Entered

DUNLOP TIRE CORPORATION
TONAWANDA, NEW YORK

CONCEPTUAL INTERIM REMEDIAL MEASURE CLOSURE PLAN FOR INACTIVE WASTE SITES NO's 915018 A, B & C

Submitted to:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
270 MICHIGAN AVENUE
BUFFALO, NEW YORK 14203

NOVEMBER 1992

Prepared By:
URS Consultants, Inc.
282 Delaware Avenue
Buffalo, New York 14202

G1509

DUNLOP TIRE CORPORATION

TONAWANDA, NEW YORK

CONCEPTUAL INTERIM REMEDIAL MEASURE CLOSURE PLAN FOR INACTIVE WASTE SITES NUMBERS 915018 A, B AND C

SUBMITTED TO

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

270 MICHIGAN AVENUE

BUFFALO, NEW YORK 14203

NOVEMBER 1992

PREPARED BY:

URS CONSULTANTS, INC.

282 DELAWARE AVENUE

BUFFALO, NEW YORK 14202

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF APPENDICES

1.0 INTRODUCTION

This report presents revised conceptual design plans for the closure of the above referenced waste disposal sites based on discussion with NYSDEC - Region 9 on June 16, 1992 and NYSDEC's October 30, 1992 comments on the previous submittal entitled "Conceptual Design Approach For Closure of Inactive Waste Sites No's. 915018, A, B, & C, August 1992". The remediation approach outlined reflects the limited extent of contaminant migration offsite and is consistent with an Interim Remedial Measure Closure. Results of laboratory and field testing, including a field demonstration test program utilizing onsite low permeability soil suitable for cover, are provided in support of the proposed final cover design.

2.0 EXISTING COVER ASSESSMENT

Investigation to determine the type and thickness of cover soil was performed by URS during December 1991. Shallow probe samples were obtained on a 50-foot grid spacing, located by survey, within each disposal area. Samples were collected at approximately 250 test locations using hand augers and were described in the field by the URS geologist. Thickness of soil cover and descriptions of material classification and vegetation types at individual bore locations were recorded. The location of sampling points and interpolation of cover thickness are shown in Figure 1 (Disposal Sites A and B) and Figure 2 (Disposal Area C). The thickness of fill material along the southern portion of Disposal Site C is depicted in Figure 3. Results are discussed by disposal area in the following paragraphs:

2.1 Disposal Site A

Major fill-area A can be characterized as consisting of a southern area containing thick (> 12 inches) clayey cover soil, and central and northern areas with minimal and discontinuous cover interspersed with isolated pockets of thicker clayey cover.

Separating the southern area from the remainder of the disposal site is a low east-west swale which becomes more pronounced along the western perimeter of the site in the vicinity of sampling locations SW-2 and SS-102. Water ponded in the vicinity of SW-2, at the time of this

investigation, appeared to be derived from seepage through waste exposed in the swale which receives drainage from low areas west of Building No. 2 (Figure 1).

The presence of a 4 to 8 foot thick clay mound (from recent construction excavation activities) within the central area of the site precluded testing of this area. Samples of the clay mound soil (to be used for site cover), and undisturbed block samples of the clayey cover within the southern area of the site, were obtained for laboratory classification and permeability testing (Figure 1). The results of this testing (Appendices A.1, and A.2) indicate permeability of the existing cover to be equal to, and less than 1×10^{-7} cm/s demonstrating the suitability of the existing onsite soil for low-permeability cover.

2.2 Disposal Site B

The majority of Disposal Site B, east of survey line 2+00E and south of survey line 1+00N (north quadrant), will be covered by an asphalt parking surface which will provide an effective barrier for this area (Figure 1). Consequently, investigation of cover thickness in this area, which coincides with an existing gravel parking area, was not performed.

Cover thickness in the remaining northern and southwestern portion of the site was found to be highly variable with most test locations reporting less than 6 inches of cover. Although the surface cover appears to be continuous, waste materials were visible along the slope of the discharge drain leading to the plant settling pond. Thickest cover depths were reported toward the settling pond on the northwestern corner of Site B.

2.3 Disposal Site C

This area includes the main disposal mound and an outlying island of fill immediately west of the site (Figure 2). In both areas, a continuous layer of soil was found covering waste materials. In general, most of the area (approximately 65%) contains 6 inches or more of soil cover with isolated areas having up to 24 inches of soil. Thinnest cover thickness was found along the edge of the main fill area where slope grades steepen. Samples of the clayey cover were obtained for laboratory classification, which demonstrated soil properties similar to those

defined for the borrow stockpile and borrow areas (Figure 2 and Appendix A.1). Probes of waste depth along the southern margin of Area C revealed the existence of a 50 to 75 foot wide perimeter zone which contained waste material less than 12 inches thick (Figure 3).

3.0 COVER CONSTRUCTION AND CERTIFICATION SUMMARY

3.1 Cover Construction

On July 21, 1992, test pads were constructed using locally available clayey soils (described in the following section) in several configurations and compaction modes. Table 1 summarizes the test data which is presented in Appendix A.3. In constructing the 18-inch test pad made from a single lift of clay, a sheepsfoot roller was employed for final compaction. That roller produced a noticeably higher result for field measurement of in-place density, as well as a lab test of 4×10^{-8} cm/sec permeability. Those results indicate that the sheepsfoot roller compactor is the equipment of choice for compacting the proposed 18" cover for these sites.

The sheepsfoot compactor used in the test pad construction weighed approximately 25,000 lbs., had 6-inch long feet, and was equipped with a vibrator. In order to achieve an average permeability coefficient of 1×10^{-7} cm/sec, or less, in the final cover, the weight of the compactor will be increased and the foot depth will be 8-inches.

3.2 Borrow Source Characterization

Clayey soil suitable for placement as low permeability cover is currently stockpiled within Disposal Site A (Figure 1). This material, consisting of approximately 1,200 cy of soil, is from a recent foundation excavation and is free of foreign material. This soil will be supplemented by the excavation of onsite sources of similar origin and quality. These sources include clay soil placed as cover within the waste areas, and excavation of borrow from an area designated east of the settling pond (Figure 1). Total estimated volume of low permeability soil from all sources is 22,000 cy.

The uniformity and consistency of the onsite clay sources is demonstrated in test boring

records (Appendix B), and laboratory test data as presented in Appendices A.1 - A.3 and summarized in Tables 2 and 3. Coarse fragments greater than 3-inches in diameter were not present in the soil. Material characterization tests performed on samples from the Area A clay stockpile, and the proposed clay borrow area east of the settling pond (Table 2), confirm the similarity of these source materials. Consequently, remolded laboratory tests and tests performed on 'undisturbed' soil cores from demonstration test pads (Table 3) are representative of both the stockpile and proposed borrow area materials.

3.3 Construction Quality Assurance (CQA) Testing:

- Material for low permeability cover will be placed at sufficient thickness to produce a compacted layer 18 inches thick. Clay soil will be placed using a dozer or pan and subsequently compacted using a medium to heavy weight (30,000 to 50,000 pound) sheepsfoot roller with 8-9 inch depth feet. Refer to the demonstration test pad results (Appendix A.3) to substantiate the compaction of a single 18 inch lift using 4 to 6 roller passes which achieved an average permeability of 1×10^{-7} cm/sec or less.

- The moisture content of the soil and resulting compacted density will be tested during placement to insure the material lies within the window of acceptable values necessary to achieve the required permeability result. The window delineated in Figure 4 defines the acceptable moisture-density range for compaction of the onsite clay material. Limits for the test window were established based on laboratory permeability results from remolded compaction samples and were confirmed by the results from undisturbed cores taken from the field demonstration test pads (Tables 1 and 3).

  The lower limit for field compaction requires a minimum 95 percent of Standard Proctor maximum density. Acceptable water content ranges from 2 to 3 percent drier than, to 3 to 6 percent wetter than optimum moisture as referenced to Standard and Modified Proctor results, respectively. For application of this approach see EPA/625/4-89/022 - Chapter 6.0 Requirements for Hazardous

Waste Landfill Design and Construction.

- o Certification QA/QC testing requirements will be conducted in accordance with Table 4.

4.0 REMEDIAL ACTION APPROACH

The specifics of the Interim Remedial Measures to be implemented for each area are presented in the following sections.

4.1 Disposal Site A Plan

- o No action is required for the southern portion of major fill-area A (Figure 5) where clay cover thickness exceeds 12 inches, vegetation is well established, and the surface is sufficiently sloped for drainage. Laboratory test data (Table 2) from undisturbed samples of the clay cover indicate hydraulic conductivities of $1x10^{-7}$ cm/s and less, and fine content in excess of 76 percent. The area encompasses approximately 1.2 acres.

- o No action, with provision for additional groundwater monitoring and/or test pitting is required for Minor Waste Area 'A'. Investigation (including test pit excavation (URS Report 4/92) and hand auger probing, has demonstrated 2 to 3 feet of clayey cover (from settling pond excavation) throughout most of the area. The western margin of the area is diversely vegetated with mature trees. A monitoring well is to be installed downgradient of this area to monitor long-term groundwater quality and evaluate the need for future action. To determine the parameters included in the long-term monitoring program, two waste samples will be collected and analyzed for TCLP parameters.

- o Regrade the east-west swale separating the southern from the central and northern disposal areas. Low-lying areas east of the site can be effectively drained by extending the cover on the southern portion of site and diverting the drainage

southwest into the plant settling pond. Any waste materials removed from the drain are to be placed within the main fill area.

To address waste contaminant migration the swale will be lined with the same compacted clay soil used for site cover, and vegetated as necessary to prevent erosion. The integrity of the protective cover, including the swale area, will be inspected and maintained throughout the closure period in accordance with the Post-Closure Maintenance/Repair Plan to be developed during design.

During construction, the Contractor will be required to submit for approval a Sedimentation Control Plan. This plan will address the problems of short term contaminant migration resulting from disturbance of the soils.

NYSDEC Division of Water will be contacted during design to address potential impacts to the existing settling pond's SPDES permit.

- A portion of the northerly and easterly parts of fill-area A will be paved to provide needed tractor-trailer staging for this expanding production facility (Figure 5). Pavement will consist of 8 inches of stone over prepared subbase with 4-inches of Type #6 binder. The existing access roadway will be expanded, covering part of the easterly portion of the area. Grades will be established to provide for surface water drainage away from unpaved areas into strategically located catch basins connected to the existing storm drain system, which leads to the settling pond.

- The northern portion of waste area 'A' will be excavated and incorporated into central waste area 'A' (Figure 5).

- Central waste area 'A' will be contoured as necessary to facilitate site drainage, cover placement, and erosion control.

- Sufficient clay borrow will be added to regraded central area 'A' (including

drainage swale) to constitute a continuous compacted clay soil layer 18 inches thick. This will be covered with 6 inches of soil amenable to plant growth.

- o Recontoured and disturbed areas will be seeded and mulched.

- o Due to the presence of impermeable underlying soils, the site A closure does not warrant the installation of a leachate or groundwater collection/treatment system.

4.2 Disposal Site B Plan

- o The gravel parking area and access road to Gate No. 3 will be paved with 8" of stone overlaid with 2-inches of Type #3 binder and 1-inch of top surface. Surface drainage will be directed to catch basins and discharged into the waterway feeding the settling pond. Post-closure monitoring will be conducted to determine effectiveness.

- o Rather than, pulling back waste exposed in the drainage ditch, the discharge pipe will be extended halfway to the settling pond, the discharge drain will be backfilled with common borrow soil, and surface prepared for cover (Figure 5).

- o The waste from the southern portion of area 'B' will be excavated and incorporate it into northern area 'B' or central area 'A' (Figure 5).

- o The northern waste area 'B' will be contoured for drainage and sufficient soil will be added to constitute a continuous layer of compacted clay 18 inches thick with a 6 inch cover of soil amenable to plant growth. Other suitable cover material, including use of gunite concrete applications, may be substituted for steep slopes at the time of final design.

- o Recontoured and disturbed areas will be seeded and mulched.

- o Due to the presence of impermeable underlying soils, the site B closure does not

warrant the installation of a leachate or groundwater collection/treatment system.

4.3 Disposal Site C Plan

- The shallow fill from the southern margin of the site will be removed and a swale for east-west drainage will be established (Figures 3 and 6). This swale will discharge into the north-south trending drainage ditch which flows into the Town of Tonawanda storm sewer via a culvert. The topsoil, fill, and clayey subsoil materials will be segregated for site grading and cover purposes.

- The outlying fill pile west of the site will be excavated and incorporate it into the main fill area (Figure 6). The topsoil will be segregated for cover placement.

- The existing cover material from the main fill area will be removal and stockpiled. The area will be contoured removed and stockpiled as necessary for site drainage and the northern fill edge will be regraded to achieve an acceptable slope for cover placement and erosion control. Minimal disturbance to the adjacent wetland areas (less than one acre) is anticipated.

- Sufficient soil will be added to constitute a continuous layer of compacted clay borrow 18 inches thick with a 6 inch cover of soil amenable to plant growth.

- Recontoured and disturbed areas will be seeded and mulched.

- Due to the presence of impermeable underlying soils, the site C closure does not warrant the installation of a leachate or groundwater collection/treatment system.

5.0 CONCLUSION

Dunlop's initial proposal of 12-inches of uncompacted subsoil and 6 inches of soil capable of supporting vegetation was protective of the environment. The additional work proposed in this Interim Remedial design is only directed at providing the Department and public with further

assurances that a protective condition will be achieved and maintained.

Moreover, the proposed cover of 18 inches of compacted clay soil and 6 inches of soil capable of supporting grass, in combination with the regrading and drainage improvements, will results in approximately 97% of all precipitation being kept from the wastes (3% annual average percolation) as shown by the HELP model infiltration analysis presented in Appendix C. The cost of this proposal is estimated to be $500,000. If Dunlop were needlessly forced to place an additional 24 inches of uncompacted intermediate cover, it would have to spend an additional $325,000 to purchase and place the material.

In addition, because of the resulting standing head of soil water in the intermediate cover directly overlying the compacted clay, the annual average percolation into the waste would more than double (Appendix C). There is no hydraulic benefit, therefore to the intermediate cover. Also, since a Post-Closure Maintenance/Repair Plan will be prepared and implemented, the integrity of the clay will be maintained without the need for an intermediate cover.

TABLES

TABLE 1

FIELD COMPACTION AND LABORATORY TEST DATA SUMMARY

	Field Moisture-Density Data			Laboratory Test Data					
6" List Test Pad						Dry Unit Wt (PCF)		Permeability (Cm/S)	
	In-place Density (pcf)	In-place Moisture (%)	% Compaction (Modified Proctor)	Moisture Content (%)	Entire Core	Trimmed Sample	Density Adjusted	Trimmed Sample	Density Adjusted
(A) Bottom Lift	113.2 116.3	13.0 13.6	90.2 92.7	16.0++	116.5	109.4	114.9	$1.7x10^{-5}$	$1.6x10^{-8}$
(B) Middle Lift	115.8 117.6	13.9 13.1	92.3 93.7	15.8++	122.5	111.8	113.1	$2.6x10^{-5}$	$9.9x10^{-8}$
(C) Top Lift	115.9 116.7	13.2 14.1	92.4 93.1	16.3++	117.6	111.7		$7.9x10^{-8}$	
9" List Test Pad						Dry Unit Wt (PCF)		Permeability (Cm/S)	
	In-place Density (pcf)	In-place Moisture (%)	% Compaction (Modified Proctor)	Moisture Content (%)	Entire Core	Trimmed Sample	Density Adjusted	Trimmed Sample	Density Adjusted
(A) Bottom Lift	114.3 115.0	14.6 14.6	91.1 91.7	14.6++	119.2	111.3	113.1	$1.1x10^{-5}$	$5.9x10^{-8}$
(B) Top Lift	14.1 116.4	14.0 13.2	91.0 92.8						

TABLE 1 - Continued

18" List Test Pad	In-place Density (pcf)	In-place Moisture (%)	% Compaction (Modified Proctor)	Moisture Content (%)	Entire Core	Dry Unit Wt (PCF)		Permeability (Cm/S)	
						Trimmed Sample	Density Adjusted	Trimmed Sample	Density Adjusted
(A) Dozer Compaction	115.4	14.9	92.0	15.7+	123.1	109.5		1.1×10^{-7}	
	117.3	12.9	93.5	15.4++					
				16.8++	123.4	108.2	110.7	7.1×10^{-5}	4.1×10^{-8}
(B) Sheepsfoot Compaction									
- 6" Depth Reading	120.5	12.0	96.1	16.4+	130.9	114.9		2.1×10^{-8}	
	121.4	12.9	96.7	16.0++					
-12" Depth Reading	121.2	11.2	96.6						
	117.3	12.2	93.5						

+ Moisture content test specimen trimmings.

++ Average moisture content from test core intervals.

TABLE 2

DUNLOP CLAY BORROW SOURCE AND EXISTING CLAY COVER TEST DATA SUMMARY

Clay Borrow Source	Grain Size (%)				Atterberg Limits				
	Gravel*	Sand	Silt	Clay	LL	PL	PI	Wc%	Permeability K (cm/s)
N+65/W+0 0-2.5'	2	12	23	63				19.0	
2.5-9.0'	2	10	25	63	34	17	17	18.4	
N+65/W+50 0-2.5'	2	17	24	57	46	21	25	25.2	
2.5-9.0'	1	9	24	66				23.7	
N+65/W+100 0-2.0'	3	14	23	60				18.2	
2.7-6.5'	1	6	26	67	37	20	17	20.9	
N+65/W+150 0-2.5	2	10	23	65				20.0	
2.5-8.5	1	9	23	67	35	17	18	15.1	
N+130/Q+50 0-2.5	2	13	17	68				21.4	
3-9.0	1	10	24	65	40	20	20	22.1	
N+130/W+100 0-2.0	2	15	26	61				23.9	
3-8.0	2	11	25	62	38	18	20	25.3	
Clay Soil Stockpile									
DLP-A-GS #1	10	14	24	42	32	18	14		
DLP-A-GS #2	0	10	35	55	45	22	23		
DUN SP #1	5	10	25	60	34	18	16	4.6	
In-Place Cover/Waste Area A									
DLP-A-SS #1	4	18	37	41	37	21	16		7.5×10^{-8}
DLP-A-SS #2	0.2	10	36	54	45	22	23		1.1×10^{-7}
In-Place Cover/Waste Area C									
STA 5+50N/4+00E 0-2.5 ft	13	16	23	48				21.0	
STA 6+00N/6+50E 0-1.2 ft	8	16	19	68				22.4	
STA 4+50N/7+00E 0-1.7 ft	6	18	19	57				21.8	
STA 2+00N/4+00E 0-2.8 ft	3	12	22	63				18.9	

* Gravel size does not exceed 3 inches in diameter

TABLE 3

DUNLOP CLAY BORROW MATERIAL
PROCTOR COMPACTION AND PERMEABILITY TEST DATA

COMPOSITE SAMPLE DUN SP #1 (See Table 2)

Moisture - Density Test		Proctor Point Moisture - Density Permeability		
Max. Dry Density (pcf)	Opt. Water Content (%)	Dry Unit Wt (pcf)	Water Content (%)	K (cm/s)
(A) Standard Proctor				
115.6	15.4	108.0	9.8	8.3×10^{-8}
		111.5	12.9	7.2×10^{-7}
		116.1	14.8	2.4×10^{-8}
		114.5	16.8	2.4×10^{-8}
		111.2	18.5	1.6×10^{-8}
(B) Modified Proctor				
125.4	12.2	121.1	9	1.3×10^{-8}
		123.8	10.6	8.8×10^{-9}
		124.9	12.2	5.2×10^{-9}
		123.5	13.6	5.2×10^{-9}

TABLE 4

CERTIFICATION QA/QC TESTING REQUIREMENTS
BORROW SOURCE AND CAP CONSTRUCTION

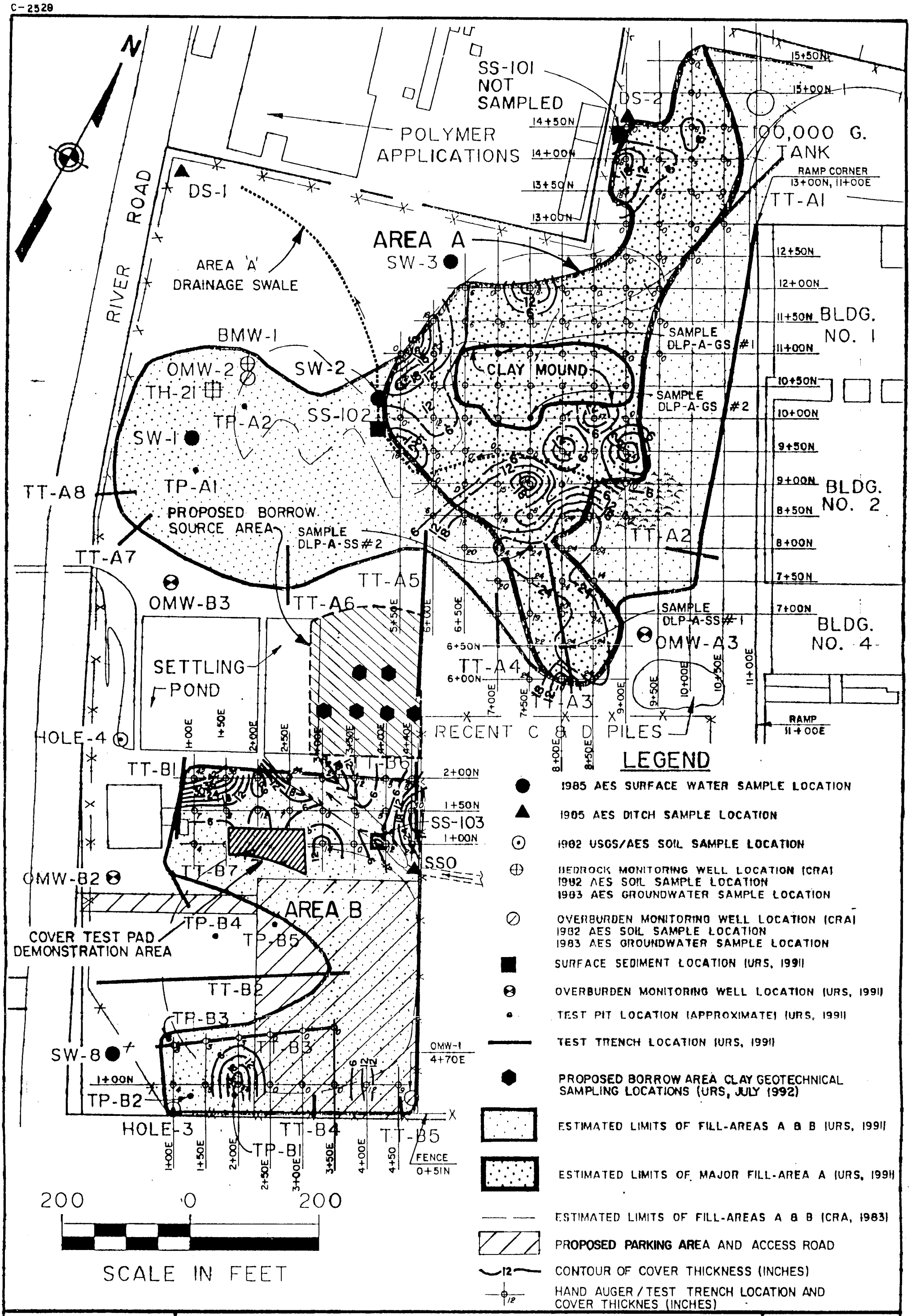
	PARAMETER	FREQUENCY	TEST METHOD
(A) Source Testing	Grain Size Moisture Content Atterberg Limits Moisture - Density Lab Permeability	1 Test per 2,500 cy 1 Test per 1,000 cy 1 Test per 1,000 cy 1 Test per 5,000 cy or change in material 1 Test per Proctor	ASTM D-422 ASTM 0-3017 ASTM D-4318 ASTM D-698 EM 110-2 1906 or ASTM D-5084
(B) Construction Testing*	Density Moisture Content Undisturbed Permeability**	9 Tests/Acre/Lift 9 Tests/Acre/Lift 1 Test/Acre/Lift	

* Field test results will be compared to, and evaluated against, quality control testing and demonstration test pad confirmation results.

** Test to be performed on representative specimen from mid-section of shelby tube core.

FIGURES

C-2528



LEGEND

- 1985 AES SURFACE WATER SAMPLE LOCATION
- 1985 AES DITCH SAMPLE LOCATION
- 1982 USGS/AES SOIL SAMPLE LOCATION
- BEDROCK MONITORING WELL LOCATION (CRA)
  1982 AES SOIL SAMPLE LOCATION
  1983 AES GROUNDWATER SAMPLE LOCATION
- OVERBURDEN MONITORING WELL LOCATION (CRA)
  1982 AES SOIL SAMPLE LOCATION
  1983 AES GROUNDWATER SAMPLE LOCATION
- SURFACE SEDIMENT LOCATION (URS, 1991)
- OVERBURDEN MONITORING WELL LOCATION (URS, 1991)
- TEST PIT LOCATION (APPROXIMATE) (URS, 1991)
- TEST TRENCH LOCATION (URS, 1991)
- PROPOSED BORROW AREA CLAY GEOTECHNICAL SAMPLING LOCATIONS (URS, JULY 1992)
- ESTIMATED LIMITS OF FILL-AREAS A & B (URS, 1991)
- ESTIMATED LIMITS OF MAJOR FILL-AREA A (URS, 1991)
- ESTIMATED LIMITS OF FILL-AREAS A & B (CRA, 1983)
- PROPOSED PARKING AREA AND ACCESS ROAD
- 12 CONTOUR OF COVER THICKNESS (INCHES)
- HAND AUGER / TEST TRENCH LOCATION AND COVER THICKNES (INCHES)

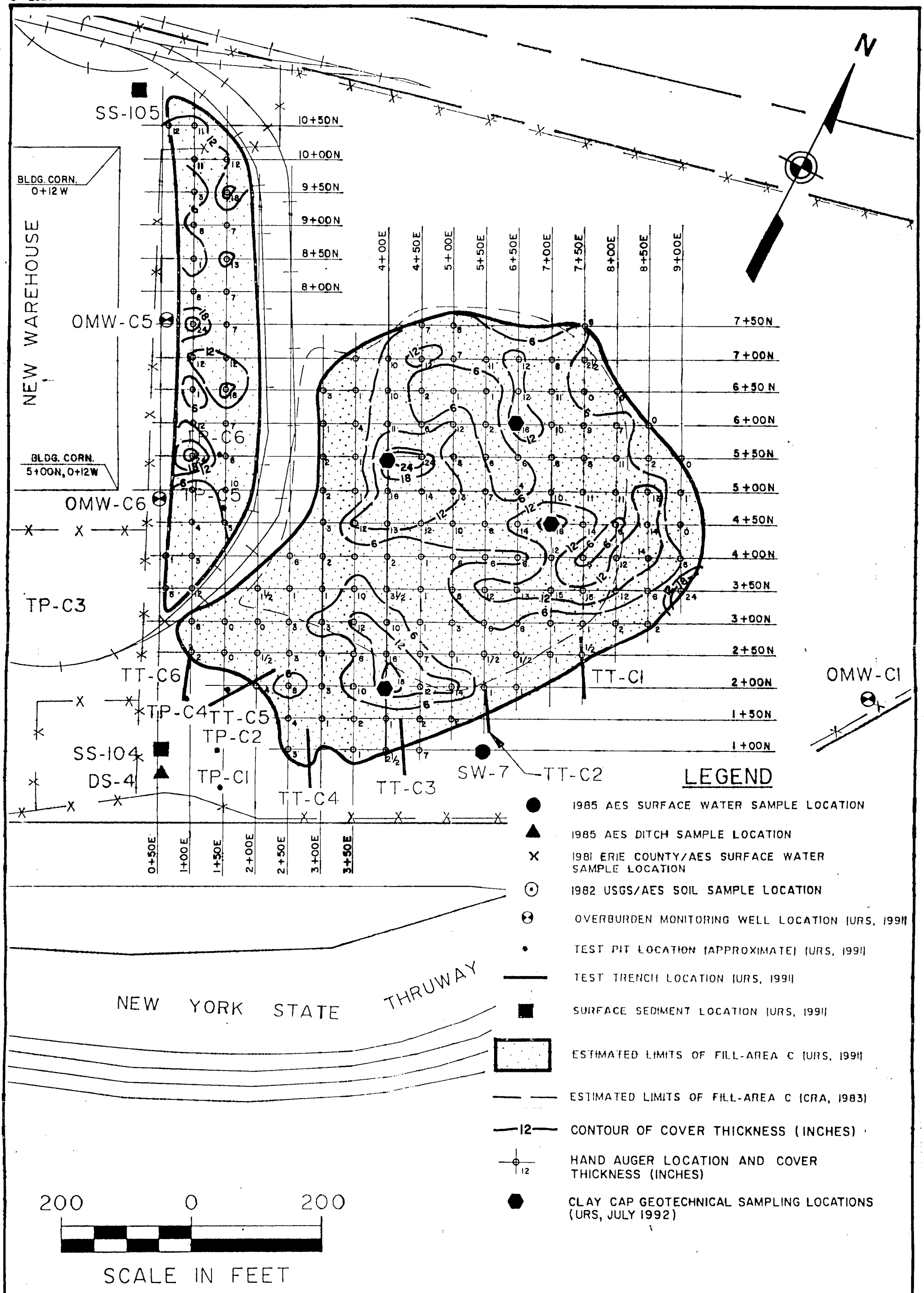
F-1

URS CONSULTANTS, INC.

