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**COLUMBUS COUNTY, NORTH CAROLINA
LAND CLEARING & INERT DEBRIS LANDFILL
PERMIT APPLICATION**



**NORTH CAROLINA SOLID WASTE MANAGEMENT RULES
SECTION .0504 COMPLIANCE**

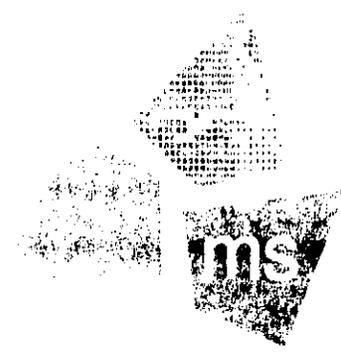
**Permit Renewal Application
October 2006**

Prepared by:



ms consultants, inc.
engineers, architects, planners

336-B Carthage Street
Sanford, North Carolina 27330
Phone: (919) 774-7303
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October 3, 2006

Mr. Leroy Sellers
Director
Columbus County Solid Waste Department
288 Legion Drive
Whiteville, North Carolina 28472

**Reference: Columbus County LCID Landfill Permit 24-01
Permit Renewal Request**

Dear Mr. Sellers:

Please find included one copy of the Permit Renewal for your existing LCID Landfill. The renewal request is on file with the Division of Waste Management. If you have any questions, please contact me at your convenience.

Sincerely,

ms consultants, inc.

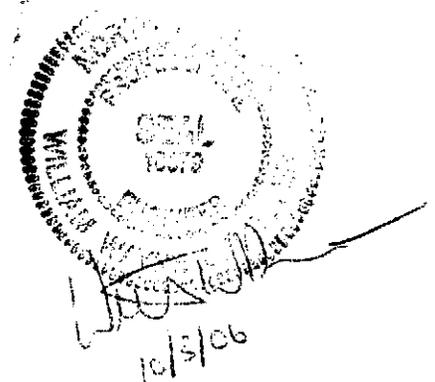
A handwritten signature in black ink, appearing to read 'William W. Dreitzler', is written over a horizontal line.

William W. Dreitzler, P.E.
Technical Manager

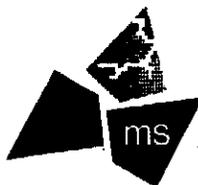
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This application for a Land Clearing & Inert Debris Landfill (LCID) at the MSW Landfill site in Columbus County, North Carolina follows the requirements of Section .0504 - Application Requirements For Sanitary Landfills, as detailed in the North Carolina Solid Waste Management Rules, as amended through January 1, 1997.

SECTION (1): "The following information shall be required for reviewing a site application for a proposed sanitary landfill:"

Section .0504(1) generally requires: an aerial photograph of the site indicating (land use, zoning, homes, industrial buildings, public and private utilities, roads, wells, watercourses, dry runs, and flood plains), a 2-mile radius map indicating (significant ground water users, existing sources of ground water and surface water pollution, water intakes, airport runways, and subdivisions), a geological and hydrological study meeting the requirements of .0504(1)(c), a conceptual design plan, local government approvals, a discussion of compliance with siting standards listed in Rule .0503(1) and a Report indicating service area population, type, quantity and source of waste, equipment to be used for operations, and a groundwater monitoring plan.

- (1)(a): Find included as Appendix 'A', an Aerial Map at a scale of 1"=200'. The property boundary remains the same as that for the Columbus County Landfill Permit 24-01. The proposed Unit Boundary for the LCID Landfill is indicated on the aerial map. In addition, labels or notes regarding: land use, zoning, homes, industrial buildings, public or private utilities, roads, wells, watercourses, dry runs and other applicable details regarding general topography and flood plains are addressed on the aerial map.
- (1)(b): Find included as Appendix 'B', a United States Geological Survey (USGS) map indicating an area within 2 miles of the proposed LCID Landfill site. The following information is either labeled or noted on the Plan: significant groundwater users, potential or existing sources of ground-water and surface water pollution, water intakes, airports, runways and subdivisions.
- (1)(c): A geological and hydrological study of the site meeting all of the requirements of Sections .0504(C)(1)(c)(i) through .0504(C)(1)(c)(iv) was completed by Titan Atlantic Group on January 12, 1998.

**GEOLOGICAL AND HYDROLOGICAL STUDY
PROPOSED CONSTRUCTION & DEMOLITION LANDFILL**

NOTE: Titan Atlantic Group, Inc. prepared two (2) revised reports after submittal of this original. The additional reports are:

- 1) Revised Geological & Hydrological Study Report (dated December 11, 1998)**

- 2) Addendum To Revised Geological and Hydrological Study Report (dated March 9, 1999)**



January 12, 1998

Marlowe, Dreitzler & Associates
219 N. Boylan Ave.
Raleigh, NC 27603

Attention: Mr. William W. Dreitzler, P.E.

Subject: Geological & Hydrological Study Report
Proposed C&D Landfill
Columbus County, North Carolina
Titan Project No. 20-7408

Dear Mr. Dreitzler:

Titan Atlantic Group (Titan) is pleased to present this geological and hydrological study report for the proposed Construction and Demolition Debris (C&D) landfill in Columbus County, North Carolina. Our services were provided in accordance with Titan Proposal No. P-7065-20 dated October 27, 1997. Findings, conclusions, and recommendations given in this report are subject to the limitations presented in the Appendix.

Please contact us if you have any questions or comments regarding this report. We are available to discuss our recommendations with you and to provide additional services as necessary during the final design and construction phases of this project. We have enjoyed assisting you and look forward to serving as your consultant on the remainder of this project and future projects.

Very truly yours,

TITAN ATLANTIC GROUP, INC.

Thomas M. Schipporeit

Thomas M. Schipporeit, P.E.
Vice President - Geotechnical Engineering
Registered, North Carolina 19331



Barney C. Hale

Barney C. Hale, P.E.
Chief Engineer
Registered, North Carolina 11285

TMS:BCH

TOM\My Documents\Titan\20\projects.97\20-7408\Cover
Attachments

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1.0 PURPOSE OF GEOLOGICAL AND HYDROLOGICAL SITE STUDY

The purpose this geological and hydrological site study was to explore the general subsurface soil and groundwater conditions at the project site and to evaluate these conditions with respect to the design of the project. Our scope of services included drilling soil test borings, installing temporary piezometers, measuring stabilized groundwater levels, performing laboratory tests, and preparing this report of our findings and recommendations.

2.0 PROJECT INFORMATION

Mr. Bill Dreitzler of Marlowe, Dreitzler & Associates provided project information to Titan. A new Construction and Demolition Debris (C&D) landfill is planned for a site south of Whiteville, North Carolina. The site, which is adjacent to the existing Columbus County municipal solid waste landfill, is at the approximate location shown on Drawing No. 1 in the Appendix.

Marlow, Dreitzler & Associates provided a site plan which shows the locations of existing site features, including existing ground surface elevations. The area under consideration for C&D disposal is approximately 4 to 5 acres in size. The area is bounded on the north by Landfill Road (S.R. 1451) and to the south by an unpaved road. The tract is a topographic low area, possibly due to previous excavation of borrow soils at the site. The North Carolina regulations require that waste placed in a C&D facility over 2 acres in size must be at least 4 feet above the seasonal high groundwater level.

The landfill property to the south of the proposed C&D area includes an existing borrow area and a proposed future borrow area. Cover soils for the proposed C&D landfill may be obtained from the future borrow area. Titan previously performed an evaluation of the proposed future borrow area. The results of that study were given in "Borrow Area Soil Evaluation Report For Closure of Existing Municipal Solid Waste Landfill, Columbus County, North Carolina, Titan Project No. 20-7407", dated December 11, 1997, prepared for Marlowe, Dreitzler & Associates.

3.0 FIELD EXPLORATION

In order to explore the general subsurface conditions in the proposed C&D area, Superior Drilling advanced 5 soil test borings (CD-1 through CD-5) to depths of 20 to 50 feet each below existing grades. In order to explore the general subsurface conditions in a portion of the future borrow area, Superior Drilling also drilled 2 soil test borings (CD-6 and CD-7) to a depth of 10 feet each below existing grades.

The borings were advanced at the approximate locations shown on Drawing Nos. 2 and 3 in the Appendix. Titan selected the number of borings and their locations, after consulting with Mr. Dreitzler and Mr. Bobby Lutfy of the North Carolina Solid Waste Section.

The borings were located in the field by Titan personnel by pacing distances and estimating right angles from existing site features. The soil test borings were advanced by a power drilling rig mounted on an all-terrain vehicle utilizing mud rotary and hollow stem auger drilling procedures. Standard Penetration Tests were performed in the soil test borings at 2.5 to 5.0 feet intervals in general accordance with ASTM D 1586. Undisturbed Shelby tube samples of the in-situ soils were obtained from Boring CD-3. Superior Drilling then installed 1-1/4 to 2-inch-diameter PVC temporary piezometers in 5 of the boreholes. Auger cuttings were generally used to backfill the annulus between the borehole sidewalls and the PVC pipe. The bottom portions of the PVC pipe were slotted.

After completion of the test borings and temporary piezometers, the soil samples were returned to Titan's laboratory. A Titan geotechnical engineer visually classified the split-spoon soil samples in general accordance with the Unified Soil Classification System. The project surveyor also measured the locations and elevations of the 5 temporary piezometers after installation.

Monitor well installation logs and boring logs are included in the Appendix of this report. The elevations given on the monitor well installation logs (CD-1 through CD-5) were taken from the ground surface elevations measured by the surveyors and given on the topographic site plan provided by Marlowe, Dreitzler & Associates. The ground surface elevations given on the boring logs (CD-6 and CD-7) were taken from contour lines shown on a topographic site plan for the entire landfill site provided by Marlowe, Dreitzler & Associates for the borrow area evaluation.

4.0 LABORATORY TESTING

Titan performed moisture content, soil classification, undisturbed permeability tests, standard Proctor compaction, and remolded permeability tests on representative samples obtained from Borings CD-3 and CD-6. These tests were performed to confirm visual soil classifications and to determine the saturated hydraulic conductivities and porosities of the soils tested. The total porosity of each permeability sample was calculated from its saturated moisture content, dry unit weight, and unit weight of water.

All testing was done in general accordance with applicable ASTM standards. A summary table of the laboratory test results, the individual Titan laboratory test results, and descriptions of the test procedures are included in the Appendix.

5.0 SITE AND SUBSURFACE CONDITIONS

5.1 Site Description

5.1.1 Proposed C&D Area

The proposed C&D landfill site is located at the existing Columbus County landfill facility. The C&D site is bounded to the west by S.R. 1428, to the south by an unpaved access road, to the east by a creek, and to the north by Landfill Road (S.R. 1551). The existing municipal solid waste landfill area is located to the southeast of the project site, on the other side of the creek.

The majority of the proposed C&D area appears to have been excavated up to about 5 to 10 feet below original grades. Puddles and shallow flows of surface water were present in the proposed C&D area at the time of the field work. The majority of the site is covered by weeds, bushes, and small trees. The eastern portion of the site near the creek is wooded. The creek flows from the south toward the north. The ground surface in the proposed C&D area generally slopes downward from the southwest toward the northeast and east from elevation 77 feet to elevation 68 feet.

5.1.2 Future Borrow Area

The future borrow area was an agricultural field covered by weed and soybeans at the time of the field work performed for this study. The eastern portion of the future borrow area was wooded. The future borrow area is bounded on the west by S.R. 1428, on the north by an existing borrow area, on the east by a creek, and on the south by woods along a fence. The ground surface generally slopes downward west to east.

5.2 Regional Geology

The project site is located in the Coastal Plain Physiographic Province. The Coastal Plain consists mainly of marine sediments which were deposited during successive periods of fluctuating sea level and moving shoreline. The soils in this province are typical of those laid down in a shallow sloping sea bottom; sands, silts, and clays with irregular deposits of shells. Alluvial sands, silts, and clays are typically present near rivers and creeks.

According to the 1985 Geologic Map of North Carolina, the site is underlain by the Duplin Formation. This formation consists of bluish-gray, shelly, medium- to coarse-grained sand, sandy marl, and limestone.

5.3 Soil Conditions

5.3.1 Proposed C&D Area

The 5 soil test borings drilled in the proposed C&D area (CD-1 through CD-5) encountered two general lithologic units. Surficial deposits were encountered from the ground surface to depths of 13 to 16.5 feet below the existing ground surface. Soils corresponding to the upper portion of the Duplin Formation were encountered below the surficial deposits. The borings were terminated in the Duplin Formation at depths of 20 to 50 feet.

The surficial deposits consist of soft to stiff clay (CL, CH), very soft to firm silt (ML), firm organic clay (OH), stiff organic silt (OL), very loose clayey sand (SC), very loose to loose silty sand (SM), and very loose to medium dense sand (SP). Standard Penetration Test N-values range from 2 to 25 blows per foot (bpf) in the surficial deposits.

The Duplin Formation soils consist of firm to very stiff sandy silty clay (CL), stiff to very stiff sandy silt (ML), medium dense clayey sand (SC), and medium dense silty sand (SM). The upper soils in the Duplin Formation materials are generally slightly-cemented and contain numerous shell fragments. These materials are typically calcareous and can be described geologically as poorly consolidated shelly sandy marl and limestone.

More detailed descriptions of the subsurface conditions encountered at each boring location are given on the boring logs in the Appendix.

5.3.2 Future Borrow Area

The 2 soil test borings drilled in the future borrow area as part of this C&D landfill study (CD-6 and CD-7) encountered surficial deposits. The surficial deposits consist of cultivated soil (silty sand, SM), soft to stiff clay (CL, CH), soft silt (ML), loose clayey sand (SC), loose to medium dense silty sand (SM), and medium dense sand (SP). Standard Penetration Test N-values range from 4 to 14 blows per foot (bpf) in the surficial deposits.

More detailed descriptions of the subsurface conditions encountered at each boring location are given on the boring logs in the Appendix.

5.4 Groundwater Conditions

5.4.1 Proposed C&D Area

Superior and Titan personnel measured the groundwater levels in the 5 piezometers (CD-1 through CD-5) at the time of installation, after 24 hours, and 7 days after installation. The elevations of the groundwater levels are given on the attached table in the Appendix. The groundwater levels in the riser pipes of three of the piezometers (CD-3 through CD-5) were above the surrounding ground surface. This indicates that the piezometric level (i.e., pressure head) was above the ground surface, which can occur when artesian conditions develop.

Fluctuations in the groundwater table on the order of 1 to 2 feet are typical in Coastal Plain, depending on variations in precipitation, evaporation, and surface water runoff. Seasonal high groundwater levels are expected to occur during or just after the typically wetter months of the year (November through April). We believe that the groundwater levels measured are indicative of the seasonal high groundwater levels at the proposed C&D landfill site.

Groundwater elevation contours developed from the piezometer readings are shown on a potentiometric map attached as Drawing No. 2 in the Appendix. This drawing was also shows the locations and groundwater elevations in nearby borings and piezometers drilled and installed for previous studies at the landfill site. This information was also used in development of the potentiometric map.

5.4.2 Future Borrow Area

Superior and Titan personnel measured the groundwater levels in the 2 boreholes drilled in the future borrow area (CD-6 and CD-7). Stabilized groundwater was measured at depths of 3.8 to 6.6 feet below the existing ground surface.

5.5 Subsurface Profile

A subsurface profile is given as Figure No. 4 in the Appendix. This profile shows the approximate ground surface and water table elevations across the C&D site.

6.0 RECOMMENDATIONS

The groundwater table contours shown on Drawing No. 2 in the Appendix should be used to develop a base grading plan for the C&D landfill. Site grades should be raised to achieve the required 4 feet of separation between the waste and the seasonal high groundwater table. We estimate that 3 to 5 feet of fill would be required over most of the proposed C&D area. Soils from the existing or future borrow areas could be used as fill, and should be "tracked in" or rolled to provide a stable subgrade for C&D placement. Tracked equipment should be used to place fill in this area, due to the relatively shallow groundwater and soft and loose soils present.

The 5 piezometers should be abandoned in accordance with the applicable North Carolina groundwater quality regulations prior to any grading activities or C&D placement at the site. This may be accomplished by pulling the PVC pipes out of the ground and placing cement-bentonite grout in the remaining holes. This work should be performed and documented by a certified well driller.

Due to the relatively soft soils at the site, C&D waste slopes should be no steeper than 3H:1V. Slope stability analysis were not performed. However, based on our experience with similar subsurface conditions, waste slopes of 3H:1V or flatter should be stable.

Additionally, long-term settlement of the C&D waste may occur due to consolidation of the soft soils at the site. Cover soil may need to be added to maintain long-term gravity drainage of stormwater upon closure of the C&D landfill. The magnitude of settlement will depend upon total height and unit weight of C&D debris to be placed at the site.

APPENDIX

LIMITATIONS

Subsurface Exploration and Conditions

The boring or test pit locations and ground surface elevations given in this report should be considered accurate only to the degree implied by the methods used to determine them.

The boring logs or test pit logs represent our interpretation of the subsurface conditions based on the field logs, and visual examinations of samples by an engineer, geologist, or technician, in addition to tests of the field samples. The lines designating the interfaces between various strata may be gradual.

The generalized subsurface strata and profiles described in this report are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized. They have been developed by interpretations of widely-spaced borings; therefore, actual subsurface conditions may vary from those given between boring locations.

Groundwater levels have been measured or inferred in the boreholes at the times and under the conditions stated on the boring logs. Changes in the groundwater conditions may occur due to variations in rainfall, evaporation, construction activity, surface water runoff, and other site specific factors.

Our geotechnical services include storing the samples collected and making them available for inspection for 90 days. The samples are then discarded unless our client requests otherwise.

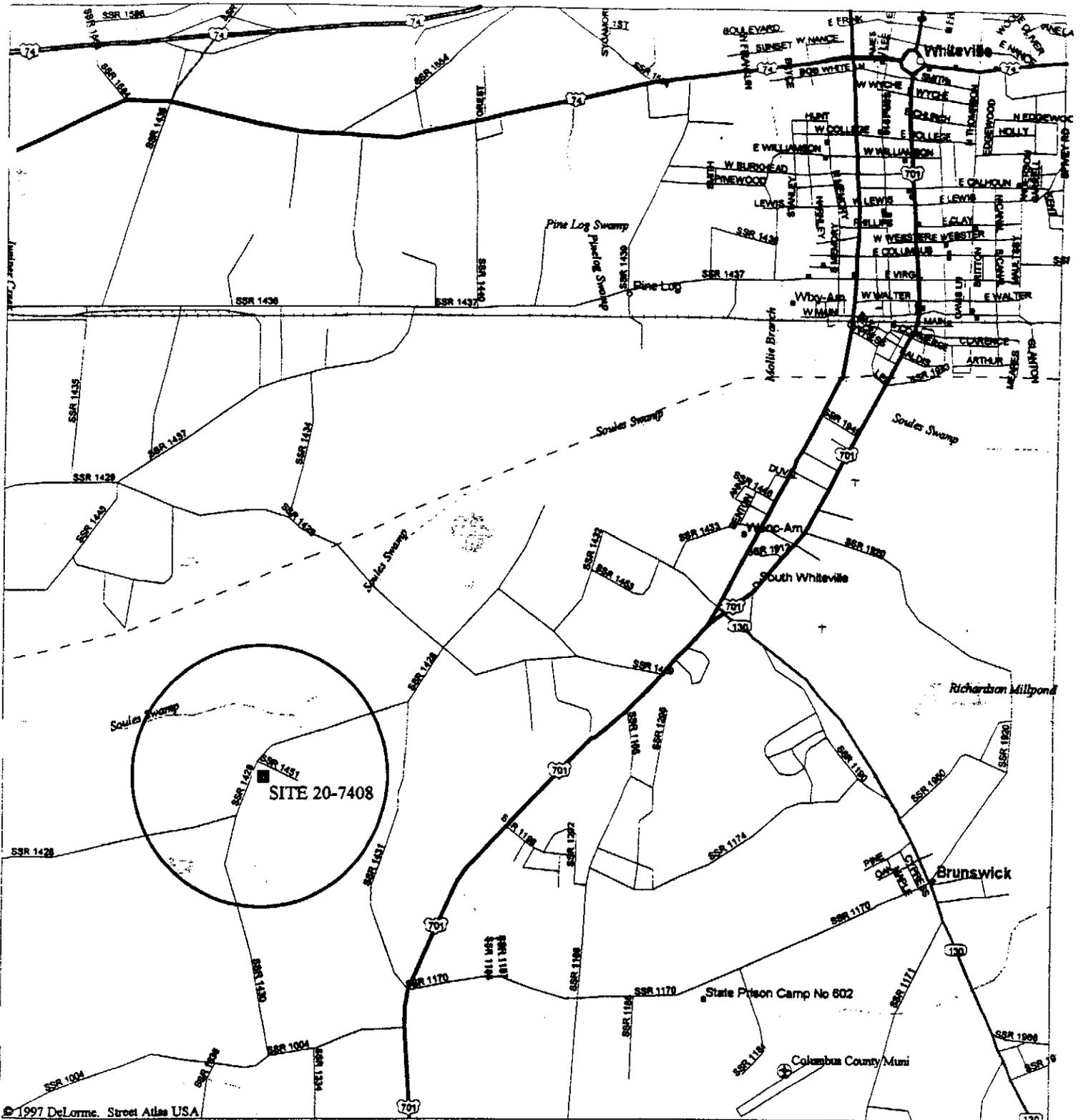
The assessment of site environmental conditions or the presence of contaminants in the soil, rock, surface water or groundwater of the site was beyond the scope of this geotechnical study.

Recommendations

The recommendations provided in this report are based on our understanding of project information given in this report and on our interpretation of the surface and subsurface data collected. We have made our recommendations based on our experience with similar subsurface conditions and similar projects. The recommendations apply to the specific project discussed in this report; therefore, any changes in the project information should be provided to us so we may review our conclusions and recommendations and make any appropriate modifications.

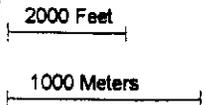
Titan Atlantic Group should be retained for a general review of the design drawings and specifications to verify that geotechnical recommendations are properly interpreted and implemented.

Regardless of the thoroughness of a geotechnical study, there is always a possibility that subsurface conditions will be different from those at the boring or test pit locations, that conditions will not be as anticipated by the designers or contractors, or that the construction process will alter soil conditions. Therefore, the geotechnical engineer's representative should observe the site preparation, earthwork, foundation construction, floor slab construction, below-grade wall construction, and pavement construction to confirm that the conditions indicated by the geotechnical exploration actually exist. We recommend the owner or contractor retain Titan for this service since we are already familiar with the project, the subsurface conditions, and the intent of the recommendations and design. The conclusions and recommendations provided in this report are subject to Titan personnel observing the construction procedures and subsurface conditions encountered at the site.



