C&D Landfill, Inc., is a privately owned and operated disposal facility located south of US 264 in eastern Pitt County, within the Pactolus community (see in-text **Figure 1**). Phase 1 commenced operations in 2001. Phase 2 is a non-contiguous expansion involving an addition of land to the permitted facility boundary. A Site Suitability evaluation for Phase 2 was prepared under then-current rules, **15A NCAC 13B .0500,** *et seq.*, which was submitted to NC DENR Division of Waste Management for review in early 2003. A hydrogeologic review was completed in 2004, involving one round of responses to review comments documented in September 2004, but the facility plan amendment and engineering plans were never reviewed by the Division due, in part, to pending rule changes and legislative action that delayed the review of many permit applications between 2004 and 2007.

New rules pertaining to C&D landfills were promulgated, i.e., **15A NCAC 13B .0531** *et seq.*, known as the "**2006 C&D Rules**", which require that ongoing facilities after January 2007 conform to the application submittal requirements and operational conditions prescribed by those rules. This is an "existing" facility as of August 31, 2007, with respect to the 2007 Solid Waste Act, and the facility meets the vertical separation requirements of the 2006 C&D Rules, as such the facility and subsequent expansions do not require a synthetic liner – the soil-type requirements prescribed by the 2006 C&D Rules for the upper two (2) feet beneath the base grade do apply for Phase 2.

At present, the Phase 1 is approaching full capacity, and the Owner/Operator desires a permit amendment to include the Phase 2 expansion, in conjunction with a renewal of the Permit to Operate. The Franchise Agreement with Pitt County was renewed in 2003, which identified the footprint expansion and increased waste tonnages, with a term of seven (7) years – the Franchise Agreement is valid and in force relative to the Phase 2 expansion. This document has been prepared to meet the requirements of the 2006 C&D Rules, i.e., the Design Hydrogeologic Evaluation, Engineering Plan, Construction Requirements, Construction Quality Assurance (CQA), Operations Plan, Monitoring Plan, and Financial Assurance. Please note, the .0500 rules required a single hydrogeologic investigation but in practice, a two-part approach was required by Division policy that has now been codified in the 2006 C&D Rules.

The original site characterization study for Phase 2, performed in 2002, included a sufficient number and depth of borings to provide the information for the **Site Suitability Evaluation** (Part 1) and the **Design Hydrogeologic Study** (Part 2); as such, no additional borings were performed since the earlier submittal. Ongoing monitoring of Phase 1 since 2000 provides ample historic data for the evaluation of the long-term seasonal high ground water table. Based on the site characterization study, conditions at Phase 2 are similar to those at Phase 1 with respect to ground water depths, flow directions, and absence of down-gradient ground water users. The data indicate an upward vertical gradient beneath the site and there is a partial confining layer present. Site conditions are present that will facilitate effective monitoring of Phases 1 and 2 as separate CDLF units.

This work is presented in two Volumes: **Volume 1** is the **Design Hydrogeologic Study** (with the **Monitoring Plan**); **Volume 2** is the **Facility, Operations**, and **Closure Plans**.

OWNER/OPERATOR INFORMATION

C&D Landfill, Inc. / EJE Recycling, Inc

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

Tel 252-752-8274
Fax 252-752-9016

Please refer to the following applicant signature page.

SITE LOCATION DATA

Latitude	N 35.3477
Longitude	E -81.9504

Pitt County Tax Department PIN identification is given on the Pitt County GIS Parcel Map (**Figure A**) following this text; deed book and page number for plat identification is given on the recombination map (**Appendix 1**).

REVISIONS

Previous documents:

x	Part 1 Site Suitability Application C&D Landfill, Inc., Phase 2	November 2002 (Revised Sept. 2004)

This document:

Rev 0	Part 2 Permit to Construct Application C&D Landfill, Inc., Phase 2 (Vol. 1 and 2)	February 2008
Rev 1	Resubmittal of Volumes 1 and 2 in response to 2006 C&D rules	October 2008
Rev 2	Update of Volumes 1 and 2 in response to regulatory Comments	February 12, 2009
Rev 2.1	Update of Volumes 1 and 2 in response to regulatory Comments	March 15, 2009

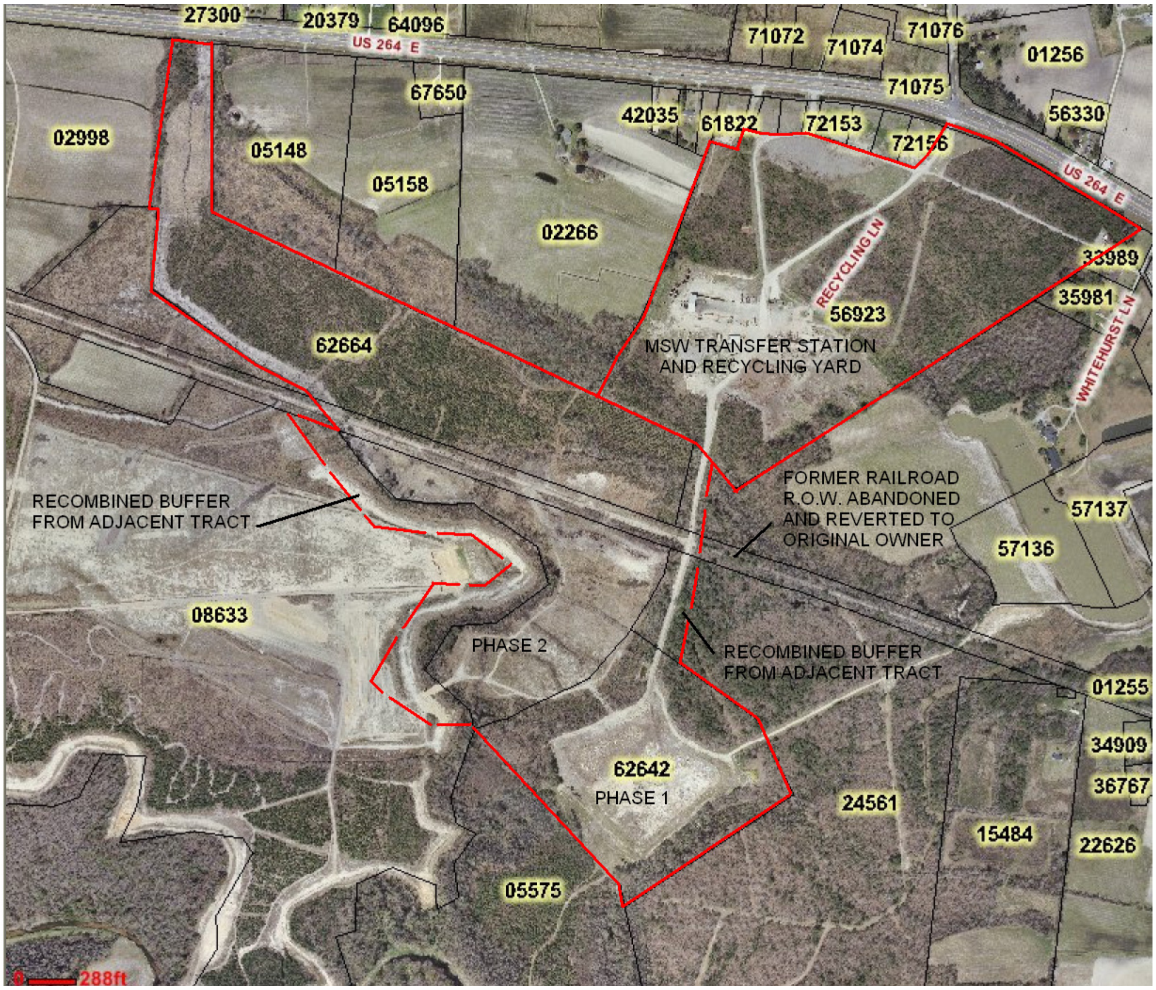

Figure A – Pitt County GIS Parcel Map

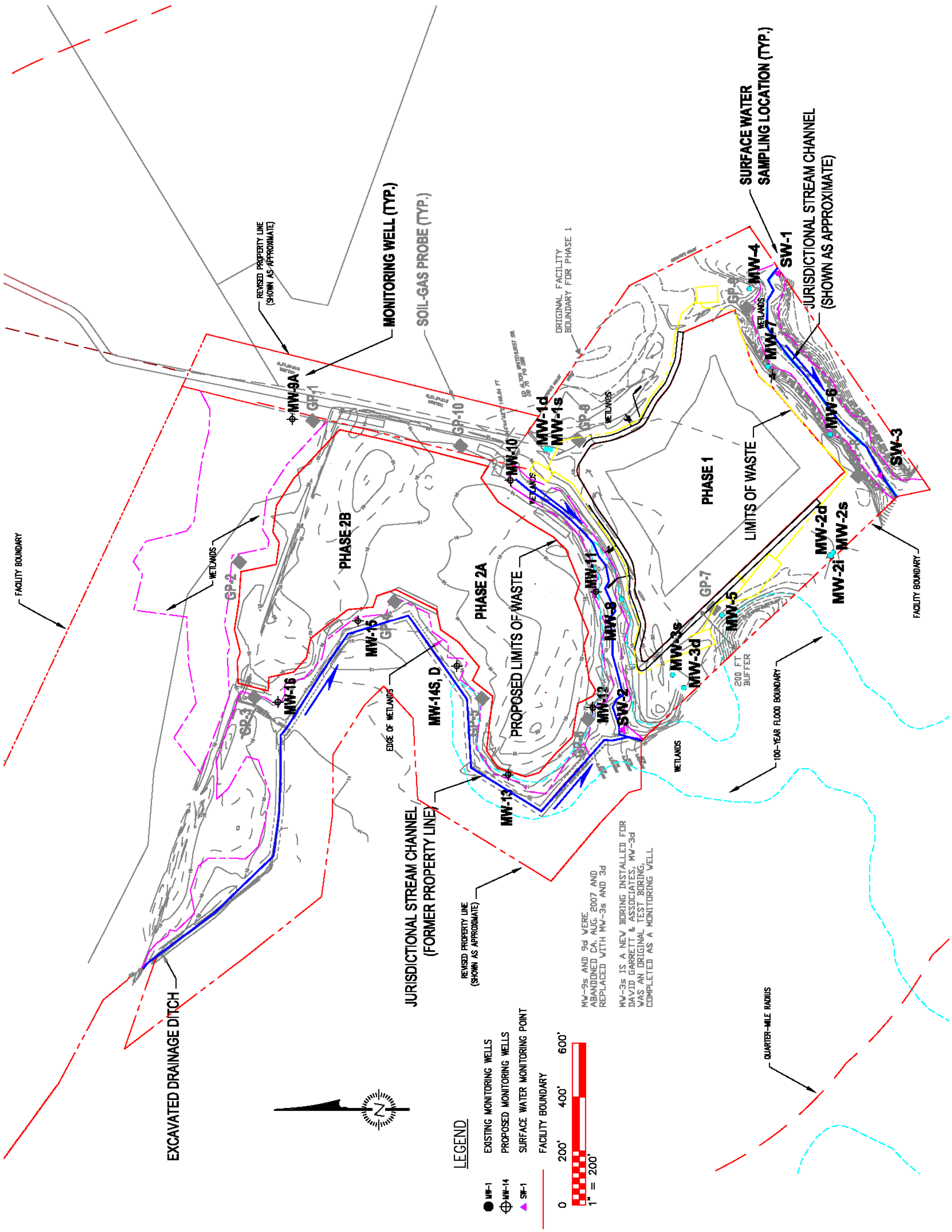

Figure B – Facility Layout and Drainage Pattern

Signature page of Applicant –

Name of facility C & D Landfill, Inc.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision and that the information provided in this application is true, accurate, and complete to the best of my knowledge.

I understand that North Carolina General Statute 130A-22 provides for administrative penalties of up to fifteen thousand dollars ($15,000.00) per day per each violation of the Solid Waste Management Rules. I further understand that the Solid Waste Management Rules may be revised or amended in the future and that the facility siting and operations of this solid waste management facility will be required to comply with all such revisions or amendments.

[signature]	Judson Whitehurst	6/24/08
Signature	Print Name	Date

President
Title

C & D Landfill, Inc.
Business or organization name

REFER TO THE TABLE OF CONTENTS IN VOLUME 2
FOR A GUIDE TO THE ENGINEERING ASPECTS OF THE FACILITY PLAN

FIGURES *Refer to page numbers in text*

TABLES *Refer to the tabbed section that follows Section 1*

DRAWINGS *Refer to the rolled drawing set that accompanies this report*

APPENDICES – VOLUME 1

APPENDICES – VOLUME 2

1.0 BACKGROUND INFORMATION

1.1 Development History

C&D Landfill, Inc. Phase 1 encompasses a 15-acre footprint within a 33-acre facility boundary. The facility is owned and operated by C&D Landfill, Inc., in conjunction with the adjacent EJE Recycling, Inc., both of which family owned business entities that operate from the one location. The C&D Landfill serves portions of multiple counties defined in the franchise agreement. Phase 1 commenced operations in 2001, and a permitted expansion (Phase 1B) was completed in 2002. When completed, Phase 1 will contain an estimated 842,000 cubic yards (421,000 tons) of inert debris. The facility has served as a disaster debris disposal site for the region.

Mixed agricultural, commercial, light industrial and residential properties exist within the community. No significant ground water users or potential sources of contaminants are located in the immediate vicinity, but certain inorganic constituents have been noted at somewhat elevated in the natural background geochemistry. Public water is available in the vicinity of the site, but no public water supply wells or surface water intakes have been identified near the site. The site suitability studies for Phases 1 and 2 identified no conditions that would limit the ongoing use of the site as a C&D disposal facility.

1.2 Existing Facilities

EJE Recycling operates a material recovery facility and a MSW transfer station north of the CDLF units. An office (doubles as a scale house) and equipment maintenance shop are located near the recycling yard. White goods are stored on a paved pad located between the Transfer Station and the CDLF Phase 1 – these materials are sold for scrap metal and removed periodically by EJE. Tires are generally not accepted at the facility; occasional tires from on-site equipment are disposed off-site, like any other consumer's. The Facility Plan map (**Drawing S3**) identifies the relevant waste management facilities.

1.3 Facility Plan Amendment

Phase 2 will encompass a 23-acre new footprint – separate from Phase 1. The expansion involves the addition of 90 acres to the facility boundary, bringing the facility boundary area to 123 acres. Phase 2 will contain an estimated 964,000 cubic yards (482,000 tons) of debris, bringing the total disposed volume to 1,806,000 cubic yards (903,000 tons). The estimated life of Phase 2 is 15 years. This document provides detailed design information pertaining to a Permit to Construct application for the Phase 2A expansion. The following describes the facility before and after the planned expansion.

EXISTING CONDITIONS — C&D Landfill, Inc. (Permit #74-07)

Solid Waste Units Present	MSW Transfer Station, Recycling Facility, CDLF		
Other Activities/Infrastructure	Scales/Office, Alternative Cover Demonstration		
CDLF Unit Footprint Acreage			15 acres
CDLF Phases/Sub-Phases [1]	**1A**	**1B**	
New Ground Footprint Acreage [1]	8 ac	7 ac	
Final Elevations (Entire Unit) [2]			EL. 124 [5]
Maximum Waste Thickness [2]			104 feet [5]
Permitted Side Slope Ratios			3H:1V
Acreage of Closed Slopes [3]			0
Facility Boundary Acreage			33 acres
Total Permitted Capacity [2]			842,000 cy
Permitted Capacity Remaining			0

PROPOSED CONDITIONS — Phase 2 is a separate unit from Phase 1

Solid Waste Units Present [4]				Unchanged
Other Activities/Infrastructure [4]				Unchanged
New CDLF Unit Footprint Acreage [4]				23 acres
New CDLF Phases/Sub-Phases [1]	**2A**	**2B**	**2C**	
New Ground Footprint Acreage [1]	10 ac	13 ac	9 ac [5]	
Interim Capacities (Sub-Phases) [2]	313,044 cy	386,045 cy	299,937 cy	
Interim Elevations (Sub-Phases)	EL. 50	EL. 50	EL. 106	
New CDLF Unit Capacity [2]				999,063 cy
Final Elevations (Entire Unit) [2]				EL. 106
Maximum Waste Thickness [2]				90 feet
Permitted Side Slope Ratios [4]				3H:1V
Acreage of Closed Slopes [3]				0
Facility Boundary Acreage [4]				90 acres
Total CDLF Footprint Acreage [4]				38 acres
Total Permitted Capacity [4]				1,841,063 cy
Permitted Capacity Remaining [4]				999,063 cy

1 Corresponding to 5-year Operating Capacity
2 Includes Final Cap System and Operational Cover
3 Per Applicable Rules at Time of Closure
4 Subject to Approval of this Application
5 Vertical Expansion – not actual ground disturbance

1.4 Regulatory Requirements

Solid Waste Rules 15A NCAC 13B .0531 *et seq.* became effective January 1, 2007 – these are known as the "**2006 C&D Rules**." Rule .0547 requires that existing CDLF units (i.e., accepted waste prior to January 1, 2007) that wish to continue operating under the "**2006 C&D Rules**" submit an application to depict the proposed long-term development of the site and demonstrate compliance with new rule requirements. This document constitutes said application and is organized in general accordance with the sequence of presentation of topics under **Rules .0531** through **.0547** (with references). Contained in this document are revisions to previous permit documents, including provisions of the "2006 C&D Rules" that must be met, as follows:

(1) Existing C&D units that did not and will not receive solid waste after June 30, 2008 must be closed under the requirements of Rule .0510 (the previous rules).

Design capacity in Phase 1 was not reached by June 30, 2008. Although many of the 3H:1V side slopes had reached final grades and, thus, had received interim soil cover under the old Rule .0510, under which Phase 1 was permitted and operated, no areas of Phase 1 were ready to be certified by June 30, 2008. As such, all of Phase 1 shall be closed under the new Rule .0547, hence making those portions subject to the financial assurance requirements.

(2) Financial Assurance must be demonstrated prior to July 1, 2008 to cover the estimated costs of closure and post-closure for C&D units (typically, a local government test for political subunits of the State, i.e., counties).

The Owners of C&D Landfill, Inc. will furnish an appropriate fiduciary instrument within the specified time frame, based on costs estimates developed elsewhere in this document for Phase 2 and the remaining portions of Phase 1 at the time of closure (as yet to be determined).

(3) A Permit to Construct application for a new phase must contain a comprehensive facility plan for long-range development, including the layout, aerial limits and capacity of various proposed waste management units, along with identification of the anticipated waste stream and criteria for waste acceptance and segregation; an Engineering Plan for the initial phase of development; a Construction Quality Assurance (CQA) plan; an Operation Plan prepared under the "**2006 C&D Rules**" that includes amended monitoring programs (both environmental and waste acceptance monitoring); a Closure and Post-Closure Plan (with cost estimates to facilitate the financial assurance demonstration).

C&D Landfill, Inc., has met the application requirements within this document (presented in later sections). The Facility Plan depicts the Phase 2 expansion; further development of the facility is possible utilizing land to the west of the Phase 2 site, but no formal plans have been derived at this time for further expansion. The Owner understands that further Facility Amendment will require additional Site Suitability characterization and local government approval.

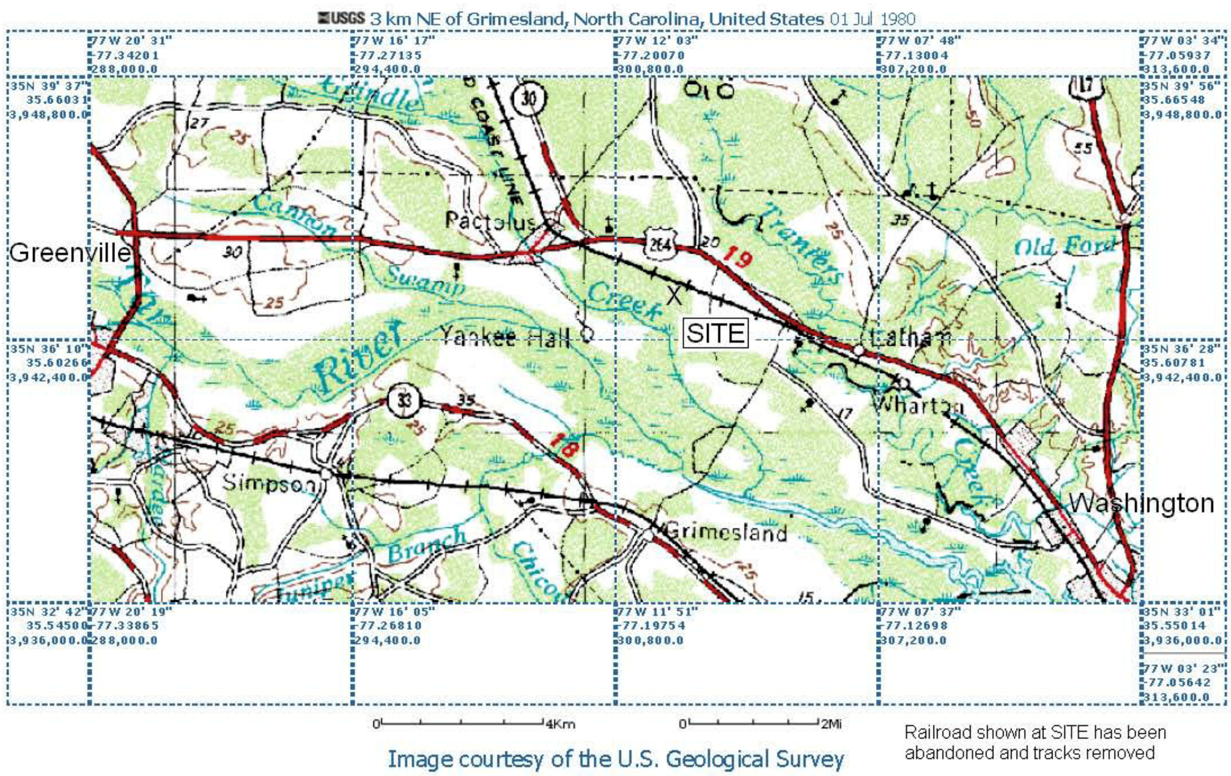

Figure 1 – General Vicinity Map

2.0 PHASE 1 CDLF CLOSURE (15A NCAC 13B .0510)

Phase 1 will receive solid waste after June 30, 2008 and, thus, is subject to the final closure requirements of **Rule .0543**, also applicable to Phase 2. Regulatory final cover requirements for both phases include 18 inches of final cover soil, capable of supporting vegetation, and 18 inches of compacted soil barrier with a field permeability of not more than 1.0×10^{-5} cm/sec. Slope ratios shall be 33% maximum (3H:1V) along side slopes, 5% minimum on upper cap surfaces (post-settlement). The final cover for Phase 1 will be subject to the same CQA requirements described as Phase 2 in **Section 7.0** (Volume 2) and the same financial assurance requirements described in **Section 11.0** (Volume 2) – a separate Closure and Post-Closure Plan was prepared for Phase 1 in June 2008, which has been updated to reflect this document. This information contained herein has been updated from the original submittal of this document (Rev. 0, February 15, 2008).

3.0 CDLF FACILITY PLAN (15A NCAC 13B .0537)

3.1 Regulatory Summary

The "2006 C&D Rules" require a comprehensive facility plan that identifies future development in phases that correspond approximately to 5-year operational capacities. The facility plan must identify and show all relevant permitted Solid Waste units and activities conducted (or proposed) at the site. The grading plan requirements emphasize vertical separation and minimum subgrade soil type requirements. The proposed C&D expansion meets or exceeds the 4-foot minimum vertical separation requirement to groundwater and bedrock, thus no liner or leachate collection system is required under these rules. Subgrade soil types that will be exposed via excavation and used in the compacted fill sections are anticipated to exhibit a mix of finer soil types, e.g., ML, MH, CL, CH, SM and mixed SM-ML classifications, thus subgrade permeability is expected to be low, providing the soils are reworked and compacted (see **Section 6.0**).

3.2 Facility Drawings

3.2.1 Facility Layout

Phase 2 is a separate CDLF unit that will be developed in two sub-phases relative to footprint expansion, with a third sub-phase (vertical expansion) over the other two. Each sub-phase is expected to provide approximately 5 years of operational capacity, based on current waste stream projections. **Drawings E1** and **E2** respectively depict the base grades and final grades for Phase 2. The aerial limits are set to provide a minimum 200-foot buffer to the facility boundary, a 50-foot buffer to jurisdictional water bodies, per the rules that were in effect when the project initiated – this is an "existing" facility relative to the 2007 Solid Waste legislation, hence the original setback requirement applies for jurisdictional waters. **Drawings E3 and E4** show the footprints and estimated interim fill grades for two 5-year sub-phases, 2A and 2B, respectively. A third 5-year sub-phase, 2C, is the vertical expansion over the other two.

The Facility Plan (**Drawing S3**) shows the locations of current and future soil borrow areas and potential future access routes, along with other permitted Solid Waste units and activities (including facility infrastructure) associated with the adjacent MSW Transfer Station and Recycling Facility – at present, these units are considered a separate facility, permitted independently of the CDLF. The Phase 2 footprint contains no identified floodplains or wetlands (adjacent areas with these features will be avoided), unstable areas or cultural resource areas that affect project development.

3.2.2 Operational Sequence

Phase 2A and associated S&EC measures (shown on **Drawing E3**) will be developed in the southern half (approximately) of the Phase 2 footprint. This sub-phase will involve minor grade cuts for reaching the approved base grading plan (see **Drawing E1**). The operational sequence is divided into 5 contiguous cells, each lasting an estimated one year of duration, which extend to an interim elevation that approximates 5 years of capacity. During the operation of Phase 2A, the footprint for Phase 2B – located in the northern half of the Phase 2 footprint – will be used for staging and stockpiling cover soil and "beneficial fill" materials that will be utilized in future construction of Phase 2B. No excavation is planned for Phase 2B – base grade fills up to 4 feet in height are required.

Interim slopes will be maintained at 3H:1V, in accordance with Division of Waste Management requirements, while upper surfaces shall be graded to promote positive drainage, ideally at a 5% slope. Operational procedures are described more fully in the Operations Plan (**Section 8.0**). Exterior slopes will be closed – with simultaneous construction of erosion control benches – in Phase 2A (and other sub-phases) as the slopes come to grade. Interim cover will be placed on exterior slopes until a maximum of 10 acres of slope is ready for final closure (refer to the Final Closure Plan, **Section 9.0**). A future Permit to Construct application for Phase 2B will be submitted to the Division approximately two years prior to the completion of Phase 2A waste placement.

3.3 Facility Report

3.3.1 Waste Stream

The CDLF is permitted and managed separately from the recycling facility and transfer station. This report pertains specifically to the CDLF operation. Scale-house records indicate an average daily C&D disposal tonnage of 200 tons per day, operating 250 days per year, for approximately 50,000 tons per year (100,000 cubic yards per year). The populations served include all or portions of the counties listed below.

SELECTED COUNTY	2000 Pop[1]	2006 Pop[1]	Pop Growth[2]	% Grow	July 2009[3]	% Grow	July 2019[3]	% Grow	July 2029[3]	% Grow
BEAUFORT	44,958	46,346	1,388	3.1%	47,342	5.3%	49,045	9.1%	50,138	11.5%
BERTIE	19,757	19,355	-402	-2.0%	18,945	-4.1%	18,147	-8.1%	17,149	-13.2%
CHOWAN	14,150	14,664	514	3.6%	15,142	7.0%	15,707	11.0%	16,011	13.2%
CRAVEN	91,523	95,558	4,035	4.4%	98,661	7.8%	104,279	13.9%	108,160	18.2%
EDGECOMBE	55,606	52,644	-2,962	-5.3%	51,563	-7.3%	47,811	-14.0%	43,850	-21.1%
GREENE	18,974	20,833	1,859	9.8%	21,378	12.7%	24,057	26.8%	26,728	40.9%
HALIFAX	57,370	55,606	-1,764	-3.1%	54,707	-4.6%	53,321	-7.1%	51,486	-10.3%
HYDE	5,826	5,511	-315	-5.4%	5,426	-6.9%	5,292	-9.2%	5,090	-12.6%
JONES	10,398	10,318	-80	-0.8%	10,512	1.1%	10,680	2.7%	10,766	3.5%

LENOIR	59,619	58,172	-1,447	-2.4%	58,083	-2.6%	57,053	-4.3%	55,711	-6.6%
MARTIN	25,546	24,396	-1,150	-4.5%	24,112	-5.6%	22,968	-10.1%	21,755	-14.8%
NASH	87,385	92,220	4,835	5.5%	94,871	8.6%	103,245	18.1%	111,136	27.2%
NORTHAMPTON	22,086	21,524	-562	-2.5%	21,544	-2.5%	21,330	-3.4%	21,003	-4.9%
PAMLICO	12,934	13,097	163	1.3%	13,236	2.3%	13,702	5.9%	13,930	7.7%
PITT	133,719	146,403	12,684	9.5%	154,430	15.5%	175,690	31.4%	196,602	47.0%
TYRRELL	4,149	4,240	91	2.2%	4,334	4.5%	4,384	5.7%	4,379	5.5%
WASHINGTON	13,723	13,360	-363	-2.6%	13,243	-3.5%	12,589	-8.3%	11,821	-13.9%
WAYNE	113,329	114,930	1,601	1.4%	116,281	2.6%	121,958	7.6%	127,160	12.2%
WILSON	73,811	77,468	3,657	5.0%	79,574	7.8%	85,835	16.3%	91,905	24.5%
	2000 Pop	**2006 Pop**	**Pop Growth**	**% Grow**	**July 2009**	**% Grow**	**July 2019**	**% Grow**	**July 2029**	**% Grow**
MULTI-COUNTY SERVICE AREA	864,863	886,645	21,782	2.5%	903,384	4.5%	947,093	9.5%	984,780	13.9%
STATE OF NORTH CAROLINA	8,046,813	8,860,341	813,528	10.1%	9,348,744	16.2%	10,744,214	33.5%	12,167,409	51.2%

[1]Source data: 2006 Certified County Population Estimates,
North Carolina State Demographics, North Carolina State Data Center,
http://demog.state.nc.us/

[2]All growth is relative to 2000 Census Data

[3]Source data: Projected Annual County Population Totals (for years given),
North Carolina State Demographics, North Carolina State Data Center,
http://demog.state.nc.us/

3.3.2 Landfill Capacity

The volumetric analysis for Phase 2 (see **Appendix 2**) indicates an estimated 999,063 cubic yards of airspace, which includes interim cover soils but excludes final cover. Based on an estimated 50,000 tons of C&D per year with an assumed 3% annual increase in C&D intake, the projected operational life for Phase 2 is between 9 (minimum) and 15 (maximum) years. Since the waste stream and compaction density is expected to vary, the projected operational capacity may vary – based on the current volume projection and waste projection, the airspace should last for two or three 5-year permitting cycles.

3.3.3 Special Engineering Features

No seeps, springs, soft ground or other deleterious conditions were identified in the site characterization studies. As such, no special engineering features are required.

4.0 DESIGN HYDROGEOLOGIC STUDY (15A NCAC 13B .0538)

The following sections are adapted from the October 2002 Site Suitability study for Phase 2; that investigation included sufficient test boring and laboratory data to meet the requirements for the Design Hydrologic Study report, discussed below.

4.1 Site Hydrogeologic Report

4.1.1 Local and Regional Geology

The site is located in the central Coastal Plain physiographic and geologic province of North Carolina. Available geologic mapping[1] places the site within the Tertiary (Miocene) age Yorktown Formation, approximately twenty miles west of the Suffolk Scarp – the dividing line between Quaternary age surficial deposits (to the east) and Tertiary age surface deposits (to the west), located at approximately 25 feet above mean sea level. The site is also located approximately twenty-four miles east of the Surry Scarp, which delineates higher ground underlain by Cretaceous (and older) units exposed south and west of Pitt County. The site is located entirely within the Tar-Pamlico River basin, draining south toward Grindle Creek, a major tributary to the Tar River.

Published literature indicates that upland areas throughout the region are underlain by relatively thin Quaternary surficial deposits (not differentiated on the state-wide map).[2] The surficial formation is characterized in the literature as stratified fluvial deposits, containing interlayered low permeability and high permeability horizons. The thickness of the aquifer ranges from 3 to 180 feet (average thickness of 35 feet near the site) – thickening eastward – with an estimated average hydraulic conductivity values ranging up to 29 feet per day. The surficial aquifer is also characterized as exhibiting less than 50 percent sand, hence lower hydraulic conductivity, west of a line that roughly coincides with the Suffolk Scarp. These observations were confirmed by the local area study and site specific reconnaissance, whereas the surficial deposits (deemed the uppermost aquifer) consist of poorly stratified sand and clay layers, which were found to exhibit an average thickness of 12 feet (varying up to 30 feet), underlain by the Yorktown Formation with a distinct fossil-marker bed of turritellas (gastropods) and a color change from tan-white (upper sands) to dark gray-green. On-site field hydraulic conductivity values were measured in the range of 0.028 ft/day to 0.667 ft/day.

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1 North Carolina Geological Map, Scale 1:62,500, NC Geological Survey, 1985.

2 Hydrogeologic Framework of the North Carolina Coastal Plain Aquifer System, U.S. Geological Survey Open File Report 87-690, USGS.

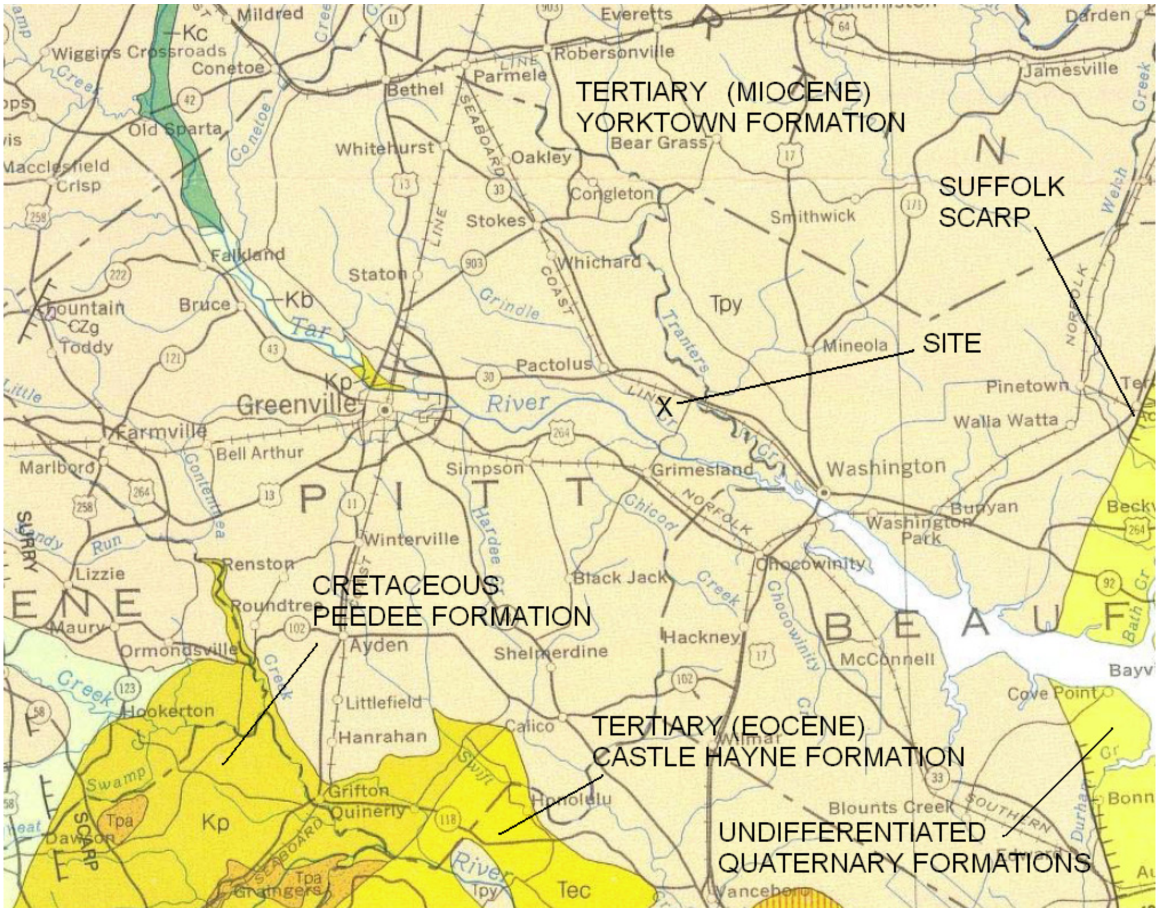

Figure 2 – North Carolina Geologic Map Excerpt

The major regional aquifers beneath the Coastal Plain, near the City of Greenville, NC, include the Yorktown Formation, the deeper Eocene-age Castle Hayne Formation (limestone) and underlying Cretaceous-age units, i.e. the Pee Dee and Black Creek Formations.[3] The Yorktown is characterized as marine sediments varying in thickness to 60 feet (thickest within Pitt County is in the northwest corner). The Castle-Hayne is localized to the southern and eastern portions of Pitt County (and further east) but is represented to be less than 30 feet in thickness everywhere in the county.

The Paleocene-age Beaufort Formation is mentioned in the literature, stratigraphically located between the Castle-Hayne and the deeper Cretaceous units, but the Beaufort does not outcrop. The Pee Dee and Black Creek Formations outcrop along the Tar River approximately eight miles west of the site (in Greenville, NC), and the Cretaceous-age

3 Brown, P.M., Geology and Ground Water Resources in the Greenville Area, North Carolina, Bulletin Number 73, prepared cooperatively by the North Carolina Department of Conservation and Development and the United States Geological Survey, 1959.

Cape Fear Formation outcrops approximately eight miles further upstream (west of the site). Based on regional data,[4] typical depths of the Cretaceous units in proximity to the site are in excess of 90 feet (see **Table 1B**). All are considered to be viable aquifers with variable water quality.

Basement rocks in the region consist of pre-Mesozoic crystalline rocks of igneous and metamorphic origin, which underlie the sediments of the Coastal Plain near the site at depths in excess of 1000 feet, based on available water well data (see Footnote 4) and published data.[5] West of the Suffolk Scarp the projected surface of the crystalline basement slopes at 0.4% (2000 feet in 90 miles), east of the Suffolk Scarp the surface of the basement slopes at 1.4% (8000 feet in 110 miles), with a maximum depth of 10,000 feet at Hatteras. The basement complex likely resembles the crystalline rocks exposed in the Piedmont, complete with various contacts, jointing, and other tecto-structural features, e.g. folds and faults. Several transform faults in the basement complex have been recognized by characteristic deformation features within the overlying late-Mesozoic and early Tertiary sediments.[6]

These relicts of Triassic-age tectonism (active throughout the Mesozoic era) are strike-slip faults with vertical rotation, oriented approximately with the alignments of the Tar, Neuse and Cape Fear Rivers. The most conspicuous feature produced by these faults, visible on the North Carolina Geologic Map, is the "up-thrown block" that occurs between the Cape Fear and Neuse Rivers (well to the south of the site). Within this area, the Yorktown has been all but eroded away, exposing the older Tertiary and Cretaceous sediments much further east than observed south of the Cape Fear or north of the Neuse. These faults are not active, and the region is not within a Seismic Impact Zone[7].

Heavy ground water extraction by water supply wells in the region has been considered as a probable cause for lowered potentiometric levels within the regional aquifers (noticeable over several decades) and localized ground subsidence.[8] High capacity wells are used to supply drinking for the cities of Greenville and Washington. The Division of

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4 DENR Monitoring Well Database (interactive), North Carolina DENR Division of Water Resources, Ground Water Branch, viewed at web site http://www.dwr.ehnr.state.nc.us.

5 Lawrence and Hoffman, Geology of the Basement Rocks Beneath the North Carolina Coastal Plain, Bulletin 95, North Carolina Geological Survey, 1993.

6 Brown, P.M., and others, Wrench-style Deformation of Rocks of Cretaceous and Paleocene Age, North Carolina Coastal Plain, Special Publication 5, NCGS, Raleigh, NC, 1977.

7 EPA/600/R-95/051, RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities, 1995, including Seismic Intensity Capable Faults Map

8 Land Subsidence Information, NC DENR Division of Water Resources - Ground Water Branch, unpublished, reviewed on-line at www.dwr.ehnr.state.nc.us

Water Resources data do not indicate how far the zone of influence around the wells extends with respect to subsidence, but the subsidence probably extends not more than a few miles from the respective wells. No high capacity production wells are located within two miles of the subject site, based on the findings of the local area study. It is not anticipated that the site could affect these wells, or that the ground water extraction at these locations could affect the site.

Daniels, *et al*., discusses drainage characteristics and ground water movement within the surficial deposits of the Coastal Plain.[9] By examining in numerous soil samples for the presence of iron-oxide staining (various hues of red and yellow, e.g. goethite) and gley coloration (gray, blue-gray or green-gray pigmentation resulting from reduced iron compounds contained in water-logged soils beneath the surface, often accompanied by the formation of a sticky clay layer), along with various geochemical and pedologic properties, water movement characteristics within certain near surface soil horizons can be determined. Gleyed sands and sand-clay horizons were observed in the drilling and test pits for the subject site, typically at depths of 7 to 12 feet, usually with a sharp near horizontal demarcation with the overlying iron-oxide pigmented soils.

This work suggests that the presence of gley colors relatively near the surface within the Coastal Plain (as in other areas) results from very slow to no movement of water, i.e. "stagnant" ground water conditions. Conditions that produce gleyed beds, whether sand or clay, do not often change, as would be expected with the introduction of oxygen-rich meteoric water from the surface. The implications are that surficial aquifers function independently as reservoirs of infiltrated meteoric water, with relatively shallow discharge to streams and little recharge to the deeper aquifers. As discussed in the Site Suitability Report, the subject site is isolated hydraulically and from human activities. It is not likely that the landfill will affect (or be affected by) regional activities.

4.1.2 Field Reconnaissance

4.1.2.1 Topographic Setting and Drainage – Generally, the land slopes to the south between US 264 (existing near El. 25) and Grindle Creek (existing near El. 10). Site mapping (see **Drawings S2** and **S4**) shows a subtle drainage divide or "rise" (the term "ridge" implies topography too steep for this context) within the center of Phase 2 footprint, in the eastern portion of the site. This feature divides surface flow between

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9 Daniels, R.B., and E.E. Gamble, W.H. Wheeler, J.W. Gilliam, E.H. Whiser, C.W. Welby, Water Movement Surficial Coastal Plain Sediments, Inferred from Sediment Morphology, Technical Bulletin No. 243, North Carolina Agricultural Experiment Station, North Carolina State University, Raleigh, NC, December 1978.

small tributaries located to the east and west of the Phase 2 area. These minor tributaries exhibit distinct channels and a perennial aquifer discharge. Both streams exist in relatively deep swales, several feet lower than the majority of the site. These features are expected to control drainage within the uppermost sandy aquifer. Mean ground elevations within the Phase 2 site occur between El. 16 to El. 18, with maximum ground elevations between El. 19 to El. 20 near the central portions of the site, sloping gently toward the streams where typical elevations occur near El. 12 to 14. The streams are generally incised and channels typically occur 3 to 4 feet lower than the bank; channel widths are typically in the range of 3 to 5 feet, water depths are typically 1 to 3 feet deep.

4.1.2.2 Springs, Seeps and Ground Water Discharge Features

Two on-site streams, situated on the east-to-south and west sides of the Phase 2 footprint originate on the site and converge south of the site. These streams, in turn, converge with larger streams that originate less than a mile east of the site and flow south to Grindle Creek. The streams are fed in part by seeps and springs located along the banks of these features within the property boundary, many of which are too small to discern, which discharge from the uppermost aquifer. Some of the streams could be older man-made drainage features. The smaller upland drainage features are recharged by a fairly small watershed area and could be prone to seasonality. There is apparent "run-on" to the site in the northwest corner (from the US 264 right-of-way) but there is no "run-on" to the Phase 2 footprint area.

An upward vertical gradient exists of the upper and lower aquifers beneath within portions the site, as seen by the piezometer couplets at B-6/6A and B-8/8A (see Table 6). Downward gradients are seen within the central and northern portions of the site, the upward gradients are located near the streams, indicating discharge conditions. Changes in the gradient direction indicate seasonality. These conditions are typical of the region and similar to the Phase 1 site. The Phase 2 site is surrounded on the down gradient side by intercepting streams (not the case with the entirety of Phase 1). Based on the presence of the confining layer – more pronounced in the southern, down gradient portion of the Phase 2 site – it appears that offsite migration within the uppermost aquifer is unlikely.

4.1.3 Test Borings/Piezometers

Test borings and hand auger borings performed in December 2001 and January 2002 are shown on **Figure S5**. The test borings, labeled as the "B" series borings on the site map, were extended to depths varying from 15 to 70 feet, penetrating the several of the major lithologic and hydrologic units mapped in the region. Test boring data are summarized on

Table 1A. The deeper subsurface data were supplemented by three relatively shallow hand auger borings. **Figure S5** also shows site topography and the locations of the hydrogeologic cross sections (discussed later in this text). The soil test borings were sampled with standard penetration test techniques (ASTM D- 1586). Soil samples were visually classified by an experienced geologist, and laboratory testing was performed to confirm the field classifications.

All of the B-series borings were converted to standpipe piezometers for long-term ground water level observation. All test borings were grouted to the surface; some e.g., B-1s/2d, B-5 and B-6, may have application as future monitoring wells (with the installation of locking steel covers). There are 34 piezometers and two surface streams serving as ground water observation points within the 89.5-acre addition to the facility boundary. There are 23 piezometers within/near the Phase 2 footprint, which covers approximately 23 acres. A ground water potentiometric map, discussed in a later section, has been prepared from these data. Test boring records are presented in **Appendix III** of the **October 2002 Site Suitability report**.

4.1.4 Laboratory Geotechnical Testing

4.1.4.1 Laboratory Analysis - Table 2 presents a summary of laboratory test data for the Phase 2 test borings. Laboratory data are presented in **Appendix IV** of the **October 2002 Site Suitability report**. The laboratory test program consists of the following:

Triaxial Shear Strength, CU - undisturbed	D4767-95	2
Triaxial Shear Strength, CU - remolded	D4767-95	2
Flexible wall permeability - undisturbed	D5084	2
Flexible wall permeability - remolded	D5084	2
Standard Proctor Compaction	D698	2
Grain Size w/Hydrometer	D422, D1140	12
Atterberg Limits	D4318	12
Natural Moisture	D2216	12
One-Dimensional Consolidation	D2435	2

The soils were classified in the laboratory according the Unified Soil Classification System (USCS). These descriptions were matched to the boring logs to verify the visual soil classifications. Supplemental laboratory testing included standard Procter moisture-density tests, triaxial-cell hydraulic conductivity tests on undisturbed and remolded samples, triaxial shear strength and one-dimensional consolidation tests.

Soil Descriptions – Within the eastern portion of the site (the proposed CDLF footprint), soils within the upper 5 to 8 feet of the surface are generally classified as low to medium plasticity clayey silt (CL-ML) and silty sand (SM). Occasional pockets of clean well graded sand (SW) were encountered in the near subsurface. Within the western portion of the site, the proposed borrow site, soils generally consist of clean, well graded sands and silty sands, with relatively little clay. These sediments appear to be a relict stream channel, whereas the more clayey soils are likely channel-bank deposits.

Below a typical depth of 12 to 17 feet exists a layer of clayey silt (ML) and plastic clay (CL-CH), which appears to be continuous over the site and varies in thickness to approximately 15 feet, or more. This layer was previously identified as a partial confining layer during the Phase 1 site investigation. Below depths of 35 feet exist layered silty and clayey sands (SM and SM-ML), which locally are cemented. The soils became very clayey (CL and ML) below depths of approximately 50 feet.

Undisturbed Samples – Shelby tube samples were procured from test borings B-1, B-8, and B-10s and subjected to laboratory triaxial permeability, shear strength and consolidation testing. The near-surface soils consist of normally consolidated fluvio-marine sediments, where potential settlement is a concern relative to vertical separation. There appears to be a low likelihood of deep-seated instability and/or excessive settlement. Settlement and stability calculations based on these data are presented in **Appendix 7 (Volume 2)** of this report.

Bulk Samples – Representative bulk samples were procured from the upper 5 feet the surface at test borings B-2 and B-8. These samples were remolded and subjected to laboratory triaxial permeability tests. Permeability values on the order of 6.5×10^{-6} cm/sec were obtained for both samples. The bulk samples are considered to be representative of the shallower soils within the eastern portion of the site.

Effective Porosity – In keeping with Division requirements, the effective porosity was estimated from the grain size distribution analysis using a ternary diagram, originally developed by the US Geological Survey for estimating specific yields in porous aquifers. It has been demonstrated (in the literature) that the specific yield is tied to the effective porosity, the Division has adopted the practice of using specific yield (effective porosity) in the hydraulic gradient calculations (see **Section 4.1.8**). Two sample populations are apparent – the more permeable upper sands exhibit effective porosity values on the range of 7% to 22% (average of 12%), while the less permeable silty clay of the confining unit exhibits effective porosity values in the range of 1% to 5% (average of 3%). The effective porosity calculations are presented in **Appendix 5** and summarized on **Table 2**.

4.1.4.2 Formation Descriptions - The various geologic formations have been discussed in Section 5.0 of the October 2002 Site Suitability report. **Section 4.1.4.4** discusses subunits or layers identified in the near-surface geology that comprises an uppermost aquifer (sand), a partial confining unit (silt-clay), and a deeper regional aquifer (variably silty and partly cemented sand). Depths and permeability characteristics identified in the site specific studies are discussed in the following sections.

4.1.4.3 Field Hydrologic Testing - Table 3 presents a summary of field hydrogeological properties, based on falling head slug tests. Values of assumed total and effective porosity, aquifer thickness and descriptions of the various hydrogeological units based on the laboratory classification data are also presented in Table 3, along with calculated conductivity values. Each piezometer was developed prior to testing using a downhole pump or bailer until clear water was obtained. Static water level measurements were made at the beginning of each slug test. Table 7 presents calculated ground water gradients and velocities at each piezometer.

The slug tests were conducted by placing a pressure transducer at the bottom of the piezometer and allowing a buoyant plastic "slug" of a known volume, placed below the water level in the bore hole casing, to come to equilibrium. The change in piezometric head in response to the "slug" was measured until static equilibrium was re-established. A Hermit 1000C data logger was used to measure the rate of influx until water level equilibrium was achieved. The slug test data was analyzed according to both the Hvorslev and the Bouwer-Rice procedures, using commercially available software. The slug test data and permeability calculations are presented in **Appendix VI** of the **October 2002 Site Suitabilty report.**

4.1.4.4 Hydrogeologic Units – **Table 3** presents the field hydraulic conductivity values (Bouwer-Rice) shown relative to the aquifer units defined for the site. **Table 2** presents laboratory conductivity data for the partial confining unit. Based on these data, the representative depths and conductivity values relative to each unit vary as follows:

Unit	Unit Description	Typical Depths, ft	Representative Hydraulic Conductivity (cm/sec)	(ft/day)
AU-1	Surficial Aquifer (Quaternary)	0 - 14	4.79E-04 to 3.25E-03	9.21 to 1.36 Average 5.95
CU-1	Soft Silt-Clay (Yorktown)	14 - 35	3.03E-05 to 2.22E-04	0.63 to 0.09 Average 0.36

AU-2	Dense Silty Sand (Yorktown)*	35 - 50	2.57E-04	0.73
CU-2	Dense Clayey Sand (Beaufort)	50+	5.25E-06	0.015**

* Alternatively identified as Castle Hayne, based on the literature

** Based on the Phase 1 site studies

From these data an order of magnitude difference in conductivity between Aquifer Unit 1 and Confining Unit 1 can be seen. Likewise, an order of magnitude difference can be seen between the lower units. While the difference in conductivity is not large, it is considered significant for modeling the site. The data can be biased due, in part, to the tendency for slug tests to measure hydraulic properties within a relatively narrow zone of influence around the piezometer.

All units exhibit variability with respect to clay content, and it is likely that the upper fluvial sediments are cross-bedded, which potentially leads to "dead-end" pore volumes and decreased effective porosity. Conversely, the upper reaches of the Yorktown have been reworked, which might lead to inconsistencies in measured properties. The "slug" test used to characterize the various formations is prone to influence by localized subsurface conditions, e.g. sand pockets, and piezometer construction, these tests are industry-standard and considered to yield reasonable representative results, sufficient for aquifer characterization and ground water modeling.

4.1.4.5 Dispersivity Characteristics – An important consideration regarding the ability to effectively monitor the site is the nature of the surficial aquifer. A concern revolves around how much dispersion would take place in the shallow and relatively sandy uppermost aquifer should a release of contaminants occur and how closely spaced must the monitoring wells be to detect such a release. This concern was addressed in the **April 2001 Design Hydrogeologic** report for **Phase 1** with respect to the distance of the regional ground water discharge feature (Grindle Creek) beyond the southwest property line. Such is not the case with Phase 2, whereas smaller tributaries provide a localized (on-site) discharge feature for the uppermost aquifer.

Appendix 5 presents a discussion of contaminant transport characteristics, along with an analytical solution to the two-dimensional advection-dispersion equation.[10] This solution assumes uniform, isotropic, and homogenous conditions within the flow regime (Darcy's

10 Walton, W.C., Principles of Ground Water Engineering, Lewis Publishers, Inc., Chelsea, Michigan, 1991.

law applies). At a given point in space within the flow field (the prospective monitoring well location) and at time zero, the concentration of a solute of interest is assumed to be zero. The mathematical solution assumes no sorption, retardation, or degradation of the solute, e.g. the solute is "conservative" by not reacting with the host media or other solutes in the aquifer system. The model does consider aquifer thickness, porosity, and both longitudinal and transverse diffusion/dispersivity coefficients.

This aquifer system is characterized by lower hydraulic conductivity values than would be expected for a sandy aquifer (10^{-5} cm/sec) and low ground water velocities (0.008 ft/day). The effective hydraulic conductivity is due to cross-bedding and clayey horizons contained within the surficial aquifer. Low velocities are caused by the low conductivity and fairly flat ground water gradients. According to published literature, these conditions place the system in a regime where molecular diffusion is the controlling factor in contaminant transport, rather than mechanical dispersion.[11] The solution verifies that an approximate monitoring well spacing of 300 feet is adequate to detect a potential release of contaminants into the ground water. The **Water Quality Monitoring Plan** presented in **Appendix 6** reflects this analytical solution.

4.1.5 Other Investigative Tools

No specialized techniques or other testing methods were required or this investigation, but a number of test pits were excavated in advance of the borings to verify the consistency of soil conditions between Phases 1 and 2, and several hand auger borings, designated by an "A" following the boring number, were used for a detailed evaluation of soil types and ground water flow trends within the uppermost aquifer (**see Table 8**).

4.1.6 Stratigraphic Cross Sections

Drawings X1 and **X2** present generalized subsurface profiles prepared from the test boring and laboratory data, which indicate the hydrogeologic and lithologic units for this site. The stratigraphy at the site has been assigned to hydrogeologic units as follows: two aquifers, upper and lower (Units 1 and 2 Aquifers) and two confining layers, upper and lower (Units 1 and 2 Confining Layers). Typical of the coastal plain, the site stratigraphy within the upper 25 feet beneath the surface is defined by a distinct boundary between recent fluvial sediments (tan-yellow and white cross-bedded sands and clays) and deeper marine sediments (dark green silty sands and clays, often with cemented zones and shell hash).

[11] Fetter, C.W., Contaminant Hydrogeology, Macmillian Publishing Company, New York, 1993.

The uppermost marine sediments have been identified as the Miocene-age Yorktown formation based on the fossil assemblage, yet the presence of glauconite (a dark green-black mica, related to biotite, which forms in deep marine environments)[12] in the deeper sediments suggests other possible formations mapped in the region, e.g., Castle Hayne, Beaufort, Pee Dee, or the Black Creek. Specific studies of index fossils were not performed to distinguish these formations, but a comparative study of water well data in the region (see Footnote 4) indicates that the on-site borings likely encountered the Castle Hayne and/or the Beaufort, in addition to the Yorktown.

Unit 1 Aquifer – Soils within the upper 5 to 8 feet below the surface consist of recent to Pliocene-age fluvial sediments, likely associated with former shorelines and/or estuaries of the Tar River and/or Grindle Creek. Pockets of buff-white, well graded sand (SW), with thicknesses of 15 feet, indicate former channel migration. Correlation of test borings and hand augers to earlier studies for Phase 1 indicates a relatively shallow, tan-yellow clay layer existing at depths between 16 to 24 inches, extending to depths of 36 to 48 inches. Cross-bedding is likely; the clay layer is present at most (but not all) test locations within the eastern portion of the site (not a true confining layer). The clay, sampled at B-2 and B-8, exhibits a laboratory permeability of 10^{-6} cm/sec (**Table 2**).

The silty sands and clean sands within the upper 10 to 14 feet are considered to be the uppermost aquifer. The water table typically occurs at 4 to 7 feet below the ground surface within this unit in the eastern portion of the site (typically shallower within the lower lying western portion of the site). Several piezometers were completed to a depth of 15 feet. Based on these data (Table 3) the hydraulic conductivity for this unit varies on the order of 10^{-3} cm/sec to 10^{-4} cm/sec.

Unit 1 Confining Layer – Below a depth of 12 to 17 feet exist sandy silt grading downward to plastic clay, which collectively vary in thickness from approximately 15 to 25 feet. The top of this layer is distinguished by a dark green-gray color, characteristic of marine sediments, and heavy shell hash, including whole turritellas (a snail-like marine mollusk). These strata represent the top of the Yorktown formation. The clay layer is present in every boring and exhibits a stiff, moist "gumbo" consistency, that is, the clay is easily molded into a thread of less than 1/8-inch diameter and maintains this level of plasticity for repeated remolding over several minutes.

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12 Hurlbut, Jr., C.S., and C. Klein, Manual of Mineralogy (after J.D. Dana), 19th ed., J.W. Wiley & Sons, New York, 1977.

Laboratory permeability testing on relatively undisturbed samples (see **Table 3** and **Appendix IV**), taken at B-1 from a depth of 11 feet and at B-10 from a depth of 14 feet, indicate hydraulic conductivity values of 1.5 x 10^{-7} cm/sec and 4.6 x 10^{-7} cm/sec, respectively. This unit has been identified as the top of the Yorktown Formation – marine clay of Miocene age – which predates the numerous sea level fluctuations associated with glacial activity (elsewhere) during the Pleistocene. The top of the confining unit, marked by the turritella -rich fossil assemblage, appears to be sculpted by channelized water during the multiple estuarine ingresses and regresses of the para-glacial period (see Figure F5). At some borings, there is a sandy transition layer, sometimes with the marker fossils (B-1d), but the clay layer is deeper or absent to the west of the footprint (B-30) and the marker bed is absent. Considering the flat potentiometric gradient and upward vertical gradient (discussed later), vertical ground water migration potential relative to the confining layer is limited.

Unit 2 Aquifer – Below depths of 35 to 45 feet exist relatively dense silty sands and clayey sands (SM and SM-ML), which locally are cemented. These soils contain variable amounts of glauconite (a type of mica found in deep marine sediments, distinguished by a green-black "speckled" color), and scattered pelecypod shell hash (including modern-type clams). The deeper sediments were often cemented, giving firm resistance to the drilling equipment. Occasional cemented shell hash concretions were encountered in the split spoon sampling, some of which resemble the distinctive pelecypod-mold structure of the Castle-Hayne formation. The concretions were not widely encountered and might represent reworked sediments derived from the older formation. A piezometer completed within this unit (MW-1d) indicates in-situ hydraulic conductivity values on the order of 10^{-6} cm/sec, while other piezometers within Phase 1 indicated conductivity values on the order of 10^{-4} to 10^{-5} cm/sec (see **Table 3**). This unit is 25 to 30 feet thick, based on the data.

Unit 2 Confining Layer – The deeper sediments (possible Castle-Hayne or Beaufort) became very clayey below depths of approximately 50 feet, but otherwise resembled the soils described in the overlying aquifer. This unit was encountered in test boring B-1d, extended to a depth of 80 feet. While the actual thickness cannot be determined, piezometer "slug test" data indicate a hydraulic conductivity on the order of 10^{-4} to 10^{-5} cm/sec (see Table 3). An earlier slug test for a nearby piezometer in Phase 1 (B-9) indicated an in-situ conductivity value on the order of 10^{-6} cm/sec. Published data indicates that confining units exist between the Yorktown and Castle Hayne formations and between the Castle

Hayne and the underlying Beaufort formation. Based on the projected depth of the Castle Hayne in this region, and the observation of pelecypod-mold concretions in the split spoon samples, it is likely that the test boring encountered this confining layer. The presence of glauconite (not typically associated with the Castle Hayne) might indicate the deeper Beaufort formation.

4.1.7 Water Table Information

4.1.7.1 Short-Term Water Levels - Table 4 presents a summary of short-term ground water levels observed at the end of drilling of the B-series piezometers and stabilized readings obtained after a period of one to fourteen days after completion of the piezometers.

4.1.7.2 Long-Term Water Levels - Table 5 presents a summary of long-term water level observations at the piezometers and nearby monitoring wells. Data for the B-series piezometers go back to November 2000. This table reflects water level elevation data acquired over a period covering more than one year for on-site data and back to November 2000 for the nearby Phase 1 monitoring well network. These data provide the basis for the ground water potentiometric surface map (**Drawing E1**), discussed in **Section 4.1.7.3** and shown on the hydrogeologic cross sections (**Drawings X1** and **X2**).

4.1.7.3 Maximum Long-Term Seasonal High Water Table – Historical climatic data from the National Weather Service,[13] discussed in the **October 2002 Site Suitability** report, provides a basis for comparing observations at on-site piezometers with historic data from the Phase 1 monitoring well network to estimate maximum long-term seasonal high water levels. A parameter of interest is the Palmer Hydrological Drought Severity Index (PHDI), compiled for 105 years of weather records. The PHDI represents an overall moisture balance within a region of interest, compiled from multiple weather stations for average precipitation, temperature (PET effects), leaf indices (growing season), wind velocities, and solar radiation. The cyclical data are shown on a time line (see Figure 3), with times of drought shown as negative values and wet times shown as positive. The relative duration of a drought or wet cycle correlates to the availability of moisture to recharge the ground water. Pitt County is located in Region 7 of the North Carolina climate network, which includes the eastern Coastal Plain.

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13 Time Bias Corrected Divisional Temperature-Precipitation-Drought Index, (TD-9640) March 1994, National Oceanic and Atmospheric Administration, periodic updates available on-line at www.ncdc.noaa.gov.

The PMDI data indicate that climatic moisture conditions were near normal to wet or the last several years. Exceptions occur during the latter portion of 1993 and 1994, which experienced prolonged dry spells that classify as moderate drought conditions. Brief dry spells occurred during the latter part of 1997 and the early part of 1999. Mild to moderate wet conditions were experienced during the period from mid-1996 through early 1997, in part contributed to Hurricane Fran and generally high precipitation patterns during that time. Moderate to severe wet conditions resulted from the well documented "el Nino" winter of 1997-98, when record warm temperatures and high rainfall was recorded throughout the southeastern United States.[14] A notable wet spell, more pronounced than "el Nino" – previously considered as a recent climatic standard – occurred in late 2003 through early 2004, which was experienced by the on-site monitoring wells.

[14] National Oceanic and Atmospheric Administration, NESDIS Press Release, March 9, 1998.

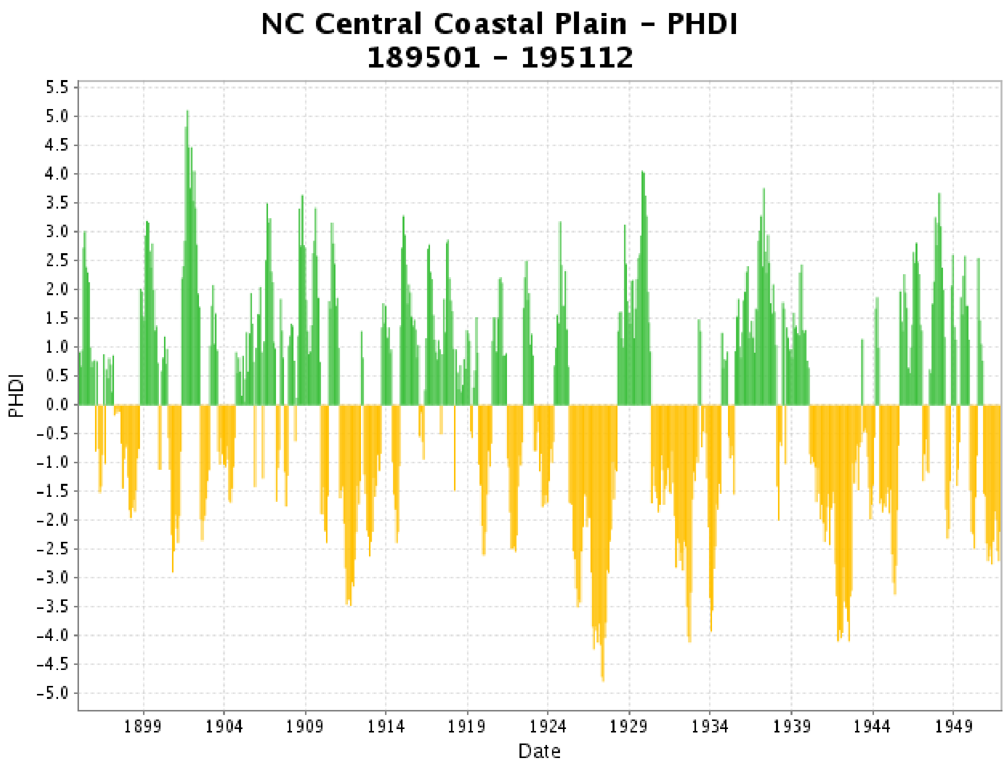


Figure 3A – Palmer Hydrologic Drought Index 1895 – 1951

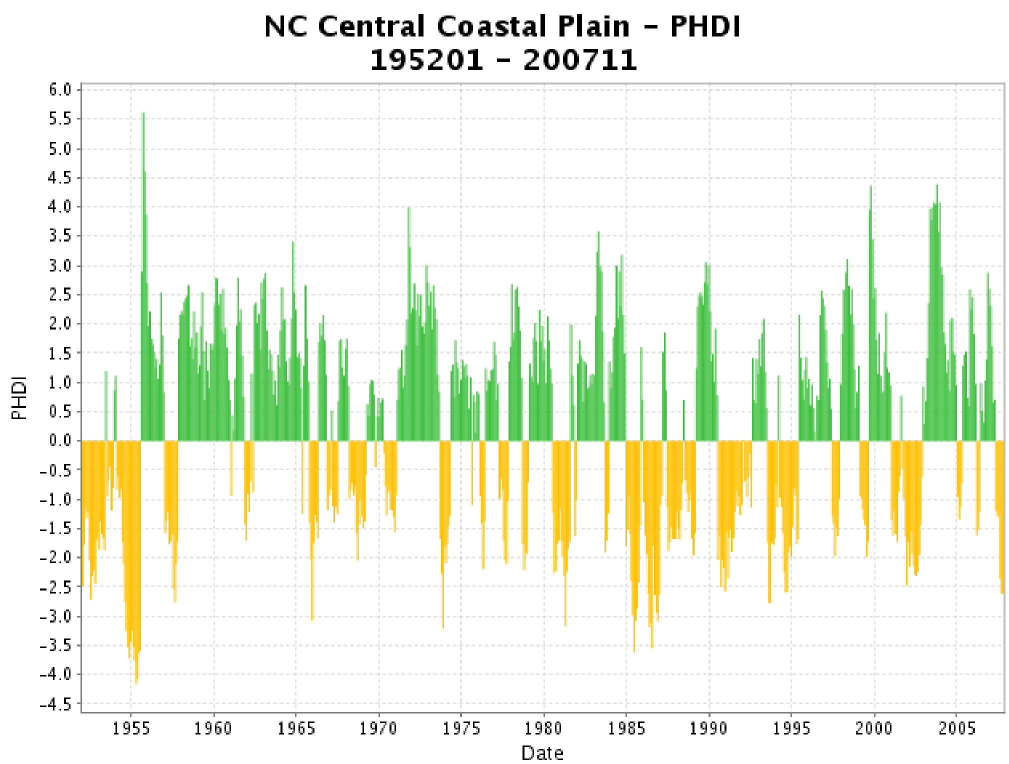


Figure 3B – Palmer Hydrologic Drought Index 1952 - 2007

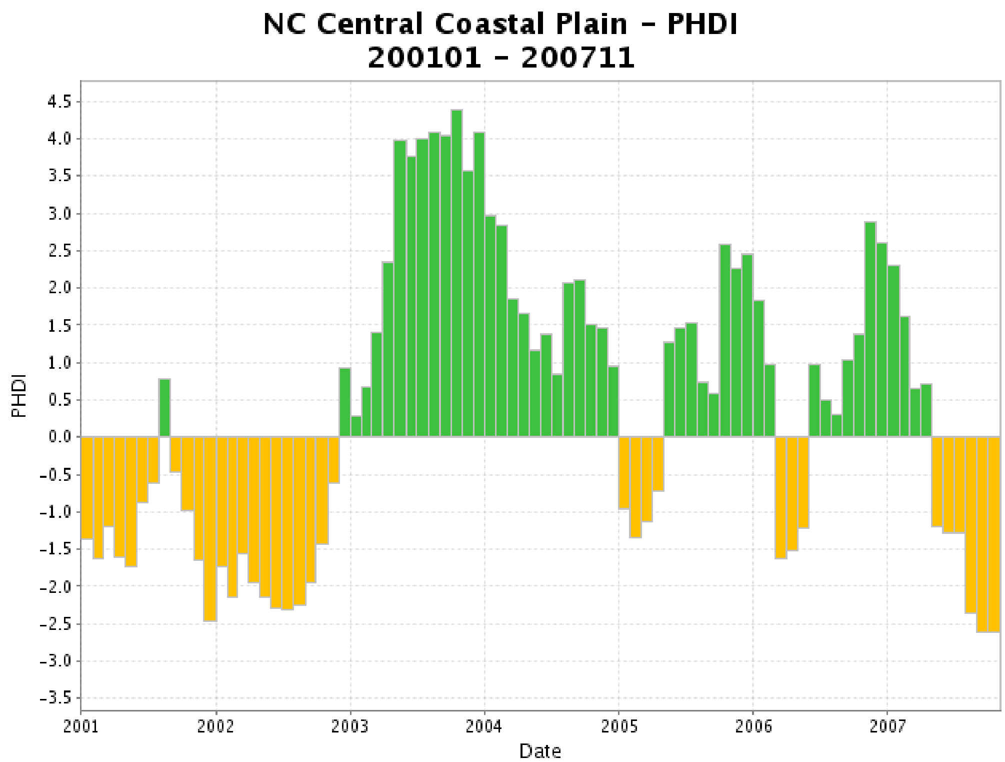


Figure 3C – Palmer Hydrologic Drought Index 2001 - 2007

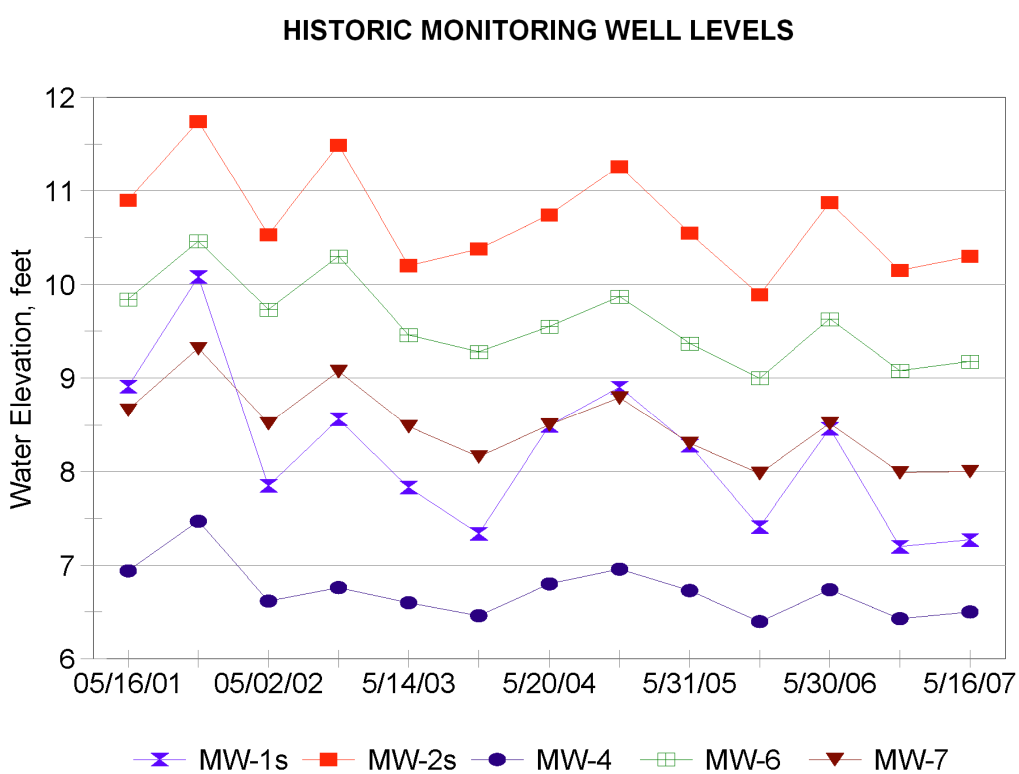


Figure 4 – Monitoring Well Hydrograph 2001 - 2007

Comparison with on-site water level observations indicates a fair correlation between the climatologic trends and the observed water levels. Peak monitoring well levels generally occur during May and November 2001 (Figure 4). The documented state-wide wet spell of 2003-04 (Figure 3C) is reflected by a trough in the monitoring well hydrograph, but the water levels responded over the following year (2004), whereas a peak occurred in the November 2004 observations. Following that, the monitoring wells reflect the general drying of the climate – with normal seasonal fluctuation – as state-wide drought conditions set in. Several factors pertaining to past and recent site development have the potential to affect ground water levels, discussed in **Section 4.1.7.4**.

Test Boring	Hydro Unit	Shallowest Max. Elev.	Deepest Min. Elev.	Observed Difference	Average Difference
MW-1s	AU-1	13.71	10.83	2.88	
MW-2s	AU-1	11.55	9.56	1.99	
MW-4	AU-1	12.02	10.74	1.28	
MW-5	AU-1	11.80	10.47	1.33	
MW-6	AU-1	11.03	9.57	1.46	
MW-7	AU-1	11.42	9.98	1.44	
MW-8	AU-1	11.85	10.63	1.22	
MW-9s	AU-1	12.52	9.11	3.41	1.88
MW-1d	AU-2	12.52	11.12	1.40	
MW-2d	AU-2	9.85	9.11	0.74	
MW-9d	AU-2	10.21	10.21	--	1.07
B-1s	AU-1	16.38	14.38	2.00	
B-2	AU-1	16.04	13.31	2.73	
B-3	AU-1	16.71	12.96	3.75	
B-4	AU-1	17.50	13.86	3.64	
B-5	AU-1	16.76	14.08	2.68	
B-5A	AU-1	19.16	17.03	2.13	
B-6	AU-1	16.99	13.76	3.23	
B-6A	AU-1	16.57	16.04	0.53	
B-7	AU-1	14.33	12.38	1.95	
B-8	AU-1	14.18	11.82	2.36	
B-8A	AU-1	14.00	12.71	1.29	
B-9	AU-1	13.30	11.15	2.15	
B-10	AU-1	14.53	11.71	2.82	
B-12	AU-1	12.62	11.90	0.72	

B-13	AU-1	13.40	12.26	1.14	
B-15s	AU-1	13.25	12.26	0.99	
B-16	AU-1	14.82	12.97	1.85	
B-17s	AU-1	14.65	13.44	1.21	
B-18	AU-1	15.40	13.80	1.60	
B-19	AU-1	15.99	14.22	1.77	
B-20	AU-1	15.25	13.80	1.45	
B-21	AU-1	15.72	13.80	1.92	
B-22	AU-1	14.34	13.08	1.26	
B-23s	AU-1	12.96	9.84	3.12	
B-24	AU-1	14.20	12.95	1.25	
B-25	AU-1	15.33	13.02	2.31	
B-27	AU-1	15.26	13.68	1.58	
B-29	AU-1	14.80	13.26	1.54	1.91
B-11	CU-1	11.91	10.75	1.16	
B-14	CU-1	13.70	12.77	0.93	
B-15d	CU-1	12.05	10.97	1.08	
B-17d	CU-1	13.71	12.56	1.15	
B-23d	CU-1	12.76	11.45	1.31	
B-26	CU-1	14.59	13.68	0.91	
B-28	CU-1	12.76	10.92	1.84	
B-30	CU-1	16.23	13.08	3.15	1.70
B-1d	AU-2	14.59	13.68	0.91	0.91

These data provide a sufficient basis for determining the Maximum Long-Term Seasonal High (MLSH) ground water levels for the site, discussed below. The summary table presents the maximum and minimum water levels observed from May 2001 through November 2007. Considering the monitoring wells, the average difference between the maxima and minima within wells completed in the uppermost aquifer (AU-1) is 1.88 feet, and within the deeper aquifer (AU-2) the difference is 1.07 feet. Within the Phase 2 test borings with piezometers completed in AU-1, the difference in the maxima and minima is 1.85 feet, during a period from December 2001 to June 2002. The difference in test borings with piezometers completed in AU-2 is 0.91 feet. Thus, while the data in Phase 2 cover a shorter time period, the difference in maximum and minimum values is virtually the same in both aquifer units. That, and the correlation with climatic trends, establishes the <u>maximum values observed in Phase 2 during 2001-2003</u> as representative of the <u>maximum long-term seasonal high water levels</u>, without further adjustment.

4.1.7.4 Factors That Influence Water Table – Conditions at the site are conducive to high infiltration of surface water (upper aquifer recharge) and poor evapotranspiration characteristics. The site is nearly flat and cultivated, and surface depressions result in localized impoundments. Poor drainage originally necessitated the use of shallow drainage ditches to facilitate the former agricultural activities. Man-made influences include shallow drainage ditches (discussed earlier in the context of surface streams) existing to the east, west, and south of the Phase 2 footprint. These features tend to provide stabilizing effect on water level fluctuation, whereas the differences between the maximum and minimum observed water levels are generally less than 2 feet across the site. Changes in land use from agricultural and forest (which promotes high infiltration) to industrial uses (including the landfill, roadways, and appurtenances) tends to reduce infiltration and promote more runoff. This may have an irreversible affect on local ground water levels but not regional ground water.

High ground water conditions persisting into the autumn months are not unusual due to low ET, caused by poor vegetative cover and cover crop wilting. The available data suggest that the upper aquifer is not "flashy", taking weeks or months to fully respond to climatic changes. It should be noted that during the period from 2001 to 2003, heavy beaver activity (surface impoundments) was noted along the tributary to the west of the Phase 2 footprint, which caused higher ground water readings in the western portion of the Phase 2 site than would have occurred due to climatic response. The impoundments have since been removed, but the Phase 2 footprint was not affected by these conditions.

4.1.8 Horizontal and Vertical Flow Dimensions

Drawings X1 and **X2** present generalized hydrogeologic cross-sections that show the horizontal and vertical extent of the uppermost aquifer (AU-1) and ground water flow characteristics. Ground water movement through this formation is unconfined porous media. Recharge within the Phase 2 footprint occurs along most of the surface, with discharge from the surficial aquifer occurring along the on-site streams. A relatively slow horizontal flow occurs in the AU-1 aquifer (ranging 0.002 to 0.737 ft/day, average 0.245 ft/day), due in part to relatively flat gradients that reflect a subdued expression of the surface topography. A partial confining unit (CU-1) provides a lower boundary to the uppermost aquifer, although some slow horizontal flow and recharge to the lower aquifer (AU-2) is expected. Artesian pressures within the deeper aquifer limit potential contaminant migration through the confining layer. The cross sections show a horizontal flow within the deep aquifer, (calculated velocity of 0.075 ft/day). Flow calculations are presented on **Tables 6** and **7**. Refer to the following detailed discussion.

Table 6 shows an upward vertical gradient between the upper and lower portions of the unconfined surficial aquifer (AU-1), as seen by the couplets at B-6/6A and B-8/8A. Upward gradients were determined between the upper aquifer (AU-1) and lower aquifer (AU-2) during the site characterization for Phase 1. Data at the couplet B-1s/1d show a downward gradient, which suggests differing conditions in the northern portion of the site – test borings indicate a sandier horizon at the elevation of the silt-clay confining unit detected at other locations. Temporal changes in the gradient direction likely reflect seasonality. The data indicate down ward gradients within the uppermost aquifer over much of the Phase 2, except as noted above.

Table 7 presents horizontal ground water gradient data and velocity calculations for various piezometers, arranged according to Hydrogeologic Units: Aquifer Units (A.U.) And Confining Units (C.U.). Calculated horizontal ground water flow velocities are based on field hydraulic conductivity data at the various piezometers (**Table 3**) and the horizontal gradients developed from the potentiometric contours shown on **Drawing E1**. Ground water velocities vary within the various Hydrogeologic Units, as follows:

Hydrogeologic Unit	Average Horizontal Ground Water Velocity, ft/day
A.U. 1	0.245
C.U. 1*	0.0011
A.U. 2	0.075
C.U. 2*	0.0003

*Determined in the Phase 1 site characterization

4.1.9 Ground Water Contour Maps

Drawing E1 shows ground water potentiometric contours based on Maximum Long-Term Seasonal High water level observations discussed in **Section 4.1.7.3**. made in March 2001. Ground water flow is generally toward the south, toward Grindle Creek and its tributaries that flank the higher ground of the site. A local divide surface drainage and ground water flow between the southeast and southwest directions. The potentiometric contours reflect a subdued expression of the surface topography, characteristic of the Coastal Plain. The potentiometric contours make a smooth transition to the unnamed tributaries. There are localized "high areas" in which the water levels are elevated due to variation in subsurface conditions and/or artesian pressure. These areas are reflected as closed contours on the potentiometric map.

4.1.10 Test Location Map

Drawing S5 shows the locations of test borings/piezometers and pre-existing monitoring wells used for this investigation.

4.1.11 Local Well and Water Use Information

A potable well survey conducted in 2000 in conjunction with the Phase 1 site characterization (**Drawing S1**). A handful of domestic wells were identified – most of the region is served by municipal water supply. No down gradient ground water wells or significant ground water users identified within a one-mile radius. A public well exists near the Pactolus cross-roads, some 2 miles west of (and upgradient of) the facility.

4.1.12 Special Geologic Considerations

No unusual geologic features have been determined which would affect the ground water flow or the ability to effectively monitor the site, including faults, mines or dikes. Site conditions appear typical of the North Carolina Coastal Plain region and similar to that determined for the adjacent Phase 1 site. Some consideration should be given to the presence of background metals in the natural geochemistry, discussed below.

Background metals – Some common inorganic constituents have been detected in the monitoring wells for Phase 1, going back to pre-disposal background sampling conducted in 2001. Detected inorganic constituents have been associated with regional background geochemistry, i.e., these are naturally occurring inorganic compounds, the detection of which can be directly attributed to turbidity (suspended and dissolved solids), that have been noted elsewhere in sampling programs in the Coastal Plain. The background sampling event (pre-disposal) of 5/16/01 detected the following constituents:

		Maximum detected concentration, mg/l	2L standard mg/l
Chromium	MW-1d, 1s, 2d, 2s, 4, 7	0.085	0.05
Lead	MW-2s, 4	0.029	0.015
Cobalt	MW-2s	0.019	NA
Vanadium	MW-1d, 2s	0.124	NA
Zinc	MW-1d, 2s	0.099	2.1

Later sampling events have detected concentrations of arsenic and barium, also believed to be associated with background geochemistry (noted during high turbidity events).

The Geochemical Atlas of North Carolina[15] provides graphical summary data for several inorganic constituents, based on the National Uranium Resource Evaluation (NURE) database. These data include stream sediment and ground water samples collected ca. 1970s. Not all inorganic constituents of interest are represented for all regions, but those of potential interest within the Coastal Plain region follow:

Constituent	Ground Water	Stream Sediment
Alkalinity	>3	0.38
Aluminum	440 ppb	64,000 ppm
Bromine	>160 ppb	
Chlorine	30,000 ppb	
Conductivity	>500 umho/cm	>180 umho/cm
Fluorine	200 – 400 ppb	
Iron		200K – 400K ppm
Manganese	200 ppb	250 ppm
Uranium	0.025 ppm	3 ppm
Vanadium	0.062 ppb	45 – 90 ppm

4.1.13 Summary Report

Hydrogeologic conditions at the C&D Landfill, Inc., site are viewed as a short segmented, closed-loop hydrologic cycle, with recharge occurring over a majority of the site and on-site discharge occurring at local streams. Ground water flow is generally toward the south, with the regional discharge feature (Grindle Creek) located beyond the property line to the southwest of Phase 1, but Phase 2 and most of Phase 1 is surrounded by smaller tributaries and deep drainage ditches that drain the uppermost aquifer, i.e., a loose sand layer extending to an average depth of 12 feet (varying to 30 feet in places) that blankets the site above a silt-clay confining unit. There are currently no development or ground water users in the down gradient direction.