COVER THICKNESS MAP
FILL AREAS A AND B

FIGURE 1

C - 2529



LEGEND

- 1985 AES SURFACE WATER SAMPLE LOCATION
- 1985 AES DITCH SAMPLE LOCATION
- 1981 ERIE COUNTY/AES SURFACE WATER SAMPLE LOCATION
- 1982 USGS/AES SOIL SAMPLE LOCATION
- OVERBURDEN MONITORING WELL LOCATION (URS, 1991)
- TEST PIT LOCATION (APPROXIMATE) (URS, 1991)
- TEST TRENCH LOCATION (URS, 1991)
- SURFACE SEDIMENT LOCATION (URS, 1991)
- ESTIMATED LIMITS OF FILL-AREA C (URS, 1991)
- ESTIMATED LIMITS OF FILL-AREA C (CRA, 1983)
- —12— CONTOUR OF COVER THICKNESS (INCHES)
- HAND AUGER LOCATION AND COVER THICKNESS (INCHES)
- CLAY CAP GEOTECHNICAL SAMPLING LOCATIONS (URS, JULY 1992)

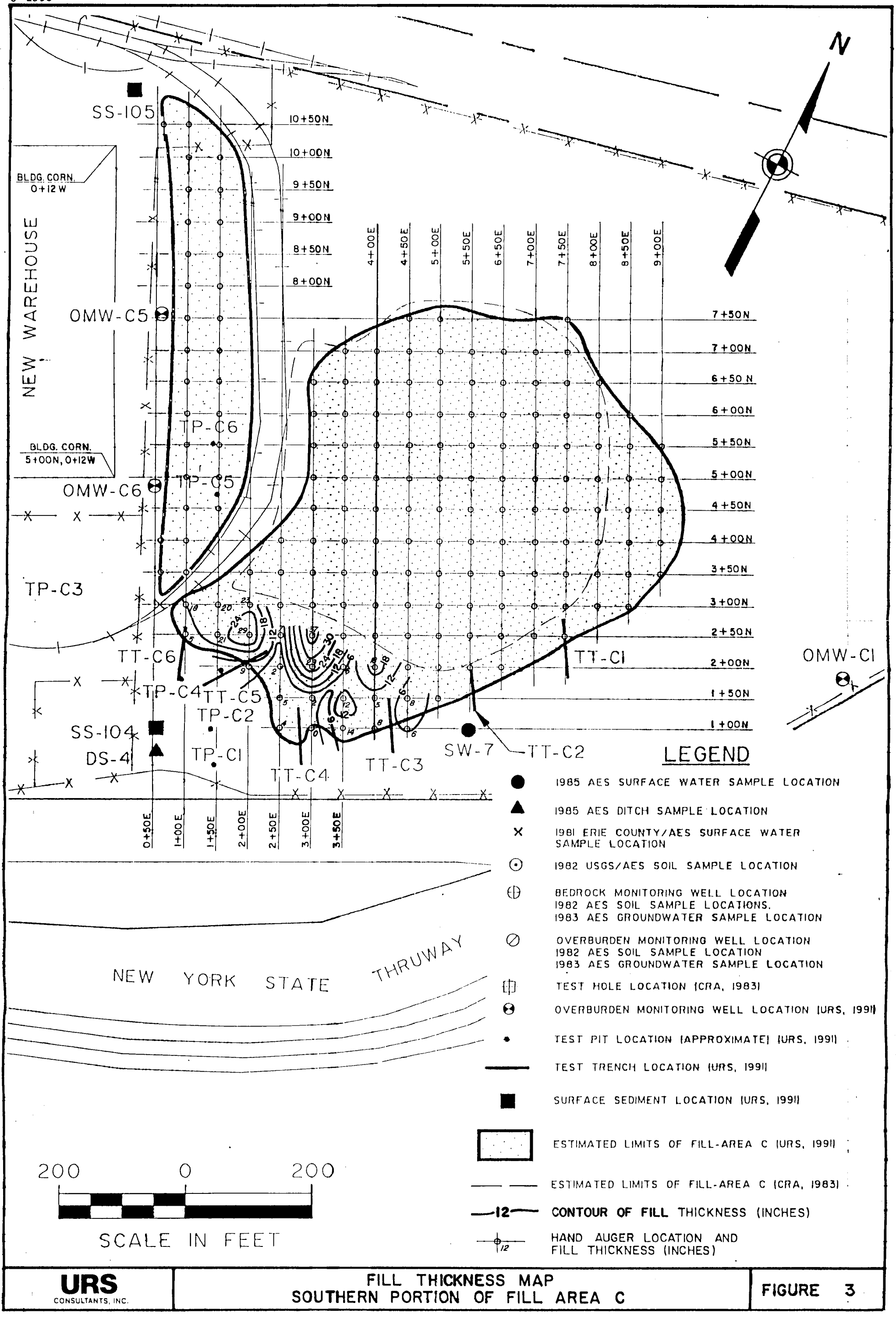
F-2

URS CONSULTANTS, INC.

COVER THICKNESS MAP
FILL AREA C

FIGURE 2

C-2390



LEGEND

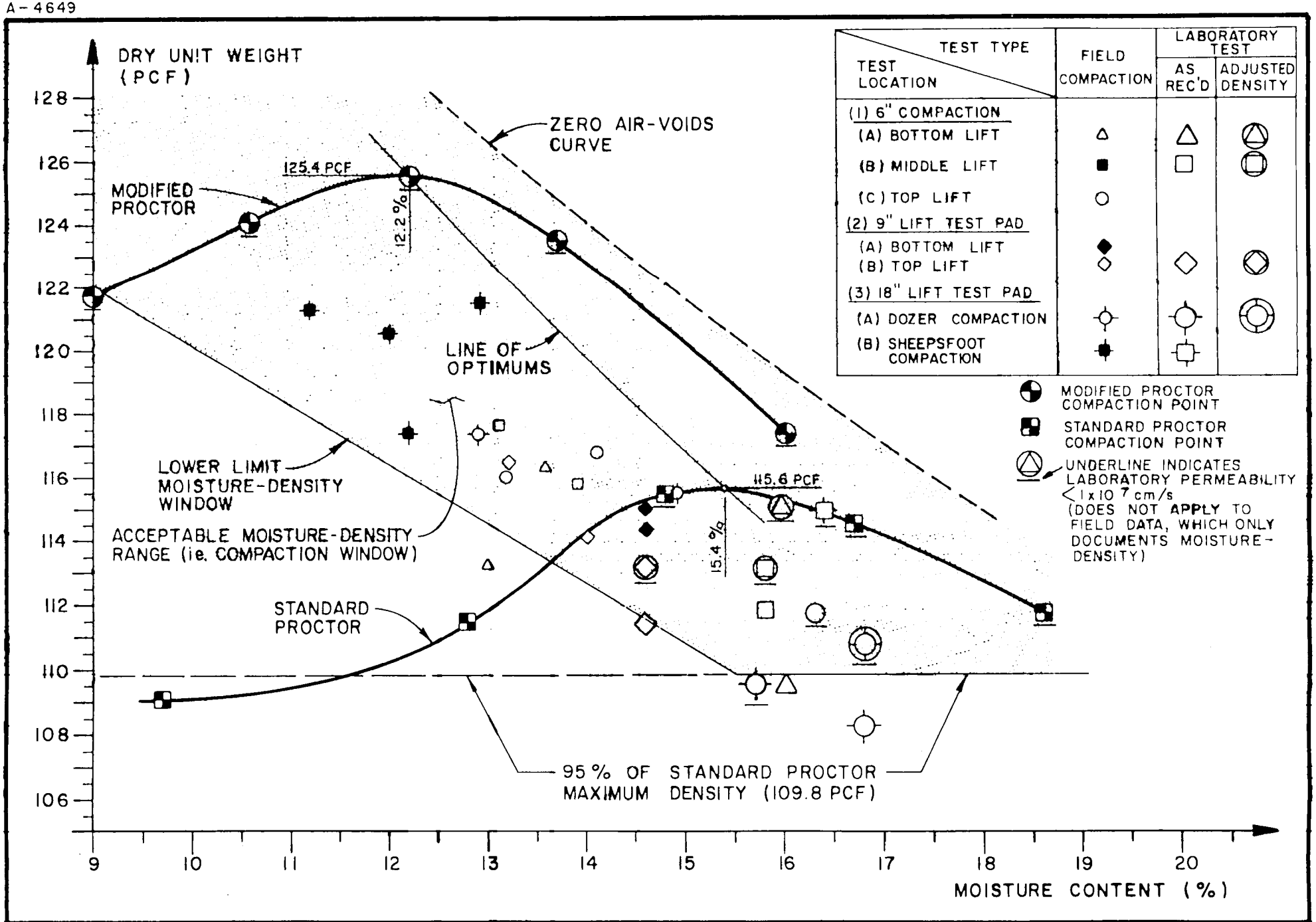
- 1985 AES SURFACE WATER SAMPLE LOCATION
- 1985 AES DITCH SAMPLE LOCATION
- 1981 ERIE COUNTY/AES SURFACE WATER SAMPLE LOCATION
- 1982 USGS/AES SOIL SAMPLE LOCATION
- BEDROCK MONITORING WELL LOCATION
  1982 AES SOIL SAMPLE LOCATIONS.
  1983 AES GROUNDWATER SAMPLE LOCATION
- OVERBURDEN MONITORING WELL LOCATION
  1982 AES SOIL SAMPLE LOCATION
  1983 AES GROUNDWATER SAMPLE LOCATION
- TEST HOLE LOCATION (CRA, 1983)
- OVERBURDEN MONITORING WELL LOCATION (URS, 1991)
- TEST PIT LOCATION (APPROXIMATE) (URS, 1991)
- TEST TRENCH LOCATION (URS, 1991)
- SURFACE SEDIMENT LOCATION (URS, 1991)
- ESTIMATED LIMITS OF FILL-AREA C (URS, 1991)
- ESTIMATED LIMITS OF FILL-AREA C (CRA, 1983)
- 12 CONTOUR OF FILL THICKNESS (INCHES)
- HAND AUGER LOCATION AND FILL THICKNESS (INCHES)

URS CONSULTANTS, INC.

FILL THICKNESS MAP SOUTHERN PORTION OF FILL AREA C

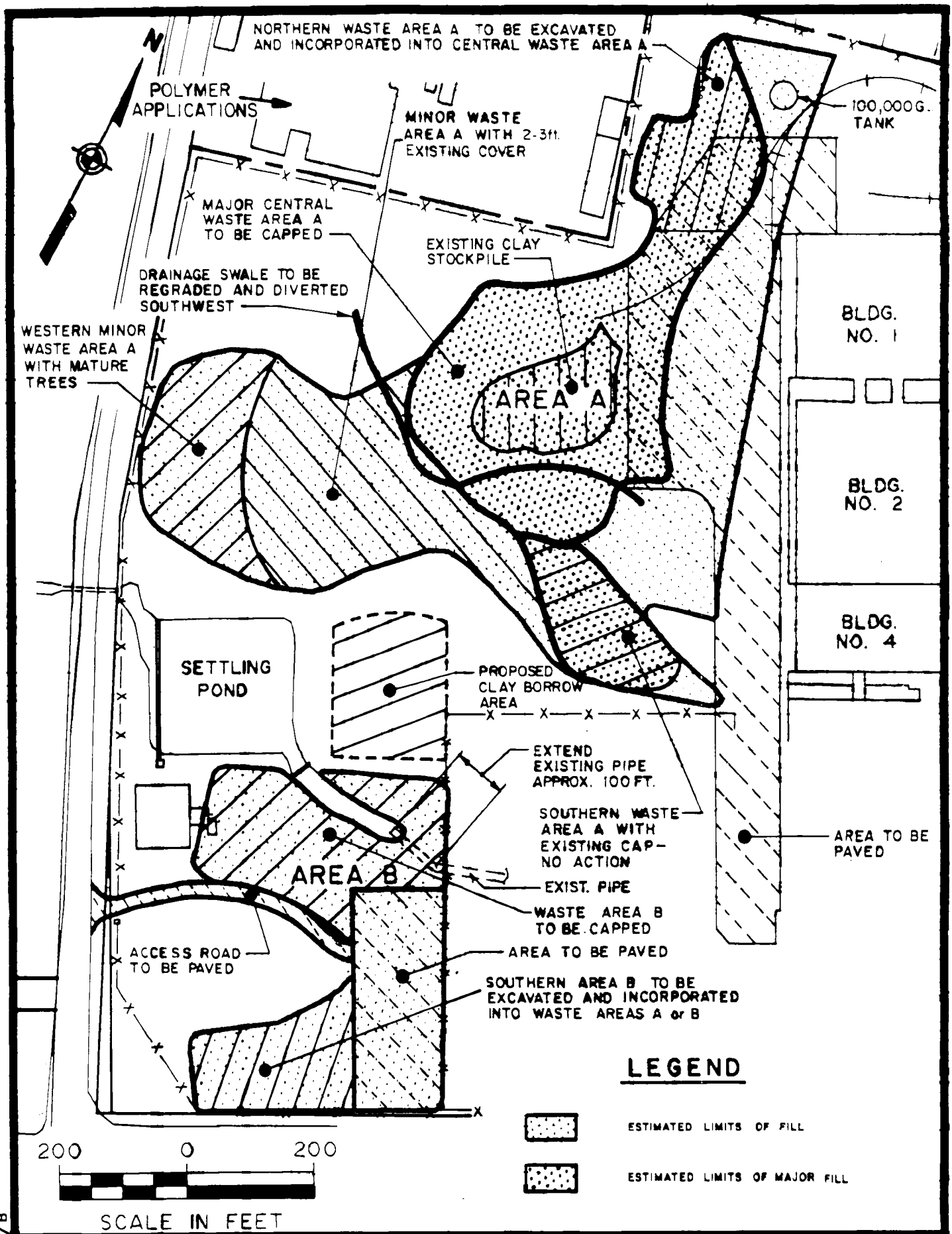
FIGURE 3

A-4649



URS CONSULTANTS, INC.	MOISTURE - DENSITY COMPACTION WINDOW / ONSITE CLAY BORROW	FIGURE 4

F-4



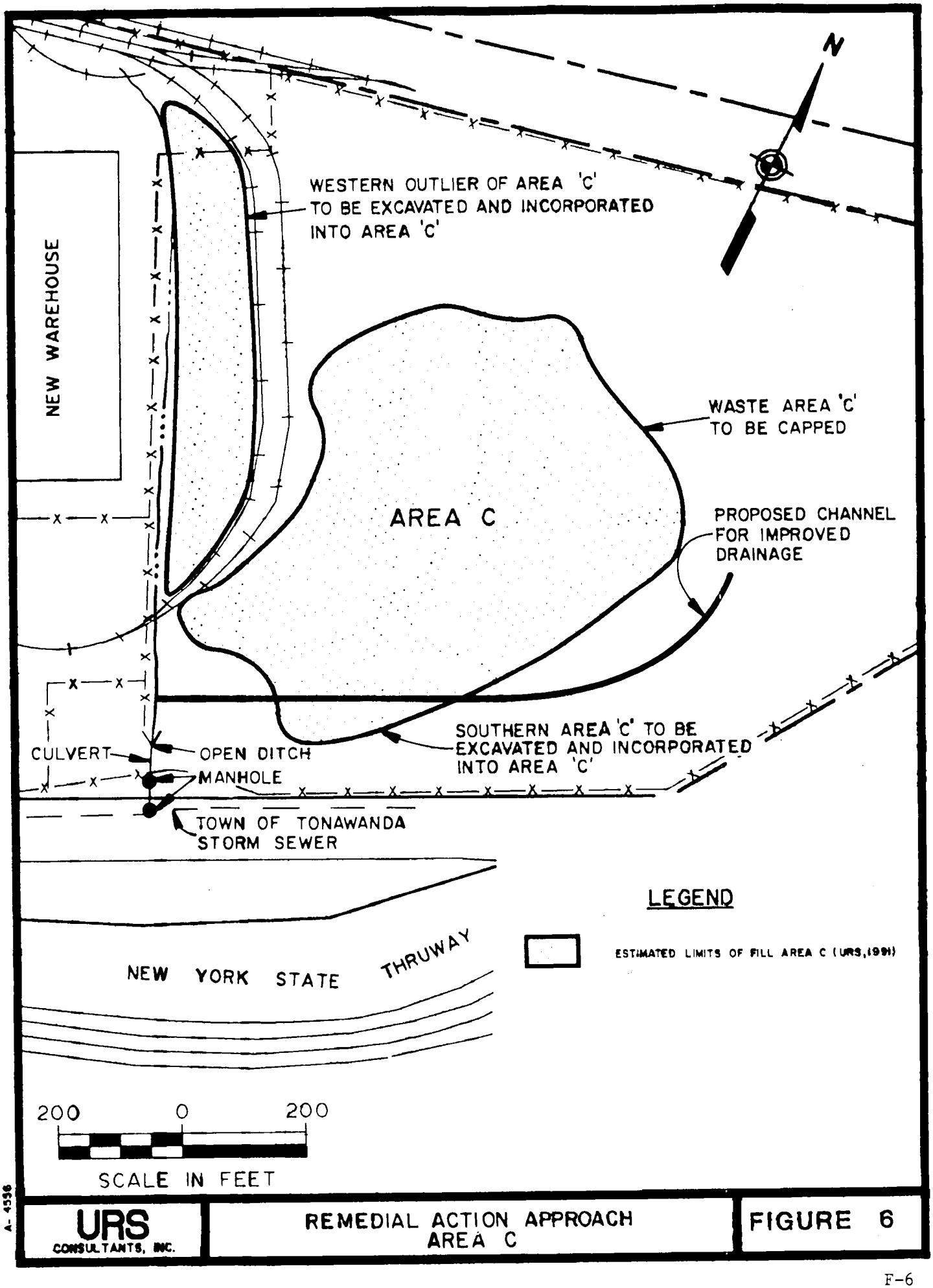
1:200 8/12/92

A-4555/B

URS CONSULTANTS, INC.

REMEDIAL ACTION APPROACH AREAS A & B

FIGURE 5


1=200 8/12/92
N
WESTERN OUTLIER OF AREA 'C'
TO BE EXCAVATED AND INCORPORATED
INTO AREA 'C'
NEW WAREHOUSE
WASTE AREA 'C'
TO BE CAPPED
AREA C
PROPOSED CHANNEL
FOR IMPROVED
DRAINAGE
SOUTHERN AREA 'C' TO BE
EXCAVATED AND INCORPORATED
INTO AREA 'C'
CULVERT
OPEN DITCH
MANHOLE
TOWN OF TONAWANDA
STORM SEWER
LEGEND
ESTIMATED LIMITS OF FILL AREA C (URS,1991)
NEW YORK STATE THRUWAY
200 0 200
SCALE IN FEET
A-4336
URS
CONSULTANTS, INC.
REMEDIAL ACTION APPROACH
AREA C
FIGURE 6

APPENDIX A.1

MATERIAL QUALITY

AND PERMEABILITY TEST DATA

UNDISTURBED COVER FROM AREA 'A'

AND AREA 'C'

C+H

URS

AN INTERNATIONAL PROFESSIONAL SERVICES [illegible]

URS CONSULTANTS, INC.
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202-1805
(716) 856-5636
FAX (716) 856-2545

ATLANTA
BOSTON
BUFFALO
CLEVELAND
COLUMBUS
DENVER
NEW YORK
PARAMUS NJ
NEW ORLEANS
SAN FRANCISCO
SAN MATEO
SEATTLE
[illegible]
WASHINGTON DC

January 28, 1992

Mr. Daniel J. Pyanowski
Environmental & Services Engineer
Dunlop Tire Corporation
P.O. Box 1109
Buffalo, New York 14240

RE: DUNLOP TIRE CORPORATION
INVESTIGATION OF HAZARDOUS WASTE SITES
GEOTECHNICAL TESTING RESULTS

Dear Mr. Pyanowski:

Enclosed are three (3) copies of the Empire Soil Laboratory report for soil samples collected by URS on January 6, 1992. Laboratory tests were performed on the following samples to determine their suitability as capping material for Waste Site A:

DLP-A-SS #1	Undisturbed block samples of clay (cap) soil from southern
DLP-A-SS #2	portions of Site A.
DLP-A-GS #1	Grab samples from clay borrow pile within northern area of
DLP-A-GS #2	Site A.

The approximate locations from which these samples were obtained are shown in Figure 1. Grain size analysis of the four samples indicate a silty clay soil (USCS: CL - lean clay as per ASTM Designation 2487-85) with a moderate to low plasticity. The high percentage of fines (74 to 89 percent finer than 0.074 mm) confirms the inherent impervious nature of both the existing clay cap and recent onsite borrow material slated for use as cover on the remainder of Site A.

Permeability tests performed on the two undisturbed 'cap' samples, provided further confirmation of the low permeability of the in-place cover soil. Hydraulic conductivity values of 1×10^{-7} cm/sec and less are derived for test results extrapolated to an effective hydraulic gradient of 1.0 which best simulates actual field conditions.

Please let me know if you have questions or comments, or if you require additional copies.

Very truly yours,

URS CONSULTANTS, INC.

Charles W. Hurley
Project Manager

CWH/DRL/ys
Enc.
1-28-92L.DP

cc: Mr. John Gorton - URS
Mr. Duane Lenhardt - URS
Mr. Mike Gutmann - URS
File: 35246.00 (1000)

EMPIRE
SOILS INVESTIGATIONS INC

JAN 2 4 1992

GEOTECHNICAL TESTING REPORT
DUNLOP TIRE CORPORATION
BUFFALO, NEW YORK

FOR:
URS CONSULTANTS, INC.
BUFFALO, NEW YORK

JOB NO. G008.008
JANUARY, 1992

EMPIRE SOILS INVESTIGATIONS INC
Corporate Offices:
140 TELEGRAPH ROAD • P.O. BOX 297 • MIDDLEPORT, NY 14105 • 716/735-3502 FAX 716/735

January 22, 1991

Mr. Duane R. Lenhardt, PhD
URS Consultants, Inc.
282 Delaware Avenue
Buffalo, New York 14202-1805

Dear Mr. Lenhardt:

SUBJECT: GEOTECHNICAL TESTING
DUNLOP TIRE CORPORATION, BUFFALO, NEW YORK

Transmitted herewith are the results of geotechnical testing performed on two (2) undisturbed block samples and two (2) bag samples of soil from the subject project. The work was performed in accord with your telephone conversation and with a letter to Mr. Kevin Czaja on January 7, 1992.

Cylindrical permeability test specimens were trimmed from the block samples. The remaining portion of the block samples have been resealed with cheesecloth and wax and is currently being stored in our wet room.

Trimmings from the block samples and a portion of the material from the bag samples were used for grain size distribution test (ASTM D422) and Atterberg Limits test (ASTM D4318). Individual test reports for these tests are presented in Appendix A.

The permeability tests were performed in accordance with ASTM Designation D 5084 using a backpressure of about 80 psi. Each specimen was subjected to two successive differential pressures, the second one approximately half the magnitude of the first. For material behaving in accord with Darcy's Law, the two test runs should have resulted in close to the same permeability. For these samples compliance with Darcy's Law was not particularly good. This could be due to preferential flow along the path of rootlets noted in the specimens. Examinations of the specimens after testing also indicated a tendency to blocky structure of the soil. The results of the permeability test are contained in Appendix B.

It has been a pleasure working with your firm again on this interesting project. Should you have any questions or in case we may be of further service, do not hesitate to contact the undersigned at 716-735-3400.

Respectfully submitted,

EMPIRE SOILS INVESTIGATIONS, INC.

Jorgen F. Christiansen, PE
Director, Geotechnical Testing

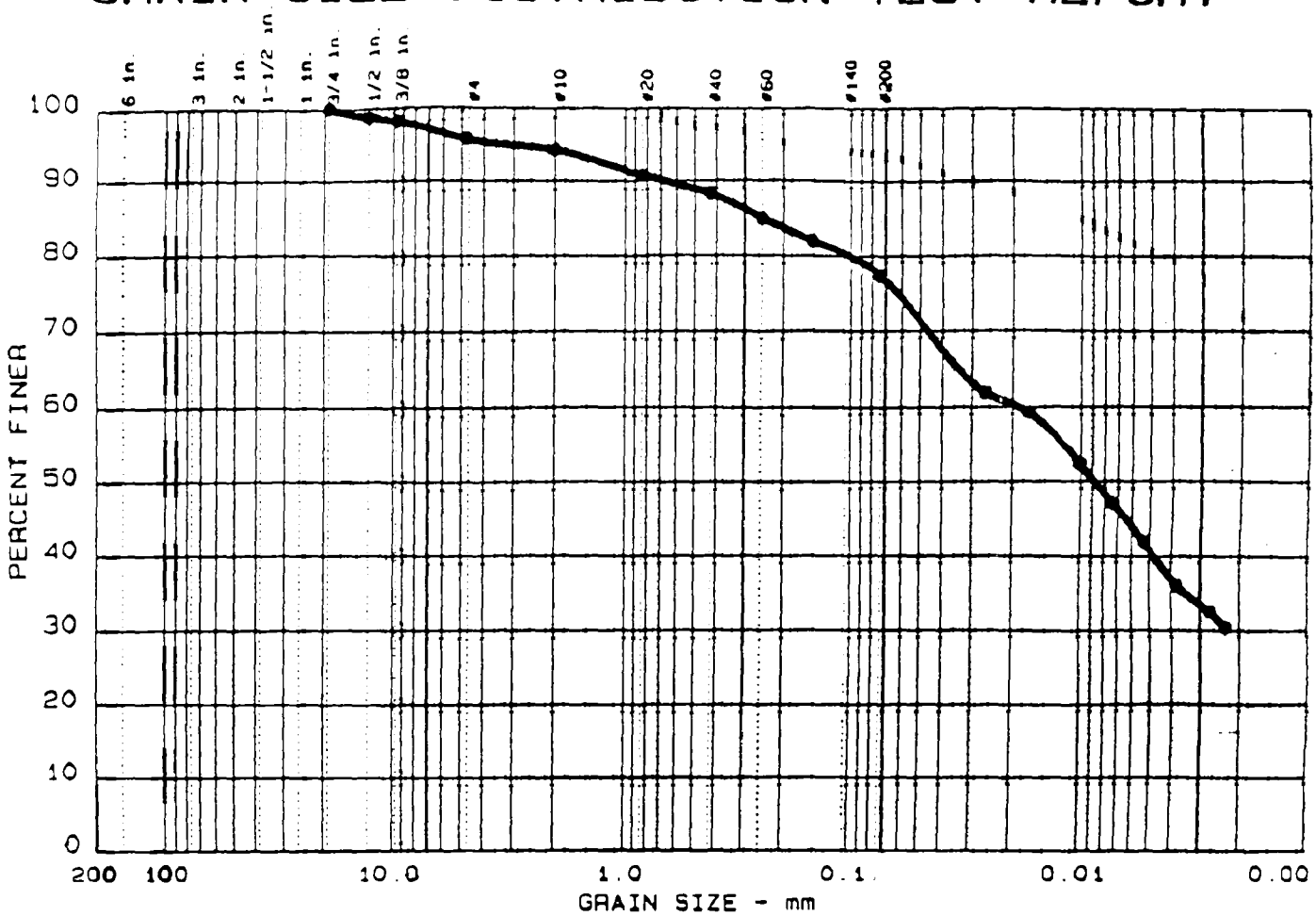
JFC/srk

ENCLOSURES

EMPIRE
SOILS INVESTIGATIONS INC

APPENDIX A
GRAIN SIZE DISTRIBUTION
ATTERBERG LIMITS

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	1	0.0	4.3	18.3	36.6	40.8

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	37	16	0.25		0.01					

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN CLAY AND SILT, Ltle Sand, tr gravel, ORGNCS	CL	

