow over 12" in height before mowing, otherwise fescue may be shaded out.

**SEEDBED PREPARATION**

1. CHISEL COMPACTED AREAS AND SPREAD TOPSOIL 3 INCHES DEEP OVER ADVERSE SOIL CONDITIONS, IF AVAILABLE.
2. RIP THE ENTIRE AREA TO 6 INCHES DEEP.
3. REMOVE ALL LOOSE ROCK, ROOTS, AND OTHER OBSTRUCTIONS LEAVING SURFACE REASONABLY SMOOTH AND UNIFORM.
4. APPLY AGRICULTURAL LIME, FERTILIZER, AND SUPERPHOSPHATE UNIFORMLY AND MIX WITH SOIL. (SEE BELOW).
5. CONTINUE TILLAGE UNTIL A WELL-PULVERIZED, FIRM REASONABLY UNIFORM SEEDBED IS PREPARED 4 TO 6 INCHES DEEP.
6. SEED ON A FRESHLY PREPARED SEEDBED AND COVER SEED LIGHTLY WITH SEEDING EQUIPMENT OR OULTPACK AFTER SEEDING.
7. MULCH IMMEDIATELY AFTER SEEDING AND ANCHOR MULCH.
8. INSPECT ALL SEEDBED AREAS AND MAKE NECESSARY REPAIRS OR RESEEDINGS WITHIN THE PLANTING SEASON, IF POSSIBLE. IF STAND SHOULD BE OVER 60% DAMAGED, REESTABLISH FOLLOWING ORIGINAL LIME, FERTILIZER AND SEEDING RATES.
9. CONSULT CONSERVATION INSPECTOR ON MAINTENANCE TREATMENT AND FERTILIZATION AFTER PERMANENT COVER IS ESTABLISHED.

\* APPLY: AGRICULTURAL LIMESTONE - 2 TONS/ACRE (3 TONS/ACRE IN CLAY SOILS)  
FERTILIZER - 1,000 LBS./ACRE - 10-10-10  
SUPERPHOSPHATE - 500 LBS./ACRE - 20% ANALYSIS  
MULCH - 2 TONS/ACRE - SMALL GRASS STRAW  
ANCHOR - ASPHALT EMULSION @ 300 GALS./ACRE

**EROSION AND SEDIMENTATION CONTROL CONSTRUCTION NARRATIVE**

**NOTIFICATIONS**

PRIOR TO COMMENCING EARTH WORK IN ANY CRITICAL AREAS, E.G., NEAR STREAM BUFFERS OR WETLANDS FEATURES, THE CONTRACTOR SHALL NOTIFY THE NC DENR DIVISION OF ENVIRONMENTAL MANAGEMENT, WATER QUALITY SECTION AND NC DENR DIVISION OF LAND RESOURCES, LAND QUALITY SECTION AND THE PROJECT ENGINEER FOR AN INSPECTION OF SEDIMENTATION AND EROSION CONTROL MEASURES. NO GROUND DISTURBING WORK SHALL TAKE PLACE WITHOUT PROPER MEASURES IN PLACE. THE PROJECT ENGINEER SHALL BE KEPT INFORMED OF ALL NEW WORK.

**GENERAL**

ALL WORK SHALL CONFORM TO THE RULES AND GUIDELINES OF THE NORTH CAROLINA SEDIMENTATION CONTROL LAW, AS ADMINISTERED BY NC DENR DIVISION OF LAND QUALITY.

CRITICAL SEDIMENTATION CONTROL FEATURES, E.G., CLEARING LIMITS, SEDIMENT TRAPS, GRADED CHANNELS, BASINS, OUTLET STRUCTURES, LEVEL SPREADERS, ETC., SHALL BE FIELD STAKED BY A LICENSED SURVEYOR OR OTHER PARTY APPROVED BY THE PROJECT ENGINEER AND CONSTRUCTED ACCORDING TO PLAN DIMENSIONS. ALL WORK SHALL PROCEED IN A METHODOICAL AND WORKMANLIKE MANNER. THE OWNER/OPERATOR IS RESPONSIBLE FOR SECURING ANY REQUIRED LAND DISTURBING PERMITS AND PAYING FEES.