The confining layer separates the uppermost aquifer from a deeper regional aquifer (contained within the Yorktown formation). The regional aquifer exhibits mildly artesian pressure that exerts an upward vertical gradient beneath much of the site. Conditions at the site are typical of the Coastal Plain region, except that ground water levels are deeper than would be expected based on local topography. The surficial aquifer is recharged through normal precipitation, ground water migration from the east. Based on an analytical solution to the two-dimensional advection-dispersion equation for contaminant transport, the site can be effectively monitored by a 300-foot well spacing in the uppermost aquifer. Both upper and lower aquifers need to be monitored, although the deeper regional aquifer has been monitored at a reduced frequency.

[15] Available on-line at http://www.geology.enr.state.nc.us/NUREgeochem/geochem2.htm

4.2 Design Hydrogeologic Report – CDLF Phase 2

A single hydrogeologic investigation was performed to satisfy the requirements of both the site suitability investigation and the design hydrogeologic evaluation, relative to the Phase 2 expansion, shown on **Drawing S5.** The test boring program described in **Section 4.1.3** indicates 34 piezometers and two surface streams serving as ground water observation points within the 89.5-acre addition to the facility boundary. There are 23 piezometers within/near the Phase 2 footprint, which covers approximately 23 acres.

4.2.1 Ground Water Monitoring System Design

4.2.1.1 Aquifer Characteristics – Site geology has been described as a multiple layer system (**Section 4.1.6**) with an upper sand serving as the uppermost aquifer (Unit AU-1), comprised of Pleistocene fluvial sediments, underlain at depths varying from 12 to 30 feet by deep marine silt-clay that serves as a partial confining layer with thicknesses varying from 10 to 15 feet (Unit CU-1). Hydraulic conductivity values vary on the order of 10^{-3} to 10^{-4} cm/sec within the upper sands and on the order of 10^{-4} to 10^{-5} cm/sec within the partial confining unit. The stratigraphy is considered a "leaky aquifer", whereas the conductivities differ by relatively little (an order of magnitude) and the silt-clay is relatively sandy in places. However, there is an upward vertical gradient, which suggests a degree of confinement due to the silt-clay layer. Beneath the confining layer exists confined, porous silty and clayey sand (AU-2), with conductivity values on the order of 10^{-4} cm/sec, and another confining unit (CU-2) with conductivity values on the order of 10^{-6} cm/sec. The data suggest transitional boundaries between the units. Ground water discharge from the uppermost aquifer (AU-1) occurs along surface streams that surround the Phase 2 site.

4.2.1.2 Relative Point of Compliance – Selection of monitoring well locations for compliance monitoring of the uppermost aquifer is based on an understanding of hydrogeological conditions presented in this report. North Carolina solid waste Rule .1631 (a)(2)(B), pertaining to MSW facilities (extended to CDLFs by Division policy) makes a provision for the relevant point of compliance to be located no more than 150 feet from the waste boundary (relative to a 200 foot buffer) but at least 50 feet within the facility boundary. Division policy has been to require the compliance wells for CDLFs to be located within approximately 75-100 feet of the waste boundary, or approximately half the distance between the edge of waste and the compliance boundary. Based on the site studies, it appears that this spacing for compliance wells is appropriate for this facility. Based on the advection-dispersion calculations performed for Phase 1, a well spacing of no more than 300 feet in the down gradient direction is appropriate.

4.2.1.3 Monitoring Plan Amendments -- Based on the foregoing discussion, amendments to the Sampling and Analysis Plan (**Appendix 6**) consist of eight new compliance wells in the uppermost aquifer (AU-1), one of which is a shallow/deep couplet to monitor the deeper aquifer (AU-2), and one upgradient background well in the upper unit (AU-1). No new surface water sampling is proposed. The existing monitoring plan for Phase 1 will be amended with the new wells, which are shown on **Drawing MP1**.

Proposed Well	Nearest Piezometer	Ground Elevation	Top of Yorktown Fm. Confining Unit	Est'd Screen Interval Depth (bgs) and Elev.*	Est'd High Water Elevation (msl)
MW-9A	B-19	19	13.3' (El. 0.9)	5 – 15' (El. 14 to 4)	13.80 to 15.99
MW-10	B-24	14	13.3' (El. 3.4)	5 – 15' (El. 9 to -1)	12.95 to 14.20
MW-11	B-15S	13	15.5' (El. 2.1)	10 – 20' (El. 3 to -7)	12.26 to 13.40
MW-12	B-11	15	10.9' (El. 4.3)	5 – 15' (El. 14 to 1)	10..75 to 11.91
MW-13	B-12	14	17.9' (El. -1.2)	10 – 20' (El. 4 to -6)	11.90 to 12.62
MW-14S	B23S*	13.90	13.0' (El. 0.9)	15 – 20' (El. -1.1 to -6.1)	9.84 to 12.96
MW-14D	B23D*	14.54	12.7' (El. 1.8)	35 – 40' (El. -20.5 to -25.5)	11.45 to 12.76
MW-15	B-17S	15	13.0' (El. 4.0)	5 – 15' (El. 8 to -2)	13.44 to 14.65
MW-17	B-7	16	17.0' (El. 1.3)	10 – 20' (El. 6 to -4)	11.82 to 14.33

*Utilize Existing Borings B-23S and D, although these have 5-foot screens
All others shall have 10-foot screens, situated just below the top of the Yorktown, i.e., drilling depths and screen intervals shall be adjusted as needed during installation. All wells shall be 2" PVC with 0.010" screen slotted screen opening, embedded in filter sand and grouted to surface with locking steel cover. It is writer's intention to bail all wells for pre-sampling purge (no dedicated pumps).

4.2.2 Rock Core Information – Not Applicable

4.2.3 Estimated Long-Term Seasonal High Water Table

Section 4.1.7 provides a detailed description of historic water level data, including wells pertaining to the CDLF. These data were used to estimate a maximum long-term seasonal high potentiometric surface, presented in **Drawing E1**. The potentiometric contours were used, in turn, to verify that a minimum of 4 feet of vertical separation exists to the proposed base grades of CDLF Phase 2.

4.2.4 Bedrock Contour Map – Not Applicable

4.2.5 Hydrogeologic Cross Sections

Drawings X1 and **X2** present generalized hydrogeologic cross-sections that depict the horizontal and vertical extent of the upper most aquifer (Units AU-1) and ground water flow characteristics (discharge areas vs. recharge areas). The cross sections show the vertical separation between the maximum long-term seasonal high potentiometric surface and the proposed CDLF Phase 2 base grades.

4.2.6 Ground Water Flow Regime

A description of ground water flow paths, horizontal and vertical gradients, flow rates, and recharge/discharge areas required by this rule are provided in **Sections 4.1.4.4, 4.1.6, 4.1.8, and 4.2.1.1**. These sections provide a sufficient basis for establishing the ground water monitoring plan amendments.

4.2.7 On-site Soils Report

The CDLF Phase 2 grading plan involves cuts up to 2 – 3 feet below existing ground surfaces – within a relatively small area in the southern end of Phase 2 – and fills on the order of 2 – 4 feet. Much of the base grades will exist near existing ground surfaces. Based on numerous test pits, hand augers, and test borings, soils within the upper 2 feet beneath existing ground surfaces are expected to meet the soil-type requirements (typically SM classifications) of the 2006 C&D Rules. Ample soil resources exist on-site and within adjacent land – over 100 acres with a NCDENR mining permit under the same ownership – available for construction and operations. A close inspection will be required during base grade construction to verify that the required soil types are present within the upper 2 feet beneath finished subgrades (see the **CQA Plan** in **Volume 2**).

4.2.8 Certification

This is to certify that all borings that intersect the water table at this site have been constructed and maintained as permanent monitoring wells or shall be abandoned in accordance with the provisions of 15A NCAC 02C .0113.

Signed ____________________________
Printed ____________________________
Date ______________________________

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

Table 1A
Test Boring/Piezometer Data

* The top of the Yorktown is generally identified by a turretella-rich marker bed in green, medium stiff silt-clay

** The Castle Hayne is generally identified by shell-rich cemented sands and clays

***The Beaufort formation is generally characterized by the presence of glauconite (a green sedimentary mica), but this material could have been reworked into the shallower Yorktown sediments, as glauconite was observed

Elevation Data				Test Boring Data								Piezometer Construction Data					Hydro Geologic Unit
Boring Number	Boring Date	PVC Pipe Elev.	Ground Elev.	Drilling Method	Total Depth, ft.	Yorktown Fm. * Depth, ft.	Yorktown Fm. * Elev.	Castle Hayne Fm. * Depth, ft.	Castle Hayne Fm. * Elev.	Poss. Beaufort Fm. ** Depth, ft.	Poss. Beaufort Fm. ** Elev.	Top of Piez. Screen Depth, ft.	Top of Piez. Screen Elev.	Bot. of Piez. Screen Depth, ft.	Bot. of Piez. Screen Elev.	Stickup ft.	
B-1d	12/27/01	20.23	17.33	Rotary	80.0	23.0	**-5.7**	32.4	**17.3**	51.9	**17.3**	55.0	**-37.7**	65.0	**-47.7**	2.90	AU-2
B-1s	12/14/01	20.06	17.19	HSA	15.0							10.0	**7.2**	15.0	**2.2**	2.87	AU-1
B-2	12/17/01	21.02	16.94	HSA	20.0	14.7	**2.2**					10.0	**6.9**	20.0	**-3.1**	4.08	AU-1
B-3	12/18/01	20.74	17.28	HSA	30.0	26.3	**-9.0**					20.0	**-2.7**	30.0	**-12.7**	3.46	AU-1
B-4	12/18/01	22.83	19.34	HSA	25.0	19.6	**-0.3**					15.0	**4.3**	25.0	**-5.7**	3.49	AU-1
B-4A	04/10/02	21.98	19.47	Hand Auger	5.0	–		–				2.5	**17.0**	5.0	**14.5**	2.50	AU-1
B-5	12/17/01	23.90	19.28	HSA	25.0	19.7	**-0.4**					15.0	**4.3**	25.0	**-5.7**	4.62	AU-1
B-5A	04/10/02	21.04	19.43	Hand Auger	4.0	–		–				1.5	**17.9**	4.0	**15.4**	3.32	AU-1
B-6	12/18/01	21.98	18.43	HSA	25.0	19.9	**-1.5**					15.0	**3.4**	25.0	**-6.6**	3.55	AU-1
B-6A	04/10/02	19.04	18.54	Hand Auger	3.8	–		–				1.3	**17.2**	3.8	**14.7**	3.64	AU-1
B-7	12/12/01	21.04	18.28	HSA	25.0	17.0	**1.3**					15.0	**3.3**	25.0	**-6.7**	2.76	AU-1
B-8	12/13/01	18.69	15.32	HSA	15.0	8.5	**6.8**					10.0	**5.3**	15.0	**0.3**	3.37	AU-1
B-8A	04/10/02	17.93	15.42	Hand Auger	3.9	–		–				1.4	**14.0**	3.9	**11.5**	3.62	AU-1
B-9	12/13/01	20.64	17.55	HSA	20.0	16.1	**1.4**					10.0	**7.6**	20.0	**-2.4**	3.09	AU-1
B-10	12/13/01	21.28	18.29	HSA	20.0	13.5	**4.8**					10.0	**8.3**	20.0	**-1.7**	2.99	AU-1
B-11	12/11/02	17.93	15.24	HSA	40.0	10.9	**4.3**	27.6	**-12.4**			35.0	**-19.8**	40.0	**-24.8**	2.69	CU-1
B-12	12/12/02	20.14	16.74	HSA	20.0	17.9	**-1.2**					15.0	**1.7**	20.0	**-3.3**	3.40	AU-1
B-13	12/12/02	21.90	18.82	HSA	20.0	17.8	**1.0**					15.0	**3.8**	20.0	**-1.2**	3.08	AU-1
B-14	12/18/02	19.17	16.26	HSA	40.0	11.8	**4.5**	31.9	**-15.6**			35.0	**-18.7**	40.0	**-23.7**	2.91	CU-1
B-15d	12/13/02	20.52	17.57	HSA	40.0	15.5	**2.1**	35.2	**-17.6**			35.0	**-17.4**	40.0	**-22.4**	2.95	CU-1
B-15s	12/13/02	20.45	17.59	HSA	20.0	15.5	**2.1**					15.0	**2.6**	20.0	**-2.4**	2.86	AU-1
B-16	12/10/02	18.77	15.92	HSA	20.0	8.1	**7.8**					15.0	**0.9**	20.0	**-4.1**	2.85	AU-1
B-17d	12/18/02	19.61	17.07	HSA	40.0	12.7	**4.4**	37.1	**-20.0**			35.0	**-17.9**	40.0	**-22.9**	2.54	CU-1
B-17s	12/18/02	19.67	17.00	HSA	20.0	13.0	**4.0**					15.0	**2.0**	20.0	**-3.0**	2.67	AU-1
B-18	12/09/02	21.55	18.77	HSA	20.0	17.9	**0.9**					15.0	**3.8**	20.0	**-1.2**	2.78	AU-1
B-19	12/06/02	21.93	18.62	HSA	20.0	13.3	**5.3**					15.0	**3.6**	20.00	**-1.4**	3.31	AU-1
B-20	12/09/02	20.74	18.18	HSA	20.0	18.1	**0.1**					15.0	**3.2**	20.00	**-1.8**	2.56	AU-1
B-21	12/10/02	19.01	16.17	HSA	20.0	8.2	**8.0**					15.0	**1.2**	20.0	**-3.8**	2.84	AU-1
B-22	12/12/02	21.07	18.02	HSA	20.0	17.8	**0.2**					15.0	**3.0**	20.0	**-2.0**	3.05	AU-1
B-23d	12/17/02	17.45	14.54	HSA	40.0	12.7	**1.8**	33.8	**-19.3**			35.0	**-20.5**	40.0	**-25.5**	2.91	CU-1
B-23s	12/18/02	16.60	13.90	HSA	20.0	13.0	**0.9**					15.0	**-1.1**	20.0	**-6.1**	2.70	AU-1
B-24	12/11/02	19.49	16.73	HSA	20.0	13.3	**3.4**					15.0	**1.7**	20.0	**-3.3**	2.76	AU-1
B-25	12/10/02	18.36	15.76	HSA	20.0	8.7	**7.1**					15.0	**0.8**	20.0	**-4.2**	2.60	AU-1
B-26	12/19/02	20.93	17.77	HSA	40.0	21.7	**-3.9**	35.4	**-17.6**			35.0	**-17.2**	40.0	**-22.2**	3.16	CU-1
B-27	12/09/02	19.81	16.98	HSA	20.0	13.4	**3.6**					15.0	**2.0**	20.0	**-3.0**	2.83	AU-1
B-28	12/17/02	19.57	16.76	HSA	40.0	12.1	**4.7**					35.0	**-18.2**	40.0	**-23.2**	2.81	CU-1
B-29	04/23/03	19.42	17.10	HSA	20.0	19.5	**-2.4**					10.0	**7.1**	20.0	**-2.9**	2.32	AU-1
B-30	04/23/03	21.27	16.33	HSA	40.0	14.3	**2.0**	37.9	**-21.6**			30.0	**-13.7**	40.0	**-23.7**	4.94	CU-1

Notes:

1. No rock or partially weathered rock was encountered, although 100+ bpf material (cemented layers) was encountered
2. Some of the formation depths are estimated as near as possible based on the sampling interval
3. Clay layer will shell marker bed was not encountered at B-1 (alluvial deposits indicate the presence of an old channel located nearby)
4. The deeper formations (Castle Hayne and Beaufort), believed to have been encountered at B-1d, were characterized in the Phase 1 investigation (these layers are beneath the conifining unit and are considered relatively insignificant to the hydrogeology of the site)

AU-1 = Upper Aquifer Unit
CU-1 = Highest Confining Unit
AU-2 = Deeper Aquifer Unit
CU-2 = Deeper Confining Unit

Table 1B
Supplemental Data for Selected Regional Water Wells

Based on NC DENR Monitoring Well Database

All dimensions given in feet, elevations refenced to mean sea level

Test Boring Data			Data on Specific Geologic Formations																			
Boring	Ground	Total	Yorktown Fm.			Castle Hayne Fm.			Beaufort Fm.			Pee Dee Fm.			Black Creek Fm.			Cape Fear Fm.			Basement	
Number	Elev.	Depth, ft.	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.	Thickness	Depth, ft.	Elev.
M21Q *	15	730	20	**15**	47	67	**-22**	-24	43	**-32**	39	86	**-71**	117	203	**-188**	319	522	**-507**			
N22I *	42	250	14	**34**	36	50	**-8**	28	78	**-45**	59	146	**-104**									
N23B	62	440	19	**36**	**				49	**4**	44	102	**-40**	73	175	**-113**						
N23D	56	432	8	**38**	**				26	**16**	24	64	**-8**	320	384	**-328**						
N23G *	68	456	10	**56**	**				68	**31**	53	90	**-22**	45	135	**-67**	259	394	**-326**			
N23O	67	480	20	**47**	**				66	**24**	29	72	**-5**	66	138	**-71**	304	442	**-375**			
O23A	50	514	10	**36**	**				38	**-28**	66	144	**-94**	110	254	**-204**	226	480	**-430**			
M24R	49	754	21	**30**	**							48	**1**	30	78	**-29**	257	335	**-286**	419	754	**-705**
M24B *	26	502	40	**18**	**							32	**-6**	14	46	**-20**	221	267	**-241**			
O23L	42	1092	28	**32**	26	54	**7**	106	160	**-26**	22	90	**-48**	90	180	**-138**	272	452	**-410**	640	1092	**-1050**
O22H	46	470	0	**26**	0	0	**-2**	0	0	**-20**	94	160	**-114**	120	280	**-234**						
N23P	70	802	0	**60**	**				0	**32**	40	78	**-8**	70	148	**-78**	266	414	**-344**			
M24U *	65	711	0	**44**	**							66	**-1**	48	114	**-49**	283	397	**-332**			
M18I	40	1526				0	**-73**	0	0	**-222**	126	388	**-348**	105	493	**-453**	194	687	**-647**			
M20E *	45	516	0	**17**	0	0	**-9**	0	0	**-115**	30	190	**-145**	120	310	**-265**						
Average formation thickness for closest borings:					**35**			**24**			**45**			**70**			**270**			**530**		

* Relatively close to site (see Map, Appx. V)

** Interface not clearly identified – deeper unit may have been absent.

Supplemental Data for On-site Wells (Phase 1)

Elevation Data				Test Boring Data								Piezometer Construction Data				
Boring	Boring	PVC Pipe	Ground	Drilling	Total	Yorktown Fm.		Castle Hayne Fm.		Beaufort Fm.		Top of Piez. Screen		Bot. of Piez. Screen		Stickup
Number	Date	Elev.	Elev.	Method	Depth, ft.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	ft.
MW-1d	10/12/00	21.14	17.40	HSA	50.0	7.5	**-32.6**	30.5	**50.0**			40.0	**17.4**	50.0	**0.0**	36789.86
(Old B-1)																
MW-1S	05/06/01	20.91	17.59	HSA	13.0	–						3.0	**18.0**	13.0	**18.0**	36786.20
MW-2D	10/09/00	21.80	17.97	Rotary	70.0	12.5	**0.0**	33.5	**0.0**	61.5	**0.0**	39.0	**0.0**	49.0	**0.0**	0.00
(Old B-2d)																
MW-2S	05/05/01	21.44	18.45	HSA	13.0	–	**0.0**		**0.0**			3.0	**0.0**	13.0	**0.0**	0.00
MW-3D	10/12/00	22.83	19.37	HSA	50.0	14.0	**1.8**	27.5	**14.8**			40.0	**14.8**	50.0	**-1.2**	36997.58
(Old B-3)																
MW-4	05/05/01	18.42	14.83	HSA	13.0	–						3.0	**16.0**	13.0	**-3.9**	36996.60
MW-5	11/18/02	17.90	14.80	HSA	18.0	18.4	**0.3**					3.0	**18.3**	18.0	**18.3**	37556.79
MW-6	05/05/01	20.03	16.87	HSA	13.0	–						3.0	**19.9**	13.0	**19.9**	37552.12
MW-7	05/05/01	19.40	16.03	HSA	13.0	–						3.0	**19.9**	13.0	**19.9**	37555.05
MW-8	11/18/02	21.21	18.30	HSA	18.0	17.6	**0.0**					3.0	**0.0**	18.0	**0.0**	0.00
MW-9D	11/15/02	22.88	19.88	HSA	39.0	16.5	**0.0**					33.0	**0.0**	38.0	**0.0**	0.00
MW-9S	11/18/02	22.95	19.91	HSA	18.5	16.5	**0.0**					3.0	**0.0**	18.0	**0.0**	0.00

Table 2
Geotechnical Laboratory Data

Grain Size Distributution and Soil Classification

S = Split Spoon Sample
B = Bulk Sample (Remolded)
U = Shelby Tube (Undisturbed)
G = Grab Sample

Boring Number	Sample Number	Sample Depth, ft.	Grain Size Distribution % F. Gravel	% C. Sand	% M. Sand	% F. Sand	% Silt	% Clay	Effective Porosity*	Liquid Limit	Plasticity Limit	Plasticity Index	USCS Class.	Natural Moisture	Hydrogeologic Description	Hydro Unit	Average Porosity
			> 4.75 mm	4.75 - 2.0 mm	2.0 - 0.425 mm	.425 - 0.074 mm	.074 - 0.002 mm	< 0.002 mm						%			
			>#4 SIEVE	#4 - #10	#10 - #40	#40 - #200	<#200	By Hydrometer									
B-2	B1	1' - 5'	0.31	0.64	20.25	43.57	30.29	4.93	0.08	NP	NP	NP	SM	31.8	Non-plastic silty fine to medium SAND	1 Remold	
B-4	S4	9.5' - 10'	0.00	1.18	59.96	36.25	2.61	**	0.14	NP	NP	NP	SP	20.9	Poorly graded fine to medium SAND	1	
B-7	S1	2' - 2.5'	0.12	0.57	28.33	55.74	15.24	**	0.08	NP	NP	NP	SM	8.4	Non-plastic silty fine to medium SAND	1	
B-7	S2	4.5' - 5'	0.00	0.41	38.33	58.67	2.59	**	0.16	NP	NP	NP	SP	3.2	Poorly graded fine to medium SAND	1	
B-7	S3	7' - 7.5'	0.11	0.69	54.26	36.83	8.11	**	0.17	NP	NP	NP	SP-SM	21.0	Slightly silty medium to fine SAND	1	
B-7	S4	9.5' - 10'	0.36	3.22	53.13	40.86	2.43	**	0.22	NP	NP	NP	SP	20.2	Poorly graded fine to medium SAND	1	
B-7	S5	14.5' - 15'	0.00	0.64	45.13	45.53	8.70	**	0.16	NP	NP	NP	SP-SM	24.1	Slightly silty medium to fine SAND (deep sand pocket w/in Unit 2	1	
B-7	S6	19.5' - 20'	0.00	0.36	31.36	61.51	6.77	**	0.13	NP	NP	NP	SP-SM	18.4	Slightly silty medium to fine SAND (deep sand pocket w/in Unit 2	1	
B-7	S7	24.5' - 25'	0.00	1.26	24.18	58.23	16.33	**	0.08	NP	NP	NP	SM	29.1	Non-plastic silty fine to medium SAND (deep sand pocket)	1	
B-8	B1	1' - 5'	0.06	0.30	17.42	45.89	30.84	5.49	0.07	NP	NP	NP	SM	16.2	Non-plastic silty fine to medium SAND	1	
B-1	U1	11.3' - 11.8'	0.07	0.41	17.69	59.6	22.23	**	0.04	NP	NP	NP	SM		Silty SAND (along Units 1 and 2 boundary)	1	0.12
B-1	U2	12.3' - 12.8'	0.00	0.30	4.76	52.83	21.54	20.57	0.04	36	19	17	CL	42.2	Fine sandy silty CLAY (Lean CLAY)	2	
B-8	U1a	13.4' - 13.9'	11.62	4.66	5.02	42.34	36.36	**	0.03	27	20	7	SC-SM		Silty and clayey SAND (along Units 1 and 2 boundary)	1, 2	
B-8	U1b	14.4' - 14.9'	1.06	1.50	2.86	56.13	20.07	18.38	0.05	30	16	14	CL	31.0	Fine sandy silty CLAY (Lean CLAY)	2	
B-10s	U1	13.7' - 14.2'	29.10	8.28	7.45	36.37	14.82	3.98	0.01	25	20	5	SM		Silty SAND w/ shells	2	0.03

Notes to Above:

Moisture Contents are Dry Unit Weight Based

Moisture data for bulk samples acquired from individual jar samples collected with the bulk sample. Samples were oven-dried.
These data are considered representative of in-situ moisture conditions for earth work considerations.

*Effective porosity values for soil were determined from the grain size distribution referencing Fetter (1988), which involved using different cutoff values and a ternary diagram to determine specific yield, referenced in USGS Water-Supply Paper 1662-D (1967). Refer to the supplemental data in Appendix B.

Samples tested by Geotechnics, Inc., Raleigh, NC

** Insufficient fraction passing #200 sieve to run hydrometer (may contain some clay)

Table 2 - Continued
Geotechnical Laboratory Data

Compaction Data -- Bulk Samples

Boring Number	Sample Number	Sample Depth, ft.	Max. Dry Density, pc	Optimum Moisture, %	Natural Moisture, %
B-2	B1	1.0 - 5.0	98.6	18.1	31.8
B-8	B2	1.0 - 5.0	103.1	17.0	16.2

Hydraulic Conductivity Data -- Remolded Bulk Samples

Boring Number	Sample Number	Sample Depth, ft.	Porosity %	Sat'd Conductivity cm/sec	Compaction % MDD	Tested Moisture, %	K cm/sec
B-2	B1	1.0 - 5.0	44.0%	6.80E-06	97.8%	19.0%	5.64E-07
B-8	B2	1.0 - 5.0	42.0%	6.50E-06	98.2%	16.6%	4.37E-07

Hydraulic Conductivity Data -- Undisturbed Samples

Boring Number	Sample Number	Sample Depth, ft.	Porosity %	Sat'd Conductivity cm/sec	Tested Density (pcf)	Tested Moisture, %	K cm/sec	K ft/day
B-1	U1	11.0 - 11.3	50.0%	1.50E-07	124.0	27.1%	2.22E-04	0.63
B-10	U2	14.4 - 14.7	36.0%	4.60E-07	115.0	19.2%	3.03E-05	0.09

Triaxial Shear Strength Data

Boring Number	Sample Number	Sample Depth, ft.	Total Strength Parameters c (psf)	phi (degrees)	Effective Strength Parameters c' (psf)	phi (degrees)
B-2	B1	1.0 - 5.0	374	19.3	0	40.0
B-1	U1	11.0 - 11.3	130	12.5	32.1	27.4
B-8	B2	1.0 - 5.0	418	20.6	0	38.8
B-8	U2	13.0 -15.0	360	13.1	179	36.2

Consolidation Test Data

Boring Number	Sample Number	Sample Depth, ft.	* Max. Past Pressure, psf	Compression Ratio **	Consolidation Coefficient***
B-1	U1	11.0 - 11.3	1700	0.045	
B-10	U3	13.4 - 13.5	1600	0.057	

Notes to Above:

* estimated as intersection of apparent virgin compression curve and recompression curve, sample exhibits smooth transition (sand-like behavior)

** based on less than one full log cycle, steepest part of virgin compression curve

*** value taken at 2000 psf

All Moisture Contents are Dry Unit Weight Based

Moisture data for bulk samples acquired from individual jar samples collected with the bulk sample. These data are considered representative of in-situ moisture conditions for earth work considerations.

Table 3
Summary of Hydrogeological Properties

Conductivity Values Based on Falling Head Slug Tests, Evaluated by Two Methods: Hvorslev Bouwer-Rice

Piezometer No.	Hydrologic Unit	Hydrogeological Description	Aquifer Thickness	Effective Porosity	Total Porosity	Conductivity k (cm/sec)	Conductivity k (cm/sec)	Max k (cm/sec)	Min k (cm/sec)	Avg k (cm/sec)	Representative Grain Size Distribution % Gravel	% Sand	% Silt	% Clay	Representative Boring, Sample I.D.
			feet												
B-10	AU 1	Loose Variably Silty F-C Sand	15	0.50	0.50	9.365E-04	2.232E-03	3.25E-03	2.57E-04	1.93E-03					
B-9		with Occ. Clay Layers				9.453E-04	2.237E-03								
B-8						1.474E-03	3.250E-03	9.21E+00	7.28E-01	5.48E+00					
B-7						3.080E-04	7.486E-04				0.00	83.67	16.33	**	B-7, S7
B-6						1.970E-04	4.788E-04								
B-5						8.542E-04	2.104E-03								
B-4						1.018E-03	2.494E-03				0.00	97.39	2.61	**	B-4, S4
B-3						1.167E-03	3.062E-03								
B-2						1.012E-03	2.532E-03				0.31	64.47	30.29	4.93	B-2, B1
B-1s						8.737E-04	1.869E-03								
B-1d	AU 2	Dense Silty Sand and Clay	30	0.40	0.40	9.216E-05	2.568E-04	7.279E-01			1.00	31.00	31.00	37.00	B-2s, U3, Phase 1

Effective and total porosity values taken from Groundwater and Wells (Driscoll, 1986), p. 67. ** Too little clay to measure in hydrometer

Aquifer thickness values assumed based on hydrogeologic cross sections

Thickness of saturated zone in Aquifer Unit 1 varies from 3 to 8 feet

No piezometers were completed in the confining units (see Undusturbed Samples on Table 2)

Table 4
Short-Term Ground Water Observations

Boring Number	Boring Date	PVC Pipe Elev.	Ground Elev.	Piezometer Stickup, ft.	Time of Boring Levels, BGS Depth, ft.	Elev.	Stabilized Levels (24 hr), BGS Depth, ft.	Elev.	Stabilized Levels (7+ day), BGS Depth, ft.	Elev.	Date
B-1d	12/27/01	20.23	17.19	3.04	1.6	**15.6**	1.6	**15.6**	1.6	**15.6**	12/27/01
B-1s	12/14/01	20.06	17.19	2.87	1.5	**15.7**	1.4	**15.8**	1.6	**15.59**	12/27/01
B-2	12/17/01	21.02	16.94	4.08	2.3	**14.6**	2.3	**14.6**	2.5	**14.44**	12/27/01
B-3	12/18/01	20.74	17.28	3.46	3.4	**13.9**	3.3	**14.0**	3.0	**14.28**	12/27/01
B-4	12/18/01	22.83	19.34	3.49	5.1	**14.2**	5.1	**14.2**	4.9	**14.44**	12/27/01
B-5	12/17/01	23.90	19.28	4.62	5.3	**14.0**	5.2	**14.1**	5.2	**14.08**	12/27/01
B-6	12/18/01	21.98	18.43	3.55	4.1	**14.3**	4.2	**14.2**	4.2	**14.23**	12/27/01
B-7	12/12/01	21.04	18.28	2.76	5.6	**12.7**	5.6	**12.7**	5.8	**12.48**	12/18/01
B-8	12/13/01	18.69	15.32	3.37	3.5	**11.8**	3.5	**11.8**	3.5	**11.82**	12/18/01
B-9	12/13/01	20.64	17.55	3.09	6.4	**11.2**	6.4	**11.2**	6.5	**11.05**	12/18/01
B-10	12/13/01	21.28	18.29	2.99	6.5	**11.8**	6.4	**11.9**	6.3	**11.99**	12/18/01
B-11	12/11/02	17.93	15.24	2.69	5.5	**9.7**	5.0	**10.2**	4.49	**10.75**	01/15/03
B-12	12/12/02	20.14	16.74	3.40	4.8	**11.9**	4.8	**11.9**	4.84	**11.90**	01/15/03
B-13	12/12/02	21.90	18.82	3.08	4.7	**14.1**	5.5	**13.3**	6.39	**12.43**	01/15/03
B-14	12/18/02	19.17	16.26	2.91	3.9	**12.4**	3.7	**12.6**	3.49	**12.77**	01/15/03
B-15d	12/13/02	20.52	17.57	2.95	14.3	**3.3**	10.5	**7.1**	6.60	**10.97**	01/15/03
B-15s	12/13/02	20.45	17.59	2.86	6.5	**11.1**	5.9	**11.7**	5.33	**12.26**	01/15/03
B-16	12/10/02	18.77	15.92	2.85	3.9	**12.0**	3.3	**12.6**	2.70	**13.22**	01/15/03
B-17d	12/18/02	19.61	17.07	2.54	4.7	**12.4**	4.5	**12.5**	4.38	**12.69**	01/15/03
B-17s	12/18/02	19.67	17.00	2.67	5.0	**12.0**	4.2	**12.8**	3.36	**13.64**	01/15/03
B-18	12/09/02	21.55	18.77	2.78	3.7	**15.1**	4.0	**14.7**	4.36	**14.41**	01/15/03
B-19	12/06/02	21.93	18.62	3.31	4.3	**14.3**	4.1	**14.5**	3.94	**14.68**	01/15/03
B-20	12/09/02	20.74	18.18	2.56	3.7	**14.5**	3.9	**14.3**	4.12	**14.06**	01/15/03
B-21	12/10/02	19.01	16.17	2.84	3.1	**13.1**	2.5	**13.6**	1.96	**14.21**	01/15/03
B-22	12/12/02	21.07	18.02	3.05	4.3	**13.7**	4.6	**13.4**	4.94	**13.08**	01/15/03
B-23d	12/17/02	17.45	14.54	2.91	2.9	**11.6**	3.0	**11.5**	3.09	**11.45**	01/15/03
B-23s	12/18/02	16.60	13.90	2.70	3.0	**10.9**	2.2	**11.7**	1.43	**12.47**	01/15/03
B-24	12/11/02	19.49	16.73	2.76	3.4	**13.3**	3.5	**13.2**	3.58	**13.15**	01/15/03
B-25	12/10/02	18.36	15.76	2.60	3.4	**12.4**	2.8	**13.0**	2.10	**13.66**	01/15/03
B-26	12/19/02	20.93	17.77	3.16	3.9	**13.9**	4.0	**13.8**	4.09	**13.68**	01/15/03
B-27	12/09/02	19.81	16.98	2.83	2.2	**14.8**	2.5	**14.4**	2.87	**14.11**	01/15/03
B-28	12/17/02	19.57	16.76	2.81	4.3	**12.5**	5.1	**11.7**	5.84	**10.92**	01/15/03
B-29	04/23/03	19.42	17.1	2.32	2.3	**14.8**	2.3	**14.8**	2.30	**14.80**	04/22/03
B-30	04/23/03	21.27	16.33	4.94	2.6	**13.7**	2.5	**13.8**	2.40	**13.93**	04/22/03

Notes: NA in depth column means water level was "Not Acquired."

BGS data referenced "below ground surface."

TOC data referenced from "top of casing."

Table 5
Long Term Ground Water Levels

Water Level Elevations All values given in feet and referenced from Top of Casing

Boring	Unit	Casing Elev.	Ground Elev.	05/16/01	11/12/01	Boring	12/27/01	02/12/02	03/12/02	04/10/02	04/22/02	05/02/02	05/08/02	06/25/02	11/27/02
MW-1s	AU-1	20.91	17.59	12.00	10.83							13.06			12.35
MW-2s	AU-1	21.44	18.45	10.54	9.70							10.91			9.95
MW-4	AU-1	18.42	14.83	11.48	10.95							11.80			11.66
MW-5	AU-1	17.90	14.80												10.92
MW-6	AU-1	20.03	16.87	10.19	9.57							10.30			9.73
MW-7	AU-1	19.40	16.03	10.74	10.08							10.89			10.33
MW-8	AU-1	21.21	18.30												11.03
MW-9s	AU-1	22.95	19.91												10.84
MW-1d	AU-2	21.14	17.40	11.12											
MW-2d	AU-2	21.80	17.97	9.11											
MW-9d	AU-2	22.88	19.88												10.21
B-1s	AU-1	20.06	17.33				15.59	16.18	15.78		16.38		16.20	14.38	
B-2	AU-1	21.02	16.94				14.44	15.94	15.97		16.04		14.94	13.31	
B-3	AU-1	20.74	17.45				14.28	16.23	16.21	16.71	16.59		15.83	14.04	
B-4	AU-1	22.83	19.47				14.44	17.50	16.73	17.49	17.13		15.82	13.86	
B-4A	AU-1	22.83	19.47							17.21			16.74		
B-5	AU-1	23.90	19.43				14.08	16.76	16.25	16.75	16.69		15.60	14.17	
B-5A	AU-1	22.75	19.43							17.50			19.16		
B-6	AU-1	21.98	18.54				14.23	16.99	16.53	16.95	16.93		15.87	13.76	
B-6A	AU-1	22.18	18.54							16.57			16.04		
B-7	AU-1	21.04	18.30				12.38	13.90	13.73		14.33		13.45	12.59	
B-8	AU-1	18.69	15.42				11.82	13.70	13.29	13.89	13.97		13.15	11.88	
B-8A	AU-1	19.04	15.42							13.62			12.93	12.77	
B-9	AU-1	20.64	17.54				11.15	12.24	12.53		13.10		12.61	11.67	
B-10	AU-1	21.30	18.09				11.71	13.50	13.42		14.33		13.56	12.39	
B-12	AU-1	20.14	16.74												
B-13	AU-1	21.90	18.82												
B-15s	AU-1	20.45	17.59												
B-16	AU-1	18.77	15.92												
B-17s	AU-1	19.67	17.00												
B-18	AU-1	21.55	18.77												
B-19	AU-1	21.93	18.62												
B-20	AU-1	20.74	18.18												
B-21	AU-1	19.01	16.17												
B-22	AU-1	21.07	18.02												
B-23s	AU-1	16.60	13.90												
B-24	AU-1	19.49	16.73												
B-25	AU-1	18.36	15.76												
B-27	AU-1	19.81	16.98												
B-29	AU-1	19.42	17.10												
B-11	CU-1	17.93	15.24												
B-14	CU-1	19.17	16.26												
B-15d	CU-1	20.52	17.57												
B-17d	CU-1	19.61	17.07												
B-23d	CU-1	17.45	14.54												
B-26	CU-1	20.93	17.77												
B-28	CU-1	19.57	16.76												
B-30	CU-1	21.27	16.33												
B-1d	AU-2	20.23	17.33				15.59	16.10	15.61		16.04		15.37	13.82	

Surface impoundments occurred at B-1s/d and B-2 during the winter/spring of 2002 due to beaver activity on the main drainage canal located south of the western "panhandle"

Borings B-1 through B-6 are located within a future soil borrow area, a relatively low-lying area that may have been influenced by the beaver activity and/or recent logging activity

Borings B-7 through B-10 are located in the proposed 20-acre waste footprint, within higher ground not as likely to have been influenced by the beavers

Table 5
Long Term Ground Water Levels

Water Level Elevations - continued All values given in feet and referenced from Top of Casing

Boring	01/15/03	02/25/03	04/22/03	05/14/03	06/22/03	11/13/03	5/20/04	11/05/04	5/31/05	11/04/05	5/30/06	11/02/06	5/16/07	11/16/07
MW-1s				13.08		13.57	12.42	12.01	12.63	13.50	12.45	13.71	13.64	11.03
MW-2s				11.24		11.06	10.70	10.18	10.89	11.55	10.57	11.29	11.14	9.56
MW-4				11.82		11.96	11.62	11.46	11.69	12.02	11.68	11.99	11.92	10.74
MW-5				11.72		11.52	11.29	10.78	11.29	11.80	11.10	11.58	11.59	10.47
MW-6				10.57		10.75	10.48	10.16	10.66	11.03	10.40	10.95	10.85	9.65
MW-7				10.92		11.24	10.90	10.61	11.10	11.42	10.89	11.41	11.40	9.98
MW-8				11.85		11.63	11.60	10.92	11.42	11.81	11.21	11.56	11.63	10.63
MW-9s				11.65		11.42	11.32	10.74	11.17	11.61	11.04	11.34	11.37	
MW-1d				11.98									12.52	
MW-2d				9.74							9.45		9.85	
MW-9d														
B-1s														
B-2														
B-3					12.96									
B-4														
B-4A														
B-5			16.44	16.30	14.85									
B-5A			17.17	17.03										
B-6														
B-6A														
B-7	13.57	14.17	14.20	14.06	13.51									
B-8	13.01	13.95	14.18	14.04	12.94									
B-8A	13.05	13.72	14.00	13.86	12.71									
B-9	12.46	13.11	13.30	13.16	12.52									
B-10	13.30	14.10	14.53	14.39	13.42									
B-12	11.90	12.42	12.62	12.48	12.05									
B-13	12.43	13.13	13.40	12.26	12.45									
B-15s	12.26	12.89	13.25	13.11	12.34									
B-16	13.22	14.82	14.27	14.13	12.97									
B-17s	13.64	14.65	14.39	14.25	13.44									
B-18	14.41	15.40	15.13	14.99	13.80									
B-19	14.68	15.99	15.54	15.40	14.22									
B-20	14.06	15.25	15.15	15.01	13.80									
B-21	14.21	15.72	15.59	15.45	13.80									
B-22	13.08	14.05	14.34	14.20	13.22									
B-23s	12.47	9.84	12.96	12.82	12.40									
B-24	13.15	14.12	14.20	13.00	12.95									
B-25	13.66	15.33	15.01	14.87	13.02									
B-27	14.11	15.26	14.82	14.03	13.68									
B-29			14.80	13.48	13.26									
B-11	10.75	11.19	11.91	11.77	11.10									
B-14	12.77	13.22	13.70	13.56	12.94									
B-15d	10.97	11.37	12.05	11.91	11.30									
B-17d	12.69	13.21	13.71	12.56	12.97									
B-23d	11.45	12.15	12.76	12.62	12.05									
B-26	13.68	14.20	14.59	14.45	13.85									
B-28	10.92	12.13	12.76	12.62	12.02									
B-30			16.23	15.06	13.08									
B-1d														

Table 6 REVISED See Note 1
Vertical Ground Water Gradient Calculations

The vertical gradients can change with time due to seasonal fluctuation of the potentiometric levels between the upper, unconfined aquifer and the deeper, partly confined aquifer

Selected Ground Water Observation Dates

Nested Piezometers: **B-1s** / **B-1d**
Aquifer Unit 1 – Silt and clay strata (10 to 15 feet)
Aquifer Unit 2 – Silty Sand, Partly Cemented

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		12/27/01 W.T.E.	02/12/02 W.T.E.	03/12/02 W.T.E.	04/10/02 W.T.E.	04/22/02 W.T.E.	05/08/02 W.T.E.	06/25/02 W.T.E.
B-1s	7.3	2.3		15.59	16.18	15.78	–	16.38	16.20	14.38
Saturated Midpoint Elevation				4.80	4.80	4.80		4.80	4.80	4.80
B-1d	-37.7	-47.7		15.59	16.10	15.61	–	16.04	15.37	13.82
Saturated Midpoint Elevation				-42.70	-42.70	-42.70		-42.70	-42.70	-42.70
	Vertical Gradient (see Note 2)			0.0000	0.0017	0.0036		0.0072	0.0175	0.0118
				Down	Down	Down		Down	Down	Down

Water level observation ceased due to elimination this portion of the site for new landfill footprint (possible borrow site)

Nested Piezometers: **B-8A** / **B-8**
Aquifer Unit 1 – Silty and clayey sand strata (upper 6 feet)
Aquifer Unit 1 – Deeper silt strata (10 to 15 feet)

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		03/23/01 W.T.E.	W.T.E.	W.T.E.	04/10/02 W.T.E.	W.T.E.	05/08/02 W.T.E.	06/25/02 W.T.E.	01/15/03 W.T.E.	02/25/03 W.T.E.	04/22/03 W.T.E.	05/14/03 W.T.E.	06/22/03 W.T.E.
B-8A	14.0	11.5		13.77	–	–	10.00	–	9.31	9.15	12.95	13.72	14.00	13.86	12.71
Saturated Midpoint Elevation				12.64			10.75		10.41	10.33	12.23	12.61	12.75	12.68	12.11
B-8	5.4	0.4		13.61	–	–	10.62	–	9.88	8.61	13.01	13.95	14.18	14.04	12.94
Saturated Midpoint Elevation				2.90			2.90		2.90	2.90	2.90	2.90	2.90	2.90	2.90
	Vertical Gradient (see Note 2)			0.0164			-0.0790		-0.0759	0.0727	-0.0064	-0.0237	-0.0183	-0.0184	-0.0250
				Down			Up		Up	Down	Up	Up	Up	Up	Up

Nested Piezometers: **B-5A** / **B-5**
Aquifer Unit 1 – Silty and clayey sand strata (upper 6 feet)
Aquifer Unit 1 – Deeper silt and sand strata (15 to 25 feet)

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		W.T.E.	W.T.E.	W.T.E.	04/10/02 W.T.E.	W.T.E.	05/08/02 W.T.E.	06/25/02 W.T.E.	01/15/03 W.T.E.	02/25/03 W.T.E.	04/22/03 W.T.E.	05/14/03 W.T.E.	06/22/03 W.T.E.
B-5A	17.9	15.4		–	–	–	14.18	–	15.84	dry	–	–	17.17	17.03	dry
Saturated Midpoint Elevation							14.79		15.62				16.29	16.22	
B-5	4.4	-5.6		–	–	–	12.28	–	11.13	9.70	–	–	16.44	16.30	14.85
Saturated Midpoint Elevation							-0.60		-0.60				-0.60	-0.60	
	Vertical Gradient (see Note 2)						0.1235		0.2904				0.0432	0.0434	
							Down		Down				Down	Down	

Nested Piezometers: **B-6A** / **B-6**
Aquifer Unit 1 – Silty and clayey sand strata (upper 6 feet)
Aquifer Unit 1 – Deeper silt and sand strata (15 to 25 feet)

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		W.T.E.	W.T.E.	W.T.E.	04/10/02 W.T.E.	W.T.E.	05/08/02 W.T.E.	06/25/02 W.T.E.
B-6A	17.2	14.7		–	–	–	12.93	–	12.40	dry
Saturated Midpoint Elevation							13.82		13.55	
B-6	3.5	-6.5		–	–	–	13.51	–	12.43	10.32
Saturated Midpoint Elevation							-1.50		-1.50	
	Vertical Gradient (see Note 2)						-0.0379		-0.0020	
							Up		Up	

Water level observation ceased due to elimination this portion of the site for new landfill footprint (possible borrow site)

Nested Piezometers: **B-15s** / **B-15d**
Aquifer Unit 1 – Silt and clay strata (10 to 15 feet)
Aquifer Unit 2 – Silty Sand, Partly Cemented

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	01/15/03 W.T.E.	02/25/03 W.T.E.	04/22/03 W.T.E.	05/14/03 W.T.E.	06/22/03 W.T.E.
B-15s	12.6	-2.4		–	–	–	–	–	–	–	12.26	12.89	13.25	13.11	12.34
Saturated Midpoint Elevation											4.93	5.10	5.10	5.10	4.97
B-15d	-17.4	-22.4		–	–	–	–	–	–	–	10.97	11.37	12.05	11.91	11.30
Saturated Midpoint Elevation											-19.90	-19.90	-19.90	-19.90	-19.90
	Vertical Gradient (see Note 2)										0.0520	0.0608	0.0480	0.0480	0.0418
											Down	Down	Down	Down	Down

Nested Piezometers: **B-17s** / **B-17d**
Aquifer Unit 1 – Silt and clay strata (10 to 15 feet)
Aquifer Unit 2 – Silty Sand, Partly Cemented

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	01/15/03 W.T.E.	02/25/03 W.T.E.	04/22/03 W.T.E.	05/14/03 W.T.E.	06/22/03 W.T.E.
B-17s	2.0	-3.0		–	–	–	–	–	–	–	13.64	14.65	14.39	14.25	13.44
Saturated Midpoint Elevation											-0.50	-0.50	-0.50	-0.50	-0.50
B-17d	-17.9	-22.9		–	–	–	–	–	–	–	12.69	13.21	13.71	12.56	12.97
Saturated Midpoint Elevation											-20.40	-20.40	-20.40	-20.40	-20.40
	Vertical Gradient (see Note 2)										0.0477	0.0724	0.0342	0.0849	0.0236
											Down	Down	Down	Down	Down

Nested Piezometers: **B-23s** / **B-23d**
Aquifer Unit 1 – Silt and clay strata (10 to 15 feet)
Aquifer Unit 2 – Silty Sand, Partly Cemented

Piezometer No.	Top of Screen, El.	Bottom of Screen, El.		W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	W.T.E.	01/15/03 W.T.E.	02/25/03 W.T.E.	04/22/03 W.T.E.	05/14/03 W.T.E.	06/22/03 W.T.E.
B-23s	8.9	-6.1		–	–	–	–	–	–	–	12.47	9.84	12.96	12.82	12.40
Saturated Midpoint Elevation											1.40	1.40	1.40	1.40	1.40
B-23d	-20.5	-25.5		–	–	–	–	–	–	–	11.45	12.15	12.76	12.62	12.05
Saturated Midpoint Elevation											-23.00	-23.00	-23.00	-23.00	-23.00
	Vertical Gradient (see Note 2)										0.0418	-0.0947	0.0082	0.0082	0.0143
											Down	Up	Down	Down	Down

Notes to Above:

* W.T.E. = Water Table Elevation

1 Revised from original Site Suitabilty report due to recalculation of gradients (see below)

2 Vertical Gradient = delta-W.T.E / delta-Saturated Midpoint Elevation

3 **Negative vertical gradients are upward, positive gradients are downward.**

Table 7 REVISED See Note 1
Horizontal Ground Water Gradient and Velocity Calculations

Based on Bouwer-Rice Solutions (Table 3)

All elevations and distances given in feet

Well / Piez. No.	Hydraulic Conductivity (k)		Water Elevation	Ref. GW Contour	Vertical Distance	Horizontal Distance	Hydraulic Gradient (I)	Effective Porosity (n)	Velocity	Hydro Unit	Average Velocity
	cm/sec	ft/day							ft/day		
B-1s	1.869E-03	5.206	16.20	16	0.20	200	0.0010	0.12	0.043	AU-1	
B-2	2.532E-03	7.053	14.94	15	0.06	40	0.0015	0.12	0.088	AU-1	
B-3	3.062E-03	8.529	15.83	15	0.83	80	0.0104	0.12	0.737	AU-1	
B-4	2.494E-03	6.947	17.50	17	0.50	70	0.0071	0.12	0.414	AU-1	
B-5	2.104E-03	5.861	16.76	17	0.24	90	0.0027	0.12	0.130	AU-1	
B-6	4.788E-04	1.334	16.99	17	0.01	45	0.0002	0.12	0.002	AU-1	
B-7	7.486E-04	2.085	14.33	14	0.33	300	0.0011	0.12	0.019	AU-1	
B-8	3.250E-03	9.053	14.18	15	0.82	185	0.0044	0.12	0.334	AU-1	
B-9	2.237E-03	6.231	13.30	14	0.70	310	0.0023	0.12	0.117	AU-1	
B-10	2.232E-03	6.217	14.53	13	1.53	140	0.0109	0.12	0.566	AU-1	0.245
B-1d	2.568E-04	0.715	15.37	16	0.63	200	0.0031	0.03	0.075	AU-2	0.075

1 Revised from original Site Suitabilty report due to recalculation of porosity values per USGS methods (see Table 2)

2 Water levels used in calculations reflect observations made on 5/8/02 (see Table 5), the date of the slug tests for borings B-1s, B-1d, B-2, and B-3 using ground water contours at the time of observation (only B-1 through B-10 existed then – these are the "Site Suitability" borings)

3 Water levels used in calculations reflect Estimated Seasonal High water Levels, observed April-May 2003 (see Figure F-4), for borings B-4 – B-30 (these borings have not been slug tested)

4 Ground Water Velocity Calculated from Equation:

$V=KI/n$ where K = Hydraulic Gradient in units of ft/ft
n = Effective Porosity is unitless
V = Ground Water Velocity in ft/day

5 Hydraulic Conductivity Conversion Factor: 1 ft/day = 3.59E-04 cm/sec

6 Hydraulic conductivity data taken from slug test data, Table 3

7 Hydraulic Gradient values were calculated from the potentiometric surface map (Figure E-4).

Table 8
Hand Auger Boring Data

These borings were made to facilitate installation of shallow piezometers required to verify shallow ground water conditions within portions of the site

Only B-8A remains within the landfill footprint due to design changes

Piezometers were installed with 2.5 foot screens, sand packs, bentonite seals

All depths given in feet

Boring	From	To	Soil description
B-4A	0	4.95	Sand (continually caving in)

Stick up 2.50 feet
Sand pack placed to 0.7 feet b.g.s.
Bentonite placed to surface
Water level 3.12 feet b.g.s. upon completion

Boring	From	To	Soil description
B-5A	0	4.01	Sand (continually caving in)

Stick up 3.32 feet
Sand pack placed to 0.3 feet b.g.s.
Bentonite placed to surface
Water level 1.83 feet b.g.s. upon completion

Boring	From	To	Soil description
B-6A	0	3.8	Sand (continually caving in)

Stick up 3.64 feet
Sand pack placed to 0.3 feet b.g.s.
Bentonite placed to surface
Water level 1.97 feet b.g.s. upon completion

Boring	From	To	Soil description
B-8A	0	3.88	Sand (continually caving in)

Stick up 3.62 feet
Sand pack placed to 0.7 feet b.g.s.
Bentonite placed to surface
Water level 1.8 feet b.g.s. upon completion

FRANCHISE RENEWAL AMENDMENT #1

For: A Construction and Demolition Landfill

Granted By: Pitt County Board of Commissioners
1717 West Fifth Street
Greenville, North Carolina 27834

Granted To: C & D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 2834
Contact: Judson Whitehurst, President

Original Franchise Date: December 18, 2000

Renewal Franchise Date: February 3, 2003

Amendment #1 Date: August 4, 2008

The following terms of the Franchise are hereby modified:

1. **The service area is changed from an area up to 50 miles in radius from the center of the waste area to an area up to 100 miles in radius from the center of the waste area. This extension of radius will include counties not specified in the Franchise Renewal.**
2. **The applicant is granted the authority to receive up to 300 tons of waste per calendar day rather than the 200 tons of waste per calendar day specified in the Franchise Renewal.**

The Franchise for C & D Landfill, Inc., is hereby amended to reflect the above changes. This Amendment #1 to the Franchise does not change any of the other requirements of the Franchise not directly set out in this Amendment.

CONTRACTOR

C & D LANDFILL, INC.

BY: ______________________

ATTEST:

____

CORPORATE SEAL

PITT COUNTY

BY: ______________________________
Mark W. Owens, Jr., Chairman
Pitt County Board of Commissioners

ATTEST:

____
Patricia Staton
Clerk to the Board

COUNTY SEAL

APPROVED
Pitt County Legal Department
Date: 8/28/08
By: ______________ Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

____
Finance Officer

FRANCHISE RENEWAL

FOR: A Construction and Demolition Debris Landfill

GRANTED BY: Pitt County Board of Commissioners
1717 West Fifth Street
Greenville, North Carolina 27834
Contact: Phil Dickerson
Deputy County Manager/Public Services

GRANTED TO: C & D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 27834
Contact: Judson Whitehurst, President

TERM OF FRANCHISE: The renewal term of this Franchise shall be one (1) year from the date of granting of the Franchise Renewal. The Franchise may renew and extend for seven (7) subsequent one (1) year terms, contingent upon County Commissioner approval pursuant to G. S. §153A-46. The Board of Commissioners may, at its sole option, require that the Franchisee meet additional terms and conditions in order to secure the renewal of the Franchise at the end of any one year term.

POPULATION AND AREA TO BE SERVED: The Site is located on US264 near the Pitt County/Beaufort County line. It is expected that the site will serve an area up to 50 miles in radius from the center of the waste area. This area will include all or portions of Pitt, Beaufort, Pamlico, Craven, Lenoir, Greene, Jones, Wayne, Wilson, Nash, Edgecombe, Halifax, Northampton, Bertie, Martin, Chowan, Washington, Tyrrell and Hyde Counties.

TYPE, QUANTITY AND SOURCE OF WASTE: Construction of new commercial and residential projects will be the main source of waste. Typical components of the waste stream are gypsum board, lumber, shingles, paper products, plastics and other miscellaneous materials. The most likely average daily rate is 50 tons per day. The Applicant is granted the authority to receive up to 200 tons per calendar day in order to accommodate future growth or other natural disasters such as Hurricane Floyd.

ANTICIPATED LIFE OF SITE: On the next page is a table of calculations of the potential useful life of the site. The useful life is based on the estimated tonnage per year arriving at the facility. It is estimated the proposed facility will have a useful life of approximately 20 years.

Annual Growth	Daily Tonnage		
	50	100	200
0%	25 years	13 years	7 years
2%	21 tears	11 years	6 years
5%	17 years	9 years	5.5 years
10%	13 years	8 years	5 years

DESCRIPTION OF SITE: Beginning at North Carolina Geodetic Survey Monument "BEACHUM-1979" with NAD '83 state plane coordinates NORTHING 2094[illegible]5.130 meters EASTING 774558.210 meters proceed on a magnetic bearing (July 22, 2000) SOUTH 28 degrees 46 minutes 00 seconds WEST 467.22 ft. to an existing iron stake, thence SOUTH 68 degrees 17 minutes 21 seconds WEST 1317.66 ft. to an existing iron pipe, thence SOUTH 24 degrees 28 minutes, 54 seconds, WEST 870.40 ft. to an existing iron pipe, thence SOUTH 19 degrees 17 minutes 19 seconds WEST 620.11 ft. to an existing iron pipe in the center of an abandoned railroad bed, thence SOUTH 2[illegible] degrees 50 minutes 42 seconds WEST 700.25 ft. to an existing iron pipe and being the TRUE POINT OF BEGINNING.

Thence from the TRUE POINT OF BEGINNING the following courses and distances:
SOUTH 44 degrees 44 minutes 42 seconds EAST 677.72 ft. to an existing iron pipe, thence SOUTH 15 degrees 30 minutes 38 seconds EAST 495.60 ft. to an existing iron pipe, thence SOUTH 66 degrees 08 minutes 47 seconds WEST 1182.37 ft to an existing iron pipe, a corner with Davenport Farms DEED BOOK K-37 PAGE [illegible]57, thence NORTH 01 degrees 05 minutes 14 seconds WEST 122.65 ft. to an existing iron pipe, thence NORTH 33 degrees 05 minutes 14 seconds WEST 1312.98 ft. to an existing railroad iron on the south bank of WOLF PITT BRANCH, thence along the branch NORTH 27 degrees 36 minutes 05 seconds EAST 51.55 ft. (no point set) to the center line intersection of WOLF PITT BRANCH and a CANAL HEADING NORTH, thence along the centerline of the canal NORTH 04 degrees 28 minutes 05 seconds WEST 62.82 ft. (no point set), thence NORTH 19 degrees 30 minutes 45 seconds EAST 26.[illegible]7 ft. (no point set), thence NORTH 36 degrees 34 minutes 19 seconds WEST 81.04 ft. (no point set), thence NORTH 37 degrees 17 minutes 08 seconds WEST 154.38 ft. to a set iron pipe in the centerline of the canal, thence leaving the canal SOUTH 82 degrees 23 minutes 10 seconds EAST 723.01 ft. (no point set), thence NORTH 54 degrees 18 minutes 09 seconds EAST 414.81 ft. (no point set), thence SOUTH 44 degrees 44 minutes 42 seconds EAST 210.00 ft. (no point set), thence SOUTH 44 degrees 44 minutes 42 seconds EAST 146.84 ft. back to THE TRUE POINT OF BEGINNINGS and having and containing 40.14 acres by the coordinate method.

CONDITIONS: The conditions upon which the Franchise renewal is granted are the following:

1. The franchisee shall cause any public road leading to the landfill to be cleared of debris at least twice per month for a distance of two miles on both sides of the landfill

entrance onto the public road.

2. The franchisee shall require that all trucks transporting debris be adequately covered or secured to prevent the spillage of debris.

3. The franchisee shall pay to the Pitt County Solid Waste Enterprise Fund a certain sum to be set each year in the fee schedules approved by the Board of County Commissioners for every ton of debris taken into the landfill. These funds shall be utilized by the County to insure that the landfill operates in accordance with all Federal, State, and local regulations and the franchise.

4. The franchisee shall comply with all fire prevention regulations and sedimentation and erosion control regulations.

5. The franchisee shall provide dust control measures that will not allow dust to leave his property.

6. The franchisee hereby gives the County the right to seek up to $500 per calendar day in damages, for violation of the franchise agreement.

Beth Ward, Chairman

ATTEST:

Susan J. Banks, CMC
Clerk to the Board

PITT COUNTY
NORTH CAROLINA

APPROVED
Pitt County Legal Department
Date: 2/26/03
By: ______
Attorney

"This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act."

Finance Officer

FRANCHISE ORDINANCE FOR CONSTRUCTION DEBRIS LANDFILLS COUNTY OF PITT NORTH CAROLINA

WHEREAS, G.S. §153A-136 provides that a county may grant a franchise to one or more persons for the disposal of solid wastes in a county; and,

WHEREAS, G.S. §130A-294 requires any applicant for a sanitary landfill permit, prior to applying for such permit from the State of North Carolina, to obtain from each local government having jurisdiction over any part of the proposed sanitary landfill a franchise for operation of same; and,

WHEREAS, construction debris (C&D) landfills, defined as facilities for the disposal of solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures, but not including inert debris, land-clearing debris or yard debris, are classified by the North Carolina Department of Environment, Health & Natural Resources as sanitary landfills; and,

WHEREAS, operational issues regarding C&D landfills are controlled by the provisions of the Rules of the North Carolina Department of Environment, Health & Natural Resources; and,

WHEREAS, because of the rapid building and development in Pitt County, there is a continual need for C&D landfills in the County, and;

WHEREAS, G.S. §130A-294 requires that certain information be contained in every franchise granted for a sanitary landfill.

NOW THEREFORE IT BE ORDAINED,

Section 1. For purposes of this ordinance a construction debris (C&D) landfill is defined as a facility for the disposal of solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures, but not including inert debris, land-clearing debris or yard debris.

Section 2. Every operator of a C&D landfill in Pitt County must obtain a franchise from the Pitt County Board of Commissioners. A franchise shall be issued upon the presentation of the following information to the County:

1. The name and address of the applicant and owner of the proposed site.
2. The trade or other fictitious names, if any, under which the applicant does business, along with a certified copy of and assumed name certificate stating such name or articles or incorporation stating such name.

3. A legal description and a map of the property proposed to be included in the C&D landfill;

4. A statement of the population to be served by the C&D landfill, including a description of the geographic area;

5. A description of the volume and characteristics of the waste stream;

6. A projection of the useful life of the C&D landfill; and

7. Evidence that the site has been approved by the Pitt County Board of Commissioners.

Section 3. Upon issuance, the franchise document shall contain a statement of the population to be served by the C&D landfill, including a description of the geographic area; a description of the volume and characteristics of the waste stream; and a projection of the useful life of the C&D landfill.

Section 4. The Board of County Commissioners, pursuant to G.S. § 130A-294, may hold a public hearing for the purpose of notifying the public of the intent to issue a franchise for a C&D landfill if the board determines that sufficient public interest exists in the proposed C&D landfill to warrant a public hearing. If the Board, in its sole discretion, determines that a public hearing should be held, the county shall schedule a time and place for said hearing.

A notice of such hearing shall be, at the expense of the applicant, published at least once in a newspaper of general circulation not less than thirty (30) days prior to the date established for the hearing. Notice of the hearing must also be posted on the property, at a place visible to all public roads adjacent to the proposed site. The notice shall be reasonably calculated to inform the public of the location, date, time and purpose of the hearing. The applicant shall provide an affidavit to the County not less than ten (10) days before the date of the hearing that the required notice has been posted.

The conditions upon which a franchise is granted shall be the following:

1. The franchisee shall cause any public road leading to the landfill to be cleared of debris at least twice per month for a distance of two miles on both sides of the landfill entrance onto the public road.

2. The franchisee shall require that all trucks transporting debris be adequately covered or secured to prevent the spillage of debris.

3. The franchisee shall pay to the Pitt County Solid Waste Enterprise Fund a certain sum to be set each year in the fee schedules approved by the Board of County Commissioners for every ton of debris taken into the landfill. These funds shall be utilized by the County to insure that the

landfill operates in accordance with all Federal, State and local regulations and the franchise.

4. The franchisee shall comply with all fire prevention regulations and sedimentation and erosion control regulations.

5. The franchisee shall provide dust control measures that will not allow dust to leave his property.

6. The franchisee hereby gives the County the right to seek up to $500 per calendar day in damages, for violation of the franchise agreement.

This ordinance shall be effective upon enactment and shall apply to all C& D landfills that have been issued a site approval by Pitt County.

Charles P. Gaskins, Chairman

ATTEST:

Susan J. Banks, CMC
Clerk to the Board

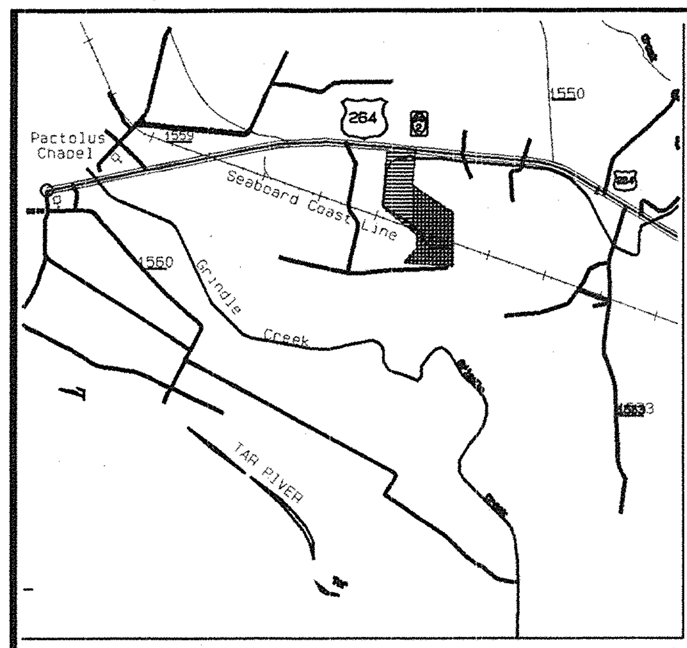
PITT COUNTY NORTH CAROLINA

C&D Landfill, Inc.
Pitt County, North Carolina

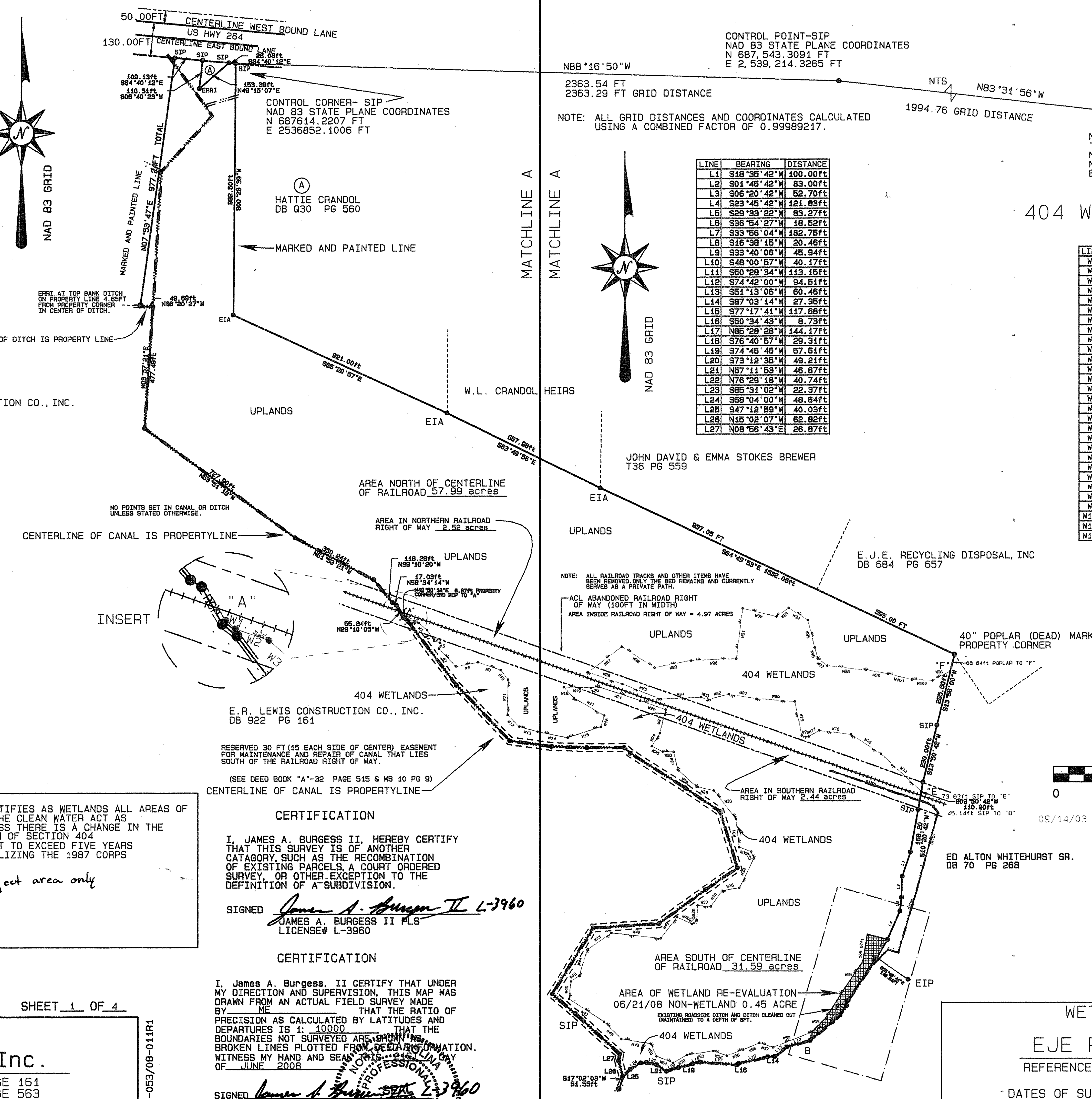
Phase 2
Note: Volumes taken from AutoCAD DTM

Soils Volume Analysis			
Total Airspace Proposed	1,046,156	Cyds	Total with 3' cover
Final Cover Required	96,700	Cyds	3' feet of cover
Net Airspace	949,456	Cyds	
Intermediate Cover Required	284,837	Cyds	Net Airspace x .30
Total Base Fill Volume	84,285	Cyds	
Soil Balance	465,822	Cyds	Borrow Material Required

Note: Borrow material is available from adjacent sand mining operation.



VICINITY MAP
NOT TO SCALE



SCALE 1"=300'
0 300 600

LEGEND
EIP = EXISTING IRON PIPE
ERRI = EXISTING RAILROAD IRON
SIP = SET IRON PIPE
EIA = EXISTING IRON AXLE
NTS = NOT TO SCALE

NOTE: ALL GRID DISTANCES AND COORDINATES CALCULATED USING A COMBINED FACTOR OF 0.99989217.

LINE	BEARING	DISTANCE
L1	S18°35'42"W	100.00ft
L2	S01°45'42"W	83.00ft
L3	S06°20'42"W	52.70ft
L4	S23°45'42"W	121.83ft
L5	S29°33'22"W	83.27ft
L6	S36°54'27"W	18.52ft
L7	S33°56'04"W	182.75ft
L8	S16°38'15"W	20.46ft
L9	S33°40'06"W	45.94ft
L10	S48°00'57"W	40.17ft
L11	S50°28'34"W	113.15ft
L12	S74°42'00"W	94.51ft
L13	S51°13'06"W	60.46ft
L14	S87°03'14"W	27.35ft
L15	S77°17'41"W	117.68ft
L16	S50°34'43"W	8.73ft
L17	N85°28'28"W	144.17ft
L18	S76°40'57"W	29.31ft
L19	S74°45'45"W	57.61ft
L20	S73°12'35"W	49.21ft
L21	N57°11'53"W	46.67ft
L22	N76°29'18"W	40.74ft
L23	S85°31'02"W	22.37ft
L24	S58°04'00"W	48.64ft
L25	S47°12'59"W	40.03ft
L26	N15°02'07"W	62.82ft
L27	N08°56'43"E	26.87ft

404 WETLAND CALLS

E-F

LINE	BEARING	DISTANCE
W74	N46°57'59"W	216.14ft
W75	N57°08'55"W	139.33ft
W76	N82°54'43"W	126.05ft
W77	S59°48'35"W	46.34ft
W78	N81°15'45"W	28.32ft
W79	N11°35'16"W	135.05ft
W80	N85°39'34"W	149.30ft
W81	N81°13'01"W	109.81ft
W82	S76°07'54"W	85.41ft
W83	N69°46'19"W	28.95ft
W84	S87°02'45"W	156.30ft
W85	N68°35'32"W	161.89ft
W86	N70°46'09"W	141.99ft
W87	N52°50'34"E	165.08ft
W88	S57°16'08"E	151.88ft
W89	N78°58'52"E	145.84ft
W90	N87°49'31"E	177.28ft
W91	N07°21'13"E	198.23ft
W92	S76°17'07"E	135.71ft
W93	N54°41'47"E	58.78ft
W94	S57°40'05"E	88.94ft
W95	S13°49'26"E	110.71ft
W96	S15°38'18"E	44.92ft
W97	S53°09'39"E	45.87ft
W98	S83°34'11"E	151.70ft
W99	S80°42'07"E	88.61ft
W100	S76°02'08"E	96.37ft
W101	S87°29'06"E	81.42ft
W102	N62°32'55"E	77.58ft

A-B

LINE	BEARING	DISTANCE
W1	S48°04'09"E	16.72ft
W2	S70°47'55"E	46.12ft
W3	S49°17'10"E	43.26ft
W4	S33°59'09"E	49.90ft
W5	S70°07'32"E	24.69ft
W6	S10°35'47"W	23.22ft
W7	S43°39'39"E	95.60ft
W8	N79°50'59"E	87.52ft
W9	S71°43'29"E	94.22ft
W10	S37°09'49"E	46.97ft
W11	S00°35'33"W	139.12ft
W12	S44°49'38"E	64.29ft
W13	S74°31'53"E	74.86ft
W14	S78°45'01"E	120.06ft
W15	N71°40'15"E	136.49ft
W16	N16°27'25"E	45.91ft
W17	N60°09'29"W	137.27ft
W18	N42°28'03"W	57.97ft
W19	S88°40'41"E	105.81ft
W20	N82°50'04"E	30.92ft
W21	S71°33'14"E	172.20ft
W22	S70°22'43"E	105.86ft
W23	S14°03'32"W	93.92ft
W24	S31°10'01"W	59.98ft
W25	S62°40'02"E	47.32ft
W26	S88°13'16"E	43.17ft
W27	S12°49'19"E	71.52ft
W28	S48°09'15"E	99.23ft
W29	S77°12'29"E	68.32ft
W30	S38°07'06"E	141.83ft
W31	S06°20'20"E	111.20ft
W32	S70°17'45"E	50.80ft
W33	S18°08'52"E	29.42ft
W34	S26°03'11"W	127.23ft
W35	S79°41'42"W	68.76ft
W36	S35°53'15"W	74.76ft
W37	N85°36'13"W	52.71ft
W38	S03°05'45"W	56.75ft
W39	S49°29'41"W	24.31ft
W40	N65°47'14"W	64.63ft
W41	S37°31'54"W	104.20ft
W42	N83°38'03"W	194.63ft
W43	S55°12'40"W	114.86ft
W44	S17°22'09"W	107.22ft
W45	S55°27'53"W	38.63ft
W46	S06°55'27"W	69.37ft
W47	S57°07'51"E	163.86ft
W48	S44°57'48"E	95.40ft
W49	S80°44'11"E	116.41ft
W50	S25°17'18"E	54.31ft
W51	S67°48'37"E	70.60ft
W52	N59°44'15"E	61.86ft
W53	N81°03'32"E	103.51ft
W54	S70°51'42"E	57.72ft
W55	N69°20'11"E	67.95ft
W56	N67°32'24"E	68.72ft
W57	S71°55'37"E	56.72ft
W58	N68°18'30"E	161.57ft
W59	N46°09'31"E	79.71ft
W60	N31°32'24"E	121.93ft
W61	N33°56'31"E	143.06ft

THIS CERTIFIES THAT THIS COPY OF THIS PLAT IDENTIFIES AS WETLANDS ALL AREAS OF WETLANDS REGULATED PURSUANT TO SECTION 404 OF THE CLEAN WATER ACT AS DETERMINED BY THE UNDERSIGNED ON THIS DATE UNLESS THERE IS A CHANGE IN THE LAW OR PUBLISHED REGULATIONS. THIS DETERMINATION OF SECTION 404 JURISDICTION MAY BE RELIED UPON FOR A PERIOD NOT TO EXCEED FIVE YEARS FROM THIS DATE. THIS DETERMINATION WAS MADE UTILIZING THE 1987 CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL.

NAME: *Joe R Pilkes?* * *Boxed project area only*
TITLE: *Regulatory Specialist*
DATE: *August 4, 2008*

CERTIFICATION

I, JAMES A. BURGESS II, HEREBY CERTIFY THAT THIS SURVEY IS OF ANOTHER CATAGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF A SUBDIVISION.

SIGNED *James A. Burgess II L-3960*
JAMES A. BURGESS II PLS
LICENSE# L-3960

CERTIFICATION

I, James A. Burgess, II CERTIFY THAT UNDER MY DIRECTION AND SUPERVISION, THIS MAP WAS DRAWN FROM AN ACTUAL FIELD SURVEY MADE BY ME THAT THE RATIO OF PRECISION AS CALCULATED BY LATITUDES AND DEPARTURES IS 1: 10000 THAT THE BOUNDARIES NOT SURVEYED ARE SHOWN AS BROKEN LINES PLOTTED FROM DEED INFORMATION. WITNESS MY HAND AND SEAL THIS 24th DAY OF JUNE 2008

SIGNED *James A. Burgess II L-3960*
REGISTRATION NO. L-3960

NORTH CAROLINA PROFESSIONAL LAND SURVEYOR SEAL L-3960 JAMES A. BURGESS II

REVISIONS

09-14-2003: 404 WETLAND BOUNDARY
06-21-2008: 404 WETLAND RE-EVALUATION AREA

ACRES

AREA IN 404 WETLANDS POCKET "A TO B"= 5.66
AREA IN 404 WETLANDS POCKET "E TO F"= 7.66
TOTAL AREA 404 WETLANDS= 13.32
TOTAL AREA UPLANDS = 76.26
TOTAL AREA PARCEL = 89.58
ALL AREAS COMPUTED BY COORDINATE METHOD

SHEET 1 OF 4

WETLANDS SURVEY
FOR
EJE Recycling, Inc.

REFERENCE: DEED BOOK 922 PAGE 161
DEED BOOK P39 PAGE 563
DATES OF SURVEY: 10/1-12/20/2000
06/13/2008
PACTOLUS TOWNSHIP PITT COUNTY NORTH CAROLINA
OWNER: EJE Recycling, Inc.
ADDRESS: 802 Recycling Lane
Greenville, NC 27834
PHONE: 252-752-8274

BURGESS LAND SURVEYING P.A. PROFESSIONAL LAND SURVEYORS 123 W. Third St., PO Box 881 GREENVILLE, N.C. 27858 (252) 758-4900 e-mail: jburgesssurveys@coastalnet.com	SURVEYED: JB DRAWN: JABII CHECKED: JABII	APPROVED: JABII DATE: 01-16-01 SCALE: 1": 300'

PROJECT #03-053/08-011R1

SHEET 2 OF 4

WETLANDS SURVEY
FOR
EJE Recycling, Inc.

REFERENCE: DEED BOOK 922 PAGE 161
DEED BOOK P39 PAGE 563
DATES OF SURVEY: (06-14-08) 10/1-12/20/2000
PACTOLUS TOWNSHIP PITT COUNTY NORTH CAROLINA
OWNER: EJE Recycling, Inc.
ADDRESS: 802 Recycling Lane
Greenville, NC 27834
PHONE: 252-752-8274

BURGESS LAND SURVEYING P.A. PROFESSIONAL LAND SURVEYORS 3931 NC HWY 30 (POB 172) STOKES, N.C. 27884 (252) 758-4900 e-mail: BURGESSSURVEYS@EMBARQMAIL.COM	SURVEYED: JB DRAWN: JABII CHECKED: JABII	APPROVED: JABII DATE: 01-16-01 SCALE: 1": 300'

eje/lewis tract/EJLEWBOUNDREVwetmfr.pro

PROJECT #08-011/03-053

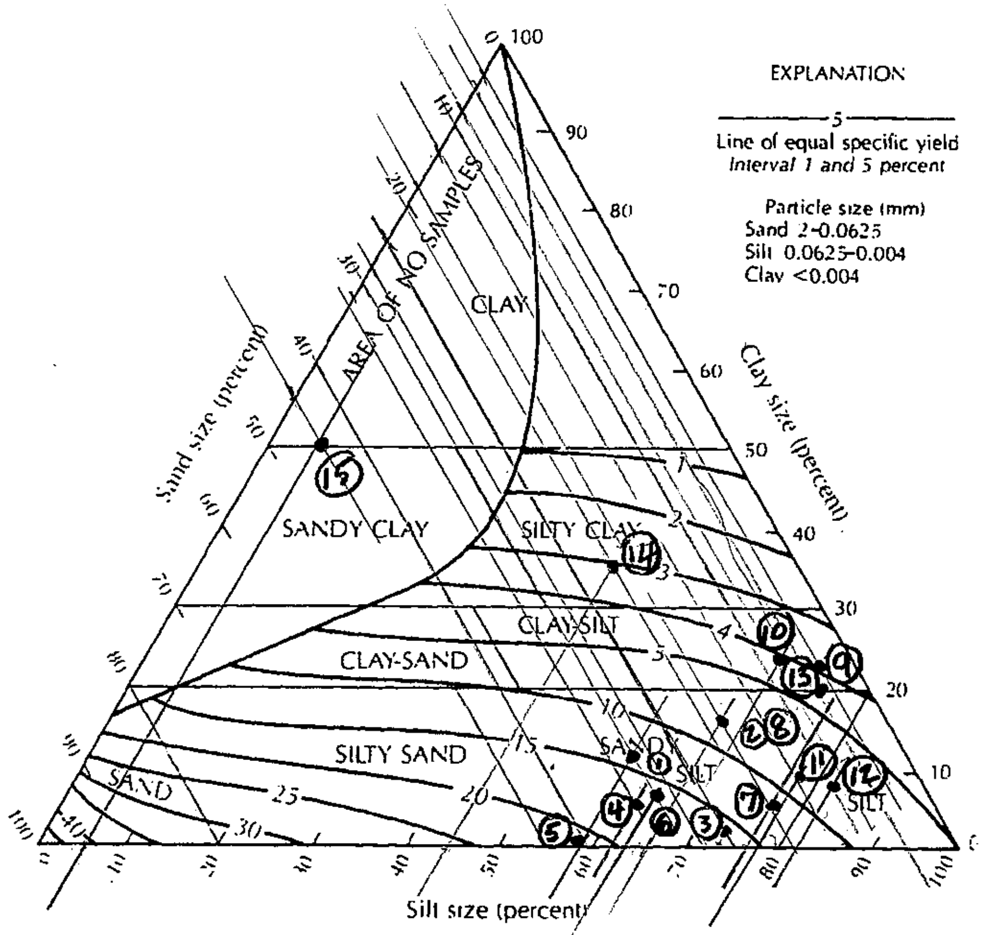


FIGURE 4.11 Textural classification triangle for unconsolidated materials showing the relation between particle size and specific yield. Source: A. I. Johnson, U.S. Geological Survey Water-Supply Paper 1662-D, 1967.