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION
● Location: DLP-A-SS #1

Date: JANUARY 16, 1992

Remarks:
CLIENT: URS CONSULTANTS

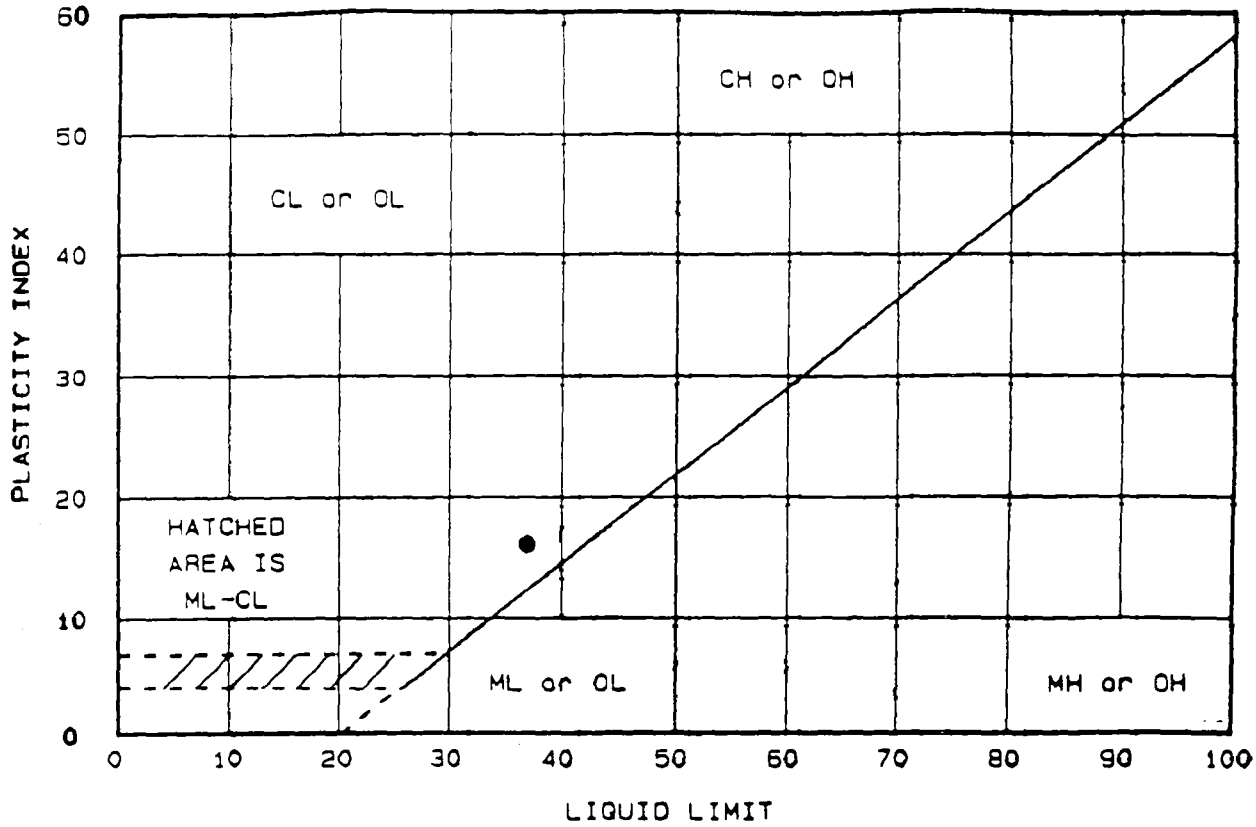
LAB NO. 1123.001

GRAIN SIZE DISTRIBUTION TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

Figure No. 1

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	OLP-A-SS #1	37	21	16	77.37	CL, Lean clay with sand

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION

Client: URS CONSULTANTS, INC.
Location:

Date: JAN. 16, 1992

Remarks:

MATERIAL SIEVED THRU #40 SIEVE

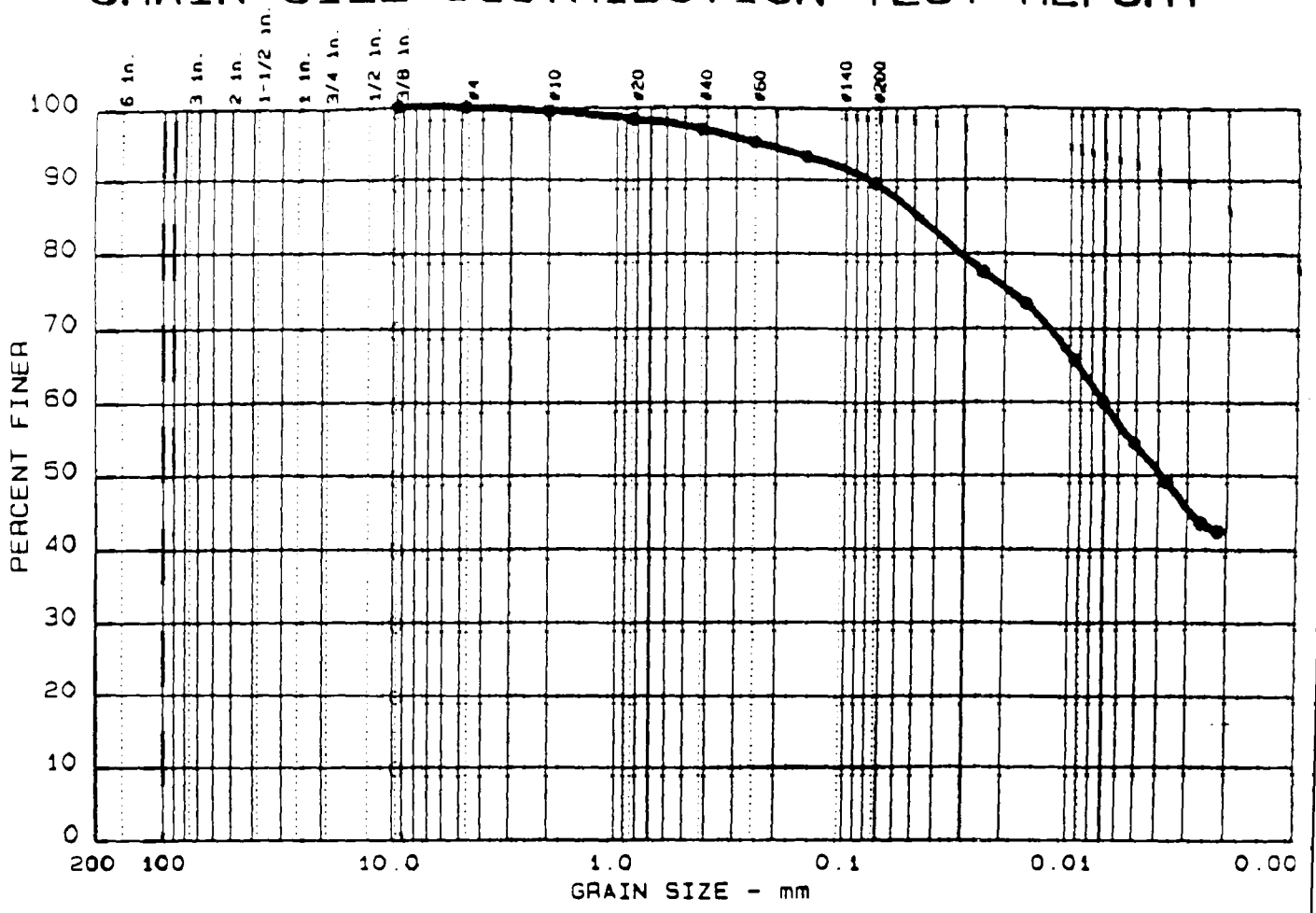
LAB NO. 1123.001

LIQUID AND PLASTIC LIMITS TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

Fig. No. 1

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	2	0.0	0.2	10.3	35.5	54.0

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	45	23			0.00					

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN CLAY AND SILT, Ltle Sand, tr gravel, ORGNCS	CL	

Project No.: G008.00B
Project: DUNLOP TIRE CORPORATION
● Location: DLP-A-SS #2

Date: JANUARY 16, 1992

Remarks:
CLIENT: URS CONSULTANTS

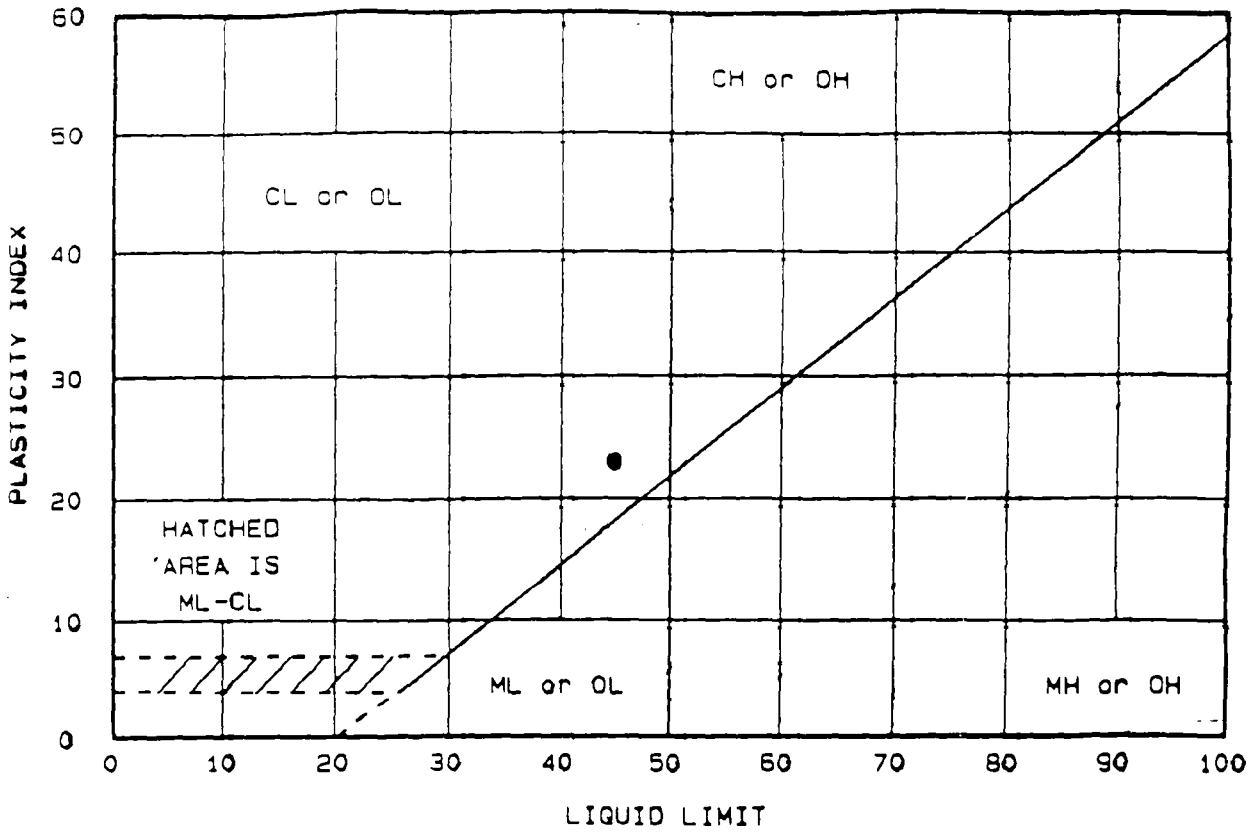
LAB NO. 1123.002

GRAIN SIZE DISTRIBUTION TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

Figure No. 1

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	DLP-A-SS #2	45	22	23	89.50	CL, Lean clay

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION

Client: URS CONSULTANTS, INC.
Location:

Date: JAN. 16, 1992

Remarks:

MATERIAL SIEVED THRU
#40 SIEVE

LAB NO. 1123.002

LIQUID AND PLASTIC LIMITS TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

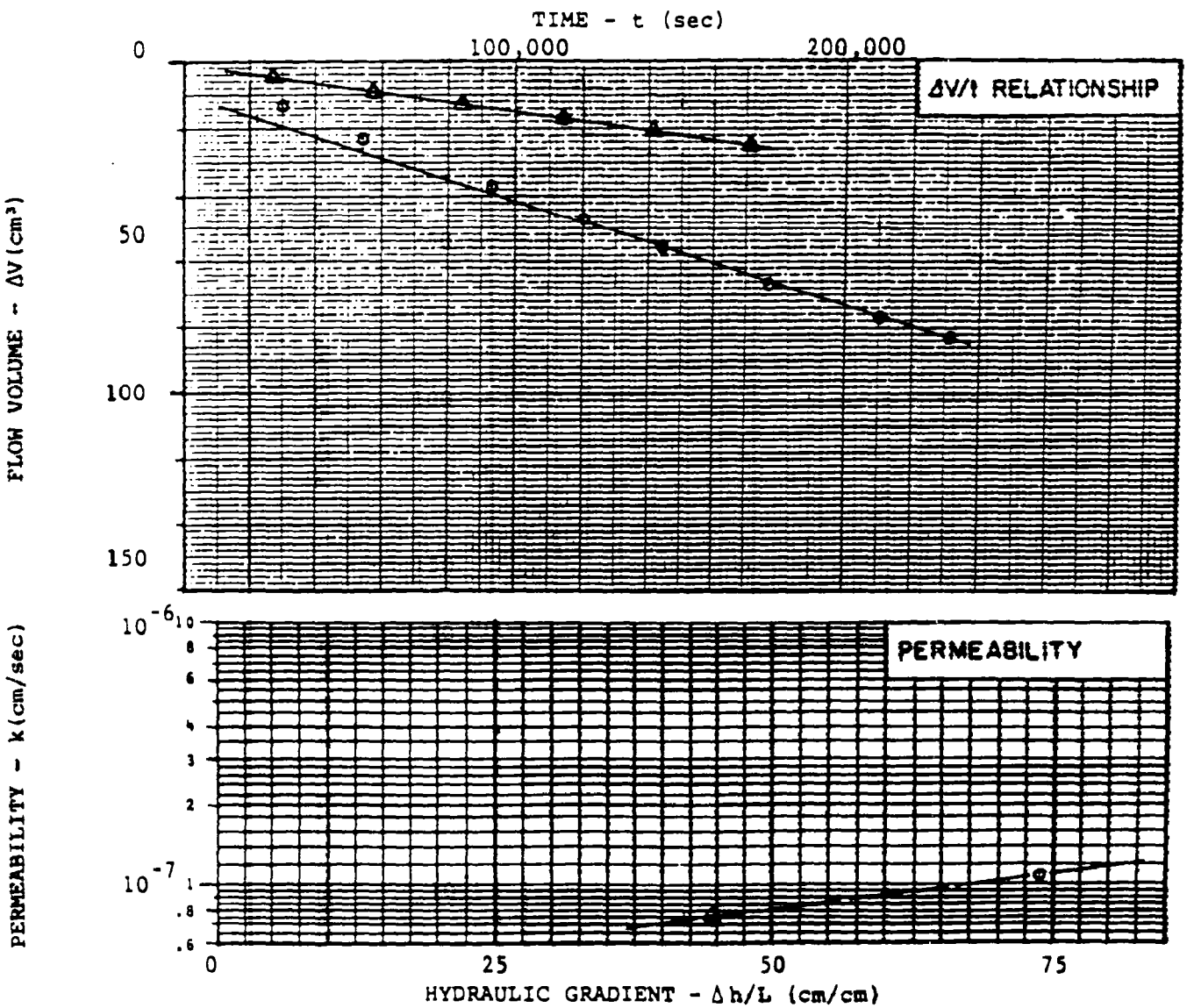
Fig. No. 1

EMPIRE
SOILS INVESTIGATIONS INC

APPENDIX B
PERMEABILITY TESTS

1123.001

TEST DATA:			SAMPLE DATA:	
Specimen Height (cm):	5.67		Sample Identification:	LAB NO. 1123.001
Specimen Diameter (cm):	7.26			DLP-A-SS#1 (8+50E/7+00N)
Dry Unit Weight (pcf):	105.2		Visual Description:	Brown & Grey SILT &
Moisture Content Before Test (%):	18.4			CLAY, trace Topsoil & rootlets
Moisture Content After Test (%):	19.3		Remarks:	Blocky structure, but no
Cell Confining Pressure (psi):	95.0			open fissures observed.
Test Pressure (psi):	85.9	83.1	Maximum Dry Density	
Back Pressure (psi):	80.2	79.8	(ASTM D ____) (pcf):	
Differential Head (psi):	5.7	3.3	Optimum Moisture Content (%):	
Flow Rate ($\Delta V/t$) (cm^3/sec) O	3.19×10^{-4}	Δ 1.38×10^{-4}	Percent Compaction:	
Permeability (cm/sec): O	1.04×10^{-7}	Δ 7.51×10^{-8}	Permeameter Type:	FLEXIBLE WALL



EMPIRE SOILS INVESTIGATIONS INC.

PERMEABILITY TEST REPORT

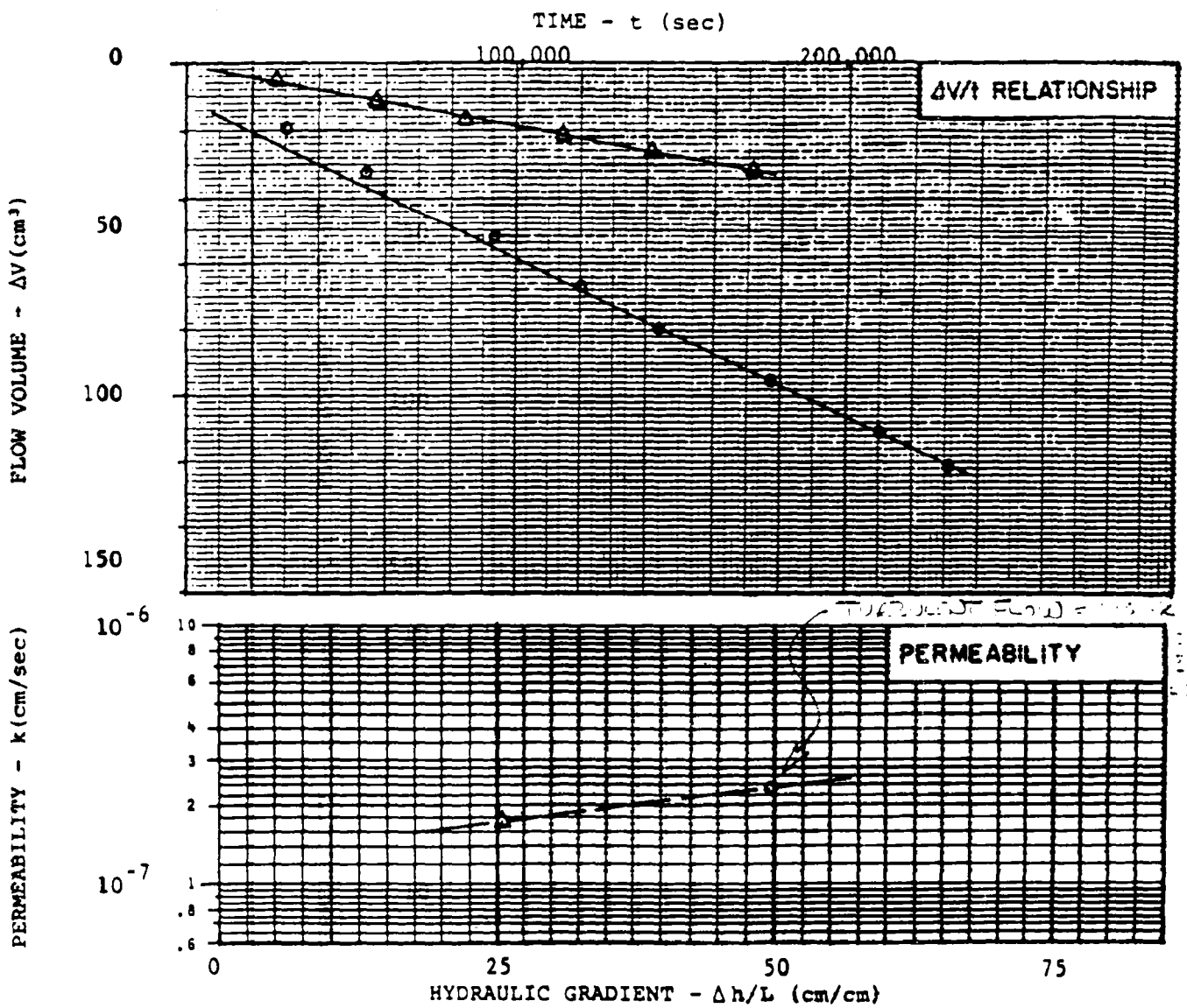
DUNLOP TIRE CORPORATION

BUFFALO, NEW YORK

DR BY: JFC	CK'D. JFC	DATE: JAN, 1992	PROJ.NO. G008.008

1123.002

TEST DATA:			SAMPLE DATA:
Specimen Height (cm):	6.24		Sample Identification: LAB NO. 1123.002
Specimen Diameter (cm):	7.28		DLP-A-SS#2 (7+50E/8+00N)
Dry Unit Weight (pcf):	99.9		Visual Description: Mottled Brown SILT &
Moisture Content Before Test (%):	22.3		CLAY, trace rootlets
Moisture Content After Test (%):	22.9		Remarks: Blocky structure, but no
Cell Confining Pressure (psi):	95.0		open fissures observed.
Test Pressure (psi):	85.5	82.1	Maximum Dry Density
Back Pressure (psi):	81.3	80.1	(ASTM D ____) (pcf): ____
Differential Head (psi):	4.2	2.0	Optimum Moisture Content (%): ____
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 4.76×10^{-4}	Δ 1.80×10^{-4}	Percent Compaction: ____
Permeability (cm/sec):	O 2.29×10^{-7}	Δ 1.69×10^{-7}	Permeameter Type: FLEXIBLE WALL



EMPIRE SOILS INVESTIGATIONS INC

PERMEABILITY TEST REPORT

DUNLOP TIRE CORPORATION

BUFFALO, NEW YORK

DR BY: JFC	CK'D JFC	DATE: JAN, 1992	PROJ. NO. G008.008

GZA-GEOENVIRONMENTAL OF NEW YORK
364 Nagel Drive
Buffalo, New York 14225
(716) 685-2300

FACSIMILE COVER SHEET

To: CHUCK HURLEY	From: ROB REDENBACH

Date: 8/11/92	Time: 11:42	File No.: R6007.00

Fax Number: (716) 856-2545	GZA's Fax No.: (716) 685-3629

Number of Pages Including Cover Sheet: 19

Regarding: LABORATORY TEST DATA FOR BAG SAMPLES COLLECTED FROM UNDISTURBED "AREA C" COVER

Comments: HARD COPY TO FOLLOW.

*SAMPLE NUMBERS ASSIGNED BY GZA BECAUSE OF DUPLICATED STATION LOCATIONS. IF THESE POSE ANY PROBLEMS PLEASE NOTIFY US ASAP.

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

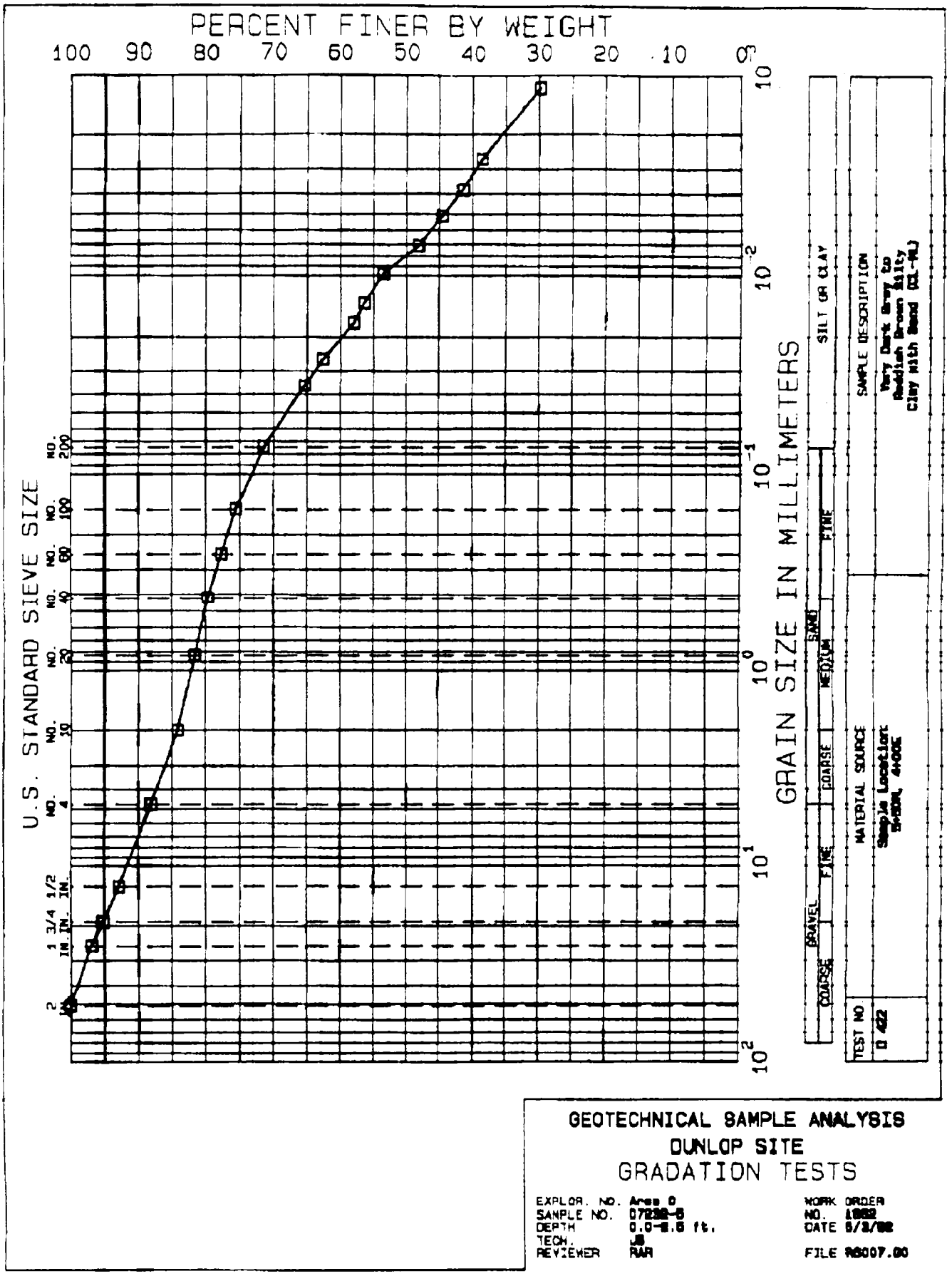
PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LENNARDT

MATERIAL SOURCE: AREA C, DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 7/24/92 WORK ORDER NO. 1662

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE STA.	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
5+50N 4+00E	07232-5	0.0-2.5	21.0				71	35								Very Dark Gray to Reddish Brown Silty Clay with Sand (CL-ML)
6+00N 6+50E	07232-6	0.0-1.2	22.4				86	47								Dark Reddish Brown Lean Clay, trace Organics (CL)
4+50N 7+00E	07232-7	0.0-1.7	21.8				77	37								Very Dark Gray to Reddish Brown Lean Clay with Sand, trace Organics (CL)
2+00N 4+00E	07232-8	0.8-2.8	18.9				85	40								Dark Gray to Reddish Brown Lean Clay with Sand, trace Waste (CL)

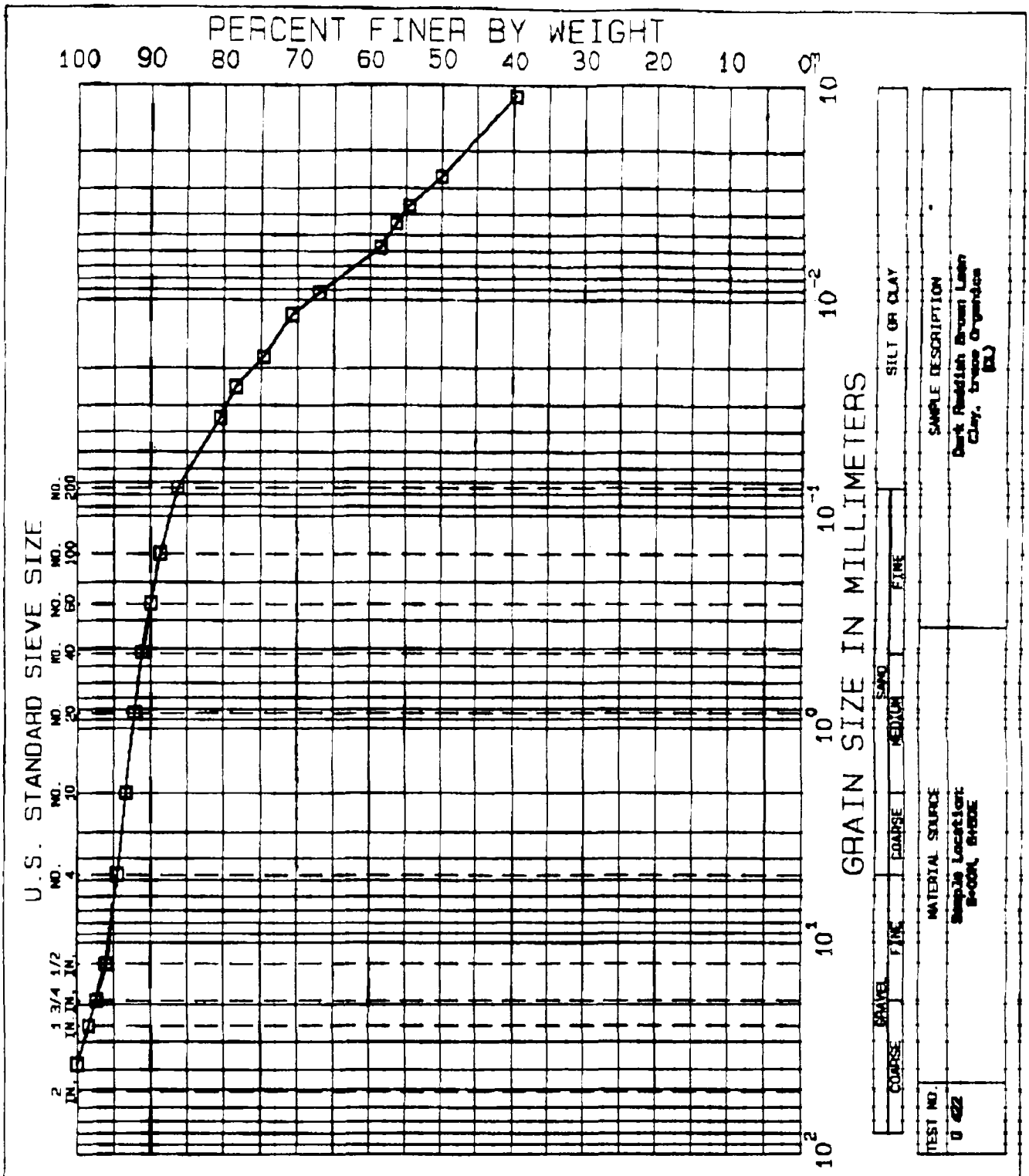
GZA GeoEnvironmental of New York
Engineers and Scientists