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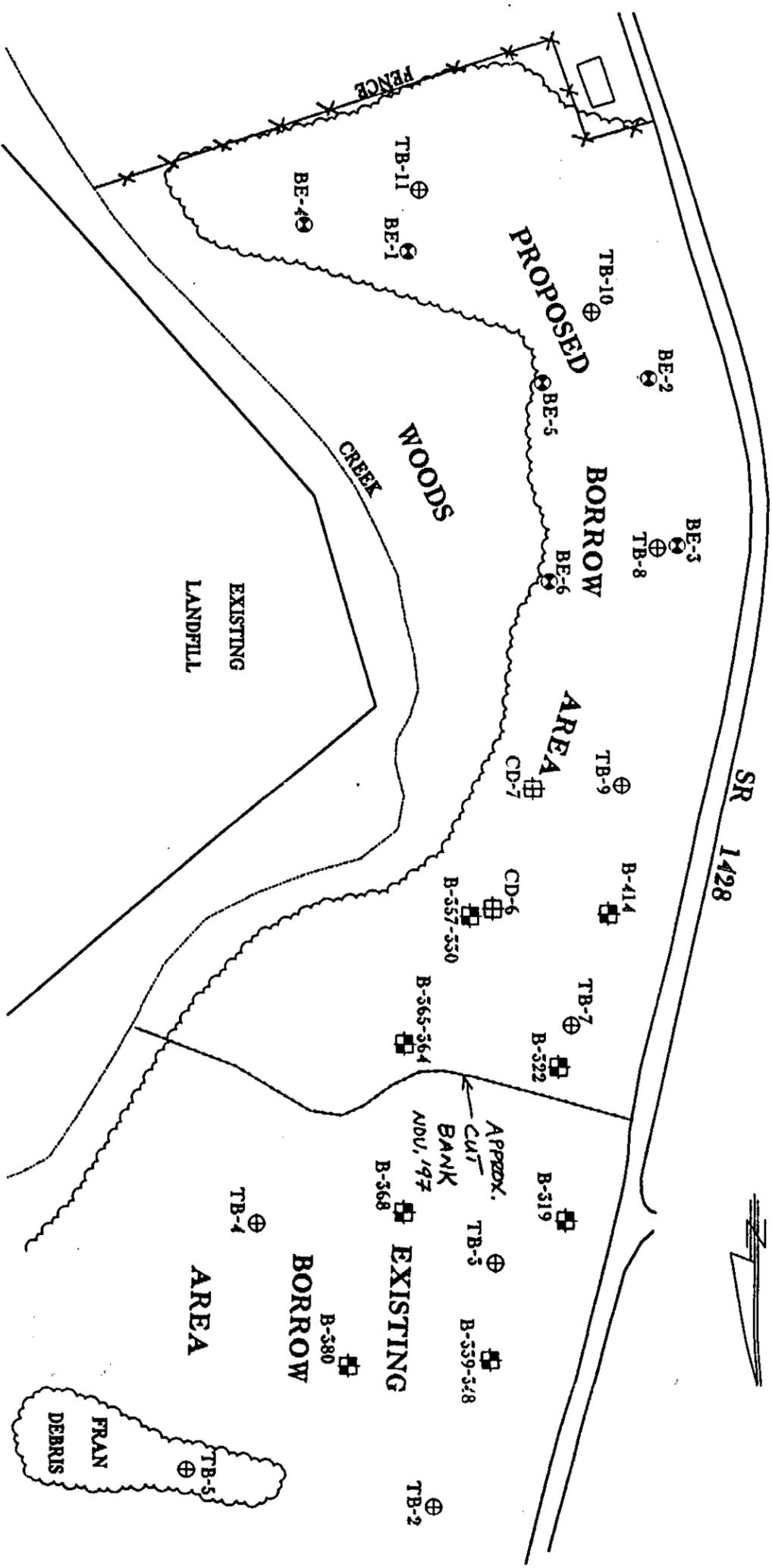
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 Scale 1:37,500 (at center)



- | | |
|---------------------------|----------------|
| Local Road | County Seat |
| US Highway | Small Town |
| Interstate/Limited Access | Airfield |
| Major Connector | Locale |
| State Route | Public Airport |
| Utility/Pipe | Cemetery |
| Railroad | Water |
| Point of Interest | River/Canal |

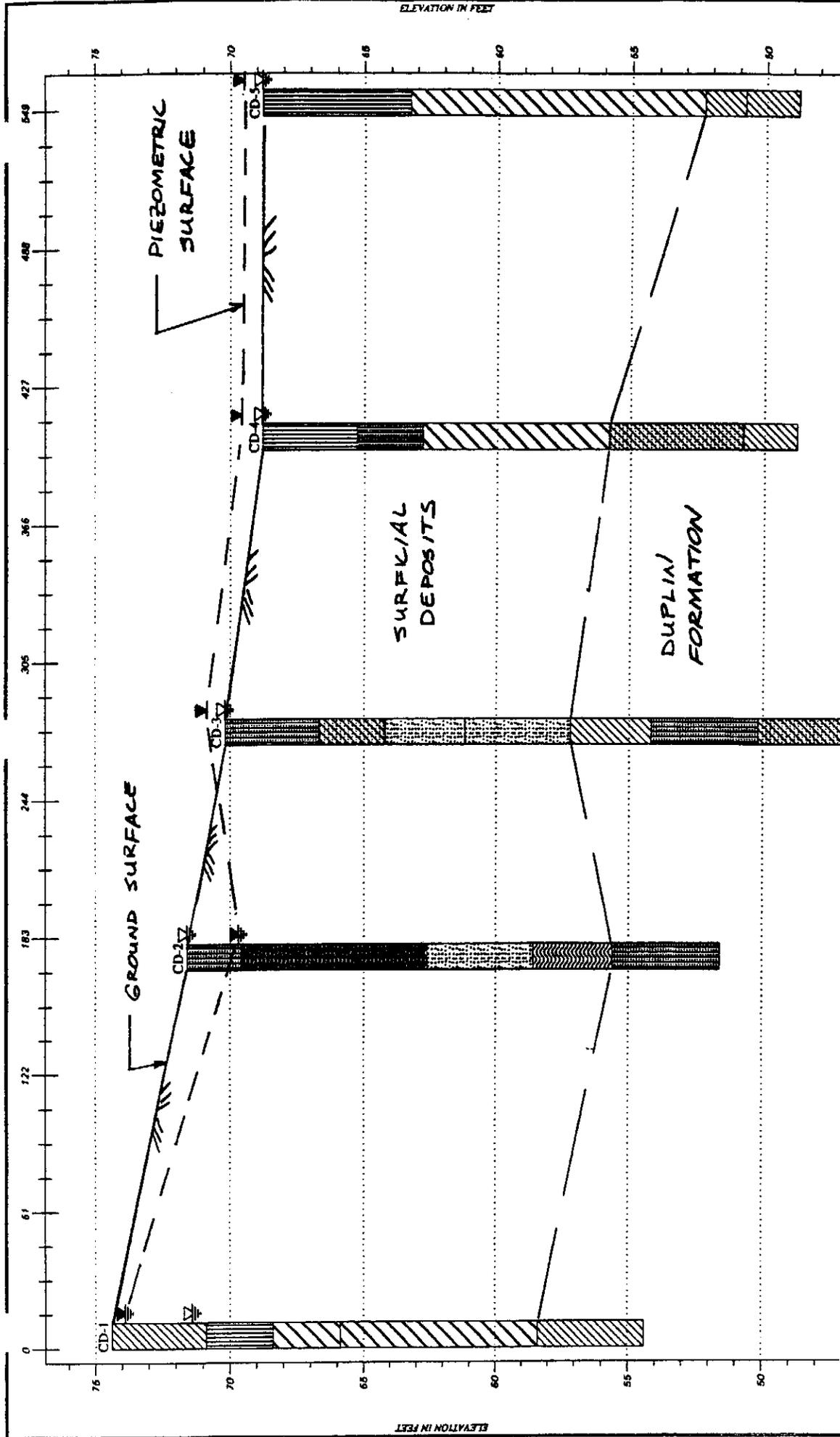


SITE LOCATION PLAN
PROPOSED C&D LANDFILL
COLUMBUS COUNTY, NC
20-7408
DRAWING NO. 1



- LEGEND**
- ⊕ TB-9 BORINGS DRILLED BY CAROLINA DRILLING ON 10-20-94
 - ⊕ B-414 BORINGS DRILLED BY CAROLINA DRILLING ON 7-24-97
 - ⊕ CD-7 BORINGS DRILLED BY SUPERIOR DRILLING ON 11-12-97
 - ⊕ BE-1 BORINGS DRILLED BY SUPERIOR DRILLING ON 11-12-97 AND 11-15-97

TITAN ATLANTIC GROUP		BORING LOCATION PLAN	
ENGINEERING 2725		SURVEYING ▲ PLANNING	
E. MILLBROOK RD. - SUITE 121 RALEIGH, N.C. 27604		PROPOSED BORROW AREA COLUMBUS COUNTY LANDFILL WHITEVILLE, N.C. TITAN PROJ. NO. 20-7407	
CHECK: T.S.	DRAWN: J.E.G.	DATE: 12/3/97	SCALE: 1"=200'
			DWG. NO. 3



TITAN ATLANTIC GROUP, INC.
GENERALIZED SOIL PROFILE

HORIZONTAL SCALE: 1" = 200' (approximate)
 DRAWN BY/APPROVED BY: [Signature]
 DATE DRAWN: 1/12/1998
 SCALE: 1" = 5'

Columbus Co. C&D Landfill

PROJECT NO. 20-7408

FIGURE NUMBER
4



TITAN Atlantic Group
Engineering, Construction and Consulting

KEY TO SOIL CLASSIFICATION

**Correlation of Penetration Resistance with
Relative Density and Consistency**

<u>Sands and Gravels</u>		<u>Silts and Clays</u>	
<u>No. of Blows, N</u>	<u>Relative Density</u>	<u>No. of Blows, N</u>	<u>Relative Density</u>
0-4	Very Loose	0-2	Very Soft
5-10	Loose	3-4	Soft
11-30	Medium Dense	5-8	Firm
31-50	Dense	9-15	Stiff
Over 50	Very Dense	16-30	Very Stiff
		31-50	Hard
		Over 50	Very Hard

**Particle Size Identification
(Unified Classification System)**

Boulders:	Diameter exceeds 12 inches	
Cobbles:	3 to 12 inches	
Gravel:	<u>Coarse</u> -	19.0 mm to 75 mm diameter
	<u>Fine</u> -	4.75 mm to 19.00 mm diameter
Sand:	<u>Coarse</u> -	2.00 mm to 4.75 mm diameter
	<u>Medium</u> -	0.425 mm to 2.00 mm diameter
	<u>Fine</u> -	0.075 mm to 0.425 mm diameter

Silt and Clay: Less than 0.075 mm (particles cannot be seen with naked eye)

Modifiers

The modifiers provided our estimate of the amount of fines (silt or clay size particles) in the soil sample.

**Approximate
Fines Content**
5% Fines 12%
>12% Fines

Modifiers
Slightly silty or slightly clayey
Silty or clayey



SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		GROUP SYMBOLS		TYPICAL NAMES
COARSE GRAINED SOILS (More Than 50% Larger Than No. 200 Sieve)	GRAVELS More than 50% of coarse fraction larger than No. 4 Sieve	CLEAN GRAVELS (little or no fines)	GW	Well graded gravels
			GP	Poorly graded gravels
		GRAVELS (with fines)	GM	Silty gravels
			GC	Clayey gravels
	SANDS More than 50% of coarse fraction smaller than No. 4 Sieve	CLEAN SANDS (little or no fines)	SW	Well graded sands
			SP	Poorly graded sands
		SANDS (with fines)	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More Than 50% Smaller Than No. 200 Sieve)	SILTS AND CLAYS (Liquid Limit < 50)		ML	Silts - sandy or clayey silts with slight plasticity
			CL	Silty clays with low plasticity
	SILTS AND CLAYS (Liquid Limit ≥ 50)		MH	Silts or clayey silts with high plasticity
			CH	Clays, silty clays with high plasticity
HIGHLY ORGANIC SOILS			PT OH OL	Peat or other high organic soils

KEY TO SYMBOLS

Symbol Description

Symbol Description

Symbol Description

Strata symbols

	High plasticity clay
	Low plasticity clay
	Fill
	Poorly graded gravel
	Elastic silt
	Silt
	High plasticity organic clays
	Low plasticity organic silts
	Basalt (or generic rock)
	Silty sand
	Poorly graded sand
	Well graded sand
	Agglomerate
	Claystone
	Cobbles
	Competent
	Dolomite
	Frac rock

	Granite
	Gravel
	Intrusive
	Limestone
	Metamorphic rocks
	Mudstone
	Organics
	Paving
	Feat
	Sand
	Sandstone
	Schist
	Sediment
	Shale
	Shell fragments
	Siltstone
	Topsoil
	Weathered

Misc. Symbols

	Water level at time of boring
	Stabilized water level
	Additional water level

Soil Samplers

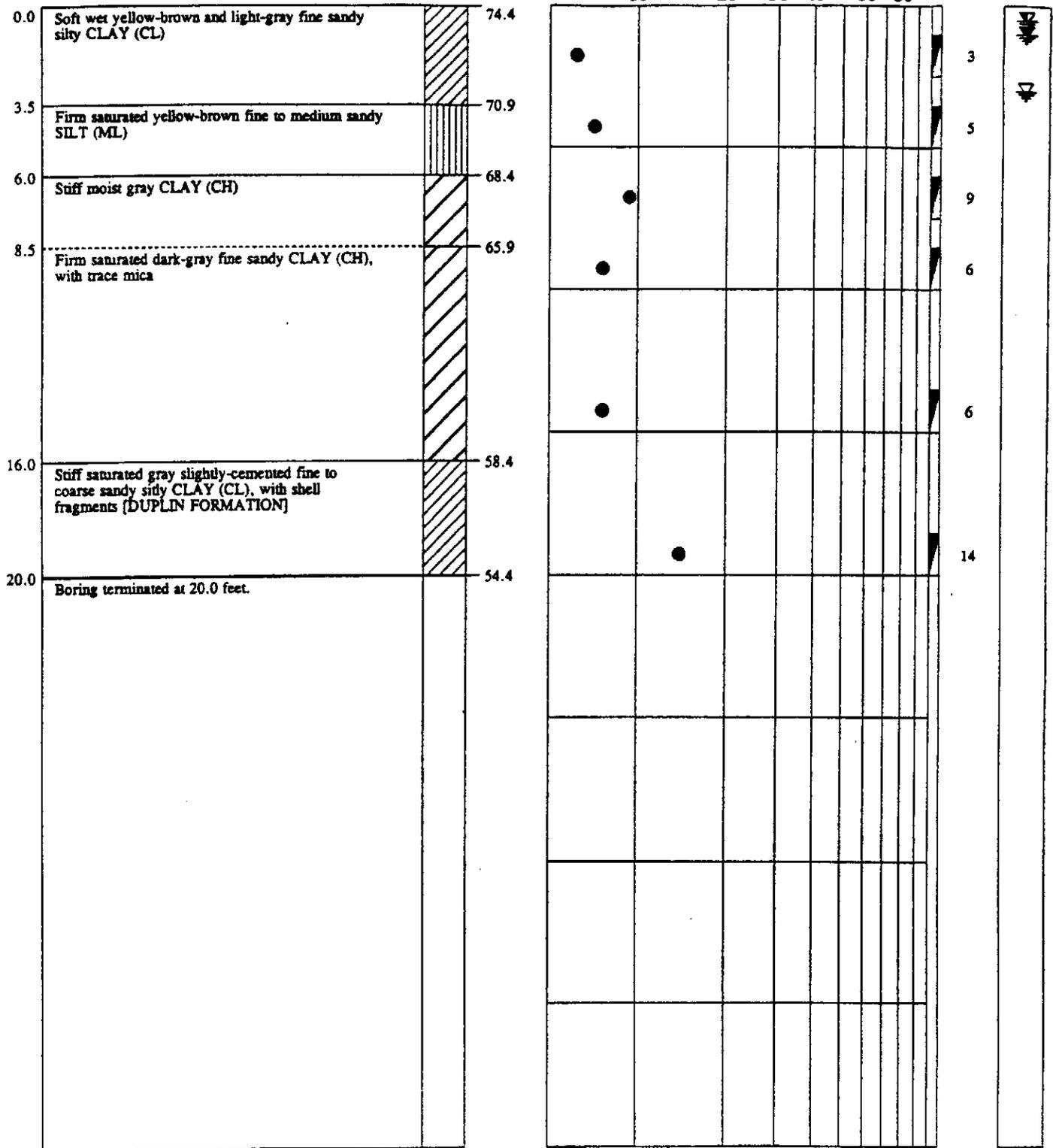
	Standard penetration test
	Bulk/Grab sample
	Undisturbed thin wall Shelby tube
	Rock core

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 2-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/12/97		3.0	71.4	0 hrs
11/13/97		0.5	73.9	1 day
11/19/97		1.0	73.4	7 days

BORING LOG	
BORING NUMBER	CD-1
DATE DRILLED	11/12/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

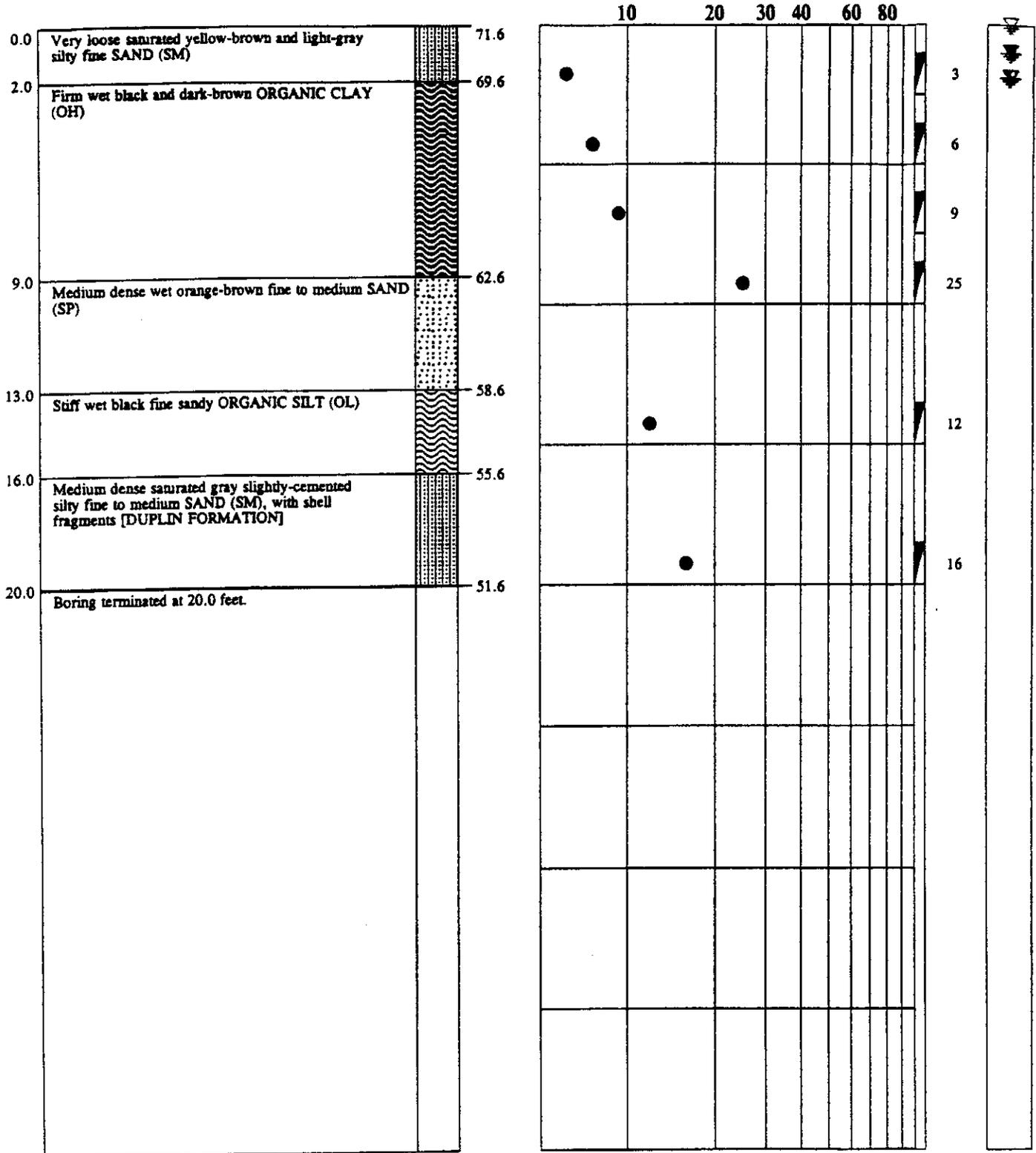
SEE KEY SHEET FOR EXPLANATION
 OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT

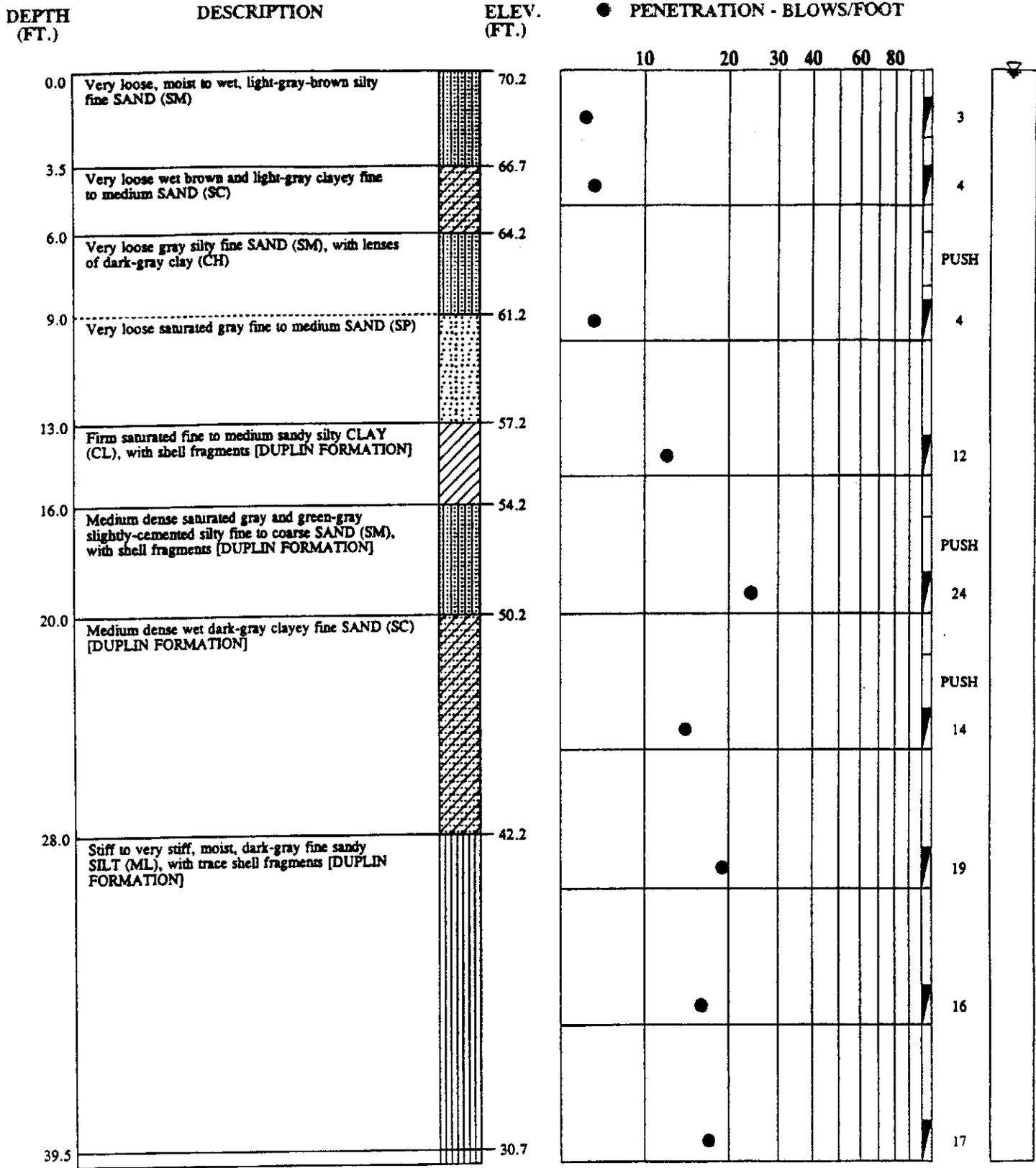


Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 2-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/12/97		0.0	71.6	0 hrs
11/13/97		1.9	69.7	1 day
11/19/97		1.0	70.6	7 days

BORING LOG	
BORING NUMBER	CD-2
DATE DRILLED	11/12/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS



Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 4" and 3" Mud Rotary

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/11/97		0.0	70.2	0 hrs
11/13/97		-0.4	70.6	2 days
11/19/97		-0.7	70.9	1 day

BORING LOG	
BORING NUMBER	CD-3
DATE DRILLED	11/11/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 2	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT

10 20 30 40 60 80

Stiff to very stiff, moist, dark-gray fine sandy SILT (ML), with trace shell fragments [DUPLIN FORMATION]

50.0

Boring terminated at 50.0 feet.