Sy = Specific yield ≈ eff. porosity

After Fetter, C.W., Applied Hydrogeology, 3rd ed., 1988

①	B-4	S-4	14%	⑦	B-7	S-6	13%	⑬	B-8	U-1a	3%
②	B-7	S-1	4%	⑧	B-7	S-7	8%	⑭	B-8	U-16	4.5%
③	B-7	S-2	16%	⑨	B-1	U-1	4%	⑮	B-105	U-1	1%
④	B-7	S-3	17%	⑩	B-1	U-2	4%				
⑤	B-7	S-4	22%	⑪	B-2	B-1	8%				
⑥	B-7	S-5	10%	⑫	B-8	B-1	7%				

geotechnics

USGS

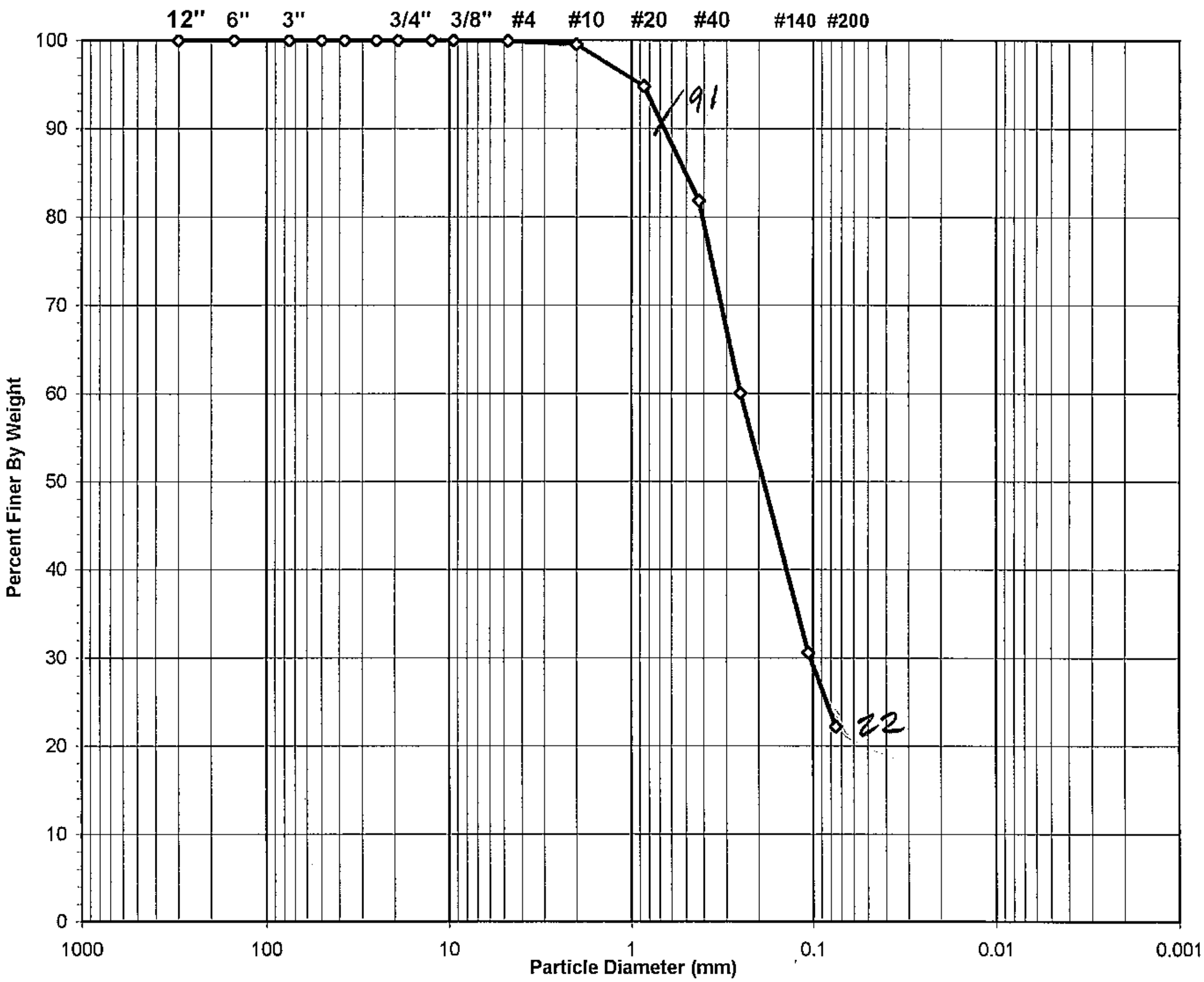
SA 8%
SI 69%
CL 22%
Sg 4%

SIEVE ANALYSIS

ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B-1
Client Reference	PITT COUNTY	Depth (ft)	11.3-11.8
Project No.	R02011-01	Sample No.	~~NA~~ U1
Lab ID	R02011-01.003	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND (NON-PLASTIC FINES)***

Tested By JP Date 3/8/02 Checked By Jem Date 3-11-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[M110.xls]Sheet1*

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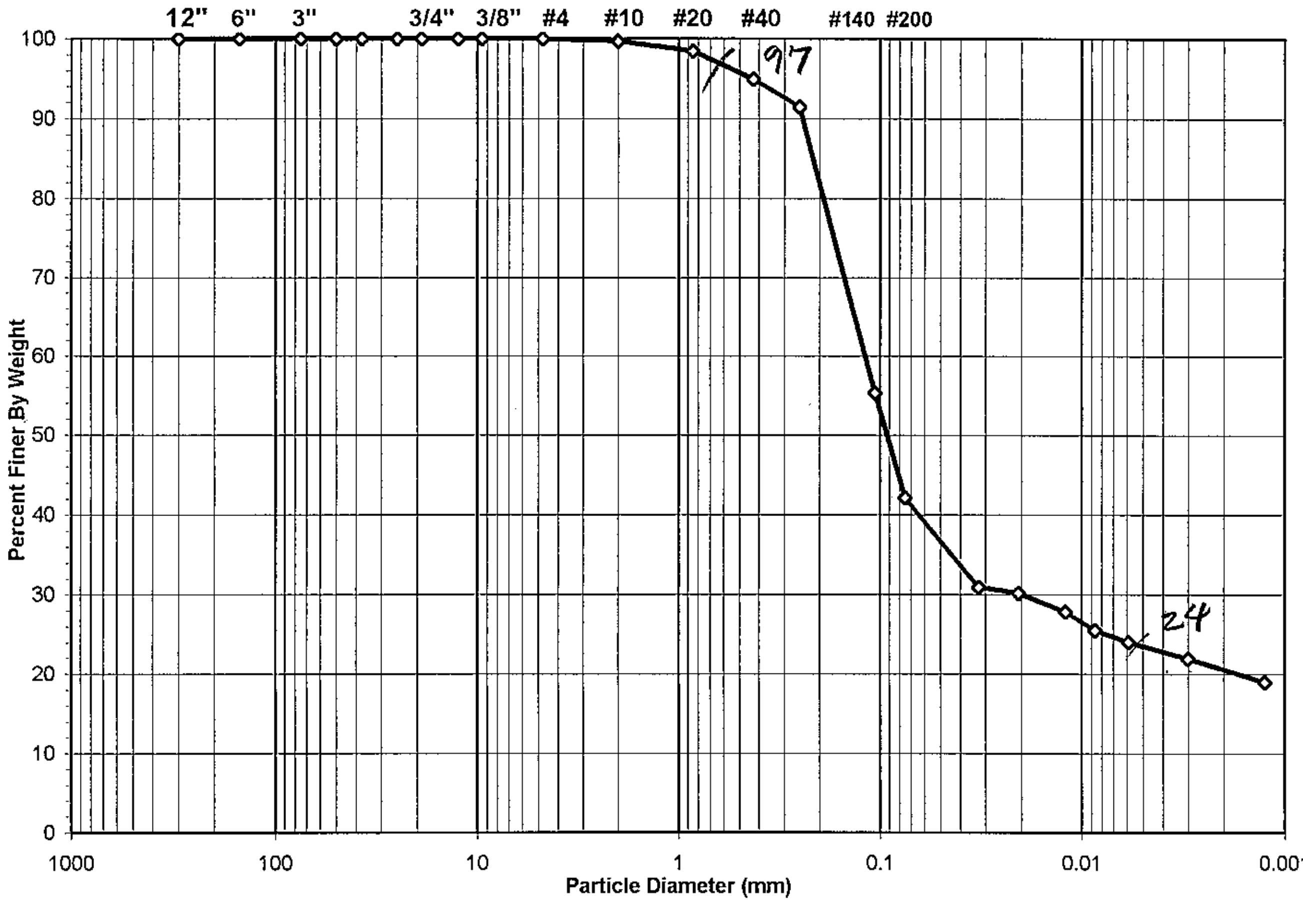
geotechnics

USGS
SA 3%
SI 73%
CL 24%
Sg 4%

SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B-1
Client Reference	PITT COUNTY	Depth (ft)	12.3-12.8
Project No.	R02011-01	Sample No.	~~NA~~ U2
Lab ID	R02011-01.003	Soil Color	GRAY

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



Sieve Sizes (mm)	USCS Summary	Percentage
Greater Than #4	*Gravel*	0.00
#4 To #200	*Sand*	57.89
Finer Than #200	*Silt & Clay*	42.11

USCS Symbol ***SC, TESTED***

USCS Classification ***CLAYEY SAND***

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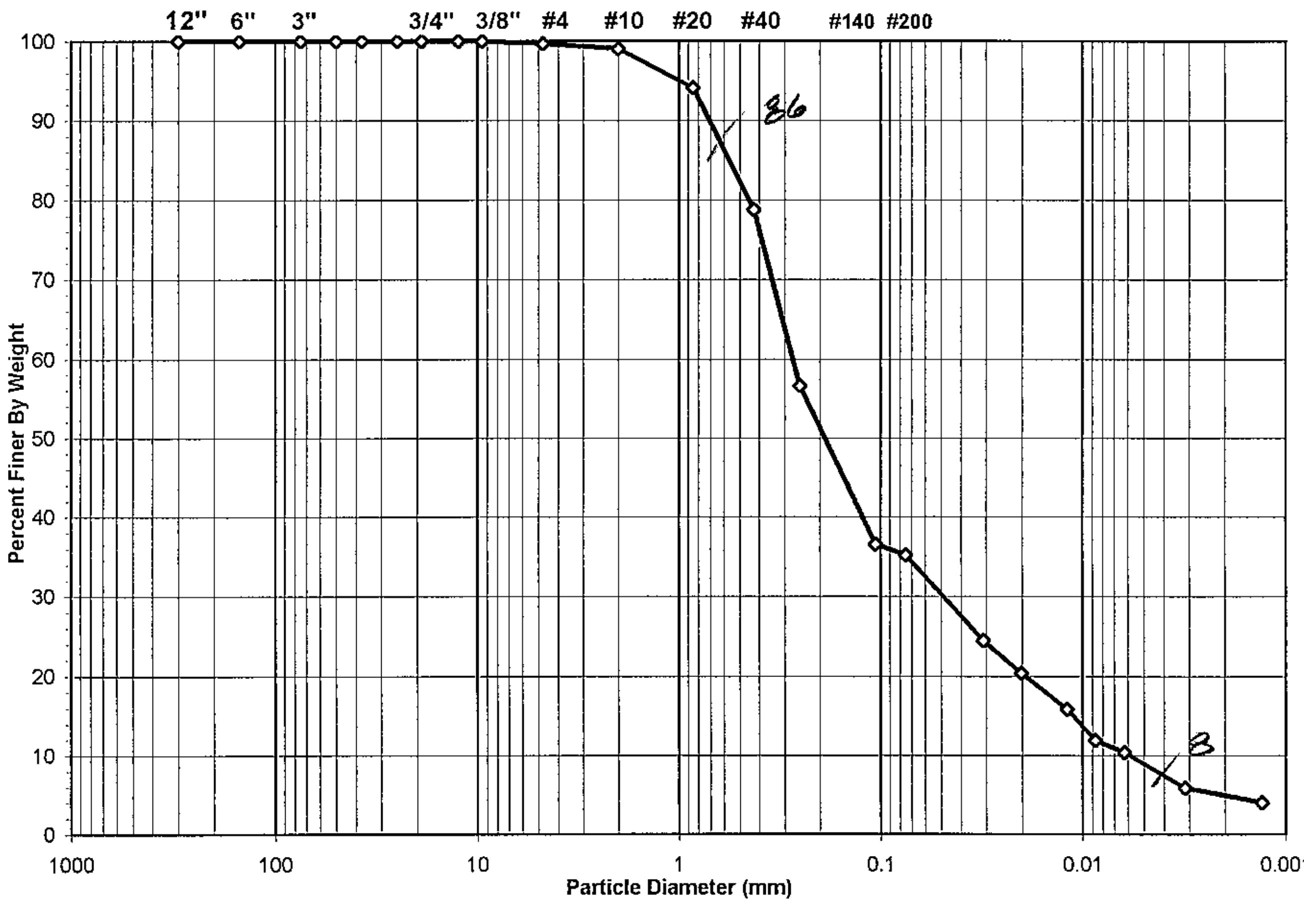
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

geotechnics

USGS
SA 14%
SI 78%
CL 8%
Sg 8%

Client	DAVID GARRETT	Boring No.	B-2
Client Reference	PITT COUNTY	Depth (ft)	1-5
Project No.	R02011-01	Sample No.	~~NA~~ B-1
Lab ID	R02011-01.001	Soil Color	BROWN

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



USCS Summary		
Sieve Sizes (mm)		Percentage
Greater Than #4	*Gravel*	0.31
#4 To #200	*Sand*	64.46
Finer Than #200	*Silt & Clay*	35.23

USCS Symbol *SM, TESTED*

USCS Classification *SILTY SAND (NON-PLASTIC FINES)*

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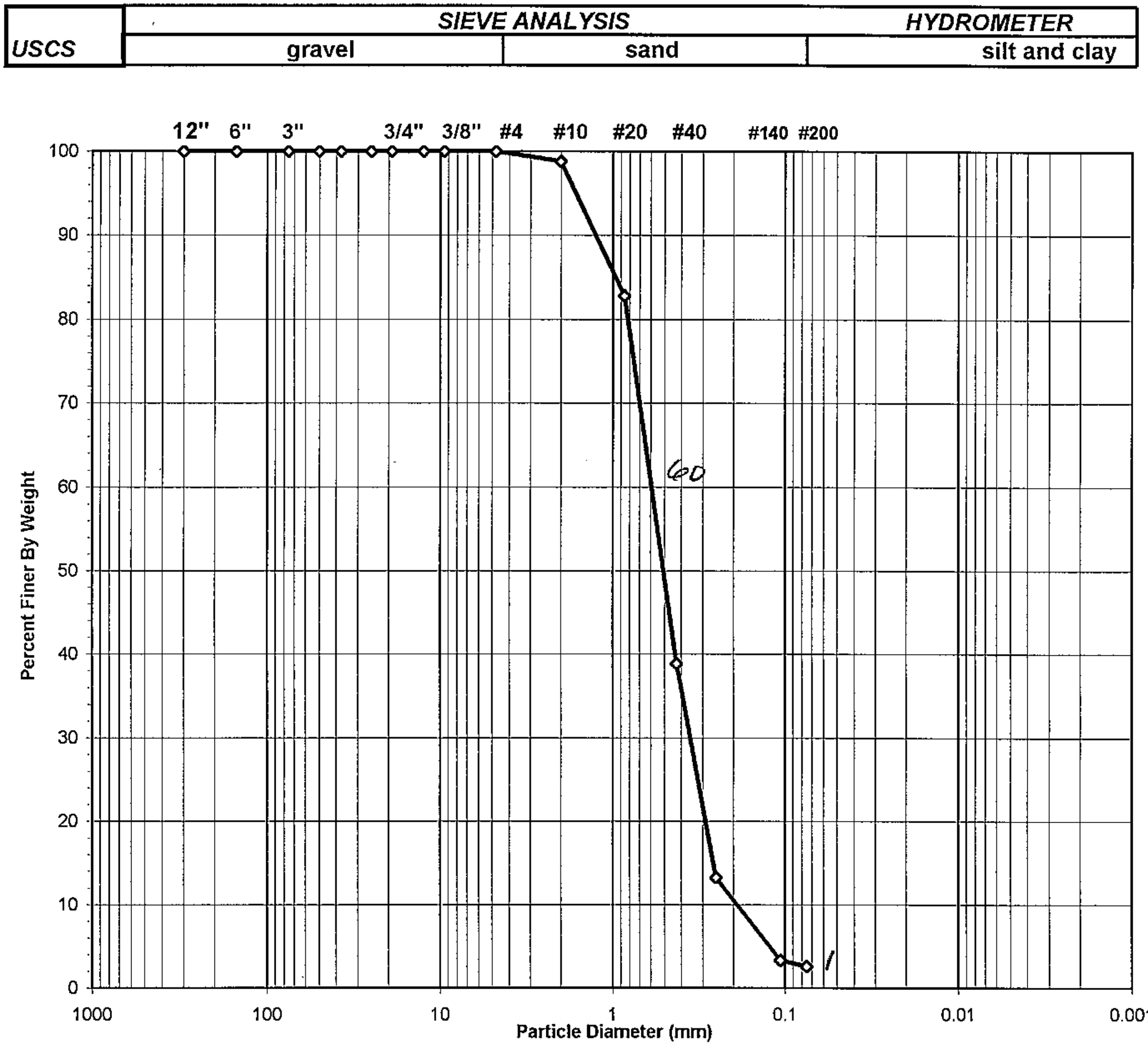
geotechnics

USGS
SA 40
SI 59
CL 1
Sg 1490

SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B4
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-4
Lab ID	R02011-01.009	Soil Color	**GRAY**



USCS Symbol	***SP, TESTED***	**D60 =**	**0.6**	**CC =**	**1.1**
USCS Classification	***POORLY GRADED SAND (NON-PLASTIC FINES) (UNABLE TO RUN HYDROMETER)***	**D30 =**	**0.4**	**CU =**	**3.1**
		D10 =	**0.2**		

Tested By JP Date 2/26/02 Checked By Jcm Date 2-28-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 C:\MSOFFICE\EXCEL\PrintQ\[L953.xls]Sheet1

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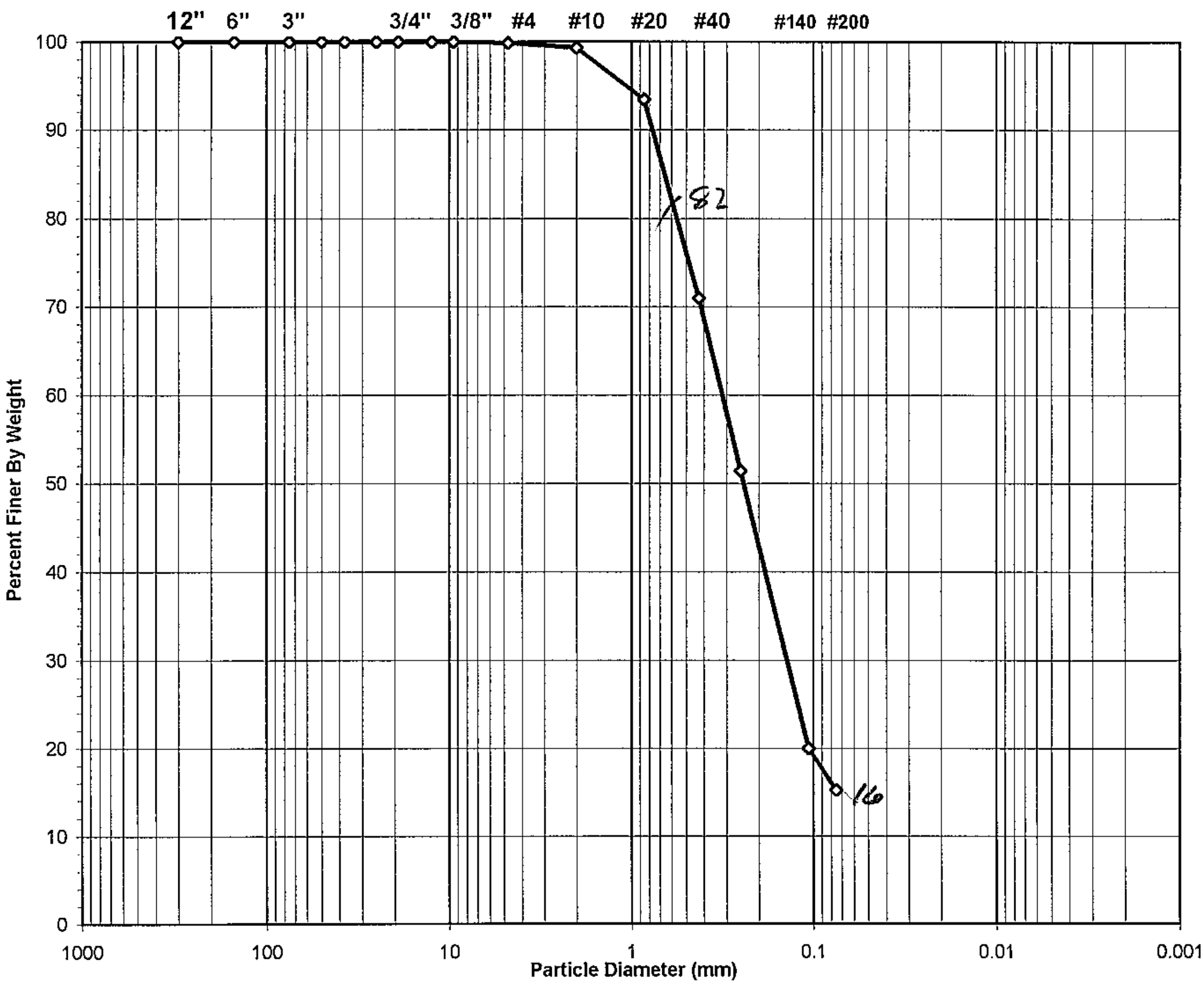
USGS
SA 18
SI 66
CL 16
Sg 87%

SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B7
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-1
Lab ID	R02011-01.010	Soil Color	**BROWN**

USCS	***SIEVE ANALYSIS***		***HYDROMETER***
	gravel	**sand**	**silt and clay**



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***
(NON-PLASTIC FINES)
(UNABLE TO RUN HYDROMETER)

Tested By JP Date 2/26/02 Checked By Jcm Date 2-28-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L954.xls]Sheet1*

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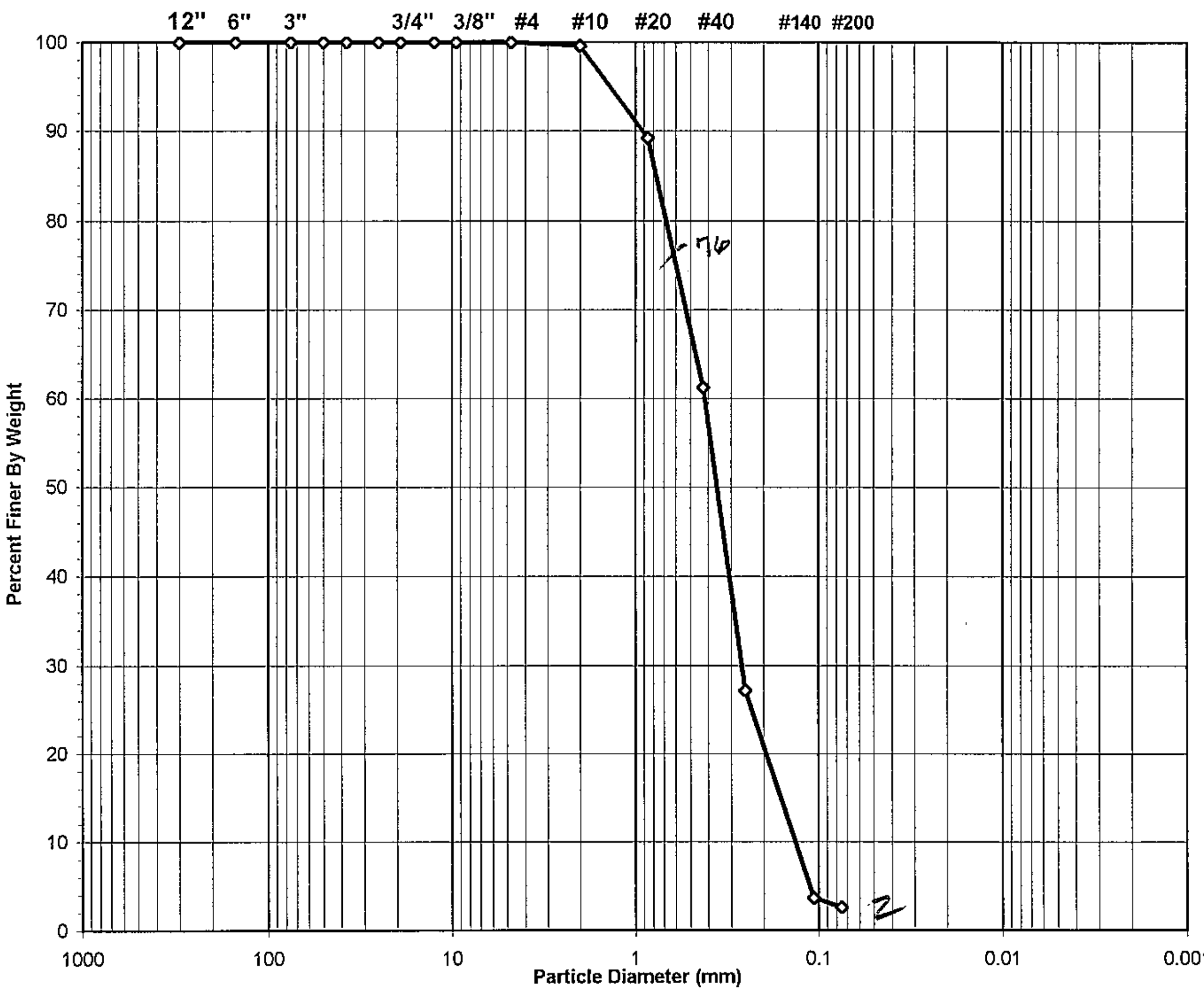
geotechnics

SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

USGS
SA 24%
SI 74%
CL 2%
Sg 16%

Client	DAVID GARRETT	Boring No.	B7
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-2
Lab ID	R02011-01.011	Soil Color	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	***SP, TESTED***	**D60 =**	**0.4**	**CC =**	**1.2**
USCS Classification	***POORLY GRADED SAND (NON-PLASTIC FINES) (UNABLE TO RUN HYDROMETER)***	**D30 =**	**0.3**	**CU =**	**3.1**
		D10 =	**0.1**		

Tested By JP Date 2/26/02 Checked By Jem Date 2.28.02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L955.xls]Sheet1*

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geotechnics

USGS

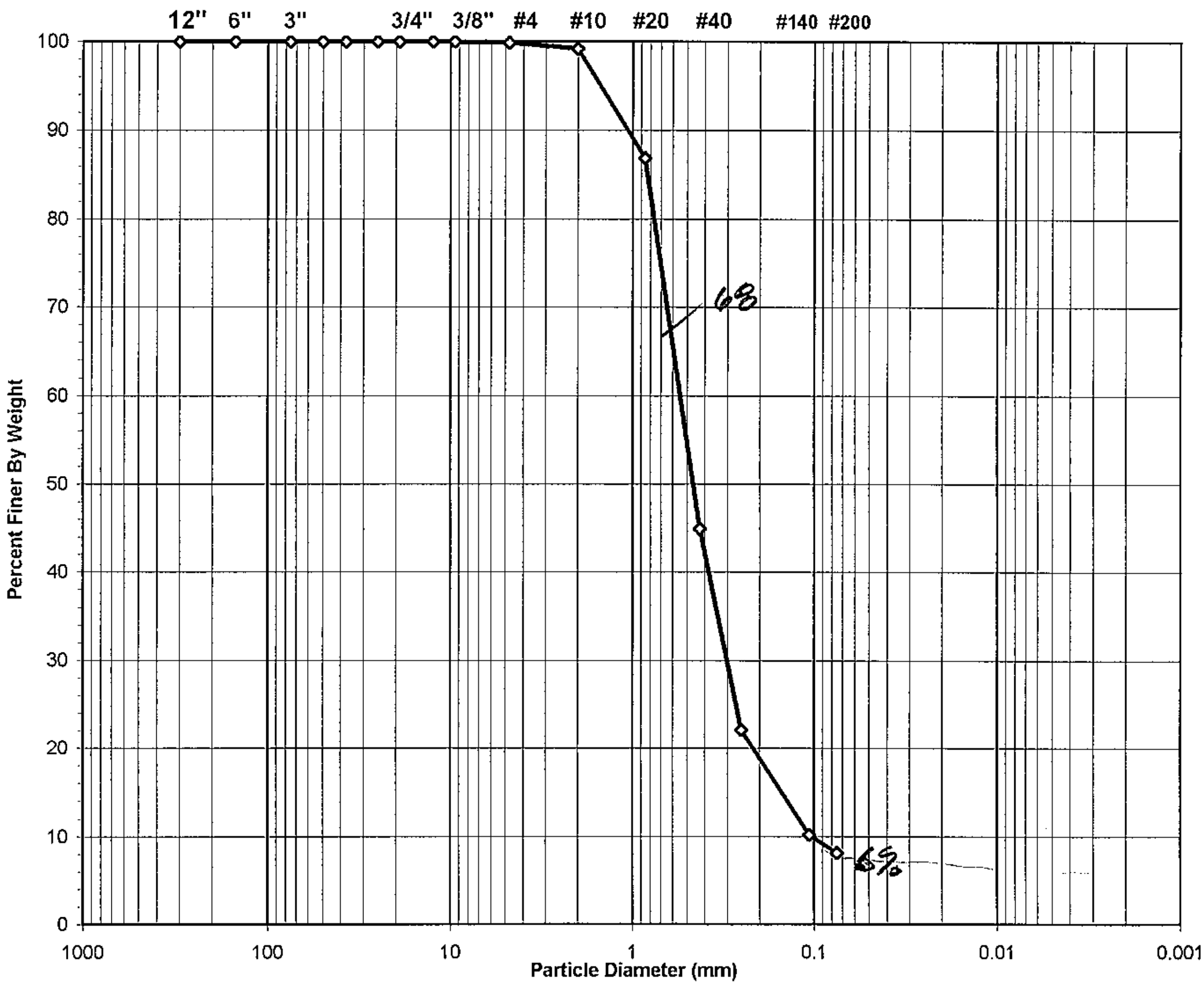
SA 32%
SI 62%
CL 6%
Sg 17%

SIEVE ANALYSIS

ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B7
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-3
Lab ID	R02011-01.012	Soil Color	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	*SP-SM, TESTED*	D60 =	0.5	CC =	1.6
USCS Classification	*POORLY GRADED SAND WITH SILT (NON-PLASTIC FINES) (UNABLE TO RUN HYDROMETER)*	D30 =	0.3	CU =	5.3
		D10 =	0.1		

Tested By JP Date 2/26/02 Checked By Jcm Date 2-28-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L956.xls]Sheet1*

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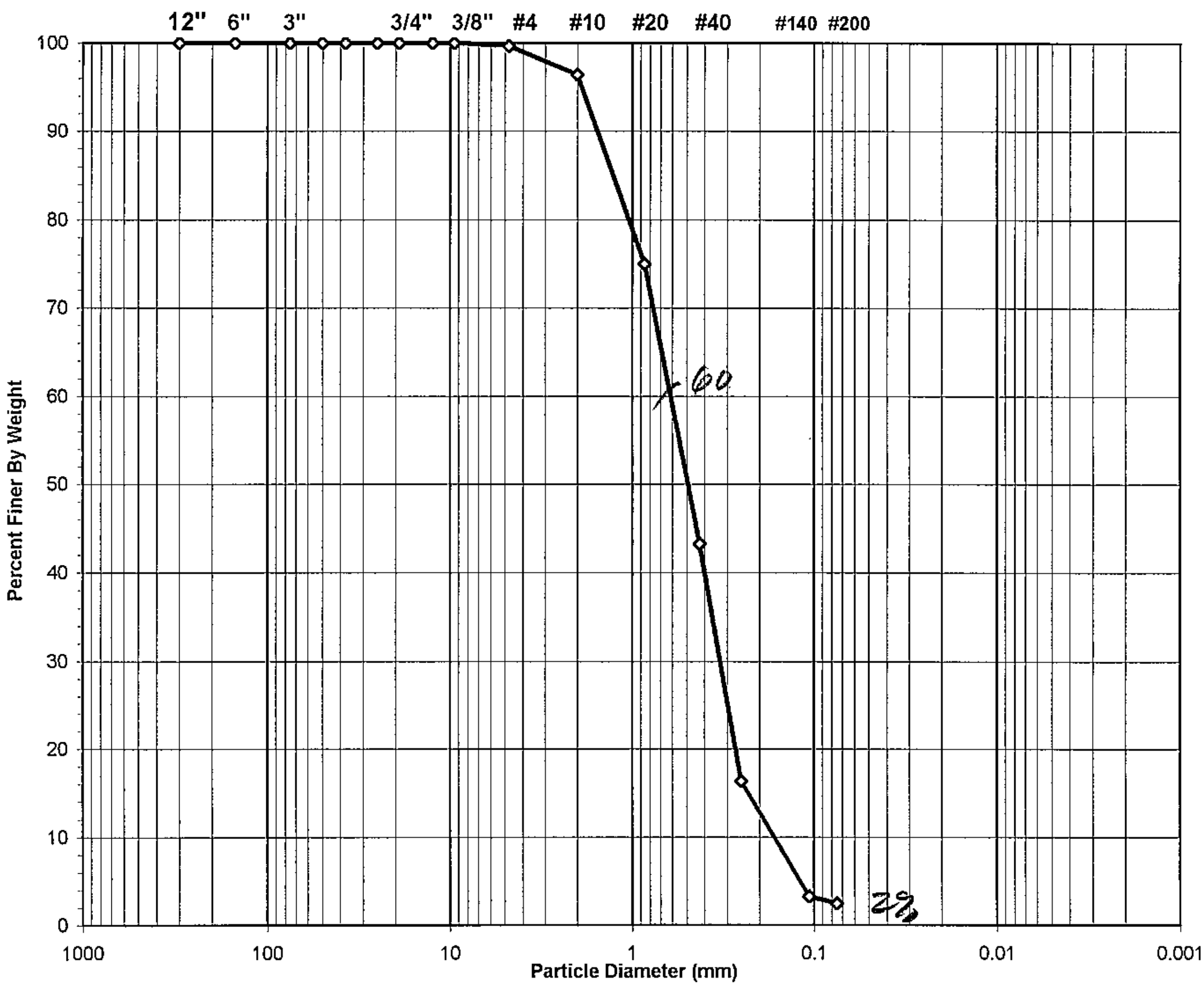
USGS
SA 40%
SI 58%
CL 2%
Sg 22%

SIEVE ANALYSIS

ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B7
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-4
Lab ID	R02011-01.013	Soil Color	BROWN

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol	***SP, TESTED***	**D60 =**	**0.6**	**CC =**	**1.1**
USCS Classification	***POORLY GRADED SAND (NON-PLASTIC FINES) (UNABLE TO RUN HYDROMETER)***	**D30 =**	**0.3**	**CU =**	**3.7**
		D10 =	**0.2**		

Tested By JP Date 2/26/02 Checked By Jcm Date 2-28-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L957.xls]Sheet1*

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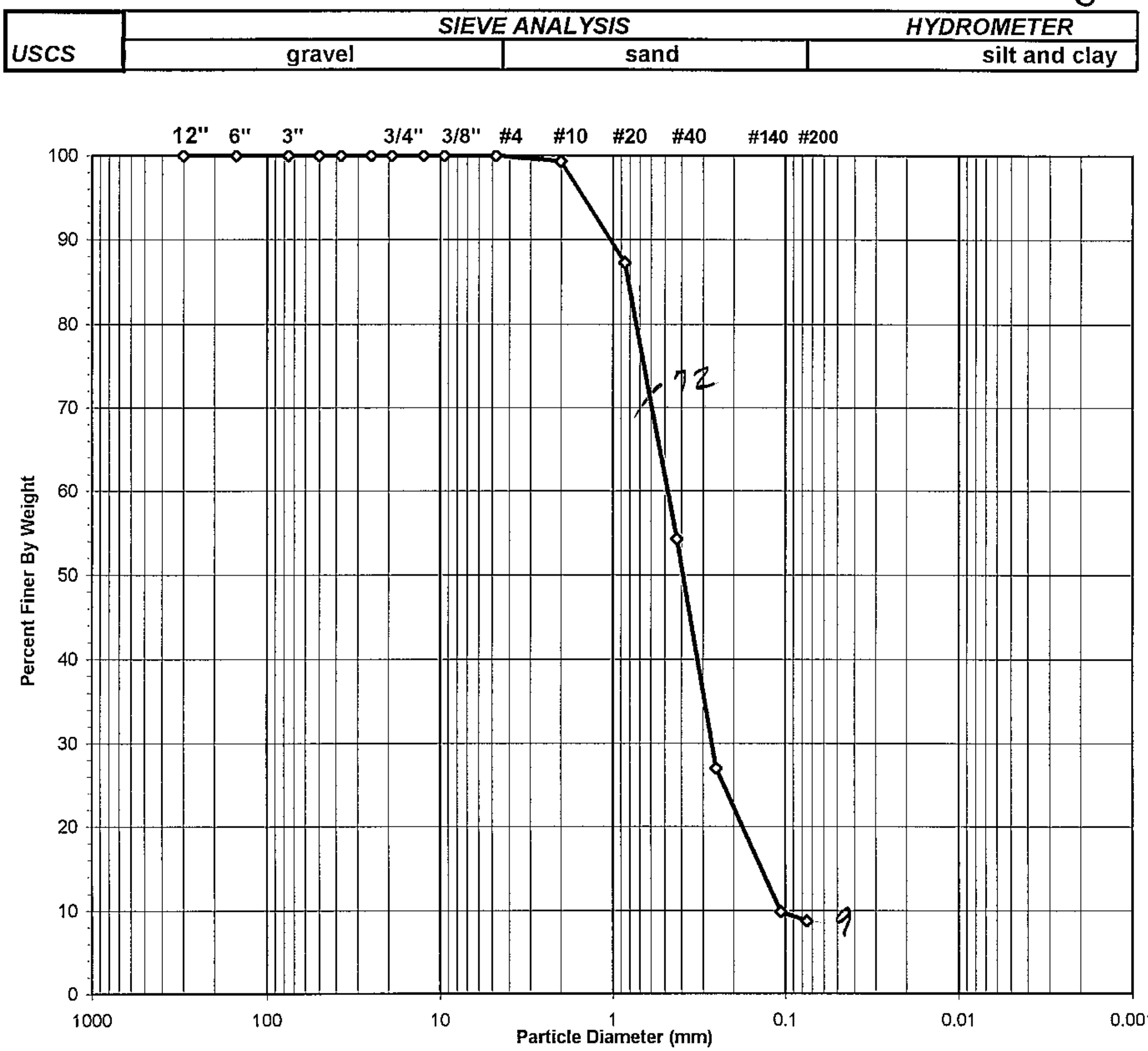
SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

USGS

Client	DAVID GARRETT	Boring No.	B7	SA	28%
Client Reference	PITT COUNTY	Depth (ft)	NA	SI	63%
Project No.	R02011-01	Sample No.	S-5	CL	9%
Lab ID	R02011-01.014	Soil Color	**GRAY**	Sg	16%



USCS Symbol	***SP-SM, TESTED***	**D60 =**	**0.5**	**CC =**	**1.4**
USCS Classification	***POORLY GRADED SAND WITH SILT (NON-PLASTIC FINES) (UNABLE TO RUN HYDROMETER)***	**D30 =**	**0.3**	**CU =**	**4.5**
		D10 =	**0.1**		

Tested By JP Date 2/26/02 Checked By Jcm Date 2·28·02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L958.xls]Sheet1*

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USGS
SA 18%
SI 76%
CL 6%
Sg 13%

SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

Client	DAVID GARRETT	Boring No.	B7
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-6
Lab ID	R02011-01.015	Soil Color	**GRAY**

USCS Symbol	***SP-SM, TESTED***	**D60 =**	**0.4**	**CC =**	**1.6**
USCS Classification	***POORLY GRADED SAND WITH SILT (NON-PLASTIC FINES) (UNABLE TO RUN HYDROMETER)***	**D30 =**	**0.3**	**CU =**	**3.4**
		D10 =	**0.1**		

Tested By JP Date 2/26/02 Checked By Jcm Date 2-28-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L959.xls]Sheet1*

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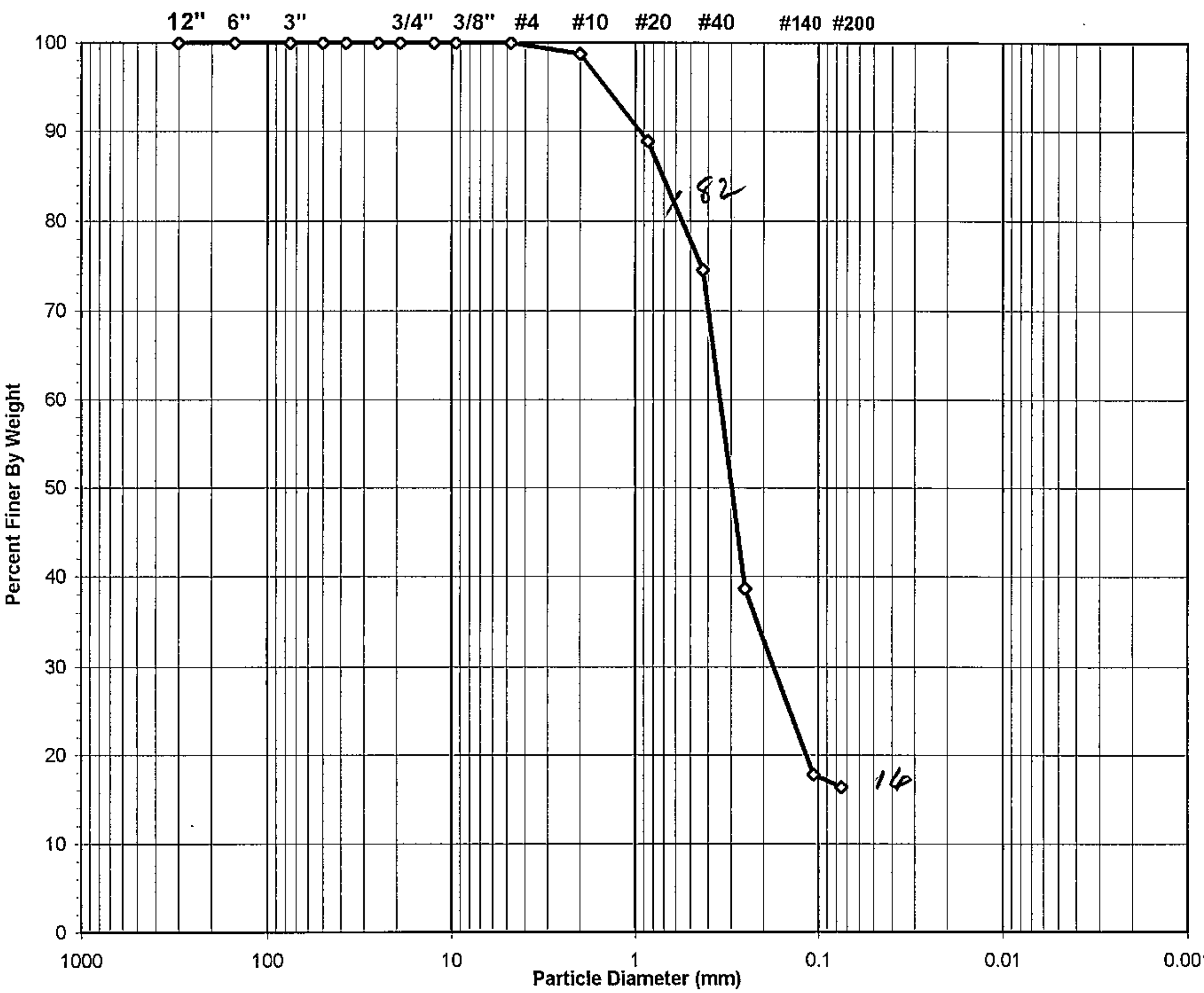
SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

USGS
SA 18%
SI 66%
CL 16%
Sg 8%

Client	DAVID GARRETT	Boring No.	B7
Client Reference	PITT COUNTY	Depth (ft)	NA
Project No.	R02011-01	Sample No.	S-7
Lab ID	R02011-01.016	Soil Color	**GRAY**

USCS	*SIEVE ANALYSIS*		*HYDROMETER*
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND***
(NON-PLASTIC FINES)
(UNABLE TO RUN HYDROMETER)

Tested By JP Date 2/26/02 Checked By Jcm Date 2-28-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[L960.xls]Sheet1*

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SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

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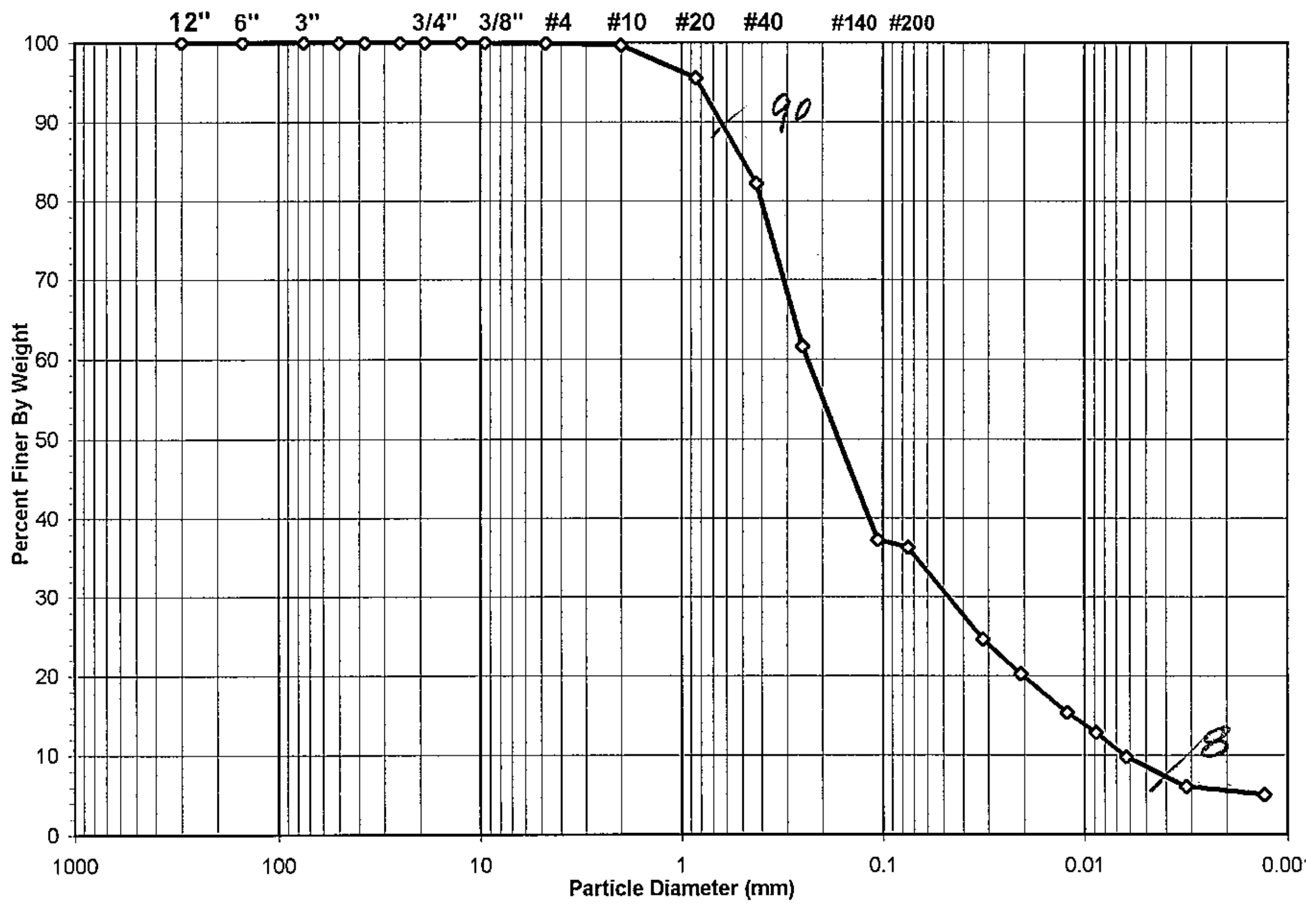
USGS

Client	DAVID GARRETT	Boring No.	B-8
Client Reference	PITT COUNTY	Depth (ft)	1-5
Project No.	R02011-01	Sample No.	~~NA~~ B-1
Lab ID	R02011-01.002	Soil Color	BROWN

SA 10%
SI 82%
CL 8%
Sg 7%

	SIEVE ANALYSIS			HYDROMETER	
USCS	cobbles	gravel	sand	silt and clay fraction	
USDA	cobbles	gravel	sand	silt	clay



Sieve Sizes (mm)	USCS Summary	Percentage
Greater Than #4	*Gravel*	0.06
#4 To #200	*Sand*	63.62
Finer Than #200	*Silt & Clay*	36.33

USCS Symbol ***SM, TESTED***

USCS Classification ***SILTY SAND (NON-PLASTIC FINES)***

DCN: CT-S3A DATE:02/06/01 REVISION: 4

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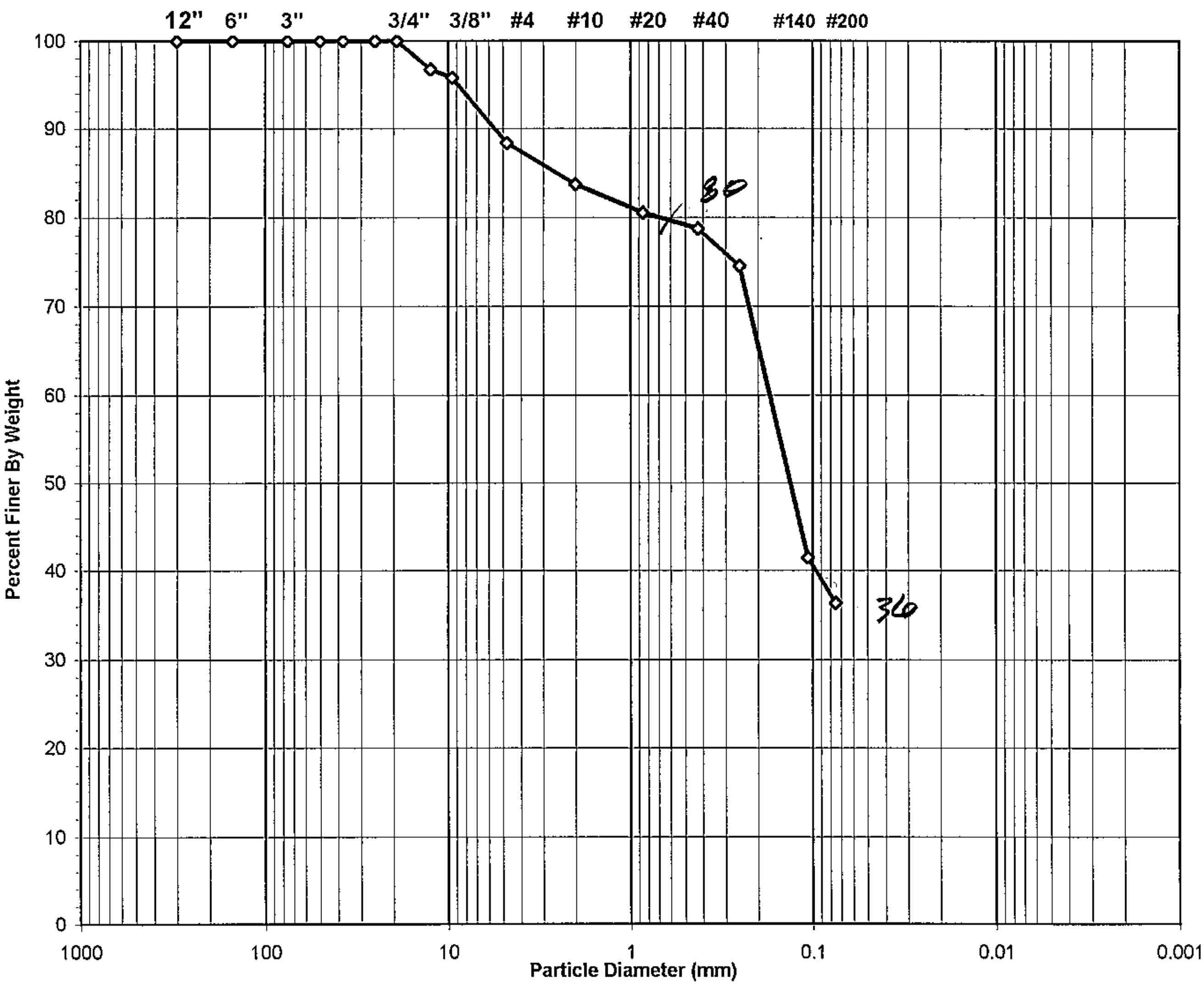
SIEVE ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

USGS
SA 20
SI 44
CL 36
Sg 3%

Client	DAVID GARRETT	Boring No.	B-8
Client Reference	PITT COUNTY	Depth (ft)	13.4-13.9
Project No.	R02011-01	Sample No.	~~NA~~ U-1a
Lab ID	R02011-01.004	Soil Color	GRAY

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SC-SM, TESTED***

USCS Classification ***SILTY, CLAYEY SAND (SEA SHELLS)***

Tested By JP Date 3/8/02 Checked By Jcm Date 3-11-02

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *C:\MSOFFICE\EXCEL\PrintQ\[M109.xls]Sheet1*

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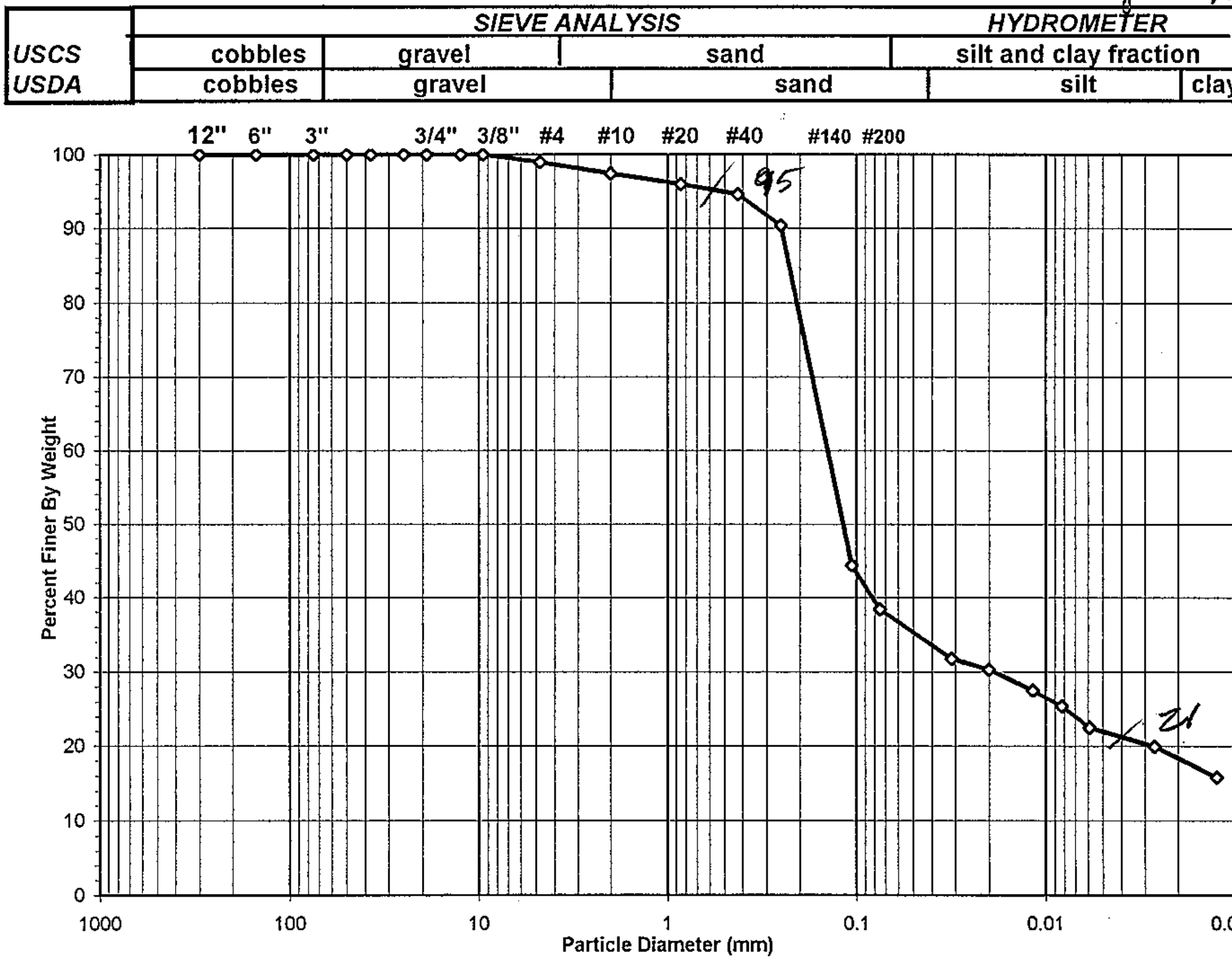
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

USGS
SA 5%
SI 74%
CL 21%
Sy 4.5%

Client	DAVID GARRETT	Boring No.	B-8
Client Reference	PITT COUNTY	Depth (ft)	14.4-14.9
Project No.	R02011-01	Sample No.	~~NA~~ U-1b
Lab ID	R02011-01.004	Soil Color	GRAY



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	1.06
#4 To #200	*Sand*	60.49
Finer Than #200	*Silt & Clay*	38.45

USCS Symbol ***SC, TESTED***

USCS Classification ***CLAYEY SAND***

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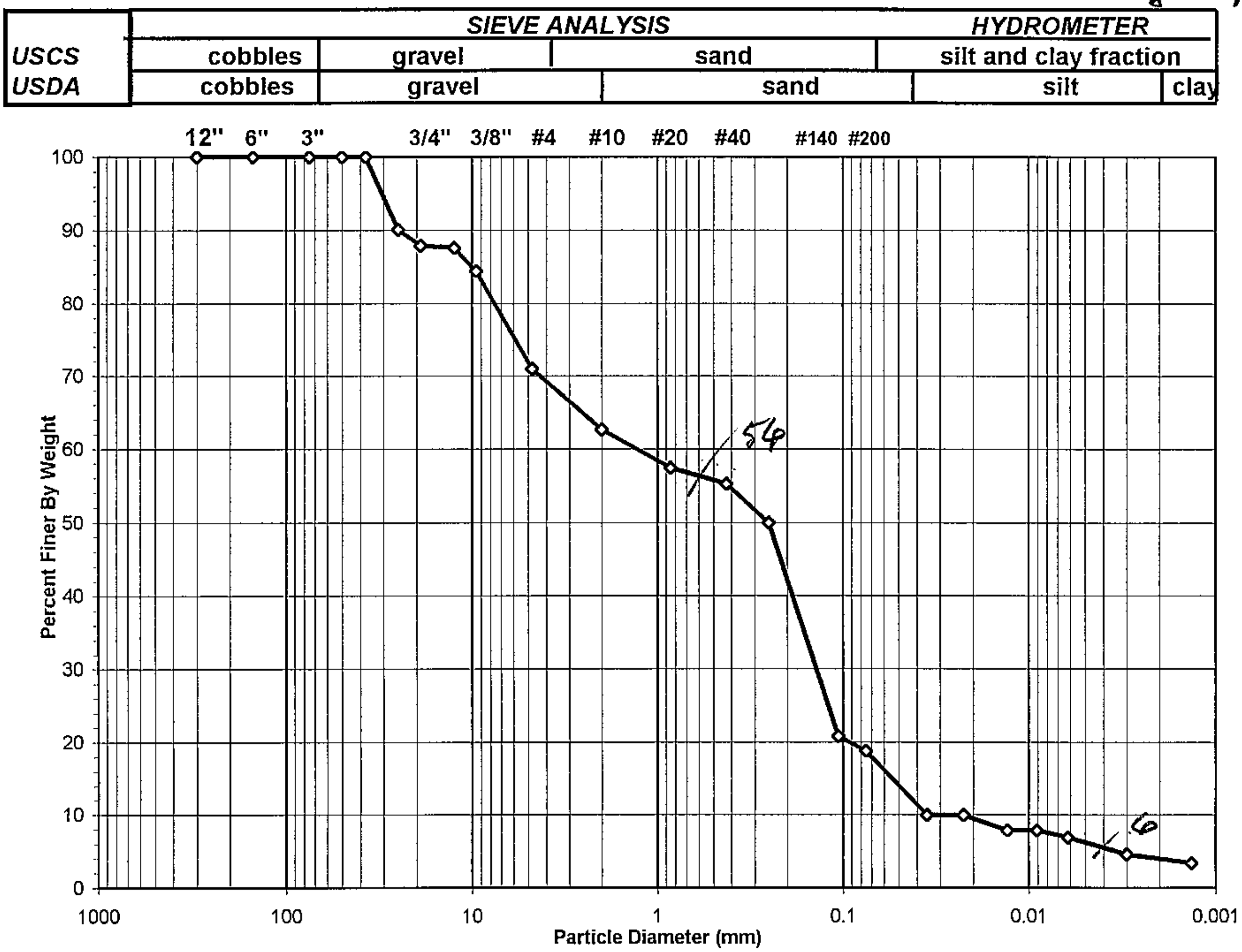
SIEVE AND HYDROMETER ANALYSIS
ASTM D 422-63/AASHTO T88-00 (SOP-S3)

USGS
SA 44%
SI 5%
CL 6%
Sg 1%

Client	DAVID GARRETT	Boring No.	B-10 S
Client Reference	PITT COUNTY	Depth (ft)	13.7-14.2
Project No.	R02011-01	Sample No.	~~NA~~ U-1
Lab ID	R02011-01.006	Soil Color	GRAY



USCS Summary		
Sieve Sizes (mm)		**Percentage**
Greater Than #4	*Gravel*	29.10
#4 To #200	*Sand*	52.10
Finer Than #200	*Silt & Clay*	18.80

USCS Symbol ***SC-SM, TESTED***

USCS Classification ***SILTY, CLAYEY SAND WITH GRAVEL (SEA SHELLS)***

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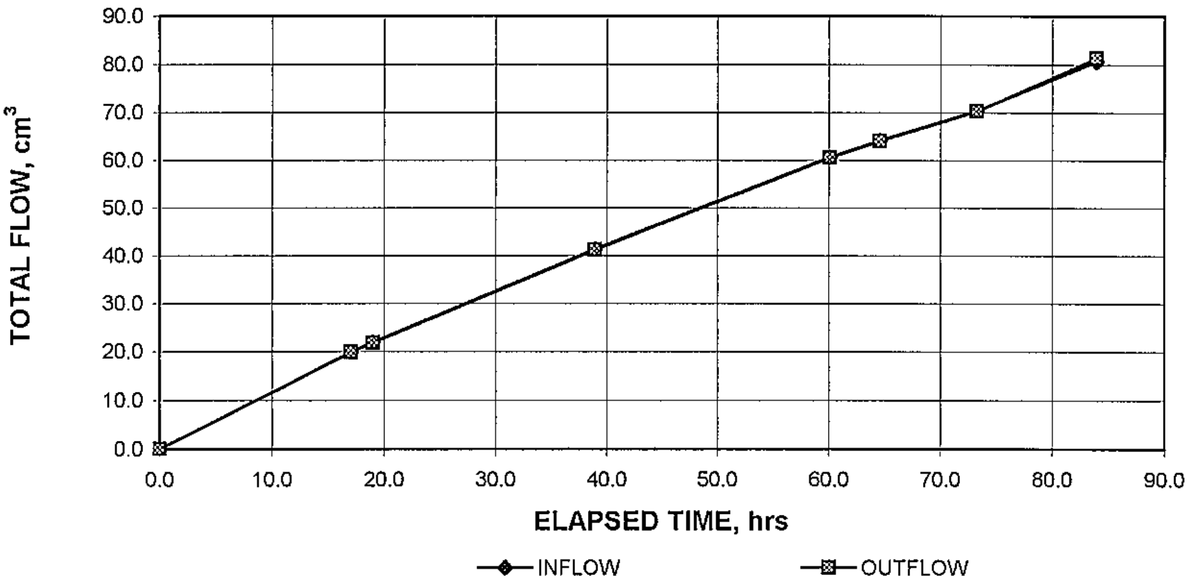
PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

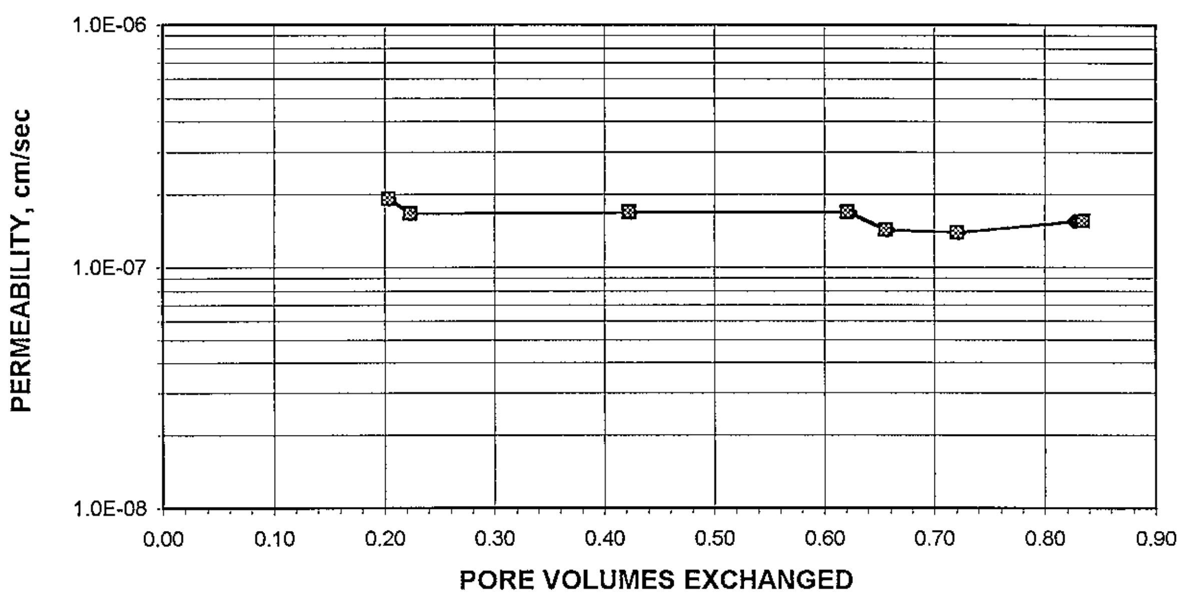
Client	DAVID GARRETT	Boring No.	B-1
Client Project	PITT COUNTY	Depth (ft.)	11.1-11.3
Project No.	R02011-01	Sample No.	NA
Lab ID No.	R02011-01.003		

AVERAGE PERMEABILITY = 1.5E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.5E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: JCM Date: 2/6/02 Checked By: JMO Date: 2/15/02

 DCN: CT-22C DATE: 01-11-99 REVISION:3 C:\MSOffice\Excel\Perms\February02\[011P1.xls]Sheet1

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MOHR TOTAL STRENGTH ENVELOPE

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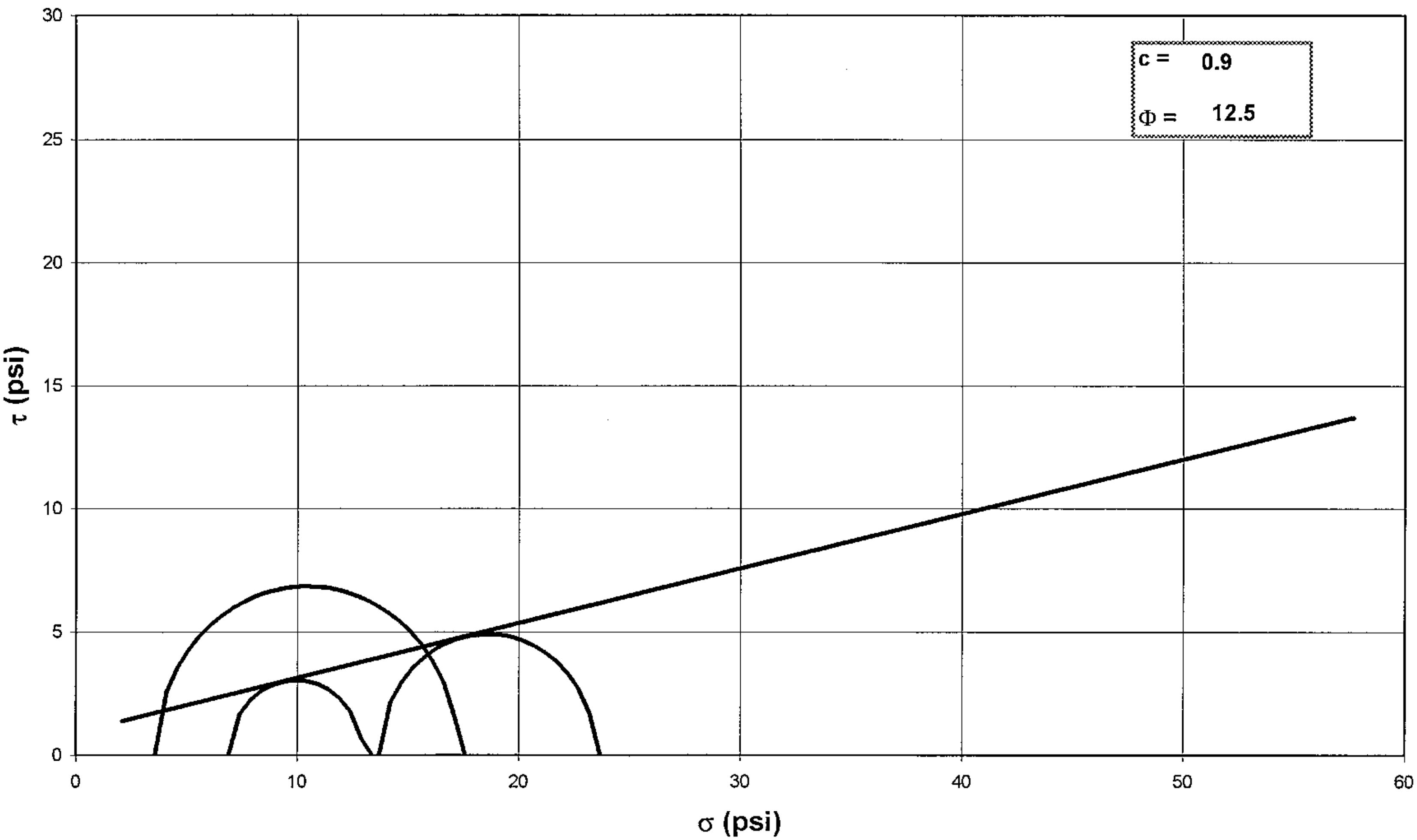
Client	DAVID GARRETT	Boring No.	B-1
Client Ref. No.	PITT COUNTY	Depth(ft.)	11.0-13.0
Project no.	R02011-01	Sample No.	NA
Lab ID	R02011-01.003	Visual Description	GRAY SILTY CLAYEY SAND (UNDISTURBED)



NOTE: GRAPH NOT TO SCALE

Tested By: JCM *Date:* 2/6/02 *Approved By:* JB *Date:* 2/22/02

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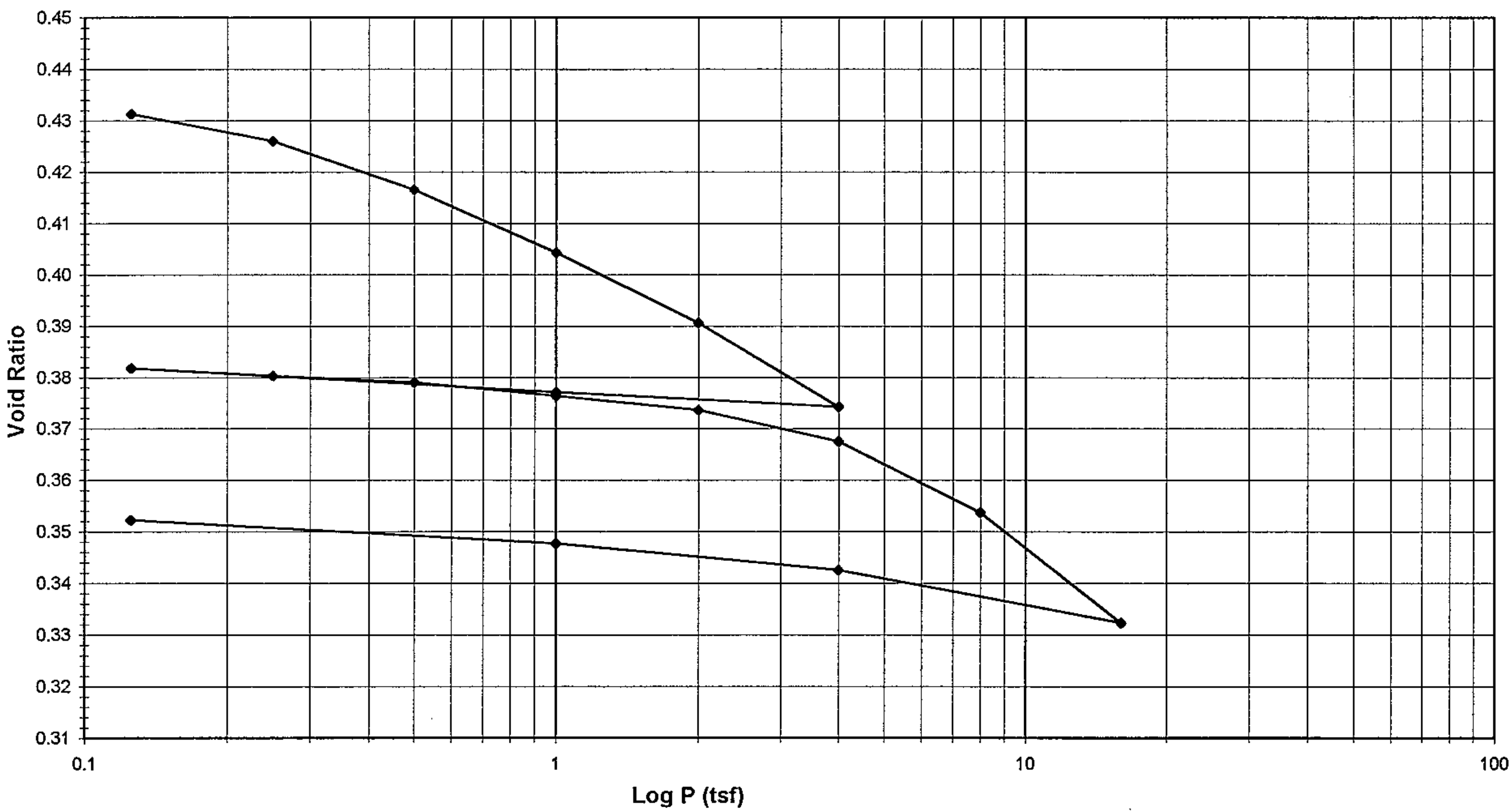
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	DAVID GARRETT	Boring No.	B-1
Client Reference	PITT COUNTY	Depth (ft)	11.0-11.1
Project No.	R02011-01	Sample No.	NA
Lab ID	R02011-01-003	Visual Description	GRAY SILTY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By TM *Date* 2/11/02 *Approved By* DB *Date* 2/20/02

DCN: CT-S24F Date: 11/9/00 Revision: 4

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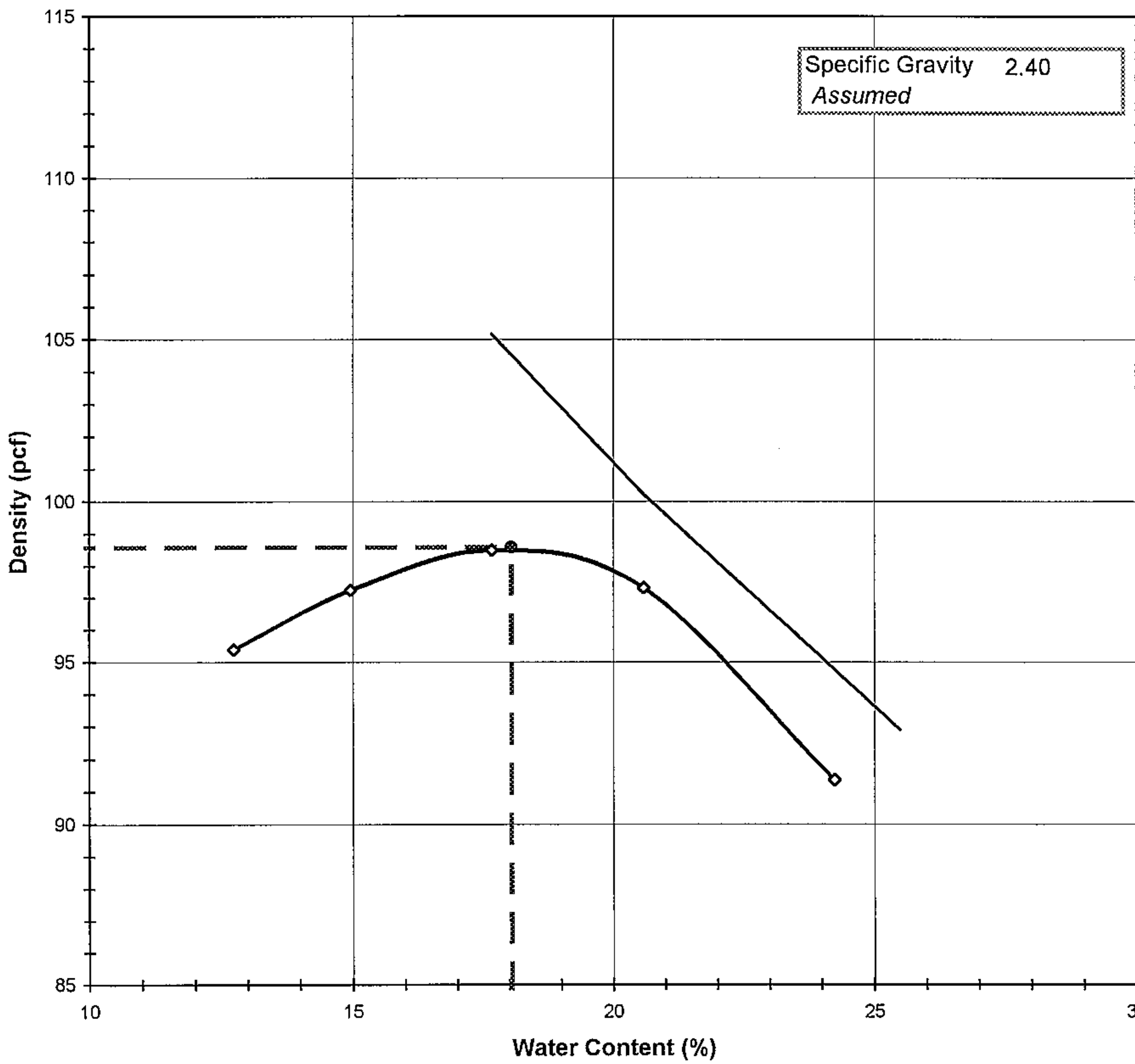
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	DAVID GARRETT	Boring No.	B-2
Client Reference	PITT COUNTY	Depth (ft)	1-5
Project No.	R02011-01	Sample No.	NA
Lab ID	R02011-01.001	Test Method	**STANDARD**

Visual Description BROWN SILTY CLAY WITH ORGANIC MATERIAL

Optimum Water Content	**18.1**
Maximum Dry Density	**98.6**



Tested By BF *Date* 2/5/02 *Checked By* [signature] *Date* 2.6.02

 DCN:CT-S12 DATE:11/17/00 REVISION 4 *C:\MSOffice\Excel\PRINTQ\[L748.xls]Sheet1*

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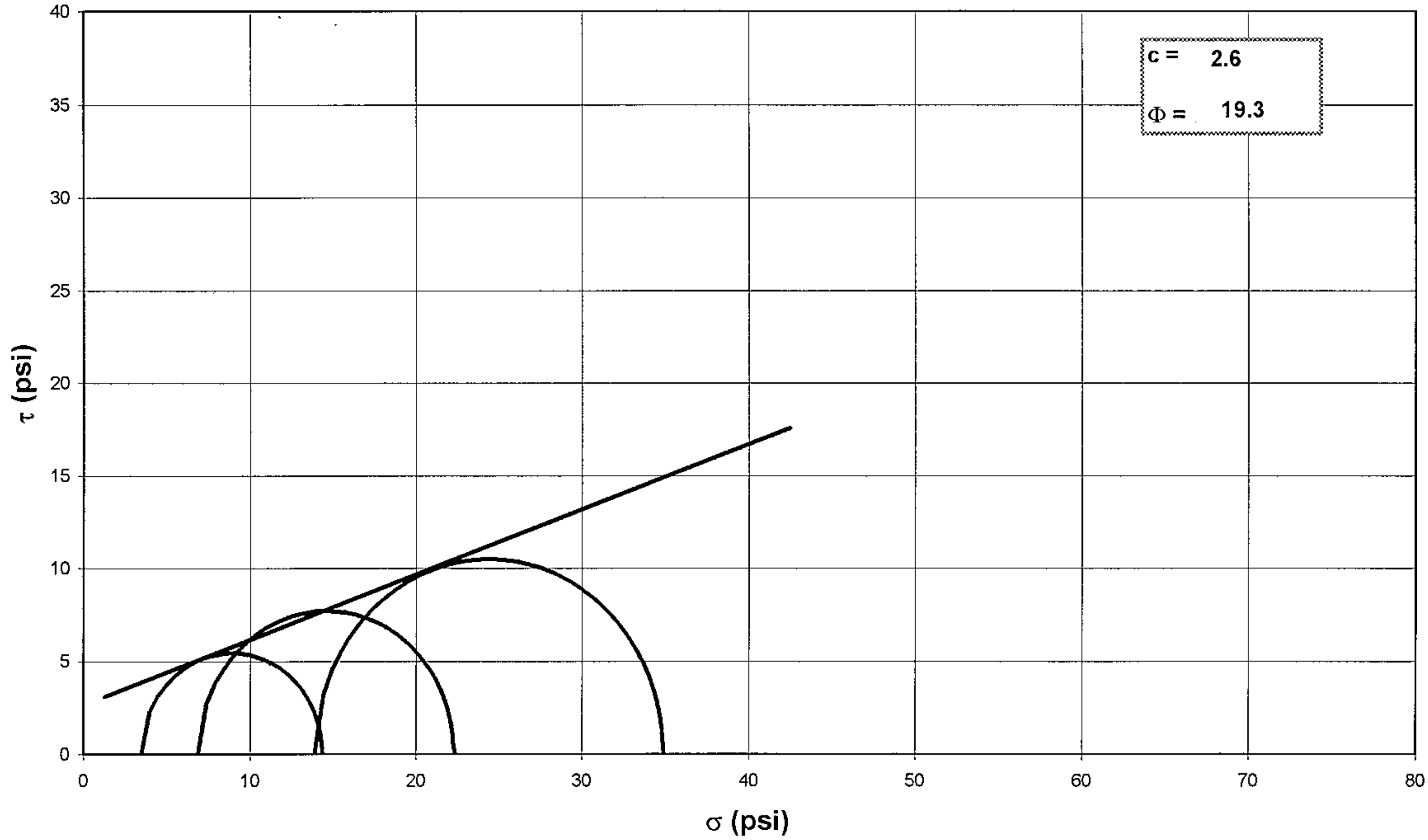
MOHR TOTAL STRENGTH ENVELOPE

Client	DAVID GARRETT	Boring No.	B-2
Client Ref. No.	PITT COUNTY	Depth(ft.)	1-5
Project no.	R02011-01	Sample No.	NA
Lab ID	R02011-01.001	Visual Description	BROWN SILT WITH ORGANIC MATERIAL (REMOLDED)



NOTE: GRAPH NOT TO SCALE

Tested By: JCM *Date:* 2/19/02 *Approved By:* DB *Date:* 3/1/02

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PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