08/11/92 11:44 716 595 3529 326 BUFFALO P.02



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

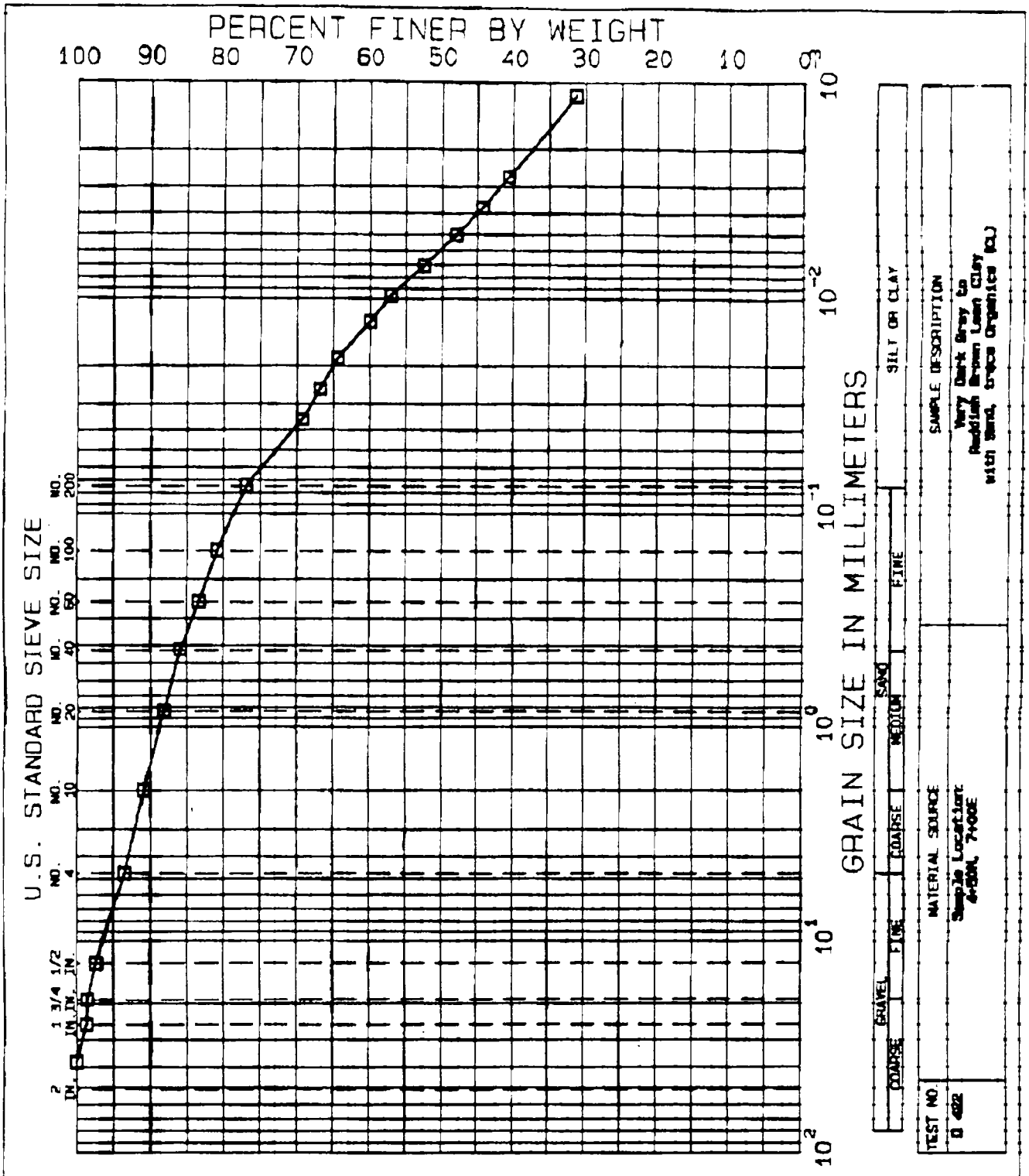
EXPLOR. NO.	Area D	WORK ORDER NO.	1992
SAMPLE NO.	D7292-S		
DEPTH	0.0-2.0 ft.	DATE	8/3/92
TECH.	JB		
REVIEWER	RAR	FILE	R8007.00



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Area C	WORK ORDER NO.	12858
SAMPLE NO.	07SB2-S		
DEPTH	0.0-1.2 ft.	DATE	7/30/92
TECH.	JB		
REVIEWER	RAR	FILE	RS007.00

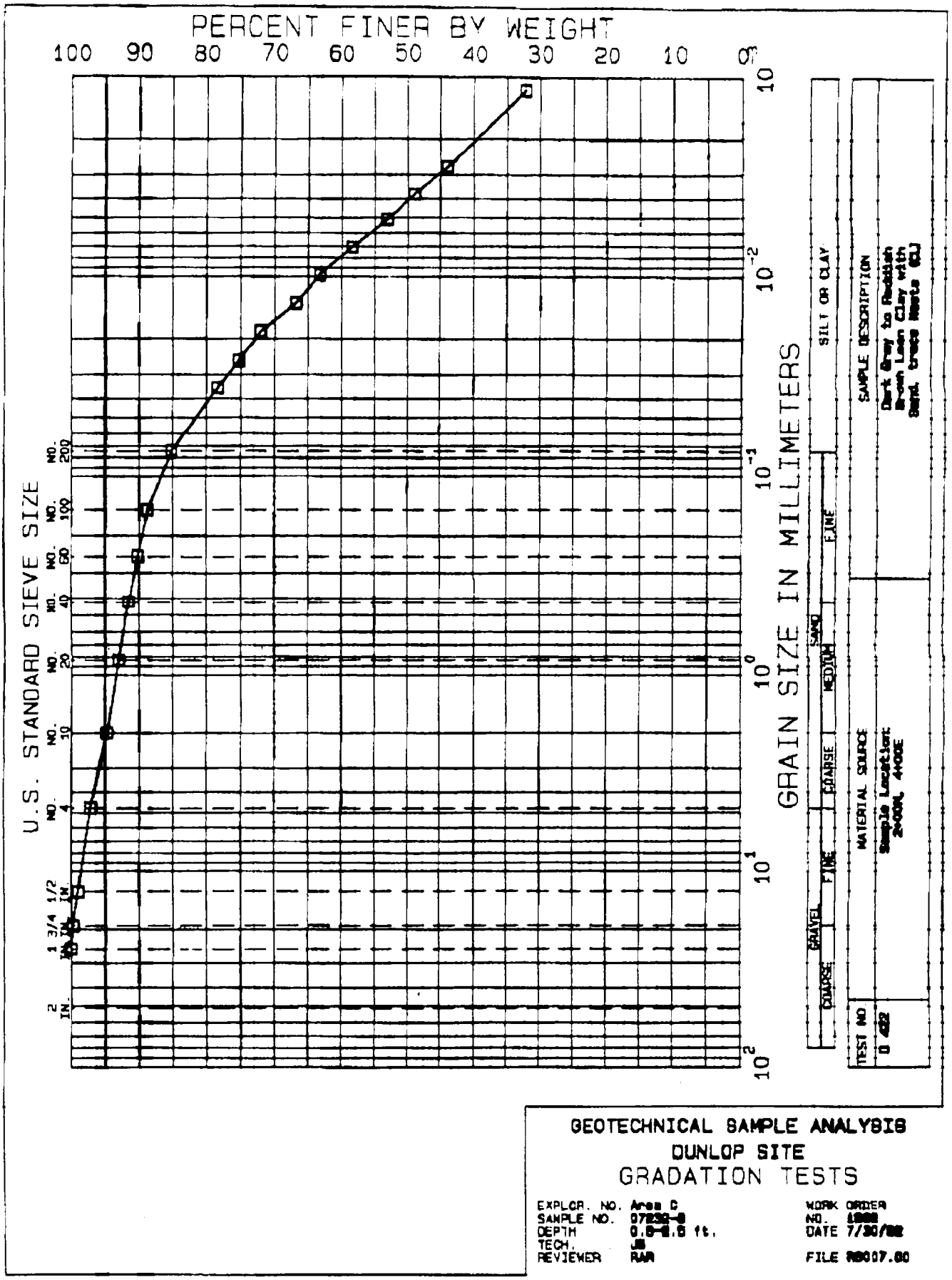
GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Area C	WORK ORDER NO.	[illegible]
SAMPLE NO.	07288-7		
DEPTH	6.0-6.7 ft.	DATE	7/30/[illegible]
TECH.	JB		
REVIEWER	RAR	FILE	#8007.00

GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS

DUNLOP SITE

GRADATION TESTS

EXPLOR. NO.	Area C	WORK ORDER NO.	[illegible]
SAMPLE NO.	07E3C-B		
DEPTH	0.0-[illegible] ft.	DATE	7/30/92
TECH.	JB		
REVIEWER	RAR	FILE	R9007.00

GZA GeoEnvironmental of New York
Engineers and Scientists

APPENDIX A.2

MATERIAL QUALITY

AND PERMEABILITY TEST DATA

CLAY BORROW AREA EAST OF SETTLING POND

AND AREA 'A' CLAY STOCKPILE

C+

URS

AN INTERNATIONAL PROFESSIONAL SERVICES ORGANIZATION

January 28, 1992

URS CONSULTANTS, INC.
282 DELAWARE AVENUE
BUFFALO, NEW YORK 14202-1805
(716) 856-5636
FAX: (716) 856-2545

ATLANTA
BOSTON
BUFFALO
CLEVELAND
COLUMBUS
DENVER
NEW YORK
PARAMUS NJ
NEW ORLEANS
SAN FRANCISCO
SAN MATEO
SEATTLE
WALNUT CREEK
WASHINGTON DC

Mr. Daniel J. Pyanowski
Environmental & Services Engineer
Dunlop Tire Corporation
P.O. Box 1109
Buffalo, New York 14240

RE: DUNLOP TIRE CORPORATION
INVESTIGATION OF HAZARDOUS WASTE SITES
GEOTECHNICAL TESTING RESULTS

Dear Mr. Pyanowski:

Enclosed are three (3) copies of the Empire Soil Laboratory report for soil samples collected by URS on January 6, 1992. Laboratory tests were performed on the following samples to determine their suitability as capping material for Waste Site A:

DLP-A-SS #1	Undisturbed block samples of clay (cap) soil from southern
DLP-A-SS #2	portions of Site A.
DLP-A-GS #1	Grab samples from clay borrow pile within northern area of
DLP-A-GS #2	Site A.

The approximate locations from which these samples were obtained are shown in Figure 1. Grain size analysis of the four samples indicate a silty clay soil (USCS: CL - lean clay as per ASTM Designation 2487-85) with a moderate to low plasticity. The high percentage of fines (74 to 89 percent finer than 0.074 mm) confirms the inherent impervious nature of both the existing clay cap and recent onsite borrow material slated for use as cover on the remainder of Site A.

Permeability tests performed on the two undisturbed 'cap' samples, provided further confirmation of the low permeability of the in-place cover soil. Hydraulic conductivity values of 1×10^{-7} cm/sec and less are derived for test results extrapolated to an effective hydraulic gradient of 1.0 which best simulates actual field conditions.

Please let me know if you have questions or comments, or if you require additional copies.

Very truly yours,

URS CONSULTANTS, INC.

Charles W. Hurley
Project Manager

CWH/DRL/ys
Enc.
1-28-92L.DP

cc: Mr. John Gorton - URS
Mr. Duane Lenhardt - URS
Mr. Mike Gutmann - URS
File: 35246.00 (1000)

EMPIRE
SOILS INVESTIGATIONS INC

JAN 2 4 1992

GEOTECHNICAL TESTING REPORT
DUNLOP TIRE CORPORATION
BUFFALO, NEW YORK

FOR:
URS CONSULTANTS, INC.
BUFFALO, NEW YORK

JOB NO. G008.008
JANUARY, 1992

EMPIRE SOILS INVESTIGATIONS INC
Corporate Offices:
140 TELEGRAPH ROAD • P.O. BOX 297 • MIDDLEPORT, NY 14105 • 716/735-3502 FAX 716/735-9

January 22, 1991

Mr. Duane R. Lenhardt, PhD
URS Consultants, Inc.
282 Delaware Avenue
Buffalo, New York 14202-1805

Dear Mr. Lenhardt:

SUBJECT: GEOTECHNICAL TESTING
DUNLOP TIRE CORPORATION, BUFFALO, NEW YORK

Transmitted herewith are the results of geotechnical testing performed on two (2) undisturbed block samples and two (2) bag samples of soil from the subject project. The work was performed in accord with your telephone conversation and with a letter to Mr. Kevin Czaja on January 7, 1992.

Cylindrical permeability test specimens were trimmed from the block samples. The remaining portion of the block samples have been resealed with cheesecloth and wax and is currently being stored in our wet room.

Trimmings from the block samples and a portion of the material from the bag samples were used for grain size distribution test (ASTM D422) and Atterberg Limits test (ASTM D4318). Individual test reports for these tests are presented in Appendix A.

The permeability tests were performed in accordance with ASTM Designation D 5084 using a backpressure of about 80 psi. Each specimen was subjected to two successive differential pressures, the second one approximately half the magnitude of the first. For material behaving in accord with Darcy's Law, the two test runs should have resulted in close to the same permeability. For these samples compliance with Darcy's Law was not particularly good. This could be due to preferential flow along the path of rootlets noted in the specimens. Examinations of the specimens after testing also indicated a tendency to blocky structure of the soil. The results of the permeability test are contained in Appendix B.

EMPIRE
SOILS INVESTIGATIONS INC

It has been a pleasure working with your firm again on this interesting project. Should you have any questions or in case we may be of further service, do not hesitate to contact the undersigned at 716-735-3400.

Respectfully submitted,

EMPIRE SOILS INVESTIGATIONS, INC.

Jorgen F. Christiansen

Jorgen F. Christiansen, PE
Director, Geotechnical Testing

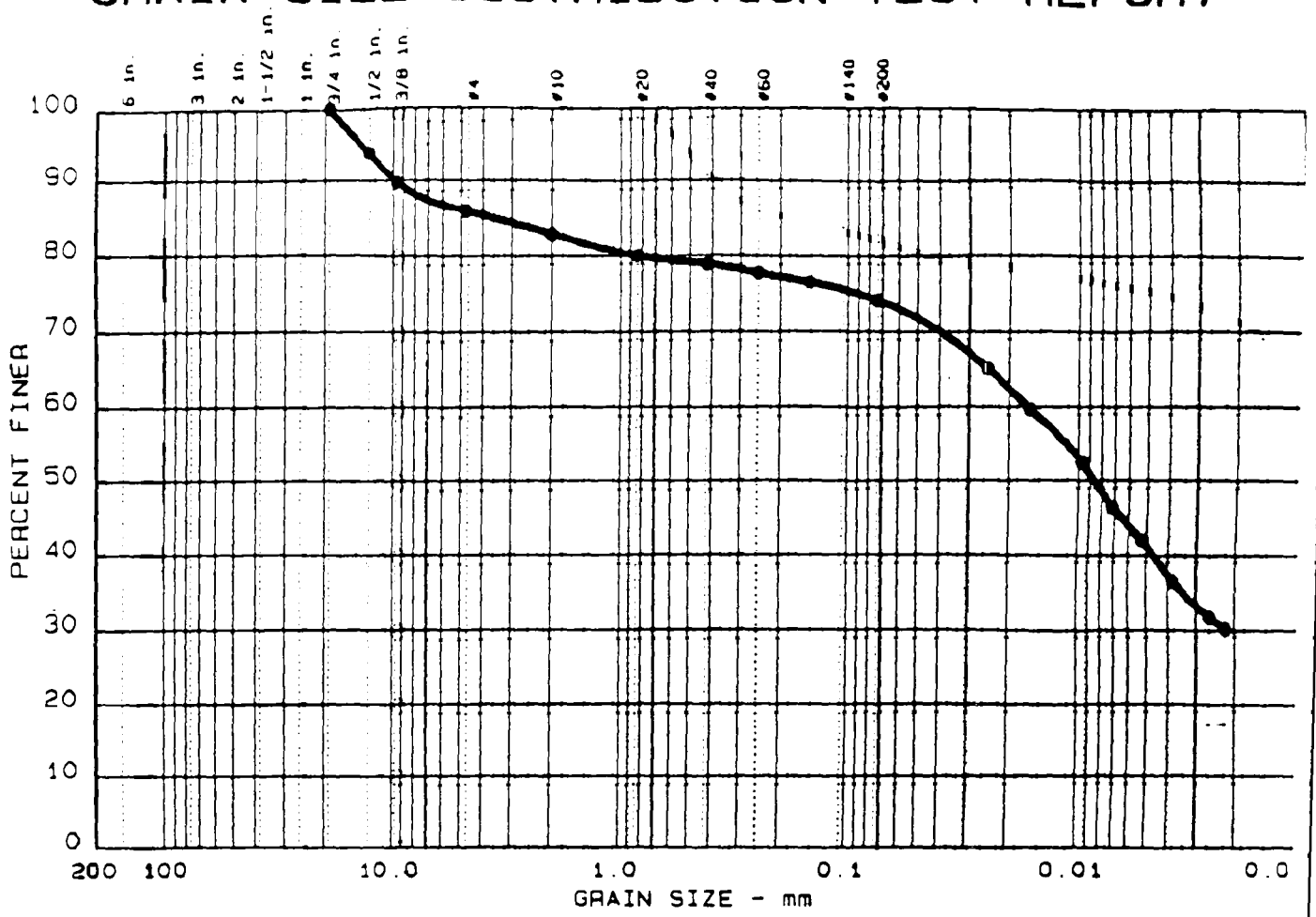
JFC/srk

ENCLOSURES

EMPIRE
SOILS INVESTIGATIONS INC

APPENDIX A
GRAIN SIZE DISTRIBUTION
ATTERBERG LIMITS

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	3	0.0	14.1	11.9	32.9	41.1

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	32	14	3.59		0.01					

MATERIAL DESCRIPTION	USCS	AASHTO
● BROWN CLAY, Some Silt, little gravel & sand	CL	

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION
● Location: DLP-A-GS #1

Date: JANUARY 16, 1992

Remarks:
CLIENT: URS CONSULTANTS

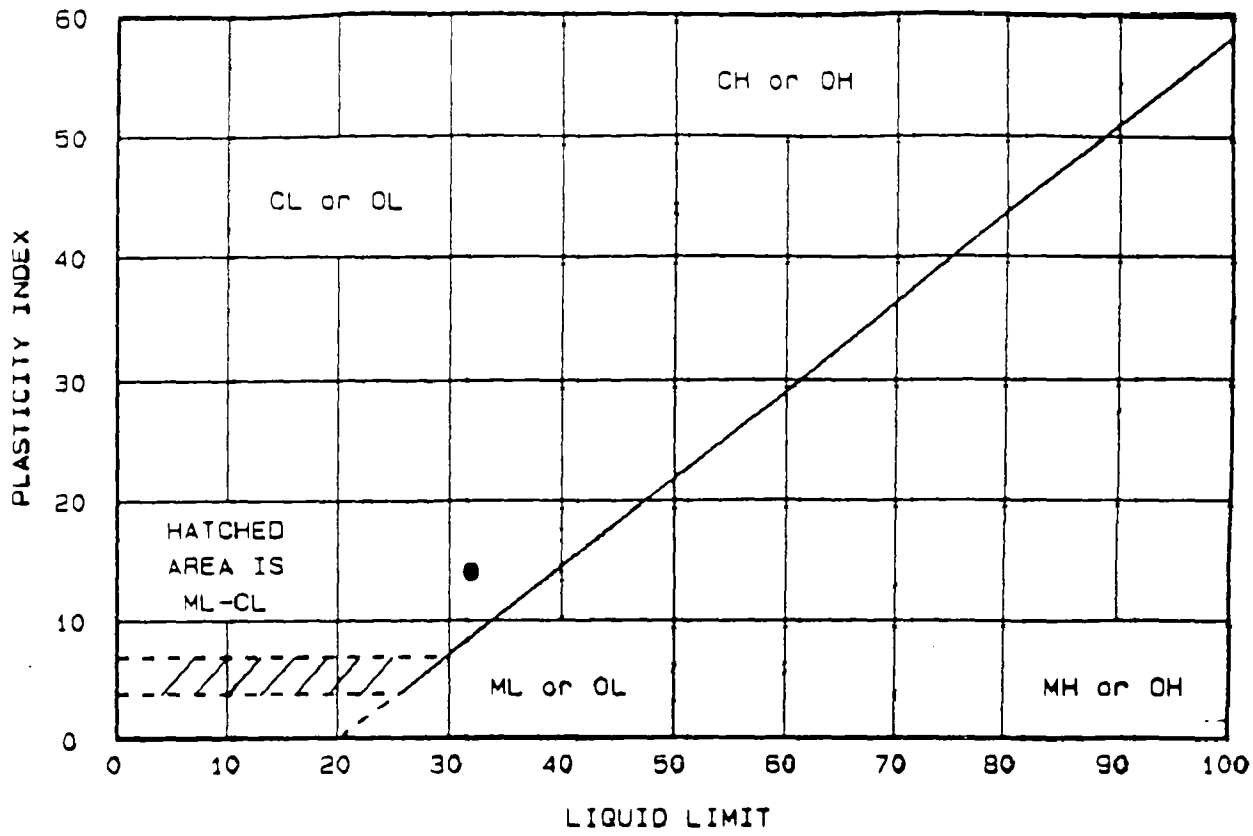
LAB NO. 1123.003

GRAIN SIZE DISTRIBUTION TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

Figure No. 1

LIQUID AND PLASTIC LIMITS TEST REPORT



Location + Description	LL	PL	PI	-200	ASTM D 2487-85
● DLP-A-GS #1	32	18	14	74.05	CL, Lean clay with gravel

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION

Client: URS CONSULTANTS, INC.
Location:

Date: JAN. 16, 1992

LIQUID AND PLASTIC LIMITS TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

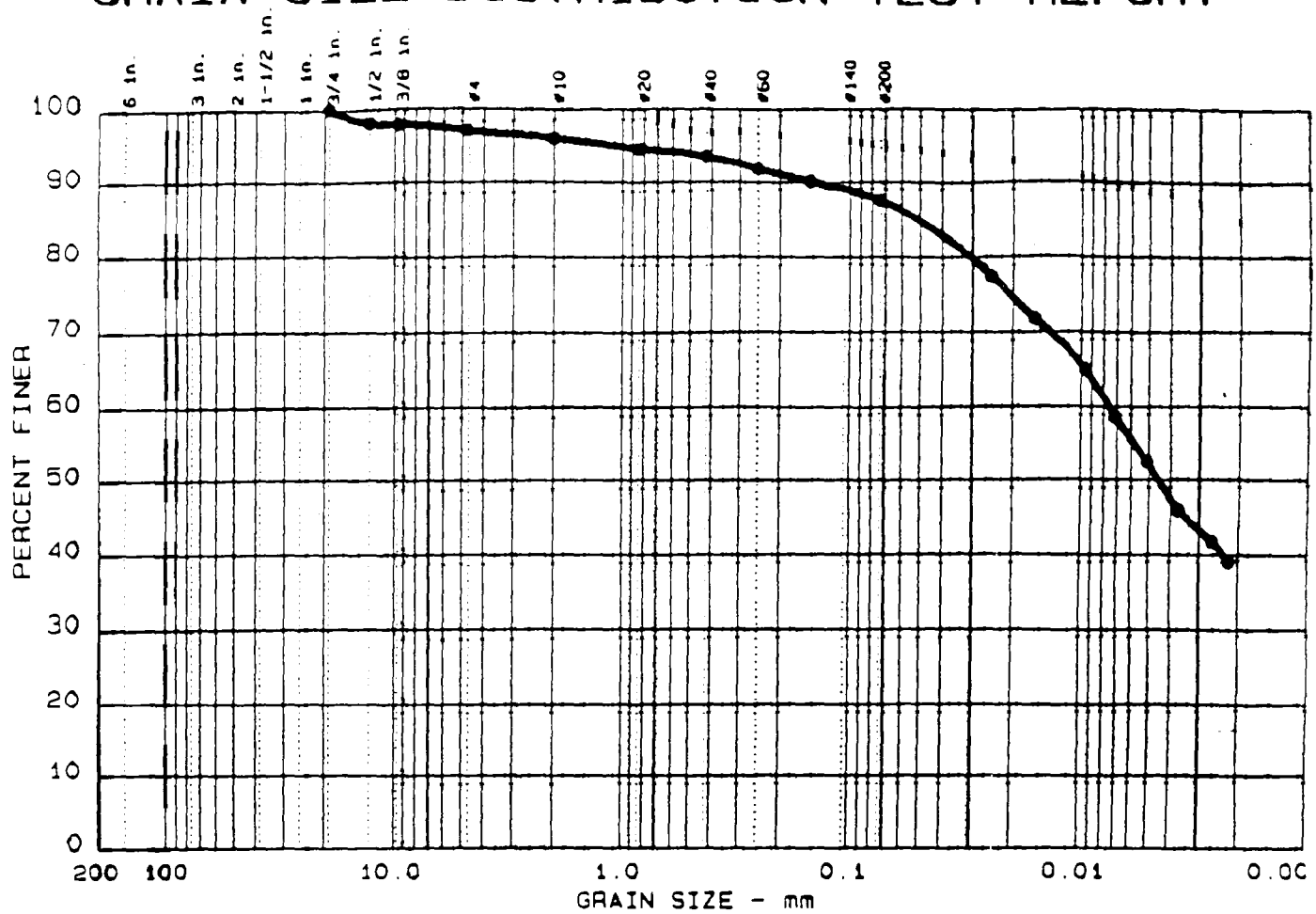
Remarks:

MATERIAL SIEVED THRU #40 SIEVE

LAB NO. 1123.003

Fig. No. 1

GRAIN SIZE DISTRIBUTION TEST REPORT



	Test	% +3"	% GRAVEL	% SAND	% SILT	% CLAY
●	4	0.0	3.0	9.5	35.6	51.9

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●	34	16			0.00					

	MATERIAL DESCRIPTION	USCS	AASHTO
●	BROWN CLAY AND SILT, trace sand & gravel	CL	

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION
● Location: DLP-A-GS #2

Date: JANUARY 16, 1992

Remarks:
CLIENT: URS CONSULTANTS

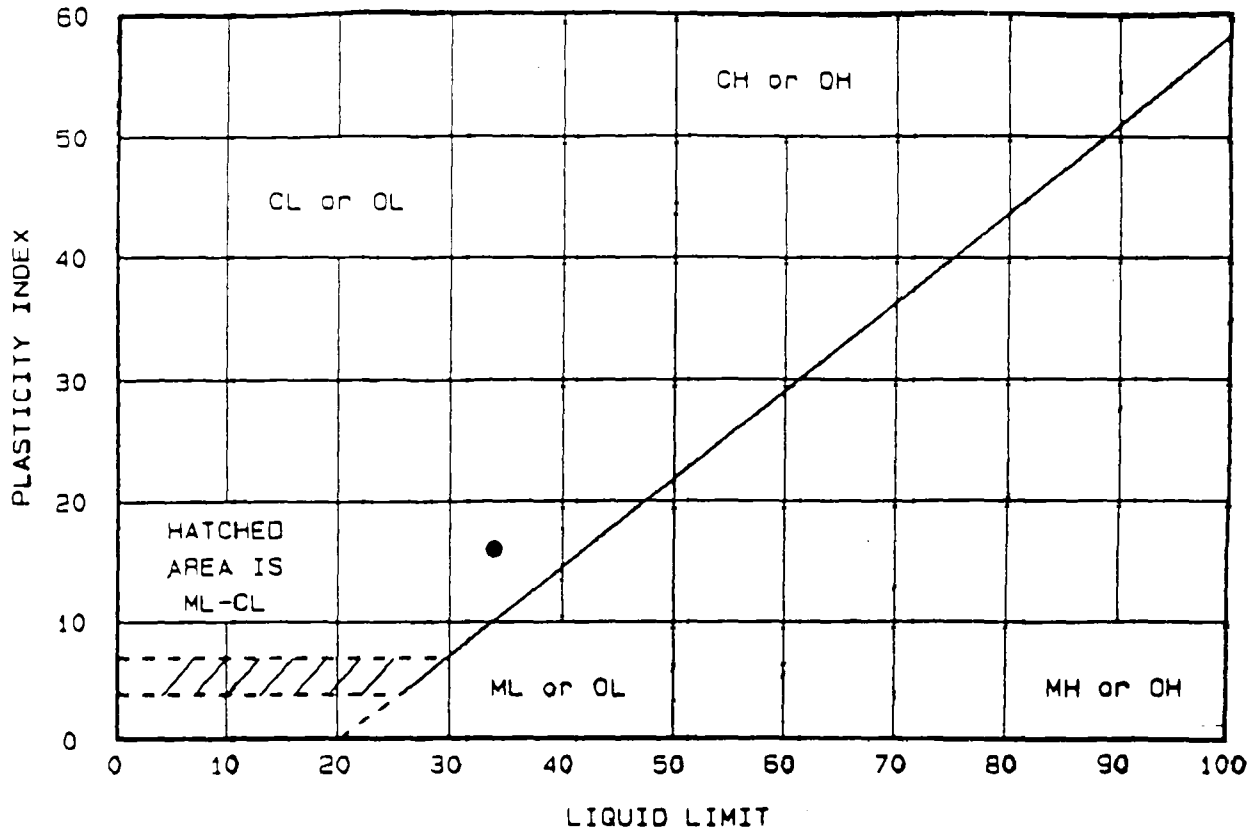
LAB NO. 1123.004

GRAIN SIZE DISTRIBUTION TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

Figure No. 1

LIQUID AND PLASTIC LIMITS TEST REPORT



	Location + Description	LL	PL	PI	-200	ASTM D 2487-85
●	DLP-A-GS #2	34	18	16	87.50	CL, Lean clay

Project No.: G008.008
Project: DUNLOP TIRE CORPORATION

Client: URS CONSULTANTS, INC.
Location:

Date: JAN. 16, 1992

Remarks:

MATERIAL SIEVED THRU
#40 SIEVE

LAB NO. 1123.004

LIQUID AND PLASTIC LIMITS TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC

Fig. No. 1

GZA-GEOENVIRONMENTAL OF NEW YORK
364 Nagel Drive
Buffalo, New York 14225
(716) 685-2300

FACSIMILE COVER SHEET

To: CHUCK HURLEY	From: ROB REDENBACH

Date: 8/11/92	Time: 11:42	File No.: R6007.00

Fax Number: (716) 856-2545	GZA's Fax No.: (716) 685-3629

Number of Pages Including Cover Sheet: 19

Regarding: LABORATORY TEST DATA FOR BAG SAMPLES COLLECTED FROM "BORROW PIT" EAST OF SETTLING POND

Comments: HARD COPY TO FOLLOW.