THIS S&EC PLAN DESCRIBES TEMPORARY AS WELL AS PERMANENT SEDIMENTATION AND EROSION CONTROL MEASURES. THIS PLAN ASSUMES THAT ALL DESIGNED MEASURES WILL BE INSTALLED. FIELD ADJUSTMENTS ARE ALLOWABLE WITH THE ADVANCE PERMISSION OF THE PROJECT ENGINEER.

SEDIMENTATION AND EROSION CONTROL MEASURES ARE SUBJECT TO FIELD INSPECTION AND PERFORMANCE EVALUATION BY WAKE COUNTY. IF ANY MEASURES ARE FOUND INADEQUATE, A REVIEW OF THE MEASURES AS CONSTRUCTED SHALL BE PERFORMED TO ENSURE ADHERENCE TO THE PLANS. THEN, IF NEEDED, ADDITIONAL DESIGNS SHALL BE SUBMITTED TO NC DENR DIVISION OF LAND RESOURCES FOR REVIEW. SUBSTANTIAL DEVIATIONS FROM THIS PLAN SHALL BE REVIEWED IN ADVANCE BY THE ENGINEER AND MAY BE SUBJECT TO PRIOR APPROVAL BY WAKE COUNTY ENVIRONMENTAL SERVICES.

**SILT FENCING**

ADEQUATE SILT FENCING SHALL BE INSTALLED AND PROPERLY MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD. THE PLANS SHOW THE MINIMUM REQUIRED AREAS INTENDED FOR SILT FENCE CONSTRUCTION. THE SILT FENCE SHALL BE OF THE TYPE DESIGNATED IN THE PLANS, UNLESS THE ENGINEER APPROVES A SUBSTITUTE. PREFABRICATED SILT FENCING ATTACHED TO WOODEN STAKES WILL NOT BE APPROVED - ONLY METAL POSTS AND WIRE-BACKED SILT FENCING WILL BE ACCEPTABLE. THE BASE OF THE FABRIC SHALL BE EMBEDDED IN A TRENCH PER THE PLANS AND AN APPROVED BACKFILL USED TO SECURE THE FABRIC. OUTLETS SHALL BE INSTALLED AT LOCATIONS SHOWN ON THE PLANS, OR AS DESIGNATED IN THE FIELD BY THE ENGINEER.

**DIVERSION DITCHES AND SOIL BERMS**

TEMPORARY AND PERMANENT DIVERSION DITCHES (SWALES) AND SOIL BERMS ARE REQUIRED THROUGHOUT THE PROJECT TO CONVEY SURFACE RUNOFF. ALL DITCHES SHALL BE BUILT TO THE DIMENSIONS AND GIVEN THE CHANNEL-LINING MATERIAL SPECIFIED IN THIS PLAN, UNLESS THE ENGINEER HAS APPROVED AN ALTERNATIVE. ALL SOIL BERMS SHALL BE BUILT TO THE MINIMUM DIMENSIONS SHOWN ON THE PLANS. SOIL SHALL BE COMPACTED AND STABILIZED WITH VEGETATION IMMEDIATELY UPON COMPLETION OF THE CONSTRUCTION. ADDITIONAL DITCHES AND SOIL BERMS MAY BE REQUIRED. ALL WATER-DIVERSION STRUCTURES, WHETHER SHOWN ON THE PLANS OR ADDED AS A FIELD ADJUSTMENT, SHALL BE MADE TO DRAIN TO AN APPROVED MEASURE.