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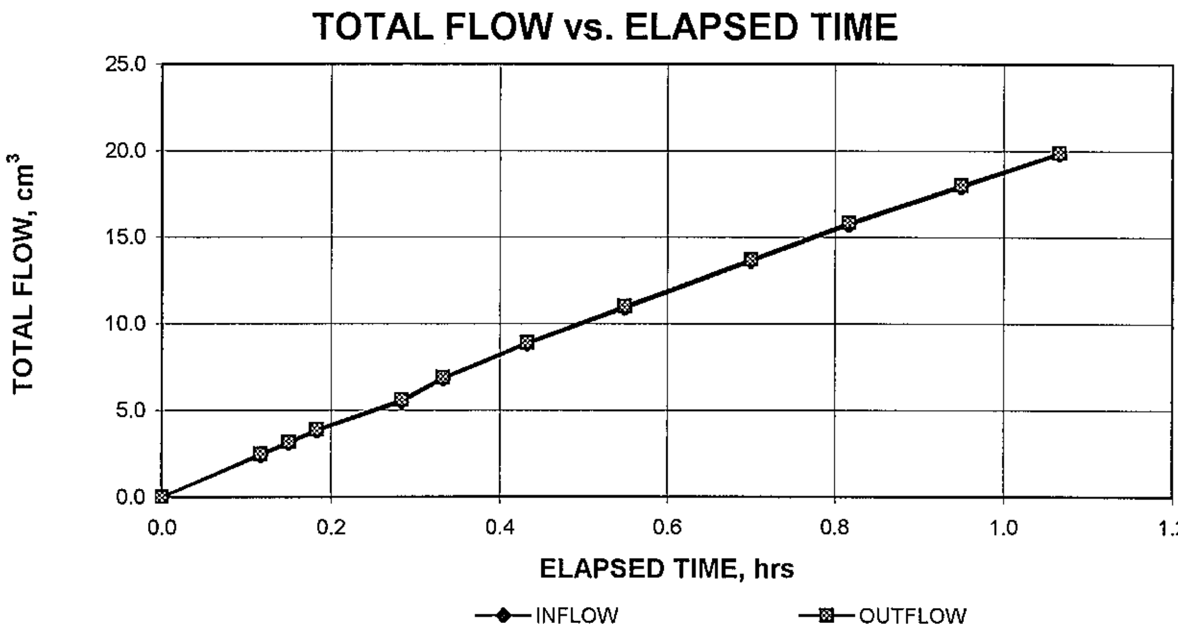
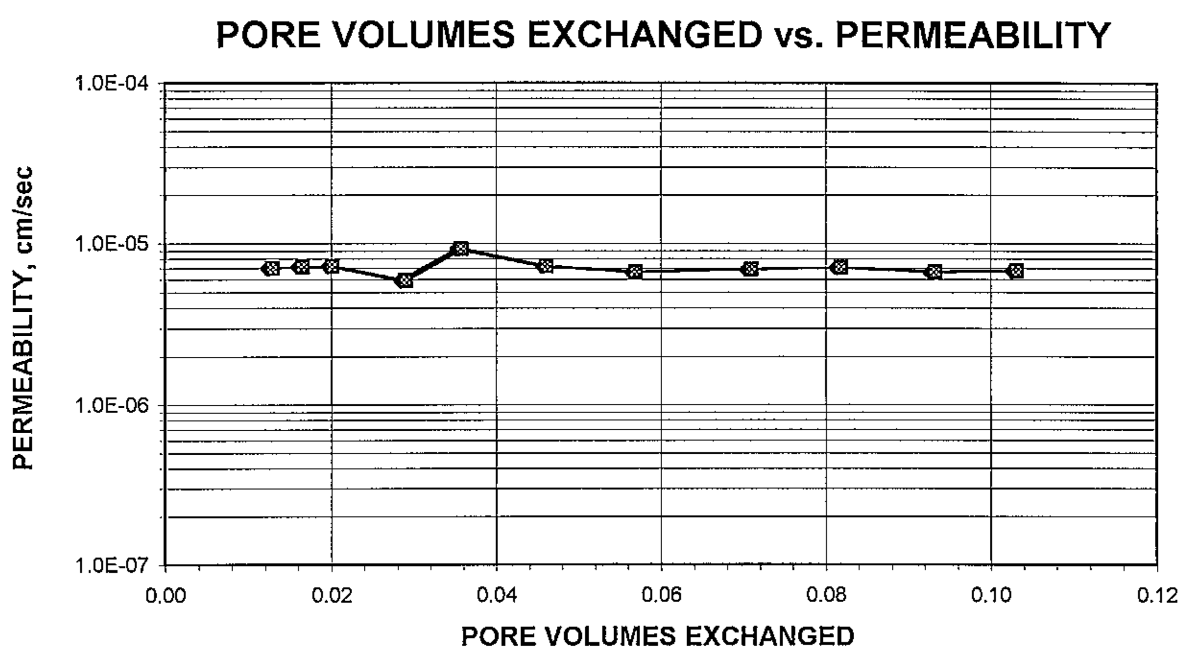
Client	DAVID GARRETT	Boring No.	B-2
Client Project	PITT COUNTY	Depth (ft.)	1-5
Project No.	R02011-01	Sample No.	NA
Lab ID No.	R02011-01.001		

AVERAGE PERMEABILITY = 6.8E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.8E-08 m/sec @ 20°C





Tested By: JCM Date: 2/19/02 Checked By: JMO Date: 2/22/02

DCN: CT-22C DATE: 01-11-99 REVISION:3
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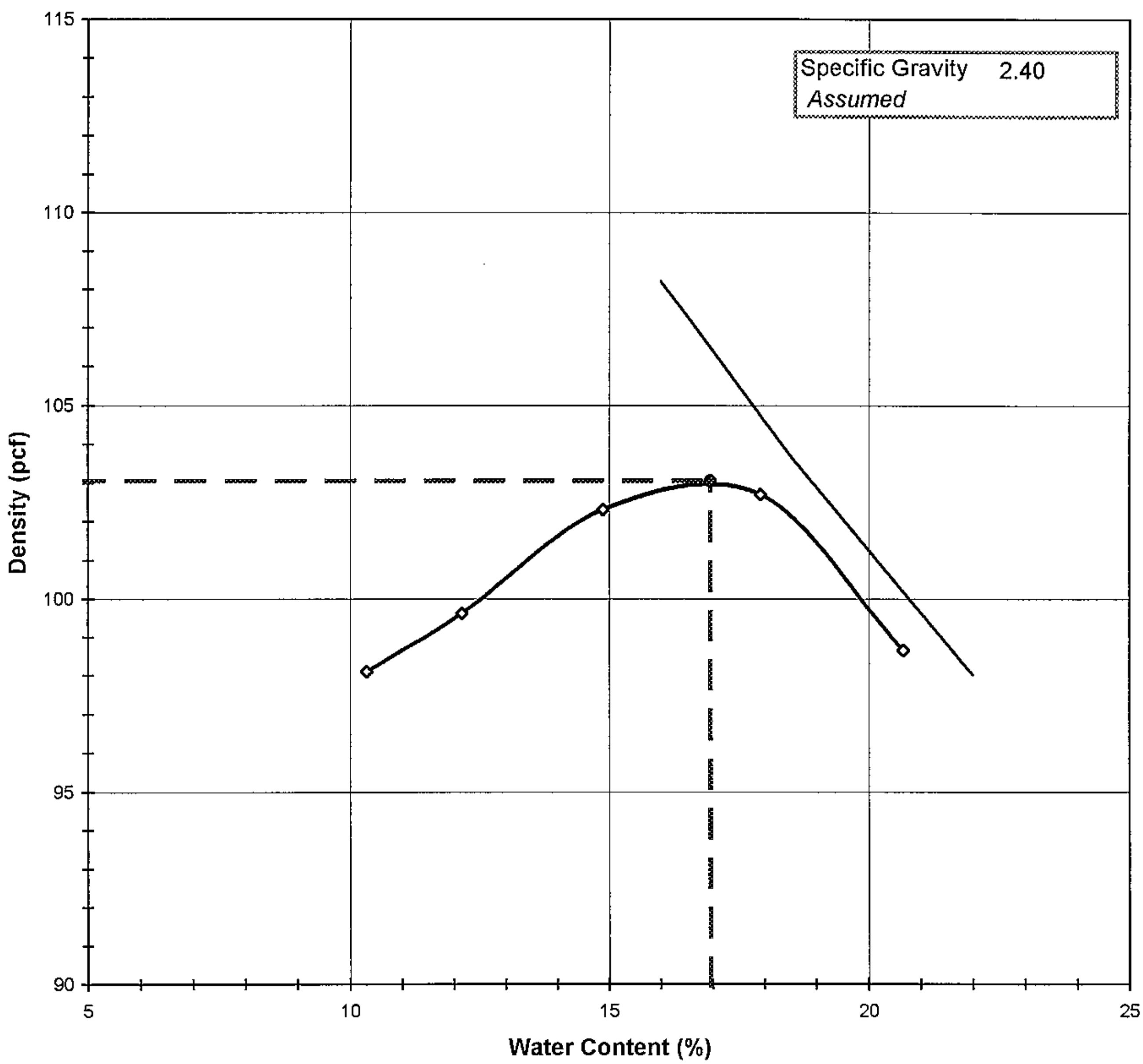
MOISTURE DENSITY RELATIONSHIP

ASTM D698-91 SOP-S12

Client	DAVID GARRETT	Boring No.	B-8
Client Reference	PITT COUNTY	Depth (ft)	1-5
Project No.	R02011-01	Sample No.	NA
Lab ID	R02011-01.002	Test Method	**STANDARD**

Visual Description BROWN CLAY WITH SOME ORGANIC MATERIAL

Optimum Water Content	**17.0**
Maximum Dry Density	**103.1**



Tested By JP *Date* 2/5/02 *Checked By* JCM *Date* 2.6.02

 DCN:CT-S12 DATE:11/17/00 REVISION 4 *C:\MSOffice\Excel\PRINTQ\[L749.xls]Sheet1*

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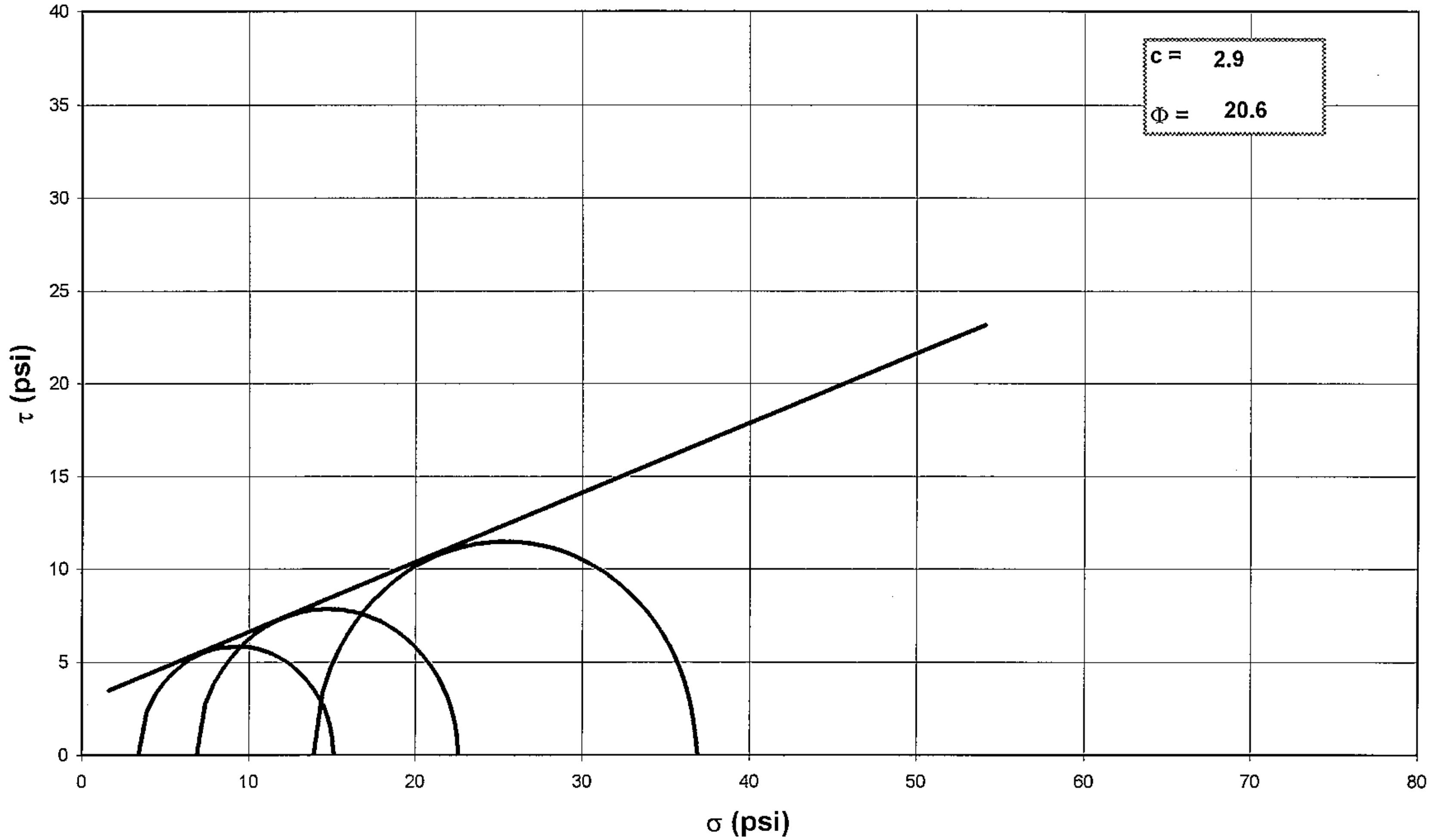
MOHR TOTAL STRENGTH ENVELOPE

Client	DAVID GARRETT	Boring No.	B-8
Client Ref. No.	PITT COUNTY	Depth(ft.)	1-5
Project no.	R02011-01	Sample No.	NA
Lab ID	R02011-01.002	Visual Description	BROWN SILT (REMOLDED)



NOTE: GRAPH NOT TO SCALE

Tested By: JCM *Date:* 2/25/02 *Approved By:* DB *Date:* 3/7/02

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PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

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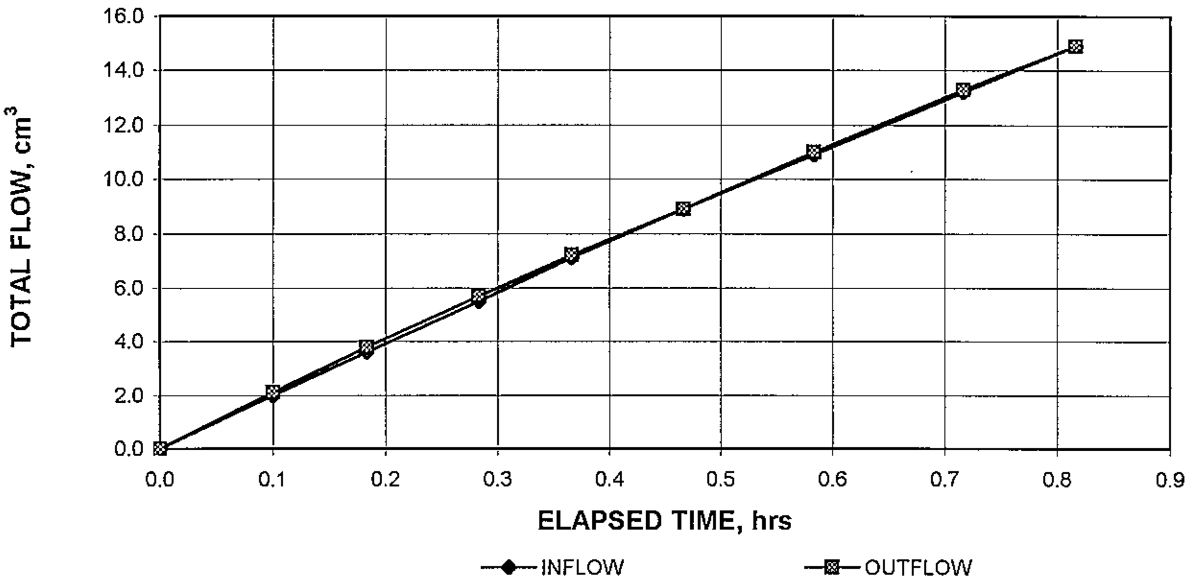
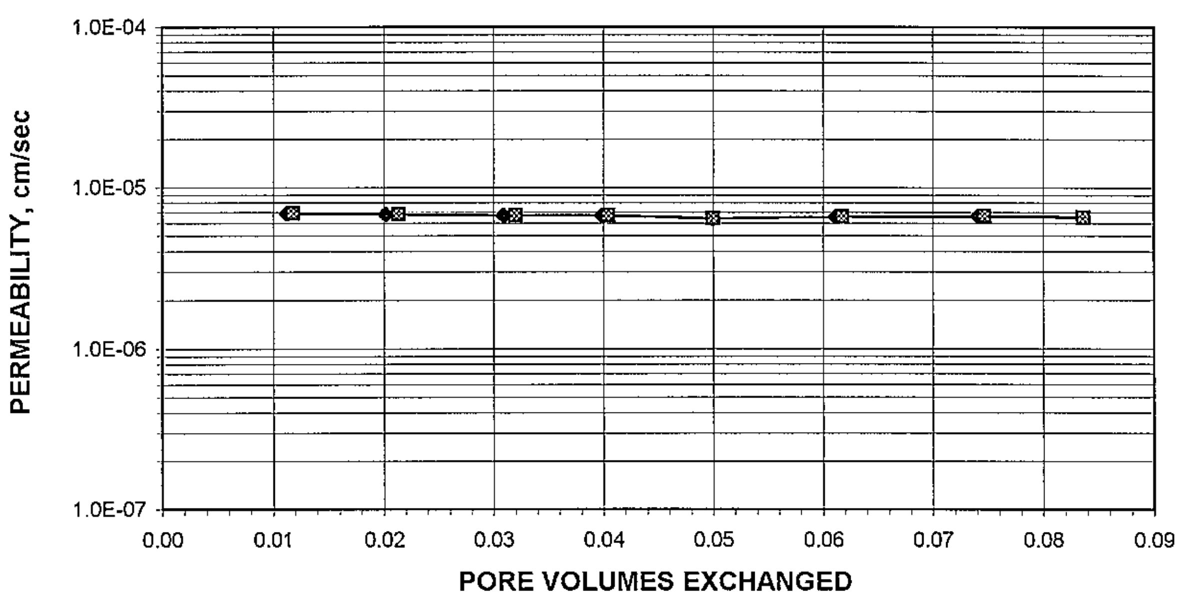
Client	DAVID GARRETT	Boring No.	B-8
Client Project	PITT COUNTY	Depth (ft.)	1-5
Project No.	R02011-01	Sample No.	NA
Lab ID No.	R02011-01.002		

AVERAGE PERMEABILITY = 6.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.5E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: JCM Date: 2/25/02 Checked By: KAL Date: 3-1-02

DCN: CT-22C DATE: 01-11-99 REVISION:3 C:\MSOffice\Excel\Perms\February02\[011P4.xls]Sheet1
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MOHR TOTAL STRENGTH ENVELOPE

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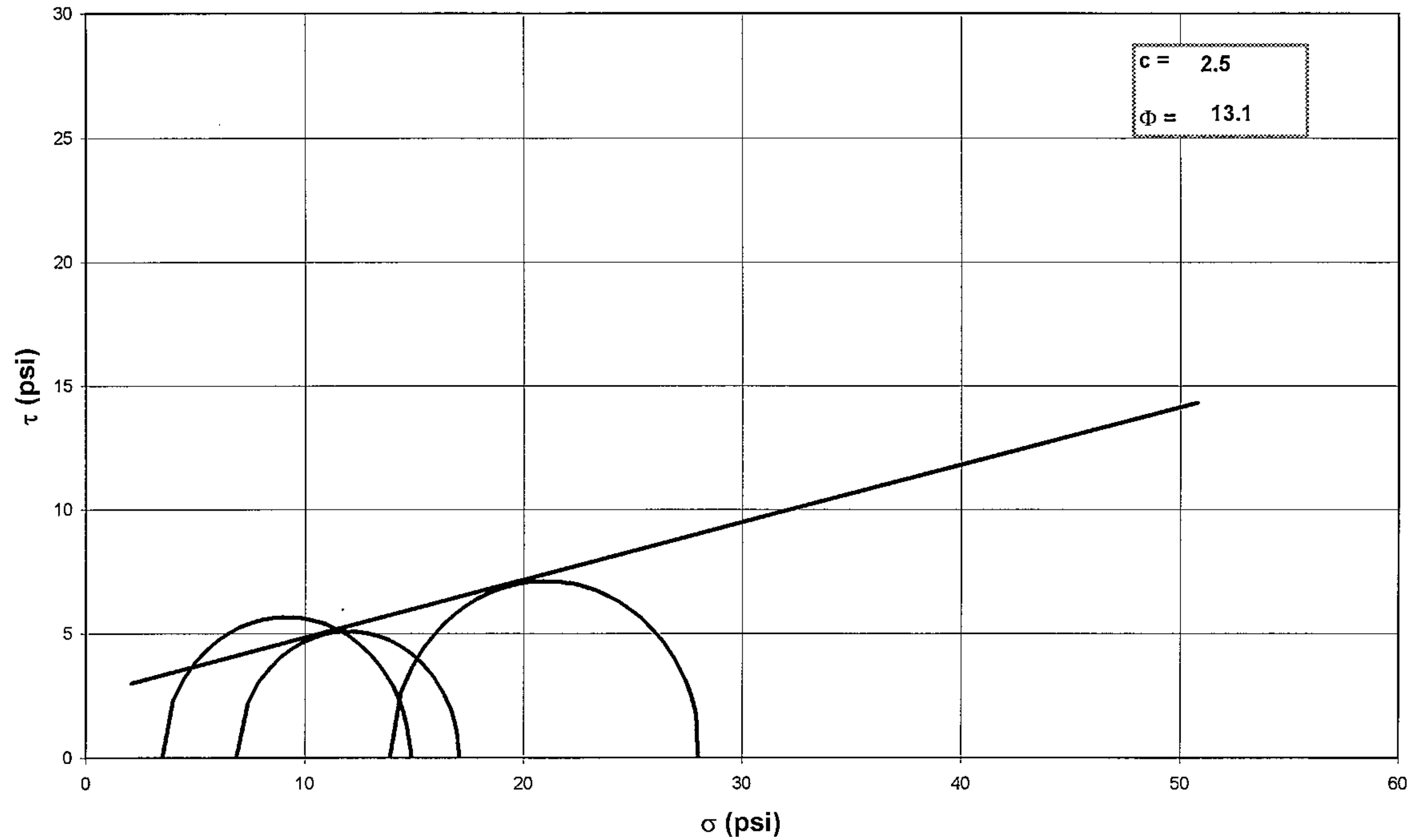
Client	DAVID GARRETT	Boring No.	B-8
Client Ref. No.	PITT COUNTY	Depth(ft.)	13.0-15.0
Project no.	R02011-01	Sample No.	NA
Lab ID	R02011-01.004	Visual Description	GRAY CLAY AND SEA SHELL FRAGMENTS (UNDISTURBED)



NOTE: GRAPH NOT TO SCALE

Tested By: JCM *Date:* 2/6/02 *Approved By:* DB *Date:* 2/22/02

#N/A

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PERMEABILITY TEST

ASTM D 5084-90(Reapproved 1997)
(SOP-S22A & S22B)

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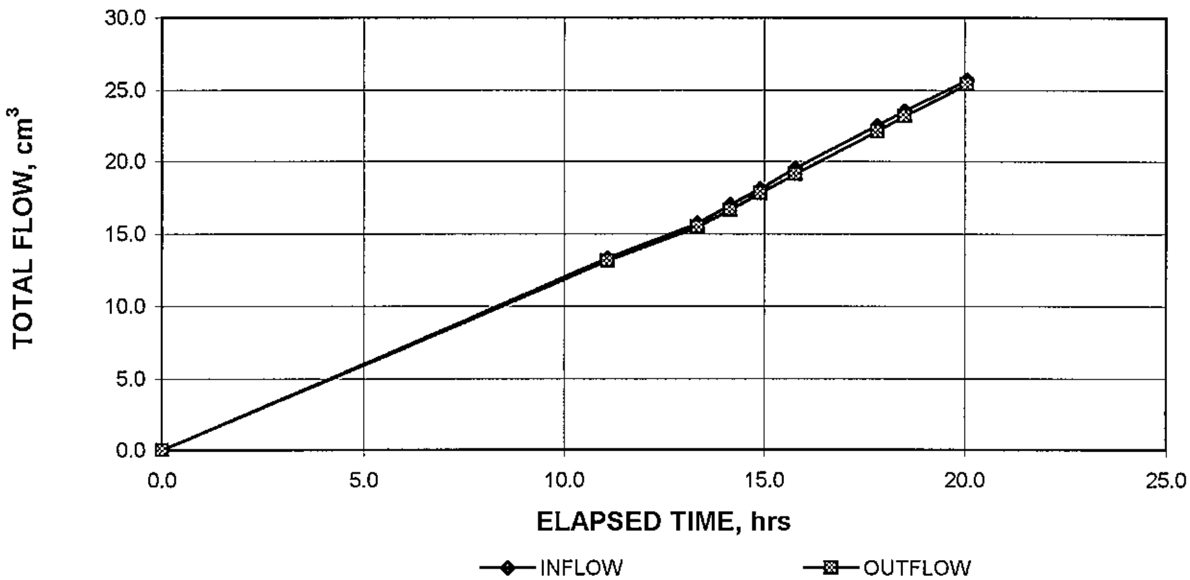
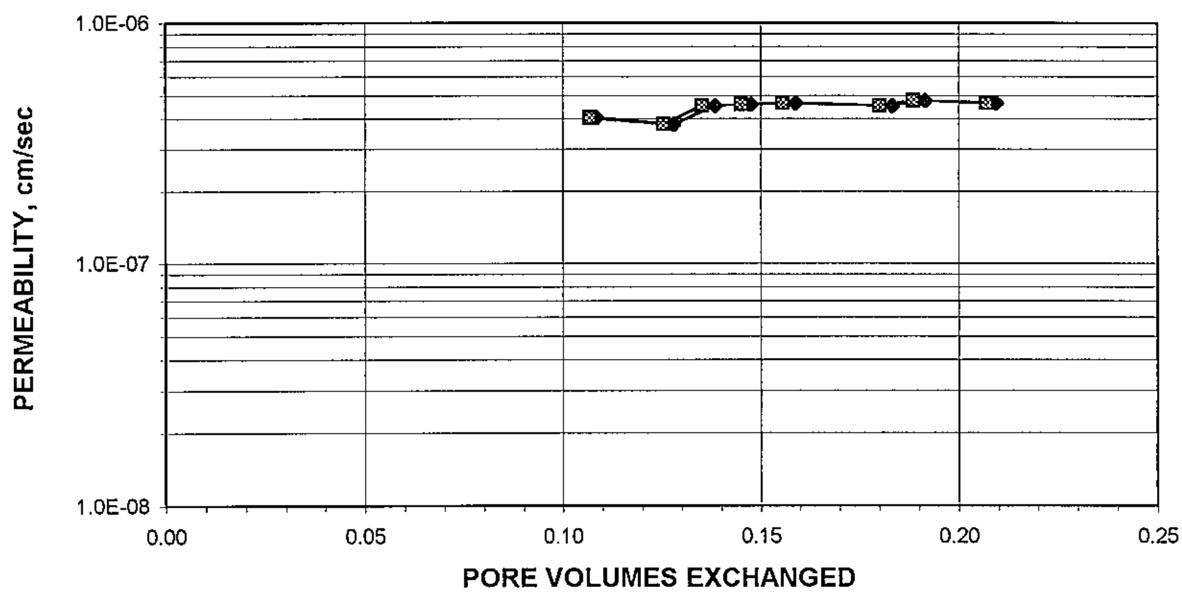
Client	DAVID GARRETT	Boring No.	B-10 S
Client Project	PITT COUNTY	Depth (ft.)	14.4-14.7
Project No.	R02011-01	Sample No.	NA
Lab ID No.	R02011-01.006		

AVERAGE PERMEABILITY = 4.6E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.6E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: JCM Date: 2/19/02 Checked By: JMO Date: 2/22/02

 DCN: CT-22C DATE: 01-11-99 REVISION:3 C:\MSOffice\Excel\Perms\February02\[011P3.xls]Sheet1

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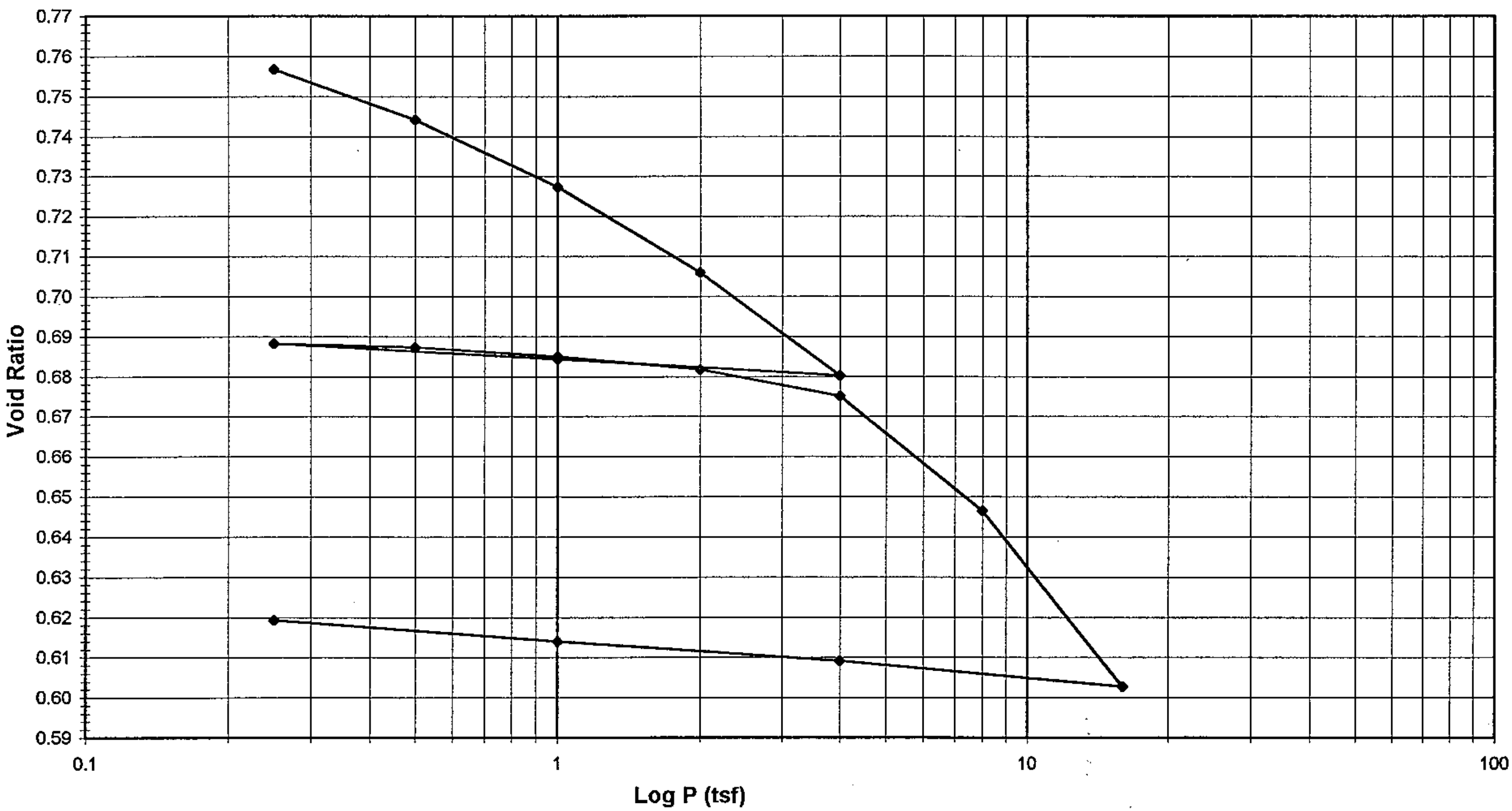
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	DAVID GARRETT	Boring No.	B-10S
Client Reference	PITT COUNTY	Depth (ft)	13.4-13.5
Project No.	R02011-01	Sample No.	NA
Lab ID	R02011-01-006	Visual Description	GRAY SANDY SILT WITH SEA SHELL FRAGMENTS

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



Tested By TM *Date* 2/20/02 *Approved By* DB *Date* 2/27/02

DCN: CT-S24F Date: 11/9/00 Revision: 4 C:\My Documents\CONSOL\Printfiles4\[GARRETTR02011_01_06FNLPLT.xls]Sheet1

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David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-1d

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**17.33**
Equipment	**CME 450**	Drilling Method	**3-15/16" Tri-cone**	Water Level, TOB	**1.6**
Date Started	**12/26/01**	Date Ended	**12/27/01**	Water Level, 24 Hr.	**1.6**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**1.6**
Comments	**Logged area, cold sunny weather**	Total Depth	**80.0**	Date of Observation	**12/27/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 – 6 (Elev. 17.33 – 11.33)	8, 8, 9	SAND: Medium dense buff-white, slightly silty, fine to medium, moist	SP	Bentonite-Cement Grout
6 – 23	2, 1, 1; 1, 1, 1; 1, 1, 2; 2, 1, 2	CLAYEY SILT: Soft, dark gray, slightly sandy, wet, medium plasticity, sticky, scattered plant fibers, increasing sand content with depth (UD's pushed at 11 - 13 feet and at 13 - 15 feet)	ML-CL; ML-CL; ML-CL	
23 – 30	10, 11, 11; 6	CLAYEY SILT: Medium stiff, light gray-black, with fine to medium sand lenses, wet	SP	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00, -8.00, -10.00, -12.00

David Garrett, P.G., P.E.
Engineering and Geology

Client and Project **C&D Landfill, Inc. (Phases 3 and 4)**
Ground Elevation **17.33**
Equipment **CME 450**
Drilling Method **3-15/16" Tri-cone**
Water Level, TOB **1.6**
Date Started **12/26/01**
Date Ended **12/27/01**
Water Level, 24 Hr. **1.6**
Drilling Firm **Bore & Core, Inc.**
Logged by **David Garrett**
Stabilized Level **1.6**
Comments **Logged area, cold sunny weather**
Total Depth **80.0**
Date of Observation **12/27/01**
All depths are given in feet and referenced b.g.s.

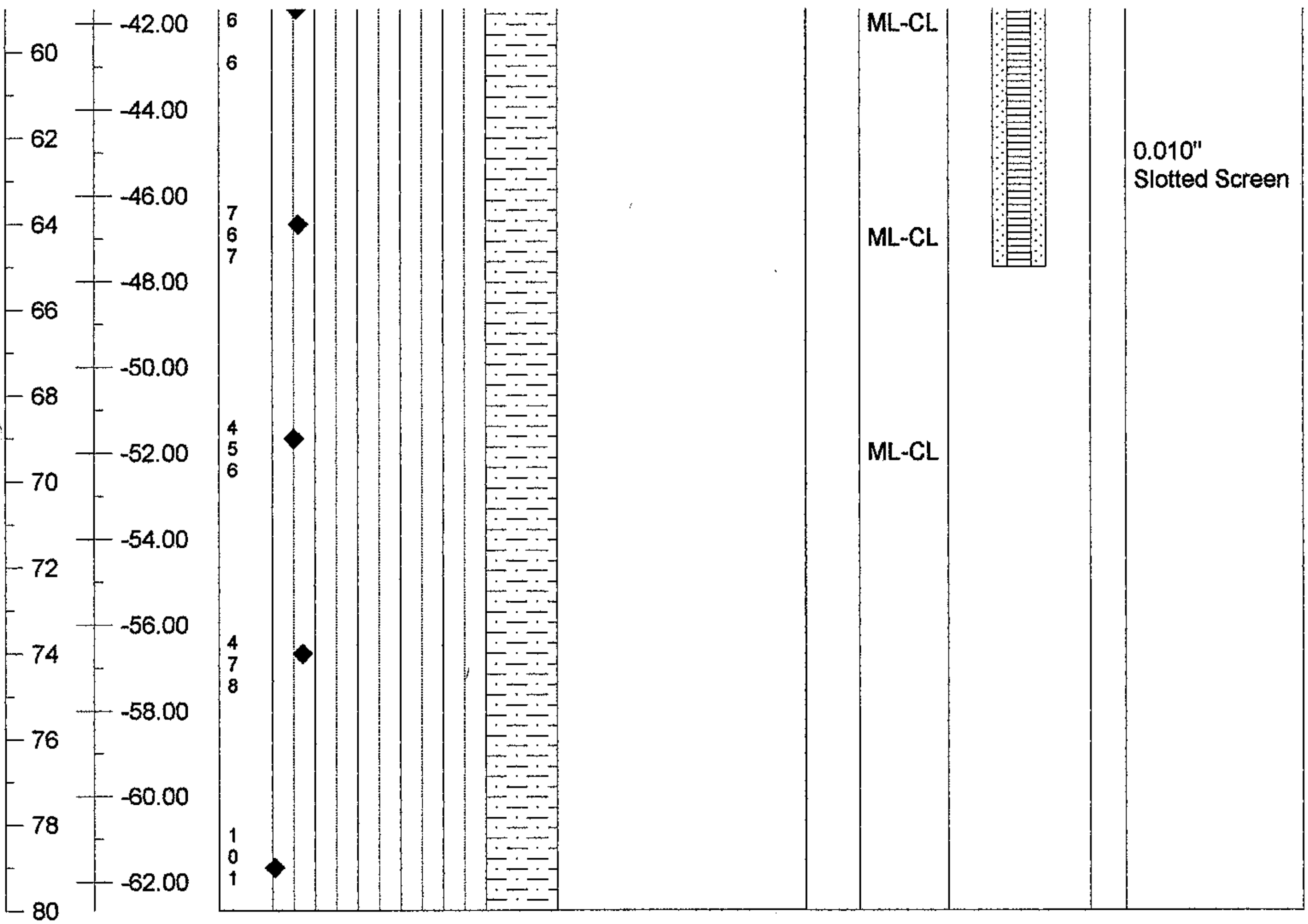
Depth	Elev.	SPT Value	Soil Description, OVA	USCS Symbol	Piezometer Constuction Data
30		5		SP	
32	-14.00				
34	-16.00	10 11 50/.3	SILTY SAND: Dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer at 34 to 36 feet, very hard below 47 feet	SM	
36	-18.00				
38	-20.00				
40	-22.00	17 50/.3		SM	
42	-24.00				
44	-26.00	37 50/.5		SM	
46	-28.00				Bentonite-Cement Grout
48	-30.00				
50	-32.00	50/.4		SM	
52	-34.00		SILT: Medium stiff to soft, dark gray-green, layered fine sandy silt layers with sticky clay layers, glauconitic (attempted to push UD tube at 78-80' with no recovery)		Bentonite Seal
54	-36.00	5 7 7		ML-CL	
56	-38.00				Sand Pack
58	-40.00	9			

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-1d

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**17.33**
Equipment	**CME 450**	Drilling Method	**3-15/16" Tri-cone**	Water Level, TOB	**1.6**
Date Started	**12/26/01**	Date Ended	**12/27/01**	Water Level, 24 Hr.	**1.6**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**1.6**
Comments	**Logged area, cold sunny weather**	Total Depth	**80.0**	Date of Observation	**12/27/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-1s

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**17.19**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**1.5**
Date Started	**12/14/01**	Date Ended	**12/14/01**	Water Level, 24 Hr.	**1.4**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**1.6**
Comments	**Logged area, cool rainy weather**	Total Depth	**15.0**	Date of Observation	**12/27/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 17.19		SAND: Loose, gray-brown, variably silty, moist, trace of clay and organics		Bentonite-Cement Grout
1–2 / 16.00	2, 3, 4		SM	
3–4 / 14.00–12.00	3, 6, 7		SP-SM	
6 / 10.00	2, 2, 2	SILT: Soft, dark brown, clayey, with decayed organics (channel deposits)	SM	Bentonite Seal
9 / 8.00	2, 1, 2		ML	Sand Pack
14 / 4.00	1, 2, 2		ML	0.010" Slotted Screen

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-2

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**16.94**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**2.3**
Date Started	**12/17/01**	Date Ended	**12/17/01**	Water Level, 24 Hr.	**2.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.5**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**12/27/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00

Soil Description
SAND: Loose, tan-gray, very silty, fine to medium, slightly moist
SAND: Medium dense, brown, silty, moist
SAND: Dense, tan-white-gray, slightly silty, wet
SAND: Med. dense, silty, tr. clay, shells
SILT: Medium stiff, green-gray, clayey, w/shells

SPT Value	USCS Symbol
2 2 2	SM-ML
1 4 9	SM
4 6 7	SP
19 20 16	SP
3 5 6	ML-CL
3 3 3	ML-CL

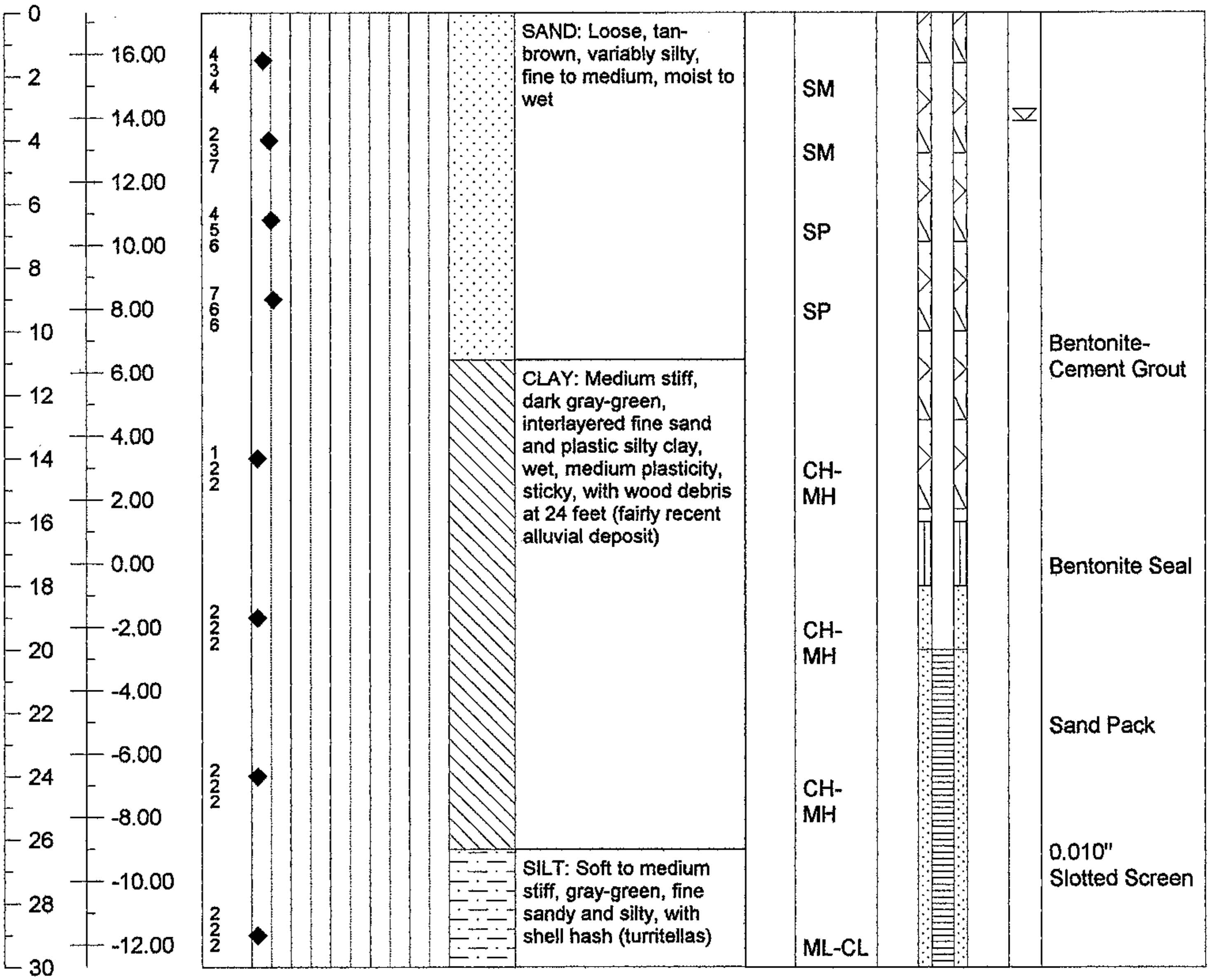
Piezometer Constuction Data:
- Bentonite-Cement Grout
- Bentonite Seal
- Sand Pack
- 0.010" Slotted Screen

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-3

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**17.28**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**3.4**
Date Started	**12/18/01**	Date Ended	**12/18/01**	Water Level, 24 Hr.	**3.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.0**
Comments	**Logged area, cool sunny weather**	Total Depth	**30.0**	Date of Observation	**12/27/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-4

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**19.34**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**5.1**
Date Started	**12/18/01**	Date Ended	**12/18/01**	Water Level, 24 Hr.	**5.1**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.9**
Comments	**Logged area, cool sunny weather**	Total Depth	**25.0**	Date of Observation	**12/27/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 18.00	2 3 4	SAND: Loose, tan-buff, slightly silty, fine to medium, slightly moist	SM	Bentonite-Cement Grout
4 / 16.00–14.00	3 4 5	CLAY: Medium stiff, light gray-orange, sandy, moist	SM-SC	
6 / 12.00	7 8 9	SAND: Medium dense, tan-white-gray, slightly silty, wet	SP	
8–10 / 10.00	5 5 7		SP	
12 / 8.00–6.00		SAND: Loose, white-buff, fine to coarse, with occ. trace of clay wet		Bentonite Seal
14 / 4.00	2 5 7		SM	
18 / 0.00	4 3 3		SM	Sand Pack
20–22 / -2.00		SILT: Medium stiff, green-gray, clayey, w/shells		
24 / -4.00	3 4 5		ML-CL	0.010" Slotted Screen

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24

Elevation scale: 18.00, 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00

David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-5

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**19.28**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**5.3**
Date Started	**12/17/01**	Date Ended	**12/17/01**	Water Level, 24 Hr.	**5.2**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.2**
Comments	**Logged area, cool sunny weather**	Total Depth	**25.0**	Date of Observation	**12/27/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 18.00		CLAY: Med. stiff, gray-orange mott., fine sandy, silty, moist		
2 / 16.00	5 6 7		ML-CL	
4 / 14.00	7 7 10	SAND: Med. dense, gray-orange, sli. clayey, silty, moist	SM	
6 / 12.00	3 6 5	SAND: Loose, tan-white-gray, slightly silty, wet	SP	Bentonite-Cement Grout
8 / 10.00	6 7 8		SP	
10 / 8.00				
12 / 6.00				Bentonite Seal
14 / 4.00	8 7 6		SP	
16 / 2.00		SAND: Loose, white-buff, fine to coarse, with occ. trace of clay wet		
18 / 0.00	5 6 33		SP	Sand Pack
20 / -2.00		SILT: Medium stiff, green-gray, w/shells		
22 / -4.00				
24 / -6.00	3 3 4		ML-CL	0.010" Slotted Screen

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-6

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**18.43**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**4.1**
Date Started	**12/18/01**	Date Ended	**12/18/01**	Water Level, 24 Hr.	**4.2**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.2**
Comments	**Logged area, cool sunny weather**	Total Depth	**25.0**	Date of Observation	**12/27/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	USCS	Piezometer Constuction Data
0 / 18.00 – 2 / 16.00	3, 4, 6	CLAY: Medium stiff, light gray-orange mottled, fine sandy, silty, moist	ML-CL	Bentonite-Cement Grout
4 / 14.00	4, 6, 8	SAND: Medium dense, light gray-tan, variably silty to clean, wet	SM	Bentonite-Cement Grout (water level ▼ at 4)
6 / 12.00	6, 5, 3		SP	Bentonite-Cement Grout
8 / 10.00 – 10 / 8.00	1, 1, 0	CLAY: Very soft, tan-gray, fine sandy, silty, wet, moderately plastic	ML-CL	
12 / 6.00				Bentonite Seal
14 / 4.00	2, 1, 2		SP	
16 / 2.00		SAND: Loose, white-buff, fine to medium, wet		
18 / 0.00 – 20 / -2.00	4, 3, 23		SP	Sand Pack
22 / -4.00				
24 / -6.00	3, 4, 4	SILT: shell hash	ML-CL	0.010" Slotted Screen

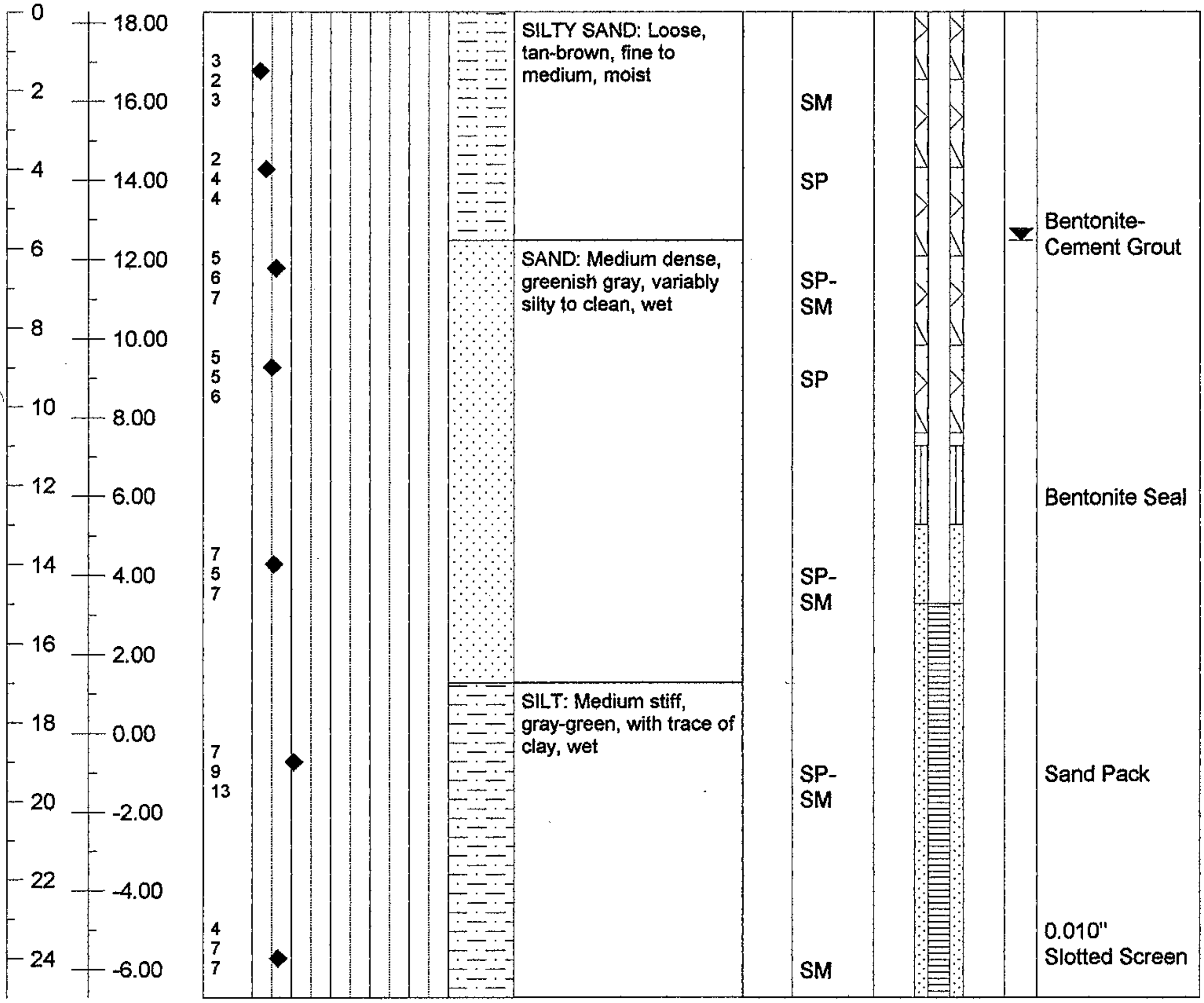
David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-7

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**18.28**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**5.6**
Date Started	**12/12/01**	Date Ended	**12/12/01**	Water Level, 24 Hr.	**5.6**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.8**
Comments	**Logged area, cool rainy weather**	Total Depth	**25.0**	Date of Observation	**12/18/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-8

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**15.32**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**3.5**
Date Started	**12/13/01**	Date Ended	**12/13/01**	Water Level, 24 Hr.	**3.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.5**
Comments	**Logged area, cool rainy weather**	Total Depth	**15.0**	Date of Observation	**12/18/01**

All depths are given in feet and referenced b.g.s.

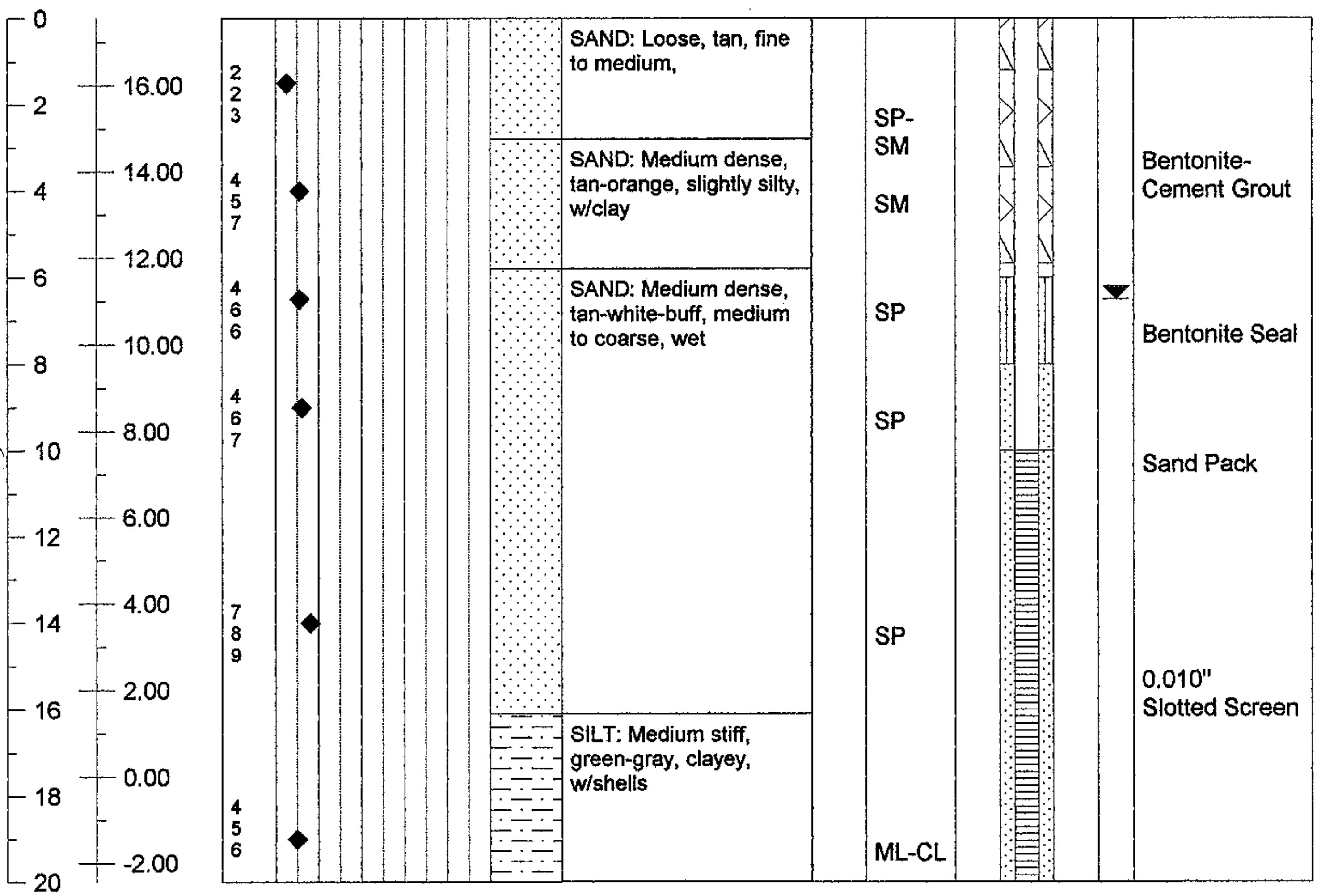
Depth	Elev.	SPT Value	Soil Description, OVA	USCS Symbol	Piezometer Constuction Data
0			SILTY SAND: Loose, gray-orange, variably clayey, moist		
2	14.00	2 3 3		SM-SC	
4	12.00	5 6 7	SAND: Medium dense to loose, gray-buff, fine to medium, wet	SP	Bentonite-Cement Grout
6	10.00	5 6 8		SP	Bentonite Seal
8	8.00				
10	6.00	2 1 2	SILT: Soft to medium stiff, gray-green, clayey w/shell hash	ML-CL	Sand Pack
12	4.00				
14	2.00	3 4 4		ML-CL	0.010" Slotted Screen

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-9

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**17.55**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**6.4**
Date Started	**12/13/01**	Date Ended	**12/13/01**	Water Level, 24 Hr.	**6.4**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.5**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**12/18/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



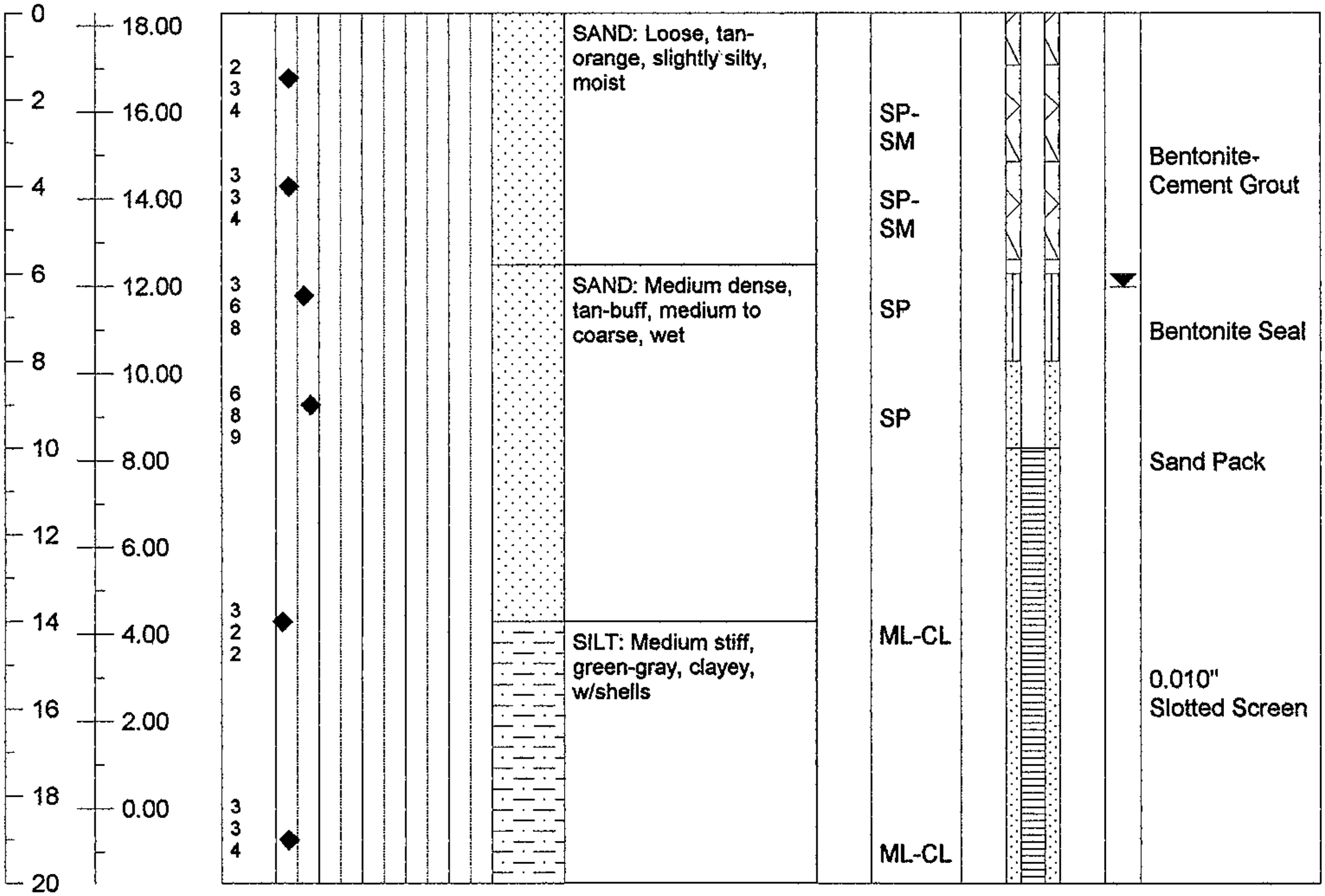
David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-10

Client and Project	**C&D Landfill, Inc. (Phases 3 and 4)**			Ground Elevation	**18.29**
Equipment	**CME 450**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**6.5**
Date Started	**12/13/01**	Date Ended	**12/13/01**	Water Level, 24 Hr.	**6.4**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.3**
Comments	**Logged area, cool rainy weather**	Total Depth	**20.0**	Date of Observation	**12/18/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-11

Client and Project	**C&D Landfill, Inc. (Phases 2)**			Ground Elevation	**15.24**
Equipment	**D-10**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**5.5**
Date Started	**12/11/02**	Date Ended	**12/11/02**	Water Level, 24 Hr.	**5.0**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**

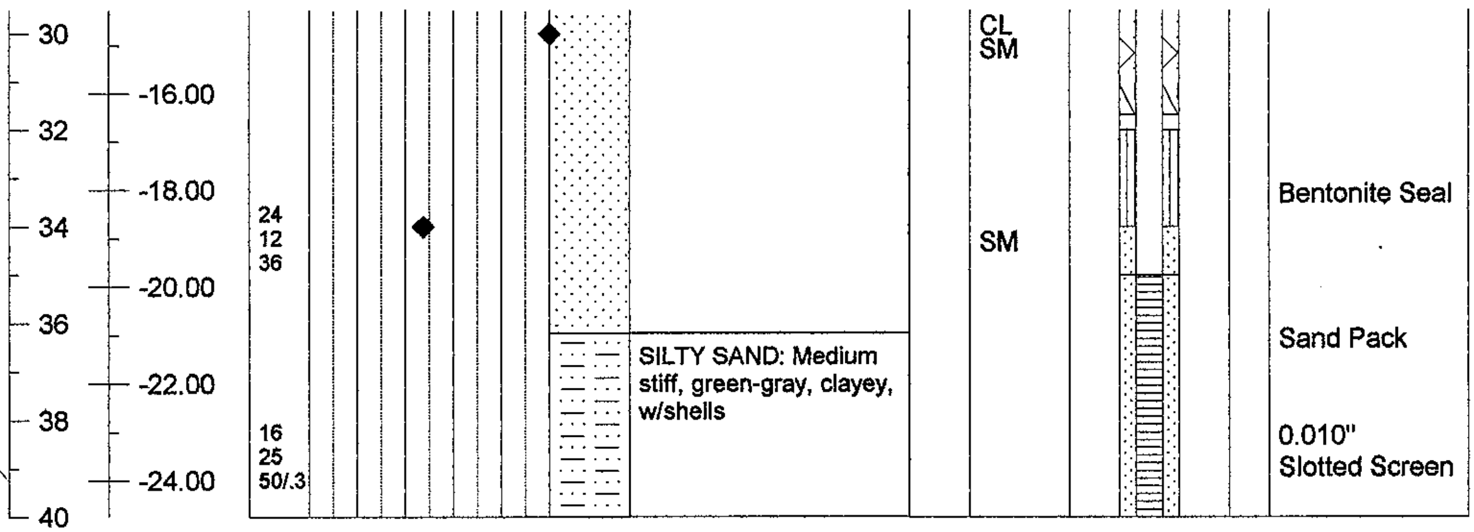
All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0		SAND: Loose, tan, fine to medium		
2 / 14.00	4 4 9		SM	
12.00		SAND: Medium dense, tan-orange, slightly silty		
4	7 4 7		SW	
6 / 10.00	4 6 7		SW	
8 / 8.00				
6.00	5 7 11		SW	
10				
4.00		CLAY: Medium stiff, gray, silty, w/fine sand, shells		
12 / 2.00				
14	3 4 4		ML-CL	
0.00 / 16				Bentonite-Cement Grout
-2.00 / 18				
-4.00	4 5 6		ML-CL	
20 / -6.00 / 22				
-8.00 / 24	3 4 6		ML-CL	
-10.00 / 26 / -12.00 / 28				
-14.00	50/.3	SAND: Very dense, partly cemented, green-black, silty		

David Garrett, P.G., P.E.
Engineering and Geology

Client and Project	**C&D Landfill, Inc. (Phases 2)**			Ground Elevation	**15.24**
Equipment	**D-10**	Drilling Method	**4-1/4" HSA**	Water Level, TOB	**5.5**
Date Started	**12/11/02**	Date Ended	**12/11/02**	Water Level, 24 Hr.	**5.0**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-12

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.74**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.8**
Date Started	**12/12/02**	Date Ended	**12/12/02**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	USCS	Piezometer Constuction Data
0–3 (16.74–14.00)	6, 7, 9	SILTY SAND: Medium dense tan-brown, fine to medium	SW	Bentonite-Cement Grout; Bentonite Seal
3–6	7, 8, 11	SANDY CLAY: Stiff, brown, silty	CL-CH	
6–9.4	5, 6, 9	SAND: Medium dense, tan-white, fine to coarse, layers of silt	SW	Sand Pack
	4, 7, 11		SP	
9.4–20	2, 2, 2	CLAY: Medium stiff, dark gray, silty, with shell hash	ML-CL	0.010" Slotted Screen
	2, 2		ML	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

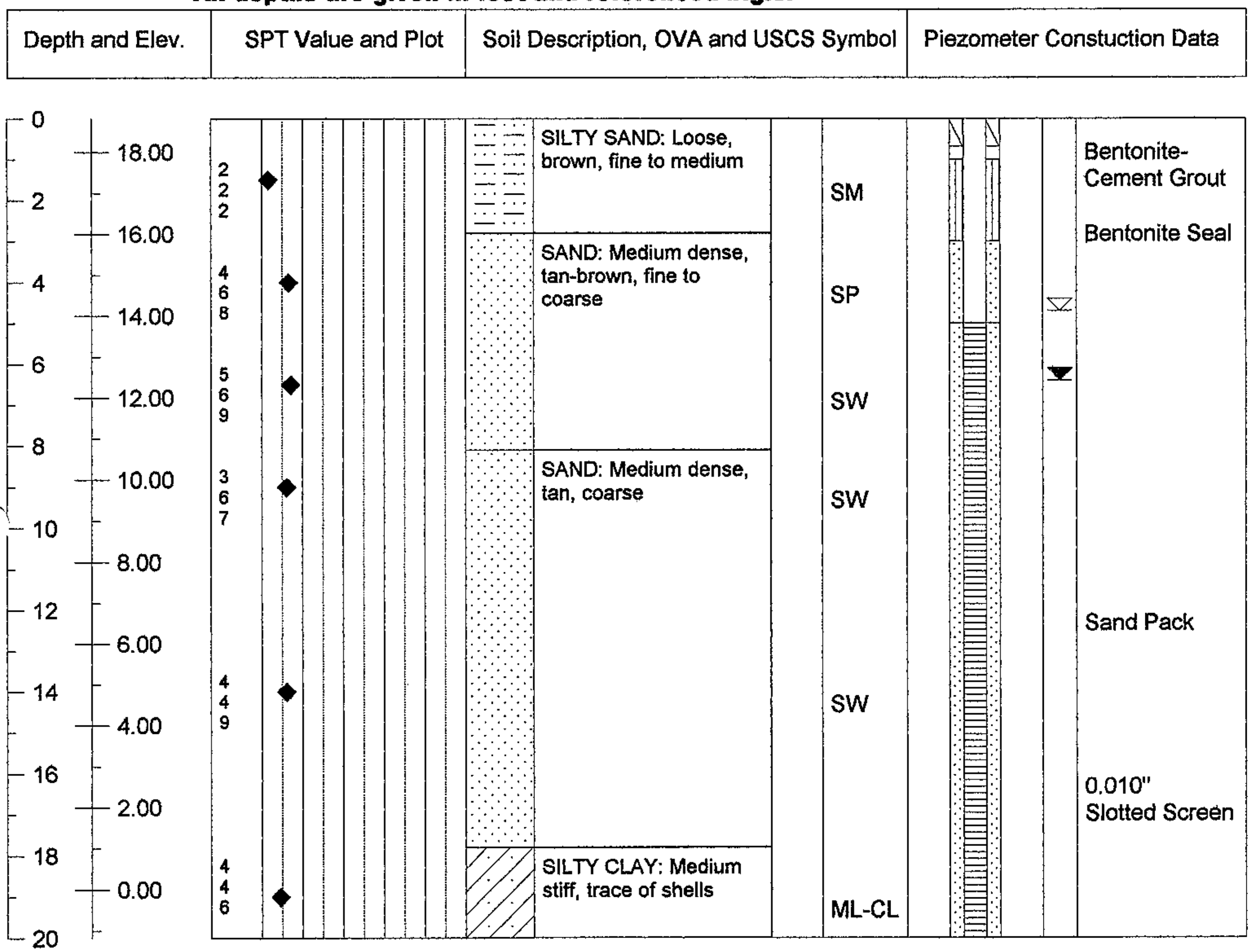
Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-13

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**18.82**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.7**
Date Started	**12/12/02**	Date Ended	**12/12/02**	Water Level, 24 Hr.	**5.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.



David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-14

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.26**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.9**
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**3.7**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.5**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 16.00		SILTY SAND: Medium dense tan-brown, fine to medium		Bentonite-Cement Grout
2 / 14.00	4 3 5		SM	
4 / 12.00	5 6 7	SAND: Medium dense, tan, medium to coarse, trace of silt	SW	
6 / 10.00	12 14 17		SW	
8 / 8.00	9 14 13		SW	
10 / 6.00				
12 / 4.00		SILTY CLAY: Stiff, dark gray, fine sand layers, shell layers		
14 / 2.00	3 5 6		ML-CL	
16 / 0.00				
18 / -2.00	3 7 6		ML-CL	
20 / -4.00				
22 / -6.00				
24 / -8.00	6 6 5		ML-CL	
26 / -10.00				
28 / -12.00	7			

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Boring No. B-14

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.26**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.9**
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**3.7**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.5**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data
30 / -14.00	5	ML-CL	
32 / -16.00		SAND: Very dense, dark gray, silty, glauconitic, shell hash	
34 / -18.00	11, 18, 27	SM	Bentonite Seal; Sand Pack
36 / -20.00			0.010" Slotted Screen
38 / -22.00	32, 100		
40		SM	

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Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.57**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**14.3**
Date Started	**12/13/02**	Date Ended	**12/13/02**	Water Level, 24 Hr.	**10.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.6**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00, -8.00, -10.00

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	USCS	Piezometer Constuction Data
	3 3 3	CLAYEY SAND: Medium dense tan, fine to medium	SC-CL	
	3 4 6	SILTY SAND: Medium dense, tan, medium to coarse	SW	
	4 8 9		SW	
	7 11 8		SC	
		CLAYEY SAND: Medium dense, dark gray, sand with clay lenses		Bentonite-Cement Grout
	7 11 11	SILTY CLAY: Stiff, dark gray, fine sand layers, shell layers	CH	
	7 23 46		CL-CH	
	4 6 5		CL-CH	
	4	SILTY SAND: Very dense, dark gray,		

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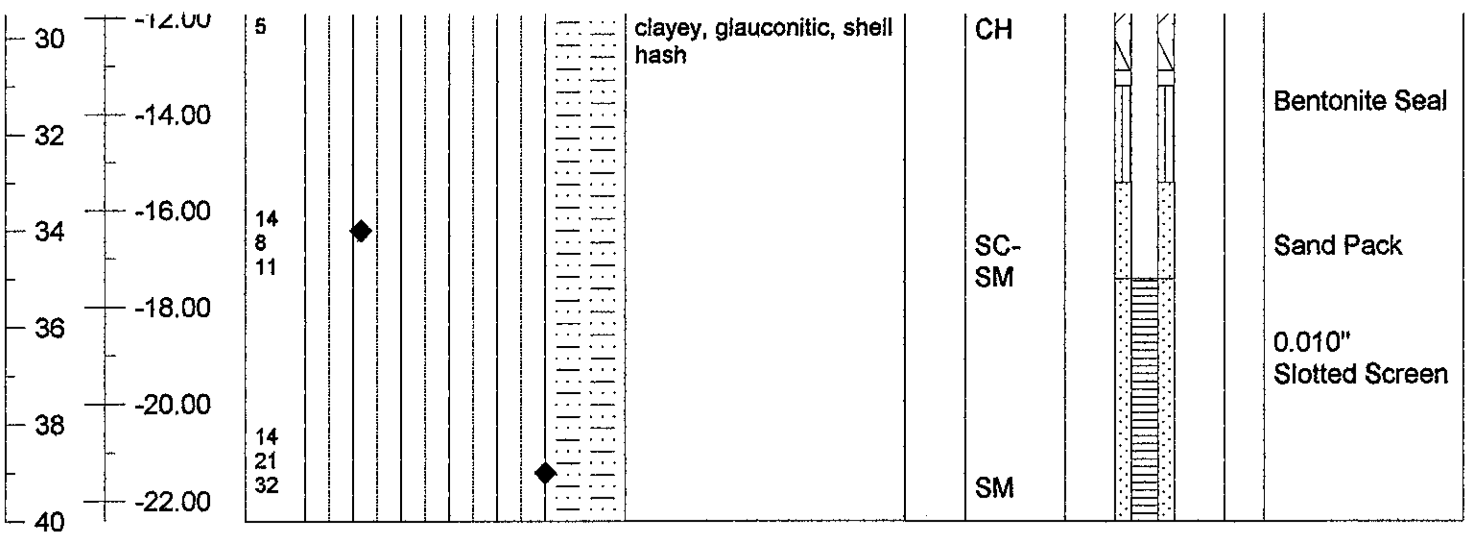
Client and Project **C&D Landfill, Inc. (Phase 2)**
Ground Elevation **17.57**
Equipment **Detrich D-10**
Drilling Method **3-1/4" HSA**
Water Level, TOB **14.3**
Date Started **12/13/02**
Date Ended **12/13/02**
Water Level, 24 Hr. **10.5**
Drilling Firm **Bore & Core, Inc.**
Logged by **David Garrett**
Stabilized Level **6.6**
Comments **Logged area, cool sunny weather**
Total Depth **40.0**
Date of Observation **1/15/03**
All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



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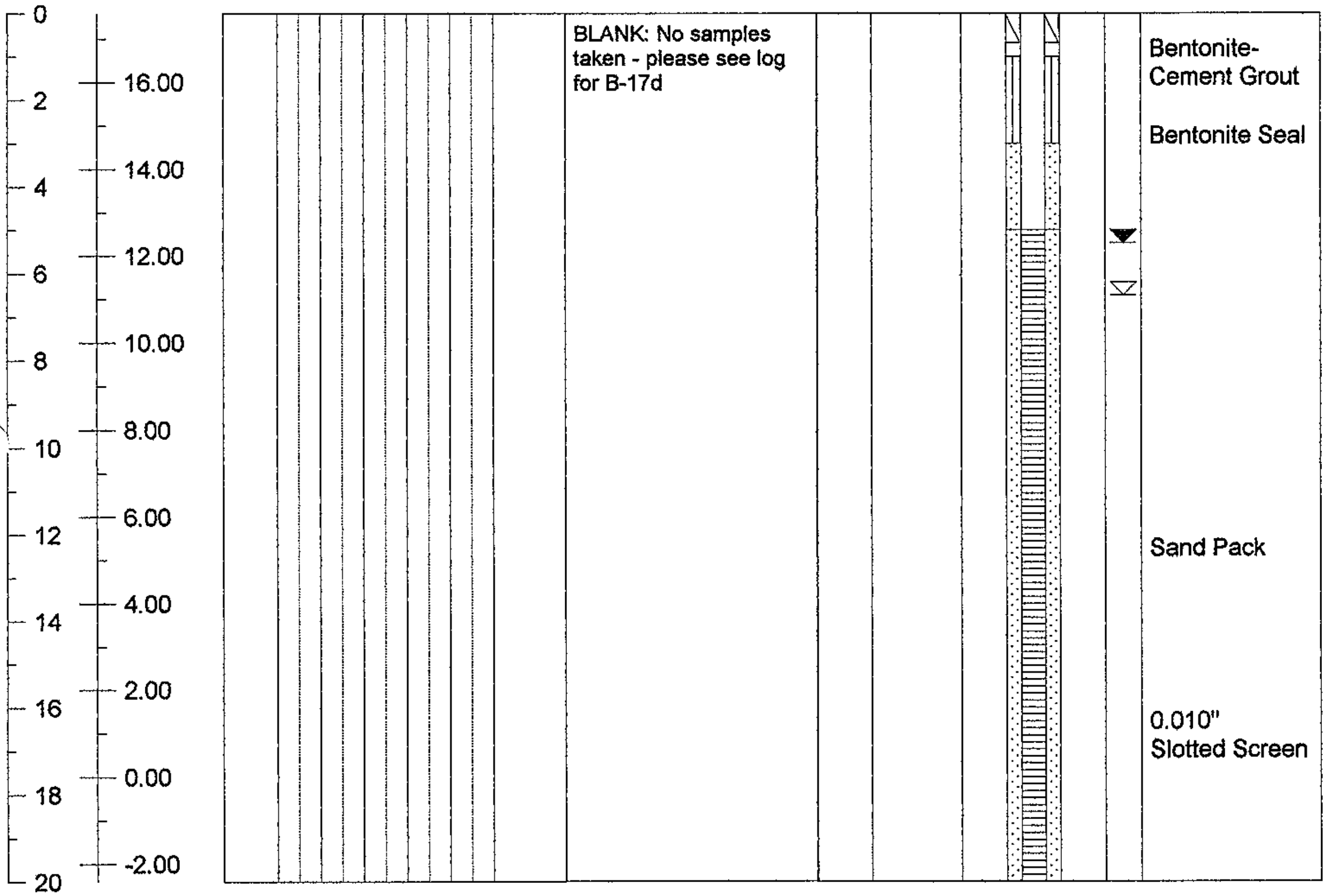
Boring No. B-15s

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.59**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**6.5**
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**5.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.3**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



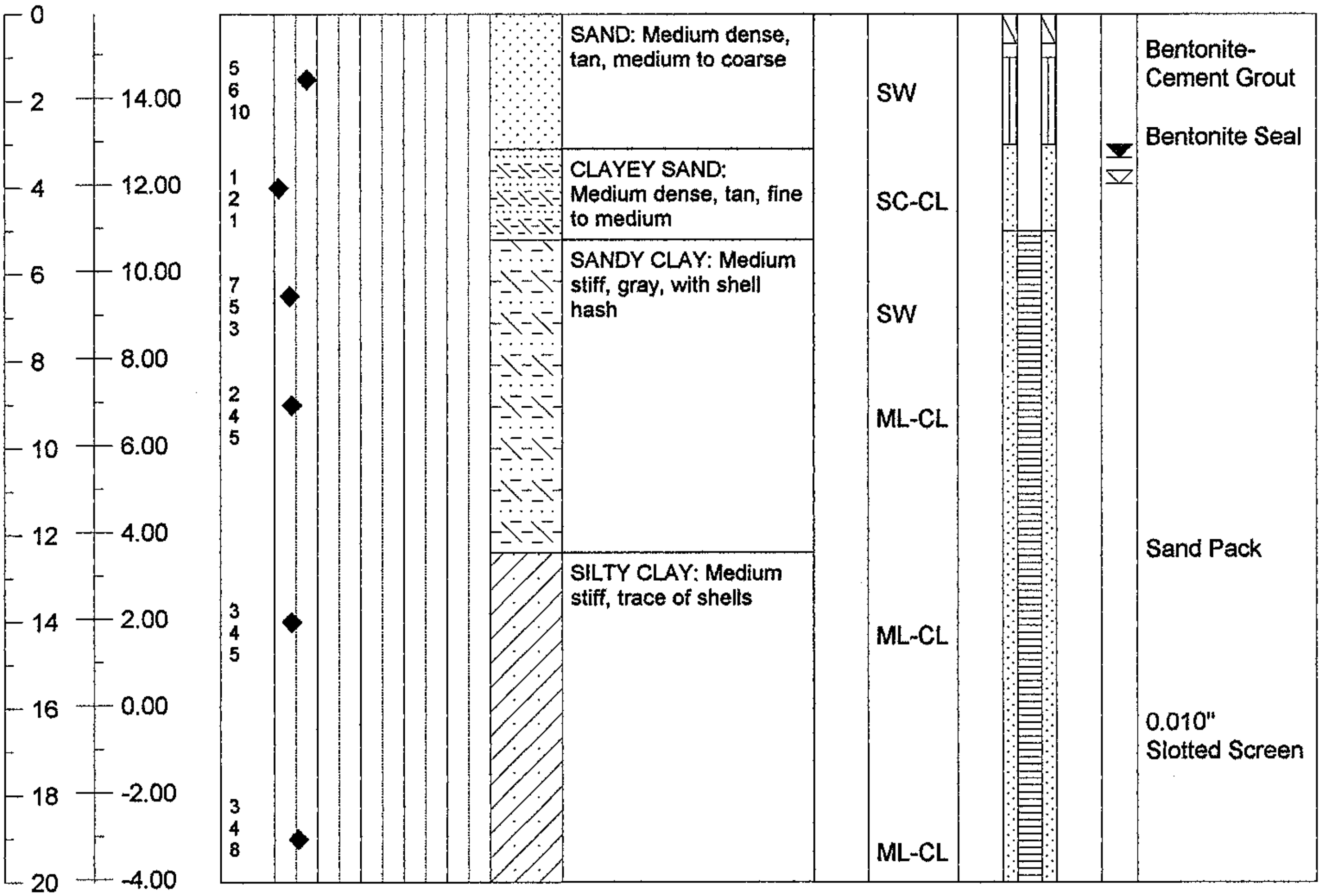
David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-16

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**15.92**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.9**
Date Started	**12/10/02**	Date Ended	**12/10/02**	Water Level, 24 Hr.	**3.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.7**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



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Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.07**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.7**
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 – 2 (16.00)	4 4 4	CLAYEY SAND: Medium dense tan, fine to medium	SC-CL	
4 (14.00 – 12.00)	10 12 15	SILTY SAND: Medium dense, tan, medium to coarse	SW	
6 (10.00)	8 9 10		SW	
8 (8.00)	5 10 13		SC	
10 – 12 (6.00)		CLAYEY SAND: Medium dense, dark gray, sand with clay lenses		Bentonite-Cement Grout
14 (4.00 – 2.00)	3 3 3	SILTY CLAY: Stiff, dark gray, fine sand layers, shell layers	CH	
16 – 18 (0.00)				
20 (-2.00)	5 6 5		CL-CH	
22 – 24 (-4.00 – -6.00)	5 6 6		CL-CH	
26 – 28 (-8.00 – -10.00)				
30 (-12.00)	7	SILTY SAND: Very dense, dark gray,		

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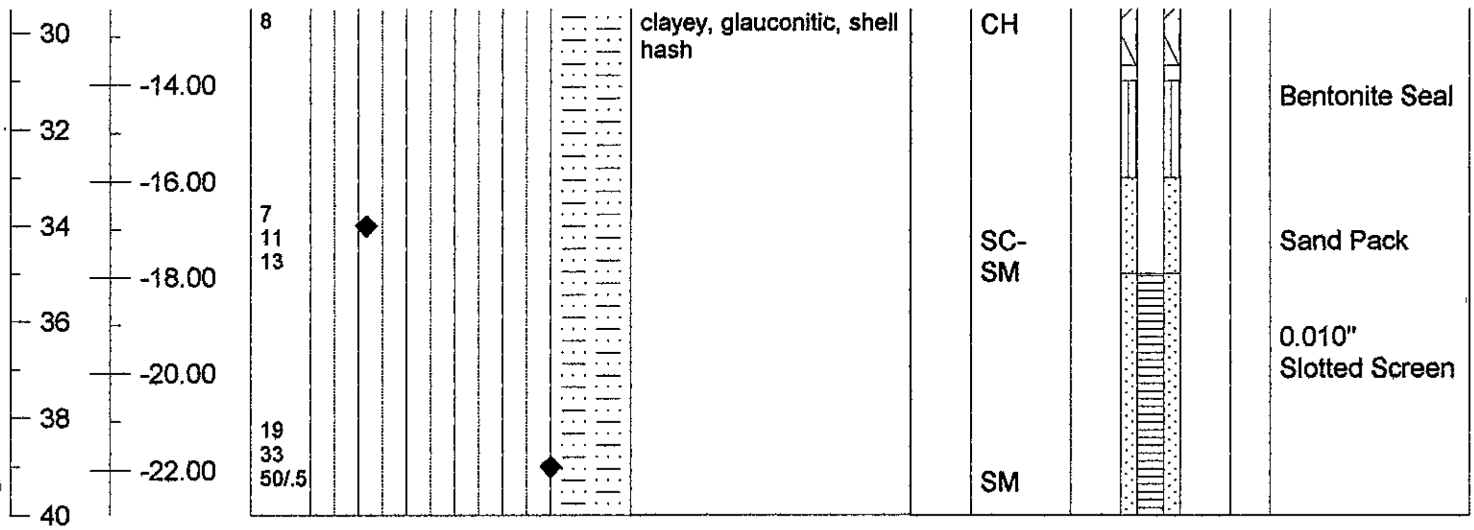
Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.07**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.7**
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



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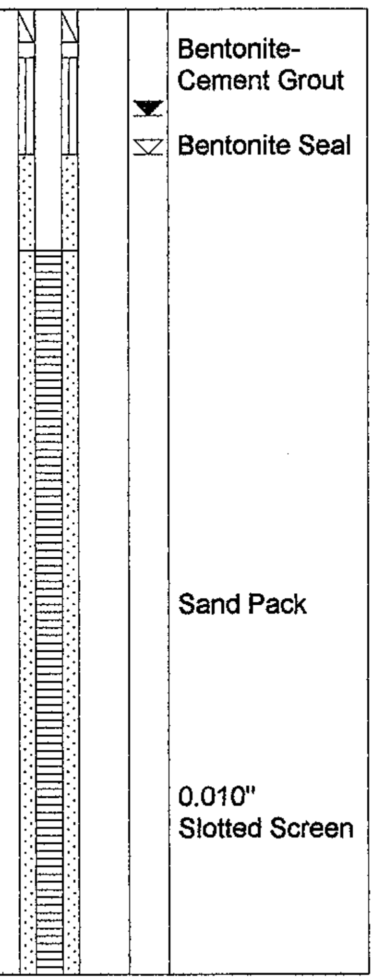
Boring No. B-17s

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.00**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**5.0** ▽
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**4.2**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.4** ▼
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data
0 – 20 (Elev. 16.00 to -2.00)		BLANK: No samples taken - please see log for B-17d	

Depth: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elev.: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00



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Boring No. B-18

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**18.77**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.7**
Date Started	**12/09/02**	Date Ended	**12/09/02**	Water Level, 24 Hr.	**4.0**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0–2 (18.00)	2 4 8	SILTY SAND: Medium dense, tan, fine to medium	SM	Bentonite-Cement Grout; Bentonite Seal
4 (14.00)	3 4 7	SAND: Medium dense, tan, fine to medium	SW	
6 (12.00)	4 8 13		SW	
8–10 (10.00)	1 1 1	SAND: Medium dense, gray	SW	
14 (4.00)	1 2 2		SW	Sand Pack
16 (2.00)				0.010" Slotted Screen
18–20 (0.00)	2 2 4	SILTY CLAY: Medium stiff, trace of shells	ML-CL	

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Boring No. B-19

Client and Project	**C&D Landfill, Inc. (Phase 2)**	Ground Elevation	**18.62**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**
Water Level, TOB	**4.3**	Date Started	**12/06/02**
Date Ended	**12/06/02**	Water Level, 24 Hr.	**4.1**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**
Stabilized Level	**3.9**	Comments	**Logged area, cool sunny weather**
Total Depth	~~40.0~~ 20.0	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	USCS	Piezometer Constuction Data
0–5.4 (approx.)	4, 8, 10; 4, 3, 2	SILTY SAND: Medium dense, dark brown, clayey with organic matter	SC-SM; SC-SM	Bentonite-Cement Grout; Bentonite Seal
5.4–8 (approx.)	6, 9, 14	SAND: Medium dense, light tan	SP	
8–13.2 (approx.)	3, 3, 4	CLAYEY SAND: Medium dense, tan-gray, with clay lenses	SC-CH	Sand Pack
13.2–20 (approx.)	4, 4, 4; 3, 2, 3	SILTY CLAY: Medium stiff, trace of shells	ML-CL; ML-CL	0.010" Slotted Screen

Depth: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elev.: 18.00, 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00

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Boring No. B-20

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**18.18**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.7**
Date Started	**12/09/02**	Date Ended	**12/09/02**	Water Level, 24 Hr.	**3.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.1**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 18.00 – 2 / 16.00	2, 3, 5	SILTY SAND: Medium dense, dark brown, fine grained	SM	Bentonite-Cement Grout; Bentonite Seal
4 / 14.00	9, 18, 19	SAND: Medium dense to dense, tan-brown, fine to medium	SW	
6 / 12.00	8, 14, 21		SW	
8 / 10.00 – 10 / 8.00	9, 12, 14		SW	
12 / 6.00				Sand Pack
14 / 4.00	2, 3, 5	SAND: Medium dense, fine to medium, trace of silt	SW	
16 / 2.00				0.010" Slotted Screen
18 / 0.00 – 20	3, 4, 5	SILTY CLAY: Medium stiff, trace of shells	ML-CL	

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Boring No. B-21

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.17**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.1**
Date Started	**12/10/02**	Date Ended	**12/10/02**	Water Level, 24 Hr.	**2.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.0**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 16.00 – 2 / 14.00	5, 4, 5	SANDY CLAY: Medium stiff, tan-gray, fine to medium, sticky	SC-CH	Bentonite-Cement Grout; Bentonite Seal
4 / 12.00	12, 15, 14	SAND: Medium dense, light gray, medium to coarse	SW	
6 / 10.00	6, 8, 9		SW	
8 / 8.00 – 10 / 6.00	2, 3, 5	SILTY CLAY: Stiff, dark gray, fine sand layers, turretella shells	ML-CL	
12 / 4.00				Sand Pack
14 / 2.00	3, 4, 4		ML-CL	
16 / 0.00				0.010" Slotted Screen
18 / -2.00 – 20	4, 3, 5	CLAY: Medium stiff, trace of shells	CL	

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Boring No. B-22

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**18.02**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.3**
Date Started	**12/12/02**	Date Ended	**12/12/02**	Water Level, 24 Hr.	**4.6**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.9**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 18.00				
2 / 16.00	2, 5, 4	SILTY SAND: Medium dense tan-light gray, fine to medium	SM	Bentonite-Cement Grout
				Bentonite Seal
4 / 14.00	5, 6, 7	SAND: Medium dense, light gray, medium to coarse	SW	
6 / 12.00	3, 6, 8		SW	
8 / 10.00	6, 8, 9	SAND: Medium dense, tan, medium to coarse	SW	
10 / 8.00				
12 / 6.00				Sand Pack
14 / 4.00	3, 3, 4		SP	
16 / 2.00				0.010" Slotted Screen
18 / 0.00	2, 2, 4	SILTY CLAY: Stiff, dark gray, fine sand layers, turretella shells	ML-CL	
20				

David Garrett, P.G., P.E.