20.2

23

23

Classified By: T. Schipporeit

Driller: Superior Drilling

Drill Rig: CME-550 ATV

Boring Type: 4" and 3" Mud Rotary

GROUNDWATER READINGS

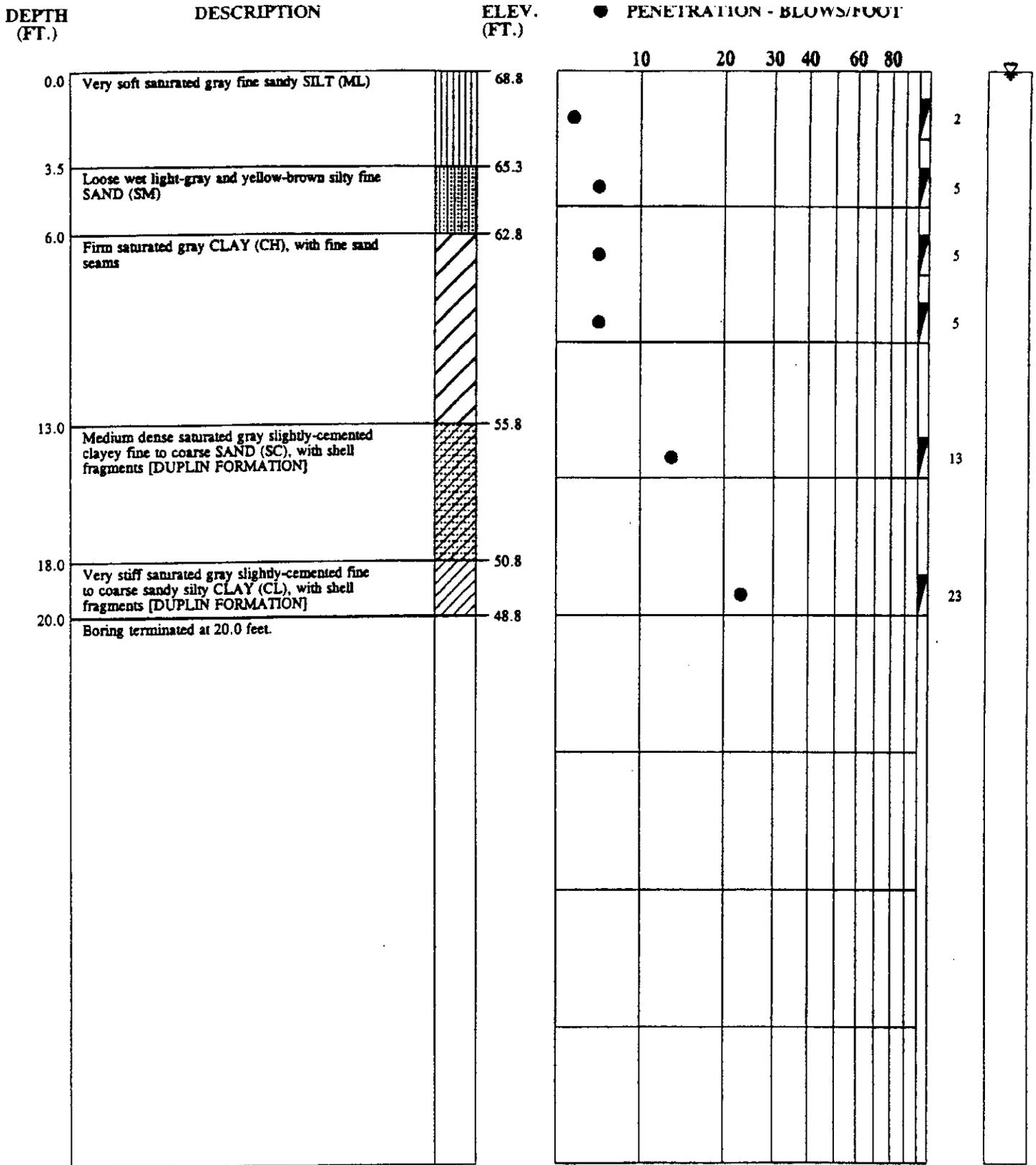
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/11/97		0.0	70.2	0 hrs
11/13/97		-0.4	70.6	2 days
11/19/97		-0.7	70.9	8 days

BORING LOG

BORING NUMBER CD-3
DATE DRILLED 11/11/97
PROJECT NUMBER 20-7408
PROJECT Columbus Co. C&D Landfill
PAGE 2 OF 2

TITAN ATLANTIC GROUP

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

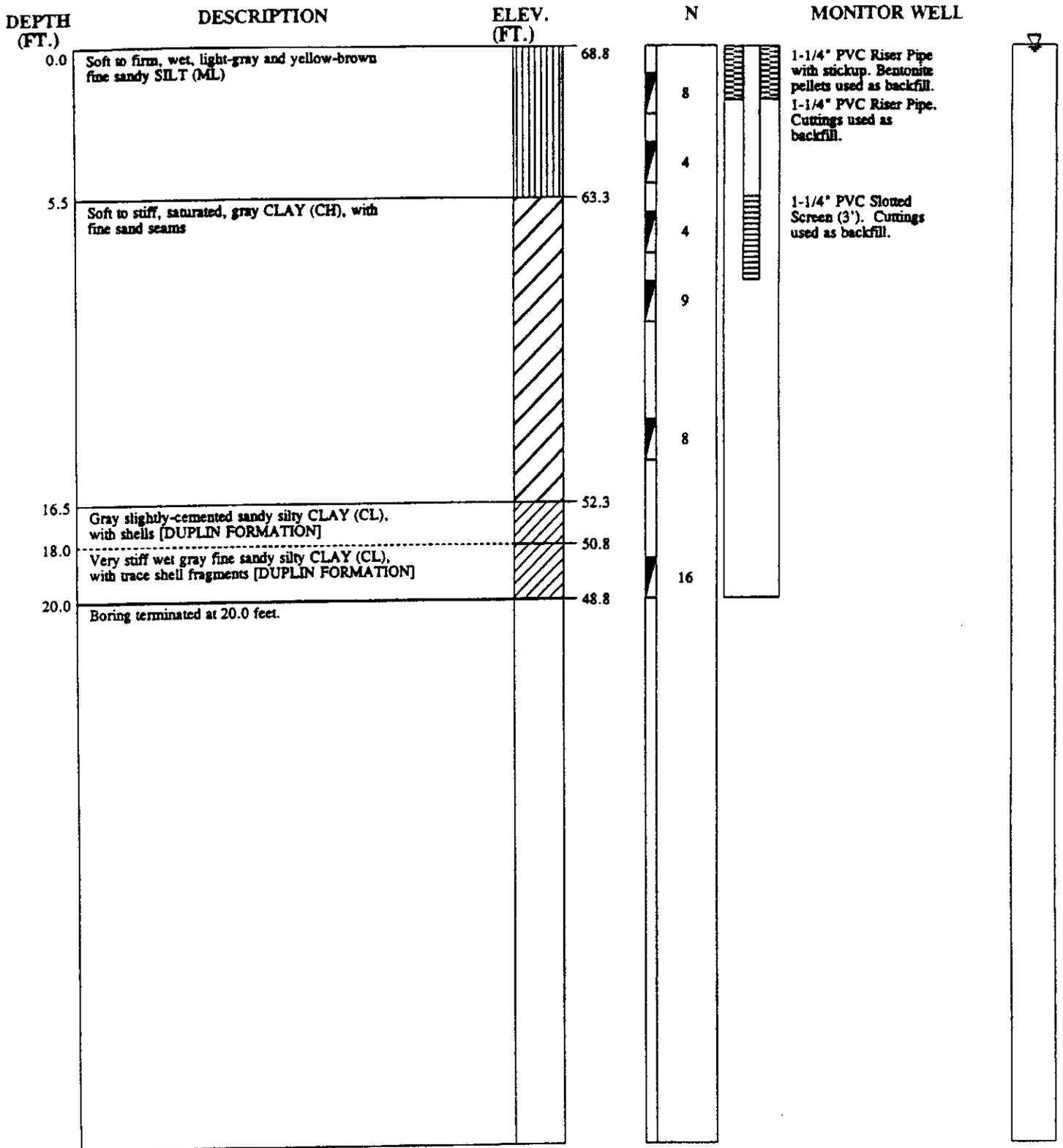


Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 2-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/12/97		0.0	68.8	0 hrs
11/13/97		-0.4	69.2	1 day
11/19/97		-0.9	69.7	7 days

BORING LOG	
BORING NUMBER	CD-4
DATE DRILLED	11/12/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS



Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 2-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/12/97		0.0	68.8	0 hrs
11/13/97		-0.1	68.9	1 day
11/19/97		-1.0	69.8	7 days

MONITOR WELL INSTALLATION	
WELL NUMBER	CD-5
DATE DRILLED	11/12/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

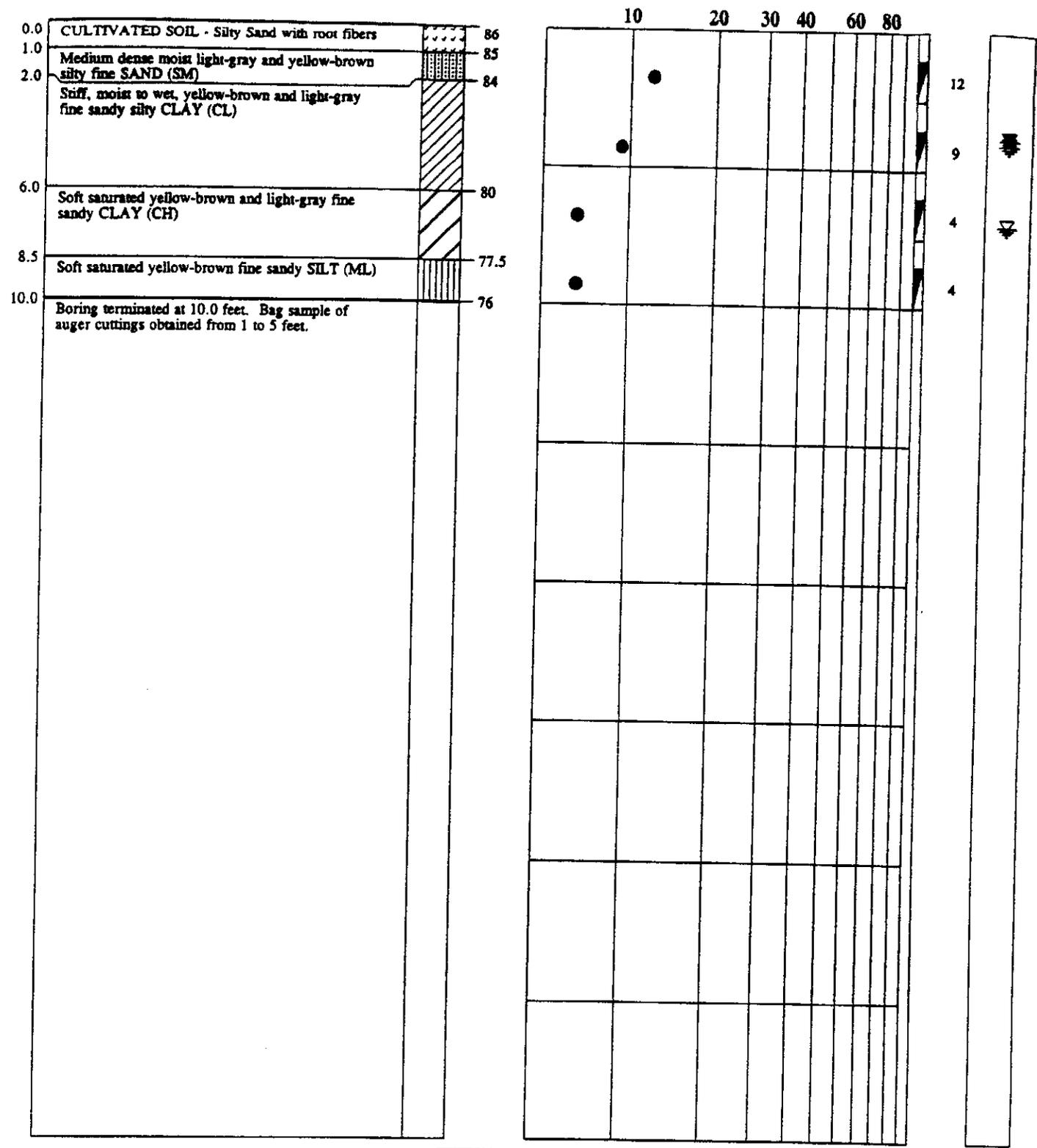
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 2-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/12/97		7.0	79.0	0 hrs
11/13/97		4.0	82.0	1 day
11/19/97		3.8	82.2	7 days

BORING LOG	
BORING NUMBER	CD-6
DATE DRILLED	11/12/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

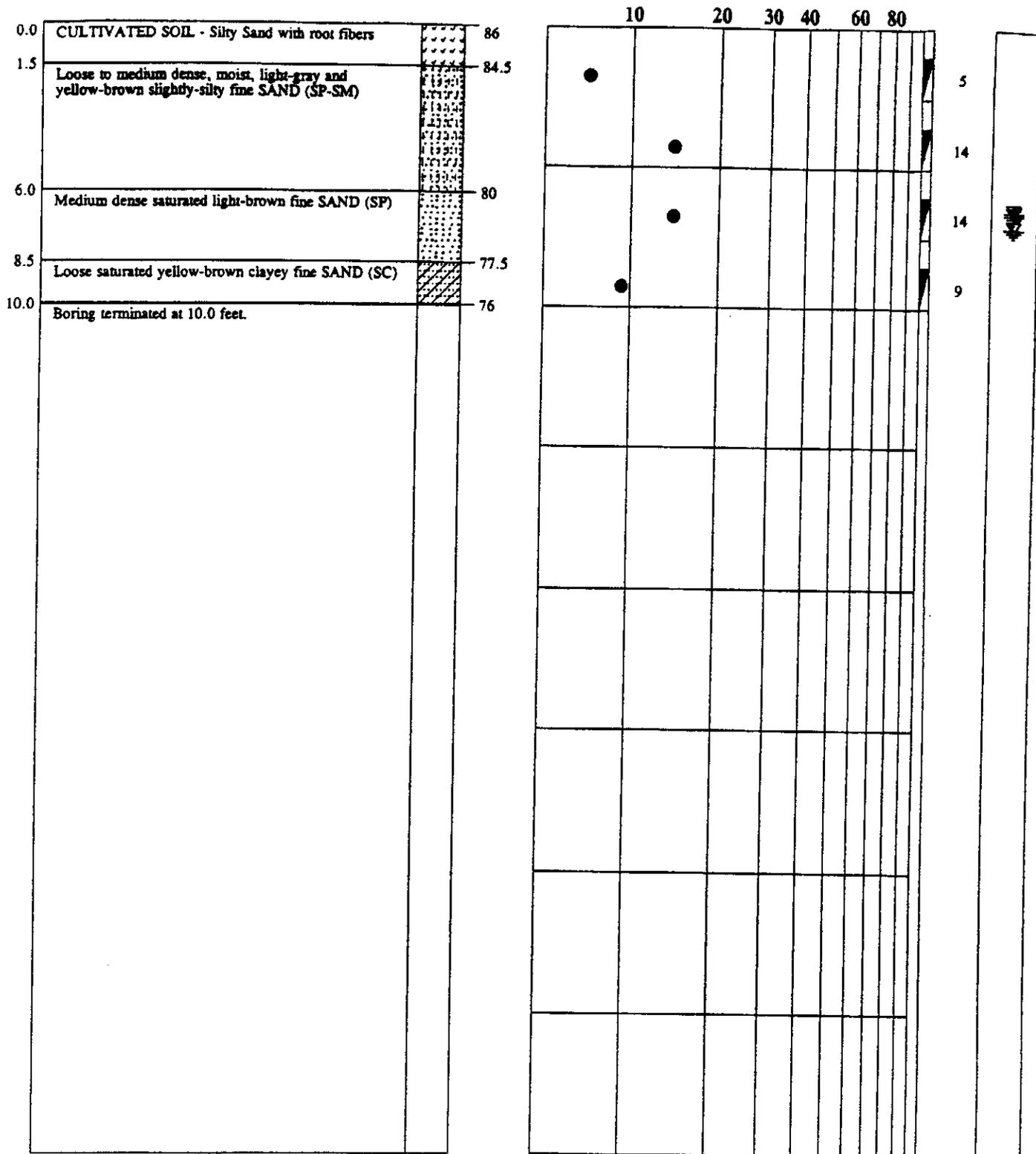
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Superior Drilling
 Drill Rig: CME-550 ATV
 Boring Type: 2-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
11/12/97		6.5	79.5	0 hrs
11/13/97		7.1	78.9	1 day
11/19/97		6.6	79.4	7 days

BORING LOG	
BORING NUMBER	CD-7
DATE DRILLED	11/12/97
PROJECT NUMBER	20-7408
PROJECT	Columbus Co. C&D Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

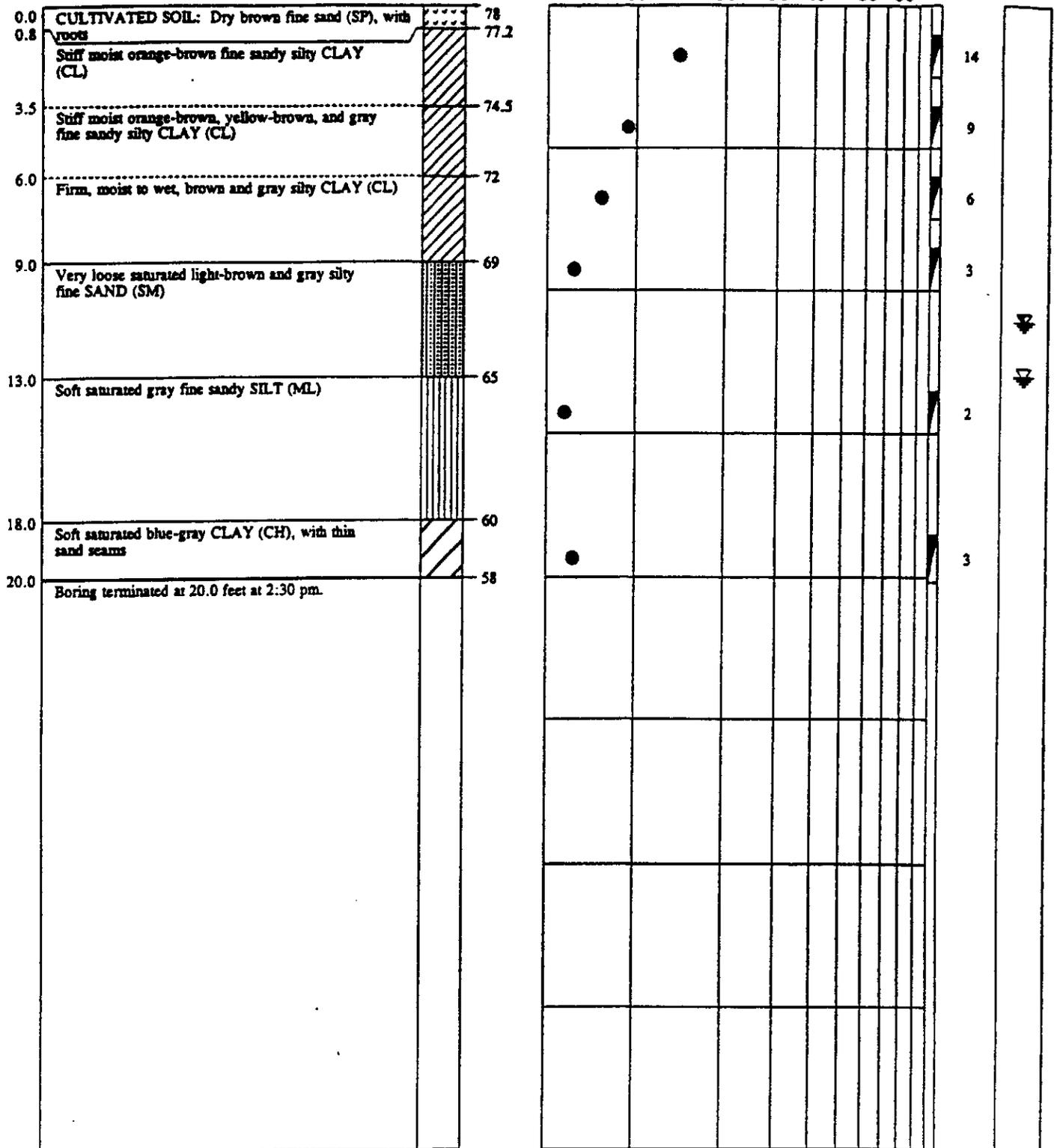
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Carolina Drilling
 Drill Rig: CME-45 Trailer-Mount
 Boring Type: 3-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
5/12/97	2:30 pm	13.0	65.0	0 hrs
5/12/97	4:10 pm	11.1	66.8	1.7 hrs

BORING LOG	
BORING NUMBER	SB-1
DATE DRILLED	5/12/97
PROJECT NUMBER	20-7062
PROJECT	Columbus County Transfer Station
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