**TEMPORARY SEDIMENT TRAPS**

SEDIMENT TRAPS SHALL CONFORM TO WAKE COUNTY "CUSTOM BASIN" STANDARDS AND SHALL BE CONSTRUCTED AT THE LOCATIONS AND DIMENSIONS SHOWN IN THE PLANS DURING THE EARLY STAGES OF CLEARING. ASSOCIATED DITCHES AND SILT FENCES SHALL BE INSTALLED. FIELD ADJUSTMENTS OF LOCATIONS MAY BE ALLOWABLE SUBJECT TO APPROVAL BY THE PROJECT ENGINEER. ALL TEMPORARY SEDIMENT TRAPS SHALL BE CLEANED OUT AND MAINTAINED AS NEEDED FOR AS LONG AS NECESSARY TO PROTECT WATER QUALITY. ALL EARTHWORK ASSOCIATED WITH THE SEDIMENT TRAPS SHALL BE VEGETATED UPON COMPLETION. THE TRAPS MAY BE LEFT IN PLACE INDEFINITELY, OR, ONCE THE ENGINEER DEEMS A TRAP TO BE OBSOLETE, IT MAY BE REMOVED AND THE GROUND RESTORED TO PROMOTE POSITIVE DRAINAGE. VEGETATION OR OTHER PROTECTIVE MEASURES SPECIFIED BY THE ENGINEER SHALL BE ESTABLISHED IMMEDIATELY AT THE SITE OF ANY ABANDONED TRAPS.

**SEDIMENT BASINS**

THE PERMANENT SEDIMENT BASIN (SB-1) LOCATED WEST OF THE LANDFILL SHALL SERVE AS THE PRIMARY SEDIMENT BASIN THROUGHOUT THE CONSTRUCTION AND OPERATION OF THE FACILITY. THE SEDIMENT BASINS WILL BE CONVERTED TO PERMANENT STORM WATER QUALITY BASINS AT THE END OF CONSTRUCTION. THE BASIN SHALL BE INSPECTED AND CLEANED OUT OR MAINTAINED AS NEEDED PRIOR TO INITIATING SITE-WIDE GRADING WORK. THE OUTLET STRUCTURES WILL REMAIN IN PLACE INDEFINITELY. AT SOME FUTURE TIME, IT MAY BE NECESSARY TO REFURBISH THE BASIN BY REPLACING THE BARREL OR RISER STRUCTURE. A PROCEDURE FOR OUTLET STRUCTURE REPAIR IS PROVIDED AT THE END OF THIS SECTION.

**CONSTRUCTION SEQUENCE**

**FINAL CLOSURE OF PHASE 1 (EXISTING CDF LANDFILL)** - UPGRADE EXISTING CHANNELS LEADING TO SB-1 (CHANNELS #26 - #30) TO DESIGN DIMENSIONS AND/OR CHANNEL LINER MATERIAL AS NEEDED. INSTALL TEMPORARY MEASURES SHOWN ON CONSTRUCTION PLANS AND REMOVE SEDIMENT BUILDUP IN SB-1. PLACE AND COMPACT COVER SOIL ON SIDE SLOPES IN ACCORDANCE WITH PROJECT SPECIFICATIONS. CONSTRUCT PERMANENT CAP DIVERSION BERMS AT 2 PERCENT GRADES (SEE CONSTRUCTION PLANS) AND INSTALL SLOPE DRAIN PIPES. BE SURE TO COMPACT ALL SOIL WORK AND INSTALL INLET PROTECTION ON SLOPE DRAINS. DELIVER SOILS TO THE TOP OF THE LANDFILL, BUT COMPLETE THE SIDE SLOPE CLOSURE IN INCREMENTS WORKING FROM THE BOTTOM UPWARDS TO HIGHER ELEVATIONS. VERY IMPORTANT - VEGETATE SIDE SLOPES (USING STRAW MULCH AND TACK) AS SOON AS SECTIONS ARE COMPLETED TO STABILIZE THE SLOPES. REFER TO THE SEEDBED PREPARATION NOTES AND SEEDING SCHEDULE. IT MAY BE NECESSARY TO ESTABLISH A WOODY CROP OF RYE AND OTHER SHORT-TERM VEGETATION, DEPENDING ON THE TIMING OF THE CONSTRUCTION START UP, FOLLOWED BY OVER-SEEDING DURING MORE FAVORABLE CONDITIONS TO ESTABLISH PERMANENT VEGETATION. IF EXCESSIVELY WET OR DRY WEATHER CONDITIONS PREVAIL DURING CONSTRUCTION, COVERING THE SLOPES WITH WOODY MULCH IS ADVISED, THEN FOLLOW UP DURING MORE FAVORABLE WEATHER BY PLOWING THE MULCH INTO THE TOPSOIL AND SEEDING IN A TYPICAL MANNER WITH SOIL AMENDMENTS, SEED, STRAW MULCH AND TACK.

