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WEYERHAEUSER PAPER COMPANY
PLYMOUTH, NORTH CAROLINA
LANDFILL VERTICAL EXPANSION/CLOSURE
VOLUME II
APPENDICES

APRIL, 1989

REVISED DECEMBER, 1989

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PERMIT APPLICATION
FOR
LANDFILL VERTICAL EXPANSION/CLOSURE
FOR
WEYERHAEUSER PAPER COMPANY
PLYMOUTH, NORTH CAROLINA

VOLUME II - APPENDICES

April 1989

Revised December, 1989

APPENDICES

APPENDIX A	Stability and Materials Evaluation Report
APPENDIX B	Solid Waste Audits
APPENDIX C	Test Results - Waste Analysis
APPENDIX D	Design Calculations

APPENDIX A

STABILITY AND MATERIALS EVALUATION REPORT

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STABILITY AND MATERIALS EVALUATION for VERTICAL EXPANSION AND CLOSURE of EXISTING LANDFILL

for

WEYERHAEUSER PAPER COMPANY

Plymouth, North Carolina

September 28, 1989
Revised December 13, 1989

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EXECUTIVE SUMMARY

This report and appendices were prepared in accordance with the Scope of Work presented in RMT's May 4, 1989, Proposal entitled "Geotechnical Investigation and Analysis of the Vertical Expansion/Closure Existing Landfill at Weyerhaeuser, Plymouth, N. C." These documents support the proposed modifications to NC DEHR Solid Waste Permit No. SR 1341 that will allow for a vertical expansion to the existing solid waste landfill. The findings of this study are summarized below and detailed in the following report.

The investigations consisted of performing ten soil borings in the existing landfill to measure the geotechnical properties of the landfill material, and the completion of six test pits in the proposed borrow area to evaluate the availability of suitable cover material for landfill closure. Additional information from the monitoring wells surrounding the landfill and soil borings in the proposed southern landfill was also used in preparing report specifics. A materials testing program was performed on selected representative soil samples.

Findings of this investigation are that the vertical expansion of the landfill to elevation 90 feet MSL is stable with side slopes of 3:1 Horizontal (H) to Vertical (V). There appear to be sufficient low permeability ($K = 1.0 \times 10^{-6}$ cm/sec or less) clayey soils in the proposed borrow area. Data indicate that the strength of the subgrade soils is sufficient to bear the weight of vertical expansion without undergoing excessive settlement.

1. INTRODUCTION

1.1 Background

As authorized by Weyerhaeuser's acceptance of the RMT May 4, 1989, Proposal, RMT has completed the Geotechnical Investigation and Analysis for the Vertical Expansion/Closure of the Existing Landfill at Weyerhaeuser, Plymouth, North Carolina.

The Vertical Expansion of the existing landfill is part of the long term solid waste disposal program being implemented by Weyerhaeuser at Plymouth, North Carolina. This phase involves raising the existing solid waste landfill from the approximate elevation of 50 feet Mean Sea Level (MSL) to 90 feet MSL. This will provide additional air space until the proposed solid waste landfill to be located south of the existing facility is available for use.

1.2 Purpose

The purpose of the geotechnical investigation and analysis is to confirm a number of assumptions that were made in the preliminary engineering design of the vertical expansion. These include the following:

- Confirm the shear strength and cohesion of the existing landfill material and subgrade soils.
- Analyze the slope stability at a 3:1 Horizontal to Vertical side slope against shallow slope failure or deep seated failure (rotational or sliding block).
- Confirm that the total and differential settlement caused by the additional landfill height will not be detrimental to long-term positive drainage.
- Confirm availability of a sufficient quantity of low permeability borrow soils that have the proper compaction properties.
- Measure the ground water level and any perched water levels in the existing landfill and assess the need for internal drainage provisions.

1.3 Scope

The Scope of Work included all steps necessary to evaluate proposed modifications to existing landfill operations and vertical expansion-closure, and appraise the borrow area. In order to complete the Scope of Work, RMT performed the following services:

1. Review historical information concerning landfill activities,
2. Conduct a site reconnaissance,
3. Execute field and laboratory investigations,
4. Complete geotechnical analysis.

2. FINDINGS

The findings of this study are summarized below. Methods and reasoning used to arrive at investigation findings are described in detail throughout the body of the report. Findings consist of three major areas; 1) Vertical Expansion, 2) Settlement Caused by Vertical Expansion, and 3) Borrow Materials.

2.1 Vertical Expansion

- The test borings indicated that the existing landfill operations have deposited compacted ash, bark, and lime mud that is predominantly firm to stiff based on the standard penetration test.

- Laboratory shear strength data on samples compacted to the same densities as those found in the field indicated that relatively high shear strengths are developed in the ash bark mixtures and ash and lime mud mixtures ($\phi = 35°$)

- Based on conservative shear strength values for existing landfill materials, assumed shear strength values in the new landfill, and using the slopes proposed by RMT's design, the slope stability analysis indicates factors of safety in excess of 2.0. This is considered adequate for static loading conditions. The slopes and foundations are not expected to undergo any significant permanent deformation caused by the design basis earthquake event.

- Ground water was not encountered within the landfill materials in any of the ten borings on the landfill. This indicates that the landfill is relatively free-draining, and that there does not appear to be any impermeable layers sufficient to cause a long-term perched water level within the waste materials.

2.2 Settlement Caused by Vertical Expansion

- Based on the test results from the surrounding monitoring well installation and on the compression index measured in the consolidation test, settlement analysis indicates that the total foundation and landfill settlements will be less than five feet. Most of this settlement will occur during the construction of the landfill. It is conservatively estimated that a total of 2-1/2 feet of the settlement would occur after completion to elevation 90 feet sea level and that this will occur within two years of completion.

- Only minor grading, if any, will be required after closure to maintain surface drainage off the crest.

2.3 Borrow Materials

- Approximately 111,500 cubic yards (c.y.) of final cover soils will be required for construction of final cover.

- Based on an approximate plan area of 20 acres, about 50,000 bank cubic yards for vegetative cover and about 145,000 bank cubic yards of clays suitable for infiltration barrier construction are estimated to be obtainable from the borrow area.

3. RECOMMENDATIONS

The details of the recommendations for the vertical expansion and final cover are presented in Sections 6 and 7. A summary of these recommendations is contained in this section.

3.1 Vertical Expansion

The findings of this investigation indicate that:

- The vertical expansion to elevation 90 feet MSL is feasible and stable at 3:1 H to V side slopes.

- It is recommended that the ash/bark/lime/miscellaneous fill be constructed as a homogenous fill. The proposed Phase 2 berms are not required for stability considerations. The entire fill area to the edges of the landfill should receive the same compactive effort. It is recommended that the ash/lime fills be compacted to about 80 per cubic foot moist unit weight. It is believed that this density can be achieved by the spreading operation of the dozer, limiting lifts to less than 9 inches and completely covering the lift with multiple pass of the dozer tracks.

- RMT recommends that test fill sections be tested to confirm that adequate density can be achieved with the spreading dozer only. Testing should be conducted prior to construction.

- In the opinion of RMT, based on the absence of a ground water level within the existing landfill, no special measures are necessary for providing internal drainage for the vertical expansion.

3.2 Final Cover

The findings of the investigation indicate that:

- RMT recommends that the clayey soils (CL, CH, SC) present in the proposed borrow area be used as the final cover (infiltration barrier).

- The topsoil and sandy near surface soils extending approximately to a depth of two feet are suitable for a vegetative cover and should be stockpiled for reuse on the landfill.

- RMT recommends that the borrow area excavation be performed under the observation of a soils engineer or technician who is capable of distinguishing "suitable" materials because there is some

variability in the depth and thickness of suitable clayey materials in the borrow area.

- RMT recommends that the infiltration barrier layer be compacted to a minimum of 90% of the Standard Proctor (ASTM D698) and at a moisture content of at least a 4 to 6% above optimum. This is to achieve the design permeability of $K = 1.0 \times 10^{-6}$ cm/sec.

- Sandy and silty (SM) layers are present within the clay stratum in the borrow area. The lab tests indicate that these can be mixed with the more clayey soils to obtain a suitable low permeable infiltration barrier.

- Conformance to the performance criteria for the cover material should be verified by a combination of field and laboratory tests and monitored with construction observation.

4. SITE EVALUATION

4.1 Site Description

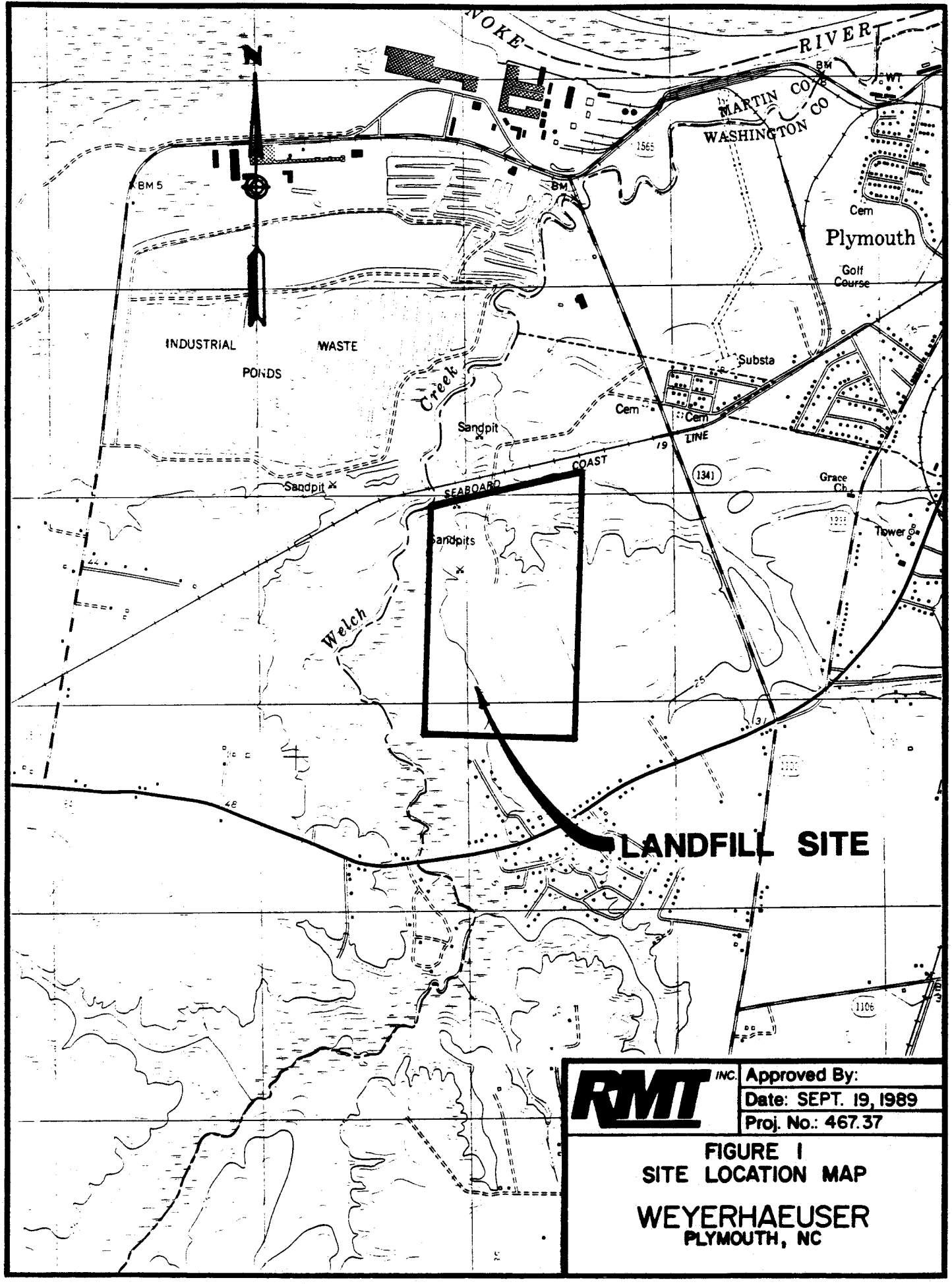
The site is located in eastern North Carolina, approximately 130 miles east of Raleigh, along State Route 64, and several miles southwest of where the Roanoke River discharges into Albermarle Sound. The site covers approximately 308 acres and consists of low lying undeveloped areas that are heavily wooded. The site is located in, and crossed by, several perennial drainages. The site slopes gently to the north and west, and is situated in an area where subsurface soils are predominantly fine-grained.

4.1.1 Location

Figure 1 shows the location of the plant, the existing landfill, designated borrow area, the existing landfill access route, and the physical boundaries. The existing landfill, borrow area, and access road (the project) are situated entirely within Washington County and located slightly more than one mile southwest of Plymouth as illustrated on Figure 1. The future solid waste and sludge landfills are both planned for location in this area.

4.1.2 Topography

A review of the Plymouth West, N. C. Quadrangle, U. S. Geological Survey (USGS), 7.5 Minute Series Topographic Map, 1979 edition, shows pre-landfill site elevations and notes the general area of the landfill as a "sand pit". Comparison of this 1979 map to more recent surveys shows that, except in the area surrounding the landfill, site topography is relatively unchanged and presumably natural.



RMT INC.

Approved By:	
Date: SEPT. 19, 1989	
Proj. No.: 467.37	

FIGURE I
SITE LOCATION MAP

WEYERHAEUSER
PLYMOUTH, NC

TELEDYNE POST N32083

An aerial topographic survey of the Weyerhaeuser site was completed based on photographs taken on December 23, 1987. The contours shown on the drawings, except where noted, are based on the elevations prevailing at the time of the 1987 photography. Since the date of the last aerial photograph, solid waste placement has raised the landfill grade to approximately 50 feet MSL. Top of landfill topography has been adjusted to reflect recent spot elevations obtained during the field investigations.

Topography of the existing landfill, borrow area, and south plantation area are shown on Plate No. 1 in Appendix A, Field Investigations. There is an earthen berm along both the western and northern boundaries of the landfill, which were presumably used for containment during initial landfill construction. The berm side slopes are vegetated with medium to tall grasses and average about 3 horizontal to 1 vertical (3H:1V). The side slopes do not exhibit visible signs of significant erosion or instability. The crest elevation of the western berm varies from 36 feet MSL at the north end to 46 feet MSL at the southern end. The crest of the northern berm is generally 28 feet MSL.

The landfill side slopes are unimproved and are estimated to range from about 4H:1V to 2H:1V. Although landfill side slopes exhibit minor signs of past erosion or surficial sloughing, there is no indication of significant past distortion which would indicate gross slope or foundation instability.

Natural grades outside the landfill limits range from elevation 40 feet MSL adjacent to the southeast corner of the landfill to elevation 10 feet MSL along the western and northern landfill limits. Ground surface

elevations west of landfill limits fall off to near Mean Sea Level along Welch Creek. The topography of the borrow area appears to be controlled by a southeast- to northwest-trending natural ridge that has an elevation of about 30 feet to 35 feet above MSL. The ridge slopes down to about elevation 20 feet MSL at the southwest corner and along the wetlands; the ridge slopes down to elevation 20 feet MSL on the opposite side.

4.2 Geology

The facility lies within the Atlantic Coastal Plain Physiographic Province. Geological site specifics are described in the following sections.

4.2.1 Site Geology

The Plymouth facility is located near the scarp formed between the lowest and most recent terraces, respectively the Pamlico and the Talbot Terrace (Nelson, 1964). Surface deposits at the proposed landfill site are of marine origin and consist of interbedded sands and clays. Previous investigations of the site area (Law Engineering, 1980 and 1987) have noted near-surface geology of the site to consist primarily of interbedded layers of variously textured sands, silts, and clays. Investigations completed for this study also encountered mostly fine-grained soils. Based on available information, bedrock at the site is estimated at a 100-foot depth or greater.

4.2.2 Ground Water

Pleistocene- and Recent-aged surficial sediments comprise the unconfined or water table aquifer of the site area. The water table is usually within 2 to 7 feet of the land surface.

4.2.3 Seismicity

No geologic or other-type faults are known to intersect the project area or to pass beneath or lay within close proximity (at least 1,000 feet) to the existing landfill. Review of the historical seismicity epicenter data did not reveal any lineaments suggesting otherwise.

5. INVESTIGATIONS

5.1 Landfill Expansion Field Investigations

Supplementary information for these analyses was obtained from investigations specific to the overall facility development completed by RMT since June, 1989. Subsurface soil conditions were investigated at seven locations (MW-1 through MW-7) outside the areal extent of the existing landfill as part of the ground water monitoring well installation program. The south plantation area is proposed as the site for the new solid waste landfill. Subsurface conditions at this site were investigated by four borings (SB-1 through SB-4) as part of the preliminary site characterization program. Subsurface stratigraphy in the borrow area was supplemented by logging subsurface conditions in the exposed faces of six test pits (TP-21 through TP-26). The test pits were necessary to obtain representative bulk samples for laboratory testing that was required to evaluate the materials to be used in final cover construction. In July, 1989, the existing landfill and foundation were investigated by drilling ten borings, GB-1 through GB-10, through the landfill and into the subgrade. In September, 1989, fourteen hand auger borings were made in the area of the proposed new landfill and two hand auger borings in the proposed borrow area. Table 1 presents a summary of the field investigations.

5.1.1 Ground-Water Monitoring Wells

Subsurface soil conditions outside the limits of the existing landfill were investigated as part of the ground water monitoring well installation program. A total of seven borings were drilled using mud rotary methods. Soils were sampled to depths of 25 feet to 30 feet.

TABLE 1[1]

INVESTIGATIONS SUMMARY

Plymouth Mill - Vertical Landfill Expansion

Location Number	Date Completed	Completed Depth	Grnd Sfc Elevation	Remarks
		Previous Investigation		
B-1	7-06-87	15.0	~10	h_s_a drilling & sampling
B-2	7-06-87	10.0	~17	h_s_a drilling & sampling
B-3	7-06-87	20.0	~18	h_s_a drilling & sampling
B-4	7-06-87	32.0	~10	h_s_a drilling & sampling
B-5	7-06-87	20.0	~18	h_s_a drilling & sampling
B-6	7-06-87	15.0	~11	h_s_a drilling & sampling
B-7	7-06-87	15.0	~26	h_s_a drilling & sampling
B-8	7-06-87	10.0	~34	h_s_a drilling & sampling
B-9	-	-	--	not drilled
B-10	7-06-87	11.0	~23	hand augered & sampled
B-11	7-06-87	8.0	~31	hand augered & sampled
B-12	7-06-87	15.0	~33	h_s_a drilling & sampling
		G-W Monitoring Wells		
MW-1	6-20-89	25.0	34.78	3-in.dia. by mud rotary
MW-2	6-21-89	25.0	24.90	4-in.dia. by mud rotary
MW-3	6-22-89	30.0	8.34	4-in.dia. by mud rotary
MW-4	6-27-89	25.0	9.79	4-in.dia. by mud rotary
MW-5	6-20-89	25.0	36.75	4-in.dia. by mud rotary
MW-6	6-21-89	25.0	11.22	4-in.dia. by mud rotary
MW-7	6-15-89	25.0	34.20	4-in dia. by mud rotary

[1] see continuation page for footnotes

TABLE 1 (cont.)

INVESTIGATIONS SUMMARY
Plymouth Mill - Vertical Landfill Expansion

Location Number	Date Completed	Completed Depth	Grnd Sfc Elevation	Remarks
		Southward Expansion Area		
SB-1	6-16-89	30.0	14.99	6-in.dia. hollow stem auger
SB-2	6-16-89	30.0	40.53	6-in.dia. h_s_a
SB-3	6-16-89	30.0	38.42	6-in.dia. h_s_a
SB-4	6-16-89	30.0	40.29	6-in.dia. h_s_a
		Existing Landfill Investigation		
GB-1	7-31-89	40.0	48.05	Base of landfill @ 16.1' msl
GB-2	7-31-89	40.0	49.56	Base of landfill @ 17.6' msl
GB-3	7-31-89	40.0	50.41	Base of landfill @ 18.4' msl
GB-4	7-31-89	45.0	38.75	Base of landfill @ 16.8' msl
GB-5	7-31-89	19.0	46.61	No waste encountered
GB-6	7-31-89	50.0	49.74	Base of landfill @ 12.7' msl
GB-7	7-31-89	45.0	49.53	Base of landfill @ 4.5' msl
GB-8	7-31-89	40.0	37.17	Base of landfill @ 10.5' msl
GB-9	7-31-89	45.0	48.22	Base of landfill @ 11.2' msl
GB-10	7-31-89	45.0	44.27	Base of landfill @ 2.3' msl
TP-GB6	6-28-89	~4.5	~49.7	Backhoe; adjacent to GB-6
		Borrow Area Investigation		
TP-21	6-28-89	~6	34.68	Backhoe test pit
TP-22	6-28-89	~7.5	32.28	Backhoe test pit
TP-23	6-28-89	~7	34.39	Backhoe test pit
TP-24	6-28-89	~6.5	34.60	Backhoe test pit
TP-25	6-28-89	~5	33.67	Backhoe test pit
TP-26	6-28-89	~7	34.24	Backhoe test pit

TABLE 1 (cont.)

INVESTIGATIONS SUMMARY

Plymouth Mill - Vertical Landfill Expansion

Location Number	Date Completed	Completed Depth	Grnd Sfc Elevation	Remarks
		Conceptual Design Invest.		
HA-1	9-07-89	~9.5	~38	Piezo to 9-ft depth
HA-2	9-07-89	~10.	~36	Piezo to 9-ft depth
HA-3	9-07-89	~10.	~36	Piezo to 9.7-ft-depth
HA-4	9-07-89	~10.	~38	Piezo to 10-ft depth
HA-5	9-07-89	~9.5	~36	Piezo to 8.7-ft depth
HA-6	9-07-89	~14.	~40	Piezo to 13.7-ft depth
HA-7	9-07-89	~10.	~39	Piezo to 9.7-ft depth
HA-8	9-07-89	~9.	~37	Piezo to 9-ft depth
HA-9	9-07-89	~13.	~40	Piezo to 12.8-ft depth
HA-10	9-08-89	~10.	~34	Piezo to 9.3-ft depth
HA-11	9-08-89	~8.	~36	Piezo to 8-ft depth
HA-12	9-08-89	~10.5	~37	Piezo to 10-ft depth
HA-13	9-08-89	~16.	~36	Piezo to 16-ft depth
HA-14	9-08-89	~11.5	~36	Piezo to 11.3-ft depth
HA-15	9-08-89	~11.	~35	Piezo to 11.2-ft depth
HA-16	9-08-89	~11.5	~24	Piezo to 11.5-ft depth

The borings were completed as ground water monitoring wells. The wells were surveyed to locate them vertically and horizontally. These locations are indicated on Plate 1 as MW-1 through MW-7. Geologic logs, in accordance with the Unified Soil Classification System (USCS, see Appendix A.2), are presented on the Log Of Test Boring forms contained in Appendix A. The logs also summarize drilling date, boring diameter, sampling intervals, type of sampler used, field penetration resistance measurements where applicable, and surface elevation.

Subsurface soil conditions were observed to vary between the seven widely-space well locations. The stratigraphy in the four locations generally surrounding the existing landfill consisted of medium dense silty sands to sandy silts overlying a stiff silty clay, which was underlain by a medium dense to dense sand to silty fine sand. Thickness of the surficial silty sand was generally less than five feet, except at location MW-3 where the layer was approximately 14 feet thick. The silty clay layer generally ranged from 4 to 10-foot thick and extended down to approximately 8-foot depth, except at location MW-3 where this stratum was not observed. Below a depth of about 8 to 10 foot and underlying the less competent stratum above it were at least 15 feet of the dense sands to silty sands.

Monitoring wells were constructed in accordance with NCAC Title 15, Subchapter 2C, Section .0100. Well completion depths and details are presented under separate cover as are the field hydraulic conductivity tests.

5.1.2 New Landfill Feasibility Investigation

Subsurface conditions in the south plantation area, upland and adjacent to the existing landfill, were investigated by 4 borings; this

general area of the site has been accepted by State regulators as the site for a new landfill. These 4 borings were drilled using continuous-flight, hollow stem augers at the SB-noted locations shown on Plate 1. Sampling and penetration resistance measurements were taken by standard split spoon sampler. The recovered samples were classified in the field by an RMT geologist. USCS descriptions, sampling intervals, penetration resistance measurements, drilling dates, and surveyed surface elevations are presented in Appendix A.4.

Subsurface conditions were observed to generally consist of a thin surficial layer of topsoil, overlying mostly fine-grained soil to the maximum 30-foot depth explored. The 3 borings on the upper plateau of the plantation that is above elevation 30 feet MSL encountered a surficial layer (approximately 5-foot thick) of loose silty to silty fine sand. The sand stratum is underlain by a 5- and 10-foot stratum of borderline firm to stiff sand and clay at locations SB-3 and SB-4, respectively. At location SB-2 the clay stratum was not encountered until a depth of almost 17 feet and was observed to be soft in consistency with a thickness of about 5 feet. Mostly stiff clays were encountered at depths greater than 20 feet in all three of the plateau locations. At location SB-1, which is located downslope of the plateau, loose to medium dense silty sand was encountered to a depth of nearly 10 feet. A dense, fine- to well-graded sand underlies the silty sand.

5.1.3 Existing Solid Waste Landfill Characterization

Conditions within the existing landfill and depth to underlying natural subgrade were explored by a total of 10 borings, GB-1 through GB-10, drilled from the top of the landfill. This investigation was completed in July of 1989 and included excavation of a 4.5-foot deep test

pit to observe the large-scale condition of the existing ash fill. These borings were drilled using hollow stem augers and sampled with a standard split spoon. Surveyed locations are indicated on Plate 1. Test Boring Record data sheets are presented in Appendix A.4.

The composition of the landfill, although locally variable, is consistent with the earlier waste stream characterization and as expected from experience with similar fills. The borings generally encountered ash and bark in varying layers or as a mixture. In some locations, deposits of gray lime mud were encountered. The Standard Penetration tests varied substantially, indicating a variable compacted fill. In general, no areas of very loose or soft fill were encountered.

The elevation of the natural subgrade is interpreted from the field logs to generally slope from a high of about 17 feet MSL in the southern portions of the landfill to less than 10 feet MSL in the northern portions. The base of the landfill appears to be founded on or closely underlain by an approximately 5-foot or thicker stratum of stiff clay and silty clay.

5.1.4 Construction Materials Investigation

In June, 1989, and commensurate with the other investigations discussed in this section, 6 backhoe test pits were excavated in the area identified previously as a source of borrow materials for final closure of the existing landfill (pursuant to its vertical expansion). These test pits were necessary to obtain bulk samples of representative materials for laboratory testing. Laboratory testing was necessary to confirm that the clays noted previously were suitable for construction of a compacted clay cover (infiltration or percolation barrier) on the completed landfill. As a priority in the selection of representative

samples and visual identification of what were considered suitable infiltration barrier construction materials, the subsurface stratigraphy in exposed faces of the test pit excavations were visually classified by an RMT geologist.

Test pit locations are shown on Plate 1 as TP-21 through TP-26. Geologic logs are presented in Appendix A.3. Logs indicate that the soil stratigraphy of this area is generally as previously described. About 1 foot of highly organic topsoil was encountered at all 6 locations. Clays suitable for cover material were observed from 2½ feet deep at location TP-22 to 5½ feet deep at location TP-26. Silts to silty fine sands were observed to generally underlay surface clays. Section 7 on borrow materials contains further discussions of construction materials and evaluations.

5.2 Laboratory Investigations

Laboratory tests were performed on selected soils and landfill samples obtained during the field investigations. Table 2 presents a Laboratory Testing/Samples Summary. Physical property testing was performed to evaluate the *in situ* state of the sampled materials. Index property tests were performed to aid in classification and for comparison and correlation, where practicable, to the broad body of existing information on engineering properties for like materials. Engineering property testing was performed to determine the representative parameters for use in the engineering analyses. Individual test results and graphic plots are presented in Appendix B, Laboratory Testing Data Sheets and Plots.

WeycoLab.wk1

TABLE 2

WEYERHAUSER - PLYMOUTH, N.C.

Laboratory Testing/Samples Summary

LOCATION	DEPTH (ft)	IN SITU PROPS %w	Dry Wt	USCS	SPECIF GRAV	INDEX PROPERTIES LL	PI	SAND+ (%)	SILT (%)	CLAY (%)	POROSITY e	n	<-COMPACTION-> O.M.C. (%)	Max DD (pcf)	R.M.C. (%)	Permeability Testing Summary Dry Wt (pcf)	Rel OMC (+/-)	Rc (%)	kv (cm/sec)	Strength C'/(C) (psi)	Phi'/(Phi) (deg)
	***** Borrow Area *****																				
TP-21	1.5	13.3	115.8	CL																	
TP-21	1.5-2.0	18.1	101	CL	2.64	29	11	20	38	42	0.587	0.370	15.8	112.4	17.9	103.8	2.1	92.3	3.6E-08		
	2-3																				
TP-21	3.5	28.4	93.7	CL-CH																	
TP-21	3.5-4.5	29.2	-	CH	2.62	55	28	22	20	58	0.905	0.475	23.2	97.3	28.8	85.8	5.6	88.2	1.6E-08		
TP-22	3 - 4	19.7	-	SM	2.64	23	2	73	7	20	0.615	0.381	14.8	110.6	19.8	102.0	5.0	92.2	5.3E-05		
	3.7-4																				
TP-24	3 -3.5	31.6	-	CH	2.68	61	31	27	17	56	0.918	0.479	24.4	96.4	27.1	87.2	2.7	90.5	7.3E-08		
TP-26	3 -3.5	20.1	-	SC	2.67	36	14	56	9	35	0.697	0.411	17.7	106.3	20.4	98.2	2.7	92.4	2.2E-05		
					2.67						0.659	0.397			23.2	100.4	5.5	94.4	8.6E-09		
TP-26	5 -5.5	20.7	-	CL	2.7	36	15	49	15	36	0.710	0.415	19.5	106.6	20.6	98.5	1.1	92.4	1.0E-06		
					2.7						0.714	0.417			24.8	98.3	5.3	92.2	1.0E-08		
TP-21/22	<note 1>	-	-	<~CL>	2.63	-	-	~47	~14	~39	0.811	0.448	~19.0	~104.0	22.9	90.6	~3.9	~87.1	4.2E-08		

NOTE: Test Sample a composite made up of approximately aqual amounts taken from TP-21 (3.5'-4.5') and TP-22 (3'-4'). Where practicable test properties averaged and distinguished by "~" preceding value noted.

	** Existing Landfill **																				
GB-1 *	sfc	44.6	36.4			<150' southwest of GB-1>															
GB-1	0.5	58.1	52.2	Wd+Fly Ash																	
		43.9			2.28			~35	~55	~10					~44	30.0				0	35
															~44	50				~3.5	~36.5
GB-3	0.75	77.9	33.4	Fly Ash																	
GB-3	3.5	99.5	32.4	Fly Ash																	
GB-6	0 -0.5	47.4			2.28			~59	~27	~14			40.5	67.0	47.4	41.2	6.9	61.5		0	32.5
															47.4	55.0	6.9	82.1		0	33
GB-6	1.5	55.1	45.5	Fly Ash																	

WeycoLab.wk1

TABLE 2 (continued)

WEYERHAUSER - PLYMOUTH, N.C.

Laboratory Testing/Samples Summary

LOCATION	DEPTH (ft)	IN SITU PROPS %w	Dry Wt	USCS	SPECIF GRAV	INDEX PROPERTIES LL	PI	SAND+ (%)	SILT (%)	CLAY (%)	e	POROSITY n	COMPACTION O.M.C. (%)	Max DD (pcf)	R.M.C. (%)	Permeability Testing Summary Dry Wt (pcf)	Rel OMC (+/-)	Rc (%)	kv (cm/sec)	Strength C'/(C) (psi)	Phi'/(Phi) (deg)
GB-6	4.5	52.3	49.6	Wd+Fly Ash																	
		70.4		"	2.28			50.1	36.9	~13					70.4	32.6				0	42.6
																			or ==>	1.5	39.5
GB-7 *	1.5	56.1	47.4	Lime md		<150' south>															
GB-7 *	4	77.9	33.4	Lime md		<150' south>															
GB-10*	sfc	51.3	51.2	Lime md		<30' west>															
GB-10	0.5	52.8			2.13			36.2	~58	~6					~53	35.9				0	44.5
															~53	55.2				11.5	?
SB-2 b	4-6	To Law; bag samples																			
SB-4 b	6-8	To Law; bag samples																			
MW-2	15-17	19.3	101.1	SM	2.7										19.3	101.1			6.1E-05		
MW-3	5-7	w/ drillers; UDs																			
MW-3	10-12	w/ drillers; UDs																			
MW-4	5-7	19.3	107.9	SC-CL	2.66	29	13	56	24	20	~0.538	s=95.4									
		16.4	113.4		"						~0.464	s=93.9%	Sigma3 = 0.50 ksf		Sigma1 = 2.25 ksf @ e=3.3%						
		20.4	105.1		"						~0.580	s=93.4%	Sigma3 = 1.00 ksf		Sigma1 = 3.56 ksf @ e=2.5%; Tot=>					(~2)	~42
		19.8	106.7		"						~0.555	s=94.7%	Sigma3 = 1.46 ksf		Sigma1 = 6.28 ksf @ e=3.3%; Eff=>					0	33
MW-4	10-12	33.0	89.3	1-d cconsol							~0.853	s= 102%									
MW-5	5-7	w/ drillers; UDs																			
MW-5	10-12	w/ drillers; UDs																			
MW-5	15-17	w/ drillers; UDs																			
MW-5	20-22	w/ drillers; UDs																			

PROJECT ITEM PIC * PGE * PM ENG1 HYD TECH DRAFT ADMIN EXP LINE

5.2.1 Physical Properties

In situ (natural) moisture content and dry density were evaluated for selected samples of natural soils and landfill material. Natural moisture content of the tested borrow area clays typically ranged from 20 percent to 30 percent. One surface sample was determined to be approximately 13 percent. Dry density of the 3 borrow area clays tested ranged from almost 94 pounds per cubic foot (pcf) for the highly plastic sample from TP-21 at 3.5-foot depth to approximately 116 pcf for the near-surface sample from the same test pit. The 101 pcf for the sample from the 2-foot depth is considered more representative since the surface sample is probably highly dessicated. The undisturbed clay samples obtained from greater depth at locations MW-2 (15-17 feet) and MW-4 (5-7 feet) were determined to have higher natural moisture contents, 33 percent and 20 percent respectively. *In situ* densities for these samples were 89 pcf for MW-2 and about 106 pcf for the sample from MW-4. *In situ* dry density for the site clays is estimated to about 110 pcf for sandy clays and about 100 pcf for the less sandy materials with moisture contents of about 20 percent to 30 percent.

In place density and natural moisture content for near-surface samples of the landfill materials were variable. Moisture content ranged from a low of 44 percent for the 0.5-foot depth sample taken in the area of GB-1 to almost 100 percent for the 3.5-foot depth sample at GB-3; 78 percent appears to be the more representative maximum moisture content. *In situ* dry densities varied from 33 pcf to a maximum about 55 pcf. Specific gravity was typically 2.28 except for the sample from GB-10 which was 2.13. The in-place physical properties of landfill materials appear to be dependant on the amount of light products contained. The

unit weight decreases and moisture content increases in proportion to those light materials.

5.2.2 Index Properties

Index properties testing was performed to aid in classification and to determine the intrinsic material characteristics which could be used for correlation and checking to like materials. Both soils and landfill materials were tested. Index properties testing consisted of specific gravity, Atterberg limits, and particle size distributions. Individual data sheets and plots are presented in Appendix B.

The site soils tested are typically fine-grained, of variable plasticity and specific gravity. The index test results for clay soils from the borrow area and foundation materials obtained from location MW-4 appear to be similar. The specific gravity of these samples averages about 2.65 plus or minus 0.05; liquid limits range from a low of 23 for the SM from TP-22 to a high of 61 for the TP-24 sample; corresponding plasticity indices range from 2 to 31; and percent fines range from 27 percent for the SM sample to 80 percent for the more plastic soils. The sample at TP-26 obtained from 5- to 5.5-foot appears representative of borrow area clays. The two MW samples are representative of foundation clays.

Landfill materials generally ranged from 35 percent to 60 percent sand sizes and from 6 percent to 14 percent clay sizes. The specific gravity of these materials (2.28) is substantially lower than that of the soils and is typical for this type of ash. The ash samples were determined to be non-plastic in the field.

5.2.3 Engineering Properties

Engineering property testing was performed on both natural soil samples and landfill materials obtained during the field investigations. These tests were performed to develop the geotechnical parameters necessary for the analyses and evaluations contained in this study. Engineering property analyses consisted of compaction, remolded permeability, hydraulic conductivity on undisturbed sample(s), one-dimensional consolidation, and shear strength testing.

A total of 7 standard Proctor compaction tests (ASTM D-698) were performed to determine moisture-density relationships for the various soils, to establish remolding criteria for permeability and strength testing, and as the basis for determining the borrow material adjustments. Graphic plots of these test results are presented in Appendix B.2. The maximum density and corresponding optimum moisture content are reported for a given compactive effort. These values are significant because dry density can be correlated to engineering properties such as strength and hydraulic conductivity.

Maximum dry density for the six borrow area samples ranged from about 97 pcf for the two highly plastic clay samples (TP-24 from 3.5 to 3.5 foot depth and TP-21 from 3.5 to 4.5-foot depth) to 112 pcf for a less plastic sample (TP-21 from 1.5 to 2.0-foot depth). Corresponding optimum moisture contents were 24 percent and 16 percent, respectively. Maximum dry density and moisture content for the shallow sample obtained TP-26 (5- to 5.5-foot depth) were 106 pcf at almost 18 percent moisture; these are considered typical values. Maximum dry density and optimum moisture content for the sample obtained within the top 0.5-foot of ash in the area around GB-6 was determined to be 67 pcf at 40.5 percent.

A total of 9 permeability tests, including 2 confirmation and 1 composite sample, were performed on 5 borrow material samples and 1 *in situ* soil sample. Individual test sample data sheets are presented in Appendix B.3. All permeability testing was performed by RMT using flexible-walled permeameters, after back-pressure saturation, and in effective hydraulic gradients of less than about 10. The borrow area materials were prepared to about 90 percent of the standard Proctor maximum density at moisture contents ranging from 1 percent to 5.5 percent wet of corresponding optimums. Results ranged from nearly 5 x 10^{-5} cm/sec to less than 1 x 10^{-8} cm/sec. It can be concluded that the predominantly fine-grained and plastic soils, when compacted to 90 percent at several percent wet of optimum moisture, generally have a remolded saturated hydraulic conductivity (K_s) of less than 1 x 10^{-7} cm/sec. Soils with low plasticity (PI < 10) and more than about 60 percent sand-sized soils were found to have K_s values greater than 1 x 10^{-6} cm/sec. Furthermore, the results of the testing show the sensitivity of the tested materials to molding moisture contents. The undisturbed sample of silty sand obtained from 15 to 17-foot depth at location MW-2 was measured to have a vertical hydraulic conductivity of 6.1 x 10^{-5} cm/sec. A one-dimensional consolidation test was performed on the undisturbed sample of clay taken at location MW-4 from 10 to 12-foot depth. Results are presented in graphic form in Appendix B.4. Past pre-consolidation pressure (P_p) of the sample is estimated to be on the order of 1.5 kips per square foot (ksf). The recompression index is calculated to be 0.005 for stress levels less than P_p and a virgin compression index ranging from 0.025 to 0.089, depending on stress level. The coefficient of consolidation for virgin compression ranges from 0.49 square feet per day at 1.0 ksf to 0.27 square feet per day at 4.0 ksf. Hydraulic

conductivity calculated from classical consolidation theory is 2 x 10^{-4} ft/day (7 x 10^{-8} cm/sec) which is comparable to laboratory measurements on the remolded samples.

Shear strength of typical landfill and foundation materials were evaluated by laboratory testing and, more qualitatively in the field, by penetration resistance measurements. Direct shear tests were performed on reconstituted samples of the landfill materials. A shear strength envelope for a typical foundation soil was developed by triaxial testing of an undisturbed sample. Individual laboratory test data and plots are presented in Appendix B.4. Field penetration resistance measurements, where performed, are recorded on the logs presented in Appendix A.4.

A total of seven direct shear tests were performed on bulk samples obtained from the surface of the landfill during field investigations. These samples were prepared to dry densities ranging from 30 pcf to 55 pcf, which correspond from the lowest to the highest practicable densities. The test results are consistent in that the cohesion intercept for 5 of the tested samples was zero. The cohesion intercept indicated by the other 2 tests is attributed to interaction effects between the material being tested and the test frame. The effective friction angles range from a low of 33 degrees to nearly 45 degrees, with little apparent relationship to compacted density. For comparison purposes, field dry densities were determined to range from almost 35 pcf to about 50 pcf. A maximum of 67 pcf at 40.5 percent moisture was determined by the compaction test.

A consolidated untrained triaxial test with pore pressure measurements was performed on an undisturbed foundation clay sample obtained at MW-4 (5- to 7-foot depth). Strength envelopes are presented at the end of Appendix B.4. This test shows the effective friction angle to be 33 degrees with a 0 cohesion intercept. The total strength parameters are interpreted to be approximately 42 degrees and 2 psi, respectively.

6. VERTICAL LANDFILL EXPANSION ANALYSES

Expansion of the existing landfill is necessary to meet the immediate solid waste disposal needs of the mill. Permitted grades of the existing landfill will be reached some time in mid-to late-1989. The expansion includes construction of new drainage controls and final closure for the completed landfill. Following a brief description of the vertical expansion and its components are discussions on the analyses performed for expansion related engineering, including slope stability and foundation considerations.

6.1 Proposed Vertical Expansion and Construction

Vertical expansion of the landfill to approximately elevation 90 feet MSL will increase the available air space by about 1.3 million c.y. The expansion will be vertical only and will not extend beyond the existing 38-acre plan limits of the landfill. The expansion will include the following components:

- Existing sideslopes will be dressed to grades not steeper than 3H:1V, compacted, and closed in accordance with regulatory requirements.

- Drainage and runoff control facilities, such as perimeter ditches, and sedimentation ponds, will be constructed or improved as appropriate during the expansion.

- Landfill operations will be continued during the expansion, whether by a specialty contractor or by the owner.

- Final closure will be implemented. Closure will also include landscaping of the landfill when permitted elevations and grades are reached.

6.2 Design

To achieve additional air space, the landfill will generally be extended from its existing plan limits to a maximum elevation of 92 feet MSL. Side slopes will be no steeper than 3H:1V (18½ degrees) and further reduced by 15-foot wide benches at 20-foot vertical intervals. The crest of the completed landfill be constructed to a grade of not less than 5 percent. Both permanent and temporary drainage control facilities will be constructed as is practicable during the expansion and will include drainage ditches and conveyance piping, runoff and runon control structures, erosion control measures, and sedimentation ponds. To access the active landfilling area and crest upon completion, a 20-foot wide access road will be constructed along the exterior face of the landfill and grades will be limited to less than 8 percent. Post-closure maintenance, although not explicit to the expansion, is an implicit consideration for design purposes. RMT understands that Weyerhaeuser plans to continue operating at this site for many years and will be capable of providing or observing the post-closure care and maintenance of the landfill.

6.3 Design Parameters

This section presents the materials properties used for the landfill expansion analyses and representative sections. Materials properties are based on information contained in this report and the understanding of the

site gained by RMT during this investigation. Representative sections were selected by interpretation of existing and planned conditions in combination with past experience for similar engineering requirements.

6.3.1 Natural Materials Properties

All field data developed to date confirm that local site conditions are heterogenous with no distinct delineation of layers between completed investigation locations. However, the existing data base shows that the materials, although not continuous, are relatively consistent within soil groups. Based on the field and laboratory investigations, the engineering properties of the different soils groups known to occur on-site are generalized in the following narrative, starting with the coarser material and continuing through to the clay.

Sands in the near surface generally range in composition from predominantly coarse-grained and relatively well-graded clean sands to fine-grained and poorly-graded sands with percentages of silt and clay. High field penetration resistance measurements indicate that the coarse sands are dense to very dense. The poorly-graded, medium- to fine-grained sands are typically borderline medium dense and generally contain a trace to some fine (i.e., from about 10 percent to 35 percent soils passing the U.S. Standard No. 200 sieve (#200)). USCS classification for these sands range from SP to SP-SM and SP-SC. All other sands are transitional to the above two sands and can be assigned to either group.

Engineering properties for the finer sands are estimated from correlation of field results to like materials based on the index properties. The finer sand to silty sand is assumed to have a saturated

unit weight of 125 pcf; a moist unit weight of 115 pcf; to exhibit a slight amount of cohesion; and to have an internal friction angle of 30 degrees. The coarse and dense sand is assumed to have a saturated unit weight of 140 pcf; to exhibit no cohesion; and to have an internal friction angle of 40 degrees.

The near surface clays range in consistency from firm to very stiff as determined by penetration resistance and vary in texture from predominantly clay with some silt to near equal amounts of clay intermixed with fine sand and silt. These ranges of material classify as CH to borderline CL to SC soils (more than 50 percent passing the #200 sieve). Laboratory testing completed for the moderately plastic, sandy clay sample obtained at MW-4 from between 5 to 7-foot depth, is considered representative for the near surface fine-grained soils observed during field investigations. The saturated unit weight of these materials is calculated from the *in situ* properties of the above sample, to be 130 pcf based on an average dry unit weight of 108 pcf and moisture content of 20 percent. The triaxial shear strength envelope developed from testing MW-4 is considered reasonable for these types of materials. Based on the laboratory results and moderated by field measurements, these materials are ascribed a cohesion of 500 psf with an internal angle of friction of 33 degrees.

6.3.2 Landfill Materials Properties

The engineering properties of both existing and future landfill material were investigated by a combination of *in situ* and laboratory tests. *In situ* tests were performed to determine the range in field densities and natural moisture contents. Index properties were tested to

aid in grouping like materials and for comparison with published data. Based on the direct shear tests and field penetration resistance measurements, the existing solid waste is interpreted to be to at a moist unit weight of 70 pcf, to have zero cohesion, and have an internal friction angle of 33 degrees. Solid wastes which will be placed as part of the vertical expansion, will be positioned in a more controlled manner. Therefore, it is assumed that they will have better engineering properties. For these analyses, RMT has interpreted that the new ash will be placed to a moist unit weight of 80 pcf (due to better compaction); with no cohesion; and have an internal friction angle of 35 degrees. This is still on the low range for the testing completed. These values are consistent with field observations and published literature.

6.3.3 Design Sections

Several vertical sections through the landfill and subgrade were considered in characterizing site conditions for these analyses. The selection process considered existing field conditions and areas where future development could produce the greatest loadings. Based on these evaluations and information from the investigations, two sections were selected for subsequent analyses. Section A-A was selected to represent least favorable conditions on the land-side of the landfill's limits. Section B-B was selected to represent areas where wetlands are located outboard of the landfill toe. These two sections were developed from the data along the alignments indicated on Plate 1 in Appendix A.

6.4 Slope Stability Analyses

Slope stability analyses were performed using classical limit equilibrium and permanent displacement methods. Stability analyses were necessary to evaluate the performance of the expanded landfill under both static and seismic loading conditions.

6.4.1 Analysis Methods

Static slope stability analyses: The analyses were performed on completed landfill using the TSTAB computer program developed by Dr. Robert Pyke (TAGA, 1987). The program's implementation of Spencer's solution method for circular slip surfaces was used to search for circular-shaped surfaces having the lowest Factor of Safety (F.S.). An F.S. of 1.0 indicates a condition of impending failure. That is the driving force, both horizontal and overturning, that are in a state of limiting equilibrium with assigned resisting forces.

Seismic Stability Analyses: The performance of the vertical landfill expansion was analyzed for Maximum Credible Earthquake (MCE) event dynamic loadings using the procedure proposed by Dr. Nathan Newmark (1965 and Pyke, 1982). The procedure compares the pseudo-static horizontal force components necessary to reduce the F.S. to unity (1.0) against anticipated peak ground accelerations (k_{max}). The pseudo-acceleration force reducing F.S. to unity is commonly referenced as the yield acceleration (k_y) (for a given potential slip surface). Peak ground acceleration anticipated at this site is 0.1 g for the design basis MCE. Then, by comparing the ratio of k_y to k_{max}, it is apparent whether the transient motions of the earthquake will, to any extent, permanently displace the potential slip surface mass being analyzed.

Under constant or static loading conditions, an F.S.=1.0 indicates incipient failure. Under the transient loadings occurring during seismic events, the extent to which any displacements occur also depends on the duration of time that k_{max} exceeds k_y, and the rationale for this displacement approach rather than limiting equilibrium.

Liquification Potential Analyses: An evaluation of the potential for liquification of the fine sands and silts underlying the site were performed by inspection (Seed et.al. 1983, and 1984). The reason for this is that although the finer, near surface sands and silts would be suspect in an area of significant historical seismicity, the distance of the Plymouth site from any previously identified epicenters or relatively low magnitude MCE event, and relatively large distance for attenuation of the event precludes more rigorous procedures. Based on this reasoning, it was concluded that the seismic shear forces will not exceed *in situ* resistance.

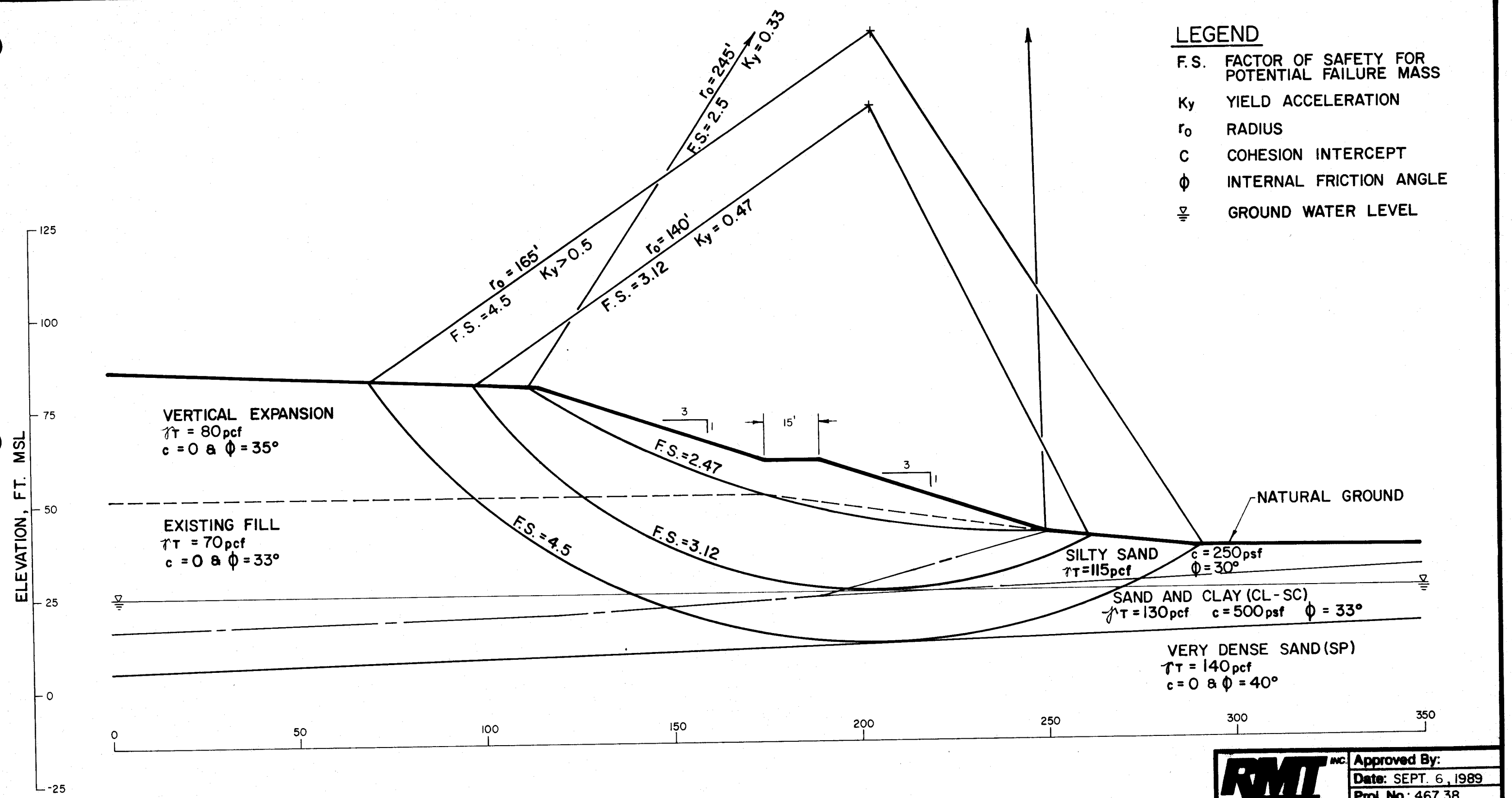
6.4.2 Analyses Results

The results of both static and pseudstatic stability analyses for representative Sections A-A and B-B are presented graphically on Figures 2 and 3. The material's engineering properties were used for the analyses. Ground water levels were assumed to be just at the base of the landfill. This assumption was partially based on the monitoring well ground water elevation measurements presented in Table 3, and the 1980 field observation regarding high ground water levels. However, based on the fact that no ground water was encountered during the landfill

investigations (borings GB-1 through GB-10); and because high ground water (intentionally elevated for the analyses) are known to reduce the computed F.S., this ground water level is considered to be conservative.

The minimum F.S. determined for both sections is greater than two and is for a circular-shaped, potential slip surface contained wholly within the old and new landfill. This F.S. approaches the limiting condition as computed from an infinite slope analyses which is the lower bound for non-cohesive materials. The F.S. increases as the potential failure surface extends deeper within the expanded landfill mass. For deeper surfaces extending down into the underlying foundation, the computed F.S. generally exceeds 2.5 as shown on the figures. These results are consistent with observations and assessments made in the field. Twenty-foot and higher slopes as steep as 2H:1V, were observed. Most slopes, which were at grades of approximately 3H:1V, did not show any indication of past instability nor did the foundation. Moreover, the occasional surficial sloughing observed in the field is compatible with what is expected for a non-cohesive material at such slopes.

The performance of the expanded landfill under seismic loadings, which can reasonably be expected to occur at the site during the design basis MCE event, are determined to be acceptable with the landfill experiencing negligible effect. Negligible as used herein is quantified as meaning that the k_y values computed for the previously noted potential



RMT INC.

Approved By:

Date: SEPT. 6, 1989

Proj. No.: 467.38

FIGURE 2

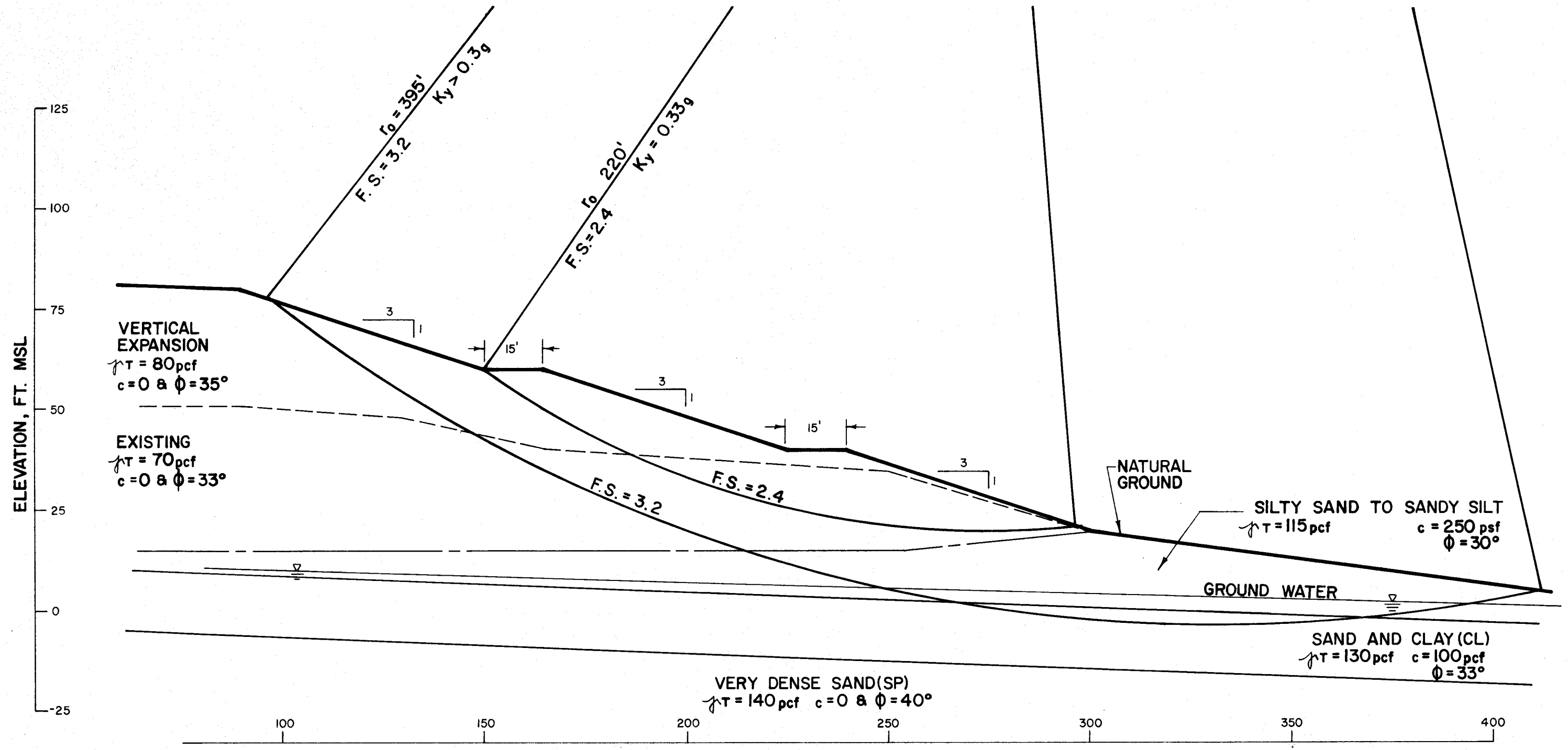
WEYERHAEUSER

PLYMOUTH, NC

SLOPE STABILITY ANALYSIS

EXISTING LANDFILL

SECTION A-A



NOTE:
FOR LEGEND, SEE SECTION A-A

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Date: SEPT. 6, 1989	
Proj. No.: 467.38	

FIGURE 3
WEYERHAEUSER
PLYMOUTH, NC
SLOPE STABILITY ANALYSIS
EXISTING LANDFILL
SECTION B-B

TABLE 3

Summary of (Monitoring Well) Ground Water Elevations

Plymouth Mill - Vertical Landfill Expansion

WELL No.	READING[1] July 7, 1989	READING[1] August 30, 1989
MW-1	33.46	32.91
MW-2	7.04	6.90
MW-3	4.46	4.34
MW-4	4.07	3.97
MW-5	25.97	26.37
MW-6	3.99	3.46
MW-7	27.51	27.58

1. Elevation in feet above mean sea level.

failure surfaces is, as shown on the two figures, at least two times greater than the k_{max} values which are projected for the site. Thus, by definition presented previously the landfill should not undergo seismically induced deformations.

6.5 Settlement Analyses

Settlement analyses were performed to evaluate the ultimate compression that can be expected to occur within the foundation materials due to the additional filling proposed for the vertical expansion. Raising the landfill to elevation 90 feet MSL will increase foundation loads approximately 3,200 pounds per square foot (psf). Based on the clay soils consolidation test data (Appendix B.4) and conservatively assuming a 20-foot thick stratum of like material to underlie the landfill within the zone of influence, ultimate settlements beneath and within the landfill are estimated to be less than 5 feet. This number includes both elastic -type settlements of both the foundation sands and landfill materials along with the consolidation-type for the finer and clayey soils. Because of the preponderance of interbedding observed in the field the drainage paths to realize complete equilibration under the added loadings is relatively short. The time to achieve full consolidation calculations are interpreted to indicate that within 2 years of landfill completion all primary consolidation will have been completed. Total settlements which can conservatively be expected to occur during this period are estimated to be less than 2½ feet. Based on the 5 percent grades and minimum runs of 150 feet, crest grades are not expected to decrease by more than about 1.5 percent. Thus, the final cover grades of 5 percent are judged to be adequate relative to post-closure settlement of the landfill.

7. SOILS BORROW AREA and MATERIALS EVALUATION

7.1 Site Description

The high area east of the existing landfill has been designated as the primary source for landfill expansion borrow soils. As shown on Plate 1, this area is estimated to encompass about 20 acres, is above the indicated wetlands limits, and more than 10 feet above the previously described 100-year flood plain. The plan limits of the borrow area are generally defined as being not less than 5 feet above the wetlands upper limit line but no closer than 50 feet. Furthermore, a 50-foot buffer will be maintained between the borrow area and the eastern property line.

7.1.1 Present Land Use and Topography

This part of the project site is an undeveloped woodland with small to medium-sized trees. It is generally covered with moderate to dense underbrush which increases with proximity to the low-lying wetlands. It contains several unpaved, fair-weather access roads and is bordered on the east by several small intermittent drainages. Topography is dominated by a centrally located north-south ridge, a large swale to the west, and several smaller swales to the east. Borrow area elevations generally range from 34 feet MSL in the southeast to about 15 feet MSL where bounded by the wetlands. Borrowing operations will maintain both a vertical and horizontal buffer relative to wetlands limits.

7.1.2 Subsurface Conditions

Investigations of this area have consisted of backhoe-excavated test pits. From these field excavations and associated laboratory testing subsurface conditions within the borrow generally consist of a thin, surficial topsoil layer which is underlain by interbedded and

gradational layers of sands, silts, and clays to the maximum 16-foot depth explored. The specific stratigraphic conditions observed at each investigation location can be seen in the geologic logs presented in TP-21 through TP-26 (Appendix A.3). The predominantly clay deposits vary in thickness from 2.5 to 7.2 feet and were generally observed within 5 feet of the existing ground surface.

7.1.3 Ground Water

Ground water within the plan limits of the borrow area generally varies with the season and amount of rainfall preceding the time of measurement. In 1987, ground water was measured by Law Engineering at depths ranging from 8 to 12 feet after an extended dry period. Ground water measurements in an abandoned monitoring well located at the approximate northeastern limit of the borrow was also measured at depths greater than 10 feet. However, ground water elevation measurements made in adjoining areas suggest that the above depths may not be representative of high conditions as would likely occur during prolonged or intense rains. For purpose of these analyses, ground water in the borrow area is assumed to limit excavations to within 10 feet of the ground surface.

7.2 Borrow Soil Requirements

Saturated hydraulic conductivity requirements for construction of the infiltration barrier are based on an earlier post-closure cover section performance analysis. Based on the results of infiltration analyses, using the publicly-available HELP Model computer program (USEPA) and assuming several different values of saturated hydraulic conductivity for the barrier layer (k_b), the following annual percolation rates (P in inches) were

predicted and performance efficiencies (E_b) calculated:

- for $k_b = 1 \times 10^{-7}$ cm/sec P= 1 in/yr and E_b = ~98%
- for $k_b = 1 \times 10^{-6}$ cm/sec P= 7 in/yr and E_b = ~85%

Closure of the existing landfill slopes and vertical expansion is planned to be by using the soils available from the on-site borrow area. Borrow material requirements are two-fold; first, the material properties, and second, volume requirements. These requirements are discussed below.

7.2.1 Borrow Material Criteria

The primary purposes of the final cover materials are to minimize infiltration of any impinging rainfall into the landfill and to protect the surface against erosion. The percolation barrier is intended to minimize infiltration and provide the topsoil for rooting of natural grasses to protect the exposed surfaces from erosion. In order to meet these design objectives the materials use must meet certain criteria.

Vegetation Layer: Selection criteria for suitable vegetative cover is that it readily support natural growth. Additionally, the materials used should be readily accessible. The existing topsoil in the borrow area, which has been characterized as being highly organic, meets this need. The volume can be increased without compromising its suitability by mixing with an approximately equal amount of the less organic, fine-grained soils observed to typically underlie it in the borrow area.

Infiltration Barrier: As noted above, an order of magnitude in permeability (k_b) was considered for design of the infiltration barrier.

Based on those studies, it is concluded that a soil having an after-placement or field permeability (k_f) of not more than 1×10^{-6} cm/sec will, according to the HELP Model analyses, be about 85 percent efficient in preventing the infiltration of rainwaters into the completed landfill. Considering that the analysis does not account for the differences in grades between the side slope which comprise approximately half the landfill plan area and the 5 percent-graded crest, the HELP analyses are interpreted to indicate that the infiltration barrier will likely be more than 90 percent effective in deflecting rains away from the covered landfill. Moreover, in light of the fact that less rigorous operations have not had any noticeable adverse effect on even the immediate surroundings, any more stringent requirements for final landfill cover would be academic rather than practical.

There are borrow materials meeting these requirements. As a point of reference, investigators generally agree that soils exhibiting moderate plasticity, with liquid limits ranging between 35 percent to 60 percent, and with not less than 50 percent finer than 0.074 mm in size (passing the No. 200 sieve) are suitable for the construction of earthen liners for hazardous waste containment (from USEPA, 1988, unpublished). Since the landfill does not contain hazardous waste nor are there any indications of its performance having thus far (approximately 10 years of operation) having had adverse effects on the environment, the above are considered good engineering guidelines for construction of the final cover of the landfill.

Table 2 summarizes the laboratory test results and physical properties for representative samples obtained from the proposed final

cover material borrow area. Index properties testing for site clays (Appendix B.1) shows that the available soils are predominantly fine-grained (passing the No. 200 sieve), generally comprised of more than 20 percent clay-sizes, are typically moderate to high plasticity. The "suitable" soils generally classify as CL to CH soils according to the USCS. Given the above guideline, it is not surprising that the laboratory tests performed for this study substantiate the empirical guidelines and lead to the conclusion that the available borrow materials are suitable for final cover construction.

From the previously described laboratory results, it is evident that on site materials conforming to the previously defined materials recommendation were determined to have saturated hydraulic conductivities of better than 1×10^{-6} cm/sec when compacted at moisture contents several degrees wet of the standard Proctor optimum. Final cover material will be based on a performance criteria such that the materials placed have a k_f not greater than 1×10^{-6} cm/sec. Conformance with this performance criteria will be verified by a combination of field and laboratory tests and monitored with construction observation.

7.2.2 Volumes Needed

According to the preliminary design by RMT, the following cover materials will be necessary for the final construction of the proposed vertical expansion.

Type	Required In-Place Vol.	Needed Vol. w/15% Increase
Infiltration Barrier	90,700 cy	104,300 cy
Vegetative Cover	30,300 cy	34,845 cy
Total		139,145 cy

7.3 Available Borrow

The quantity of materials meeting the above stated requirement are estimated to be (1) 50,000 bank-yards of material suitable for vegetative cover and (2) 145,000 bank-yards of material with a $k_f \leq 1 \times 10^{-6}$ cm/sec. A waste factor of 15 percent has been included with the required volumes noted above. These available volume estimates are based on the interpretation that (1) of the surficial 2 feet of soil observed within most of the field investigations, about 1½ feet can be combined for use as vegetative cover, and; (2) that an average of 4½ feet of the underlying soil are clays meeting the above described index properties and which can reasonably be obtained directly or blended with more plastic clayey materials to achieve recommended properties. Actual depths are expected to vary from 2½ feet at location TP-22 to 7 feet at HA-16. Descriptions of the soils encountered during test pit excavations are provided in Appendix A.4 and Appendix A.5.

7.4 Borrow Area Development

Although beyond the scope of this study, suffice it to say that borrow area development will be planned to meet the above noted material criteria and volume needs; to minimize the duration that excavations are exposed; and to conform with boundary constraints. Borrow operations and material quantities are summarized below.

7.4.1 Surface Preparation

As part of borrow preparation for development, an approximately 5-acre tract will cleared of trees and large shrubs by the most efficient and economical means practicable; any clearings suitable for use by the plant as hog fuel can be set aside if so requested. After unobstructed access has been provided to large earthmoving equipment, the grasses and remaining small bushes should be cleared and disposed of away from the area which will be excavated. Once some surface drainage diversion berms are constructed to protect the area to be developed from potential runon, actual borrowing may begin.

7.4.2 Topsoil

Topsoil and materials suitable for blending, estimated to extend down to 2-foot depth, will be stripped and stockpiled in the designated area for subsequent use as vegetative cover on the expanded landfill and borrow area restoration. The materials should be spread out in windrows, sprayed lightly with water, and turned over with a blade or other suitable equipment. The topsoil should not be stockpiled in segregated piles as would occur by end dumping. Spreading and nominal blending will enable the use of marginal materials by mixing with the more organic and thereby extending topsoil to the above estimated quantities without compromising its ability to support growth.

7.4.3 Infiltration Barrier

Once the surficial 1½ to 2 feet have been removed, excavation of the underlying soils should proceed in an orderly fashion and with the assistance of an engineer capable of distinguishing "suitable" materials from unsuitable final cover construction materials. Suitable and

unsuitable materials should be stockpiled separately. Where suitable clays directly underlie topsoil they would preferably be moved to the stockpile for processing prior to transport to the landfill area. Processing is recommended for several reasons. Processing of the material in either the stockpile or off to the side of the fill will be required to break down any remanent structure, eliminate most rootlets (observed to exist down to depths of 5 or more feet) and most importantly homogenize the clays. It is assumed that the stockpile area will be more manageable for the large construction perceived to be required for a project of this magnitude. Additionally, stockpiling of the excavated materials has the advantage that it will be easier to either include or exclude marginal materials depending on the composition of the stockpile; only materials which are "suitable" to achieving the specified performance should be allowed on the fill.

7.4.4 Borrow Area Restoration

The depleted borrow area will be graded to maintain gravity drainage and revegetated with the set aside topsoil after removal of the above described desired materials. Completed subgrade cross-slopes will limited to not less than 2 percent and to maximum side slopes not greater than 4H:1V. In general, existing drainage patterns will be maintained. After contiguous portions of subgrade grading have been completed to operations, the subgrade will be prepared and topsoil spread to a minimum thickness of 4 to 6 inches. The completed area will be restored in accordance with NC DOT specifications by fertilizing, seeding and mulching.

APPENDIX A

FIELD INVESTIGATIONS

APPENDIX A.1

PLATE 1

VERTICAL EXPANSION
FIELD INVESTIGATION LOCATION PLAN

Under Seperate Cover

APPENDIX A.2

TEST BORING RECORDS, GB-1 THRU GB-10

REFERENCE SHEET FOR BORING LOGS

I. SYMBOLS AND EXPLANATIONS

■	UNDISTURBED SAMPLE
▽	24-HOUR WATER LEVEL
▽	WATER LEVEL AT BORING TERMINATION
C	BOREHOLE CAVED
◀	LOSS OF DRILLING WATER
NX	CORE BARREL SIZE
90 / 65	% ROCK CORE RECOVERY / ROCK QUALITY DESIGNATION, RQD, %
	KNOWN STRATA CHANGE LOCATION
SP	UNIFIED SOIL CLASSIFICATION
	ESTIMATED STRATA CHANGE LOCATION

STRATA CHANGE LOCATIONS

INDICATES MATERIALS WITH ONLY SUBTLE DIFFERENCES

INDICATES MATERIALS WITH SIGNIFICANT DIFFERENCES

BORING AND SAMPLING MEETS ASTM D—1586
CORE DRILLING MEETS ASTM D—2113

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 IN REQUIRED TO DRIVE 1 4 IN I D SAMPLER 1 FT

THE SAMPLER IS DRIVEN 18". AND THE NUMBER OF BLOWS PER 6—INCH INCREMENT IS GIVEN UNDER "BLOWS PER 6 INCHES"

REC IS THE LENGTH OF SAMPLE RECOVERY IN INCHES

II. CORRELATION OF PENETRATION RESISTANCE WITH RELATIVE DENSITY AND CONSISTENCY

SANDS

NUMBER OF BLOWS, N	RELATIVE DENSITY
0 — 3	VERY LOOSE
4 — 10	LOOSE
11 — 30	FIRM
31 — 50	DENSE
OVER 50	VERY DENSE

SILTS AND CLAYS

NUMBER OF BLOWS, N	CONSISTENCY
0 — 2	VERY SOFT
3 — 4	SOFT
5 — 8	FIRM
9 — 15	STIFF
16 — 30	VERY STIFF
31 — 50	HARD
OVER 50	VERY HARD

III. UNIFIED SOIL CLASSIFICATION SYMBOLS

GP — POORLY GRADED GRAVEL
GW — WELL GRADED GRAVEL
GM — SILTY GRAVEL
GC — CLAYEY GRAVEL
SP — POORLY GRADED SAND
SW — WELL GRADED SAND
SM — SILTY SAND
SC — CLAYEY SAND

ML — LOW LIQUID LIMIT SILT
MH — HIGH LIQUID LIMIT SILT
CL — LOW PLASTICITY INORGANIC CLAYS
CH — HIGH PLASTICITY INORGANIC CLAYS
OL — LOW PLASTICITY ORGANIC CLAYS AND SILTS
OH — HIGH PLASTICITY ORGANIC CLAYS AND SILTS
SP/SM — TYPICAL DUAL CLASSIFICATION

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UNIFIED SOIL CLASSIFICATION

(Including Identification and Description)

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES	FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3 in. and basing fractions on estimated weights)		
COARSE-GRAINED SOILS More than half of material is larger than No. 200 sieve size. The No. 200 sieve is about the smallest particle visible to the naked eye	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size (For visual classification, the ¼-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	Wide range in grain sizes and substantial amounts of all intermediate particle sizes		
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines	Predominantly one size or a range of sizes with some intermediate sizes missing		
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravel, gravel-sand-silts mixture	Nonplastic fines or fines with low plasticity (for identification procedures see ML below)		
			GC	Clayey gravels, gravel-sand-clay mixtures	Plastic fines (for identification procedures see CL below)		
	SANDS More than half of coarse fraction is smaller than No. 4 sieve size	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	Wide range in grain size and substantial amounts of all intermediate particle sizes.		
			SP	Poorly graded sands or gravelly sands, little or no fines	Predominantly one size or a range of sizes with some intermediate sizes missing		
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures	Nonplastic fines or fines with low plasticity (for identification procedures see ML below)		
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below)		
					IDENTIFICATION PROCEDURES On Fraction Smaller than No. 40 Sieve Size		
					Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)
FINE-GRAINED SOILS More than half of material is smaller than No. 200 sieve size. The No. 200 sieve is about the smallest particle visible to the naked eye	SILTS AND CLAYS Liquid limit is less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	None to slight	Quick to slow	None
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	Medium to high	None to very slow	Medium
			OL	Organic silts and organic silty clays of low plasticity	Slight to medium	Slow	Slight
	SILTS AND CLAYS Liquid limit is greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	Slight to medium	Slow to none	Slight to medium
			CH	Inorganic clays of high plasticity, fat clays	High to very High	None	High
			OH	Organic clays of medium to high plasticity, organic silts	Medium to high	None to very slow	Slight to medium
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils	Readily identified by color, odor, spongy feel and frequently by fibrous texture		

CORRELATION OF PENETRATION RESISTANCE (ASTM D 1586) WITH RELATIVE DENSITY AND CONSISTENCY

	PENETRATION RESISTANCE, N Blows per foot	RELATIVE DENSITY
SANDS AND GRAVELS	0 — 4	Very Loose
	5 — 10	Loose
	11 — 20	Firm
	21 — 30	Very Firm
	31 — 50	Dense
	Over 50	Very Dense

	PENETRATION RESISTANCE, N Blows per foot	CONSISTENCY
SILTS AND CLAYS	0 — 2	Very Soft
	3 — 4	Soft
	5 — 8	Firm
	9 — 15	Stiff
	16 — 30	Very Stiff
	31 -	Hard

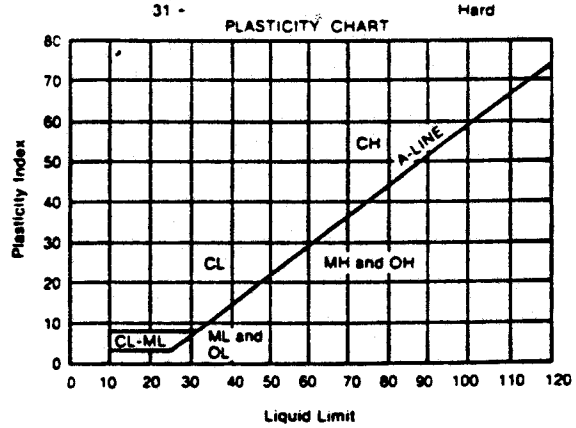
PARTICLE SIZE IDENTIFICATION

BOULDER	- Greater than 12 inches	SAND	- Coarse - 2 mm to 4.76 mm Medium - 0.42 mm to 2 mm Fine - 0.074 mm to 0.42 mm
COBBLES	- 3 inches to 12 inches		
GRAVEL	- Coarse - ¾ inch to 3 inches - Fine - 4.76 mm to ¾ inch	SILT & CLAY	- Less than 0.074 mm

SOIL LABORATORY TEST DATA SYMBOLS FOR BORING LOGS

γ_w	= Wet Unit Weight	W	= Moisture Content (%)
γ_d	= Dry Unit Weight	LL	= Liquid Limit (%)
e	= Void Ratio	PL	= Plastic Limit (%)
q	= Unconfined Compressive Strength	PI	= Plasticity Index (%) (LL-PL)
C_c	= Compression Index		
c	= Cohesion, Total Stress		
c'	= Cohesion, Effective Stress		
Φ	= Friction Angle, Degrees, Total Stress	TRIAXIAL	= Triaxial Shear Test
Φ'	= Friction Angle, Degrees, Effective Stress	CONSOL.	= Consolidation Test
		G.S.	= Grain Size Distribution Test

PLASTICITY CHART



TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Stiff to firm black SILT with wood chips. [FLY ASH]	ML		4-7-7	14
				5-2-1	10
				15-3-3	8
				6-4-3	5
				5-3-3	2
22.0	Very dense wood chips with small amounts of black SILT. [FLY ASH]			0-0-50/1.0"	1
27.0	Very stiff black SILT with wood chips [FLY ASH]	ML		5-6-13	6
32.0	Very stiff olive and gray silty CLAY. [NATURAL SOIL]	CL		8-7-9	14
37.0	Firm tan silty fine SAND with some wood chips. [NATURAL SOIL]	SM		14-11-11	14
40.0					

Boring terminated at 40 feet.
Cave in at 30 feet.

REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-1
DATE 7/31/89

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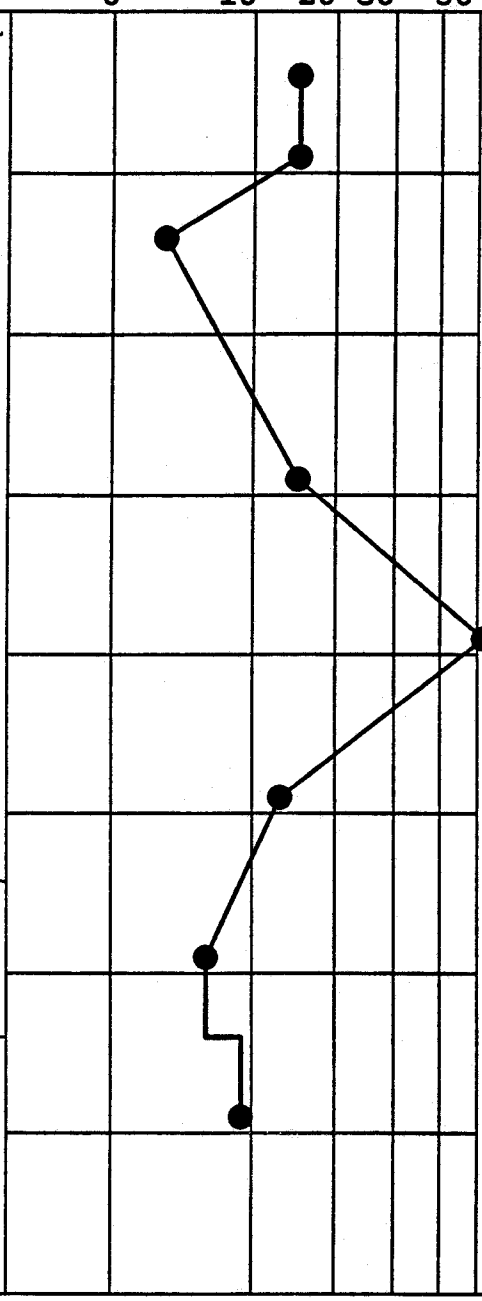
TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Stiff to very hard to stiff black silt with wood chips. Wood chips predominant below 15 feet. [FLY ASH]	ML		6-7-8	0
				10-3-12	0
				3-1-2	0
				17-10-5	0
				50/1.0"	1
				4-7-6	0
27.0	Firm black SILT with wood chips and gray silty SAND. [FLY ASH]	SM/ML		0-3-3	0
32.0	Stiff olive and blue silty CLAY. [NATURAL SOIL]	CL		8-4-5	0
40.0	Boring terminated at 40 feet.				



REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-2
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Soft to very stiff to firm black SILT with wood chips. [FLY ASH]	ML		3-2-2	8
				1-1-1	8
				18-7-10	8
				9-3-5	4
				12-8-11	14
				15-4-4	6
				3-3-3	0
32.0	Dense light brown to gray silty medium SAND. [NATURAL SOIL]	SM		31-20-30	18
40.0				14-18-25	18

Boring terminated at 40 feet.
Cave in at 25 feet.

REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-3
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Very loose to dense black to white silty very fine SAND with wood chips. [FLY ASH]	SM		1-2-1	12
				5-31-10	6
7.0	Stiff to firm white and black sandy SILT with wood chips. [FLY ASH]	ML		5-7-2	8
				6-4-3	8
				2-2-3	8
22.0	Firm tan clayey silty fine SAND. [NATURAL SOIL]	SM		9-11-11	14
				7-8-9	14
32.0	Stiff gray sandy silty CLAY. [NATURAL SOIL]	CH		4-5-6	14
37.0	Firm red brown silty very fine SAND. [NATURAL SOIL]	SM		6-7-8	14

REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-4
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN. (IN.)	
				5-8-12	0
45.0	Boring terminated at 45 feet.				

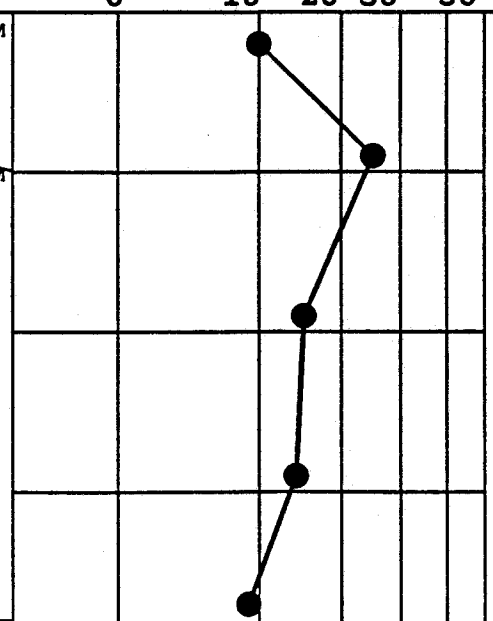
REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-4
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Loose brown silty very fine SAND with gravel to firm gray silty medium SAND with gravel. [GRITS/DREGS]	SM		5-5-5	14
4.8	Firm to loose light brown to tan silty fine SAND. [GRITS/DREGS]	SM		17-16-9	14
				5-7-8	12
				5-7-7	16
				4-5-4	16
19.0	Boring terminated at 19 feet. Cave in at 13.5 feet.				



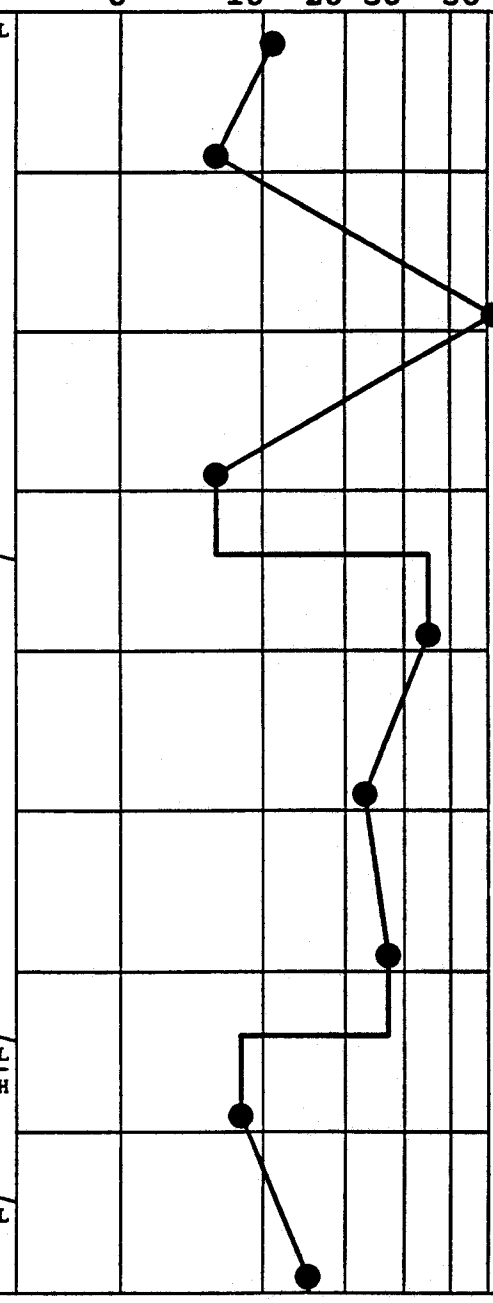
REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-5
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Firm to very hard to firm black SILT with wood chips. [FLY ASH]	ML		4-6-5	14
				4-3-3	10
				0-0-50/1.0"	1
				6-3-3	8
17.0	Hard to very stiff wood chips with some black SILT. [FLY ASH]			27-25-10	3
				14-13-10	4
				5-7-20	4
32.0	Stiff black SILT and wood chips with blue and olive CLAY. [FLY ASH]	ML/CH		6-4-4	14
37.0	Stiff olive and blue sandy silty CLAY [NATURAL SOIL]	CL		6-7-8	18



REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-6
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER SIX IN.	REC. (IN.)
42.0	Stiff to hard red brown and gray silty CLAY. [NATIVE SOIL]	CL		7-8-8	18
				11-23-25	18
50.0	Boring terminated at 50 feet.				

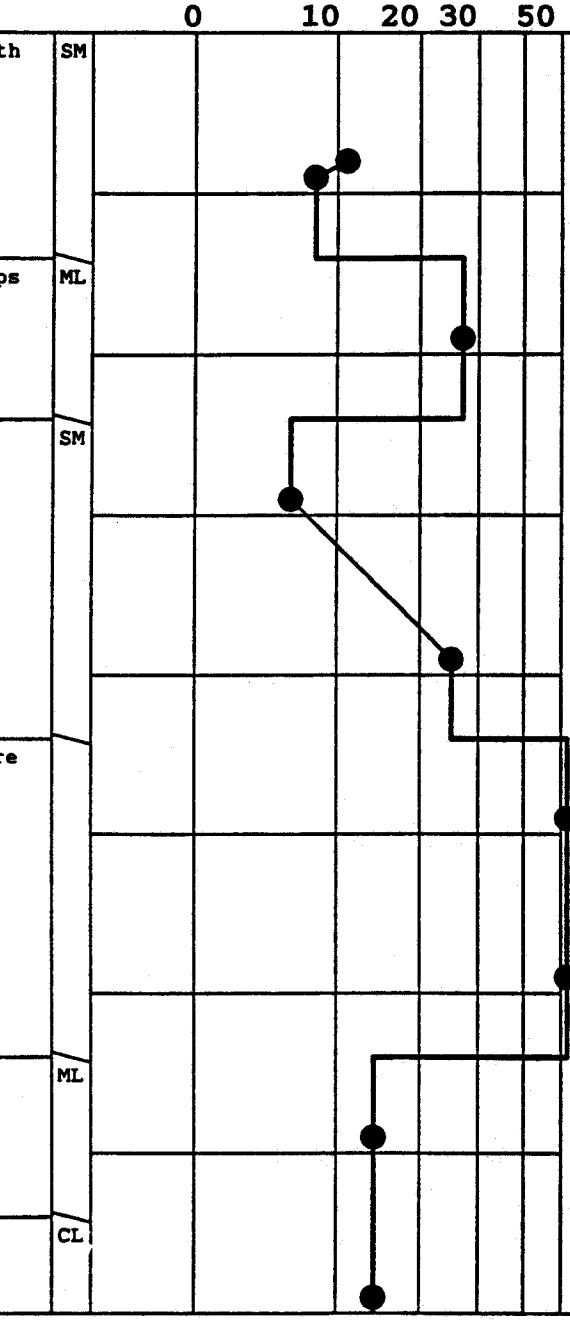
REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-6
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER SIX IN.	REC. (IN.)
0.0	Loose black and white silty SAND with some gravel at 4 to 5 foot. [GRITS/DREGS]	SM		4-5-6	14
				10-4-4	10
7.0	Very stiff black silt with wood chips and wire fragments. [FLY ASH]	ML		18-15-12	8
12.0	Loose to firm black silty SAND with wood chips and wire fragments. [GRITS/DREGS]	SM		7-4-2	8
				17-14-11	6
22.0	Very dense mostly wood chips and wire fragments with some black SILT. [FLY ASH]			0-0-50/5.0"	5
				0-0-50/1.0"	5
32.0	Stiff black SILT with wood chips. [FLY ASH]	ML		31-9-5	4
37.0	Stiff olive and blue CLAY with wood chips. [NATURAL SOIL]	CL		4-7-7	18



REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-7
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN. (IN.)	
				9-7-7	8
45.0	Boring terminated at 45 feet.				

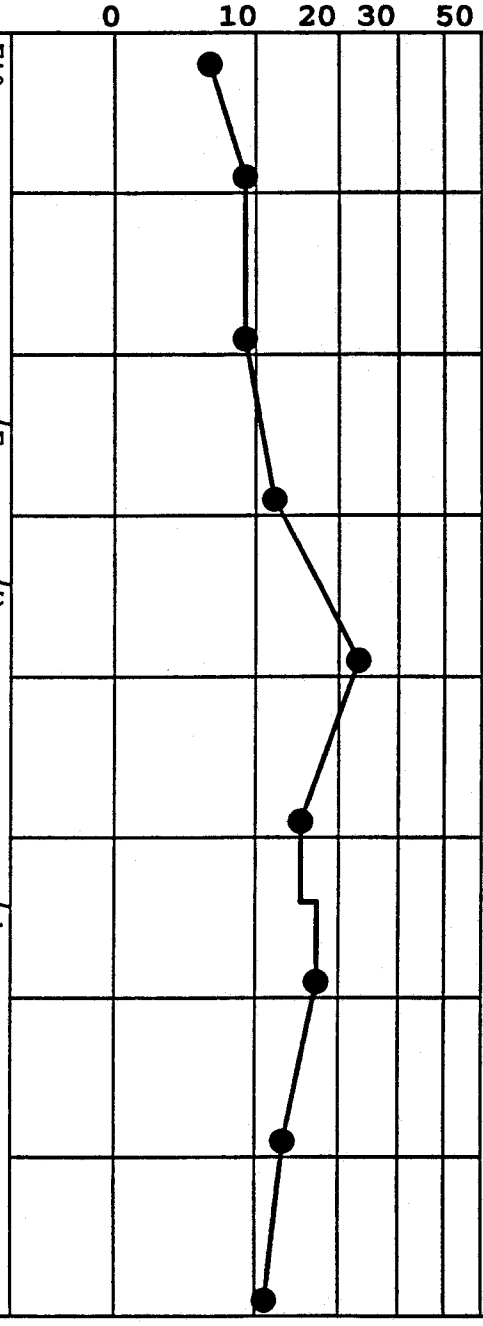
REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-7
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	BLOWS PER SIX IN.	REC. (IN.)
0.0	Loose tan silty fine SAND. [GRITS/DREGS]	SM/SP	2-3-3	14
			3-4-5	18
			4-4-5	18
12.0	Loose black silty fine SAND with gravel and small wood chips. [GRITS/DREGS]	SM	6-6-6	8
17.0	Firm tan clayey SAND interbedded with black SILT and wood chips. [GRITS/DREGS]	SC	8-12-11	18
			5-7-8	6
27.0	Very stiff to stiff tan sandy CLAY. [NATURAL SOIL]	CL	5-8-9	18
			5-5-8	18
40.0			4-6-5	18



Boring terminated at 40 feet.
Cave in at 30 feet.

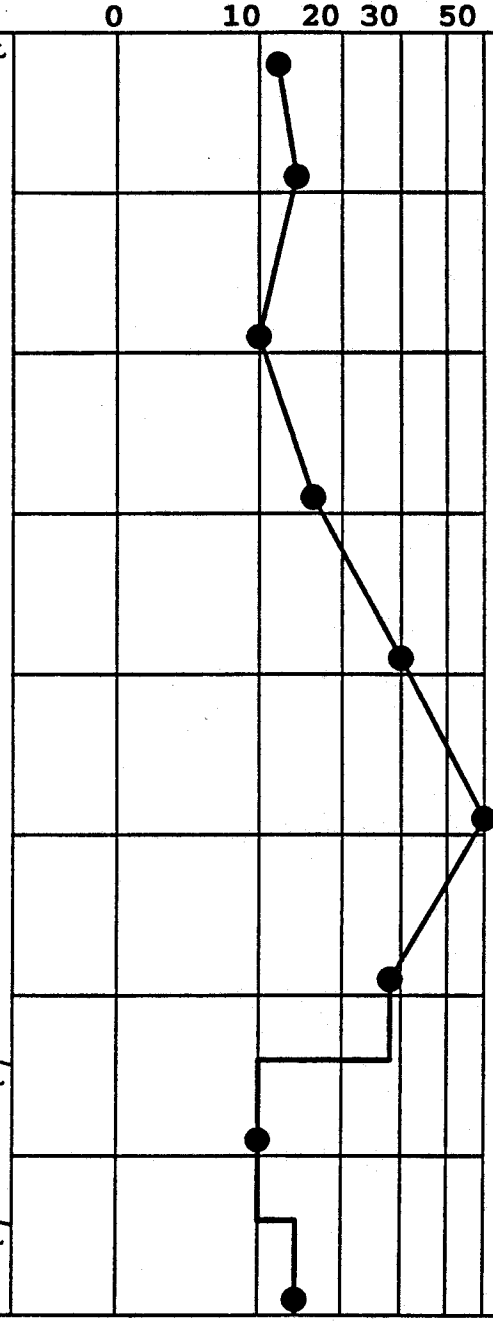
REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-8
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	BLOWS PER SIX IN.	REC. (IN.)
0.0	Stiff to very stiff black SILT with wood chips. Mostly wood chips from 8.5 to 10.0 feet. [FLY ASH]	ML	4-4-8	12
			5-8-6	8
			8-5-5	2
			8-7-9	14
			5-5-25	14
			0-0-50/0.0"	0
			28-13-15	8
32.0	Wood and cardboard.	ML		
32.0	Stiff black SILT and cardboard. [FLY ASH]		7-5-5	2
37.0	Stiff olive and blue silty CLAY. [NATURAL SOIL]	CL	6-7-7	14



REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-9
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
				5-8-6	18
45.0	Boring terminated at 45 feet. Cave in at 6.5 feet.				

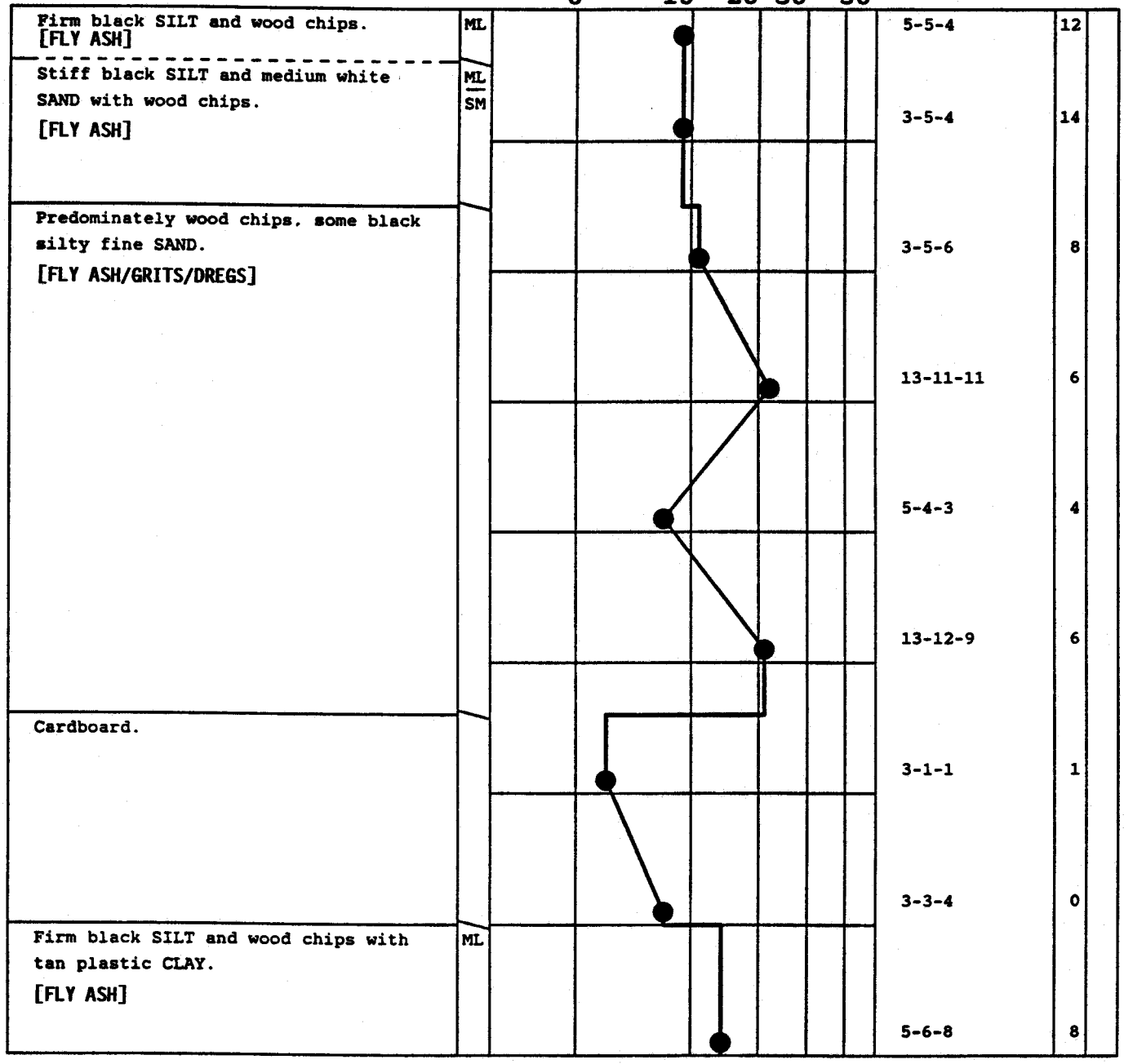
REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-9
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
0.0	Firm black SILT and wood chips. [FLY ASH]	ML		5-5-4	12
2.0	Stiff black SILT and medium white SAND with wood chips. [FLY ASH]	ML SM		3-5-4	14
7.5	Predominately wood chips, some black silty fine SAND. [FLY ASH/GRITS/DREGS]			3-5-6	8
				13-11-11	6
				5-4-3	4
				13-12-9	6
27.0	Cardboard.			3-1-1	1
				3-3-4	0
35.0	Firm black SILT and wood chips with tan plastic CLAY. [FLY ASH]	ML		5-6-8	8



REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-10
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

TEST BORING RECORD

DEPTH (FT.)	DESCRIPTION	ELEVATION (FT.)	PENETRATION (BLOWS/FT.) 0 10 20 30 50	BLOWS PER REC. SIX IN.	(IN.)
42.0	Firm tan silty fine SAND. [NATURAL SOIL]	SM		9-10-14	18
45.0	Boring terminated at 45 feet.				

REFER TO ATTACHED SHEET FOR EXPLANATIONS AND SYMBOLS

JOB NUMBER J4596
BORING NUMBER GB-10
DATE 7/31/89

LAW ENGINEERING
TESTING COMPANY

APPENDIX A.3

LOG OF TEST PIT @ GB-6 AND TP-21 THRU 26

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP @ GB-6

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.37

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

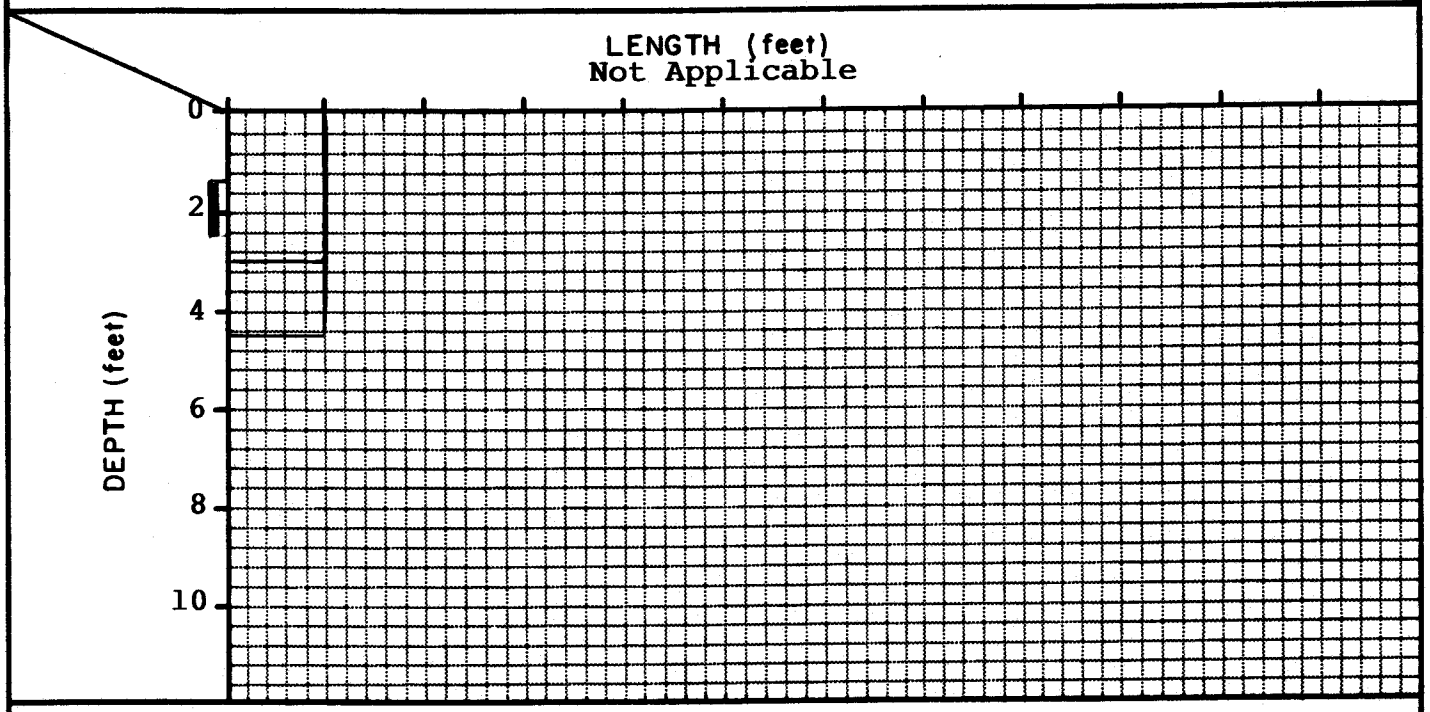
WIDTH

LOGGED BY DEMc

CHECKED BY

PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) Dark gray ash with layers of sawdust; very compact to slightly cemented; moist.

2) Wood waste.

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP-21

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.38

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

WIDTH

LOGGED BY DEMc

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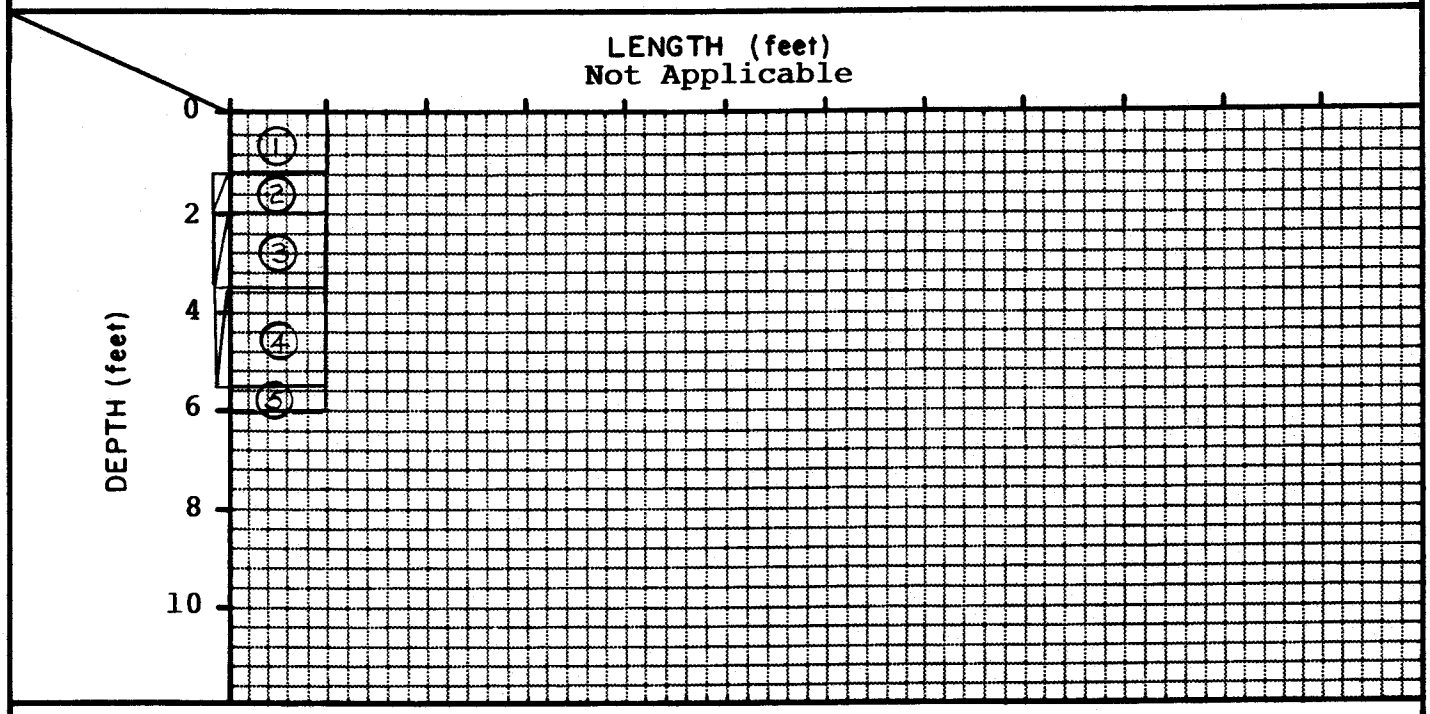
PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) SILT (ML) - gray-brown; sandy; topsoil; organics; piece of glass at 12 inches.

2) SILTY CLAY (CL) - tan; stiff; some fine grained sand; moist.

3) SILTY CLAY (CL) - gray to tan; firm; trace of sand; grading less silty with depth.

4) CLAY (CH) - gray with brown mottling; firm; some silt; some fine grained sand; moist.

5) SILTY SAND (SM) - tan; fine grained; trace of clay.

LEGEND:

Bulk Sample Jar Sample Drive Tube Sample

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP-22

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.38

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

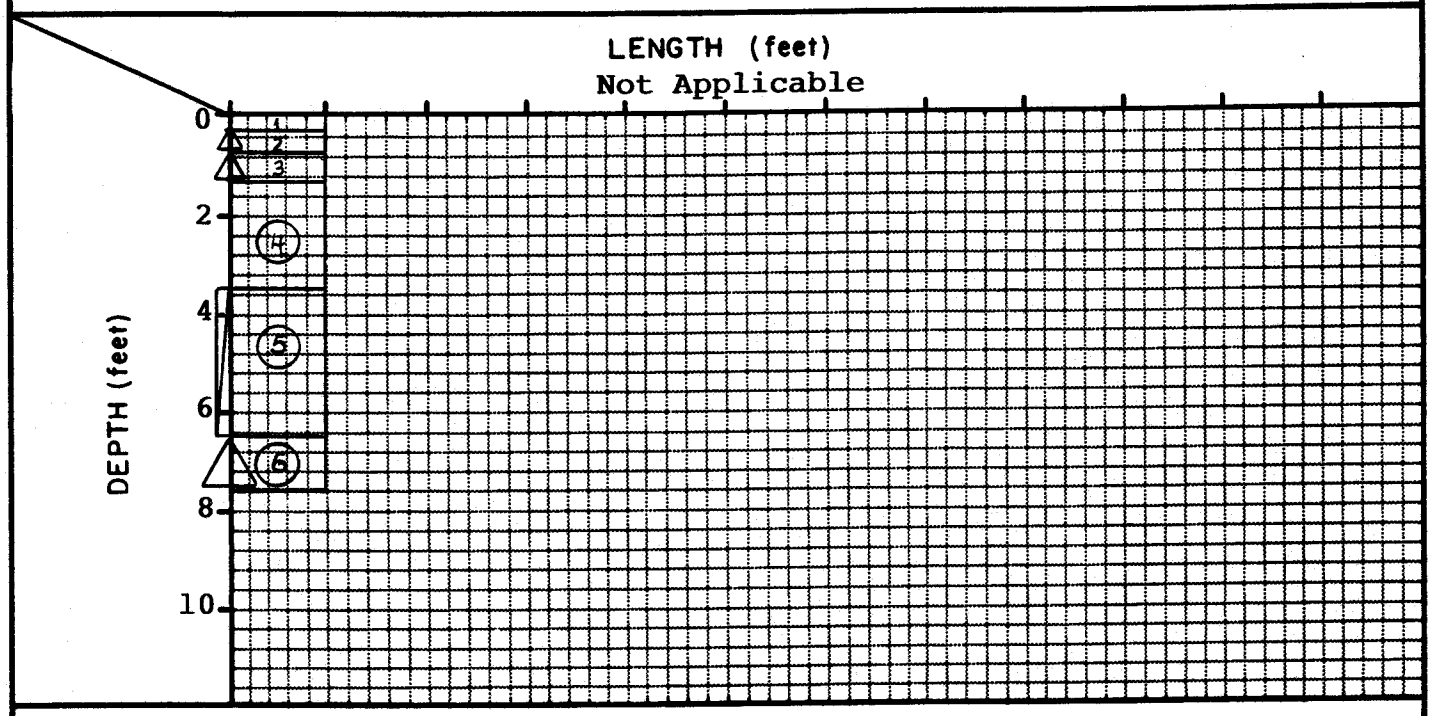
WIDTH

LOGGED BY DEMc

CHECKED BY ZB

PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) SILT (ML) - dark brown; sandy; topsoil; with organics.

2) SILT (ML) - gray-tan; trace of clay; firm; some organics.

3) SILTY SAND (SM) - orange-brown; firm to hard; trace of clay.

4) SILTY CLAY (CL) - orange-brown; firm; trace of sand; micaceous.

5) SILTY SAND (SM) - orange-brown; fine grained; some clay; thin silty clay layers, gray.

6) SILTY SAND (SM) - light gray; some orange-brown; fine grained; micaceous.

LEGEND:

Bulk Sample

Jar Sample

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP-23

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.38

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

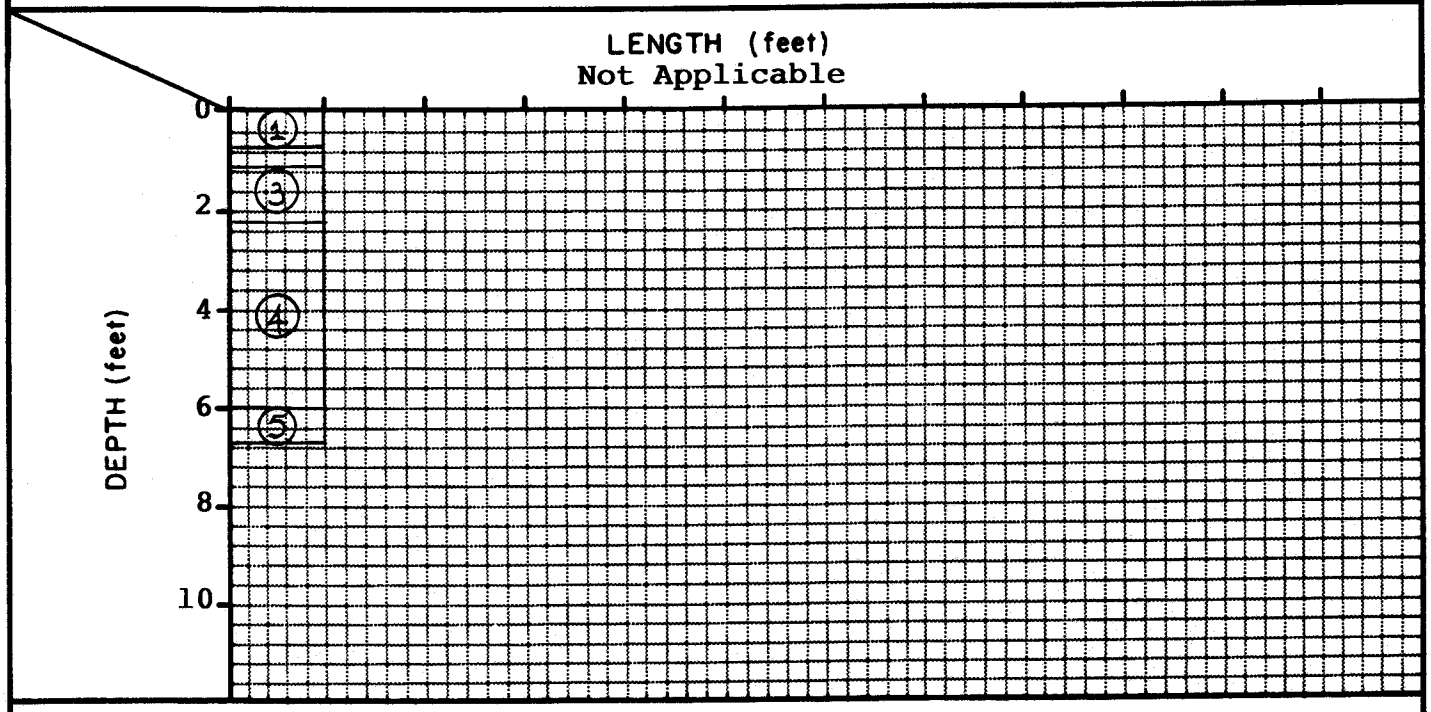
WIDTH

LOGGED BY DEMc

CHECKED BY SB

PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) SILT (ML) - gray-brown; topsoil; with organics.

2) SILT (ML) - tan to gray-brown; soft to firm; some organics.

3) SILTY SAND (SM) - light orange-brown; firm; fine grianed; trace of clay.

4) SILTY CLAY (CL) - orange-brown; color change at 4 ft. to gray with brown mottling; stiff.

5) SILTY SAND (SM) - light orange-brown to light gray; fine grained; with thin gray clay galls.

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP-24

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.38

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

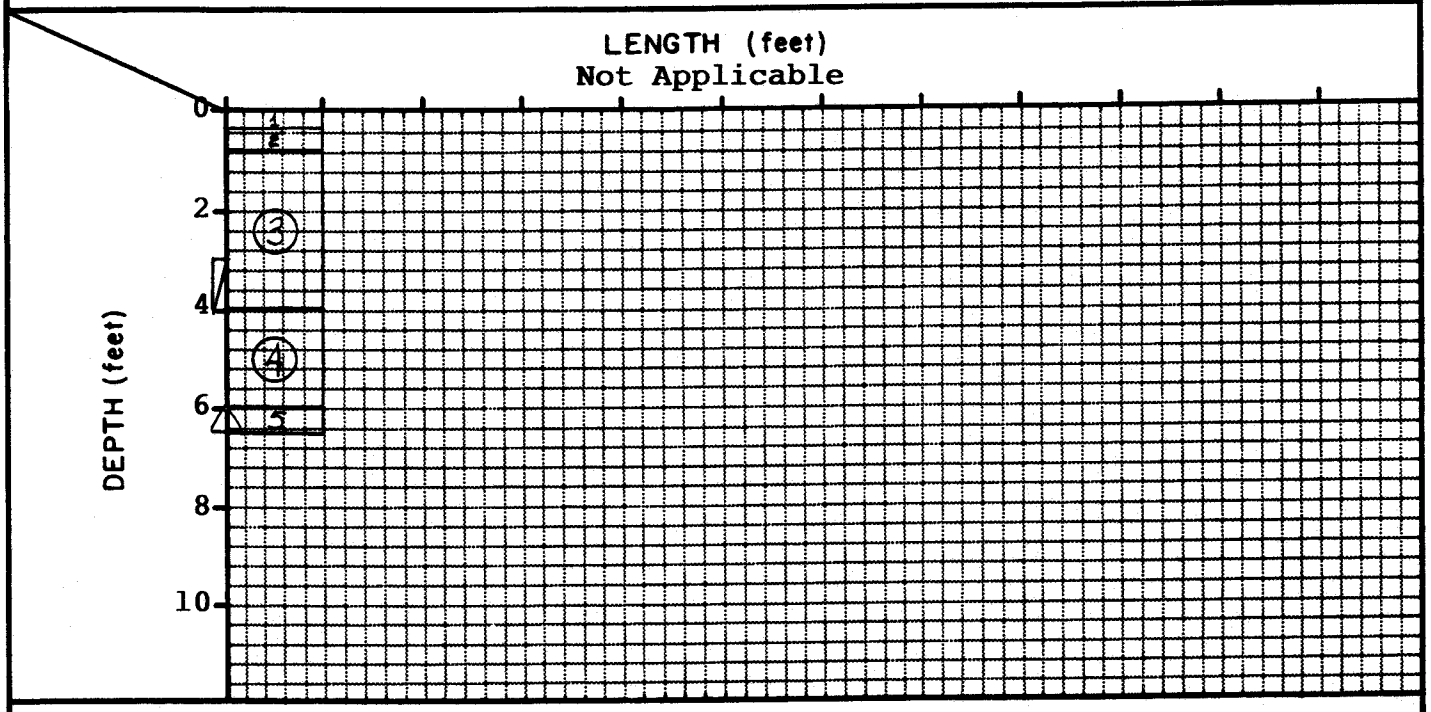
WIDTH

LOGGED BY DEMc

CHECKED BY ZB

PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) SILT (ML) - gray-brown; topsoil; with organics.

2) SILT (ML) - brown to light orange-brown; firm; trace of clay.

3) CLAY (CH) - light orange-brown; soft to firm; thin stringers (< 0.1 ft.) of SANDY CLAY (CL).

4) CLAYEY SAND (SC) - light orange-brown to brown-gray; fine grained; soft.

5) SILTY SAND (SM) - orange-brown; fine grained; with thin clay galls scattered throughout.

LEGEND:

Bulk Sample

Jar Sample

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP-25

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.38

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

WIDTH

LOGGED BY DEMc

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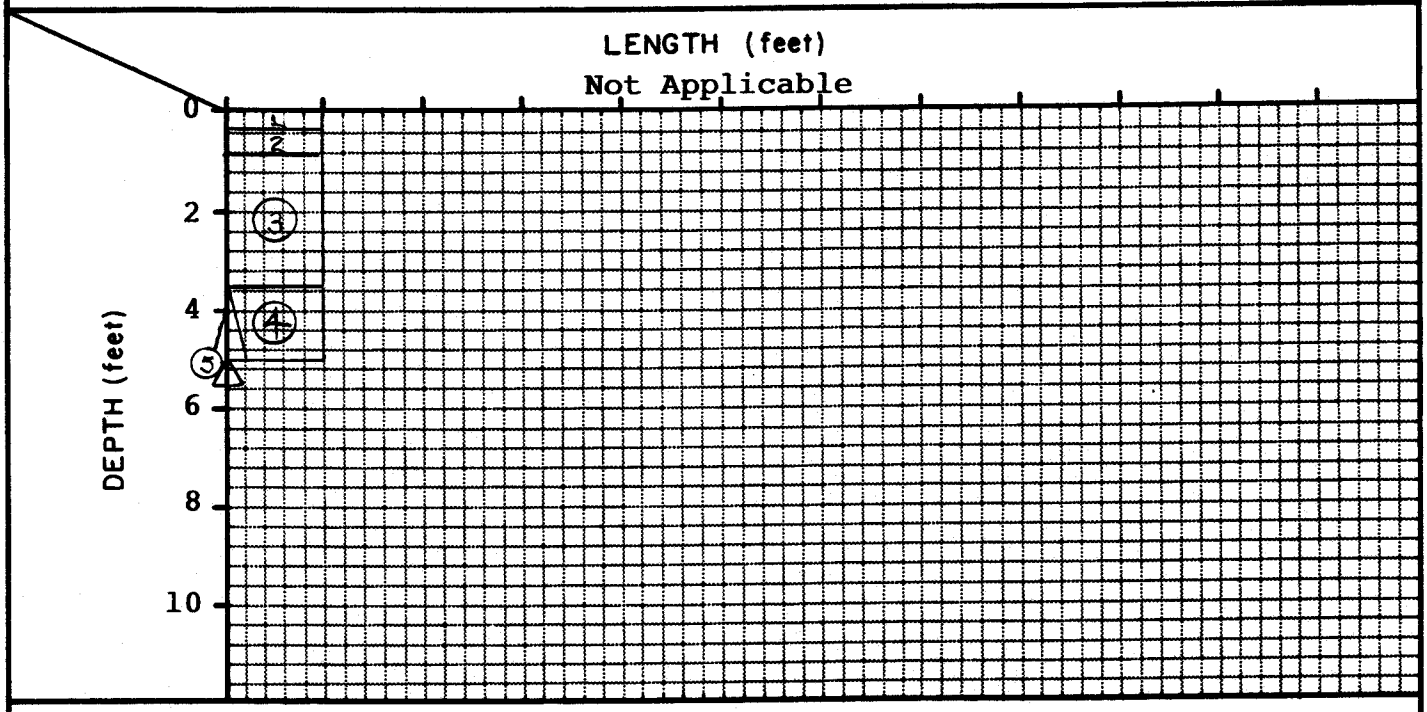
PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) SILT (ML) - gray-brown; soft; topsoil; with organics.

2) SILTY SAND to SILT (SM-ML) - gray-brown; firm; trace of clay.

3) SILTY CLAY (CL) - orange-brown; firm to soft.

4) CLAYEY SAND (SC) - orange-brown to light gray; soft to firm.

5) SILTY SAND (SM) - orange-brown to gray; soft; fine grained; scattered clay galls.

LEGEND:

Bulk Sample

Jar Sample

LOG OF TEST PIT OR EXCAVATION

RMT INC.

PIT NUMBER TP-26

PROJECT NAME Weyerhaeuser

PROJECT NUMBER 467.38

LOCATION Plymouth, NC

DATE June 28, 1989

CONTRACTOR Hopkins

METHOD Backhoe

WIDTH

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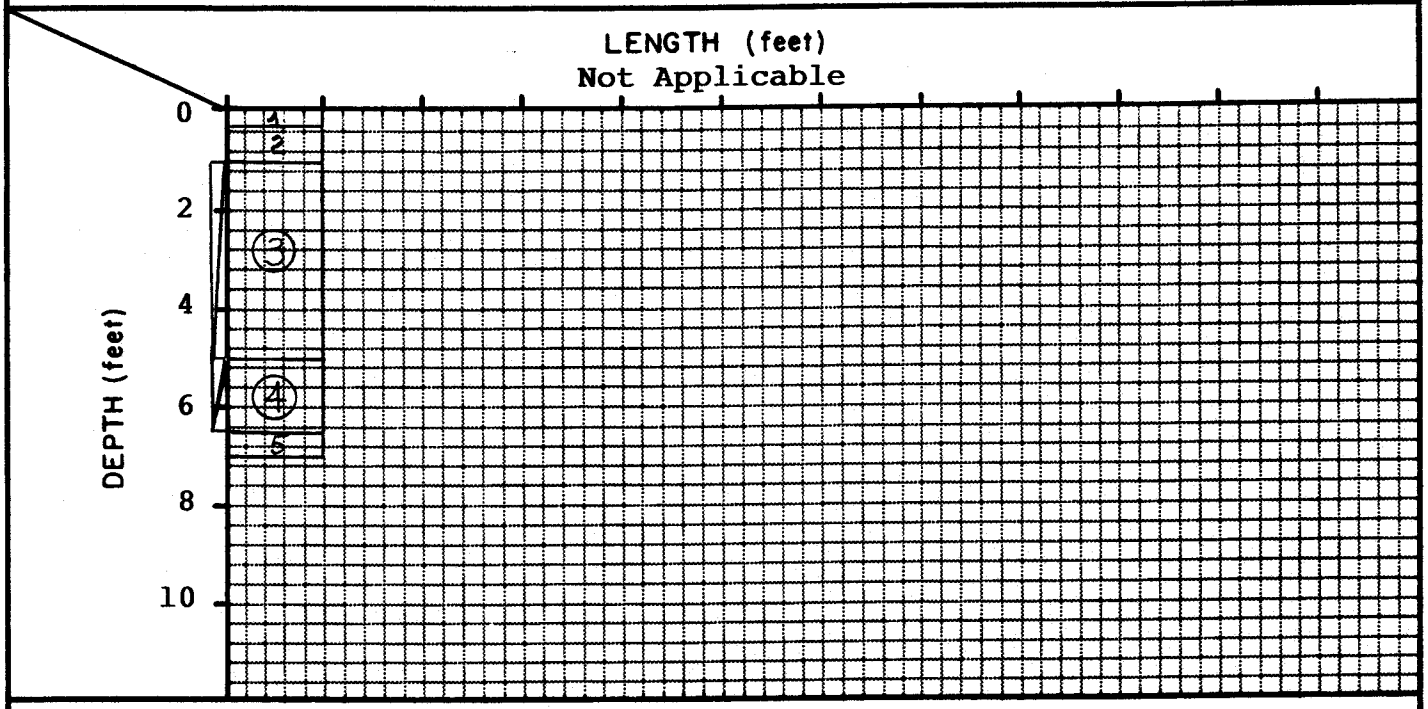
PAGE 1 OF 1

GRAPHIC REPRESENTATION OF EXCAVATION



ORIENTATION

DESCRIPTION OF UNITS

1) SILT (ML) - gray-brown; topsoil.

2) SILT (ML) - brown-gray to orange-brown; trace of clay.

3) SILTY CLAY (CL) -orange-brown; with few scattered, thin (1") SILTY SANDS (SM).

4) CLAYEY SAND (SC) - orange-brown; fine grained; with scattered clayey zones.

5) SILTY SAND (SM) - orange-brown; fine grained; trace of clay; scattered clay galls.

LEGEND:

Bulk Sample

Jar Sample

APPENDIX A.4

LOG OF TEST BORINGS FOR
MONITORING WELLS MW-1 THRU MW-7

RMT INC.

100 Verdae Boulevard
P.O. Box 16778
Greenville, SC 29606
Phone: 803-281-0030
FAX: 803-281-0288

LOG OF TEST BORING REFERENCE SHEET

SAMPLE TYPES

SS	Split Spoon
UD	Undisturbed

PENETRATION RESISTANCE

SANDS

0 - 4	Very Loose
5 - 10	Loose
11 - 20	Firm
21 - 30	Very Firm
31 - 50	Dense
Over 50	Very Dense

SILTS & CLAYS

0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
Over 30	Hard

VISUAL CLASSIFICATION OF SOILS

- GRAVEL, WELL GRADED; POORLY SORTED (GW)
- GRAVEL, POORLY GRADED; WELL SORTED (GP)
- SILTY GRAVELS (GM)
- CLAYEY GRAVEL (GC)
- SAND, WELL GRADED; POORLY SORTED (SW)
- SAND, POORLY GRADED; WELL SORTED (SP)
- SILTY SAND (SM)
- CLAYEY SAND (SC)
- INORGANIC SILTS WITH SLIGHT PLASTICITY (ML)
- CLAYS--INORGANIC; LOW TO MEDIUM PLASTICITY (CL)
- CLAY, HIGH PLASTICITY (CH)
- INORGANIC SILTS WITH ELASTICITY (MH)
- PEAT--ORGANIC SOILS (PT)
- SLUDGE (FILL)
- WASTE AND/OR TRASH (AF)
- NO DESCRIPTION

STANDARD PENETRATION TEST

4-7-6 blows of hammer required to drive sample tube, 6" intervals

WOH weight of hammer

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ | AT COMPLETION ▼

VISUAL CLASSIFICATION OF ROCK TYPES

- GNEISS (GNEISS)
- SCHIST (SCH)
- LIMESTONE (LIME)
- DOLOMITE (DOLO)
- SHALE (SHALE)

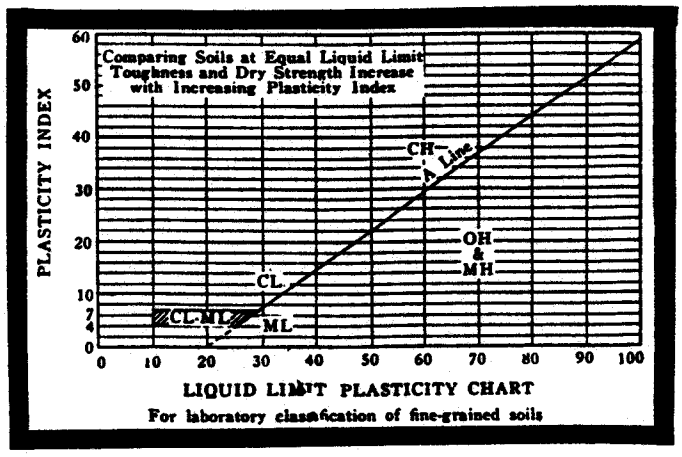
RMT INC.

100 Verdae Boulevard
P.O. Box 16778
Greenville, SC 29606
Phone: 803-281-0030
FAX: 803-281-0288

UNIFIED SOIL CLASSIFICATION SYSTEM

Major Divisions			Group Symbols	Typical Names	Field Identification Procedures (Excluding particles larger than 3 inches and basing fractions on estimated weights)			Information Required for Describing Soils
1	2		3	4	5			6
Coarse-grained Soils More than half of material is larger than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Gravels More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the ¼-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			For undisturbed soils add information on stratification, degree of compactness, cementation, moisture conditions and drainage characteristics.
			GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity. (for identification procedures see ML below)			
			GC	Clayey gravels, gravel-sand-clay mixtures.	Plastic fines (for identification procedures see CL below).			Give typical name; indicate approximate percentages of sand and gravel, max. size; angularity, surface condition, and hardness of the coarse grains; local or geologic name and other pertinent descriptive information; and symbol in parentheses.
	Sands More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			
			SP	Poorly-graded sands, gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			Example: Silty sand, gravelly; about 20% hard, angular gravel particles ½-in. maximum size; rounded and subangular sand grains coarse to fine; about 15% nonplastic fines with low dry strength; well compacted and moist in place; alluvial sand; (SM).
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity. (for identification procedures see ML below)			
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).			
Fine-grained Soils More than half of material is smaller than No. 200 sieve size.	Silts and Clays Liquid limit less than 50				Identification Procedures on Fraction Smaller than No. 40 Sieve Size			
					Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)	
			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	Give typical name, indicate degree and character of plasticity, amount and maximum size of coarse grains, color in wet condition, odor if any, local or geologic name, and other pertinent descriptive information; and symbol in parentheses.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium	
			OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight	
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium	For undisturbed soils add information on structure, stratification, consistency in undisturbed and remolded states, moisture and drainage conditions.
			CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High	
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to medium	Example: Clayey silt, brown, slightly plastic, small percentage of fine sand, numerous vertical root holes, firm and dry in place, loess, (ML).
Highly Organic Soils			Pt	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.			

Component	Size Range
Cobbles	Above 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to ¾ in.
Fine gravel	¾ in. to No. 4 sieve
Sand	No. 4 to No. 200
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine	No. 40 to No. 200
Fines (silt or clay)	Below No. 200 sieve



LIQUID LIMIT PLASTICITY CHART
For laboratory classification of fine-grained soils

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-1
SHEET NO. 1 OF 1
PROJECT NAME WEYERHAEUSER
PROJECT NO. 467.37
LOCATION PLYMOUTH, NC
INSTALLATION
CONTRACTOR LAW ENGINEERING
SURFACE ELEV. 34.8
DRILLING METHOD MUD ROTARY
BOREHOLE DIA. 3 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	4-4-3				SILT (ML) - tan to brown; organics.
2	SS	4-2-3			5	SILTY SAND (SM) - fine grained; trace of clay and mica; orange-brown; mottled gray.
3	SS	5-5-9			10	- with gray silty clay partings and wood fragments.
4	SS	WOH			15	SILTY CLAY (CL) - trace of sand; soft; gray; thin (0.1 ft. thick) fine grained clayey sand layers.
5	SS	17-15-20			20	SAND (SP) - fine grained; trace of silt; gray silt layer from 18.5 - 19.0 ft.
6	SS	8-10-10			25	SILTY CLAY (CL) - No sample recovered; blue/green-gray clay on drill bit and spoon.
					30	BORING TERMINATED AT 25.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 20 JUN 89
DATE COMPLETED 20 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ----
AT COMPLETION 3.8 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-2
SHEET NO. 1 OF 1
PROJECT NAME WEYERHAEUSER
PROJECT NO. 467.37
LOCATION PLYMOUTH, NC
INSTALLATION
CONTRACTOR LAW ENGINEERING
SURFACE ELEV. 24.9
DRILLING METHOD MUD ROTARY
BOREHOLE DIA. 4 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	4-10-11				SILT (ML) - orange-brown; some fine grained sand and sandy clay.
2	SS	3-5-5			5	SILTY CLAY (CL) - firm; gray to brown; clayey sand at 3.5 ft.
3	SS	19-23-30			10	SAND (SP) - fine grained; trace of silt; tan to gray to orange-brown; some mica; thin zones of gray silty clay and clayey sand; very dense.
4	SS	8-8-12			15	
5	UD					
6	SS	7-13-13			20	
7	SS	10-12-15			25	BORING TERMINATED AT 25.0 FEET.
					30	
					35	

GENERAL NOTES

DATE STARTED 21 JUN 89
DATE COMPLETED 21 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ----
AT COMPLETION 18.5 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-3
SHEET NO. 1 OF 1

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD MUD ROTARY

PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 8.3
BOREHOLE DIA. 4 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	3-4-4				SILT (ML) - tan; trace of mica; clayey at the top.
2	SS	7-5-3				- light gray.
3	UD				5	
4	SS	4-3-3				- brown; trace of clay; scattered thin (0.01 ft. thick) clay layers.
5	UD				10	
						14.0
6	SS	6-26-23			15	SILTY SAND (SM) - fine grained, trace of medium and coarse grained; very dense; quartz pebbles; gray to brown.
7	SS	24-43-34			20	- red-brown to orange-brown with iron oxide layer.
8	SS	14-16-17			25	- quartz pebbles to 1/2 in. diameter.
9	SS	5-4-5				- dark gray; interbeds of 0.2 ft. thick silty clay, soft with mica.
					30	BORING TERMINATED AT 30.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 22 JUN 89
DATE COMPLETED 22 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ----
AT COMPLETION 4.2 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-4
SHEET NO. 1 OF 1

PROJECT NAME WEYERHAEUSER
PROJECT NO. 467.37
LOCATION PLYMOUTH, NC
INSTALLATION
CONTRACTOR LAW ENGINEERING
SURFACE ELEV. 9.8
DRILLING METHOD MUD ROTARY
BOREHOLE DIA. 4 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	3-4-7				SILTY SAND (SM) - fine grained; trace of clay; some silt; tan; wood fragments at 1.5 ft.
2	SS	3-4-4				CLAYEY SAND (SC) - fine; tan with gray molting; some silt; moist; stiff.
3	UD				5	
4	SS	3-4-4				- thin gray silty clay layers (0.01 ft. thick).
5	UD				10	
6	SS	12-15-17				SILTY SAND (SM) - fine grained; dense; light orange-brown; gray micaceous silt from 13.5-14.0 ft.
					15	
7	SS	22-30-31				- fine to medium grained, trace of coarse grained; very dense; iron oxide layer at 19.5 ft.; orange-brown.
					20	
8	SS	16-17-15				SAND (SP) - fine to medium grained; trace of silt; dense; orange-brown; iron oxide staining.
					25	BORING TERMINATED AT 25.0 FEET.
					30	
					35	

GENERAL NOTES

DATE STARTED 27 JUN 89
DATE COMPLETED 27 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING -----
AT COMPLETION 5.3 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-5
SHEET NO. 1 OF 1

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD MUD ROTARY

PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 36.9
BOREHOLE DIA. 4 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	11-11-7				SILT (ML) - light tan to orange-brown; firm; organics; clayey at the bottom.
2	SS	5-4-6				SILTY CLAY (CL) - clayey sand interbeds; orange-brown and gray.
3	UD				5	
4	SS	4-4-5				SILTY SAND (SM) - fine grained; light orange-brown; some clay.
5	UD				10	
6	SS	4-3-2				- with gray, soft, SILTY CLAY (CL) at 14.2 ft.
7	UD				15	
8	SS	11-11-10				- tan to red-brown below 20.0 ft.
9	UD				20	
						SILTY CLAY (CL) - blue/green-gray; trace of mica and sand; firm to stiff.
10	SS	3-4-5				
					25	BORING TERMINATED AT 25.0 FEET.
					30	
					35	

GENERAL NOTES

DATE STARTED 20 JUN 89
DATE COMPLETED 20 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ----
AT COMPLETION 11.1 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-6
SHEET NO. 1 OF 1
PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 11.2
BOREHOLE DIA. 4 IN.

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD MUD ROTARY

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY	MOISTURE			
NO.	TYPE	N			DEPTH	
1	SS	2-2-4				SILT (ML) - tan; organics.
2	SS	4-5-4			5	
3	SS	6-4-4			10	SILTY SAND (SM) - fine grained, trace of medium grained; trace of mica; thin silty layers; orange-brown and gray.
4	SS	3-4-6			15	- alternating silt and sandy clay layers; soft at 15 ft.
5	SS	8-6-7			20	
6	SS	9-6-11			25	SAND (SP) - fine grained, trace of medium grained; micaceous; trace of silt; some clay.
					30	BORING TERMINATED AT 25.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 21 JUN 89
DATE COMPLETED 21 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ----
AT COMPLETION 9.1 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. MW-7
SHEET NO. 1 OF 1
PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 34.2
BOREHOLE DIA. 4 IN.

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD MUD ROTARY

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY	MOISTURE			
NO.	TYPE	N			DEPTH	
1	SS	4-5-6				SILT (ML) - brown; organics; some fine grained sand. 0.7
2	SS	4-6-9			5	SILTY CLAY (CL) - light brown; micaceous; stiff. - mottled gray and tan; some fine grained sand.
3	SS	1-1-1			10	CLAYEY SILT (ML) - gray; some fine-grained sand.
4	SS	3-8-15			15	SAND (SP) - fine grained; trace of silt and mica; gray.
5	SS	3-5-5			20	SILTY CLAY (CL) - blue/green-gray; trace of mica; firm to stiff.
6	SS	5-3-4			25	- No sample recovered.
					30	BORING TERMINATED AT 25.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 15 JUN 89
DATE COMPLETED 15 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ----
AT COMPLETION 8.4 ft. BGS
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

APPENDIX A.5

LOG OF TEST BORING SB-1 THRU SB-4

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. SB-1
SHEET NO. 1 OF 1
PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 15.0
BOREHOLE DIA. 6 IN.

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD H.S. AUGER

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	3-3-3				SILT (ML) - light tan; micaceous; some clayey silt.
2	SS	5-4-4			5	SILTY SAND (SM) - fine grained; trace of clayey sand; light orange-brown to light tan. 9.5
3	SS	6-7-7			10	SAND (SP) - fine to medium grained; some mica; light tan to gray.
4	SS	8-9-9			15	- fine grained, silty in part; light tan to orange-brown.
5	SS	7-16-23			20	
6	SS	13-20-23			25	- some coarse grained; quartz pebbles to 1/4 in. diameter.
7	SS	18-22-26				
					30	BORING TERMINATED AT 30.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 16 JUN 89
DATE COMPLETED 16 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 8.5 ft. BGS
AT COMPLETION ▼ -----
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. SB-2
SHEET NO. 1 OF 1
PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 40.5
BOREHOLE DIA. 6 IN.

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD H.S. AUGER

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY	MOISTURE			
NO.	TYPE	N			DEPTH	
1	SS	2-2-3				SAND (SP) - fine grained; trace of silt; organics; brown to light tan. 4.5
2	SS	3-5-5			5	SILTY SAND (SM) - fine grained; trace of clay; orange-brown.
3	SS	3-4-5			10	- sandy clay interbeds; gray; 1 in. thick.
4	SS	1-5-14			15	- thin, scattered gray clay zones; some fine to medium grained sand at 15.0 ft.
5	SS	0-1-2			20	SILTY CLAY (CL) - soft; dark gray; some sand and sandy clay.
6	SS	5-9-12			25	SILTY SAND (SM) - fine grained; trace of medium grained; dark gray; some clayey sand and thin gray clay; wood fragments.
7	SS	3-4-4				SILTY CLAY (CL) - blue/green-gray; firm to stiff; micaceous.
					30	BORING TERMINATED AT 30.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 16 JUN 89
DATE COMPLETED 16 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 13.0 ft. BGS
AT COMPLETION ▼ -----
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. SB-3
SHEET NO. 1 OF 1
PROJECT NAME WEYERHAEUSER
PROJECT NO. 467.37
LOCATION PLYMOUTH, NC
INSTALLATION
CONTRACTOR LAW ENGINEERING
SURFACE ELEV. 38.4
DRILLING METHOD H.S. AUGER
BOREHOLE DIA. 6 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	3-5-4				SILTY SAND (SM) - fine grained; tan.
2	SS	4-5-6			5	CLAYEY SAND (SC) - fine grained; trace of mica; silty; tan, mottled gray.
3	SS	4-3-2			10	SILTY SAND (SM) - fine grained; micaceous; light tan to gray with orange-brown mottling.
4	SS	1-4-3			15	- gray, silty clay layers, 0.1 - 0.2 ft. thick.
5	SS	2-2-1			20	- trace of clay in sand; thin (< 0.1 ft. thick) gray clay.
6	SS	5-6-7			25	SILTY CLAY (CL) - blue/green-gray; trace of mica; firm.
7	SS	5-5-4				
					30	BORING TERMINATED AT 30.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 16 JUN 89
DATE COMPLETED 16 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 13.5 ft. BGS
AT COMPLETION ▼ -----
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

LOG OF TEST BORING

F-203 (R 01-87)

BORING NO. SB-4
SHEET NO. 1 OF 1
PROJECT NO. 467.37
INSTALLATION
SURFACE ELEV. 40.3
BOREHOLE DIA. 6 IN.

PROJECT NAME WEYERHAEUSER
LOCATION PLYMOUTH, NC
CONTRACTOR LAW ENGINEERING
DRILLING METHOD H.S. AUGER

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS
INTERVAL		RECOVERY		MOISTURE		
NO.	TYPE	N			DEPTH	
1	SS	4-4-4				SILT (ML) - tan.
2	SS	4-4-4			5	SILTY SAND (SM) - fine grained; trace of mica and clay.
3	SS	5-5-6			10	CLAYEY SAND (SC) - fine grained; trace of mica; some silty sand; light orange-brown mottled gray.
4	SS	5-5-6			15	- thin (0.1 ft. thick) silty sand and silty clay layers.
5	SS	2-2-2			20	SILTY SAND (SM) - fine grained; some clayey sand; orange-brown to gray.
6	SS	2-3-5			25	SILTY CLAY (CL) - blue/green-gray; micaceous; wood fragments; soft to stiff.
7	SS	3-4-5				
					30	BORING TERMINATED AT 30.0 FEET.
					35	

GENERAL NOTES

DATE STARTED 16 JUN 89
DATE COMPLETED 16 JUN 89
RIG CME 5-50
CREW CHIEF C. CORNELISSEN
LOGGED DEMc CHECKED

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽ 13.0 ft. BGS
AT COMPLETION ▼ -----
AFTER DRILLING
CAVE-IN: DATE/TIME ----- DEPTH -----
WATER: DATE/TIME ----- DEPTH -----

APPENDIX A.6

LOG OF HAND AUGER BORINGS HA-1 THRU HA-16

APPENDIX A.6

LOG OF HAND AUGER BORINGS HA-1 THRU HA-16

HA - 1

Date: 9/07/89		Depth of Casing (ft):	9.0
By: Z.B.		Casing Stickup (ft):	1.0
		G.W. @ completion (ft):	7.5

Location:
Southwesterly inside corner of south pine forrest plantation
Elevation estimated to be 38' msl from topo

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, silty, dark brown (10YR3/3),
0.25				dry, some fine roots, non-plastic
0.50				-light brown (10YR8/3), trace fine
0.75				roots, and moist below 0.5'
1.00				
1.25				
1.50	1.5		SM-SC	SAND,silty fine, some clay,
1.75				yellowish red (5YR4/6), moist, sl. plastic.
2.00		~2		-w/ some silt and trace clay, n.p. @ 2'
2.25				
2.50				
2.75				
3.00	3		SP_SM	SAND, fine, silty, light brown
3.25				(10yr8/3), moist, n.p.
3.50				
3.75				
4.00				-medium to fine w/ trace silt below 4'
4.25				
4.50				
4.75				
5.00	5	~5	CL	CLAY, silty, stiff, reddish brown
5.25				(10R3/6) w/ light gray (N7) mottling,
5.50				moist, tough, plastic
5.75				-grading to Lt.G and wet with depth
6.00				-ground water @ 6'
6.25				
6.50				
6.75				
7.00	7		SP-SC	SAND, med. to fine, some clay, Br.Y
7.25				(10YR6/8), wet w/ tr. free water, sl.
7.50				plastic
7.75				
8.00			SP-SM	-grading more silty with depth
8.25				
8.50	8.5	~8.5	SW	SAND, medium, trace silt, Br.Y
8.75				(10YR6/8), wet w/ free water, n.p.
9.00				-grading coarser w/ depth
9.25				-Caving at ~8
9.50	9.5		---------T.D.	

HA - 2

Date: 9/07/89		Depth of Casing (ft):	9.0
By: Z.B.		Casing Stickup (ft):	1.0
		G.W. @ completion (ft):	7.5

Location:
Approx. 275' paces west of HA-1 down south perimiter road;
Elevation estimated to be 36' msl from topo & visual est.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, silty, dark brown (10YR3/3),
0.25				dry, some fine roots, non-plastic
0.50				-light brown (10YR8/3), trace fine
0.75				roots, and moist below 0.5'
1.00				
1.25				
1.50	1.5		CL-SC	CLAY and SAND, stiff, R.Br (10R3/6), moist,
1.75				mod. tough.
2.00				
2.25				-grading less clay with depth
2.50				
2.75				
3.00				
3.25				
3.50				
3.75				
4.00	4		SC-CL	SAND, clayey, R.Br. (10R3/6), with Lt.G.
4.25				(N7) SAND and CLAY nodules, moist+
4.50				
4.75				
5.00				
5.25				
5.50				
5.75				
6.00	6		SW	SAND, med. to fine, trace silt, R.Br.
6.25				(10R3/6) mottled with Lt.G. (N7) silty
6.50				SAND, moist +, no free water.
6.75				
7.00				-coarse to medium w/ tr. fine gravel @ 7'
7.25				-trace free water @ 7'
7.50				-ground water @ 7.5'
7.75				
8.00	8	~8		SAND, med to fine, R.Br. (10R3/6)
8.25				intermixed w/ soft sandy CLAY pkts,
8.50				saturated, slow dilatancy, sl. plastic,
8.75				low toughness.
9.00	9		CH	CLAY, firm, some silt, Lt.G. (N7), moist,
9.25				mod. tough.
9.50				-caving to 9.5
9.75				-@ 10 very soft, no recovery
10.00	10			---------T.D.

HA - 3

Date: 9/07/89		Depth of Casing (ft):	9.7
By: Z.B.		Casing Stickup (ft):	0.3
		G.W. @ completion (ft):	8.2

Location:

Approximately 350' [153 paces] west of HA-1 at end of access in clearing within pine forrest; Elevation estimated to be 36' msl from topo

DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0	SP-SM	SAND and SILT, fine, Dk.Br. (10YR3/3),
0.25			dry, tr. fine roots and some med. gravel.
0.50			
0.75			
1.00	1	CL-CH	CLAY, silty, stiff, R.Br. (10R3/6) w/
1.25			Lt.G. (N7) mottling, dry-moist, tough.
1.50			-moist @ 1.5'
1.75			
2.00			
2.25			
2.50			-w/ trace fine sand @ 2.5'
2.75			
3.00			
3.25			
3.50	3.5	CL	CLAY, some med. to fine sand, Lt.G. (N7),
3.75			moist, tough.
4.00			
4.25			
4.50			- grading to sandy CLAY with depth
4.75			
5.00			
5.25			
5.50	5.5	SP-SM	SAND, med-fine, some silt and clay, Lt.G.
5.75			(N7) w/ Lt.Br. (10YR8/3) mottling, wet+,
6.00			sl. plastic to n.p.
6.25			-trace free water @ ~6'
6.50			-clayey @ ~6.5'
6.75			-below ~6.5' interbedded R.Br. (10R3/6)
7.00			silty SAND with Lt.G. (N7) silty CLAY with
7.25			occasional silty CLAY partings
7.50			
7.75			
8.00			-grading more sandy below ~8', w/ free water
8.25			-caving @ ~8'
8.50			
8.75			
9.00	9	SP	SAND, fine, some silt, trace clay, Lt.G.
9.25			(N7), dilatancy quick, n.p.
9.50			
10.00	10	---------T.D.	

HA - 4

Date: 9/07/89	Depth of Casing (ft): 10.0
By: Z.B.	Casing Stickup (ft): 0.0
	G.W. @ completion (ft): 6.5

Location:
Southerly limit along south pine forrest/plantation perimeter road, on north side, @ ~250' [95 paces] west of MW-1; Elevation estimated to be ~38' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		CL	CLAY and SAND, fine, stiff, Dk.Gr.G.
0.25				(5G6/1), dry, with tr. fine roots.
0.50				-below 6" stiff, moist, mod. plastic, Gr.G.
0.75				(5G6/1) w/ occ. R.Br. (10R3/6) mottling
1.00				
1.25				
1.50				-grading more sandy with depth
1.75				
2.00				
2.25				
2.50				
2.75				
3.00	3	3	SC-CL	SAND, med to fine, clayey, R.Br. (10R3/6)
3.25				w/ occ. Lt.G. (N7) mottling, mod. tough,
3.50				sl. plastic, slow dilatancy.
3.75				-trace free water @ ~3.5'
4.00				-wet below 4'
4.25				
4.50				-decreasing clay content with depth
4.75				
5.00		5		-very wet and mod dilatancy below 5'
5.25				
5.50				
5.75				
6.00	6		SP-SC	SAND, fine, trace silt and clay, Lt.G.
6.25				(N7) interbedded w/ R.Br. (10R3/6) fine
6.50				sandy CLAY seams, dilatancy quick, low
6.75				toughness, n.p.
7.00				
7.25				
7.50				-caving @ ~7.5'
7.75				
8.00				
8.25				
8.50				
8.75				
9.00				
9.25				
9.50				
10.00	10		---------T.D.	