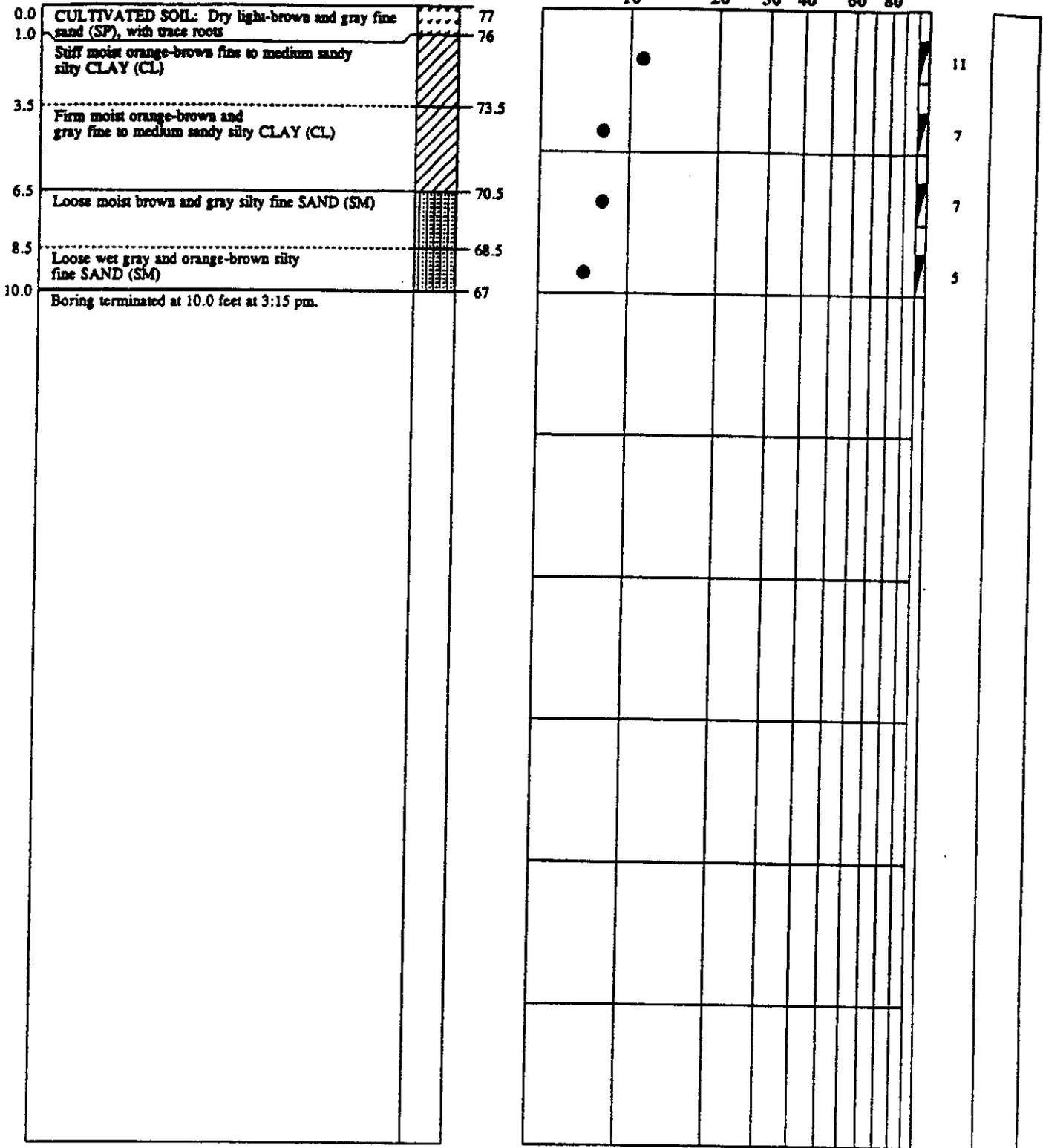
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Carolina Drilling
 Drill Rig: CME-45 Trailer-Mount
 Boring Type: 3-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
5/12/97	3:15 pm	Dry	< 67	0 hrs
5/12/97	4:15 pm	Dry	< 67	1.0 hrs

BORING LOG	
BORING NUMBER	SB-2
DATE DRILLED	5/12/97
PROJECT NUMBER	20-7062
PROJECT	Columbus County Transfer Station
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

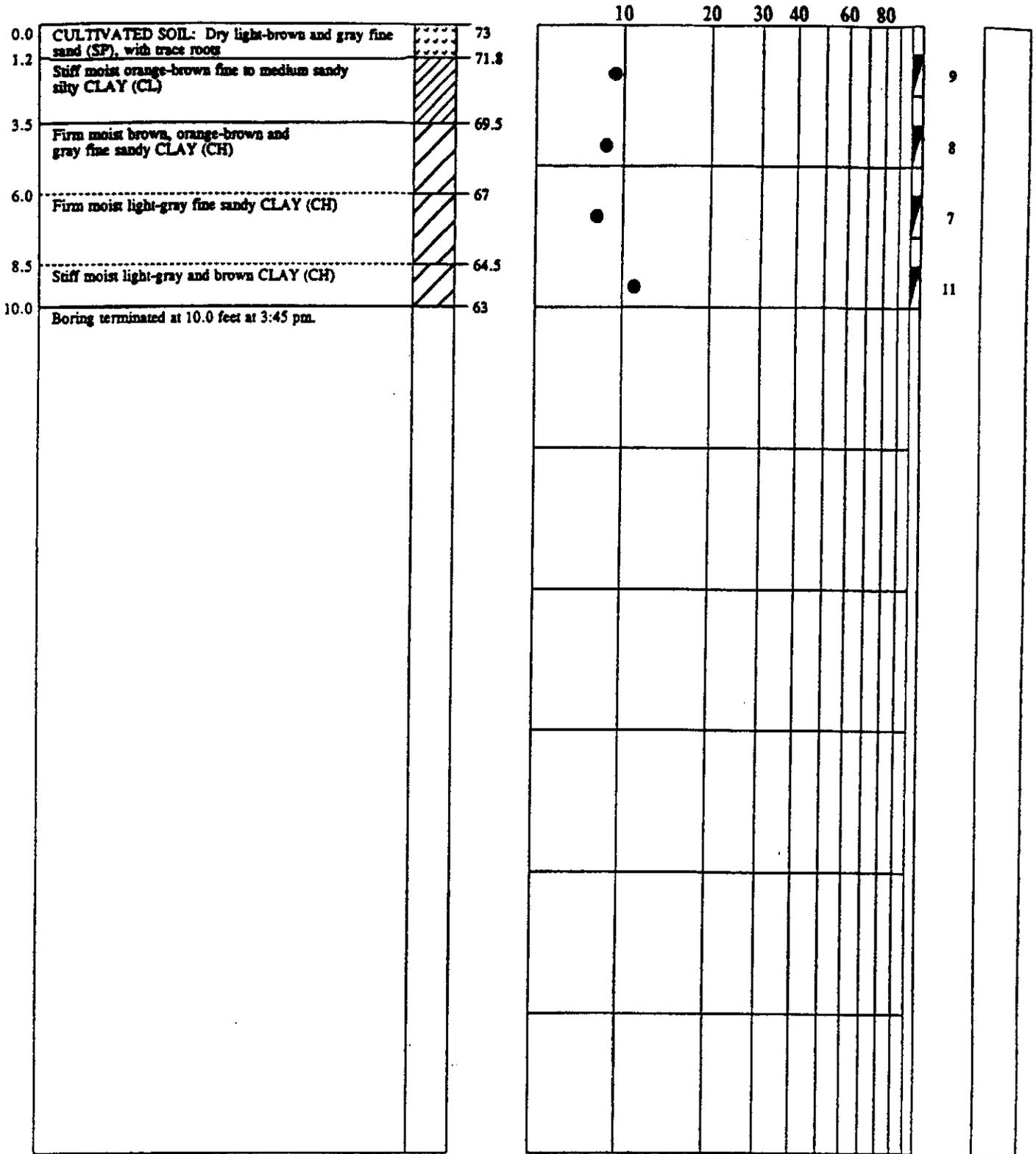
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Carolina Drilling
 Drill Rig: CME-45 Trailer-Mount
 Boring Type: 3-1/4" ID HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
5/12/97	3:45 pm	Dry	< 63	0 hrs
5/12/97	4:15 pm	Dry	< 63	0.5 hrs

BORING LOG	
BORING NUMBER	SB-3
DATE DRILLED	5/12/97
PROJECT NUMBER	20-7062
PROJECT	Columbus County Transfer Station
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

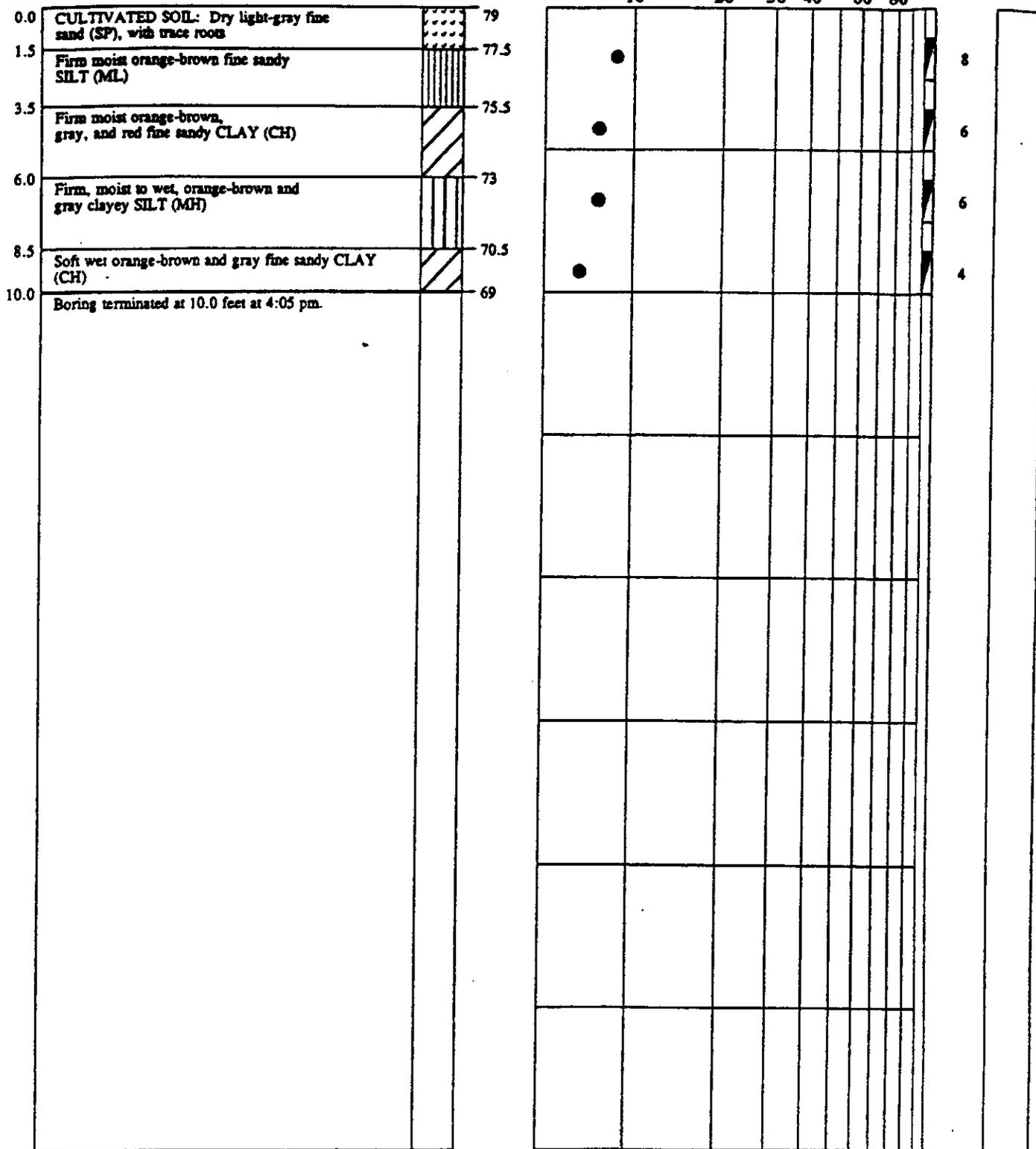
SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

DEPTH
(FT.)

DESCRIPTION

ELEV.
(FT.)

● PENETRATION - BLOWS/FOOT



Classified By: T. Schipporeit
 Driller: Carolina Drilling
 Drill Rig: CME-45 Trailer-Mount
 Boring Type: 3-1/4" ID HSA

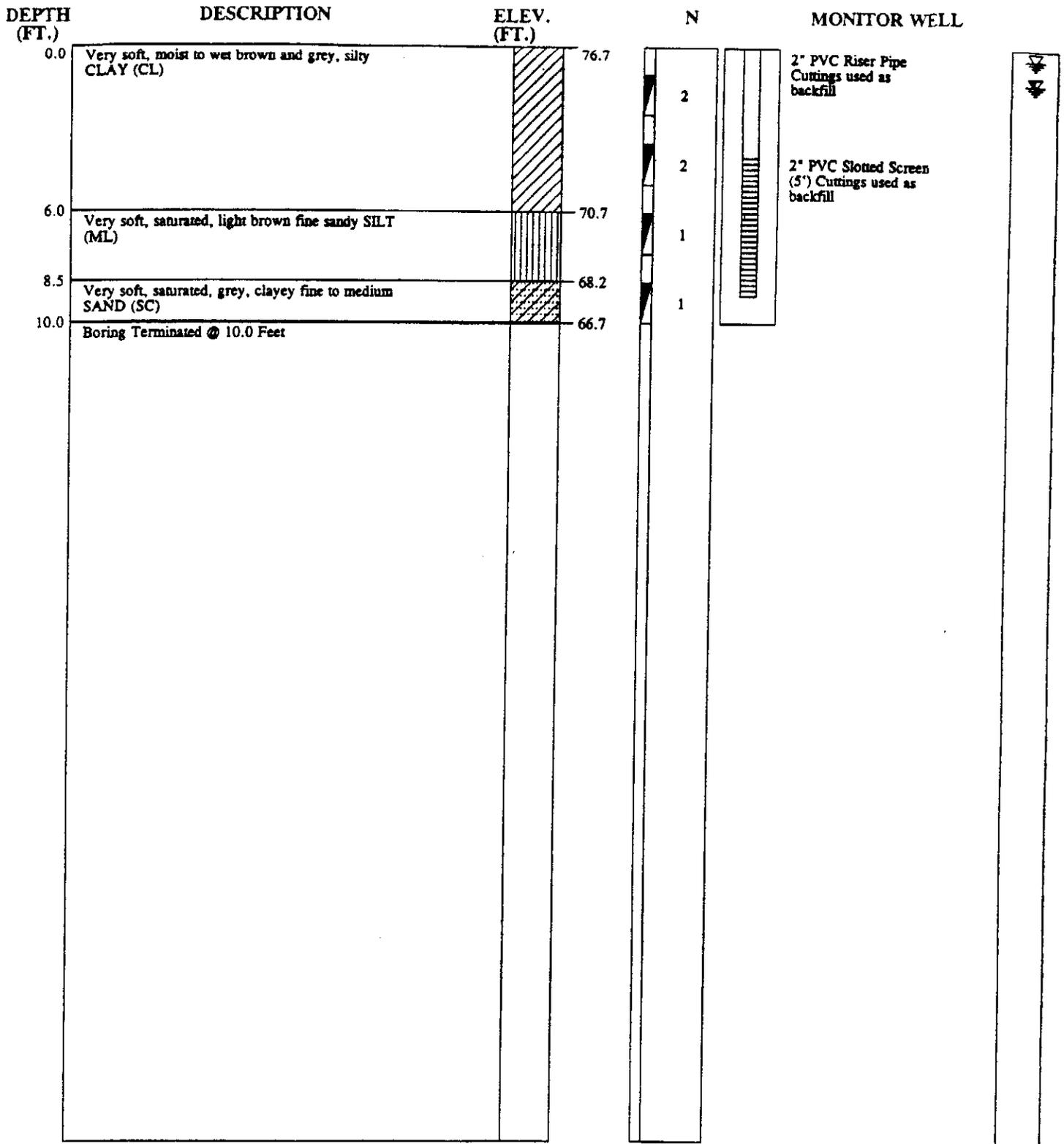
GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
5/12/97	4:05 pm	Dry	< 69	0 hrs
5/12/97	4:15 pm	Dry	< 69	0.2 hrs

BORING LOG

BORING NUMBER SB-4
 DATE DRILLED 5/12/97
 PROJECT NUMBER 20-7062
 PROJECT Columbus County Transfer Station
 PAGE 1 OF 1

TITAN ATLANTIC GROUP

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

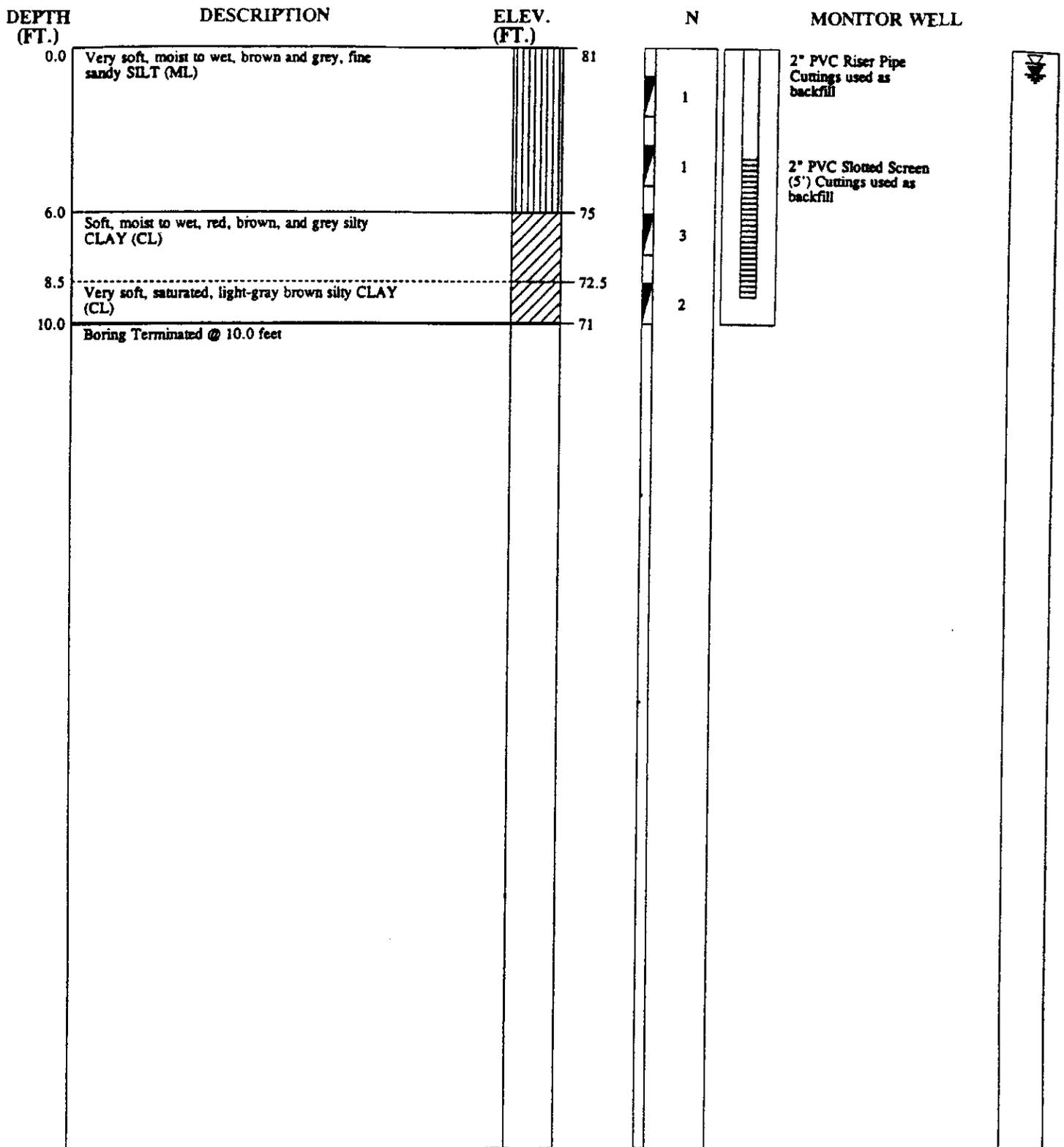


Classified By: E. Norgiel
 Driller: Carolina Drilling
 Drill Rig: CME - 45 ATV
 Boring Type: 3 1/4" HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
7/31/97		0.4	76.3	1 week
11/19/97		1.3	75.4	4 months

MONITOR WELL INSTALLATION	
WELL NUMBER	B-380
DATE DRILLED	7-24-97
PROJECT NUMBER	20-7043
PROJECT	Columbus County LCID Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

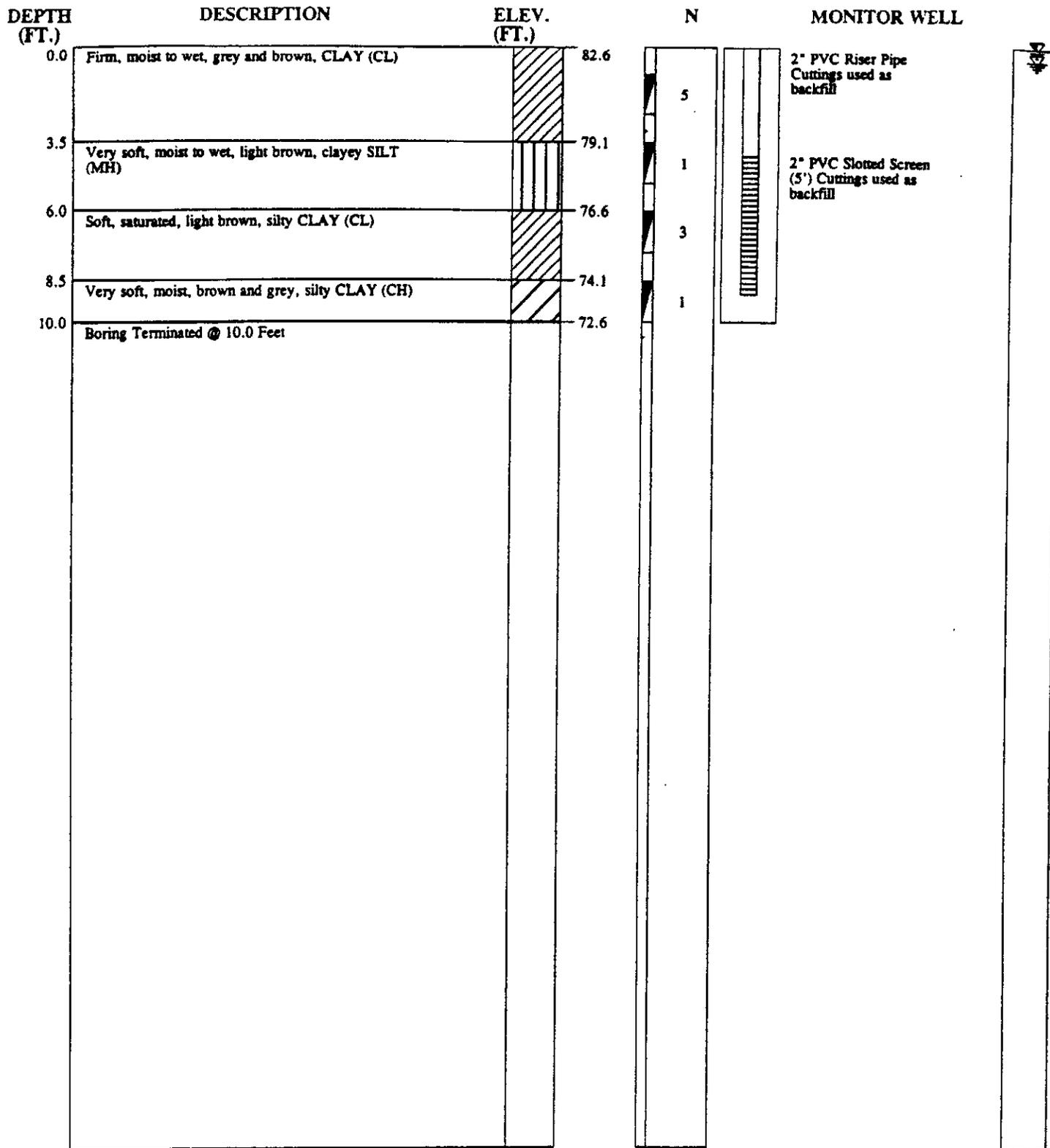


Classified By: E. Norgiel
 Driller: Carolina Drilling
 Drill Rig: CME - 45 ATV
 Boring Type: 3 1/4" HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
7/31/97		0.4	80.6	1 week
11/19/97		0.8	80.2	4 months