*SAMPLE NUMBERS ASSIGNED BY GZA BECAUSE OF DUPLICATED STATION LOCATIONS. IF THESE POSE ANY PROBLEMS PLEASE NOTIFY US ASAP.

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LENHARDT

MATERIAL SOURCE: BORROW PIT, DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 7/24/92 WORK ORDER NO. 1662

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE STA.	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
N+65 W+0	07222-6	0.0-2.5	19.0				86	41								Reddish Brown to Black Lean Clay, trace Waste, trace Organics (CL)
N+65 W+0	07222-7	2.5-9.0	18.4	34	17	17	88	39								Reddish Brown Lean Clay (CL)
N+65 W+50	07222-8	0.0-2.0	25.2				81	35								Black to Reddish Brown Lean Clay with Sand, trace Organics (CL)
N+65 W+50	07212-1	3.0-9.0	23.7	46	21	25	90	42								Light Reddish Brown Lean Clay, trace Organics (CL)
N+65 W+100	07222-1	0.0-2.0	18.2				83	38								Reddish Brown to Black Lean Clay with Sand, trace Organics (CL)
N+65 W+100	07222-2	2.7-6.5	20.9	37	20	17	93	45								Dark Brown Lean Clay, trace Organics (CL)
N+65 W+150	07222-3	0.0-2.5	20.0				88	41								Reddish Brown Lean Clay, trace Organics (CL)
N+65 W+150	07222-4	2.5-8.5	15.1	35	17	18	90	41								Reddish Brown Lean Clay, trace Organics (CL)
N+130 W+50	07232-1	0.0-2.5	21.4				85	40								Reddish Brown to Black Lean Clay with Sand, trace Organics (CL)
N+130 W+50	07232-2	3.0-9.0	22.1	40	20	20	89	41								Reddish Brown Lean Clay, trace Organics (CL)
N+130 W+100	07232-3	0.0-2.0	23.9				87	37								Black to Reddish Brown Lean Clay, trace Organics (CL)
N+130 W+100	07232-4	3.0-8.0	25.3	38	18	20	87	38								Brown Lean Clay, trace Organics (CL)

GZA GeoEnvironmental of New York
Engineers and Scientists

08/11/92 11:49 716 695 3529 GZA BUFFALO P.07

GZA GeoEnvironmental of New York
Engineers and Scientists

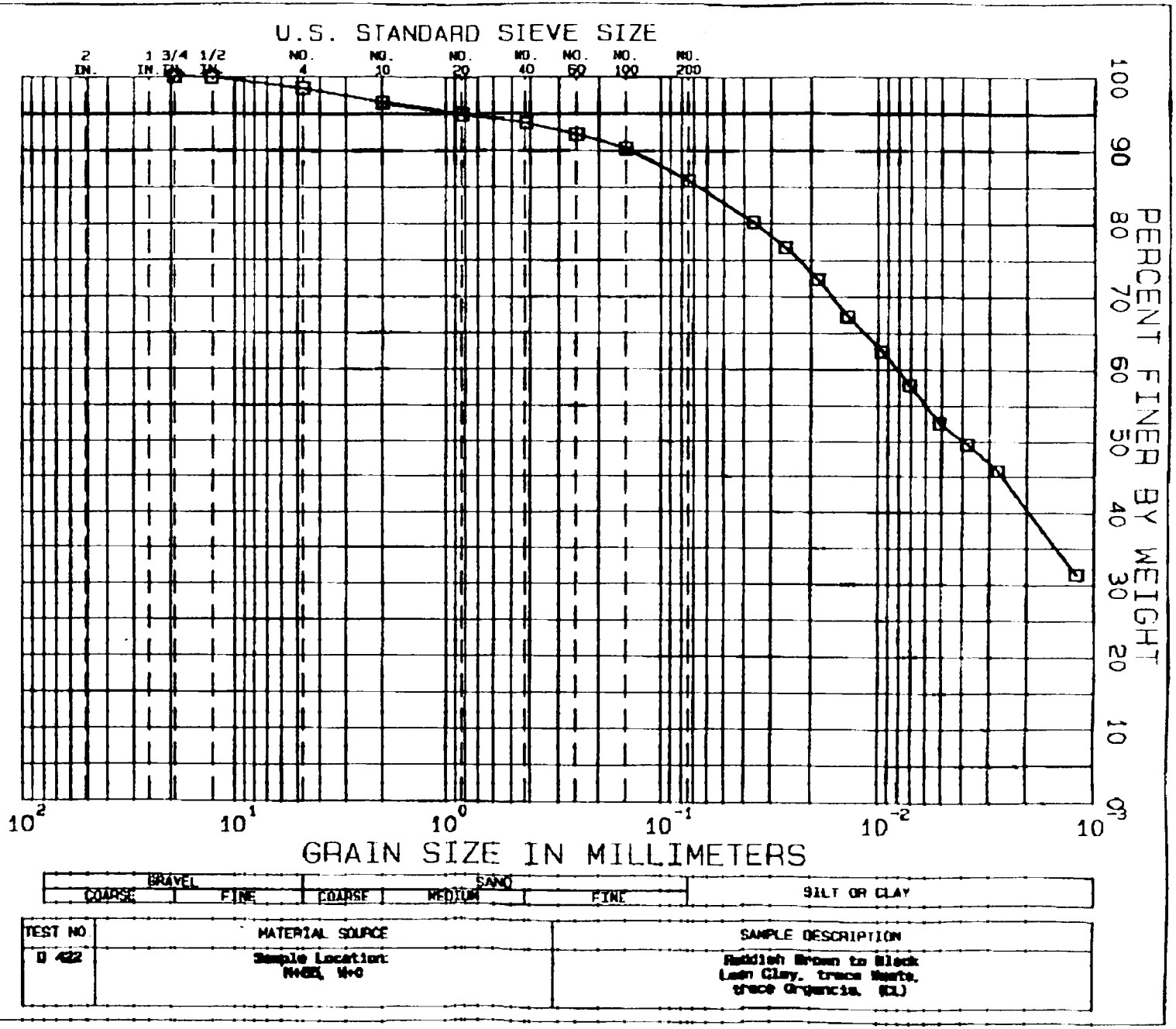
GEOTECHNICAL SAMPLE ANALYSIS

DUNLOP SITE

GRADATION TESTS

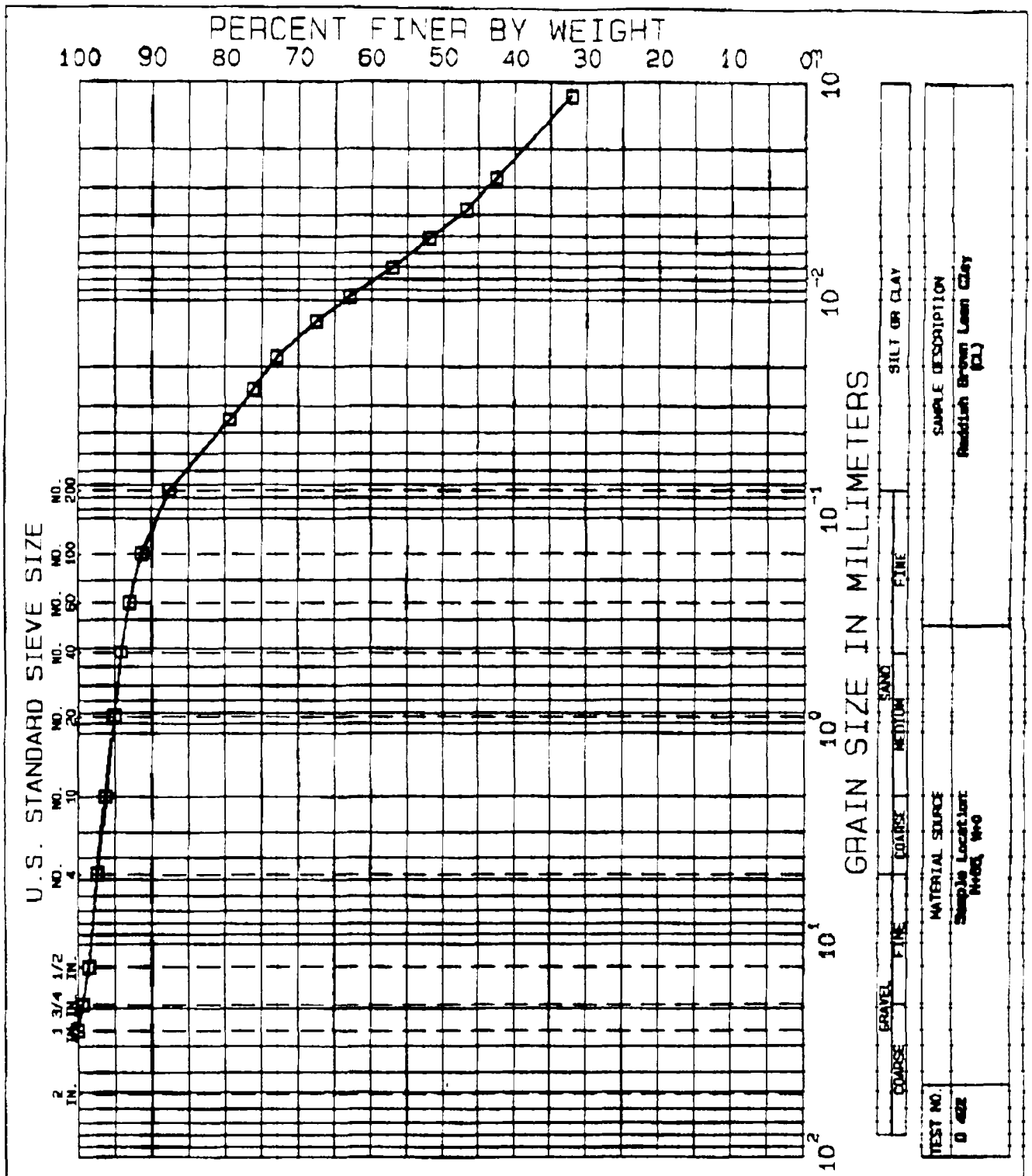
EXPLOR. NO. Borrow Pit
SAMPLE NO. 07888-S
DEPTH 0.0-6.0 ft.
TECH. KS
REVIEWER RWA

WORK ORDER NO. 13888
DATE 7/28/92
FILE #8007.00



TEST NO	MATERIAL SOURCE	SAMPLE DESCRIPTION
B 422	Sample Location: N+65E, W+0	Reddish Brown to Black Lean Clay, trace Waste, trace Organics. (CL)

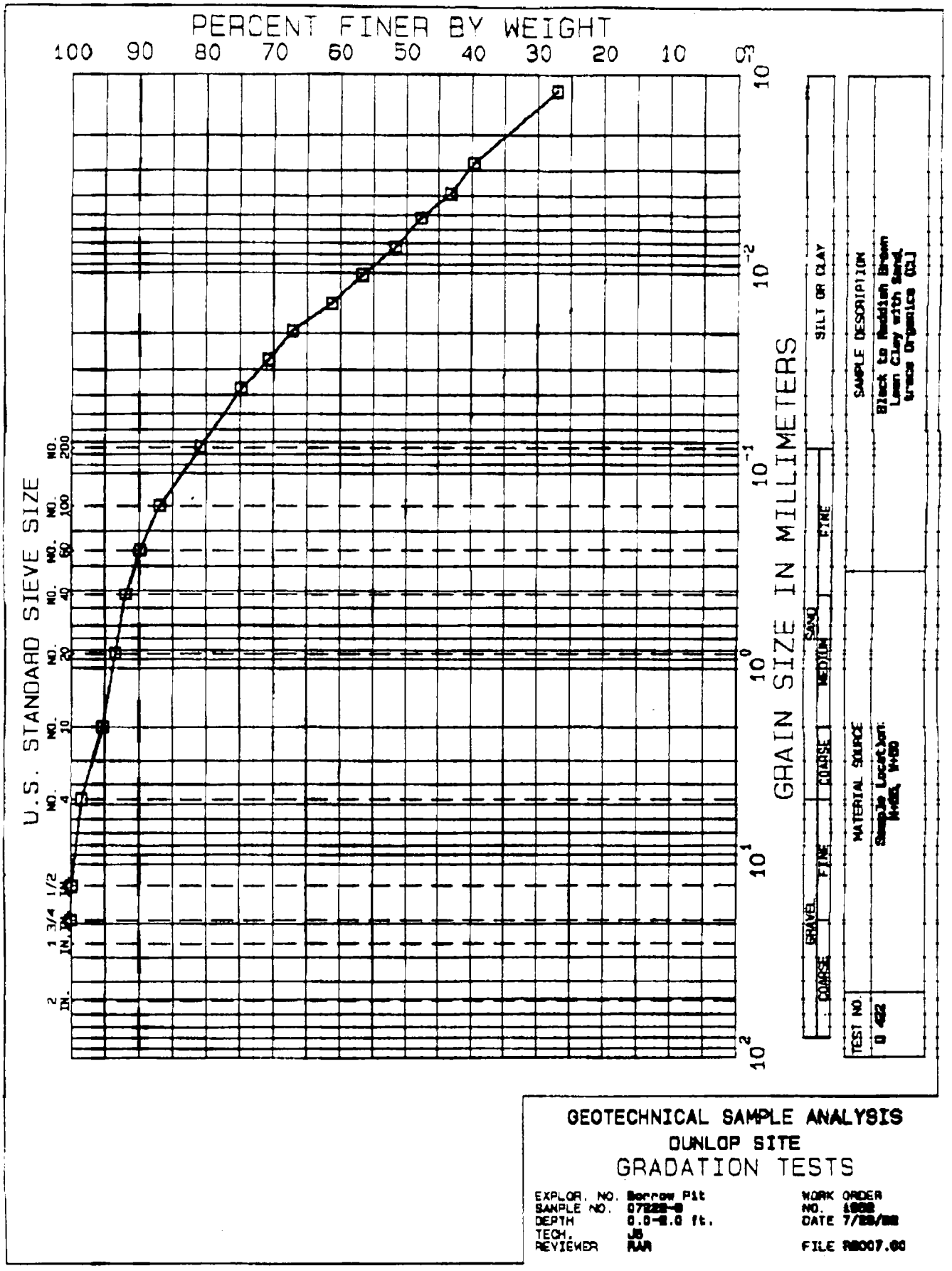
08/11/92 11:53 ☎ 716 685 3529 GZA BUFFALO P.08



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	1868
SAMPLE NO.	07868-7		
DEPTH	2.5-6.0 ft.	DATE	7/30/92
TECH.	JB		
REVIEWER	RAR	FILE	R0007.00

GZA GeoEnvironmental of New York
Engineers and Scientists

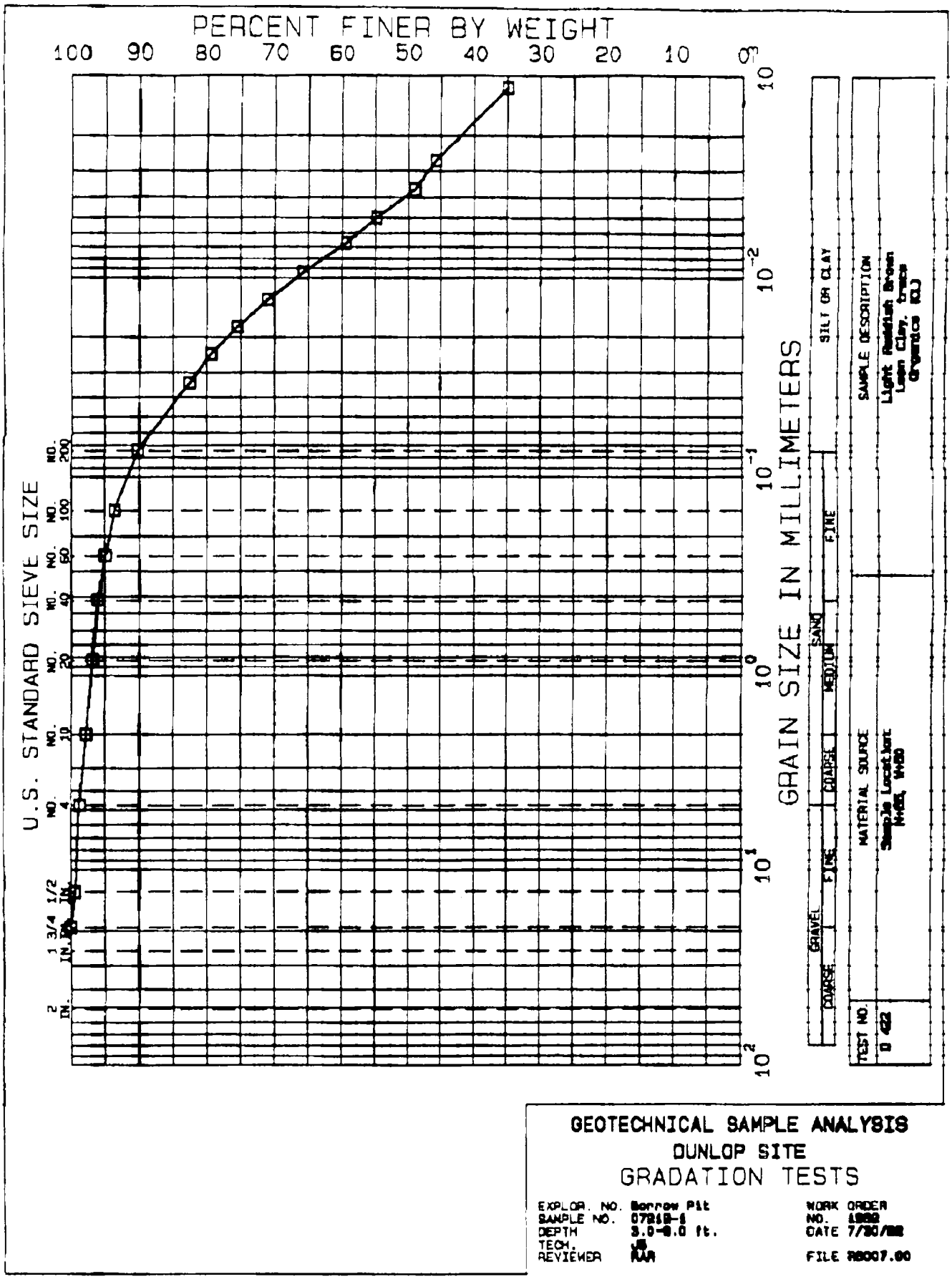


GEOTECHNICAL SAMPLE ANALYSIS

DUNLOP SITE

GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	1998
SAMPLE NO.	07228-B		
DEPTH	0.0-8.0 ft.	DATE	7/28/98
TECH.	JS		
REVIEWER	RAR	FILE	R8007.00



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	1992
SAMPLE NO.	07218-1		
DEPTH	3.0-8.0 ft.	DATE	7/30/92
TECH.	JB		
REVIEWER	KAR	FILE	92007.00

GZA GeoEnvironmental of New York
Engineers and Scientists

GZA GeoEnvironmental of New York
Engineers and Scientists

GEOTECHNICAL SAMPLE ANALYSIS

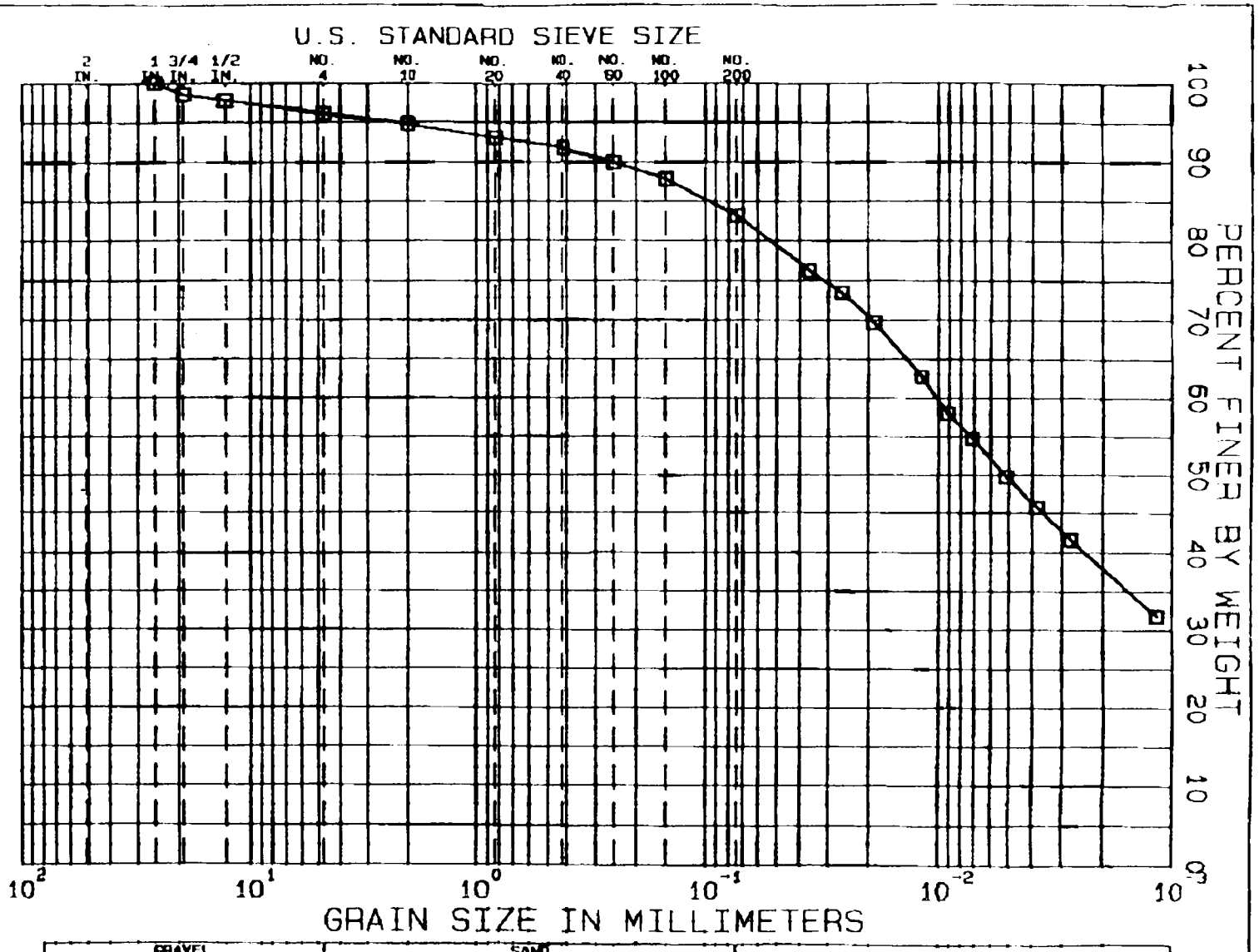
DUNLOP SITE

GRADATION TESTS

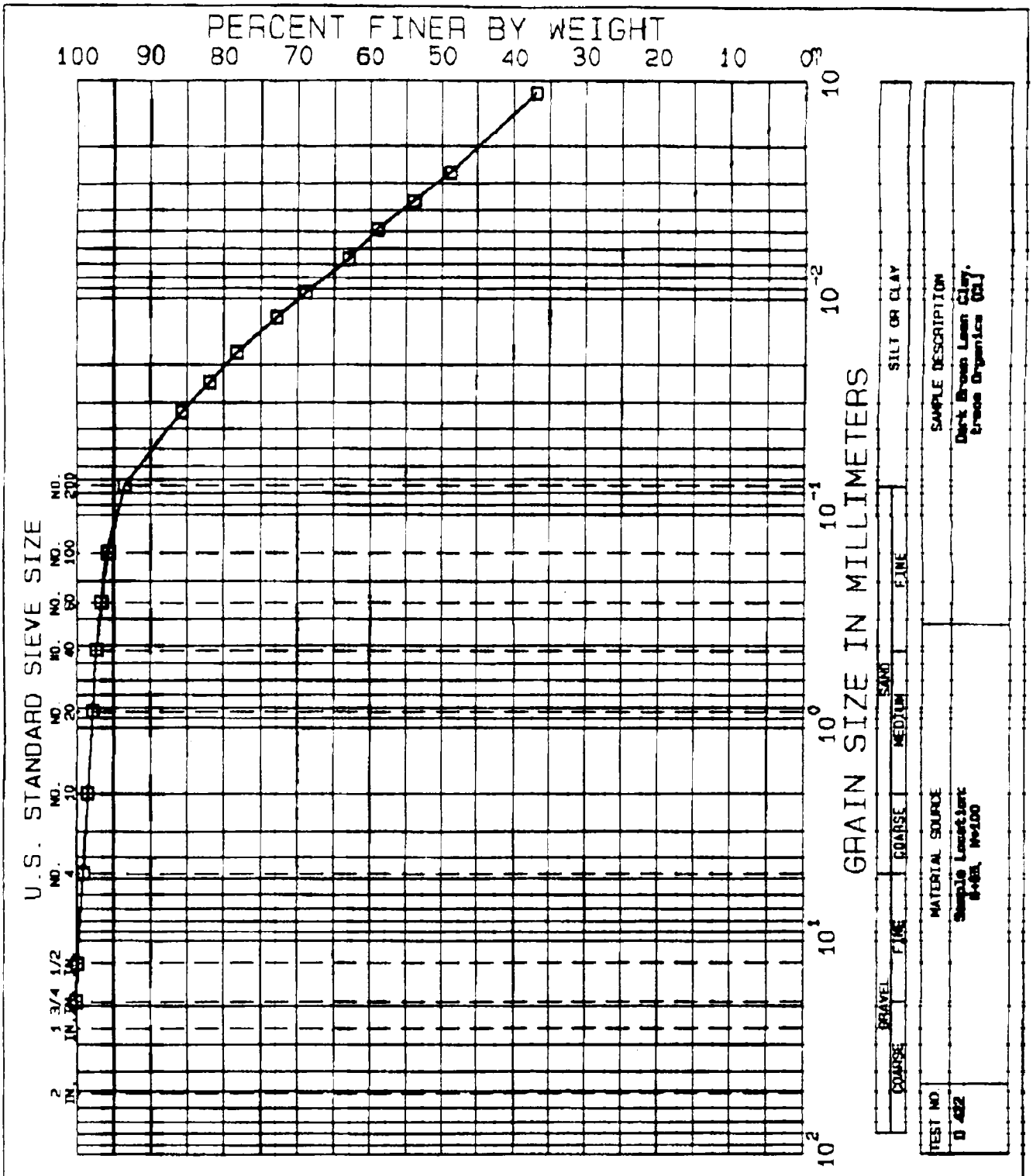
EXPLOR. NO. Bentley Pit
SAMPLE NO. S7
DEPTH 0.0-4.0 ft.
TECH. MJA
REVIEWER MJA