HA - 5

Date: 9/07/89		Depth of Casing (ft):	8.7
By: Z.B.		Casing Stickup (ft):	1.3
		G.W. @ completion (ft):	6.3

Location:
Approximately 0.1 mi [by odometer] north of MW-1 on west side of main N-S plantation road; Elevation estimated to be 36' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00		0	SM	SAND, fine, silty, Lt.Br. (10YR8/3), dry,
0.25				w/ trace fine roots, n.p.
0.50				- below 6" dry-moist w/ few roots
0.75				
1.00				
1.25				
1.50		1.5	CL-SC	CLAY and SAND, fine, stiff, Br.Y.
1.75				(10YR6/8), moist, with occ. fine roots.
2.00				
2.25				-grading more sandy w/ depth
2.50				
2.75				
3.00		3	SC-SP	SAND, med to fine, clayey, R.Br. (10R3/6),
3.25				moist, mod. tough, low plasticity.
3.50				
3.75				-grading less clayey with depth
4.00				
4.25				
4.50				
4.75				
5.00				
5.25				
5.50				
5.75				
6.00				-below 6' moist+ w/ trace free water, mod
6.25				dilatancy, mod tough
6.50				
6.75				
7.00				
7.25				-below 7'very soft SAND with some clay
7.50				-caving @ ~7.5'
7.75				
8.00		8	SP	SAND, med to fine, trace silt, R.Br. (10R3/
8.25				
8.50				
8.75				
9.00				
9.25				
9.50		9.5	---------T.D.	

HA - 6

Date: 9/07/89
By: Z.B.

Depth of Casing (ft): 13.7
Casing Stickup (ft): 1.3
G.W. @ completion (ft): 12.7

Location:
Western half of plantation, approximately 600' west of N-S access road; Elevation estimated to be 40' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00		0	SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry to moist, some fine roots, n.p.
0.50				-below ~6" Lt.Br. (10YR8/3), moist, with
0.75				occ fine roots
1.00				
1.25				
1.50				
1.75				
2.00				
2.25				
2.50		2.5	CL-CH	CLAY, some sand, stiff, R.Br. (10R3/6),
2.75				moist, mod. tough.
3.00				
3.25				
3.50		3.5	SP-SM	SAND, fine, some silt, trace clay, R.Br.
3.75				(10R3/6), dry to moist, n.p.
4.00				
4.25				
4.50				
4.75				
5.00		5	CL-SC	SAND, some clay, firm to stiff, R.Br.
5.25				(10R3/3), moist, low tough, sl. plastic.
5.50				
5.75				
6.00		6	CL	CLAY and SAND, fine, stiff, Lt.Br.
6.25				(10YR3/3), moist, mod tough.
6.50				
6.75				
7.00				
7.25				
7.50				-@ ~7.5 w/ R.Br. (10R3/6) med. SAND pockets
7.75				
8.00		8	SP-SM	SAND,fine, silty, mottled Gr.G. (5G6/1)
8.25				and R.Br. (10R3/3), moist-, n.p.
8.50				
8.75				
9.00				-Lt.G. (N7) and moist below 9'
9.25				
9.50				-grading less silt with depth
10.00				

HA - 6 (continued)

Date: 9/07/89	Depth of Casing (ft): 13.7
By: Z.B.	Casing Stickup (ft): 1.3
	G.W. @ completion (ft): 12.7

Location:
Western half of plantation, approximately 600' west of N-S access road; Elevation estimated to be 40' msl from topo.

DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
10.25			
10.50			
10.75			
11.00			-wet w/ R.Br. (10R3/3) clayey SAND
11.25			partings @ 11'
11.50			
11.75			
12.00	12	SP	SAND, med to fine, trace silt, Lt.G. (N7),
12.25			wet, trace free water, w/ R.Br. (10R3/3)
12.50			clayey SAND partings.
12.75			-caving @ ~12.5'
13.00		SW	-below ~13' grading to SW
13.25			
13.50			
13.75			
14.00	14	---------T.D.	

HA - 7

Date: 9/07/89		Depth of Casing (ft):	9.7
By: Z.B.		Casing Stickup (ft):	0.3
		G.W. @ completion (ft):	8.4

Location:

In western half of plantation, approximately 250' south of SB-2 or 0.1 mi south of west access road leading to HA-7; Elevation estimated to be 39' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, silty, Dk.Br. (10YR3/3), dry,
0.25				occ. fine roots.
0.50				
0.75				
1.00				
1.25				
1.50	1.5	1.5	CL-SC	CLAY and SAND fine, firm, R.Br. (10R3/6),
1.75				moist; mod. tough, mod plastic.
2.00				
2.25				
2.50				-grading more silt and less clay with depth
2.75				
3.00				
3.25				
3.50	3.5		SM-SP	SAND, fine, silty, R.Br. (10R3/6), dry to
3.75				moist, with Br.Y. (10YR6/8) clayey SAND
4.00				partings and nodules.
4.25				
4.50				-moist below ~4.5'
4.75				
5.00				
5.25				
5.50				
5.75				
6.00	6		CL-CH	CLAY, some fine sand and silt, stiff,
6.25				R.Br. (10R3/6) intermixed w/ Lt.G. (N7)
6.50				mohling moist, tough.
6.75				
7.00				-grading more sandy below ~7'
7.25				
7.50	7.5		SC-CL	CLAY and SAND, trace silt, firm, Lt.G.
7.75				(N7) mottled R.Br. (10R3/6), moist +, low
8.00				toughness.
8.25				-grading more sandy and wet below ~8'
8.50				
8.75				-caving @ 9'
9.00	9		SP-SM	SAND, fine, trace medium, some silt, Lt.G.
9.25				(N7), dripping wet, dilatant, n.p.
9.50				
10.00	10		---------T.D.	

HA - 8

Date: 9/07/89	Depth of Casing (ft): 9.0
By: Z.B.	Casing Stickup (ft): 1.0
	G.W. @ completion (ft): 7.0

Location:
Approximately 190 south of SB-3 on east side of N-S plantation access road across from power line pole; Elevation estimated to be 37' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00		0	SM-ML	SAND and SILT, fine, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-Lt.Br. (10YR8/3) below ~6"
0.75				
1.00				
1.25				
1.50		1.5	CL	CLAY and SAND, fine, trace silt, firm, Br.Y.
1.75				(10YR6/8), dry to moist, mod tough.
2.00				
2.25				
2.50				-moist below ~2.5'
2.75				
3.00				
3.25				
3.50				
3.75				
4.00		4	SP	SAND, med. to fine, trace some silt, R.Br.
4.25				(10R3/6), moist, n.p.
4.50				
4.75		4.75	CH	CLAY, some fine sand, stiff, Lt.G. (N7),
5.00				moist, very tough.
5.25				
5.50		5.5	SP-SM	SAND, fine, some silt, trace clay, Lt.G.
5.75				(N7) mottled R.Br. (10R3/6), moist+, sl.
6.00				plastic.
6.25				
6.50				-below ~6.5' very wet
6.75				-ground water @ ~7'
7.00				
7.25				
7.50				-@ ~7.5' some sandy CLAY nodules
7.75				
8.00				-@ 8' 1-inch dia. fresh root
8.25				
8.50		8.5	SW	SAND, coarse to fine, trace silt, Lt.G.
8.75				(N7), wet w/ free water.
9.00		9	---------	T.D.

HA - 9

Date: 9/07/89	Depth of Casing (ft): 12.8
By: Z.B.	Casing Stickup (ft): 2.2
	G.W. @ completion (ft): 11.8

Location:

Approximately 475' north of HA-8 up main N-S plantation access road on west side at intersection with western access road; Elevation estimated to be 40' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-Lt.Br. (10YR8/3), dry to moist below 6"
0.75				
1.00				
1.25				
1.50	1.5		CL-SC	CLAY and SAND, fine, firm, R.Br. (10R3/6),
1.75				dry to moist, mod tough, mod plastic.
2.00				
2.25				
2.50				-grading more fine sand with depth
2.75				
3.00				
3.25				
3.50				
3.75				
4.00	4		SP-SC	SAND, fine, some clay, R.Br. (10R3/6),
4.25				moist-, sl. plastic to n.p.
4.50				
4.75				
5.00				-medium SAND below 5'
5.25				
5.50				
5.75				
6.00				-w/ occ. fine roots @ 6'
6.25				
6.50				
6.75				
7.00	7		CL-CH	CLAY, some fine sand, stiff, Y.R. (5YR4/6)
7.25				w/ tr. Lt. G. (N7) mottling, moist-.
7.50				
7.75				
8.00	8		SP-SC	SAND, some clay and silt, R.Br. (10R3/6),
8.25				moist, sl. plastic.
8.50				-grading less clay and n.p. w/ depth
8.75				
9.00				-below 9' intermixed Lt.G. (N7) and R.Br.
9.25				(10R3/6), moist
9.50				
9.75				

HA - 9 (continued)

Date: 9/07/89		Depth of Casing (ft):	12.8
By: Z.B.		Casing Stickup (ft):	2.2
		G.W. @ completion (ft):	11.8

Location:

Approximately 475' north of HA-8 up main N-S plantation access road on west side at intersection with western access road; Elevation estimated to be 40' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
10.00				-@ 10' clayey and wet
10.25				
10.50	10.5		SP-SW	SAND, med. to fine, trace silt, mottled
10.75				Lt.G. (N7) and Lt.Br. (10YR8/3), moist+.
11.00				-grading coarser with depth to SW
11.25				
11.50				-dilatancy quick @ 11.5'
11.75				
12.00				-caving @ 12'
12.25				
12.50				-@ 12.5' mottled Y.R. (5YR4/6) and Lt.G.
12.75				(N7) w/ silty CLAY partings
13.00	13		---------	T.D.

HA - 10

Date: 9/08/89	Depth of Casing (ft): 9.3
By: Z.B.	Casing Stickup (ft): 0.7
	G.W. @ completion (ft): 6.7

Location:

Along south plantation boundary road in south east corner approximately 600 feet south of MW-7 @ alignment break, on plantation side of road; Elevation estimated to be 34' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-Lt.Br. (10YR8/3), dry to moist below 6"
0.75				
1.00	1		CL-SC	CLAY and SAND, firm, Br.Y. (10R6/8),
1.25				moist, tough.
1.50				
1.75				
2.00				
2.25				
2.50	2.5		SC-CL	SAND, fine, clayey, firm, Br.Y. (10R6/8),
2.75				moist-, sl. plastic.
3.00				
3.25				-grading less clay w/ depth
3.50				
3.75				
4.00				
4.25				
4.50				
4.75				
5.00	5		CL-CH	CLAY, trace fine sand stiff, mottled Lt.G.
5.25				(N7) and Br.Y. (10YR6/8), moist-, very tough.
5.50	5.5		SP	SAND, medium to fine, trace silt, Br.Y.
5.75				(10YR6/8), moist-, n.p.
6.00		6		-moist w/ Lt.G. (N7) mottling below 6'
6.25				
6.50				
6.75				
7.00				-med dilatancy @ 7' w/ free water
7.25				
7.50				-trace silty CLAY ptngs below 7.5'
7.75				
8.00				-caving @ 8'
8.25				
8.50				
8.75				
9.00	9		SW	SAND, well, Lt.Br. (10YR8/3), wet.
9.50				
10.00	10		---------T.D.	

HA - 11

Date: 9/08/89	Depth of Casing (ft): 8.0
By: Z.B.	Casing Stickup (ft): 2.0
	G.W. @ completion (ft): 6.3

Location:

Along south east plantation boundary road approximately 325 feet north of HA-11 and 225 south of MW-7 @ at corner of road on plantation side of road; Elevation estimated to be 36' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-below 6" Lt.Br. (10YR8/3) and dry to moist
0.75	0.75		CL-SC	CLAY and SAND, fine, stiff, Br.Y. (10R6/8)
1.00				w/ occ. Lt.G. (N7) mottling, moist, tough.
1.25				
1.50				
1.75				
2.00				
2.25				
2.50				-@ 2.5' 3/8" fresh root
2.75				
3.00	3		CL-ML	CLAY, silty, trace fine sand, firm, Br.Y.
3.25				(10R6/8) w/ Lt.G. mottling, moist, mod tough.
3.50				
3.75				
4.00				
4.25				
4.50				
4.75				
5.00	5		CL-CH	CLAY, very stiff, mottled Lt.G. (N7) and
5.25				Br.Y. (10R6/8), dry to moist, very tough.
5.50	5.5		SP-SM	SAND, fine, trace silt, Br.Y. (10YR6/8),
5.75				moist.
6.00				-grading coarser w/ depth
6.25				
6.50				-below 6.5' moist w/ Lt.G. (N7) mottling
6.75				
7.00				-medium grained below 7'
7.25				-caving @ ~7'
7.50				-wet below ~7.5'
7.75				
8.00	8		---------T.D.	

HA - 12

Date: 9/08/89	Depth of Casing (ft): 10.0
By: Z.B.	Casing Stickup (ft): 0.0
	G.W. @ completion (ft): 9.2

Location:
Approximately 325' from main N-S access road towards MW-7 along east access road in eastern half of plantation; Elevation estimated to be 37' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00				
	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-Lt.Br. (10YR8/3), dry to moist below 6"
0.75				
1.00				
1.25				
1.50	1.5		CL	CLAY, silty, trace fine sand, firm to stiff,
1.75				Br.Y. (10YR6/8), moist, tough.
2.00				
2.25				
2.50				
2.75				
3.00	3		CL-SC	CLAY and SAND, fine, firm to stiff, Br.Y.
3.25				(10YR6/8), moist-, mod. tough.
3.50				
3.75				
4.00	4		CL-CH	CLAY, very stiff, Lt.G. (N7) mottled R.Br.
4.25				(10R3/6), moist-, very tough.
4.50				
4.75				
5.00	5		SP	SAND, silty fine, trace clay, Br.Y.
5.25				(10YR6/8), moist, n.p.
5.50				
5.75				
6.00				
6.25				
6.50				-@ 6.5' Lt.G. (N7) w/ Lt.B. (10YR8/3)
6.75				mottling
7.00	7		CL-SC	CLAY and SAND, fine, firm, Br.Y. (10YR6/8) w/
7.25				Lt.G. (N7) SILT partings, moist, mod. tough.
7.50				
7.75	7.75		SP-SM	SAND, fine, silty, Br.Y. (10YR6/8), wet,
8.00				mod. dilatant, Sl. plastic to n.p.
8.25				
8.50				-medium to fine @ 8.5'
8.75				
9.00				-@ 9' coarse to medium and Lt.G. (N7)
9.50				-caving @ ~9.5'
10.00				
10.50	10.5		---------T.D.	

HA - 13

Date: 9/08/89
By: Z.B.

Depth of Casing (ft):
Casing Stickup (ft):
G.W. @ completion (ft):

Location:
At southeast toe of landfill, approximately 650 feet south of Fueling Station at outside bend of road; Elevation estimated to be 36' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, trace fine roots.
0.50				-Lt.Br. (10YR8/3), dry to moist below 6"
0.75				
1.00				
1.25				
1.50				
1.75				
2.00	2		CL	CLAY, sandy, trace silt, stiff, Y.R.
2.25				(5YR4/6), dry-moist, tough.
2.50				
2.75				-grading more sandy and less clayey
3.00				
3.25				
3.50	3.5		SP-SM	SAND, fine, some silt and clay, Y.R.
3.75				(5YR4/6), dry-moist, n.p.
4.00				-Lt.Br. (10YR8/3) and silty below 4'
4.25				
4.50				
4.75				
5.00				-moist below 5'
5.25				
5.50				-medium fine sand below 5.5'
5.75				
6.00	6		SP-SC	SAND, medium, some clay, Lt.G (N7) w/
6.25				Br.Y. (10YR6/8) stringers, moist, sl. pl.
6.50		6.5		-silty and less clay @ 6.5'
6.75				
7.00				
7.25				
7.50				
7.75				
8.00	8		CL-SC	CLAY and SAND, med sand, stiff, Br.Y.
8.25				(10YR6/8), moist, mod tough, mod. pl.
8.50				
8.75				
9.00				
9.50	9.5		SP-SC	SAND, fine, some silt, Lt.G. (N7) w/ R.Br.
9.75				(10R3/6) mottling, moist, w/ silty clay
10.00				partings, sl. pl.

HA - 13 (continued)

Date: 9/08/89 Depth of Casing (ft):
By: Z.B. Casing Stickup (ft):
G.W. @ completion (ft):

Location:
At southeast toe of landfill, approximately 650 feet south of Fueling Station at outside bend of road; Elevation estimated to be 36' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
10.25		10	CH-CL	CLAY, trace fine sand, very stiff, Lt.G.
10.50				(N7), moist-, very tough.
10.75				-increasingly sandy w/ depth
11.00				-w/ med to fine SAND partings @ 11'
11.25				-w/ ferrous nodules below 11'
11.50				-@ 11.5' med sand interbedded w/ sandy CLAY
11.75				
12.00		12	SP	SAND, medium to fine, trace silt, Lt.G.
12.25				(N7), dry-moist.
12.50				-grading coarser w/ depth
12.75				
13.00				-R.Br. (10R3/6) below 13'
13.25				
13.50				-Lt.G. (N7) w/ R.Br. (10R3/6) stringers
13.75				and dry-moist @ 13.5'
14.00				-moist below 14'
14.25				
14.50				
14.75				
15.00				
15.25				
15.50				-w/ trace clay nodules @ 15.5'
15.75				
16.00		16		---------T.D.; dry at completion depth

HA - 14

Date: 9/08/89 Depth of Casing (ft): 11.3
By: B.Neel Casing Stickup (ft): 1.6
G.W. @ completion (ft): 5.8

Location:
Along northern south plantation perimeter road, approximately 450 feet from refueling station along south side of roadway; Elevation estimated to be 36' (?) msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-Lt.Br. (10YR8/3), dry to moist below 6"
0.75				
1.00		1		
1.25				
1.50				
1.75				
2.00				
2.25				
2.50				
2.75				
3.00	3	3	CL	CLAY, sandy, trace silt, stiff, Y.R.
3.25				(5YR4/6), dry-moist, tough.
3.50				
3.75				
4.00				
4.25				
4.50				
4.75				
5.00	5	5	SP-SM	SAND, fine, some silt and clay, Lt.G. (N7)
5.25				and Br.Y. (10YR6/8), moist-dry, n.p.
5.50				
5.75				
6.00				
6.25				
6.50				
6.75				
7.00				
7.25				
7.50		7.5		
7.75				
8.00				
8.25				
8.50				
8.75				
9.00		9		-wet below 9'
10.00				
11.00		11		
11.50	11.5		---------T.D.	

HA - 15

Date: 9/08/89	Depth of Casing (ft): 11.2
By: Z.B.	Casing Stickup (ft): 2.2
	G.W. @ completion (ft): 10.9

Location:

In borrow area approximately 275' north of TP-22 and 180' west of TP-23, at intersection of two interior access roads. Elevation estimated to be 35 feet msl from topo.

DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0	SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25			dry, trace fine roots.
0.50			-Lt.Br. (10YR8/3), dry to moist below 6"
0.75			
1.00	1	CL	CLAY, sandy, trace silt, stiff, Br.Y.
1.25			(10YR6/8), dry-moist, very tough, w/ occ.
1.50			R.Br. (10R3/6) silt pockets.
1.75			
2.00			
2.25			
2.50			
2.75			
3.00			
3.25			
3.50			
3.75			
4.00			
4.25			
4.50	4.5	SP-SM	SAND, fine, some silt, Lt.Br. (10YR8/3),
4.75			dry-moist.
5.00			
5.25			
5.50			
5.75			
6.00			-moist below 6'
6.25			
6.75			
7.00			-occ. clay pocket below 7'
7.25			
7.50			
7.75			
8.00	8	CH-CL	CLAY, silty, very stiff, Lt.G. (N7),
8.25			dry-moist, very tough.
8.50	8.5	SP	SAND, med to fine, trace clay pockets,
9.00			Lt.G. (N7), dry-moist, n.p.
9.50			-R.Br. (10R3/6), silty, and wet below 9.5'
9.75			-grading coarser w/ depth
10.50	10.5	SW	SAND, well, trace silt, R.Br. (10R3/6),
10.75			wet, w/ occ. fine gravel.
11.00	11		---------T.D.

HA - 16

Date: 9/08/89		Depth of Casing (ft):	11.5
By: Z.B.		Casing Stickup (ft):	1.0
		G.W. @ completion (ft):	6.3

Location:

In borrow area approximately 500' north of TP-24 along main access road at top of knoll just beyond access road leading to TP-26; Elevation estimated to be 24' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
0.00	0		SP-SM	SAND, fine, some silt, Dk.Br. (10YR3/3),
0.25				dry, some fine roots.
0.50				-Lt.Br. (10YR8/3), dry to moist below 6"
0.75				
1.00	1		CL-CH	CLAY, trace sand, trace silt, stiff, R.Br.
1.25				(10R3/6), dry-moist, tough.
1.50				
1.75				
2.00				
2.25				
2.50				
2.75				
3.00			CL	-CLAY and SAND @ 3'
3.25				
3.50				
3.75				
4.00				-Lt.G. (N7) w/ R.Br. (10R3/6) mottling and
4.25				trace fine SAND partings @ 4'
4.50				
4.75				
5.00				
5.25				
5.50				-very stiff and purplish gray below 5.5'
5.75				
6.00				-w/ R.Br. (10R3/6) mottling and ferrous
6.25				stains @ 6'
6.50				
6.75				
7.00				-Lt.G. (N7) w/ SILT partings @ 7'
7.25				
7.50				
7.75				
8.00	8		SP	SAND, med to fine, Lt.Br. (10YR8/3), dry+,
8.25				w/ ferrous staining.
8.50				
8.75				-increasingly well; graded with depth
9.00				-medium SAND @ 9'
9.25				
9.50			SW	-Lt.G (N7) and coarse to medium below 9.5'
9.75				

HA - 16 (continued)

Date: 9/08/89	Depth of Casing (ft): 11.5
By: Z.B.	Casing Stickup (ft): 1.0
	G.W. @ completion (ft): 6.3

Location:

Approximately 500 feet north of TP-24 at top of knoll just beyond access road leading to TP-26; Elevation estimated to be 24' msl from topo.

	DEPTH (ft)	SAMPLED (ft)	USCS	DESCRIPTION
10.00				
10.25				
10.50	10.5		CL	CLAY, silty, very stiff, Lt.G. (N7),
10.75				moist, very tough.
11.00				
11.25				
11.50	11.5			T.D.; dry at completion

APPENDIX B

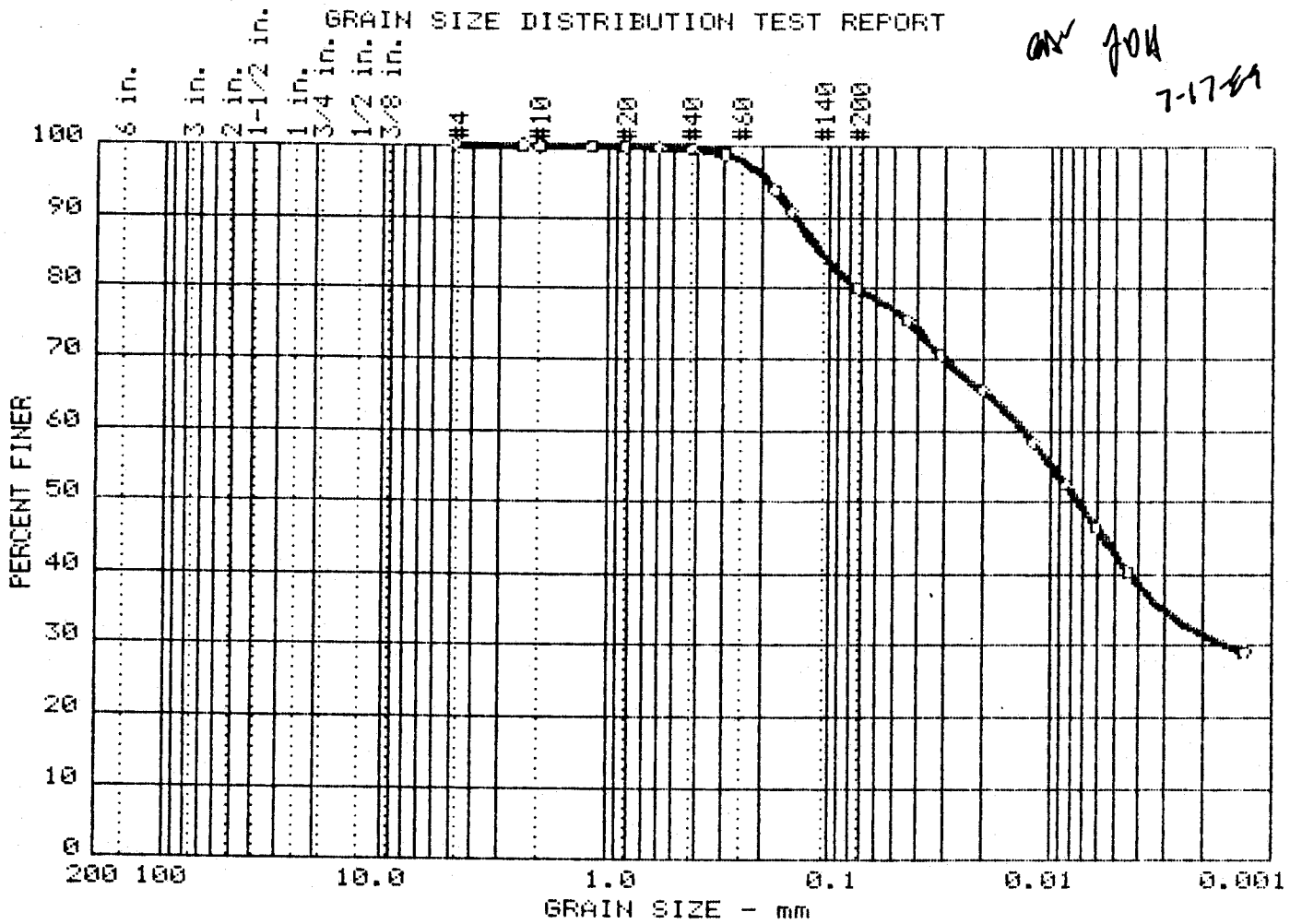
LABORATORY TESTING DATA SHEETS AND PLOTS

APPENDIX B-1

GRAIN SIZE DISTRIBUTION

AMZ 7-17-89

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
○	4	0.0	0.0	20.0	37.5	42.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.11		0.01	0.002				

MATERIAL DESCRIPTION	USCS	AASHTO
○	CL	

Project No.: 467.38
Project: WEYCO/PLYMOUTH
○ Location: TP-21, 1.5-2.0'

Date: 7-10-89

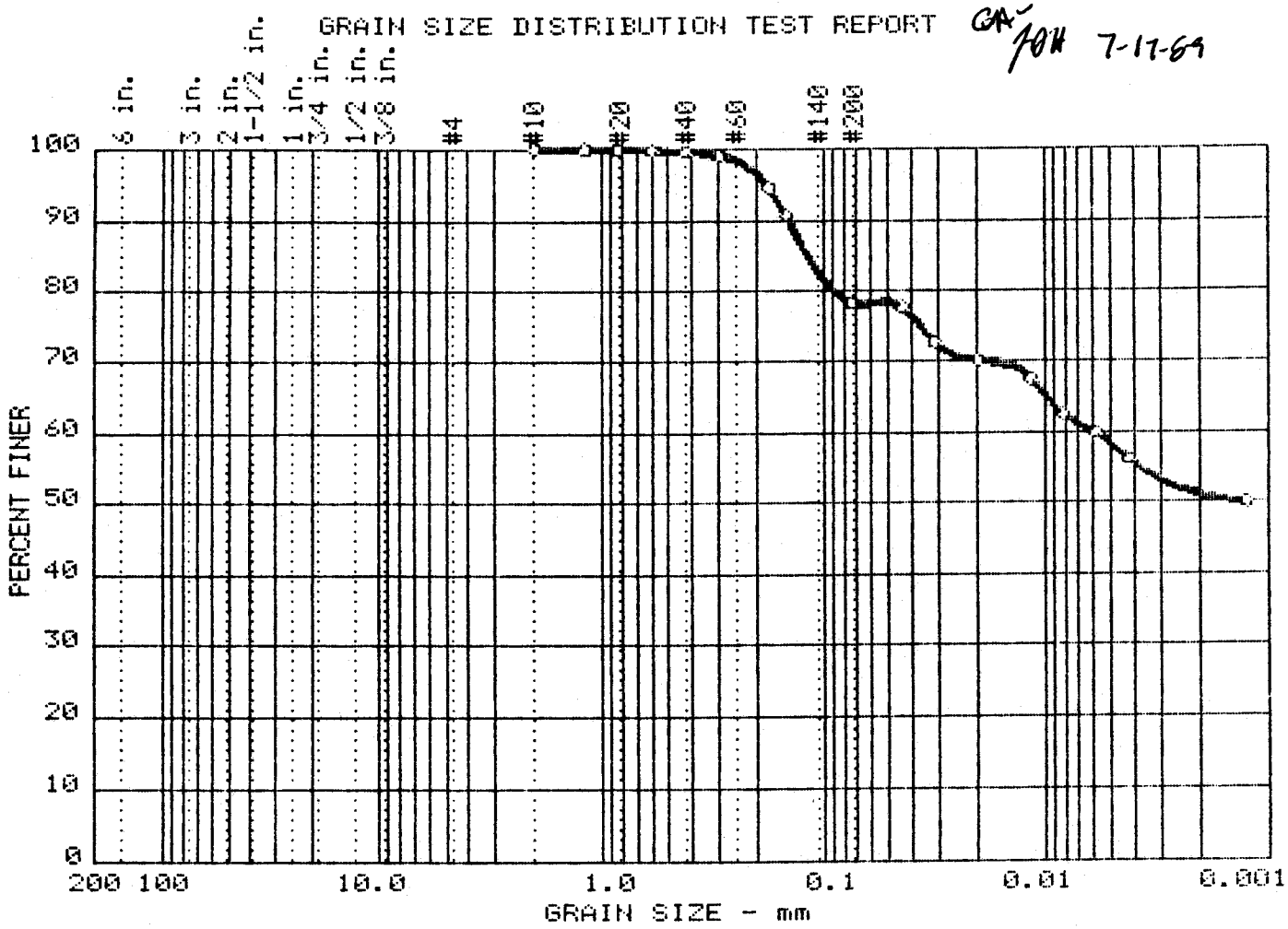
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
O	3	0.0	0.0	21.6	20.2	58.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O			0.12		0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
O	CH	

Project No.: 467.38
Project: WEYCO/PLYMOUTH
O Location: TP-21, 3.5-4.5'

Date: 7-10-89

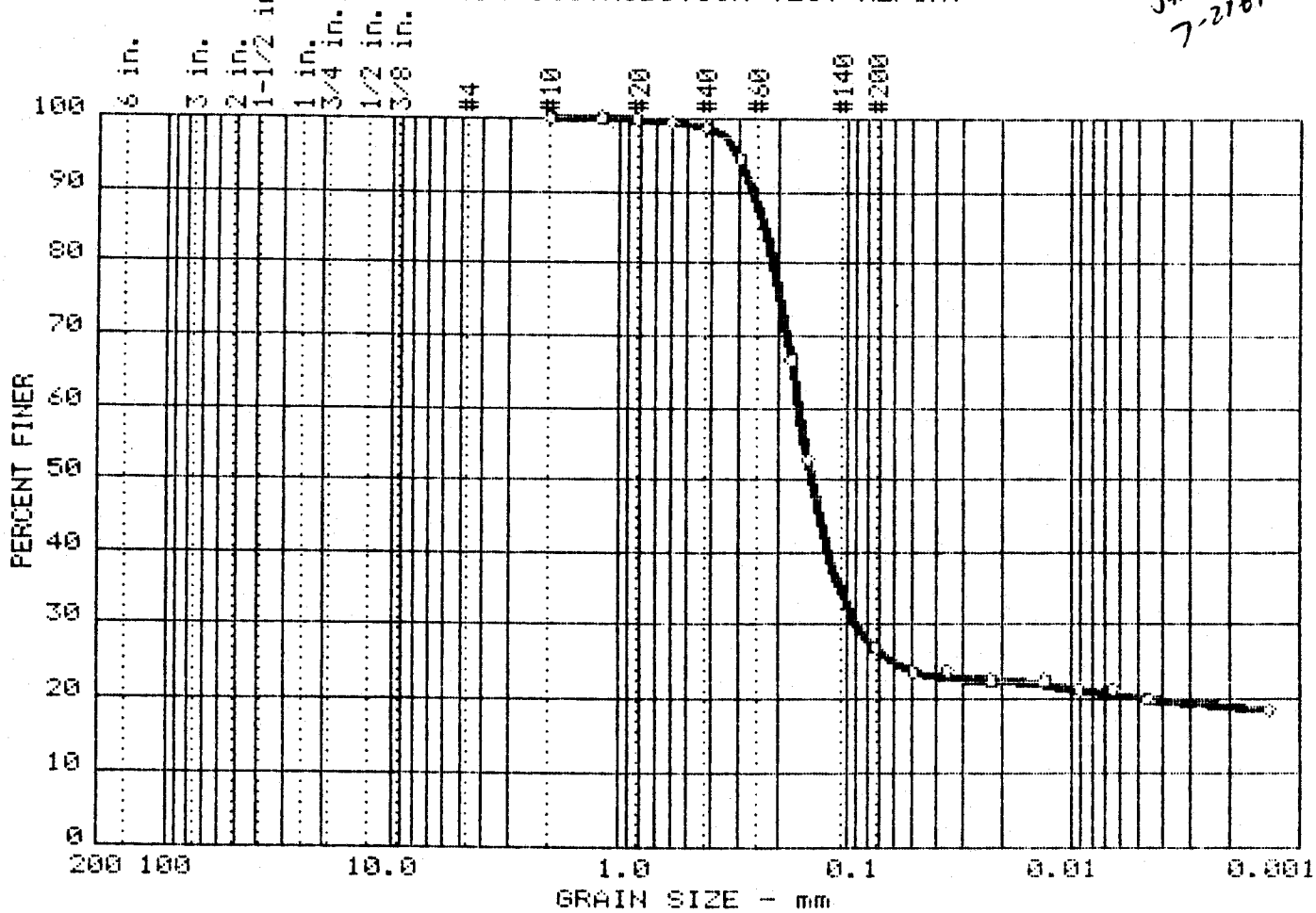
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
O	5	0.0	0.0	73.2	6.6	20.2

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O			0.23	0.16	0.14	0.090				

MATERIAL DESCRIPTION	USCS	AASHTO
O TAN SILTY-SAND		

Project No.: 467.38
Project: WEYCO/PLYMOUTH
O Location: TP-22, 3-4'

Date: 7-10-89

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

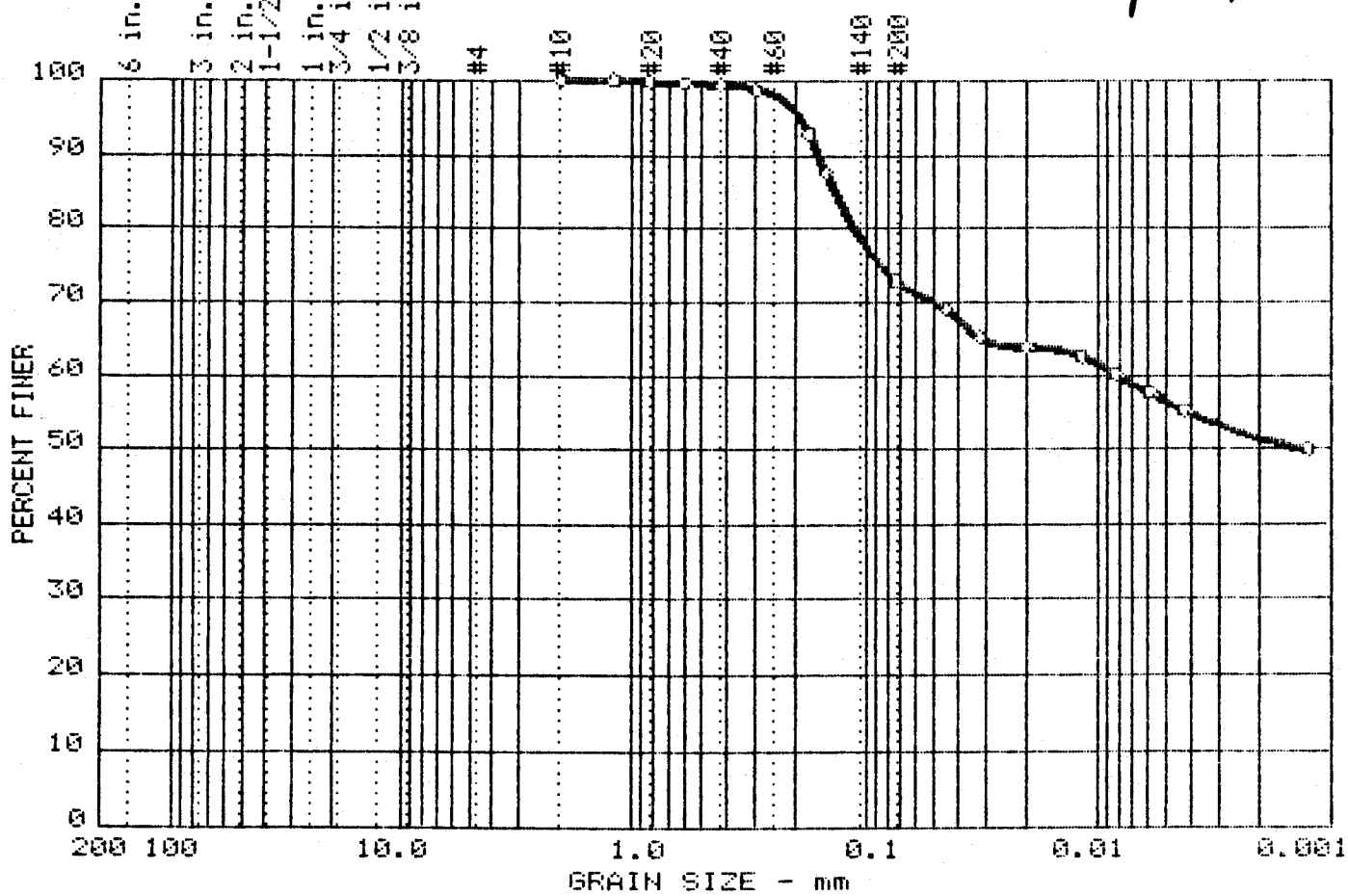
RMT Inc.

Figure No. _____

AMZ 7-17-89

GRAIN SIZE DISTRIBUTION TEST REPORT

QAV JOA 7-17-89



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
O	2	0.0	0.0	27.1	16.6	56.3

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O			0.14		0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
O		

Project No.: 467.38
Project: WEYCO/PLYMOUTH
O Location: TP-24 3.0-3.5'

Date: 7-10-89

Remarks:

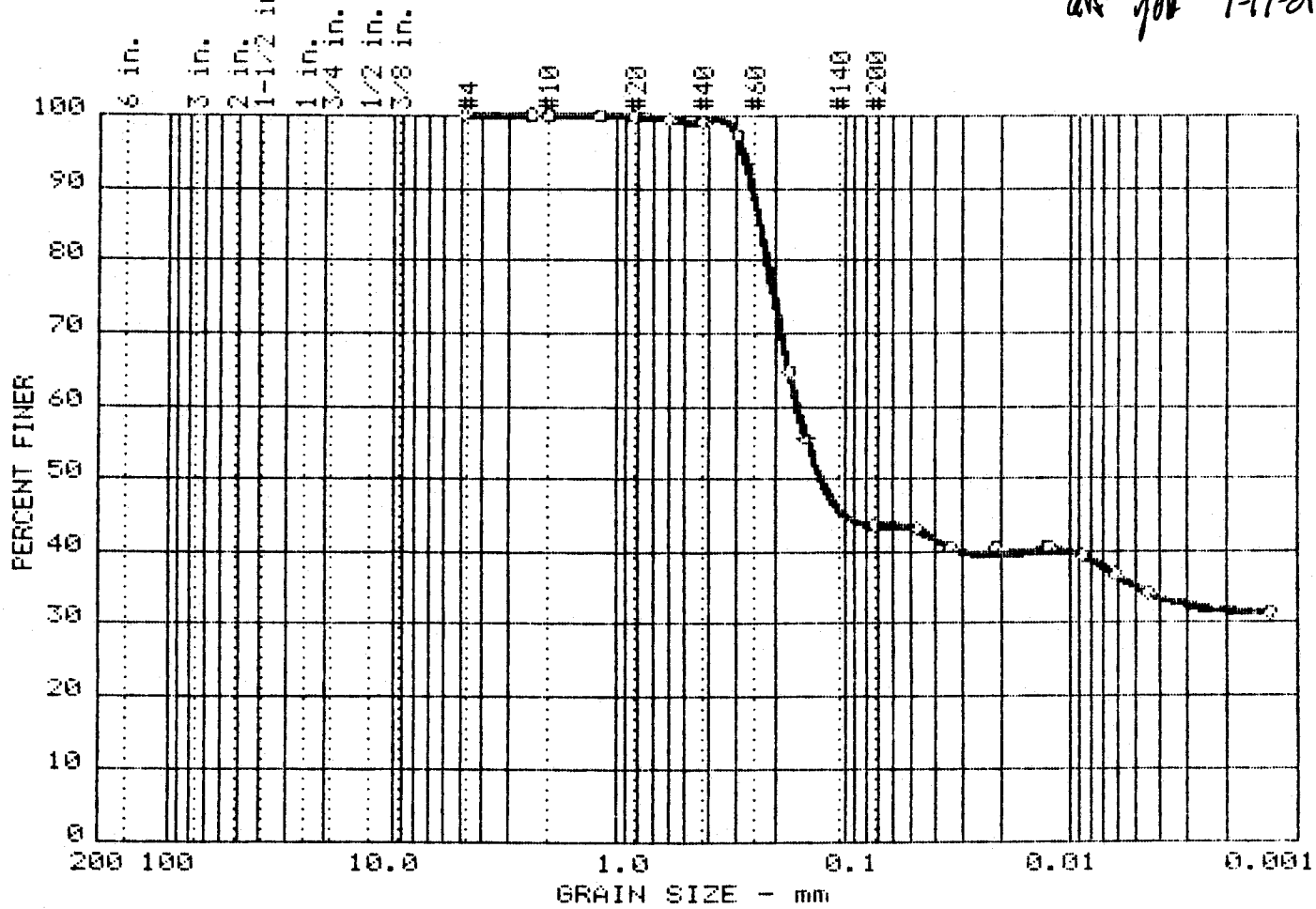
GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Figure No. _____

AMZ 7-17-89

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
O	1	0.0	0.0	56.5	8.5	35.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O			0.23	0.16	0.13					

MATERIAL DESCRIPTION	USCS	AASHTO
O		

Project No.: 467.38
Project: WEYCO/PLYMOUTH
O Location: TP-26 3.0-3.5'

Date: 7-10-89

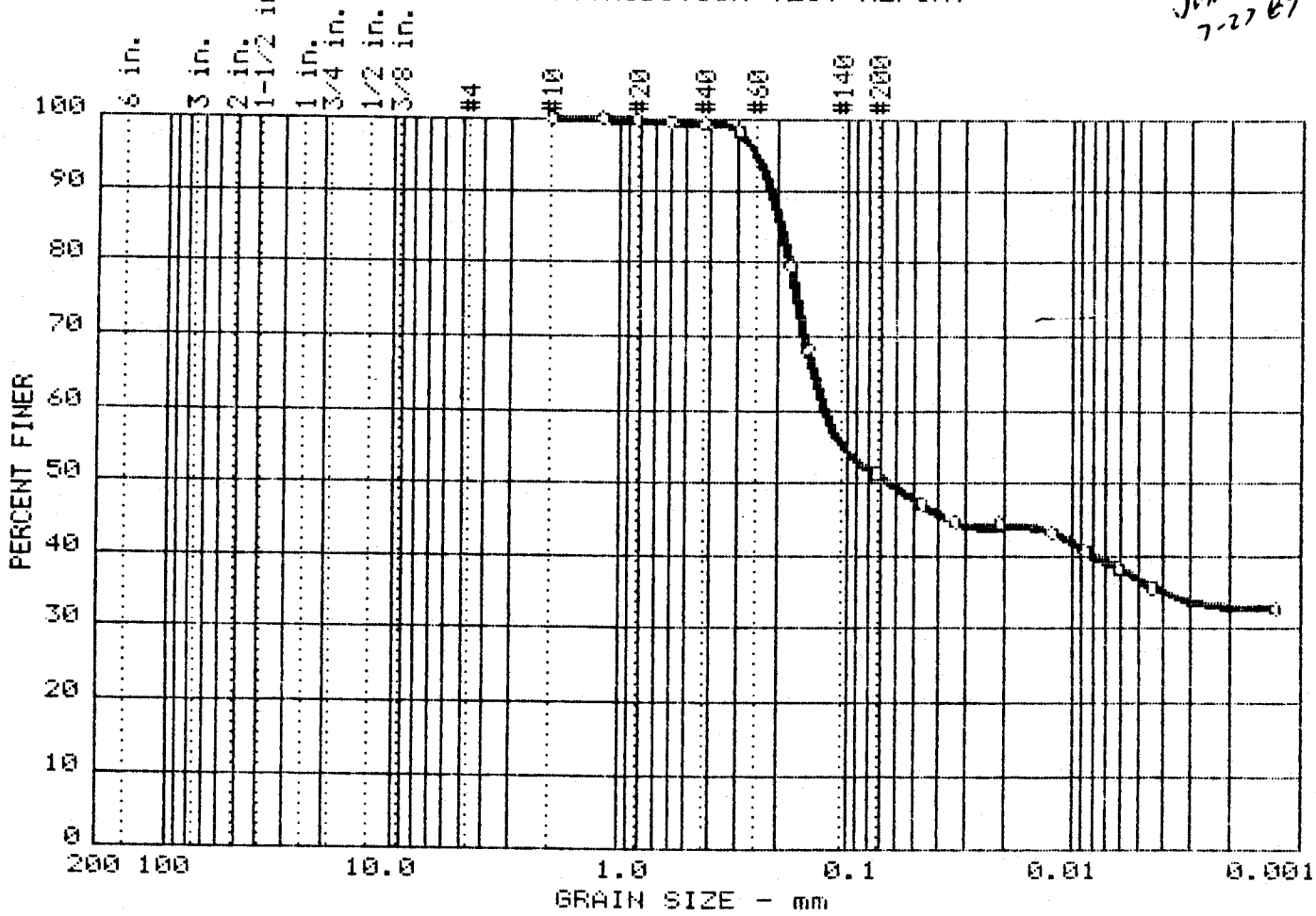
Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Figure No. _____

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	%+75mm	% GRAVEL	% SAND	% SILT	% CLAY
O	10	0.0	0.0	49.0	14.5	36.5

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
O			0.19	0.13	0.06					

MATERIAL DESCRIPTION	USCS	AASHTO
O		

Project No.: 467.38
Project: WEYCO/PLYMOUTH
O Location: TP-26 5.0-5.5

Date: 7-10-89

Remarks:

GRAIN SIZE DISTRIBUTION TEST REPORT

RMT Inc.

Figure No._____

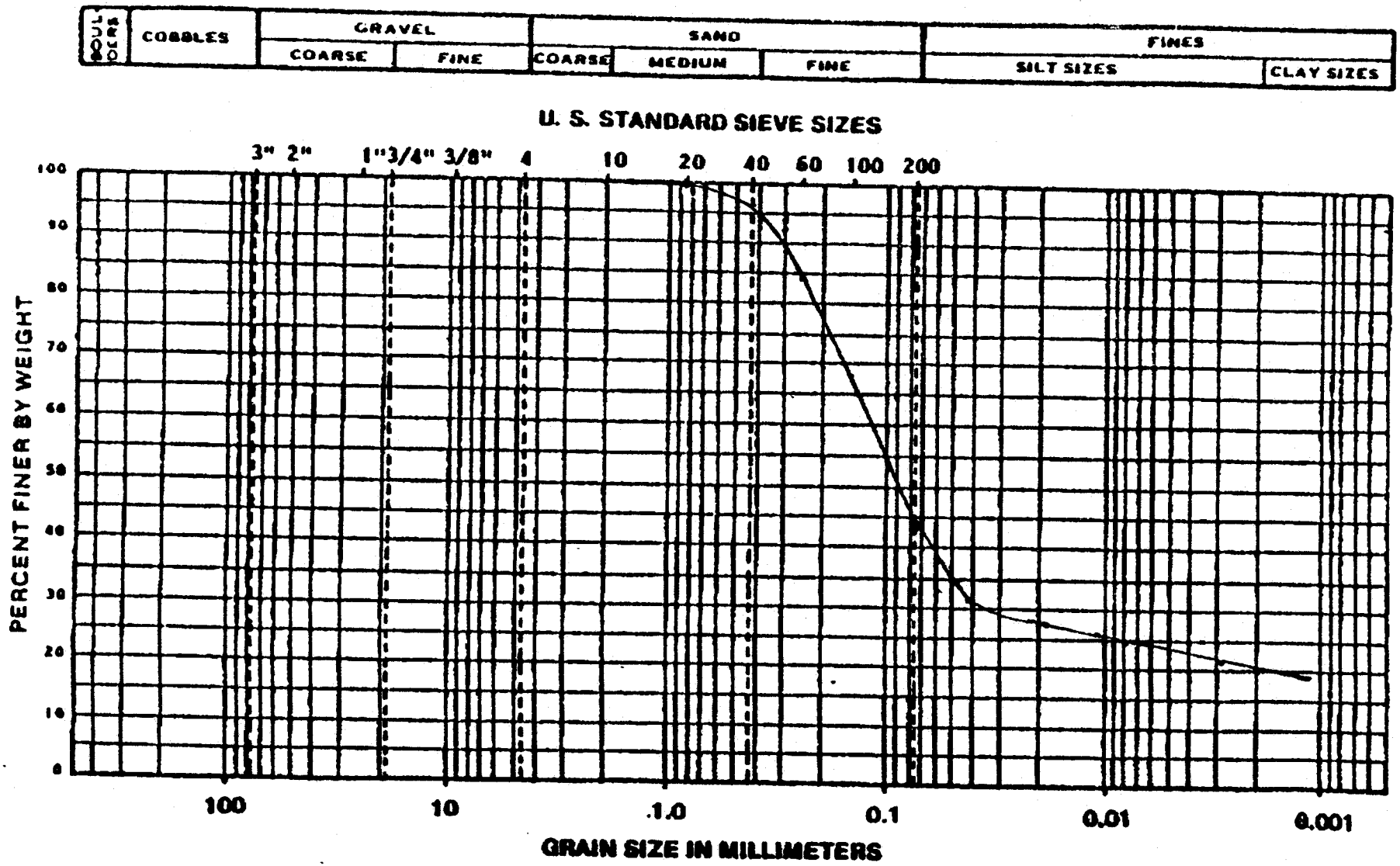
LABORATORY DATA SUMMARY SHEET

RMT, INC.
WEYERHAEUSER LANDFILL
LAW ENGINEERING PROJECT NO. J-4596

LOCATION	SAMPLE DEPTH (ft.)	SAMPLE TYPE	UNIFIED SOIL CLASSIFICATION	UNIT WEIGHT pcf WET	UNIT WEIGHT pcf DRY	% FINER NO. 200	SPECIFIC GRAVITY	VOID RATIO	NATURAL MOISTURE %	ATTERBERG LIMITS L.L.	ATTERBERG LIMITS P.L.	ATTERBERG LIMITS P.I.	T	U	C	P
NM-4	5-7	UD					2.66		19.3	29	16	13	X			

NOTES:
1. Soil tests performed in accordance with applicable ASTM Standards
2. Soil classification in accordance with Unified Soil Classification System
3. T = see Triaxial Test Results
4. U = see Unconfined Compression Test Results
5. C = see Consolidation Test Results
6. P = see Proctor Test Results
7. UD = Undisturbed Sample
8. SS = Split Spoon Sample

LAW ENGINEERING, INC.

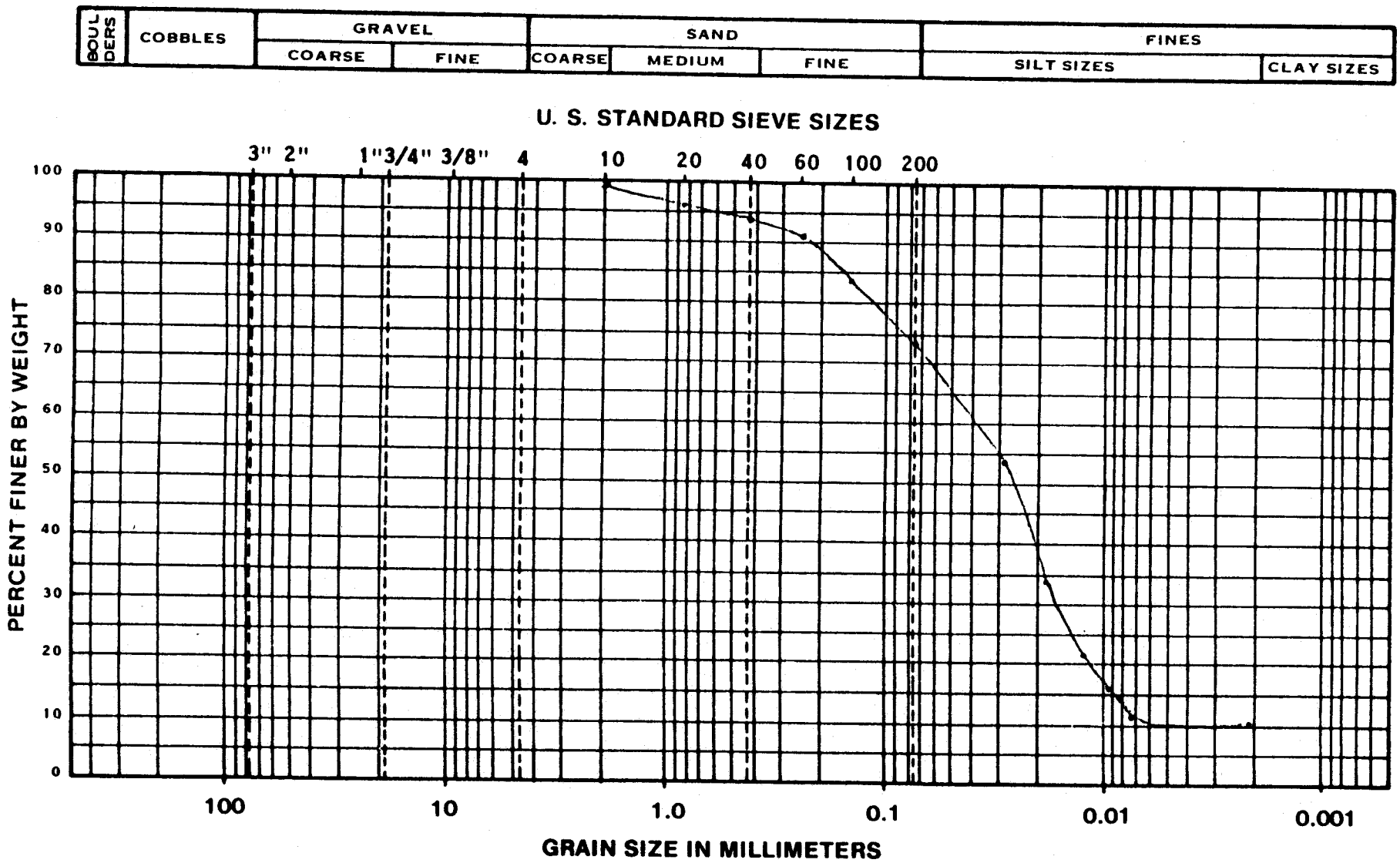


Law Engineering

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
HN-4	5-7 FT.	79.3%	29	16	13	Clayey silty fine SAND (SC)
JOB NO. J-4596						

1400001



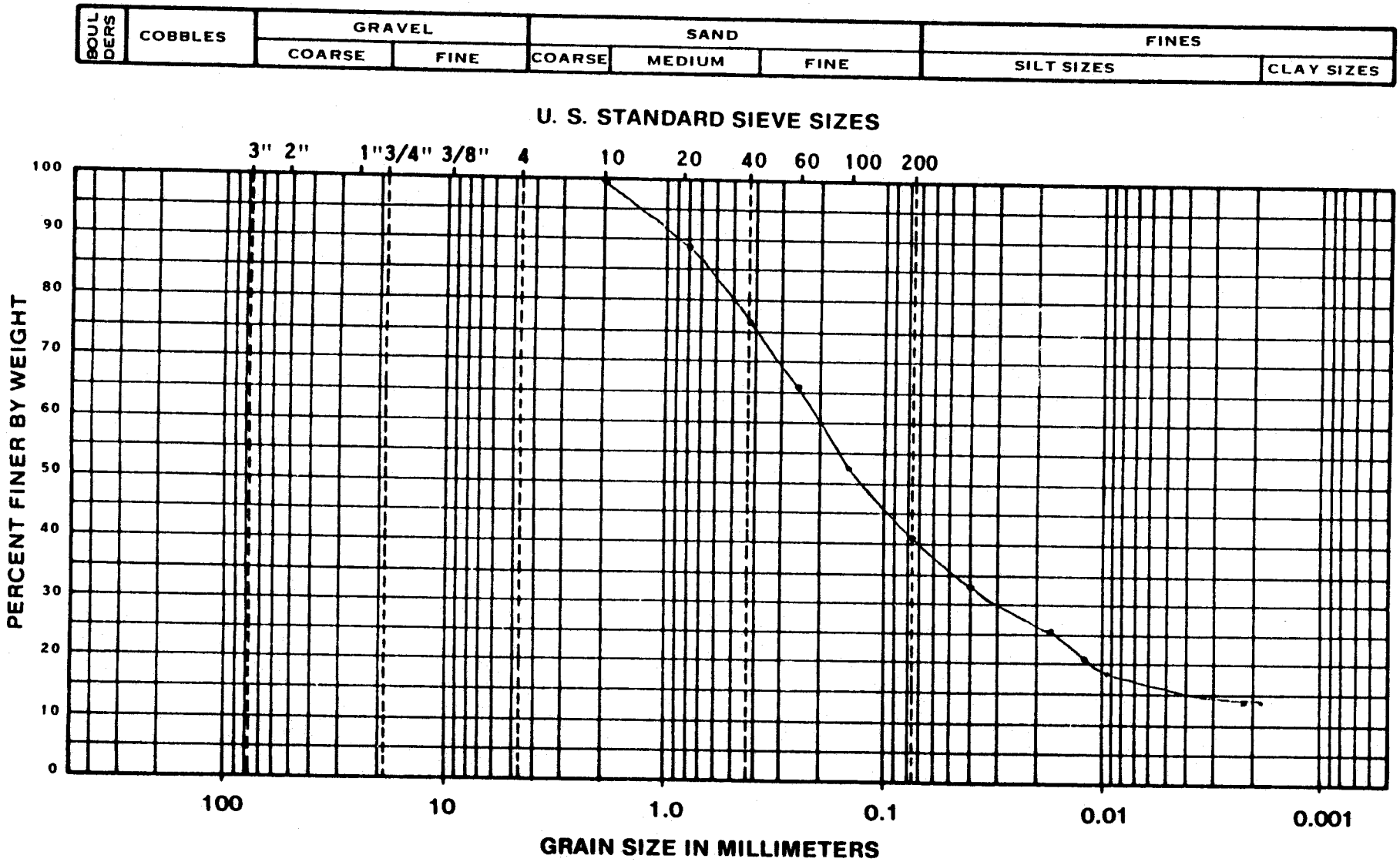
Law Engineering

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
GB-1	0-.5'	43.9%				

JOB NO. J-4596

1400001



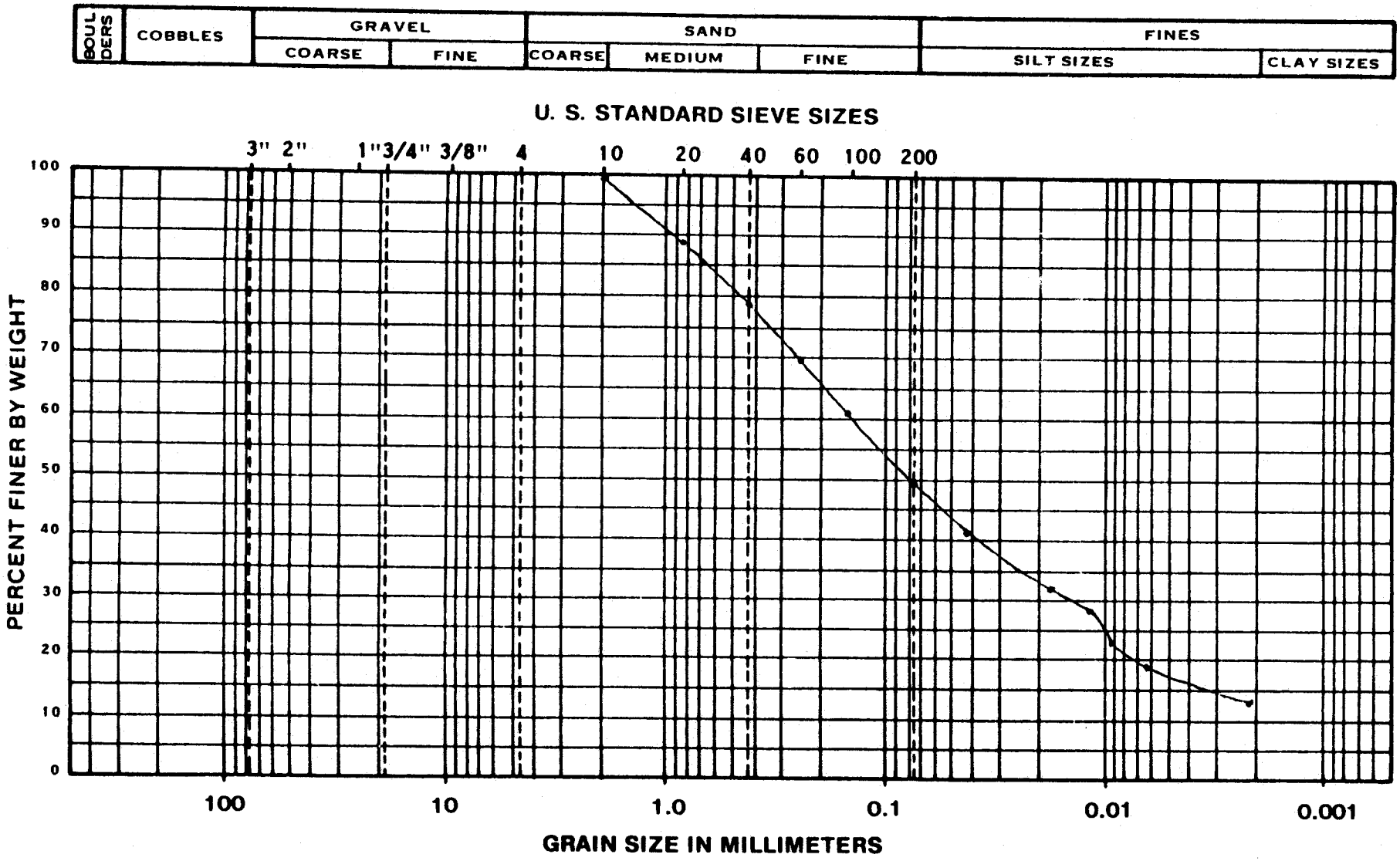
Law Engineering

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
GB-6	0-.5'	47.4%				

JOB NO. J-4596

1400001



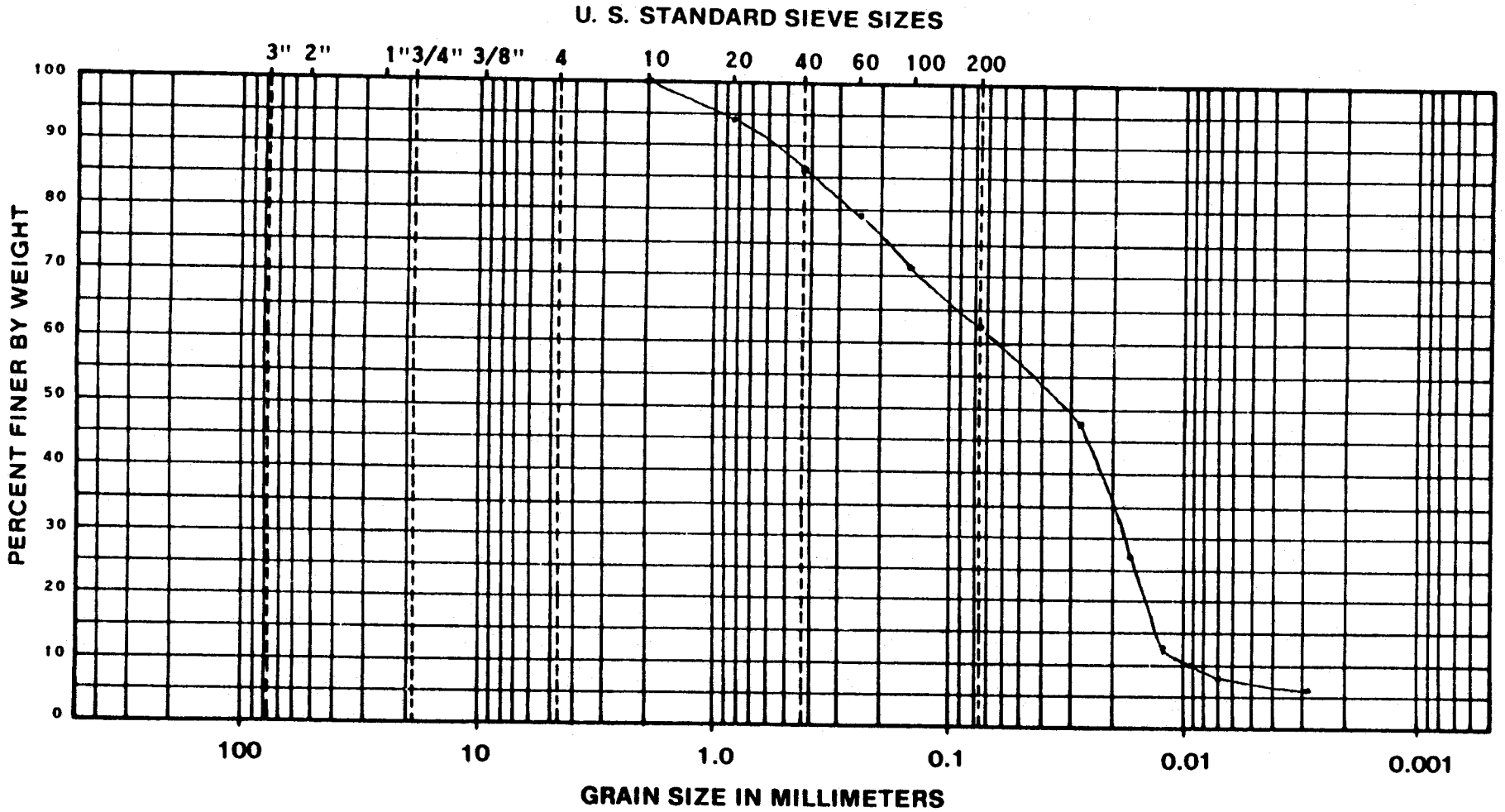
Law Engineering

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
GB-6	4.5'	70.4%				
JOB NO.						
J-4596						

1400001

BOULDERS	COBBLES	GRAVEL		SAND			FINES	
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT SIZES	CLAY SIZES



Law Engineering

Grain Size Distribution

BORING NO.	DEPTH	NAT WC	LL	PL	PI	DESCRIPTION OR CLASSIFICATION
GB-10	0-.5'	52.8%				
JOB NO.						
J-4596						

1400001

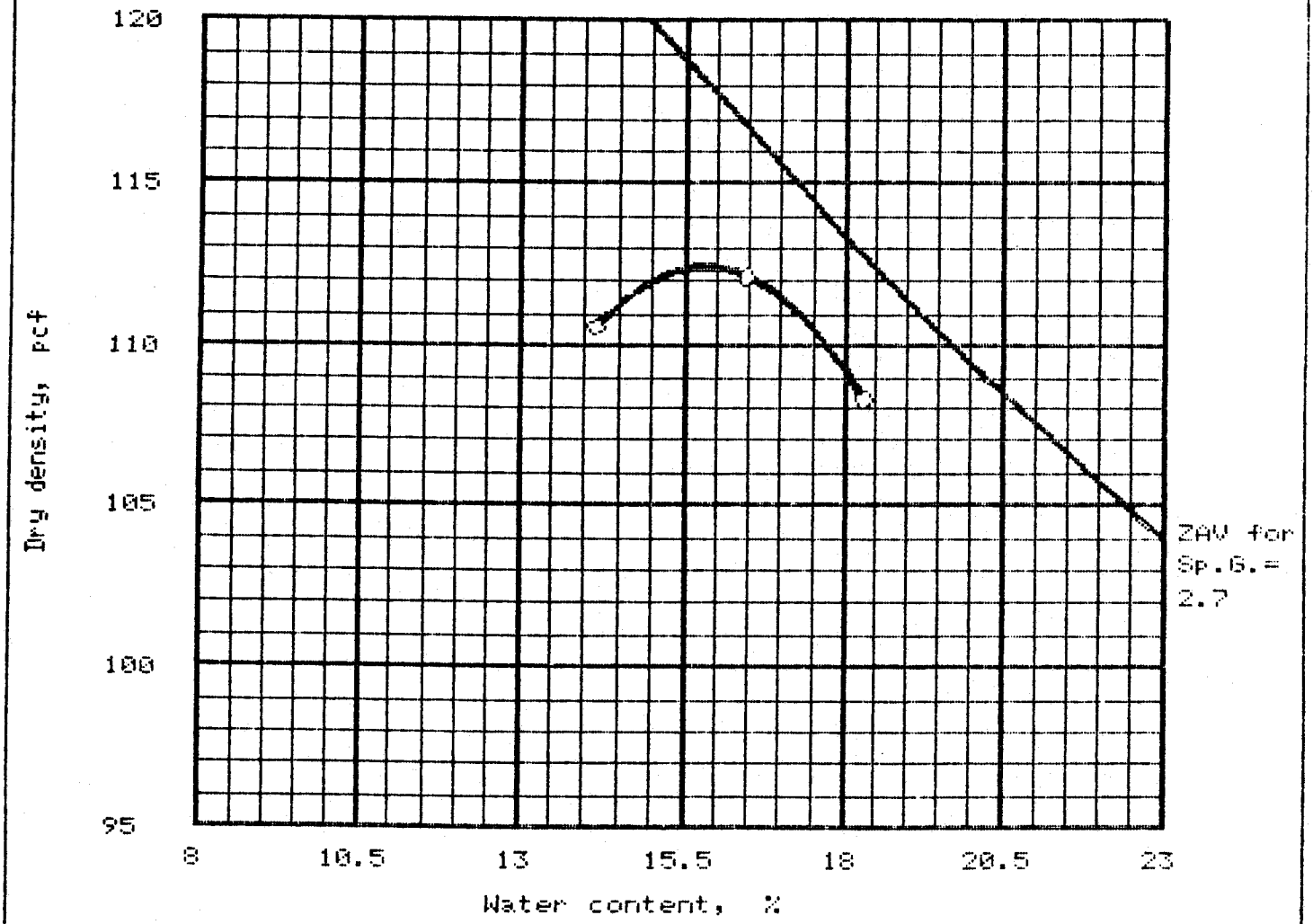
APPENDIX B.2

STANDARD PROCTOR TEST RESULTS

AMC 7-17-89

ANV JOH 7-17-89

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL		18.1 %	2.64	29	11	0	80

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 15.8 % Maximum dry density = 112.4 pcf	

Project No.: 467.38

Project: WEYCO/PLYMOUTH

Location: TP-21, 1.5-2.0'

Date: 7-14-1989

Remarks:

PROCTOR TEST REPORT

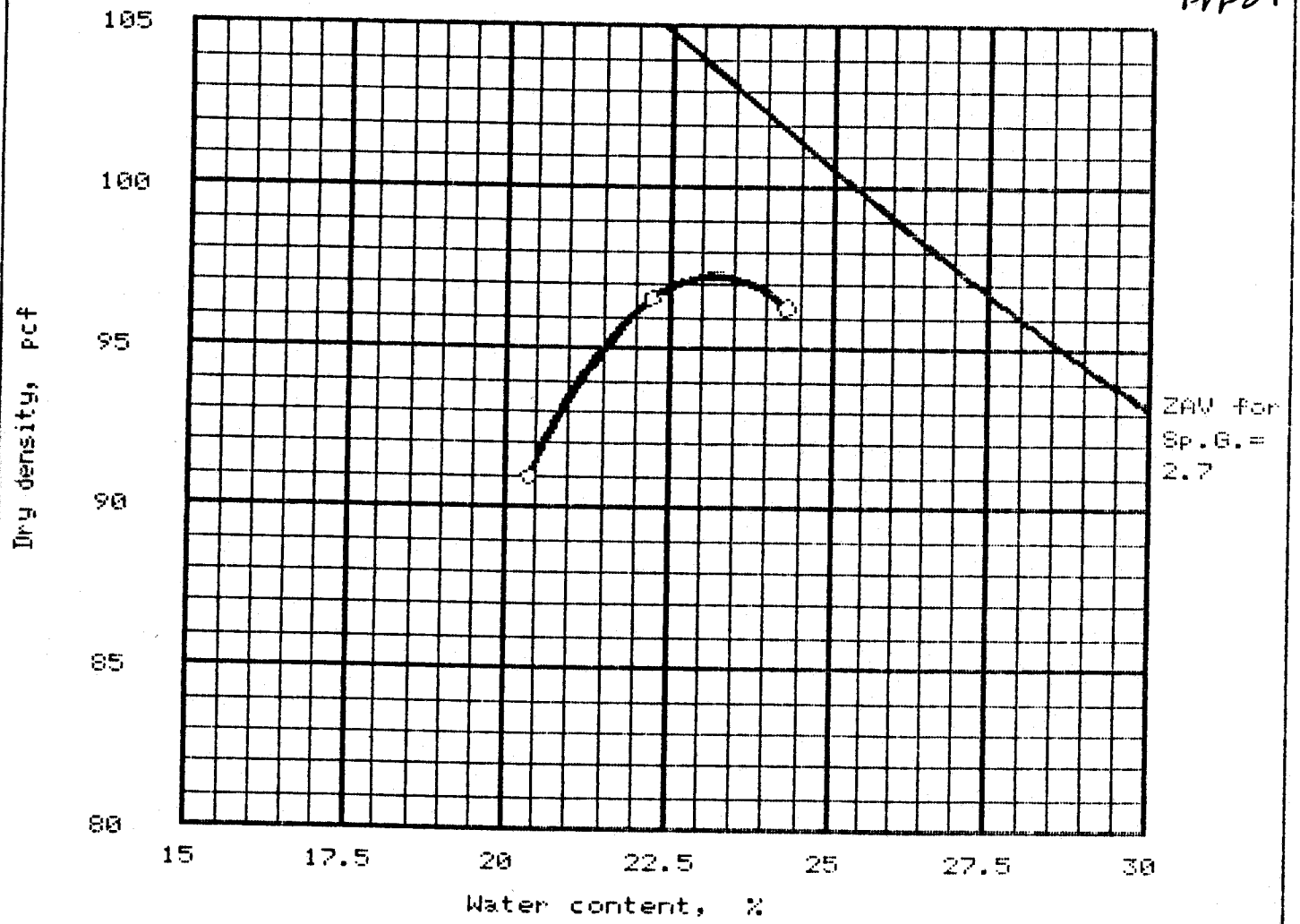
RMT Inc.