MONITOR WELL INSTALLATION	
WELL NUMBER	B339/348
DATE DRILLED	7-24-97
PROJECT NUMBER	20-7043
PROJECT	Columbus County LCID Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

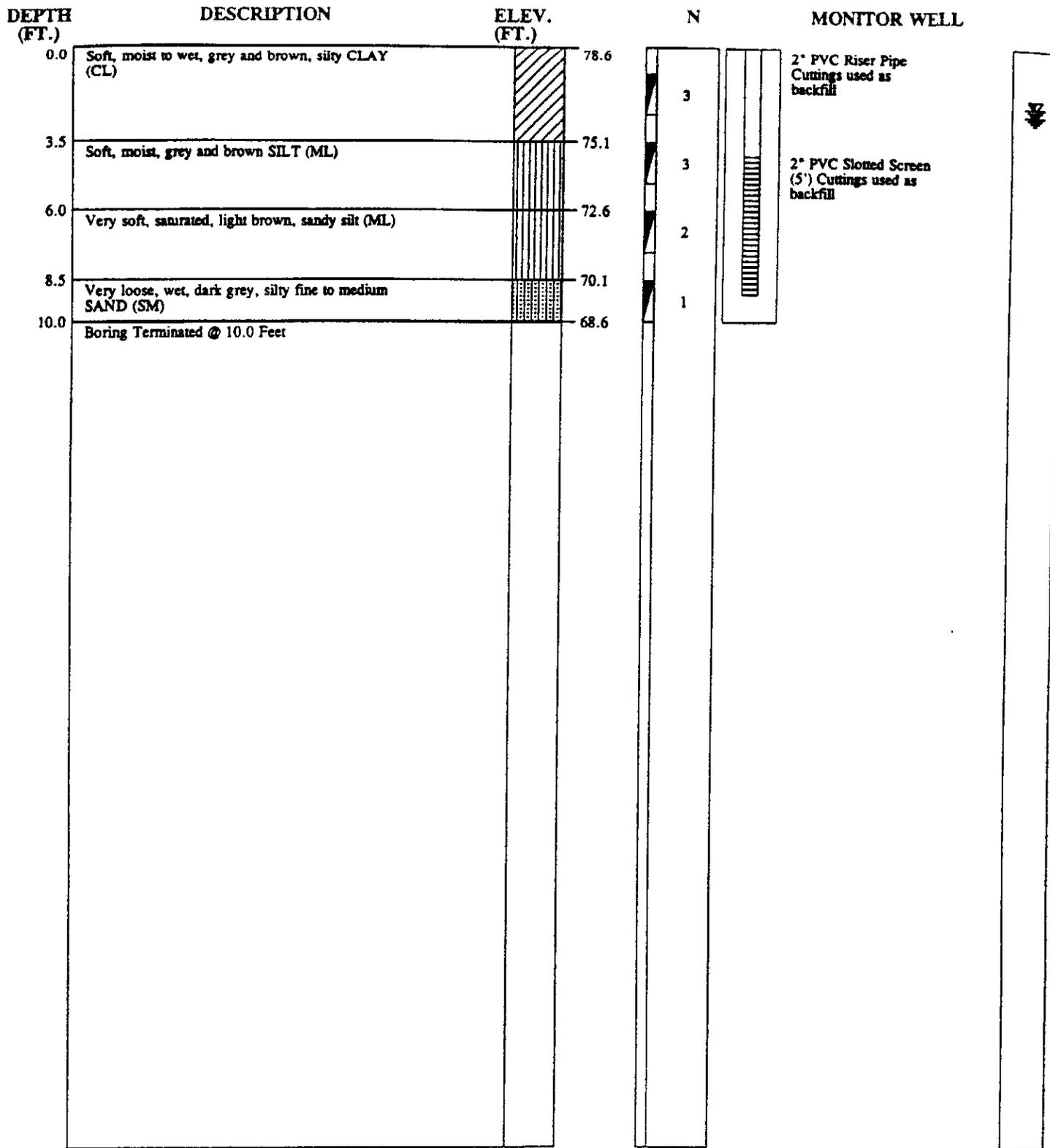


Classified By: E. Norgiel
 Driller: Carolina Drilling
 Drill Rig: CME - 45 ATV
 Boring Type: 3 1/4" HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
7/31/97		0.5	82.1	1 week
11-19-97		0.0	82.6	4 months

MONITOR WELL INSTALLATION	
WELL NUMBER	B-319
DATE DRILLED	7-24-97
PROJECT NUMBER	20-7043
PROJECT	Columbus County LCID Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS



Classified By: E. Norgiel
 Driller: Carolina Drilling
 Drill Rig: CME -45 ATV
 Boring Type: 3 1/4" HSA

GROUNDWATER READINGS				
DATE	TIME	DEPTH	ELEVATION	STABILIZATION TIME
7/31/97		2.5	76.1	1 week
11/19/97		2.2	75.8	4 months

MONITOR WELL INSTALLATION	
WELL NUMBER	B-368
DATE DRILLED	7-24-97
PROJECT NUMBER	20-7043
PROJECT	Columbus County LCID Landfill
PAGE 1 OF 1	
TITAN ATLANTIC GROUP	

SEE KEY SHEET FOR EXPLANATION OF SYMBOLS AND ABBREVIATIONS

TITAN ATLANTIC GROUP

RALEIGH, NORTH CAROLINA

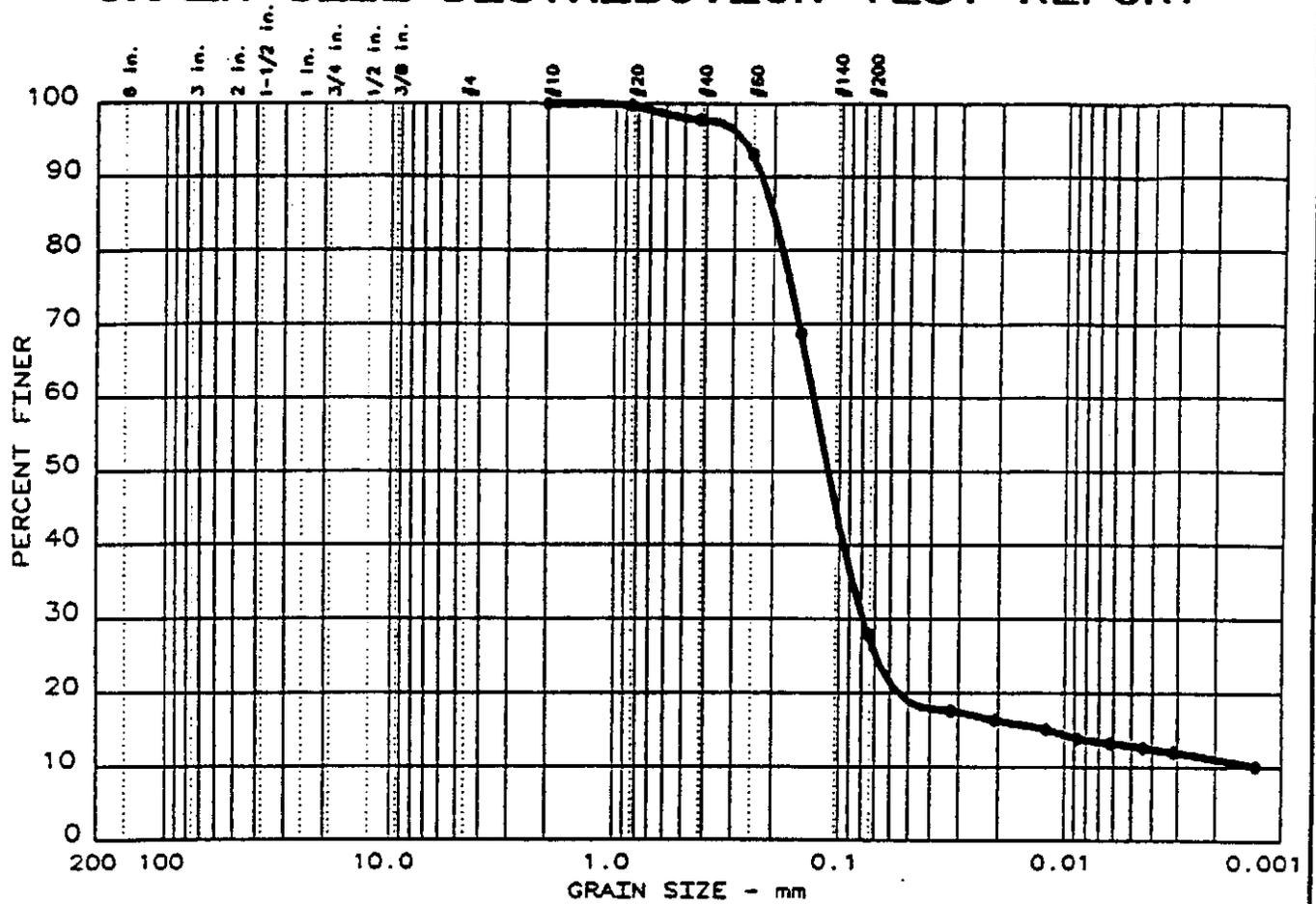
GROUNDWATER ELEVATIONS COLUMBUS COUNTY C&D LANDFILL

TITAN JOB NO. 20-7408

BORING/ PIEZOMETER	GROUNDWATER ELEVATION (FEET)			
	TIME OF BORING (DATE)	24-HOURS (DATE)	7-DAYS (DATE)	4-MONTHS (DATE)
CD-1	71.4 (11/12/97)	73.9 (11/13/97)	73.4 (11/19/97)	N/M
CD-2	71.6 (11/12/97)	69.7 (11/13/97)	70.6 (11/19/97)	N/M
CD-3	70.2 (11/11/97)	70.6 (11/13/97)	70.9 (11/19/97)	N/M
CD-4	68.8 (11/12/97)	69.2 (11/13/97)	69.7 (11/19/97)	N/M
CD-5	68.8 (11/12/97)	68.9 (11/13/97)	69.8 (11/19/97)	N/M
B-380	N/M	N/M	76.3 (7/31/97)	75.4 (11/19/97)
B-339/348	N/M	N/M	80.6 (7/31/97)	80.2 (11/19/97)
B-319	N/M	N/M	82.1 (7/31/97)	82.6 (11/19/97)
B-368	N/M	N/M	76.1 (7/31/97)	75.8 (11/19/97)
SB-1	66.8 (5/12/97)	N/M	N/M	N/M

FILE: TOM:C\My Documents\Titan\20\Projects.97\20-7408\Groundwater Elevations

GRAIN SIZE DISTRIBUTION TEST REPORT



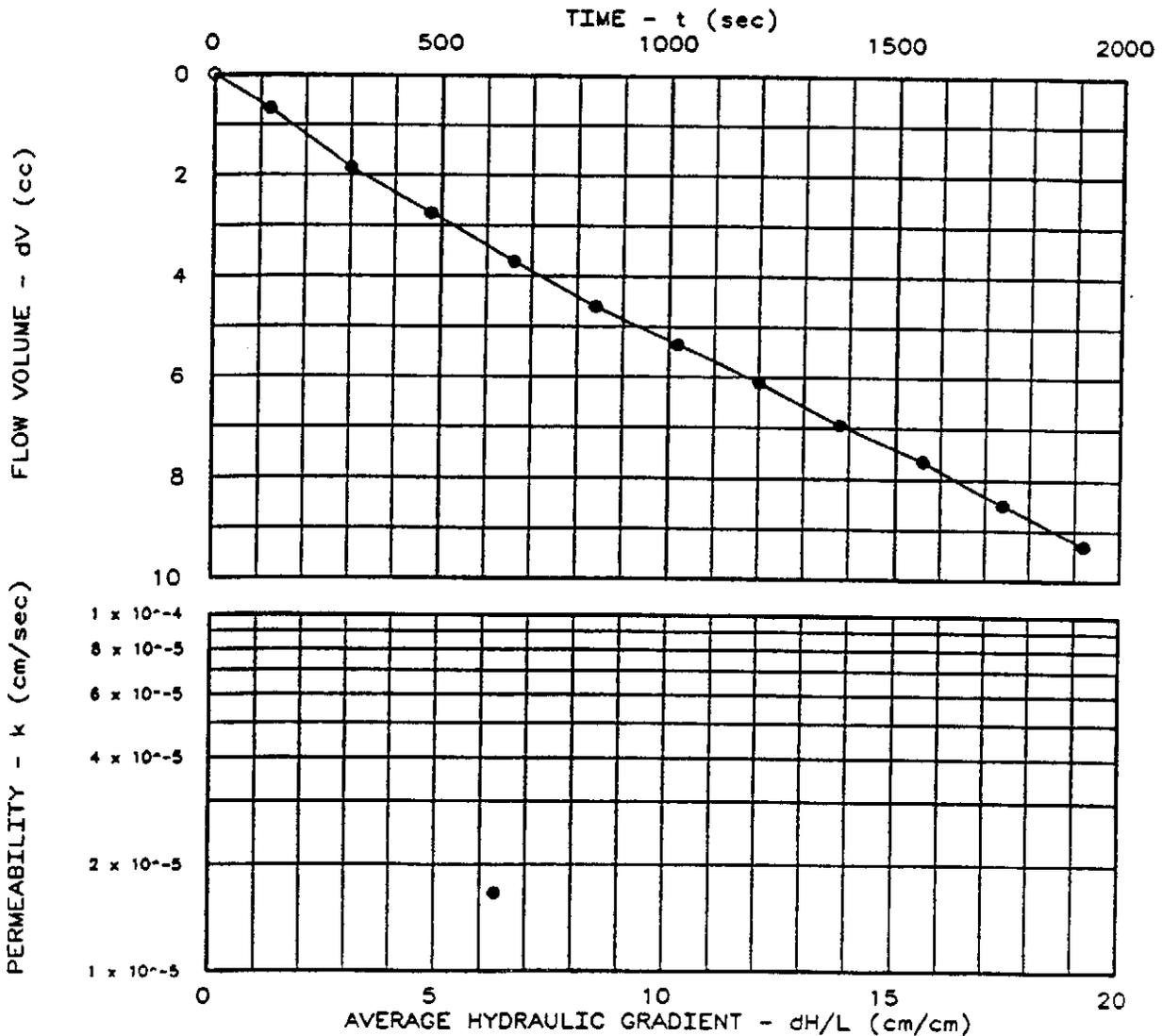
PERMEABILITY TEST REPORT

TEST DATA:

Specimen Height (cm): 10.07
 Specimen Diameter (cm): 7.17
 Dry Unit Weight (pcf): ~~0.0~~ 89.7
 Moisture Before Test (%): ~~0.0~~ 30.0 TMS 12-31-97
 Moisture After Test (%): 32.9
 Run Number: 1 ● 2 ▲
 Cell Pressure (psi): 21.0
 Test Pressure (psi): 21.0
 Back Pressure (psi): 20.1
 Diff. Head (psi): 0.9
 Flow Rate (cc/sec): 4.67×10^{-3}
 Perm. (cm/sec): 1.66×10^{-5}

SAMPLE DATA:

Sample Identification: Boring CD-3
 Sample UD-1
 Visual Description: Gray silty fine sand
 Remarks:
 Maximum Dry Density (pcf): N/A
 Optimum Moisture Content (%): N/A
 ASTM (None)
 Percent Compaction:
 Permeameter type: Flexible wall
 Sample type: Undisturbed

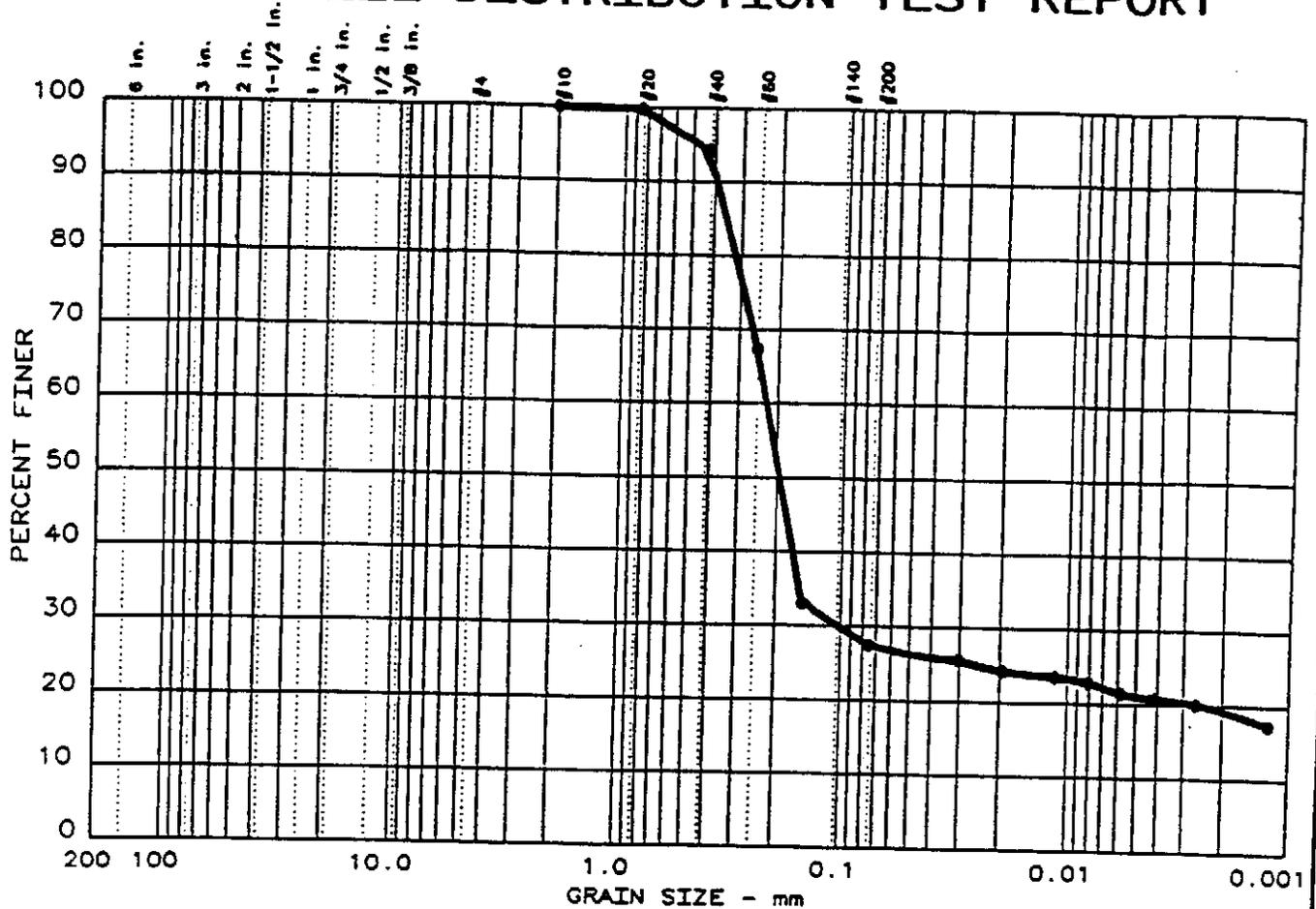


Project: C & D Landfill
 Location: Columbus County, North Carolina
 Date: 11-18-97

Project No.: 20-7408
 File No.:
 Lab No.:
 Tested by: jon b
 Checked by: cfb
 Test: CH - Constant head

PERMEABILITY TEST REPORT
TITAN ATLANTIC GROUP, INC.

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
• 1	0.0	0.0	72.5	6.4	21.1

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
• NL	NP	0.354	0.224	0.193	0.102				

MATERIAL DESCRIPTION	USCS	AASHTO
•	SM	A-2-4

Project No.: 20-7408
 Project: Columbus County Landfill
 • Location: Sample UD-~~7~~³ from 21.5 to 23.5 feet
 Boring CD-3 TMS 12-31-97

Date: December 8, 1997

Remarks:

 NATURAL MOISTURE: 16.4

GRAIN SIZE DISTRIBUTION TEST REPORT
TITAN ATLANTIC GROUP, INC.