**SOIL BORROW ACTIVITIES AND PHASE 2 SITE PREPARATION** - INSTALL TEMPORARY MEASURES (E.G., SILT FENCE) SHOWN ON CONSTRUCTION PLANS, FOLLOWED BY CLEARING AND GRUBBING FOR NEW EMBANKMENT AND CONVEYANCES. PLACE ALL MEASURES INTO SERVICE PRIOR TO INITIATING FULL-SCALE GRADING ACTIVITIES. COMPLETE PERIMETER EMBANKMENT AND STABILIZE EXTERIOR SLOPES WITH VEGETATION AND/OR EROSION CONTROL MAT, STONE, MULCH, ETC., TO PREVENT EROSION. ONCE PERIMETER EMBANKMENT IS COMPLETED, GRADE INTERIOR PORTIONS OF LANDFILL, KEEPING ALL RUNOFF DIRECTED TOWARD INTERNAL SUMPS (LOWEST ELEVATIONS WITHIN TWO SEPARATE CELLS, LOCATED ON NORTH AND SOUTH SIDE OF CENTRAL RIDGE. SUMPS SHALL STAY OPERATIONAL THROUGHOUT CONSTRUCTION AND EARLY STAGES OF OPERATIONS - WATER SHALL BE REMOVED VIA PUMPS AS NEEDED TO PREVENT WASTE DEPOSITION INTO STANDING WATER, PER NC DENR REGULATIONS.

**DURING DISPOSAL OPERATIONS** - AS WASTE SLOPES BECOME POSITIVE (ABOVE THE ELEVATIONS OF THE PERIMETER CHANNELS), USE VEGETATION AND/OR WOODY MULCH TO STABILIZE INTERIM COVER SOIL. WORK THE LANDFILL IN SMALL INCREMENTS TO MINIMIZE EXPOSED SLOPE AREAS - IDEALLY, THE WORKING FACE SHOULD BE KEPT TO A HALF-ACRE IN SIZE. ONCE AN AREA IS BROUGHT TO FINAL GRADE, IT SHOULD BE CLOSED WITH APPROVED FINAL COVER. INTERIM COVER SHALL BE APPLIED AND VEGETATED OR COVERED WITH WOODY MULCH IN AREAS THAT WILL NOT RECEIVE ADDITIONAL ACTIVITY FOR 20 DAYS, OR MORE. DURING ALL PHASES OF OPERATIONS, INSPECT THE SEDIMENT BASINS AND/OR OTHER MEASURES FOR EXCESS SEDIMENT BUILDUP OR DAMAGE - INSPECTIONS SHOULD BE CONDUCTED WEEKLY OR AFTER ANY RAINFALL EVENT MEASURING IN EXCESS OF ONE-HALF INCH WITHIN 24 HOURS. REMOVE EXCESS SEDIMENT AND/OR MAKE REPAIRS AS NEEDED. INSPECT SLOPES FREQUENTLY AND CORRECT OBVIOUS EROSION PROBLEMS.

**FINAL CLOSURE OF PHASE 2 - FINAL COVER** SHALL BE APPLIED AND VEGETATED INCREMENTALLY AS AREAS ARE BROUGHT TO FINAL DESIGN GRADES. SEE PROCEDURES FOR FINAL CLOSURE OF PHASE 1 (ABOVE). INSPECT AND REFURBISH SEDIMENT CONTROL MEASURES AS NEEDED, ESTABLISH VEGETATION WITHIN 20 DAYS FOLLOWING COMPLETION OF GRADING ACTIVITIES ON ALL PORTIONS OF THE LANDFILL FINAL COVER.