Figure No. _____

AMZ 7-17-89

CAF JOW 7/17/89

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CH		29.2 %	2.62	55	28	0	78

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 23.2 % Maximum dry density = 97.3 pcf	

Project No.: 467.38
Project: WEYCO/PLYMOUTH
Location: TP-21, 3.5-4.5'

Date: 7-14-1989

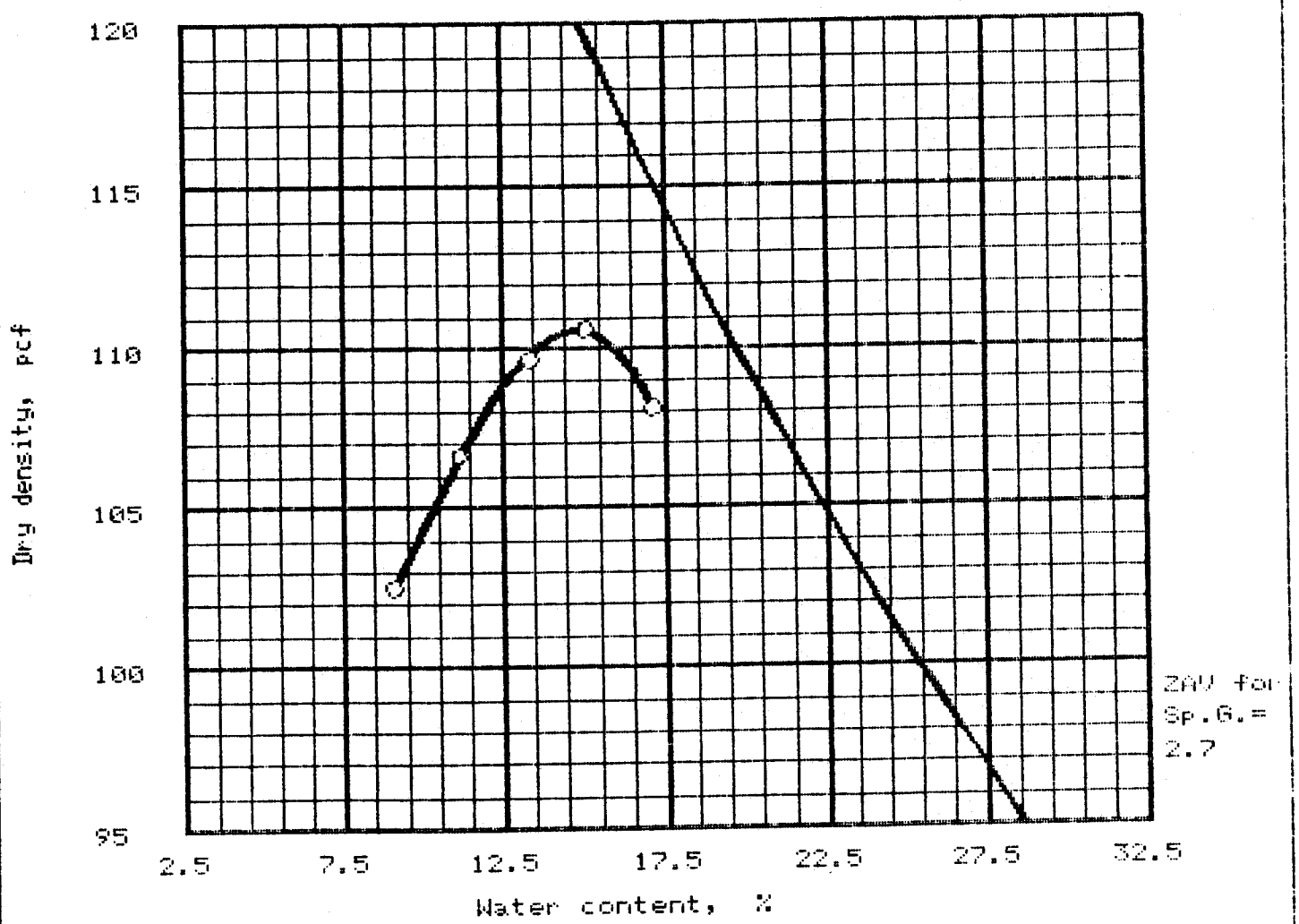
Remarks:

PROCTOR TEST REPORT

RMT Inc.

Figure No. _____

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SM		19.7	2.64	23	2	0	27

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 14.8 % Maximum dry density = 110.6 pcf	LT. BRN. CLAY

Project No.: 467.38
Project: WEYCO/PLYMOUTH
Location: TP-22 3.0-4.0'

Date: 7-17-89

Remarks:

PROCTOR TEST REPORT

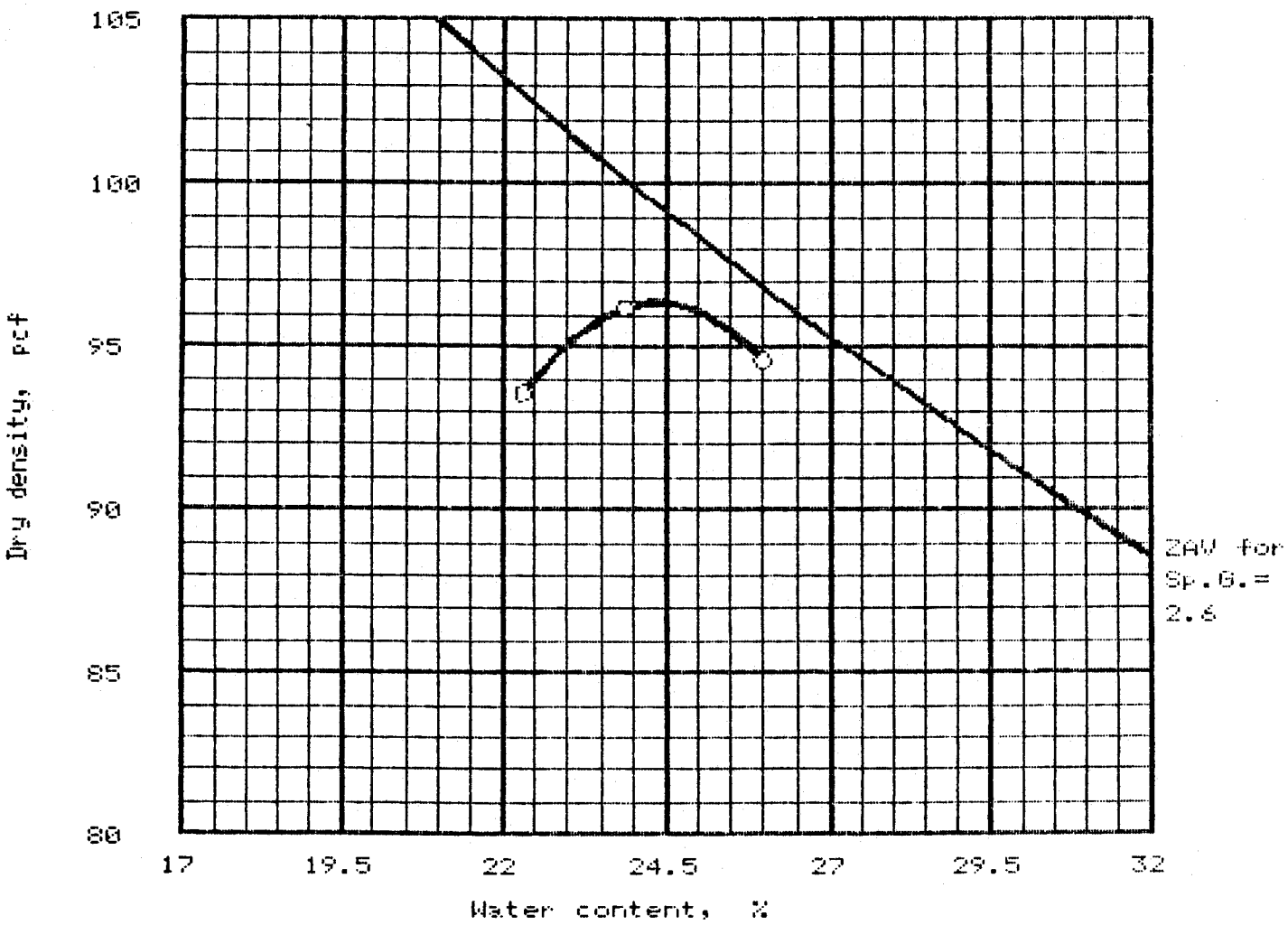
RMT Inc.

Figure No. _____

GTF 7-20-89

JCH 7-21-89

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CH		20.1	2.67	61	31	0	73

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 24.4 % Maximum dry density = 96.4 pcf	LT. BROWN CLAY

Project No.: 467.38

Project: WEYCO/PLYMOUTH

Location: TP-24, 3.0-3.5

Date: 7-20-1989

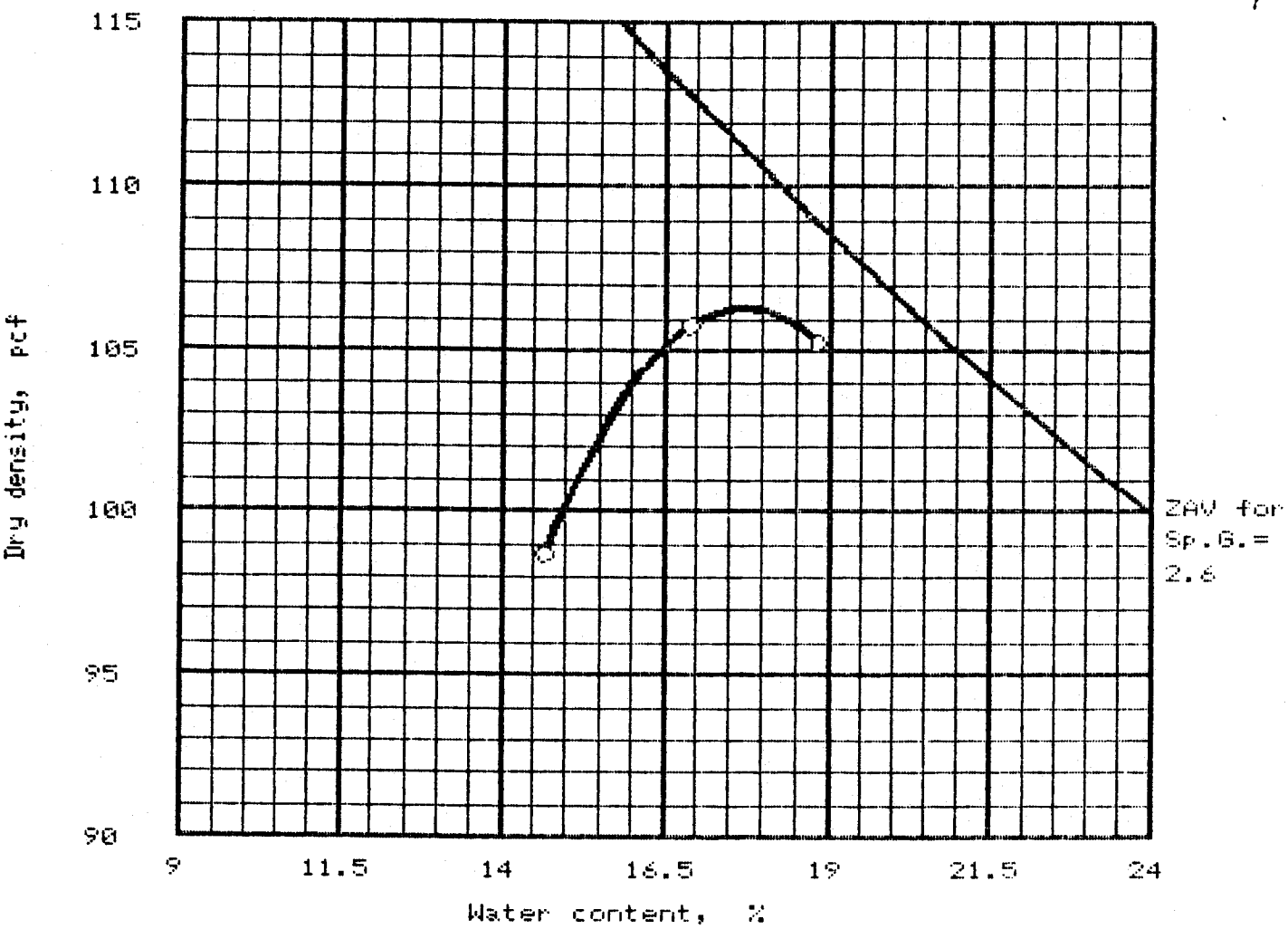
Remarks:

PROCTOR TEST REPORT

RMT Inc.

Figure No. _____

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	SC		20.1	2.67	36	14	0	41

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 17.7 % Maximum dry density = 106.3 pcf	SILTY CLAY LT BROWN-RUST

Project No.: 467.38

Project: WEYCO/PLYMOUTH

Location: TP-26, 3.0-3.5

Date: 7-20-1989

Remarks:

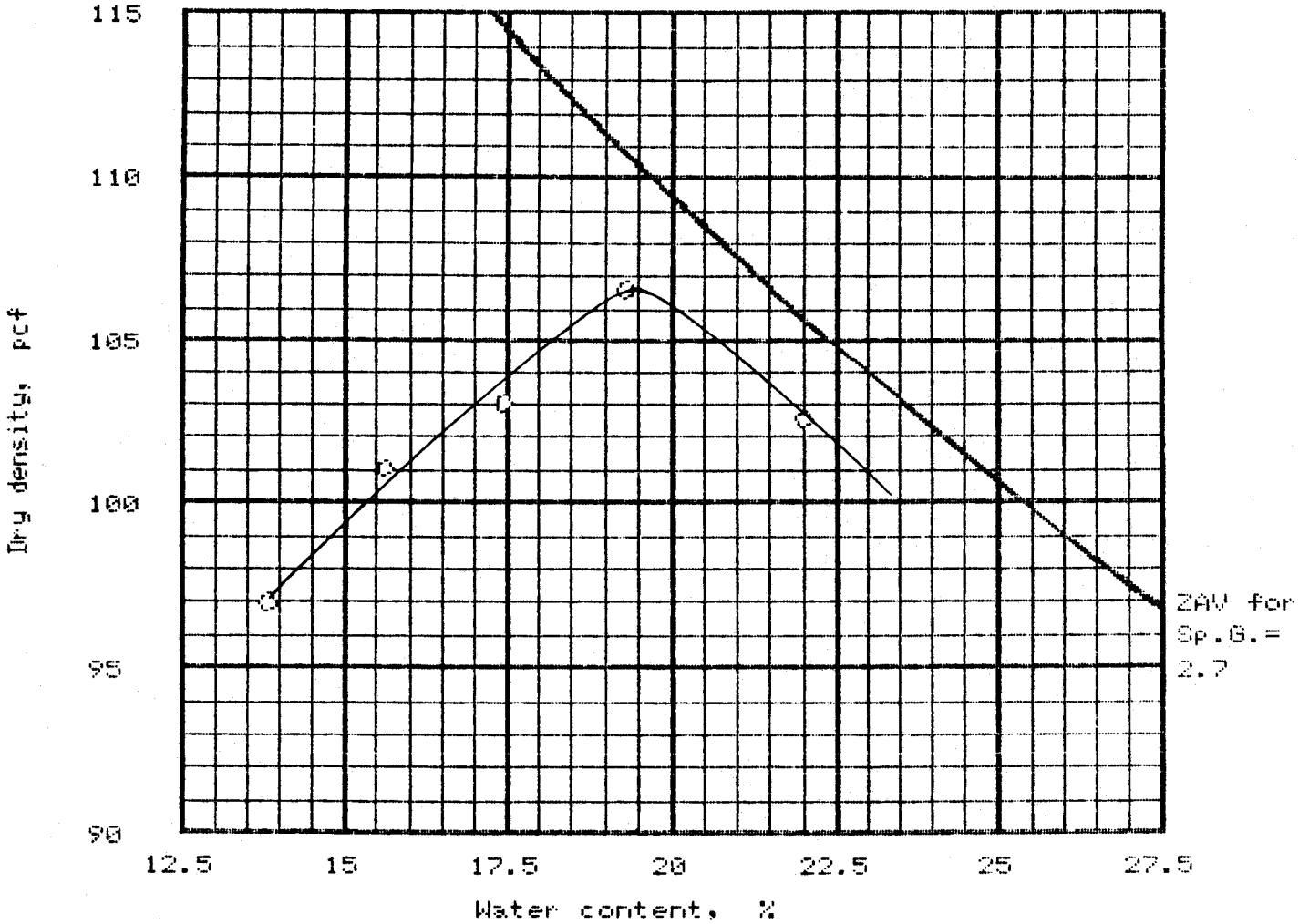
PROCTOR TEST REPORT

RMT Inc.

Figure No._____

GJF 7-21-89
JSH 7-27-89

PROCTOR TEST REPORT



"Standard" Proctor, ASTM D 698, Method A

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > No.4	% < No.200
	USCS	AASHTO						
	CL		20.7	2.7	36	15	0	51

TEST RESULTS	MATERIAL DESCRIPTION
Optimum moisture = 19.5 % Maximum dry density = 106.6 pcf	
Project No.: 467.38 Project: WEYCO/PLYMOUTH Location: TP-26 5.0-5.5 Date: 7-17-89	Remarks:
PROCTOR TEST REPORT RMT Inc.	Figure No.

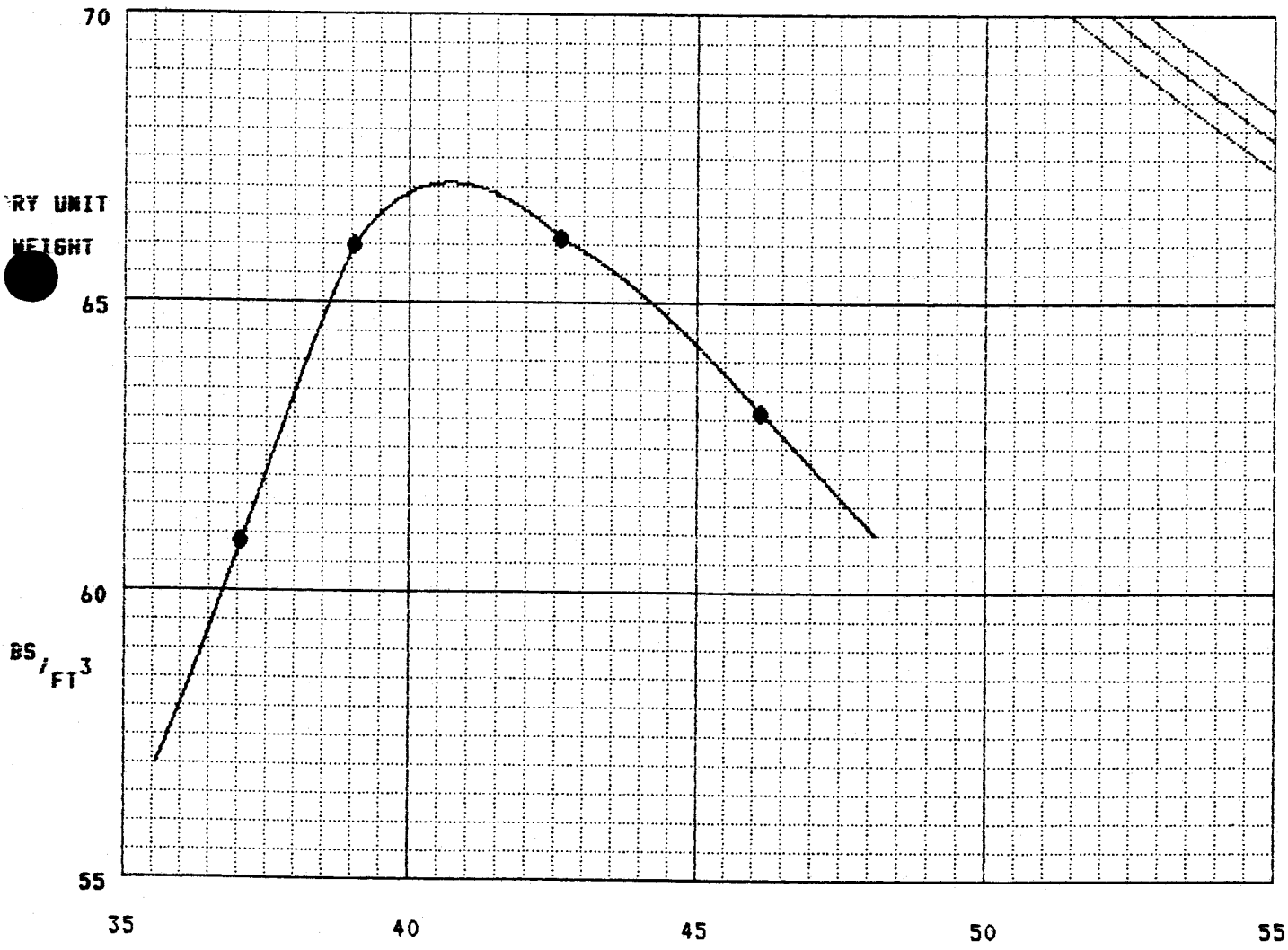
LAW ENGINEERING

STANDARD PROCTOR REPORT
ASTM D 698A

DATE: JULY 20,1989
PROJECT NUMBER: J47789-4596
PROJECT NAME: WAYCO PLYMOUTH
CLIENT: RMT
SAMPLE NUMBER: ~~SAMPLE 2~~ GB-6 0.0 - 0.5'
FIELD MOISTURE: N/A

SOIL DESCRIPTION:
(VISUAL)DARK GRAY SLIGHTLY SANDY ASH
PROPOSED USE:
FILL MATERIAL
SOURCE LOCATION:
ON SITE

MOISTURE - DENSITY RELATIONSHIP



OPTIMUM MOISTURE CONTENT 40.7 MAXIMUM DRY DENSITY 67.1

APPENDIX B.3

FALLING HEAD PERMEABILITY TESTS

7-20-89 BW
✓JPH 7-21-89

RMT, Inc.
Falling Head Permeability Test

Job:	WEYERHAEUSER / PLYMOUTH	Date:	20-Jul-89
Job #:	476.37	Tech:	HJW
Sample:	MW-2, S-1	File:	WYPLY1
:	15-17'	Cell #:	9S
Visual Descript:	TAN SILTY-SAND		

INPUT VALUES

	INIT.	FINAL		
Sample Dia. (in)	2.87	2.87	Permeant:	DEAIRED TAP WAT.
Sample Ht. (in)	2.44	2.38	Permeant Specific Gravity:	1.00
Tare & Wet (g)	209.9	766.0	Sample Specific Gravity:	2.70 EST.
Tare & Dry (g)	194.7	668.2	Confining Pressure (psi):	100.0
Tare (g)	115.9	262.7	Burette Diameter (in):	0.250
Sample Wt. (g)	499.8	503.3	Burette Zero (cm):	100.0

CALCULATED VALUES

MOISTURE (%)	19.3	24.1	MAXIMUM GRADIENT:	13.8
WET DENS. (pcf)	120.6	124.5	AVERAGE GRADIENT:	11.4
DRY DENS. (pcf)	101.1	100.3	MAX. EFFECT. STRESS (psi):	6.0
SATURATION (%)	78.3	95.9	MIN. EFFECT. STRESS (psi):	4.6
			AVE. EFFECT. STRESS (psi):	5.3

Y	Date MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
89	7	6	7	17.0	0	95	95	31.60	2.50	100.40			
89	7	6	7	17.5	20	95	95	31.60	6.50	96.40	0.0	6.5E-05	
89	7	6	7	18.0	20	95	95	31.60	10.20	92.70	-0.0	6.6E-05	
89	7	6	7	18.5	20	95	95	31.60	13.40	89.50	-0.0	6.2E-05	
89	7	6	7	19.0	20	95	95	31.60	16.40	86.50	-0.0	6.3E-05	
89	7	6	7	19.5	20	95	95	31.60	19.00	83.90	0.0	5.9E-05	
89	7	6	7	20.0	20	95	95	31.60	21.60	81.30	-0.0	6.4E-05	
89	7	6	7	20.5	20	95	95	31.60	23.80	79.10	-0.0	5.9E-05	
89	7	6	7	30.0	0	95	95	31.60	2.20	100.90			
89	7	6	7	30.5	20	95	95	31.60	6.10	97.00	-0.0	6.3E-05	
89	7	6	7	31.0	20	95	95	31.60	9.60	93.50	0.0	6.1E-05	
89	7	6	7	31.5	20	95	95	31.60	12.80	90.30	-0.0	6.1E-05	
89	7	6	7	32.0	20	95	95	31.60	15.70	87.40	0.0	5.9E-05	
89	7	6	7	32.5	20	95	95	31.60	18.50	84.60	-0.0	6.2E-05	
89	7	6	7	33.0	20	95	95	31.60	21.00	82.10	0.0	6.0E-05	
89	7	6	7	33.5	20	95	95	31.60	23.30	79.80	0.0	6.0E-05	
89	7	6	13	1	0	95	95	30.80	2.20	100.20			
89	7	6	13	1.5	20	95	95	30.80	6.00	96.40	0.0	6.2E-05	
89	7	6	13	2	20	95	95	30.80	9.60	92.80	-0.0	6.3E-05	
89	7	6	13	2.5	20	95	95	30.80	12.70	89.70	0.0	5.9E-05	1
89	7	6	13	3	20	95	95	30.80	15.60	86.80	-0.0	6.0E-05	1
89	7	6	13	3.5	20	95	95	30.80	18.40	83.90	-1.8	6.4E-05	1
89	7	6	13	4	20	95	95	30.80	20.90	81.40	0.0	6.1E-05	1
89	7	6	13	4.5	20	95	95	30.80	23.20	79.10	-0.0	6.0E-05	1

Average Kv for those rows with a 1 in the Ave. column 6.1E-05 cm/sec
2.4E-05 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

7-26-89

✓ JPH 7-27-89

RMT. Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-21
: 1.5-2.0'
Visual Descript:

Date: 26-Jul-89
Tech: HJW
File: WEY6
Cell #: 1S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.49	2.46
Sample Ht. (in)	2.26	2.22
Tare & Wet (g)	183.6	435.5
Tare & Dry (g)	173.4	376.3
Tare (g)	116.1	76.9
Sample Wt. (g)	353.7	358.6

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	100.0	

CALCULATED VALUES

	INIT.	FINAL
MOISTURE (%)	17.9	19.7
WET DENS. (pcf)	122.4	129.5
DRY DENS. (pcf)	103.8	108.1
SATURATION (%)	77.7	95.5

MAXIMUM GRADIENT:	9.4
AVERAGE GRADIENT:	9.0
MAX. EFFECT. STRESS (psi):	5.9
MIN. EFFECT. STRESS (psi):	4.9
AVE. EFFECT. STRESS (psi):	5.4

Date YY	MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
89	7	19	10	35	0	95	95	7.00	1.55	69.25			
89	7	20	7	37	21	95	95	7.30	4.25	68.50	56.5	4.5E-08	
89	7	20	14	11	21	95	95	7.00	4.85	68.00	9.1	4.8E-08	
89	7	21	7	30	20	95	95	8.00	6.25	66.60	-0.0	4.8E-08	
89	7	21	9	59	20	95	95	7.90	6.45	66.40	0.0	4.9E-08	
89	7	23	17	50	21	95	95	8.40	10.15	63.00	4.2	4.1E-08	
89	7	24	7	14	20	95	95	8.50	10.80	62.20	-10.3	3.8E-08	1
89	7	25	7	51	21	95	95	8.80	12.00	61.10	4.3	3.4E-08	1

Average Kv for those rows with a 1 in the Ave. column 3.6E-08 cm/sec
1.4E-08 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

7-26-89

✓ JPH 7-27-89

RMT. Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-21
: 3.5-4.5'
Visual Descript:

Date: 26-Jul-89
Tech: HJW
File: WEY5
Cell #: 2S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.49
Sample Ht. (in)	2.35	2.27
Tare & Wet (g)	180.4	419.8
Tare & Dry (g)	165.7	339.0
Tare (g)	114.5	76.7
Sample Wt. (g)	334.7	343.1

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	100.0	

CALCULATED VALUES

	INIT.	FINAL
MOISTURE (%)	28.8	30.8
WET DENS. (pcf)	110.5	118.2
DRY DENS. (pcf)	85.8	90.4
SATURATION (%)	80.8	96.3

MAXIMUM GRADIENT:	10.0
AVERAGE GRADIENT:	9.8
MAX. EFFECT. STRESS (psi):	6.0
MIN. EFFECT. STRESS (psi):	5.0
AVE. EFFECT. STRESS (psi):	ERR

YY	Date MM	Date DD	Time HH	Time MM	Temp *	Press.(psi) BOT	Press.(psi) TOP	Readings (cm) CHAM	Readings (cm) BOT	Readings (cm) TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
[illegible]	7	19	10	46	0	95	95	2.50	2.15	69.70			
[illegible]	7	20	13	28	0	95	95	2.10	8.00	70.00			
[illegible]	7	20	14	12	21	95	95	2.10	8.00	70.00	ERR	0.0E+00	
[illegible]	7	21	7	31	20	95	95	3.10	8.70	69.60	27.3	1.9E-08	
89	7	21	9	58	20	95	95	3.00	8.80	69.50	0.0	2.4E-08	
89	7	23	17	51	20	95	95	4.10	10.50	68.20	13.3	1.6E-08	
89	7	24	7	15	20	95	95	4.30	10.85	67.90	7.7	1.5E-08	1
89	7	25	7	53	20	95	95	4.80	11.50	67.25	-0.0	1.7E-08	1

Average Kv for those rows with a 1 in the Ave. column 1.6E-08 cm/sec
6.4E-09 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

JPH 7-27-89

RMT, Inc.
Falling Head Permeability Test

Job: WETCO/PLYMOUTH
Job #: 467.38
Sample: TP-22
: 3-4'
Visual Descript:

Date: 26-Jul-89
Tech: HJW
File: WEY4
Cell #: 3S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.49	2.48
Sample Ht. (in)	2.27	2.25
Tare & Wet (g)	182.2	438.6
Tare & Dry (g)	170.9	373.2
Tare (g)	114.0	76.6
Sample Wt. (g)	354.5	362.0

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	100.0	

CALCULATED VALUES

	INIT.	FINAL
MOISTURE (%)	19.8	22.1
WET DENS. (pcf)	122.2	126.9
DRY DENS. (pcf)	102.0	103.9
SATURATION (%)	81.9	95.9

MAXIMUM GRADIENT:	10.9
AVERAGE GRADIENT:	8.3
MAX. EFFECT. STRESS (psi):	5.8
MIN. EFFECT. STRESS (psi):	4.9
AVE. EFFECT. STRESS (psi):	ERR

Date YY	MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
89	7	19	10	56	0	95	95	9.70	3.20	67.80			
89	7	20	13	20	21	95	95	9.50	10.50	3.20	-79.7	ERR	
89	7	20	14	13	21	95	95	10.50	31.80	38.50	-404.3	ERR	
89	7	21	10	46	0	95	95	11.60	2.00	69.00			
89	7	21	9	51	20	95	95	11.60	8.50	62.50	0.0	-4.3E-06	
89	7	21	10	0	20	95	95	11.50	17.45	53.50	-0.3	4.9E-05	
89	7	21	10	11	20	95	95	11.50	25.10	45.70	-1.0	5.5E-05	
89	7	21	15	10	0	95	95	11.40	1.50	69.40			
89	7	21	15	14	21	95	95	11.40	8.55	62.40	0.4	6.3E-05	
89	7	21	15	18	21	95	95	11.35	13.50	57.40	-0.5	5.6E-05	
89	7	21	15	25	21	95	95	11.35	19.10	51.60	-1.8	4.7E-05	
89	7	25	8	7	0	95	95	12.70	4.20	66.70			
89	7	25	8	12	20	95	95	12.70	11.00	59.80	-0.7	5.4E-05	1
89	7	25	8	16	20	95	95	12.70	15.30	55.50	0.0	5.3E-05	1
89	7	25	8	19	20	95	95	12.70	17.90	52.80	-1.9	5.1E-05	1

Average Kv for those rows with a 1 in the Ave. column — 5.3E-05 cm/sec, 2.1E-05 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

JPH 7-27-89

RMT, Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-24
: 3.0-3.5
Visual Descript:

Date: 26-Jul-89
Tech: HJW
File: WEY3
Cell #: 4S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.50
Sample Ht. (in)	2.30	2.30
Tare & Wet (g)	180.0	422.8
Tare & Dry (g)	166.2	335.5
Tare (g)	115.4	76.5
Sample Wt. (g)	328.3	346.3

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	100.0	

CALCULATED VALUES

	INIT.	FINAL
MOISTURE (%)	27.1	33.7
WET DENS. (pcf)	110.8	116.9
DRY DENS. (pcf)	87.2	87.4
SATURATION (%)	78.3	98.1

MAXIMUM GRADIENT:	11.5
AVERAGE GRADIENT:	9.0
MAX. EFFECT. STRESS (psi):	6.0
MIN. EFFECT. STRESS (psi):	5.0
AVE. EFFECT. STRESS (psi):	5.5

YY	Date MM	Date DD	Time HH	Time MM	Temp *	Press.(psi) BOT	Press.(psi) TOP	Readings (cm) CHAM	Readings (cm) BOT	Readings (cm) TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
8	7	19	11	8	0	95	95	2.15	2.30	69.40			
89	7	20	7	35	21	95	95	1.10	8.30	66.70	37.9	1.2E-07	
89	7	20	14	14	21	95	95	1.40	9.40	65.80	10.0	9.6E-08	
89	7	21	7	33	20	95	95	1.70	11.90	63.60	6.4	9.2E-08	
89	7	21	10	1	20	95	95	1.50	12.20	63.35	9.1	7.9E-08	1
89	7	23	17	52	20	95	95	2.01	17.70	58.40	5.3	7.5E-08	1
89	7	23	17	54	0	95	95	2.00	2.10	69.25			
89	7	24	7	16	20	95	95	2.00	3.90	67.60	4.3	7.2E-08	1
89	7	25	7	54	20	95	95	2.40	6.70	65.00	3.7	6.6E-08	1

Average Kv for those rows with a 1 in the Ave. column 7.3E-08 cm/sec
2.9E-08 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

✓ JH 7-27-89

RMT. Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-26
: 3.0-3.5'
Visual Descript:

Date: 26-Jul-89
Tech: HJW
File: WEY2
Cell #: 5S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.49	2.48
Sample Ht. (in)	2.25	2.25
Tare & Wet (g)	177.5	432.6
Tare & Dry (g)	166.9	357.6
Tare (g)	114.8	77.1
Sample Wt. (g)	340.0	355.6

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	70.0	

CALCULATED VALUES

MOISTURE (%)	20.4	26.7
WET DENS. (pcf)	118.2	124.6
DRY DENS. (pcf)	98.2	98.3
SATURATION (%)	76.8	101.2

MAXIMUM GRADIENT:	10.6
AVERAGE GRADIENT:	8.8
MAX. EFFECT. STRESS (psi):	5.9
MIN. EFFECT. STRESS (psi):	4.9
AVE. EFFECT. STRESS (psi):	5.3

Date YY	MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
89	7	19	16	40	0	95	95	6.75	3.85	67.85			
89	7	20	13	30	0	95	95	7.20	6.00	66.00			
89	7	20	14	15	21	95	95	7.30	26.10	45.90	0.0	2.7E-05	
89	7	21	9	48	0	95	95	8.20	2.30	69.40			
89	7	21	9	54	20	95	95	8.00	7.40	64.55	2.5	2.9E-05	
89	7	21	10	1	20	95	95	8.00	11.80	60.10	-0.6	2.6E-05	
89	7	21	10	12	20	95	95	8.00	17.30	54.70	0.9	2.5E-05	
89	7	21	15	11	0	95	95	8.00	1.90	69.20			
89	7	21	15	17	20	95	95	7.90	5.90	65.30	1.3	2.3E-05	
89	7	21	15	23	20	95	95	7.90	10.50	60.60	-1.1	3.1E-05	
89	7	21	15	38	20	95	95	7.90	17.80	53.20	-0.7	2.5E-05	
89	7	25	8	9	0	95	95	8.90	3.00	65.30			
89	7	25	8	13	20	95	95	8.90	5.90	66.20	190.0	8.9E-06	
89	7	25	8	17	20	95	95	8.90	8.40	63.60	-2.0	2.4E-05	1
89	7	25	8	31	20	95	95	8.80	15.30	57.60	7.0	2.1E-05	1

Average Kv for those rows with a 1 in the Ave. column — 2.2E-05 cm/sec, 8.8E-06 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

✓ HJW
8-22-89
✓ JPH 8-24-89

RMT, Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-26 3-3.5'
:
Visual Descript:

Date: 21-Aug-89
Tech: HJW
File: WEY
Cell #: 6S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.50
Sample Ht. (in)	2.30	2.25
Tare & Wet (g)	172.6	444.6
Tare & Dry (g)	161.7	374.6
Tare (g)	115.0	76.4
Sample Wt. (g)	366.7	368.2

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	100.0	

CALCULATED VALUES

	INIT.	FINAL
MOISTURE (%)	23.2	23.5
WET DENS. (pcf)	123.7	127.3
DRY DENS. (pcf)	100.4	103.1
SATURATION (%)	92.6	99.9

MAXIMUM GRADIENT:	11.4
AVERAGE GRADIENT:	11.2
MAX. EFFECT. STRESS (psi):	5.8
MIN. EFFECT. STRESS (psi):	4.8
AVE. EFFECT. STRESS (psi):	5.3

Date MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
8	9	13	3	0	95	95	11.00	2.20	69.20			
8	10	7	28	21	95	95	13.30	3.30	69.80	340.0	7.2E-09	
8	11	7	30	21	95	95	13.70	3.95	69.50	36.8	1.1E-08	
8	11	12	9	0	95	95	13.45	1.60	69.50			
8	14	7	24	21	95	95	14.40	2.90	68.60	18.2	8.7E-09	
8	15	7	33	21	95	95	14.30	3.30	68.20	0.0	9.0E-09	
8	16	7	46	22	95	95	14.00	3.75	67.90	20.0	8.6E-09	1
8	17	9	26	21	95	95	13.85	4.15	67.50	-0.0	8.7E-09	1

Average Kv for those rows with a 1 in the Ave. column — 8.6E-09 cm/sec, 3.4E-09 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

7-26-89

JPH 7-27-89

RMT, Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-26
: 5.0-5.5'
Visual Descript:

Date: 26-Jul-89
Tech: HJW
File: WEY1
Cell #: 6S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.49
Sample Ht. (in)	2.25	2.25
Tare & Wet (g)	178.8	441.2
Tare & Dry (g)	167.7	363.6
Tare (g)	114.0	78.7
Sample Wt. (g)	344.7	362.5

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.375	
Burette Zero (cm):	70.0	

CALCULATED VALUES

MOISTURE (%)	20.7	27.3
WET DENS. (pcf)	118.9	126.0
DRY DENS. (pcf)	98.5	99.0
SATURATION (%)	78.8	104.9

MAXIMUM GRADIENT:	11.9
AVERAGE GRADIENT:	11.7
MAX. EFFECT. STRESS (psi):	5.9
MIN. EFFECT. STRESS (psi):	4.9
AVE. EFFECT. STRESS (psi):	5.4

YY	Date MM	Date DD	Time HH	Time MM	Temp *	Press.(psi) BOT	Press.(psi) TOP	Readings (cm) CHAM	Readings (cm) BOT	Readings (cm) TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
89	7	19	16	48	0	95	95	4.95	1.60	69.60			
89	7	20	7	35	0	95	95	6.50	2.15	69.40			
89	7	20	14	20	21	95	95	6.50	4.00	67.50	-1.3	1.5E-07	
89	7	21	9	49	0	95	95	7.50	1.30	69.55			
89	7	21	9	55	20	95	95	7.45	1.50	69.40	14.3	9.3E-07	
89	7	21	10	2	20	95	95	7.45	1.80	69.15	9.1	1.3E-06	1
89	7	21	10	13	20	95	95	7.45	2.10	68.90	9.1	8.1E-07	1
89	7	21	15	13	0	95	95	7.45	1.70	69.80			
89	7	25	8	11	0	95	95	8.45	2.30	69.00			
89	7	25	8	32	20	95	95	8.40	2.90	68.30	-7.7	1.0E-06	1

Average Kv for those rows with a 1 in the Ave. column 1.0E-06 cm/sec
4.0E-07 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

✓ HJW 8-22-89 ✓ JFH 6-27-89

RMT, Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: TP-26, 5-5.5'
:
Visual Descript:

Date: 21-Aug-89
Tech: HJW
File: WEY8
Cell #: 7S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.50
Sample Ht. (in)	2.35	2.28
Tare & Wet (g)	189.1	450.0
Tare & Dry (g)	174.4	376.1
Tare (g)	115.1	78.0
Sample Wt. (g)	371.3	372.0

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.250	
Burette Zero (cm):	100.0	

CALCULATED VALUES

MOISTURE (%)	24.8	24.8
WET DENS. (pcf)	122.6	126.6
DRY DENS. (pcf)	98.3	101.4
SATURATION (%)	93.6	101.3

MAXIMUM GRADIENT:	15.9
AVERAGE GRADIENT:	15.2
MAX. EFFECT. STRESS (psi):	6.3
MIN. EFFECT. STRESS (psi):	4.8
AVE. EFFECT. STRESS (psi):	5.4

Date MM	DD	Time HH	MM	Temp *	Press.(psi) BOT	TOP	Readings (cm) CHAM	BOT	TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
89	8	9	15 24	0	95	95	9.20	2.20	101.60			
89	8	10	7 33	21	95	95	18.30	4.30	101.50	90.9	1.1E-08	
89	8	11	7 29	21	95	95	19.55	5.90	100.20	10.3	1.0E-08	
89	8	11	12 15	0	95	95	18.70	1.65	102.40			
89	8	14	7 29	21	95	95	22.70	5.95	98.30	2.4	1.0E-08	
89	8	15	7 28	21	95	95	22.00	7.40	97.00	5.5	1.0E-08	1
89	8	16	7 49	22	95	95	20.40	8.75	95.70	1.9	9.9E-09	1
89	8	17	9 17	21	95	95	20.10	10.20	94.20	-1.7	1.1E-08	1

Average Kv for those rows with a 1 in the Ave. column — 1.0E-08 cm/sec, 4.1E-09 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

✓ HWW 8-22-89 ✓ JH 8-24-89

RMT, Inc.
Falling Head Permeability Test

Job: WEYCO/PLYMOUTH
Job #: 467.38
Sample: COMPOSITE TP-22, 3-4'
: &TP-21, 3.5-4.5'
Visual Descript:

Date: 21-Aug-89
Tech: HJW
File: WEY9
Cell #: 9S

INPUT VALUES

	INIT.	FINAL
Sample Dia. (in)	2.50	2.45
Sample Ht. (in)	2.30	2.20
Tare & Wet (g)	180.9	416.9
Tare & Dry (g)	168.7	349.7
Tare (g)	115.3	78.7
Sample Wt. (g)	329.9	338.2

Permeant:	DEAIRED TAP WATE	
Permeant Specific Gravity:	1.00	
Sample Specific Gravity:	2.70	EST.
Confining Pressure (psi):	100.0	
Burette Diameter (in):	0.250	
Burette Zero (cm):	100.0	

CALCULATED VALUES

	INIT.	FINAL
MOISTURE (%)	22.9	24.8
WET DENS. (pcf)	111.3	124.2
DRY DENS. (pcf)	90.6	99.5
SATURATION (%)	71.9	96.7

MAXIMUM GRADIENT:	12.2
AVERAGE GRADIENT:	10.1
MAX. EFFECT. STRESS (psi):	6.3
MIN. EFFECT. STRESS (psi):	4.8
AVE. EFFECT. STRESS (psi):	5.4

Date YY MM DD	Time HH MM	Temp *	Press.(psi) BOT	Press.(psi) TOP	Readings (cm) CHAM	Readings (cm) BOT	Readings (cm) TOP	Flow Dif. %	Kv cm/sec	Ave. 0,1
9 8 9	16 7	0	95	95	11.70	2.25	100.40			
9 8 10	7 35	21	95	95	17.80	10.40	97.30	44.9	6.4E-08	
9 8 11	7 27	21	95	95	19.30	18.85	91.10	15.4	6.3E-08	
9 8 11	12 17	0	95	95	18.40	1.45	101.20			
9 8 14	7 32	21	95	95	21.80	17.45	85.60	1.3	4.6E-08	
9 8 15	7 26	21	95	95	21.00	21.50	81.60	0.6	4.3E-08	1
9 8 16	7 50	22	95	95	19.40	25.10	78.05	0.7	4.2E-08	1
9 8 17	9 16	21	95	95	19.20	28.40	74.90	2.3	4.1E-08	1

Average Kv for those rows with a 1 in the Ave. column 4.2E-08 cm/sec
1.6E-08 in/sec

Termination determined by stable Kv and low flow differential
* A zero in this column starts a series of measurements

APPENDIX B.4

CONSOLIDATION TEST

LAW ENGINEERING TESTING COMPANY

CONSOLIDATION TEST

ATE	JULY 21,1989
NUMBER	J-4596
OB NAME	WEYCO / PLYMOUTH
ORING NUMBER	MW-4
EPTH	10'-12'
AMPLE ID.	(VISUAL) OLIVE BROWN SILTY CLAY

SOIL PROPERTIES

PECIFIC GRAVITY	2.65	INITIAL WET UNIT WT (PCF)	118.79
ET SAMPLE WT (GM)	148.60	INITIAL WATER CONTENT (%)	33.0
OL OF SAMPLE (CC)	78.12	INITIAL SATURATION (%)	102.58
IA OF SAMPLE (IN)	2.50	INITIAL VOID RATIO	0.8525

AMPLE INUNDATED AT 0.1 KSF
QUARE ROOT OF TIME METHOD
OUBLE DRAINAGE
UILTIN CORRECTIONS USED

CONSOLIDATION TEST RESULTS

STRESS (KSF)	D(0) (IN)	D(90) (IN)	D(END) (IN)	T(90) MIN	SAMPLE HT AT END	% INIT	% SEC
0.1	0.2471	0.2469	0.2466	0.75	0.9705	32	48
0.5	0.2451	0.2431	0.2428	3.24	0.9671	40	2
.1	0.2453	0.2454	0.2455	1.00	0.9694	-	-
.5	0.2448	0.2433	0.2431	4.00	0.9674	30	1
1.0	0.2420	0.2393	0.2387	4.00	0.9633	27	7
2.0	0.2359	0.2300	0.2292	6.25	0.9544	30	2
4.0	0.2252	0.2154	0.2139	7.02	0.9400	27	3
8.0	0.2085	0.1897	0.1866	11.56	0.9141	21	4
0.1	0.2205	0.2206	0.2207	840.00	0.9446	-	-

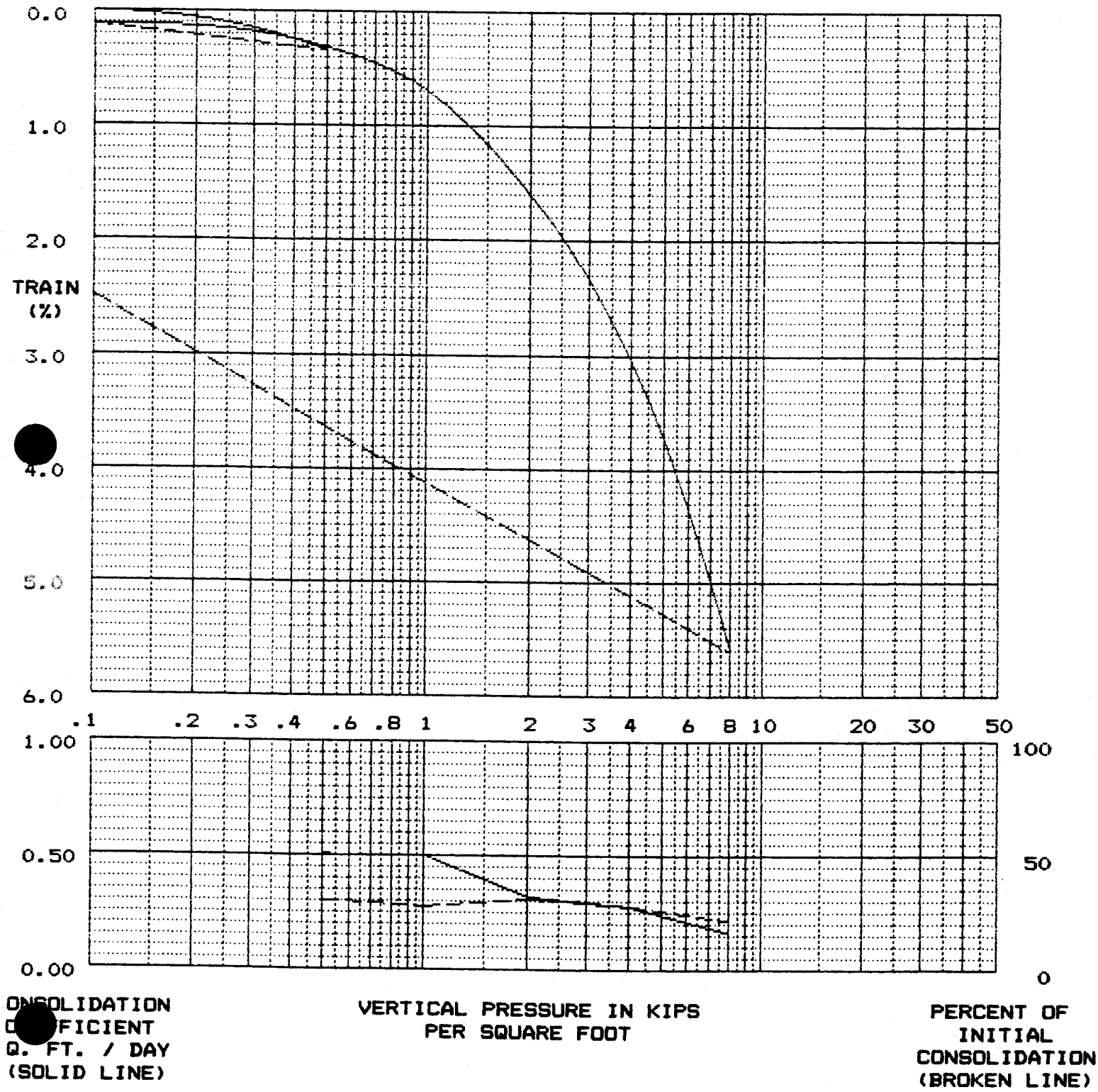
STRESS (KSF)	SAMPLE HEIGHT (IN)	STRAIN (%)	VOID RATIO	AVG STRESS (KSF)	CV SQFT/DAY	PERM 1/1000 FT/DAY	MV 1/1000 SQFT/KIP	CC
0.1	0.9708	0.00	0.852					
0.5	0.9674	0.34	0.846	0.30	0.61	0.329	8.61	0.009
0.1	0.9697	0.11	0.850	0.30	-	-	-	-
0.5	0.9677	0.32	0.846	0.30	0.50	0.158	5.10	0.005
1.0	0.9639	0.70	0.839	0.75	0.49	0.239	7.78	0.024
2.0	0.9551	1.61	0.822	1.50	0.31	0.178	9.21	0.056
4.0	0.9411	3.05	0.796	3.00	0.27	0.124	7.44	0.089
8.0	0.9162	5.62	0.748	6.00	0.15	0.065	6.79	0.158
0.1	0.9467	2.48	0.806	4.05	-	-	-	-

LAW ENGINEERING TESTING COMPANY

CONSOLIDATION TEST

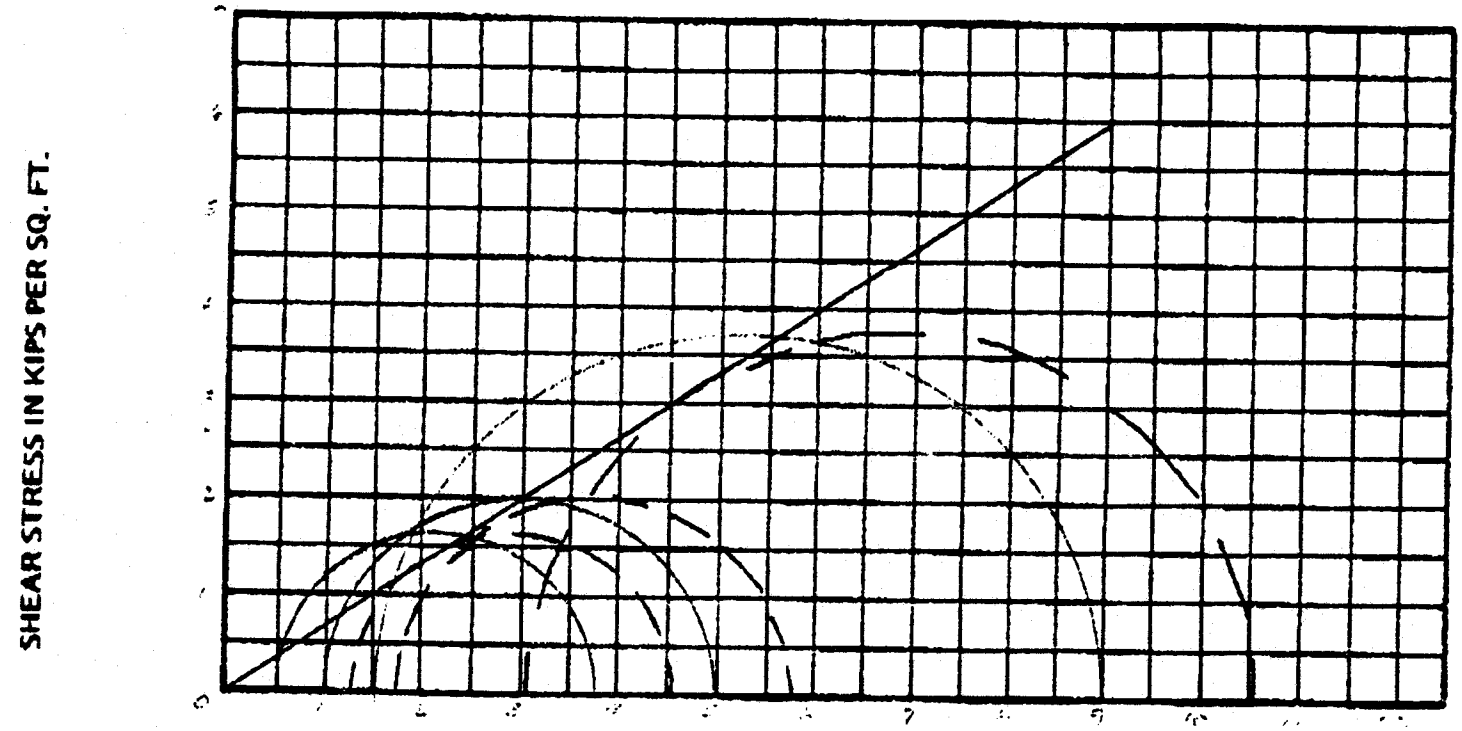
ATE	JULY 21,1989
NUMBER	J-4596
NAME	WEYCO / PLYMOUTH
ORING NUMBER	MW-4
EPTH	10'-12'
AMPLE TYPE	UD

WATER CONTENT	(%)	33.0
SATURATION	(%)	102.6
DRY UNIT WEIGHT	(PCF)	89.3
WET UNIT WEIGHT	(PCF)	118.8
COMPRESSION INDEX		0.158
		AT 8.00 KSF



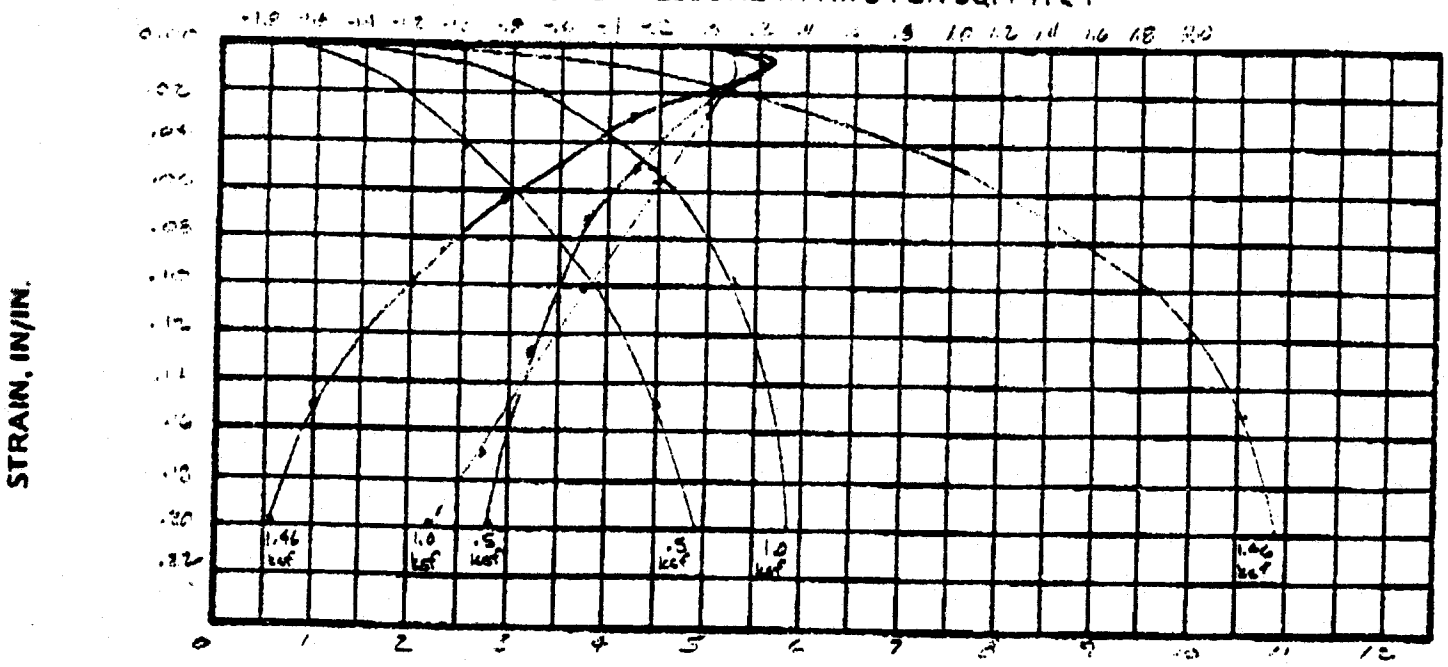
APPENDIX B.5

TRIAXIAL SHEAR STRENGTH AND DIRECT SHEAR STRENGTH TEST RESULTS



MOHR DIAGRAMS

EXCESS PORE PRESSURE IN KIPS PER SQ. FT. (e)



STRESS-STRAIN AND PORE PRESSURE-STRAIN CURVES

EFFECTIVE COHESION, c̄ 0

EFFECTIVE SHEAR ANGLE, φ̄ 33°

TOTAL COHESION, c

TOTAL SHEAR ANGLE, φ

VOID RATIO 0.456, 0.566, 0.539

DRY DENSITY (PCF) 114.0, 106.0, 107.9

MOISTURE CONTENT (%) 17.1, 21.3, 20.3

SATURATED, CONSOLIDATED UNDRAINED TRIAXIAL SHEAR TEST WITH PORE PRESSURE MEASUREMENTS

SAMPLE NO. UD BORING NO. MW-4

DEPTH 5'-7' JOB NO. J-4596

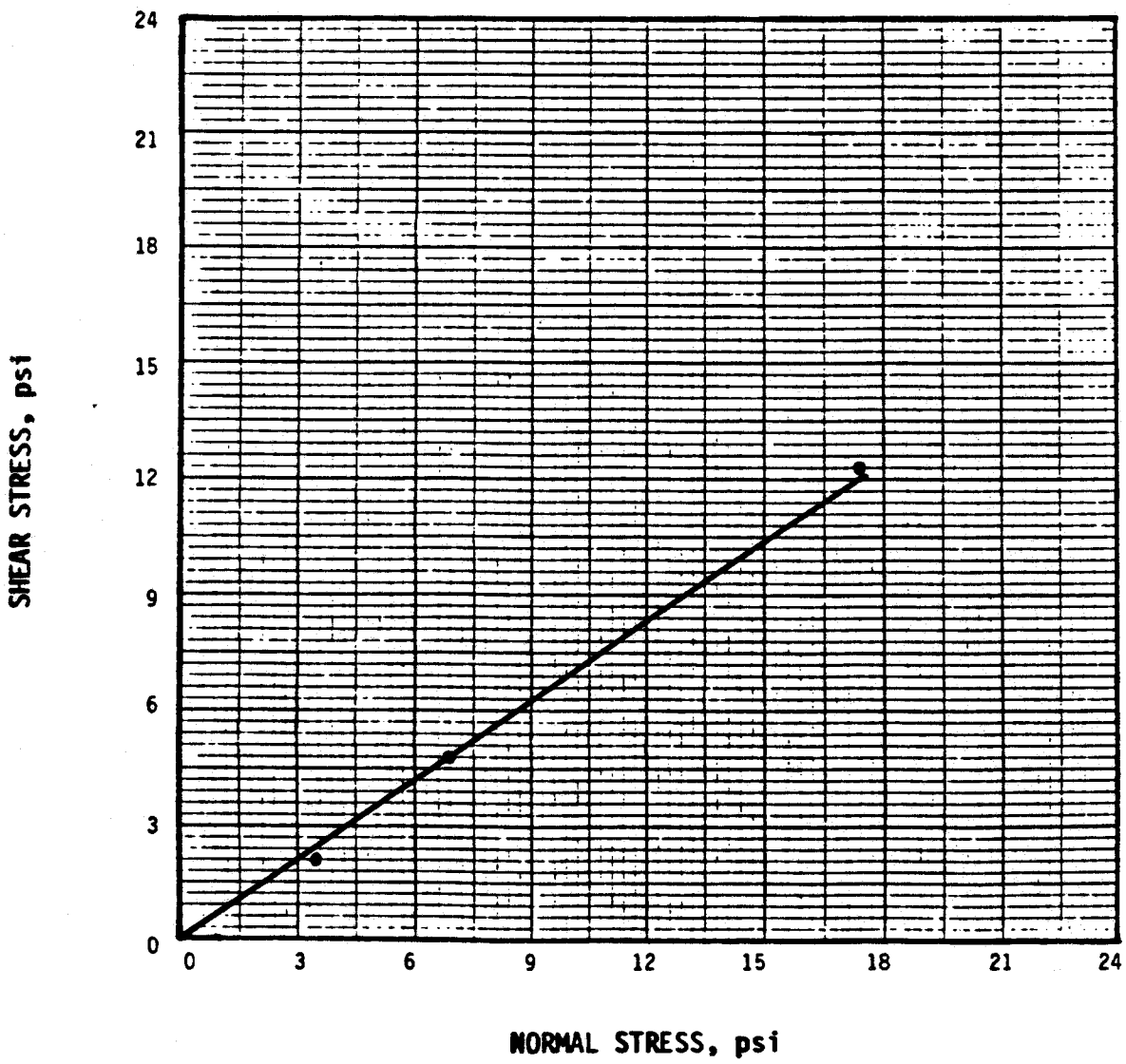
LAW ENGINEERING TESTING COMPANY

GRAPH IV

SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC. LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-1 @ 0'-0.5' DENSITY: 30 pcf

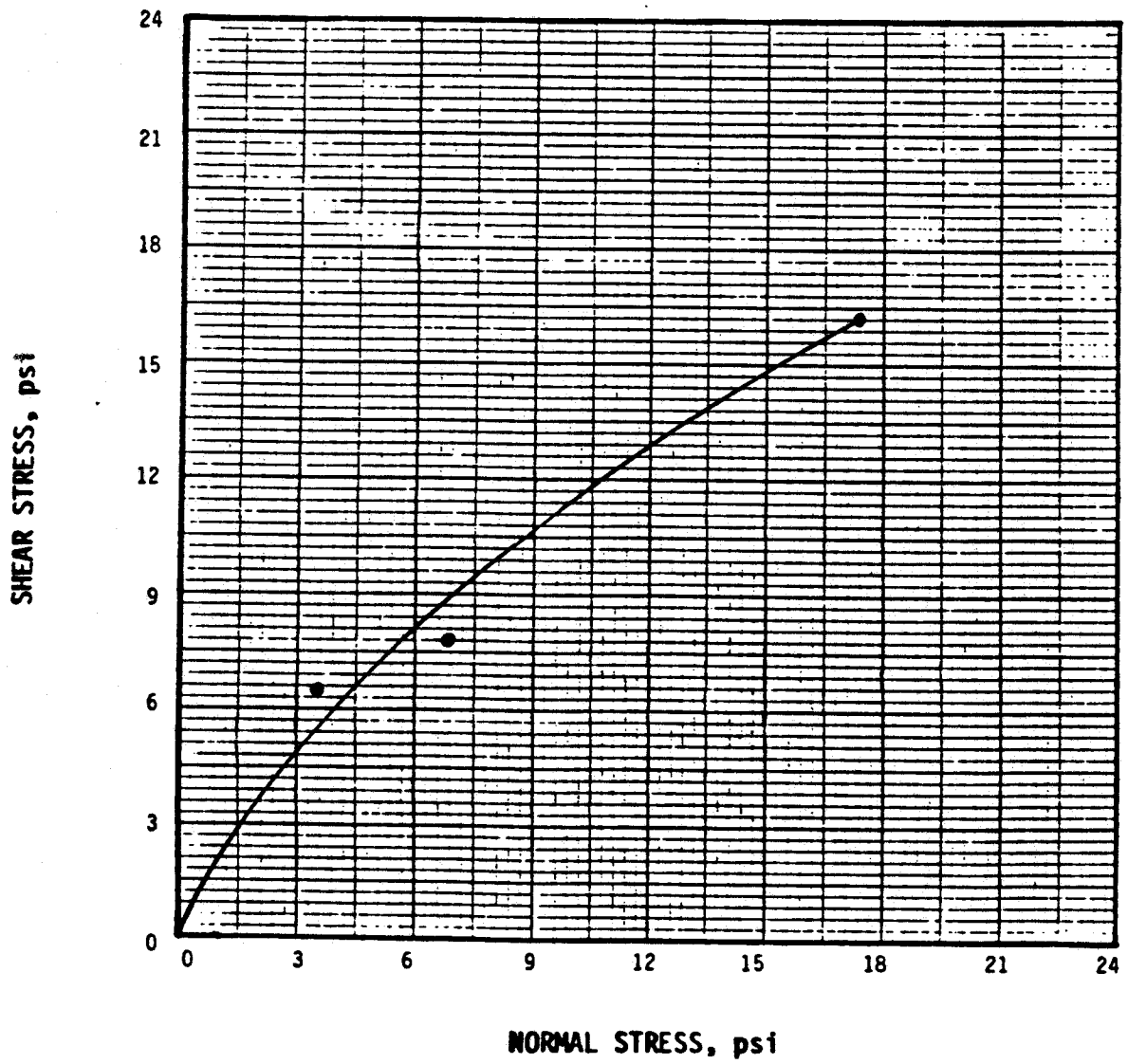


GRAPH V

SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC. LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-1 @ 0'-0.5' DENSITY: 50 pcf



GRAPH II

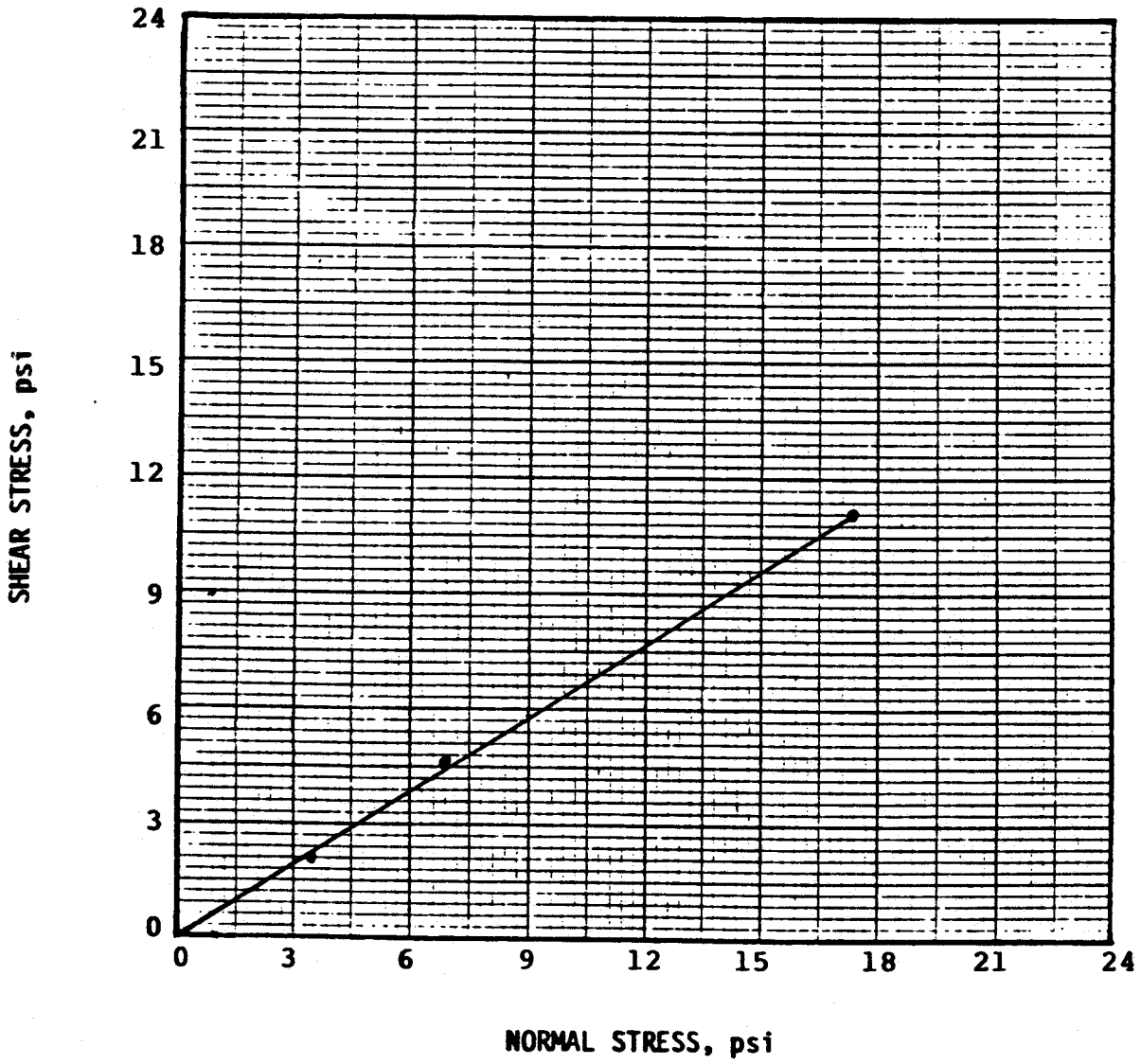
SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC.

LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-6 @ 0'-0.5'

DENSITY: 41.2 pcf



GRAPH III

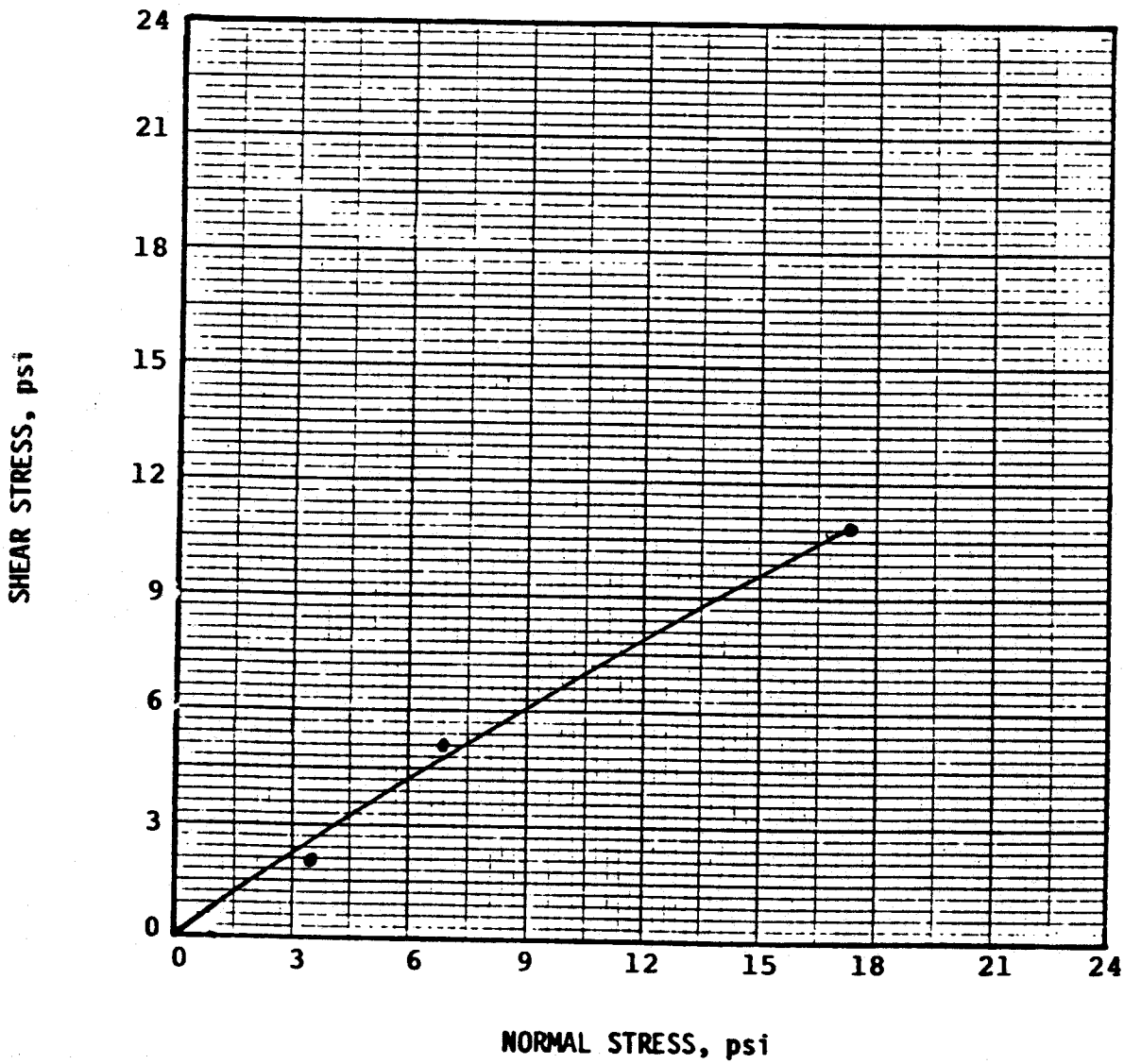
SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC.

LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-6 @ 0'-0.5'

DENSITY: 55 pcf



GRAPH I

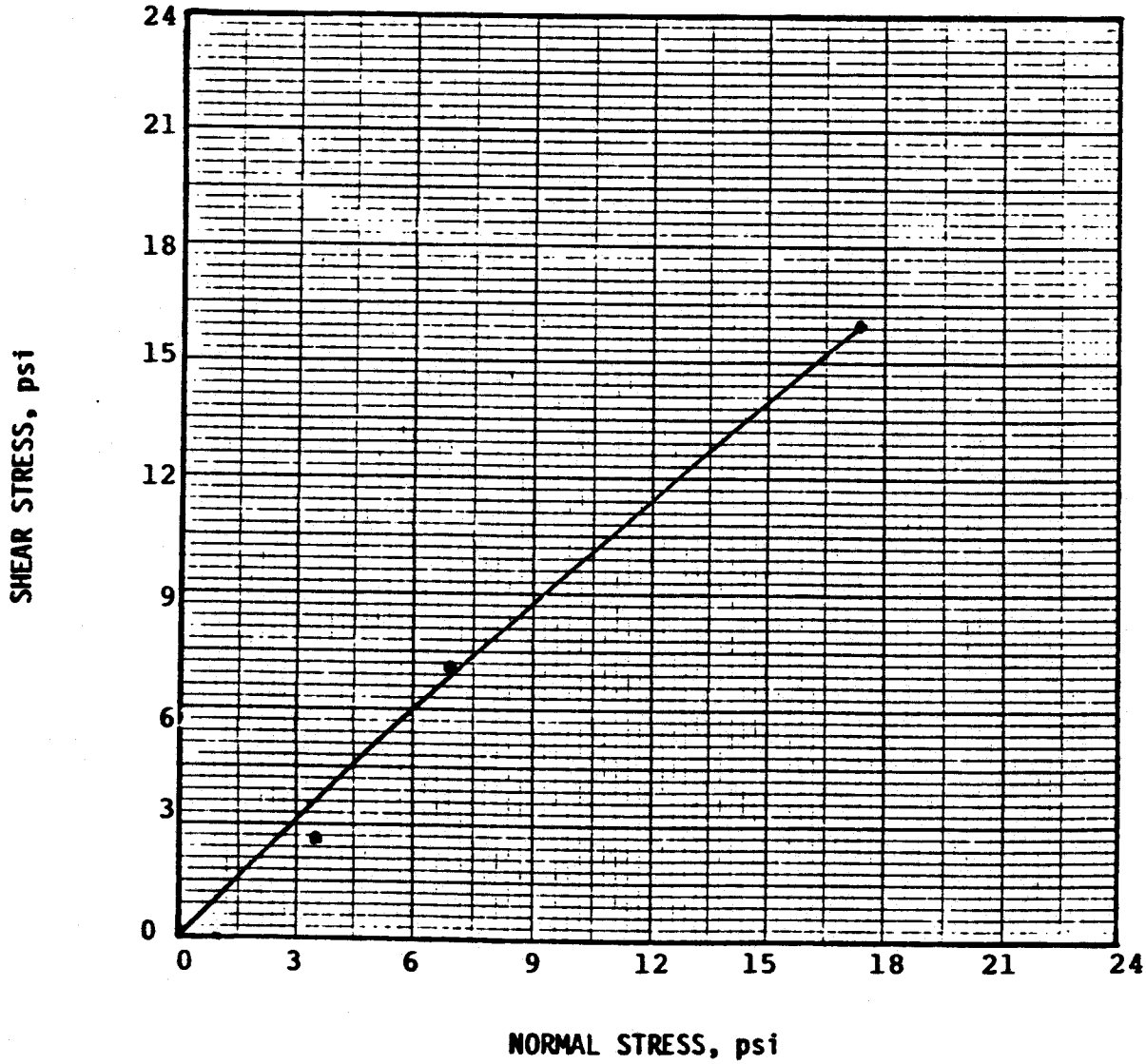
SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC.

LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-6 @ 4.5 ft.

DENSITY: 32.6 pcf



GRAPH VI

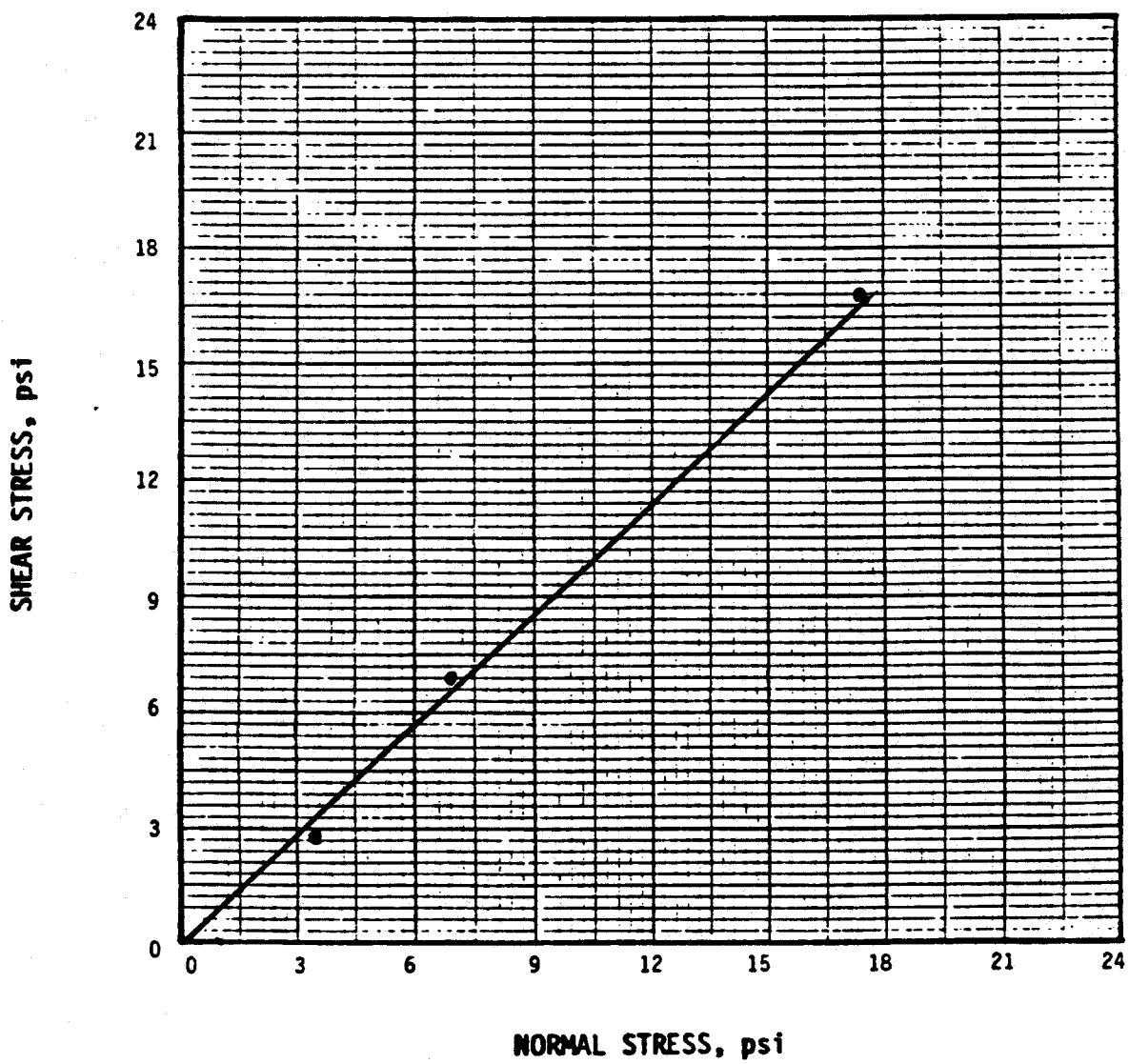
SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC.

LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-10 @ 0'-0.5'

DENSITY: 35.4 pcf



GRAPH VII

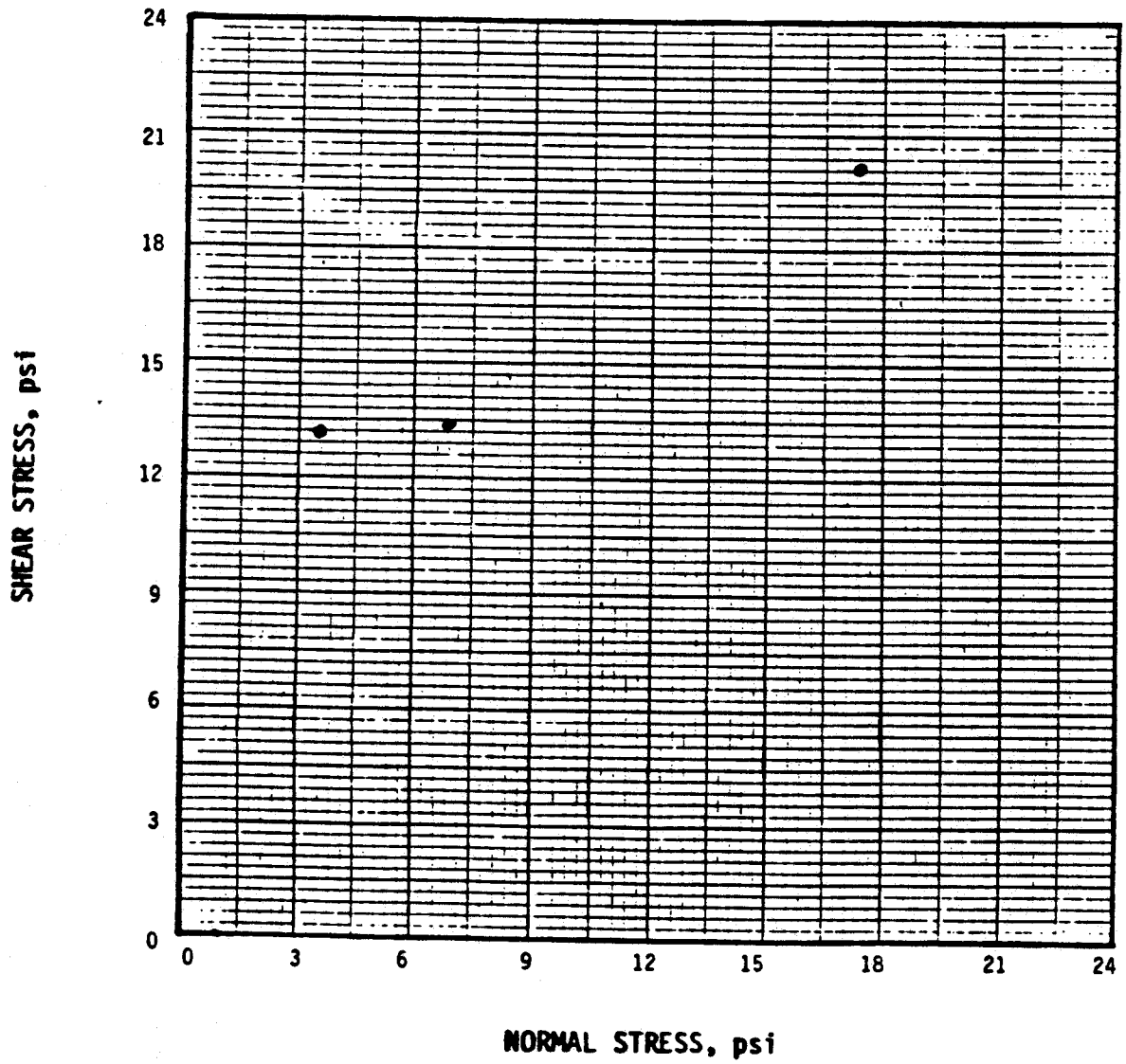
SHEAR STRESS VERSUS NORMAL STRESS

CLIENT: RMT, INC.

LAW ENGINEERING JOB NO.: J-4596

SAMPLE ID: GB-10 @ 0'-0.5'

DENSITY: 55.2 pcf



APPENDIX B

SOLID WASTE AUDITS

APPENDIX B.1

APRIL 17, 1987

LANDFILL LOADING STUDY

TABLE OF CONTENTS

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APPENDIX C: BULK DENSITIES OF WASTE MATERIAL

APPENDIX D: MARCH 9-13, 1987 SCALEUP AUDIT

DATE APRIL 17, 1987

FROM DONALD CRUSE & STEVE HARLAN

LOCATION NEW BERN RESEARCH STATION

SUBJECT LANDFILL LOADING STUDY

Donald G. Cruse
Steve M. Harlan

SUMMARY
LANDFILL LOADING STUDY
APRIL 2 -APRIL 3, 1987

MAJOR POINTS OF CONCERN

1) 99 LOADS/2 DAYS, AVERAGE 50/DAY, 16 HOURS/DAY

2) 433.8 TONS/2 DAYS, AVERAGE 216.9 TONS/DAY

3) 4447 CUBIC YARDS/2 DAYS, 2224 CUBIC YARDS/DAY

4) LARGEST SINGLE CONTRIBUTOR - HOG FUEL BOILER - FLY ASH

36% BY LOADS
55% BY WEIGHT
40% BY VOLUME
122.4 TPD
RECYCLEABLE

4) MAJOR SOURCES OF POSSIBLE REUSE

A) FLY ASH - BURNED COAL AND BARK FROM HOG FUEL BOILERS.

B) WOOD MATERIAL - LOGS, BARK, PLYWOOD, PALLETS, ETC.

C) FIBER MATERIAL - CARDBOARD TRASH, SECONDARY FIBER. TRASH (NON-REJECTS), FINE PAPER.

D) GRITS - FROM LIME KILN.

E) DREG - FROM SLACKER

	% WEIGHT	% VOLUME	AVERAGE TPD	AVERAGE YD3/DAY
FLY ASH	55	40	122.4	295.3
WOOD	26	47	57	348.1
FIBER	9	7	18.6	49.6
GRITS	6.5	5	14.3	33.4
DREGS	3.5	2	7.9	15.9

5) OTHER MATERIALS NON-REUSABLE (DIRT, METAL, TRASH)

4% BY LOAD
0.18% BY WEIGHT
0.8 TPD

6) MAJOR AREAS OF CONTRIBUTION

BY WEIGHT IN DESCENDING ORDER
(SEE FIGURE 1a)

A) FLY ASH - HOG FUEL BOILERS
B) PLYWOOD - WOOD PRODUCTS AREA
C) NON-MILL PRODUCT TRASH
D) BARK - WOOD YARD PRODUCTIONS
E) GRITS - LIME KILN
F) DREGS - SLACKER

BY VOLUME IN DESCENDING ORDER
(SEE FIGURE 1b)

A) FLY ASH
B) PLYWOOD
C) BARK
D) NON-MILL PRODUCT TRASH
E) GRITS
F) DREGS

7) MAJOR AREAS OF POSSIBLE REUSE

BY WEIGHT IN DESCENDING ORDER

A) PLYWOOD - WOOD PRODUCTS
B) GRITS
C) SECONDARY FIBER
D) DREGS
E) FINE PAPER
F) MILL CLEANUP

BY VOLUME IN DESCENDING ORDER

A) PLYWOOD
B) MILL CLEANUP
C) FINE PAPER
D) SECONDARY FIBER
E) GRITS
F) DREGS

FIGURE 1a

PLYMOUTH SOLID WASTE AUDIT (MATERIAL BEING LANDFILLED)
APRIL 1987

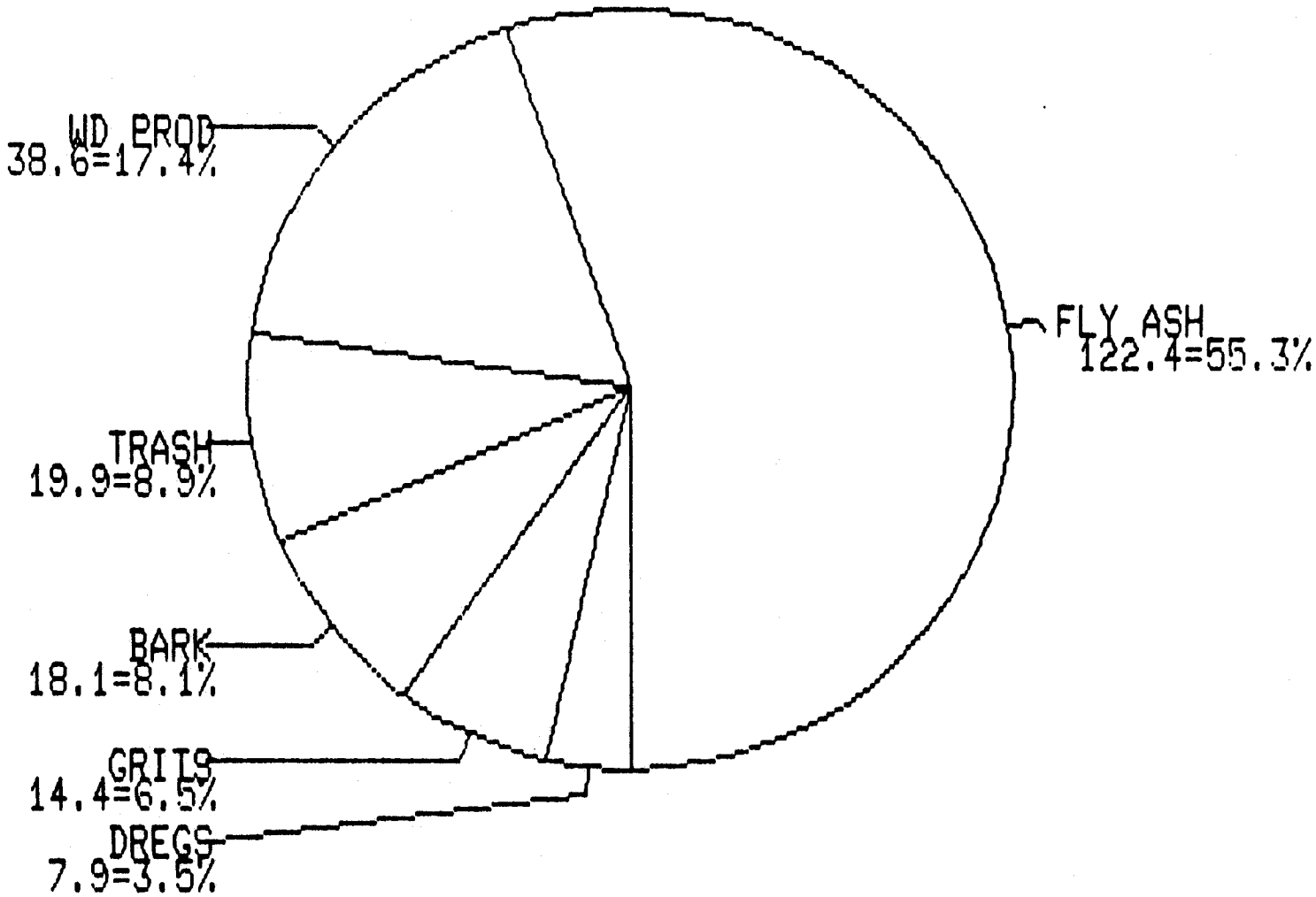
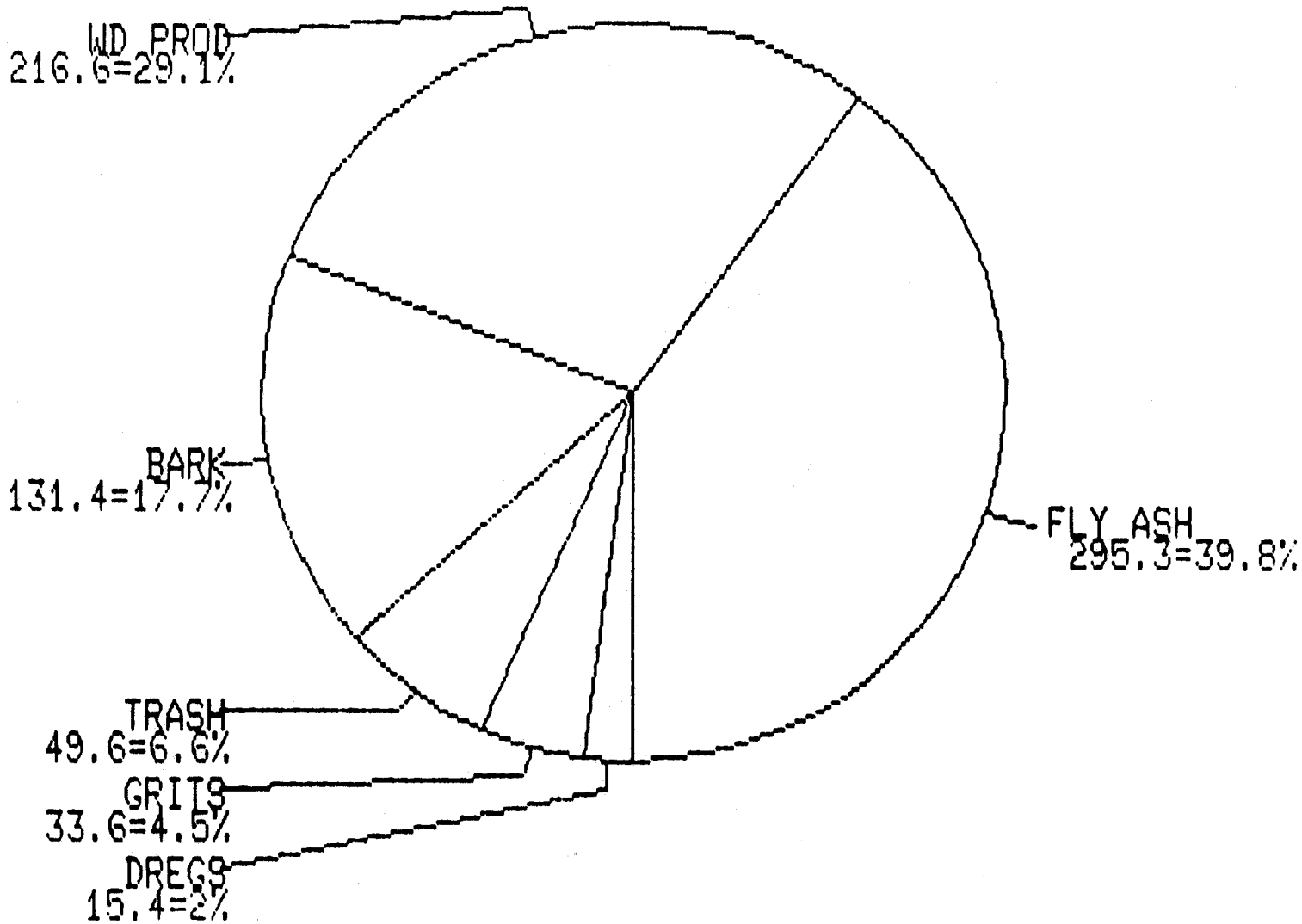


FIGURE 16

PLYMOUTH SOLID WASTE AUDIT (MATERIAL BEING LANDFILLED)
APRIL 1987



UNITS: YD^3/DAY

LANDFILL LOADING STUDY

On April 2nd and 3rd a solid waste audit was conducted at the Plymouth mill complex landfill. The results of this audit are given in Table 1. It was pointed out that the waste that was being dumped these two days were abnormally low compared to normal operations. Therefore, inflated values were estimated to obtain normal operating values (See Appendix D for scalup audit/information).

TABLE 1
SUMMARY OF SOLID WASTE AUDIT

	% BASED ON VOLUME	% BY WEIGHT	AVG. TPD	INFLATED TPD	INFLATED VOLUME YD3/DAY
FLY ASH	39.8	55.3	122.4	122.4	295.3
*PLYWOOD SCRAPS	29.1	17.4	38.6	73.6	413.0
MILL CLEANUP	6.6	8.9	19.9	19.9	49.6
BARK	17.7	8.1	18.1	18.1	131.5
*GRITS	4.5	6.5	14.4	16.5	38.6
*DREGS	2.0	3.5	7.9	12.5	25.2
TOTALS			221.2	263.0	953.2

*NOTE: AUDIT VALUES SUSPECTED OF BEING UNDER ESTIMATED.

A MORE DETAILED BREAK DOWN OF THIS AUDIT IS LOCATED IN APPENDIX A ALONG WITH THE RAW DATA (THE BULK DENSITIES OF THE ABOVE MATERIAL IS LOCATED IN APPENDIX C).

Fiber process wastes can be either landfilled or sewered. One possible waste flow diagram is presented in Figure 3. In 1980 a similar solid waste audit was conducted (see Appendix B) and compared to this 1987 audit. At present (1987) a total of 221 TPD is being trucked out to the landfill which is up approximately 32% from the 1980 value of 167 TPD (Presently no primary sludge waste is being landfilled). The mills production has been relatively constant since 1980 so this seems to suggest that the solid waste to production ratio has been increasing over the years. This is due to keeping increasingly more waste out of the sewers (Waste products are being taken out before they enter the sewers).

Some possible reasons why there is more waste being landfilled and less being sewered might be due to improvements in various parts of the mill. These effluent treatment technologies are those end-of-pipe treatment systems used to reduce the discharge of pollutants contained in mill effluents, thus reducing the load on the primary treatment system. An example might be dry collection of screen and cleaner rejects with separate discharge to the landfill will reduce TSS raw waste loads. Two other improvements could be Lime Mud Ponds and Green Liquor Dregs Filters which both reduce the TSS caused by upsets, start-ups, and shutdowns. Further investigation is being done to find where these possible improvements have taken place.

One major class of waste can be compared to previous years and that is fly ash from the hog fuel boilers. Presently 122 TPD of ash is being landfilled which is up 52% from 1980. This suggest that more bark is being burned instead of being landfilled. It should be noted that the 1980 audit was conducted over a two week period and the 1987 audit was conducted over a two day period. The variablility in the 1987 audit is also of some concern.

The estimate of the amount of primary sludge that was being produced in 1980 was 72 BDTPD and present estimates yield 90 BDTPD. Mill personnel believes that both of these numbers are low estimates, as there is some concern about the sampling techiques used in the 1980 estimate of the primary sludge. No conclusions can be drawn on Plymouths effort to reduce waste at this time.

The trends of the Plymouth complex seems to be following trends discussed in a report by Gorham International titled "STUDY OF SOLID WASTE MANAGEMENT PRACTICES IN THE PULP AND PAPER INDUSTRY". This report shows wood processings (bark) waste decreasing and fly ash and primary sludge increasing which are the trends showing up at the Plymouth mill complex.

An important aspect that arises from this audit is how long it will take to fill the existing landfill after making the decision to dispose the primary sludge at the landfill site (see Figure 2a & 2b). There are three general methods to dispose of sludge: sludge-only trench fill, sludge-only area fill, and co-disposal with refuse. There are various sludge characteristics that determine which method of disposal is perferable. Each method requires a certain application range (See Table 2) and are discussed in a paper by the EPA titled "SLUDGE TREATMENT AND DISPOSAL". The impact of these methods on the amount of land needed for disposal is quite significant not to mention the equipment and structures that are needed to store this type of waste.

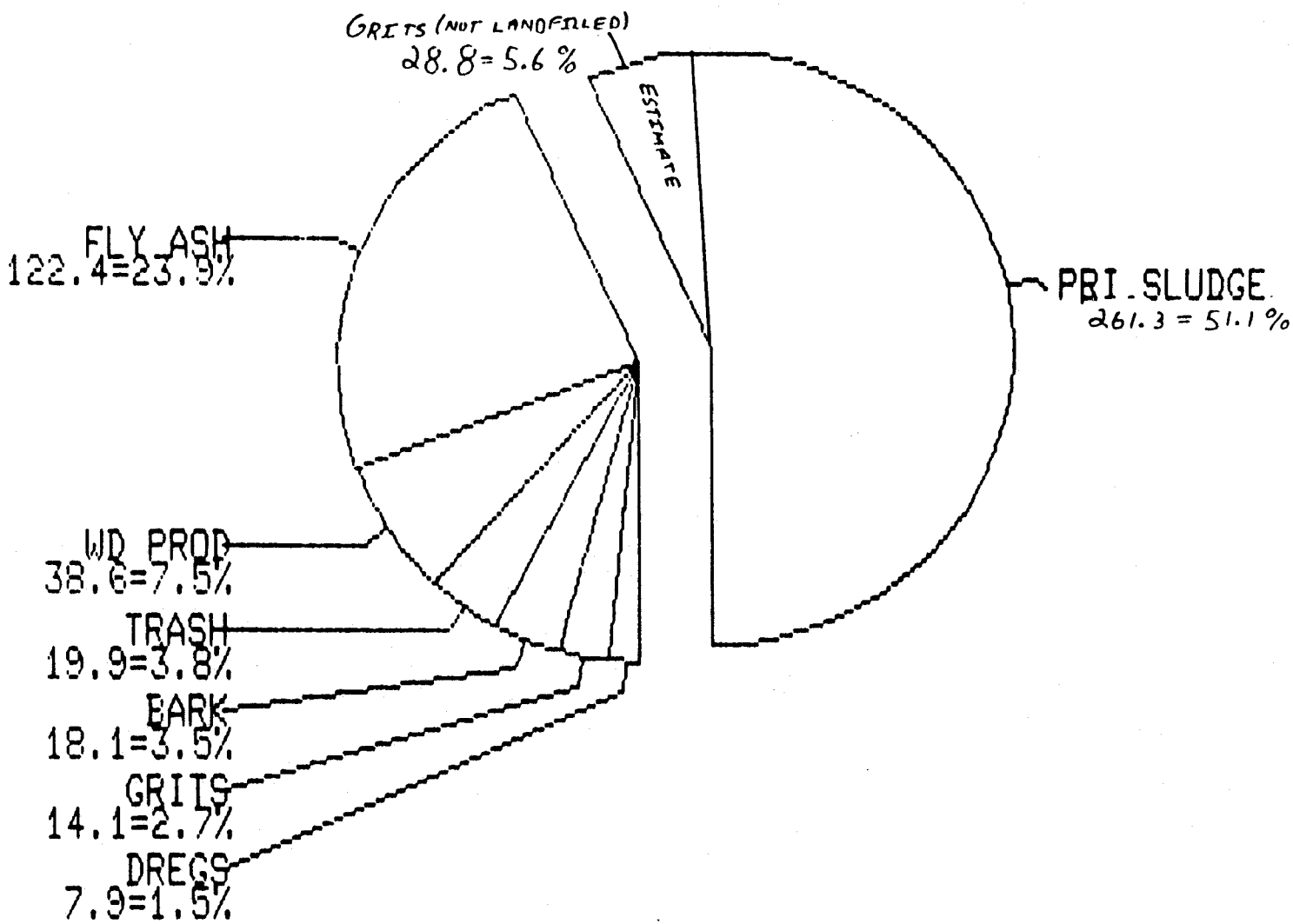
TABLE 2
SLUDGE APPLICATION RANGES

	RANGE
SLUDGE-ONLY TRENCH FILL	1200 - 1450 CU. YD/ACRE
SLUDGE-ONLY AREA FILL	6 FOOT MOUNDS COVERED WITH 3 - 5 FEET OF SOIL
CO-DISPOSAL WITH REFUSE	500 - 4200 CU. YD/ACRE

At present rates of solid waste disposal (excluding primary sludge) it is estimated that it will only be one year until Plymouth's licensed landfill is completely full. If the primary sludge is added to the landfill (see Figure 3 for a waste flowsheet) it will at least double the amount of land needed for disposal, leaving only six months until the landfill is full. Therefore, other alternatives for disposing of this sludge must be given serious consideration.

FIGURE 2a

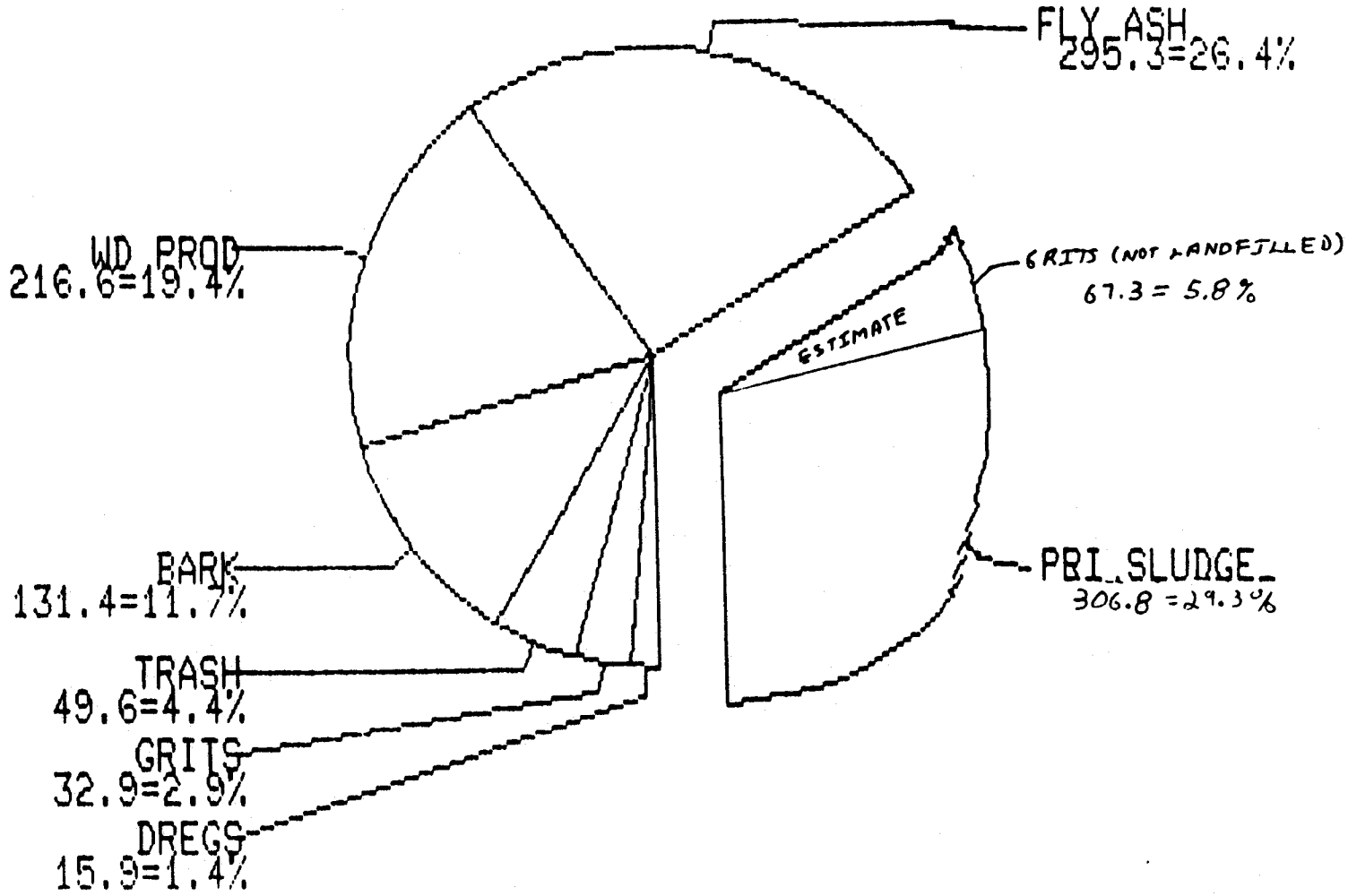
PLYMOUTH SOLID WASTE (TPD)
APRIL 1987



UNITS = TPD

FIGURE 2b

PLYMOUTH SOLID WASTE (CUBIC YARDS/DAY)
APRIL 1987



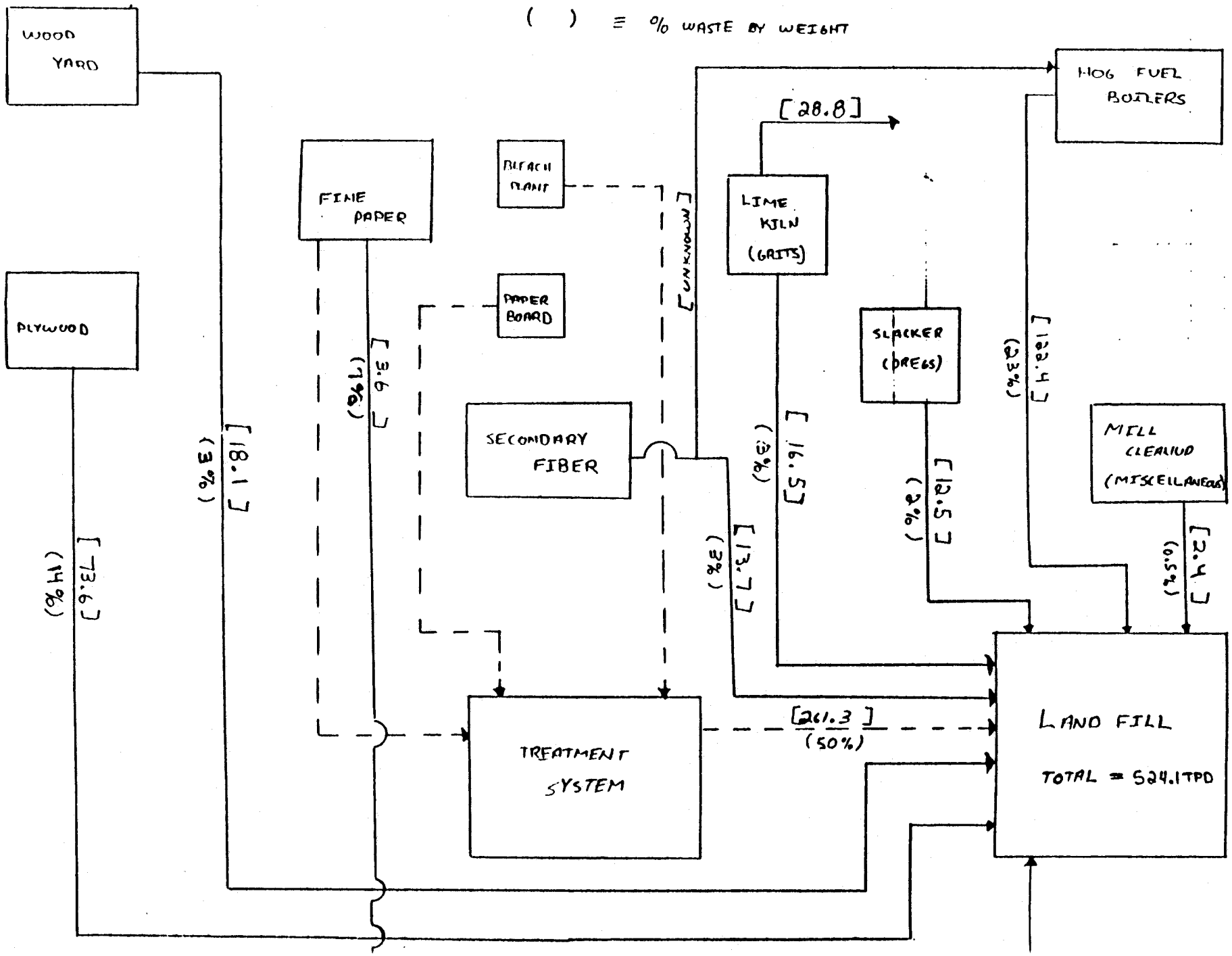
UNITS: YD^3/DAY

FIGURE 3

WASTE FLOWSHEET

[ ] ≡ TON/DAY

( ) ≡ % WASTE BY WEIGHT



APPENDIX A

DETAILED BREAK DOWN OF 1987 SOLID WASTE AUDIT AND RAW DATA

DETAILED

SUMMARY OF SOLID WASTE AUDIT

( ) TOTAL NON-MILL PRODUCT TRASH
— NO VALUES FOR THAT DAY

WASTE	LOCATION	APRIL 21 (7:00 AM–11:00 PM) WEIGHT (TPD)	% TOTAL WASTE	APRIL 3 (7:00 AM–11:00 PM) WEIGHT (TPD)	% TOTAL WASTE	MEAN VALUE FOR BOTH DAYS WEIGHT (TPD)	% TOTAL WASTE	RANK IN DECREASING ORDER
FLY ASH	HOG FUEL BOILERS	120.32	61.8	124.44	52.1	122.38	55.3	1
BARK	WOOD YARD	3	1.54	33.23	13.9	18.12	8.19	3
GRITS	LIME KILNS	14.78	7.59	13.85	5.79	14.32	6.47	4
DREGS	SLACKER	7.88	4.05	—	—	7.88	3.56	6
) SAWDUST/PLYWOOD	PLYWOOD MILL	31.71	16.3	45.46	19.0	38.59	17.5	2
) SECONDARY FIBER TRASH	SECONDARY FIBER	11.26	5.78	12.88	5.39	12.07	5.46	5
) NON-MILL PRODUCT REJECTS	OVERALL (A–C)	(5.84)	(2.99)	(9.14)	(3.83)	(7.82)	(3.53)	7
A) METAL (WIRE, DRUMS)		0.65	0.33	—	—	0.65	0.29	
B) BRANCHES/LOGS	CONSTRUCTION SITES	0.3	0.15	0.3	0.13	0.3	0.14	
C) PALLETS PLASTICS TRASH	FINE PAPER	1.89	0.97	15.67	2.37	3.78	1.71	
	SECONDARY FIBER	1.13	0.58	2.12	0.89	1.63	0.73	
	SEABOARD RAILWAY WOOD SHOP MISCELLANEOUS	1.87	0.96	1.05	0.44	1.46	0.66	
TOTALS		194.76	100.%	[illegible]	100.%			

FLY ASH (FROM AUG FUEL BOILER)

APRIL 2 WEIGHT (lb)	VOLUME ( )	APRIL 3 WEIGHT (lb)	VOLUME ( )
→ 13370		13520	
14680		14700	
14240		14900	
14940		14440	
15880		14340	
14440		13820	
15300		13040	
14540		12100	
12400		16100	
11360		16700	
10800		15600	
11860		13800	
11080		13640	
11240		13000	
15440		11840	
11820		11700	
→ 13370		12000	
→ 13370		13640	
TOTAL 240630		TOTAL 248880	

AVG TRUCK LOAD 13370

AVG TRUCK LOAD 13830

TRUCKS/

1st 8 - 8

2nd 10 - 10

→ WEIGHT WAS NOT AVAILABLE SO AN AVERAGE WAS USED

WOOD YARD (BARK, WOOD SCRAPS)

APRIL 2 WEIGHT (lb)	VOLUME ( )	APRIL 3 WEIGHT (lb)	VOLUME ( )
6000		17960	
		17360	
		2520	
		9980	
		8860	
		9780	
6000 TOTAL		66460 TOTAL	

TRUCKS

1st 0 - 0

2nd 1 - 1

FINE PAPER (TRASH, REJECTS, CARDBOARD, NON-MILL PRODUCTS)

APRIL 2

WEIGHT (lb)	VOLUME ( )
920	
2860	
3780 TOTAL	

APRIL 3

WEIGHT (lb)	VOLUME ( )
2240	
2240	
1760	
1320	
→ 1840	
→ 1840	
11340 TOTAL	

TRUCKS
1st I -
2nd I -

SECONDARY FIBER (REJECTS AND TRASH)

APRIL 2

WEIGHT (lb)	VOLUME ( )
12880	
1580	
920	
8060	
1340	
24780 TOTAL	

APRIL 3

WEIGHT (lb)	VOLUME ( )
7880	
4240	
17880	
30000 TOTAL	

TRUCKS
1st 3 -
2nd 2 -

PLYWOOD MILL (SAWDUST, PLYWOOD SCRAPS)

APRIL 2

WEIGHT (lb)	VOLUME ( )
7440	
16620	
13340	
12520	
13500	
63420 TOTAL	

APRIL 3

WEIGHT (lb)	VOLUME ( )
5700	
4960	
20460	
16620	
14340	
10560	
7660	
10620	
90920 TOTAL	

TRUCKS/SHIFT
1st 5 - 8
2nd 0 - 0

GRITS (FROM LIME KILN)

APRIL 2

WEIGHT (lb)	VOLUME ( )
11360	
18200	
29560 TOTAL	

AVG. TRUCK LOAD 14780

APRIL 3

WEIGHT (lb)	VOLUME ( )
14900	
12800	
27700 TOTAL	

AVG. TRUCK LOAD 13850

# TRUCK/SHIFT	
1st	1 - 1
2nd	1 - 1

DREGS (FROM SLACKER)

APRIL 2

WEIGHT (lb)	VOLUME ( )
15760	
15760 TOTAL	

APRIL 3

WEIGHT (lb)	VOLUME ( )
NONE FOR THIS DAY	

# TRUCK/SHIFT	
1st	1 - 0
2nd	0 - 0

MISCELLANEOUS TRASH, NON-MILL PRODUCTS (SEABOARD RAILWAY TRASH, TY-WHITE CONST., WOOD SHOP)

APRIL 2

WEIGHT (lb)	VOLUME ( )
320	
100	
180	
300	
100	
600	
200	
600	
300	
2240	
300	
180	
→ 450	
5870 TOTAL	

APRIL 3

WEIGHT (lb)	VOLUME ( )
200	
300	
300	
300	
300	
300	
400	
300	
300	
2700 TOTAL	

# TRUCK/SHIFT	
1st	7 - 7
2nd	6 - 2

SOLID WASTE SURVEY DATA SHEET

4/2/87

STEVE HARLEN
DONALD CRUZE

		POUNDS				
7:05	NON-MILL PRODUCTS SCRAPS	920	FINE PAPER		E-	DUMPSTER 55
7:20	FLY ASH		HOG FUEL BOILER			TRUCK 48
8:00	GRITS	11360	LIME KILN		#53 PALLET	GROSS-43360 EMPTY-32000
8:15	FLY ASH	14680	NUC FUEL COAL BOILER		G- 39120 E- 24440	
8:30	PLYWOOD	7440	PLYWOOD MILL		G- 32560 E- 25120	TRUCK 9
8:45	PLYWOOD SAW DUST	16620	PYLWOOD MILL		G- 27640 E- 21920	TRUCK 46
9:05	FLY ASH	14290	HOG FUEL BOILER		G- 38680	TRU
9:15	TRASH (CARDBOARD CARTONS)	LESS THAN 100			C-BOARD	
9:30	SECONDARY FIBER REJECTS	12880	SECONDARY FIBER		G- 44880 E- 32000	DUMPSTER TRUCK II
9:45	EMPTY DRUMS 12 OF THEM	600			STEEL FLOAT DRUMS	
9:50	FLY ASH	14940	HOG FUEL BOILER		G- 39380	TRUCK 4
10:15	DREGS	15760	SLACKER		G- 47760 E- 32000	TRUCK DUMPSTER
10:30	FLY ASH	15880	HOG FUEL BOILER		G- 40320	TRUCK
10:40	PACKAGING MATERIAL SCRAPS (PLASTIC, CARD BOARD)	320	C-BOARD RIVER (COMPOSITE BOARD)		G- 12000 E- 11680	TRUCK=
11:00	FLY ASH	14940	HOG FUEL BOILER		G- 39380	TRUCK 4
12:05	Secondary Fiber rejects	1580	Secondary Fiber		G- 32040 E- 30460	TRUCK II Dumpster
12:20	FLY ASH	15300	HOG FUEL BOILER		G- 39740	TRUCK #
12:55	FLY ASH	14540	HOG FUEL BOILER		G- 38980	TRUCK #
1300	PLYWOOD SAW DUST	13340	PLYWOOD		G- 34360	TRUCK
13:00	MUD	200	FROM A DITCH			TRUCK
13:15	PACKAGING MATERIAL SCRAPS (PLASTIC, CARD BOARD	100	C-BOARD RIVER (COMPOSITE BOARD)		G- 5560	TRUCK#
13:25	NON-MILL PRODUCT TRASH	2860	FINE PAPER		G- 14440 E- 11580	TRUCK#
13:30	TRASH, PALLETS, PLASTIC NON-MILL PRODUCTS	920	SECONDARY FIBER		G- 32420 E- 32000	DUMPSTER TRUCK II
13:35	FLY ASH	12400	HOG FUEL BOILER		G- 36940 E- 24110	TRUCK#

SOLID WASTE SURVEY DATA SHEET

4/2/87 CRUSE, HARVAY

13:40	PLYWOOD	12520	PLYWOOD MILL	G-37640 E-25720 TRUCK 9604 TY WATER CONST
13:30	BRANCHES, TWIGS	600		
14:20	FLY ASH	11360	HOG FUEL BOILER	G-35800 E-24440 TRUCK#
14:25	PLYWOOD SAWDUST	13500	PLYWOOD MILL	G-34520 E-21020 TRUCK#
15:30	FLY ASH	10800	HOG FUEL BOILER	G-35240 E-24440 TRUCK#
15:35	Metal, Drums	300		TI water Const.
15:36	Grits	16200	Lime Kiln	G-510801b Truck # 21 E-32880 Dumpster #
15:56	Pallets + Non-Mill products	300	From Sand Blasting	Eastern Omni Const.
1600	Trash (cardboard boxes)	180	C. Board	Truck #26
1610	FLY Ash	11660	Hog Fuel Boiler	G-36500 E-24440 Truck # 49
1633	Secondary fiber reject	4060	Secondary fiber	Dumpster # 17 Truck # 21 G-040120 E-32060
1644	FLY ASH	11090	Hog Fuel Boiler	G-35520 Truck # 48 E-24440
1649	Paper Trash	300		TI. water Constr.
1722	FLY ASH	11240	Hog Fuel Boiler	G-35680 Truck # 48 E-24440
1810	Non Mill Products Wire + trash	1340	2ndary fiber	G-33400 E-32060 Truck # 21 Dumpster # 17
1821	FLY ASH	15440	Hog Fuel Boiler	G-39490 Truck # 49 E-24440
1854	Sawdust, sticks	6000	Wood yard	G-38060 E-32060 Truck # 21 Dumpster # 17
*1902	FLY ASH	11820	Hog Fuel Boiler	G-36260 E-24440 Truck # 49
2022	FLY ASH		Hog Fuel Boiler	Truck # 48
2037	Non Mill products (trash)	2240	Garage	G-34300 E-32060 Dumpster # 17 Truck # 21
2122	FLY ASH		Hog Fuel Boiler	Truck # 49
2140	Non Mill products		"#2 Machine"	G-15220 E- Truck # 17

*"Scales Closed"

SOLID WASTE SURVEY DATA SHEET

APRIL 3, 87

CRUSE

✓	7:25	FLY ASH	135 20	HOG FUEL BOILER	✓	G-37460 E-24440	TRUCK # 48
✓	7:35	PALLETS, METAL PACKAGING MATERIAL	2240	FINE PAPER		G-34300 E-32060	DUMPSTER # TRUCK # 2
✓	8:05	PLYWOOD, METAL	5700	PLYWOOD	✓	G-30820 E-25120	TRUCK # 9
✓	8:10	FLY ASH	14700	HOG FUEL BOILERS	✓	G-39140 E-24440	TRUCK #
✓	8:15	DIRT	200	CONSTRUCTION ON LIME KILN		From "MERIC" TRUCK	TRUCK #
✓	8:20	CARDBOARD, TRASH NON-MILL PRODUCTS	2240	FINE PAPER	✓	G-34300 E-32060	DUMPSTER # TRUCK #
✓	8:40	PLYWOOD SCRAPS PLYWOOD SAWDUST	4960	PLYWOOD	✓	G-25980 E-21020	TRUCK #
✓	8:45	TRASH NON-MILL PRODUCT PLASTIC, CARDBOARD	200	C-BOARD GROUP	✓	G-11700 E-	TRUCK #
✓	8:50	FLY ASH	14900	HOG FUEL BOILERS	✓	G-39340 E-24440	TRUCK #
✓	9:00	WIRE & TRASH NON-MILL PRODUCT WET	7880	SECONDARY FIBER	✓	G-39440 E-32060	DUMPSTER TRUCK #
✓	9:30	BARK SCRAPS	17960	WOOD YARD PRODUCTION	✓	G-40040 E-22080	TRUCK #
✓	9:35	PLYWOOD SCRAPS AND SAWDUST	20460	PLYWOOD	✓	G-45580 E-25120	TRUCK #
✓	9:50	FLY ASH	14940	HOG FUEL BOILERS	✓	G-38680 E-24440	TRUCK #
✓	10:05	CARDBOARD, NON-MILL PRODUCTS	1760	FINE PAPER	✓	G-33820 E-32060	DUMPSTER TRUCK #
✓	10:15	BARK SCRAPS	17360	WOOD YARD PRODUCTION		G-39440 E-22080	TRUCK #
✓	10:20	PLYWOOD SCRAP & SAWDUST	16620	PLYWOOD		G-37640 E-21020	TRUCK #
✓	10:25	FLY ASH	14340	HOG FUEL BOILERS		G-38780 G-24440	TRUCK #
✓	10:35	PLYWOOD SCRAPS AND SAWDUST	14340	PLYWOOD		G-39460 E-25120	TRUCK #
✓	10:45	WET FLY ASH	13640	HOG FUEL BOILER		G-46520 E-32880	DUMPSTER TRUCK #
✓	10:55	WOOD BRANCHES	300	CLEAN-UP AREA		TIDEWATER CONSTRUCTION	TRUCK #
✓	11:05	FLY ASH	13820	HOG FUEL BOILERS		G-38260 E-24440	TRUCK #
✓	11:10	PLYWOOD SCRAPS AND SAWDUST	10560	PLYWOOD MILL		G-31580 E-21020	TRUCK #
✓	11:15	PALLETS, PACKAGING WOOD PAPER (BROWN)	300	C-BOARD	✓	G-12000 E-	TRUCK #
✓	11:30	BRANCHES AND LOGS	300	CLEAN-UP AREAS		G- TIDEWATER CONST	TRUCK #

SOLID WASTE SURVEY DATA SHEET

APRIL 3, 1987 CRUSE

✓	11:35	GRITS	14900	LIME KILN	✓	G- 47780 E- 32880	DARK, DIRTY BARK DUMPSTER TRUCK # 21
✓	12:20	FLY ASH	13040	HOG FUEL BOILER	✓	G- 37480 E- 24440	TRUCK # 48
✓	13:00	PALLETS, NON-MILL PRODUCTS TRASH	1320	FINE PAPER		G- 12900 E- 11580	TRUCK # 16
✓	13:00	TRASH, NON-MILL PRODUCTS PALLETS	300	C-BOARD	✓	G- 10300	TRUCK # 26
✓	13:10	FLY ASH	12100	HOG FUEL BOILER	✓	G- 36540 E- 24440	TRUCK # 48
✓	13:25	SCRAP WOOD, DOORS, PANEL NON-MILL PRODUCT	400	WOOD SHOP	✓	DOORS & PANELING	TRUCK # AC
✓	13:55	UTRF, TRASH, NON MILL PRODUCT	4240	SECONDARY FIBER	✓	G- 36240 E- 32000	DUMPSTER TRUCK # 18
✓	14:25	PLYWOOD SCRAPS & SAWDUST	7660	PLYWOOD MILL	✓	G- 28680 E- 21020	TRUCK #
	14:35	PLYWOOD SCRAPS & SAWDUST	10620	PLYWOOD MILL	✓	G- 35740 E- 25120	TRUCK # 9
✓	1541	FLY ASH	16100	Hog Fuel Boiler	✓	G- 40540 E- 24440	TRUCK #
✓	1545	Cardboard boxes	300	C-board	✓	G- 11700	Truck # 26
✓	1610	Pallets, trash	300	Clean-up Areas	✓	G- Tide Water	Constr. Truck
✓	1622	FLY ASH	16700	Hog Fuel Boiler	✓	G- 41140 E- 24440	Truck # 48
✓	1630	Grits	12800	Lime Kiln	✓	G- 44800 E- 32000	Truck # 18
✓	1645	Non Mill Products	17880	Secondary Fiber	✓	G- 48340 E- 30460	Dumpster #49 Truck # 18
✓	1702	FLY ASH	15600	Hog Fuel Boiler		G- 40640 E- 24440	Truck # 48
✓	1725	Bark	2520	"Hog Fuel"	✓	G- 32980 E- 30460	Dumpster #49 Truck # 18
✓	1744	FLY ASH	13900	Hog Fuel Boiler	✓	G- 38240 E- 24440	Truck # 48
	1810	Bark	9980	Hog Fuel		G- 40440 E- 30460	Dumpster # 49 Truck # 18
✓	1845	FLY ASH	13640	Hog Fuel Boiler		G- 38080 E- 24440	Truck # 48
✓	1858	Bark	8860	Hog Fuel		G- 39820 E- 30460	Dumpster # 26 Truck # 18
✓	1935	FLY ASH	13000	Hog Fuel Boiler		G- 37440 E- 24440	Truck # 48
✓	1952	Bark	9980	Hog Fuel		G- 40240 E- 30460	Dumpster # 49 Truck # 18
✓	2018	FLY ASH	11840	Hog Fuel Boiler		G- 36280 E- 24440	Truck # 48

SOLID WASTE SURVEY DATA SHEET

4/3/87 B. White

				COMMENTS
✓ 2103 FLY ASH	11700	Hog Fuel Boiler	G-36140 F-24440	Truck # 42
✓ 2151 Pallets + trash	1890 (EST)	Fine Paper		Yellow dumper Truck # 18
✱ ✓ 2216 FLY ASH	12000	Hog Fuel Boiler	G-36440 F-24440	Truck # 4
✓ 2226 Pallets + trash	1890 (EST)	Fine Paper		Yellow dumper Truck # 18

✱ Truck # 49's driver said he may work the next shift (4:1 8:00 AM); If so he will leave scale tickets with AM Shift Engineer.

APPENDIX B

1980 SOLID WASTE AUDIT

LANDFILL LOADING STUDY - OCTOBER 27 - NOVEMBER 9, 1980 tue

Major Points Of Concern

1) 573 Loads/2 Weeks, Average 41 Loads/Day, 7 Days/Week

2) 2338 Tons of Waste/2 Weeks, Average 167 Tons/Day

3) Largest single contributor - Hog Fuel Boiler - Soot

38% by Loads
48% by Weight
80 T/D Average
Non-reusable - used for cover at landfill

4) Two Major Sources For Possible Reuse

A) Woody materials - Log, chips, bark, lumber, pallets, cores, etc.

B) Fibrous materials - Paper (clean & dirty), stock, Secondary Fiber, cores, etc.

	% LOADS		% WEIGHT		Average TONS/DAY	
Wood	18	33	22	29	36	49
Paper	15		7		12	

5) Other Materials Non-reclaimable (Dirt, trash, metal, lime, etc.)

29% by Loads
23% by Weight
28 T/D Average

6) Major Areas Of Contribution - By Weight

A) Hog Fuel Boiler
B) Plywood - Wood Products Area
C) Fine Paper
D) Mill Cleanup
E) Secondary Fiber

7) Major Areas Of Possible Reuse - By Weight

A) Plywood - Wood Products
B) Fine Paper
C) Mill Cleanup
D) Secondary Fiber

MAJOR TYPES OF WASTE

	% BASED ON TRUCK LOADS	% BY WEIGHT	Average TONS/DAY	TOTAL TON 2 WKS.
Hog Fuel Soot	38	48.3	80.5	1127
Woody Materials	18	21.7	36.3	508
	33	29.1	48.7	
Paper & Stock	15	7.4	12.4	174
Other	29	22.6	37.8	529
Total			167	2338

Truck Loads

573 Loads, Average 41/day used in calculations
30 Loads Outside contractor hauled from Old Woodyard (Not Included)

603 Total

:A	% BASED ON TRUCK LOADS	% BY WEIGHT	TOTAL TONS 2 WKS.	Avg AUGUST TONS/DAY	T/D/% WOODY MATERIALS	T/D/% PAPER MATERIALS	POSSIBLE REUSE %	COMMENTS
:al			233	167				
ı Fuel ›t	33.7	48.3	1127	80.5			0	
ıe Paper	16.5	5.4	124	8.8	3.5/40	4.3/49	89	
wood	10.5	16.6	379	27.1	24.5/90	.20/	90	
side tractor	11.8	No Weights			- /	/		No Truck Weighc
e Kiln	4.0	7.0	167	11.9	1.8/15	0.1/1	16	(Chip Belt Cleanup)
ondary er	3.7	4.6	103	7.3	0.2/2	5.1/70	72	20 Tons Wire Non-reusable
anup	2.5	1.0	22	1.6	0.1/20	0.9/59	79	(Mill Clean)
Shipping tform	2.8	1.0	22	1.6	/0	0.7/46	46	
5 Mill	1.4	1.9	46	3.3	2.1/65	0.8/26	91	(Cleanup)
ls	Total 573							
	Average 40.9 L/D							

SOLID WASTE STUDY - FALL 1980

PULPING AND RECOVERY AREAS

Total Complex	167 T/D	
Pulping & Recovery Total	98 T/D	59%

BREAKDOWN	T/D	%
Soot	80	82
Lime	10	10
Cleanup (Bark & Chips)	4	4
No. 5 Mill (Cleanup)	3	3
Boiler Room Area	1	1
Recovery Area	~0	0

While the Pulping and Recovery areas make up about 59% of the total loading to the landfill by weight at least 82% is non-reclaimable soot. At present soot makes up about 48% of the total weight to the landfill and is used for cover material there. Another 10% is from the Lime Kiln area. Part of this can be reclaimed (lumps) with the installation of "crushers" (now being put in), part is grits, good for roads and the remainder is mud and cleanup which is of no value at this time.

The remaining 8% is mainly cleanup from the bark and chip belts. This material should go to Hog Fuel, not to landfill. On Tuesday, December 2, 1980 at least eight trucks of bark and chips from around the No. 5 Mill area went to landfill.

While there is a low percentage of reusable waste generated from the Pulp & Recovery areas there is still room for improvement.

Dumpsters from the Bleach Plants, Pulp Mills and hog fuel bark rejects should not be contaminated with metal and garbage so these materials could be recycled through the Hog Fuel System.

All metal should be placed in the "metal only" buckets and sold as scrap.

All garbage and office waste should be placed in the sanitary dumpsters.

SOLID WASTE STUDY - FALL 1980

MISCELLANEOUS AREAS

Total Complex	167 T/D	
Miscellaneous Areas	4 T/D	2%

BREAKDOWN	T/D
Sales yard (Cleanup)	1.5
Storeroom	0.9
Garage	0.7
Main Office	0.3
Carpenter Shop	0.2
Wood Shop	0.1
Project Bldg. & Firehouse	0.1

These areas contribute a very small percentage to the overall picture at first glance. However, maintenance can be a major factor throughout the mill, especially by depositing the correct materials in the appropriate containers (metal, wood, etc.).

There are several "paper only" buckets in the mill now. They are dumped into a truck and hauled to landfill. Some of these paper waste could be bailed and used in Secondary Fiber or Hog Fuel.

The wood waste should either go to employ sales or to Hog Fuel, not to landfill.

The cleanup crews must be educated as to what can be reclaimed and how. This may mean more buckets, a new bailer, a new hogger or shredder.

These are the ways to reduce the burden cost of landfill.

APPENDIX C

BULK DENSITIES OF WASTE MATERIAL

BULK DENSITIES OF WASTE MATERIAL

	DENSITY LB/FT3
FLY ASH FROM LANDFILL	30.7
FLY ASH FROM TRUCKS	26.5
GRITS	31.7
DREGS	36.7
MILL CLEANUP TRASH (UNCOMPACTED)	8.1
MILL CLEANUP TRASH (LANDFILL)	29.7
BARK	10.2
PLYWOOD SCRAPS	13.2

APPENDIX D

MARCH 9 - 13, 1987 SCALEUP AUDIT

SCALEUP AUDIT

This audit was conducted by Perry Davis, the bulldozzer operator at the landfill site. It was conducted the week of March 9-13,1987. Table 3 contains the data from this audit. It should be noted that this data is only for the morning work shift. To obtain the inflated values the average truck load, for the 1987 aduit, was taken and scaled-up by using a weighted average of the number of trucks in each work shift.

TABLE 3
RAW DATA FROM AUDIT

	NUMBER OF TRUCK LOADS					
DATE	3/9	3/10	3/11	3/12	3/13	AVG.
PLYWOOD	15	16	13	13	5	12.5
FLY ASH	6	4	10	9	8	7.4
DUMPSTERS	4	5	7	5	3	4.8
METRIC (CONSTRUCTION)	1	3	2	0	0	1.2
WOOD YARD	11	6	15	11	16	11.8
MILL CLEANUP	4	6	6	2	11	5.8
TIDEWATER CONSTRUCTION	4	0	2	0	0	1.2
OTHERS	2	0	0	0	1	0.2
TOTALS	46	36	55	40	55	44.9

APPENDIX B.2

1989 SOLID WASTE MONITORING REPORT

SOLID WASTE MONITORING REPORT - WEYERHAEUSER, PLYMOUTH MILL COMPLEX
VOLUME OF WASTE GENERATED FROM EACH COLLECTION AREA DURING JANUARY 1, 1989 - NOVEMBER 26, 1989

WASTE TYPE	WASTE NAME	WASTE VOLUME (CU. FT.) FROM EACH COLLECTION AREA: BUCK SAW	FINE PAPER	GENERAL MILL	MAINT.	PAPER BOARD	PULP MILL	POWER RECOVERY	SECONDARY FIBER	WOOD PRODUCTS	WOOD YARD	OTHER	CONTRACTOR	WASTE ** TOTAL VOLUME (CU. FT.)	WASTE ** TOTAL VOLUME (CU. TDS.)
1	ASBESTOS												50976.60	0.00	0.00
2	ASH							3722120.00					16524.00	3722120.00	137856.30
3	BARK	2160.00		858.00				5210.00		182348.00	1696.00			192272.00	7121.19
4	CHIPS						1734.00	840.00		14538.00	742.00			17854.00	661.26
5	SAWDUST				361.00		943.00			16341.00	2447.00			20092.00	744.15
6	LOGS/BRANCHES	7560.00			1444.00			722.00		898.00	1931.00			12555.00	465.00
7	GEN. TRASH	1080.00	287471.50	41058.25	123714.50	79421.50	31320.25	52070.00	26864.75	308664.00	45886.25	1037.00	40286.00	998588.00	36984.74
8	DRUMS		1680.00		169.00			1466.00		2011.00				5326.00	197.26
9	GRITS							34785.50						34785.50	1288.35
10	DREGS							201864.75						201864.75	7476.47
11	DIRT	14040.00		376.00	1385.00	332.00	870.00	5562.00	221.00	449.00	1186.00		19648.00	24421.00	904.48
12	LIME MUD/LIME							24457.00					102808.00	24457.00	905.81
13	METAL TRASH		722.00	221.00	582.00	270.75		361.00	32979.50	1259.00	3894.00		4065.00	40289.25	1492.19
14	PAPER/PAPERBOARD		241037.75	1649.75	4501.25	9394.00	1039.00	361.00	4413.00		169.00	169.00		262733.75	9730.88
15	PLASTICS			858.00	221.00		361.00		13188.50				224.00	14628.50	541.80
16	PULP/REJECTS		781.00	169.00		361.00	3382.25		48612.75					53306.00	1974.30
17	MIXED WOOD	126630.00	5487.00	2318.00	13789.75	1444.00	361.00	12355.00	2276.50	414926.00	49264.26	361.00	4112.00	629212.51	23304.17
18	CONCRETE		943.00		1444.00	831.00			722.00		424.00		37672.75	4364.00	161.63
19	PAPER		10620.00			74.00		361.00						11055.00	409.44
20	PAPERBOARD							221.00						221.00	8.19
21	DEMO. W/O BRICK									898.00			2620.00	898.00	33.26
22	DEMO. W/ BRICK												2128.00	0.00	0.00
23	BRICK												2016.00	0.00	0.00
24	LIME MUD							1260.00					2688.00	1260.00	46.67
25	LIME							1164.00					224.00	1164.00	43.11
26	OTHER		1234.00		221.00	2157.50	2067.50	582.00			848.00	2652.00	280.00	9762.00	361.56
TOTAL INDUSTRIAL WASTE (CU. FT.)		151470.00	549976.25	47508.00	147832.50	94285.75	42078.00	4065762.25	129278.00	942332.00	108487.51	4219.00	286272.35	6283229.26	
TOTAL INDUSTRIAL WASTE (CU. TDS.)		5610.00	20369.49	1759.56	5475.28	3492.06	1558.44	150583.79	4788.07	34901.19	4018.06	156.26	10602.68		232712.19
TOTAL CONTRACTOR WASTE (CU. FT.)														286272.35	
TOTAL CONTRACTOR WASTE (CU. TDS.)															10602.68
TOTAL MILL WASTE (CU. FT.)														6569501.61	
TOTAL MILL WASTE (CU. TDS.)															243314.87

** - CONTRACTOR WASTE AMOUNTS NOT ADDED INTO WASTE TYPE TOTALS.

3302.