Fig. No.: UD-~~7~~³ TMS 12-31-97

PERMEABILITY TEST REPORT

TMS 12-31-97

TEST DATA:

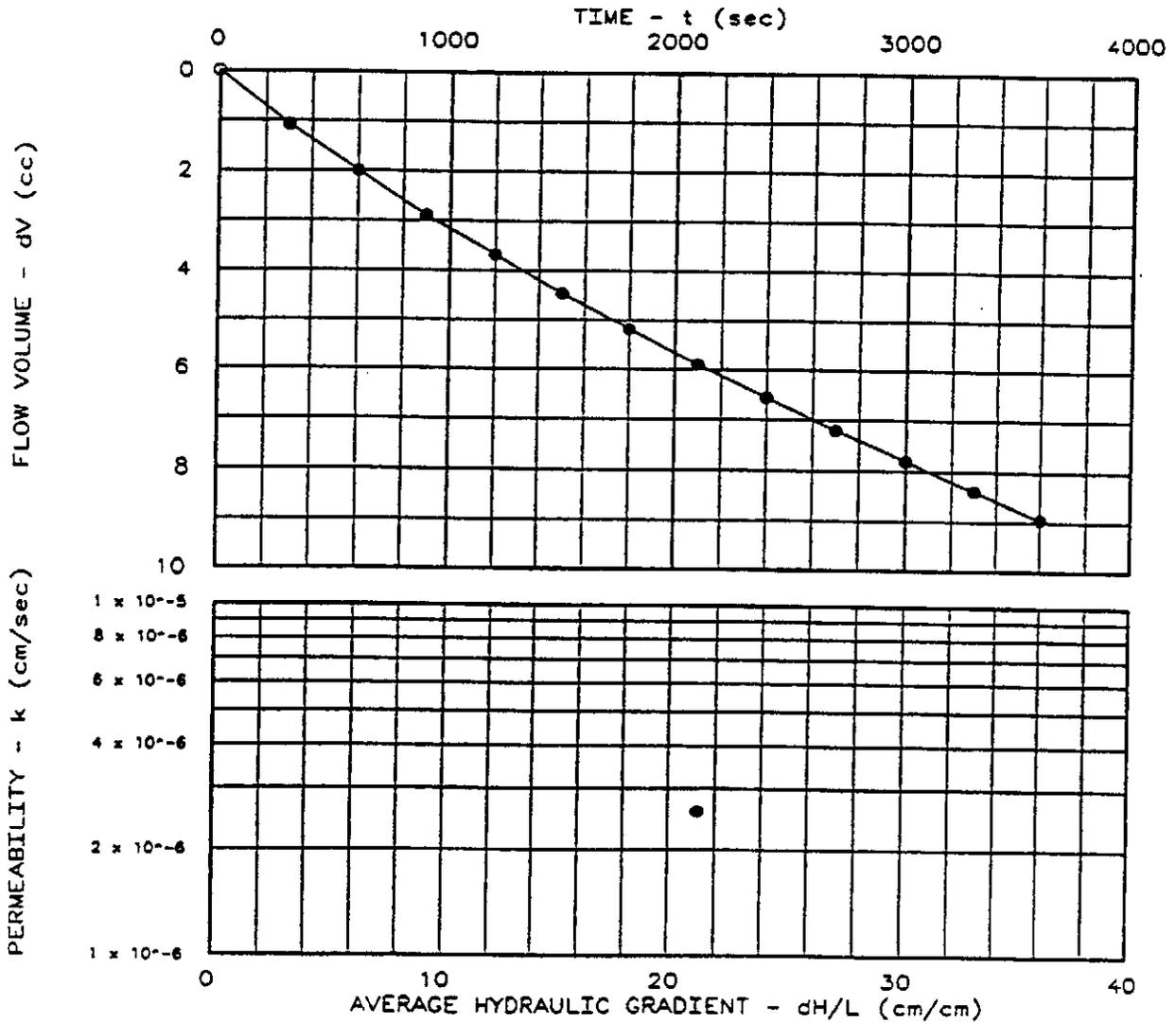
Specimen Height (cm): 9.53
 Specimen Diameter (cm): 7.24
 Dry Unit Weight (pcf): 96.9
 Moisture Before Test (%): 23.7
 Moisture After Test (%): 24.7
 Run Number: 1 ● 2 ▲
 Cell Pressure (psi): 53.0
 Test Pressure (psi): 53.0
 Back Pressure (psi): 50.1
 Diff. Head (psi): 2.9
 Flow Rate (cc/sec): 2.37×10^{-3}
 Perm. (cm/sec): 2.58×10^{-6}

SAMPLE DATA:

Boring CD-3

Sample Identification: UD-3 21.5'-23.5'

 Visual Description: Gray and Black Silty Sand
 Remarks:
 Maximum Dry Density (pcf): N/A
 Optimum Moisture Content (%): N/A
 ASTM(N/A)
 Percent Compaction:
 Permeometer type: Flexible wall
 Sample type: Undisturbed



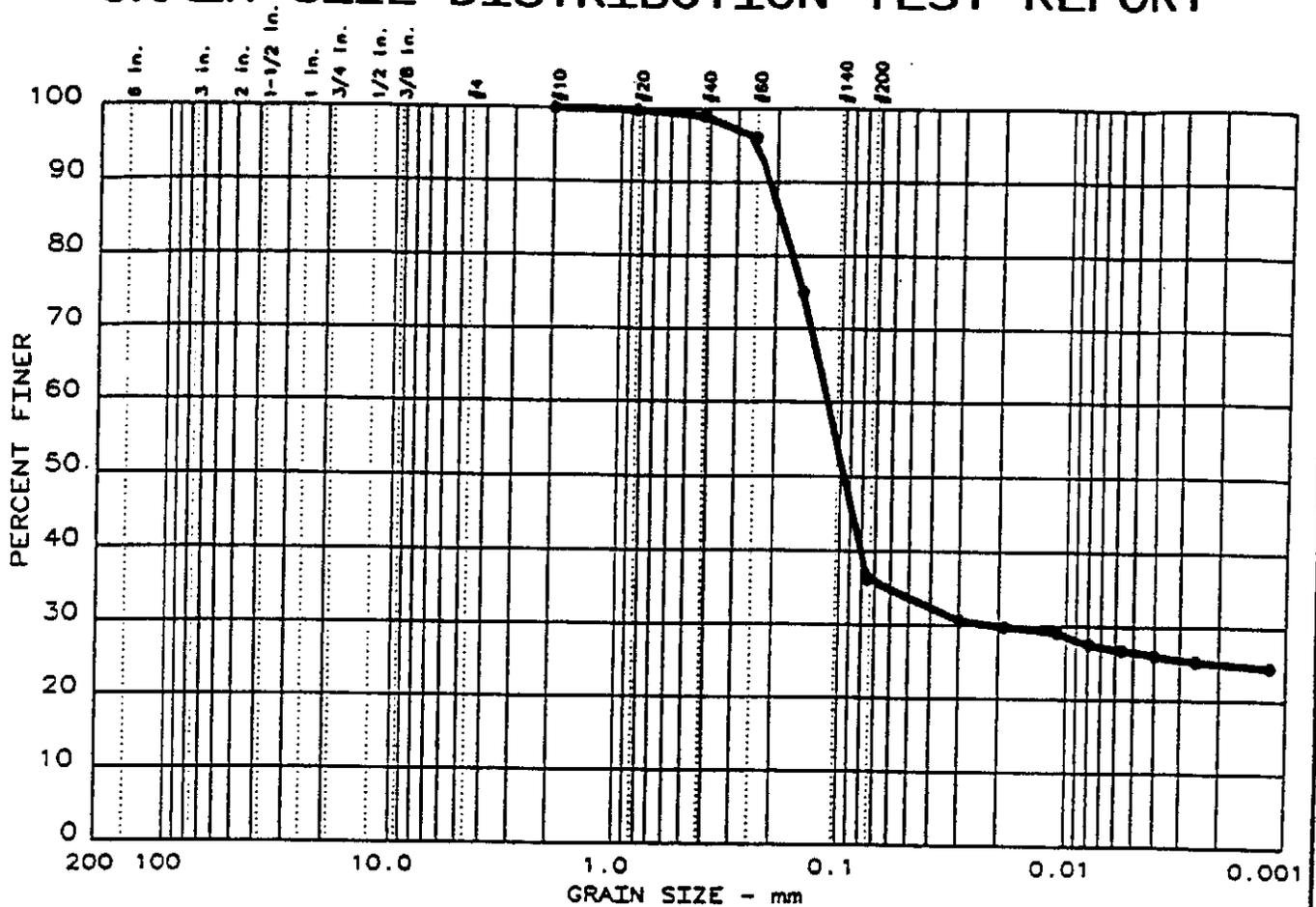
Project: Columbus County C & D Landfill
 Location: Columbus County, North Carolina
 Date: 12-1-97

Project No.: 20-7408
 File No.:
 Lab No.:

PERMEABILITY TEST REPORT
TITAN ATLANTIC GROUP, INC.

Tested by: jon b
 Checked by: cfb
 Test: CH - Constant head

GRAIN SIZE DISTRIBUTION TEST REPORT



Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
● 1	0.0	0.0	63.8	9.6	26.6

LL	PI	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
		0.184	0.115	0.0959	0.0207				

MATERIAL DESCRIPTION	USCS	AASHTO
●	SM	A-4

Project No.: 20-7408
 Project: Columbus County Landfill
 ● Location: CD-6

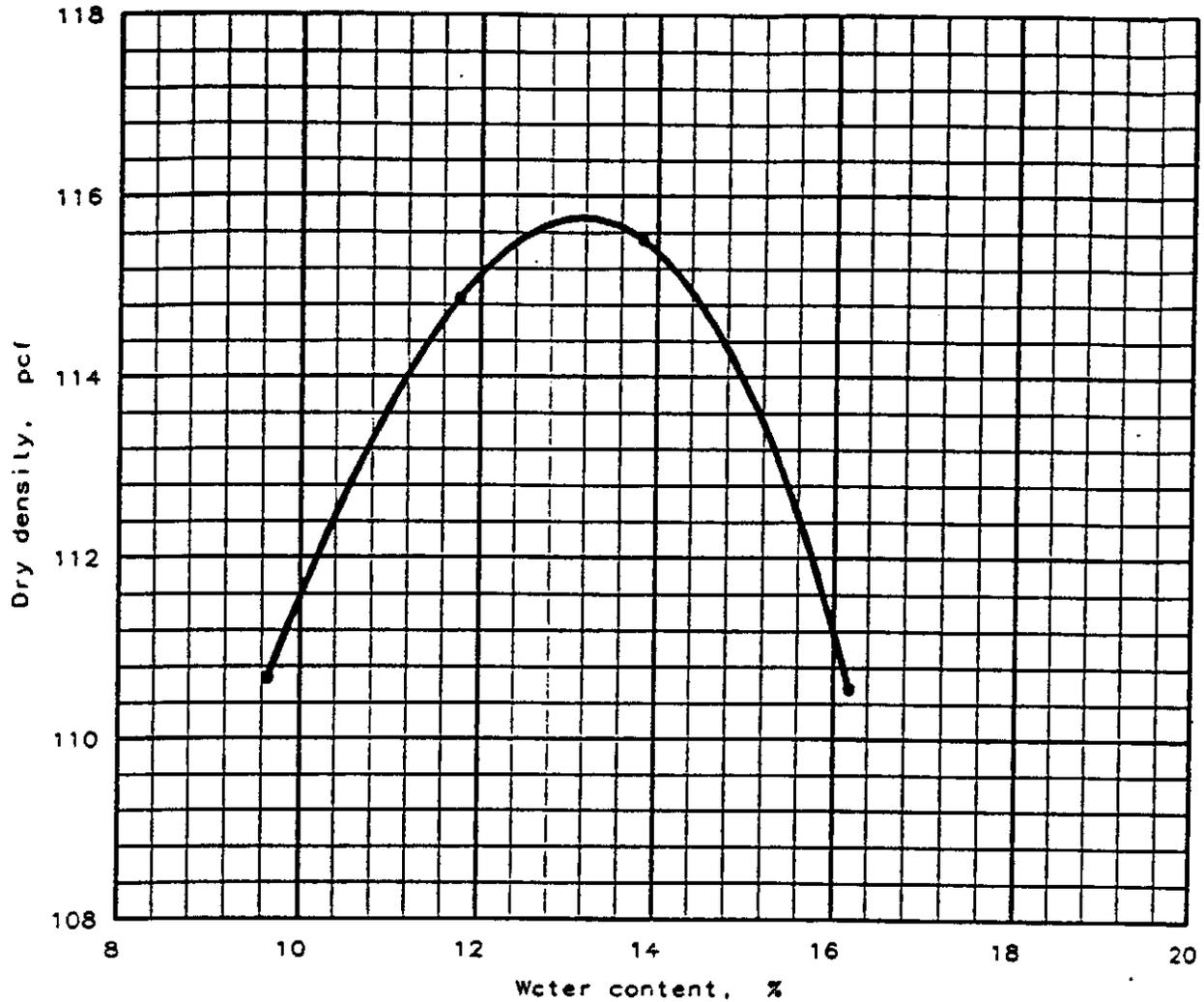
 Date: December 8, 1997

Remarks:
 Sample CD-6

 Fig. No.: CD-6

GRAIN SIZE DISTRIBUTION TEST REPORT
TITAN ATLANTIC GROUP, INC.

MOISTURE-DENSITY RELATIONSHIP TEST



Test specification: ASTM D 698-91 Procedure A, Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No. 4	% < No. 200
	USCS	AASHTO						

TEST RESULTS	MATERIAL DESCRIPTION
--------------	----------------------

Maximum dry density = 115.8 pcf Optimum moisture = 13.2 %	YELLOW BROWN CLAYEY SAND
--	--------------------------

Project No.: 7408-80 Project: COLUMBUS COUNTY LANDFILL Location: SAMPLE CD - 6 Date: NOVEMBER 26, 1997	Remarks: PROPOSED CLAY LINER MATERIAL
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MOISTURE-DENSITY RELATIONSHIP TEST TITAN ATLANTIC GROUP, INC.	Fig. No. CD - 6
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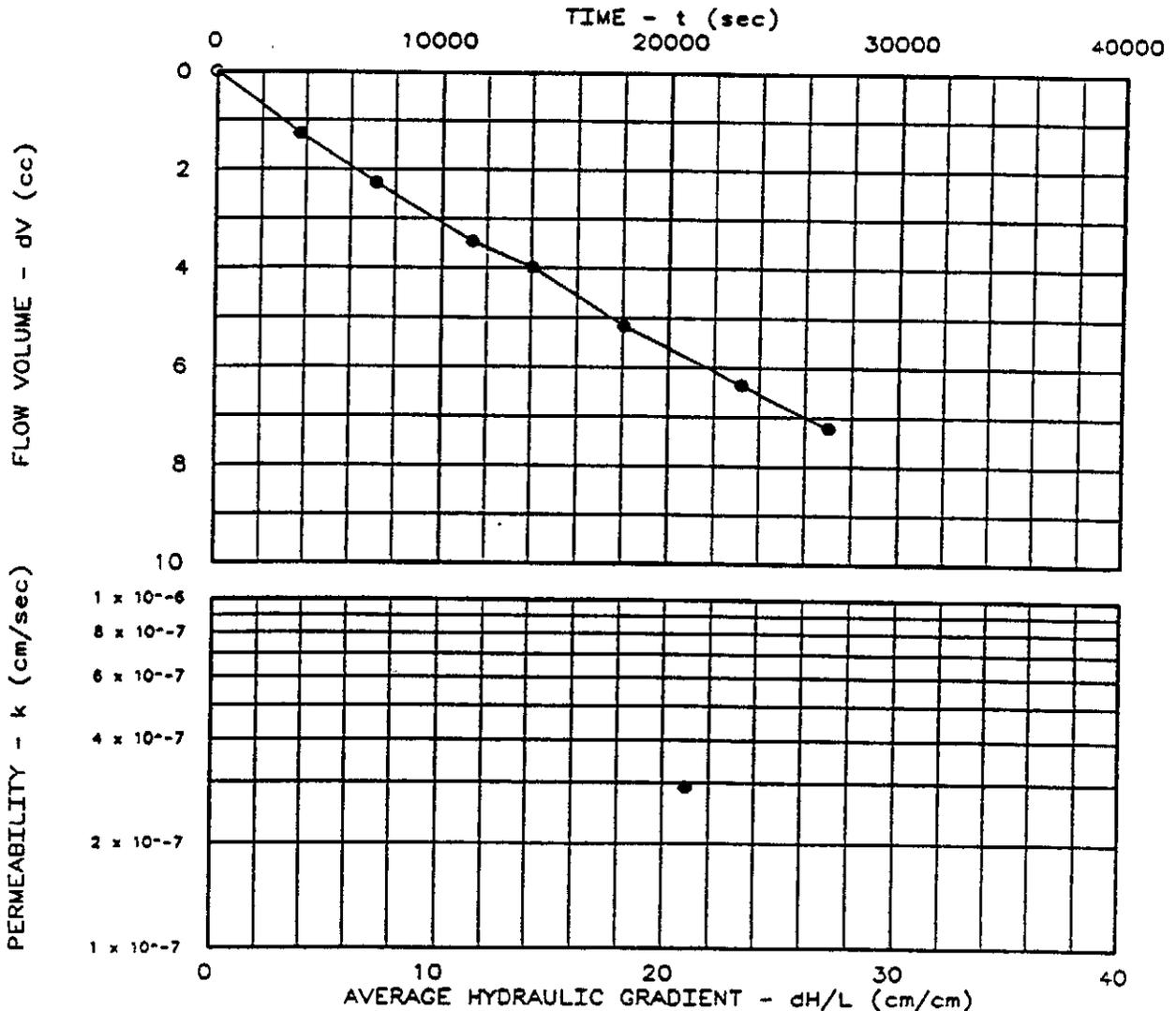
PERMEABILITY TEST REPORT

TEST DATA:

Specimen Height (cm): 10.16
 Specimen Diameter (cm): 7.11
 Dry Unit Weight (pcf): 109.5
 Moisture Before Test (%): 16.7
 Moisture After Test (%): 18.1
 Run Number: 1 ● 2 ▲
 Cell Pressure (psi): 55.0
 Test Pressure (psi): 53.0
 Back Pressure (psi): 50.0
 Diff. Head (psi): 3.0
 Flow Rate (cc/sec): 2.55×10^{-4}
 Perm. (cm/sec): 2.91×10^{-7}

SAMPLE DATA:

Sample Identification: Sample CD-6
 Visual Description: Yellow Brown Clayey Sand
 Remarks: Proposed Clay Liner Material
 Maximum Dry Density (pcf): 115.8
 Optimum Moisture Content (%): 13.2
 ASTM(D698)
 Percent Compaction: 94.6%
 Permeometer type: Flexible wall
 Sample type: Remolded



Project: Columbus County Landfill
 Location: Columbus County, North Carolina
 Date: 12-6-97

Project No.: 20-7408
 File No.:
 Lab No.:
 Tested by: jon b
 Checked by: cfb
 Test: CH - Constant head

PERMEABILITY TEST REPORT
TITAN ATLANTIC GROUP, INC.

MOISTURE CONTENT DETERMINATION

REFERENCES: ASTM D-2216-90, "Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock".

ASTM D-4643-87, "Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method."

PURPOSE: The moisture content test is performed to determine the phase relationships of air, water, and solids in a given volume of material. The consistency of a fine-grained cohesive soil depends on its moisture content relative to its liquid and plastic limits.

EQUIPMENT: The equipment used includes drying ovens, balances, specimen containers, and miscellaneous items noted in the various references.

PROCEDURE: Field samples are placed in sealable glass jars or plastic bags. In the laboratory, the wet and dry weights of a sample are determined before and after drying. The test specimen is dried in an oven to a constant weight. The standard oven is set at $110 \pm 5^{\circ}\text{C}$. Microwave oven temperatures may be higher. The loss of weight due to drying is considered to be water (moisture). The moisture content is calculated as the weight of water divided by the weight of dry soil or rock.

REPORT: The test result is reported as a percentage and is given on the attached GRAIN SIZE DISTRIBUTION TEST REPORTS or SOIL DATA SUMMARY TABLE.

PARTICLE SIZE ANALYSIS OF SOILS

- REFERENCES:** ASTM D-421-85, "Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants".
- ASTM D-2217-85, "Standard Practice for Wet Preparation of Soil Samples for Particle Size Analysis and Determination of Soil Constants".
- ASTM D-422-63, "Standard Test Method for Particle Size Analysis of Soils".
- ASTM D-2487-90, "Standard Test Method for Classification of Soils for Engineering Purposes".
- ASTM D-1140-54, "Standard Test Method for Amount of Material in Soils Finer Than the No. 200 (75- μ m) Sieve."
- PURPOSE:** The grain size distribution test or No. 200 sieve test is performed to determine the classification of a soil sample. The grain size data are often used to estimate other soil properties such as permeability, compressibility and strength.
- EQUIPMENT:** The equipment used includes sieves, balances, hydrometers, mixers, thermometers and assorted laboratory equipment and agents as noted in the various references.
- PROCEDURE:** The test samples can be prepared using either the dry method or wet method as described in the various references. After preparation, the test can be divided into two parts: the determination of the size and distribution of the coarse fraction and the determination of the size and distribution of the fines. The division between the two tests is the No. 200 sieve. The coarse fraction is tested using the sieve method whereas the fines are tested using the hydrometer method. If both tests are performed, the test is referred to as a combined analysis.
- In the sieve analysis of the coarse fraction, the soil is passed through a series of sieves, and the weight retained on each sieve is determined. The distribution of weights is then computed and the percent passing is plotted versus grain size in millimeters.
- In the hydrometer method, the particle size is determined by Stoke's equation. The soil is mixed in a heavy slurry and the rate of sedimentation is measured with a hydrometer. This data can then be reduced to a distribution of particle size and percent fines as in the sieve analysis.
- REPORT:** The data are reported on the attached GRAIN SIZE DISTRIBUTION TEST REPORTS or SOIL DATA SUMMARY TABLE.

PLASTICITY INDEX OF SOILS

REFERENCES: ASTM D-4318-84, "Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils".

Soil Testing for Engineers by T. W. Lambe, John Wiley and Sons, Inc., New York, 1962, Chapter 3, "Atterberg Limits and Indices", pages 22-28.

PURPOSE: Atterberg Limits or Plasticity tests are performed to determine the soil classification and plasticity properties of a soil specimen. These properties can be correlated with other soil properties such as strength, compressibility, shrink-swell potential, and permeability.

EQUIPMENT: The equipment includes a liquid limit device, grooving tools, spatula, balances, evaporating dish, ovens, and other apparatus as described by the references.

PROCEDURE: The liquid limit of a soil is the water content, expressed as a percentage of the weight of the oven dry soil, at the boundary between the liquid and plastic states. The plastic limit is the water content expressed as a percentage of the weight of the oven dry soil, at the boundary between the plastic and semi-solid states. The difference between these two values is the Plasticity Index (PI).

The liquid limit is determined by obtaining the water content at which the soil will flow under a specified dynamic force. The soil is wetted, placed in a special liquid limit device and grooved into two halves. The device is then dropped a specified distance 25 times. The liquid limit is defined as the water content at which the two halves will flow together over a specified distance.

The plastic limit is determined by obtaining the water content at which the soil can be rolled into thin threads by hand, on a ground-glass or non-absorbent paper. The plastic limit is defined as the moisture content at which the soil cannot be rolled into threads smaller than 1/8 inch in diameter.

REPORT: The Atterberg Limits, including the sample number, liquid limit, plastic limit, and plasticity index are given on either the attached GRAIN SIZE DISTRIBUTION TEST REPORTS or SOIL DATA SUMMARY TABLE.

MOISTURE DENSITY RELATIONS OF SOILS USING 5.5 RAMMER AND 12 INCH DROP

REFERENCES: ASTM D-698-91, "Test Method for Laboratory Compaction of Soil Using Standard Effort".
AASHTO T-99-81

PURPOSE: The purpose of this test is to determine the relation between moisture content and density of soils compacted in a specified mold with a specified dynamic energy. The test value obtained is used in the field to compare moisture contents and densities for soils compacted with earth moving equipment. The method is often referred to as the Standard Proctor Method. Four alternate procedures are provided as follows:

METHOD A - 4 Inch Mold: Soil Passing No. 4 Sieve
METHOD B - 6 Inch Mold: Soil Passing No. 4 Sieve
METHOD C - 4 Inch Mold: Soil Passing 3/4 Inch Sieve
METHOD D - 6 Inch Mold: Soil Passing 3/4 Inch Sieve

If no method is specified, the test is performed according to Method A.

EQUIPMENT: Molds, rammers, balances, scales, ovens, straight edge, sieves, mixing tools, containers and apparatus as specified by the references.

PROCEDURE: A portion of the total sample is mixed with water and placed in the mold in three separate layers. Each layer is compacted either 25 times (Methods A and C) or 56 times (Methods B and D) with the 5.5 pound rammer falling 12 inches. After compaction, the wet unit weight is determined and a sample dried for moisture content determination. Next, the unit dry weight is determined. The procedure is continued for other portions of the total sample until the wet unit weight of a compacted specimen fails to increase. The moisture samples are dried and the dry unit weights of each compacted specimen determined.

REPORT: The results for each compacted specimen are plotted as moisture content versus dry unit weight on the attached STANDARD PROCTOR REPORT. A best-fit curve is plotted through the points and the maximum dry density and optimum moisture content are selected as the peak of the curve.