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Boring No. B-23d

Client and Project	**C&D Landfill, Inc. (Phase 2)**		
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**
Date Started	**12/17/02**	Date Ended	**12/17/02**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**
	All depths are given in feet and referenced b.g.s.		

Ground Elevation	**14.54**
Water Level, TOB	**2.9**
Water Level, 24 Hr.	**3.0**
Stabilized Level	**3.1**
Date of Observation	**1/15/03**

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 14.00	2, 5, 5	SILTY SAND: Medium dense tan-brown, fine to medium	SM	
2 / 12.00				
4 / 10.00	6, 10, 9	SAND: Medium dense, tan, medium to coarse	SP	
6 / 8.00	7, 10, 7		SW	
8 / 6.00	4, 3, 5	CLAYEY SAND: Medium dense, dark gray	SC	
10 / 4.00				
12 / 2.00				Bentonite-Cement Grout
14 / 0.00	4, 5, 6	SILTY CLAY: Stiff, dark gray, fine sand layers, shell layers, becomes sandy with shell hash below 28.4 feet	ML-CL	
16 / -2.00				
18 / -4.00	4, 6, 6		CH	
20 / -6.00				
22 / -8.00				
24 / -10.00	4, 5, 6		CH	
26 / -12.00				
28 / -14.00	21			

David Garrett, P.G., P.E.

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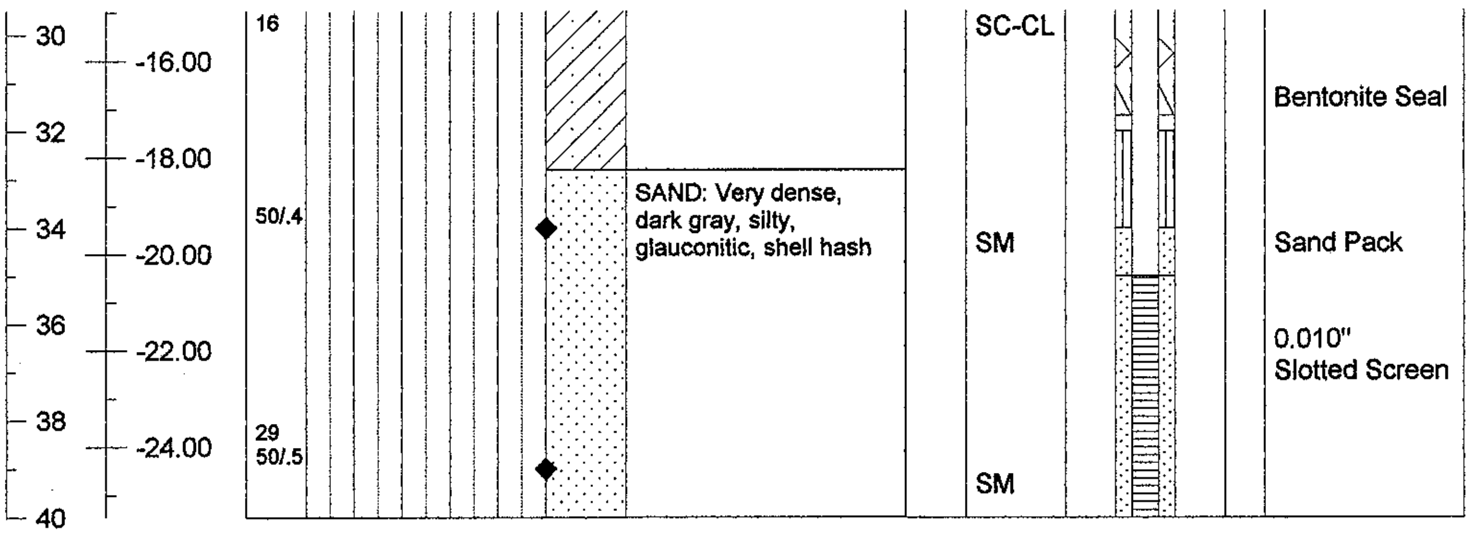
Boring No. B-23d

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**14.54**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**2.9**
Date Started	**12/17/02**	Date Ended	**12/17/02**	Water Level, 24 Hr.	**3.0**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.1**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



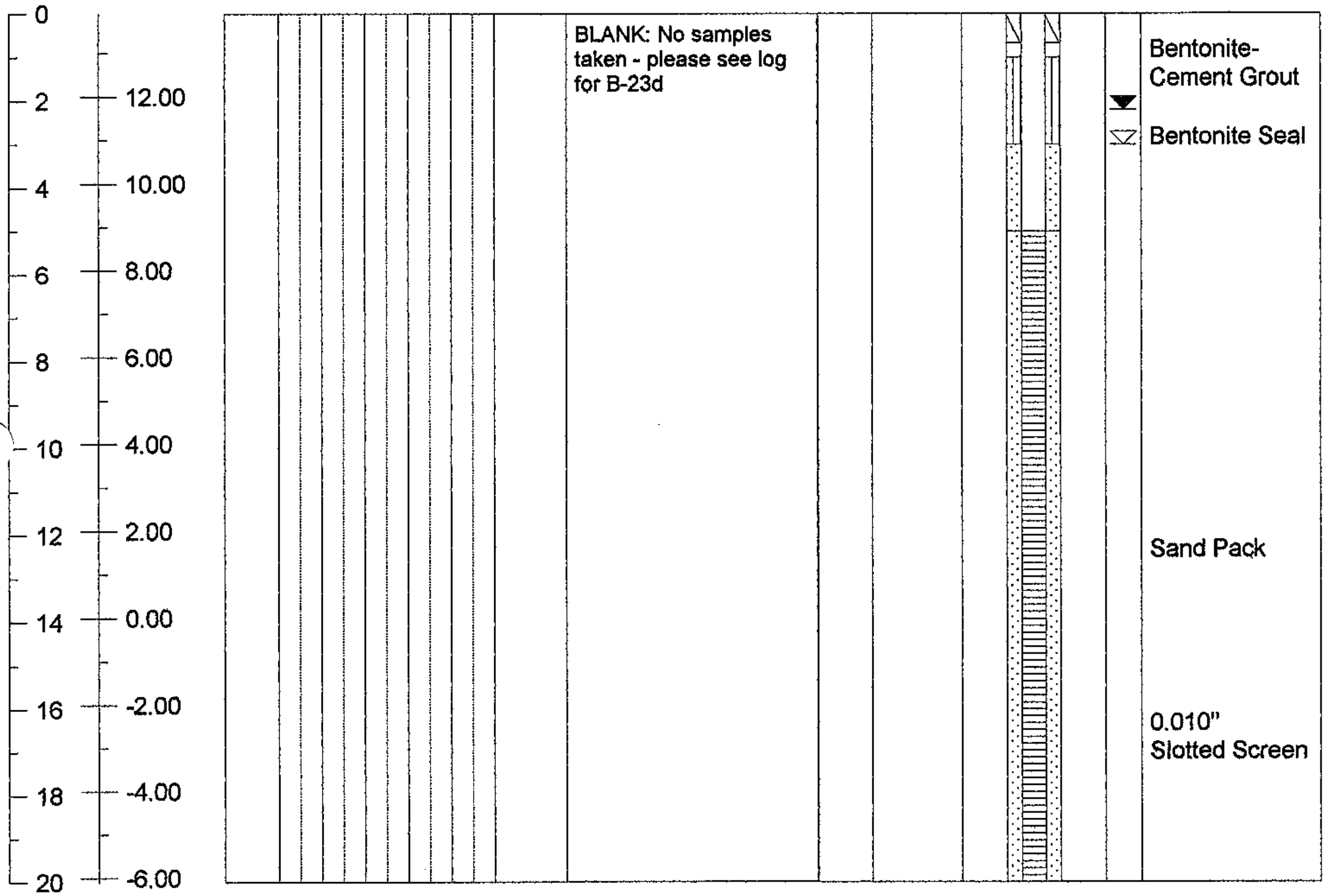
David Garrett, P.G., P.E.
Engineering and Geology

Boring No. B-23s

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**13.90**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.0**
Date Started	**12/18/02**	Date Ended	**12/18/02**	Water Level, 24 Hr.	**2.2**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**1.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. B-24

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.73**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.4**
Date Started	**12/11/02**	Date Ended	**12/11/02**	Water Level, 24 Hr.	**3.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.6**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 – 3 (16.73 – 14.00)	5, 6, 11	SILTY SAND: Medium dense tan-light gray, fine to medium	SM	Bentonite-Cement Grout
3 – 8	6, 13, 12	SAND: Medium dense, light gray, medium to coarse	SW	Bentonite Seal
	4, 5, 5		SP	
8 – 13	4, 5, 6	SAND: Medium dense, light gray	SP	Sand Pack
13 – 20	4, 4, 7	SILTY CLAY: Stiff, dark gray, fine sand layers, turretella shells	ML-CL	0.010" Slotted Screen
	4, 4, 4		ML-CL	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00

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Boring No. B-25

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**15.76**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.4** ▽
Date Started	**12/10/02**	Date Ended	**12/10/02**	Water Level, 24 Hr.	**2.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.1** ▼
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0		SILTY SAND: Medium dense tan-light gray, fine to medium		Bentonite-Cement Grout
2 / 14.00	5, 9, 11		SM-SC	Bentonite Seal
4 / 12.00	10, 11, 14	SAND: Medium dense, light gray, medium to coarse	SW	
6 / 10.00	2, 3, 3		SW	
8 / 8.00	5, 4, 6	SILTY CLAY: Stiff, dark gray, fine sand layers, turretella shells	ML-CL	
10 / 6.00				
12 / 4.00				Sand Pack
14 / 2.00	7, 7, 10		ML-CL	
16 / 0.00				0.010" Slotted Screen
18 / -2.00	4, 6, 11	CLAY: Stiff, dark gray	CH	
20 / -4.00				

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Boring No. B-26

Client and Project	C&D Landfill, Inc. (Phase 2)			Ground Elevation	17.77
Equipment	Detrich D-10	Drilling Method	3-1/4" HSA	Water Level, TOB	3.9
Date Started	12/19/02	Date Ended	12/19/02	Water Level, 24 Hr.	4.0
Drilling Firm	Bore & Core, Inc.	Logged by	David Garrett	Stabilized Level	4.1
Comments	Logged area, cool sunny weather	Total Depth	40.0	Date of Observation	1/15/03
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data
0			
2 / 16.00	4, 5, 5	SM	
4 / 14.00	5, 6, 6	SW	
6 / 12.00	8, 10, 13	SW	
8 / 10.00	5, 7, 6	SW	
10 / 8.00			
12 / 6.00			Bentonite-Cement Grout
14 / 4.00	10, 11, 4	SW	
16 / 2.00			
18 / 0.00			
20 / -2.00	10, 11, 4	SW	
22 / -4.00			
24 / -6.00	5, 5, 7	CH	
26 / -8.00			
28 / -10.00	5		

Depth (approx.)	Soil Description	USCS
0–2.8	SILTY SAND: Medium dense tan-brown, fine to medium	SM
2.8–19.6	SAND: Medium dense, grey-white, medium to coarse	SW
19.6–21.7	SAND: Medium dense, dark gray, fine grained	
21.7–	SILTY CLAY: Stiff, dark gray, fine sand layers, shell layers	CH

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Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.77**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**3.9**
Date Started	**12/19/02**	Date Ended	**12/19/02**	Water Level, 24 Hr.	**4.0**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.1**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth	Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
30	-12.00	8		ML-CL	
32	-14.00				Bentonite Seal
34	-16.00	7 19 32		SC-SM	Sand Pack
36	-18.00		SILTY SAND: Very dense, dark gray, clayey, glauconitic		0.010" Slotted Screen
38	-20.00	50/.5		SM	
40	-22.00				

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Boring No. B-27

Client and Project	**C&D Landfill, Inc. (Phase 2)**	Ground Elevation	**16.98**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**
Water Level, TOB	**2.2**	Water Level, 24 Hr.	**2.5**
Date Started	**12/09/02**	Date Ended	**12/09/02**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**
Stabilized Level	**2.9**	Total Depth	**20.0**
Comments	**Logged area, cool sunny weather**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.		

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	USCS	Piezometer Constuction Data
0–3 (16.98–14.00)	7 3 4	SILTY SAND: Medium dense tan, fine to medium	SM	Bentonite-Cement Grout; Bentonite Seal
3–13.5	3 4 3	SAND: Medium dense, tan, medium to coarse	SW	
	4 3 5		SW	
	4 3 3		SW	
				Sand Pack
13.5–17.7	5 6 14	SILTY CLAY: Stiff, dark gray, fine sand layers, turretella shells	SC-CH	0.010" Slotted Screen
17.7–20	1 3 5	CLAY: Stiff, dark gray	ML-CL	

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00

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Boring No. B-28

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.76**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.3**
Date Started	**12/17/02**	Date Ended	**12/17/02**	Water Level, 24 Hr.	**5.1**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.8**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 – 16.00		SILTY SAND: Medium dense tan-brown, fine to medium		
2 – 14.00	2 2 3		SM	
4 – 12.00	3 3 3		SP	
6 – 10.00	6 9 7	SAND: Medium dense, tan-white, coarse	SW	
8 – 8.00	6 7 7		SW	
10 – 6.00				
12 – 4.00		CLAYEY SAND: Medium dense, dark gray, fine to medium, with shell layers		Bentonite-Cement Grout
14 – 2.00	2 3 5		SC-CH	
16 – 0.00				
18 – -2.00	2 3 6	SILTY CLAY: Stiff, dark gray, sand layers, shell hash	ML-CL	
20 – -4.00				
22 – -6.00				
24 – -8.00	5 4 5		CH	
26 – -10.00				
28 – -12.00	5			

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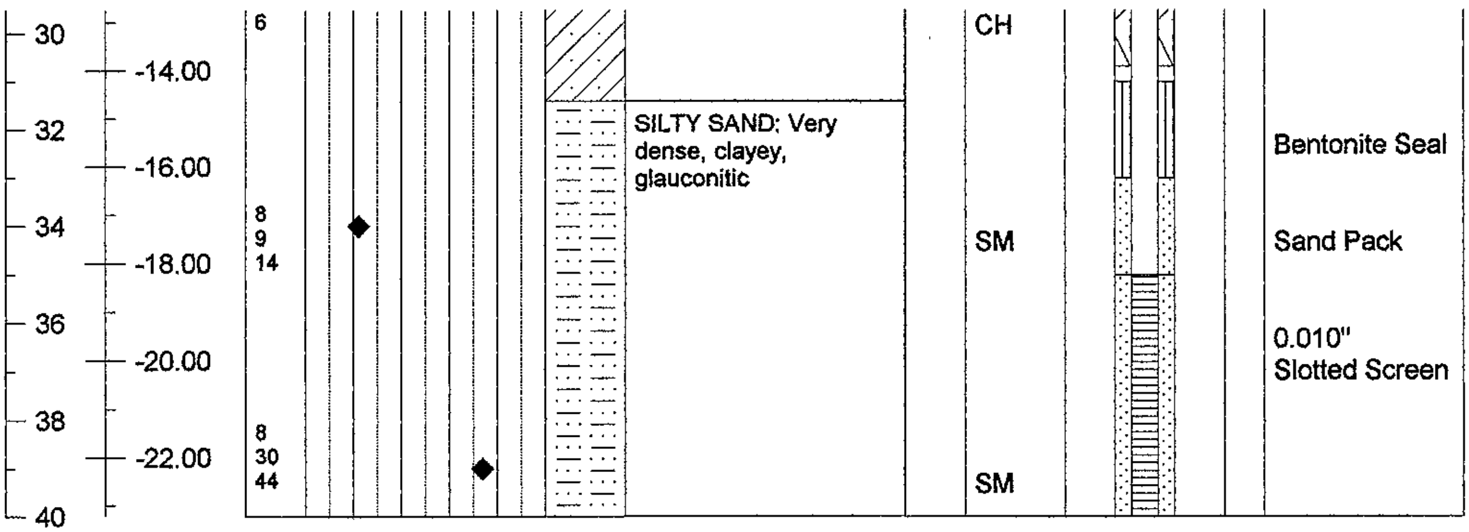
Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.76**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**4.3**
Date Started	**12/17/02**	Date Ended	**12/17/02**	Water Level, 24 Hr.	**5.1**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.8**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**1/15/03**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



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Boring No. B-29
Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**17.10**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**2.3**
Date Started	**4/23/02**	Date Ended	**4/23/02**	Water Level, 24 Hr.	**2.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.3**
Comments	**Logged area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**4/22/03**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	USCS
0–3 (Elev. 17.10–14.00)	6, 10, 13	SILTY SAND: Medium dense tan, fine to medium	SM
3–8.7	8, 12, 18	SAND: Medium dense, tan, medium to coarse	SW
	8, 10, 11		SW
8.7–10.3	2, 3, 4	SILTY CLAY: Stiff, dark gray, fine sand layers	CH
10.3–19.5	8, 6, 8	SAND: Medium dense, gray-tan, slightly silty	SW
19.5–20	4, 5, 4		CL

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20
Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00

Piezometer Constuction Data	Approx. Depth
Bentonite-Cement Grout	0–6
Bentonite Seal	6–8
Sand Pack	8–20
0.010" Slotted Screen	10–20

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Boring No. B-30

Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.33**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**2.6**
Date Started	**4/23/02**	Date Ended	**4/23/02**	Water Level, 24 Hr.	**2.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**4/22/03**

All depths are given in feet and referenced b.g.s.

Depth	Elev.	SPT Value	Soil Description, OVA	USCS Symbol	Piezometer Constuction Data
0	16.00	11 14 13	SILTY SAND: Medium dense tan-brown, fine to medium	SM	
2	14.00				
4	12.00	6 8 11	SAND: Medium dense, tan-white, slightly silty	SW	
6	10.00	5 6 9		SW	
8	8.00	5 4 6		SW-SC	
10	6.00				
12	4.00				Bentonite-Cement Grout
14	2.00	4 5 7	SILTY SAND: Medium dense, dark gray, fine to medium, with clay lenses	SW-SM	
16	0.00				
18	-2.00	6 6 8		SW-SM	
20	-4.00				
22	-6.00				
24	-8.00	7 12 14	CLAYEY SAND: Dense, dark gray, clayey	SC-CL	
26	-10.00				
28	-12.00	8			Bentonite Seal

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Client and Project	**C&D Landfill, Inc. (Phase 2)**			Ground Elevation	**16.33**
Equipment	**Detrich D-10**	Drilling Method	**3-1/4" HSA**	Water Level, TOB	**2.6**
Date Started	**4/23/02**	Date Ended	**4/23/02**	Water Level, 24 Hr.	**2.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**2.4**
Comments	**Logged area, cool sunny weather**	Total Depth	**40.0**	Date of Observation	**4/22/03**

All depths are given in feet and referenced b.g.s.

Depth	Elev.	SPT Value	Soil Description, OVA	USCS Symbol	Piezometer Constuction Data
30	-14.00	14		SP	
32	-16.00		CLAY: Very stiff, dark gray-green, sandy, with trace shell		
34	-18.00	12 / 18 / 21		ML-CL	Sand Pack
36	-20.00				0.010" Slotted Screen
38	-22.00	18 / 38 / 50/.5	SILTY SAND: Very dense, clayey, glauconitic	SM	
40					

PHASE 1 (MW-1d)

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-1

Client and Project	C&D Landfill, Inc. (Pitt County)			Collar Elevation	17.40
Equipment	CME 750	Drilling Method	3-1/4" Hollow Auger	Water Level, TOB	NA
Date Started	10/12/00	Date Ended	10/13/00	Water Level, 24 Hr.	4.8
Drilling Firm	Bore & Core, Inc.	Logged by	David Garrett	Stabilized Level	4.8
Comments	Plowed field, cool sunny weather	Total Depth	50.0	Date of Observation	10/16/00

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data
0–4 (Elev. 17.40–13.40)		SAND: Medium dense buff-white, slightly silty, moist	Bentonite-Cement Grout
4–7.5	3, 4, 5 (at 4)	SAND: Loose, green-gray, silty and clayey, wet — SM	Bentonite-Cement Grout
7.5–18.5	2, 1, 1 (at 9) — SM; 3, 4, 6 (at 14) — ML-CL	SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	Bentonite-Cement Grout
18.5–31.5	4, 4, 6 (at 19) — CL; 4, 5, 7 (at 24) — CL; 3, 3, 7 (at 29) — CL	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	Bentonite-Cement Grout
31.5–37	6, 22, 18 (at 34) — SM	SILTY SAND: Dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer at 36 to 38 feet, very hard below 45 feet	Bentonite Seal

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

Elevation scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00, -8.00, -10.00, -12.00, -14.00, -16.00, -18.00

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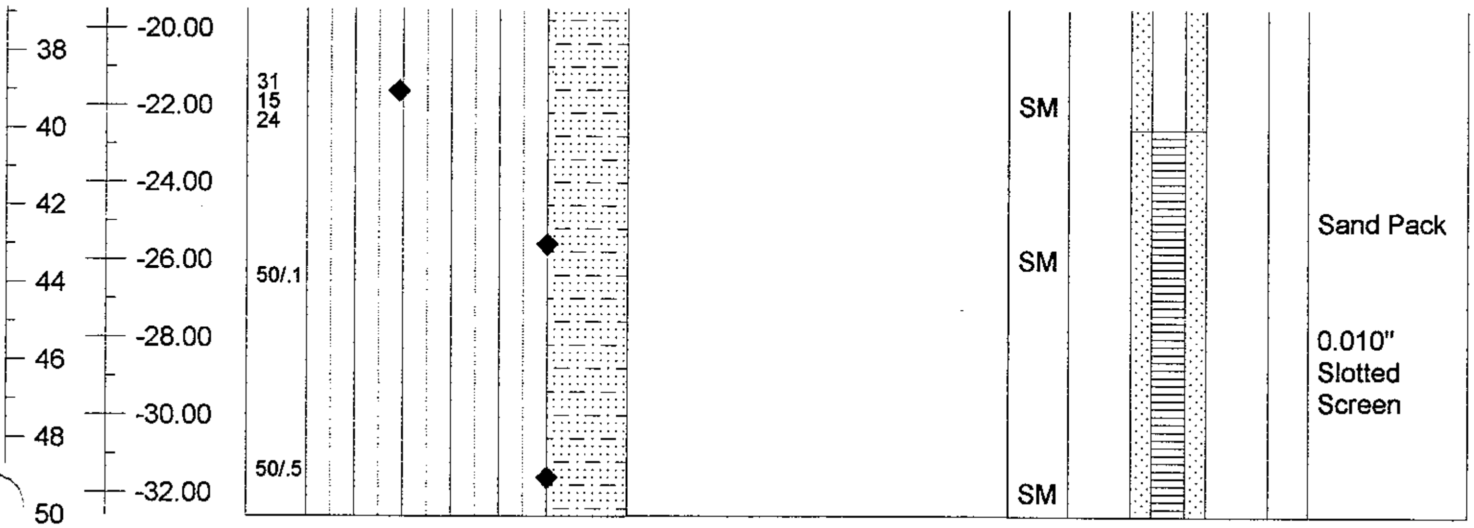
Test Boring No. B-1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



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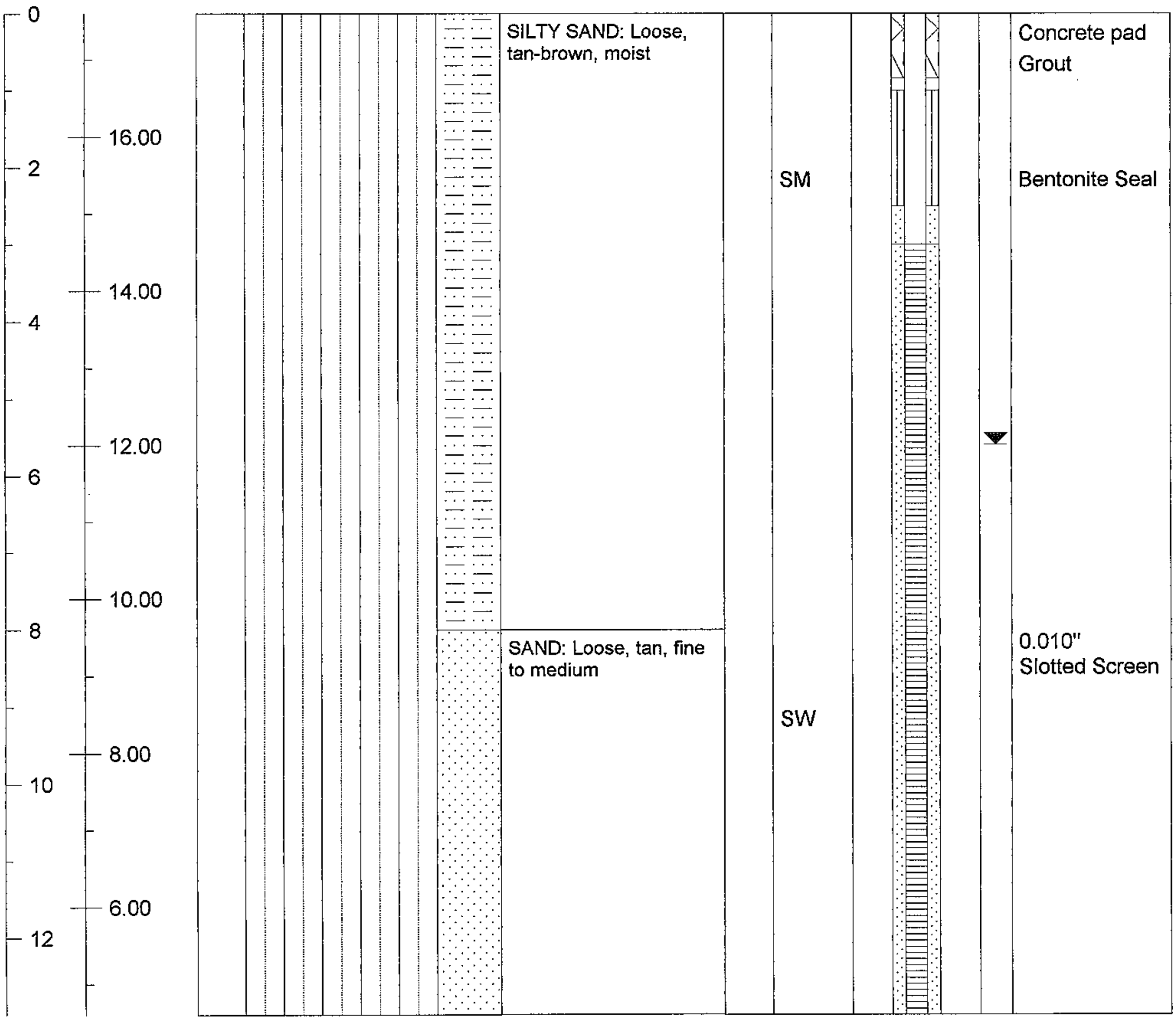
Boring No. MW-1s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.59**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/02/01**	Date Ended	**05/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.59**
Comments	**Locking cover with 3.32' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



(MW-2d)

David Garrett, P.G., P.E.

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Test Boring No. B-2d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0		SAND: Loose, tan-yellow, variably silty sand		
2 / 16.00				
4 / 14.00	16 8 9	CLAY: Medium stiff, tan-orange, very sandy, silty, slightly plastic, moist, crumbly	CL & SM	
6 / 12.00				
8 / 10.00		SAND: Medium dense, tan, subangular, f - c well graded (boring collapsed at 13.6 feet when casing pulled, redrilled, with 4-1/4" hollow stem auger)	SP-SM	Bentonite-Cement Grout
10 / 8.00	5 8 8			
12 / 6.00				
14 / 4.00	3 3 4	CLAYEY SILT: Medium stiff, gray-green, fine sandy, with heavy shell hash (whole turritellas), moist, moderately plastic	CL-ML	
16 / 2.00				
18 / 0.00				
20 / -2.00	2 2 3		CL-ML	
22 / -4.00				
24 / -6.00	2 2 4	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	
26 / -8.00				
28 / -10.00				
30 / -12.00	2 2 3		CL	
32 / -14.00				
34 / -16.00	1 6 8	SILT: Stiff, gray-green, fine sandy, clayey, interlayered with sand	SM	
36 / -18.00				Bentonite Seal

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Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
38 / -20.00		SILT: Hard, black-green speckled, clayey, fine sandy, moist, moderately plastic, scattered pelecypod shell hash		Sand Pack
39	5 4 29		ML	
40 / -22.00				
42 / -24.00				0.010" Slotted Screen
43	10 20 27		ML	
44 / -26.00				
46 / -28.00				
48 / -30.00				
49	22 38 50/.2	SAND: Very dense (partly cemented), black-green speckled, clayey, silty, fine glauconite nodules	SM	Bentonite Seal
50 / -32.00				
52 / -34.00				
54 / -36.00	50/.1		SM	
56 / -38.00				
58 / -40.00		SAND: Medium dense, green-black speckled, silty, clayey, fine grained, wet		
59	6 7 7		SC	
60 / -42.00				
62 / -44.00		CLAY: Medium stiff to very hard, gray-green, fine sandy, silty, moderately plastic		
64 / -46.00	5 6 5		CL	
66 / -48.00				
68 / -50.00				
69	40 38 50/.5		CL	
70 / -52.00				

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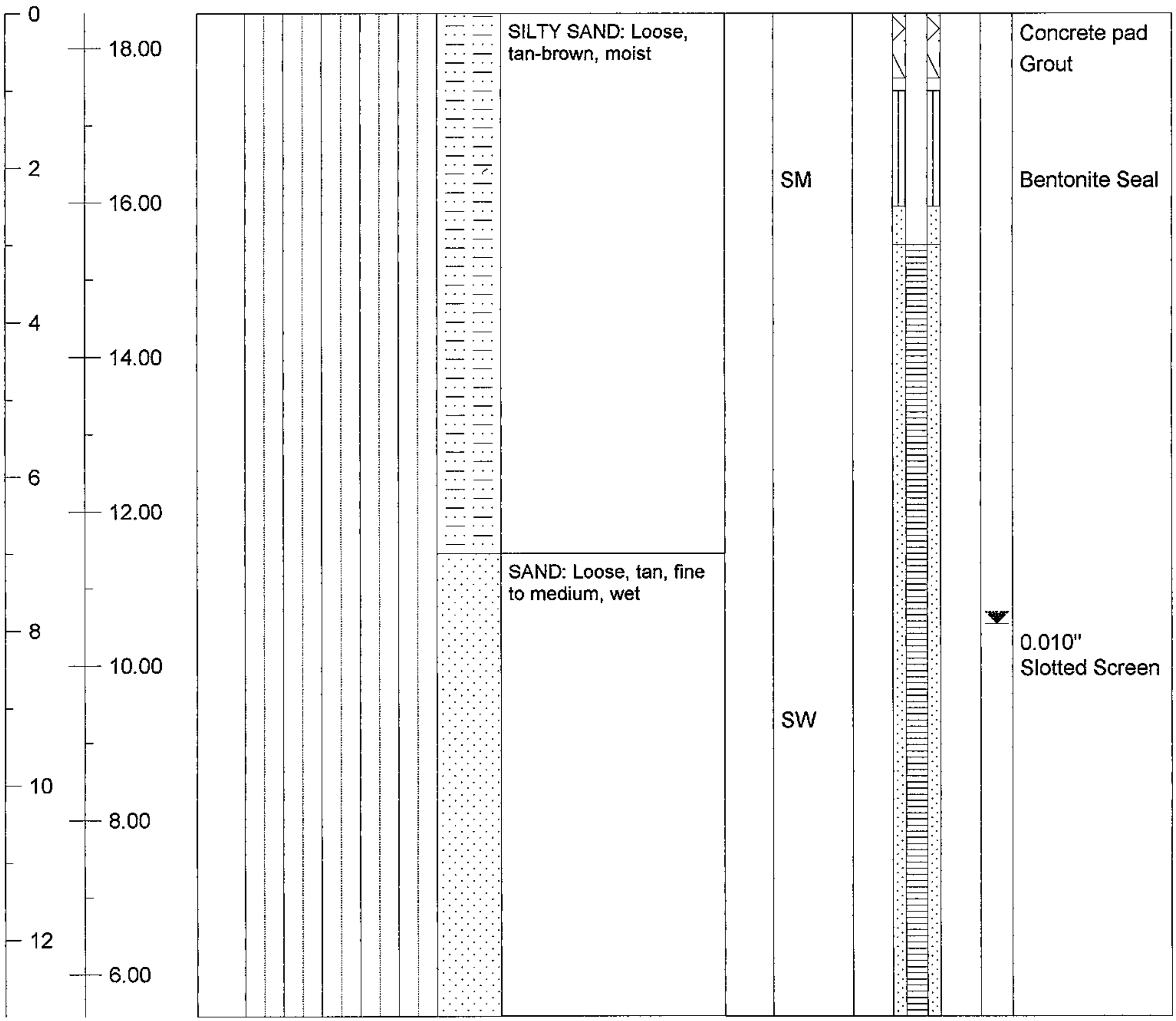
Boring No. MW-2s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.45**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.91**
Comments	**Locking cover with 2.99' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



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Test Boring No. B-3 (MW-3d)

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	USCS	Piezometer Constuction Data
0 – 4 (Elev. 19.37 – 15.37)		CLAY: Stiff, bright yellow-orange, fine sandy, silty, moist		Caved (≈3.0)
4 – 7	4-4-6	SAND: Medium dense, tan-yellow, silty, trace of clay, moist	CL	Water level ▼ (≈4.5)
7 – 14	4-5-5	SAND: Medium dense, tan-buff, well graded fine to coarse, wet	SW	
14 – 23.5	2-4-4; 2-2-4	SILT: Stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	ML-CL; CL	
23.5 – 27.5	2-5-7	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	Bentonite-Cement Grout
27.5 – 36+	3-6-5; 5-18-20	SILTY SAND: Medium dense to dense, partly cemented, black-green speckled, variably clayey, silty, moist, very hard drilling (cemented) below 38 feet, glauconitic	SM; SM	Bentonite Seal (≈34 – 36)

Depth scale: 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36

Elevation scale: 18.00, 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00, -8.00, -10.00, -12.00, -14.00, -16.00

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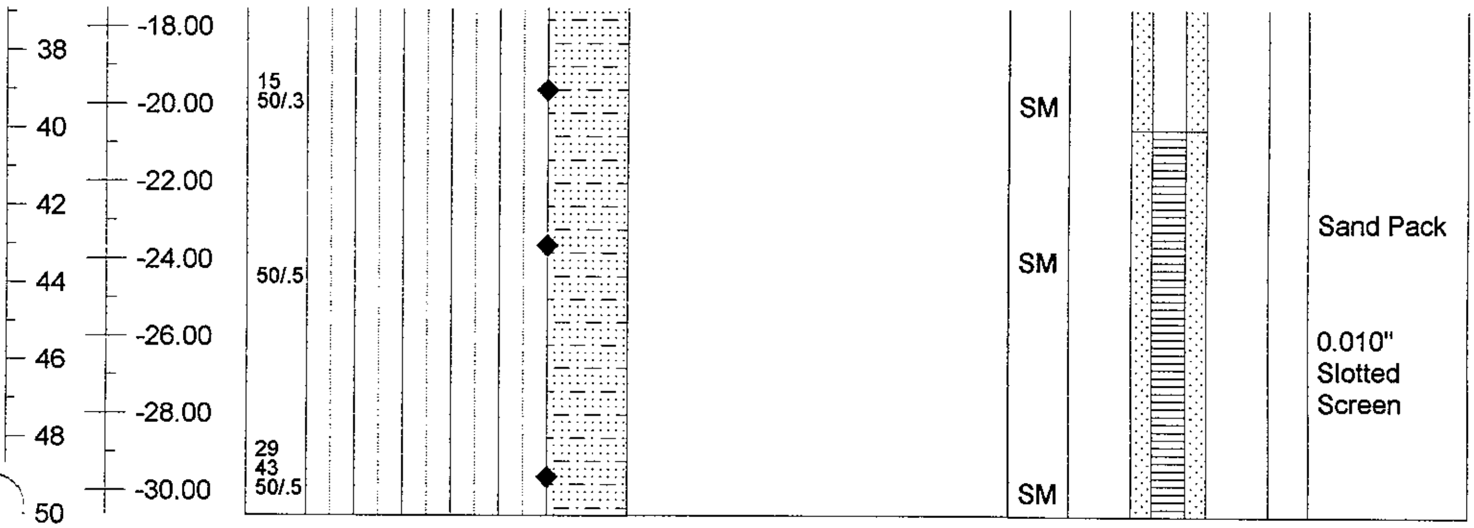
Test Boring No. B-3

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

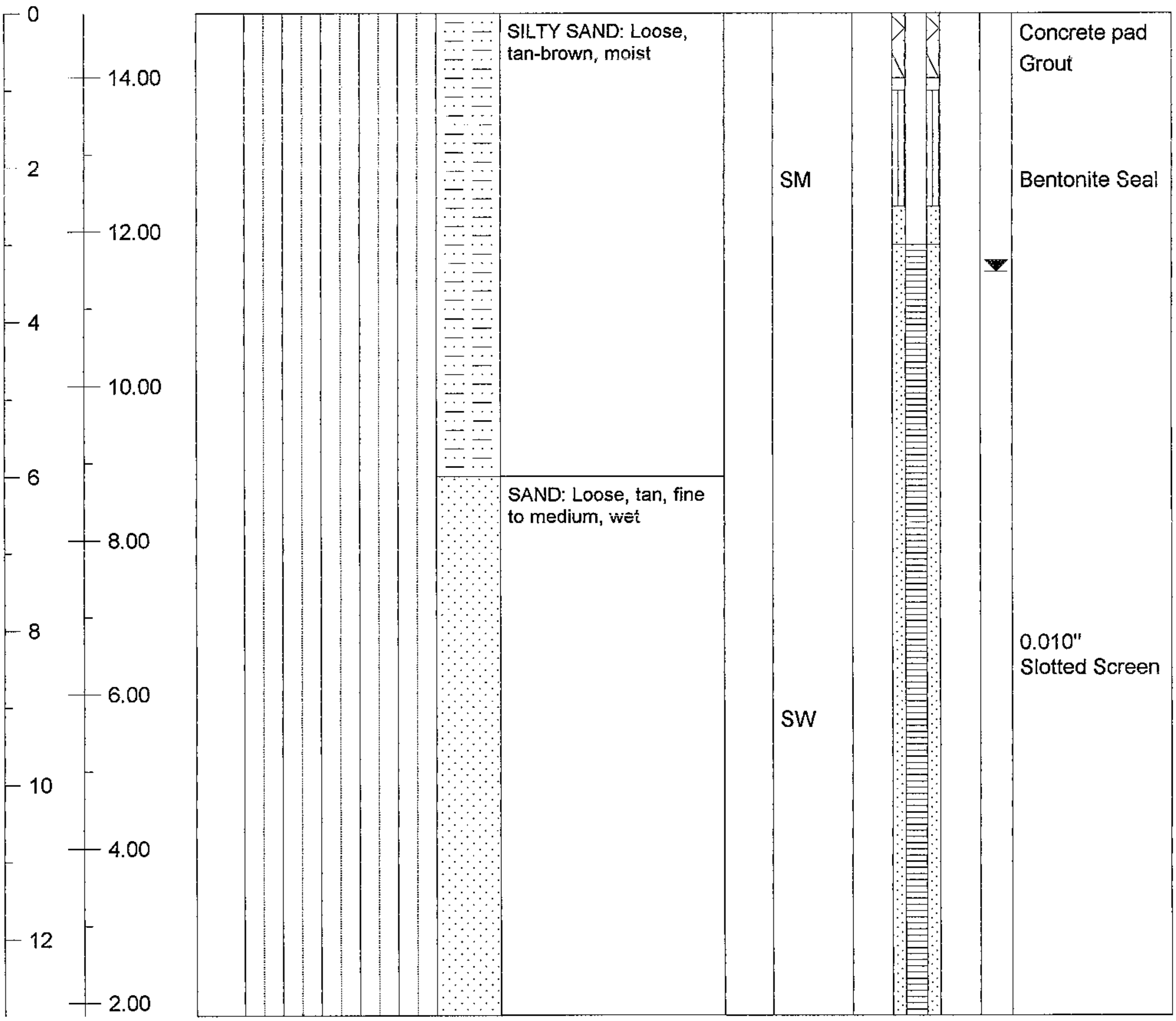
Engineering and Geology

Boring No. MW-4

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**14.83**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.35**
Comments	**Locking cover with 3.59' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. MW-5

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**14.80**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.6**
Date Started	**11/19/02**	Date Ended	**11/19/02**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.9**
Comments	**Wooded area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**11/27/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
Depth 0 / Elev. 14.00	4, 4, 6	SAND: Loose, tan, silty, fine to medium, dry	SM	* Bentonite-Cement Grout; Bentonite Seal
Depth 2 / Elev. 12.00	9, 14, 16	SAND: Medium dense, tan-buff, medium to coarse, wet (fluvial)	SW	
Depth 4 / Elev. 10.00				
Depth 6 / Elev. 8.00	9, 9, 4	SAND: Loose to medium dense, tan-buff, fine to coarse, wet, trace of silt (fluvial)	SM	
Depth 8 / Elev. 6.00	4, 3, 4	CLAYEY SAND: Loose, green-gray, silty, wet, sampled as distinct sand layers with plastic clay lenses (channel or near-shore deposits)	SC	Sand Pack
Depth 10 / Elev. 4.00				
Depth 12 / Elev. 2.00				0.010" Slotted Screen
Depth 14 / Elev. 0.00	3, 4, 4		SC	
Depth 16 / Elev. -2.00				* Locking steel cover w/ 3 foot stickup
Depth 18 / Elev. -4.00	3, 4, 6	SILTY CLAY: Stiff, gray-green, var. sandy, shell hash, moist, plastic **	CL-CH	** Deep marine deposits (Yorktown Fm.)
Depth 20				

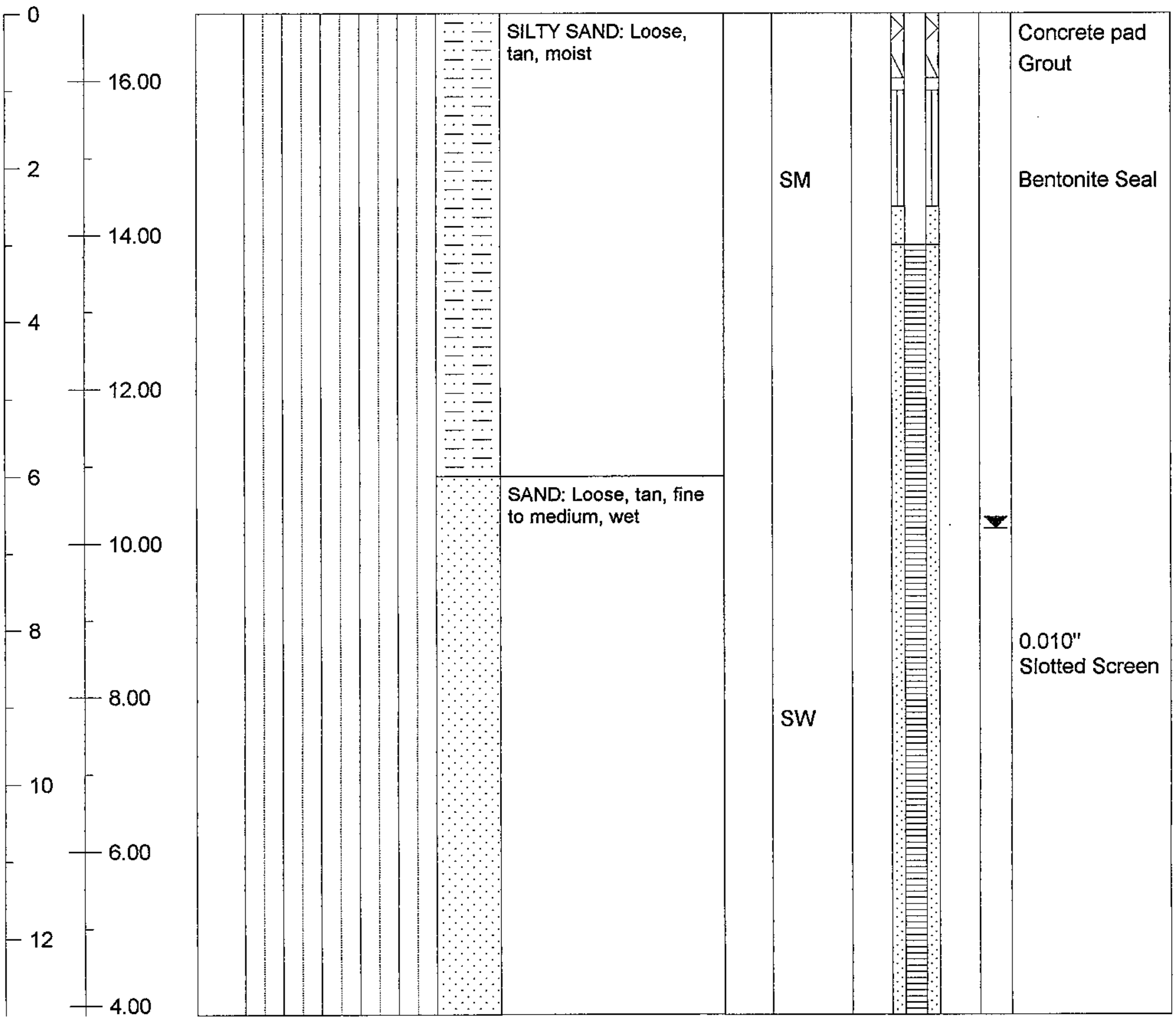
David Garrett, P.G., P.E.

Engineering and Geology

Boring No. MW-6

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.87**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.68**
Comments	**Locking cover with 3.16' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data

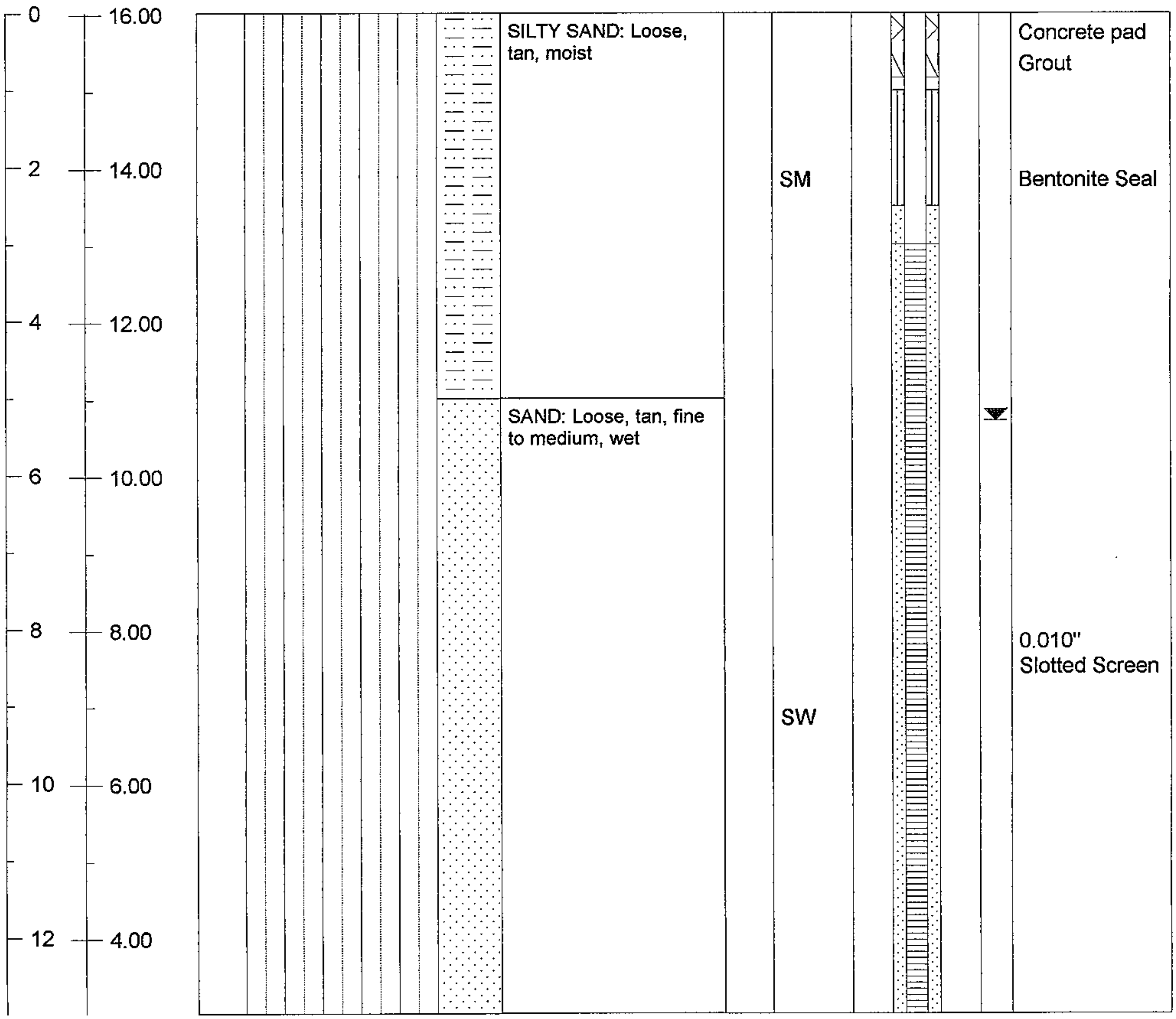


David Garrett, P.G., P.E.
Engineering and Geology

Boring No. MW-7

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.03**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.29**
Comments	**Locking cover with 3.37' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. MW-8

Client and Project **C&D Landfill, Inc. (Phase 1)**

Ground Elevation **18.30**

Equipment **Mobile B-53 ATV** Drilling Method **4-1/4" Hollow Auger**

Water Level, TOB **7.3**

Date Started **11/18/02** Date Ended **11/18/02**

Water Level, 24 Hr. **7.3**

Drilling Firm **Bore & Core, Inc.** Logged by **David Garrett**

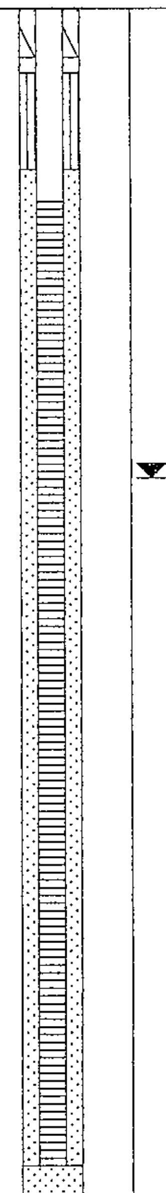
Stabilized Level **7.3**

Comments **Wooded area, cool sunny weather** Total Depth **20.0**

Date of Observation **11/27/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0 / 18.00	2, 2, 3	SAND: Loose, tan, slightly silty, fine to medium, dry	SW	* Bentonite-Cement Grout
2 / 16.00				Bentonite Seal
4 / 14.00	3, 3, 4		SW	
6 / 12.00	4, 4, 4	SAND: Medium dense, tan-buff, medium to coarse, wet	SW	
8 / 10.00	7, 8, 11	SAND: Loose to medium dense, tan-buff, fine to coarse, wet, trace of silt	SW	Sand Pack
10 / 8.00				
12 / 6.00				0.010" Slotted Screen
14 / 4.00	4, 4, 4		SW	
16 / 2.00				* Locking steel cover w/ 3 foot stickup
18 / 0.00	3, 4, 6	SILTY CLAY: Med. stiff, gray-green, var. sandy, heavy shell hash (turritellas) moist, plastic **	CL-CH	** Deep marine deposits (Yorktown Fm.)
20				



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. MW-9d

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**19.88**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**10.3**
Date Started	**11/14/02**	Date Ended	**11/14/02**	Water Level, 24 Hr.	**10.2**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**9.7**
Comments	**Wooded area, cool sunny weather**	Total Depth	**39.0**	Date of Observation	**11/27/02**

All depths are given in feet and referenced b.g.s.

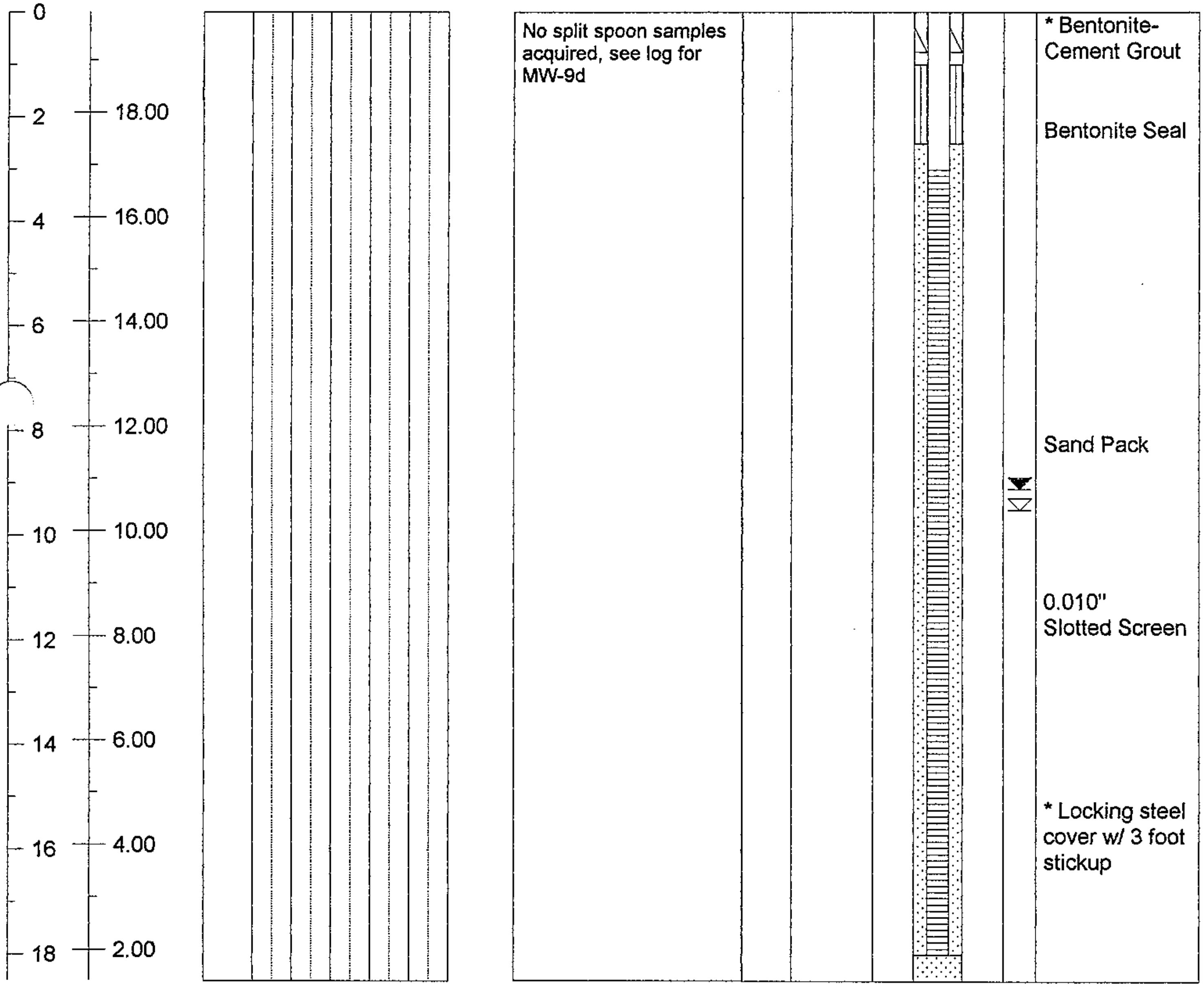
Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol		Piezometer Constuction Data
0				
2 / 18.00	2 3 5	CLAY: Medium stiff, tan-orange, silty, fine sandy, moist	CL	Locking steel cover w/ 3 foot stickup
4 / 16.00	5 6 6	SAND AND SILT: Medium dense, tan-orange, very silty, fine,	ML-SM	
6 / 14.00	6 8 12	SAND: Medium dense, light tan, slightly silty, fine to coarse, wet (fluvial)	SW	
8 / 12.00	5 8 10		SW	
10 / 10.00				
12 / 8.00				
14 / 6.00	2 3 4	CLAYEY SAND: Loose, green-gray, silty, wet, distinct lenses	SM+CL	Bentonite-Cement Grout
16 / 4.00				
18 / 2.00		SILTY CLAY: Med. stiff, gray-green, var. sandy, heavy shell hash (turritellas) moist, plastic (deep marine sediments - Yorktown Formation)		
20 / 0.00	2 2 3		CL	
22 / -2.00				
24 / -4.00	2 4 8		CL-CH	
26 / -6.00				
28 / -8.00				
30 / -10.00	2 3 6		CL-CH	Bentonite Seal
32 / -12.00				
34 / -14.00	50/.2	SILTY SAND: Very dense, partly cemented, black-green speckled (fine glauconite nodules), variably clayey, silty, moist	SM	Sand Pack
36 / -16.00				0.010" Slotted Screen
38 / -18.00	50/.1		SM	

David Garrett, P.G., P.E.
Engineering and Geology

Boring No. MW-9s

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**19.91**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**9.5**
Date Started	**11/19/02**	Date Ended	**11/19/02**	Water Level, 24 Hr.	**9.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**9.1**
Comments	**Wooded area, cool sunny weather**	Total Depth	**18.5**	Date of Observation	**11/27/02**
	All depths are given in feet and referenced b.g.s.				

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology — *Depths in feet, referenced b.g.s.*

Boring No. MW-1s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.59**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/02/01**	Date Ended	**05/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**5.59**
Comments	**Locking cover with 3.32' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

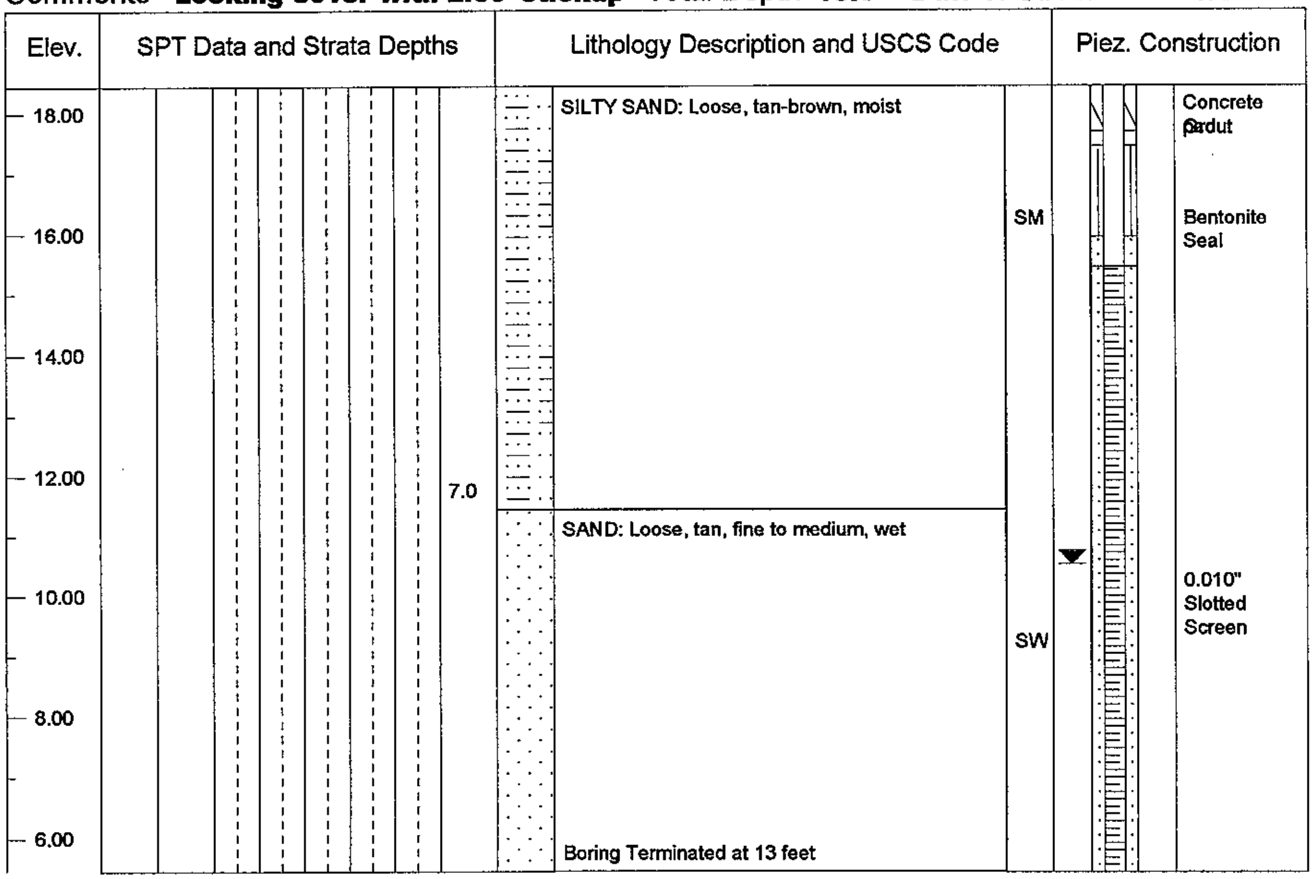
Elev.	SPT Data and Strata Depths	Lithology Description and USCS Code		Piez. Construction
16.00		SILTY SAND: Loose, tan-brown, moist	SM	Concrete pad
14.00				Bentonite Seal
12.00				
10.00	8.0			
		SAND: Loose, tan, fine to medium	SW	0.010" Slotted Screen
8.00				
6.00		Boring Terminated at 13 feet		

David Garrett, P.G., P.E.

Engineering and Geology *Depths in feet, referenced b.g.s.*

Boring No. MW-2s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**18.45**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.91**
Comments	**Locking cover with 2.99' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

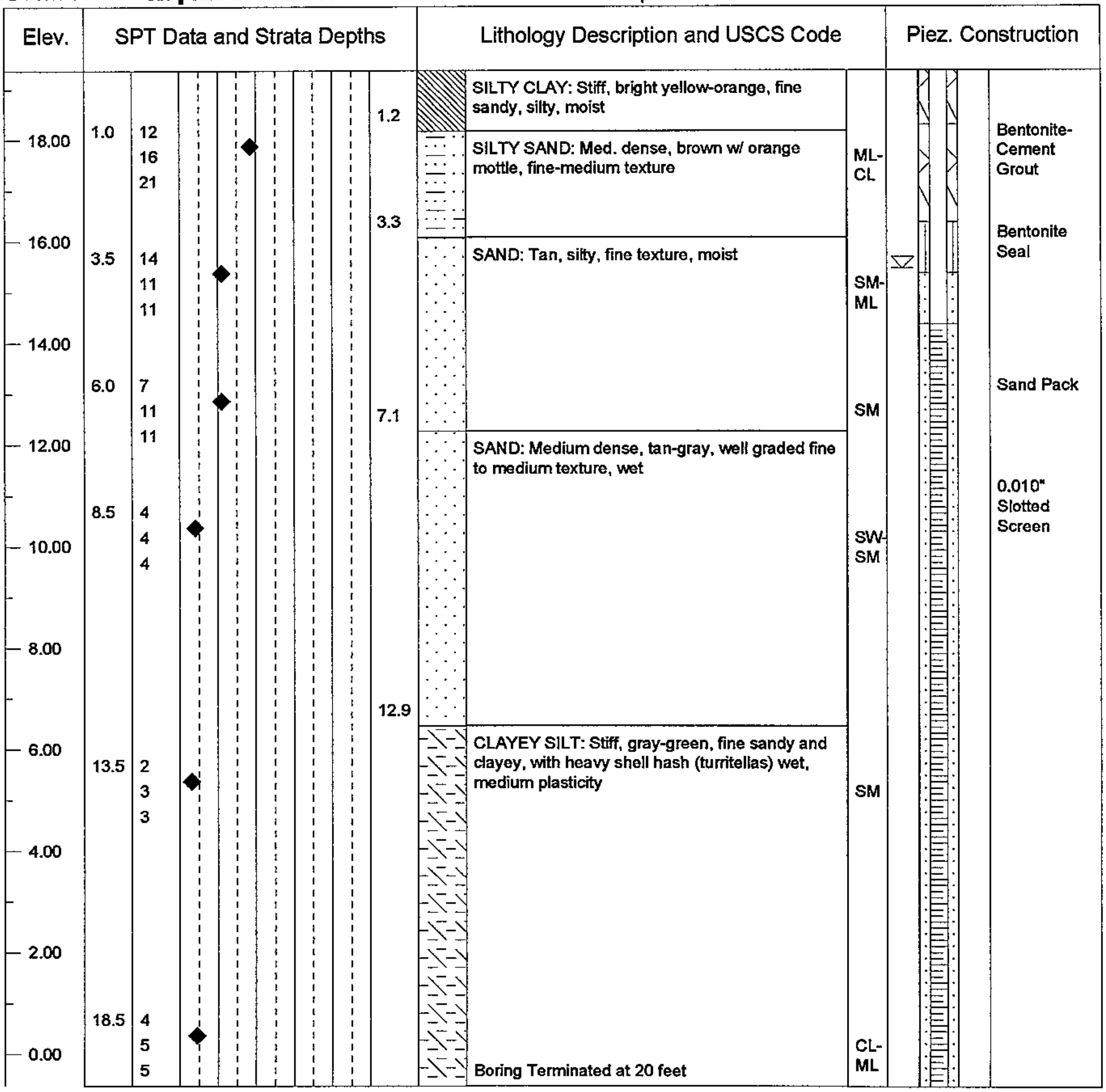


David Garrett, P.G., P.E.

Engineering and Geology — *Depths in feet, referenced b.g.s.*

Boring No. MW-3s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.9**
Date Started	**8/6/07**	Date Ended	**8/6/07**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**Aaron Hill**	Stabilized Level	**NA**
Comments	**Replaces former MW-9s**	Total Depth	**20.0**	Date of Observation	**NA**



SPT Depth	Blow Counts
1.0	12, 16, 21
3.5	14, 11, 11
6.0	7, 11, 11
8.5	4, 4, 4
13.5	2, 3, 3
18.5	4, 5, 5

Strata Depth	Lithology Description	USCS Code
0–1.2	SILTY CLAY: Stiff, bright yellow-orange, fine sandy, silty, moist	
1.2–3.3	SILTY SAND: Med. dense, brown w/ orange mottle, fine-medium texture	ML-CL
3.3–7.1	SAND: Tan, silty, fine texture, moist	SM-ML / SM
7.1–12.9	SAND: Medium dense, tan-gray, well graded fine to medium texture, wet	SW-SM
12.9–20.0	CLAYEY SILT: Stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	SM / CL-ML
	Boring Terminated at 20 feet	

David Garrett, P.G., P.E.

Engineering and Geology — *Depths in feet, referenced b.g.s.*

Boring No. MW-4

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**14.83**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**3.35**
Comments	**Locking cover with 3.59' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

Elev.	SPT Data and Strata Depths	Lithology Description and USCS Code		Piez. Construction
14.00		SILTY SAND: Loose, tan-brown, moist		Concrete pad
				Grout
12.00			SM	Bentonite Seal
10.00	6.0			
8.00		SAND: Loose, tan, fine to medium, wet		
6.00			SW	0.010" Slotted Screen
4.00				
2.00		Boring Terminated at 13 feet		

David Garrett, P.G., P.E.

Engineering and Geology — *Depths in feet, referenced b.g.s.*

Boring No. MW-5

Client and Project	**C&D Landfill, Inc. (Phase 1)**	Ground Elevation	**14.80**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**
Date Started	**11/19/02**	Date Ended	**11/19/02**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**
Comments	**Wooded area, cool sunny weather**	Total Depth	**20.0**
Water Level, TOB	**3.6**	Water Level, 24 Hr.	**NA**
Stabilized Level	**3.9**	Date of Observation	**11/27/02**

Elev.	SPT Depth	SPT Blows	Strata Depth	Lithology Description	USCS Code
14.00	1.0	4, 4, 6	2.9	SAND: Loose, tan, silty, fine to medium, dry	SM
12.00–10.00	3.5	9, 14, 16	5.6	SAND: Medium dense, tan-buff, medium to coarse, wet (fluvial)	SW
8.00	6.0	9, 9, 4	8.1	SAND: Loose to medium dense, tan-buff, fine to coarse, wet, trace of silt (fluvial)	SM
6.00	8.5	4, 3, 4		CLAYEY SAND: Loose, green-gray, silty, wet, sampled as distinct sand layers with plastic clay lenses (channel or near-shore deposits)	SC
0.00	13.5	3, 4, 4	18.4		SC
-4.00	18.5	3, 4, 6		SILTY CLAY: Stiff, gray-green, var. sandy, shell hash, moist, plastic ** Boring Terminated at 20 feet	CL-CH

Elevation scale: 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00

Piez. Construction

* Bentonite-Cement Grout

Bentonite Seal

Sand Pack

0.010" Slotted Screen

* Locking steel cover w/ 3 foot stickup

** Deep marine deposits (Yorktown Fm.)

David Garrett, P.G., P.E.

Engineering and Geology — Depths in feet, referenced b.g.s.

Boring No. MW-6

Client and Project	C&D Landfill, Inc. (Pitt County)			Ground Elevation	16.87
Equipment	CME 75	Drilling Method	4-1/4" ID HSA	Water Level, TOB	NA
Date Started	05/03/01	Date Ended	05/03/01	Water Level, 24 Hr.	NA
Drilling Firm	Bore & Core	Logged by	David Garrett	Stabilized Level	6.68
Comments	Locking cover with 3.16' stickup	Total Depth	13.0	Date of Observation	5/16/01

Elev.	SPT Data and Strata Depths	Lithology Description and USCS Code		Piez. Construction
16.00		SILTY SAND: Loose, tan, moist	SM	Concrete pad; Grout; Bentonite Seal
14.00				
12.00	6.0			
10.00		SAND: Loose, tan, fine to medium, wet		
8.00			SW	0.010" Slotted Screen
6.00				
4.00		Boring Terminated at 13 feet		

David Garrett, P.G., P.E.

Engineering and Geology — *Depths in feet, referenced b.g.s.*

Boring No. MW-7

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**16.03**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**5.29**
Comments	**Locking cover with 3.37' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

Elev.	SPT Data and Strata Depths	Lithology Description and USCS Code	USCS	Piez. Construction
16.00		SILTY SAND: Loose, tan, moist		Concrete pad
				Grout
14.00			SM	Bentonite Seal
12.00				
	5.0			
		SAND: Loose, tan, fine to medium, wet		
10.00				
8.00				0.010" Slotted Screen
			SW	
6.00				
4.00				
		Boring Terminated at 13 feet		

David Garrett, P.G., P.E.

Engineering and Geology — *Depths in feet, referenced b.g.s.*

Boring No. MW-8

Client and Project **C&D Landfill, Inc. (Phase 1)** — Ground Elevation **18.30**
Equipment **Mobile B-53 ATV** — Drilling Method **4-1/4" Hollow Auger** — Water Level, TOB **7.3**
Date Started **11/18/02** — Date Ended **11/18/02** — Water Level, 24 Hr. **7.3**
Drilling Firm **Bore & Core** — Logged by **David Garrett** — Stabilized Level **7.3**
Comments **Wooded area, cool sunny weather** — Total Depth **20.0** — Date of Observation **11/27/02**

Elev.	SPT Data (Depth)	Blows	Strata Depths	Lithology Description	USCS Code	Piez. Construction
18.00	1.0	2, 2, 3		SAND: Loose, tan, slightly silty, fine to medium, dry	SW	* Bentonite-Cement Grout
16.00						Bentonite Seal
14.00	3.5	3, 3, 4			SW	
12.00	6.0	4, 4, 4	6.3	SAND: Medium dense, tan-buff, medium to coarse, wet	SW	
10.00	8.5	7, 8, 11	8.4	SAND: Loose to medium dense, tan-buff, fine to coarse, wet, trace of silt	SW	Sand Pack
8.00						
6.00						0.010" Slotted Screen
4.00	13.5	4, 4, 4			SW	
2.00						* Locking steel cover w/ 3 foot stickup
0.00	18.5	3, 4, 6	17.6	SILTY CLAY: Med. stiff, gray-green, var. sandy, heavy shell hash (turritellas) moist, plastic **	CL-CH	** Deep marine deposits (Yorktown Fm.)
				Boring Terminated at 20 feet		

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

Elev. scale: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00

SPT Depth	Blows	Strata Depth	Lithology Description	USCS Code
			SAND: Medium dense buff-white, slightly silty, moist	
3.5	3, 4, 5	4.0	SAND: Loose, green-gray, silty and clayey, wet	SM
		7.5	SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	
8.5	2, 1, 1			SM
13.5	3, 4, 6			ML-CL
18.5	4, 4, 6	18.5	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL
23.5	4, 5, 7			CL

Piez. Construction

David Garrett, P.G., P.E.
Engineering and Geology

Depths in feet, referenced b.g.s.

Boring No. MW-1d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
-8.00			CLAY: Medium stiff, gray-green, plastic gumbo clay, moist		GROUTED ANNULUS
-10.00					
-12.00	28.5	3 3 7		CL	
-14.00	31.5		SILTY SAND: Dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer at 36 to 38 feet, very hard below 45 feet		
-16.00	33.5	6 22 18		SM	Bentonite Seal
-18.00					
-20.00					
-22.00	38.5	31 15 24		SM	
-24.00					Sand Pack
-26.00	43.5	50/.1		SM	
-28.00					0.010" Slotted Screen
-30.00					
-32.00	48.5	50/.5	Boring Terminated at 50 feet	SM	

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

Elev.: 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00, -6.00

SPT Depth	Blow Counts	Strata Depth	Lithology Description	USCS Code
			SAND: Loose, tan-yellow, variably silty sand	
3.5	16, 8, 9	3.5	CLAY: Medium stiff, tan-orange, very sandy, silty, slightly plastic, moist, crumbly	CL & SM
8.5	5, 8, 8	7.5	SAND: Medium dense, tan, subangular, f - c well graded (boring collapsed at 13.6 feet when casing pulled, redrilled with 4-1/4" hollow stem auger)	SP-SM
13.5	3, 3, 4	12.5	CLAYEY SILT: Medium stiff, gray-green, fine sandy, with heavy shell hash (whole turritellas), moist, moderately plastic	CL-ML
18.5	2, 2, 3			CL-ML
23.5	2, 2, 4	22.5	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL

Piez. Construction: Bentonite-Cement Grout

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

Elev. scale: -8.00, -10.00, -12.00, -14.00, -16.00, -18.00, -20.00, -22.00, -24.00, -26.00, -28.00, -30.00, -32.00

SPT Data and Strata Depths

Sample Depth	Blow Counts
28.5	2, 2, 3
33.5	1, 6, 8
38.5	5, 4, 29
43.5	10, 20, 27
48.5	22, 38, 50/.2

Lithology Description and USCS Code

Strata Depth	Lithology Description	USCS Code
to 33.5	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL
33.5 – 37.0	SILT: Stiff, gray-green, fine sandy, clayey, interlayered with sand	SM
37.0 – 49.0	SILT: Hard, black-green speckled, clayey, fine sandy, moist, moderately plastic, scattered pelecypod shell hash	ML, ML
49.0 –	SAND: Very dense (partly cemented), black-green speckled, clayey, silty, fine glauconite nodules	SM

Piez. Construction

Bentonite Seal

Sand Pack

0.010" Slotted Screen

Bentonite Seal

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6** ▽
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.9** ▼
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

Elevation scale (Elev.): -34.00, -36.00, -38.00, -40.00, -42.00, -44.00, -46.00, -48.00, -50.00, -52.00

SPT Data: Depth	SPT Data: Blows	Strata Depth
53.5	50/.1	
		57.4
58.5	6, 7, 7	
		61.5
63.5	5, 6, 5	
68.5	40, 38, 50/.5	

Lithology Description	USCS Code
SAND: Very dense (partly cemented), black-green speckled, clayey, silty, fine glauconite nodules	SM
SAND: Medium dense, green-black speckled, silty, clayey, fine grained, wet	SC
CLAY: Medium stiff to very hard, gray-green, fine sandy, silty, moderately plastic	CL
Boring Terminated at 70 feet	CL

Piez. Construction: Boring collapsed below 50 feet

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0** ▽
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.5** ▼
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

Elev.: 18.00, 16.00, 14.00, 12.00, 10.00, 8.00, 6.00, 4.00, 2.00, 0.00, -2.00, -4.00

SPT Depth	SPT Blows	Strata Depth	Lithology Description	USCS Code
			CLAY: Stiff, bright yellow-orange, fine sandy, silty, moist	CL
3.5	4, 4, 6	4.0	SAND: Medium dense, tan-yellow, silty, trace of clay, moist	
		7.0	SAND: Medium dense, tan-buff, well graded fine to coarse, wet	SW
8.5	4, 5, 5			
13.5	2, 4, 4	14.0	SILT: Stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	ML-CL
18.5	2, 2, 4			CL
		23.5	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL
23.5	2, 5, 7			

Piez. Construction: Caved

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
-6.00			CLAY: Medium stiff, gray-green, plastic gumbo clay, moist		Bentonite-Cement Grout
-8.00	27.5				
	28.5	3 6 5	SILTY SAND: Medium dense to dense, partly cemented, black-green speckled, variably clayey, silty, moist, very hard drilling (cemented) below 38 feet, glauconitic	SM	
-10.00					
-12.00					
-14.00	33.5	5 18 20		SM	
-16.00					Bentonite Seal
-18.00					
	38.5	15 50/.3		SM	
-20.00					
-22.00					Sand Pack
-24.00	43.5	50/.5		SM	
-26.00					0.010" Slotted Screen
-28.00					
	48.5	29 43 50/.5		SM	
-30.00			Boring Terminated at 50 feet		

DATE: _______________

BOUNDARY PROBE MONITORING LOG

Project Name: ________________________ **Project Number:** ________________________

Site Contact: ________________________ **Technician(s):** ________________________

Starting Temperature: ________________ **End Temperature:** ________________

Starting Barometric Pressure: ____________ **End Barometric Pressure:** ____________

Monitoring Equipment: ____

Probe No.	% Methane (CH_4)	% Carbon Dioxide (CO_2)	% Oxygen (O_2)	% Balance Gas	Static Pressure (inches of water)	Comments

Completed by: ________________________

Water Quality Monitoring Plan Amendment

C&D Landfill, Inc., CDLF (Phases 1 and 2)
Pitt County, North Carolina
NCDENR Solid Waste Permit #74-07

Prepared for

May 2008

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Engineering and Geology

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1.0 Introduction

1.1 Background

Water quality monitoring for C&D Landfill, Inc., (the "Facility"), located 15 miles east of Greenville, North Carolina, in rural Pitt County, commenced in 2001 with the opening of Phase 1. The monitoring well network consists of eleven (11) wells and three (3) surface sampling locations, shown on Drawing MP-1. The plan was most recently amended in late 2007 to accommodate two replacement wells (MW-3s and MW-3d, which replaced MW-9s and MW-9d), required to allow the full build-out of Phase 1 to permitted limits, and to incorporate new regulatory requirements pertaining to reporting limits. The CDLF is undergoing detection monitoring under 15A NCAC 13B .0544 (b) (5) (B). This monitoring plan amendment reflects the current site-wide monitoring network conditions, i.e., wells locations and depths and surface water sampling locations, along with proposed new monitoring wells for the CDLF Phase 2 expansion, shown on Drawing MP-1. This plan is scheduled to go into effect concurrent with the opening of Phase 2, with the background sampling of the new wells to be scheduled prior to opening the new footprint.

Changes to the sampling and analysis protocols include "Solid Waste Section Limits" that replace the formerly required Practical Quantification Limits (PQL's). This Facility is required to undergo semi-annual sampling for Appendix I constituents with selected additional field and laboratory parameters (see Tables). The monitoring wells provide water quality data on both the upper and lower aquifers identified in various site studies. The facility background wells (MW-1s and MW-1d) will be augmented by a new background well upgradient (north) of Phase 2 (MW-9A). Compliance wells are located west and south (i.e., the primary ground water flow direction); one compliance well located along a shallow drainage canal north of Phase 1 (MW-8) is considered redundant to new wells proposed for Phase 2 (MW-11 and MW-12), thus the potential for eliminating this well is under consideration. Eight new compliance wells are proposed to the south and west (downgradient) of Phase 2 (MW-10 through MW-16), including one new shallow/deep couplet (MW-14s and MW-14d). No new surface water sampling stations are proposed.