WORK ORDER NO. 1068
DATE 7/28/92

FILE 88007.80



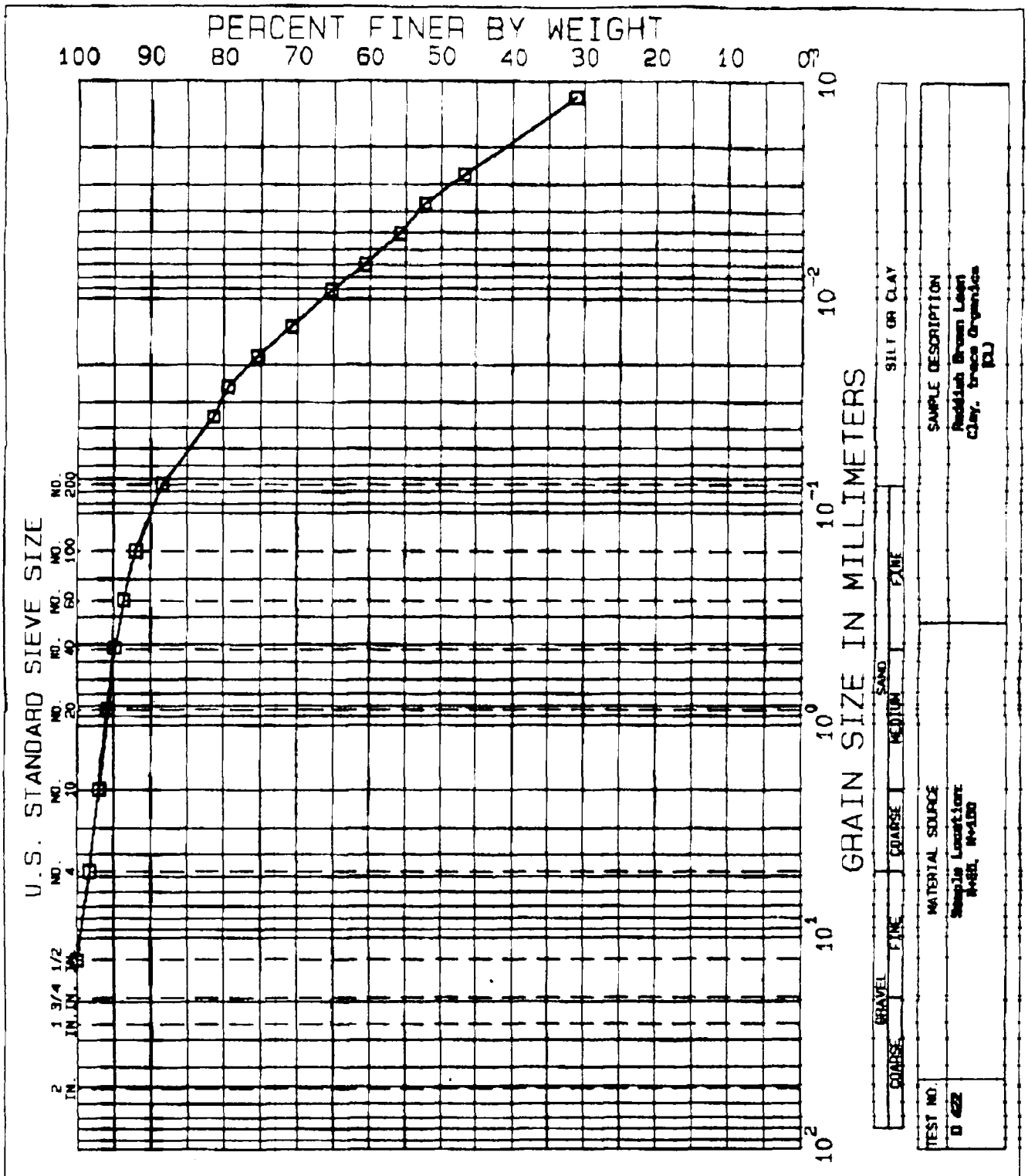
TEST NO.	MATERIAL SOURCE	SAMPLE DESCRIPTION
D 422	Sample Location: B+88, N+100	Reddish Brown to Black Lean Clay with Sand, trace Organics (CL)



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	[illegible]
SAMPLE NO.	07992-B		
DEPTH	5.7-6.5 ft.	DATE	7/30/92
TECH.	JB		
REVIEWER	RAR	FILE	R8007.00

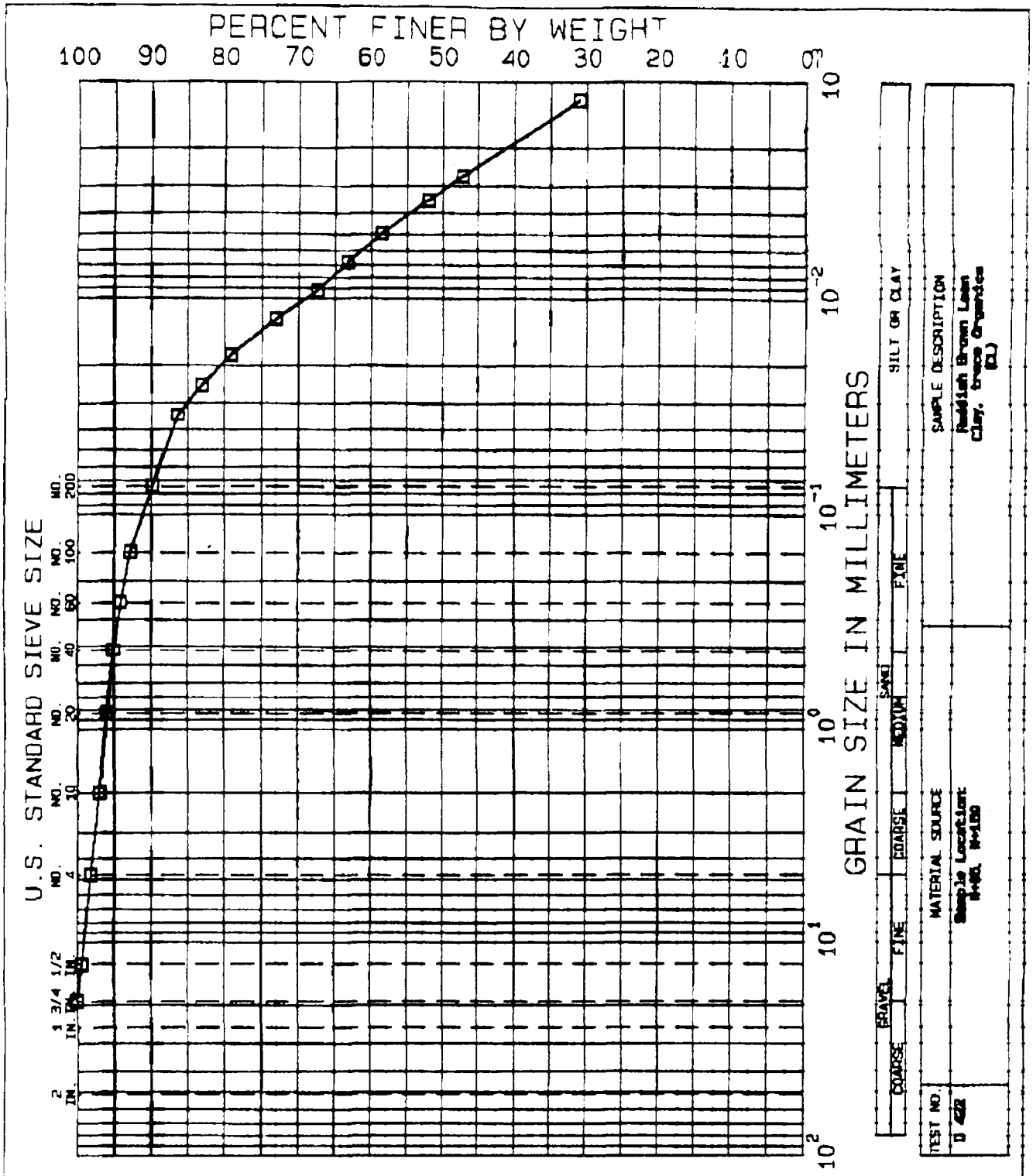
GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	1868
SAMPLE NO.	07288-3	DATE	7/28/92
DEPTH	0.0-8.5 ft.		
TECH.	JB		
REVIEWER	RAR	FILE	RG07.00

GZA GeoEnvironmental of New York
Engineers and Scientists



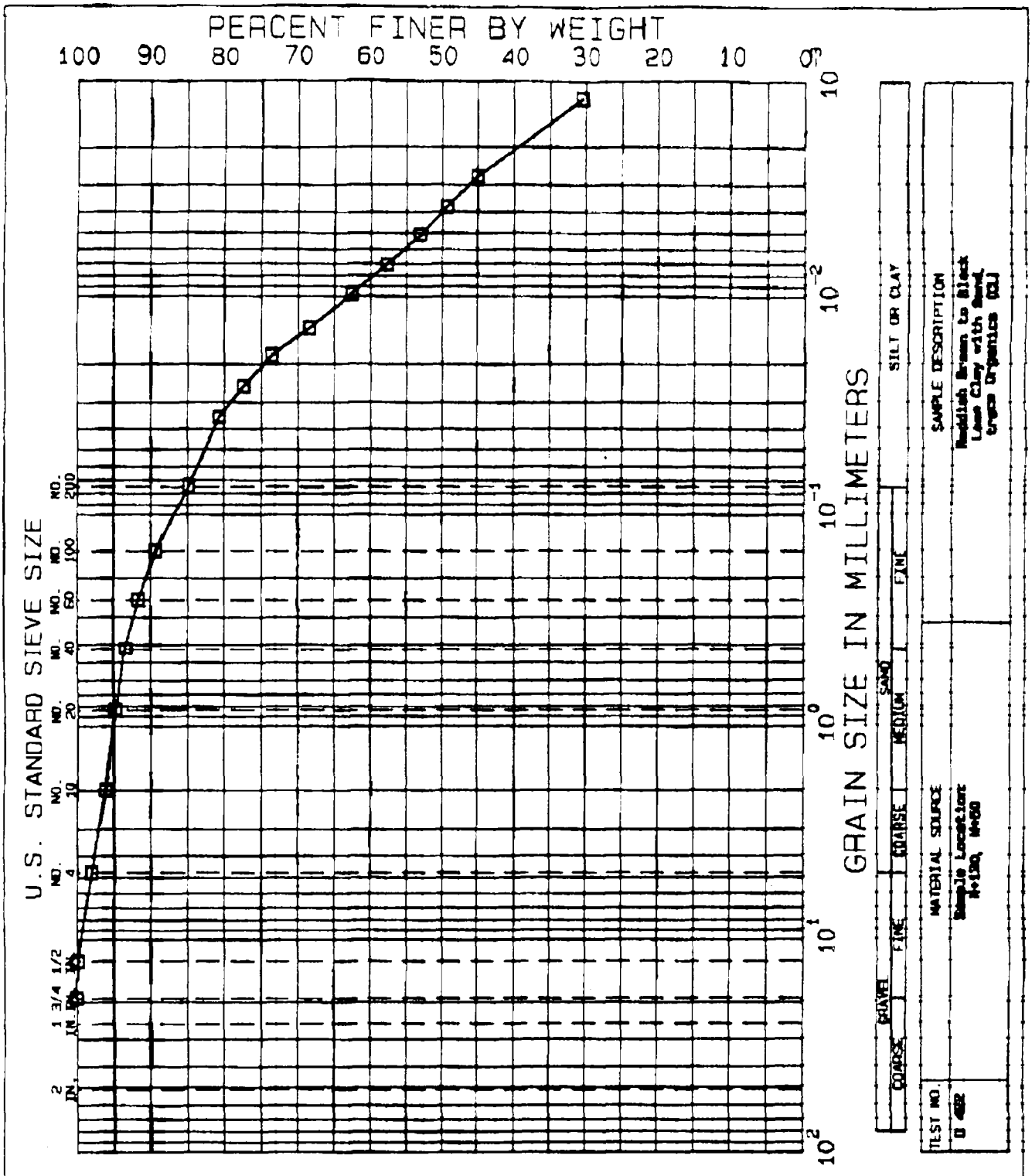
GEOTECHNICAL SAMPLE ANALYSIS

DUNLOP SITE

GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	[illegible]
SAMPLE NO.	07202-4		
DEPTH	8.5-8.8 ft.	DATE	7/[illegible]/92
TECH.	JB		
REVIEWER	RAR	FILE	92007.00

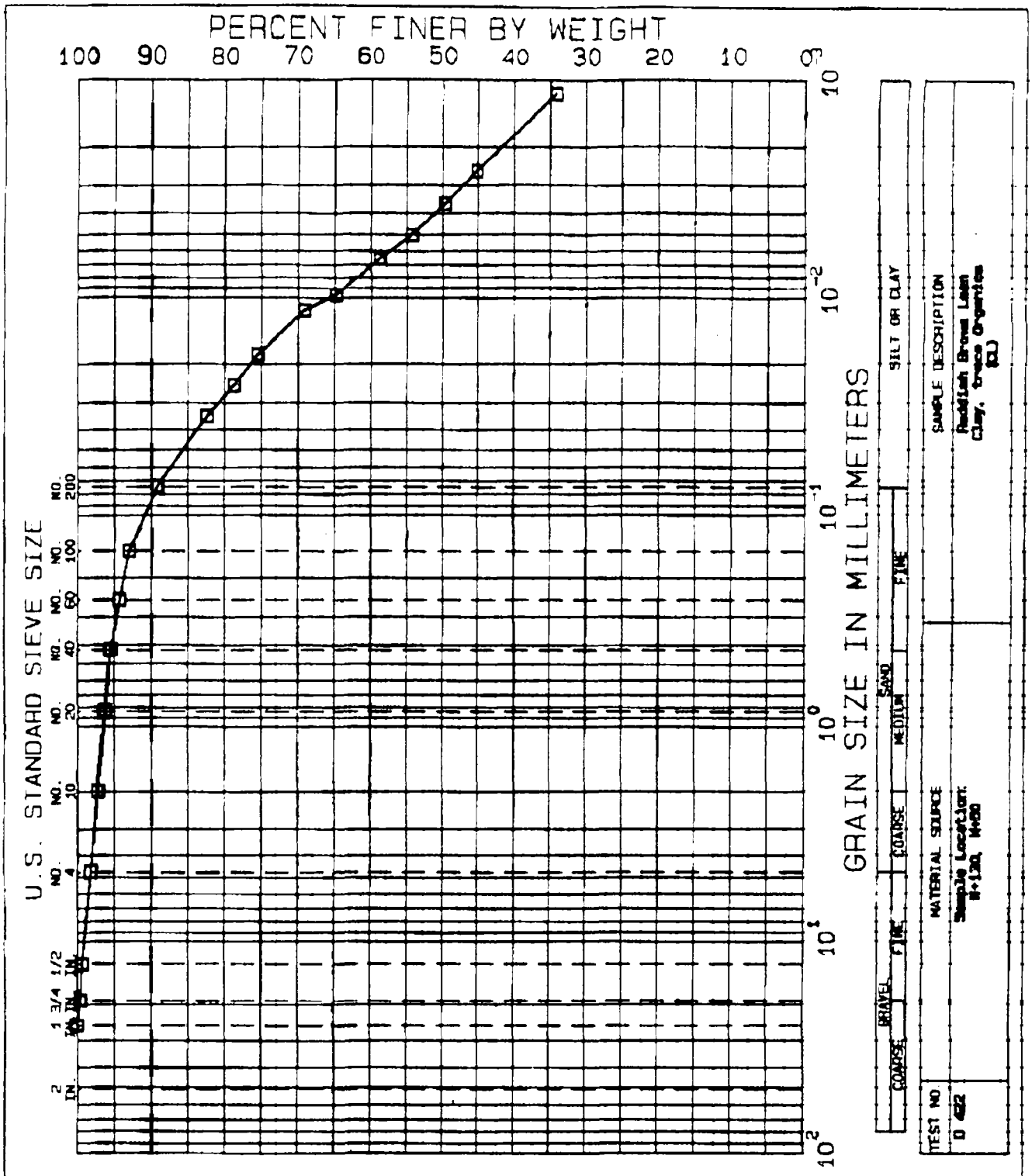
GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	1868
SAMPLE NO.	07230-1	DATE	7/28/92
DEPTH	0.0-2.0 ft.		
TECH.	JB		
REVIEWER	RAR	FILE	R0007.00

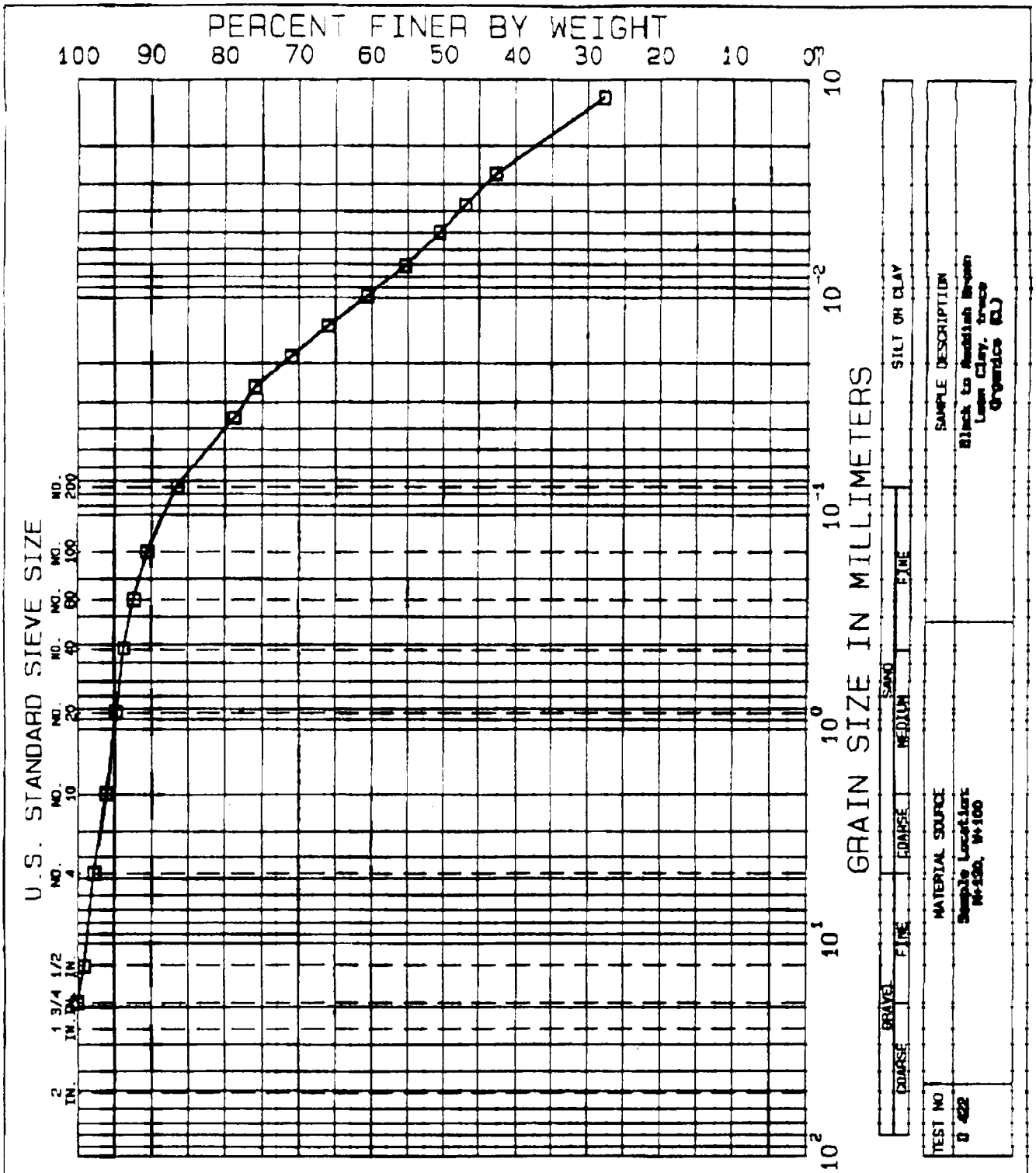
GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	1992
SAMPLE NO.	07230-2		
DEPTH	8.0-9.0 ft.	DATE	7/30/92
TECH.	JB		
REVIEWER	RAR	FILE	R0007.00

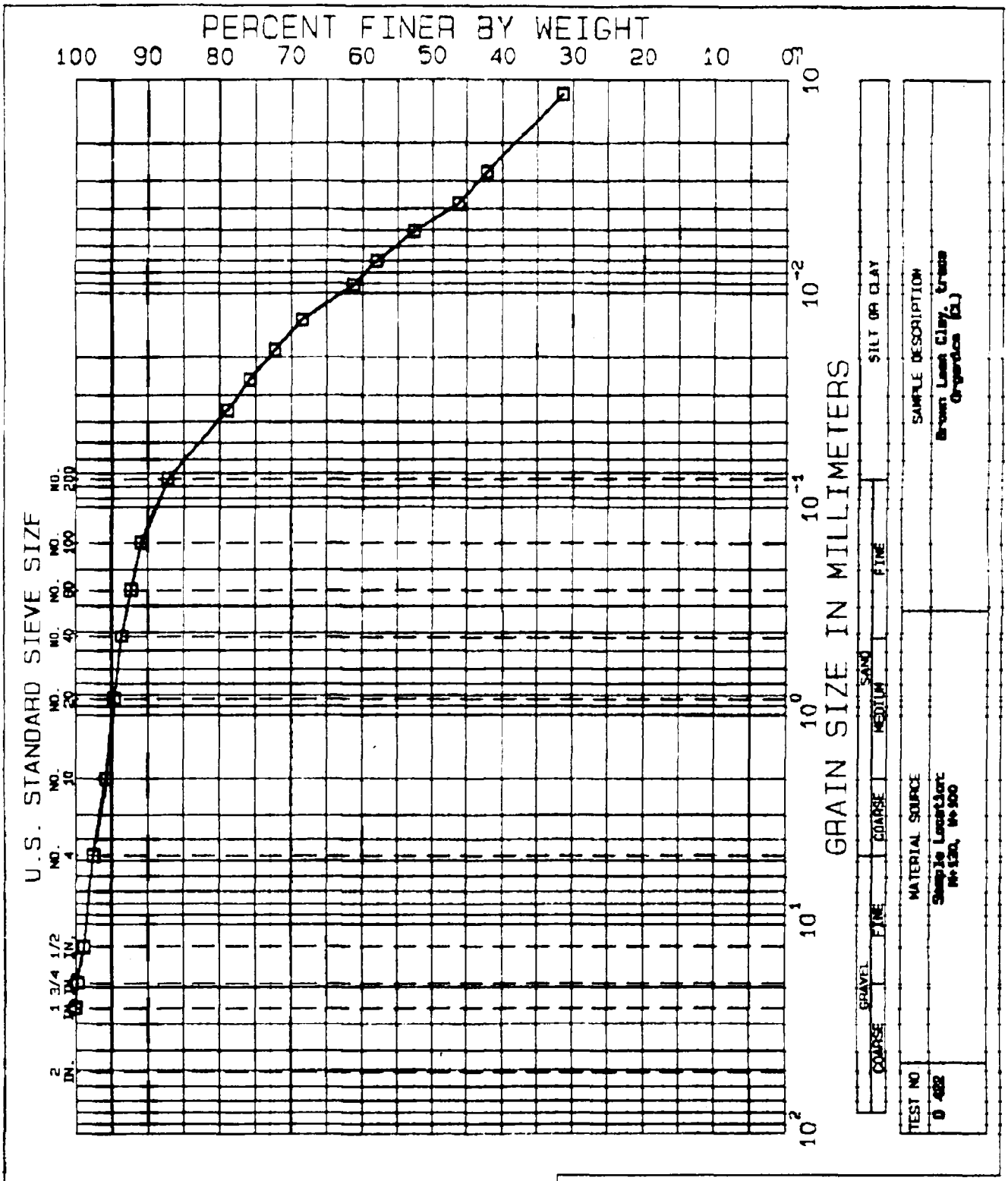
GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	[illegible]
SAMPLE NO.	07939-3		
DEPTH	0.0-8.0 ft.	DATE	7/29/92
TECH.	JB		
REVIEWER	RAR	FILE	RB007.00

GZA GeoEnvironmental of New York
Engineers and Scientists



GEOTECHNICAL SAMPLE ANALYSIS

DUNLOP SITE

GRADATION TESTS

EXPLOR. NO.	Borrow Pit	WORK ORDER NO.	[illegible]
SAMPLE NO.	07030-4	DATE	7/30/92
DEPTH	3.0-6.0 ft.		
TECH.	JB		
REVIEWER	RAR	FILE	R8007.00

GZA GeoEnvironmental of New York
Engineers and Scientists

APPENDIX A.3

CLAY BORROW COMPACTION

AND

TEST PAD DATA

DEMONSTRATION TEST PROGRAM SUMMARY

(A) Introduction

Demonstration tests of onsite clay soil were performed to assess construction methods and parameters for cover placement. Material used in the test program was obtained from the clay stockpile in Waste Area 'A'. Data characterizing the properties of the stockpile and borrow area soil are provided in Appendix A.2. The test program consisted of two related phases: (1) laboratory test on remolded samples, and (2) demonstration test on constructed test pads.

(B) Program Description

(1) Compaction and Remolded Permeability Testing:

- Representative samples of the clay stockpile were tested for material properties and compaction response by Standard and Modified Proctor Compaction (ASTM D1557-91).

- Permeability values were subsequently determined for each respective compaction point by maintaining corresponding unit weight in flexible wall perimeters (ASTM D5084-90).

(2) Demonstration Test Pads:

- Three test pads were constructed consisting of: (1) three 6-inch lifts, (2) two 9-inch lifts, and (3) one 18-inch lift. Soil placed in the 6-inch and 9-inch lifts was compacted by 10 passes of a D-6 dozer, while the 18-inch lift was compacted by the dozer and the use of a 24,000 pound vibratory sheepsfoot roller (4 to 6 passes).

- Following compaction, the lift surface was proofrolled with a smooth-drum roller and moisture-density were measured at 2 locations using a

nuclear densimeter.

- o Prior to placement of the next lift, two undisturbed cores of the lift were obtained by pushing 3" diameter Shelby tubes to the depth of the lift. Samples were sealed and forwarded to GZA's laboratory for hydraulic conductivity determination (ASTM D5084-90).

(C) Analysis of Test Results

(1) Compaction and Remolded Permeability:

(i) Gradation - Compaction Results. Grain size analysis and Atterberg limits were determined on a composite sample (DUN SP#1) taken from the area A soil stockpile. Material parameters confirmed a high content of fines (85%) and clay (35%) with low plasticity properties (ML-CL) consistent with samples obtained from the proposed borrow area (Appendix A.2).

Maximum compacted densities of 125.4 pcf at 12.2% moisture, and 116.4 pcf at 15.4% moisture, were determined by Modified and Standard Proctor compaction procedures (Figure 4).

(ii) Remolded Permeability Results. Remolded permeability tests were performed for each of the five (5) Modified and Standard compaction points to define moisture-density/permeability relationships for the proposed onsite borrow soil. Hydraulic conductivity values ranging from 8.3×10^{-8} to 5.2×10^{-9} cm/s were recorded for 9 of the 10 compaction points. Samples were remolded between 5% drier than, to 3% wetter than, optimum moisture (Figure 4). One test, prepared on the dry side of optimum, produced a permeability greater than 1×10^{-7} cm/s.

These results demonstrate that low permeabilities can be achieved over a relatively wide range of moisture-density conditions.

(2) Demonstration Test Pads:

(i) Field Compaction Results. Measurements of moisture and density performed on the test lifts during construction are summarized in Table 1. In-place moisture content ranged from 11.2% to 14.9%. In-place densities obtained by dozer compaction ranged from 113.2 pcf to 117.6 pcf, equivalent to a modified maximum density of between 90.2% and 93.7%.

Compaction of the 18-inch lift using a medium weight sheepsfoot roller with 6-inch feet produced a 3 to 4 percent increase in lift density over dozer compaction alone (Table 1). Densimeter readings recorded at 6- and 12-inch depths were equivalent using the sheepsfoot roller suggesting good compaction at depth.

(ii) Permeability Test on Soil Core. Soil cores from the respective lifts were tested in the lab following extrusion from the Shelby tube and sample trimming. Measurement of test core dimensions following testing indicated that the prepared lab samples were 2% to 5% less dense than corresponding densimeter measurements taken in the field. This implies possible 'bulking' of the sample during test handling, or systematic error in field measurements. Hydraulic conductivity values for the 6-inch lifts, and upper 6 inches of the 9-inch and 18-inch lifts, ranged from 10^{-5} to 10^{-7} cm/s for dozer compaction. The core sample from the sheepsfoot roller test produced a considerably lower permeability of 2×10^{-8} cm/s.

Following initial permeability testing, the density of the test specimens was increased to reflect corresponding field measurements of density, and the samples retested. All retested samples produced permeabilities in the 10^{-8} cm/s range representing a 2- to 3-order of magnitude reduction in permeability for an average 3 pcf increase in density.

Results of this testing confirm a significant increase in compaction and reduction of permeability using the sheepsfoot roller. The compaction data further demonstrate effective compaction of the upper 6 inches using dozer compaction, and enhanced compaction of the 18-inch lift using the sheepsfoot roller.

TABLE 1

FIELD COMPACTION TEST DATA SUMMARY

(1)

6" Lift Test Pad	In-place Density (pcf)	In-place Moisture (%)	% Compaction (Modified Proctor)
(A) Bottom Lift	113.2 116.3	13.0 13.6	90.2 92.7
(B) Middle Lift	115.8 117.6	13.9 13.1	92.3 93.7
(C) Top Lift	115.9 116.7	13.2 14.1	92.4 93.1

(2)

9" Lift Test Pad	In-place Density (pcf)	In-place Moisture (%)	% Compaction (Modified Proctor)
(A) Bottom Lift	114.3 115.0	14.6 14.6	91.1 91.7
(B) Top Lift	114.1 116.4	14.0 13.2	91.0 92.8

(3)

18" Lift Test Pad	In-place Density (pcf)	In-place Moisture (%)	% Compaction (Modified Proctor)
(A) Dozer Compaction	115.4 117.3	14.9 12.9	92.0 93.5
(B) Sheepsfoot Compaction			
- 6" Depth Reading	120.5 121.4	12.0 12.9	96.1 96.7
- 12" Depth Reading	121.2 117.3	11.2 12.2	96.6 93.5

GZA
GeoEnvironmental
of New York

Engineers and
Scientists

JUL 1 1992
35246
(1000)

June 30, 1992
File: R6007

URS Consultants, Inc.
282 Delaware Avenue
Buffalo, New York 14202-1805

Attention: Mr. Duane Lenhardt

Re: Geotechnical Sample Analysis, Dunlop Site

Dear Mr. Lenhardt:

GZA GeoEnvironmental of New York (GZA) in accordance with our proposal dated June 22, 1992 has laboratory tested one bulk sample designated as DUN SP#1 and delivered to GZA's Buffalo office by URS Consultants, Inc. (URS).