SOLID WASTE MONITORING REPORT - WEYERHAEUSER, PLYMOUTH MILL COMPLEX
AMOUNTS OF WASTE GENERATED FROM EACH COLLECTION AREA DURING JANUARY 1, 1989 - NOVEMBER 26, 1989

WASTE TYPE	WASTE NAME	WASTE WEIGHT (POUNDS) FROM EACH COLLECTION AREA: BUCK SAW	FINE PAPER	GENERAL MILL	MAINT.	PAPER BOARD	PULP MILL	POWER RECOVERY	SECONDARY FIBER	WOOD PRODUCTS	WOOD YARD	OTHER	CONTRACTOR	WASTE ** TOTAL WEIGHT (LBS)	WASTE ** TOTAL WEIGHT (TONS)
1	ASBESTOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	443496.42	0.00	0.00
2	ASH	0.00	0.00	0.00	0.00	0.00	0.00	**********	0.00	0.00	0.00	0.00	561816.00	126552080.00	63276.04
3	BARK	66960.00	0.00	26598.00	0.00	0.00	0.00	161510.00	0.00	5652788.00	52576.00	0.00	0.00	5960432.00	2980.22
4	CHIPS	0.00	0.00	0.00	0.00	0.00	36587.40	17724.00	0.00	306751.80	15656.20	0.00	0.00	376719.40	188.36
5	SAWDUST	0.00	0.00	0.00	9530.40	0.00	24895.20	0.00	0.00	431402.40	64600.80	0.00	0.00	530428.80	265.21
6	LOGS/BRANCHES	102816.00	0.00	0.00	19638.40	0.00	0.00	9819.20	0.00	12212.80	26261.60	0.00	0.00	170748.00	85.37
7	GEN. TRASH	12096.00	3219680.80	459852.40	1385602.40	889520.80	350786.80	583184.00	300885.20	3457036.80	513926.00	11614.40	451203.20	11184185.60	5592.09
8	DRUMS	0.00	3192.00	0.00	321.10	0.00	0.00	2785.40	0.00	3820.90	0.00	0.00	0.00	10119.40	5.06
9	GRITS	0.00	0.00	0.00	0.00	0.00	0.00	2824582.60	0.00	0.00	0.00	0.00	0.00	2824582.60	1412.29
10	DREGS	0.00	0.00	0.00	0.00	0.00	0.00	12838598.10	0.00	0.00	0.00	0.00	0.00	12838598.10	6419.30*
11	DIRT	1373112.00	0.00	36772.80	135453.00	32469.60	85086.00	543963.60	21613.80	43912.20	115990.80	0.00	1921574.40	2388373.80	1194.19
12	LIME MUD/LIME	0.00	0.00	0.00	0.00	0.00	0.00	2274501.00	0.00	0.00	0.00	0.00	9561144.00	2274501.00	1137.25-
13	METAL TRASH	0.00	131404.00	40222.00	105924.00	49276.50	0.00	65702.00	6002269.00	229138.00	708708.00	0.00	739830.00	7332643.50	3666.32
14	PAPER/PAPERBOARD	0.00	1349811.40	9238.60	25207.00	52606.40	5818.40	2021.60	24712.80	0.00	946.40	946.40	0.00	1471309.00	735.65
15	PLASTICS	0.00	0.00	3517.80	906.10	0.00	1480.10	0.00	54072.85	0.00	0.00	0.00	918.40	59976.85	29.99
16	PULP/REJECTS	0.00	14448.50	3126.50	0.00	6678.50	62571.63	0.00	899335.88	0.00	0.00	0.00	0.00	986161.00	493.08
17	MIXED WOOD	3621618.00	156928.20	66294.80	394386.85	41298.40	10324.60	353353.00	65107.90	11866883.60	1408957.84	10324.60	117603.20	17995477.79	8997.74
18	CONCRETE	0.00	44415.30	0.00	68012.40	39140.10	0.00	0.00	34006.20	0.00	19970.40	0.00	1774386.53	205544.40	102.77
19	PAPER	0.00	86022.00	0.00	0.00	599.40	0.00	2924.10	0.00	0.00	0.00	0.00	0.00	89545.50	44.77
20	PAPERBOARD	0.00	0.00	0.00	0.00	0.00	0.00	685.10	0.00	0.00	0.00	0.00	0.00	685.10	0.34
21	DEMO. W/O BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8890.20	0.00	0.00	25938.00	8890.20	4.45
22	DEMO. W/ BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31494.40	0.00	0.00
23	BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53424.00	0.00	0.00
24	LIME MUD	0.00	0.00	0.00	0.00	0.00	0.00	148680.00	0.00	0.00	0.00	0.00	317184.00	148680.00	74.34
25	LIME	0.00	0.00	0.00	0.00	0.00	0.00	79152.00	0.00	0.00	0.00	0.00	15232.00	79152.00	39.58
26	OTHER	0.00	13820.80	0.00	2475.20	24164.00	23156.00	6518.40	0.00	0.00	9497.60	29702.40	3136.00	109334.40	54.67
TOTAL INDUSTRIAL WASTE (POUNDS)		5176602.00	5019723.00	645622.90	2147456.85	1135753.70	600706.13	**********	7402003.63	22012836.70	2937091.64	52587.80	16018380.55	193598168.44	
TOTAL INDUSTRIAL WASTE (TONS)		2588.30	2509.86	322.81	1073.73	567.88	300.35	73233.89	3701.00	11006.42	1468.55	26.29	8009.19		96799.08
TOTAL CONTRACTOR WASTE (POUNDS)														16018380.55	
TOTAL CONTRACTOR WASTE (TONS)															8009.19
TOTAL MILL WASTE (POUNDS)														209616548.98	
TOTAL MILL WASTE (TONS)															104808.27

** - CONTRACTOR WASTE AMOUNTS NOT ADDED INTO WASTE TYPE TOTALS.

SOLID WASTE MONITORING REPORT - WEYERHAEUSER, PLYMOUTH MILL COMPLEX
VOLUME OF WASTE GENERATED FROM EACH COLLECTION AREA DURING JANUARY 1, 1989 - MAY 31, 1989

WASTE TYPE	WASTE NAME	WASTE VOLUME (CU. FT.) FROM EACH COLLECTION AREA: BUCK SAW	FINE PAPER	GENERAL MILL	MAINT.	PAPER BOARD	PULP MILL	POWER RECOVERY	SECONDARY FIBER	WOOD PRODUCTS	WOOD YARD	OTHER	CONTRACTOR	WASTE ** TOTAL VOLUME (CU. FT.)	WASTE ** TOTAL VOLUME (CU. YDS.)
1	ASBESTOS												21075.60	0.00	0.00
2	ASH							1776940.75						1776940.75	65812.62
3	BARK			858.00				3405.00		173979.00	1696.00			179938.00	6664.37
4	CHIPS						1734.00	840.00		13308.00	424.00			16306.00	603.93
5	SAWDUST				361.00		722.00			14213.00	2071.00			17367.00	643.22
6	LOGS/BRANCHES				1083.00			722.00		898.00	361.00			3064.00	113.48
7	GEN. TRASH		137432.75	22073.75	61330.50	33195.00	12829.50	20612.75	17910.00	146365.00	21645.75		18838.00	473395.00	17533.15
8	DRUMS		1680.00					1466.00		2011.00				5157.00	191.00
9	GRITS							13123.75						13123.75	486.06
10	DREGS							103541.75						103541.75	3834.88
11	DIRT				943.00			3072.00	221.00				448.00	4236.00	156.89
12	LIME MUD/LIME							10468.00					2328.00	10468.00	387.70
13	METAL TRASH		722.00	221.00				361.00	10496.75	1259.00	3109.00		2793.00	16168.75	598.84
14	PAPER/PAPERBOARD		133429.25	338.00	2302.50	2750.00	678.00		1444.00		169.00			141110.75	5226.32
15	PLASTICS			858.00	221.00		361.00		6657.75				224.00	8097.75	299.92
16	PULP/REJECTS		781.00	169.00		361.00	1083.00		46841.00					49235.00	1823.52
17	MIXED WOOD	5130.00	2074.00	1190.00	6800.00	722.00	361.00	10911.00	1915.50	338085.00	37061.26		1284.00	404249.76	14972.21
18	CONCRETE		582.00		361.00				722.00				10960.75	1665.75	61.69
19	PAPER		9868.00			74.00		361.00						10303.00	381.59
20	PAPERBOARD													0.00	0.00
21	DEMO. W/O BRICK									898.00			1500.00	898.00	33.26
22	DEMO. W/ BRICK												1904.00	0.00	0.00
23	BRICK												2016.00	0.00	0.00
24	LIME MUD							1260.00					2688.00	1260.00	46.67
25	LIME							1164.00					224.00	1164.00	43.11
26	OTHER		1234.00		221.00		295.00							1750.00	64.81
TOTAL INDUSTRIAL WASTE (CU. FT.)		5130.00	287803.00	25707.75	73623.00	37102.00	18063.50	1948249.00	86208.00	691016.00	66537.01	0.00	66283.35	3239439.26	
TOTAL INDUSTRIAL WASTE (CU. YDS.)		190.00	10659.37	952.14	2726.78	1374.15	669.02	72157.37	3192.89	25593.19	2464.33	0.00	2454.94		119979.23
TOTAL CONTRACTOR WASTE (CU. FT.)														66283.35	
TOTAL CONTRACTOR WASTE (CU. YDS.)															2454.94
TOTAL MILL WASTE (CU. FT.)														3305722.61	
TOTAL MILL WASTE (CU. YDS.)															122434.17

** - CONTRACTOR WASTE AMOUNTS NOT ADDED INTO WASTE TYPE TOTALS.

SOLID WASTE MONITORING REPORT - WEYERHAEUSER, PLYMOUTH MILL COMPLEX
AMOUNTS OF WASTE GENERATED FROM EACH COLLECTION AREA DURING JANUARY 1, 1989 - MAY 31, 1989

WASTE TYPE	WASTE NAME	WASTE WEIGHT (POUNDS) FROM EACH COLLECTION AREA: BUCK SAW	FINE PAPER	GENERAL MILL	MAINT.	PAPER BOARD	PULP MILL	POWER RECOVERY	SECONDARY FIBER	WOOD PRODUCTS	WOOD YARD	OTHER	CONTRACTOR	WASTE ** TOTAL WEIGHT (LBS)	WASTE ** TOTAL WEIGHT (TONS)
1	ASBESTOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	183357.72	0.00	0.00
2	ASH	0.00	0.00	0.00	0.00	0.00	0.00	60415985.50	0.00	0.00	0.00	0.00	0.00	60415985.50	30207.99
3	BARK	0.00	0.00	26598.00	0.00	0.00	0.00	105555.00	0.00	5393349.00	52576.00	0.00	0.00	5578078.00	2789.04
4	CHIPS	0.00	0.00	0.00	0.00	0.00	36587.40	17724.00	0.00	280798.80	8946.40	0.00	0.00	344056.60	172.03
5	SAWDUST	0.00	0.00	0.00	9530.40	0.00	19060.80	0.00	0.00	375223.20	54674.40	0.00	0.00	458488.80	229.24
6	LOGS/BRANCHES	0.00	0.00	0.00	14728.80	0.00	0.00	9819.20	0.00	12212.80	4909.60	0.00	0.00	41670.40	20.84
7	GEN. TRASH	0.00	1539246.80	247226.00	686901.60	371784.00	143690.40	230862.80	200592.00	1639288.00	242432.40	0.00	210985.60	5302024.00	2651.01
8	DRUMS	0.00	3192.00	0.00	0.00	0.00	0.00	2785.40	0.00	3820.90	0.00	0.00	0.00	9798.30	4.90
9	GRITS	0.00	0.00	0.00	0.00	0.00	0.00	1065648.50	0.00	0.00	0.00	0.00	0.00	1065648.50	532.82
10	DREGS	0.00	0.00	0.00	0.00	0.00	0.00	6585255.30	0.00	0.00	0.00	0.00	0.00	6585255.30	3292.63
11	DIRT	0.00	0.00	0.00	92225.40	0.00	0.00	300441.60	21613.80	0.00	0.00	0.00	43814.40	414280.80	207.14
12	LIME MUD/LIME	0.00	0.00	0.00	0.00	0.00	0.00	973524.00	0.00	0.00	0.00	0.00	216504.00	973524.00	486.76
13	METAL TRASH	0.00	131404.00	40222.00	0.00	0.00	0.00	65702.00	1910408.50	229138.00	565838.00	0.00	508326.00	2942712.50	1471.36
14	PAPER/PAPERBOARD	0.00	747203.80	1892.80	12894.00	15400.00	3796.80	0.00	8086.40	0.00	946.40	0.00	0.00	790220.20	395.11
15	PLASTICS	0.00	0.00	3517.80	906.10	0.00	1480.10	0.00	27296.78	0.00	0.00	0.00	918.40	33200.77	16.60
16	PULP/REJECTS	0.00	14448.50	3126.50	0.00	6678.50	20035.50	0.00	866558.50	0.00	0.00	0.00	0.00	910847.50	455.42
17	MIXED WOOD	146718.00	59316.40	34034.00	194480.00	20649.20	10324.60	312054.60	54783.30	9669231.00	1059952.04	0.00	36722.40	11561543.14	5780.77
18	CONCRETE	0.00	27412.20	0.00	17003.10	0.00	0.00	0.00	34006.20	0.00	0.00	0.00	516251.33	78421.50	39.21
19	PAPER	0.00	79930.80	0.00	0.00	599.40	0.00	2924.10	0.00	0.00	0.00	0.00	0.00	83454.30	41.73
20	PAPERBOARD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	DEMO. W/O BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8890.20	0.00	0.00	14850.00	8890.20	4.45
22	DEMO. W/ BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	28179.20	0.00	0.00
23	BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	53424.00	0.00	0.00
24	LIME MUD	0.00	0.00	0.00	0.00	0.00	0.00	148680.00	0.00	0.00	0.00	0.00	317184.00	148680.00	74.34
25	LIME	0.00	0.00	0.00	0.00	0.00	0.00	79152.00	0.00	0.00	0.00	0.00	15232.00	79152.00	39.58
26	OTHER	0.00	13820.80	0.00	2475.20	0.00	3304.00	0.00	0.00	0.00	0.00	0.00	0.00	19600.00	9.80
TOTAL INDUSTRIAL WASTE (POUNDS)		146718.00	2615975.30	356617.10	1031144.60	415111.10	238279.60	70316114.00	3123345.48	17611951.90	1990275.24	0.00	2145749.05	97845532.31	
TOTAL INDUSTRIAL WASTE (TONS)		73.36	1307.99	178.31	515.57	207.56	119.14	35158.06	1561.67	8805.98	995.14	0.00	1072.87		48922.77
TOTAL CONTRACTOR WASTE (POUNDS)														2145749.05	
TOTAL CONTRACTOR WASTE (TONS)															1072.87
TOTAL MILL WASTE (POUNDS)														99991281.36	
TOTAL MILL WASTE (TONS)															49995.64

** - CONTRACTOR WASTE AMOUNTS NOT ADDED INTO WASTE TYPE TOTALS.

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SOLID WASTE MONITORING REPORT - WEYERHAEUSER, PLYMOUTH MILL COMPLEX
VOLUME OF WASTE GENERATED FROM EACH COLLECTION AREA DURING JUNE 1, 1989 - NOVEMBER 26, 1989

WASTE TYPE	WASTE NAME	WASTE VOLUME (CU. FT.) FROM EACH COLLECTION AREA: BUCK SAW	FINE PAPER	GENERAL MILL	MAINT.	PAPER BOARD	PULP MILL	POWER RECOVERY	SECONDARY FIBER	WOOD PRODUCTS	WOOD YARD	OTHER	CONTRACTOR	WASTE ** TOTAL VOLUME (CU. FT.)	WASTE ** TOTAL VOLUME (CU. YDS.)
1	ASBESTOS												29901.00	0.00	0.00
2	ASH							1945179.25					16524.00	1945179.25	72043.68
3	BARK	2160.00						1805.00		8369.00				12334.00	456.81
4	CHIPS									1230.00	318.00			1548.00	57.33
5	SAWDUST						221.00			2128.00	376.00			2725.00	100.93
6	LOGS/BRANCHES	7560.00			361.00						1570.00			9491.00	351.52
7	GEN. TRASH	1080.00	150038.75	18984.50	62384.00	46226.50	18490.75	31457.25	8954.75	162299.00	24240.50	1037.00	21448.00	525193.00	19451.59
8	DRUMS				169.00									169.00	6.26
9	GRITS							21661.75						21661.75	802.29
10	DREGS							98323.00						98323.00	3641.59
11	DIRT	14040.00		376.00	442.00	332.00	870.00	2490.00		449.00	1186.00		19200.00	20185.00	747.59
12	LIME MUD/LIME							13989.00					100480.00	13989.00	518.11
13	METAL TRASH				582.00	270.75			22482.75		785.00		1272.00	24120.50	893.35
14	PAPER/PAPERBOARD		107608.50	1311.75	2198.75	6644.00	361.00	361.00	2969.00			169.00		121623.00	4504.56
15	PLASTICS								6530.75					6530.75	241.88
16	PULP/REJECTS						2299.25		1771.75					4071.00	150.78
17	MIXED WOOD	121500.00	3413.00	1128.00	6989.75	722.00		1444.00	361.00	76841.00	12203.00	361.00	2828.00	224962.75	8331.95
18	CONCRETE		361.00		1083.00	831.00					424.00		26712.00	2699.00	99.96
19	PAPER		752.00											752.00	27.85
20	PAPERBOARD							221.00						221.00	8.19
21	DEMO. W/O BRICK												1120.00	0.00	0.00
22	DEMO. W/ BRICK												224.00	0.00	0.00
23	BRICK													0.00	0.00
24	LIME MUD													0.00	0.00
25	LIME													0.00	0.00
26	OTHER					2157.50	1772.50	582.00			848.00	2652.00	280.00	8012.00	296.74
TOTAL INDUSTRIAL WASTE (CU. FT.)		146340.00	262173.25	21800.25	74209.50	57183.75	24014.50	2117513.25	43070.00	251316.00	41950.50	4219.00	219989.00	3043790.00	
TOTAL INDUSTRIAL WASTE (CU. YDS.)		5420.00	9710.12	807.42	2748.50	2117.92	889.43	78426.42	1595.19	9308.00	1553.72	156.26	8147.74		112732.96
TOTAL CONTRACTOR WASTE (CU. FT.)														219989.00	
TOTAL CONTRACTOR WASTE (CU. YDS.)															8147.74
TOTAL MILL WASTE (CU. FT.)														3263779.00	
TOTAL MILL WASTE (CU. YDS.)															120880.70

** - CONTRACTOR WASTE AMOUNTS NOT ADDED INTO WASTE TYPE TOTALS.

SOLID WASTE MONITORING REPORT - WEYERHAEUSER, PLYMOUTH MILL COMPLEX
AMOUNTS OF WASTE GENERATED FROM EACH COLLECTION AREA DURING JUNE 1, 1989 - NOVEMBER 26, 1989

WASTE TYPE	WASTE NAME	WASTE WEIGHT (POUNDS) FROM EACH COLLECTION AREA: BUCK SAW	FINE PAPER	GENERAL MILL	MAINT.	PAPER BOARD	PULP MILL	POWER RECOVERY	SECONDARY FIBER	WOOD PRODUCTS	WOOD YARD	OTHER	CONTRACTOR	WASTE ** TOTAL WEIGHT (LBS)	WASTE ** TOTAL WEIGHT (TONS)
1	ASBESTOS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	260138.70	0.00	0.00
2	ASH	0.00	0.00	0.00	0.00	0.00	0.00	66136094.50	0.00	0.00	0.00	0.00	561816.00	66136094.50	33068.05
3	BARK	66960.00	0.00	0.00	0.00	0.00	0.00	55955.00	0.00	259439.00	0.00	0.00	0.00	382354.00	191.18
4	CHIPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25953.00	6709.80	0.00	0.00	32662.80	16.33
5	SAWDUST	0.00	0.00	0.00	0.00	0.00	5834.40	0.00	0.00	56179.20	9926.40	0.00	0.00	71940.00	35.97
6	LOGS/BRANCHES	102816.00	0.00	0.00	4909.60	0.00	0.00	0.00	0.00	0.00	21352.00	0.00	0.00	129077.60	64.54
7	GEN. TRASH	12096.00	1680434.00	212626.40	698700.80	517736.80	207096.40	352321.20	100293.20	1817748.80	271493.60	11614.40	240217.60	5882161.60	2941.08
8	DRUMS	0.00	0.00	0.00	321.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	321.10	0.16
9	GRITS	0.00	0.00	0.00	0.00	0.00	0.00	1758934.10	0.00	0.00	0.00	0.00	0.00	1758934.10	879.47
10	DREGS	0.00	0.00	0.00	0.00	0.00	0.00	6253342.80	0.00	0.00	0.00	0.00	0.00	6253342.80	3126.67
11	DIRT	1373112.00	0.00	36772.80	43227.60	32469.60	85086.00	243522.00	0.00	43912.20	115990.80	0.00	1877760.00	1974093.00	987.05
12	LIME MUD/LIME	0.00	0.00	0.00	0.00	0.00	0.00	1300977.00	0.00	0.00	0.00	0.00	9344640.00	1300977.00	650.49
13	METAL TRASH	0.00	0.00	0.00	105924.00	49276.50	0.00	0.00	4091860.50	0.00	142870.00	0.00	231504.00	4389931.00	2194.97
14	PAPER/PAPERBOARD	0.00	602607.60	7345.80	12313.00	37206.40	2021.60	2021.60	16626.40	0.00	0.00	946.40	0.00	681088.80	340.54
15	PLASTICS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26776.08	0.00	0.00	0.00	0.00	26776.08	13.39
16	PULP/REJECTS	0.00	0.00	0.00	0.00	0.00	42536.13	0.00	32777.38	0.00	0.00	0.00	0.00	75313.50	37.66
17	MIXED WOOD	3474900.00	97611.80	32260.80	199906.85	20649.20	0.00	41298.40	10324.60	2197652.60	349005.80	10324.60	80880.80	6433934.65	3216.97
18	CONCRETE	0.00	17003.10	0.00	51009.30	39140.10	0.00	0.00	0.00	0.00	19970.40	0.00	1258135.20	127122.90	63.56
19	PAPER	0.00	6091.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6091.20	3.05
20	PAPERBOARD	0.00	0.00	0.00	0.00	0.00	0.00	685.10	0.00	0.00	0.00	0.00	0.00	685.10	0.34
21	DEMO. W/O BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11088.00	0.00	0.00
22	DEMO. W/ BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3315.20	0.00	0.00
23	BRICK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
24	LIME MUD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	LIME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	OTHER	0.00	0.00	0.00	0.00	24164.00	19852.00	6518.40	0.00	0.00	9497.60	29702.40	3136.00	89734.40	44.87
TOTAL INDUSTRIAL WASTE (POUNDS)		5029884.00	2403747.70	289005.80	1116312.25	720642.60	362426.53	76151670.10	4278658.15	4400884.80	946816.40	52587.80	13872631.50	95752636.13	
TOTAL INDUSTRIAL WASTE (TONS)		2514.94	1201.87	144.50	558.16	360.32	181.21	38075.84	2139.33	2200.44	473.41	26.29	6936.32		47876.32
TOTAL CONTRACTOR WASTE (POUNDS)														13872631.50	
TOTAL CONTRACTOR WASTE (TONS)															6936.32
TOTAL MILL WASTE (POUNDS)														109625267.63	
TOTAL MILL WASTE (TONS)															54812.63

** - CONTRACTOR WASTE AMOUNTS NOT ADDED INTO WASTE TYPE TOTALS.

APPENDIX C

TEST RESULTS - WASTE ANALYSIS

DATE: January 8, 1988

FROM: Steve M. Harlan

TO: Robert Sackellares

SUBJECT: Plymouth samples analyses

As per our recent conversation, I have compiled all information concerning the Plymouth samples we have sent to WTC for analysis to date. The samples that we have had analyzed are as follows:

1) freshly dredged sludge (land application)
2) fly ash from the Riley boiler (coal ash)
3) ASB sludge
4) No. 1 retention pond sludge
5) No. 2 retention pond sludge
6) freshly dredged sludge (TCLP and PCB)
7) old stored sludge from the north end of easterly ponds
8) old stored sludge from the south end of easterly ponds
9) dregs
10) lime mud
11) grits
12) coal ash (sample 2 for reactivity and corrosivity)
13) hog fuel ash

TCLP and PCB (Arochlor) analyses has been run on all samples (except that the No. 1 retention pond sample was unanalyzable for PCB). The grits, dregs and lime mud samples were further analyzed for corrosivity and reactivity. TS, TVS, pH, Cl^-, TKN, NO_3/NO_2-N, NH_3, TOX and HHV were run on freshly dredged sluge only. I am sending a sample of the older stored sludge for all other analyses except TCLP, and PCB, corrosivity and reactivity this week. A complete listing of the results of all analyses run on the above samples is summarized in the following tables.

Service Request# for old stored sludge: 16648

ELEMENTAL ANALYSES

(1) Freshly Dredged Sludge and (2) Fly Ash (Riley)

Element	Percent of O.D. Weight			
	TOTAL	FILTERED	FILTRATE	FLY ASH (Riley)
C	22.80	24.20	2.00	22.90*
H	1.65	1.76	----	<0.10
N	0.19	0.20	----	0.25
O	38.00	46.00	----	2.00
P	0.08	----	----	----
S	----	0.50	----	----
SO_4	0.14	----	----	----
Al	----	0.68	0.008	----
As	----	<0.0001	<0.0001	----
B	----	<0.001	0.003	----
Ca	2.96	2.50	16.70	----
Cd	----	<0.0002	<0.0003	----
Co	----	<0.0002	<0.0003	----
Cr	----	0.0022	<0.0003	----
Cu	----	0.0042	<0.0003	----
Fe	----	0.36	0.042	----
K	0.062	0.01	0.55	----
Mg	0.088	0.071	0.66	----
Mn	----	0.012	0.055	----
Mo	----	<0.0002	<0.0003	----
Na	----	0.11	10.90	----
Ni	----	0.002	<0.0006	----
Pb	----	0.0015	0.0001	----
Se	----	<0.0001	<0.00005	----
Si	----	24.00	0.29	----
Sn	----	0.002	<0.0015	----
V	----	0.0024	0.0008	----
Zn	----	0.0089	<0.0003	----
Hg	----	0.00002	<0.0001	----

*L.O.I. was found to be 25.3 (ASTM Method).

All samples were found to contain less than the detention limit for Arochlor 1221, 1016, 1232, 1242/48, 1254 and 1260/1262.

NUTRIENTS AND PHYSICAL CHARACTERISTICS

(1) Freshly Dredged Sludge and (2) Fly Ash (Riley)

Oven Dryed Weight Basis

Analysis	TOTAL	FILTERED	FILTRATE	FLY ASH (Riley)
TS (%)	21.6	36.2	0.38	----
TVS (%)	37.4	37.7	0.19	----
pH	7.2	----	----	----
Cl (mg/kg)	1560	----	----	----
TKN (mg/kg)	1900	----	----	----
NO_3-NO_2 (mg/kg)	1.6	----	----	----
NH^{-} (mg/kg)	2.0	----	----	----
TOX (mg/l)	2.8*	----	----	----
HHV (BTU/lb.)	3080	2960	----	----

*Supernatant only

TCLP AND PCB ANALYSIS

(3) ASB, (4)NO. 1 RETENTION POND, (5)NO. 2 RETENTION POND, (6)FRESHLY DREDGED SLUDGE, (7) OLD SLUDGE; NORTH END AND (8)OLD SLUDGE; SOUTH END

METALS

mg/l in TCLP extract

Element	ASB	No. 1 Ret.	No. 2 Ret.	Fresh	Old North	Old South
Ag	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
As	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Ba	0.50	<0.01	<0.01	<0.01	<0.01	<0.01
Cd	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cr	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Pb	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25
Se	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Hg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001

TCLP AND PCB ANALYSIS

(9)Dregs, (10)Lime Mud, (11)Grits, (12)Coal Ash and (13)Hog fuel Ash

METALS
mg/l in TCLP extract

Element	Dregs	Lime Mud	Grits	Coal Ash	Hog fuel Ash
Ag	<0.02	<0.02	<0.02	<0.02	<0.02
As	<0.1	<0.1	<0.1	<0.1	<0.1
Ba	0.8	0.7	1.1	<0.5	1.0
Cd	<0.02	<0.02	<0.02	<0.02	<0.02
Cr	<0.02	<0.02	<0.02	<0.02	<0.02
Pb	<0.1	<0.1	<0.1	<0.1	<0.1
Se	<0.2	<0.2	<0.2	<0.2	<0.2
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

NOTE: Dregs, Lime Mud and Grits were also tested for corrosivity and reactivity. All three were found to exhibit corrosivity (pH of all ranged from 13.0 to 13.1) but none were found to exhibit reactivity.

WEYERHAEUSER TECHNOLOGY CENTER
ANALYTICAL LABORATORY
TACOMA, WASHINGTON

REPORT

PLYMOUTH PRIMARY SLUDGE
AROCHLOR ANALYSIS
AMOUNT IN PPM ~~(uG/GRAM)~~

(1) (2)

Compound	Report Limit	#1 TOTAL SLUDGE 99891	#2 FILT SLUDGE 99892	#3 SLUDGE FILTRATE 99893	#4 FLY ASH 99894
Arochlor 1221	0.025 ppm	*	*	L	L
Arochlor 1016	0.005 ppm	*	*	L	L
Arochlor 1232	0.005 ppm	*	*	L	L
Arochlor 1242/48	0.005 ppm	*	*	L	L
Arochlor 1254	0.005 ppm	*	*	L	L
Arochlor 1260/1262	0.005 ppm	*	*	L	L

'L' indicates that the amount is less than the report limit
'*' indicates that the report limit is a factor of 10 times higher

* detection limit

Approved [signature] Date 11/2/87 Notebook _____

Page Number _____

WEYERHAEUSER TECHNOLOGY CENTER
ANALYTICAL LABORATORY
TACOMA, WASHINGTON

REPORT

PLYMOUTH MILL TREATMENT SYSTEM SLUDGE
TCLP ORGANICS

VOLATILES
ug/L

	(3) ASB	(5) #2 RP	(6) NEW	(7) OLD-N	(8) OLD-S	Regulatory level
Acrylonitrile*	<50	<50	<50	<50	<50	5 000
Benzene	<5	<5	<5	<5	<5	70
Carbon disulfide	<10	<10	<10	<10	<10	70
Carbon tetrachloride	<5	<5	<5	<5	<5	70
Chlorobenzene	<5	<5	<5	<5	<5	1 400
Chloroform	<5	<5	13	<5	<5	70
1,2-Dichloroethane	<5	<5	<5	<5	<5	400
1,1-Dichloroethylene	<5	<5	<5	<5	<5	100
Isobutanol*	<50	<50	<50	<50	<50	25 000
Methylene chloride	<5	<5	<5	5	<5	8 600
Methyl ethyl ketone	<50	<50	<50	<50	<50	7 200
Pyridine*	<50	<50	<50	<50	<50	5 000
1,1,1,2-Tetrachloroethane*	<5	<5	<5	<5	<5	10 000
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	1 300
Tetrachloroethylene	<5	<5	<5	<5	<5	100
Toluene	<5	<5	<5	<5	<5	14 400
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	25 000
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	1 200
Trichloroethylene	<5	<5	<5	<5	<5	70
Vinyl chloride	<10	<10	<10	<10	<10	50

Sample #1 RP TCLP volatiles bottle was found to have the teflon side of the liner incorrectly placed. The sample was thus unanalyzable.

* - Compound searched for in volatiles run.

Approved [signature] Date [illegible] Notebook _____

Page Number _____

Semivolatiles

ug/L

	ASB	#1 RP	#2 RP	NEW	OLD-N	OLD-S	Regulatory level
Bis(2-chloroethyl)ether	<10	<10	<10	<10	<10	<10	50
o-Cresol	<20	<20	<20	<20	<20	<20	10 000
m-Cresol	<20	<20	<20	<20	<20	<20	10 000
p-Cresol	<20	<20	<20	<20	14	17	10 000
1,2-Dichlorobenzene	<10	<10	<10	<10	<10	<10	4 300
1,4-Dichlorobenzene	<10	<10	<10	<10	<10	<10	10 800
1,3-Dichlorobenzene	<10	<10	<10	<10	<10	<10	400
2,4-Dinitrotoluene	<10	<10	<10	<10	<10	<10	130
Hexachlorobenzene	<10	<10	<10	<10	<10	<10	130
Hexachlorobutadiene	<10	<10	<10	<10	<10	<10	720
Hexachloroethane	<10	<10	<10	<10	<10	<10	4 300
Nitrobenzne	<10	<10	<10	<10	<10	<10	130
Pentachlorophenol	<20	<20	<20	<20	<20	<20	3 600
Phenol	120	100	140	54	39	20	14 400
2,3,4,6-Tetrachlorophenol	<20	<20	<20	<20	<20	<20	1 500
2,4,5-Trichlorophenol	<20	<20	<20	<20	<20	<20	5 800
2,4,6-Trichlorophenol	<20	<20	<20	<20	<20	<20	300

Pesticides

ug/L

	Regulatory level
	See attached sheet
Chlordane	30
Endrin	3
Heptachlor	1
Heptachlor epoxide	1
Lindane	60
Methoxychlor	1 400
Toxaphene	70

Herbicides

ug/L

	ASB	#1 RP	#2 RP	NEW	OLD-N	OLD-S	Regulatory level
2,4-D	<30	<30	<30	<30	<30	<30	1 400
2,4,5-TP	<3	<3	<3	<3	<3	<3	140

APPENDIX D

DESIGN CALCULATIONS

RMT INC.
100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

DESIGN SHEET

SHEET _____ OF _____

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	12/5/89			467.36

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RMT INC.
100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

DESIGN SHEET

SHEET _____ OF _____

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	12/2/89			467.36

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SEDIMENT POND SUMMARY SHEET

POND #	DRAINAGE AREA (AC)	INFLOW (CFS) Q_{10}	INFLOW (CFS) Q_{100}	BOTTOM EL. (MSL)	SEDIMENT VOLUME (AC-FT)	RISER SIZE (IN)	RISER EL. (MSL)	PRINCIPAL SPILL SIZE (IN)	PRINCIPAL SPILL Q_{10} (CFS)	EMERG. SPILL EL. (MSL)	EMERG. SPILL FLOW DEPTH (FT)
1	33.9	47.25	87.50	5	1.67	18	8	12	6.6	11.0	1.26
2	20.3	42.57	72.89	13	0.80	18	16	12	8.1	22.2	1.68

- SCS Curve number method used for runoff & time of concentration concentration
- Riser elevation set above sediment storage level
- Emergency Spillway Elevation set above the crest of the 10 year event.
- Curve Number - 70

Revised 10/89

RMII INC.

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT/PROPOSAL NAME: Weyerhaeuser Landfill

PREPARED By: SLM Date: 2/23/89

CHECKED By: Date:

PROJECT/PROPOSAL NO. 4L736

SHEET ____ OF ____

DESIGN SHEET

POND 1

10 YR EVENT
STORM ROUTING
RESULTS
PG 2-5

Reservoir Routing Program
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POND 1 - 10 YEAR STORM

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
5	0	0
6	1.27	0
7	2.61	0
8	4.01	0
9	5.48	5.55
10	7.03	6.15
11	8.64	6.7
12	10.33	7.2
13	12.09	7.68
14	13.93	8.13

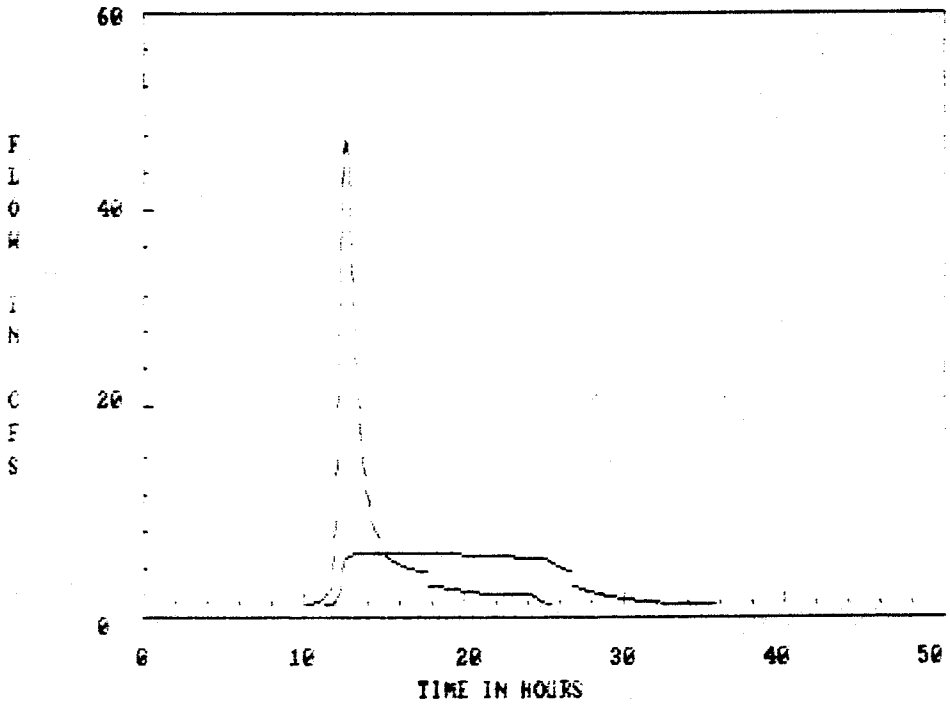
MAXIMUM INFLOW = 47.25 CFS AT 12.60 HOURS.
MAXIMUM RESERVOIR ELEVATION = 10.75 FEET AT 14.90 HOURS.
MAXIMUM OUTFLOW = 5.56 CFS AT 14.90 HOURS.

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	8.00	4.01	0.00	
0.20	0.00	8.00	4.01	0.00	
0.40	0.00	8.00	4.01	0.00	
0.60	0.00	8.00	4.01	0.00	
0.80	0.00	8.00	4.01	0.00	
1.00	0.00	8.00	4.01	0.00	
1.20	0.00	8.00	4.01	0.00	
1.40	0.00	8.00	4.01	0.00	
1.60	0.00	8.00	4.01	0.00	
1.80	0.00	8.00	4.01	0.00	
2.00	0.00	8.00	4.01	0.00	
2.20	0.00	8.00	4.01	0.00	
2.40	0.00	8.00	4.01	0.00	
2.60	0.00	8.00	4.01	0.00	
2.80	0.00	8.00	4.01	0.00	
3.00	0.00	8.00	4.01	0.00	
3.20	0.00	8.00	4.01	0.00	
3.40	0.00	8.00	4.01	0.00	
3.60	0.00	8.00	4.01	0.00	
3.80	0.00	8.00	4.01	0.00	
4.00	0.00	8.00	4.01	0.00	
4.20	0.00	8.00	4.01	0.00	
4.40	0.00	8.00	4.01	0.00	
4.60	0.00	8.00	4.01	0.00	
4.80	0.00	8.00	4.01	0.00	
5.00	0.00	8.00	4.01	0.00	
5.20	0.00	8.00	4.01	0.00	
5.40	0.00	8.00	4.01	0.00	
5.60	0.00	8.00	4.01	0.00	
5.80	0.00	8.00	4.01	0.00	
6.00	0.00	8.00	4.01	0.00	
6.20	0.00	8.00	4.01	0.00	
6.40	0.00	8.00	4.01	0.00	
6.60	0.00	8.00	4.01	0.00	

7.20	0.00	8.00	4.01	0.00
7.40	0.00	8.00	4.01	0.00
7.60	0.00	8.00	4.01	0.00
7.80	0.00	8.00	4.01	0.00
8.00	0.00	8.00	4.01	0.00
8.20	0.00	8.00	4.01	0.00
8.40	0.00	8.00	4.01	0.00
8.60	0.00	8.00	4.01	0.00
8.80	0.00	8.00	4.01	0.00
9.00	0.00	8.00	4.01	0.00
9.20	0.00	8.00	4.01	0.00
9.40	0.00	8.00	4.01	0.00
9.60	0.02	8.00	4.01	0.00
9.80	0.06	8.00	4.01	0.00
10.00	0.12	8.00	4.01	0.01
10.20	0.22	8.00	4.01	0.02
10.40	0.34	8.01	4.02	0.03
10.60	0.51	8.01	4.03	0.06
10.80	0.72	8.02	4.03	0.09
11.00	0.99	8.02	4.05	0.14
11.20	1.35	8.04	4.06	0.20
11.40	1.83	8.05	4.08	0.26
11.60	3.55	8.07	4.11	0.40
11.80	4.53	8.10	4.16	0.58
12.00	12.03	8.18	4.26	1.01
12.20	28.99	8.36	4.57	3.11
12.40	42.55	8.74	5.10	4.11
12.60	47.22	9.16	5.77	5.66
12.80	43.15	9.61	6.43	5.92
13.00	34.34	9.92	6.97	6.13
13.20	26.17	10.21	7.36	6.26
13.40	20.65	10.36	7.63	6.36
13.60	16.57	10.51	7.85	6.43
13.80	13.60	10.59	7.99	6.46
14.00	11.40	10.66	8.09	6.51
14.20	9.77	10.70	8.15	6.53
14.40	8.52	10.72	8.20	6.55
14.60	7.56	10.74	8.22	6.56
14.80	6.80	10.75	8.23	6.56
15.00	6.21	10.75	8.23	6.56
15.20	5.65	10.74	8.22	6.56
15.40	5.47	10.73	8.21	6.55
15.60	5.16	10.72	8.19	6.55
15.80	4.91	10.70	8.16	6.54
16.00	4.68	10.69	8.13	6.53
16.20	4.45	10.67	8.10	6.52
16.40	4.25	10.64	8.07	6.50
16.60	4.06	10.62	8.03	6.49
16.80	3.89	10.59	7.99	6.48
17.00	3.76	10.57	7.94	6.46
17.20	3.65	10.54	7.90	6.45
17.40	3.55	10.51	7.85	6.43
17.60	3.46	10.48	7.80	6.41
17.80	3.38	10.45	7.75	6.40
18.00	3.30	10.42	7.70	6.38
18.20	3.22	10.39	7.65	6.36
18.40	3.14	10.35	7.60	6.34
18.60	3.06	10.32	7.54	6.33
18.80	2.98	10.29	7.49	6.31
19.00	2.90	10.25	7.43	6.29
19.20	2.83	10.22	7.38	6.27
19.40	2.75	10.18	7.32	6.25
19.60	2.67	10.14	7.26	6.23
19.80	2.59	10.11	7.20	6.21

20.40	2.36	9.95	7.02	6.15
20.60	2.39	9.98	6.96	6.12
20.80	2.24	9.91	6.89	6.10
21.00	2.19	9.87	6.83	6.07
21.20	2.16	9.83	6.76	6.03
21.40	2.14	9.79	6.70	6.02
21.60	2.11	9.75	6.63	6.00
21.80	2.10	9.70	6.57	5.97
22.00	2.08	9.66	6.51	5.93
22.20	2.06	9.62	6.44	5.92
22.40	2.03	9.58	6.38	5.90
22.60	2.03	9.54	6.32	5.87
22.80	2.01	9.50	6.25	5.85
23.00	2.00	9.46	6.19	5.82
23.20	1.98	9.42	6.13	5.80
23.40	1.97	9.38	6.06	5.78
23.60	1.95	9.34	6.00	5.75
23.80	1.94	9.29	5.94	5.73
24.00	1.92	9.25	5.87	5.70
24.20	1.87	9.21	5.81	5.66
24.40	1.69	9.17	5.75	5.65
24.60	1.33	9.13	5.68	5.63
24.80	0.96	9.08	5.61	5.60
25.00	0.62	9.03	5.53	5.57
25.20	0.40	8.97	5.44	5.41
25.40	0.22	8.92	5.36	5.10
25.60	0.16	8.87	5.28	4.81
25.80	0.10	8.81	5.21	4.52
26.00	0.07	8.77	5.14	4.25
26.20	0.04	8.72	5.07	4.00
26.40	0.03	8.68	5.01	3.76
26.60	0.02	8.64	4.92	3.53
26.80	0.01	8.60	4.89	3.22
27.00	0.01	8.56	4.84	3.12
27.20	0.00	8.53	4.79	2.93
27.40	0.00	8.50	4.74	2.72
27.60	0.00	8.47	4.70	2.59
27.80	0.00	8.44	4.65	2.43
28.00	0.00	8.41	4.61	2.28
28.20	0.00	8.39	4.58	2.14
28.40	0.00	8.38	4.54	2.01
28.60	0.00	8.34	4.51	1.89
28.80	0.00	8.32	4.48	1.78
29.00	0.00	8.30	4.45	1.67
29.20	0.00	8.28	4.43	1.57
29.40	0.00	8.27	4.40	1.47
29.60	0.00	8.25	4.38	1.38
29.80	0.00	8.23	4.35	1.30
30.00	0.00	8.22	4.33	1.22
30.20	0.00	8.21	4.31	1.15
30.40	0.00	8.19	4.30	1.08
30.60	0.00	8.18	4.28	1.01
30.80	0.00	8.17	4.26	0.95
31.00	0.00	8.16	4.25	0.89
31.20	0.00	8.15	4.23	0.84
31.40	0.00	8.14	4.22	0.79
31.60	0.00	8.13	4.21	0.74
31.80	0.00	8.13	4.19	0.70
32.00	0.00	8.12	4.18	0.65
32.20	0.00	8.11	4.17	0.61
32.40	0.00	8.10	4.16	0.58
32.60	0.00	8.10	4.15	0.54
32.80	0.00	8.09	4.15	0.51
33.00	0.00	8.09	4.14	0.48

45.60	0.00	8.00	4.01	0.01
46.80	0.00	8.00	4.01	0.01
47.00	0.00	8.00	4.01	0.01
47.20	0.00	8.00	4.01	0.01
47.40	0.00	8.00	4.01	0.01
47.60	0.00	8.00	4.01	0.01
47.80	0.00	8.00	4.01	0.00
48.00	0.00	8.00	4.01	0.00



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POND 1
100 YR EVENT
STORM ROUTING
RESULTS
Pg 6-9

Reservoir Routing Program
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POND 1 - 100 YEAR STORM

STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
5	0	0
6	1.27	0
7	2.61	0
8	4.01	0
9	5.48	5.55
10	7.03	6.15
11	8.64	6.7
12	10.33	16.76
13	12.09	54.47
14	13.93	178.27

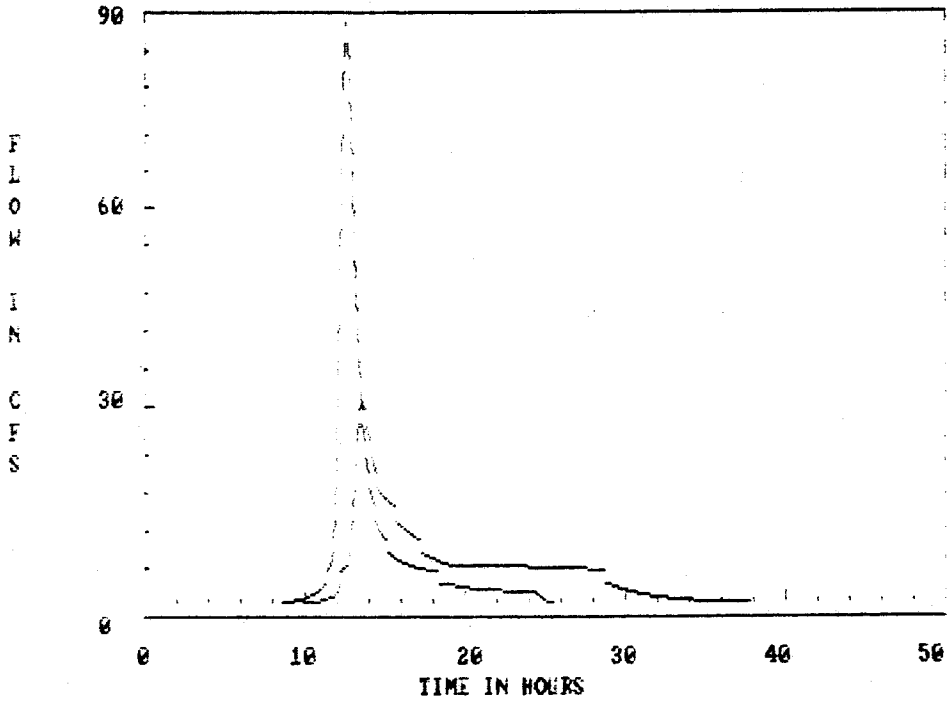
MAXIMUM INFLOW = 87.50 CFS AT 12.60 HOURS.
MAXIMUM RESERVOIR ELEVATION = 12.26 FEET AT 13.60 HOURS.
MAXIMUM OUTFLOW = 30.48 CFS AT 13.60 HOURS.

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	8.00	4.01	0.00	
0.20	0.00	8.00	4.01	0.00	
0.40	0.00	8.00	4.01	0.00	
0.60	0.00	8.00	4.01	0.00	
0.80	0.00	8.00	4.01	0.00	
1.00	0.00	8.00	4.01	0.00	
1.20	0.00	8.00	4.01	0.00	
1.40	0.00	8.00	4.01	0.00	
1.60	0.00	8.00	4.01	0.00	
1.80	0.00	8.00	4.01	0.00	
2.00	0.00	8.00	4.01	0.00	
2.20	0.00	8.00	4.01	0.00	
2.40	0.00	8.00	4.01	0.00	
2.60	0.00	8.00	4.01	0.00	
2.80	0.00	8.00	4.01	0.00	
3.00	0.00	8.00	4.01	0.00	
3.20	0.00	8.00	4.01	0.00	
3.40	0.00	8.00	4.01	0.00	
3.60	0.00	8.00	4.01	0.00	
3.80	0.00	8.00	4.01	0.00	
4.00	0.00	8.00	4.01	0.00	
4.20	0.00	8.00	4.01	0.00	
4.40	0.00	8.00	4.01	0.00	
4.60	0.00	8.00	4.01	0.00	
4.80	0.00	8.00	4.01	0.00	
5.00	0.00	8.00	4.01	0.00	
5.20	0.00	8.00	4.01	0.00	
5.40	0.00	8.00	4.01	0.00	
5.60	0.00	8.00	4.01	0.00	
5.80	0.00	8.00	4.01	0.00	

8.20	0.00	8.00	4.01	0.00
8.40	0.00	8.00	4.01	0.00
8.60	0.00	8.00	4.01	0.00
8.80	0.00	8.00	4.01	0.00
7.00	0.00	8.00	4.01	0.00
7.20	0.00	8.00	4.01	0.00
7.40	0.00	8.00	4.01	0.00
7.60	0.01	8.00	4.01	0.00
7.80	0.02	8.00	4.01	0.00
8.00	0.06	8.00	4.01	0.00
8.20	0.12	8.00	4.01	0.01
8.40	0.20	8.00	4.01	0.02
8.60	0.30	8.01	4.02	0.03
8.80	0.43	8.01	4.02	0.05
9.00	0.57	8.01	4.03	0.06
9.20	0.75	8.02	4.04	0.11
9.40	0.94	8.03	4.05	0.16
9.60	1.15	8.04	4.07	0.21
9.80	1.36	8.05	4.08	0.28
10.00	1.59	8.06	4.10	0.35
10.20	1.85	8.08	4.12	0.43
10.40	2.18	8.10	4.15	0.53
10.60	2.58	8.12	4.18	0.64
10.80	3.09	8.14	4.21	0.77
11.00	3.72	8.17	4.26	0.53
11.20	4.53	8.20	4.31	1.12
11.40	5.59	8.25	4.37	1.36
11.60	7.15	8.30	4.45	1.66
11.80	11.23	8.38	4.57	2.10
12.00	25.67	8.55	4.81	3.04
12.20	53.21	8.94	5.39	5.21
12.40	73.57	9.60	6.41	5.91
12.60	87.50	10.43	7.72	6.36
12.80	78.61	11.20	8.98	9.16
13.00	61.64	11.77	9.94	13.96
13.20	46.45	12.10	10.51	23.45
13.40	35.27	12.24	10.75	29.55
13.60	25.75	12.26	10.78	30.48
13.80	23.41	12.22	10.72	28.85
14.00	19.44	12.16	10.62	26.19
14.20	16.54	12.10	10.50	23.27
14.40	14.32	12.04	10.40	20.49
14.60	12.63	11.98	10.30	18.54
14.80	11.41	11.92	10.20	17.81
15.00	10.45	11.86	10.09	17.04
15.20	9.67	11.79	9.98	16.26
15.40	9.00	11.73	9.87	15.49
15.60	8.47	11.67	9.77	14.74
15.80	8.06	11.61	9.67	14.01
16.00	7.67	11.55	9.57	13.33
16.20	7.29	11.50	9.48	12.68
16.40	6.94	11.44	9.39	12.06
16.60	6.62	11.40	9.31	11.47
16.80	6.35	11.35	9.23	10.91
17.00	6.13	11.31	9.16	10.39
17.20	5.94	11.27	9.09	9.91
17.40	5.78	11.23	9.03	9.46
17.60	5.63	11.19	8.97	9.04
17.80	5.49	11.16	8.91	8.63
18.00	5.35	11.13	8.86	8.29
18.20	5.22	11.10	8.82	7.96
18.40	5.09	11.08	8.77	7.64
18.60	4.96	11.05	8.73	7.35
18.80	4.83	11.03	8.69	7.08
19.00	4.70	11.01	8.65	6.82

19.60	4.32	10.94	8.55	6.67
19.80	4.19	10.92	8.51	6.66
20.00	4.06	10.89	8.47	6.64
20.20	3.93	10.87	8.42	6.63
20.40	3.80	10.84	8.38	6.61
20.60	3.69	10.81	8.33	6.59
20.80	3.61	10.78	8.28	6.58
21.00	3.54	10.75	8.23	6.56
21.20	3.48	10.72	8.18	6.54
21.40	3.44	10.68	8.13	6.53
21.60	3.40	10.65	8.08	6.51
21.80	3.37	10.62	8.03	6.49
22.00	3.34	10.59	7.98	6.47
22.20	3.32	10.56	7.92	6.46
22.40	3.29	10.52	7.87	6.44
22.60	3.26	10.49	7.82	6.42
22.80	3.24	10.46	7.77	6.40
23.00	3.21	10.43	7.72	6.38
23.20	3.19	10.39	7.66	6.37
23.40	3.16	10.36	7.61	6.35
23.60	3.14	10.33	7.56	6.33
23.80	3.11	10.29	7.50	6.3[illegible]
24.00	3.06	10.26	7.45	6.29
24.20	2.99	10.23	7.40	6.28
24.40	2.70	10.19	7.34	6.26
24.60	2.16	10.15	7.28	6.24
24.80	1.54	10.11	7.21	6.21
25.00	1.01	10.06	7.13	6.18
25.20	0.63	10.00	7.04	6.15
25.40	0.41	9.94	6.94	6.12
25.60	0.26	9.88	6.85	6.08
25.80	0.17	9.82	6.75	6.04
26.00	0.10	9.76	6.65	6.00
26.20	0.07	9.69	6.56	5.97
26.40	0.04	9.63	6.46	5.93
26.60	0.03	9.57	6.36	5.89
26.80	0.01	9.51	6.26	5.85
27.00	0.01	9.44	6.17	5.82
27.20	0.00	9.38	6.07	5.78
27.40	0.00	9.32	5.96	5.74
27.60	0.00	9.26	5.86	5.71
27.80	0.00	9.20	5.79	5.67
28.00	0.00	9.14	5.69	5.63
28.20	0.00	9.08	5.60	5.60
28.40	0.00	9.02	5.51	5.56
28.60	0.00	8.96	5.42	5.32
28.80	0.00	8.90	5.33	5.00
29.00	0.00	8.85	5.25	4.70
29.20	0.00	8.79	5.18	4.41
29.40	0.00	8.75	5.11	4.14
29.60	0.00	8.70	5.04	3.89
29.80	0.00	8.66	4.98	3.66
30.00	0.00	8.62	4.92	3.44
30.20	0.00	8.58	4.87	3.23
30.40	0.00	8.55	4.81	3.03
30.60	0.00	8.51	4.76	2.85
30.80	0.00	8.48	4.72	2.68
31.00	0.00	8.45	4.68	2.51
31.20	0.00	8.43	4.64	2.36
31.40	0.00	8.40	4.60	2.22
31.60	0.00	8.38	4.56	2.08
31.80	0.00	8.35	4.53	1.96
32.00	0.00	8.33	4.50	1.84
32.20	0.00	8.31	4.47	1.73

45.80	0.00	8.00	4.02	0.02
46.00	0.00	8.00	4.02	0.02
46.20	0.00	8.00	4.02	0.02
46.40	0.00	8.00	4.02	0.02
46.60	0.00	8.00	4.02	0.02
46.80	0.00	8.00	4.01	0.02
47.00	0.00	8.00	4.01	0.02
47.20	0.00	8.00	4.01	0.02
47.40	0.00	8.00	4.01	0.02
47.60	0.00	8.00	4.01	0.01
47.80	0.00	8.00	4.01	0.01
48.00	0.00	8.00	4.01	0.01



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POND 1

INFLOW HYDROGRAPH
10 YR EVENT

POND 1 - 10 YEAR (FINAL GRADE)

DRAINAGE AREA = .05237 SQUARE MILES
TIME OF CONCENTRATION = 1.10045 HOURS
RUNOFF CURVE NUMBER = 68
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.85 INCHES = 8.06 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 47.25 CFS AT 12.6 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

SCS Hydrograph Generation Program
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POND 1
INFLOW HYDROGRAPH
100 YR EVENT

POND 1 - 100 YEAR (FINAL GRADE)

DRAINAGE AREA = .05257 SQUARE MILES
TIME OF CONCENTRATION = 1.10045 HOURS
RUNOFF CURVE NUMBER = 68
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 9.1 INCHES
RUNOFF = 5.17 INCHES = 14.62 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 87.50 CFS AT 12.6 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.02	0.00	0.00
0.40	0.04	0.00	0.00
0.60	0.06	0.00	0.00
0.80	0.08	0.00	0.00
1.00	0.10	0.00	0.00
1.20	0.12	0.00	0.00
1.40	0.14	0.00	0.00
1.60	0.16	0.00	0.00
1.80	0.18	0.00	0.00
2.00	0.20	0.00	0.00
2.20	0.22	0.00	0.00
2.40	0.24	0.00	0.00
2.60	0.27	0.00	0.00
2.80	0.29	0.00	0.00
3.00	0.31	0.00	0.00
3.20	0.34	0.00	0.00
3.40	0.36	0.00	0.00
3.60	0.39	0.00	0.00
3.80	0.41	0.00	0.00
4.00	0.44	0.00	0.00
4.20	0.46	0.00	0.00
4.40	0.49	0.00	0.00
4.60	0.52	0.00	0.00
4.80	0.54	0.00	0.00
5.00	0.57	0.00	0.00
5.20	0.60	0.00	0.00
5.40	0.63	0.00	0.00
5.60	0.66	0.00	0.00
5.80	0.70	0.00	0.00
6.00	0.73	0.00	0.00
6.20	0.76	0.00	0.00
6.40	0.79	0.00	0.00
6.60	0.83	0.00	0.00
6.80	0.86	0.00	0.00
7.00	0.90	0.00	0.00
7.20	0.94	0.00	0.00
7.40	0.98	0.00	0.00
7.60	1.01	0.00	0.01
7.80	1.05	0.00	0.02
8.00	1.09	0.00	0.06
8.20	1.13	0.01	0.12
8.40	1.18	0.01	0.20

STAGE STORAGE RELATIONSHIP
WEYERHAEUSER LANDFILL
NE SEDIMENT POND - POND 1

Elevation	Area	Ave. Area	Depth	Volume	Acc. Volume
5	53961				0.00
		55373	1	1.27	
6	56785				1.27
		58230	1	1.34	
7	59675				2.61
		61153.5	1	1.40	
8	62632				4.01
		64143	1	1.47	
9	65654				5.48
		67198	1	1.54	
10	68742				7.03
		70319.5	1	1.61	
11	71897				8.64
		73307.5	1	1.69	
12	78118				10.33
		76762	1	1.76	
13	76406				12.09
		80083	1	1.84	
14	81760				13.93

RISER-POND 1

RISER ELEVATION 8
RISER DIAMETER 18
PRINCIPAL SPILLWAY DIAMETER 12
LENGTH OF PRINCIPAL SPILLWAY 100
SLOPE OF PRINCIPAL SPILLWAY PIPE 1

ELEV.	RISER		PRINCIPAL		TRICKLE TUBE			OPEN	TOTAL
	WEIR	ORIFICE	PIPE	ORIFICE	WEIR	ORIFICE	PIPE	CHANNEL	FLOW
5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9.00	15.08	8.51	5.55	7.08	0.00	0.00	0.00	0.00	5.55
10.00	42.65	12.03	6.15	8.02	0.00	0.00	0.00	0.00	6.15
11.00	78.36	14.74	6.70	8.87	0.00	0.00	0.00	0.00	6.70
12.00	120.64	17.02	7.20	9.64	0.00	0.00	0.00	0.00	7.20
13.00	168.59	19.03	7.68	10.36	0.00	0.00	0.00	0.00	7.68

EMERGENCY
SPILLWAY - STA
DISCHARGE - POND

ELEVATION OF DOWNSTREAM TOE OF DAM 0
OPEN CHANNEL INV. 0
OPEN CHANNEL BOTTOM WIDTH 8
OPEN CHANNEL: LEFT SIDE SLOPE 4 :1 RIGHT SIDE SLOPE 4 :1
OPEN CHANNEL: SLOPE (%) 1 LENGTH 25
OPEN CHANNEL ROUGHNESS COEFF. .08

ELEV.	RISER		PRINCIPAL		TRICKLE TUBE			OPEN	TOTAL
	WEIR	ORIFICE	PIPE	ORIFICE	WEIR	ORIFICE	PIPE	CHANNEL	FLOW
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.80	6.80
1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.56	11.56
1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.65	19.65
1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.41	33.41
1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.79	56.79
2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	96.55	96.55
3.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	164.14	164.14
3.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	279.03	279.03

POND 2
10 YR EVENT
STORM ROUTING
RESULTS
PG 14-17

Reservoir Routing Program
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POND2 - 10 YEAR STORM

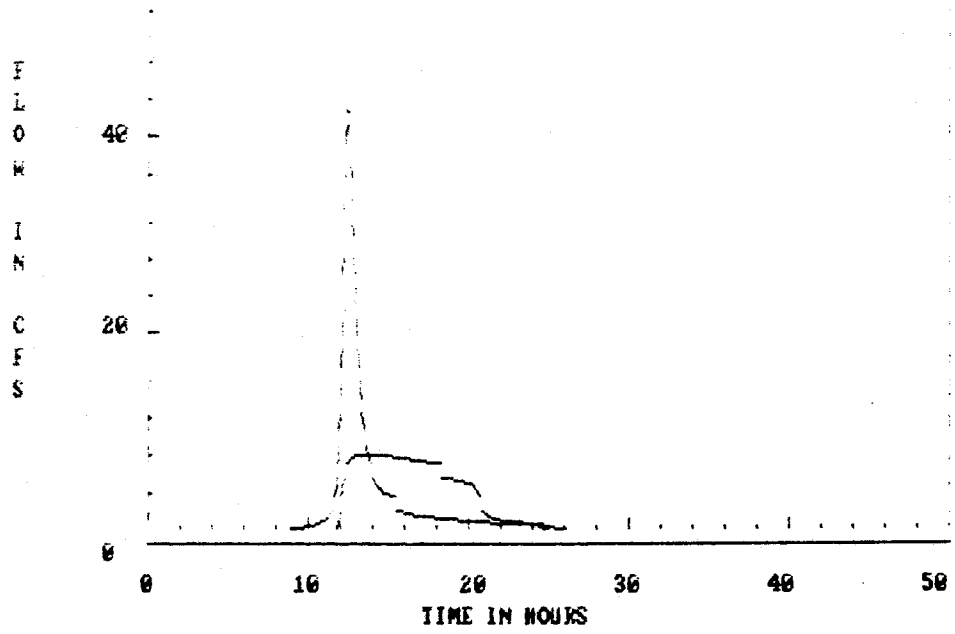
STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
13	0	0
14	.24	0
15	.52	0
16	.82	0
17	1.16	5.55
18	1.53	6.15
19	1.93	6.7
20	2.38	7.2
21	2.86	7.68
22	3.34	8.12
22.2	3.49	8.2
23	3.92	13.54
24	4.56	55.44
25	5.34	132.64

MAXIMUM INFLOW = 42.57 CFS AT 12.40 HOURS.
MAXIMUM RESERVOIR ELEVATION = 21.99 FEET AT 13.70 HOURS.
MAXIMUM OUTFLOW = 8.11 CFS AT 13.70 HOURS.

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	15.00	0.52	0.00	
0.20	0.00	15.00	0.52	0.00	
0.40	0.00	15.00	0.52	0.00	
0.60	0.00	15.00	0.52	0.00	
0.80	0.00	15.00	0.52	0.00	
1.00	0.00	15.00	0.52	0.00	
1.20	0.00	15.00	0.52	0.00	
1.40	0.00	15.00	0.52	0.00	
1.60	0.00	15.00	0.52	0.00	
1.80	0.00	15.00	0.52	0.00	
2.00	0.00	15.00	0.52	0.00	
2.20	0.00	15.00	0.52	0.00	
2.40	0.00	15.00	0.52	0.00	
2.60	0.00	15.00	0.52	0.00	
2.80	0.00	15.00	0.52	0.00	
3.00	0.00	15.00	0.52	0.00	
3.20	0.00	15.00	0.52	0.00	
3.40	0.00	15.00	0.52	0.00	
3.60	0.00	15.00	0.52	0.00	
3.80	0.00	15.00	0.52	0.00	
4.00	0.00	15.00	0.52	0.00	
4.20	0.00	15.00	0.52	0.00	
4.40	0.00	15.00	0.52	0.00	
4.60	0.00	15.00	0.52	0.00	
4.80	0.00	15.00	0.52	0.00	
5.00	0.00	15.00	0.52	0.00	
5.20	0.00	15.00	0.52	0.00	
5.40	0.00	15.00	0.52	0.00	
5.60	0.00	15.00	0.52	0.00	

6.00	0.00	15.00	0.52	0.00
6.20	0.00	15.00	0.52	0.00
6.40	0.00	15.00	0.52	0.00
6.60	0.00	15.00	0.52	0.00
6.80	0.00	15.00	0.52	0.00
7.00	0.00	15.00	0.52	0.00
7.20	0.00	15.00	0.52	0.00
7.40	0.00	15.00	0.52	0.00
7.60	0.00	15.00	0.52	0.00
7.80	0.01	15.00	0.52	0.00
8.00	0.03	15.00	0.52	0.00
8.20	0.06	15.00	0.52	0.00
8.40	0.09	15.01	0.52	0.00
8.60	0.14	15.01	0.52	0.00
8.80	0.20	15.02	0.53	0.00
9.00	0.27	15.04	0.53	0.00
9.20	0.35	15.05	0.54	0.00
9.40	0.43	15.07	0.54	0.00
9.60	0.52	15.10	0.55	0.00
9.80	0.61	15.13	0.56	0.00
10.00	0.71	15.17	0.57	0.00
10.20	0.83	15.21	0.58	0.00
10.40	0.93	15.26	0.60	0.00
10.60	1.18	15.32	0.62	0.00
10.80	1.43	15.39	0.64	0.00
11.00	1.74	15.45	0.66	0.00
11.20	2.13	15.59	0.70	0.00
11.40	2.67	15.72	0.74	0.00
11.60	3.50	15.89	0.79	0.00
11.80	6.14	16.12	0.86	0.84
12.00	16.45	16.55	1.01	3.05
12.20	33.92	17.49	1.34	5.84
12.40	42.57	18.89	1.89	6.64
12.60	37.79	20.14	2.45	7.27
12.80	27.37	21.01	2.86	7.68
13.00	19.50	21.50	3.12	7.90
13.20	14.43	21.76	3.26	8.02
13.40	11.07	21.93	3.34	8.05
13.60	8.86	21.98	3.37	8.11
13.80	7.34	21.98	3.37	8.11
14.00	6.27	21.94	3.35	8.09
14.20	5.48	21.87	3.31	8.06
14.40	4.86	21.78	3.26	8.02
14.60	4.37	21.67	3.21	7.97
14.80	4.03	21.55	3.15	7.92
15.00	3.80	21.42	3.08	7.87
15.20	3.61	21.29	3.01	7.81
15.40	3.45	21.16	2.94	7.75
15.60	3.29	21.02	2.87	7.69
15.80	3.14	20.87	2.80	7.62
16.00	2.99	20.71	2.72	7.54
16.20	2.85	20.55	2.65	7.47
16.40	2.71	20.39	2.57	7.39
16.60	2.60	20.23	2.49	7.31
16.80	2.51	20.07	2.41	7.23
17.00	2.43	19.90	2.33	7.15
17.20	2.37	19.73	2.26	7.06
17.40	2.31	19.55	2.18	6.96
17.60	2.25	19.38	2.10	6.89
17.80	2.20	19.21	2.03	6.81
18.00	2.15	19.04	1.95	6.72
18.20	2.09	18.86	1.87	6.62
18.40	2.04	18.68	1.80	6.52
18.60	1.99	18.49	1.73	6.42
18.80	1.94	[illegible]	1.65	6.32

19.20	1.83	17.95	1.51	6.12
19.40	1.78	17.76	1.44	6.00
19.60	1.72	17.57	1.37	5.83
19.80	1.67	17.38	1.30	5.76
20.00	1.62	17.20	1.23	5.87
20.20	1.58	17.02	1.17	5.55
20.40	1.52	16.85	1.11	4.70
20.60	1.48	16.71	1.06	3.94
20.80	1.45	16.60	1.03	3.35
21.00	1.43	16.52	1.00	2.90
21.20	1.41	16.46	0.98	2.55
21.40	1.40	16.41	0.96	2.28
21.60	1.39	16.37	0.95	2.07
21.80	1.38	16.34	0.94	1.91
22.00	1.36	16.32	0.93	1.78
22.20	1.35	16.30	0.92	1.68
22.40	1.34	16.29	0.92	1.60
22.60	1.32	16.28	0.91	1.54
22.80	1.32	16.27	0.91	1.49
23.00	1.31	16.26	0.91	1.45
23.20	1.30	16.25	0.91	1.41
23.40	1.29	16.25	0.90	1.39
23.60	1.28	16.25	0.90	1.36
23.80	1.27	16.24	0.90	1.34
24.00	1.26	16.24	0.90	1.32
24.20	1.21	16.23	0.90	1.30
24.40	0.98	16.23	0.90	1.25
24.60	0.89	16.21	0.89	1.15
24.80	0.39	16.18	0.88	1.00
25.00	0.24	16.15	0.87	0.83
25.20	0.13	16.12	0.86	0.67
25.40	0.07	16.10	0.85	0.54
25.60	0.04	16.08	0.85	0.42
25.80	0.02	16.06	0.84	0.32
26.00	0.01	16.05	0.84	0.25
26.20	0.01	16.04	0.83	0.20
26.40	0.00	16.03	0.83	0.15
26.60	0.00	16.03	0.83	0.12
26.80	0.00	16.02	0.83	0.09
27.00	0.00	16.01	0.82	0.07
27.20	0.00	16.01	0.82	0.05
27.40	0.00	16.01	0.82	0.04
27.60	0.00	16.01	0.82	0.03
27.80	0.00	16.00	0.82	0.02
28.00	0.00	16.00	0.82	0.02
28.20	0.00	16.00	0.82	0.01
28.40	0.00	16.00	0.82	0.01
28.60	0.00	16.00	0.82	0.01
28.80	0.00	16.00	0.82	0.01
29.00	0.00	16.00	0.82	0.00
29.20	0.00	16.00	0.82	0.00
29.40	0.00	16.00	0.82	0.00
29.60	0.00	16.00	0.82	0.00
29.80	0.00	16.00	0.82	0.00
30.00	0.00	16.00	0.82	0.00



Enter P to print, or C to clear screen and continue P

POND 2
100 YR EVENT
STORM ROUTING
RESULTS
PG 18-21

Reservoir Routing Program
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POND 2 - 100 YEAR STORM

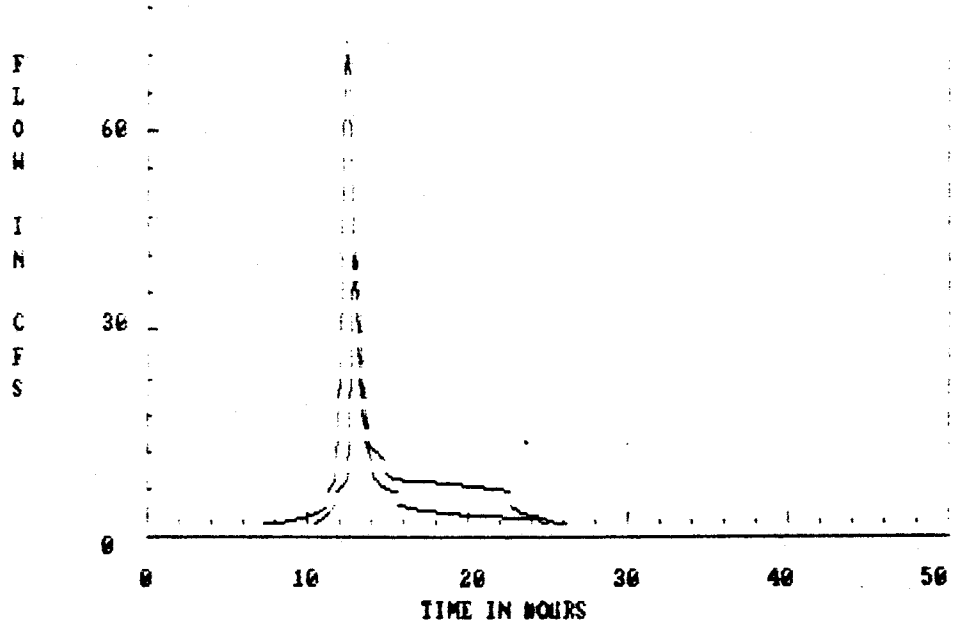
STAGE (FT)	STORAGE (AC-FT)	DISCHARGE (CFS)
13	0	0
14	.24	0
15	.52	0
16	.82	0
17	1.16	5.55
18	1.53	6.15
19	1.93	6.7
20	2.38	7.2
21	2.86	7.68
22	3.36	8.12
22.2	3.49	8.2
23	3.93	13.84
24	4.56	55.44
25	5.64	132.64

MAXIMUM INFLOW = 72.69 CFS AT 12.40 HOURS.
MAXIMUM RESERVOIR ELEVATION = 23.68 FEET AT 12.80 HOURS.
MAXIMUM OUTFLOW = 42.02 CFS AT 12.80 HOURS.

TIME (HRS)	INFLOW (CFS)	ELEVATION (FT)	STORAGE (A-FT)	OUTFLOW (CFS)	NOTES
0.00	0.00	15.00	0.52	0.00	
0.20	0.00	15.00	0.52	0.00	
0.40	0.00	15.00	0.52	0.00	
0.60	0.00	15.00	0.52	0.00	
0.80	0.00	15.00	0.52	0.00	
1.00	0.00	15.00	0.52	0.00	
1.20	0.00	15.00	0.52	0.00	
1.40	0.00	15.00	0.52	0.00	
1.60	0.00	15.00	0.52	0.00	
1.80	0.00	15.00	0.52	0.00	
2.00	0.00	15.00	0.52	0.00	
2.20	0.00	15.00	0.52	0.00	
2.40	0.00	15.00	0.52	0.00	
2.60	0.00	15.00	0.52	0.00	
2.80	0.00	15.00	0.52	0.00	
3.00	0.00	15.00	0.52	0.00	
3.20	0.00	15.00	0.52	0.00	
3.40	0.00	15.00	0.52	0.00	
3.60	0.00	15.00	0.52	0.00	
3.80	0.00	15.00	0.52	0.00	
4.00	0.00	15.00	0.52	0.00	
4.20	0.00	15.00	0.52	0.00	
4.40	0.00	15.00	0.52	0.00	
4.60	0.00	15.00	0.52	0.00	
4.80	0.00	15.00	0.52	0.00	
5.00	0.00	15.00	0.52	0.00	
5.20	0.00	15.00	0.52	0.00	
5.40	0.00	15.00	0.52	0.00	
5.60	0.00	15.00	0.52	0.00	

6.20	0.03	15.00	0.52	0.00
6.40	0.06	15.00	0.52	0.00
6.60	0.11	15.01	0.52	0.00
6.80	0.17	15.02	0.52	0.00
7.00	0.23	15.03	0.53	0.00
7.20	0.30	15.04	0.53	0.00
7.40	0.37	15.06	0.54	0.00
7.60	0.44	15.08	0.54	0.00
7.80	0.52	15.11	0.55	0.00
8.00	0.59	15.14	0.56	0.00
8.20	0.68	15.17	0.57	0.00
8.40	0.77	15.21	0.58	0.00
8.60	0.87	15.26	0.60	0.00
8.80	1.01	15.31	0.61	0.00
9.00	1.16	15.37	0.63	0.00
9.20	1.34	15.44	0.65	0.00
9.40	1.52	15.52	0.68	0.00
9.60	1.69	15.61	0.70	0.00
9.80	1.86	15.71	0.73	0.00
10.00	2.04	15.81	0.76	0.00
10.20	2.28	15.93	0.80	0.00
10.40	2.58	16.05	0.84	0.30
10.60	2.97	16.16	0.87	0.65
10.80	3.45	16.26	0.91	1.44
11.00	4.04	16.36	0.94	1.98
11.20	4.60	16.46	0.98	2.56
11.40	5.61	16.56	1.02	3.21
11.60	7.36	16.72	1.07	4.00
11.80	12.20	16.95	1.14	5.29
12.00	30.16	17.60	1.38	5.91
12.20	59.48	19.20	2.02	6.80
12.40	72.69	21.31	3.02	7.82
12.60	63.77	23.07	3.99	16.52
12.80	45.67	23.66	4.36	42.02
13.00	32.25	23.61	4.32	38.94
13.20	23.65	23.41	4.20	30.81
13.40	17.99	23.24	4.10	23.54
13.60	14.26	23.11	4.02	18.19
13.80	11.78	23.02	3.96	14.47
14.00	9.98	22.94	3.92	13.16
14.20	8.69	22.84	3.86	12.49
14.40	7.65	22.73	3.79	11.73
14.60	6.69	22.61	3.73	10.95
14.80	6.34	22.50	3.66	10.19
15.00	5.97	22.39	3.60	9.46
15.20	5.67	22.30	3.55	8.84
15.40	5.41	22.21	3.50	8.26
15.60	5.16	22.12	3.45	8.17
15.80	4.92	22.03	3.40	8.13
16.00	4.68	21.92	3.34	8.09
16.20	4.45	21.81	3.28	8.04
16.40	4.24	21.70	3.22	7.99
16.60	4.05	21.58	3.16	7.93
16.80	3.91	21.45	3.09	7.88
17.00	3.79	21.32	3.03	7.82
17.20	3.69	21.19	2.96	7.77
17.40	3.60	21.06	2.89	7.71
17.60	3.51	20.93	2.83	7.65
17.80	3.43	20.78	2.76	7.58
18.00	3.34	20.64	2.69	7.51
18.20	3.26	20.50	2.62	7.44
18.40	3.17	20.35	2.55	7.37
18.60	3.09	20.21	2.48	7.30
18.80	3.01	20.08	2.41	7.23

19.20	2.84	19.76	2.27	7.00
19.40	2.76	19.60	2.20	6.92
19.60	2.68	19.44	2.13	6.84
19.80	2.59	19.29	2.06	6.77
20.00	2.51	19.13	1.99	6.68
20.20	2.43	18.97	1.92	6.59
20.40	2.35	18.80	1.85	6.49
20.60	2.29	18.62	1.78	6.40
20.80	2.24	18.45	1.71	6.30
21.00	2.21	18.28	1.64	6.21
21.20	2.19	18.11	1.57	6.11
21.40	2.16	17.94	1.51	6.01
21.60	2.15	17.77	1.44	5.91
21.80	2.13	17.60	1.38	5.81
22.00	2.11	17.43	1.32	5.71
22.20	2.09	17.26	1.26	5.61
22.40	2.08	17.11	1.20	5.26
22.60	2.06	16.95	1.14	4.50
22.80	2.04	16.81	1.10	3.91
23.00	2.03	16.71	1.06	3.47
23.20	2.01	16.62	1.03	3.12
23.40	1.99	16.56	1.01	2.85
23.60	1.98	16.51	0.99	2.64
23.80	1.96	16.48	0.98	2.48
24.00	1.95	16.45	0.97	2.34
24.20	1.88	16.42	0.96	2.19
24.40	1.51	16.38	0.95	1.97
24.60	1.02	16.35	0.94	1.68
24.80	0.59	16.30	0.92	1.40
25.00	0.33	16.25	0.91	1.13
25.20	0.19	16.20	0.89	0.89
25.40	0.11	16.16	0.87	0.70
25.60	0.06	16.13	0.86	0.56
25.80	0.03	16.10	0.85	0.42
26.00	0.02	16.08	0.85	0.33
26.20	0.01	16.06	0.84	0.25
26.40	0.00	16.04	0.84	0.19
26.60	0.00	16.03	0.83	0.15
26.80	0.00	16.03	0.83	0.11
27.00	0.00	16.02	0.83	0.08
27.20	0.00	16.02	0.83	0.06
27.40	0.00	16.01	0.82	0.05
27.60	0.00	16.01	0.82	0.05
27.80	0.00	16.01	0.82	0.04
28.00	0.00	16.01	0.82	0.03
28.20	0.00	16.00	0.82	0.02
28.40	0.00	16.00	0.82	0.02
28.60	0.00	16.00	0.82	0.01
28.80	0.00	16.00	0.82	0.01
29.00	0.00	16.00	0.82	0.01
29.20	0.00	16.00	0.82	0.01
29.40	0.00	16.00	0.82	0.00
29.60	0.00	16.00	0.82	0.00
29.80	0.00	16.00	0.82	0.00
30.00	0.00	16.00	0.82	0.00



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(22a)

POND 2
INFLOW HYDROGRAPH
10 YR EVENT

POND 2 -10 YEAR (DIKE)

DRAINAGE AREA = .03172 SQUARE MILES
TIME OF CONCENTRATION = .8669923 HOURS
RUNOFF CURVE NUMBER = 75
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 3.54 INCHES = 5.99 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 42.57 CFS AT 12.4 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
5.80	0.60	0.00	0.00
.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.01
8.00	0.76	0.00	0.03
8.20	0.78	0.00	0.06
8.40	0.82	0.01	0.09

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POND 2
INFLOW HYDROGRAPH
100 YR EVENT

POND 2 - 100 YEAR (DIKE)

DRAINAGE AREA = .03178 SQUARE MILES
TIME OF CONCENTRATION = .8669923 HOURS
RUNOFF CURVE NUMBER = 75
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 9.1 INCHES
RUNOFF = 6.04 INCHES = 10.23 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 72.89 CFS AT 12.4 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.02	0.00	0.00
0.40	0.04	0.00	0.00
0.60	0.06	0.00	0.00
0.80	0.08	0.00	0.00
1.00	0.10	0.00	0.00
1.20	0.12	0.00	0.00
1.40	0.14	0.00	0.00
1.60	0.16	0.00	0.00
1.80	0.18	0.00	0.00
2.00	0.20	0.00	0.00
2.20	0.22	0.00	0.00
2.40	0.24	0.00	0.00
2.60	0.27	0.00	0.00
2.80	0.29	0.00	0.00
3.00	0.31	0.00	0.00
3.20	0.34	0.00	0.00
3.40	0.36	0.00	0.00
3.60	0.39	0.00	0.00
3.80	0.41	0.00	0.00
4.00	0.44	0.00	0.00
4.20	0.46	0.00	0.00
4.40	0.49	0.00	0.00
4.60	0.52	0.00	0.00
4.80	0.54	0.00	0.00
5.00	0.57	0.00	0.00
5.20	0.60	0.00	0.00
5.40	0.63	0.00	0.00
5.60	0.66	0.00	0.00
5.80	0.70	0.00	0.00
6.00	0.73	0.00	0.01
6.20	0.76	0.00	0.03
6.40	0.79	0.00	0.06
6.60	0.83	0.01	0.11
6.80	0.86	0.01	0.17
7.00	0.90	0.02	0.23
7.20	0.94	0.02	0.30
7.40	0.98	0.03	0.37
7.60	1.01	0.03	0.44
7.80	1.05	0.04	0.52
8.00	1.09	0.05	0.59
8.20	1.13	0.06	0.68
8.40	1.18	0.07	0.77

STAGE STORAGE RELATIONSHIP
WEYERHAEUSER LANDFILL
NW SEDIMENT POND - POND 2

Elevation	Area	Ave. Area	Depth	Volume	Acc. Volume
13	10000				0.00
		10618	1	0.24	
14	11236				0.24
		11890	1	0.27	
15	12544				0.52
		13234	1	0.30	
16	13924				0.82
		14650	1	0.34	
17	15376				1.16
		16138	1	0.37	
18	16900				1.53
		17698	1	0.41	
19	18496				1.93
		19320	1	0.44	
20	20164				2.38
		21034	1	0.48	
21	21904				2.86
		22810	1	0.52	
22	23716				3.38
		24658	1	0.57	
23	25600				3.95
		26650	1	0.62	
24	28100				4.57
		29550	1	0.68	
25	31000				5.24

STAGE DISCHARGE
RISER - POND 2

VATION OF LOWEST TOE OF DAM	13
R[illegible]R ELEVATION	16
R[illegible]R DIAMETER	18
P[illegible]CIPAL SPILLWAY DIAMETER	12
LENGTH OF PRINCIPAL SPILLWAY	100
SLOPE OF PRINCIPAL SPILLWAY PIPE	1

ELEV.	RISER		PRINCIPAL		TRICKLE TUBE			OPEN	TOTAL
	WEIR	ORIFICE	PIPE	ORIFICE	WEIR	ORIFICE	PIPE	CHANNEL	FLOW
13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17.00	15.08	8.51	5.55	7.08	0.00	0.00	0.00	0.00	5.55
18.00	42.65	12.03	6.15	8.02	0.00	0.00	0.00	0.00	6.15
19.00	78.36	14.74	6.70	8.87	0.00	0.00	0.00	0.00	6.70
20.00	120.64	17.02	7.20	9.64	0.00	0.00	0.00	0.00	7.20
21.00	168.59	19.03	7.68	10.36	0.00	0.00	0.00	0.00	7.68
22.00	221.62	20.84	8.12	11.03	0.00	0.00	0.00	0.00	8.12
23.00	279.28	22.51	8.54	11.66	0.00	0.00	0.00	0.00	8.54
24.00	341.21	24.07	8.94	12.25	0.00	0.00	0.00	0.00	8.94
25.00	407.15	25.53	9.33	12.82	0.00	0.00	0.00	0.00	9.33

EMERGENCY SPILLWAY
STAGE DISCHARGE-
POND 1&2

ELEVATION OF DAM AT TOP OF DAM 0
OPEN CHANNEL INV. 0
OPEN CHANNEL BOTTOM WIDTH 8
OPEN CHANNEL: LEFT SIDE SLOPE 4 :1 RIGHT SIDE SLOPE 4 :1
OPEN CHANNEL: SLOPE (%) 1 LENGTH 25
OPEN CHANNEL ROUGHNESS COEFF. .06

ELEV.	RISER WEIR	RISER ORIFICE	RISER PIPE	PRINCIPAL ORIFICE	PRINCIPAL WEIR	TRICKLE TUBE ORIFICE	TRICKLE TUBE PIPE	OPEN CHANNEL	TOTAL FLOW
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00
0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.80	6.80
1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.56	11.56
1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.65	19.65
1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33.41	33.41
1.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	56.79	56.79
2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	96.55	96.55
3.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	164.14	164.14
3.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	279.03	279.03

RMT INC.