These monitoring network changes are based on the Site Suitability Evaluation and the Design Hydrogeologic Report for Phase 2. The following Sampling and Analysis Plan (SAP) has been prepared to meet North Carolina's sampling and analysis requirements and describes amendments to the detection-stage monitoring program, prepared in accordance with the following applicable rules, which are hereby incorporated by reference:

- 15A NCAC 13B .0544 (Solid Waste Rules)
- 15A NCAC 2C (Well Construction Rules)
- 15A NCAC 2L (Ground Water Classifications and Standards)
- 15A NCAC 27 (Well Contractor Certification Rules)
- 15A NCAC 2H (Water Quality Laboratory Certification Rules)

1.2 Purpose & Scope

This WQMP has been designed to insure accurate and representative field and laboratory results are obtained for all-round and surface water quality monitoring points. The WQMP addresses the following subjects:

- Ground water sample collection
- Surface water sample collection
- Sample preservation and shipment
- Laboratory analytical procedures
- Sample Chain-of-custody control
- Quality assurance/quality control programs.

The methods and procedures described in the following sections are intended to facilitate the collection of true and representative samples and test data. Field procedures are presented in the following Sections 3.0 through 6.0 in their general order of implementation. Equipment requirements for each field task are presented within the applicable section. Laboratory procedures, quality assurance methods and record keeping requirements are presented in Sections 7.0 through 9.0. Strict adherence to these procedures stipulated in this plan is required. Any variation from these procedures should be thoroughly documented in the assessment report.

1.3 New Monitoring Location Criteria

The compliance well network for Phase 2 shall consist of seven (7) wells within the uppermost aquifer, shown as MW-10 through MW-16 on Drawing MP-1. The relatively close spacing of these wells is based on advection-dispersion analyses performed during the original permitting of Phase 1. One (1) new well within the deep aquifer is identified as MW-14d on Drawing MP-1. Historically, the shallower wells for Phase 1 have been sampled semi-annually and the deep wells have been sampled on a bi-annual basis. A partial confining unit (normally consolidated marine silt-clay) provides separation of the upper aquifer unit (silty to relatively clean fluvial sand) from the deeper aquifer unit (silty sand with shell hash). The depth of the partial confining unit varies from 8 to 16 feet within the Phase 2 footprint, whereas the thickness of the confining unit is on the order of 20 feet, or more. A new background well, MW-9A, is proposed to the north of Phase 2 to augment MW-1s and MW-1d, which could be influenced by Phase 2 due to cross-gradient relationships. Refer to Table 1 following this text.

Three surface water sampling points are present: SW-1 is located up gradient of Phase 1, SW-3 is down gradient of Phase 1 on the same stream, SW-2 is located down gradient of both Phase 1 and Phase 2 along the drainage feature that separates the phases. The drainage feature begins near the Phase 2 footprint and presents little opportunity for an upgradient sampling location - no new surface sampling locations are proposed.

2.0 Ground Water Sample Collection

This section presents details of the procedures and equipment required to perform sampling from monitoring wells for each ground water monitoring event. Monitoring wells and surface sampling locations are shown on the attached map and are described in the Tables following this text.

For this discussion, it is assumed that well evacuation and sampling will be accomplished by bailing. A suitable alternative will be the use of dedicated sampling equipment, including low-flow purging and sampling techniques.

2.1 Water Level Measurements

Static water level and total depth to the bottom shall be measured in each well prior to any purging or sampling activities. Static water level and well depth measurements are necessary to calculate the volume of stagnant water in the well prior to purging. Additionally these measurements provide a field check on well integrity, degree of siltation, and are used to prepare potentiometric maps, calculate aquifer flow velocities and monitor changes in site hydrogeologic conditions.

Prior to opening each well, new latex or nitrile surgical gloves shall be donned. New gloves shall be when taking, water level measurements at each well. Appropriate measures shall be taken during all measurement activities to prevent soils, decontamination supplies, precipitation, and other potential contaminants from entering, the well or contacting clean equipment.

An electronic water level indicator shall be used to accurately measure depth to ground water in each well and/or piezometer. Ground water depths shall measured to a vertical accuracy of 0.01 feet relative to established wellhead elevations. Each well shall have a permanent, easily identified reference point on the lip of the well riser from which all water level measurements shall be taken. The elevation of the reference point shall be established by a Registered Land Surveyor.

The electronic water level indicator shall be constructed of inert materials such as stainless steel and Teflon. Between well measurements the device shall be thoroughly decontaminated by washing, with non-phosphate soap and triple rinsing with de-ionized water to prevent cross contamination from one well to another. Te following measurements shall be recorded in a dedicated field book prior to sample collection:

- Depth to static water level and well bottom (to the nearest 0.01 foot)
- Height of water column in the riser (based upon known depth of well)
- Condition of wellhead protective casing, base pad and riser
- Changes in condition of well and surroundings.

2.2 Monitor Well Evacuation

Water accumulated in each well may be stagnant and unrepresentative of surrounding aquifer conditions, and therefore must be removed to ensure that fresh formation water is sampled. Each well will be purged of standing water following the measurement of the static water level.

New latex or nitrile surgical gloves shall be donned for all well purging and sampling activities and whenever handling decontaminated field equipment. Appropriate measures shall be taken during all measurement, purging and sampling activities to prevent surface soils, decontamination supplies, precipitation, and other potential contaminants from entering the well or contacting the equipment.

The volume of standing water in the well riser and screen shall be calculated immediately before well evacuation during each monitoring event. A standing water volume shall be calculated for each well using measured static water level, well depth and well casing diameter according to the equation:

$$V = (TD - SWL) \times C$$

Where: V = One well volume
TD = Total depth of the well (in feet)
SWL = Static water level (in feet)
C = Volume constant for given well diameter (gallons/foot)
C = 0.163 gal/ft for two-inch wells and C = 0.653 gal/ft for four-inch wells.

After the volume of standing water within the casing, is established, a minimum of three and a maximum of five well casing, volumes of water shall be evacuated from each well. New, disposable bailers with either double or bottom check-valve shall be used to purge each well. Disposable purge bailers shall be constructed of fluorocarbon resin (Teflon) or inert plastic suitable for the well and ground conditions. Each bailer shall be factory-clean and remain sealed in a plastic sleeve until use. A new Teflon-coated stainless steel, inert mono-filament line or nylon cord shall be used for each well to retrieve the bailers. **Dedicated purging and sampling equipment may be used.**

Wells shall be purged at a rate that will not cause recharge water to be excessively agitated or cascade through the screen. Care will also be taken to minimize disturbance to the well sidewalls and bottom which could result in the suspension of silt and fine particulate matter. The volume of water pureed from each well and the relative rate of recharge shall be documented in sampling field notes Wells which are of very low recharge rates shall be purged once until dry. Damaged, dry or low yielding, and high turbidity wells shall noted for reconsideration before the next sampling event.

Purge water shall be managed to prevent possible soil and surface water contamination.

Durable, non-dedicated equipment to be lowered into the well or which may contact the water shall be thoroughly decontaminated before each use. Equipment shall be disassembled to the degree practical, washed with (non-phosphate) soapy potable tap water, and triple rinsed using de-ionized water. Detailed equipment decontamination procedures are detailed in Section 2.6.

2.3 Ground Water Sample Collection

After purging activities are complete, ground water samples will be collected for laboratory analysis. Sampling shall occur within 24 hours of the purging of each well and as soon after well recovery as possible. Wells which fail to recharge or produce an adequate sample volume within 24 hours of purging shall not be sampled. High turbidity wells (>1000 units/ml) shall be noted and scheduled for redevelopment following the sampling event.

Field measurements of temperature, pH, specific conductivity and turbidity shall be made immediately prior to sampling each monitoring point. The field test specimens shall be collected with the sampling bailer acid placed in a clean, non-conductive glass or plastic container for observation. The calibration of the pH, temperature, conductivity and turbidity meters shall be completed according to the manufacturers' specifications and consistent with *Test Methods for Evaluating Solid Waste -Physical/Chemical Methods* (SW-846). A pocket thermometer and litmus paper will be available in case of meter malfunction.

Each well shall be sampled using, a new, factory-cleaned, disposable Teflon bailer with bottom check-valve and sample discharge mechanism. A new segment of Teflon-coated stainless steel wire, inert mono-filament line or nylon cord shall be used to lower and retrieve each bailer. The bailer will be lowered into each well to the point of ground water contact, then allowed to fill as it is sinks below the water table. Bottom contact will be avoided in order to avoid suspending sediment in the samples. The bailer will be retrieved and emptied in a manner which minimizes sample agitation.

Samples shall be transferred directly from the Teflon bailer into a sample container that has been specifically prepared for the preservation and storage of compatible parameters. A bottom emptying device provided with the bailer shall be used to transfer samples from bailer to sample container. The Generation of air bubbles and sample agitation will be minimized during bailer discharge.

Ground water samples shall be collected and contained in the order of volatilization sensitivity. Initially, only purgeable organics and total metals specimens shall be collected for laboratory analysis. Subsequently, other analytical methods may required. When collected, the following order of sampling, shall be observed:

1. Initial measurements of pH, temperature, conductivity and turbidity
2. Volatile and Purgeable Organics
3. Base Neutral and Acid Extractable Organics
4. Total Metals
5. Dissolved Metals
6. Final measurements of pH, temperature, conductivity and turbidity

All samples shall be collected and analyzed in an unfiltered state during all sampling events. If excessively silty ground water conditions persist, analyses of dissolved metal analysis may be proposed to the DWM, although DWM typically does not consider filtered sample data. Any optional dissolved metals sampling, which can be performed in addition, shall be completed on samples prepared by field filtration using a decontaminated peristaltic pump and a disposable 0.45 micron filter cartridge specifically manufactured for this purpose.

All reusable sampling equipment including water level probes, pH/conductivity meters, interface probes, and filtering, pumps which might contact aquifer water or samples shall be thoroughly decontaminated between wells by washing with non-phosphate soapy, de-ionized water and triple rinsing, with de-ionized water. Equipment decontamination procedures are detailed in Section 2.6.

2.4 Field Quality Assurance

Field and trip blanks shall be prepared, handled and analyzed as ground water samples to ensure cross-contamination has not occurred. One set of trip blanks, as described later in this document, shall be prepared before leaving the laboratory to ensure that the sample containers or handling processes have not affected the quality of the samples. One set of field (equipment) blanks shall be created in the field at the time of sampling to ensure that the field conditions, equipment, and handling during sampling collection have not affected the quality of the samples. A duplicate ground water sample may be collected from a single well as a check of laboratory accuracy. Blanks and duplicate containers, preservatives, handling, and transport procedures for surface water samples shall be identical to those noted for around water samples.

2.5 Sample Containers

Sample containers shall be provided by the laboratory for each sampling event. Containers must be either new and factory-certified analytically clean by the manufacturer, or cleaned by the laboratory prior to shipment for sampling. Laboratory cleaning methods shall be based on the bottle type and analyte of interest. Metal containers are thoroughly washed with non-phosphate detergent and tap water, and rinsed with 1:1 nitric acid, tap water, 1:1 hydrochloric acid, tap water, and de-ionized water, in that order. Organic sample containers are thoroughly washed with non-phosphate detergent in hot water and rinsed with tap water, distilled water, acetone, and pesticide-quality hexane, in that order. Other sample containers are thoroughly washed with non-phosphate detergent and tap water, rinsed with tap water, and rinsed with de-ionized water. The laboratory shall provide proper preservatives in the sample containers prior to shipment (see Section 7.0).

2.6 Equipment Decontamination

All non-dedicated equipment that shall come in contact with the well casing and water shall be decontaminated. The procedure for decontaminating non-dedicated equipment is as follows:

1. Clean item with tap water and phosphate-free laboratory detergent (Liquinox or equivalent), using, a brush if necessary to remove particulate matter and surface films.

2. Rinse thoroughly with tap water

3. Rinse thoroughly with de-ionized or distilled water and allow to air dry

4. Rinse thoroughly with high grade isopropanol and allow to air dry

5. Wrap with aluminum foil to prevent contamination of equipment during storage or transport.

2.7 Detection of Immiscible Layers

The detection of non-aqueous phase liquids (fluids that are immiscible in water and vary in density from 1.0 g/ml) is highly unlikely. Should organic constituents be detected that suggest the presence of immiscible liquids, a plan for the detection of these liquids shall be submitted to DWM.

3.0 Surface Water Sample Collection

This section presents details of the procedures and equipment required to perform surface water field measurements and sampling. Surface water monitoring station locations are shown in Drawing MP-1. Surface water samples shall be obtained from areas of minimal turbulence and aeration. New latex or nitrile surgical gloves shall be donned prior to sample collection. The following procedure shall be implemented regarding sampling of surface waters:

1. Put on new latex or nitrile surgical gloves.

2. Hold the bottle in the bottom with one hand, remove the cap with the other.

3. Push the sample container slowly into the water and tilt up towards the current to fill. A water depth of six inches is generally satisfactory. Care shall be taken to avoid breaching the surface or losing, sample preservatives while filling the container.

4. If there is little current movement, the container should be moved slowly, in side to side direction, with the mouth of the container pointing upstream.

Temperature, pH, specific conductivity and turbidity shall be taken at the start of sampling as a measure of field conditions and check on the stability of the water samples over time. Measurements of temperature, pH, specific conductivity and turbidity shall be recorded for all surface water samples. The calibration of the pH, temperature, conductivity, and turbidity meters shall be completed at the beginning, of each sampling event, according to the manufacturers' specifications and consistent with *Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846).*

Surface water samples shall be collected and contained in the order of volatilization sensitivity of the parameters as follows:

1. Measurements of pH, temperature, conductivity and Turbidity

2. Volatile and Purgeable Organics

3. Base Neutral and Acid Extractable Organics

4. Total Metals

5. Dissolved Metals

All surface water samples shall be collected unfiltered in each sampling event. If future dissolved metal analysis is required, samples shall be prepared by field filtration using a decontaminated peristaltic pump, hand-operated filtering pump (or equivalent) and a disposable 0.45 micron filter cartridge specifically manufactured for this purpose. All field meters which might contact surface water samples shall be thoroughly decontaminated between stations by washing with non-phosphate soapy, de-ionized water and triple rinsing with de-ionized water.

Samples shall be collected directly from the station in the container that has been specifically prepared for the preservation and storage of compatible parameters. Samples shall be collected in a manner that assures minimum agitation. Sample containers shall be prepared and provided by the analytical laboratory, following the procedures presented in Section 2.5, for each surface water sampling event.

4.0 Field QA/QC Program

Field Quality Assurance/Quality Control (QA/QC) requires the routine collection and analysis of trip blanks to verify that the handling process has not affected the quality of the samples. Any contaminants found in the trip blanks could be attributed to:

- Interaction between the sample and the container,
- Contaminated source water, or
- Handling procedures that alter the sample.

The laboratory shall prepare a trip blank by filling each type of sample bottle with distilled or de-ionized water. Trip blanks shall be placed in bottles of the specific type required for the analyzed parameters and taken from a bottle pack specifically assembled by the laboratory for each -round water sampling event. Trip blanks shall be taken prior to the sampling event and transported with the empty bottle packs. The blanks shall be analyzed for volatile and purgeable organics only.

The concentration levels of any contaminants found in the trip blank shall be reported but shall not be used to correct the ground water data. In the event that elevated parameter concentrations are found in a blank, the analysis will be flagged for future evaluation and possible re-sampling.

All instruments utilized in the field to measure ground water characteristics shall be calibrated prior to entering the field, and recalibrated in the field as required, to insure accurate measurement for each sample. The specific conductivity and pH meter shall be recalibrated utilizing two prepared solutions of known concentration in the range of anticipated values (between 4 and 10).

A permanent thermometer, calibrated against a National Bureau of Standards Certified thermometer, will be used for temperature meter calibration. The turbidity meter shall be calibrated using Lucite standard blocks provided by the manufacturer.

5.0 Sample Preservation and Shipment

Methods of sample preservation, shipment, and chain-of-custody procedures to be observed between sampling and laboratory analysis are presented in the following sections. Proper storage and transport conditions must be maintained in order to preserve the integrity of specimens between collection and analysis. Ice and chemical cold packs shall be used to cool and preserves samples, as directed by the analytical laboratory. Samples will be maintained at a temperature of 4° C. **Dry ice is not to be used.**

Pre-measured chemical preservatives shall be provided in the sample containers provided by the analytical laboratory. Hydrochloric acid shall be used as a chemical stabilizer and preservative for volatile and purgeable organic specimens. Nitric acid shall be used as the preservative for samples for metals analysis.

Upon collection, samples shall be placed on ice in high impact polystyrene coolers and cooled to a temperature of 4° C. Samples shall be packed and/or wrapped in plastic bubble wrap to inhibit breakage or accidental spills. Chain-of-Custody control documents shall be placed in a waterproof pouch and sealed inside the cooler with the shipped samples. Tape and/or custody seals shall be placed on the outside of the shipping coolers to prevent and aid in the detection tampering.

Samples shall be delivered to the analytical laboratory within a 24-hour period in person or using an overnight delivery service.   Shipment and receipt of samples shall be coordinated with the laboratory to insure holding times are not exceeded and to maintain samples at the proper temperature. Chain-of-Custody control shall be maintained from sampling through analysis to prevent tampering with analytical specimens. Chain-of-Custody forms shall be used to transfer direct deliveries from the sampler to the laboratory. A coded express delivery shipping bill shall constitute the Chain-of-Custody between the sampler and laboratory for overnight courier deliveries. Chain-of-Custody control procedures follow:

1. Chain-of-Custody shall originate at the laboratory with the shipment of prepared sample bottles and a sealed trip blank. Identical container kits shall be shipped by express carrier to the sampler or site or picked up at the laboratory in sealed coolers.

2. Upon receipt of the sample kit, the sampler shall inventory the container kit and check its consistency with number and types of containers indicated in the Chain-of-Custody forms and required for the sampling event.

3. Labels for individual sample containers shall be completed in the field, indicating the site, time of sampling, date of sampling, sample location/well number, and preservation methods used.

4. Collected specimens shall be placed in the iced coolers and shall remain in the continuous possession of the field technician until shipment or transferral via the Chain-of-Custody form. If the field technician cannot maintain continuous possession, the coolers shall be stored in a secured area.

5. Upon delivery to the laboratory, samples are logged in and the laboratory director or his designee shall sign the Chain-of-Custody control forms and formally receive the samples.

6. Copies of the complete Chain-of-Custody forms shall be placed in the laboratory's analytical project file and attached results of laboratory analysis report upon completion.

6.0 Field Logbook

The field technician shall keep an up-to-date logbook documenting important information pertaining to the technician's field activities. The field logbook shall document the following:

- Site Name and Location
- Date and Time of Sampling
- Climatic Conditions During Sampling Event
- Sampling Point/Well Identification Number
- Well Static Water Level
- Height of Water Column in Well
- Purged Water Volume and Well Yield (High or Low)
- Presence of Immiscible Layers and Detection Method
- Observations on Purging and Sampling Event
- Time of Sample Collection
- Temperature, pH, Turbidity, and Conductivity Readings
- Signature of Field Technician.

7.0 Laboratory Analysis

The ground and surface water parameters to be analyzed shall be those specified by DWM for detection monitoring purposes. These shall include field indicators of water quality (pH, conductivity, temperature and turbidity) and selected purgeable organic and metals constituents listed in RCRA Subtitle-D, Appendix I of 40 CFR 258, plus additiona parameters required by the Division of Waste Management per guidance effective as of January 1, 2007 (see Table 1). All analytical methods are taken from *Test Methods For Evaluating Solid Waste - Physical/Chemical Methods* (SW-846) or *Methods For the Chemical Analysis of Water and Wastes* and will be consistent with DWM's policies regarding analytical methods and Solid Waste3 Section Limits (SWSL's). Table 2 presents a summary of proposed analytical methods. **Analysis shall be performed by a laboratory certified by the North Carolina DENR for the analyzed parameters.**

Formal environmental laboratory Quality Assurance/Quality Control (QA/QC) procedures are to be utilized at all times. The owner/operator of the landfill is responsible for selecting a laboratory contractor and insuring that the laboratory is utilizing proper QA/QC procedures. The laboratory must have a QA/QC program based upon specific routine procedures outlined in a written laboratory Quality Assurance/Quality Control Manual. The QA/QC procedures listed in the manual shall provide the lab with the necessary assurances and documentation that accuracy and precision goals are achieved in all analytical determinations. Internal quality control checks shall be undertaken regularly by the lab to assess the precision and accuracy of analytical procedures. During the course of the analyses, quality control data and sample data shall be reviewed by the laboratory manager to identify questionable data and determine if the necessary QA/QC requirements are being followed. If a portion of the lab work is subcontracted, it is the responsibility of the contracted laboratory to verify that all subcontracted work is completed by certified laboratories, using identical QA/QC procedures.

8.0 Record Keeping and Reporting

8.1 Sampling Reports

Copies of all laboratory analytical data shall be forwarded the DWM within 45 calendar days of the sample collection date. In addition to the sampling results being submitted in Table format with a written report, the laboratory analytical data shall also be submitted electronically on the Solid Waste Section's **Electronic Data Template**. The submittal shall specify the date of sample collection, the sampling point identification, and a map of the sampling locations. Should significant concentrations of contaminants be detected in ground and surface water during monitoring (as defined in North Carolina Solid Waste Rules or Ground Water Quality Standards), the owner/operator shall notify the DWM and shall place a notice in the landfill records as to which constituents were detected.

8.2 Well Abandonment/Rehabilitation

Should wells become irreversibly damaged or require rehabilitation, the DWM shall be notified. If monitoring wells and/or piezometers are damaged irreversibly they shall be abandoned under the direction of the DWM. The abandonment procedure in unconsolidated materials shall consist of over-drilling and/or pulling the well casing and plugging the well with an impermeable, chemically-inert sealant such as neat cement grout and/or bentonite clay. For bedrock well completions the abandonment shall consist of plugging the interior well riser and screen with an impermeable neat cement grout and/or bentonite clay sealant. Piezometers in the waste footprint shall be abandoned by over drilling the boring and backfilling with a bentonite-cement grout. **All well abandonments shall be certified by a NC-licensed geologist or engineer.**

8.3 Additional Well Installations

All additional monitoring wells (new or replacement) shall be installed under the supervision of a qualified geologist or engineer who is registered in North Carolina and who shall certify to the DWM that the installation complies with the North Carolina Regulations. Upon installation of future wells the documentation for the construction of each well shall be submitted by the registered geologist or engineer within 30 days after well construction.

8.4 Implementation Schedule

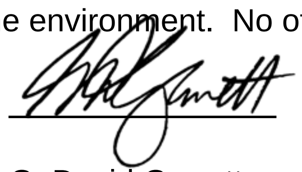
The Ground Water Quality Monitoring Program shall be implemented upon approval. Analyses shall be performed at a minimum on a semi-annual basis.

8.5 Modifications and Revisions

At some future time it may be appropriate to modify this plan, e.g. add or delete sampling locations or analytical parameters. Such changes may require approval from NCDENR Division of Waste Management, Solid Waste Section. Also, this plan will be amended as new Phases are developed. Refer to the revision section for the latest edition.

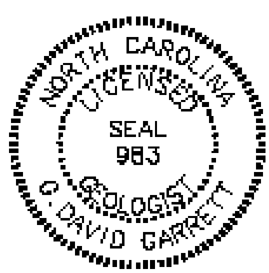
9.0 Certification

The water quality monitoring plan for this facility has been prepared by a qualified geologist who is licensed to practice in the State of North Carolina. The plan has been prepared based on first-hand knowledge of site conditions and familiarity with North Carolina solid waste rules and industry standard protocol. In accordance with North Carolina Solid Waste Regulations, this Water Quality Monitoring Plan should provide early detection of any release of hazardous constituents to the uppermost aquifer, so as to be protective of public health and the environment. No other warranties, expressed or implied, are made.

Signed 

Printed G. David Garrett

Date May 21, 2008



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

References to earlier versions of this plan include:

Water Quality Monitoring Plan
C&D Landfill, Inc., March 2001

Upon approval by NC DENR-Division of Waste Management, this plan will supercede all previous versions for the detection-phase monitoring of the CDLF.

10.0 Revisions

Rev 0.0	March 2001	Phase 1 Permit to Construct - review submittal
Rev 0.1	April 2, 2001	Phase 1 Permit to Construct - approved copy
Rev 0.2	Sept. 11, 2007	Replaced wells, added new DWM protocols
Rev 0.3	May 21, 2008	Phase 2 Permit to Construct - review submittal

TABLE 1A
Existing Monitoring Wells for Phase 1

Elevation Data				Test Boring Data								Piezometer Construction Data				
Boring	Boring	PVC Pipe	Ground	Drilling	Total	Yorktown Fm.		Castle Hayne Fm.		Beaufort Fm.		Top of Piez. Screen		Bot. of Piez. Screen		Stickup
Number	Date	Elev.	Elev.	Method	Depth, ft.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	ft.
MW-1d	10/12/2000	21.14	17.40	HSA	50.0	7.5	**9.9**	30.5	**-13.1**			40.0	**-22.6**	50.0	**-32.6**	3.74
MW-1s	5/6/2001	20.91	17.59	HSA	13.0							3.0	**14.6**	13.0	**4.6**	3.32
MW-2d	10/9/2000	21.80	17.97	Rotary	70.0	12.5	**5.5**	33.5	**-15.5**	61.5	**-43.5**	39.0	**-21.0**	49.0	**-31.0**	3.83
MW-2s	5/5/2001	21.44	18.45	HSA	13.0							3.0	**15.5**	13.0	**5.5**	2.99
MW-3d	10/12/2000	22.83	19.37	HSA	50.0	14.0	**5.4**	27.5	**-8.1**			40.0	**-20.6**	50.0	**-30.6**	3.46
MW-3s	8/6/2007	□	19.37	HSA	20.0	12.9	**6.5**					5.0	**14.4**	20.0	**-0.6**	□
MW-4	5/5/2001	18.42	14.83	HSA	13.0							3.0	**11.8**	13.0	**1.8**	3.59
MW-5	11/18/2002	17.90	14.80	HSA	18.0	18.4	**-3.6**					3.0	**11.8**	18.0	**-3.2**	3.10
MW-6	5/5/2001	20.03	16.87	HSA	13.0							3.0	**13.9**	13.0	**3.9**	3.16
MW-7	5/5/2001	19.40	16.03	HSA	13.0							3.0	**13.0**	13.0	**3.0**	3.37
MW-8	11/18/2002	21.21	18.30	HSA	18.0	17.6	**0.7**					3.0	**15.3**	18.0	**0.3**	2.91
MW-9d*	11/15/2002	22.88	19.88	HSA	39.0	16.5	**3.4**					33.0	**-13.1**	38.0	**-18.1**	3.00
MW-9s*	11/18/2002	22.95	19.91	HSA	18.5	16.5	**3.4**					3.0	**16.9**	18.0	**1.9**	3.04

Notes: *These wells were abandoned in August 2007 and replaced by activating existing MW-3d and installing MW-3s

TABLE 1B
Proposed Monitoring Wells for Phase 2

Elevation Data				Anticipated Conditions Based on Nearest Boring								Proposed Piezometer Construction Data				
Boring	Nearest	PVC Pipe	Ground	Drilling	Total	Yorktown Fm.		Castle Hayne Fm.		Beaufort Fm.		Top of Piez. Screen		Bot. of Piez. Screen		Stickup
Number	Boring**	Elev.	Elev.	Method	Depth, ft.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	Depth, ft.	Elev.	ft.
MW-9A	B-19	TBD	TBD	HSA	15.0	13.3	**3.4**					5.0	TBD	15.0	TBD	TBD
MW-10	B-24	TBD	TBD	HSA	15.0	13.3	**3.4**					5.0	TBD	15.0	TBD	TBD
MW-11	B-15s	TBD	TBD	HSA	15.0	15.5	**2.1**					5.0	TBD	15.0	TBD	TBD
MW-12	B-11	TBD	TBD	HSA	15.0	10.9	**4.3**					5.0	TBD	15.0	TBD	TBD
MW-13	B-12	TBD	TBD	HSA	20.0	17.9	**-1.2**					5.0	TBD	20.0	TBD	TBD
MW-14d	B-23d	TBD	TBD	HSA?	50.0	12.7	**1.8**	33.8	**-19.3**			40.0	TBD	50.0	TBD	TBD
MW-14s	B-23s	TBD	TBD	HSA	20.0	13.0	**0.9**					5.0	TBD	20.0	TBD	TBD
MW-15	B-16	TBD	TBD	HSA	15.0	8.1	**7.8**					5.0	TBD	15.0	TBD	TBD
MW-16	B-7	TBD	TBD	HSA	20.0	17.0	**1.3**					5.0	TBD	20.0	TBD	TBD

Notes: **Reference made to Phase 2 piezometers, installed ca. 2002 for the Design Hydro investigation

Convert B-23d and B-23s to MW-14d and MW-14s if possible

The upper Yorktown Formaton contains a marine silt-clay layer that comprises the upper confining unit

The upper Castle Hayne Formation contains a silty marine sand that comprises the deep aquifer

The upper Beaufort Formation contains a marine silt-clay layer that comprises a deep confining unit

TABLE 1C
Existing Surface Sampling Locations

Monitoring Location	Description of Monitoring Location
SW-1	Background on “south” stream at property line (northeast of Phase 1)
SW-2	Down gradient on “south” stream at property line (southeast of Phase 1)
SW-3	Down gradient on “north” drainage ditch (between Phases 1 and 2)

Table 2

Ground And Surface Water Analysis Methodology

C&D Landfill, Inc., Phases 1 and 2 CDLF Units
Permit No. 74-07, Pitt County, North Carolina

Inorganic Constituent	Required Solid Waste Section Limit (ug/l)*	North Carolina 2L** Ground Water Standard	
Antimony	6	1.4	***
Arsenic	10	50	
Barium	100	2000	
Beryllium	1	4	***
Cadmium	1	1.75	
Chromium	10	50	
Cobalt	10	2	***
Copper	10	1000	
Lead	10	15	
Nickel	50	100	
Selenium	10	50	
Silver	10	17.5	
Thallium	5.5	0.28	***
Vanadium	25	25	***
Zinc	10	1050	

New Field and Lab Parameters per 2007 rule changes:
Mercury
Chloride
Manganese
Sulfate
Iron
Alkalinity
Total Dissolved Solids
Specific Conductivity (field)
pH (field)
Temperature (field)
Turbidity (field)

<u>All samples shall be unfiltered</u>.

* Per North Carolina DENR Division of Waste Management guidelines, eff. 2006, equivalent to the PQL. Only SW-846 methodologies that are approved by the NC DENR Solid Waste Section shall be used for laboratory analyses. The laboratory must be certified by NC DENR for the specific lab methods.
** 15A NCAC 2L Standard for Class GA Ground Water – this applies unless otherwise noted (see below)

***North Carolina DWM Ground Water Protection Standard (quoted from site specific monitoring reports)

Table 2 (continued)

Ground And Surface Water Analysis Methodology

Organic Constituent	Required Solid Waste Section Limit (ug/l)*	North Carolina Ground Water Standard	
1,1,1,2-Tetrachloroethane	5	1.3	***
1,1,1-Trichloroethane	1	200	
1,1,2,2-Tetrachloroethane	1	0.17	
1,1,2-Trichloroethane	5	0.6	***
1,1-Dichloroethane	5	70	
1,1-Dichloroethylene	5	7	
1,2,3-Trichloropropane	1	0.005	
1,2-Dibromo-3-chloropropane	1	0.025	
1,2-Dibromoethane	1	0.0004	
1,2-Dichlorobenzene	5	24	
1,2-Dichloroethane	1	0.38	
1,2-Dichloropropane	1	0.51	
1,4-Dichlorobenzene	1	1.4	
2-Butanone	100	4200	
2-Hexanone	50	280	
4-Methyl-2-pentanone	100	560	***
Acetone	100	700	
Acrylonitrile	200		
Benzene	1	1	
Bromochloromethane	3	0.6	***
Bromodichloromethane	1	0.56	
Bromoform	4	4.43	
Bromomethane	10		
Carbon Disulfide	100	700	
Carbon Tetrachloride	1	0.269	
Chlorobenzene	3	50	
Chloroethane	10	2800	
Chloroform	5	70	
Chloromethane	1	2.6	
Cis-1,2-dichloroethylene	5	70	
Cis-1,3-dichloropropene	1	0.19	
Dibromochloromethane	1	0.41	
Dibromomethane	10		
Ethylbenzene	1	550	
Iodomethane	10		
Methylene chloride	1	4.6	
Styrene	1	100	
Tetrachloroethylene	1	0.7	
Toluene	1	1000	
Trans-1,2-dichloroethylene	5	100	

Table 2 (continued)

Ground And Surface Water Analysis Methodology

Organic Constituent	Required Solid Waste Section Limit (ug/l)*	North Carolina Ground Water Standard
Trans-1,3-dichloropropene	1	0.19
Trans-1,4-dichloro-2-butene	100	
Trichloroethylene	1	2.8
Trichloroflouromethane	1	2100
Vinyl acetate	50	88 ***
Vinyl chloride	1	0.015
Xylene (total)	4	530

Figure 1 – Type 3 Monitoring Well Construction Schematic (Lower Aquifer)

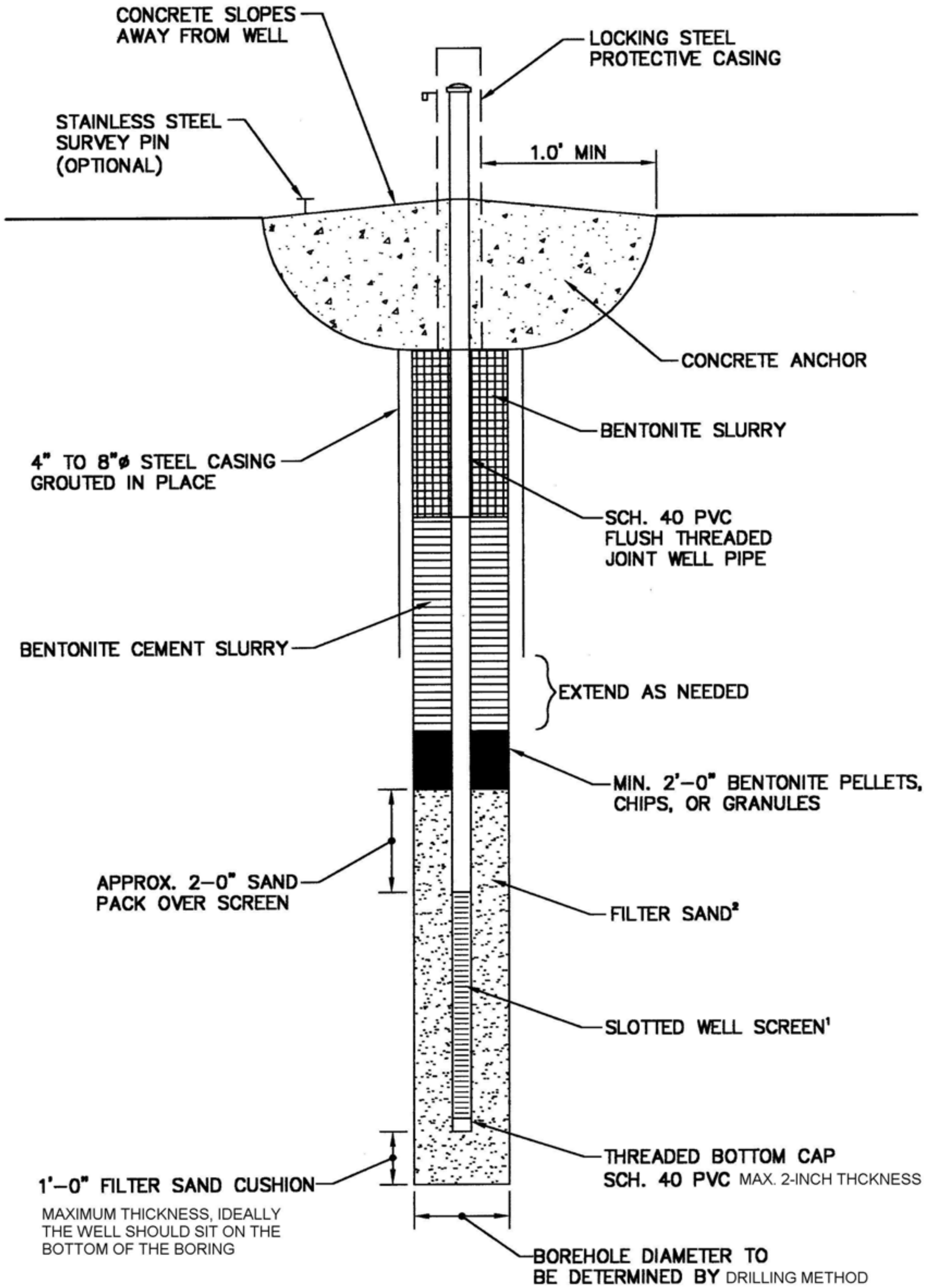
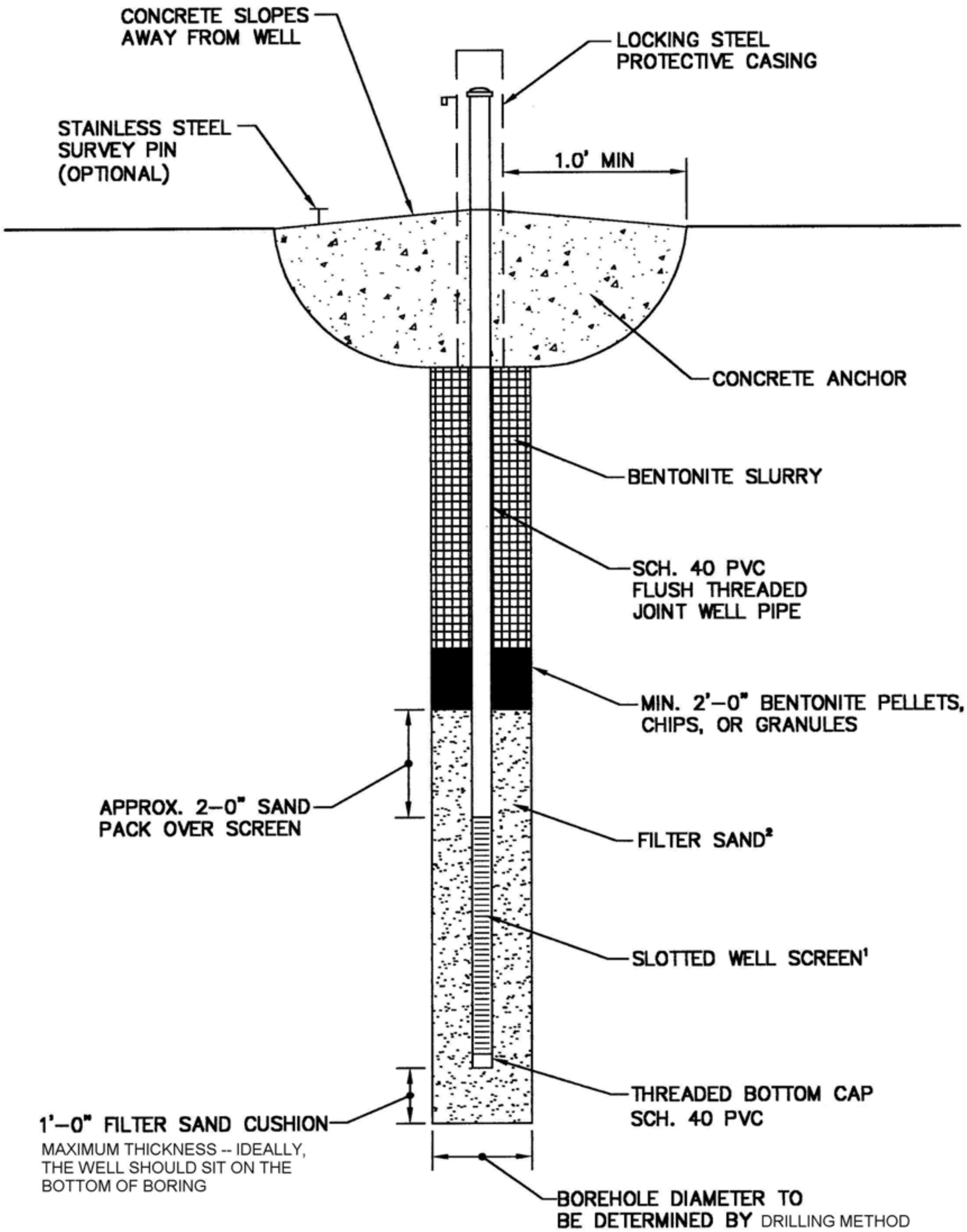
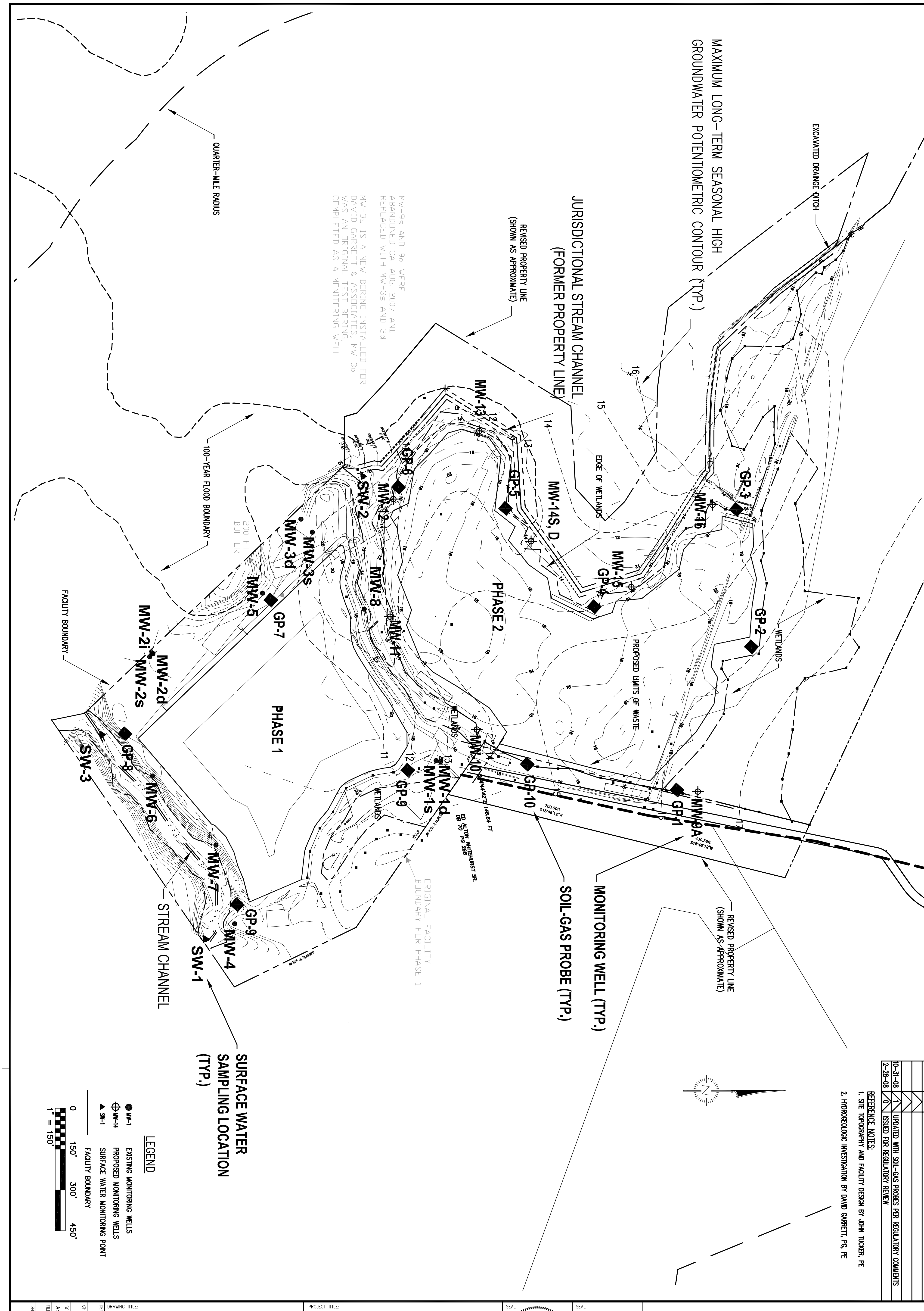


Figure 2 – Type 2 Monitoring Well Construction Schematic (Upper Aquifer)





SHEET NO. 16	DRAWING NO. MP1	FILE NAME: CDLF-2-WQMP
SCALE: AS SHOWN	DATE: FEBRUARY 2008	
CHECKED BY: J.A.T.	PROJECT NO. CDLF-2	
DESIGNED BY: G.D.G.	DRAWN BY: G.D.G.	

DRAWING TITLE:
FACILITY MONITORING PLAN AMENDMENTS (PHASE 2 APPLICATION)

PROJECT TITLE:
C&D LANDFILL, INC.
PITT COUNTY, NC
PERMIT TO CONSTRUCT
PERMIT #74-07

SEAL: NORTH CAROLINA LICENSED GEOLOGIST SEAL 983 G. DAVID GARRETT 3-17-09

SEAL

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REFER TO THE VOLUME1 TABLE OF CONTENTS FOR A GUIDE TO THE GEOLOGICAL ASPECTS OF THE FACILITY PLAN

TABLES *Refer to the in-text tables referenced by page number*

DRAWINGS *Refer to the rolled drawing set that accompanies this report*

APPENDICES – VOLUME 2

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

5.1 Engineering Report

This section of the report describes the physical aspects of the facility design, with emphasis on waste containment and environmental control systems, based on the hydrogeologic data discussed in **Section 4.0**. The design was prepared by a qualified Professional Engineer, who is licensed to practice in North Carolina and is familiar with the requirements of the North Carolina Division of Waste Management (Division) rules. The design of CDLF Phase 2 is set to provide approximately 9 years of capacity, in keeping with rules. Also, in keeping with the intent of the **2006 C&D Rules**, there is no liner or leachate collection system proposed for this facility since the site meets the rule requirements for soil types present within two feet below planned base grades, and there is at least 4 feet of vertical separation between the waste and seasonal high ground water and/or bedrock, (see **Rule .0540 (2)**). The planned base grades and outer slopes will have maximum slope ratios of 3H:1V, which have been demonstrated to be stable.

5.1.1 Analytical Methods

The facility design incorporates elements that are consistent with Division rules and guidelines, as well as sound engineering practice. Various analyses used in the design of the facility include evaluations of soil conditions, i.e., the consistency of subgrade soils and the availability of suitable soils for constructing stable embankments and other earthen structures (discussed below), and ground water characteristics, i.e., flow directions and seasonal water depth fluctuations (discussed in **Section 4.0**). Soil properties testing used to facilitate these evaluations included grain size analysis, shear strength, consolidation, and compaction characteristics (see **Appendix 5**). Stability and settlement of foundation soils were considered in setting base grades, as was outer slope stability for the final cover system (see **Appendix 7**). Other analyses included a detailed evaluation of S&EC and storm water management systems (see **Appendix 8**).

5.1.2 Identified Critical Conditions

Based on the nature of the soils within the Phase 2 footprint and the understanding of geologic conditions within the region (and the site), no inherent foundation stability or long-term settlement problems are anticipated. Some considerations that are both generic to landfills and specific to the on-site soils, learned through practical experience with the construction and operation of Phase 1, are discussed below.

- On-site soils are typically sandy, whereas fine grained soils that meet the soil-type requirements for the upper two (2) feet beneath the base grade elevations are available but often difficult to obtain in the region. Required soil types for the upper two (2) feet of base grades include SM, SC, ML, MH, CL, and CH. Borrow site selection and a field evaluation of the soils during construction (i.e., the CQA program, see Section 7) will be critical to assure the subgrade construction complies with the rule requirements.

- Soil compaction is dependent on both compaction effort (i.e., the right equipment) and working within the correct range of near-optimum moisture (**Section 5.2**).

- Properly compacted embankments are expected to be stable. Outer slope stability (relative to final cover) will also rely on adequate compaction and observation of proper slope ratios, due to the strength considerations.

- Another consideration is significant soil erosivity, which is counteracted with good cover construction practices and vegetative cover. The on-site soils have moderate field capacity and poor nutrient value, which may require additional effort to establish vegetation. These conditions pose operational considerations but require no special design accommodations.

5.1.3 Technical References

Calculations found in **Appendix 7** are referenced within the various analyses.

5.1.4 Location Restriction Demonstrations

The site was granted a Site Suitability determination in accordance with **15A NCAC 13B .0531** *et seq***.** based on work completed in 2003-04, i.e., the site characteristics were determined suitable for a C&D landfill. Relative to **Rule .0536** pertaining to C&D landfills, the site has no disqualifying conditions with respect to zoning, setbacks from residences or potable wells, historic or cultural sites, state or nature preserves, 100-year floodplains, wetlands (except as discussed in **Section 3.3.3**), water supply watersheds, or endangered species. Documentation pertaining to these site selection criteria is found in **Appendix II** in the October 2002 **Site Suitability Report**.

5.2 Construction Materials and Practices

Based on the Design Hydrogeologic investigation (see **Section 4.0**), on-site soils available for embankment and subgrade construction consist chiefly of variably silty sand (i.e., Unified Soil Classification System classifications of SM and SM-ML) with silty clay (CL) and clayey silt (ML). These soils meet the requirements for the upper two feet beneath the landfill subgrade referenced in **15A NCAC 13B .0540 (2)** (see **Section 6.0**). The soils exhibit adequate compaction characteristics and shear strength (when properly compacted) to build stable embankments and subgrades that will not undergo excessive settlement – subject to the caveats discussed in **Section 5.1.2** (see above). Some selective use of soils and/or field evaluation will be required to place the correct soil types within the upper two (2) beneath the subgrade elevations.

Good construction practices for embankments and subgrades include compaction using steel-wheel rollers, sheep foot rollers, and/or smooth-drum rollers of sufficient weight – not dozers – making a minimum numbers of passes (typically three to five passes) in two perpendicular directions in order to achieve the desired strength properties for stability. Past experience at the site indicates that material selection (i.e., avoiding soils that are excessively wet or exhibit excess organic debris content) and/or blending soils to negate the effects of wet or slick soils will produce satisfactory results. The targeted compaction criterion is 95% of standard Proctor maximum dry density (**ASTM D-698**). Critical embankment and subgrade areas should be tested to ensure proper compaction in accordance with the criteria outlined in the CQA Plan (**Section 7.0**).

5.3 Design Hydrogeologic Report

Refer to **Section 4.0** of this report.

5.4 Engineering Drawings

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

5.4.1 Existing Conditions

See **Drawings S1 – S5**.

5.4.2 Grading Plan

See **Drawing E1**.

5.4.3 Stormwater Segregation

See **Drawing E1** – while this rule requirement pertains to separation of stormwater runoff from leachate (i.e., a lined landfill), in order to reduce generated leachate volumes, good practices for water management include maintaining slopes with positive drainage (always directed toward approved stormwater control measures), facilitated by an orderly waste placement sequence, shown on this drawing.

5.4.4 Final Cap System

See **Drawing E2** for final contours and **Drawing EC2** for final cover cross-section and details.

5.4.5 Temporary and Permanent S&EC

See **Drawing E1** for temporary sedimentation and erosion control (S&EC) measures and **Drawing EC1** for permanent measures pertaining to the final cover. A separate S&EC plan has been submitted to the Pitt County Planning Department, which has delegated jurisdiction from the NC DENR Division of Land Quality. Minor design revisions to the S&EC plan, if any, resulting from the Pitt County review will be incorporated during construction and shown on "as-built" drawings for the Permit to Operate application.

5.4.6 Vertical Separation

See **Drawing E1** for base grades relative to ground water; also see cross section **Drawings X1 – X2**.

5.4.7 Other Features

This rule pertains to liners and leachate collection systems, if proposed (none are).

5.5 Specific Engineering Calculations and Results

Calculations for settlement and slope stability were performed using site specific data. The calculations can be found in **Appendix 7**, the geotechnical lab data are found in **Appendix 4**. The following is brief description of the analyses and results.

5.5.1 Settlement

Settlement is a concern at unlined landfills for maintaining vertical separation between the bottom of the waste (or base liner) and the maximum long-term seasonal high water table. Settlements of the foundation soils result from time-dependent strain, i.e., a change in thickness within the various soil layers due to the vertical stress (weight of the landfill) applied at the surface, accompanied by drainage of the various soil layers. Vertical stresses beneath landfills gradually increase as the waste becomes thicker over long periods of time; strain-induced settlements within sands and/or well drained silts and clays are relatively short-term, thus long-term settlements are not typically a concern unless thick uniform clay deposits are present (which tend to drain slowly) – such is not the case at the subject landfill.

Settlements were calculated using elastic methods adapted from the US Federal Highway Administration (FHWA) for highway embankments. Ostensibly, a landfill is a large flexible embankment with the highest stresses impinging on the foundation soils near the center. The FHWA settlement calculation is based on the work of Hough (1959) and others, which considers both the material type and overburden depth for determining a "correction factor" for standard penetration test (SPT) values, from which the compressibility and load-induced strain of each soil layer can be evaluated. For sandy soils conventional sampling via Shelby tubes and laboratory consolidation testing is infeasible. For clayey soils, representative Shelby tube samples were acquired and laboratory consolidation tests were performed (see **Section 4.1.4**), and the consolidation data were substituted into the calculations for appropriate soil layers.

A spreadsheet facilitates the settlement calculation (see **Appendix 7**). Initially, the vertical stress increase resulting from varying embankment heights was calculated using an average unit weight of 1000 pounds per cubic yard (37 pcf) and by applying a depth-related "influence factor" based on elastic stress distribution theory. Next a subsurface stress distribution was developed for original and post-construction (final height) conditions, based on the depth and average unit weight of the soil layers, plus the added vertical stresses. The SPT correction factor was applied to determine the compressibility factor and strain within each sand layer. For the clays, consolidation theory was applied to determine the strain in those layers, which was added to the strain in the sand layers to estimate total settlement under a given load. Time-dependent settlement was not considered due to the well drained conditions indicated by the subsurface data.

Assuming fairly uniform subsurface conditions within the footprint – as confirmed by the test borings – a representative subsurface profile was used to estimate the maximum settlements beneath the landfill (at the center), then successive calculations were made to evaluate areas within the footprint where lower stresses will occur, i.e., along side slopes. The variable settlement values were plotted on a map of the footprint (**Appendix 7**), from which it was confirmed that the base grade design, which provides 5 feet of vertical separation (not the minimum required 4 feet), is sufficient to accommodate the anticipated settlement while maintaining the required minimum vertical separation. Differential settlement within the footprint is not a concern. ***For this project, the maximum estimated settlement at the center of the landfill is 0.75 feet.***

5.5.2 Slope Stability

Two primary concerns exist for landfills with respect to slope stability: deep-seated or global stability involving a deep layer in the foundation or along the base of the landfill, which could potentially result in catastrophic slope failure, and veneer stability (sliding of the cover), which can expose the waste but is typically more of a maintenance issue relative to repairs in the event of a failure (veneer stability can also be catastrophic). Subsurface conditions identified at this site are relatively sandy (high strength soils) with interspersed this clay layers with sand seams that are expected to drain readily under the applied embankment loads – only "effective" stresses (i.e., drained conditions) were considered. The site is not earthquake prone, so liquefaction is not a concern. No extremely soft layers that would pose stability concerns were identified by the SPT testing, but the foundation is expected to undergo a strain-hardening strength increase as settlement occurs, i.e., the foundation soils will become even more stable with time.

5.5.2.1 Deep-seated stability – Limit-equilibrium methods, i.e., the STABL-5M model used for this project, evaluate the balance of forces driving a slide (weight of the porous material and contained water) against the forces resisting a slide (shear strength, expressed as cohesion and friction) along a theoretical failure surface, which can be either a circular surface or a series of intersecting planar surfaces. A "static" analysis considers just the weight of the materials and the shear strength (tie-back loads may be considered for reinforced embankments); a "dynamic" analysis might consider external loads, such as linear loads at the top of the embankment (i.e., traffic forces) or additional horizontal loads to represent earthquakes (expressed as a fraction of the normal gravity field, specific to the region of interest). In more advanced routines, the mass above the failure surface is divided into many slices, the driving and resisting forces for each of which are calculated and summed up. This "method of slices" expresses the balance of resisting forces and driving forces as a ratio, e.g., 1.5:1, or simply 1.5, which is the "safety factor." Ratios less than unity (safety factor <1) indicate unstable conditions.

Typical minimum safety factors for maintaining stable embankment conditions throughout the life of a project are 1.5 for static conditions, 1.2 for seismic conditions.

Shear strength inputs to the STABL-5M model were developed from the drilling and laboratory data (see **Section 4.1**). A circular failure surface was used with a Janbu method of slices analysis. A representative soil profile was developed from the drilling data. A side slope ratio of 3H:1V was modeled. The following table shows a summary of the soil strength input values for the representative cross section at the project site.

Soil Layer	Layer Thickness (feet)	Soil Layer Description	Saturated Unit Weight (pcf)	Drained Cohesion (psf)*	Drained Friction Angle (deg)
1	15	Sli. silty-clean sand N = 17	110	0	35
2	25	Silt-Clay N = 3 to 20	125	100	25
3	40	Silty sand N = 100	130	100	35
4	Undefined	Silt-clay N = 10	112	20	15
5	85	Waste	60	20	45

*Apparent cohesion for silty sands and waste is based on retrogression analysis from other projects (past experience). The water table was modeled at a depth of 5 feet below ground surface, i.e., the base of the waste, which reflects seasonal high conditions.

Based on the analysis presented in Appendix 7, the minimum safety factor for static conditions is 1.55; the minimum safety factor for seismic conditions (2%g) is 1.41.

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

A worse-case scenario involves little (or no) cohesion, as in a geotextile-geomembrane interface, and complete saturation of the soils overlying that interface. Good engineering practice requires a drainage layer (typically a synthetic geonet) whenever a flexible membrane barrier is used, e.g., an alternative final cover that might be considered. The regulatory minimum cover includes 18 inches of vegetative support soil overlying a compacted soil barrier. Given the soils available in the region, the upper 18 inches could include a high permeability sand layer near the base, but the compacted soil barrier (maximum 1×10^{-5} cm/sec permeability) may not be readily available. North Carolina Solid Waste regulations allow alternative final covers, subject to approval by the Solid Waste Section, but specific interface testing will be required to verify future designs.

Even when all natural soil covers are used, drainage is still important relative to veneer stability, so a final cover section should include higher permeability sand layer next to the barrier to prevent the soils above the barrier from becoming saturated. Assuming a regulatory minimum cover soil profile is used, the critical interface for veneer stability exists within a low-cohesion sand layer overlying the compacted soil barrier at full saturation on a 3H:1V slope. While a minimum cohesion could be assumed along the sand layer and the compacted soil barrier, the stresses near the base of the sand layer would control stability.

A veneer stability analysis (**Appendix 7**) adapted from Matasovic (1991) was performed to evaluate four conditions: static unsaturated and saturated conditions (with a required safety factor of 1.5) and seismic unsaturated and saturated conditions (with a safety factor of 1.1). For this site, the static (non-seismic) saturated case is the critical condition for design because of the higher required safety factor. The calculations start with the given slope geometry and saturation state, then for a given safety factor the required friction (with or without cohesion) is back-calculated to provide the desired safety factor.

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

5.5.3 Slope Ratios

Both the deep-seated stability analysis (Section 5.5.2) and the veneer stability analysis (Section 5.5.4) assumed a 3H:1V slope ratio. These analyses demonstrate that stability safety factors meet the minimum acceptable requirement of 1.5 for static (non-seismic) conditions. The use of 3H:1V slope ratios will result in stable slopes, providing that the drainage requirements are accommodated, and assuming proper vegetation maintenance.

5.5.4 Required Soil Volume Calculations

A soil volume analysis performed in part using AutoCAD Digital Terrain Model (DTM) methods is presented in Appendix 7. The following summary is revised for the slightly smaller airspace volume with the revised layout (see Section 3.3.3. The final cover soil volume is the same (assuming 36 inches of cover), as is the base grade fill volume, but the net airspace and intermediate cover have been adjusted. The analysis does not represent an actual earthwork balance, that is, the modest amount of soil cut is not factored into the volume of required borrow.

Total Airspace (includes 3' final cover thickness)	999,063 cy
Final Cover Required (23 ac. x 43,560 x 3' /27 x 1.1 x 1.15)	140,820 cy*
Net Airspace (total minus final cover)	858,243 cy
Intermediate Cover (assume 20% soil)	171,648 cy**
Base Fill Volume (fill depth varies up to 4 feet)	84,285 cy
Required Soil Balance (from adjacent borrow pit)	**396,753 cy**

*Use a slope factor of 1.1 (increases volume determined from plannimetric area) and a 15 percent shrinkage factor from borrow site to field placement (compaction)

**Available cover soils are sand, expect relatively high soil loss into voids

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

This section demonstrates compliance of the facility design for CDLF Phase 1A with the requirements of the **2006 C&D Rules, 15A NCAC 13B .0531 *et seq.*** Reference is made to the construction plan set and various appendices, in which the calculations are presented.

6.1 Horizontal Separation

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

6.1.1 Property Lines

The minimum setback to property lines is 200 feet (**Drawings E1 and E2**).

6.1.2 Residences and Wells

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

6.1.3 Surface Waters

The minimum setback to surface waters is 50 feet (**Drawings E1 and E2**).

6.1.4 Existing Landfill Units

The minimum setback to Phase 1 C&D landfill is 100 feet (**Drawing S3**). The Phases are separated by a small stream with associated wetlands – essentially these are separate disposal units for monitoring purposes. The planned expansion (Phase 2) is cross-gradient from Phase 1 relative to local and regional ground water flow. Phase 2 is not expected to impact either operations or monitoring of Phase 1, nor vice-versa.

6.2 Vertical Separation

6.2.1 Settlement

Maximum waste thicknesses are approximately 85 feet; the waste density is approximately 0.5 tons/cubic yard. Foundation soils are very medium stiff, normally consolidated silty sand, sandy silt and/or clayey sand and silt (all marine deposits). Settlement calculations (see **Appendix 7**) indicate maximum post-construction settlements on the order of 0.75 feet (9 inches), or less. Based on the grading plan (**Drawing E1)**, settlements of this magnitude will not decrease the vertical separation to less than 4 feet, nor will strains adversely affect the engineered subgrade. Discussion of the assumptions and procedures behind the calculations is presented in **Section 5.5**.

6.2.2 Soil Consistency

Based on the laboratory data (see **Section 4.1.4**), a majority of the on-site soils generally classify as silty sands (SM), silt (ML) or dual classify as sand-silt (SM-ML). A relatively small fraction of the near surface soils consist of low plasticity silty clay (CL), and there are minor high plasticity silty clay (MH-CH) soil types present. These soil types will be present either in-situ or within compacted subgrades, meeting the requirements of **Rule .0540 (2) (b)** for the upper two feet beneath the subgrade. No modification of the soils, i.e., admixtures, will be required to meet this rule requirement, but reworking to blend the soils to a more uniform consistency and proper compaction may be required to mitigate isolated pockets of highly granular soils. For new base grade fill sections, proper soil selection will be required. The soil types shall be documented in the CQA program.

6.3 Survey Control Benchmarks

A permanent benchmark has been established by Burgess Land Surveying, P.A., of Wilson, NC. The benchmark is tied into the North Carolina State Plan (NCSP) coordinate system. The NCSP coordinates of the benchmark are as follows:

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

6.4 Site Location Coordinates

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

N 35.3477,
E -81.9504.

6.5 Landfill Subgrade

6.5.1 Subgrade Inspection Requirement

The Owner/Operator shall have the Phase 2 subgrade inspected by a qualified engineer or geologist upon completion of the excavation, in accordance with **Rule .0534 (b)** and **Rule .0539**. Said inspection is required by the Division to verify that subgrade conditions are consistent with expected conditions based on the Design Hydrogeologic Report.

6.5.2 Division Notification

The Owner/Operator shall notify the Division at least 24 hours in advance of the subgrade inspection.

6.5.3 Vertical Separation Compliance

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

6.6 Special Engineering Features

This section of the rules generally pertains to liners and leachate collection systems, if any are present (none will be).

6.7 Sedimentation and Erosion Control

The sedimentation and erosion control structures described elsewhere in this report (see **Appendix 8**) have been designed to accommodate the 25-year, 24-hour storm event, per the North Carolina Sedimentation Pollution Control Law (**15A NCAC 04**). A separate plan has been prepared and submitted to the NC DENR Division of Land Resources, Land Quality Section, and is depicted in the construction plan set (see **Drawings E1 and EC3**). Existing sediment basins for Phase 1 shall be cleaned out and upgraded as needed; new sediment basins shall be constructed for Phase 2.

7.0 CONTRUCTION QUALITY ASSURANCE (15A NCAC 13B .0541)

7.1 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.

7.1.1 Definitions

7.1.1.1 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.

7.1.1.2 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 us not required to be) incorporated into the final CQA certification document at the Owner's discretion.

7.1.1.3 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 competed 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.

7.1.1.4 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.

7.1.2 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).

7.1.2.1 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.

7.1.2.2 Engineer – The Engineer (a.k.a. the "Engineer of Rcord") 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 7.3**. 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.

7.1.2.3 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.

7.1.2.4 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.

7.1.3 Control vs. Records Testing

7.1.3.1 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.

7.1.3.2 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.

7.1.4 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.

7.1.5 Miscellaneous

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

7.1.5.2 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 7D** at the end of this text contains a list of these procedures.

7.2 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.

7.2.1 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.

7.2.1.1 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.

7.2.1.2 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).

7.2.1.3 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.

7.2.1.4 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 7A**.

7.2.2 General Earthwork Construction

7.2.2.1 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.

7.2.2.2 Control Tests – The control tests, as shown on **Table 7A**, will be performed by the CQA Testing Firm prior to placement of additional compacted embankment.

7.2.2.3 Record Tests – The record tests, as shown on **Table 7A**, 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.

7.2.2.4 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. Recompaction of the failed area shall be performed and retested until the area meets or exceeds requirements outlined in the specifications.

7.2.2.5 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.

7.2.2.6 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.

7.2.3 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.

7.2.3.1 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 furnished 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. <u>High Density Polyethylene (HDPE) Pipe</u>

(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 7B**.

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 7C**.

E. Compacted Barrier Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Conduct material control tests in accordance with **Table 7C**.

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.

7.2.3.2 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.

7.2.3.3 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.

7.3 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.

7.3.1 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.

7.3.2 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.

7.3.3 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.

7.4 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.

7.4.1 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.

7.4.2 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.

7.4.3 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.

7.4.4 Documentation of Deficiencies

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

7.4.5 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.

7.5 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
7.0 Project Certification

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

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.

7.6 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.

7.7 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 7A
CQA TESTING SCHEDULE FOR GENERAL EARTHWORK

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
CONTROL TESTS:		
Consistency Evaluation	ASTM D 2488 (visual)[1]	Each Material
RECORD TESTS:		
Lift Thickness	Direct Measure	Each compacted lift
In-Place Density	ASTM D 2922[2]	20,000 ft^2 per lift
Moisture Content	ASTM D 3017[3]	20,000 ft^2 per lift
Subgrade Consistency within the upper 24 inches[4]	Visual	4 tests per acre
Subgrade Consistency within the upper 24 inches[4]	ASTM D 422 ASTM D 4138	1 test per acre

Notes:

1. To be performed by Contractor Superintendent, Engineer, or CQA Testing Firm. Direct measure shall be facilitated with hand auger borings.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device. ***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 7B
CQA TESTING SCHEDULE FOR DRAINAGE AND FINAL COVER SOIL

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

Notes:

1. A quarry certification is acceptable for aggregate from a commercial quarry. If a byproduct is used, i.e., crushed concrete aggregate, the gradation test frequency may be adjusted based on project specific conditions. The Engineer shall approve all materials and alternative test frequencies. ***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 7C
CQA TESTING SCHEDULE FOR FINAL COVER COMPACTED SOIL BARRIER

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

Notes:

1. Optionally use ASTM D6391. ***Maximum allowable soil permeability is 1 x 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 7D
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^3).
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.

8.0 OPERATION PLAN
(15A NCAC 13B .0542)

8.1 General Conditions

This Operations Plan was prepared for C&D Landfill, Inc., Phase 2 to provide landfill personnel with an understanding of relevant rules and how the Design Engineer assumed that the facility would be operated. While deviations from the operation plan outlined here may be acceptable, significant changes should be reviewed and approved by the Design Engineer and/or regulatory personnel.

8.1.1 Facility Description

The landfill entrance is located at 802 Recycling Lane, accessed from US 264. The scales and office are located near the front gate, which is the only means of accessing the site by the public. After crossing the scales, incoming loads are directed either to the Recycling Yard or to the working face of the C&D disposal unit (see **Drawing S3**).

8.1.2 Geographic Service Area

The current service area authorized by the Pitt County Commissioners includes a multi-county area (see **Section 3.3**). The facility receives C&D from commercial haulers, contractors, and private individuals. The recycling facility and MSW transfer station receive other wastes, which are segregated from the C&D and managed in separate areas. The operator will be responsible for knowing his customer base and waste stream characteristics, such that the approved service area is observed.

8.1.3 Hours of Operation

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

8.1.4 Personnel Training and Certification

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

8.1.5 Utilities

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

8.1.6 Equipment Requirements

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

8.1.7 Safety

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

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

8.2 CONTACT INFORMATION

8.2.1 Emergencies

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

A partial listing Emergency and other Useful Contacts, published on the NC DENR Division of Waste Management web site, is provided in **Appendix 9C**.

All correspondence and questions concerning the operation of the C&D Landfill should be directed to the appropriate County staff and/or State personnel listed below.

8.2.2 C&D Landfill, Inc. / EJE Recycling, Inc.

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

Tel 252-752-8274
Fax 252-752-9016

8.2.3 North Carolina Department of Environment and Natural Resources

Washington Regional Office
943 Washington Square Mall
Washington, NC 27889
Tel. 252/946-6481
Fax 252/975-3716

Division of Waste Management - Solid Waste Section

Eastern Regional Supervisor: Fayetteville Regional Office	Dennis Shackelford dennis.shackelford@ncmail.net	Tel. (910) 433-3300
Environmental Engineer: DWM Central Office	Donna Wilson donna.wilson@ncmail.net	Tel. (919) 508-8487
Waste Management Specialist: Washington Regional Office	Chuck Boyette charles.boyette@ncmail.net	Tel. (252) 946-6481
Waste Management Specialist: Washington Regional Office	Ben Barnes ben.barnes@ncmail.net	Tel. (252) 946-6481
Groundwater Hydrogeologist: DWM Central Office	Jaclynne Drummond jaclynne.drummond@ncmail.net	Tel. (919) 508-8500

Division of Land Resources - Land Quality Section

Regional Engineer: Washington Regional Office	Pat McClain, P.E pat.mcclain@ncmail.net	Tel. (252) 946-6481

Division of Water Quality - Water Quality Section - Storm Water Unit

Regional Engineer: Washington Regional Office	Alton Hodge, Supervisor alton.hodge@ncmail.net	Tel. (252) 946-6481

8.3 Facility Operation Documents

A copy of the approved Facility Plan and construction drawings must be kept on-site at all times. Periodically, the Owner/Operator shall note the location of the active working area on a copy of the drawing, noting areas that have come to final grade and are ready to be closed. The drawings show special waste areas (e.g., asbestos) and the locations of soil borrow and stockpile areas.

Other documents required to be kept on-site at all times include the Engineering Plan, the Permit to Construct, and Permit to Operate, and the Monitoring Plan.

8.4 Waste Acceptance Criteria

8.4.1 Permitted Wastes

C&D Landfill, Inc., shall only accept (for disposal) the following wastes generated within approved areas of service:

- Construction and Demolition Debris Waste: (Waste or debris from construction, remodeling, repair, or demolition operations on pavement or other structures);

- Land Clearing and Inert Debris Waste: (stumps, trees, limbs, brush, grass, concrete, brick, concrete block, uncontaminated soils and rock, untreated and unpainted wood, etc.);

- Other Wastes as approved by the NC DENR Solid Waste Section.

In addition, the special wastes, i.e., asbestos (see **Section 8.3.2**) may also be accepted at this facility. Municipal solid waste (MSW) will be routed to the on-site transfer station.

8.4.2 Asbestos

C&D Landfill, Inc., may dispose of asbestos within a designated area within the normal footprint, only if the asbestos has been processed, packaged and transported in accordance with State and Federal (40 CFR 61) regulations. Handling asbestos requires advance arrangements between the hauler and the landfill and special placement techniques (see (**Section 8.5.3.3**).

8.4.4 Wastewater Treatment Sludge

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

8.5 Waste Exclusions

No municipal solid waste (MSW), hazardous waste as defined by 15A NCAC 13A .0102, or hazardous waste from conditionally exempt small quantity generators (CESQG waste), or liquid waste will be accepted. No drums or industrial wastes shall be accepted. No tires, batteries, polychlorinated biphenyl (PCB), electronic devices (computer monitors), medical wastes, radioactive wastes, septage, white goods, yard trash, fluorescent lamps, mercury switches, lead roofing materials, transformers, of CCA treated wood shall be disposed. No pulverized or shredded C&D wastes may be accepted.

The Facility will implement a waste-screening program, described in **Section 8.6** below, to control these types of waste. The reader is directed to **Solid Waste Rule .0542 (e)** for further exclusions.

8.6 Waste Handling Procedures

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

8.6.1 Waste Receiving and Inspection

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

Signs informing users of the acceptable and unacceptable types of waste shall be posted at the entrance near the scale house. The attendant shall visually check the vehicle as it crosses the scale. A camera mounted over the scales may facilitate this activity. Any suspicious loads will be pulled aside for a more detailed inspection prior to leaving the scale house area. Loads with unacceptable materials will be required to be recovered (with a tarp) and turned away from the facility. Wastes generated from outside of the service area will be turned away. Once passing the scales, the vehicles containing C&D wastes are routed to the working face. **Vehicles shall be selected for random screening a minimum of three times per week.** The selection of vehicles for screening might be based on unfamiliarity with the vehicle/driver or based on the driver’s responses to interrogation about the load content.

Selected vehicles shall be directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded and the waste shall be carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill shall inspect the waste discharged at the screening site. The Operator shall use the **Waste Screening Form** (see **Appendix 9B**) to document the waste screening activities. If no unacceptable waste is found, the load will be pushed to the working face and incorporated into the daily waste cell.

- If unacceptable waste is found, including, the load will be isolated and secured via soil berms, barricades or cordons. Unacceptable wastes that are non-hazardous will be removed from the C&D area and reloaded onto the delivery vehicle for removal from the facility.

- For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 8.6.3** will be followed.

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

8.6.2 Disposal of Rejected Wastes

Attempts will be made to inspect waste as soon as it arrives in order to identify the waste hauler; ideally, the hauler can be stopped from leaving the site and the rejected materials reloaded onto the delivery vehicle. Non-allowed materials that are found in the waste during sorting or placement, i.e., after the delivery vehicle has left the site, shall be taken to the on-site Transfer Station.

The Operator shall be responsible for removing any garbage (i.e., food containers), "black bags" or any prohibited wastes that are found in the waste stream, whether during a waste screening inspection or on the working face. Non-authorized materials discovered in the waste stream shall be isolated (e.g., in a dedicated, covered roll-off box) and taken to the nearby Transfer Station at the earliest practical time, no less frequently than once per week.

8.6.3 Waste Disposal Procedures

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

8.6.3.2 General Procedures – Waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, a limited number of vehicles will be allowed on the working face at a time. The working face superintendent and/or equipment operator(s) will serve as 'spotters' to maintain orderly disposal operations and to minimize the potential of unloading unacceptable waste and to control disposal activity. ***The working face shall be kept to a maximum area of one-half acre at all times.***

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

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

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and length of the working face will be maintained as small as practical in order to maintain the appearance of the site, control windblown waste, and minimize the amount of required periodic cover.

Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either periodic or final cover, as appropriate. The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e., 5H: IV max.) using a minimum number of three full passes. Depending on the nature of the wastes and long-term volume analysis of in-situ density, the waste placement geometry and compaction procedures may require adjustment to optimize airspace.

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

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

8.7 Cover Material

8.7.1 Periodic Cover

At the completion of waste placement each week or sooner if the area of exposed waste exceeds ***one-half acre*** in size, a 6 inch layer of earthen material will be placed over the exposed waste. This periodic cover is intended to control vectors, fire, odors, and blowing debris. Alternative periodic cover may consist of ground LCID, WWTP sludge (with permission from the Division) and/or other non-C&D waste materials, wood ash. Any alternative cover proposed for the facility will require prior approval from the Solid Waste Section before implementing. Additional documentation of Alternative Cover Material use (e.g., when, where and how much) shall be required.

8.7.2 Final Cover

Exterior slopes shall be closed upon reaching final grades in increments throughout the operation of the facility. The permitted final cover for Phase 2 consists of a minimum of 18 inches of compacted soil cover (minimum 10^{-5} cm/sec permeability requirement), overlain by 18 inches of vegetation support soil. An interim soil cover (at least 12 inches in thickness) may be placed on exterior slopes that have attained final grade and left for no more than 20 days without temporary vegetation, until an area of approximately 2 to 3 acres is ready to be closed simultaneously. Alternative final cover designs are allowed by the 2006 C&D rules. Future consideration may be given to alternative covers, in the interest of meeting the permeability requirements for the compacted soil barrier. All future alternative final cover designs shall be submitted for review by the Division.

All final soil cover shall be spread in at least two uniform lifts (maximum of 12 inches before compaction), and all soils shall be compacted by "tracking" with dozers or other equipment. All disturbed soils shall be vegetated with a seed mix that is suitable to climatic conditions (see construction plans) within 20 days following completion of the grading. All seeded areas should be provided with lime, fertilizer and straw mulch. An emulsified tack may be required to prevent wind damage. Other stabilization treatments, e.g., curled wood matting of synthetic slope stabilization blankets may be employed.

Wood mulch may be spread evenly over the final cover surfaces at a maximum thickness of 1 to 2 inches to provide nutrient and for temporary erosion control. This practice does not alleviate the Operator's responsibility for establishing vegetative cover, but the mulch does constitute temporary ground cover in accordance with NC DENR DLQ regulations until vegetation emerges. All final surfaces shall be planted and mulched within 20 days following completion of earthwork, per DLQ regulations. Depending on prevailing moisture conditions at the time of seeding, slopes may require reseeding at more optimal times of the year. The operator shall ensure that all protective measures are functioning prior to placing soil on exterior slopes.

If settlement or erosion occurs after the cover is placed, the cover shall be fortified with additional soil to re-establish grades, followed by revegetation. In the case of extreme settlement (unlikely), the old cover can be stripped and the affected area built up with waste or soil prior to replacing the cover. Long-term post-closure maintenance is phased in incrementally, as such, final cover maintenance (erosion repair, reseeding as needed). The sedimentation and erosion control criteria that govern the final closure (final reclamation) of this facility are performance-based; some trial and error may be required, but the goal is to protect the adjacent water bodies and buffers throughout the operational and post-closure periods.

8.8 Contingency Plan

8.8.1 Unacceptable Waste Contingency

8.8.1.1 Hot Loads Contingency Plan – In the event of a "hot" load attempting to enter the landfill, the scale house staff will turn away all trucks containing waste that is suspected to be hot, unless there is imminent danger to the driver. The vehicle will be isolated away from structures and other traffic and the fire department will be called. The vehicle will not be allowed to unload until the fire is out. If a hot load is detected on the working face, then the load will be treated as a fire condition (see **Section 8.9.2**), whereas the load will be spread as thin as possible and cover soil will be immediately placed on the waste to extinguish the fire. Other traffic will be redirected to another tipping area (away from the fire), or other waste deliveries may be suspended until the fire is out. The fire will be monitored to ensure it does not spread. If the fire cannot be controlled, the fire department will be notified and the area cleared of non-essential personnel.

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

Staff will act prudently to protect personnel but no attempt will be made to remove the material until trained personnel arrive. A partial listing of Emergency and Other Useful Contacts is found in **Appendix 9C**. The Owner/Operator is encouraged to compile a list of regional **Hazardous Waste Responders** and disposal firms – these are available on the **NC Division of Waste Management** Hazardous Waste Section web site – and keep it handy in the event of an incident. These firms have the training and equipment to deal with hazardous materials, as needed.

The Operator will notify the Division (see **Section 8.2.3**) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, attempts will be made to prevent that vehicle from leaving the site until it is identified (license tag, truck number driver and/or company information) or, if the vehicle leaves the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

The landfill staff will assist the Division as necessary and appropriate in the removal and disposition of the hazardous waste (acting under qualified supervision) and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with on-site soils, tarps, or other covering until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps hazardous waste in the landfill may be barred from using the landfill or reported to law enforcement authorities. Any hazardous waste found at the scales or in the landfill that requires mitigation under this plan shall be documented by staff using the **Waste Screening Form** provided in **Appendix 9B**. Records of information gathered as part of the waste screening programs will be maintained throughout the operational life of the facility.

8.8.2 Severe Weather Contingency

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

8.8.2.1 Ice Storms – In the event that an ice storm hinders access or prevents safe equipment movement or placement of periodic cover, landfill operations shall be suspended until the ice is removed or has melted and access routes are passable.

8.8.2.2 Heavy Rains – Exposed soil surfaces can create a muddy situation in some portions of the landfill during rainy periods. The control of drainage and use of crushed stone (or recycled aggregates) on unpaved roads should provide all-weather access for the site and promote drainage away from critical areas. In areas where the aggregate surface is washed away or otherwise damaged, aggregate should be replaced. Intense rains can affect newly constructed drainage structures such as swales, diversions, cover soils, and vegetation. After such a rain event, inspection by landfill personnel will be initiated and corrective measures taken to repair any damage found before the next rainfall.

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

8.8.2.4 Windy Conditions – High winds can create windblown wastes, typically paper and plastic, but larger objects have been known to blow in extreme circumstances. Operations should be suspended if blowing debris becomes a danger to staff, after the working face is secured. The proposed operational sequence minimizes the occurrence of unsheltered operations relative to prevailing winds. If this is not adequate during a particularly windy period, work will be temporarily shifted to a more sheltered area.

When this is done, the previously exposed face will be immediately covered with daily cover. Soil cover shall be applied whenever windblown wastes become a problem. Staff shall patrol the perimeter of the landfill periodically, especially on windy days, to remove windblown litter from tress and adjacent areas. Windscreens of various sorts have been used with mixed success at other facilities in the region. Good planning is essential on the operator's part to be prepared for windy conditions.

8.8.2.5 Violent Storms – In the event of a hurricane, tornado, or severe winter storm warning issued by the National Weather Service, landfill operations should be suspended until the warning is lifted. If safe to do so, exposed waste shall be covered and buildings and equipment shall be secured – if eminent danger to staff is present, personal safety shall take precedence over concerns regarding the waste or equipment.

8.9 Spreading and Compaction of Waste

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

8.10 Vector Control

Steps shall be employed to minimize the risk of disease carrying vectors associated with the landfill (e.g., birds, rodents, dogs, mosquitoes). The C&D wastes should be mostly inert and not attractive to animals. Putrescible wasters shall not be allowed; care shall be taken to keep the waste covered in case undetected putrescible wastes are inadvertently admitted. Pools of standing water shall be avoided in and around the disposal area.

8.11 Air Quality Criteria and Fire Control

8.11.1 State Implementation Plan

A demonstration of compliance with the State Implementation Plan (SIP) for air quality under Section 110 of the Clean Air Act is required by the 2006 Solid Waste Rules. Typically, the SIP focuses on industries that require air permits and activities that have regulated emissions that contribute to unhealthy levels of ozone (NOx , SO_4, VOC's), particularly coal combustion (electric power plants) and other "smokestack" industries. Compliance with the spirit of the SIP is demonstrated by the prohibition of combustion of solid waste, the fact that the wastes are generally inert and do not emit sufficient quantities of landfill gas to require active controls (such as flaring), and the current status of the regional attainment. The facility is not currently located in a designated area of non-attainment for ozone and/or fine particle emissions (e.g., VOC's, NOx), designation based on NCDENR Division of Air Quality (DAQ) web site information.

However, on January 20, 2009 the DAQ held a public meeting in Greenville to discuss the possibility of Pitt County being designated as a non-attainment area for ozone. Based on information presented at that meeting, it does not appear that a non-attainment designation would affect existing facilities (more impact might be expected on future industrial location in the region), and the three-year data that lead to this consideration is barely above the US-EPA's current threshold for attainment. State-wide, ozone monitoring data show general improvement since the implementation of the "clean smokestacks" legislation within the last five years, and if the next few months show continued improvement, US-EPA may not impose the non-attainment designation. [1] This leads to a conclusion that the facility is not contributing to an existing non-attainment condition in the local area, nor is it likely to in the future.

Nonetheless, proactive steps that can be taken at the facility include dust control measures (see below) to minimize airborne particle emissions, minimizing the idling time on trucks and equipment, keeping mechanized equipment in good operating condition, and the use of low-sulfur fuels, subject to availability. Adherence to the waste acceptance criteria will minimize VOC emissions. Regular application of periodic cover (in accordance with Solid Waste regulations) will reduce the risk of fires and curtail wind-blown debris; the proper use of vegetative cover will further minimize fugitive emissions of dust and particulates.

8.11.2 Dust Control Air Quality Criteria

Measures shall be taken to control dust from the operations. Dusty wastes shall be covered immediately with soil, and water shall be sprinkled on roads and other exposed surfaces (including operational cover and/or the working face, as needed) to control dust. Disposal activities may need to be suspended during high winds (see **Section 8.8.3.4**).