Bulk sample no. DUN SP#1 was tested for as received moisture content, liquid and plastic limits, grain size analysis, moisture-density relationship, and permeability following ASTM procedures. Enclosed are a copy of a geotechnical laboratory testing data summary sheet, associated data plots and test procedures.

After you have reviewed these data, please do not hesitate to contact the undersigned if you have any questions or require any additional information. GZA appreciates the opportunity to work with you on this project and we look forward to a continued association.

Very truly yours,

GZA GEOENVIRONMENTAL OF NEW YORK

Robert A. Redenbach
Senior Engineering Technician

Donald R. McMahon, P.E.
Associate Principal

RAR

Enclosures

cc: Chuck Hurley

Distribution		
FILE		

364 Nagel Drive
Buffalo, New York
14225
716-685-2300
FAX 716-685-3629

An Equal Opportunity Employer M/F/V/H

GEOTECHNICAL LABORATORY TEST PROCEDURES

GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE
TONAWANDA, N.Y.
File No. R6007.00

1. The following tests were performed with the noted ASTM test designation:

TEST	ASTM DESIGNATION
Moisture Content	D 2216-90
Liquid and Plastic Limits	D 4318-84 (method A)
Grain Size Analysis	D 422-63 (see Item 2)
Moisture Density Relationships	D 1557-91
Permeability Test	D 5084-90 (see Item 3)

2. Test Procedures for Combined Sieve and Hydrometer Analysis

When both sieve and hydrometer analyses are required a combined mechanical analysis is performed. This procedure is, in part, similar to ASTM's D 2217-66 (wet preparation of soil sample for grain-size analysis and determination of soil constants-B).

A representative portion of the minus No. 4 material was mixed with water so as to form a thin homogeneous slurry. The fines suspended in this slurry were then decanted over a No. 200 sieve into an empty hydrometer jar, and the mixing-decanting process repeated until most of the fines had been removed. Coarser fractions remaining after the decantation were then oven dried and sieved through a nest of sieves (Nos. 10, 20, 40, 60, 100, and 200). Any material passing the No. 200 sieve was added to the hydrometer jar containing the finer fraction.

Hydrometer analysis of these fines was performed in the conventional manner.

3. Test Procedures for Permeability Test

Permeability tests were performed on samples reconstituted to specified densities approximately equivalent to the dry density of the five points obtained from the modified Proctor test (ASTM D 1557-91 Method A) at the corresponding water content.

Reconstituted test specimens were prepared in a manner similar to that described in "Special Procedures for Testing of Soil and Rock for Engineering Purposes" STP 479, ASTM 5th Edition, pages 101-103. The specimens were reconstituted in 2.8-inch diameter by 2.5-inch long sample formers. A specific amount of soil at the appropriate water content was weighed in five equal portions. Each portion was tamped by means of a mechanical tamping foot to a specified height in the mold. After five layers were compacted the samples were weighed, dimensioned, and their

unit weight verified. After verification of the unit weight, the test samples were placed on a previously de-aired, modified triaxial cell base and porous stone. A membrane was added and the samples sealed top and bottom by '0' rings.

The samples were back pressured under a small effective stress to create complete saturation of the samples. The chamber pressure was then increased such that the desired effective stress was obtained to prevent volume change of the samples. This effective stress was allowed to act for about 24 hours.

After the saturation phase, the response of the soil samples were checked by increasing the cell pressure and monitoring the pore pressure. Where required, additional back pressure was applied so as to achieve a pore pressure response equal to or greater than 95 percent. When the desired saturation was achieved, the samples were attached to the permeability apparatus and tested in accordance with ASTM procedure D 5084-90, "Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter". During the test, measurements of flow vs. time were recorded with the permeability value reported being the average of several consistent values obtained during the test.

LEGEND FOR GEOTECHNICAL LABORATORY DATA SUMMARY SHEET

WATER CONTENT (ASTM D 2216)

%	=	WATER CONTENT IN PERCENT

ATTERBERG LIMITS (ASTM D 4318)

LL %	=	LIQUID LIMIT IN PERCENT
PL %	=	PLASTIC LIMIT IN PERCENT
PI	=	PLASTICITY INDEX

GRAIN SIZE ANALYSIS (ASTM D 422)

SIEVE -200 %	=	PERCENT FINES, MATERIAL FINER THAN NO. 200 SIEVE (0.074 MM)
HYD. -2μ %	=	PERCENT FINER THAN 2 MICRONS

MOISTURE-DENSITY RELATIONSHIP (Modified) (ASTM D 1557)

MAX. DRY DENSITY pcf	=	MAXIMUM DRY DENSITY IN POUNDS PER CUBIC FOOT
OPT. WATER CONTENT %	=	OPTIMUM WATER CONTENT IN PERCENT

PERMEABILITY TEST (ASTM D 5084)

PERMEABILITY cm/sec.	=	PERMEABILITY MEASURED IN CENTIMETERS PER SECOND
TYPE OF TEST · Kr	=	RECONSTITUTED (REMOLDED) SAMPLE
K	=	UNDISTURBED SAMPLE
$\bar{\sigma}_c$ psf	=	EFFECTIVE CONFINING PRESSURE DURING PERMEABILITY TEST IN POUNDS PER SQUARE FOOT
DRY UNIT WT. pcf	=	DRY DENSITY OF TEST SAMPLE IN POUNDS PER CUBIC FOOT
WATER CONTENT %	=	WATER CONTENT OF TEST SAMPLE IN PERCENT

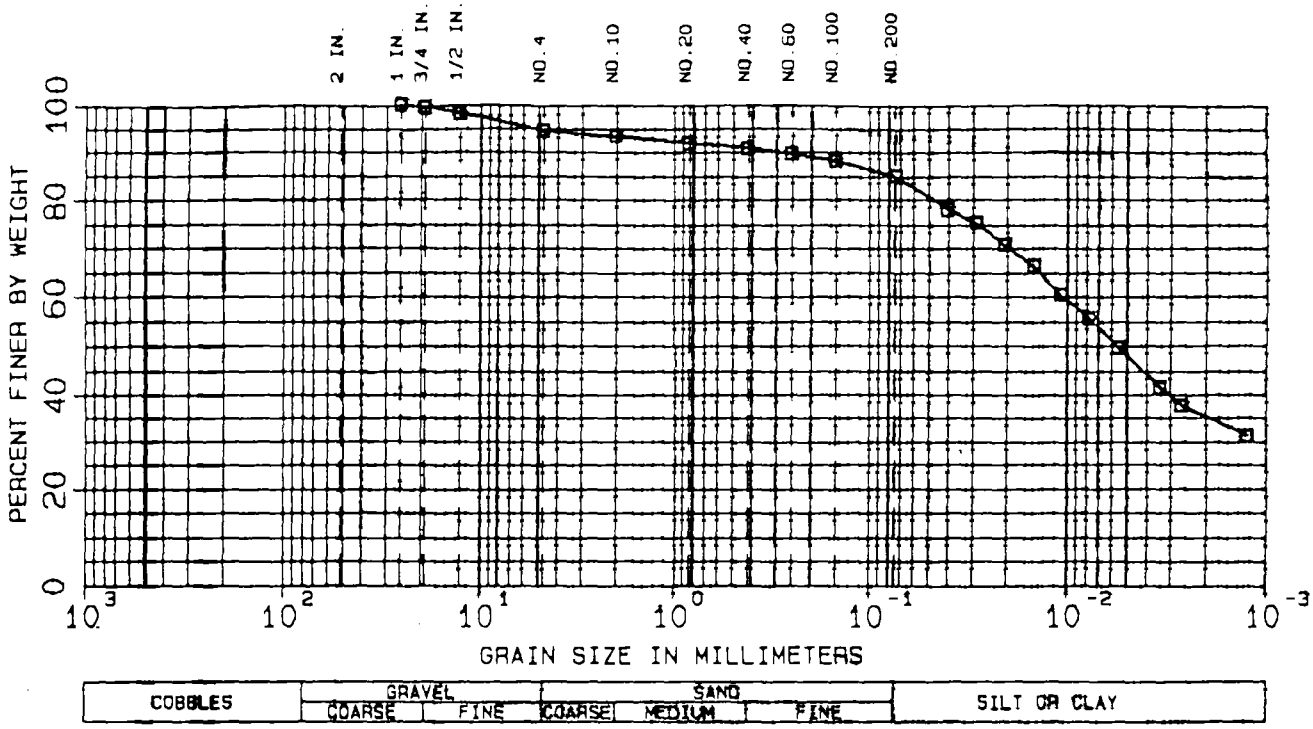
GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LENHARDT

MATERIAL SOURCE: DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 6/23/92 WORK ORDER NO. 1639

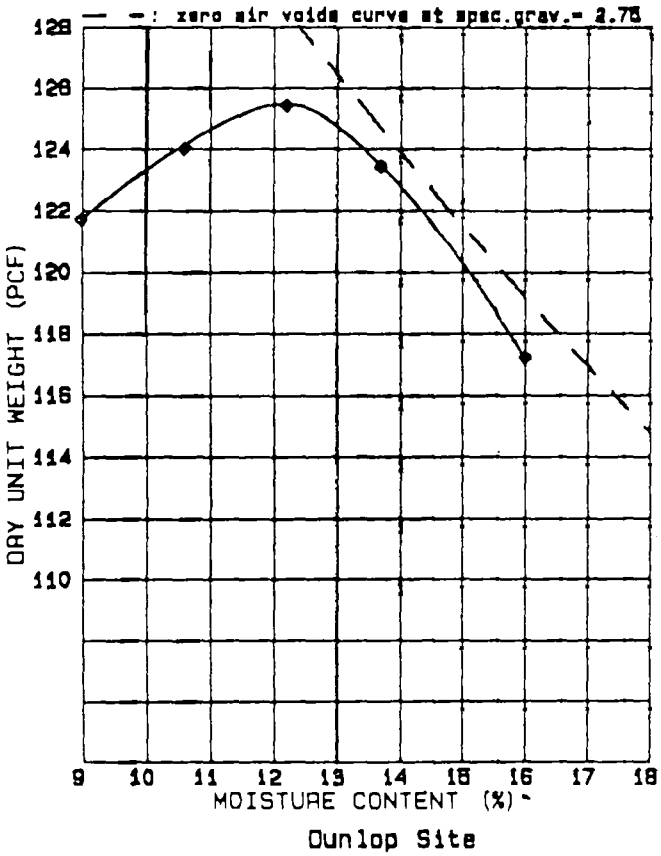
IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE TYPE	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
Bulk Sample	DUN SP#1		4.6	34	18	16	85	35	125.4	12.2	1.3xEE-08	Kr	4176	121.1	9.0	Brown Lean Clay with Sand (CL)
											8.8xEE-09	Kr	4176	123.8	10.6	
											5.2xEE-09	Kr	2880	124.9	12.2	
											5.2xEE-09	Kr	1440	123.5	13.6	
											1.1xEE-08	Kr	432	116.8	16.2	

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

COMPACTION



SOIL PROPERTIES					
SOIL DESCRIPTION: Brown Lean Clay with Sand (CL)					
OPT. WATER CONTENT	12.2 %	MAX. DRY UNIT WT.	126.4	pcf	
LIQUID LIMIT	34 %	PLASTIC LIMIT	18 %	SPECIFIC GRAVITY	

COMPACTION PROCEDURE			
ASTM TEST	D1557-91	PROCEDURE	A
AASHTO TEST		PROCEDURE	
MOLD HEIGHT	4.59 in.	MOLD DIA.	4 in.
NO. LAYERS	5	BLOWS/LAYER	25
HAMMER WT.	10 lbs.	DROP HEIGHT	18 in.

GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE

COMPACTION-GRADATION TESTS

EXPLOR. NO. Bulk Sample
SAMPLE NO. DUN SP#1
DEPTH
TECH. WGL/RAR
REVIEWER RAR

WORK ORDER NO. 1630
DATE 8/25/92
FILE R6007.00

GZA GeoEnvironmental of New York
Engineers and Scientists

GZA-GEOENVIRONMENTAL OF NEW YORK
364 Nagel Drive
Buffalo, New York 14225
(716) 685-2300

FACSIMILE COVER SHEET

To: STEVE MOELLER	From: ROBERT REGENBACH

Date: 8/12/92	Time:	File No.: R6007.00

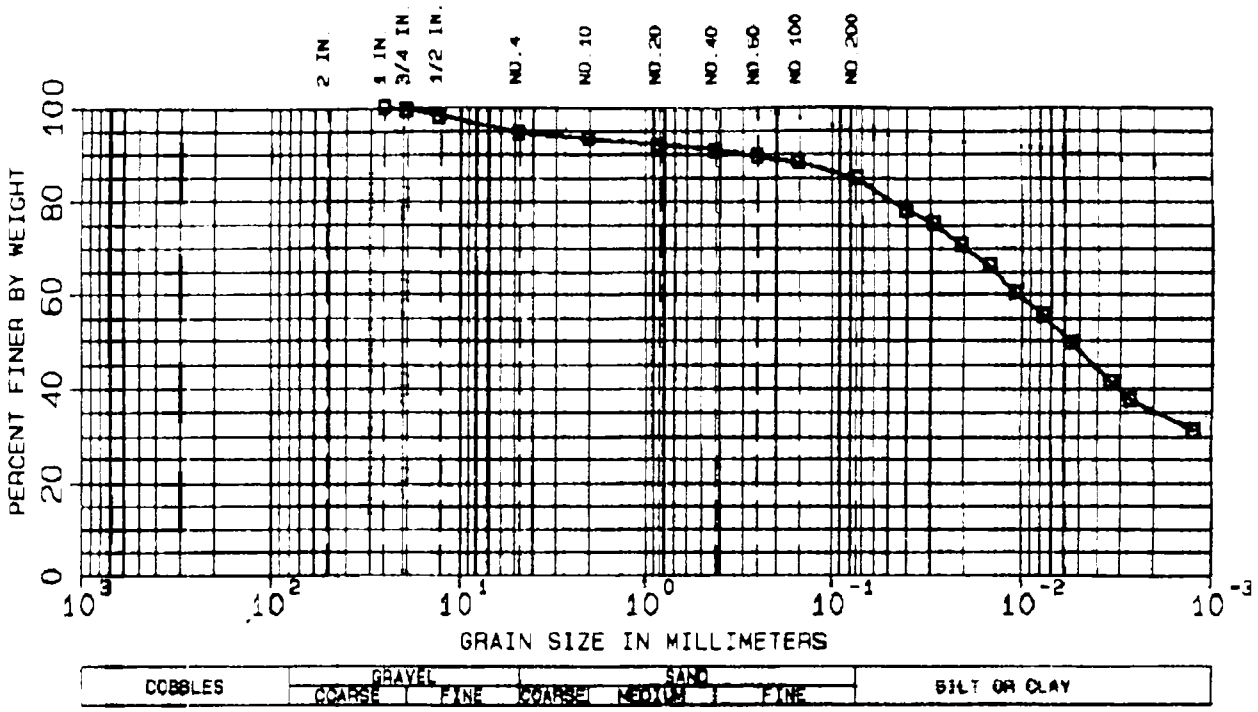
Fax Number: (716) 856-2545	GZA's Fax No.: (716) 685-3629

Number of Pages Including Cover Sheet: 3

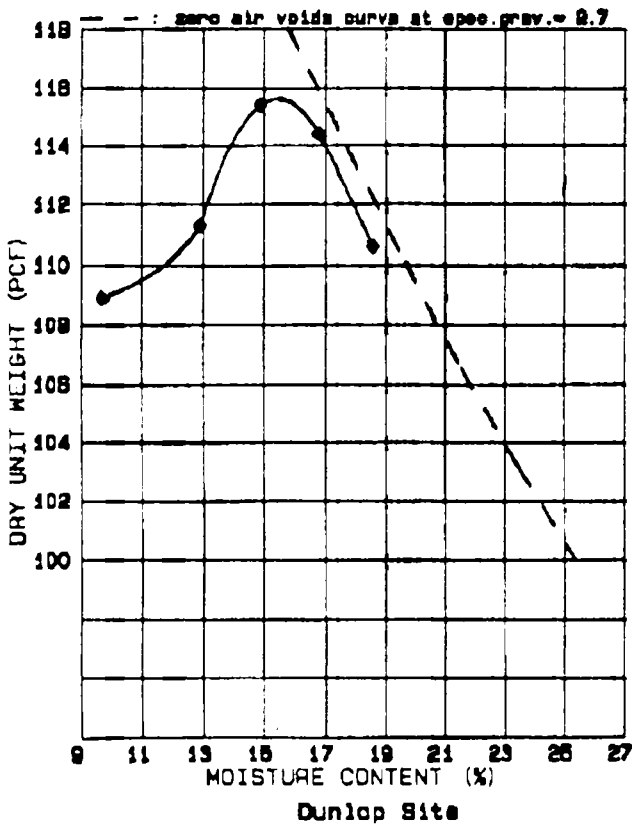
Regarding: LABORATORY TEST DATA FOR SAMPLE DUN SP#1 STANDARD PROCTOR & PERMEABILITY DATA.

Comments: HARD COPY TO FOLLOW

GRAIN SIZE DISTRIBUTION



COMPACTION



SOIL PROPERTIES					
SOIL DESCRIPTION: Brown Lean Clay with Sand (CL)					
OPT. WATER CONTENT	15.4 %	MAX. DRY UNIT WT.	115.6	pcf	
LIQUID LIMIT	34 %	PLASTIC LIMIT	18 %	SPECIFIC GRAVITY	

COMPACTION PROCEDURE			
ASTM TEST	D698-91	PROCEDURE	A
AASHTO TEST		PROCEDURE	
MOLD HEIGHT	4.58 in.	MOLD DIA.	4 in.
NO. LAYERS	3	BLOWS/LAYER	25
HAMMER WT.	5.5 lbs.	DROP HEIGHT	12 in

GEOTECHNICAL SAMPLE ANALYSIS
DUNLOP SITE

COMPACTION-GRADATION TESTS

EXPLOR. NO.	Bulk Sample	WORK ORDER NO.	L630
SAMPLE NO.	DUN BP#1	DATE	7/16/92
DEPTH			
TECH.	RAR		
REVIEWER	RAR	FILE	R6007.00

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LENHARDT

MATERIAL SOURCE: DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 7/13/92 WORK ORDER NO. 1639

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Standard)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
SAMPLE TYPE	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
Bulk Sample	DUN SP#1		4.6	34	18	16	85	35	115.6	15.4	8.3xEE-08	Kr	1296	108.0	9.8	Brown Lean Clay with Sand (CL)
	DUN SP#1										7.2xEE-07	Kr	720	111.5	12.9	
	DUN SP#1										2.4xEE-08	Kr	864	116.1	14.8	
	DUN SP#1										2.4xEE-08	Kr	432	114.5	16.8	
	DUN SP#1										1.6xEE-08	Kr	288	111.2	18.5	
	DUN SP#1										9.3xEE-07	Kr	720	111.6	12.4	

03/12/92 16:24 716 685 3529 GZG BUFFALO P.02

GZA-GEOENVIRONMENTAL OF NEW YORK
364 Nagel Drive
Buffalo, New York 14225
(716) 685-2300

FACSIMILE COVER SHEET

To: CHUCK HURLEY	From: ROB REDENBACH

Date: 8/12/92	Time: 15:03	File No.: R6007.00

Fax Number: (716) 856-2545	GZA's Fax No.: (716) 685-3629

Number of Pages Including Cover Sheet: 5

Regarding: LABORATORY TEST DATA FOR SHELBY TUBE SAMPLES FROM TEST PADS

Comments: HARD COPY TO FOLLOW

GZA
GeoEnvironmental
of New York

Engineers and
Scientists

GZA

566 Nippel Drive
Buffalo, New York
14223
716-685-2300
FAX 716-685-3629

July 22, 1992
File: R6007

URS Consultants, Inc.
282 Delaware Avenue
Buffalo, New York 14202-1805

Attention: Mr. Duane Lenhardt

Re: Geotechnical Sample Analysis, Dunlop Site

Dear Mr. Lenhardt:

GZA GeoEnvironmental of New York (GZA) is in receipt of 14 Shelby tube samples collected from the Dunlop Site project and delivered to our Buffalo office by URS Consultants, Inc. (URS). Below is a list of information pertaining to the Shelby tubes that you requested.

TEST PAD NO.	SAMPLE NO.	LIFT NO.	RECOVERY
1	ST#1	1	5"
1	ST#2	1	5"
1	ST#1	2	7"
1	ST#2	2	8"
1	ST#1	3	7"
1	ST#2	3	7"
2	ST#1	-	17"
2	ST#2	-	13"
2	ST#3	1	18"
2	ST#4	1	17"
3	ST#1	1	9.5"
3	ST#2	1	9"
3	ST#1	2	9"
3	ST#2	2	8"

GZA will store the Shelby tube samples until a testing program is defined by URS.

Very truly yours,

GZA GEOENVIRONMENTAL OF NEW YORK

Robert A Redenbach

Robert A. Redenbach
Senior Engineering Technician

An Equal Opportunity Employer M/F/V/H

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LENHARDT
MATERIAL SOURCE: DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 7/23/92 WORK ORDER NO. 1661

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
TEST PAD AND LIFT NO.	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
TP#1 LIFT#1	ST#1	0.0-0.46		Average Total Unit Weight (0.0 - 0.46') = 116.5 PCF (1)												Reddish Brown Lean Clay with Sand (CL)
	ST#1	0.2-0.4									1.7xEE-05	K	432	109.4	16.0	
	ST#1	0.2-0.4									1.6xEE-08	K	3312	114.9	17.9	
TP#1 LIFT#2	ST#2	0.0-0.61		Average Total Unit Weight (0.0 - 0.61') = 122.5 PCF												Reddish Brown Lean Clay with Sand (CL)
	ST#2	0.0-0.1	16.1													
	ST#2	0.2-0.4									2.6xEE-05	K	432	111.8	15.6	
	ST#2	0.2-0.4									1.1xEE-07	K	1872	113.1	17.6	gradient equal to 29
	ST#2	0.2-0.4									9.9xEE-08	K	1872	113.1	17.6	gradient equal to 15
	ST#2	0.5-0.6	15.7													
TP#1 LIFT#3	ST#1	0.0-0.54		Average Total Unit Weight (0.0 - 0.54') = 117.6 PCF												Reddish Brown Lean Clay with Sand (CL)
	ST#1	0.05-0.15	15.5													
	ST#1	0.15-0.35									7.9XEE-08	K	576	111.7	16.3	
	ST#1	0.35-0.45	16.2													
																(1) = total unit weight includes wax that penetrated into the top and bottom of the sample.

GZA GeoEnvironmental of New York
Engineers and Scientists

08/12/92 15:05 716 685 7529 GZA BUFFALO P.02

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LENHARDT

MATERIAL SOURCE: DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 7/23/92 WORK ORDER NO. 1661

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
TEST PAD AND LIFT NO.	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	**SIEVE** -200 %	**HYD.** -2μ %	**MAX. DRY** DENSITY pcf	**OPT. WATER** CONTENT %	**PERME-**ABILITY cm/sec.	**TYPE** OF TEST	$\bar{\sigma}_c$ psf	**DRY** UNIT WT pcf	**WATER** CONTENT %	
TP#2	ST#1	0.0-0.43	Average Total Unit Weight (0.0 - 0.43') = 123.1 PCF													Reddish Brown Lean Clay (CL)
	ST#1	0.0-0.1	15.1													
	ST#1	0.2-0.4									1.3xEE-07	K	576	109.5	17.6	gradient equal to 28
	ST#1	0.2-0.4									1.1xEE-07	K	576	109.5	17.6	gradient equal to 15
	ST#1		*15.7													* = water content of trimmings from portion tested for permeability
TP#2 LIFT#1	ST#3	0.0-0.5	Average Total Unit Weight (0.0 - 0.5') = 130.9 PCF													Reddish Brown Lean Clay (CL)
	ST#3	0.0-0.1	15.2													
	ST#3	0.2-0.4									2.1xEE-08	K	432	114.9	16.3	
	ST#3		*16.4													* = water content of trimmings from portion tested for permeability
TP#2 LIFT#1	ST#3	0.5-1.0	Average Total Unit Weight (0.5 - 1.0') = 123.4 PCF													Reddish Brown Lean Clay (CL)
	ST#3	0.55-0.65	16.5													
	ST#3	0.75-0.92									7.1xEE-05	K	288	108.2	17.0	
	ST#3	0.75-0.92									4.1xEE-08	K	2736	110.7	18.5	
	ST#3	0.92-1.0	17.1													

GZA GeoEnvironmental of New York
Engineers and Scientists

GEOTECHNICAL LABORATORY TESTING DATA SUMMARY

PROJECT NAME: GEOTECHNICAL SAMPLE ANALYSIS, DUNLOP SITE
PROJECT NO. R6007.00 PROJECT ENGINEER: D.R. LEONARDT
MATERIAL SOURCE: DUNLOP SITE, TONAWANDA, N.Y.
DATE ASSIGNED: 7/23/92 WORK ORDER NO. 1661

IDENTIFICATION			WATER CONTENT	ATTERBERG LIMITS			GRAIN SIZE ANALYSIS		MOISTURE-DENSITY RELATIONSHIP (Modified)		PERMEABILITY TEST					LABORATORY LOG AND SOIL DESCRIPTION
TEST PAD AND LIFT NO.	SAMPLE NUMBER	DEPTH ft.	%	LL %	PL %	PI	SIEVE -200 %	HYD. -2μ %	MAX. DRY DENSITY pcf	OPT. WATER CONTENT %	PERME-ABILITY cm/sec.	TYPE OF TEST	$\bar{\sigma}_c$ psf	DRY UNIT WT pcf	WATER CONTENT %	
TP#3 LIFT#2	ST#1	0.0-0.77	Average Total Unit Weight (0.0 - 0.77') = 119.2 PCF													Reddish Brown Lean Clay with Sand (CL)
	ST#1	0.0-0.1	15.5													
	ST#1	0.2-0.3	12.8													
	ST#1	0.45-0.65									1.1xEE-05	K	576	111.3	15.6	
	ST#1	0.65-0.65									5.9xEE-08	K	2304	113.1	17.8	

CZR GeoEnvironmental of New York
Engineers and Scientists

08/12/92 15:09 #716 665 7229 CZR BUFFALO P.05

URS
CONSULTANTS
MAKING TECHNOLOGY WORK

DAILY CONSTRUCTION REPORT

DATE JULY 21, 1992

DAY | S | M | T X | W | TH | F | S |

PROJECT DUNLOP REMEDIAL DESIGN
JOB NO. 35296.02
CLIENT DUNLOP TIRE
CONTRACTOR NORTHEAST PAVING
PROJECT MANAGER CHARLES W. HURLEY

WEATHER	Brite Sunl X	Clear	Overcast X	Rain	Snow
TEMP.	To 32	32-50	50-70	70-85 X	85 up
WIND	Still	Mod X	High	Report No 1	
HUMIDITY	Dry	Mod X	Humid		

AVERAGE FIELD FORCE 3

Name of Contractor	Non-manual	Manual	Remarks
NORTH EAST PAVING		1 SUPERINTENDANT 2 OPERATORS	

VISITORS

Time	Representing	Representing	Remarks
8AM	CHARLES HURLEY & DUANE LENHARDT	URS CONSULTANTS	SITE VISIT
9:20AM	JEFF BLOCK	EMPIRE SOILS	SOIL TECHNICIAN
1:00PM	GLENN MAY JOE SCIASCIA	NYSDEC NYSDEC	SITE VISIT SITE VISIT

EQUIPMENT AT THE SITE
1 TEN WHEELED DUMP TRUCK, 1 CAT 950B FRONT END LOADER, CAT D6C DOZER, CAT CP563 SHEEPFOOT ROLLER W/ 6" TOES AND A CASE 602B SMOOTH ROLLER

CONSTRUCTION ACTIVITIES

I ARRIVED ON-SITE AT 8:00AM AND THE CONTRACTOR WAS ALREADY ONSITE AND HAD ALREADY MOBILIZE THE ABOVE LISTED EQUIPMENT.

BY 8:30AM THE CONTRACTOR STARTED TO PREPARE THE SUBGRADE FOR TEST PADS # 1 & 2 BY GRUBBING AND LEVELING THE AREA SHOWN ON FIGURE 1 WITH THE D6C DOZER.

AT 8:45AM I INSPECTED THE STOCKPILE OF CAPPING MATERIAL. THE MATERIAL IS REDDISH BROWN CLAY WITH SOME SILT AND SOME STONES LESS THAN 2 INCHES IN DIAMETER.

BY 9:00AM THE CONTRACTOR STARTED TO COMPACT SUBGRADE WITH CAT CP563 SHEEPFOOT.

AT 9:20AM EMPIRE SOILS ARRIVED ON-SITE AND BY 9:45AM STARTED TO TAKE IN-PLACE DENSITY (IPDs) TESTS ON THE SUBGRADE AFTER A TOTAL OF FOUR (9) OVERLAPPING PASSES WITH THE SHEEPFOOT.