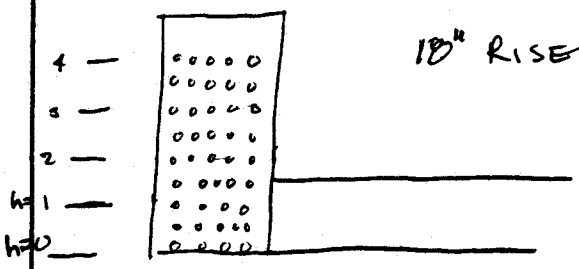
DESIGN SHEET

SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	1/19/89			467.36

RISER - ORIFICE DESIGN



18" RISER w/ 3/8" ϕ @ 4" CC - Rows 6" Apart
14 holes per row

$Q = 0.6 \times A_o \sqrt{2gh}$

Per Row - $A_o = \pi\left(\frac{.375}{24}\right)^2 \times 14 = 0.010737865\ ft^2$

Depth of Water (h)	Flow Rate (cfs)	Total Flow Rate @ Depth
9	0.16	1.94
8.5	0.15	1.78
8	0.15	1.63
7.5	0.14	1.48
7	0.14	1.34
6.5	0.13	1.20
6	0.13	1.07
5.5	0.12	0.94
5	0.12	0.82
4.5	0.11	0.70
4	0.10	0.59
3.5	0.10	0.49
3	0.09	0.39
2.5	0.08	0.30
2	0.07	0.22
1.5	0.06	0.15
1	0.05	0.09
0.5	0.04	0.04
0	0	0

RMT INC.
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DESIGN SHEET

SHEET ____ OF ____

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
WEYERHAEUSER	JCJ	7-20			467.36

ANTI-SEEP COLLARS

POND #1 (NE)

Riser Height = 2'
Embankment Slope = 3:1
Pipe Slope = 2%
Pipe Diameter = 8"

Saturated Length of Pipe = L_s = 16'

Anti-Seep Collar Size = 2' x 2'
Number of Collars = n = 2

COLLAR PROJECTION

CHECK:

$$\frac{L_s + 2nV}{L_s} \geq 1.15$$

$$\frac{16 + 2(2)(.8)}{16} = 1.2$$

OK

POND #2 (NW)

Riser Height = 4'
Embankment Slope = 3:1
Pipe Slope = 2%
Pipe Diameter = 8"

L_s = 30'
Collar Size = 3.5' x 3.5'
n = 2

CHECK:

$$\frac{30 + 2(2)(1.2)}{30}$$

= 1.16 > 1.15

OK

POND #3 (SW)

Riser Height = 4
Embankment Slope = 3:1
Pipe Slope = 1%
Pipe Diameter = 10"

L_s = 30'
Collar Size = 3.5' x 3.5'
n = 2

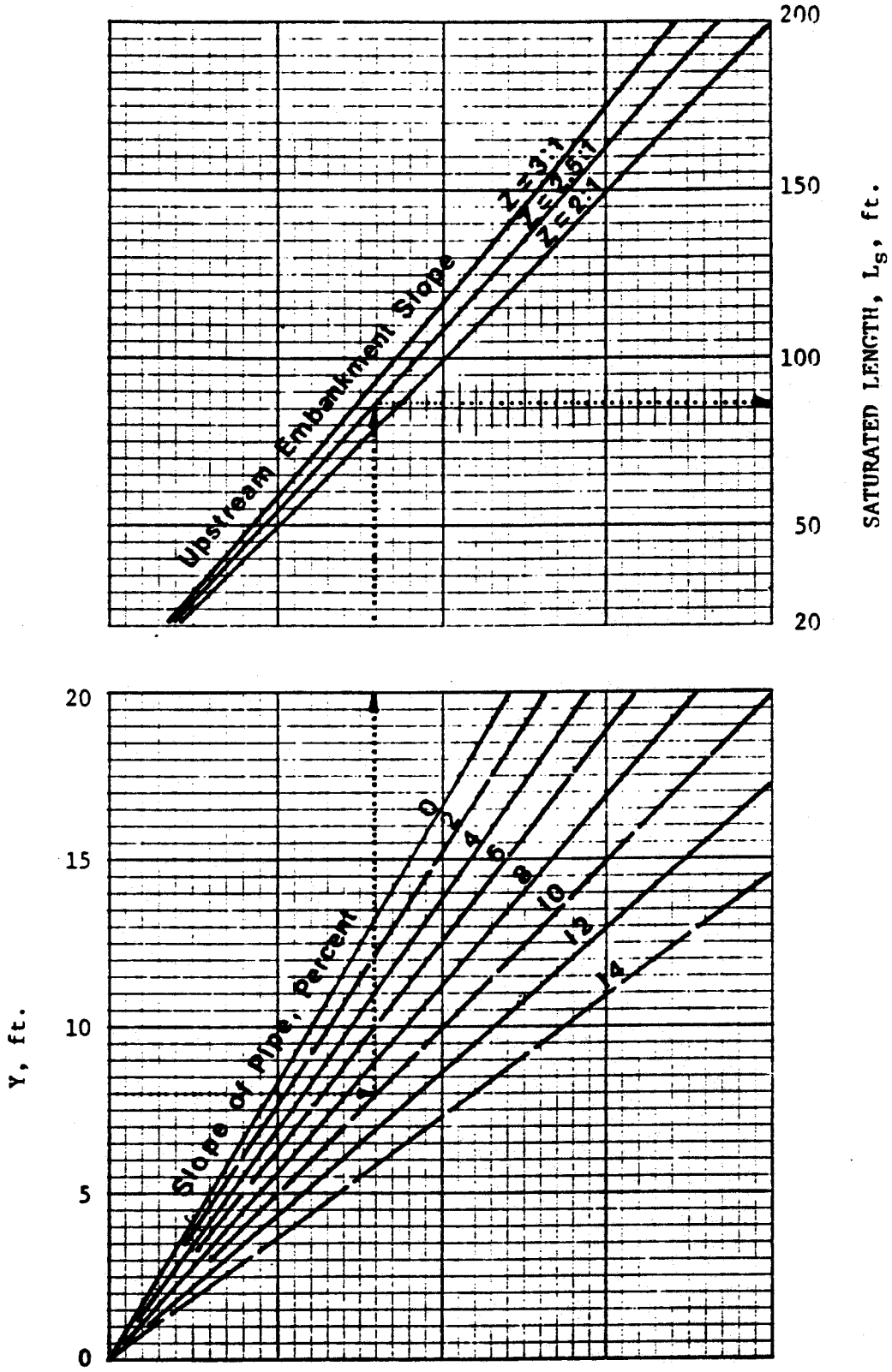
CHECK:

$$\frac{30 + 2(2)(1.2)}{30}$$

= 1.16 > 1.15

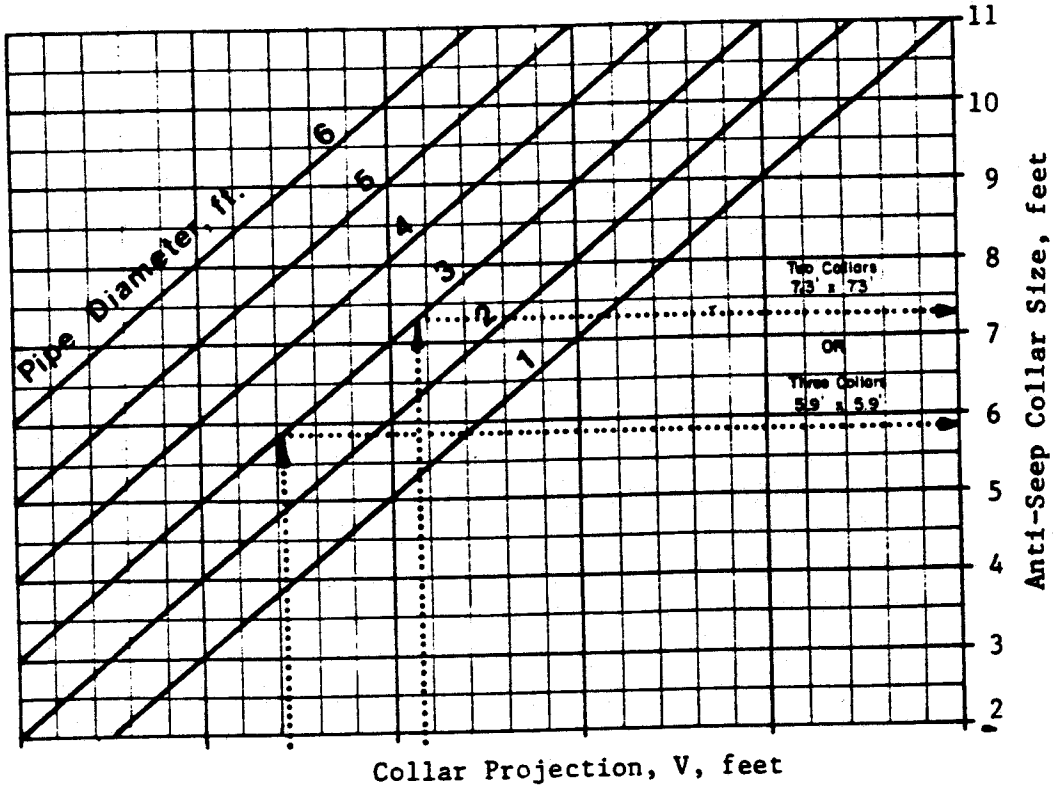
OK

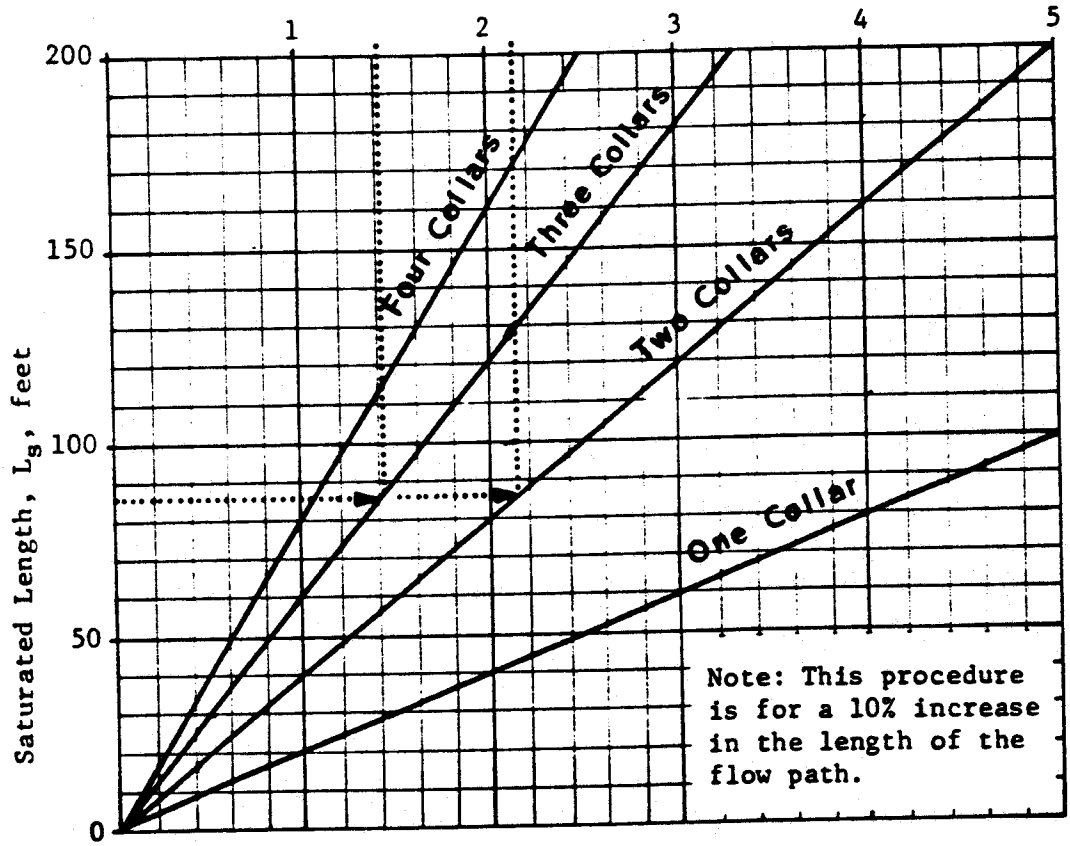
PIPE LENGTH IN SATURATED ZONE

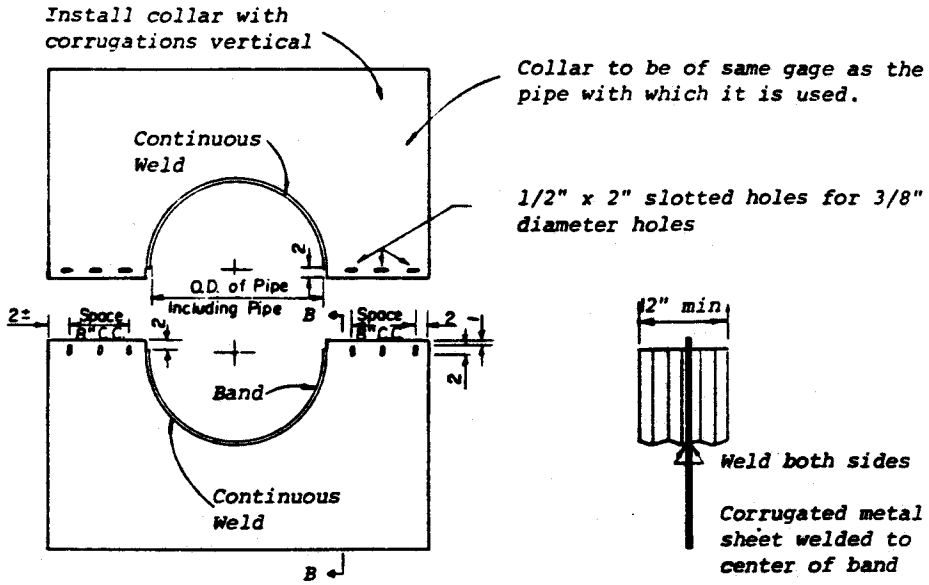


A-19.23

ANTI-SEEP COLLAR DESIGN







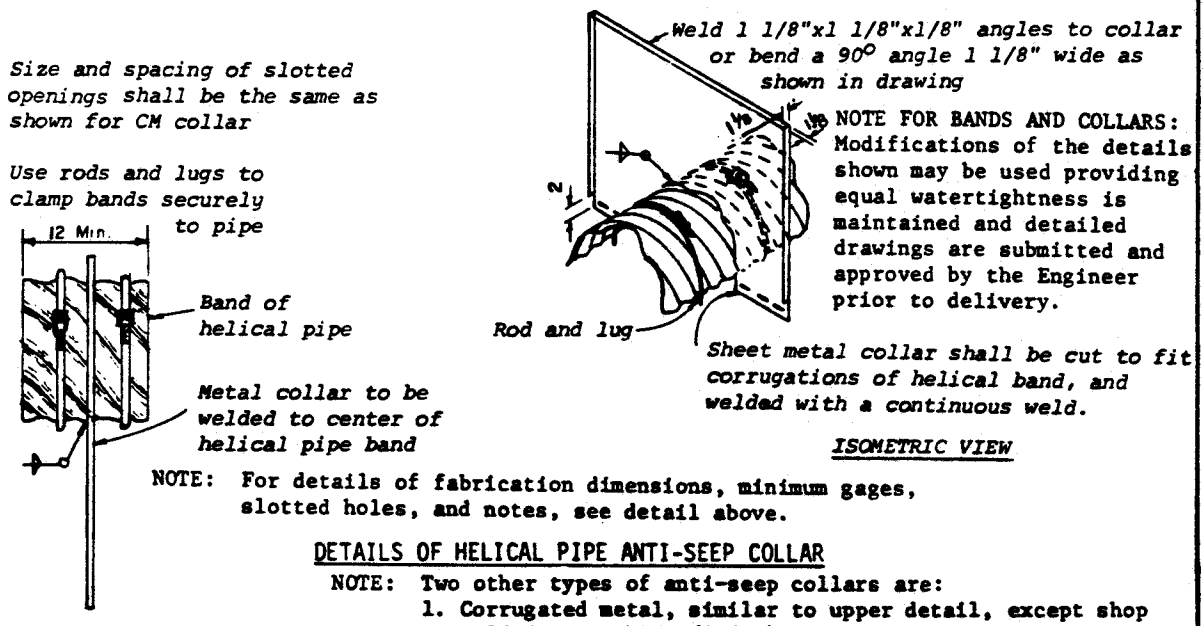
ELEVATION OF UNASSEMBLED COLLAR

SECTION B-B

NOTES FOR COLLARS:

1. All materials to be in accordance with construction and construction material specifications.
2. When specified on the plans, coating of collars shall be in accordance with construction and construction material specifications.
3. Unassembled collars shall be marked by painting or tagging to identify matching pairs.
4. The lap between the two half sections and between the pipe and connecting band shall be caulked with asphalt mastic at time of installation.
5. Each collar shall be furnished with two 1/2" diameter rods with standard tank lugs for connecting collars to pipe.

DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR



NOTE FOR BANDS AND COLLARS: Modifications of the details shown may be used providing equal watertightness is maintained and detailed drawings are submitted and approved by the Engineer prior to delivery.

ISOMETRIC VIEW

PARTIAL ELEVATION

NOTE: For details of fabrication dimensions, minimum gages, slotted holes, and notes, see detail above.

DETAILS OF HELICAL PIPE ANTI-SEEP COLLAR

NOTE: Two other types of anti-seep collars are:

1. Corrugated metal, similar to upper detail, except shop welded to a short (4 ft.) section of the pipe and connected with connecting bands to the pipe.
2. Concrete, six inches thick formed around the pipe with #3 rebar spaced 15" horizontally and vertically.

Ref: Engr. Field Manual

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DESIGN SHEET

SHEET 1. OF

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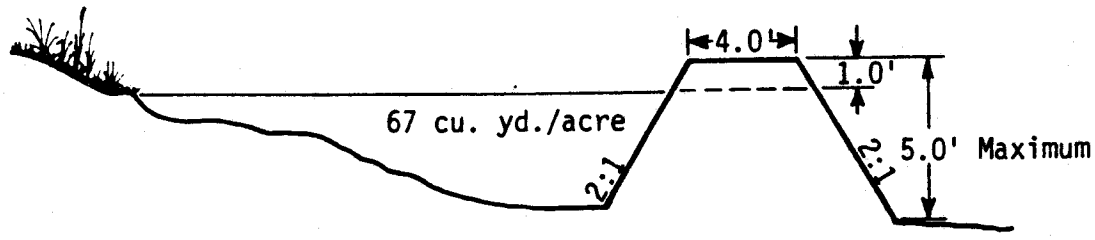
WEYERHAUSER LANDFILL	KS	1.17.89			467.36

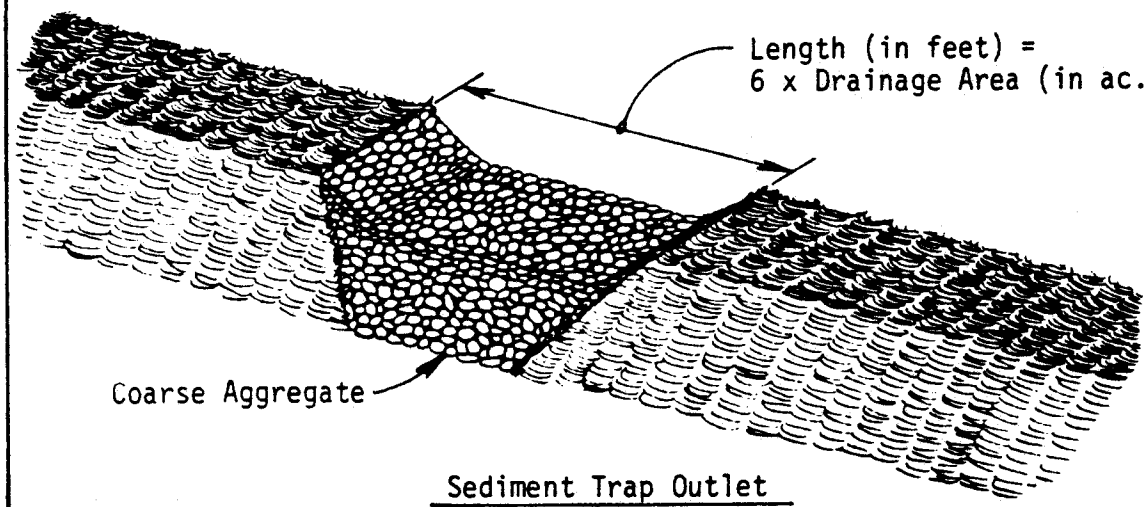
BORROW AREA.

TEMPORARY SEDIMENT TRAPS.

TYPICAL DETAIL



Cross-Section



Sediment Trap Outlet

DESIGN CRITERIA.

1. VOLUME OF SEDIMENT STORAGE REQUIRED IS BASED ON 67 CU. YDS/ACRE (0.5 ACRE INCH/ACRE.).

2. PEAK FLOW IS CALCULATED USING 10YR/24HR RAINFALL OF 6.3 INCHES.

3. CURVE NUMBER, CN = 80, SHALL BE USED FOR THE

TABLE C009A - BORROW AREA SEDIMENT TRAPS •

OUTLET •	AREA DESIGNATION	ACREAGE CONTRIBUTING	ACREAGE DISTURBED	Q_{10} (CFS)	CREST ELEV. (MSL)	TOP BERM ELEV. (MSL)	SEDIMENT STORAGE (CUBIC YDS.)	L (FT.)	H (FT.)
1	A	1.9	1.9	13.7	21.0	24.0	127.3	12	4
2	B	1.0	1.0	7.9	18.0	19.0	67.0	6	4
3	F	0.8	0.8	7.9	21.0	22.0	53.6	5	4
4	C	3.8	3.8	22.8	18.0	19.0	254.6	23	5
5	D	2.1	2.1	13.7	21.0	22.0	140.7	13	4
6	E	2.9	2.9	18.7	19.0	20.0	194.3	18	5
7	G	5.0	4.8	29.1	9.0	10.0	321.6	30	4
8	H	1.3	1.3	10.0	22.0	23.0	87.1	8	4

• REFER TO DWG. NO. C007 FOR LOCATION OF SEDIMENT TRAPS

RMT INC.
100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

DESIGN SHEET

SHEET ____ OF ____

PROJECT/PROPOSAL NAME

PREPARED By: Date:

CHECKED By: Date:

PROJECT/PROPOSAL NO.

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
					467.360

LIFE OF THE INSTALLATION.

AREA A. (1)

DISTURBED AREA = ~~7.71~~ 1.90 AC. (= WATERSHED AREA)

REQUIRED SEDIMENT STORAGE = (~~7.71~~ 1.90)(67) = ~~516.6~~ 120.6 YD³.

SPILLWAY LENGTH = (6)(~~7.71~~ 1.90) ≅ ~~43~~ 12 FT.

PEAK FLOW;

FROM FIG. D-2, PEAK DISCHARGE = ~~9.5~~ 3.3 CFS/IN. RUNOFF.
FROM TABLE 2-1, RUNOFF = 4.15 IN.
∴ PEAK FLOW = (~~9.5~~ 3.3)(4.15) = ~~39.4~~ 13.7 CFS. = Q_{10}

AREA B. (2)

DISTURBED AREA = ~~3.41~~ 1.0 AC.

WATERSHED AREA = ~~4.04~~ 1.0 AC.

REQUIRED SEDIMENT STORAGE = (~~3.41~~ 1.0)(67) = ~~228.5~~ 67 YD³.

SPILLWAY LENGTH = (6)(~~3.41~~ 1.0) ≅ ~~21~~ 6 FT.

PEAK FLOW;

FROM FIG. D-2, PEAK DISCHARGE = ~~5.8~~ 1.9 CFS/IN. RUNOFF.
FROM TABLE 2-1, RUNOFF = 4.15 IN.
∴ PEAK FLOW = (~~5.8~~ 1.9)(4.15) = ~~24.1~~ 7.9 CFS = Q_{10}

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
					467.36

AREA C. (4)

DISTURBED AREA = 3.75 AC. (= WATERSHED AREA.)

REQUIRED SEDIMENT STORAGE = (3.75)(67) = 251.3 YD³.

SPILLWAY LENGTH = (6)(3.75) = 23 FT.

PEAK FLOW;

FROM FIG. D-2, PEAK DISCHARGE = 5.5 CFS/IN. RUNOFF
FROM TABLE 2-1, RUNOFF = 4.15 IN.
∴ PEAK FLOW = (5.5)(4.15) = 22.8 CFS = Q_{10}

AREA D. (5)

DISTURBED AREA = 2.04 AC. (= WATERSHED AREA.)

REQUIRED SEDIMENT STORAGE = (2.04)(67) = 136.7 YD³.

SPILLWAY LENGTH = (6)(2.04) = 13 FT.

PEAK FLOW;

FROM FIG. D-2, PEAK DISCHARGE = 3.3 CFS/IN. RUNOFF
FROM TABLE 2-1, RUNOFF = 4.15 IN.
∴ PEAK FLOW = (3.3)(4.15) = 13.7 CFS = Q_{10}

AREA E. (6)

DISTURBED AREA = 2.90 AC. (= WATERSHED AREA).

REQUIRED SEDIMENT STORAGE = (2.90)(67) = 194.3 YD³

SPILLWAY LENGTH = (6)(2.90) = 18 FT.

PEAK FLOW;

FROM FIG. D-2, PEAK DISCHARGE = 4.5 CFS/IN. RUNOFF.
FROM TABLE 2-1, RUNOFF = 4.15 IN.
∴ PEAK FLOW = (4.5)(4.15) = 18.7 CFS. = Q_{10}

AREA F. (3)

DISTURBED AREA = 0.84 AC. (= WATERSHED AREA.)

REQUIRED SEDIMENT STORAGE = (0.84)(67) = 56.3 YD^3.

SPILLWAY LENGTH = (6)(0.84) = 5 FT.

PEAK FLOW (ASSUME 1 ACRE);

FROM FIG. D-2, PEAK DISCHARGE = 1.9 CFS/IN. RUNOFF.
FROM TABLE 2-1, RUNOFF = 4.15 IN.
∴ PEAK FLOW = (1.9)(4.15) = 7.9 CFS = Q_{10}.

AREA G (7)

Disturbed Area - 4.8 Ac Total Area - 5.0 Ac.
Required Sediment Storage - (4.8)(67) = 321.6 yd^3
Spillway Length - (6)(5) = 30 ft.
Peak Flow: From Fig D-2, Peak Discharge - 7.0 cfs/in Runoff
From Table 2-1 Runoff = 4.15 in
∴ Peak Flow = (7.0)(4.15) = 29.1 cfs

AREA H (8)

Disturbed Area - 1.3 Ac.
Required Sediment Storage - (1.3)(67) = 87.1 yd^3
Spillway Length - 1.3 × 6 = 8 ft.
Peak Flow - From Fig D-2, Peak Discharge = 2.4, From Table 2-1 Runoff 4.15 in
∴ Peak Flow = (4.15)(2.4) = 10.0 cfs

Revised 10/89

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	PREPARED Date:	CHECKED By:	CHECKED Date:	PROJECT/PROPOSAL NO.
					467.36

REFERENCE TR-55.

Table 2-1.--Runoff depth in inches for selected CN's and rainfall amounts

Rainfall (inches)	Curve Number (CN)[1/]								
	60	65	70	75	80	85	90	95	98
1.0	0	0	0	0.03	0.08	0.17	0.32	.56	.79
1.2	0	0	0.03	0.07	0.15	0.28	0.46	.74	.99
1.4	0	0.02	0.06	0.13	0.24	0.39	0.61	.92	1.18
1.6	0.01	0.05	0.11	0.20	0.34	0.52	0.76	1.11	1.38
1.8	0.03	0.09	0.17	0.29	0.44	0.65	0.93	1.29	1.58
2.0	0.06	0.14	0.24	0.38	0.56	0.80	1.09	1.48	1.77
2.5	0.17	0.30	0.46	0.65	0.89	1.18	1.53	1.96	2.27
3.0	0.33	0.51	0.72	0.96	1.25	1.59	1.98	2.45	2.78
4.0	0.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
5.0	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
(6.3) 6.0	1.92	2.35	2.80	3.28	3.78	4.31	4.85	5.41	5.76
7.0	2.60	3.10	3.62	4.15 (4.15)	4.69	5.26	5.82	6.41	6.76
8.0	3.33	3.90	4.47	5.04	5.62	6.22	6.81	7.40	7.76
9.0	4.10	4.72	5.34	5.95	6.57	7.19	7.79	8.40	8.76
10.0	4.90	5.57	6.23	6.88	7.52	8.16	8.78	9.40	9.76
11.0	5.72	6.44	7.13	7.82	8.48	9.14	9.77	10.39	10.76
12.0	6.56	7.32	8.05	8.76	9.45	10.12	10.76	11.39	11.76

[1/] To obtain runoff depths for CN's and other rainfall amounts not shown in this table, use an arithmetic interpolation.

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SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
					467.36

REFERENCE TR-55.

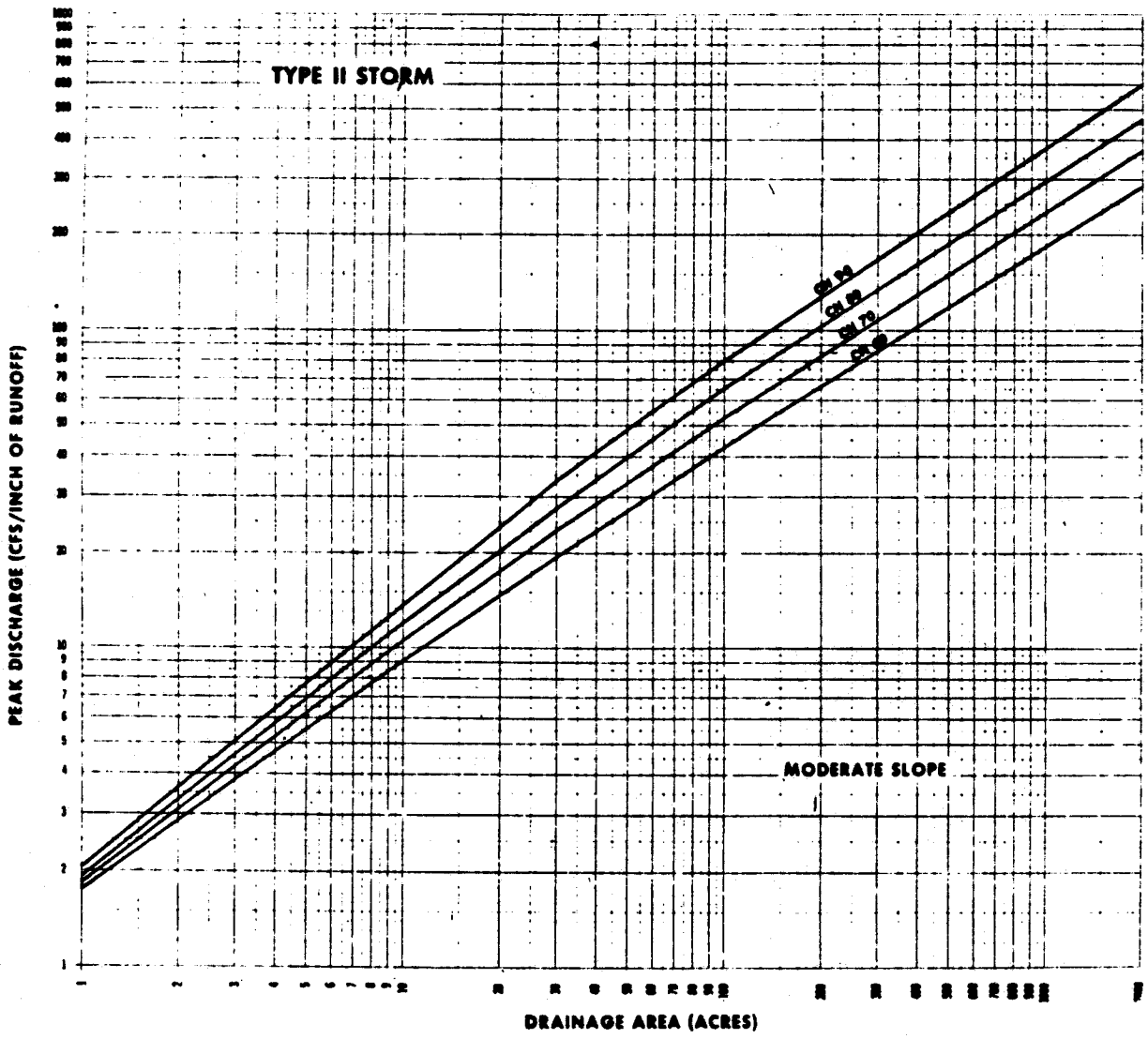

Figure D-2.--Peak rates of discharge for small watersheds (24-hour, type-II storm distribution). Sheet 2 of 3

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DESIGN SHEET

(37)

SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	VLM	2/23			46736

DIVERSION DITCH DESIGNS

* Runoff calculated using SCS Hydrograph Method
* Depths calculated using Manning's Equation

RMT INC.

DESIGN SHEET

SHEET ____ OF ____

(3B)

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM				467.36

Ditch Identification

Name	Location	
PD 1A	Perimeter Ditch B	- Minimum Slope
PD 1B	Perimeter Ditch B	- Maximum Slope
PD 2A	" " D	- Minimum Slope
PD 2B	" " D	- Maximum Slope
PD 3A	" " C	- Maximum Slope
PD 4A	" " A	Minimum Slope
PD 4B	" " A	- Maximum Slope
MT SOUTH A	Middle Terrace - South of Site	- Minimum Slope
MT SOUTH B	" " - " " "	- Maximum Slope
MT SOWEST A	" " - SouthWest of Site	- Minimum Slope
MT SOWEST B	" " - " " "	- Maximum Slope
MT WEST A	" " - West of Site	- Minimum Slope
MT WEST B	" " - " " "	- Maximum Slope
MT NORTH A	" " - North " "	- " "
MT EAST A	" " - East " "	- Minimum Slope
MT EAST B	" " - " " "	- Maximum Slope
UT SOUTH A	Upper Terrace - South of Site	- Maximum Slope
UT SOWEST A	" " - Southwest of Site	- " "
UT WEST A	" " - West of Site	- Minimum Slope
UT WEST B	" " - West of Site	- Maximum Slope
UT EAST A	" " - East of Site	- Maximum Slope

WEYERHAEUSER LANDFILL JOB # - 467.39

DITCH DESIGNS

DISCHARGE VALUES
10 YEAR STORM EVENT
Greensboro, North Carolina Region

DITCH	TOTAL ACRES	DISCHARGE (cfs) *
PD F	6.8	6.3
PD E	6.5	6.3
PD D	6.5	17.5
PD D	6.5	17.5
PD C	1.7	4.3
PD A	4.3	5.1
PD A	4.3	5.1

DITCH DESIGN DATA

DITCH	FLOW	ROUGH. COEFF	SIDE SLOPES LEFT	SIDE SLOPES RIGHT	BOTTOM WIDTH	SLOPE	DEPTH	VELOCITY
PD E	6.3	0.040	3.00	4.00	2	0.5	0.7	1.3
PD F	6.3	0.040	3.00	4.00	2	2.0	0.5	3.4
PD D	17.5	0.040	4.00	4.00	4	0.5	0.3	2.5
PD D	17.5	0.040	4.00	4.00	4	1.0	0.7	3.3
PD C	4.3	0.040	4.00	4.00	2	0.5	0.6	1.7
PD A	5.1	0.040	3.00	15.00	0	0.5	0.7	1.3
PD A	5.1	0.040	3.00	15.00	0	4.0	0.5	2.7

*Calculated using SCS Hydrograph Method – 10 YR/24 HR PEAK

WEYERHAEUSER LANDFILL JOB # - 467.36

DITCH DESIGNS

DISCHARGE VALUES
10 YEAR STORM EVENT
Greensboro, North Carolina Region

DITCH	TOTAL ACRES	DIST	ELEV DIFF	INTENSITY	WEIGHTED C	DISCHARGE* (cfs)
MT SOUTH A	0.6	485	22	8.0	0.2	0.7
MT SOUTH B	0.6	485	22	8.0	0.2	0.7
MT SOWEST A	0.7	650	30	8.0	0.2	0.8
MT SOWEST B	0.7	650	30	8.0	0.2	0.8
MT WEST A	3.4	2235	36	6.9	0.2	3.5
MT WEST B	3.4	2235	36	6.9	0.2	3.5
MT NORTH A	0.3	200	22	8.0	0.2	0.4
MT EAST A	3.3	1905	49	7.5	0.2	3.7
MT EAST B	3.3	1905	49	7.5	0.2	3.7

DITCH DESIGN DATA

DITCH	FLOW	ROUGH COEFF	SIDE SLOPES LEFT	SIDE SLOPES RIGHT	BOTTOM WIDTH	BOTTOM SLOPE	DEPTH	VELOCITY
MT SOUTH A	0.7	0.040	15.00	3.00	0	0.5	0.3	0.8
MT SOUTH B	0.7	0.040	15.00	3.00	0	1.0	0.3	1.0
MT SOWEST A	0.8	0.040	15.00	3.00	0	1.0	0.3	1.0
MT SOWEST B	0.8	0.040	15.00	3.00	0	2.0	0.3	1.3
MT WEST A	3.5	0.040	15.00	3.00	0	0.5	0.6	1.2
MT WEST B	3.5	0.040	15.00	3.00	0	4.0	0.4	2.5
MT NORTH A	0.4	0.040	15.00	3.00	0	1.0	0.2	0.8
MT EAST A	3.7	0.040	15.00	3.00	0	0.5	0.6	1.2
MT EAST B	3.7	0.040	15.00	3.00	0	4.0	0.4	2.5

*Calculated using SCS Hydrograph Method - 10 YR/24 Hr PEAK

WEYERHAEUSER LANDFILL JOB # - 467.36

DITCH DESIGNS

DISCHARGE VALUES
10 YEAR STORM EVENT
Greensboro, North Carolina Region

DITCH	TOTAL ACRES	DIST	ELEV DIFF	INTENSITY	WEIGHTED C	DISCHARGE (cfs) *
UT SOUTH A	0.4	380	10	8.0	0.2	0.5
UT SOWEST A	1.3	460	12	8.0	0.2	1.6
UT WEST A	6.8	2200	28	6.5	0.2	6.6
UT WEST B	6.8	2200	28	6.5	0.2	6.6
UT EAST A	0.9	580	10	8.0	0.2	1.1

DITCH DESIGN DATA

DITCH	FLOW	ROUGH COEFF	SIDE SLOPES LEFT	SIDE SLOPES RIGHT	BOTTOM WIDTH	BOTTOM SLOPE	DEPTH	VELOCITY
UT SOUTH A	0.5	0.040	15.00	3.00	0	1.0	0.2	0.9
UT SOWEST A	1.6	0.040	15.00	3.00	0	1.0	0.4	1.2
UT WEST A	6.6	0.040	15.00	3.00	0	0.5	0.7	1.3
UT WEST B	6.6	0.040	15.00	3.00	0	8.0	0.4	3.8
UT EAST A	1.1	0.040	15.00	3.00	0	8.0	0.2	2.4

*Calculated using SCS Hydrograph Method - 10 YR/24 HR Peak

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DESIGN SHEET

SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyhaeuser Landfill	JLM	2/23/89			467.36

INLET / PIPE DESIGNS

STORM DRAINAGE

PROJECT NO.: 467.39
STORM FREQUENCY/DURATION: 10 YR/24 HR

SHEET 1 OF 1
DATE: 01/01/80
BY: JONES/McGRANER

LOCATION DESCRIPTION	FROM	TO	AREA [AC]	CURVE NUMBER	FLOW PATH SLOPE	LENGTH [FT]	T.C. [HRS]	10 YR. RAIN	PEAK OF INFLOW HYD.	PEAK [HRS]	PIPE SIZE	PIPE SLOPE	Q-FULL [CFS]	V-FULL [FPS]	V [FPS]	VELOCITY HEAD	STRUCTURE LOSSES
	AREA A	DI-6	7.9	65	0.012857	2100	1.2879	6.3	8.63	12.7	-	-	-	-	-	-	-
	AREA B	DI-1	3.5	65	0.017619	2100	1.1002	6.3	4.33	12.6	-	-	-	-	-	-	-
	AREA C	DI-3	4.2	65	0.017972	2170	1.1183	6.3	5.12	12.6	-	-	-	-	-	-	-
	AREA D	DITCH D	1.7	65	0.036364	660	0.3034	6.3	4.61	12.1	-	-	-	-	-	-	-
	AREA E	DI-8	1.3	65	0.023636	550	0.3252	6.3	3.52	12.1	-	-	-	-	-	-	-
	AREA F	DI-7	1.7	65	0.020690	580	0.3627	6.3	4.44	12.1	-	-	-	-	-	-	-
	AREA G	DI-5	6.8	65	0.028626	2620	1.0303	6.3	8.76	12.6	-	-	-	-	-	-	-
	AREA H	DI-2	7.9	65	0.020370	2160	1.0466	6.3	10.09	12.6	-	-	-	-	-	-	-
	AREA I	DI-4	3.6	65	0.025758	1980	0.8681	6.3	5.27	12.4	-	-	-	-	-	-	-
	AREA J	DITCH D	1.8	65	0.033824	680	0.3222	6.3	4.88	12.1	-	-	-	-	-	-	-
FLOW FROM A	DI-6	DI-2	-	-	-	-	-	-	8.63	12.7	18"	0.113	38	21.7	17.4	4.7	-
FLOW FROM B	DI-1	DI-2	-	-	-	-	-	-	4.33	12.6	18"	0.005	8	4.6	4.8	0.4	-
STRUCTURE LOSSES		DI-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.27
SUM OF A,B,H	DI-2	DI-4	-	-	-	-	-	-	22.74	12.6	18"	0.171	47	26.7	26.7	11.1	-
FLOW FROM C	DI-3	DI-4	-	-	-	-	-	-	5.12	12.6	18"	0.005	8	4.6	4.9	0.4	-
STRUCTURE LOSSES		DI-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.96
SUM OF A,B,C,H,I	DI-4	DI-5	-	-	-	-	-	-	32.69	12.6	24"	0.076	68	21.6	21.6	7.2	-
STRUCTURE LOSSES		DI-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.22
SUM OF A,B,C,G,H,I	DI-5	HW-1	-	-	-	-	-	-	41.45	12.6	30"	0.017	369	18.8	11.3	2.0	-
FLOW FROM F	DI-7	DI-8	-	-	-	-	-	-	4.44	12.1	18"	0.257	58	32.7	16.7	4.3	-
STRUCTURE LOSSES		DI-8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.81
SUM OF E & F	DI-8	HW-3	-	-	-	-	-	-	7.96	12.1	18"	0.183	49	27.6	18.8	5.5	-

RMT INC.
100 Verdae Boulevard P.O. Box 16778 Greenville, SC 29606 Phone: 803-281-0030 FAX: 803-281-0288

DESIGN SHEET

SHEET _____ OF _____

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Plymouth	JLM				46736

Flow Paths for Drainage Areas

Area	Length of Flow Path (ft)	Change in Elevation (ft)	S, ft/ft
A	2100	27	0.012857
B	2100	37	0.017619
C	2170	39	0.017972
D	660	24	0.036364
E	550	13	0.023636
F	580	12	0.020690
G	2620	75	0.028626
H	2160	44	0.020370
I	1980	51	0.025758
J	680	23	0.033824

Time of Concentrations calculated by Curve Number Method in hydrograph program.

Curve Number Used – 65

Inlet operation requires the greatest capacity when final grades are reached. The surface at this time will be a mixture of partially vegetated areas and areas that have been seeded, mulched, and treated with erosion control blankets. This will increase moisture retention and reduce the volume of runoff from the area. A CN of 65 was selected to make some allowance for the reduction in runoff due to the design conditions.

SCS Hydrograph Generation Program
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AREA A - 10 YEAR

DRAINAGE AREA = .01634 SQUARE MILES
TIME OF CONCENTRATION = 1.257549 HOURS
RUNOFF CURVE NUMBER = 85
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 1.69 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 8.63 CFS AT 12.7 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.18	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.89	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.00
10.40	1.25	0.01	0.01
10.60	1.32	0.01	0.02
10.80	1.39	0.02	0.05
11.00	1.48	0.03	0.08
11.20	1.58	0.04	0.14
11.40	1.71	0.07	0.21
11.60	1.93	0.12	0.32
11.80	2.71	0.38	0.60
12.00	4.18	1.13	1.64
12.20	4.40	1.27	3.79
12.40	4.57	1.37	6.56
12.60	4.68	1.45	8.32
12.80	4.78	1.51	8.62
13.00	4.86	1.56	7.84
13.20	4.94	1.61	6.43
13.40	5.00	1.66	5.11
13.60	5.06	1.70	4.18
13.80	5.12	1.73	3.47
14.00	5.17	1.76	2.91
14.20	5.21	1.80	2.48
14.40	5.26	1.83	2.15
14.60	5.30	1.85	1.89
14.80	5.34	1.88	1.68
15.00	5.38	1.91	1.53
15.20	5.41	1.93	1.41
15.40	5.45	1.96	1.31
15.60	5.48	1.98	1.23
15.80	5.51	2.00	1.15
16.00	5.54	2.03	1.08
16.20	5.57	2.05	1.02
16.40	5.60	2.07	0.97
16.60	5.63	2.08	0.93
16.80	5.65	2.10	0.89
17.00	5.68	2.12	0.85
17.20	5.71	2.14	0.83
17.40	5.73	2.16	0.80
17.60	5.76	2.18	0.78
17.80	5.78	2.19	0.76
18.00	5.80	2.21	0.74
18.20	5.82	2.22	0.72
18.40	5.85	2.24	0.71
18.60	5.87	2.26	0.69
18.80	5.89	2.27	0.67
19.00	5.91	2.28	0.65
19.20	5.93	2.30	0.64
19.40	5.95	2.31	0.62
19.60	5.96	2.32	0.60
19.80	5.98	2.34	0.59
20.00	6.00	2.35	0.57
20.20	6.01	2.36	0.55
20.40	6.03	2.37	0.53
20.60	6.05	2.38	0.52
20.80	6.06	2.40	0.50
21.00	6.08	2.41	0.49
21.20	6.09	2.42	0.49
21.40	6.11	2.43	0.48
21.60	6.12	2.44	0.47

22.00	6.16	2.46	0.46
22.20	6.17	2.48	0.46
22.40	6.19	2.49	0.46
22.60	6.20	2.50	0.45
22.80	6.21	2.51	0.45
23.00	6.23	2.52	0.44
23.20	6.24	2.53	0.44
23.40	6.26	2.54	0.44
23.60	6.27	2.55	0.43
23.80	6.29	2.56	0.43
24.00	6.30	2.57	0.43
24.20	6.30	2.57	0.42
24.40	6.30	2.57	0.39
24.60	6.30	2.57	0.34
24.80	6.30	2.57	0.27
25.00	6.30	2.57	0.19
25.20	6.30	2.57	0.13
25.40	6.30	2.57	0.09
25.60	6.30	2.57	0.06
25.80	6.30	2.57	0.04
26.00	6.30	2.57	0.03
26.20	6.30	2.57	0.02
26.40	6.30	2.57	0.01
26.60	6.30	2.57	0.01
26.80	6.30	2.57	0.01
27.00	6.30	2.57	0.00
27.20	6.30	2.57	0.00
27.40	6.30	2.57	0.00
27.60	6.30	2.57	0.00
27.80	6.30	2.57	0.00
28.00	6.30	2.57	0.00

SCS Hydrograph Generation Program
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AREA B - 10 YEAR

DRAINAGE AREA = .00547 SQUARE MILES
TIME OF CONCENTRATION = 1.100216 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.75 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 4.33 CFS AT 12.6 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.89	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.00
10.40	1.25	0.01	0.01
10.60	1.32	0.01	0.01
10.80	1.39	0.02	0.03
11.00	1.48	0.03	0.05
11.20	1.58	0.04	0.08
11.40	1.71	0.07	0.12
11.60	1.93	0.12	0.18
11.80	2.71	0.38	0.35
12.00	4.18	1.13	1.02
12.20	4.40	1.27	2.39
12.40	4.57	1.37	3.83
12.60	4.68	1.45	4.33
12.80	4.78	1.51	3.99
13.00	4.86	1.56	3.19
13.20	4.94	1.61	2.45
13.40	5.00	1.66	1.94
13.60	5.06	1.70	1.56
13.80	5.12	1.73	1.29
14.00	5.17	1.76	1.09
14.20	5.21	1.80	0.93
14.40	5.26	1.83	0.82
14.60	5.30	1.85	0.73
14.80	5.34	1.88	0.66
15.00	5.38	1.91	0.61
15.20	5.41	1.93	0.57
15.40	5.45	1.96	0.53
15.60	5.48	1.98	0.50
15.80	5.51	2.00	0.48
16.00	5.54	2.03	0.45
16.20	5.57	2.05	0.43
16.40	5.60	2.07	0.41
16.60	5.63	2.08	0.39
16.80	5.65	2.10	0.38
17.00	5.68	2.12	0.37
17.20	5.71	2.14	0.36
17.40	5.73	2.16	0.35
17.60	5.76	2.18	0.34
17.80	5.78	2.19	0.33
18.00	5.80	2.21	0.32
18.20	5.82	2.22	0.31
18.40	5.85	2.24	0.31
18.60	5.87	2.26	0.30
18.80	5.89	2.27	0.29
19.00	5.91	2.28	0.28
19.20	5.93	2.30	0.28
19.40	5.95	2.31	0.27
19.60	5.96	2.32	0.26
19.80	5.98	2.34	0.25
20.00	6.00	2.35	0.25
20.20	6.01	2.36	0.24
20.40	6.03	2.37	0.23
20.60	6.05	2.38	0.22
20.80	6.06	2.40	0.22
21.00	6.08	2.41	0.21
21.20	6.09	2.42	0.21
21.40	6.11	2.43	0.21
21.60	6.12	2.44	0.21

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22.00	6.16	2.46	0.20
22.20	6.17	2.48	0.20
22.40	6.19	2.49	0.20
22.60	6.20	2.50	0.20
22.80	6.21	2.51	0.20
23.00	6.23	2.52	0.20
23.20	6.24	2.53	0.19
23.40	6.26	2.54	0.19
23.60	6.27	2.55	0.19
23.80	6.29	2.56	0.19
24.00	6.30	2.57	0.19
24.20	6.30	2.57	0.18
24.40	6.30	2.57	0.17
24.60	6.30	2.57	0.13
24.80	6.30	2.57	0.09
25.00	6.30	2.57	0.06
25.20	6.30	2.57	0.04
25.40	6.30	2.57	0.02
25.60	6.30	2.57	0.02
25.80	6.30	2.57	0.01
26.00	6.30	2.57	0.01
26.20	6.30	2.57	0.00
26.40	6.30	2.57	0.00
26.60	6.30	2.57	0.00
26.80	6.30	2.57	0.00
27.00	6.30	2.57	0.00
27.20	6.30	2.57	0.00
27.40	6.30	2.57	0.00

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AREA C - 10 YEAR

DRAINAGE AREA = .00656 SQUARE MILES
TIME OF CONCENTRATION = 1.118311 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.90 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 5.12 CFS AT 12.6 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

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8.80	0.89	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.00
10.40	1.25	0.01	0.01
10.60	1.32	0.01	0.02
10.80	1.39	0.02	0.03
11.00	1.48	0.03	0.06
11.20	1.58	0.04	0.09
11.40	1.71	0.07	0.14
11.60	1.93	0.12	0.21
11.80	2.71	0.38	0.40
12.00	4.18	1.13	1.18
12.20	4.40	1.27	2.77
12.40	4.57	1.37	4.48
12.60	4.68	1.45	5.12
12.80	4.78	1.51	4.78
13.00	4.86	1.56	3.88
13.20	4.94	1.61	2.98
13.40	5.00	1.66	2.36
13.60	5.06	1.70	1.91
13.80	5.12	1.73	1.58
14.00	5.17	1.76	1.33
14.20	5.21	1.80	1.14
14.40	5.26	1.83	0.99
14.60	5.30	1.85	0.88
14.80	5.34	1.88	0.80
15.00	5.38	1.91	0.74
15.20	5.41	1.93	0.69
15.40	5.45	1.96	0.64
15.60	5.48	1.98	0.60
15.80	5.51	2.00	0.57
16.00	5.54	2.03	0.55
16.20	5.57	2.05	0.52
16.40	5.60	2.07	0.50
16.60	5.63	2.08	0.47
16.80	5.65	2.10	0.46
17.00	5.68	2.12	0.44
17.20	5.71	2.14	0.43
17.40	5.73	2.16	0.42
17.60	5.76	2.18	0.40
17.80	5.78	2.19	0.40
18.00	5.80	2.21	0.39
18.20	5.82	2.22	0.38
18.40	5.85	2.24	0.37
18.60	5.87	2.26	0.36
18.80	5.89	2.27	0.35
19.00	5.91	2.28	0.34
19.20	5.93	2.30	0.33
19.40	5.95	2.31	0.32
19.60	5.96	2.32	0.31
19.80	5.98	2.34	0.30
20.00	6.00	2.35	0.29
20.20	6.01	2.36	0.29
20.40	6.03	2.37	0.28
20.60	6.05	2.38	0.27
20.80	6.06	2.40	0.26
21.00	6.08	2.41	0.26
21.20	6.09	2.42	0.25
21.40	6.11	2.43	0.25
21.60	6.12	2.44	0.25

22.00	6.16	2.46	0.24
22.20	6.17	2.48	0.24
22.40	6.19	2.49	0.24
22.60	6.20	2.50	0.24
22.80	6.21	2.51	0.24
23.00	6.23	2.52	0.23
23.20	6.24	2.53	0.23
23.40	6.26	2.54	0.23
23.60	6.27	2.55	0.23
23.80	6.29	2.56	0.23
24.00	6.30	2.57	0.23
24.20	6.30	2.57	0.22
24.40	6.30	2.57	0.20
24.60	6.30	2.57	0.16
24.80	6.30	2.57	0.12
25.00	6.30	2.57	0.08
25.20	6.30	2.57	0.05
25.40	6.30	2.57	0.03
25.60	6.30	2.57	0.02
25.80	6.30	2.57	0.01
26.00	6.30	2.57	0.01
26.20	6.30	2.57	0.01
26.40	6.30	2.57	0.00
26.60	6.30	2.57	0.00
26.80	6.30	2.57	0.00
27.00	6.30	2.57	0.00
27.20	6.30	2.57	0.00
27.40	6.30	2.57	0.00

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AREA D - 10 YEAR

DRAINAGE AREA = .00266 SQUARE MILES
TIME OF CONCENTRATION = .3033837 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.36 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 4.61 CFS AT 12.1 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.18	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.89	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.01
10.40	1.25	0.01	0.02
10.60	1.32	0.01	0.03
10.80	1.39	0.02	0.05
11.00	1.48	0.03	0.07
11.20	1.58	0.04	0.11
11.40	1.71	0.07	0.16
11.60	1.93	0.12	0.29
11.80	2.71	0.38	1.28
12.00	4.18	1.13	4.60
12.20	4.40	1.27	3.10
12.40	4.57	1.37	1.40
12.60	4.68	1.45	0.84
12.80	4.78	1.51	0.61
13.00	4.86	1.56	0.51
13.20	4.94	1.61	0.44
13.40	5.00	1.66	0.40
13.60	5.05	1.70	0.36
13.80	5.12	1.73	0.33
14.00	5.17	1.76	0.30
14.20	5.21	1.80	0.28
14.40	5.26	1.83	0.26
14.60	5.30	1.85	0.25
14.80	5.34	1.88	0.24
15.00	5.38	1.91	0.23
15.20	5.41	1.93	0.22
15.40	5.45	1.96	0.21
15.60	5.48	1.98	0.20
15.80	5.51	2.00	0.19
16.00	5.54	2.03	0.18
16.20	5.57	2.05	0.18
16.40	5.60	2.07	0.17
16.60	5.63	2.08	0.17
16.80	5.65	2.10	0.16
17.00	5.68	2.12	0.16
17.20	5.71	2.14	0.16
17.40	5.73	2.16	0.15
17.60	5.76	2.18	0.15
17.60	5.78	2.19	0.15
18.00	5.80	2.21	0.14
18.20	5.82	2.22	0.14
18.40	5.85	2.24	0.14
18.60	5.87	2.26	0.13
18.80	5.89	2.27	0.13
19.00	5.91	2.28	0.12
19.20	5.93	2.30	0.12
19.40	5.95	2.31	0.12
19.60	5.96	2.32	0.11
19.60	5.98	2.34	0.11
20.00	6.00	2.35	0.11
20.20	6.01	2.36	0.10
20.40	6.03	2.37	0.10
20.60	6.05	2.38	0.10
20.80	6.06	2.40	0.10
21.00	6.08	2.41	0.10
21.20	6.09	2.42	0.10
21.40	6.11	2.43	0.10
21.60	6.12	2.44	0.10

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22.00	6.16	2.46	0.10
22.20	6.17	2.48	0.09
22.40	6.19	2.49	0.09
22.60	6.20	2.50	0.09
22.80	6.21	2.51	0.09
23.00	6.23	2.52	0.09
23.20	6.24	2.53	0.09
23.40	6.26	2.54	0.09
23.60	6.27	2.55	0.09
23.80	6.29	2.56	0.09
24.00	6.30	2.57	0.09
24.20	6.30	2.57	0.04
24.40	6.30	2.57	0.01
24.60	6.30	2.57	0.00
24.80	6.30	2.57	0.00

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AREA E - 10 YEAR

DRAINAGE AREA = .00203 SQUARE MILES
TIME OF CONCENTRATION = .3252314 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.28 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 3.52 CFS AT 12.1 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.75	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

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8.80	0.83	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.01
10.40	1.25	0.01	0.01
10.60	1.32	0.01	0.02
10.80	1.39	0.02	0.04
11.00	1.48	0.03	0.06
11.20	1.58	0.04	0.08
11.40	1.71	0.07	0.12
11.60	1.93	0.12	0.21
11.80	2.71	0.38	0.89
12.00	4.18	1.13	3.30
12.20	4.40	1.27	2.52
12.40	4.57	1.37	1.15
12.60	4.68	1.45	0.68
12.80	4.78	1.51	0.48
13.00	4.86	1.56	0.40
13.20	4.94	1.61	0.34
13.40	5.00	1.66	0.31
13.60	5.06	1.70	0.28
13.80	5.12	1.73	0.25
14.00	5.17	1.76	0.23
14.20	5.21	1.80	0.21
14.40	5.26	1.83	0.20
14.60	5.30	1.85	0.19
14.80	5.34	1.88	0.19
15.00	5.38	1.91	0.18
15.20	5.41	1.93	0.17
15.40	5.45	1.96	0.16
15.60	5.48	1.98	0.16
15.80	5.51	2.00	0.15
16.00	5.54	2.03	0.14
16.20	5.57	2.05	0.13
16.40	5.60	2.07	0.13
16.60	5.63	2.08	0.13
16.80	5.65	2.10	0.13
17.00	5.68	2.12	0.12
17.20	5.71	2.14	0.12
17.40	5.73	2.16	0.12
17.60	5.76	2.18	0.11
17.80	5.78	2.19	0.11
18.00	5.80	2.21	0.11
18.20	5.82	2.22	0.11
18.40	5.85	2.24	0.10
18.60	5.87	2.26	0.10
18.80	5.89	2.27	0.10
19.00	5.91	2.28	0.10
19.20	5.93	2.30	0.09
19.40	5.95	2.31	0.09
19.60	5.96	2.32	0.09
19.80	5.98	2.34	0.08
20.00	6.00	2.35	0.08
20.20	6.01	2.36	0.08
20.40	6.03	2.37	0.08
20.60	6.05	2.38	0.08
20.80	6.06	2.40	0.08
21.00	6.08	2.41	0.08
21.20	6.09	2.42	0.08
21.40	6.11	2.43	0.07
21.60	6.12	2.44	0.07

22.00	6.16	2.46	0.07
22.20	6.17	2.48	0.07
22.40	6.19	2.49	0.07
22.60	6.20	2.50	0.07
22.80	6.21	2.51	0.07
23.00	6.23	2.52	0.07
23.20	6.24	2.53	0.07
23.40	6.26	2.54	0.07
23.60	6.27	2.55	0.07
23.80	6.29	2.56	0.07
24.00	6.30	2.57	0.07
24.20	6.30	2.57	0.03
24.40	6.30	2.57	0.01
24.60	6.30	2.57	0.00
24.80	6.30	2.57	0.00

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AREA F - 10 YEAR

DRAINAGE AREA = .00266 SQUARE MILES
TIME OF CONCENTRATION = .362709 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.36 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 4.44 CFS AT 12.1 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.89	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.01
10.40	1.25	0.01	0.02
10.60	1.32	0.01	0.03
10.80	1.39	0.02	0.05
11.00	1.48	0.03	0.07
11.20	1.58	0.04	0.10
11.40	1.71	0.07	0.15
11.60	1.93	0.12	0.25
11.80	2.71	0.38	0.99
12.00	4.18	1.13	3.83
12.20	4.40	1.27	3.53
12.40	4.57	1.37	1.70
12.60	4.68	1.45	0.99
12.80	4.78	1.51	0.68
13.00	4.86	1.56	0.54
13.20	4.94	1.61	0.46
13.40	5.00	1.66	0.41
13.60	5.06	1.70	0.37
13.80	5.12	1.73	0.34
14.00	5.17	1.76	0.31
14.20	5.21	1.80	0.28
14.40	5.26	1.83	0.27
14.60	5.30	1.85	0.25
14.80	5.34	1.88	0.24
15.00	5.38	1.91	0.24
15.20	5.41	1.93	0.23
15.40	5.45	1.96	0.22
15.60	5.48	1.98	0.21
15.80	5.51	2.00	0.20
16.00	5.54	2.03	0.19
16.20	5.57	2.05	0.18
16.40	5.60	2.07	0.17
16.60	5.63	2.08	0.17
16.80	5.65	2.10	0.16
17.00	5.68	2.12	0.16
17.20	5.71	2.14	0.16
17.40	5.73	2.16	0.15
17.60	5.76	2.18	0.15
17.80	5.78	2.19	0.15
18.00	5.80	2.21	0.14
18.20	5.82	2.22	0.14
18.40	5.85	2.24	0.14
18.60	5.87	2.26	0.13
18.80	5.89	2.27	0.13
19.00	5.91	2.28	0.13
19.20	5.93	2.30	0.12
19.40	5.95	2.31	0.12
19.60	5.96	2.32	0.11
19.80	5.98	2.34	0.11
20.00	6.00	2.35	0.11
20.20	6.01	2.36	0.10
20.40	6.03	2.37	0.10
20.60	6.05	2.38	0.10
20.80	6.06	2.40	0.10
21.00	6.08	2.41	0.10
21.20	6.09	2.42	0.10
21.40	6.11	2.43	0.10
21.60	6.12	2.44	0.10

22.00	6.16	2.45	0.10
22.20	6.17	2.46	0.10
22.40	6.19	2.49	0.09
22.60	6.20	2.50	0.09
22.80	6.21	2.51	0.09
23.00	6.23	2.52	0.09
23.20	6.24	2.53	0.09
23.40	6.26	2.54	0.09
23.60	6.27	2.55	0.09
23.80	6.29	2.56	0.09
24.00	6.30	2.57	0.09
24.20	6.30	2.57	0.05
24.40	6.30	2.57	0.01
24.60	6.30	2.57	0.00
24.80	6.30	2.57	0.00
25.00	6.30	2.57	0.00

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AREA G - 10 YEAR

DRAINAGE AREA = .01062 SQUARE MILES
TIME OF CONCENTRATION = 1.030278 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 1.46 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 8.76 CFS AT 12.6 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.85	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.00
10.40	1.25	0.01	0.01
10.60	1.32	0.01	0.03
10.80	1.39	0.02	0.06
11.00	1.48	0.03	0.10
11.20	1.58	0.04	0.16
11.40	1.71	0.07	0.25
11.60	1.93	0.12	0.37
11.80	2.71	0.38	0.75
12.00	4.18	1.13	2.28
12.20	4.40	1.27	5.37
12.40	4.57	1.37	8.19
12.60	4.68	1.45	8.76
12.80	4.78	1.51	7.64
13.00	4.86	1.56	5.81
13.20	4.94	1.61	4.45
13.40	5.00	1.66	3.51
13.60	5.06	1.70	2.82
13.80	5.12	1.73	2.33
14.00	5.17	1.76	1.97
14.20	5.21	1.80	1.71
14.40	5.26	1.83	1.50
14.60	5.30	1.85	1.35
14.80	5.34	1.88	1.23
15.00	5.38	1.91	1.14
15.20	5.41	1.93	1.06
15.40	5.45	1.96	1.00
15.60	5.48	1.98	0.95
15.80	5.51	2.00	0.91
16.00	5.54	2.03	0.87
16.20	5.57	2.05	0.83
16.40	5.60	2.07	0.79
16.60	5.63	2.08	0.75
16.80	5.65	2.10	0.73
17.00	5.68	2.12	0.70
17.20	5.71	2.14	0.68
17.40	5.73	2.16	0.67
17.60	5.76	2.18	0.65
17.80	5.78	2.19	0.63
18.00	5.80	2.21	0.62
18.20	5.82	2.22	0.60
18.40	5.85	2.24	0.59
18.60	5.87	2.26	0.58
18.80	5.89	2.27	0.56
19.00	5.91	2.28	0.55
19.20	5.93	2.30	0.53
19.40	5.95	2.31	0.52
19.60	5.96	2.32	0.50
19.80	5.98	2.34	0.49
20.00	6.00	2.35	0.47
20.20	6.01	2.36	0.46
20.40	6.03	2.37	0.44
20.60	6.05	2.38	0.43
20.80	6.06	2.40	0.42
21.00	6.08	2.41	0.41
21.20	6.09	2.42	0.41
21.40	6.11	2.43	0.40
21.60	6.12	2.44	0.40

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22.00	6.16	2.46	0.39
22.20	6.17	2.48	0.39
22.40	6.19	2.49	0.39
22.60	6.20	2.50	0.39
22.80	6.21	2.51	0.38
23.00	6.23	2.52	0.38
23.20	6.24	2.53	0.38
23.40	6.26	2.54	0.37
23.60	6.27	2.55	0.37
23.80	6.29	2.56	0.37
24.00	6.30	2.57	0.37
24.20	6.30	2.57	0.35
24.40	6.30	2.57	0.31
24.60	6.30	2.57	0.24
24.80	6.30	2.57	0.16
25.00	6.30	2.57	0.10
25.20	6.30	2.57	0.06
25.40	6.30	2.57	0.04
25.60	6.30	2.57	0.02
25.80	6.30	2.57	0.01
26.00	6.30	2.57	0.01
26.20	6.30	2.57	0.01
26.40	6.30	2.57	0.00
26.60	6.30	2.57	0.00
26.80	6.30	2.57	0.00
27.00	6.30	2.57	0.00
27.20	6.30	2.57	0.00

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AREA H - 10 YEAR

DRAINAGE AREA = .01834 SQUARE MILES
TIME OF CONCENTRATION = 1.046551 HOURS
RUNOFF CURVE NUMBER = 65
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 1.69 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 10.09 CFS AT 12.6 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.88	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.00
10.40	1.25	0.01	0.02
10.60	1.32	0.01	0.04
10.80	1.39	0.02	0.07
11.00	1.48	0.03	0.12
11.20	1.58	0.04	0.19
11.40	1.71	0.07	0.28
11.60	1.93	0.12	0.43
11.80	2.71	0.38	0.85
12.00	4.18	1.13	2.56
12.20	4.40	1.27	6.03
12.40	4.57	1.37	9.30
12.60	4.68	1.45	10.09
12.80	4.78	1.51	8.92
13.00	4.86	1.56	6.85
13.20	4.94	1.61	5.25
13.40	5.00	1.66	4.15
13.60	5.06	1.70	3.32
13.80	5.12	1.73	2.72
14.00	5.17	1.76	2.33
14.20	5.21	1.80	2.01
14.40	5.26	1.83	1.79
14.60	5.30	1.85	1.56
14.80	5.34	1.88	1.44
15.00	5.38	1.91	1.33
15.20	5.41	1.93	1.24
15.40	5.45	1.96	1.17
15.60	5.48	1.98	1.11
15.80	5.51	2.00	1.06
16.00	5.54	2.02	1.01
16.20	5.57	2.05	0.96
16.40	5.60	2.07	0.92
16.60	5.63	2.08	0.88
16.80	5.65	2.10	0.84
17.00	5.68	2.12	0.82
17.20	5.71	2.14	0.79
17.40	5.73	2.16	0.77
17.60	5.76	2.18	0.76
17.80	5.78	2.19	0.74
18.00	5.80	2.21	0.72
18.20	5.82	2.22	0.70
18.40	5.85	2.24	0.69
18.60	5.87	2.26	0.67
18.80	5.89	2.27	0.65
19.00	5.91	2.28	0.64
19.20	5.93	2.30	0.62
19.40	5.95	2.31	0.60
19.60	5.96	2.32	0.58
19.80	5.98	2.34	0.57
20.00	6.00	2.35	0.55
20.20	6.01	2.36	0.53
20.40	6.03	2.37	0.52
20.60	6.05	2.38	0.50
20.80	6.06	2.40	0.49
21.00	6.08	2.41	0.48
21.20	6.09	2.42	0.4[illegible]
21.40	6.11	2.43	0.47
21.60	6.12	2.44	0.47

[illegible]	[illegible]	[illegible]	[illegible]
22.20	6.17	2.46	0.45
22.40	6.18	2.49	0.43
22.60	6.20	2.50	0.45
22.80	6.21	2.51	0.44
23.00	6.23	2.52	0.44
23.20	6.24	2.53	0.44
23.40	6.26	2.54	0.43
23.60	6.27	2.55	0.43
23.80	6.28	2.56	0.43
24.00	6.29	2.57	0.42
24.20	6.30	2.57	0.41
24.40	6.30	2.57	0.36
24.60	6.30	2.57	0.28
24.80	6.30	2.57	0.19
25.00	6.30	2.57	0.12
25.20	6.30	2.57	0.08
25.40	6.30	2.57	0.05
25.60	6.30	2.57	0.03
25.80	6.30	2.57	0.02
26.00	6.30	2.57	0.01
26.20	6.30	2.57	0.01
26.40	6.30	2.57	0.00
26.60	6.30	2.57	0.00
26.80	6.30	2.57	0.00
27.00	6.30	2.57	0.00
27.20	6.30	2.57	0.00

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AREA I - [illegible]

52a

DRAINAGE AREA = .00868 SQUARE MILES
TIME OF CONCENTRATION = .0661054 HOURS
RUNOFF CURVE NUMBER = 60
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.77 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 5.27 CFS AT 12.4 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.38	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.89	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.00
10.40	1.25	0.01	0.01
10.60	1.32	0.01	0.02
10.80	1.39	0.02	0.04
11.00	1.48	0.03	0.07
11.20	1.58	0.04	0.11
11.40	1.71	0.07	0.16
11.60	1.93	0.12	0.24
11.80	2.71	0.38	0.52
12.00	4.18	1.13	1.75
12.20	4.40	1.27	4.00
12.40	4.57	1.37	5.27
12.60	4.68	1.45	4.83
12.80	4.78	1.51	3.58
13.00	4.86	1.56	2.60
13.20	4.94	1.61	1.96
13.40	5.00	1.66	1.53
13.60	5.06	1.70	1.24
13.80	5.12	1.73	1.04
14.00	5.17	1.76	0.90
14.20	5.21	1.80	0.79
14.40	5.26	1.83	0.71
14.60	5.30	1.85	0.64
14.80	5.34	1.88	0.59
15.00	5.38	1.91	0.56
15.20	5.41	1.93	0.53
15.40	5.45	1.96	0.51
15.60	5.48	1.98	0.49
15.80	5.51	2.00	0.47
16.00	5.54	2.03	0.44
16.20	5.57	2.05	0.42
16.40	5.60	2.07	0.40
16.60	5.63	2.08	0.39
16.80	5.65	2.10	0.37
17.00	5.68	2.12	0.36
17.20	5.71	2.14	0.35
17.40	5.73	2.16	0.35
17.60	5.76	2.18	0.34
17.80	5.78	2.19	0.33
18.00	5.80	2.21	0.32
18.20	5.82	2.22	0.31
18.40	5.85	2.24	0.31
18.60	5.87	2.26	0.30
18.80	5.89	2.27	0.29
19.00	5.91	2.28	0.28
19.20	5.93	2.30	0.28
19.40	5.95	2.31	0.27
19.60	5.96	2.32	0.26
19.80	5.98	2.34	0.25
20.00	6.00	2.35	0.24
20.20	6.01	2.36	0.24
20.40	6.03	2.37	0.23
20.60	6.05	2.38	0.22
20.80	6.06	2.40	0.22
21.00	6.08	2.41	0.22
21.20	6.09	2.42	0.21
21.40	6.11	2.43	0.21
21.60	6.12	2.44	0.21

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22.00	6.18	2.46	0.21
22.20	6.17	2.48	0.21
22.40	6.19	2.49	0.20
22.60	6.20	2.50	0.20
22.80	6.21	2.51	0.20
23.00	6.23	2.52	0.20
23.20	6.24	2.53	0.20
23.40	6.26	2.54	0.20
23.60	6.27	2.55	0.20
23.80	6.29	2.56	0.19
24.00	6.30	2.57	0.19
24.20	6.30	2.57	0.18
24.40	6.30	2.57	0.15
24.60	6.30	2.57	0.10
24.80	6.30	2.57	0.06
25.00	6.30	2.57	0.03
25.20	6.30	2.57	0.02
25.40	6.30	2.57	0.01
25.60	6.30	2.57	0.01
25.80	6.30	2.57	0.00
26.00	6.30	2.57	0.00
26.20	6.30	2.57	0.00
26.40	6.30	2.57	0.00
26.60	6.30	2.57	0.00