8.11.3 Fire Control

The possibility of fire within the landfill or a piece of equipment must be anticipated in the daily operation of the landfill. A combination of factory installed fire suppression systems and/or portable fire extinguishers shall be operational on all heavy pieces of equipment at all times. Brush fires of within the waste may be smothered with soil, if combating the fire poses no danger to the staff. The use of water to combat the fire is allowable, but soil is preferable. For larger or more serious fire outbreaks, the local fire department will respond. In the event of any size fire at the facility, the Owner shall contact NC DENR Division Waste Management personnel immediately and complete a **Fire Notification Form** (**Appendix 9D**), which will be placed in the Operating Record.

8.12 Access and Safety

8.12.1 Access Control

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

[1] Tom Mather, Public Information Officer, NC DENR DAQ, personal communication (2-12-09)

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

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

8.12.1.1 Physical Restraints – The site will be accessed by the existing entrance along Laurel Hill Drive. Scales and a scale house are provided near the entrance. All waste will be weighed prior to being placed in the landfill. The entrance gates will be securely locked during non-operating hours.

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

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

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

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

8.12.2 Signage

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

8.12.3 Communications

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

8.13 Sedimentation and Erosion Control

Measures depicted in the approved S&EC plan (see construction plans) shall be installed and maintained throughout the operational life of the facility and into the post-closure period (see Section 9.0). Measures to curtail erosion include vegetative cover and woody mulch as ground cover. Measures to control sedimentation include stone check dams in surface ditches, sediment traps and basins. The key to compliance with Sedimentation and Erosion Control rules is vegetative cover. A rule of thumb is that all exposed soils, regardless of whether they are inside or outside the disposal area, should be covered as soon as possible, not to exceed 20 days after any given area is brought to final grade.

8.14 Drainage Control and Water Protection

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

8.15 Survey for Compliance

8.15.1 Height Monitoring

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

8.15.2 Annual Survey

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

8.16 Operating Record and Recordkeeping

The following related to the C&D landfill shall be maintained in an operating record:

- A Waste inspection records (on designated forms); fire notification forms, as needed;
- B Daily tonnage records - including source of generation;
- C Records of periodic and final cover placement;

D Audit records and regulatory compliance inspection reports;

E Quantity, location of disposal, generator, and special handling procedures employed for all special wastes disposed of at the site;

F List of generators and haulers that have attempted to dispose of restricted wastes;

G Employee training procedures and records of training completed;

H All ground water quality monitoring and surface water quality information including:

1. Monitoring well construction records;
2. Sampling dates and results;
3. Statistical analyses; and
4. Results of inspections, repairs, etc.

I All closure and post-closure information, where applicable, including:

1. Testing;
2. Certification; and
3. Completion records.

J Cost estimates for financial assurance documentation.

K Annual topographic survey of the active disposal phase intended to determine volume consumption.

L Records of operational problems or repairs needed at the facility, e.g., slope maintenance, upkeep of SE&C measures, other structures (excluding equipment)

M Daily rainfall records (via on-site rain gauge).

The Owner or his designee will keep the operating record up to date. Daily logbooks may be used for some items. Records shall be presented upon request to DWM for inspection. A copy of this Operations Manual shall be kept at the landfill and will be available for use at all times.

8.17 ANNUAL REPORTING

Reporting requirements for the C&D Landfill include a summary of waste intake by type and tonnage, and disposal practice. The Division requires an **Annual Report** be submitted, detailing the waste intake in tonnage. New rules for C&D landfills require an annual survey to determine slope, height, and volume (see **Section 8.13**). The reporting requirements include a map prepared by a licensed surveyor.

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

9.1 Summary of Regulatory Requirements

9.1.1 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 x 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.

9.1.2 Construction Requirements

Final cap installation shall conform to the approved plans (see accompanying plan set), inclusive of the approved Sedimentation and Erosion Control Plan (see **Section 6.7** and **Appendix 8**). The CQA plan must be followed (see **Section 7.0**) 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.

9.1.3 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 x 10^{-5} cm/sec, as supported by the laboratory data for the soils discussed in **Section 4.0**. 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.

9.1.4 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.

9.1.5 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 late that 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.

9.1.6 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.

9.2 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.

9.2.1 Final Cap Installation

9.2.1.1 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.

9.2.1.2 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.

9.2.1.3 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 x 10^{-5} cm/sec,

  overlain by

- An 18-inch thick "topsoil" or vegetated surface layer (VSL),
  i.e., the "erosion layer."

9.2.1.4 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 7.0**). 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 x 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 7.0**). 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.

9.2.1.5 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.

9.2.1.6 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.

9.2.1.7 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 pacing 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.

9.2.1.8 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 9B**.

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 9B**).

9.2.2 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 (**Appendix 3**), the combined volumes of Phase 1 and Phase 2A is 1,119,800 cubic yards (see **Section 1.3**).

9.2.3 Closure Schedule

Refer to the requirements outlined in **Section 9.1.5** (above). Phase 1 is nearing the end of its capacity and will be closed within 180 days of the opening of Phase 2A.

9.2.4 Closure Cost Estimate

The foregoing cost estimate is considered suitable for the **Financial Assurance** requirements (see **Section 11.0)**.

TABLE 9A
ESTIMATED FINAL CLOSURE COSTS FOR PHASES 1 and 2A (2009 dollars) [1]

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

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 1×10^{-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

9.3 Post-Closure Plan

9.3.1 Monitoring and Maintenance

9.3.1.1 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.

9.3.1.2 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).

9.3.1.3 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.

9.3.1.4 Ground Water Monitoring – Groundwater monitoring will be conducted under the current version of the approved Sampling and Analysis Plan (see **Section 10.2**). 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.

9.3.1.5 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.

9.3.1.6 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 9B
POST-CLOSURE MONITORING AND MAINTENANCE SCHEDULE

Activity	Frequency Yrs. 1 - 5	Frequency Yrs. 6-15	Frequency Yrs. 16-30
General - Inspect access gates, locks, fences, signs, site security	Quarterly	Quarterly	Quarterly
Maintain access roads, monitoring well access	As needed	As needed	As needed
Final Cover Systems/Stability - Inspect cap and slope cover for erosion, sloughing, bare spots in vegetation, make corrections as needed (1)	Quarterly	Semi-Annually	Annually
Storm Water/Erosion Control Systems - Inspect drainage swales, 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

9.3.2 Responsible Party Contact

C&D Landfill, Inc.
Mr. Judson Whitehurst, Owner
Mr. Wayne Bell, General Manager
C&D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 27834 Tel 252-752-8274
Fax 252-752-9016

9.3.3 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.

9.3.4 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 11.0)**.

TABLE 9C
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
	Total Estimated Annual Cost				**$41,450.00**

*Appendix I Detection Monitoring (**Section 10.0**)

10.0 MONITORING PLAN (15A NCAC 13B .0544)

10.1 Summary of Regulatory Requirements

C&D landfills must implement a detection phase monitoring program for ground water and surface water. Normally, this includes an up gradient background well and several down gradient (or cross gradient) compliance wells, along with several strategically placed surface water sampling locations (with up gradient and down gradient coverage). The placement of the wells is to be based on the hydraulic and topographic characteristics of the site, determined in the site investigations (see Section 4.0). Compliance wells are placed at a "review boundary" located approximately half the distance to the "compliance boundary," which is normally established 50 feet inside the facility boundary, or 150 feet from the waste boundary at a C&D landfill.

Detection phase monitoring for all landfills includes semi-annual sampling and analysis for ensuring compliance with North Carolina ground water standards, i.e., **15A NCAC 2L .0300** (the "2L rules"). The detection phase sampling list includes organic constituents on the Appendix 1 list [2] (i.e., volatiles and semi-volatiles that are analyzed by US-EPA Method 8260 and the eight RCRA metals), key indicator parameters (measured in the field), and – new for the **2006 C&D Rules** – several additional constituents (mercury, manganese, sulfate, iron, alkalinity, and total dissolved solids). Assuming no detects of ground water constituents that exceed a 2L standard, the term of detection phase monitoring runs for the operational life of the facility plus the post-closure period (minimum of 30 years beyond closure). Should one or more detected constituents exceed a 2L standard, the facility must undergo an expanded assessment monitoring program to determine the source, extent, and rate of contaminant migration, plus an evaluation of potential human receptors and/or other environmental impacts.

The **Sampling and Analysis Plan** (discussed below and found within **Appendix 6**), considers both present and anticipated future needs of the assessment monitoring program, with respect to surface water sampling and strategic placement of monitoring wells, but the program described herein stands alone for detection phase monitoring for the C&D landfill.

10.2 Ground Water Monitoring

The following discusses the rationale behind planned amendments to the detection phase monitoring program for the C&D landfill, reflected in the **Sampling and Analysis Plan** (see **Appendix 6**). The format of the SAP is consistent with that used for numerous Division-accepted landfill monitoring programs.

10.2.1 Monitoring System Requirements

The Design Hydrogeologic studies (see **Section 4.2**) indicate a radial ground water flow pattern toward the south, southwest, and southeast. This flow pattern reflects surface

[2] 40 CFR Part 258

topography along a gentle ridge, surrounded on three sides by surface streams (i.e., ground water receptors). Based on site topography and hydrogeologic conditions, predominant ground water flow direction to the south (toward Grindle Creek), with loose to medium dense sandy surficial soils serving as the uppermost (unconfined) aquifer (**Unit 1**), which exists above a variably thick, clayey partial confining layer **(Unit 2**). A deeper, regional (confined) aquifer (**Unit 3**) exists beneath the partial confining unit, exhibiting a pronounced upward vertical gradient beneath much of the site.

The placement of wells for the CDLF should focus on the upper sand layer (**Unit 1**), keeping in mind that the regional discharge point (Grindle Creek) is off-site, separated by a distance of several hundred feet. The interstitial land is old-family farm land is not likely to be developed. Regional municipal water is typically supplied to residences and other consumers throughout the area. However, the distance to the off-site ground water discharge point was considered in determining an appropriate monitoring well spacing in the original studies for Phase 1. An advection-dispersion calculation was made to determine a well spacing around the landfill perimeter that would likely intercept a release of contaminants from the landfill.

Applying these principles to the similar geologic conditions at Phase 2, a well spacing of approximately 300 to 400 feet appears appropriate. Please refer to **Section 4.2.1.3** (**Volume 1**) for a discussion of new well depths and screen intervals and refer to the **Sampling and Analysis Plan** (**Appendix 6**) for detailed discussion of sampling and analysis protocols. New wells are shown on Drawing MP-1.

10.2.2 Background Water Quality

Low concentrations of metals also have been detected on occasion at the facility background well, MW-2, including cadmium, lead, and zinc (see **Section 4.1.12**).

10.2.3 Point of Compliance Water Quality

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

10.2.4 Sampling and Analysis Procedures

Industry accepted protocols (also consistent with Division guidelines)[3] are discussed in the **Sampling and Analysis Plan** (see **Appendix 6**).

10.2.5 Detection-phase Monitoring Parameters

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

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[3] NC DENR Division of Waste Management Guidance Document, Ground Water Sampling for Construction and Demolition, Closed or Industrial Landfills, http://www.wastenotnc.org/swhome/enviro_monitoring.asp

10.2.6 Sampling Frequency

The detection phase sampling frequency shall be semi-annually.

10.2.7 Water Level Elevations

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

10.2.8 Reporting

Data analysis and reporting, consistent with Division requirements, are described in the **Sampling and Analysis Plan** (see **Appendix 6**).

10.2.9 Source Demonstration

In the event of the detection of a ground water constituent that exceeds a 2L standard, an evaluation may be made in accordance with Division policy to determine the source, e.g., sampling error, laboratory contamination, extenuating circumstances (improper repairs to a well or incidental spill near a well). Typically, such evaluations are accompanied by re-sampling and, if appropriate, correction of conditions that may have lead to the detection. If such demonstrations cannot be made, the landfill might be considered as the source.

10.2.10 Monitoring Well Design

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

10.2.11 Monitoring Well Layout

The layout takes advantage of topographic features, the shape of the top of the confining unit (as indication of buried former channels), regional flow conditions and access considerations within the generally flat terrain.

10.2.12 Alternative Monitoring Systems

None are proposed at this time.

10.2.13 Assessment Monitoring

Requirements of assessment monitoring, if required, are outlined in **Rule .0545** of the **2006 C&D Rules**. If such conditions exist in the future at the CDLF that requires assessment monitoring, a plan will be prepared for review by the Division. It is not anticipated at this time that future assessment activities will be required.

10.3 Surface Water Monitoring

Surface water monitoring should (and does) focus on the unnamed tributaries shown to be shallow ground water discharge features to the east, west, and south of the Phase 2 footprint. An existing surface sampling location between Phases 1 and 2 (SW-2), shown on **Drawing MP-1**, is sufficient to monitor both CDLF units. The streams that converge near SW-2 emanate adjacent to the Phase 2 footprint – on both sides – and do not present upgradient monitoring opportunities. Actually, this is an ideal monitoring condition, whereas all the surface water monitored in the stream at SW-2 originates on-site.

10.4 Landfill Gas Monitoring and Control Plan

Landfill gas is a by-product from the decomposition of organic waste in a sanitary landfill, including certain C&D wastes. Landfill gas typically includes methane, which can be explosive under certain conditions, and gas has been known to promote the migration of contaminants into ground water. The Solid Waste Rules typically focus on the explosive properties from a public safety standpoint. Normally, gas migrates above the ground water table and is restricted laterally by streams. No pipelines or trenches exist nearby to serve as potential conduits for off-site landfill gas migration at this facility, although the on-site soils are porous and can potentially serve as gas migration pathways. No occupied structures exist nearby that appear to be at risk for gas migration.

The landfill gas management plan for C&D Landfill, Inc. is currently proposed to include monitoring of subsurface soil-gas adjacent to the landfill via bar-hole punch tests and headspace analysis of monitoring wells (see **Drawing MP-1**). Passive landfill gas vents will be installed along with the final cover system at a density of approximately three per acre of final cap surface area – these will not be monitored. A construction detail of these vents is included on **Drawing E2**.

Landfill gas monitoring will be performed during the active life of the landfill and throughout the post-closure care period. Quarterly monitoring will be conducted at all subsurface gas detection locations and in all occupied structures located on the landfill property. The passive gas vents, when installed, are not required to be monitored. Additional sampling may be performed in the future and/or remedial measures will be implemented as required to mitigate a potential gas migration problem.

10.4.1 Regulatory Limits

NCDENR rules require monitoring to the following explosive gas limits:

- 25% of the Lower Explosive Limit (LEL, 5% methane in standard atmosphere), within occupied structures – excluding gas collection/venting structures

- 100% LEL at the facility boundary

- No detectable concentration at off-site occupied structures.

10.4.2 Gas Monitoring Program

Gas monitoring will be conducted along the perimeter boundary of the facility (bar-hole punch tests), at locations shown approximately on **Drawing MP-1**, within occupied structures on the site (scale house), and in the head-space of monitoring wells.

Equipment: A portable combustible gas monitor, e.g., an Organic Vapor Analyzer (OVA) or Photo-Ion Detector (PID), shall be used to measure the concentration of combustible gases at sampling locations in units of percent of lower explosive limit. Lower explosive limit (LEL) means the lowest percent by volume of a mixture of combustible gas in air that will propagate a flame at 25 degrees Celsius and atmospheric pressure. The gas monitor shall be calibrated to methane using the manufacturer's calibration kit and procedure before the monitoring activities begin.

On-site Structures: Gas monitoring in on-site structures will be conducted during regular quarterly monitoring events at the earliest possible time after the structure has been unused (e.g., early morning). The monitoring locations will be in corners along floors and ceilings, at cracks in the floor, and at other areas likely to accumulate gas. Gas monitoring will also be conducted in any confined space requiring the entry of personnel for maintenance or inspection. The monitoring will take place prior to entry by personnel in accordance with OSHA regulations.

Gas Detection Bar-Hole Punch Locations: Gas monitoring in bar-hole punches will consist of punching a hole with a 3-foot probe. Tubing that is open-ended and perforated on the bottom should be placed in the bottom of the hole, taking care not to plug the bottom of the tubing with soil. The peak methane reading should then be recorded for each bar-hole probe location.

Monitoring Well Head-Space: The well heads will be sampled during routing ground water monitoring events.

Record Keeping: The operator will record the date, time, location, sampling personnel, atmospheric temperature, reported barometric pressure, and general weather conditions at the time of sampling, in addition to the concentration of combustible gases (see the example **Landfill Gas Monitoring Field Log** in **Appendix 6**). These monitoring records shall be maintained in the landfill operating record book.

10.4.3 Corrective Action

Prior to initiating corrective action, the monitoring plan may be augmented to include more sampling locations (possibly focusing on occupied structures in the area), permanent probes (in lieu of bar-hole punch tests), and /or more frequent sampling. Corrective action to control gas migration, if any is required, might consist of additional passive venting and/or active gas recovery. The likelihood of such measures ever being required is remote – this issue is addressed in the interest of compliance with the rules.

10.5 Waste Acceptance

Monitoring of the waste intake is addressed in the **Operations Plan** (see **Section 8.0**). The plan calls for routine waste screening and record keeping with respect to waste types, sources, and haulers. Maintaining strict adherence to the waste acceptance criteria is the sure way to maintain compliance with ground water quality criteria.

10.6 Plan Preparation and Certification

This monitoring plan for the C&D Landfill, Inc., disposal units has been prepared by, or under the responsible charge of, one or more North Carolina Licensed Geologists or Professional Engineers. The individual signature and seal below attests to compliance with this rule requirement.

Signed ____________

Printed G. DAVID GARRETT

Date MARCH 20, 2009

NORTH CAROLINA LICENSED GEOLOGIST SEAL 983 G. DAVID GARRETT

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

11.0 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 9.2.4** and **9.3.4**, respectively. The following is a detailed analysis of the closure and post closure costs, based on the preceding, all in 2007 dollars, projected over the anticipated life of the landfill (Phase 2) and 30 years of post-closure care. Please refer to **Tables 11A** and **11B** (following).

Table 11A shows the post-closure costs projected as future values over the 30-year period. Table 11B shows the annual decrease in the annual financial assurance obligation due to the expenditures of prior years, assuming no increased liabilities for unforeseen events, e.g., assessment monitoring. Based on this analysis, 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 **Table 9A**)	$1,404,675
2.	Projected Post-Closure Costs (see **Table 9C**)	
	$41,450.00 x 30 years =	$1,243,500
	TOTAL CLOSURE/POST-CLOSURE COST	**$2,648,175**

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. Said documentation shall be furnished by the deadline and will be included as a future amendment to this report (see **Appendix 10**).

12.0 CERTIFICATION

This engineering plan for the C&D Landfill, Inc. Phase 2 disposal unit has been prepared by, or under the responsible charge of, one or more North Carolina Licensed Professional Engineers to meet the requirements of 15A NCAC 13B .0539. The individual signature and seal below attests to compliance with this rule requirement.

Signed ____________

Printed G. DAVID GARRETT

Date MARCH 20, 2009

NORTH CAROLINA PROFESSIONAL SEAL 25462 ENGINEER G. DAVID GARRETT

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

Calculations based on Hough's method for sand (corrected SPT values) and consolidation theory for clays (using lab data)*
These preliminary calculations assume no soil surcharge (preloading) to establish baseline settlement for planning purposes

Assume soil surcharge height =	0	feet	x	soil unit weight =	100	pcf =	0	psf
				Soil surcharge pressure increase =			0	psf
Max. final waste height =	85	feet	x	unit weight =	37	pcf =	3145	psf
Est'd base soil thickness =	4	feet	x	soil unit weight =	100	pcf =	400	psf
				Final vertical pressure increase =			3545	psf

ALL STRESSES USED IN THE CALCULATIONS ARE EFFECTIVE STRESS

Soil Profile for Boring B-1d (worst case) **Grd. Elev. 18.5** **Water table depth (ft)** = 6.5**

												initial vertical stress condition			surcharge preload, if any		final vertical stress	
Layer	**Depth (ft)**	**Base Elev.**	**Unit Wt. (pcf) - wet**	**Po (psf)**	**u (psf)**	**Po' (psf)**	**Thickness (ft)**	**Soil Type**	**N (bpf)**	**Zave (ft)**	**I**	**Average Po'**	**Past Pc*** **	**Pi**	**Surcharge Ps**	**Pp=Pi+Ps**	**del-P**	**Pf**
				0		0				0								
1	6	12.5	120	720.00	-31.20	751.20	6	SM	17	3	1	376	376	376	0	376	3545	3921
2	23	-4.5	135	3015.00	1029.60	1985.40	17	ML-CL	3	14.5	0.97	1368	1700	1700	0	1700	3439	4807
3	32	-13.5	140	4275.00	1591.20	2683.80	9	ML-CL	20	27.5	0.9	2335	1700	2335	0	2335	3191	5525
4	52	-33.5	135	6975.00	2839.20	4135.80	20	SM	100	42	0.78	3410	1700	3410	0	3410	2765	6175
5	80	-61.5	135	10755.00	4586.40	6168.60	28	ML-CL	10	66	0.63	5152	1700	5152	0	5152	2233	7386

*Reference: Cheney, R.S., and R.G. Hassie, Soils and Foundations Workshop Manual, US Federal Highway Administration, November 1982

RR = Recompression ratio (staged loading/unloading)

CR = Consolidation ratio (virgin compression curve)

Use consolidation data, considering maximum past pressure for peat & clay layers:

for log Pc/Po < Pc: **del-H = Ho * RR * log(Pc/Po)**

for log Pf/Pc > Pc: **del-H = Ho * CR * log(Pf/Pc)**

add the two:

Use corrected spf, without past pressure, for sands:

del-H = Ho * 1/C' * log(pf/Po)

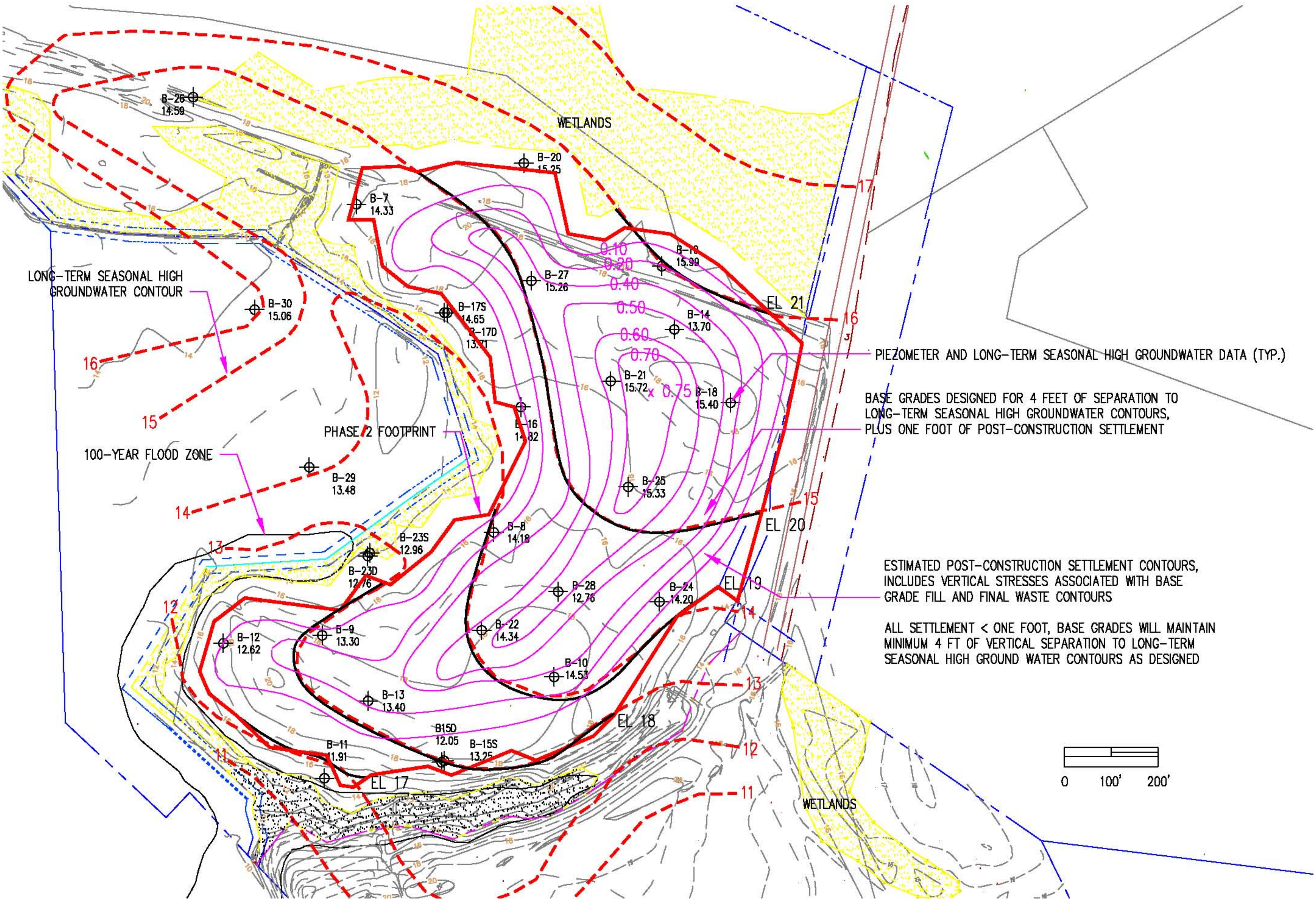
Ref. Consol Data	RR Cr/1+eo	CR Cc/1+eo	log Pp/Po	del-H (ft)	log Pf/Pp	del-H (ft)	del-H clay (ft)	N'/N	N'	C'	log Po/Pf	del-H sand (ft)	TOTAL SETTLEMENT
								2	34	85	1.02	0.07	0.07
B-1d, 10 - 12 feet	0.005	0.045	0.09	0.01	0.45	0.35	0.35						0.35
								1.7	34	85	0.37	0.04	0.04
								1.4	140	25	0.26	0.21	0.21
								1.3	13	55	0.16	0.08	0.08
				Consolidation Settlement - Clay Layers			**0.35**	**Elastic Settlement - Sand Layers**				**0.40**	**0.75**

Summary of Anticipated Settlement Variation with Increasing Waste Thickness

This analysis charts the anticipated settlement beneath final slopes (i.e., variation on additional stress), based on the foregoing soil profile, to be used for determining required additional base grade separation at initial construction

Base Grade Thickness, ft.											
4	0.09	0.2	0.3	0.39	0.47	0.54	0.61	0.67	0.72	0.78	0.83
3	0.05	0.17	0.28	0.37	0.45	0.52	0.59	0.65	0.71	0.76	0.81
2	0.02	0.14	0.25	0.34	0.43	0.5	0.57	0.63	0.69	0.75	0.8
1	0	0.11	0.22	0.32	0.4	0.48	0.55	0.62	0.68	0.73	0.79
0	0	0.08	0.19	0.29	0.38	0.46	0.53	0.6	0.66	0.72	0.77
	0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
				Waste Thickness, ft. -->							


Settlement with Increasing Stress
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Settlement, ft.
0
10
20
30
40
50
60
70
80
90
100
Final Waste Thickness, ft.
4 feet base
3 feet base
2 feet base
1 foot base
at grade base


WETLANDS
LONG-TERM SEASONAL HIGH GROUNDWATER CONTOUR
PIEZOMETER AND LONG-TERM SEASONAL HIGH GROUNDWATER DATA (TYP.)
BASE GRADES DESIGNED FOR 4 FEET OF SEPARATION TO LONG-TERM SEASONAL HIGH GROUNDWATER CONTOURS, PLUS ONE FOOT OF POST-CONSTRUCTION SETTLEMENT
PHASE 2 FOOTPRINT
100-YEAR FLOOD ZONE
ESTIMATED POST-CONSTRUCTION SETTLEMENT CONTOURS, INCLUDES VERTICAL STRESSES ASSOCIATED WITH BASE GRADE FILL AND FINAL WASTE CONTOURS
ALL SETTLEMENT < ONE FOOT, BASE GRADES WILL MAINTAIN MINIMUM 4 FT OF VERTICAL SEPARATION TO LONG-TERM SEASONAL HIGH GROUND WATER CONTOURS AS DESIGNED
B-26 14.59
B-20 15.25
B-7 14.33
B-19 15.99
B-27 15.26
B-30 15.06
B-17S 14.65
B-17D 13.71
B-14 13.70
B-21 15.72
B-18 15.40
B-16 14.32
B-25 15.33
B-29 13.48
B-8 14.18
B-23S 12.96
B-23D 12.76
B-28 12.76
B-24 14.20
B-12 12.62
B-9 13.30
B-22 14.34
B-10 14.53
B-13 13.40
B15D 12.05
B-15S 13.25
B-11 11.91
0.10
0.20
0.40
0.50
0.60
0.70
0.75
EL 21
EL 20
EL 19
EL 18
EL 17
WETLANDS
0 100' 200'

geotechnics

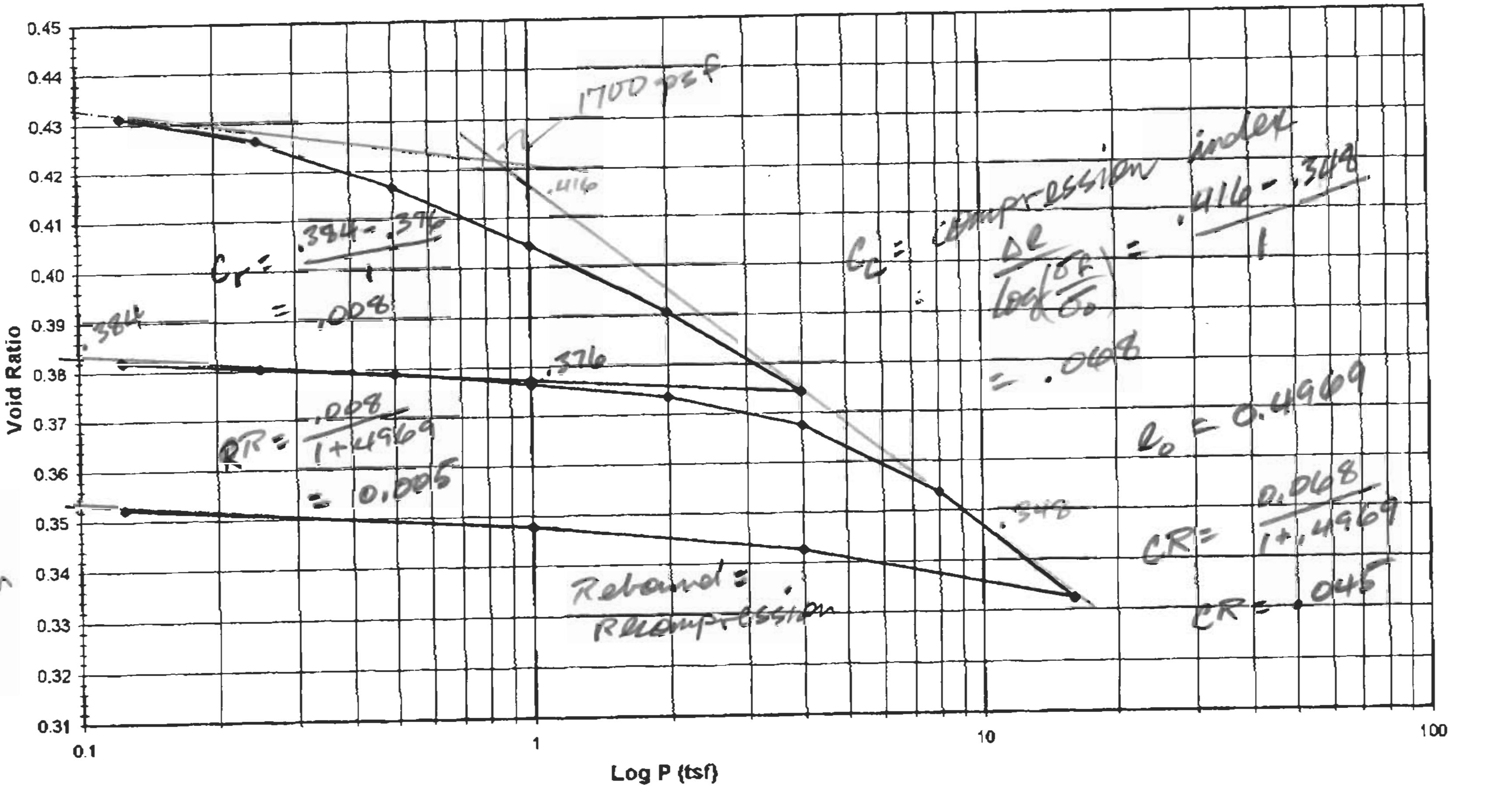
SAND-LIKE BEHAVIOR

ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	DAVID GARRETT	Boring No.	B-1
Client Reference	PITT COUNTY	Depth (ft)	11.0-11.1
Project No.	R02011-01	Sample No.	NA
Lab ID	R02011-01-003	Visual Description	GRAY SILTY SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



e

CR = Cc/(1+e0) compression ratio

Tested By TM *Date* 2/11/02 *Approved By* DB *Date* 2/20/02

DCN: CT-S24F Date: 11/8/00 Revision: 4 544 Braddock Avenue · East Pittsburgh, PA 15112 · Phone (412) 823-7600 · Fax (412) 823-8999

C:\My Documents\CONSOLMACHINE4\[GARRETTR02011FNLPLT.xls]Sheet1

geotechnics

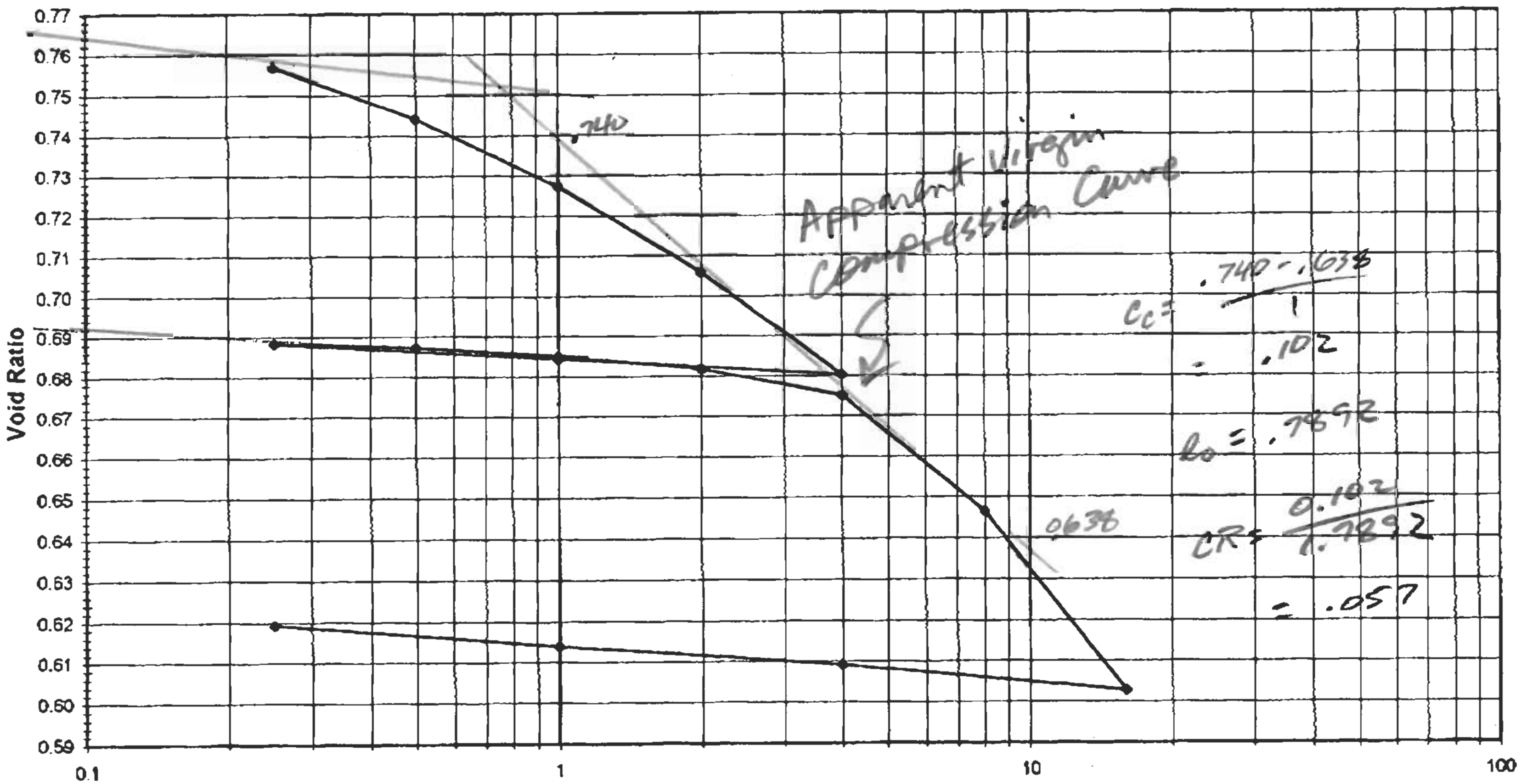
SAND-LIKE BEHAVIOR

ONE DIMENSIONAL CONSOLIDATION

ASTM D 2435-96 (SOP-S24)

Client	DAVID GARRETT	Boring No.	B-10S
Client Reference	PITT COUNTY	Depth (ft)	13.4-13.5
Project No.	R02011-01	Sample No.	NA
Lab ID	R02011-01-006	Visual Description	GRAY SANDY SILT WITH SEA SHELL FRAGMENTS

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



$C_c = \frac{.740 - .6336}{1}$

$= .102$

$e_0 = .7892$

$CR = \frac{0.102}{1.7892}$

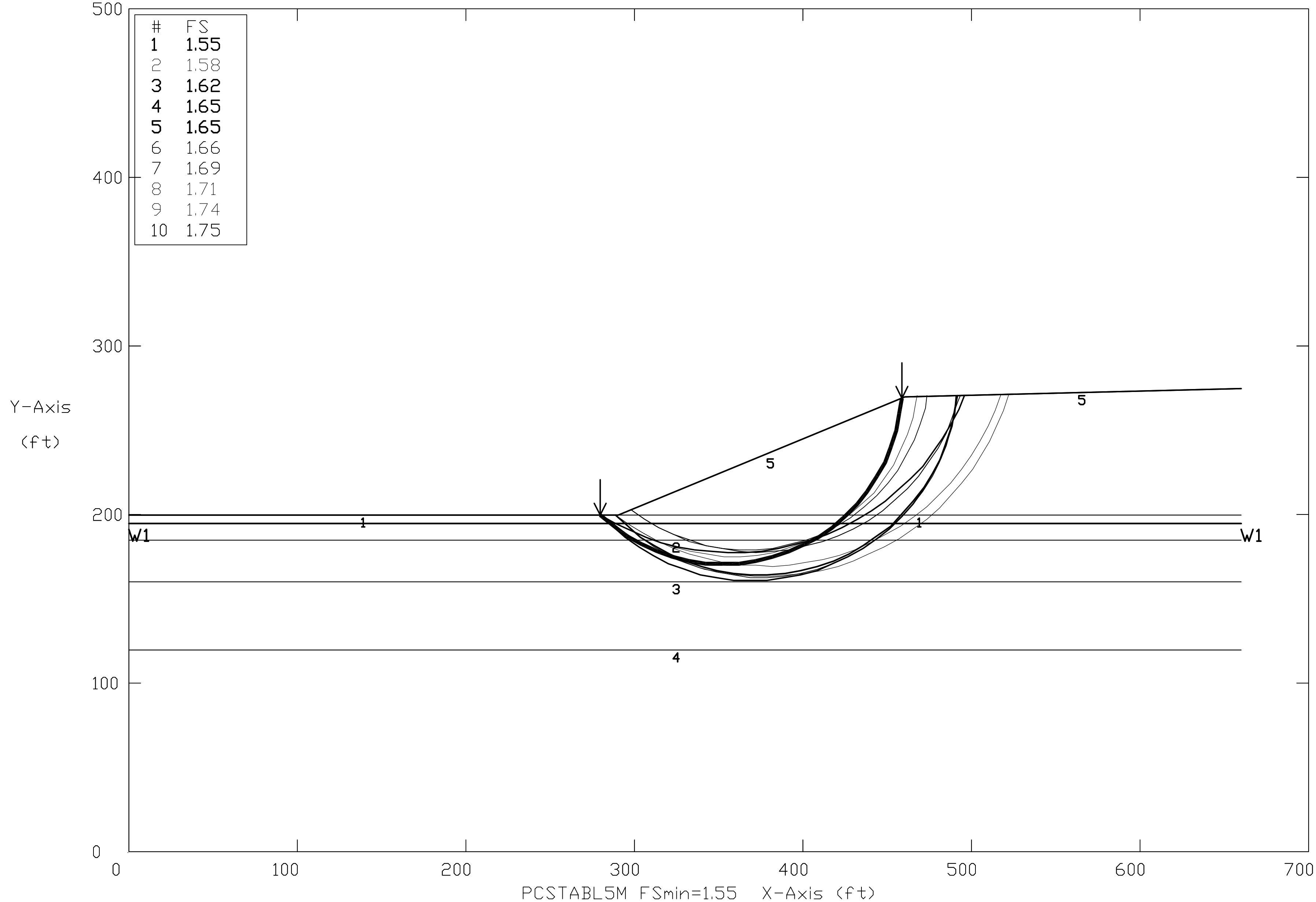
$= .057$

Tested By TM *Date* 2/20/02 *Approved By* DG *Date* 2/27/02

544 Braddock Avenue · East Pittsburgh, PA 15112 · Phone (412) 823-7600 · Fax (412) 823-8999

CDLF.IN   Side Slope Stability

Ten Most Critical. C:CDLF_3.PLT   02-24-08   2:43pm



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	93	110	0	35	.3	0	1
2	115	125	100	25	.3	0	1
3	120	130	100	35	.3	0	1
4	100	112	20	15	.3	0	1
5	45	60	20	45	.3	0	1

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 02-24-08
Time of Run: 2:43pm
Run By:
Input Data Filename: C:CDLF_3
Output Filename: C:CDLF_3.OUT
Plotted Output Filename: C:CDLF_3.PLT

PROBLEM DESCRIPTION CDLF.IN Side Slope Stability

BOUNDARY COORDINATES

3 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	200.00	290.00	200.00	1
2	290.00	200.00	460.00	270.00	5
3	460.00	270.00	660.00	275.00	5
4	290.00	200.00	660.00	200.00	1
5	.00	185.00	660.00	185.00	2
6	.00	160.00	660.00	160.00	3
7	.00	120.00	660.00	120.00	4

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	93.0	110.0	.0	35.0	.30	.0	1

2	115.0	125.0	100.0	25.0	.30	.0	1
3	120.0	130.0	100.0	35.0	.30	.0	1
4	100.0	112.0	20.0	15.0	.30	.0	1
5	45.0	60.0	20.0	45.0	.30	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	195.00
2	660.00	195.00

1

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

Janbus Empirical Coef. is being used for the case of c & phi both > 0
100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced Along The Ground Surface Between X = 280.00 ft.
and X = 360.00 ft.

Each Surface Terminates Between X = 450.00 ft.
and X = 530.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	287.53	193.42
3	295.65	187.59
4	304.29	182.55
5	313.37	178.35
6	322.80	175.03
7	332.51	172.62
8	342.40	171.14
9	352.38	170.60
10	362.37	171.01
11	372.28	172.36
12	382.02	174.65
13	391.49	177.85
14	400.62	181.93
15	409.32	186.85
16	417.52	192.58
17	425.14	199.06
18	432.11	206.23
19	438.37	214.03
20	443.86	222.39
21	448.53	231.23
22	452.35	240.47
23	455.28	250.03
24	457.29	259.83
25	458.31	269.30

*** 1.548 ***

Individual data on the 30 slices

Slice No.	Width Ft(m)	Weight Lbs(kg)	Water Force Top Lbs(kg)	Water Force Bot Lbs(kg)	Tie Force Norm Lbs(kg)	Tie Force Tan Lbs(kg)	Earthquake Force Hor Lbs(kg)	Earthquake Force Ver Lbs(kg)	Surcharge Load Lbs(kg)
1	5.7	1331.4	.0	530.2	.0	.0	.0	.0	.0
2	1.8	996.6	.0	514.9	.0	.0	.0	.0	.0
3	2.5	1815.5	.0	1137.4	.0	.0	.0	.0	.0
4	5.7	6272.5	.0	4654.5	.0	.0	.0	.0	.0
5	4.4	6960.1	.0	5208.1	.0	.0	.0	.0	.0
6	4.2	8165.6	.0	6242.2	.0	.0	.0	.0	.0
7	9.1	22532.1	.0	16526.7	.0	.0	.0	.0	.0
8	9.4	29467.8	.0	20796.5	.0	.0	.0	.0	.0
9	9.7	35514.9	.0	24191.4	.0	.0	.0	.0	.0

10	9.9	40393.1	.0	26681.0	.0	.0	.0	.0	.0
11	10.0	43884.5	.0	28242.7	.0	.0	.0	.0	.0
12	10.0	45841.6	.0	28862.6	.0	.0	.0	.0	.0
13	9.9	46192.8	.0	28535.1	.0	.0	.0	.0	.0
14	9.7	44944.9	.0	27263.2	.0	.0	.0	.0	.0
15	9.5	42182.8	.0	25058.2	.0	.0	.0	.0	.0
16	9.1	38066.2	.0	21940.1	.0	.0	.0	.0	.0
17	5.4	20948.5	.0	11714.8	.0	.0	.0	.0	.0
18	3.3	11919.8	.0	6237.7	.0	.0	.0	.0	.0
19	8.2	27320.4	.0	13296.5	.0	.0	.0	.0	.0
20	2.8	8497.9	.0	3628.8	.0	.0	.0	.0	.0
21	4.8	13058.0	.0	5142.8	.0	.0	.0	.0	.0
22	.9	2336.9	.0	1005.9	.0	.0	.0	.0	.0
23	6.1	14756.0	.0	6351.7	.0	.0	.0	.0	.0
24	6.3	13990.9	.0	6705.8	.0	.0	.0	.0	.0
25	5.5	10878.6	.0	5942.0	.0	.0	.0	.0	.0
26	4.7	7893.6	.0	5063.9	.0	.0	.0	.0	.0
27	3.8	5192.3	.0	4079.5	.0	.0	.0	.0	.0
28	2.9	2923.7	.0	2997.6	.0	.0	.0	.0	.0
29	2.0	1223.1	.0	1828.0	.0	.0	.0	.0	.0
30	1.0	207.9	.0	582.6	.0	.0	.0	.0	.0

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.90	194.01
3	305.42	188.78
4	314.38	184.35
5	323.71	180.74
6	333.33	178.00
7	343.15	176.14
8	353.11	175.18
9	363.11	175.13
10	373.07	175.99
11	382.91	177.75
12	392.56	180.39
13	401.92	183.91
14	410.93	188.25
15	419.50	193.40
16	427.57	199.30
17	435.07	205.92
18	441.94	213.18
19	448.12	221.04
20	453.57	229.43
21	458.22	238.28
22	462.06	247.52
23	465.04	257.06
24	467.14	266.84
25	467.55	270.19

*** 1.577 ***

1

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	287.07	192.93
3	294.70	186.46
4	302.83	180.64
5	311.41	175.50
6	320.38	171.08
7	329.68	167.41
8	339.25	164.52
9	349.03	162.41
10	358.94	161.12
11	368.93	160.64
12	378.93	160.97
13	388.86	162.13
14	398.66	164.09
15	408.28	166.85
16	417.63	170.39
17	426.66	174.68
18	435.31	179.70
19	443.52	185.41
20	451.24	191.77
21	458.41	198.74
22	464.99	206.27
23	470.93	214.32
24	476.18	222.82
25	480.73	231.73
26	484.53	240.98
27	487.56	250.51
28	489.80	260.25
29	491.24	270.15
30	491.28	270.78

*** 1.616 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	288.65	194.98
3	297.61	190.55
4	306.86	186.73

5	316.34	183.56
6	326.01	181.02
7	335.84	179.15
8	345.76	177.95
9	355.75	177.42
10	365.75	177.57
11	375.71	178.39
12	385.60	179.88
13	395.37	182.04
14	404.96	184.85
15	414.35	188.31
16	423.48	192.39
17	432.31	197.08
18	440.80	202.36
19	448.92	208.19
20	456.63	214.57
21	463.89	221.44
22	470.66	228.80
23	476.93	236.59
24	482.65	244.79
25	487.81	253.36
26	492.37	262.26
27	496.09	270.90

*** 1.646 ***

1

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.14	193.11
3	303.94	186.86
4	312.25	181.29
5	321.00	176.44
6	330.12	172.35
7	339.56	169.05
8	349.24	166.56
9	359.11	164.90
10	369.07	164.07
11	379.07	164.09
12	389.03	164.96
13	398.89	166.67
14	408.56	169.21
15	417.98	172.55
16	427.09	176.68
17	435.82	181.57
18	444.10	187.17
19	451.88	193.46
20	459.09	200.38

21	465.70	207.89
22	471.65	215.93
23	476.89	224.44
24	481.40	233.37
25	485.13	242.64
26	488.07	252.20
27	490.19	261.97
28	491.33	270.78

*** 1.652 ***

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.01	192.97
3	303.70	186.58
4	311.90	180.87
5	320.57	175.88
6	329.63	171.65
7	339.02	168.21
8	348.67	165.58
9	358.51	163.79
10	368.46	162.84
11	378.46	162.75
12	388.43	163.51
13	398.30	165.12
14	408.00	167.57
15	417.45	170.84
16	426.58	174.90
17	435.34	179.73
18	443.65	185.29
19	451.46	191.54
20	458.70	198.44
21	465.33	205.93
22	471.30	213.95
23	476.55	222.46
24	481.06	231.38
25	484.80	240.66
26	487.72	250.22
27	489.82	260.00
28	491.08	269.92
29	491.11	270.78

*** 1.658 ***

1

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.78	203.20
2	305.82	197.26
3	314.38	192.09
4	323.38	187.72
5	332.73	184.20
6	342.38	181.54
7	352.22	179.79
8	362.19	178.95
9	372.18	179.02
10	382.14	180.01
11	391.95	181.91
12	401.55	184.71
13	410.86	188.37
14	419.79	192.87
15	428.27	198.18
16	436.22	204.23
17	443.59	211.00
18	450.30	218.41
19	456.31	226.40
20	461.56	234.91
21	466.00	243.87
22	469.60	253.20
23	472.34	262.82
24	473.74	270.34

*** 1.685 ***

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	287.77	193.70
3	295.93	187.93
4	304.47	182.72
5	313.33	178.09
6	322.49	174.06
7	331.89	170.66
8	341.50	167.89
9	351.27	165.76
10	361.16	164.30
11	371.13	163.49
12	381.13	163.36
13	391.11	163.89

14	401.04	165.09
15	410.87	166.95
16	420.55	169.46
17	430.04	172.61
18	439.30	176.38
19	448.28	180.77
20	456.96	185.75
21	465.28	191.29
22	473.21	197.38
23	480.72	203.98
24	487.77	211.07
25	494.34	218.62
26	500.38	226.59
27	505.88	234.94
28	510.81	243.64
29	515.14	252.65
30	518.87	261.93
31	521.97	271.44
32	521.99	271.55

*** 1.711 ***

1

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	297.00	194.15
3	305.49	188.86
4	314.32	184.17
5	323.45	180.10
6	332.84	176.66
7	342.45	173.88
8	352.22	171.76
9	362.12	170.32
10	372.09	169.55
11	382.09	169.48
12	392.07	170.09
13	401.98	171.38
14	411.79	173.36
15	421.43	175.99
16	430.87	179.29
17	440.07	183.22
18	448.97	187.78
19	457.54	192.94
20	465.73	198.67
21	473.51	204.95
22	480.85	211.75
23	487.70	219.03
24	494.03	226.77

25	499.82	234.93
26	505.03	243.46
27	509.65	252.33
28	513.65	261.50
29	517.00	270.92
30	517.15	271.43

*** 1.737 ***

Failure Surface Specified By 26 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.78	203.20
2	305.97	197.46
3	314.59	192.40
4	323.60	188.05
5	332.92	184.44
6	342.51	181.59
7	352.29	179.52
8	362.21	178.25
9	372.20	177.78
10	382.19	178.11
11	392.13	179.25
12	401.94	181.18
13	411.56	183.90
14	420.93	187.38
15	430.00	191.61
16	438.69	196.55
17	446.96	202.18
18	454.74	208.46
19	462.00	215.34
20	468.68	222.78
21	474.74	230.74
22	480.13	239.15
23	484.84	247.98
24	488.81	257.15
25	492.04	266.62
26	493.10	270.83