PERMEABILITY OF COHESIVE SOILS

- REFERENCES:** ASTM D-5084-90, "Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter."
- PURPOSE:** The hydraulic conductivity (also referred to as coefficient of permeability) test is performed to determine the relative rate at which water will flow through a soil under a unit hydraulic gradient at standard temperature. Cohesive soils (clays and silts) generally have much lower permeabilities than cohesion less soils (sands and gravels). Low permeability soils act as barriers to groundwater flow and surface water infiltration. Recompacted cohesive soils are utilized as barrier liners, caps, and cores for landfills, lagoons, and dams.
- EQUIPMENT:** The equipment used includes the hydraulic system, back pressure system, flow measurement system, cell pressure system, permeameter cell, top cap and base, flexible membranes, porous end pieces, filter paper, compaction equipment, extruder, trimming equipment, and sample measuring devices.
- PROCEDURE:** Undisturbed samples are extruded from the Shelby tube and placed in the permeameter. Remolded samples are first compacted to the specified density and moisture content, then extruded from the compaction mold and set-up in the permeameter. The sample, sealed in the membrane, is subjected to an external cell pressure and an internal back pressure to achieve saturation (B value ≥ 0.95). The cell pressure minus the back pressure equals the confining pressure or effective stress. This value should correspond with the anticipated field effective stress. (Testing for landfill and lagoon liners and caps is normally performed using an effective stress of 5 psi). Once saturation is achieved, an initial head is applied at the top of the specimen, causing flow out of the bottom of the specimen. The initial hydraulic gradient utilized (head difference divided by sample height) depends on the anticipated permeability order of magnitude. In a constant head test, the applied head does not change and the flow rate of water through the specimen is measured. In a falling head test, the head is allowed to decrease or fall and the flow rate and change in head are measured. The permeability is expressed in units of length divided by time.
- REPORT:** The data are reported on the attached LABORATORY PERMEABILITY TEST REPORTS and/or SOIL DATA SUMMARY TABLE.

- (1)(d):** Section .0504(1)(d) requires a conceptual design plan representing special engineering features or considerations which must be included or maintained in site construction, operation, maintenance and closure. As a LCID Landfill application on an existing landfill site, construction plans meeting the requirements of Section .0504(2) are included in this package and shall be considered replacement for the conceptual design.
- (1)(e):** The proposed LCID Landfill is located on the Columbus County MSW Landfill site and is adjacent to the Columbus County MSW Transfer Station (also located on the MSW Landfill Site). The County has provided a letter stating that the LCID Landfill meets the County's land use plan, as well as zoning restrictions. The County's letter is included as Figure 1.
- (1)(f):** This Section requires a discussion of compliance standards with Rule .0503(1):

FIGURE 1
COUNTY ZONING APPROVAL LETTER

Columbus County Commissioners

ADMINISTRATIVE BUILDING

111 WASHINGTON STREET - WHITEVILLE, NORTH CAROLINA 28472 - PHONE 910-642-5700 - FAX 910-642-2386

July 30, 1998

COMMISSIONERS

C.W. Williams
Zone 1

C.E. Wilson
Zone 2

Sammie Jacobs
Zone 3

A. Dial Gray, III
Zone 4

Lynwood Norris
Zone 5

Spruell R. Britt
Zone 6

David L. Dutton, Jr.
re 7

James E. Hill, Jr.
County Attorney

Dempsey B. Herring
Administrator

Ida L. Smith
Clerk to Board/
Asst. to Administrator

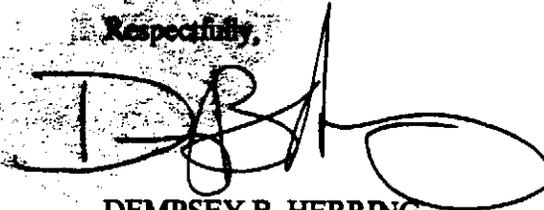
Mr. William Drietzler
Marlowe, Drietzler and Associates
219 North Boylan Avenue
Raleigh, North Carolina 27603

IN RE: [REDACTED]

Dear Mr. Drietzler:

Please be advised that the proposed Construction and Demolition Landfill for Columbus County meets all standards and regulations in reference to the County's land use plan, as well as zoning restrictions that may be affected by the project.

Respectfully,



DEMPSEY B. HERRING
COUNTY ADMINISTRATOR

DBH/jbh

(1)(f): This Section requires a discussion of compliance standards with Rule .0503(1):

.0503 SITING AND DESIGN REQUIREMENTS FOR DISPOSAL SITES

Section .0503(1) generally requires that a site not restrict the 100-year flood, not cause or contribute to the taking of any endangered or threatened species of plants, fish or wildlife, not destroy or cause adverse modification to critical habitat or threatened species, not damage or destroy archaeological or historical sites, not cause an adverse impact on a state park, recreation or scenic area, or any other lands included in the state nature and historic preserve, shall not be located within 10,000 feet of an airport runway used by jets or 5,000 feet from an airport runway used by piston-type aircraft, and the site shall have available adequate suitable soils for operations.

Floodplains

The drainage of the Columbus County Landfill Site is generally to the North. The Spring Branch separates the landfill borrow area from the formally permitted MSW waste boundary. The proposed C&D area is located west of the Spring Branch while the MSW Unit is located east of the Spring Branch. The Spring Branch discharges into the Deep Branch along the northern border of the Landfill property. Minor 100-year floodplain limitations exist along the Deep Branch and along the confluence of the Spring Branch and the Deep Branch. All of the mapped floodplain area is located north of the landfill access road and thus separated from the proposed LCID Landfill Unit. Figure 2 is a photocopy of the Flood Insurance Rate Map, Panel 150 of 350, Community Panel Number 370305 0150 B, with an effective date of June 3, 1991. In addition, reference the "2 Mile Radius Location Map" in Appendix B indicating the Spring Branch and the Deep Branch in relationship to the Landfill Property.

Fish and Wildlife

The proposed LCID Landfill Site is located on the existing Columbus County MSW Landfill property. The LCID site is adjacent to the existing Municipal Solid Waste Transfer Station and is located in a section of the former borrow site for the County's MSW Landfill. Because of the selected location, the proposed facility shall not cause or contribute to the taking of any endangered or threatened species of plants, fish or wildlife.

Critical Habitat for Endangered or Threatened Species

The proposed LCID Landfill Site is located on the existing Columbus County MSW Landfill property. The LCID site is adjacent to the existing Municipal Solid Waste Transfer Station and is located in a section of the former borrow site for the County's MSW Landfill. Because of the selected location, the proposed facility shall not result in the destruction or adverse modification of the critical habitat of endangered or threatened species, as identified in 50 C.F.R. Part 17.

Archaeological or Historical

The proposed LCID Landfill Site is located on the existing Columbus County MSW Landfill property. The LCID site is adjacent to the existing Municipal Solid Waste Transfer Station and is located in a section of the former borrow site for the County's MSW Landfill. It has been previously determined and approved by the Division that the County's Landfill and MSW Transfer Station did not damage or destroy any archaeological or historical sites. Given the proposed location within the former MSW Landfill borrow site, the LCID Landfill will not damage or destroy any archaeological or historical site.

Parks and Recreation Facilities

The proposed LCID Landfill Site is located on the existing Columbus County MSW Landfill property. The LCID site is adjacent to the existing Municipal Solid Waste Transfer Station and is located in a section of the former borrow site for the County's MSW Landfill. It has been previously determined and approved by the Division that the County's Landfill and MSW Transfer Station did not cause an adverse impact on State parks, recreation facilities, scenic areas or other nature or historic preserves. Given the proposed location within the former MSW Landfill borrow site, the LCID Landfill will not cause an adverse impact on State parks, recreation facilities, scenic areas or other nature or historic preserves.

Airport Location

The nearest airport to the existing Columbus County Landfill is located southeast of the existing landfill site. The Columbus County airport is accessed from SR 1170. 10,600 feet separate the nearest point along the airport runway (southwest corner) to the nearest point of the landfill property (southeast corner). The criteria for airports, which utilize only piston-powered aircraft, are 5,000 feet of horizontal separation. Refer to the "2 Mile Radius Location Map", in Appendix 'B', for a detailed location of the Columbus County Airport in conjunction with the existing Landfill property.

Available and Adequate Soils

The closed-out Columbus County MSW Landfill included an approximately 42 acre borrow area. Adequate amounts of suitable soils remain to both complete the capping of the 33 acre MSW Landfill and provide operational cover materials for the approximately 4 acre C&D Landfill Area. Rust Environment & Infrastructure completed a subsurface study of the borrow site in December of 1994. The information in this report can be made available to the Division upon request.

FIGURE 2
FLOOD PLAIN LOCATION MAP

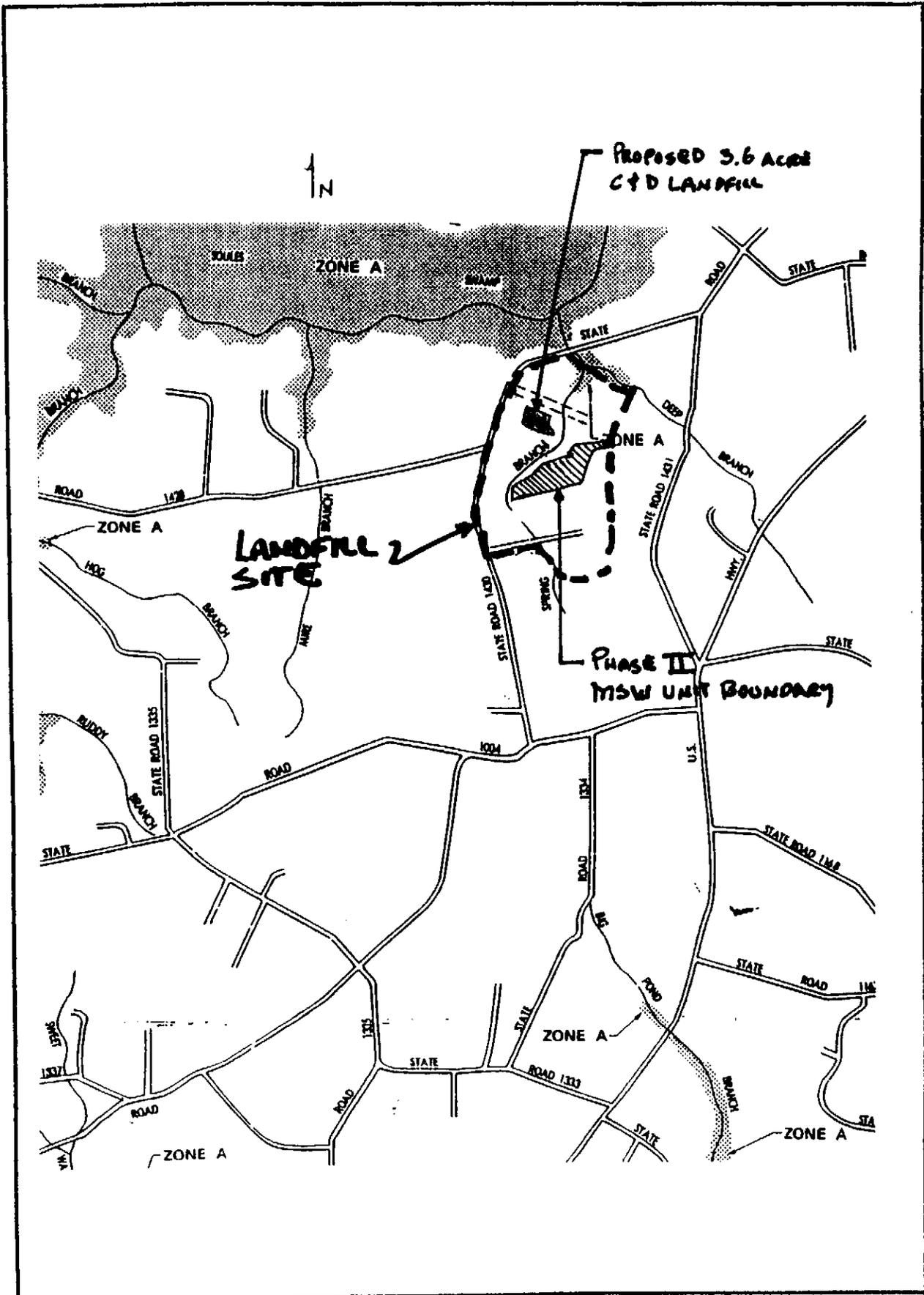


FIGURE 2

**COLUMBUS COUNTY C&D LANDFILL
FLOOD PLAIN LOCATION MAP**

Marlowe, Dretzler & Associates
 219 N. Boylan Ave.
 Raleigh, NC 27603
 919-834-1113

- (1)(g):** This Section requires a report indicating the population and area to be served, type, quantity and source of waste, equipment to be used to operate the site, groundwater monitoring plan, and a schematic drawing of the groundwater monitoring wells to be provided.

The C&D Landfill will only serve the residents of Columbus County. The current population estimate for Columbus County is 56,000 citizens.

The waste received will be all types allowed by the Division under the Construction and Demolition Landfill definition. The Columbus County Landfill currently receives approximately 20 tons per day of LCID material from within Columbus County. Based on an evaluation of total volume placed since the LCID Landfill was originally permitted on December 12, 2000, usage is estimated as approximately 5 tons per day in lieu of the originally estimated 20 tons per day.

The LCID Landfill will be operated and maintained by Waste Management, Inc. under Contract with Columbus County. The Operator has indicated that the following equipment will be available for use: 1) Caterpillar D6 Bulldozer and 2) Case 1280 Backhoe. When periodic cover is required, the Operator intends to hire a local contractor to provide a dump truck to be used with the Operator's Backhoe.

Groundwater Monitoring Wells are not required for a Land Clearing and Inert Debris Landfill.

FIGURE 3
THIS FIGURE WAS REMOVED

Section (2): "The following information shall be required for reviewing a construction plan application for a proposed sanitary landfill:"

Section .0504(2) generally requires information related to the construction plan application phase. This application for a C&D Landfill on an existing MSW Landfill site combines the site application phase with the construction plan application phase. Construction Plan requirements can be summarized as: map indicating existing features, grading plan, construction plan, erosion control plan, details, cross sections, and a site development phasing plan. In addition Section .0503(2)(h) requires a written report that contains a copy of the property deed, name of the individual responsible for operations and maintenance, post-closure land use projection, systematic usage description, earthwork calculations, discussion of erosion control requirements and a discussion of compliance with Rule .0503(2).

(2)(a) through (2)(g):

Find included in this application under Appendix 'C' a complete set of construction/operation plans for the Columbus County LCID Landfill, including the following sheets:

- C-1 COVER SHEET
- C-2 GROUNDWATER SEPARATION PLAN
- C-3 LANDFILL SUBGRADE PLAN
- C-4 LANDFILL CLOSURE GRADING PLAN
- C-5 LANDFILL PHASING PLAN (Revised Plan – Oct. 2006)
- C-6 LANDFILL CROSS SECTIONS
- C-7 CONSTRUCTION DETAILS AND SPECIFICATIONS

(2)(h): This Section requires a written report containing: a copy of the landfill property deed, name of the individual responsible for operations and maintenance, post-closure land use projection, projected life of the site, description of schematic usage, earthwork calculations, seeding specifications, erosion control computations and narrative and a discussion regarding compliance with Rule .0503(2).

Figure 4 is a copy of the deed to the Columbus County Landfill Property. This property is listed under Landfill Permit 24-01. The proposed LCID Landfill is within the former Columbus County MSW Landfill Site.

Columbus County will own the proposed LCID Landfill. Columbus County has an Operations Agreement with Waste Management, Inc. Waste Management is currently Operating and Maintaining the Solid Waste Transfer Station and the current Land Clearing and Inert Debris Disposal Area on the Columbus County Landfill Site.

Upon future closure of the Columbus County LCID Landfill, the approximately 4 acres of property will be seeded and maintained. No other use is anticipated at this time.

Landfill Life Estimate: The proposed height of the LCID Landfill is 35 feet. This will leave an approximately 0.5 acre "top" over an approximately 3.6 disposal area. The total projected air space is 103,000 cubic yards. It is estimated that 75 percent of the available air space will be used for waste disposal, cover material and the final cap will occupy the other 25 percent. With this assumption, an estimated 77,250 cubic yards of space will be available to receive the Columbus County C&D material. Using an in-place density of 750 lbs/cy, a total of 28,969 tons will be disposed of in the proposed LCID Landfill. Columbus County projects on average, 20 tons per day of LCID material over a 5 1/2 day week. Therefore, the projected life of the 3.6 acre facility is approximately 5 years.

October 2006 update: Based on in-place volumes since the facility was permitted on December 12, 2000, an estimated 30,000 cubic yards of air space remains available for disposal. Given the same parameters used in the original landfill life estimate, with the exception of a usage of 5 tons per day, the facility has 5.9 years of life expectancy.

The systematic use of the LCID Landfill is described via drawing C-5, Landfill Phasing Plan, in Appendix 'C'. The Landfill Phasing Plan has been updated to reflect current field conditions as of this October 2006 permit renewal request.

Current Regulations do not require daily cover of LCID Landfills. The calculations for landfill life estimated that cover material and the final cap would occupy 25 percent of the available air space. The overall air space was calculated at 103,000 cy; therefore, the estimate of required soil is 25,750 cy. Adequate quantities are available in the adjacent borrow pit.

The seeding schedule and seeding specifications are provided as Figure 5 and Figure 5A respectively.

FIGURE 4
LANDFILL PROPERTY DEED

Verified by _____
 by, JP 8-21-86
 Mail after recording to James E. Hill, Jr., 109 Courthouse Square, Whiteville, N. C.
 This instrument was prepared by James E. Hill, Jr.

NORTH CAROLINA GENERAL WARRANTY DEED

THIS DEED made this 20th day of AUGUST, 1986, by and between

GRANTOR	GRANTEE
<p>GARLAND WILLIAMSON and wife, SHELBA P. WILLIAMSON,</p>	<p>COUNTY OF COLUMBUS, A Body Politic</p>

Enter in appropriate block for each party: name, address, and, if appropriate, character of entity, e.g. corporation or partnership.

The designation Grantor and Grantee as used herein shall include said parties, their heirs, successors, and assigns, and shall include singular, plural, masculine, feminine or neuter as required by context.

WITNESSETH, that the Grantor, for a valuable consideration paid by the Grantee, the receipt of which is hereby acknowledged, has and by these presents does grant, bargain, sell and convey unto the Grantee in fee simple, all that certain lot or parcel of land situated in Whiteville Township, Columbus County, North Carolina and more particularly described as follows:

Being all of that 193.77 acre tract of land inclusive of highway right of way as shown on that plat for "Columbus County Landfill Property" by Billy M. Duncan, Registered Land Surveyor, dated the 23rd day of July, 1986, and filed and recorded in the Office of the Register of Deeds of Columbus County, N.C. in Map Book 44, page 7, on the 8th day of August, 1986. Reference is hereby made to said recorded map for a more particular and accurate description of the entire premises described and intended to be conveyed herein. The 0.65 acre Cemetery is reserved by the grantors and is not to be conveyed to the County of Columbus. The land of the easement is conveyed to Columbus County, but the right of ingress and regress is reserved by the grantors, their heirs and assigns.

This conveyance specifically excludes any A.S.C.S. crop allotments.

FIGURE 4	COLUMBUS COUNTY C&D LANDFILL LANDFILL PROPERTY DEED	<i>Marlowe, Dretzler & Associates</i> 216 N. Boylan Ave. Raleigh, NC 27603 819-834-1113
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**FIGURE 5
SEEDING SCHEDULE**

PERMANENT SEEDING SHOULDERS, SIDE DITCHES, UTILITY OUTFALLS, AND SLOPES (MAXIMUM 3:1)

DATE	TYPE	PLANTING RATE
AUG 15 - NOV 1	TALL FESCUE	200 LBS/ACRE
NOV 1 - MARCH 1	TALL FESCUE AND ABRUZZI RYE (NURSE CROP)	200 LBS/ACRE
MARCH 1 - APRIL 15	TALL FESCUE	25 LBS/ACRE
APRIL 1 - JUNE 30	TALL FESCUE HULLED COMMON BERMUDAGRASS	200 LBS/ACRE 15 LBS/ACRE

PERMANENT SEEDING SLOPES 3:1 UP TO 2:1

DATE	TYPE	PLANTING RATE
AUG 15 - NOV 1	TALL FESCUE AND SERICEA LESPEDEZA (UNHULLED, UNSCARIFIED)	200 LBS/ACRE
NOV 1 - MARCH 1	TALL FESCUE AND SERICEA LESPEDEZA (UNHULLED, UNSCARIFIED)	200 LBS/ACRE 60-70 LBS/ACRE
MARCH 1 - JUNE 1	AND ABRUZZI RYE TALL FESCUE AND SERICEA LESPEDEZA (SCARIFIED)	25 LBS/ACRE 200 LBS/ACRE
MARCH 15 - JUNE 30	WEeping LOVEGRASS AND SERICEA LESPEDEZA (SCARIFIED)	40-50 LBS/ACRE 10 LBS/ACRE
MARCH 15 - JUNE 30	HULLED COMMON BERMUDAGRASS AND SERICEA LESPEDEZA (SCARIFIED)	40-50 LBS/ACRE 15 LBS/ACRE
		40-50 LBS/ACRE

TEMPORARY SEEDING

DATE	TYPE	PLANTING RATE
JUNE 1 - SEPT 1	TALL FESCUE AND BROWN TOP MILLET (NURSE CROP) OR SORGHUM-SUDAN HYBRIDS (NURSE CROP)	200 LBS/ACRE 35 LBS/ACRE 30 LBS/ACRE

CONSULT CONSERVATION ENGINEER OR SOIL CONSERVATION SERVICE FOR ADDITIONAL INFORMATION CONCERNING OTHER ALTERNATIVES FOR VEGETATION OF DENUBED AREAS. THE ABOVE VEGETATION RATES ARE THOSE WHICH DO WELL UNDER LOCAL CONDITIONS; OTHER SEEDING RATE COMBINATIONS ARE POSSIBLE.

NURSE CROP/TEMPORARY SEEDINGS: RESEED ACCORDING TO THE OPTIMUM SEASON FOR DESIRED PERMANENT VEGETATION. DO NOT ALLOW TEMPORARY COVER TO GROW OVER 12 INCHES IN HEIGHT BEFORE MOWING, OTHERWISE FESCUE MAY BE SHADED OUT.

FIGURE 5

COLUMBUS COUNTY C&D LANDFILL
SEEDING SCHEDULE

Marlowe, Dretzler & Associates
218 N. Boylan Ave.
Raleigh, NC 27603
919-854-1113

**FIGURE 5A
SEEDING SPECIFICATIONS**

A. STEPS IN SEEDING

1. GRADE THE SITE ACCORDING TO THE PLAN.
2. INSTALL NEEDED SURFACE WATER CONTROL MEASURES SUCH AS SILT FENCE, ETC.
3. GENSEL COMPACT AREA UP TO 6 INCHES; SPREAD 4 INCHES OF TOPSOIL OR LOAM IF REQUIRED. SEE SECTION B OF THIS PLAN FOR TOP SOIL REQUIREMENTS.
4. RIP ENTIRE AREA UP TO 6 INCHES DEPTH.
5. REMOVE ALL LOOSE ROCKS, ROOTS, AND OTHER OBSTRUCTIONS LEAVING REASONABLY SMOOTH AND UNIFORM SURFACE.
6. INCORPORATE FERTILIZER AND LIME TO 4 INCHES OF TOPSOIL.
7. APPLY SEED.
8. APPLY MULCH.
9. WHEN HYDRAULIC SEEDING IS USED, MIX THE FERTILIZER, SEED AND WOOD CELLULOSE FIBER MULCH WITH WATER AND APPLY THE SLURRY UNIFORMLY OVER THE AREA BEING TREATED. THE SLURRY MUST BE APPLIED WITHIN ONE HOUR AFTER MIXING THE SEED WITH FERTILIZER.