SCS Hydrograph Generation Program

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AREA 3 - 10 YEAR

DRAINAGE AREA = .00681 SQUARE MILES
TIME OF CONCENTRATION = .3281743 HOURS
RUNOFF CURVE NUMBER = 68
STORM DURATION = 24 HOURS
SCS TYPE 2 STORM
RAINFALL = 6.3 INCHES
RUNOFF = 2.57 INCHES = 0.39 ACRE FEET

VOLUME ADJUSTMENT FACTOR = 1.00

*** MAXIMUM FLOW = 4.68 CFS AT 12.1 HOURS ***

TIME (HOURS)	CUM. RAINFALL (INCHES)	CUM. RUNOFF (INCHES)	FLOW (CFS)
0.00	0.00	0.00	0.00
0.20	0.01	0.00	0.00
0.40	0.03	0.00	0.00
0.60	0.04	0.00	0.00
0.80	0.05	0.00	0.00
1.00	0.07	0.00	0.00
1.20	0.08	0.00	0.00
1.40	0.09	0.00	0.00
1.60	0.11	0.00	0.00
1.80	0.12	0.00	0.00
2.00	0.14	0.00	0.00
2.20	0.15	0.00	0.00
2.40	0.17	0.00	0.00
2.60	0.19	0.00	0.00
2.80	0.20	0.00	0.00
3.00	0.22	0.00	0.00
3.20	0.23	0.00	0.00
3.40	0.25	0.00	0.00
3.60	0.27	0.00	0.00
3.80	0.28	0.00	0.00
4.00	0.30	0.00	0.00
4.20	0.32	0.00	0.00
4.40	0.34	0.00	0.00
4.60	0.36	0.00	0.00
4.80	0.36	0.00	0.00
5.00	0.40	0.00	0.00
5.20	0.42	0.00	0.00
5.40	0.44	0.00	0.00
5.60	0.46	0.00	0.00
5.80	0.48	0.00	0.00
6.00	0.50	0.00	0.00
6.20	0.53	0.00	0.00
6.40	0.55	0.00	0.00
6.60	0.57	0.00	0.00
6.80	0.60	0.00	0.00
7.00	0.62	0.00	0.00
7.20	0.65	0.00	0.00
7.40	0.68	0.00	0.00
7.60	0.70	0.00	0.00
7.80	0.73	0.00	0.00
8.00	0.76	0.00	0.00
8.20	0.78	0.00	0.00
8.40	0.82	0.00	0.00

8.80	0.85	0.00	0.00
9.00	0.93	0.00	0.00
9.20	0.97	0.00	0.00
9.40	1.01	0.00	0.00
9.60	1.05	0.00	0.00
9.80	1.09	0.00	0.00
10.00	1.14	0.00	0.00
10.20	1.19	0.00	0.01
10.40	1.25	0.01	0.02
10.60	1.32	0.01	0.03
10.80	1.39	0.02	0.05
11.00	1.46	0.03	0.08
11.20	1.58	0.04	0.11
11.40	1.71	0.07	0.17
11.60	1.93	0.12	0.29
11.80	2.71	0.38	1.24
12.00	4.18	1.13	4.60
12.20	4.40	1.27	3.47
12.40	4.57	1.37	1.58
12.60	4.68	1.45	0.94
12.80	4.78	1.51	0.67
13.00	4.86	1.56	0.55
13.20	4.94	1.61	0.47
13.40	5.00	1.66	0.43
13.60	5.06	1.70	0.38
13.80	5.12	1.73	0.35
14.00	5.17	1.76	0.32
14.20	5.21	1.80	0.29
14.40	5.26	1.83	0.26
14.60	5.30	1.85	0.27
14.80	5.34	1.88	0.26
15.00	5.36	1.91	0.25
15.20	5.41	1.93	0.24
15.40	5.45	1.95	0.23
15.60	5.48	1.98	0.22
15.80	5.51	2.00	0.21
16.00	5.54	2.03	0.20
16.20	5.57	2.05	0.19
16.40	5.60	2.07	0.18
16.60	5.63	2.08	0.18
16.80	5.65	2.10	0.17
17.00	5.68	2.12	0.17
17.20	5.71	2.14	0.17
17.40	5.73	2.16	0.16
17.60	5.76	2.18	0.16
17.80	5.78	2.19	0.16
18.00	5.80	2.21	0.15
18.20	5.82	2.22	0.15
18.40	5.85	2.24	0.14
18.60	5.87	2.26	0.14
18.80	5.89	2.27	0.14
19.00	5.91	2.28	0.13
19.20	5.93	2.30	0.13
19.40	5.95	2.31	0.12
19.60	5.96	2.32	0.12
19.80	5.98	2.34	0.12
20.00	6.00	2.35	0.11
20.20	6.01	2.36	0.11
20.40	6.03	2.37	0.11
20.60	6.05	2.38	0.11
20.80	6.06	2.40	0.11
21.00	6.08	2.41	0.10
21.20	6.09	2.42	0.10
21.40	6.11	2.43	0.10
21.60	6.12	2.44	0.10

22.00	6.16	2.46	0.10
22.20	6.17	2.48	0.10
22.40	6.19	2.49	0.10
22.60	6.20	2.50	0.10
22.80	6.21	2.51	0.10
23.00	6.23	2.52	0.10
23.20	6.24	2.53	0.10
23.40	6.26	2.54	0.10
23.60	6.27	2.55	0.10
23.80	6.29	2.56	0.09
24.00	6.30	2.57	0.09
24.20	6.30	2.57	0.05
24.40	6.30	2.57	0.01
24.60	6.30	2.57	0.00
24.80	6.30	2.57	0.00

RMT INC.
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DESIGN SHEET

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser	VCJ	12-11			467.39

ESTIMATED VELOCITY OF FLOW

1) Flow from Area A: DI-6 to DI-2

Given: - 18"ø Pipe @ 0.113 ft/ft slope
- Peak flow from Inflow Hydrograph is 8.63 cfs

$Q_{FULL} = \frac{1.49}{n}(A)(r_H)^{2/3}\sqrt{S}$ (Manning Equation)

n = roughness coefficient
A = area of flow ($A_{FULL} = \pi r^2$)
r_H = hydraulic radius ($r_{H\,FULL} = A/2\pi r$)
S = slope or energy gradient

$Q_{FULL} = [1.49/(.012)](\pi(.75)^2(.375)^{2/3}\sqrt{.113}) = 38$ cfs

$V_{FULL} = Q_{FULL}/A = 21.7$ fps

check w/ HDS #3, BPK, HSDC

$Q_{Peak} = 8.63$ cfs

$V_{Peak} = 0.8\ V_{FULL} = 17.4$ fps ok (Note: 0.8 factor came from the attached Chart of Circular Channel Ratios) - PG 54D

≈ 17 fps

2) Flow from Area B: DI-1 to DI-2

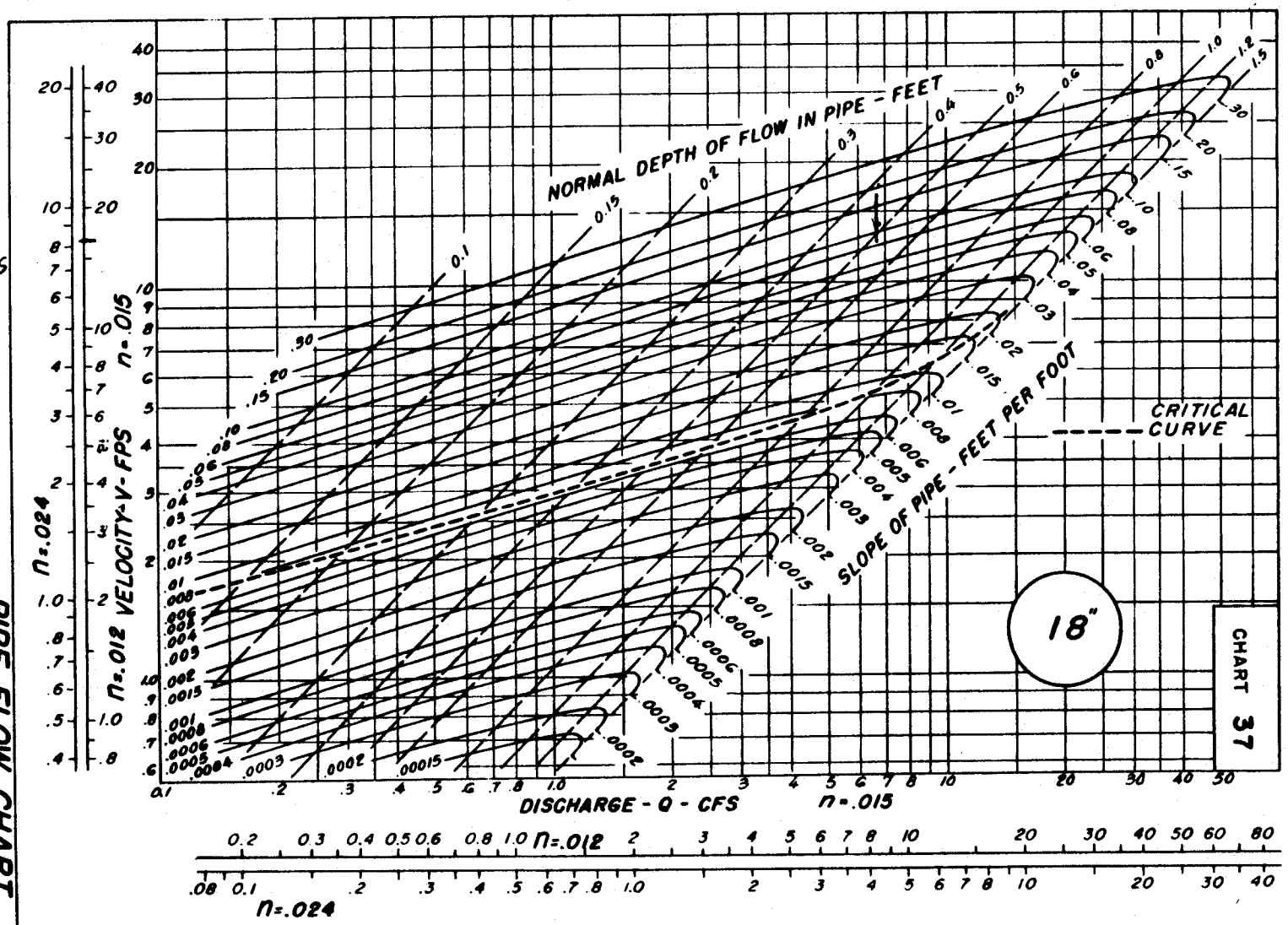
Given: - 18" ø Pipe @ 0.005 ft/ft slope
- Peak flow is 4.33 cfs

$Q_{FULL} = 8$ cfs (Manning Equation)

$V_{FULL} = 4.6$ fps

$Q_{Peak} = 4.33$ cfs $V_{Peak} = 1.05\ V_{FULL}$

$V_{Peak} = 4.8$ fps (Chart of Circular Channel Ratios)



V ≈ 17 fps

PIPE FLOW CHART
18-INCH DIAMETER

DI-6 to DI-2
Q = 8.63 cfs n = .012
s = 11.3%

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Weyerhaeuser	VCJ	12-11			467.39

3) Flow from Areas A, B, & H — DI-2 to DI-4

Given: - 18" ϕ Pipe @ 0.171 ft/ft slope
- Peak flow is 22.74 cfs from addition of hydrographs

Q_{FULL} = 47 cfs (Manning Equation) V_{FULL} = 26.7 fps

Q_{Peak} = 22.74 cfs V_{Peak} = 26.7 fps (Chart)
V_{Peak} = 1.0 V_{Full} ok
⇒ 27 fps

4) Flow from Area C — DI-3 to DI-4

Given: - 18" ϕ Pipe @ 0.005 ft/ft slope
- Peak flow is 5.12 cfs

Q_{FULL} = 8 cfs (Manning Equation) V_{FULL} = 4.6 fps
V_{Peak} = 1.07 V_{Full}

Q_{Peak} = 5.12 cfs V_{Peak} = 4.9 fps (Chart)

5) Flow from Areas A, B, C, H, & I — DI-4 to DI-5

Given: - 24" ϕ Pipe @ 0.076 ft/ft slope
- Peak flow is 32.69 cfs from addition of hydrographs

Q_{FULL} = 68 cfs (Manning Equation) V_{FULL} = 21.6
V_{Peak} = 1.0 V_{Full}

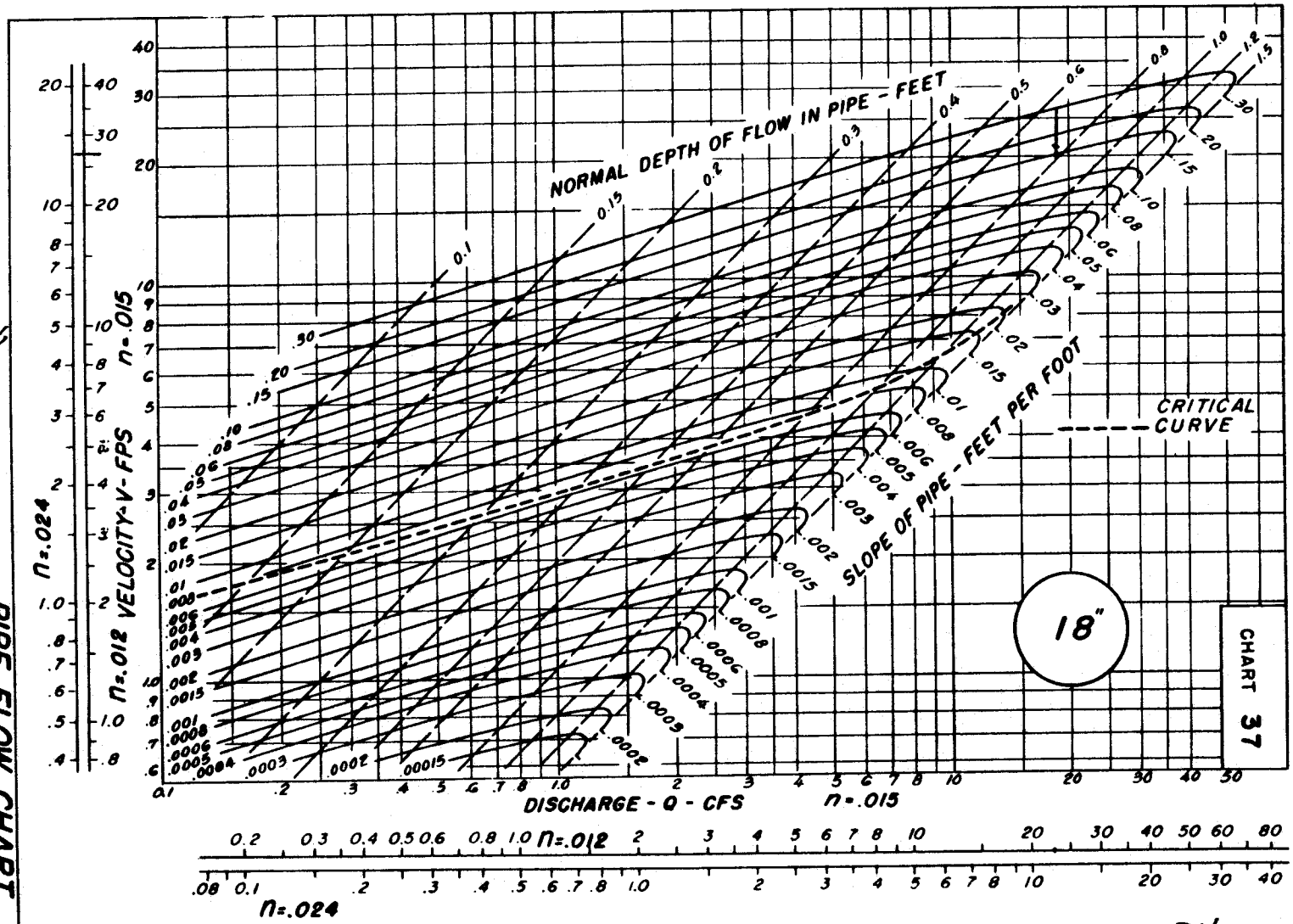
Q_{Peak} = 32.69 cfs V_{Peak} = 21.6 fps (Chart) ok → 21 fps

6) Flow from Area F — DI-7 to DI-8

Given: - 18" ϕ Pipe @ 0.257 ft/ft slope
- Peak flow is 4.44 cfs

Q_{FULL} = 58 cfs (Manning Equation) V_{FULL} = 32.7 fps
V_{PEAK} = 0.51 V_{FULL}

Q_{PEAK} = 4.44 cfs V_{PEAK} = 16.7 fps (Chart)

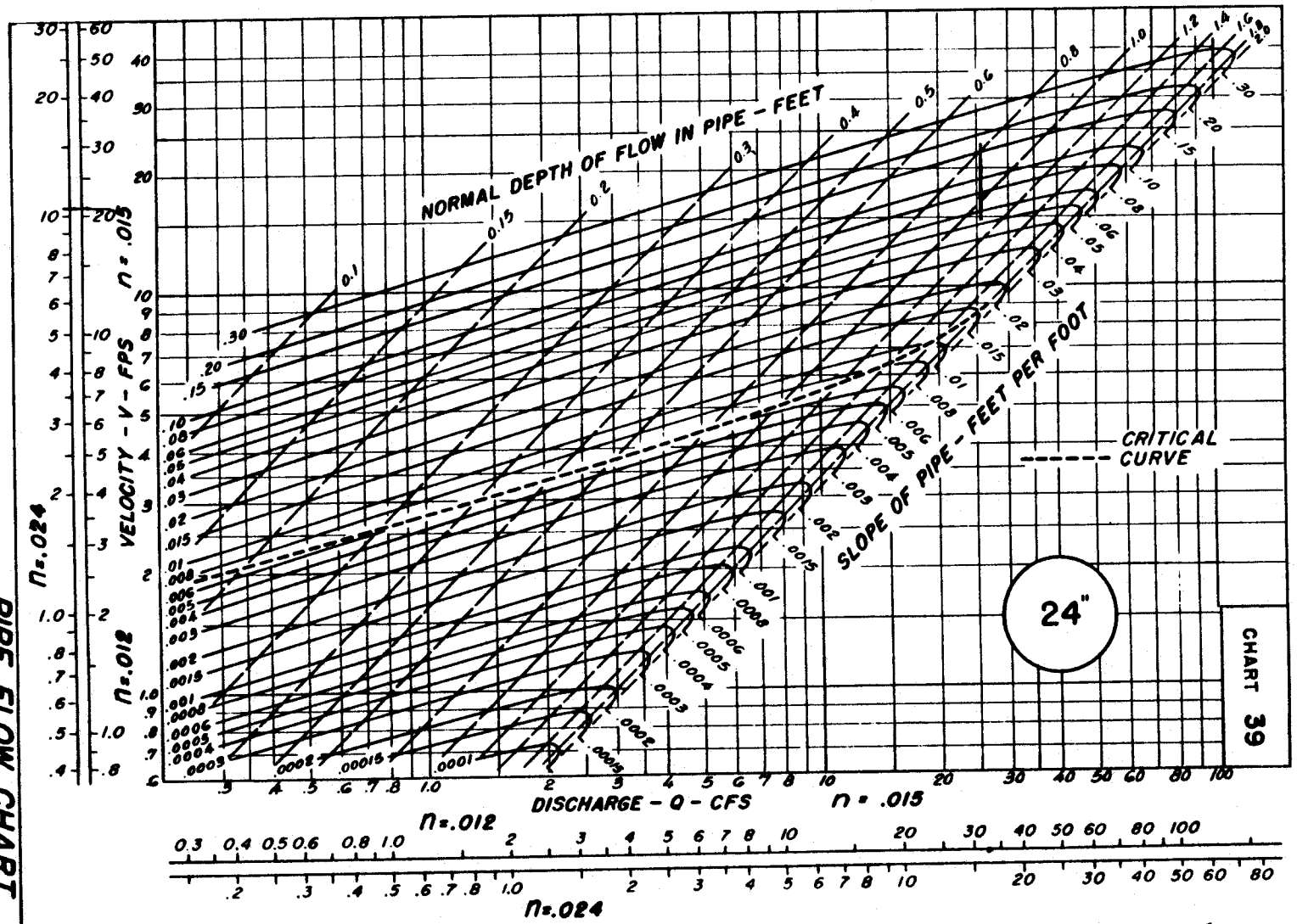


PIPE FLOW CHART
18-INCH DIAMETER

V ≈ 27fps

DI-2 to DI-4
Q = 22.74 cfs n = .012
S = 17.3%

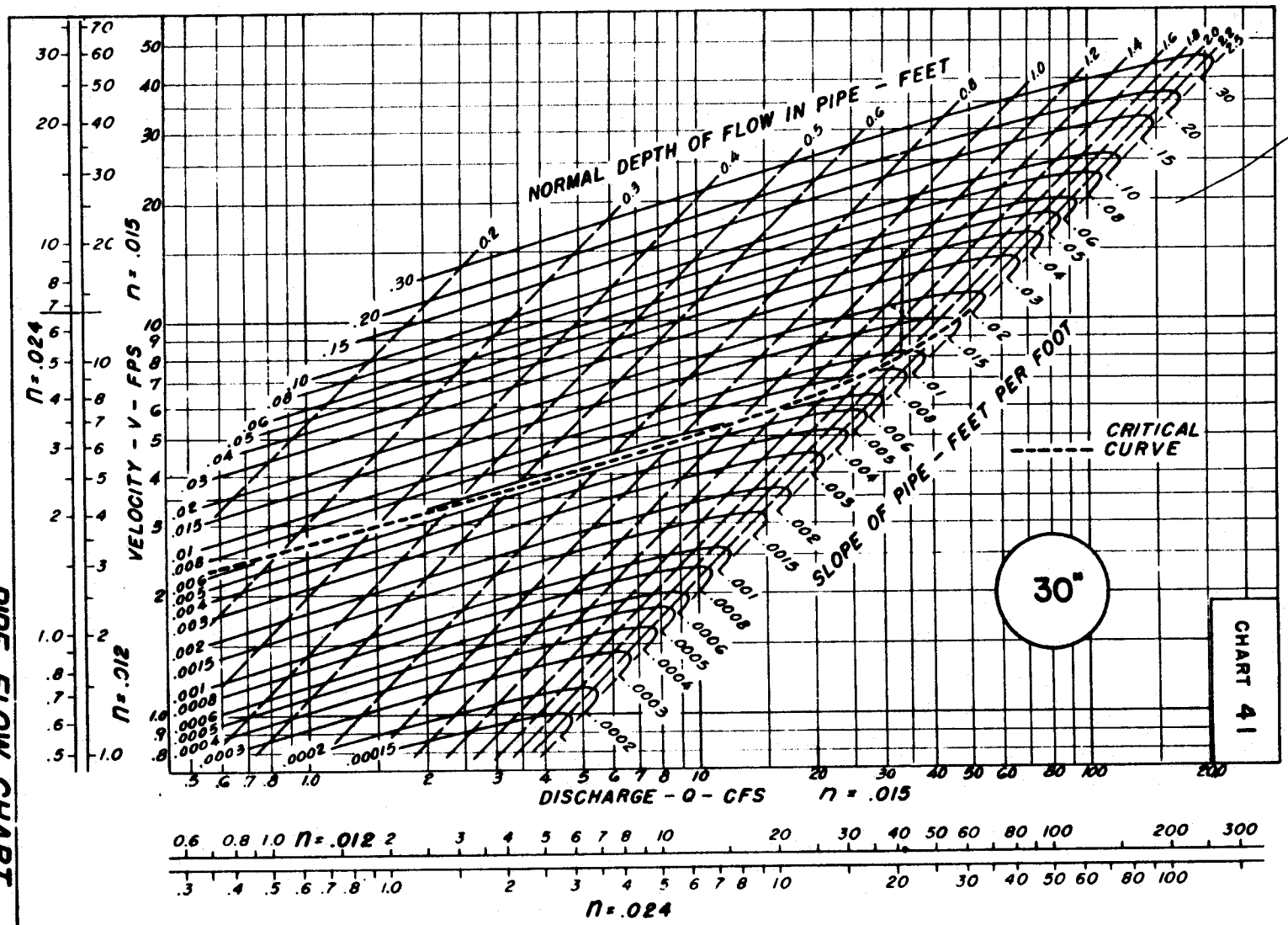
V≈21fps



PIPE FLOW CHART
24-INCH DIAMETER

DI-4 to DI-5
Q = 326 cfs n = .012
s = 7.64%

V = 13 fps



PIPE FLOW CHART
30-INCH DIAMETER

OT-5 to HW-1
Q = 41.45 cfs n = .012
s = 1.74%

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Weyerhaeuser	VCJ	11-12			467.39

7) Flow ~~from~~ Areas E&F OI-8 to HW-3

Given: - 18" ϕ Pipe @ 0.183 ft/ft slope
- Peak flow is 7.96 cfs ~~from~~ addition of hydrographs

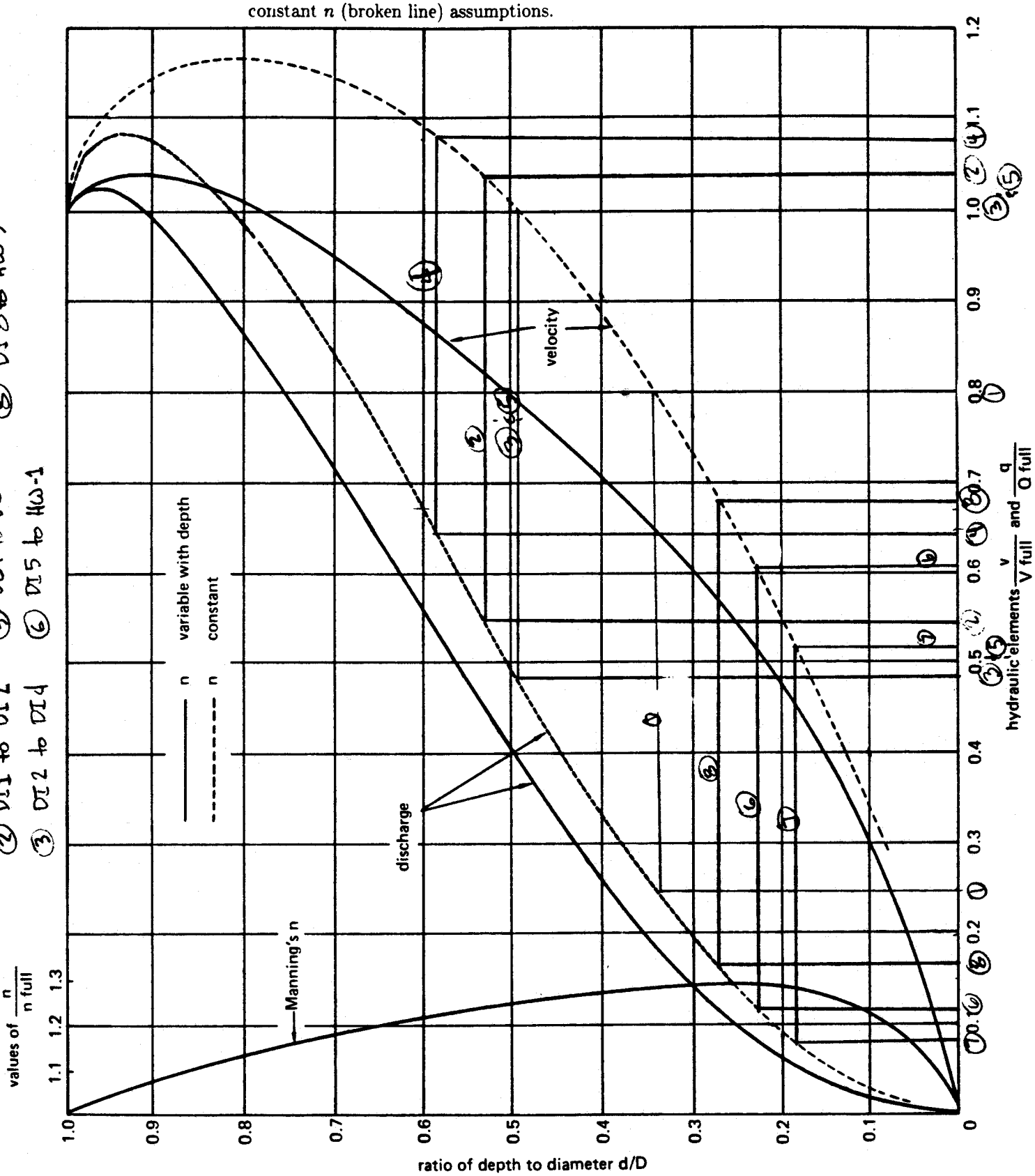
Q_{FULL} = 49 cfs (Manning Equation) V_{FULL} = 27.6 fps

$V_{PEAK} = 0.68\ V_{FULL}$

Q_{PEAK} = 7.96 cfs V_{PEAK} = 18.8 cfs (chart)

Appendix C: Circular Channel Ratios

Experiments have shown that n varies slightly with depth. This figure gives velocity and flow rate ratios for varying n (solid line) and constant n (broken line) assumptions.



① DI6 to DI2 ④ DI4 ⑦ DI7 to DI8
② DI1 to DI2 ⑤ DI4 to DI5 ⑧ DI8 to HW3
③ DI2 to DI4 ⑥ DI5 to HW-1

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PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser	KJ	11-30			467.39

STRUCTURE LOSSES

Structure DI-8:

Outlet Losses -

Flow from DI-7 to DI-8 @ 16.7 fps Loss = 0.43

Inlet Losses -

Flow from DI-8 to HW-3 @ 18.8 fps Loss = 1.37

Total Losses = 1.81

* Outlet losses are based on the outlet being well shaped similar to a bell-mouthed outlet.

** See PG 54a - 54d for velocity calculations.

*** Inlet losses are computed assuming the inlet will be slightly rounded.

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DESIGN SHEET

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser	VKJ	11-30			467.39

STRUCTURE LOSSES

Structure DI-2:

Outlet Losses - $.1\ V^2/2g$ *

Flow from DI-6 to DI-2 @ 17.4 fps** Loss = 0.47

Flow from DI-1 to DI-2 @ 4.8 fps Loss = 0.04

Inlet Losses - $.25\ V^2/2g$ ***

Flow from DI-2 to DI-4 @ 26.7 fps Loss = 2.77

Total Losses = 3.27

Structure DI-4:

Outlet Losses -

Flow from DI-2 to DI-4 @ 26.7 fps Loss = 1.11

Flow from DI-3 to DI-4 @ 4.9 fps Loss = 0.04

Inlet Losses -

Flow from DI-4 to DI-5 @ 21.6 fps Loss = 1.81

Total Losses = 2.96

Structure DI-5:

Outlet Losses -

Flow from DI-4 to DI-5 @ 21.6 fps Loss = 0.72

Inlet Losses -

Flow from DI-5 to HW-1 @ 11.3 fps Loss = 0.50

Total Losses = 1.22

HYDROGRAPH PEAK SUMMATIONS *

HYDROGRAPH ADDITIONS

Time	A	B	H	Σ_{ABH}
12.4	6.56	3.83	9.30	19.69
12.6	8.32	4.33	10.09	22.74
12.7	8.63	4.16	9.51	22.30
12.8	8.62	3.99	8.92	21.53

← FLOW FROM DI-2 TO DI-4 - SEE PG. 43

	C	I	Σ_{ABCHI}
12.4	4.48	5.27	29.44
12.6	5.12	4.83	32.69
12.9	4.95	4.21	31.46
12.8	4.78	3.58	29.89

← FLOW FROM DI-4 TO DI-5 - SEE PG. 43

	G	Σ_{ABCGHI}
12.4	8.19	37.63
12.6	8.76	41.45
12.7	8.20	39.66
12.8	7.64	37.53

← FLOW FROM DI-5 TO HW-1 SEE PG. 43

	E	F	Σ_{EF}
12.0	3.30	3.83	7.13
12.1	3.52	4.44	7.96
12.2	2.52	3.53	6.05
12.4	1.15	1.70	2.85

← FLOW FROM DI-8 TO HW-3 - SEE PG. 43

*These tables reflect the addition of combined hydrographs (see pg. 44a - 53c for hydrographs) to determine the actual time and size of the combined hydrograph peak. Flow time between inlets was less than 2 minutes and thus flow between inlets was assumed instantaneous.

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DESIGN SHEET

SHEET ____ OF ____

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Maple Plymouth	JTG	11/88			467.39/37

Rehoboth Storm Drainage Structure Schedule

#	N	E	Dev. North	Elev. South	East	West	T/Rim
1	769777.50	2657023.39	—	—	40.00	—	44.00
2	769837.39	2657233.92	38.80	39.0	—	38.92	44.50
3A	769933.33	2657300.94	—	—	21.00	—	25.00
4B	769830.08	2656933.73	—	19.56	19.00	19.11	25.00
3B	769721.10	2657094.97	—	—	59.00	—	63.60
4B	769915.97	2657445.15	—	—	8.10	8.20	11.20
HW-1	769855.6	2657552.3	—	—	6.00	—	—
HW-2	769714.8	2657792.5	—	—	4.30	—	—

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PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.

#	N	E	North	South	East	West	T/Grate
DI-7	767691.02	2657285.77	—	72.50	—	—	77.40
DI-8	767617.23	2657299.17	54.00	53.23	—	—	58.40
HW-3	767527.5	2657289.4	—	37.00	—	—	
HW-4	767990.6	2656595.1	—	—	—	11.35	—
HW-6	768241.7	2657652.9	—	36.75	—	—	—

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PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Wayco Plymouth Vert. Expansion	HCC	11/24			467.39/37

Revisions to Storm Drainage Design & Check

DI-1 to DI-2

checked

$L = 215.4'$ ✓ $n = .012$

18" $S = 0.5\%$ (Set) $Q_f = \frac{1.486 A R^{2/3} S^{1/2}}{n} = 8.05$ cfs

$A = 1.767$ ft² $R^{2/3} = .520$

Inv. DI-1 = 40.00 (Set) $V_f = 4.55$ fps

Δh = 1.08

Inv. DI-2 38.92 (West)

DI-6 to DI-2

$L = 177.0$ ft

Inv. DI-6 = 59.00 (Set)

Inv. DI-2 = 39.00 (Set) (South)

Δh = 20.00

$S = \frac{20.00}{177.0} = 11.3\%$ ⟹ $\Delta h = 20.00$ ok

$Q_f = 38.25$ cfs $V_f = 21.65$ fps $V^2/2g = 7.3'$

⟹ Inlet Control ∴ pipe will not flow full

Check for depth & actual velocity

Shape Inlet to reduce losses

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PROJECT/PROPOSAL NAME	PREPARED By	Date	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Wagco Plymouth Vent. Expansion	JTK	11/29			467.39/37

DI-2 to DI-4

Inv. DI-2 = 38.80 (Set) (North)
Inv. DI-4 = 19.6 Tentative
Δh 19.20

L = 112.5' s = 19.2 / 112.5 = 17.1% ⇒ Δh = 19.24

38.80
19.24
19.56 Inv. DI-4 (South)

DI-3 to DI-4

L = 377.9 18" s = 0.5% (Set)

Inv. DI-3 = 21.00 (Set) (East)
Δh = 1.84
Inv. DI-4 = 19.11 (West)

Q_f = 8.05 cfs v_f = 4.55 fps

DI-4 to DI-5

L = 141.4'
Inv. DI-4 = 19.00 (Set) (East)
Inv DI-5 = 8.20 Tentative (West)
Δh 10.80

s = 10.80 / 141.46 = 7.64%

⇒ Δh = 10.80 OK

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SHEET 3 OF

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PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Wayco Plymouth Yard Expansion	JTB	11/29			467.34/37

DI-4 to DI-5 24" S = 7.64%

A = 3.1416 $R^{2/3}$ = .630

Q_f = 67.74 cfs

V_f = 21.56 fps

DI-5 to HW-1

L = 120.8 Ft

Inv. DI-5 = 8.10 (Set) (East)
Inv HW-1 = 6.00 Set
Δh 2.10

$S = \frac{2.10}{120.8} = 1.74\%$ ⇒ Δh = 2.10' ok

30" n = .012 A = 4.909 $R^{2/3}$ = .731

Q_f = 58.62 cfs V_f = 11.94 fps

Outlet to HW-2

L = 70 S = 1.0%

Δh = .70 ft

Inv. Outlet = 5.00
Δh = 0.70
Inv. HW-2 4.30

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DESIGN SHEET

SHEET 1 OF

PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Wagco Plymouth Unit Expansion	HG	11/29			467.39/37

Storm Drainage Revised Layout

DI-7 to DI-8

L = 72.00' 18" n = .012

Inv. DI-7 = 72.5 (Set) (South)
Inv. DI-8 = 54.0 Tentative (North)
Δh = 18.5

$S = \frac{18.5}{72} = 25.7\%$ ⇒ Δh = 18.50' ok

DI-8 to HW-3

Carry slope thru inlet

L = 88.7'

54.00
.23
53.23

Inv. DI-8 = 53.20 (Set) (South)
Inv. @ HW-3 = 37.00 (Set)
16.2

$S = \frac{16.20}{88.7} = 18.3\%$ Δh = 16.23 ok

Inv. DI-8 = 53.23 (South)

Outlet Pd #2 to HW-4

L = 165' ±

S = 1.0% Δh = 1.65

Inv @ Outlet = 13.0
Δh = 1.65
Inv @ HW-4 = 11.35

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11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	3/21/89			46736

Inlet Capacity

Available Area − (less area of bars) = 4.5 ft²

H = 1 ft

Capacity = $0.98 \cdot 4.5 \cdot \sqrt{2gH}$

Capacity = 35.39 cfs

With 40% obstructed, Capacity = 21.23 cfs

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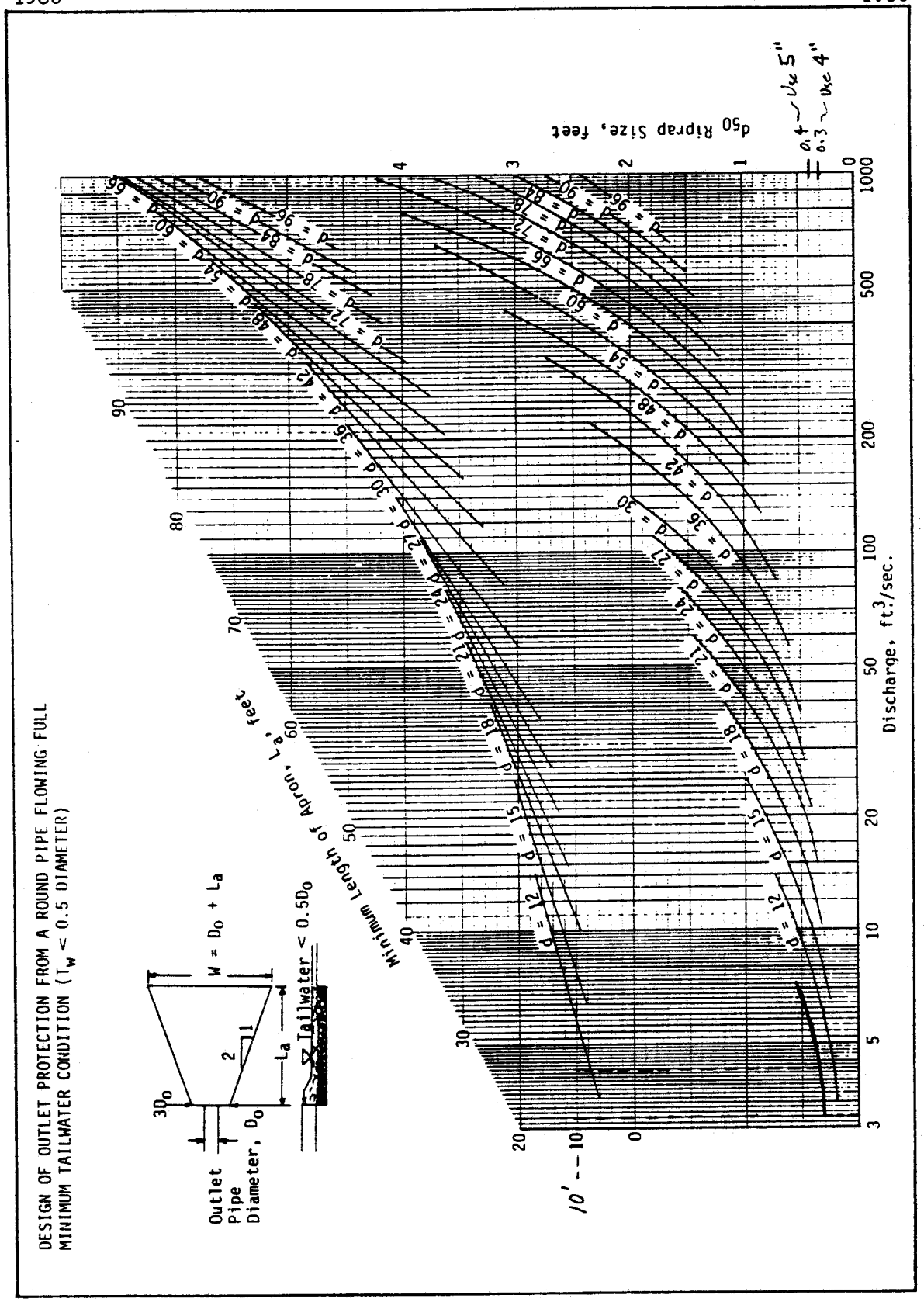
PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	12/11/89			467.36

Outlet Protection Summary

Outlet	Q_{10} (cfs)	V_{10} (fps)	D_o	D_x	D_y	D_{50}
HW-1	41.5	11.3	30"	19'	21'-6"	7"
HW-2	6.6	8.9	12"	10'	11'-0"	4"
HW-3	8.0	18.8	18"	[SEE	DETAIL]	Class 2 RIPRAP
HW-4	8.1	9.6	12"	12'	13'-0"	6'



Source: USDA-SCS

Plate 1.36c

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PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.

Access Road Culvert

Invert El. HW-5 - 36.25
Invert El. HW-6 - 36.75
Length of Culvert - 100 ft
Culvert Slope - 0.5%
Pipe Size - 18" ϕ
n = 0.012
Drainage Area - 1.7 ac (0.00265 mi²) Length of Flow Path - 850' Slope of Path - 0.0329 ft/ft
CN - 65
Rainfall - 6.3 in (10 yr event)

Q - Peak of 10 yr hydrograph (see computer output) = 4.29 cfs
Time of Peak - 12.1 hrs

$Q_{full} = \frac{0.0001}{0.012}(18)^{8/3}(.005)^{1/2}$ $\therefore Q_{full} = 8$ cfs

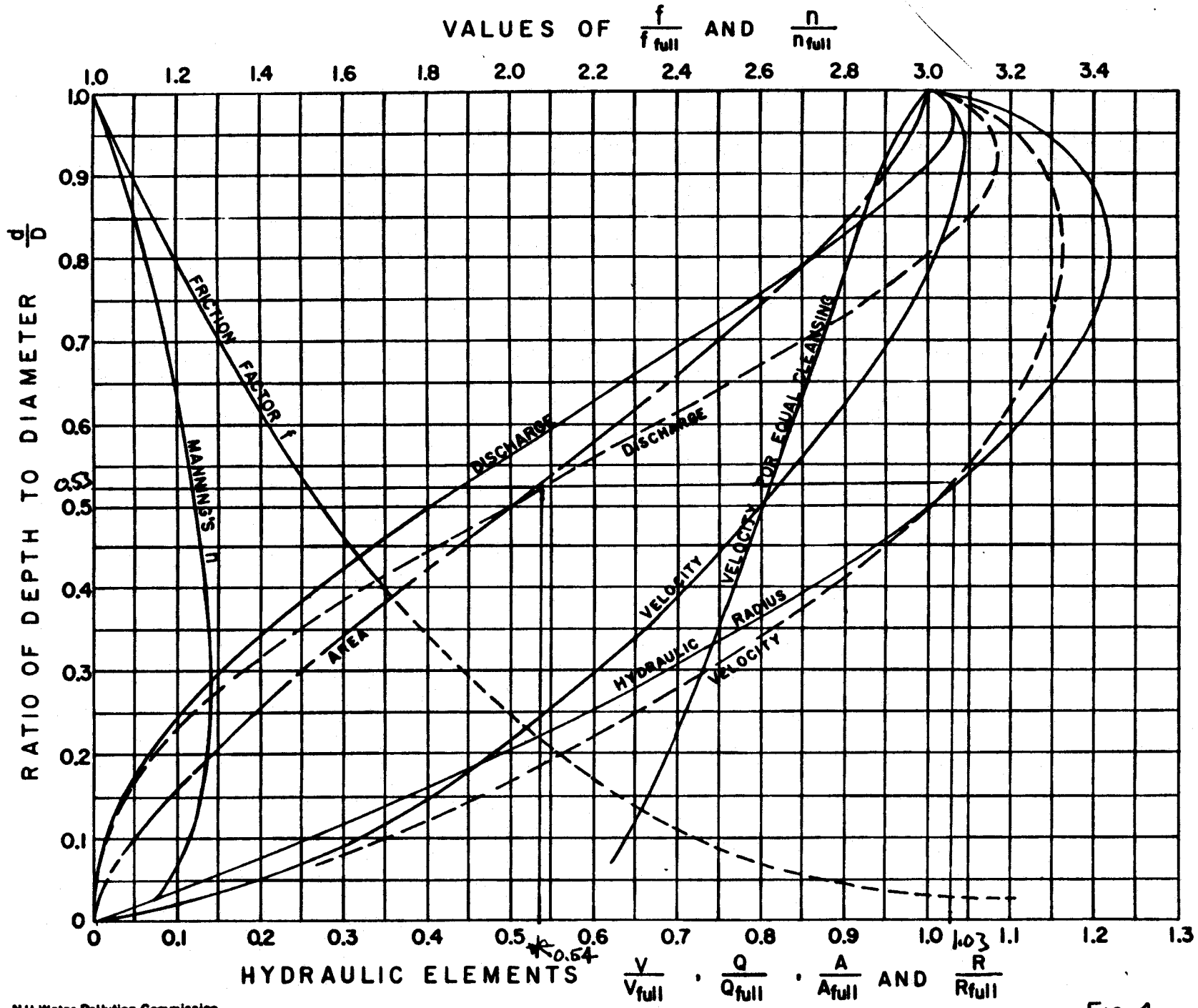
$V_{full} = \frac{1.49}{0.012}(0.375)^{2/3}(0.005)^{1/2}$ $\therefore V_{full} = 4.52$ fps

$Q/Q_{full} = 4.29/8 = 0.54$

From Fig. 4 - $V/V_{full} = 1.03$ $d/D = 0.53$

$V = V/V_{full} \times V_{full} = 1.03 \times 4.52$ $d = d/D \times D = 0.53 \times 18"$

$\therefore V = 4.66$ fps $\therefore d = 9.54"$



N.H. Water Pollution Commission
Concord N.H.
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FIG 4

Map No. 7

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PROJECT/PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Wayne Plymouth Park Expansion	JSK	11/21			467.39/37

Check

DI-5 to DI-2

18" Q = 16.4 cfs

n = .012

$S_{req'd} = Q^2 \left[\frac{n}{1.486 A R^{2/3}} \right]^2 \Rightarrow 2.1\%$

Not use 24"

Revise Layout

Redirect Flow from DI-3 & DI-4 ✓

∴ 18" OK for Q = 3.9 cfs

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SHEET 1 OF

PROJECT/PROPOSAL NAME	PREPARED By: JMH Date: 11/21	CHECKED By: Date:	PROJECT/PROPOSAL NO.
Wayne Plymouth Vertical Expansion			467.39/37

Check of Storm Drainage

*Need to verify/check Flow Quantities @ DI's.

DI-3 to DI-4

$n = .012$

$Q = 8.2$ cfs

$s = 20.7\%$

DI-3

$Q = 8.2$ cfs *

11/22/89

Permit to DI-I

From Chart #37 p. 50

$d_n = 0.4'$

$V_n \approx 22$ fps

Entrance losses

velocity loss $= .5 \frac{v^2}{2g} = 3.8'$

Shape to direct flow to outlet

Set Inv. @ $3.8 + .75 = 4.5$ ft below grate

DI-4 to DI-5

$Q = 12.5$ cfs

DI-4

$Q = 4.3$ cfs *

$s = 20.1\%$

From Chart #37 p. 50

$d_n = .48$

$V_n \approx 24$ fps

Shape Inv. to half depth of pipe

Permit to DI-1 11/22/89

DI-5 to DI-2

$Q = 16.4$ cfs

DI-5

$Q = 3.9$ cfs *

if $s = 0.5\%$

$\Rightarrow$ use 24"

$n = .012$

$Q_f = 17.3$ cfs

$V \approx 6$ fps

S

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DESIGN SHEET

SHEET 2 OF

PROJECT/PROPOSAL NAME	PREPARED By: JSA	Date: 11/21	CHECKED By:	Date:	PROJECT/PROPOSAL NO. 467.39/37

DI-1 to DI-2

$Q = 93$ cfs

$S = 17.3\%$ 18.2%

From Chart #37, pg. 50

$d_n = .45'$

$V_n = 20$ fps 21 fps

$.5\left(\frac{V^2}{2g}\right) = 3.1$ ft

DI-2 to HW-1

$Q = 31.1$ cfs

Try 24" $V_f = 9.9$ cfs

$S_{req'd} = \left[\frac{1}{(1.486)(R^{2/3})(A)}\right]^2 Q^2 = 1.6\%$

$S_{available} \Rightarrow 5.5\%$ 7.6%

From Chart #39, p 52

$d_n \approx 1.5'$ $1.5\frac{V^2}{2g} = 6.7'$ Potential Ent. & Exit Losses

$V_n \approx 17$ fps 20 fps ∴ Replace HW-1 & HW-2 with DI Shape to full depth of pipe

S

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DESIGN SHEET

SHEET 3 OF

PROJECT/PROPOSAL NAME	PREPARED By: JRG	Date: 11/21	CHECKED By:	Date:	PROJECT/PROPOSAL NO. 467.39/37

HW-2 to HW-3

$Q = 39.9$ cfs

$s = 4.3\%$

From Chart #34, p 52

$d_n \approx 1.2'$

$v_n \approx 18$ fps

Potential Entrance & Exit Losses $\Rightarrow 6.7'$

∴ Replace HW-1 & HW-2 with DI

∴ Slope to full depth of pipe

T/Grate — 11.2
− 3.0
8.2 Inv. In.
.1
8.1 Inv. Out
6.
2.1 Available Drop

length = 117.8 ft

$s = 1.8\%$

$Q_f = 32.9$ cfs

$S_{req'd} = \left[\frac{n}{1.486 A R^{2/3}}\right]^2 Q^2 = 2.65\%$

$v_f = 12.7$ fps

S

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PROJECT/PROPOSAL NAME	PREPARED By: JGA	Date: 11/21	CHECKED By:	Date:	PROJECT/PROPOSAL NO. 767.39/37

Try 27"

$Q_D = 39.9$ $n = .012$ $A =$

Energy d =

Try 30" $n = .012$ $A = 4.909$

Energy d = 1.87

$V_f = 8.1$ fps.

From chart #41, p. 54 check for type of flow

$d_n = 1.5$

$V_n \approx 13$ fps

Worst Case - Design outlet protection for 13 fps

$L_a = 18$ ft

$W = 2.5 + 18 = 20.5$ ft

$d_{50} = .55$ ft $\Rightarrow 7''$

5

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11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	2/23/89			467.36

VOLUME CALCULATIONS

SUMMARY:

TOTAL LANDFILL VOLUME (compacted)	1,397,916 yd^3
TOTAL CAP VOLUME (compacted)	90,751 yd^3
TOTAL TOPSOIL VOLUME (compacted)	30,251 yd^3
TOTAL VOLUME FROM BORROW AREA (bank)	102,362 yd^3
* TOTAL WASTE VOLUME FOR BERM CONSTRUCTION (COMPACTED)	414,933 yd^3
ACTUAL VOLUME OF WASTE (UNCOMPACTED)	1,164,944 yd^3

* Given current annual volumes, it is estimated that approximately 300,000 yd^3 of waste has been placed in the landfill since 1987, the date of the most recent mapping. This volume was deducted from the BERM CONSTRUCTION volume since this material is already in place.

MATERIAL BALANCE CALCULATIONS
WEYERHAEUSER LANDFILL

Elevation	Area	Ave. Area	Depth	Volume	Acc. Volume
8	5184				0
		7920	2	587	
10	10656				587
		13500	2	1000	
12	16344				1587
		17934	2	1328	
14	19524				2915
		19308	2	1430	
16	19092				4345
		19344	2	1433	
18	19596				5778
		19032	2	1410	
20	18468				7188
		10062	2	745	
22	1656				7933
		25722	2	1905	
24	49788				9839
		67648.5	2	5011	
26	85509				14850
		97729.5	2	7239	
28	109950				22089
		130237.5	2	9647	
30	150525				31736
		200437.5	8	59389	
35	250350				91125
		378712.5	2	28053	
40	507075				119178
		641850	10	237722	
50	776625				356900
		891787.5	10	330292	
60	1006950				687192
		915712.5	10	339153	
70	824475				1026344
		722912.5	10	267745	
80	621350				1294090
		571337.5	1	21161	
81	521325				1315250
		482850	1	17883	
82	444375				1333134
		408637.5	1	15135	
83	372900				1348269
		340050	1	12594	
84	307200				1360863
		280162.5	1	10376	
85	253125				1371239
		227512.5	1	8426	
86	201900				1379666
		178837.5	1	6624	
87	155775				1386289
		135450	1	5017	

88	115185				1391306
		94387.5	1	3496	
89	73550				1394802
		56325	1	2086	
90	39000				1396888
		23400	1	867	
91	7800				1397755
		4350	1	161	
92	900				1397916

TOTAL LANDFILL VOLUME 1,397,916 yd³

*TOTAL CAP VOLUME 121,002 yd³

WASTE CAPACITY OF EXPANSION (COMPACTED) 1,276,914 yd³

* SEE FOLLOWING PAGES

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SHEET ____ OF ____

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM				467.36

Topsoil and Cap Volume

Stage I - Rough Grading
Area = 11.30 acres (492,156 ft²)

6" Topsoil - 0.5' × (492,156 ft²)/27 = 9,114 yd³
18" Cap - 1.5' × (492,156 ft²)/27 = 27,342 yd³

Stage II - Berm Construction
Additional Area = 23.20 acres - 11.30 acres = 11.9 acres (518,544 ft²)

6" Topsoil - 0.5' × (518,544 ft²)/27 = 9,603 yd³
18" Cap - 1.5' × (518,544 ft²)/27 = 28,808 yd³

Stage III Final Grading
Additional Area 14.35 acres (622,820 ft²)

6" Topsoil - 0.5' × (622,820 ft²)/27 = 11,534 yd³
18" Cap - 1.5' × (622,820 ft²)/27 = 34,601 yd³

Totals:

Topsoil = 9,114 + 9,603 + 11,534 = 30,251 yd³
Cap = 27,342 + 28,808 + 34,601 = 90,751 yd³

Total = 121,002 yd³

Terrace Volumes - (Included in above calculations)
6" Topsoil - 0.5' × (9540 L.F × 15' WIDE + 1130 L.F. × 20' WIDE)/27 = 3,780 yd³
18" Cap - 1.5' × (9540 L.F. × 15' WIDE + 1130 L.F. × 20' WIDE)/27 = 11,340 yd³

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11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	7/23/89			46736

BORROW AREA SUMMARY

BORROW MATERIALS

Material for Cap on Landfill Terraces	11,340 yd^3
Material for Cap on Perimeter of Landfill (Slopes)	44,810 yd^3
Material for Cap on Top of Landfill	34,601 yd^3
Topsoil Volume on Landfill Terraces	3,780 yd^3
Topsoil Volume on Perimeter of Landfill (Slopes)	14,937 yd^3
Topsoil Volume on Top of Landfill	11,534 yd^3
Total Volume of Cap Material	90,751 yd^3
Total Volume of Topsoil	30,251 yd^3
Total Volume of Material	121,002 yd^3

Topsoil from Borrow Area	16,500 yd^3
	85,862 yd^3
Topsoil from New Landfill Area	13,751 yd^3

BORROW AREA SILT TRAPS

AREA	ACREAGE	CREST EL. (MSL)	TOP EL. (MSL)
A	7.7 ac.	10.0	11.0
B	3.4 ac.	11.0	12.0
C	3.8 ac.	16.0	17.0
D	2.1 ac.	20.0	21.0
E	2.9 ac.	18.0	19.0
F	0.8 ac.	20.0	21.0
	20.7 ac.		

TOPSOIL – Total topsoil depth on Borrow Area is 1 ft., 6 in will remain on site and 6" will be used at the landfill.
Total Topsoil = 20.7 ac × 43560 × 1/27 = 33,396 yd^3 ~ use 33,000 yd^3
To be used at Landfill – 16,500 yd^3 *

*This volume is included in the total 102,362 yd^3 of borrow available from this site.

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SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
WEYERHAUSER LANDFILL	KB	1-18-89			467.36

FINAL VOLUME OF MATERIAL ABOVE ELEVATION 14 FT. AND WITHIN BOUNDARY OF BORROW AREA.

CONTOUR	PLANIMETER READING.	CONVERSION FACTOR.	AREA (SQ. FT.)	AVE. AREA (SQ. FT.)	CONTOUR DIFF.	VOL. YD³.
34	308	x(100)²(0.015)	46200			
				66600	2	4933
32	580	"	87000			
32	692	"	103800			
				122025	2	9039
30	935	"	140250			
				214125	2	15861
28	1920	"	288000			
				363750	2	26944
26	2930	"	439500			
				526050	4	77933
22	4084	"	612600			
				661350	2	48989
20	4734	"	710100			
				765975	4	113478
16	5479	"	821850			
				856725	2	63461
14	5944	"	891600			
				TOTAL		360638

RMT INC.
11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

DESIGN SHEET

(79)

SHEET ____ OF ____

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
WEYERHAUSER LANDFILL	KB	1-18-89			467.36

EXISTING VOLUME OF MATERIAL ABOVE ELEVATION 14 FT. AND WITHIN BOUNDARY OF BORROW AREA.

CONTOUR	PLANIMETER READING	CONVERSION FACTOR	AREA (SQ.FT.)	AVE. AREA (SQ.FT.)	CONTOUR DIFF.	VOL. YD³.
34	635	X(100)²(0.015)	95250			
				156900	2	11622
32	1457	"	218550			
32	1792	"	268800			
				345375	2	25583
30	2813	"	421950			
				515475	4	76367
26	4060	"	609000			
				653775	2	48428
24	4657	"	698550			
				755100	4	111867
20	5411	"	811650			
				852450	6	189433
14	5955	"	893250			

TOTAL 463000

FINAL VOLUME 360638

AVAILABLE BORROW (BLNK) 102362

RMT INC.
11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

DESIGN SHEET

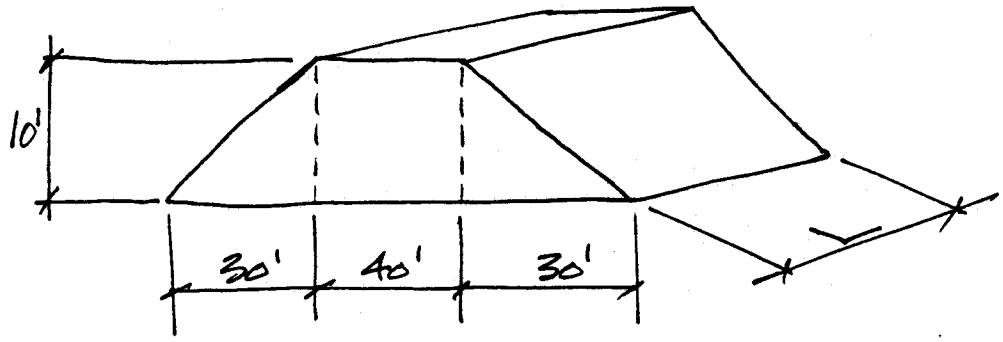
PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
WEYERHAUSER LANDFILL.	KB.	1.17.89			467.36

BORROW AREA.

TOPSOIL STOCKPILE.

AREA/BORROW = 893,250 SQ. FT.

VOL./TOPSOIL @ 6" THICK = (893,250)(0.5)/27 = 16,542 YD^3



CROSS-SECTION.

AREA = (2)(15)(10) + (40)(10) = 700 SQ. FT.

APPROX. LENGTH = (16542)(27)/700 = 638 FT.

RMT INC.

DESIGN SHEET

(81)

SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By:	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill	JLM	2/14/09			467.36

INTERIOR OF BERM

ELEV	AREA	Ave Area	Depth	Vol (yd³)	Acc Vol (yd³)
52	159,750				0
	394,050	276,900	2	20,511	
54	289,150 + 105,000				20,511
	427,950	411,000	2	30,445	
56	[illegible] + 132,450				50,956
	465,300	446,625	4	66,167	
60	312,300 + 153,000				117,123
	545,550	505,425	10	187,195	
70	356,250 + 189,300				304,318
	534,300	539,925	10	199,972	
80	422,[illegible] + 111,300				504,290

BERM VOLUME

*VOLUME AT TOP OF BERM (APPROX. EL. 80)	1,294,090 yd³
INTERIOR OF BERM (OPEN SPACE)	504,290 yd³
BERM VOLUME	789,800 yd³

*From page 54 - @ El. 80

RMT INC.

DESIGN SHEET

SHEET ____ OF ____

11 Regency Hills Drive, P.O. Box 16778 Greenville, S.C. 29606 (803) 292-1921

PROJECT / PROPOSAL NAME	PREPARED By: JLM	Date:	CHECKED By:	Date:	PROJECT/PROPOSAL NO.
Weyerhaeuser Landfill					467.36

Actual Waste Volumes

Volume reductions due to compaction: Berm Wastes - 25% Reduction
Interior Wastes - 15% Reduction
(Anticipated Reductions)

Total Landfill Volume (Compacted)	-	1,397,916 yd^3
Total Cap Volume (Compacted)	-	90,751 yd^3
		1,307,165 yd^3
Total Topsoil Volume (Compacted)		30,251 yd^3
Total Waste Volume (compacted)		1,276,914 yd^3
* Total Berm Volume (compacted) (from pg 61)		789,800 yd^3
Cap & Topsoil for outside of Berm (compacted) (Combination of Stage I & II on pg 52a)		74,867 yd^3
Total Waste Volume in Berm (compacted)		714,933 yd^3
Allowance for Material Placement since 1987		300,000 yd^3

Total Waste Volume for Berm Construction (compacted) 414,933 yd^3

Interior Waste Volume (compacted) = Total Waste Volume (compacted) - Total Waste Volume in Berm (compacted)

Interior Waste Volume (compacted) = 1,276,914 yd^3 - 714,933 yd^3 = 561,981 yd^3

Actual Volume of Waste = 1.25 × 414,933 yd^3 + 1.15 × 561,981 yd^3

Actual Volume of Waste = 1,164,944 yd^3

* TOTAL FOR STAGE I AND STAGE II CONSTRUCTION

PERIMETER DITCH "A"

Client: WEYERHAEUSER - PLYMOUTH
Subject: LANDFILL - VERTICAL EXPANSION
HORIZONTAL CONTROL DATA

Job No. 467.39 Sheet 01/02
Date 11-22-89 Rev.
By PBS Ckd.

POINT	DISTANCE	BEARING	COSINE	SINE	N(+)	S(-)	E(+)	W(-)	N-COORD	E-COORD	POINT
STA 0+52.23									767522.92	2657283.60	0+52.23
PCA1	73.86'	N72°26'20"W	0.301722853	0.953395678	22.285	—	—	70.418	767545.205	2657213.182	PCA1
PIA1	47.90'	N72°26'20"W			14.453	—	—	45.668	767559.658	2657167.514	PIA1
PTA1	47.90'	N34°9'29"W	0.827491836	0.561477747	39.637	—	—	26.895	767599.295	2657140.619	PTA1
PCA2	248.03'	N34°9'29"W			205.243	—	—	139.263	767804.538	2657001.356	PCA2
PIA2	85.13'	N34°9'29"W			70.444	—	—	47.799	767874.982	2656953.557	PIA2
PTA2	85.13'	N19°59'22"W	0.939755615	0.341847018	80.001	—	—	29.101	767954.983	2656924.456	PTA2
PCA3	352.54'	N19°59'22"W			331.301	—	—	120.515	768286.284	2656803.941	PCA3
PIA3	56.45'	N19°59'22"W			53.049	—	—	19.297	768339.333	2656784.644	PIA3
PTA3	56.45'	N41°18'14"W	0.751219335	0.660052657	42.406	—	—	37.260	768381.739	2656747.384	PTA3
PCA4	217.76'	N41°18'14"W			163.586	—	—	143.733	768545.325	2656603.651	PCA4
PIA4	104.60'	N41°18'14"W			78.578	—	—	69.042	768623.903	2656534.609	PIA4
PTA4	104.60'	N45°48'48"E	0.696998251	0.717072825	72.906	—	75.006	—	768696.809	2656609.615	PTA4
PCA5	88.11'	N45°48'48"E			61.413	—	63.181	—	768758.222	2656672.796	PCA5
PIA5	180.58'	N45°48'48"E			125.864	—	129.489	—	768884.086	2656802.285	PIA5
PTA5	180.58'	N0°43'2"W	0.999921652	0.012517562	180.566	—	—	2.260	769064.652	2656800.025	PTA5
PCA6	193.87'	N0°43'2"W			193.855	—	—	2.427	769258.507	2656797.598	PCA6
PIA6	68.44'	N0°43'2"W			68.435	—	—	0.857	769326.942	2656796.741	PIA6
PTA6	68.44'	N22°42'57"E	0.922431411	0.386160765	63.131	—	26.429	—	769390.073	2656823.170	PTA6
PCA7	160.27'	N22°42'57"E			147.838	—	61.890	—	769537.911	2656885.060	PCA7
PIA7	102.27'	N22°42'57"E			94.337	—	39.493	—	769632.248	2656924.553	PIA7
PTA7	102.27'	N1°50'8"W	0.999486875	0.032031008	102.218	—	—	3.276	769734.466	2656921.277	PTA7
PCA8	66.38'	N1°50'8"W			66.346	—	—	2.126	769800.812	2656919.151	PCA8
PIA8	23.48	N1°50'8"W			23.468	—	—	0.752	769824.280	2656918.399	PIA8
PTA8	23.48	N74°15'56"E	0.271179137	0.962528895	6.367	—	22.600	—	769830.647	2656940.999	PTA8

PERIMETER DITCH "A"

Client: WEYERHAEUSER - PLYMOUTH
Subject: LANDFILL VERTICAL EXPANSION
HORIZONTAL CONTROL DATA

Job No. 467.39 Sheet 02/02
Date 11-22-89 Rev.
By PBS Ckd.

POINT	DISTANCE	BEARING	COSINE	SINE	N(+)	S(-)	E(+)	W(-)	N-COORD	E-COORD	POINT
PTA8									769830.647	2656940.999	PTA8
	374.31'	N 74°15'56" E	0.271179137	0.962528895	101.505	—	360.284	—			
PCA9									769932.152	2657301.283	PCA9
	38.64'	N 74°15'56" E			10.478	—	37.192	—			
PIA9									769942.630	2657338.475	PIA9
	38.64'	S 10°4'27" E	0.984582148	0.174922818	—	38.044	6.759	—			
PTA9									769904.586	2657345.234	PTA9
	76.13'	S 10°4'27" E			—	74.956	13.317	—			
PCA10									769829.630	2657358.551	PCA10
	5.88'	S 10°4'27" E			—	5.789	1.029	—			
PIA10									769823.841	2657359.580	PIA10
	5.88'	S 8°59'26" W	0.987714113	0.156271655	—	5.808	—	0.919			
PTA10									769818.033	2657358.661	PTA10
	199.46'	S 8°59'26" W			—	197.009	—	31.170			
PCA11									769621.024	2657327.491	PCA11
	9.48'	S 8°59'26" W			—	9.364	—	1.481			
PIA11									769611.660	2657326.010	PIA11
	9.48'	S 19°49'28" W	0.940736165	0.339139303	—	8.918	—	3.215			
PTA11									769602.742	2657322.795	PTA11
	152.12'	S 19°49'28" W			—	143.105	—	51.590			
PCA12									769459.637	2657271.205	PCA12
	67.62'	S 19°49'28" W			—	63.613	—	22.933			
PIA12									769396.024	2657248.272	PIA12
	67.62'	S 0°51'59" W	0.999885674	0.015120762	—	67.612	—	1.022			
PTA12									769328.412	2657247.250	PTA12
	134.16'	S 0°51'59" W			—	134.145	—	2.029			
PCA13									769194.267	2657245.221	PCA13
	115.59'	S 0°51'59" W			—	115.577	—	1.748			
PIA13									769078.690	2657243.473	PIA13
	115.59'	S 30°59'29" E	0.857244697	0.514909243	—	99.089	59.518	—			
PTA13									768979.601	2657302.991	PTA13
	94.90'	S 30°59'29" E			—	81.353	48.865	—			
PCA14									768898.248	2657351.856	PCA14
	97.19'	S 30°59'29" E			—	83.316	50.044	—			
PIA14									768814.932	2657401.900	PIA14
	97.19'	S 11°38'17" E	0.979441478	0.201728505	—	95.192	19.606	—			
PTA14									768719.740	2657421.506	PTA14
	225.32'	S 11°38'17" E			—	220.688	45.453	—			
									768499.052	2657466.959	
	428.14'	S 13°21'24" E	0.972950873	0.231013117	—	416.559	98.906	—			
									768082.493	2657565.865	
	626.72	S 26°46'8" W	0.892830509	0.450392807	—	559.547	—	282.270			
									767522.938	2657283.595	

PERIMETER DITCH "D"

Client WEYERHAEUSER - PLYMOUTH Job No. 467.39 Sheet 01/01

Subject LANDFILL - VERTICAL EXPANSION Date 11-27-89 Rev.

HORIZONTAL CONTROL DATA By PBS Ckd.

POINT	DISTANCE	BEARING	COSINE	SINE	N(+)	S(-)	E(+)	W(-)	N-COORD	E-COORD	POINT
STA 0+00									767809.84	2656814.60	
PCD1	41.53'	S63° 1' 45" E	0.453536871	0.891237514	—	18.835	37.013	—	767791.01	2656851.61	PCD1
PID1	12.87'	S63° 1' 45" E			—	5.837	11.470	—	767785.17	2656863.08	PID1
PTD1	12.87'	S34° 9' 29" E	0.827491836	0.561477747	—	10.650	7.226	—	767774.52	2656870.31	PTD1
PCD2	322.39'	S 34° 9' 29" E			—	266.775	181.015	—	767507.74	2657051.32	PCD2
PID2	162.71'	S 34° 9' 29" E			—	134.641	91.358	—	767373.10	2657142.68	PID2
PTD2	162.71'	N51° 11' 17" E	0.626766266	0.779207319	101.981	—	126.785	—	767475.07	2657269.46	PTD2
PCD3	58.53'	N 51° 11' 17" E			36.685	—	45.607	—	767511.76	2657315.07	PCD3
PID3	49.50'	N 51° 11' 17" E			31.025	—	38.571	—	767542.79	2657353.64	PID3
PTD3	49.50'	N80° 23' 38" E	0.166873911	0.985978244	8.260	—	48.806	—	767551.05	2657402.45	PTD3
PCD4	34.78'	N 80° 23' 38" E			5.804	—	34.292	—	767556.85	2657436.74	PCD4
PID4	17.14'	N 80° 23' 38" E			2.860	—	16.900	—	767559.71	2657453.64	PID4
PTD4	17.14'	S89° 17' 43" E	0.012299413	0.999924359	—	0.211	17.129	—	767559.50	2657470.77	PTD4
	82.36'	S 89° 17' 43" E			—	1.013	82.354	—	767558.49	2657553.12	

PERIMETER SECTION "B"

Client WEYERHAEUSER - PLYMOUTH

Subject LANDFILL - VERTICAL EXPANSION

HORIZONTAL CONTROL DATA

Job No. 467.39 Sheet 01/01

Date 11-27-89 Rev.

By PBS Ckd.

POINT	DISTANCE	BEARING	COSINE	SINE	N(+)	S(-)	E(+)	W(-)	N-COORD	E-COORD	POINT
STA 0+00									768317.63	2657588.15	
	203.35'	N13° 21' 24" W	0.972950873	0.231012117	197.850	—	—	46.976	768515.48	2657541.17	
	224.18'	N11° 38' 17" W	0.979441478	0.201728505	219.571	—	—	45.223	768735.05	2657495.95	PCB1
PCB1	110.15'	N11° 38' 17" W			107.885	—	—	22.220	768842.94	2657473.73	PIB1
PIB1	110.15'	N 30° 59' 29" W	0.857244697	0.514909243	94.426	—	—	56.717	768937.37	2657417.01	PTB1
PTB1	94.90'	N 30° 59' 29" W			81.352	—	—	48.865	769018.72	2657368.14	PCB2
PCB2	93.90'	N 30° 59' 29" W			80.495	—	—	48.350	769099.22	2657319.79	PIB2
PIB2	93.90'	N0° 51' 59" E	0.999885674	0.015120762	93.889	—	1.420	—	769193.11	2657321.21	PTB2
PTB2	134.16'	N 0° 51' 59" E			134.145	—	2.029	—	769327.25	2657323.24	PCB3
PCB3	54.93'	N 0° 51' 59" E			54.924	—	0.831	—	769382.17	2657324.07	PIB3
PIB3	54.93'	N 19° 49' 28" E	0.940736165	0.339139303	51.675	—	18.629	—	769433.84	2657342.70	PTB3
PTB3	116.75'	N 19° 49' 28" E			109.931	—	39.595	—	769543.67	2657382.29	PCB4
PCB4	52.05'	N 19° 49' 28" E			48.965	—	17.652	—	769592.64	2657399.94	PIB4
PIB4	52.05'	N 8° 59' 26" E	0.987714113	0.156271655	51.411	—	8.134	—	769644.05	2657408.07	PTB4
PTB4	198.34'	N 8° 59' 26" E			195.903	—	30.995	—	769839.95	2657439.07	PCB5
PCB5	21.52'	N 8° 59' 26" E			21.256	—	3.363	—	769861.21	2657442.43	PIB5
PIB5	21.52'	N 2° 49' 54" E	0.998778986	0.04940179	21.494	—	1.063	—	769882.70	2657443.49	PTB5
PTB5	32.84'	N 2° 49' 54" E			32.800		1.622		769915.50	2657445.11	

PERIMETER DITCH "C"

Client: WEYERHAEUSER - PLYMOUTH
Subject: LANDFILL - VERTICAL EXPANSION
HORIZONTAL CONTROL DATA

Job No. 467.39 Sheet 01/01
Date 11-27-89 Rev.
By PBS Ckd.

POINT	DISTANCE	BEARING	COSINE	SINE	N(+)	S(-)	E(+)	W(-)	N-COORD	E-COORD	POINT
STA 0+00									767576.32	2657598.14	
PCC1	208.14'	N0° 40' 3" E	0.999932138	0.011649809	208.126	—	2.425	—	767784.45	2657600.57	PCC1
PIC1	12.41'	N0° 40' 3" E			12.409	—	0.145	—	767796.86	2657600.71	PIC1
PTC1	12.41'	N23° 39' 26" E	0.915962437	0.401264019	11.367	—	4.980	—	767808.23	2657605.69	PTC1
PCC2	63.75'	N23° 39' 26" E			58.393	—	25.581	—	767866.62	2657631.27	PCC2
PIC2	65.33'	N 23° 39' 26" E			59.840	—	26.215	—	767926.46	2657657.49	PIC2
PTC2	65.33'	N 0° 49' 58" W	0.999894372	0.014534202	65.323	—	—	0.950	767991.78	2657656.54	PTC2
	250.00'	N 0° 49' 58" W			249.974	—	—	3.634	768241.75	2657652.91	

(.01) (.01)