*** 1.746 ***

1

Y A X I S F T

.00 82.50 165.00 247.50 330.00 412.50

```
X       .00 +---------+----*---*+-*-*-----+---------+---------+
            -
            -
            -
            -
            -
          82.50 +
            -
            -
            -
            -
            -
A     165.00 +
            -
            -
            -
            -
            -
X     247.50 +
            -
            -                       1
            -                      1*
            -                     1127
            -                    117...
I     330.00 +                  3127...
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            -                  .314......
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            -                   .8350211.....
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F     577.50 +
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T     660.00 +             *   *  * *         *
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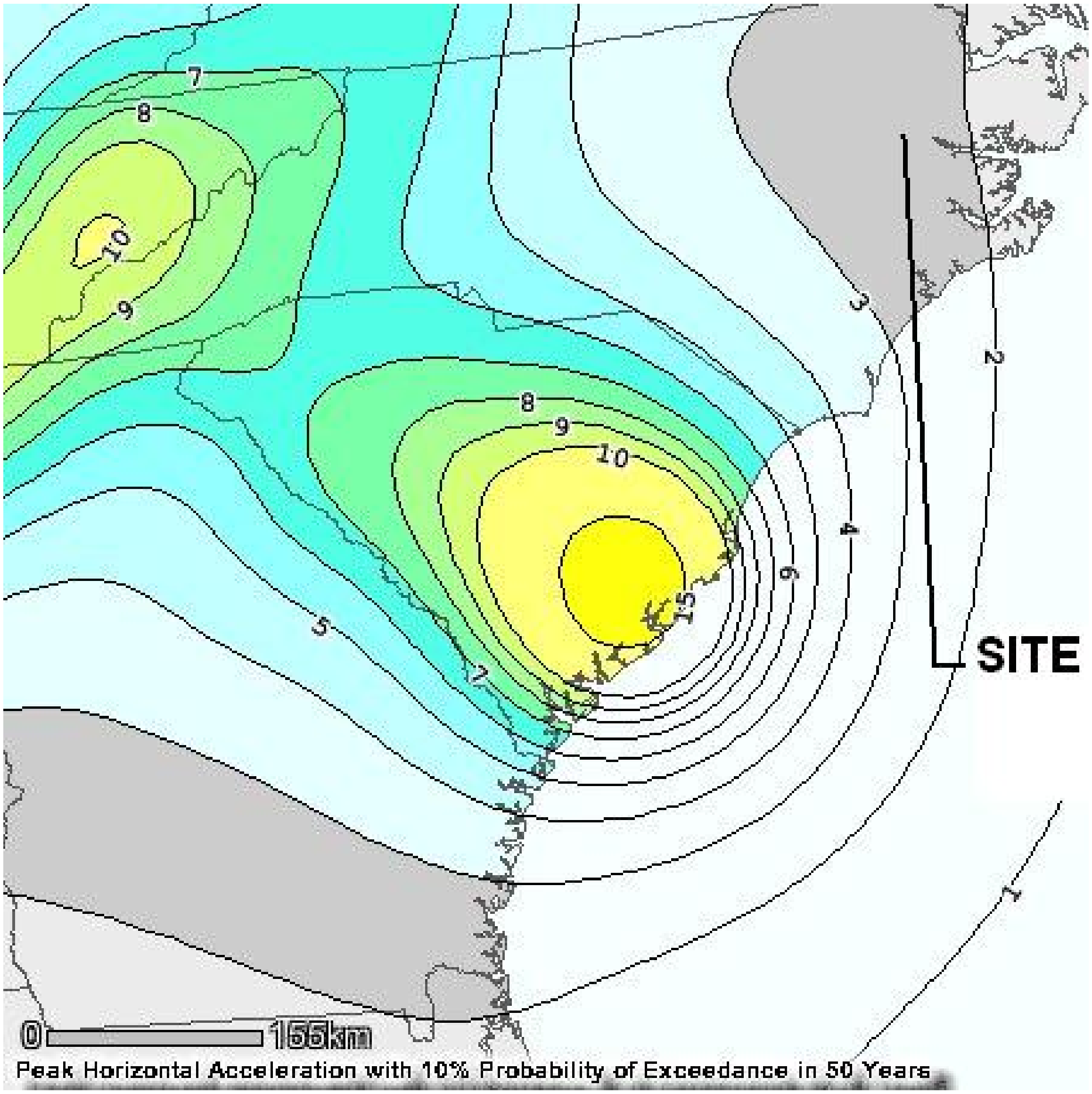
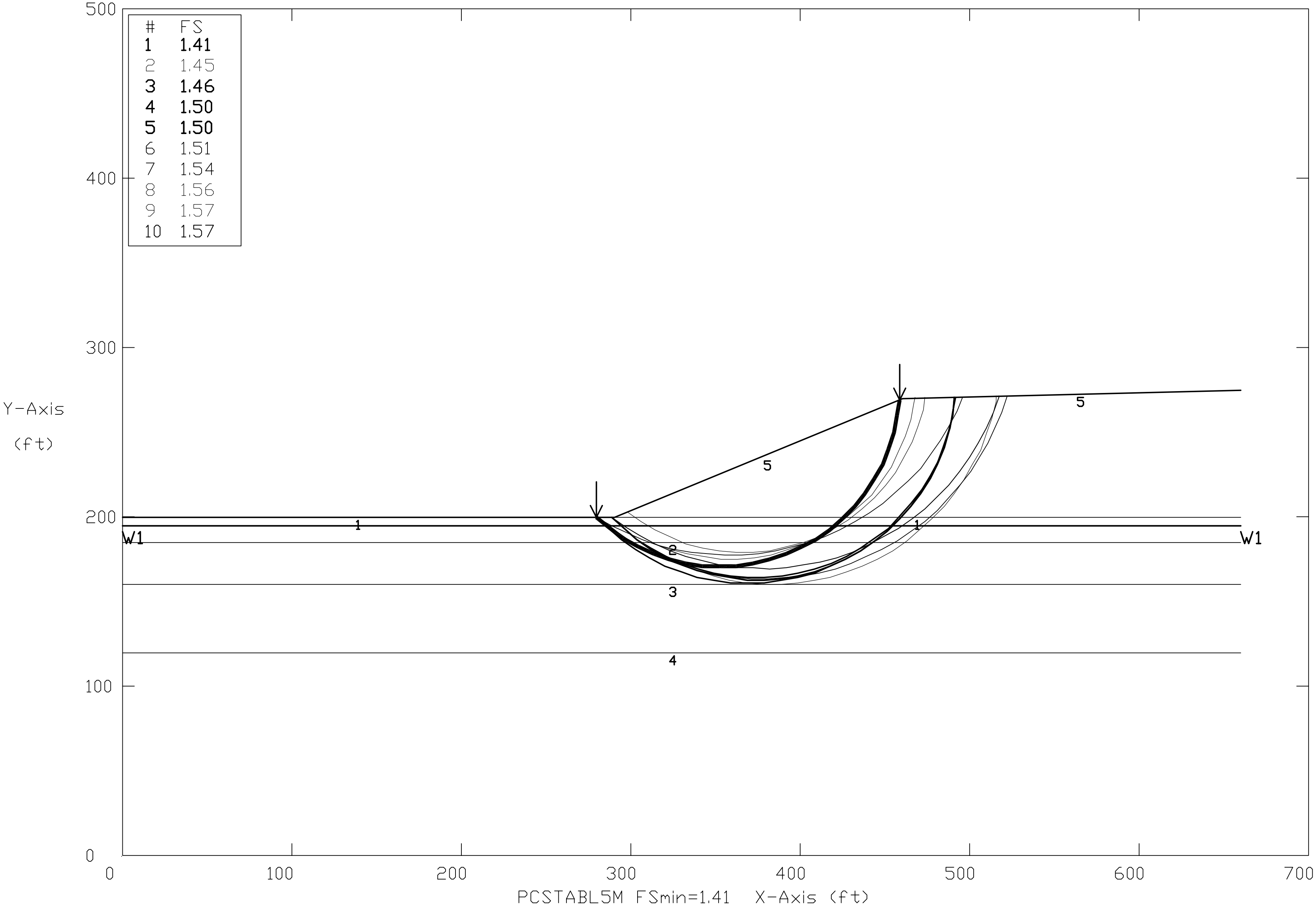
Data from US Geological Survey, on line at www.eqmaps.cr.usgs.gov/serv1



CDLF.IN   Side Slope Stability (Seismic Condition)

Ten Most Critical. C:CDLF_4.PLT   02-24-08   3:03pm



Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	93	110	0	35	.3	0	1
2	115	125	100	25	.3	0	1
3	120	130	100	35	.3	0	1
4	100	112	20	15	.3	0	1
5	45	60	20	45	.3	0	1

** PCSTABL5M **

by
Purdue University

1

--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 02-24-08
Time of Run: 3:03pm
Run By:
Input Data Filename: C:CDLF_4
Output Filename: C:CDLF_4.OUT
Plotted Output Filename: C:CDLF_4.PLT

PROBLEM DESCRIPTION CDLF.IN Side Slope Stability
Seismic Condition

BOUNDARY COORDINATES

3 Top Boundaries
7 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	200.00	290.00	200.00	1
2	290.00	200.00	460.00	270.00	5
3	460.00	270.00	660.00	275.00	5
4	290.00	200.00	660.00	200.00	1
5	.00	185.00	660.00	185.00	2
6	.00	160.00	660.00	160.00	3
7	.00	120.00	660.00	120.00	4

1

ISOTROPIC SOIL PARAMETERS

5 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	93.0	110.0	.0	35.0	.30	.0	1

2	115.0	125.0	100.0	25.0	.30	.0	1
3	120.0	130.0	100.0	35.0	.30	.0	1
4	100.0	112.0	20.0	15.0	.30	.0	1
5	45.0	60.0	20.0	45.0	.30	.0	1

1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 2 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	195.00
2	660.00	195.00

A Horizontal Earthquake Loading Coefficient
Of .020 Has Been Assigned

A Vertical Earthquake Loading Coefficient
Of .000 Has Been Assigned

Cavitation Pressure = .0 psf

1

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.

Janbus Empirical Coef. is being used for the case of c & phi both > 0
100 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 10 Points Equally Spaced
Along The Ground Surface Between X = 280.00 ft.
and X = 360.00 ft.

Each Surface Terminates Between X = 450.00 ft.
and X = 530.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = .00 ft.

10.00 ft. Line Segments Define Each Trial Failure Surface.

1

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Janbu Method * *

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	287.53	193.42
3	295.65	187.59
4	304.29	182.55
5	313.37	178.35
6	322.80	175.03
7	332.51	172.62
8	342.40	171.14
9	352.38	170.60
10	362.37	171.01
11	372.28	172.36
12	382.02	174.65
13	391.49	177.85
14	400.62	181.93
15	409.32	186.85
16	417.52	192.58
17	425.14	199.06
18	432.11	206.23
19	438.37	214.03
20	443.86	222.39
21	448.53	231.23
22	452.35	240.47
23	455.28	250.03
24	457.29	259.83
25	458.31	269.30

*** 1.413 ***

Individual data on the 30 slices

Slice	Width	Weight	Water Force Top	Water Force Bot	Tie Force Norm	Tie Force Tan	Earthquake Force Hor	Earthquake Force Ver	Surcharge Load

No.	Ft(m)	Lbs(kg)	Lbs(kg)	Lbs(kg)	Lbs(kg)	Lbs(kg)	Lbs(kg)	Lbs(kg)	Lbs(kg)
1	5.7	1331.4	.0	530.2	.0	.0	26.6	.0	.0
2	1.8	996.6	.0	514.9	.0	.0	19.9	.0	.0
3	2.5	1815.5	.0	1137.4	.0	.0	36.3	.0	.0
4	5.7	6272.5	.0	4654.5	.0	.0	125.4	.0	.0
5	4.4	6960.1	.0	5208.1	.0	.0	139.2	.0	.0
6	4.2	8165.6	.0	6242.2	.0	.0	163.3	.0	.0
7	9.1	22532.1	.0	16526.7	.0	.0	450.6	.0	.0
8	9.4	29467.8	.0	20796.5	.0	.0	589.4	.0	.0
9	9.7	35514.9	.0	24191.4	.0	.0	710.3	.0	.0
10	9.9	40393.1	.0	26681.0	.0	.0	807.9	.0	.0
11	10.0	43884.5	.0	28242.7	.0	.0	877.7	.0	.0
12	10.0	45841.6	.0	28862.6	.0	.0	916.8	.0	.0
13	9.9	46192.8	.0	28535.1	.0	.0	923.9	.0	.0
14	9.7	44944.9	.0	27263.2	.0	.0	898.9	.0	.0
15	9.5	42182.8	.0	25058.2	.0	.0	843.7	.0	.0
16	9.1	38066.2	.0	21940.1	.0	.0	761.3	.0	.0
17	5.4	20948.5	.0	11714.8	.0	.0	419.0	.0	.0
18	3.3	11919.8	.0	6237.7	.0	.0	238.4	.0	.0
19	8.2	27320.4	.0	13296.5	.0	.0	546.4	.0	.0
20	2.8	8497.9	.0	3628.8	.0	.0	170.0	.0	.0
21	4.8	13058.0	.0	5142.8	.0	.0	261.2	.0	.0
22	.9	2336.9	.0	1005.9	.0	.0	46.7	.0	.0
23	6.1	14756.0	.0	6351.7	.0	.0	295.1	.0	.0
24	6.3	13990.9	.0	6705.8	.0	.0	279.8	.0	.0
25	5.5	10878.6	.0	5942.0	.0	.0	217.6	.0	.0
26	4.7	7893.6	.0	5063.9	.0	.0	157.9	.0	.0
27	3.8	5192.3	.0	4079.5	.0	.0	103.8	.0	.0
28	2.9	2923.7	.0	2997.6	.0	.0	58.5	.0	.0
29	2.0	1223.1	.0	1828.0	.0	.0	24.5	.0	.0
30	1.0	207.9	.0	582.6	.0	.0	4.2	.0	.0

Failure Surface Specified By 25 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.90	194.01
3	305.42	188.78
4	314.38	184.35
5	323.71	180.74
6	333.33	178.00
7	343.15	176.14
8	353.11	175.18
9	363.11	175.13
10	373.07	175.99
11	382.91	177.75
12	392.56	180.39
13	401.92	183.91
14	410.93	188.25
15	419.50	193.40
16	427.57	199.30
17	435.07	205.92
18	441.94	213.18
19	448.12	221.04

20	453.57	229.43
21	458.22	238.28
22	462.06	247.52
23	465.04	257.06
24	467.14	266.84
25	467.55	270.19

*** 1.447 ***

1

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	287.07	192.93
3	294.70	186.46
4	302.83	180.64
5	311.41	175.50
6	320.38	171.08
7	329.68	167.41
8	339.25	164.52
9	349.03	162.41
10	358.94	161.12
11	368.93	160.64
12	378.93	160.97
13	388.86	162.13
14	398.66	164.09
15	408.28	166.85
16	417.63	170.39
17	426.66	174.68
18	435.31	179.70
19	443.52	185.41
20	451.24	191.77
21	458.41	198.74
22	464.99	206.27
23	470.93	214.32
24	476.18	222.82
25	480.73	231.73
26	484.53	240.98
27	487.56	250.51
28	489.80	260.25
29	491.24	270.15
30	491.28	270.78

*** 1.460 ***

Failure Surface Specified By 28 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.14	193.11
3	303.94	186.86
4	312.25	181.29
5	321.00	176.44
6	330.12	172.35
7	339.56	169.05
8	349.24	166.56
9	359.11	164.90
10	369.07	164.07
11	379.07	164.09
12	389.03	164.96
13	398.89	166.67
14	408.56	169.21
15	417.98	172.55
16	427.09	176.68
17	435.82	181.57
18	444.10	187.17
19	451.88	193.46
20	459.09	200.38
21	465.70	207.89
22	471.65	215.93
23	476.89	224.44
24	481.40	233.37
25	485.13	242.64
26	488.07	252.20
27	490.19	261.97
28	491.33	270.78

*** 1.498 ***

1

Failure Surface Specified By 29 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.01	192.97
3	303.70	186.58
4	311.90	180.87
5	320.57	175.88
6	329.63	171.65
7	339.02	168.21
8	348.67	165.58
9	358.51	163.79

10	368.46	162.84
11	378.46	162.75
12	388.43	163.51
13	398.30	165.12
14	408.00	167.57
15	417.45	170.84
16	426.58	174.90
17	435.34	179.73
18	443.65	185.29
19	451.46	191.54
20	458.70	198.44
21	465.33	205.93
22	471.30	213.95
23	476.55	222.46
24	481.06	231.38
25	484.80	240.66
26	487.72	250.22
27	489.82	260.00
28	491.08	269.92
29	491.11	270.78

*** 1.502 ***

Failure Surface Specified By 27 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	288.65	194.98
3	297.61	190.55
4	306.86	186.73
5	316.34	183.56
6	326.01	181.02
7	335.84	179.15
8	345.76	177.95
9	355.75	177.42
10	365.75	177.57
11	375.71	178.39
12	385.60	179.88
13	395.37	182.04
14	404.96	184.85
15	414.35	188.31
16	423.48	192.39
17	432.31	197.08
18	440.80	202.36
19	448.92	208.19
20	456.63	214.57
21	463.89	221.44
22	470.66	228.80
23	476.93	236.59
24	482.65	244.79

25	487.81	253.36
26	492.37	262.26
27	496.09	270.90

*** 1.507 ***

1

Failure Surface Specified By 32 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	280.00	200.00
2	287.77	193.70
3	295.93	187.93
4	304.47	182.72
5	313.33	178.09
6	322.49	174.06
7	331.89	170.66
8	341.50	167.89
9	351.27	165.76
10	361.16	164.30
11	371.13	163.49
12	381.13	163.36
13	391.11	163.89
14	401.04	165.09
15	410.87	166.95
16	420.55	169.46
17	430.04	172.61
18	439.30	176.38
19	448.28	180.77
20	456.96	185.75
21	465.28	191.29
22	473.21	197.38
23	480.72	203.98
24	487.77	211.07
25	494.34	218.62
26	500.38	226.59
27	505.88	234.94
28	510.81	243.64
29	515.14	252.65
30	518.87	261.93
31	521.97	271.44
32	521.99	271.55

*** 1.536 ***

Failure Surface Specified By 24 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	297.78	203.20
2	305.82	197.26
3	314.38	192.09
4	323.38	187.72
5	332.73	184.20
6	342.38	181.54
7	352.22	179.79
8	362.19	178.95
9	372.18	179.02
10	382.14	180.01
11	391.95	181.91
12	401.55	184.71
13	410.86	188.37
14	419.79	192.87
15	428.27	198.18
16	436.22	204.23
17	443.59	211.00
18	450.30	218.41
19	456.31	226.40
20	461.56	234.91
21	466.00	243.87
22	469.60	253.20
23	472.34	262.82
24	473.74	270.34

*** 1.556 ***

1

Failure Surface Specified By 31 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	296.17	193.15
3	303.95	186.86
4	312.17	181.17
5	320.80	176.11
6	329.78	171.71
7	339.06	168.00
8	348.60	164.99
9	358.33	162.69
10	368.21	161.14
11	378.18	160.32
12	388.18	160.25
13	398.15	160.93
14	408.05	162.35

15	417.82	164.51
16	427.39	167.39
17	436.73	170.98
18	445.77	175.25
19	454.46	180.19
20	462.76	185.77
21	470.63	191.95
22	478.00	198.70
23	484.86	205.98
24	491.15	213.75
25	496.84	221.98
26	501.90	230.60
27	506.31	239.58
28	510.03	248.86
29	513.04	258.39
30	515.34	268.13
31	515.85	271.40

*** 1.569 ***

Failure Surface Specified By 30 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	288.89	200.00
2	297.00	194.15
3	305.49	188.86
4	314.32	184.17
5	323.45	180.10
6	332.84	176.66
7	342.45	173.88
8	352.22	171.76
9	362.12	170.32
10	372.09	169.55
11	382.09	169.48
12	392.07	170.09
13	401.98	171.38
14	411.79	173.36
15	421.43	175.99
16	430.87	179.29
17	440.07	183.22
18	448.97	187.78
19	457.54	192.94
20	465.73	198.67
21	473.51	204.95
22	480.85	211.75
23	487.70	219.03
24	494.03	226.77
25	499.82	234.93
26	505.03	243.46
27	509.65	252.33

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             28        513.65      261.50
             29        517.00      270.92
             30        517.15      271.43


                ***     1.571   ***


1
                     Y            A     X     I     S            F     T

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          X       .00 +---------+----*---*+-*-*-----+---------+---------+
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T     660.00 +              *    *   * *          *
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Calculation of Veneer Stability for Static and Seismic Condition
Saturated and Unsaturated Cases

Project: C&D Landfill, Inc, Phase 2 3H:1V slope ratio

Reference: **Geotechnical and Stability Analyses for Ohio Waste Containment Facilitie**
Ohio EPA Geotechnical Resource Group, Guidance Document 660, September 2004
http://www.epa.state.oh.us/dsiwm/document/guidance/gd_660.pdf

The described method calculates the factor of safety against final cover sliding with varying depths of water (head) above barrier layer, e.g., an upper vegetation-support layer above a synthetic membrane or compacted soil; precipitation depth can be specified (design storm), or for a given desired factor of safety, the minimum required friction angle can be determined (after Matasovic, 1991)

For saturated conditions, assume a minimum 10-year, 60-min design storm impinges on surface soils at field capacity

The following assumes a 3H:1V slope ratio, with 18 inches of vegetative cover soil above a compacted soil barrier (10^-5 cm/sec)

A mimimal amount of cohesion may be assumed for a soil-to-soil interface - if a flexible membrane barrier is to be used, no cohesion is assumed and a synthetic drain layer or free draining sand must be used!

The assumed design condition places a bench or diversion berm every 25 to 30 vertical feet, thus the slope length of interest is 75 feet

The basic equation for the safety factor is:

FS = {c/Gam-c*Zc*Cos^2Beta + tanPhi[1 - Gam-w(Zc - Dw)/(Gam-c*Zc)] - Ng*tanBeta*tanPhi } / Ng+tanBeta Eq. 9.1

where:	Fs	=	1.5	=	Factor of Safety (for static case use 1.5, for seismic use 1.1)	
	Ng	=	0	=	peak horizontal acceleration, %g (specific to region)	
	Gam-c	=	120	=	unit weight of cover material, pcf (assume saturated)	
	Gam-w	=	62.4	=	unit weight of water, pcf	
	c	=	0	=	cohesion along failure surface, psf	
	Phi	=		=	internal angle of friction, degrees	
	Beta	=	18.43	=	angle of slope (degrees), for 3H:1V slopes =	18.43
	Zc	=	1.5	=	depth of cover soil, ft.	
	Dw	=		=	depth of water (assume parallel to slope), see Eq. 9.2 below	

Turned around, the equation becomes:

Phi = tan^-1 {Fs*(Ng + tanBeta) - (c/Gam-c*Zc*Cos^2Beta) / [1 - (Gam-w*(Zc-Dw)/(Gam-c*Zc)] - Ng*tanBeta]} = 30.50 degrees
See Summary

The calculation of head follows:

Havg = P(1-RC)*(L*cosBeta) / Kd*sinBeta = 13.3 cm = 0.44 feet Eq. 9.2

where:	Havg	=	average head on failure surface				
	P	=	precipitation, in/hr =	2.75	=	1.94E-03	(cm/sec)
	L	=	slope length, ft =	75	=	2286	(cm)
	RC	=	runoff coefficient =	0			
	Kd	=	permeability of drainage layer		=	1	(cm/sec)

thus, Dw = Zc - Havg = 1.06 feet Eq. 9.4

SUMMARY OF REQUIRED DESIGN PARAMETERS

THE FOLLOWING ANALYSES ASSUME NO INTERFACE COHESION

For unsaturated, static conditions, required minimum friction angle for a safety factor of 1.5 is	26.56	degrees	
For unsaturated, seismic conditions, required min. friction angle for a safety factor of 1.1 is	21.23	degrees	
For saturated, static conditions, required minimum friction angle for a safety factor of 1.5 is	30.50	degrees	CRITICAL
For saturated, seismic conditions, required minimum friction angle for a safety factor of 1.1 is	24.60	degrees	

INTERFACE TESING SHALL BE PERFORMED AS A CQA REQUIREMENT FOR ACTUAL FIELD CONDITIONS

C&D Landfill - Phase 2

Erosion and Sedimentation Control Plan
for
Proposed Site Improvements

Greenville, North Carolina

Owner

C&D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 27834

Project Number
0801

February 18, 2008

John A.K. Tucker, P.E.
Consulting Engineer
Post Office Box 297
Fuquay-Varina, North Carolina 27526
Voice (919) 567-0483
Fax (919) 567-3611

Pitt County Forms

Construction & Soil Erosion and Sedimentation Control Application

Pitt County Planning Department
Telephone: (252) 902-3250
Fax: (252) 830-2576

1717 West Fifth Street
Greenville, NC 27834

Visit us at our web site:
www.pittcountync.gov/depts/planning

Section A. *SUMMARY INFORMATION*

DEVELOPMENT NAME: C&D Landfill - Phase 2
LOCATION: Pitt County NC
PITT COUNTY PARCEL IDENTICICATION NUMBER: 568757763
TOTAL ACRES: 89 **TOTAL # OF LOTS:** ______ **DISTURBED ACRES** 22

CLIENT (Owner or Developer):

Name(s) Judson Whitehurst
Address: 802 Recycling Lane
Greenville, NC 27834 ZIP ________
Telephone: 252 752 8274 FAX: 252 752 9016
E-Mail Address: ________

CONSULTANT (Person to contact regarding questions or revisions to the plan):

Company John AK Tucker, PE - Consulting Engineer
Contact Name(s) ________
Address: PO Box 297
Greenville, NC 27834 ZIP ________
Telephone: 919 567 0483 FAX: 919 567 3611
E-Mail Address: johnak@johntuckerpe.com

ALL ITEMS ON THIS APPLICATION MUST BE ADDRESSED PRIOR TO SUBMITTAL.

ALL INCOMPLETE SUBMITTALS WILL BE RETURNED.

Section B. *SUBMITTAL CHECKLIST AND PROCEDURE*

(1) THIS APPLICATION IS FOR THE APPROVAL OF THE FOLLOWING PLANS:

Subdivisions, Multifamily Developments, and Mobile Home Parks. If you do not know what category your proposal falls into, call us at 902-3250.

(2) PLANS MAY BE SUBMITTED TO THE PLANNING DEPARTMENT, DEVELOPMENT SERVICES BUILDING, 1717 WEST FIFTH STREET.

(3) WITHIN FOURTY FIVE DAYS, A PLANNER WILL TAKE ACTION ON THIS PLAN.

Once the plan has been reviewed an approval letter will be sent to both the developer and engineer/surveyor. The approval letter may contain conditions of approval. Once all improvements have been completed, final plats may be submitted.

PLEASE INCLUDE ALL OF THE FOLLOWING (CHECK OFF). *Please check the list below carefully before you submit:*

[X] **FOR CONSTRUCTION / SESC PLANS: FIFTEEN (15) SETS OF PLANS.**
Plans must be to engineering scale (Minimum scale 1" =100').
Plans must be folded to fit in 8 ½" x 11" hanging file folder with title block showing.

[X] **APPROPRIATE REVIEW FEES:**
- [ ] **Review fee for Construction Plan ($150.00)**
- [X] **Review fee for S**oil Erosion and Sedimentation Control Plan Fees ($200.00 per disturbed acre)
- Checks may be made out to the "Pitt County".

[ ] **LOT EVALUATIONS COMPLETED**

[X] **COMPLETED FINANCIAL RESPONSIBILITY/OWNERSHIP FORM**

[X] **STORMWATER APPLICATION**

[X] **SIX (6) COPIES OF SOIL EROSION & SEDIMENTATION CONTROL NARRATIVE**

Section C. *DATA TO BE SHOWN ON PLANS**

(a) Sheet size.

The preliminary subdivision plan shall be drawn on a sheet size not larger than twenty-four (24) by thirty-six (36) inches.

(b) Key Information.

(1) A vicinity sketch or key map at a scale of not more than one thousand (1000) feet to the inch, showing the position of the subdivision with its relation to surrounding streets and properties, and oriented in the same direction as the remainder of the preliminary subdivision plan;
(2) True north arrow, with north being at the top of the map;
(3) Scale of the map using engineer's scale (Scale of 1" = 100" or less) and date of preparation, including all revision dates;
(4) Specify Township, County and State;
(5) Legend with all symbols used on plan;
(6) Registration number and seal of surveyor or engineer;
(7) Type of submittal (i.e. Construction and/or Soil Erosion and Sedimentation Control Plan).

(c) Summary Information.

(1) The name of the development with section and/or phase, name of the owner and agent, name, address and telephone number and fax number of the designer who prepared the plan;
(2) All information included in Section A. of this application. (Owner's signature not required on plans);
(3) For properties in a conditional use zoning district, list of zoning conditions should appear on the plan;

(d) Property Information.

(1) Boundary lines of the proposed development;
(2) New and existing lot lines with scaled dimensions;
(3) Individual lot numbers and lot area (sq. ft. or acres);
(4) Existing and proposed easements for natural and man-made features;
(5) Street right-of-way lines and other property lines, drawn to scale and with tentative dimensions;
(6) Zoning districts (Development and adjacent properties);
(7) Adjoining properties land uses, existing streets and owner(s) names;
(8) Reserved or special parcels and their intended use;

(e) Site Features.

(1) Existing topographic contours;
(2) Proposed topographic contours;
(3) Limit of disturbed area;

(f) Drainage Features.

(1) Existing and planned drainage pattern;
(2) Size and location of culverts and sewers;
(3) Soils information;
(4) Design calculations and details for energy dissipaters,channels, culverts and storm sewers;
(5) Design calculations for peak discharges of runoff (Pre and Post development);
(6) Name of receiving watercourse and/or river basin.

(g) Erosion Control Measures.

(1) Location of temporary and permanent measures;
(2) Design calculations for sediment basins and other measures;
(3) Maintenance requirements during construction.

(h) Vegetative Stabilization.

(1) Areas and acreage to be vegetatively stabilized;
(2) Planned vegetation with details of plants, seed, mulch, and fertilizer;
(3) Temporary and permanent vegetation;
(4) Method of soil preparation;
(5) Denuded slopes must be seeded within 15 working days or 90 calendar days following completion of any phase of development.

(i) Building Information

(1) Existing buildings, their dimensions from existing and proposed property lines, and any building to be removed or demolished;
(2) Setback dimensions setbacks from property lines and from all streets.

(j) Street Information.

(1) Existing and proposed street names, with state road numbers if applicable;.
(2) Cross-sections of typical proposed streets;
(3) Sight distance triangles at intersections (Shown as right-of-way);
(4) Proposed private or public streets;
(5) Typical street cross section;
(5) Street right-of-way dimensions and curve data.

(k) Stormwater and Floodplain Information.

(1) Existing and proposed contours of intervals at five (5) feet or less, referred to sea level datum;
(2) Drainage swales, ditches channels, watercourses, and direction of flow;
(3) Impoundment or retention / detention structures for stormwater, if required;
(4) Flood hazard boundaries, indicating source of information;
(5) Tentative wetland boundary.

(l) Public Utility Information.

(1) Existing and proposed water lines, fire hydrants, valves, with pipe sizes and locations indicated as applicable;
(2) Existing and proposed overhead/underground electrical lines, poles, electrical easements where applicable;
(3) List of utility and service providers;
(4) Existing farm drain tile, septic systems, drain fields, repair areas;
(5) Fire district, distance to nearest fire department and distance to nearest fire hydrant.

(m) Other Requirements.

(1) Narrative describing construction sequence (as needed);
(2) Narrative describing nature and purpose of construction activity;
(3) Completed Financial Responsibility Ownership Form (signed and notarized;
(4) Construction sequence related to installment and removal of erosion control measures.

*** PLEASE REFER TO THE PITT COUNTY SUBDIVISION AND SOIL EROSION AND SEDIMENTATION CONTROL ORDINANCES FOR A COMPLETE LISTING OF PRELIMINARY PLAT REQUIREMENTS.**

Pitt County Planning Department
Development Services Building
1717 W. Fifth Street
Greenville, North Carolina 27834-1696
Telephone: (252) 902-3250
Fax: (252) 830-2576

Erosion and Sediment Control Plan Review Checklist

Legend

AS= Alternatives Suggested	**A= Adequate**	**INC= Incomplete**
R= Requested, Not Submitted	**NA= Not Applicable**	**NC= Not checked**

Project Name: C&D Landfill - Phase 2
Site Location US 264
Applicant's Name and Address: Judson Whitehurst
802 Recycling Lane
Greenville, NC 27834

Location Information

- X **Project Location**
- X **Roads, Streets**
- X **North Arrow and Scale**
- X **Streams, Intermittent and Perennial**
- X **Legend**
- X **Parcel Number (s)**

General Site Features

- X **Existing Contours**
- X **Proposed Contours**
- X **Limit and Acreage of Disturbed Area**
- X **Building Locations and Elevations**
- X **Lot and/ or Building Numbers**
- X **Wetland Limits**
- X **Easements**
- X **Ponds, Drainage Ways, Streams, Dams**
- X **Borrow and/or waste areas/ Stockpiled Topsoil Location**
- na **Street Profiles**

Site Drainage Features

- X **Existing and Planned Drainage Patterns**
- X **Size of Areas/ Acreage/ Square Feet**
- X **Size and location of Culverts and Sewers**
- X **Soils Information (Type, Characteristics etc)**
- X **Design calculations for peak discharges of runoff (Construction and Final Phase)**
- X **Design Calculations and Details for culverts and Storm sewers**
- X **Design calculations for channels**
- X **Design calculations for (rip-rap, include stone sizes etc)**
- X **Design calculations for energy dissipators etc**
- X **Requested velocity calculations**
- X **Name of Receiving Watercourse or river basin**

Erosion Control Measures

- X **Legend**
- X **Location of temporary and permanent measures**
- X **Design calculations for sediment basins and other measures**
- X **Maintenance requirements during construction**

Vegetative Stabilization

- X **Areas and acreage to be vegetatively stabilized**
- X **Planned vegetation with details of plants, seed, mulch, and fertilizer**
- X **Temporary and permanent vegetation**
- X **Method of Soil Preparation**
- X **Denuded slopes must be seeded within 15 working days or 90 calendar days following completion of any phase of development.**

Other Requirements

- X **Narrative describing construction sequence (as needed)**
- X **Narrative describing nature and purpose of construction activity**
- X **Completed Financial Responsibility Ownership Form (signed and notarized)**
- X **Construction sequence related to installment and removal of erosion control measures.**
- ____ ***Approval***
- ____ ***Conditional Approval***
- ____ ***Disapproval***

Reviewed by ____________________________ ***Date*** __________________________________ ***Time***_____________
.

Pitt County
Planning Department
Development Services Building
1717 W. 5th Street
Greenville, North Carolina 27834-1696
Telephone: (252) 902-3250
Fax: (252) 830-2576

James F. Rhodes, AICP
Director

Financial Responsibility / Ownership Form
Soil Erosion and Sedimentation Control Ordinance

No person may initiate any land-disturbing activity on one or more contiguous acres as covered by the Act before this form and an acceptable erosion and sedimentation control plan have been completed and approved by the Pitt County Planning Department. (Please type or print and, if question is not applicable, place N/A in the blank.)

Part A.

1. Project Name C&D Landfill - Phase 2
2. Location of land-disturbing activity: County Pitt
   City or Township ________, and Highway/Street US 264
3. Approximate date land-disturbing activity will be commenced: June 2008
4. Purpose of development (residential, commercial, industrial, etc.): Commercial
5. Approximate acreage of land to be disturbed or uncovered: 22 ac
6. Has an erosion and sedimentation control plan been filed? Yes X No ___
7. Person to contact should sedimentation control issues arise during land-disturbing activity:
   Name Judson Whitehurst Telephone 252 752 8274
8. Landowner(s) of Record (Use blank page to list additional owners):

Judson Whitehurst	
Name(s)	Name(s)
802 Recycling Lane	
Current mailing address	Street address
Greenville NC 27834	
City State Zip	City State Zip

9. Recorded in Deed Book No. ______ Page No. ______

Part B.

1. Person(s) or firm(s) who are financially responsible for this land-disturbing activity (Use the blank page to list additional persons or firms):

Judson Whitehurst	
Name of person(s) or Firm(s)	Name(s)
802 Recycling Lane	
Current mailing address	Street Address
Greenville NC 27834	
City State Zip	City State Zip
252 752 8274	
Telephone	Telephone

2. (a) If the Financially Responsible Party is a Corporation, give name and street address of the Registered Agent.

Name(s)	
Current mailing address	Street Address
City State Zip	City State Zip
Telephone	Telephone

(b) If the Financially Responsible Party is a Partnership give the name and street address of each General Partner (Use blank page to list additional partners):

Name(s)	Name(s)
Current mailing address	Current mailing address
City State Zip	City State Zip
Telephone	Telephone

The above information is true and correct to the best of my knowledge and belief and was provided by me under oath. (This form must be signed by the financially responsible person if an individual or his/her attorney-in-fact or if not an individual by an officer, director, partner, or registered agent with authority to execute instruments for the financially responsible person). I agree to provide corrected information should there be any change in the information provided herein.

Judson Whitehurst Type or print name	Title or Authority
Signature	Date

I,______________________________, a Notary Public of the County of _______________ State of North Carolina, hereby certify that____ appeared personally before me this day and being duly sworn acknowledged that the above form was executed by him.

Witness my hand and notarial seal this_____day of_____________. 20___.

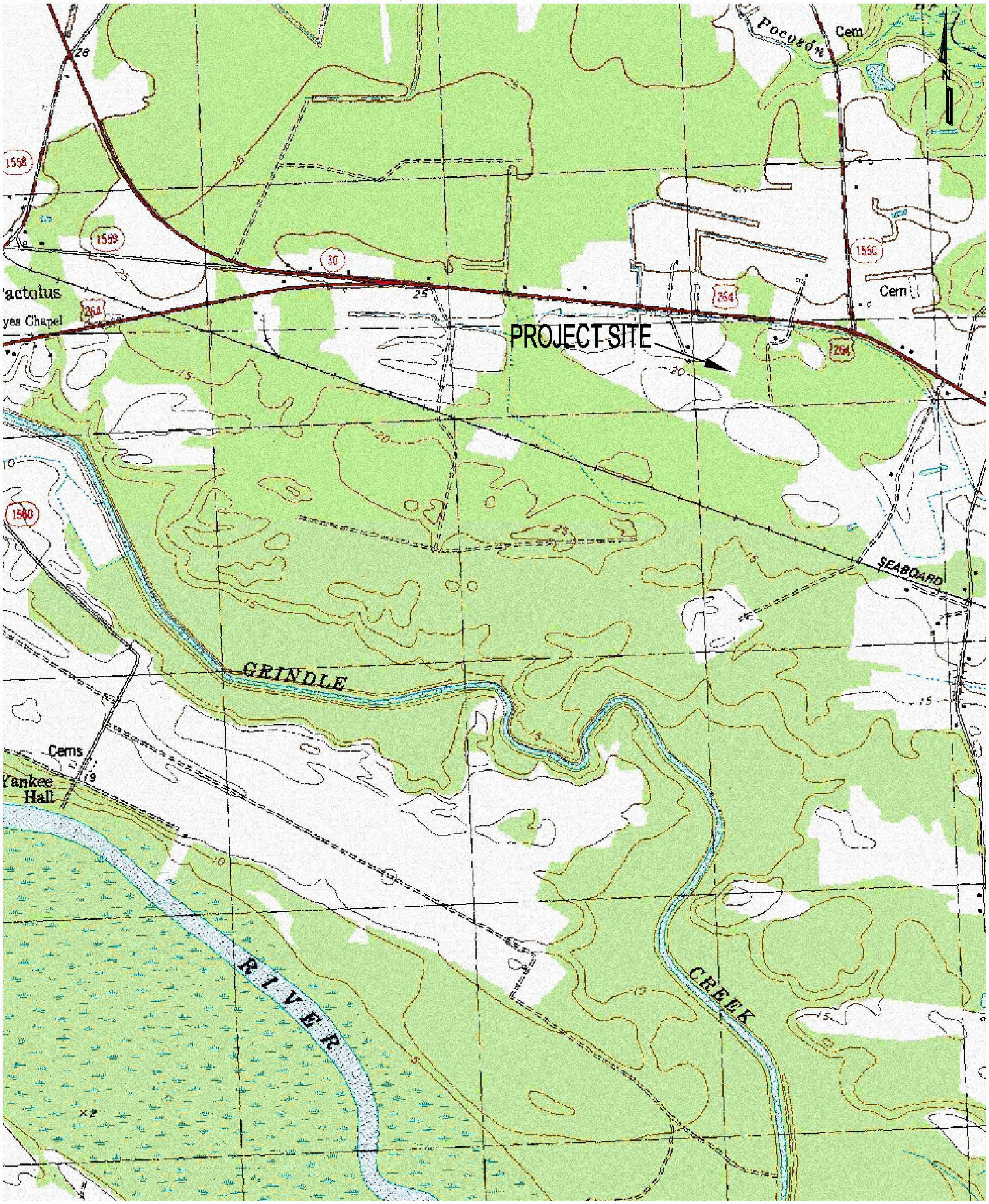
____
Notary
My commission expires___________.

Area Maps

John A.K Tucker, P.E.
Consulting Engineer
P.O. Box 297 Fuquay-Varina, North Carolina 27526

Project C&D LANDFILL - PHASE 2
Sheet ______ of ______
Date ______
Scale AS NOTED

PORTION OF 7.5 MIN USGS QUAD SHEET GREENVILLE NE



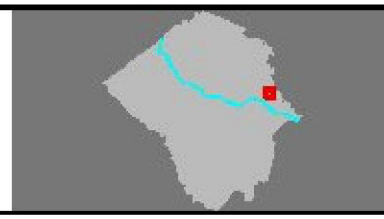
GRAPHIC SCALE 1"= 2000

0 2000 4000 6000

Pitt County Government

Greenville, North Carolina

www.pittcountync.gov

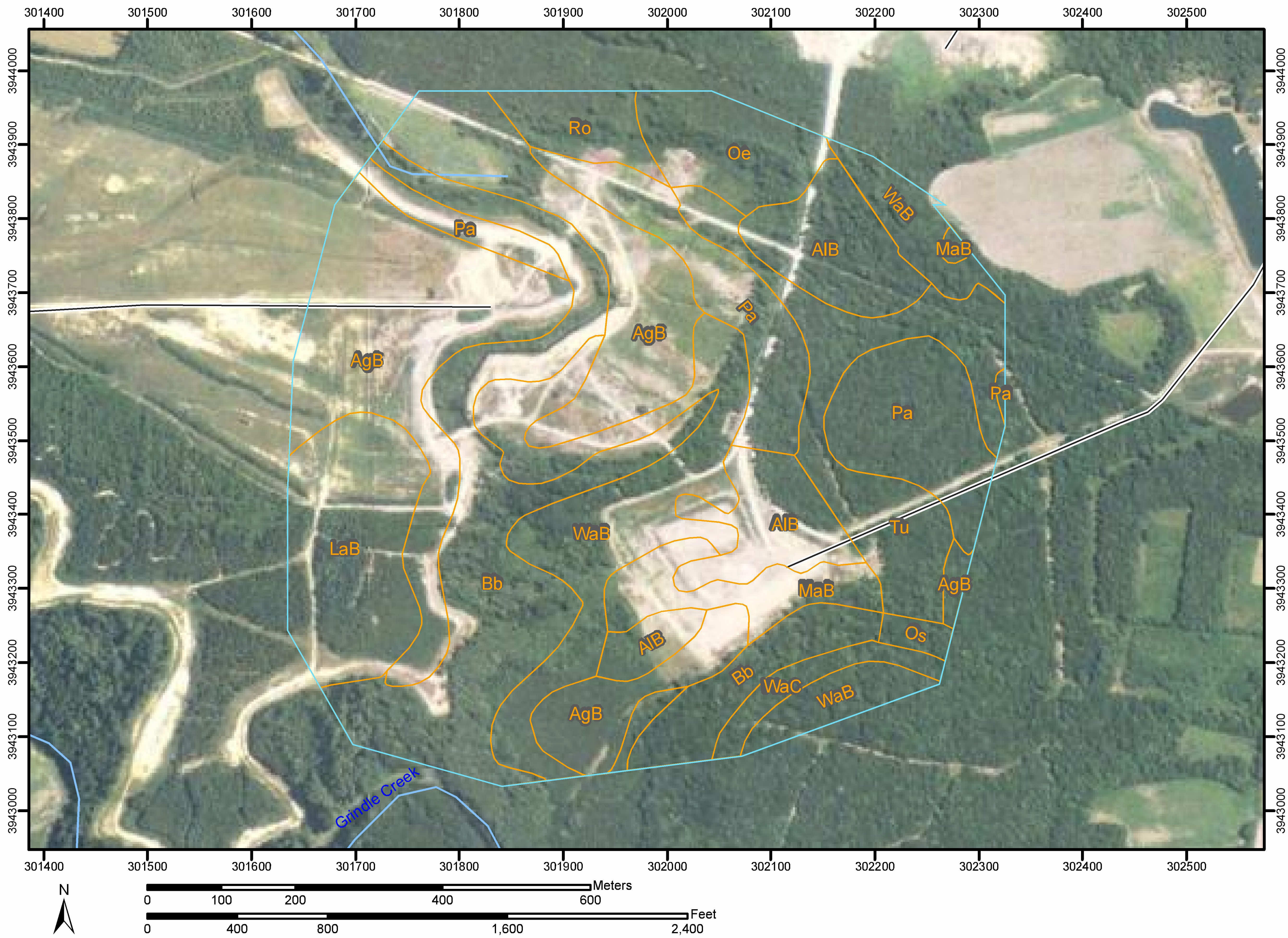


Parcel	062664
Physical Address	0 US 264-E (OFF) HY
OwnerName	E J E RECYCLING DISPOSAL INC
OwnerAddress1	802 RECYCLING LANE
OwnerAddress2	
OwnerAddress3	
City / State / Zip	GREENVILLE NC 27834
NC PIN	5638757763
Subdivision / Section / Phase	
Block Lot	
Tract	
Building Number / Unit	
Acres	89.71
Current Owner Deed/Document	1588 108
Map Book	54-150,60
Deed/Document Date	10/2006
Deed/Document Sales Price	$0
Building Type / Use	GI RESIDENTIAL(Single Family Residential)
Number of Buildings	0
Year Built	
Heated Square Feet	
Building Value	
Extra Features Value	$0
Land Value	$53,830
Total Market Value	$53,830
Revaluation Year	2004
Municipality	
Township	PACTOLUS
Fire District	PACTOLUS
Census Tract	9
Neighborhood	005502
Elementary School	PACTOLUS
Middle School	PACTOLUS
High School	NORTH PITT HIGH

PLEASE NOTE:

The parcel ownership information is updated nightly; HOWEVER, the value information is frozen as of the 2007 year due to the 2008 revaluation in process.

Soil Map–Pitt County, North Carolina
(C&D Landfill - Phase 2)



Natural Resources
Conservation Service

Web Soil Survey 2.0
National Cooperative Soil Survey

2/19/2008
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features

Municipalities
- Cities
- Urban Areas

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails

Roads
- Interstate Highways
- US Routes
- State Highways
- Local Roads
- Other Roads

MAP INFORMATION

Original soil survey map sheets were prepared at publication scale. Viewing scale and printing scale, however, may vary from the original. Please rely on the bar scale on each map sheet for proper map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pitt County, North Carolina
Survey Area Data: Version 7, Aug 23, 2007

Date(s) aerial images were photographed: 2/15/1998

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Pitt County, North Carolina (NC147)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AgB	Alaga loamy sand, banded substratum, 0 to 6 percent slopes (Alpin)	43.6	22.9%
AlB	Altavista sandy loam, 0 to 4 percent slopes	15.9	8.4%
Bb	Bibb complex	32.0	16.8%
LaB	Lakeland sand, 0 to 6 percent slopes	14.1	7.4%
MaB	Masada sandy loam, 0 to 4 percent slopes (State)	6.2	3.3%
Oe	Olustee loamy sand, sandy subsoil variant (Murville)	7.2	3.8%
Os	Osier loamy sand, loamy substratum (Plummer)	1.0	0.5%
Pa	Pactolus loamy sand	21.3	11.2%
Ro	Roanoke silt loam	4.1	2.2%
Tu	Tuckerman fine sandy loam (Yonges)	14.9	7.8%
WaB	Wagram loamy sand, 0 to 6 percent slopes	27.3	14.3%
WaC	Wagram loamy sand, 6 to 10 percent slopes	2.7	1.4%
Totals for Area of Interest (AOI)		190.4	100.0%

Calculations

C&D Landfill Phase 2
Skimmer Basin Design

Basin Number	DA	Peak Q - 10 yr	Req'd Vol	Req'd SA	Suggested Length	Top Width	Top Length	Side Slope	Depth	Bottom Width	Bottom Length	Bottom Area	Actual Volume		Actual Area		Trial Weir Lenth	Depth over Weir	Spillway Capacity	
	(ac)	(cfs)	(cf)	(sf)		(ft)	(ft)	(z:1)	(ft)	(ft)	(ft)	(sf)	(cf)		(sf)		(ft)	(ft)	(cfs)	
1	3.15	9.3	5670	3023		25	130	2	2.5	15	120	1800	6224	**Okay**	3250	**Okay**	10	0.5	10.61	**Okay**
2	2.01	5.9	3618	1918		25	110	2	2.5	15	100	1500	5234	**Okay**	2750	**Okay**	6	0.5	6.36	**Okay**
3	1.36	4	2448	1300		25	110	2	2.5	15	100	1500	5234	**Okay**	2750	**Okay**	6	0.5	6.36	**Okay**
4	3.34	9.8	6012	3185		25	130	2	2.5	15	120	1800	6224	**Okay**	3250	**Okay**	10	0.5	10.61	**Okay**
5	2.92	8.6	5256	2795		25	120	2	2.5	15	110	1650	5729	**Okay**	3000	**Okay**	10	0.5	10.61	**Okay**
6	2.81	8.3	5058	2698		25	110	2	2.5	15	100	1500	5234	**Okay**	2750	**Okay**	10	0.5	10.61	**Okay**
7	2.92	8.6	5256	2795		25	120	2	2.5	15	110	1650	5729	**Okay**	3000	**Okay**	10	0.5	10.61	**Okay**
8	2.36	7	4248	2275		25	110	2	2.5	15	100	1500	5234	**Okay**	2750	**Okay**	10	0.5	10.61	**Okay**

Diversion Berm/Swale
Basin 2
Side North

Open Channel Flow Worksheet

User Data	Calculated Value

Mannings Equation

Q_2	3.7	cfs
Q_{10}	4.8	cfs
Q_{25}	5.5	cfs
Design Flow	3.70	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	6.19	ft./sec.
Velocity	2.97	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp Synthetic	Perm Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

Revised 12/21/2006

Diversion Berm/Swale
Basin 2
Side South

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation		
Q_2	1.5	cfs
Q_{10}	1.9	cfs
Q_{25}	2.2	cfs
Design Flow	1.40	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	4.34	ft./sec.
Velocity	1.12	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp	Perm
	Earth	Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

Revised 12/21/2006

Diversion Berm/Swale
Basin 3
Side North

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	1.5	cfs
Q_{10}	1.9	cfs
Q_{25}	2.2	cfs
Design Flow	2.10	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	4.91	ft./sec.
Velocity	1.69	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp Grass	Perm Grass

Manning's Roughness Coefficients n

Lining Type	Depth of Flow Range (feet) 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

Revised 12/21/2006

Diversion Berm/Swale
Basin 3
Side South

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	1.5	cfs
Q_{10}	1.9	cfs
Q_{25}	2.2	cfs
Design Flow	2.10	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	4.91	ft./sec.
Velocity	1.69	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

	Temp	Perm
Liner Type	Grass	Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

Revised 12/21/2006

Diversion Berm/Swale
Basin 4
Side North

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	1.5	cfs
Q_{10}	1.9	cfs
Q_{25}	2.2	cfs
Design Flow	5.00	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	7.23	ft./sec.
Velocity	4.01	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

	Temp	Perm
Liner Type	Synthetic Matting	Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

Revised 12/21/2006

Diversion Berm/Swale
Basin 4
Side South

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	1.5	cfs
Q_{10}	1.9	cfs
Q_{25}	2.2	cfs
Design Flow	5.00	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	7.23	ft./sec.
Velocity	4.01	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

	Temp	Perm
Liner Type	Synthetic Matting	Grass

Manning's Roughness Coefficients n

Lining Type	Depth of Flow Range (feet) 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 5
Side North

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation		
Q_2	6.5	cfs
Q_{10}	8.5	cfs
Q_{25}	9.6	cfs
Design Flow	8.50	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	10.04	ft./sec.
Velocity	6.82	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

	Temp	Perm
Liner Type	Synthetic Matting	Synthetic Matting

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)**		
	0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

Revised 12/21/2006

Diversion Berm/Swale
Basin 5
Side South

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	1.5	cfs
Q_{10}	1.9	cfs
Q_{25}	2.2	cfs
Design Flow	1.90	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	4.75	ft./sec.
Velocity	1.53	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp	Perm
	Earth	Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 6
Side North

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	2.4	cfs
Q_{10}	3.1	cfs
Q_{25}	3.5	cfs
Design Flow	3.10	cfs
Mannings n	0.03	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	5.71	ft./sec.
Velocity	2.49	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp Earth	Perm Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 6
Side South

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation		
Q_2	3.6	cfs
Q_{10}	4.7	cfs
Q_{25}	5.3	cfs
Design Flow	4.70	cfs
Mannings n	0.03	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	6.99	ft./sec.
Velocity	3.77	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp Syn Mat	Perm Grass

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 7
Side North

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	3.1	cfs
Q_{10}	4.1	cfs
Q_{25}	4.6	cfs
Design Flow	4.10	cfs
Mannings n	0.03	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	6.51	ft./sec.
Velocity	3.29	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp	Perm
	Syn Mat	Grass

Manning's Roughness Coefficients n

Lining Type	Depth of Flow Range (feet) 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 7
Side South

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation

Q_2	4.0	cfs
Q_{10}	5.3	cfs
Q_{25}	6.0	cfs
Design Flow	5.30	cfs
Mannings n	0.03	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	7.48	ft./sec.
Velocity	4.26	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp	Perm
	Syn Mat	Syn Mat

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)** 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 8
Side

Open Channel Flow Worksheet

User Data	Calculated Value

Mannings Equation

Q_2	5.3	cfs
Q_{10}	6.9	cfs
Q_{25}	7.8	cfs
Design Flow	6.90	cfs
Mannings n	0.03	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.01	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	8.76	ft./sec.
Velocity	5.54	ft./sec.
Shear Stress	0.39	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

Liner Type	Temp	Perm
	Syn Mat	Syn Mat

Manning's Roughness Coefficients n

Lining Type	**Depth of Flow Range (feet)**		
	0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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Diversion Berm/Swale
Basin 1
Side North

Open Channel Flow Worksheet

User Data | Calculated Value

Mannings Equation		
Q_2	7.1	cfs
Q_{10}	9.2	cfs
Q_{25}	10.5	cfs
Design Flow	9.20	cfs
Mannings n	0.02	
Bottom Width	0.1	feet
Depth of Flow	0.63	feet
Channel Slope	0.025	ft./ft.
Side Slope	3	H:V
Area of Flow	1.25	sq. ft.
Wetted Perimeter	4.07	feet
Surface Width	3.87	feet
Hydraulic Radius	0.31	feet
Kinematic Wave Speed	10.61	ft./sec.
Velocity	7.39	ft./sec.
Shear Stress	0.98	lb./sq.ft.

Enter the Design Flow value within the Solver Window. Click Tools, Select and Click Solver, enter "Value of", then click Solve Button. Mannings Equation will be solved for Depth of Flow.

	Temp	Perm
Liner Type	Synthetic Mat	Synthetic Mat

Manning's Roughness Coefficients n

Lining Type	Depth of Flow Range (feet) 0-0.5	0.5-2.0	>2.0
Bare Soil	0.023	0.02	0.02
Jute Net with straw	0.028	0.022	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Matting	0.066	0.035	0.028
Synthetic Matting	0.036	0.025	0.021
Riprap 6" D_{50}	0.104	0.069	0.035
Riprap 12" D_{50}		0.078	0.04

Permissible Unit Shear Stress (lb./sq.ft.)

Lining Type	
Bare Soil	NA
Jute Net with straw	0.45
Straw with Net	1.45
Curled Wood Matting	1.55
Synthetic Matting	2.00
Riprap 6" D_{50}	2.00
Riprap 9" D_{50}	3.00
Riprap 12" D_{50}	4.00
Riprap 15" D_{50}	5.00
Riprap 18" D_{50}	6.00
Riprap 21" D_{50}	7.80
Riprap 24" D_{50}	8.00

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References

Raleigh, North Carolina 35.8706N, 78.7864W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	5.58	4.46	3.74	2.58	1.62	0.94	0.66	0.40	0.24	0.14
10	7.08	5.66	4.78	3.46	2.25	1.33	0.95	0.58	0.34	0.021
25	7.78	6.19	5.24	3.88	2.58	1.54	1.11	0.68	0.41	0.24
100	8.64	6.86	5.78	4.43	3.05	1.85	1.36	0.84	0.51	0.30

Fayetteville, North Carolina 35.0583N, 78.8583W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.11	4.88	4.09	2.83	1.77	1.04	0.74	0.44	0.26	0.15
10	7.96	6.36	5.36	3.88	2.53	1.54	1.10	0.66	0.39	0.23
25	8.94	7.13	6.02	4.46	2.97	1.83	1.32	0.80	0.47	0.28
100	10.44	8.29	6.99	5.35	3.69	2.29	1.69	1.03	0.62	0.36

Wilmington, North Carolina 34.2683N, 77.9061W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	7.39	5.92	4.96	3.42	2.15	1.28	0.91	0.56	0.33	0.19
10	9.70	7.75	6.54	4.74	3.08	1.94	1.39	0.87	0.51	0.30
25	10.98	8.75	7.40	5.48	3.65	2.38	1.73	1.08	0.64	0.38
100	12.92	10.27	8.65	6.63	4.56	3.18	2.37	1.49	0.89	0.53

Washington, North Carolina 35.5333N, 77.0167W

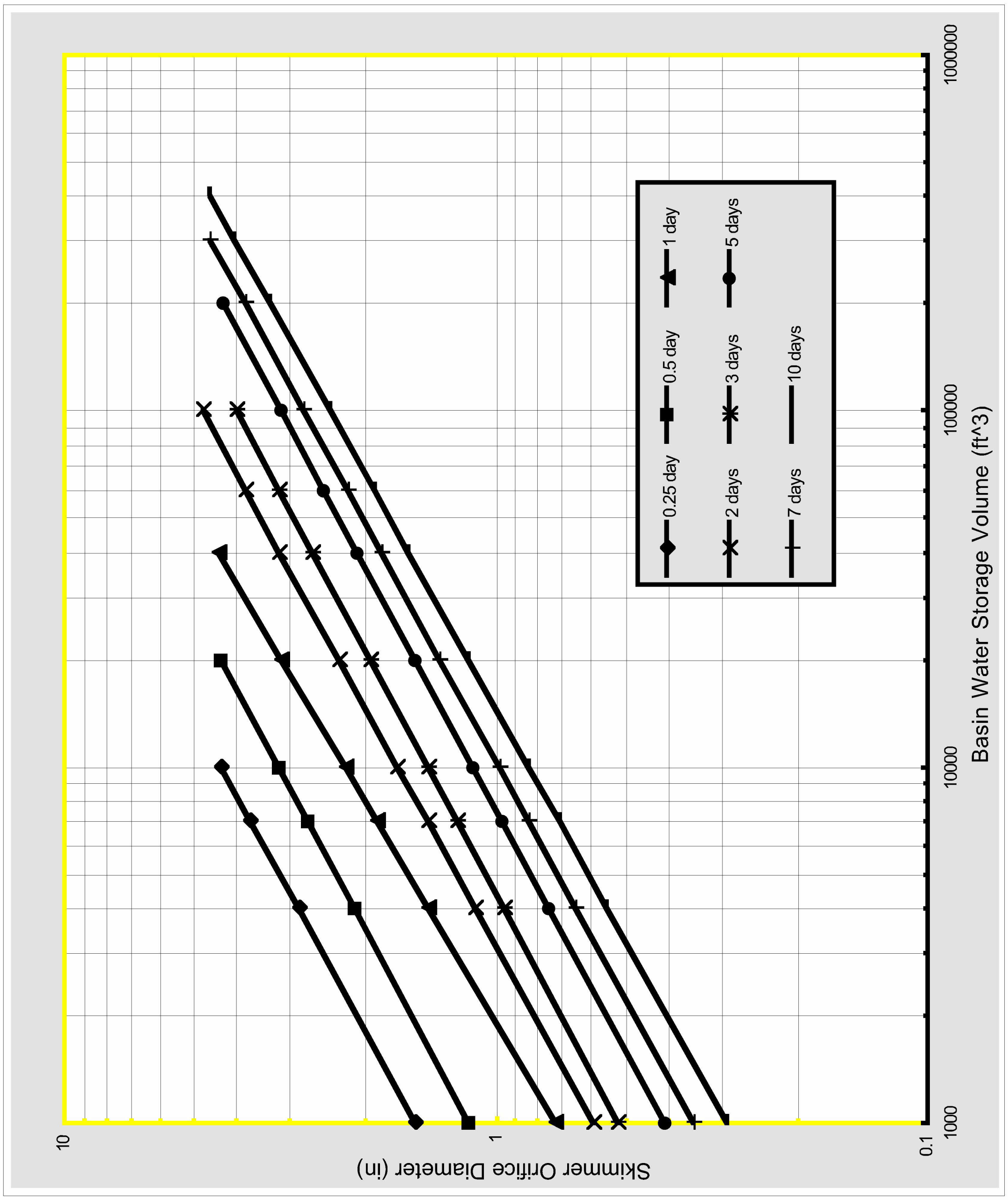
ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.41	5.12	4.29	2.96	1.86	1.10	0.78	0.47	0.27	0.16
10	8.38	6.70	5.65	4.09	2.66	1.64	1.19	0.72	0.42	0.25
25	9.48	7.55	6.38	4.73	3.15	1.99	1.46	0.88	0.52	0.31
100	11.16	8.87	7.47	5.72	3.94	2.58	1.93	1.18	0.70	0.42

Manteo Airport, North Carolina 35.9167N, 75.7000W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.46	5.16	4.32	2.99	1.87	1.08	0.79	0.48	0.29	0.17
10	8.47	6.77	5.71	4.14	2.69	1.62	1.20	0.74	0.44	0.27
25	9.56	7.62	6.44	4.77	3.17	1.96	1.47	0.91	0.54	0.33
100	11.26	8.95	7.54	5.77	3.98	2.54	1.95	1.21	0.73	0.44

Cape Hatteras, North Carolina, 35.2322N, 75.6225W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	7.20	5.75	4.82	3.33	2.09	1.29	0.94	0.58	0.34	0.20
10	9.41	7.52	6.35	4.60	2.99	1.93	1.43	0.89	0.53	0.31
25	10.66	8.49	7.18	5.31	3.54	2.33	1.75	1.09	0.65	0.38
100	12.53	9.95	8.39	6.42	4.42	3.03	2.32	1.45	0.88	0.51


Skimmer Orifice Diameter (in)
Basin Water Storage Volume (ft^3)
10
1
0.1
1000
10000
100000
1000000
0.25 day
0.5 day
1 day
2 days
3 days
5 days
7 days
10 days

6.64

SKIMMER SEDIMENT BASIN

Definition

An earthen embankment suitably located to capture runoff, with a trapezoidal spillway lined with an impermeable geotextile or laminated plastic membrane, and equipped with a floating skimmer for dewatering.

Purpose

Sediment basins are designed to provide an area for runoff to pool and settle out a portion of the sediment carried down gradient. Past designs used a perforated riser for dewatering, which allowed water to leave the basin from all depths. One way to improve the sediment capture rate is to have an outlet which dewaters the basin from the top of the water column where the water is cleanest. A skimmer is probably the most common method to dewater a sediment basin from the surface. The basic concept is that the skimmer does not dewater the basin as fast as runoff enters it, but instead allows the basin to fill and then slowly drain over hours or days. This process has two effects. First, the sediment in the runoff has more time to settle out prior to discharge. Second, a pool of water forms early in a storm event and this further increases sedimentation rates in the basin. Many of the storms will produce more volume than the typical sediment basin capacity and flow rates in excess of the skimmer capability, resulting in flow over the emergency spillway. This water is also coming from the top of the water column and has thereby been "treated" to remove sediment as much as possible. (Adapted from SoilFacts: Dewatering Sediment Basins Using Surface Outlets. N. C. State University, Soil Science Department.)

Conditions Where Practice Applies

Skimmer sediment basins are needed where drainage areas are too large for temporary sediment traps. Do not locate the skimmer sediment basin in intermittent or perennial streams.

Planning Considerations

Select locations for skimmer basins during initial site evaluation. Install skimmer sediment basins before any site grading takes place within the drainage area.

Select skimmer sediment basin sites to capture sediment from all areas that are not treated adequately by other sediment control measures. Always consider access for cleanout and disposal of the trapped sediment. Locations where a pond can be formed by constructing a low dam across a natural swale are generally preferred to sites that require excavation. Where practical, divert sediment-free runoff away from the basin.

A skimmer is a sedimentation basin dewatering control device that withdraws water from the basin's water surface, thus removing the highest quality water for delivery to the uncontrolled environment. A skimmer is shown in Figure 6.64a. By properly sizing the skimmer's control orifice, the skimmer can be made to dewater a design hydrologic event in a prescribed period. Because the spillway is actually used relatively frequently, it should be carefully stabilized using geotextiles, or rock if necessary, that can withstand the expected flows. The spillway should be placed as far from the inlet of the basin as possible to maximize sedimentation before discharge. The spillway should be located in natural groundcover to the greatest extent possible

The costs of using a skimmer system are similar, or occasionally less, than a conventional rock outlet or perforated riser. However, the basin is more efficient in removing sediment. Another advantage of the skimmer is that it can be reused on future projects. The main disadvantage of the skimmer is that it does require frequent maintenance, primarily in removing debris from the inlet.

A skimmer must dewater the basin from the top of the water surface. The rate of dewatering must be controlled. A dewatering time of 24 to 72 hours is required. **Any skimmer design that dewaters from the surface at a controlled rate is acceptable.**

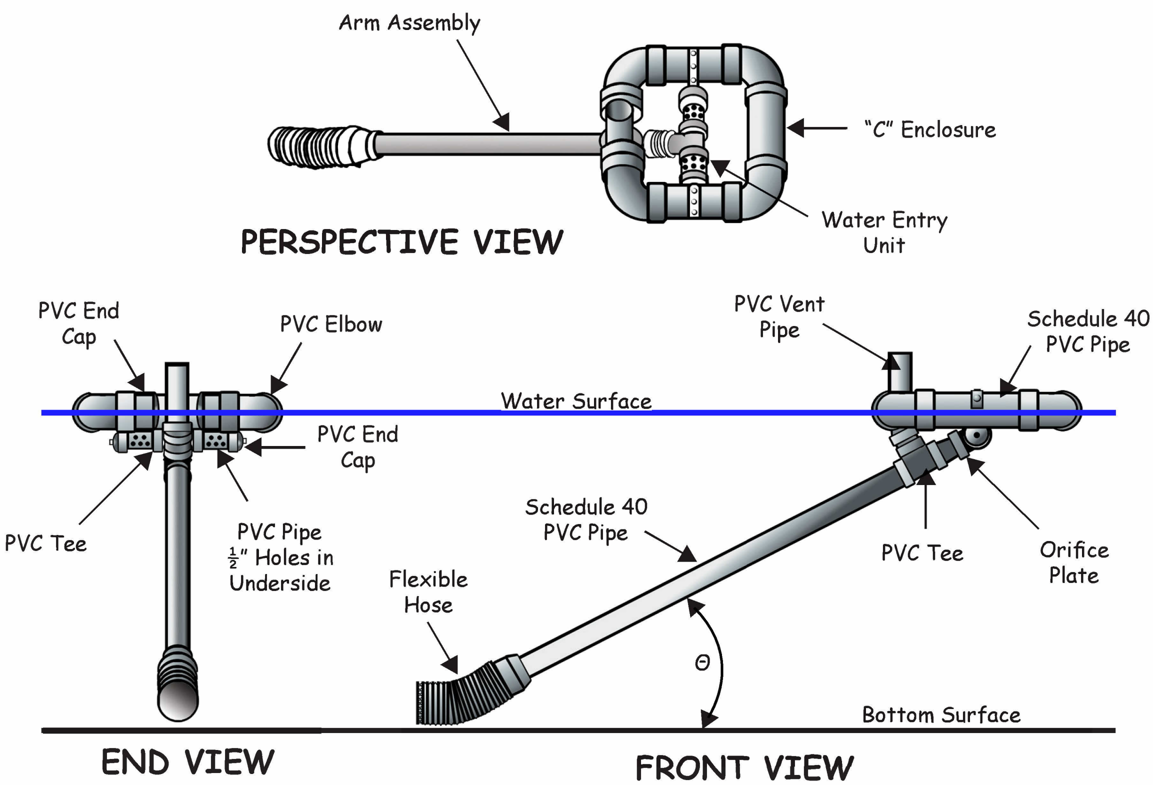
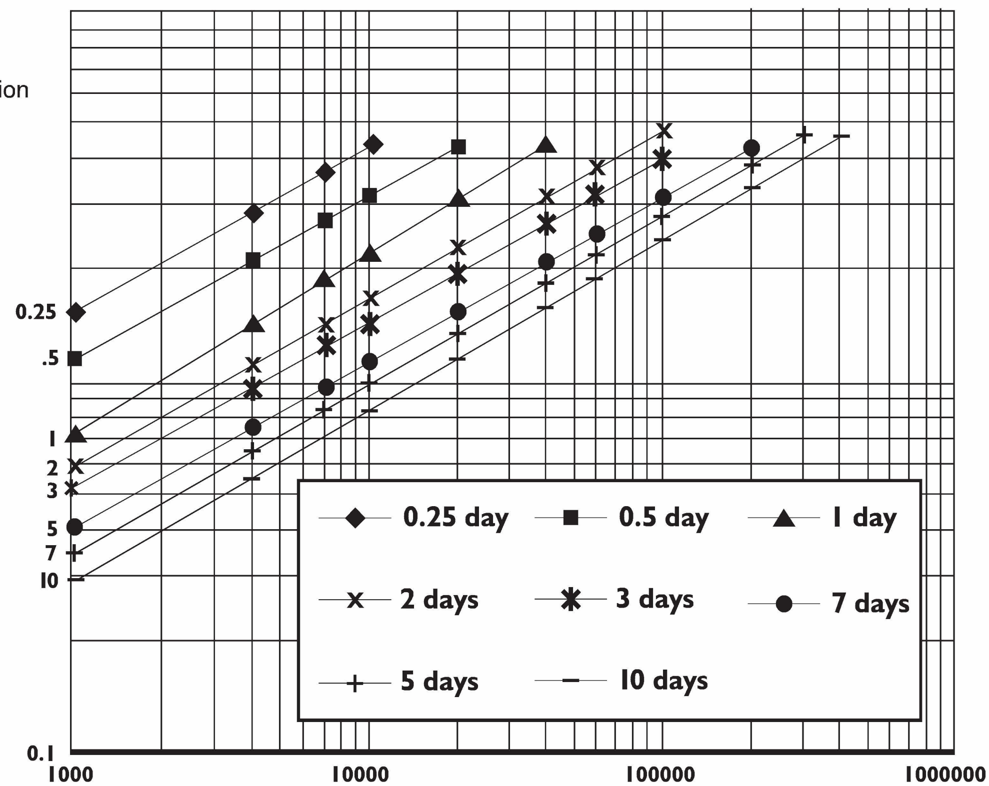


Figure 6.64a Schematic of a skimmer, from Pennsylvania Erosion and Sediment Pollution Control Manual, March, 2000.

SKIMMER ORIFICE DIAMETER

In order to streamline the orifice sizing procedure, Figure 6.64b, may be used. This design chart assumes the designer knows or has determined the sedimentation basin's water storage volume in cubic feet and the desired dewatering time (in days) for the basin under consideration. The skimmer orifice size (in inches) can be read by entering Figure 6.64b from the x-axis with the basin's water storage volume (in cubic feet), moving vertically to the line that represents the basin's desired dewatering time (in days), then moving to the left to the y-axis.

Figure 6.64b Skimmer orifice diameter as a function of the basin volume and basin dewatering time.



DESIGN EXAMPLE

Example: The design professional in charge of designing the sedimentation basin for a 10-acre construction site desires to use a skimmer to control dewatering of a sedimentation basin. The sedimentation basin for a 10-acre disturbed area requires a water storage volume of 18,000 cubic feet. The desired dewatering time is 1-3 days.

Solution: Using the water storage volume of 18,000 cubic feet and the 1-3 day dewatering time on Figure 6.64b, a 2-inch orifice diameter is required. (Adapted from Proper Sizing of the Control Orifice for the Faircloth Skimmer. Pennsylvania State University Department of Agricultural and Biological Engineering Fact Sheet #252.)

Design Criteria

Summary:	**Skimmer Sediment Basin**
Primary Spillway:	Trapezoidal spillway with impermeable membrane
Maximum Drainage Area:	10 acres
Minimum Volume:	1800 cubic feet per acre of disturbed area
Minimum Surface Area:	325 square feet per cfs of Q_{10} peak inflow
Minimum L/W Ratio:	2:1
Maximum L/W Ratio:	6:1
Minimum Depth:	2 feet
Dewatering Mechanism:	Skimmer
Minimum Dewatering Time:	24 hours
Baffles Required:	3 baffles

Drainage areas—Limit drainage areas to 10 acres.

Design basin life—Ensure a design basin life of 3 years or less.

Dam height—Limit dam height to 5 feet.

Basin locations—Select areas that:

- Provide capacity for storage of sediment from as much of the planned disturbed area as practical;
- Exclude runoff from undisturbed areas where practical;
- Provide access for sediment removal throughout the life of the project;
- Interfere minimally with construction activities.

Basin shape—Ensure that the flow length to basin width ratio is at least 2:1 to improve trapping efficiency. Length is measured at the elevation of the principal spillway.

Storage volume—Ensure that the sediment storage volume of the basin, as measured to the elevation of the crest of the principal spillway, is at least 1,800 cubic feet per acre for the disturbed area draining into the basin (1,800 cubic feet is equivalent to half an inch of sediment per acre of basin disturbed area).

Remove sediment from the basin when approximately one-half of the storage volume has been filled.

Spillway capacity—The spillway system must carry the peak runoff from the 10-year storm with a minimum 1 foot of freeboard in the spillway. Base runoff computations on the disturbed soil cover conditions expected during the effective life of the structure.

Sediment cleanout elevation—Determine the elevation at which the invert of the basin would be half-full. This elevation should also be marked in the field with a permanent stake set at this ground elevation (not the top of the stake).

Basin dewatering—The basin should be provided with a surface outlet. A floating skimmer should be attached to a Schedule 40 PVC barrel pipe of the same diameter as the skimmer arm. The orifice in the skimmer will control the rate of dewatering. The skimmer should be sized to dewater the basin in 24-72 hours (1-3 days).

Outlet Protection—Discharge velocities must be within allowable limits for the receiving stream (References: *Outlet Protection*).

Basin spillway—Construct the entire flow area of the spillway in undisturbed soil if possible. Make the cross section trapezoidal with side slopes of 3:1 or flatter.

- Capacity—The minimum design capacity of the spillway must be the peak rate of runoff from the 10-year storm. Maximum depth of flow during the peak runoff should be 6 inches. In no case should the freeboard of the spillway be less than 1 foot above the design depth of flow.
- Velocity—Ensure that the velocity of flow discharged from the basin is nonerosive for the existing conditions. When velocities exceed that allowable for the receiving areas, provide outlet protection (References: *Outlet Protection*).

Embankment—Ensure that embankments for skimmer sediment basins do not exceed 5 feet in height (measured at the center line from the original ground surface to the top of the embankment). Keep the crest of the spillway outlet a minimum of 1.5 feet below the top of the embankment. Additional freeboard may be added to the embankment height which allows flow through a designated bypass location. Construct embankments with a minimum top width of 5 feet and side slopes of 2:1 or flatter. Machine compact the embankments.

Excavation—Where sediment pools are formed or enlarged by excavation, keep side slopes at 2:1 or flatter for safety.

Erosion protection—Stabilize all areas disturbed by construction (except the lower half of the sediment pool) by suitable means immediately after completing the basin (References: *Surface Stabilization*).

Trap efficiency—Improve sediment basin trapping efficiency by employing the following considerations in the basin design:

- Surface area—In the design of the settling pond, allow the largest surface area possible.
- Length—Maximize the length-to-width ratio of the basin to prevent short circuiting, and ensure use of the entire design settling area.
- Baffles—Provide a minimum of three porous baffles to evenly distribute flow across the basin and reduce turbulence.
- Inlets—Area between the sediment inlets and the basin should be stabilized by geotextile material, with or without rocks (Figure 6.64c shows the area with rocks). The inlet to basin should be located the greatest distance possible from the principal spillway.

• Dewatering—Allow the maximum reasonable detention period before the basin is completely dewatered (at least 24 hours).

• Inflow rate—Reduce the inflow velocity and divert all sediment-free runoff.

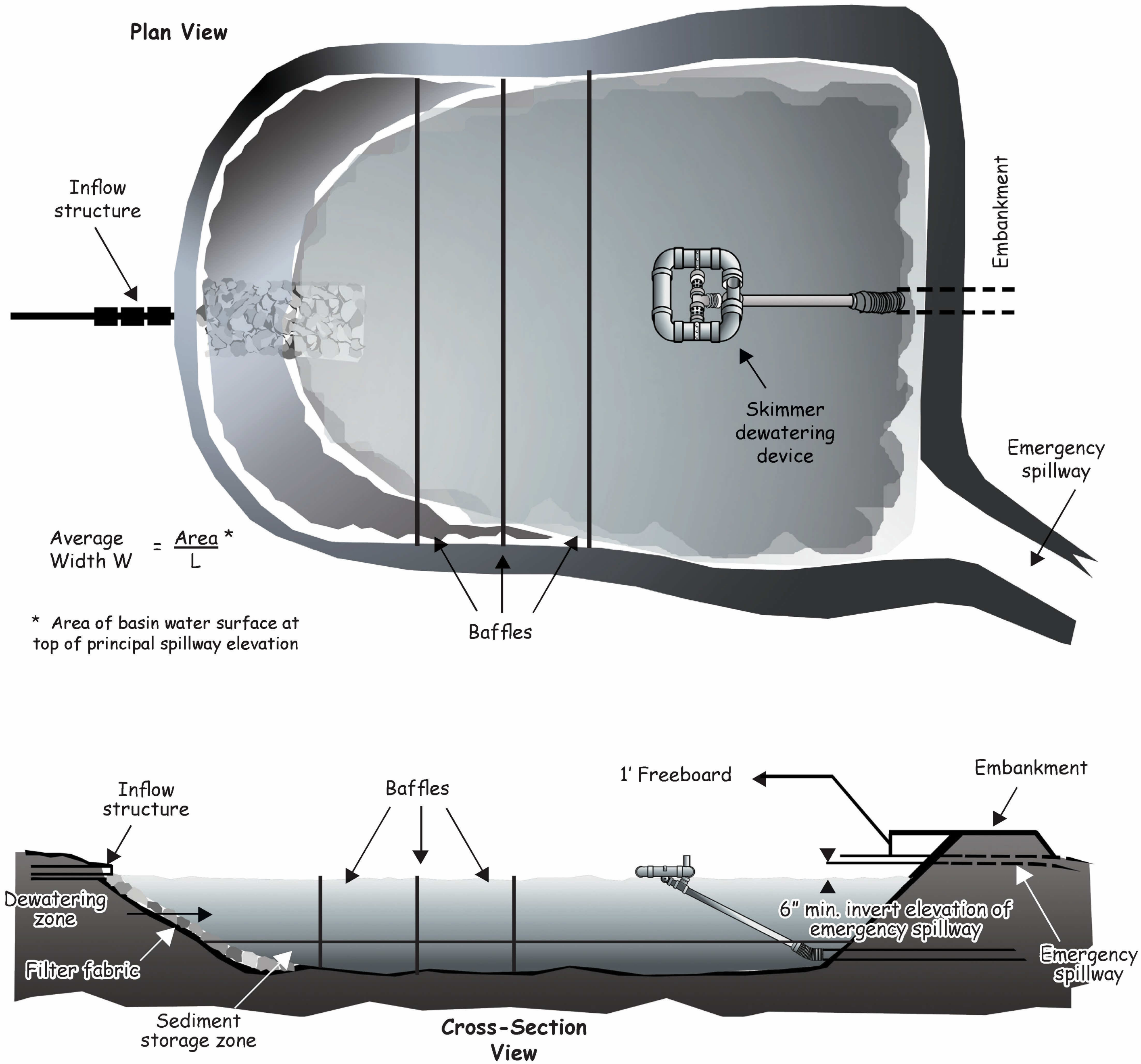


Figure 6.64c Example of a sediment basin with a skimmer outlet and emergency spillway. From Pennsylvania Erosion and Sediment Pollution Control Manual, March, 2000.

Construction Specifications

1. Clear, grub, and strip the area under the embankment of all vegetation and root mat. Remove all surface soil containing high amounts of organic matter and stockpile or dispose of it properly. Haul all objectionable material to the designated disposal area. Place temporary sediment control measures below basin as needed

2. Ensure that fill material for the embankment is free of roots, woody vegetation, organic matter, and other objectionable material. Place the fill in lifts not to exceed 9 inches, and machine compact it. Over fill the embankment 6 inches to allow for settlement.

3. Shape the basin to the specified dimensions. Prevent the skimming device from settling into the mud by excavating a shallow pit under the skimmer or providing a low support under the skimmer of stone or timber.

4. Place the barrel (typically 4-inch Schedule 40 PVC pipe) on a firm, smooth foundation of impervious soil. Do not use pervious material such as sand, gravel, or crushed stone as backfill around the pipe. Place the fill material around the pipe spillway in 4-inch layers and compact it under and around the pipe to at least the same density as the adjacent embankment. Care must be taken not to raise the pipe from the firm contact with its foundation when compacting under the pipe haunches.

Place a minimum depth of 2 feet of compacted backfill over the pipe spillway before crossing it with construction equipment. In no case should the pipe conduit be installed by cutting a trench through the dam after the embankment is complete.

5. Assemble the skimmer following the manufacturers instructions, or as designed.

6. Lay the assembled skimmer on the bottom of the basin with the flexible joint at the inlet of the barrel pipe. Attach the flexible joint to the barrel pipe and position the skimmer over the excavated pit or support. Be sure to attach a rope to the skimmer and anchor it to the side of the basin. This will be used to pull the skimmer to the side for maintenance.

7. Earthen spillways—Install the spillway in undisturbed soil to the greatest extent possible. The achievement of planned elevations, grade, design width, and entrance and exit channel slopes are critical to the successful operation of the spillway. The spillway should be lined with laminated plastic or impermeable geotextile fabric. The fabric must be wide and long enough to cover the bottom and sides and extend onto the top of the dam for anchoring in a trench. The edges may be secured with 8-inch staples or pins. The fabric must be long enough to extend down the slope and exit onto stable ground. The width of the fabric must be one piece, not joined or spliced; otherwise water can get under the fabric. If the length of the fabric is insufficient for the entire length of the spillway, multiple sections, spanning the complete width, may be used. The upper section(s) should overlap the lower section(s) so that water cannot flow under the fabric. Secure the upper edge and sides of the fabric in a trench with staples or pins. (Adapted from "A Manual for Designing, Installing and Maintaining Skimmer Sediment Basins." February, 1999. J. W. Faircloth & Son.).

8. Inlets—Discharge water into the basin in a manner to prevent erosion. Use temporary slope drains or diversions with outlet protection to divert sediment-laden water to the upper end of the pool area to improve basin trap efficiency (References: *Runoff Control Measures and Outlet Protection*).

9. Erosion control—Construct the structure so that the disturbed area is minimized. Divert surface water away from bare areas. Complete the embankment before the area is cleared. Stabilize the emergency spillway embankment and all other disturbed areas above the crest of the principal spillway immediately after construction (References: *Surface Stabilization*).

10. Install porous baffles as specified in Practice 6.65, *Porous Baffles*.

11. After all the sediment-producing areas have been permanently stabilized, remove the structure and all the unstable sediment. Smooth the area to blend with the adjoining areas and stabilize properly (References: *Surface Stabilization*).

Maintenance

Inspect skimmer sediment basins at least weekly and after each significant (one-half inch or greater) rainfall event and repair immediately. Remove sediment and restore the basin to its original dimensions when sediment accumulates to one-half the height of the first baffle. Pull the skimmer to one side so that the sediment underneath it can be excavated. Excavate the sediment from the entire basin, not just around the skimmer or the first cell. Make sure vegetation growing in the bottom of the basin does not hold down the skimmer.

Repair the baffles if they are damaged. Re-anchor the baffles if water is flowing underneath or around them.

If the skimmer is clogged with trash and there is water in the basin, usually jerking on the rope will make the skimmer bob up and down and dislodge the debris and restore flow. If this does not work, pull the skimmer over to the side of the basin and remove the debris. Also check the orifice inside the skimmer to see if it is clogged; if so remove the debris.

If the skimmer arm or barrel pipe is clogged, the orifice can be removed and the obstruction cleared with a plumber's snake or by flushing with water. Be sure and replace the orifice before repositioning the skimmer.

Check the fabric lined spillway for damage and make any required repairs with fabric that spans the full width of the spillway. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Make all necessary repairs immediately. Remove all trash and other debris from the skimmer and pool areas.

Freezing weather can result in ice forming in the basin. Some special precautions should be taken in the winter to prevent the skimmer from plugging with ice.

Reference

Jarrett, A. R. Proper Sizing of the Control Orifice for the Faircloth Skimmer. Pennsylvania State University Department of Agricultural and Biological Engineering Fact Sheet #252. http://www.age.psu.edu/extension/factsheets/f/F252.pdf

Jarrett, A. R. Controlling the Dewatering of Sedimentation Basins. Pennsylvania State University Department of Agricultural and Biological Engineering Fact Sheet #253. http://www.age.psu.edu/extension/factsheets/f/F253.pdf

Erosion and Sediment Pollution Control Manual, March, 2000. Commonwealth of Pennsylvania Dept. of Environmental Protection, Office of Water Management, Document #363-2134-008. http://www.co.centre.pa.us/conservation/esmanual.pdf.

McLaughlin, Richard. SoilFacts: Dewatering Sediment Basins Using Surface Outlets. N. C. State University, Soil Science Department.

A Manual for Designing, Installing and Maintaining Skimmer Sediment Basins. February, 1999. J. W. Faircloth & Son.

Surface Stabilization
6.10, Temporary Seeding
6.11, Permanent Seeding
6.12, Sodding
6.13, Trees, Shrubs, Vines, and Ground Covers

Runoff Control Measures
6.20, Temporary Diversions
6.21, Permanent Diversions
6.22, Perimeter Dike

Outlet Protection
6.41, Outlet Stabilization Structure

Sediment Traps and Barriers
6.65, Porous Baffles

Appendices
8.03, Estimating Runoff
8.07, Sediment Basin Design

6.65

BAFFLES

Definition

Porous barriers installed inside a temporary sediment trap, rock dam, skimmer basin, or sediment basin to reduce the velocity and turbulence of the water flowing through the measure, and facilitate the settling of sediment from the water before discharge.

Purpose

Sediment traps and basins are designed to temporarily pool runoff water to allow sediment to settle before the water is discharged. Unfortunately, they are usually not very efficient due to high turbulence and "short-circuiting" flows which take runoff quickly to the outlet with little interaction with most of the basin. Baffles improve the rate of sediment retention by distributing the flow and reducing turbulence. This process can improve sediment retention.

Conditions Where Practice Applies

This practice should be used in any temporary sediment trap, rock dam, skimmer basin or temporary sediment basin.

Planning Considerations

Porous baffles effectively spread the flow across the entire width of a sediment basin or trap. Water flows through the baffle material, but is slowed sufficiently to back up the flow, causing it to spread across the entire width of the baffle (Figure 6.65a).

Spreading the flow in this manner utilizes the full cross section of the basin, which in turns reduces flow rates or velocity as much as possible. In addition, the turbulence is also greatly reduced. The combination increases sediment deposition and retention and also decreases the particle size of sediment captured.

The installation should be similar to a sediment fence (Figure 6.65b). Materials such as 700 g/m^2 coir erosion blanket (Figure 6.65d), coir mesh, or tree protection fence folded over to reduce pore size have been used successfully. Other similar materials could work as well. A support wire or rope across the top will help prevent excessive sagging if the material is attached to it with appropriate ties. Another option is to use a sawhorse type of support with the legs stabilized with rebar inserted into the basin floor. These structures work well and can be prefabricated off site and quickly installed. Another baffle system involves placing silt fence fabric in front of a wire fence (hog wire) backing, and slitting the fabric in alternating squares (Figure 6.65b). This permits flow through the silt fence similar to more porous materials.

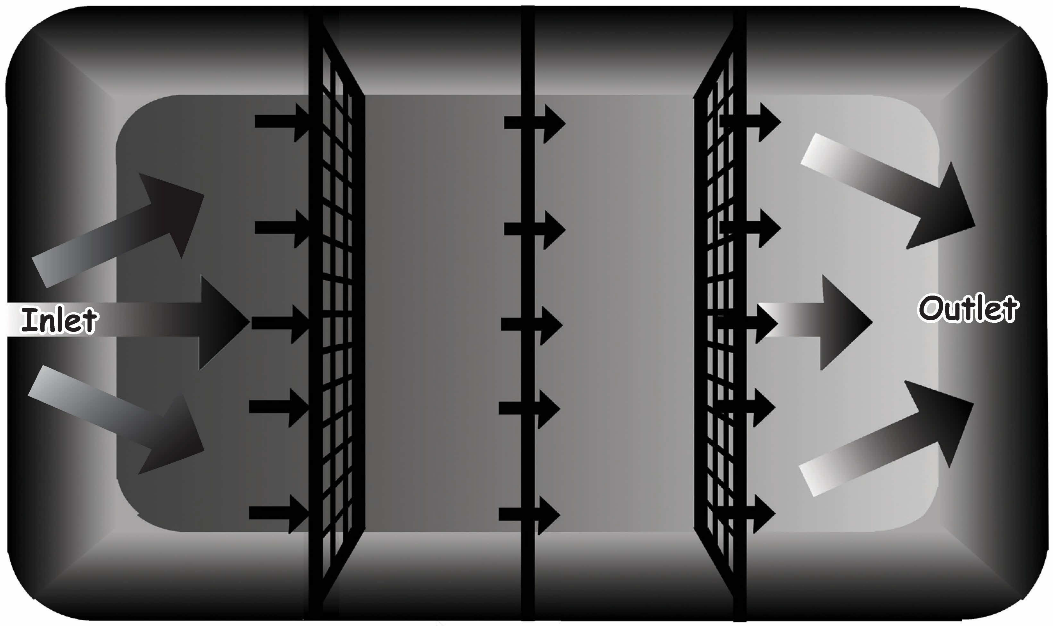


Figure 6.65a Porous baffles in a sediment basin. The flow is distributed evenly across the basin to reduce flow rates and turbulence, resulting in greater sediment retention.

Baffles need to be installed correctly in order fully provide their benefits. Refer to Figure 6.65b and the following key points:

- The baffle material needs to be secured at the bottom and sides using staples or by trenching as for silt fence.
- Most of the sediment will accumulate in the first bay, so this should be readily accessible for maintenance.

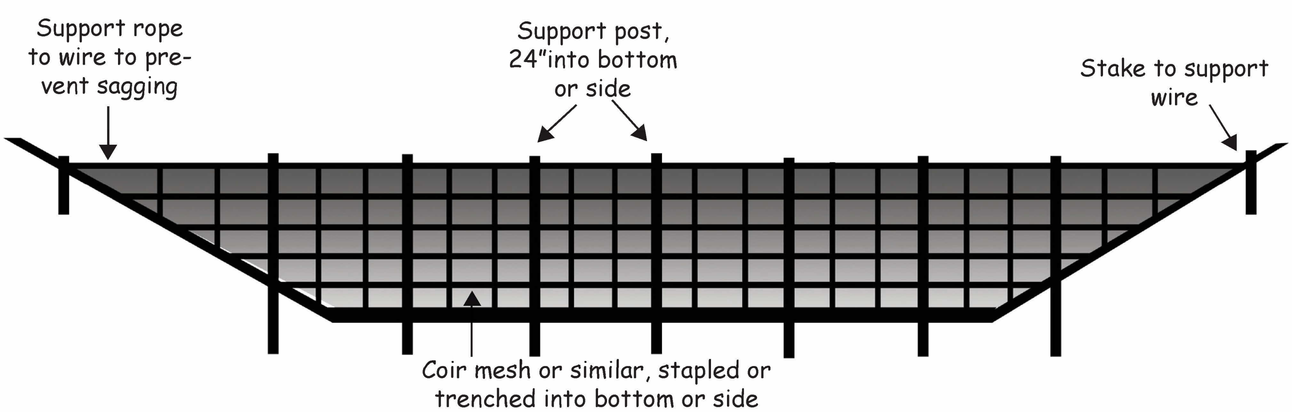


Figure 6.65b Cross-section of a porous baffle in a sediment basin. Note that there is no weir because the water flows through the baffle material.

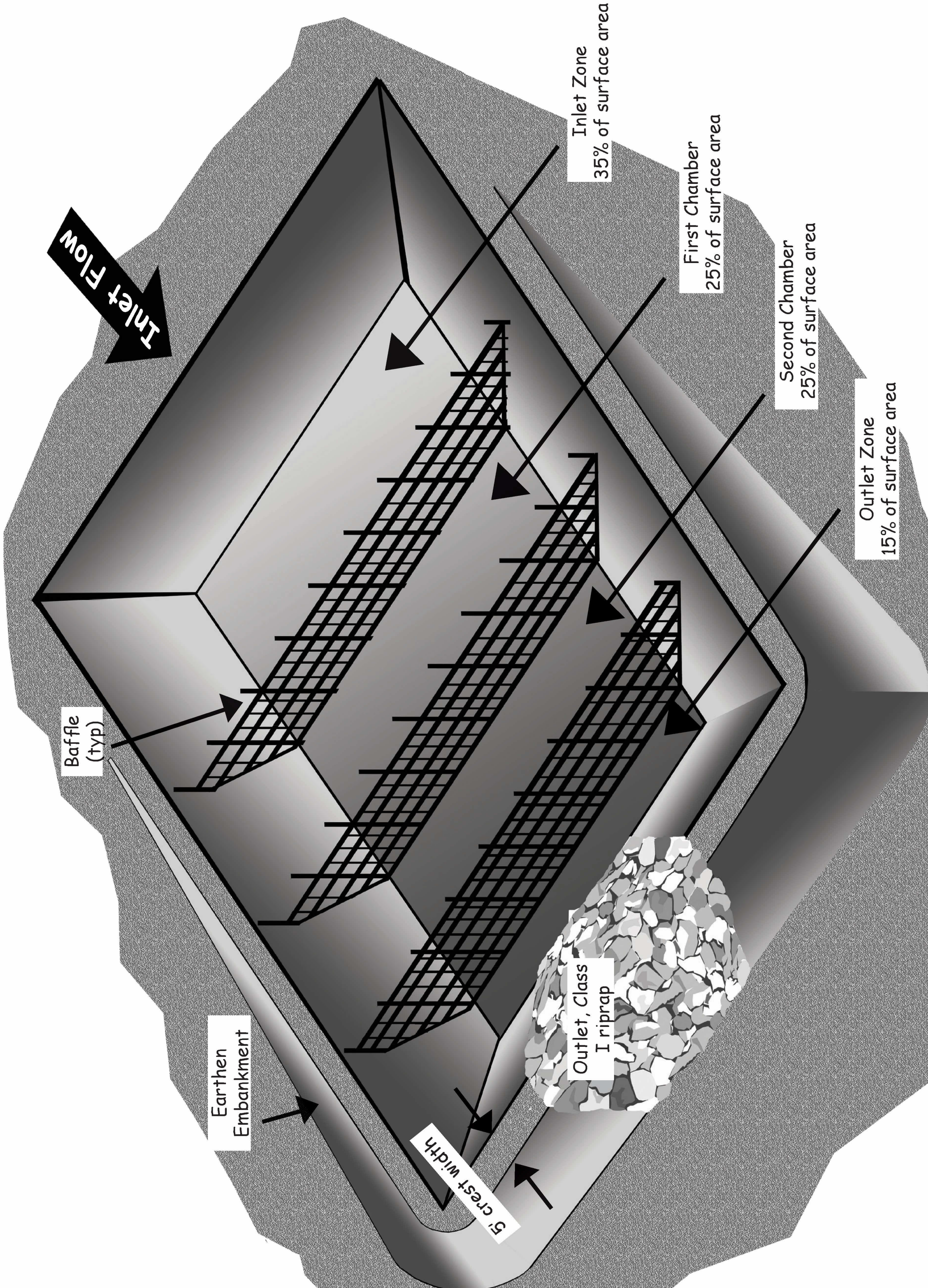


Figure 6.65c Example of porous baffle using silt fence with slits cut in each alternating space of wire backing fence. (City of High Point, NC detail.)

Figure 6.65d Example of porous baffles made of 700 g/m² coir erosion blanket as viewed from the inlet.

Design Criteria

The temporary sediment trap, rock dam, or temporary sediment basin should be sized using the appropriate design criteria.

The percent of surface area for each section of the baffle are as follows:

- inlet zone: 35%
- first cell: 25%
- second cell: 25%
- outlet zone: 15%
- Basins less that 20 feet in length may use 2 baffles that divide the basin into thirds.

Be sure to construct baffles up the sides of the trap or basin banks so water does not flow around the structures. Most of the sediment will be captured in the inlet zone. Smaller particle size sediments are captured in the latter cells. Be sure to maintain access to the trap for maintenance and sediment removal.

The design life of the fabric is 6-12 months, but may need to be replaced more often if damaged or clogged.

Construction Specification

1. Grade the basin so that the bottom is level front to back and side to side.

2. Install posts or saw horses across the width of the sediment trap (Practice 6.62, *Sediment Fence*).

3. Steel posts should be driven to a depth of 24 inches, spaced a maximum of 4 feet apart, and installed up the sides of the basin as well. The top of the fabric should be 6 inches higher than the invert of the spillway. Tops of baffles should be 2 inches lower than the top of the berms.

4. Install at least three rows of baffles between the inlet and outlet discharge point. Basins less than 20 feet in length may use 2 baffles.

5. When using posts, add a support wire or rope across the top of the measure to prevent sagging.

6. Wrap porous material, like jute backed by coir material, over a sawhorse or the top wire. Hammer rebar into the sawhorse legs for anchoring. The fabric should have five to ten percent openings in the weave. Attach fabric to a rope and a support structure with zip ties, wire, or staples.

7. The bottom and sides of the fabric should be anchored in a trench or pinned with 8-inch erosion control matting staples.

8. Do not splice the fabric, but use a continuous piece across the basin.

Maintenance

Inspect baffles at least once a week and after each rainfall. Make any required repairs immediately.

Be sure to maintain access to the baffles. Should the fabric of a baffle collapse, tear, decompose, or become ineffective, replace it promptly.

Remove sediment deposits when it reaches half full to provide adequate storage volume for the next rain and to reduce pressure on the baffles. Take care to avoid damaging the baffles during cleanout. Sediment depth should never exceed half the designed storage depth.

After the contributing drainage area has been properly stabilized, remove all baffle materials and unstable sediment deposits, bring the area to grade, and stabilize it.

References

Sediment Traps and Barriers
6.60 Temporary Sediment Trap
6.61 Sediment Basins
6.62 Sediment Fence
6.63 Rock Dams
6.64 Skimmer Sediment Basin

McLaughlin, Richard, "SoilFacts: Baffles to Improve Sediment Basins." N. C. State University Cooperative Extension Service Fact Sheet AGW-439-59, 2005.

Sullivan, Brian. City of High Point Erosion Control Specifications.

Thaxton, C. S., J. Calantoni, and R. A. McLaughlin. 2004. Hydrodynamic assessment of various types of baffles in a sediment detention pond. Transactions of the ASAE. Vol. 47(3): 741-749.

6.21

→ D →

PERMANENT DIVERSIONS

Definition

A permanent ridge or channel or a combination ridge and channel constructed on a designed grade across sloping land.

Purpose

To divert water from areas where it is in excess to locations where it can be used or released without erosion or flood damage.

Conditions Where Practice Applies

This permanent site development practice applies to construction areas where runoff can be diverted and used or disposed of safely to prevent flood damage or erosion and sedimentation damage. Specific locations and conditions include:

- above steep slopes to limit surface runoff onto the slope;
- across long slopes to reduce slope length to prevent gully erosion;
- below steep grades where flooding, seepage problems, or sediment deposition may occur;
- around buildings or areas that are subject to damage from runoff.

Planning Considerations

Permanent diversions should be planned as a part of initial site development. They are principally runoff control measures that subdivide the site into specific drainage areas (Figure 6.21a). Permanent diversions can be installed as temporary diversions until the site is stabilized then completed as a permanent measure, or they can be installed in final form during the initial construction operation (Practice 6.20, *Temporary Diversions*). The amount of sediment anticipated and the maintenance required as a result of construction operations will determine which approach should be used. Stabilize permanent diversions with vegetation or materials such as riprap, paving stone, or concrete as soon as possible after installation. Base the location, type of stabilization, and diversion configuration on final site conditions. Evaluate function, need, velocity control, outlet stability, and site aesthetics. When properly located, land forms such as landscape islands, swales or ridges can be used effectively as permanent diversions. Base the capacity of a diversion on the runoff characteristics of the site and the potential damage after development. Consider designing an emergency overflow section or bypass area to limit damage from storms that exceed the design storm. The overflow section may be designed as a weir with riprap protection.

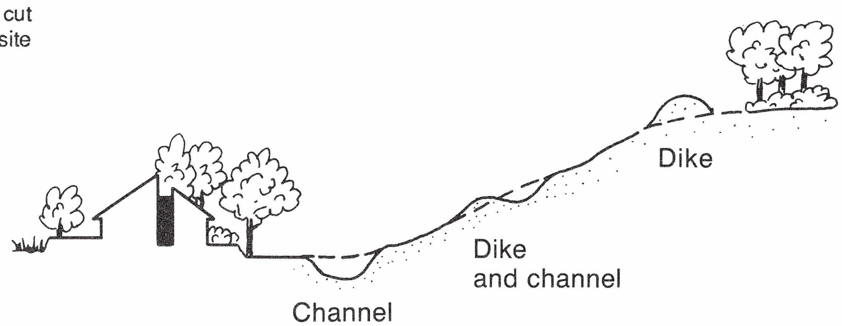


Figure 6.21a Use of diversions to protect cut or fill slopes, protect structures or off-site property, or break long slopes.

Design Criteria

Location—Determine diversion locations by topography, development layout, soil conditions, outlet conditions, length of slope, seepage planes, and need for water and sediment storage.

Capacity—Ensure that permanent diversions have sufficient capacity to carry the peak runoff expected from a storm frequency consistent with the hazard involved, as shown in Table 6.21a.

Velocity—See Table 8.05a, *Appendix 8.05*.

Ridge design—	side slope:	2:1 or flatter 3:1 or flatter when maintained by mowing
	top width:	2 feet minimum
	freeboard:	0.5 feet minimum
	settlement:	10% of total fill height minimum
Channel design—	material:	to meet velocity requirements and site aesthetics
	shape:	to fit site conditions
	side slope:	2:1 or flatter 3:1 or flatter when maintained by mowing

Grades—Either a uniform or a gradually increasing grade is preferred.

Outlet—Design the outlet stable enough to accept flow from the diversions plus any other contributing runoff. Divert sediment-laden runoff and release it through a sediment-trapping device (Practice 6.60, *Temporary Sediment Trap*, or Practice 6.61, *Sediment Basin*).

Stabilization—Unless the area is otherwise stabilized, provide vegetative stabilization after installation of the diversion. Seed and mulch disturbed areas draining into the diversion within 21 calender days of completing any phase of grading.

Table 6.21a
Minimum Design Storm for Degrees of Hazard

Level of Protection	Area to Be Protected	Minimum Design Storm
Low	All erosion control facilities. Open areas, parking lots, minor recreation areas.	10 year
Medium	Recreation development, low-capacity roads and minor structures.	25 year, 24 hour 50 year, 24 hour
High	Major structures, homes, main school buildings, high-capacity roads.	100 year, 24 hour

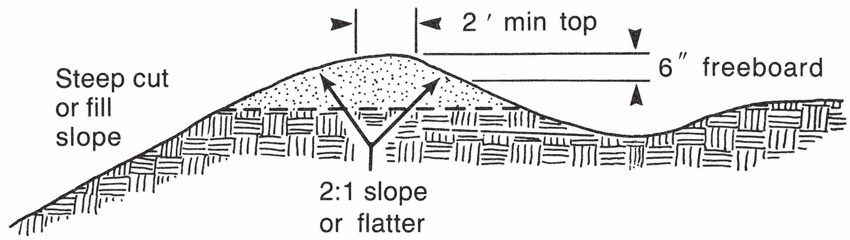
Construction Specifications

1. Remove and properly dispose of all trees, brush, stumps, or other objectionable material. Fill and compact all ditches, swales, or gullies that will be crossed to natural ground level or above.

2. Just before placement of fill, the base of the ridge should be disked by machinery.

3. Excavate, shape, and stabilize the diversion to line, grade, and cross section, as required in the design plan (Figure 6.21b).

Figure 6.21b Permanent diversion located above a slope.



4. Compact the ridge to prevent unequal settlement, and to provide stability against seepage.

5. Vegetatively stabilize the diversion after its installation.

Maintenance

Inspect permanent diversions after every rainfall during the construction operation. Immediately remove any obstructions from the flow area, and repair the diversion ridge. Check outlets, and make timely repairs as needed. Maintain the vegetation in a vigorous, healthy condition at all times.

References

Surface Stabilization
6.10, Temporary Seeding
6.11, Permanent Seeding
6.14, Mulching

Runoff Control Measures
6.20, Temporary Diversions

Outlet Protection
6.40, Level Spreader
6.41, Outlet Stabilization Structure

Sediment Traps and Barriers
6.60, Temporary Sediment Trap
6.61, Sediment Basin

Appendices
8.03, Estimating Runoff
8.05, Design of Stable Channels and Diversions

6.21.4

6.32

TSD

TEMPORARY SLOPE DRAINS

Definition

A flexible tubing or conduit extending temporarily from the top to the bottom of a cut or fill slope.

Purpose

To convey concentrated runoff down the face of a cut or fill slope without causing erosion.

Conditions Where Practice Applies

This practice applies to construction areas where stormwater runoff above a cut or fill slope will cause erosion if allowed to flow over the slope. Temporary slope drains are generally used in conjunction with diversions to convey runoff down a slope until permanent water disposal measures can be installed.

Planning Considerations

There is often a significant lag between the time a cut or fill slope is graded and the time it is permanently stabilized. During this period, the slope is very vulnerable to erosion, and temporary slope drains together with temporary diversions can provide valuable protection (Practice 6.20, *Temporary Diversions*).

It is very important that these temporary structures be sized, installed, and maintained properly because their failure will usually result in severe erosion of the slope. The entrance section to the drain should be well entrenched and stable so that surface water can enter freely. The drain should extend downslope beyond the toe of the slope to a stable area or appropriately stabilized outlet.

Other points of concern are failure from overtopping from inadequate pipe inlet capacity and lack of maintenance of diversion channel capacity and ridge height.

Design Criteria

Capacity—Peak runoff from the 10-year storm.

Pipe size—Unless they are individually designed, size drains according to Table 6.32a.

Table 6.32a
Size of Slope Drain

Maximum Drainage Area per Pipe (acres)	Pipe Diameter (inches)
0.50	12
0.75	15
1.00	18
>1.00*	as designed

*Inlet design becomes more complex beyond this size.

Conduit—Construct the slope drain from heavy-duty, flexible materials such as nonperforated, corrugated plastic pipe or specially designed flexible tubing (Figure 6.32a). Install reinforced, hold-down grommets or stakes to anchor the conduit at intervals not to exceed 10 ft with the outlet end securely fastened in place. The conduit must extend beyond the toe of the slope.

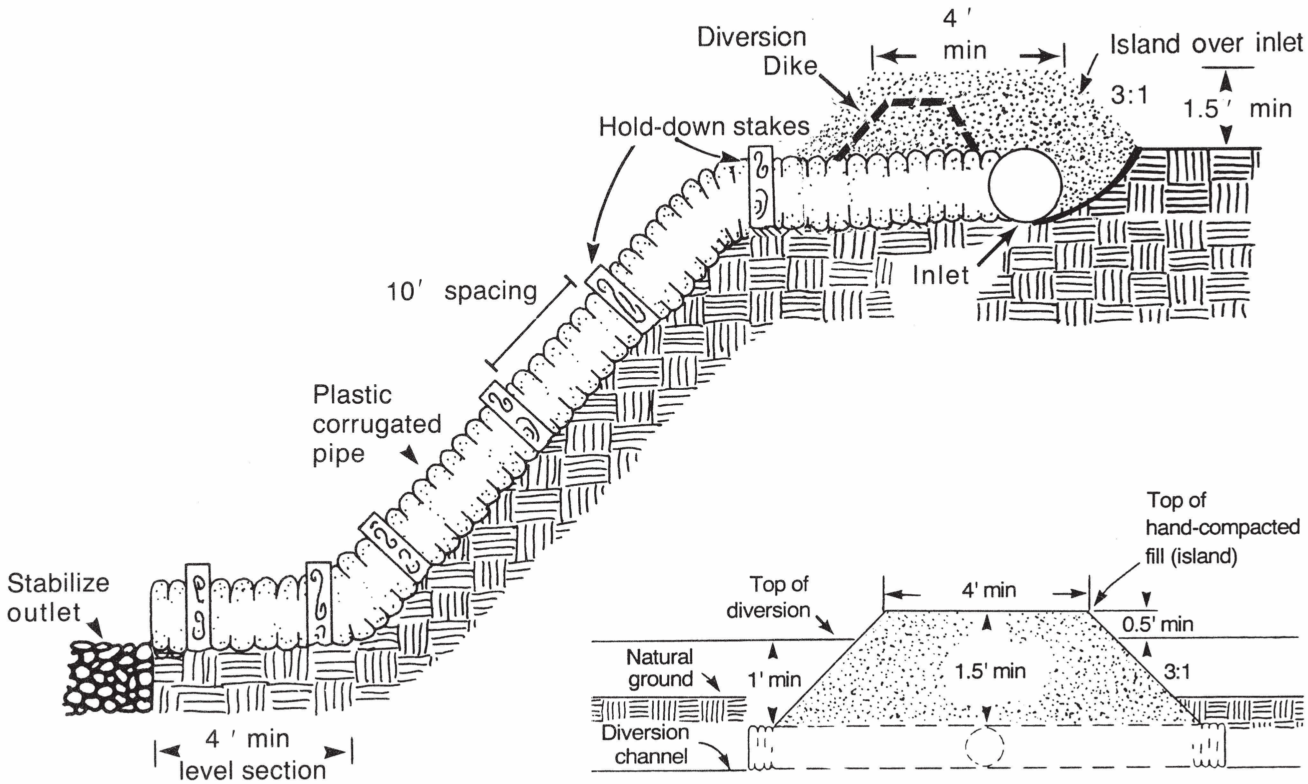


Figure 6.32a Cross section of temporary slope drain.

Entrance—Construct the entrance to the slope drain of a standard flared-end section of pipe with a minimum 6-inch metal toe plate (Figure 6.32a). Make all fittings watertight. A standard T-section fitting may also be used at the inlet.

Temporary diversion—Generally, use an earthen diversion with a dike ridge to direct surface runoff into the temporary slope drain. Make the height of the ridge over the drain conduit a minimum of 1.5 feet and at least 6 inches higher than the adjoining ridge on either side. The lowest point of the diversion ridge should be a minimum of 1 foot above the top of the drain so that design flow can freely enter the pipe.

Outlet protection—Protect the outlet of the slope drain from erosion (Practice 6.41, *Outlet Stabilization Structure*).

Construction Specifications

A common failure of slope drains is caused by water saturating the soil and seeping along the pipe. This creates voids from consolidation and piping and causes washouts. Proper backfilling around and under the pipe "haunches" with stable soil material and hand compacting in 6-inch lifts to achieve firm contact between the pipe and the soil at all points will eliminate this type of failure.

1. Place slope drains on undisturbed soil or well compacted fill at locations and elevations shown on the plan.

2. Slightly slope the section of pipe under the dike toward its outlet.

3. Hand tamp the soil under and around the entrance section in lifts not to exceed 6 inches.

4. Ensure that fill over the drain at the top of the slope has minimum dimensions of 1.5 feet depth, 4 feet top width, and 3:1 side slopes.

5. Ensure that all slope drain connections are watertight.

6. Ensure that all fill material is well-compacted. Securely fasten the exposed section of the drain with grommets or stakes spaced no more than 10 feet apart.

7. Extend the drain beyond the toe of the slope, and adequately protect the outlet from erosion.

8. Make the settled, compacted dike ridge no less than 1 feet above the top of the pipe at every point.

9. Immediately stabilize all disturbed areas following construction.

Maintenance

Inspect the slope drain and supporting diversion after every rainfall, and promptly make necessary repairs. When the protected area has been permanently stabilized, temporary measures may be removed, materials disposed of properly, and all disturbed areas stabilized appropriately.

References

Runoff Control Measures
6.20, Temporary Diversions

Outlet Protection
6.41, Outlet Stabilization Structure

6.32.4

NOTE:

IMAGE TAKEN FROM AERIAL PHOTOGRAPH OBTAINED FROM THE NORTH CAROLINA FLOOD MAPPING PROGRAM, CIRCA 2000

FIELD VERIFIED BY DAVID GARRETT, P.G., P.E. - 12/12/2000
UPDATED BY JOHN A.K. TUCKER, P.E. - 05/15/2003

LEGEND

EXIST GROUND		
PROPSED GRADE	18	
GROUND WATER	18	
WETLANDS		
FLOOD ZONE		
BORING - SEASONAL HIGH WATER ELEVATION		B-18 15.40
BORING COORDINATES		B-18 N 5000 E 5000

GENERAL NOTES:

1. Boundary, topographic and wetland information take from maps prepared by James A. Burgess, PLS, P.O. Box 881, Greenville, NC 27834, 252-758-4900
2. All work shall be in accordance with applicable Federal, State and Local regulations.
3. 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.

GRID NORTH
NAD 83

1.	REVISED PER DSW COMMENTS	10-28-08

REVISIONS

S 3

C&D LANDFILL - PHASE 2

PERMIT TO CONSTRUCT

LOCAL AREA PHOTO & FACILITY PLAN

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

John A. K. Tucker, P.E.
Consulting Engineer
P.O. Box 297 Fuquay-Varina, North Carolina 27526
(919) 567-0483 fax (919) 567-3611
Email: johnak@johntuckerpe.com

February 18, 2008

WASTE SCREENING FORM

C&D Landfill, Inc.
Permit No. 74-07

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

Waste Generator / Source: ____

Inspection Location: ____

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

Description of Load: ____

____

Approved Waste Determination Form Present? (Check one) Yes______ No ______ N/A____

Load Accepted (signature) ______________________________ Date _______________

Load Not Accepted (signature) ______________________________ Date _______________

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

Description of Suspicious Contents: Color ________ Haz. Waste Markings ___________
Texture ________ Odor/Fumes___________________
Drums Present ________ Other _______________________
(describe)_____________________
Est. Cu. Yds. Present in Load ________
Est. Tons Present in Load ________

Identified Hazardous Materials Present:____

County Emergency Management Authority Contacted? Yes______ No ______

Generator Authority Contacted? ____

Hauler Notified (check if waste not accepted)? ____ Phone ______________ Time Contacted ________

Final Disposition of Load ____

Signed ____ Date ________________________
Solid Waste Director

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

HAZARDOUS WASTE CONTACTS

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

EMERGENCY RESPONSE

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

TRANSPORTERS

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

DISPOSAL AND LANDFILLS

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

USED OIL AND ANTIFREEZE

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

FLUORESCENT HANDLERS

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

PCB DISPOSAL

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

U S E F U L   A G E N C I E S   a n d   C O N T A C T S

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

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

FIRE OCCURRENCE NOTIFICATION

NC DENR Division of Waste Management
Solid Waste Section

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

NAME OF FACILITY: ______________________ PERMIT #_______________

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

HOW WAS THE FIRE REPORTED AND BY WHOM ______________________________________

____

LIST ACTIONS TAKEN____

____

____

____

WHAT WAS THE CAUSE OF THE FIRE____

____

____

____

DESCRIBE AREA, TYPE, AND AMOUNT OF WASTE INVOLVED __________________________

____

____

WHAT COULD HAVE BEEN DONE TO PREVENT THIS FIRE______________________________

____

____

____

CURRENT STATUS OF FIRE ____

____

____

DESCRIBE PLAN OF ACTIONS TO PREVENT FUTURE INCIDENTS: _______________________

____

____

____

____

NAME_______________________TITLE__________________________DATE_______________

THIS SECTION TO BE COMPLETED BY SOLID WASTE SECTION REGIONAL STAFF

DATE RECEIVED__________________________

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

____

____

FOLLOW-UP REQUIRED:

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

ACTIONS TAKEN OR REQUIRED:

Revised 6/29/01