**CONVERTING SEDIMENT BASIN TO STORM WATER QUALITY POND**

AFTER THE SITE IS STABILIZED WITH VEGETATION, INCLUDING THE DAM AND SIDE SLOPES WITHIN THE BASIN, THE BASIN SHALL BE INSPECTED AND ACCUMULATED SEDIMENT REMOVED. REPAIR ANY EROSION AND UPGRADE STONE ENERGY DISSIPATORS AND/OR VEGETATIVE COVER AS NEEDED. ENSURE THAT THE POND DRAIN IS FUNCTIONAL (MAKE SURE THE DRAIN IS SHUT). REMOVE ANY ACCUMULATED DEBRIS FROM THE TRASH RACK AND/OR RISER PIPE AND CHECK THE SECURITY OF THE RISER PIPE AND TRASH RACK. ENSURE ALL ENERGY DISSIPATORS, INCLUDING INLETS TO BASIN THAT EXTEND TO BOTTOM, ARE IN PLACE. ENSURE ALL PIPES, INLETS, GRATES, AND APPROPRIATE PROTECTIVE MEASURES ARE FUNCTIONAL.

**PROCEDURE FOR REPLACING A PIPE OR RISER/BARREL STRUCTURE**

PERMANENT STORM DRAIN PIPES AND RISER/BARREL STRUCTURES FOR THE SEDIMENT BASIN ARE DESIGNED FOR AN OPERATIONAL LIFE OF SEVERAL DECADES. IF A PIPE OR SEDIMENT BASIN RISER/BARREL STRUCTURE FAILS OR MUST BE REFURBISHED, THE STRUCTURE MAY BE TEMPORARILY BYPASSED DURING THE REPAIRS VIA PUMPING TO A TEMPORARY SEDIMENT TRAP. IDEALLY, THIS SHOULD BE PERFORMED DURING A TIME OF FAIR WEATHER. INLETS TO AFFECTED PIPES SHOULD BE BLOCKED AND RUNOFF DIVERTED TO AN APPROVED MEASURE.

**REMOVAL** - INITIAL BARREL/RISER REMOVAL ACTIVITIES SHALL CONSIST OF DEWATERING THE BASIN (IF NEEDED), INSTALLING TEMPORARY SEDIMENT CONTROL MEASURES (E.G., SILT FENCING, TEMPORARY SEDIMENT TRAPS, DIVERSION SWALES AND/OR BERMS), THEN REMOVING ALL SEDIMENT BUILD-UP. THE REMOVED SEDIMENT SHOULD BE STOCKPILED WITHIN THE BASIN (AWAY FROM THE MAIN FLOW CHANNEL) OR WITHIN A SEPARATE AREA THAT IS PROTECTED BY APPROPRIATE SEDIMENT CONTROL MEASURES. THE SEDIMENT SHALL BE ALLOWED TO DRAIN THEN DISPOSED OFF-SITE OR UTILIZED ON-SITE.

**REPLACEMENT** - THE DAMAGED PORTION OF THE STRUCTURE SHALL BE EXCAVATED AND REPLACED WITH EQUAL OR BETTER MATERIALS AS THE ORIGINAL. ALL BACKFILL SHALL BE COMPACTED AND VEGETATED IMMEDIATELY UPON COMPLETION. IF THE ENERGY DISSIPATORS ARE DISTURBED, E.G., RIP-RAP APRONS, THAT WORK SHALL BE RESTORED TO ORIGINAL OR BETTER CONDITION. THE ENGINEER SHALL BE GIVEN AN OPPORTUNITY TO EVALUATE WHETHER THE ORIGINAL MATERIALS AND SIZES ARE ADEQUATE FOR REPLACEMENT FUNCTION. IT IS ANTICIPATED THESE STORM WATER CONTROL FEATURES WILL REMAIN INDEFINITELY.

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**C&D LANDFILL, INC.**  
CDFL PHASE 1 CLOSURE PLAN  
PITT COUNTY (#74-07)

**SEDIMENTATION & EROSION CONTROL SCHEDULES & NARRATIVE (SHEET 3 OF 3)**

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