B. TOP SOIL

TOP SOIL SHALL BE PLACED TO A MINIMUM DEPTH OF 4 INCHES WHEN THE FOLLOWING CONDITIONS EXIST:

1. THE STRUCTURE, PH, OR NUTRIENT BALANCE OF THE AVAILABLE SOIL CANNOT BE AMENDED BY REASONABLE MEANS TO PROVIDE AN ADEQUATE GROWTH MEDIUM FOR THE DESIRED VEGETATION.
2. THE SOIL IS TOO SHALLOW TO PROVIDE ADEQUATE ROOTING DEPTH AND WILL NOT SUPPLY NECESSARY MEASURES AND NUTRIENTS FOR THE GROWTH OF DESIRED VEGETATION.
3. THE TOP SOIL CONTAINS SUBSTANCE TOXIC TO DESIRED VEGETATION.

ANY MEDIUM TEXTURE SOIL SUCH AS VERY FINE SANDY LOAM, LOAM, SILT LOAM AND SILT COULD BE USED FOR LOAMING PURPOSES. LOAM SHOULD BE FREE FROM ROOTS, LARGE STONE, (LARGER THAN 2 INCHES), BRUSH STUMPS, LITTER, OBJECTIONABLE WEEDS, ROCKS AND CONTAIN NO TOXIC PRIOR TO APPLICATION. LOAM NEEDS TO BE TESTED FOR THE FOLLOWING PARAMETERS:

1. CONTENT OF ORGANIC MATTER
2. CONTENT OF SOLUBLE SALT
3. PH
4. RATION OF SODIUM ABSORPTION

THE STATE LAB WILL RUN THE NECESSARY SOIL TESTS AND MAKE RECOMMENDATIONS.

C. LIME

APPLY LIME ACCORDING TO SOIL TEST RECOMMENDATION. FOR PLANTS BEING GROWN IN THE ABSENCE OF A SOIL TEST, APPLY AS FOLLOWS:

	TONS/ACRE	IBS/1000 SQ. FT.
CLAY AND CLAY LOAM	3	135
SANDY LOAM, LOAM, AND SILT LOAM	2	90
LOAMY SANDS; SANDS	1	50

LIME SHOULD BE GROUND LIMESTONE CONTAINING NOT LESS THAN 85 PERCENT CALCIUM OR MANGANESE CARBONATE.

D. FERTILIZER

FERTILIZER SHALL BE 10-10-10 ANALYSIS APPLIED AT A RATE OF 800 TO 1,000 IBS/ACRE. SUPERPHOSPHATE SHALL BE APPLIED AT A RATE OF 500 IBS/ACRE (20% ANALYSIS SUPERPHOSPHATE).

E. MULCH

AFTER COMPLETION OF SEEDING GRAIN STRAW (WHEAT, OAT, BARLEY, RYE) SHOULD BE APPLIED AT A RATE OF 2 TONS/ACRE.

AS MULCH ANCHOR, APPLY ASPHALT EMULSION AT THE RATE OF 300 GALLONS/ACRE. IN THE STEEP AREAS AND WATER WAYS, OTHER MULCH MATERIAL AND TACKING METHODS SUCH AS WOOD EXCELSTOR, MATS, JUTE MESH NET, ETC. SHOULD BE USED.

FIGURE 5A

COLUMBUS COUNTY C&D LANDFILL
SEEDING SPECIFICATIONS

Marlowe, Draitzier & Associates
218 N. Boylan Ave.
Raleigh, NC 27603
919-834-1113

The final requirement of Rule .0504(2) is a discussion of compliance with the design requirements of Rule .0503(2).

Section .0503(2) generally requires that the Site meet certain design requirements pertaining to: explosive gases, public access, surface water controls, ground water protection, open burning, buffers and erosion control.

Explosive Gases

It was previously determined that the concentration of explosive gases generated by the MSW Landfill Site would not exceed those standards of Section .0503(2)(a). Given that the C&D Landfill will likely generate a concentration of explosive gases less than the MSW Landfill, the site is considered in compliance with the requirements of this Section.

Public Access

The proposed LCID Landfill Site is located in the borrow area of the former MSW Landfill and is on the County's MSW Landfill property. The access road into the LCID Landfill area shall be gated and closed when the facility is not in operation. Columbus County has contracted the operation of the LCID Landfill with Waste Management, Inc. Waste Management also operates the MSW Transfer Station, and the operator's office is located at the Transfer Station. The Transfer Station is adjacent to and immediately north of the proposed LCID Landfill.

Surface Water Requirements

The proposed LCID Landfill Site drains to the east. The discharge of all runoff from the site is the existing ditch that separates the former MSW Landfill with the Landfill Borrow Area. The ditch flows to the north and discharges into the sediment pond constructed to handle sediment runoff from the entire landfill and borrow area. The County's current semi-annual landfill groundwater monitoring requirements include one upstream and one downstream surface water sample. These sampling locations are not only upstream and downstream of the closed MSW Landfill; they are upstream and downstream of the proposed LCID Landfill. Monitoring of the surface water quality will continue to be made through the 30-year post-closure sampling requirements for the MSW Landfill.

Ground Water Requirements

A LCID Landfill design does not require liners and leachate collection systems. Therefore, only Section .0503(2)(d)(i) applies to this application. A Potentiometric Map was prepared by the Titan Atlantic Group for this project and is provided as Figure 6. It was determined during the subsurface study phase that seasonal high groundwaters are generally less than 1

foot below grade in the landfill area. The landfill design calls for approximately 4 to 6 feet of fill over the proposed Unit Boundary to achieve the required 4-foot of separation from seasonal high groundwater elevations. Refer to Appendix 'C' for detailed grading plans of the LCID Landfill.

Open Burning

Columbus County does not allow open burning at the Landfill site, and this requirement will include the proposed LCID Landfill Area.

Landfill Buffers

The Rules require a 50-foot buffer from property lines and streams and a 500-foot buffer from private dwellings and wells to the Unit Boundary of the LCID Landfill. The western boundary of the LCID Landfill was placed at approximately 500 feet from the centerline of SR 1428. A new trailer park subdivision has been constructed immediately opposite the entrance to the County's Landfill. Using the roadway as the buffer line, we are assured that any units installed in the new subdivision will be buffered in excess of 500-feet from the Unit Boundary of the LCID Landfill. Refer to Figure 7 for existing well locations and a drawing of the buffer areas provided.

Sedimentation Pollution Control Law

A sediment basin along the northern boundary of the landfill collects the majority of runoff from the landfill site. This sediment basin will collect all runoff from the proposed LCID Landfill and from the borrow source for the LCID Landfill. The basin was designed and approved to handle runoff from the entire landfill site and landfill borrow site. The existing landfill erosion control permit remains in effect and shall apply to this site development. The Erosion Control Permit is provided as Figure 8.

FIGURE 6
POTENTIOMETRIC MAP

FIGURE 7
EXISTING POTABLE WELL LOCATION MAP

NO.	REV.	DATE	DESCRIPTION

EXISTING WELL LOCATION MAP
 L.C.I.D. LANDFILL SUBMITTAL
 FIGURE 7

Designed by: WMD
 Checked by: WMD
 Drawn by: HSS
 Scale: 1" = 200'
 Date: 09/28/00
 Sheet: 09/28/00

ENGINEERS SEAL & SIGNATURE

Marlowe, Dreitzler & Associates
 Consulting Engineers
 218 N. Boylan Ave., Raleigh NC 27603
 919 834-1113

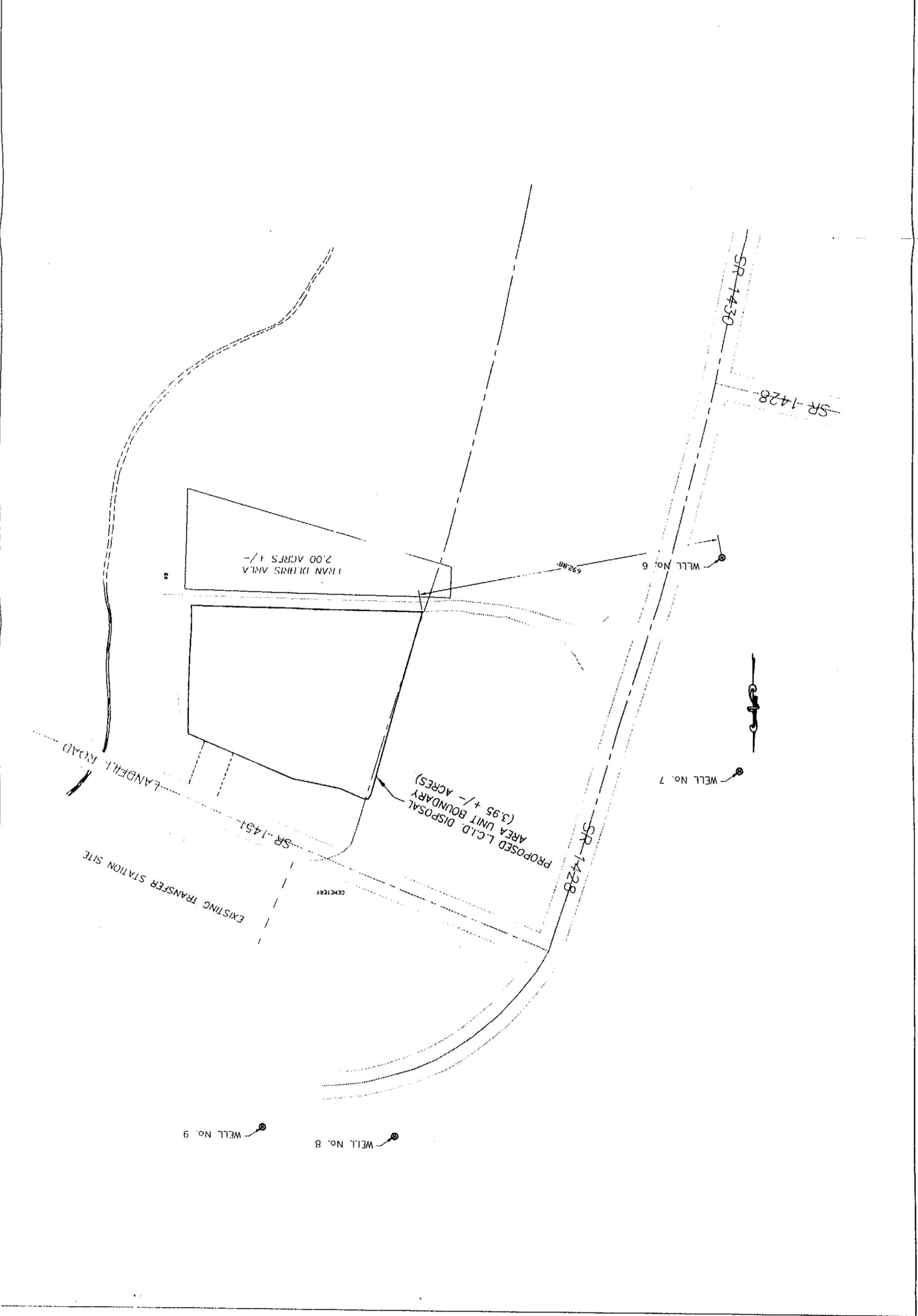


FIGURE 8
EROSION CONTROL PERMIT



State of North Carolina
Department of Natural Resources and Community Development
Wilmington Regional Office

James G. Martin, Governor
S. Thomas Rhodes, Secretary

Bob Jamieson

July 10, 1987

Mr. Gordon A. Rose, P. E.
Rpse & Purcell, Inc.
P. O. Box 103
Fayetteville, North Carolina 28302461

RE: Letter of Approval
Project Name: Columbus County Landfill
Location: NCSR 1428 - Columbus County
Submitted by: Rose & Purcell, Inc.
Date Received: July 7, 1987
New Submittal

Dear Mr. Rose:

This office has reviewed the subject sedimentation and erosion control Plan. We find the plan to be acceptable and hereby issue this letter of approval with comments as attached.

Please be advised that Title 15, North Carolina Administrative Code, 4B.0017(a) requires that a copy of the approved plan be on file at the job site. Also, inspections will be performed by this office over the life of the project to insure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Program is performance oriented, requiring protection of the natural resources and adjoining properties. If following the commencement of this project it is determined that the sedimentation and erosion control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute 113A-51 thru 66), this office may require revisions in the plan and its implementation to insure compliance with the Act.

Recognizing the desirability of early coordination of sedimentation control, we believe that it would be beneficial if a pre-construction conference could be arranged to discuss the approved plan for this project. Please contact this office and let us know the date of construction start-up and the date of the pre-construction conference so that we may attend.

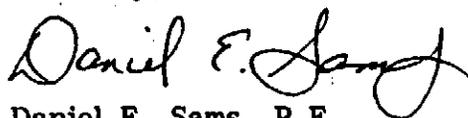
Mr. Gordon A. Rose, P.E.

Page 2

July 10, 1987

We look forward to working with you on this project.

Sincerely,

A handwritten signature in cursive script that reads "Daniel E. Sams". The signature is written in black ink and is positioned above the typed name.

Daniel E. Sams, P.E.
Regional Engineer
Land Quality Section

DES/trw

Attachment

APPENDICES

APPENDIX 'A'
AERIAL MAP

LCID L
COLUMBUS C

**AERIAL MAP
MARCH, 1993**

Drawn by:

Designed by:

Checked by: WWD

Date
OCT. 2000

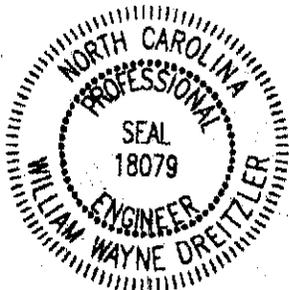
Scale
1" = 200'

Sheet

1 of 1

File number

97-043



ENGINEERS SEAL & SIGNATURE

PTION



GENERAL NOTES:

1. THE LAND USE NORTH AND EAST OF THE LCDI UNIT BOUNDARY IS RESIDENTIAL AND/OR FARMING.
2. THE ZONING JURISDICTION IS COLUMBUS COUNTY AND THE SUBJECT AREA IS RURAL WITH NO ZONING DESIGNATION.
3. A NEW RESIDENTIAL DEVELOPMENT HAS BEEN INSTALLED WEST OF THE INTERSECTION OF SR 1451 AND SR 1428 (LABELED ON PLAN). THE ROADS ARE IN; HOWEVER NO HOMES HAVE BEEN INSTALLED. THE WESTERN UNIT BOUNDARY OF THE PROPOSED LCDI LANDFILL IS 500 FEET FROM THE CENTERLINE OF SR 1428. THEREFORE, ANY NEW WELLS INSTALLED IN THE NEW SUBDIVISION SHALL BE GREATER THAN 500 FEET FROM THE C&D LANDFILL UNIT BOUNDARY.
4. THERE ARE NO INDUSTRIAL LOCATIONS WITHIN THE SUBJECT AREA.
5. THE HOMES WITHIN THE SUBJECT AREA ARE SERVED BY INDIVIDUAL WELL AND SEPTIC TANKS.

ENTIAL SUBDIVISION

EXISTING TRANSFER STATION SITE

SR 1428

SR 1451

500 FOOT BUFFER LINE

G FARMLAND CONTINUES

LCID LANDFILL UNIT BOUNDARY



APPENDIX 'B'
2-MILE RADIUS MAP

LCID
COLUMBUS

2 MILE RADIUS LOCATION MAP

A
↑
N

Drawn by:

Designed by:

Checked by: WWD

Date

OCT, 2000

Scale

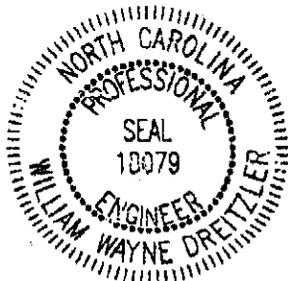
1" = 1000'

Sheet

1 of 1

File number

97-043



ENGINEERS SEAL & SIGNATURE

DN

GENERAL NOTES:

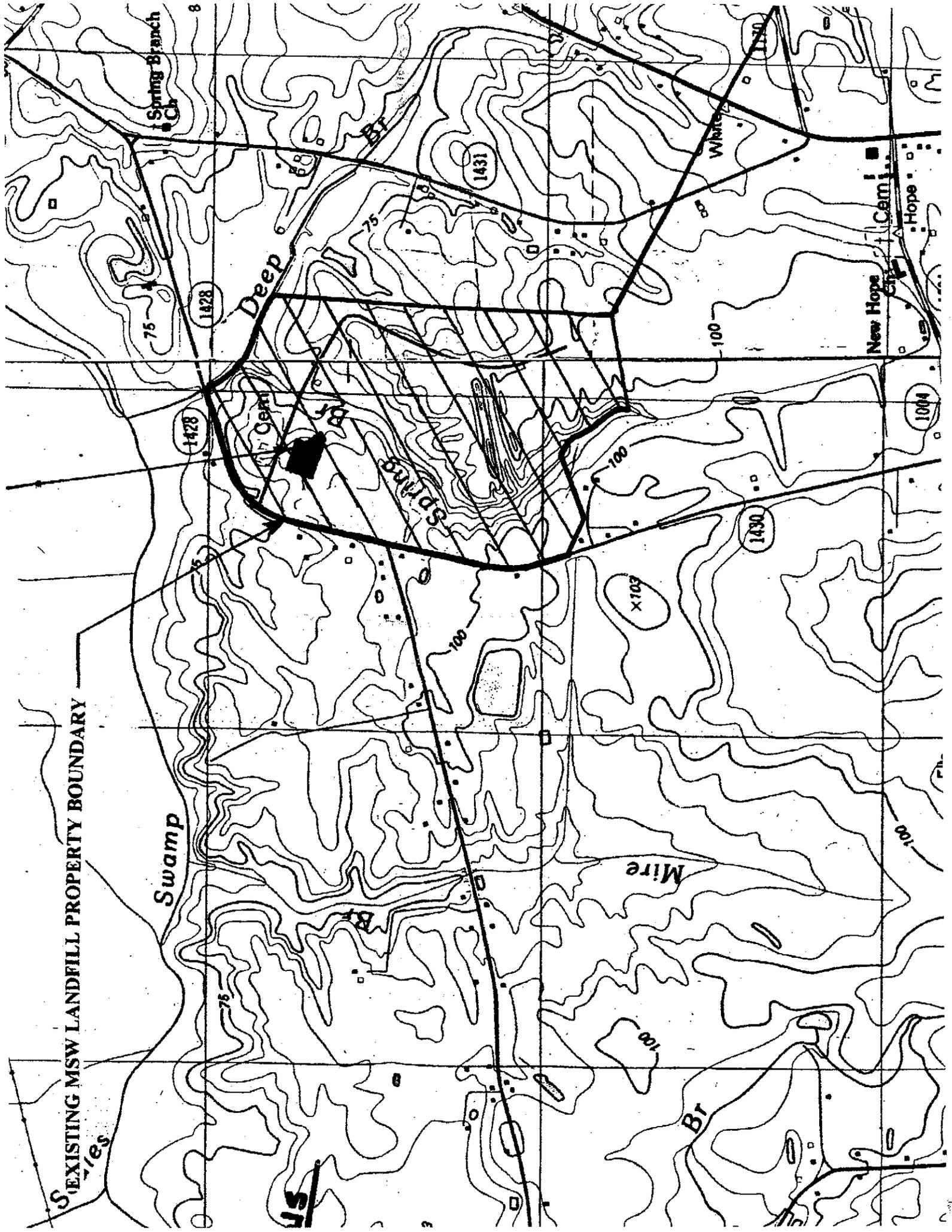
1. GROUND WATER USERS WITHIN THE SUBJECT AREA ARE PRIMARILY RESIDENTIAL.
2. TWO SOURCES OF POTENTIAL GROUND WATER AND SURFACE WATER POLLUTION WITHIN THE SUBJECT AREA ARE:
 1. THE COLUMBUS COUNTY MSW LANDFILL UNIT BOUNDARY
 2. AREA FARMS
3. WATER INTAKES WITHIN THE SUBJECT AREA ARE LIMITED TO PRIVATE WELLS. NO SURFACE WATER INTAKES ARE PRESENT WITHIN THE SUBJECT AREA.
4. THE DISTANCE FROM THE MSW LANDFILL PROPERTY BOUNDARY AND THE NEAREST AIRPORT RUNWAY IS 10,600 FEET (AS NOTED ON THE PLAN).
5. A NEW RESIDENTIAL SUBDIVISION WAS RECENTLY INSTALLED JUST WEST OF THE INTERSECTION OF SR 1428 AND 1451. REFERENCE THE AERIAL MAP FOR THE EXACT LOCATION OF THE NEW SUBDIVISION.
6. THIS MAP IS A REPRODUCTION OF THE "WHITEVILLE" USGS QUADRANGLE MAP.

Marlowe, Dreitzler & Associates



Consulting Engineers
219 N. Boylan Ave., Raleigh NC 27603
☎ 919 834-1113

APPENDIX 'B'
LANDFILL SUBMITTAL
COUNTY, NORTH CAROLINA



EXISTING MSW LANDFILL PROPERTY BOUNDARY

Spring Branch

Deep

SPRINGS

Swamp

Mire

New Hope Camp

White

8

1428

1428

1431

1430

1004

X103

100

100

100

100

Br

US

APPENDIX 'C'
CONSTRUCTION AND OPERATIONS PLANS
SHEETS C-1 THROUGH C-7

SHEET C-5 LANDFILL PHASING PLAN (REVISED)

LCID I
COLUMBUS

**AERIAL MAP
MARCH, 1993**

NORTHERN LANDFILL BOUNDARY

Drawn by:

Designed by:

Checked by: **WWD**

Date

OCT. 2000

Scale

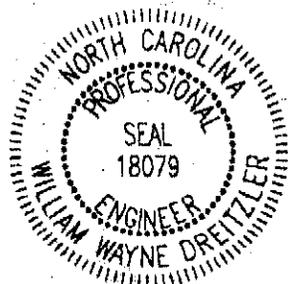
1" = 200'

Sheet

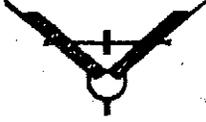
1 of 1

File number

97-043



ENGINEERS SEAL & SIGNATURE



GENERAL NOTES:

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4. THERE ARE NO INDUSTRIAL LOCATIONS WITHIN THE SUBJECT AREA
5. THE HOMES WITHIN THE SUBJECT AREA ARE SERVED BY INDIVIDUAL WELL AND SEPTIC TANKS.

EXISTING TRANSFER STATION SITE

SR 1457

500 FOOT BUFFER LINE

SR 1428

LCID LANDELL UNIT BOUNDARY

SPRING BRANCH



APPENDIX 'D'
SITE PHOTOGRAPHS – SUMMER 2006