BY THOMAS A OSTRANDER TITLE ENGINEER

DAILY CONSTRUCTION REPORT

(Continuation Sheet)

PROJECT DUNLOP REMEDIAL DESIGN REPORT NO. 1

JOB NO. 35246.02 DATE JULY 21, 1992

CONSTRUCTION ACTIVITIES (Continued)

AFTER 2 IPD'S IT WAS FOUND THAT THE COMPACTION WAS TOO LOW AND THE MOISTURE CONTENT WAS HIGH. THEREFORE, URS INSTRUCTED THE CONTRACTOR TO TAKE SIX (6) MORE ADDITIONAL PASSES WITH THE SHEEPFOOT. REFER TO THE EMPIRE SOILS IPD TEST REPORT FOR RESULTS OF ALL IPD TEST PREFORMED TODAY. (TABLE 1)

AT THIS TIME, I WOULD LIKE TO NOTE THAT THE SUBGRADE IS A MIXTURE OF WASTE MATERIAL (BRICKS, MISCELLANEOUS DEBRIS, ASH) AND AMBIENT SOILS.

BY 10:15AM THE CONTRACTOR WAS FINISHED WITH COMPACTING THE SUBGRADE (NOW A TOTAL OF 10 PASSES WITH THE ROLLER) WHEN FEASIBLE, WE TOOK 2 IPD TEST OF THE SUBGRADE. BOTH TESTS THE % COMPACTION WAS ~90%. DUANE LEHARDT STATED THAT THOSE RESULTS WERE GOOD ENOUGH AND HE TOLD THE CONTRACTOR TO PROCEDE WITH PLACING LIFT NO 1 FOR TEST PAD NO. 1 (A SIX (6) INCH LIFT)

AT 10:45AM THE CONTRACTOR WAS FINISH PLACING LIFT NO. 1 FOR TEST PAD NO. 1, AND PROCEDED TO COMPACT THIS 6 INCH LIFT BY TRACKING WITH THE D6 DOZER (6 PASSES)

AT 11:20AM DUANE LEHARDT MADE THE CALL TO HAVE THE CONTRACTOR TO MOBILIZE A SMOOTH DRUM ROLLER TO COMPACT THE TOP 2 TO 3 INCH OF THE LIFT WHICH THE DOZER WAS JUST SCARIFYING, NOT COMPACTING. THE CONTRACTOR AGREED AND SAID IT WOULD TAKE APPROXIMATELY 1.5 HRS TO GET A ROLLER. THEREFORE, AT 11:30AM THE CONTRACTOR STARTED TO PLACE TEST PAD NO. 2 18 INCH SINGLE LIFT.

BY 12:30PM THE CONTRACTOR WAS FINISH PLACING THE TEST PAD AND THAN PROCEDED TO BRAKE FOR LUNCH.

BY THOMAS A OSTRANDER TITLE ENGINEER

DAILY CONSTRUCTION REPORT

(Continuation Sheet)

PROJECT Dunlop Remedial Design REPORT NO. 1

JOB NO. 352462.02 DATE July 21, 1992

CONSTRUCTION ACTIVITIES (Continued)

By 1:15PM, the Contractor started compacting Test Pad No. 2 18 inch lift by tracking with the Dozer (6 passes)

At 1:30 PM the Smooth Roller arrived on site and the Contractor used this roller to make 2 passes on each of the Test Pads to finish compacting them.

When it was feasible, I instructed Empire to test both Test Pads with 2 IPDs each. All four (4) IPDs passed and we push a set of 2 Shelby tubes per Test Pad (one Shelby tube to be tested and the second to be a backup).

At 2:05PM the Contractor proceed to place and compact the second 6 inch on Test Pad No. 1 and by 2:45PM I instructed Empire to take 2 IPD test on this Lift No. 2. One of the two tests failed compaction, therefore I instructed the Contractor to take two (2) more additional passes with the Smooth Roller.

When feasible, we retested Test Pad No 1 Lift No. 2; this time both tests passed. So we proceed to push Shelby tubes.

Follow that at 3:00PM the Contractor started to place and compact Lift No. 3 (the final 6 inch lift) on Test Pad No. 1.

By 3:45PM, I had Empire take 2 IPD tests on this lift; both of which passed. Next we pushed the final Shelby tubes for this Test Pad No. 1.

BY Thomas A Ostanora TITLE Engineer

DAILY CONSTRUCTION REPORT

(Continuation Sheet)

PROJECT Dunlop Remedial Design REPORT NO. 1

JOB NO. 35246.02 DATE July 21, 1992

CONSTRUCTION ACTIVITIES (Continued)

Per Duane Lenhardt request, the contractor proceeded to recompact Test Pad No 2 with 4 passes with the sheepfoot and 2 more passes of the smooth roller to see what effect it would have on the test pad (at 4:10 PM).

By 4:20 PM Empire was able to take a total of four (4) PD test at two (2) location. Two (2) of the test were taken at 6 inch in depth and the other 2 were at the full depth possible with the Troxler. All tests passed. Therefore we proceed to push to more Shelby tubes on this pad per Duane Lenhardt request.

Next URS checked the thicknesses on the test pads, which were:

Test Pad No.1 : 1.65'

Test Pad No.2 : 1.5'

In summary, the following was the necessary compacting methods utilized:

A. Subgrade = 10 passes with Cat 563 Sheepfoot Roller

B. Test Pad No.1 = 6 passes with Cat D6C Dozer
= 2 passes with Case 602B Smooth Roller

C. Test Pad No.1 for additional compaction:
= 2 more passes with Smooth Roller

D. Test Pad No.2 = 6 passes with Cat D6C Dozer
= 2 passes with Smooth Roller

E. Test Pad No.2 with additional compaction for comparison = 4 passes Sheepfoot
= 2 passes with Smooth Roller

I left the site at 5:20 PM.

SHEET 4 OF 6

BY Thomas A Ostrander TITLE Engineer

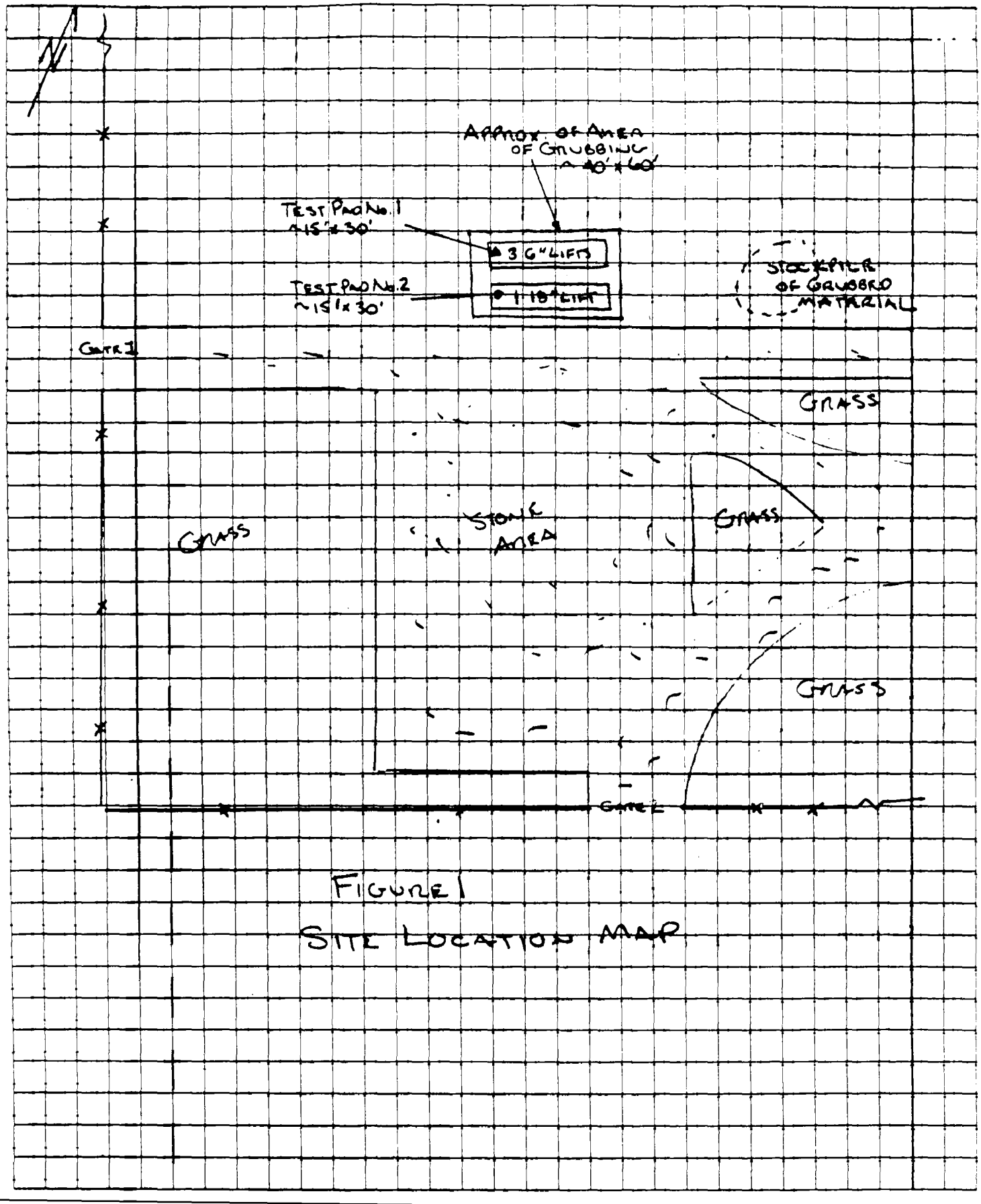


FIGURE 1

SITE LOCATION MAP

FIELD IN-PLACE DENSITY TEST REPORT

TABLE 1

EMPIRE SOILS INVESTIGATIONS INC.

- 5 KNABNER ROAD, P.O. BOX 2199, BALLSTON SPA, NY 12020 518/899-7491
- S-6167 SOUTH PARK AVENUE, P.O. BOX 0913, HAMBURG, NY 14075 716/649-8110
- 105 CORONA AVENUE, GROTON, NY 13073 607/898-5881
- 140 TELEGRAPH ROAD, P.O. BOX 287, MIDDLEPORT, NY 14105 716/735-3602
- 4287 WITMER ROAD, B.P.O. BOX 188, NIAGARA FALLS, NY 14305-0188 716/297-6991
- 535 SUMMIT POINT DRIVE, HENRIETTA, NY 14467 716/359-1990
- 35 NATIONAL ROAD, EDISON, NJ 08817 908/287-2224
- MORGANTOWN BUS. PARK, P.O. BOX 189, MORGANTOWN, PA 19543 215/286-9057

Project: Rinco Tire Co. Report No: _____

Client: URS Date: 7-21-92

Contractor: _____ Job No.: 92-

Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	In-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks
1	7-21	SG	110.2	16.9	87.8		SW corner of Test Pad ~~Area~~ SUBGRADE
2			112.2	15.7	89.4		Retest of no. 1
3		↓	109.3	17.7	87.1		center of Pad ↓
4		6" BSG	113.2	13.0	90.2		Pad #1 Test Pad No. 1 Lift No. 1 (6")
5		↓	116.3	13.6	92.7		" Shelby Tube Location ↓
6		18" BSG	113.4	14.9	92.0		Pad #2 Test Pad No. 2 18" Lift
7		↓	117.3	12.9	93.5		" Shelby Tube Location ↓
8		1'4" SG	115.8	13.9	92.3		Pad #1 Test Pad No. 1 Lift No. 2 (6")
9		↓	112.6	17.1	93.7		" Shelby Tube Location ↓
10		18" BSG	115.9	13.2	92.5		" Test Pad No. 1 Lift No. 3 (6")
11			116.7	14.1	93.1		" Shelby Tube Location ↓
12	↓	↓	121.2	11.2	96.6		Pad #2 Test Taken at 12" depth Test Pad No. 2 18" Lift
13	↓	↓	117.3	12.2	93.5		" Shelby Tube Location ↓ After additional compaction

Proctor Code	Maximum Density (pcf)	Optimum Moisture (%)	Material Type and Source
↓	125.4	12.2	Proctor Curve Information
14	120.5	12.0	96.1 % → Pad #2 Test Taken at 6" depth (6 inch)
15	121.4	10.9	96.7 → " ↓ (6 inch)

Respectfully submitted,

EMPIRE SOILS INVESTIGATIONS, INC.

Remarks: _____

Technician Time: 9:15 - 5:30

Technician: _____

E.O. Printg. Inc. East Aurora, NY F0088-81

URS
CONSULTANTS
MAKING TECHNOLOGY WORK

DAILY CONSTRUCTION REPORT

DATE JULY 22, 1992

DAY | S | M | T | W X | TH | F | S |

PROJECT DUNLOP REMEDIAL DESIGN
JOB NO. 35246.02
CLIENT DUNLOP TIRE
CONTRACTOR NORTHEAST PAVING
PROJECT MANAGER CHARLES W. HURLEY

WEATHER: Bright Sun X | Clear X | Overcast | Rain | Snow
TEMP.: To 32 | 32-50 | 50-70 | 70-85 X | 85 up
WIND: Still | Moderate X | High
HUMIDITY: Dry | Moderate | Humid X
Report No. 2

AVERAGE FIELD FORCE 2

Name of Contractor	Non-manual	Manual	Remarks
NORTHEAST PAVING		2 OPERATORS	

VISITORS

Time	Representing	Representing	Remarks
7:30 AM	DUANE LENHARDT	URS CONSULTING	SITE VISIT
8 AM	GLENN MAY	NYSDEC	SITE VISIT
9 AM	JEFF BLOCK	EMPIRE SOILS	SOIL TECHNICIAN

EQUIPMENT AT THE SITE
1 TEN WHEELED DUMP TRUCK, CAT 950B FRONT END LOADER, CAT D6C DOZER, CAT CP563 SHEEPFOOT ROLLER W/ 6' TORE AND A CASE 602B SMOOTH ROLLER

CONSTRUCTION ACTIVITIES

I ARRIVED ONSITE AT 7:30 AM AND THE CONTRACTOR ARRIVED BY 7:45 AM.

AT 8 AM THE CONTRACTOR PROCEEDED TO GRUB AND LEVEL THE PROPOSED LOCATION FOR TEST PAD NO. 3 (TWO 9 INCH LIFTS). REFER TO FIGURE 1 FOR LOCATION.

BY 8:40 AM NE PAVING STARTED TO COMPACT THE SUBGRADE WITH THE SHEEPFOOT, WHILE IT WAS BEING COMPACTED, IT WAS DETERMINED THAT THE LOCATION WAS TOO SATURATED WITH WATER. THEREFORE, DUANE LENHARDT DESIRED TO RELOCATE TEST PAD NO. 3 NEAR TEST PADS NO 1 & 2 (REFER TO FIGURE 1).

AT 9:15 AM THE CONTRACTOR STARTED TO GRUB AND LEVEL THE NEW LOCATION FOR TEST PAD NO. 3

BY THOMAS A. OSTRANDER TITLE ENGINEER

DAILY CONSTRUCTION REPORT

(Continuation Sheet)

PROJECT Dunlop Remedial Design REPORT NO. 2

JOB NO. 35246.02 DATE July 22, 1992

CONSTRUCTION ACTIVITIES (Continued)

By 9:35AM the Contractor proceed to compact the subgrade with 10 passes with the sheepfoot. When feasible, I instructed Empire to take a IPD test of the subgrade. The result was 69% compaction and 23% moisture, but Duane Lenhardt said that even with more compaction the results would not improve due to the presence of waste in the subgrade. Therefore he gave the go ahead for the contractor to start placing Lift No. 1 of low perm soil for test pad No. 3. (9 inch)

At 10:30AM the Contractor started to compact Lift No. 1 with 6 passes with the D6C dozer and 2 passes with the smooth roller.

By 10:45AM Empire took two (2) IPDs; they passed. Refer to Empire IPD test report for detail on today IPD tests. (Table 1) Then the Contractor proceed to take 4 additional passes with the dozer and 2 passes with the smooth roller per Duane's request. Before the Contractor proceed with that, we took 2 Shelby tubes.

Empire retested Lift No. 1, the result were not much different from the first results.

At 11:05AM the Contractor started to place Lift No. 2 on test pad No. 3. When the Contractor was finished compacting this lift at 11:35AM, Empire tested it. We had one failing % compaction result; therefore I instructed the Contractor to take two (2) additional passes with the smooth roller. When feasible, we retested the lift and this time both IPD tests passed. Then we pushed 2 Shelby tubes in this final lift.

BY Thomas A Ostrander TITLE Engineer

DAILY CONSTRUCTION REPORT

(Continuation Sheet)

PROJECT Dunlop Remedial Design REPORT NO. 2

JOB NO. 35296.02 DATE July 22, 1992

CONSTRUCTION ACTIVITIES (Continued)

At 11:45AM the contractor proceeded the recompact the lift with 4 additional passes with the sheepfoot and 2 passes with the smooth roller. When feasible, Empire took 2 IPD tests. The IPD test results were passing, and were not much of different from the first tests for this lift.

At 12:15PM Empire Soil left the site and at 12:45PM I left the site for lunch only after finishing prepping the Shelby tubes for transport.

Summary of Compaction Methods

Subgrade : 10 passes with Cat CP563 Sheepfoot Roller

Test Pad No. 3 9 inch lifts: 6 passes with Cat D6C Dozer (tracking)
2 passes with Case 602B Smooth Roller

BY Thomas A Ostrandi TITLE Engineer

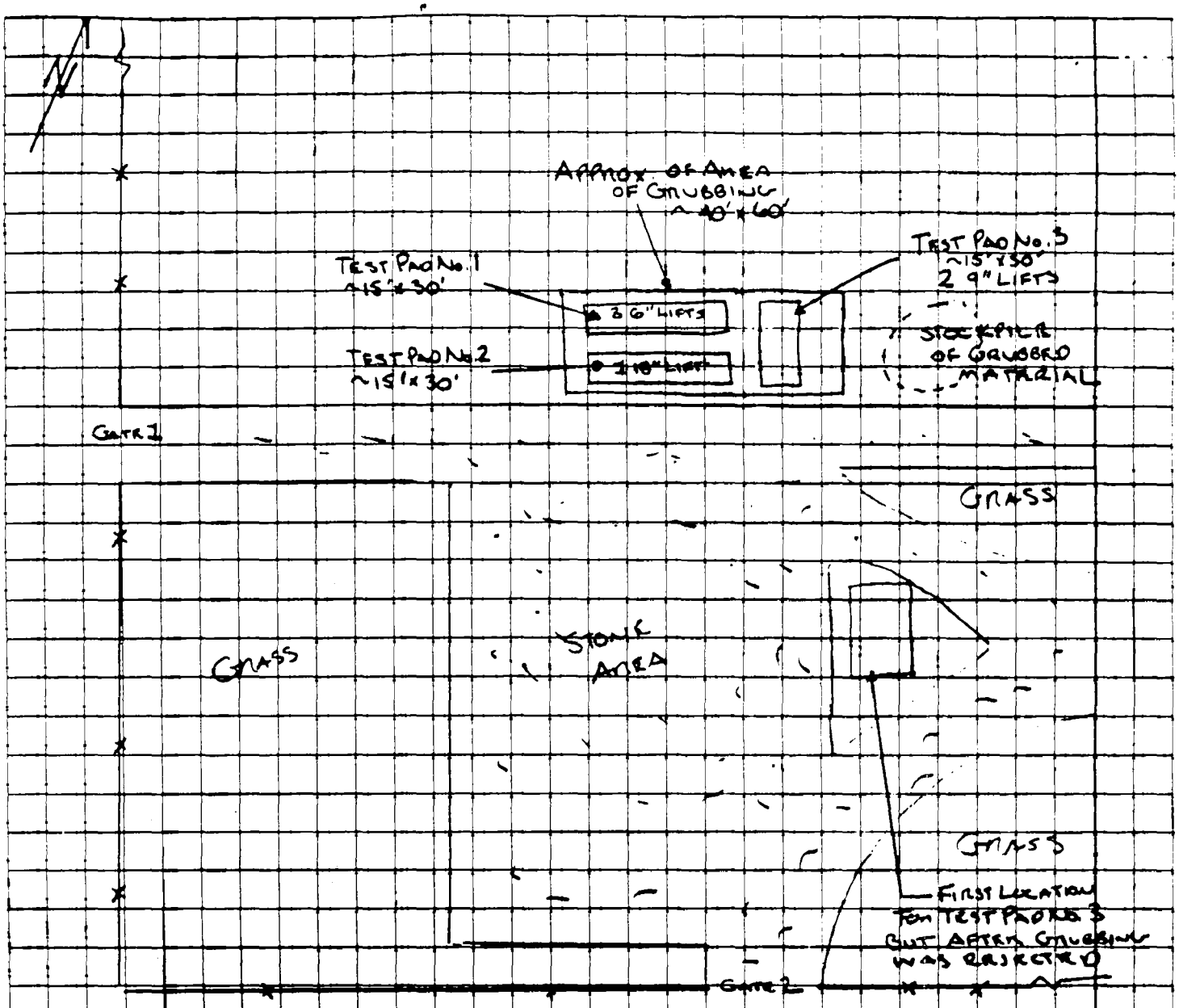


FIGURE 1

SITE LOCATION MAP

FIELD IN-PLACE DENSITY TEST REPORT

EMPIRE SOILS INVESTIGATIONS, INC.
5 KNAGNER ROAD, P.O. BOX 8188, BALLSTON SPA, NY 12020 518/885-7401
6-8167 SOUTH PARK AVENUE, P.O. BOX 0813, HAMBURG, NY 14075 716/648-0110
103 CORONA AVENUE, GROTON, NY 13073 607/898-4551
149 TELEGRAPH ROAD, P.O. BOX 587, MIDDLEPORT, NY 14105 716/735-3562
4567 WITMER ROAD, E.P.O. BOX 188, NIAGARA FALLS, NY 14305-0188 716/297-6901
666 SUMMIT POINT DRIVE, HENRIETTA, NY 14467 716/359-1535
66 NATIONAL ROAD, EDISON, NJ 08817 908/287-6334
MORGANTOWN SUB. PARK, P.O. BOX 188, MORGANTOWN, PA 19543 215/286-0957

Project: Dunlop Tire Co. Report No: _____

Client: URS Date: 7-22-92

Contractor: Northeast Paving Job No.: RT-92-

Test No.	Date of Test	Depth or Elevation	In-place Density (pcf)	In-place Moisture (%)	% Compaction	Proctor Code	Location and Remarks
1	7-22	SG	96.6	23.2	69.0		Pad # 3 - SUBGRADE
2		9"A SG	114.3	14.6	91.1		" LIFT No.1 TEST PAD No.3
3		↓	116.0	14.6	91.7		" SHELBY TUBE LOCATION 9 INCH LIFT
4		↓	115.0	15.3	91.7		" - TEST PAD No.3 LIFT No.1
5		↓	114.4	15.4	91.2		" AFTER ADDITIONAL COMPACTION
6		18"ASG	112.5	14.2	89.7		"FAILED TEST PAD No.3 LIFT No.2
7		↓	114.1	14.0	91.0		" - RETEST OF # 6 9 INCH LIFT
8		↓	116.4	13.2	92.8		" -
9		↓	116.7	13.0	93.1		" - TEST PAD No.3 LIFT No.2
10		↓	114.2	12.1	91.0		" - AFTER ADDITIONAL COMPACTION

Proctor Code	Maximum Density (pcf)	Optimum Moisture (%)	Material Type and Source
	125.1	12.2	Brown sand w/ some gravel PROCTOR INFORMATION

Respectfully submitted,

Remarks: A REP. OF THE CLIENT WAS PRESENT TO INFORM ME ALL TEST RESULTS.

EMPIRE SOILS INVESTIGATIONS, INC.

Technician Time: 9:00 12:30

Technician: [signature]

APPENDIX B

TEST BORING LOGS

URS CONSULTANTS, Inc.

TEST BORING LOG
BORING NO. OMW-A3

PROJECT: DUNLOP
CLIENT: DUNLOP
BORING CONTRACTOR: BUFFALO DRILLING CO.

GROUND WATER:				CAS.	SAMP	CORE	TUBE
DATE	TIME	LEV	TYPE	TYPE		SS		
				DIA.		2 IN		
				WT.		140 lb		
				FALL		30 IN		
				* POCKET PENETROMETER READING				

SHEET NO. 1 OF 1
JOB NO. : 35246
BORING LOCATION: FILL AREA A
GROUND ELEVATION: 595.427 FT
DATE STARTED: 4/25/91
DATE FINISHED: 4/26/91
DRILLER: CHARLES NICOMETI
GEOLOGIST: MICHAEL GUTMANN
REVIEWED BY: DUANE LEONHARDT

DEPTH FT	STRATA	SAMPLE NO.	TYPE	BLOWS PER 6"	RECOVERY ROD %	COLOR	CONSISTENCY HARDNESS	DESCRIPTION MATERIAL DESCRIPTION	CLASS USCS	HNU	REMARKS
2		1	SS	2 2 / 5 6	70	BRN AND RED/BRN	LOOSE	FILL 6" TOPSOIL WITH GRAVEL & C & D CRUSH, SOME CLAY	SM	0	SOME ROOTS MOIST
5		2	SS	2 4 / 6 12	60	RED/BRN MOTTLED	MEDIUM STIFF	SILTY CLAY TRACE FINE GRAVEL SOME DESICCATION CRACKS		0	SLIGHTLY MOIST
		3	SS	14 14 / 22 24	80	YLW/BRN AND GRAY	VERY STIFF			0	MEDIUM PLASTICITY
		4	SS	12 22 / 32 40	90		HARD		CL	0	
10		5	SS	11 22 / 28 32	90					0	
		6	SS	9 22 / 30 38	80					0	
14		7	SS	13 14 / 18 21	75		VERY STIFF			0	
15		8	SS	7 11 / 16 18	95	RED/BRN	VERY STIFF	SILTY CLAY TRACE FINE GRAVEL		0	MOIST
		9	SS	5 11 / 15 14	90					0	MEDIUM PLASTICITY
20		10	SS	5 7 / 11 11	90		STIFF		CL	0	
		11	SS	2 4 / 7 8	95		MEDIUM STIFF			0	
24		12	SS	4 5 / 7 8	100					0	
25								BOREHOLE COMPLETE AT 24 FEET			
30											
35											

A-3205

COMMENTS

PROJECT NO. 35246.
BORING NO. OMW-A3

URS CONSULTANTS, Inc.

TEST BORING LOG
BORING NO. OMW-B2

PROJECT: DUNLOP
CLIENT: DUNLOP
BORING CONTRACTOR: BUFFALO DRILLING CO.
GROUND WATER:

DATE	TIME	LEV	TYPE

	CAS.	SAMP	CORE	TUBE
TYPE		SS		
DIA.		2 IN		
WT.		140 lb		
FALL		30 IN		

* POCKET PENETROMETER READING

SHEET NO. 1 OF 1
JOB NO. : 35246
BORING LOCATION: FILL AREA B
GROUND ELEVATION: 583.777 FT
DATE STARTED: 4/25/91
DATE FINISHED: 4/29/91
DRILLER: CHARLES NICOMETI
GEOLOGIST: MICHAEL GUTMANN
REVIEWED BY: DUANE LEINHARST

DEPTH FT	STRATA	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6"	RECOVERY / RQD %	DESCRIPTION: COLOR	CONSISTENCY / HARDNESS	MATERIAL DESCRIPTION	CLASS USCS	N / V	REMARKS
-5						BROWN	MED. STIFF	SILT, SOME CLAY, TR. SAND	ML		SOME ROOTS
		1	SS	1 7 / 7 5	60	RED/ BROWN MOTTLED GRAY	MEDIUM STIFF	SILTY CLAY		0	MOIST
		2	SS	5 8 / 22 27	70		VERY STIFF	TRACE FINE GRAVEL		0	MEDIUM PLASTICITY
5		3	SS	18 21 / 30 36	75			SOME DESICCATION CRACKS	CL	0	SLIGHTLY MOIST
		4	SS	11 19 / 30 32	90					0	
		5	SS	8 17 / 27 32	95					0	
10		6	SS	6 12 / 17 21	100	RED/ BRN	STIFF	SILTY CLAY TRACE FINE GRAVEL		0	
		7	SS	5 10 / 16 22	100					0	MOIST
15		8	SS	3 6 / 14 16	100				CL	0	MEDIUM PLASTICITY
		9	SS	5 4 / 8 10	100					0	
18								BOREHOLE COMPLETE AT 18 FEET			
20											
25											
30											
35											

A-3205

COMMENTS

PROJECT NO. 35246.
BORING NO. OMW-B2

URS CONSULTANTS, Inc.

TEST BORING LOG
BORING NO. OMW-B3

PROJECT: DUNLOP
CLIENT: DUNLOP
BORING CONTRACTOR: BUFFALO DRILLING CO.
GROUND WATER:

DATE	TIME	LEV	TYPE

	CAS.	SAMP	CORE	TUBE
TYPE		SS		
DIA.		2 IN.		
WT.		140 lb		
FALL		30 IN.		

• POCKET PENETROMETER READING

SHEET NO. 1 OF 1
JOB NO.: 35246
BORING LOCATION: FILL AREA A
GROUND ELEVATION: 577.847 FT
DATE STARTED: 4/30/91
DATE FINISHED: 4/30/91
DRILLER: KENNETH HUBER
GEOLOGIST: MICHAEL GUTMANN
REVIEWED BY: DUANE LENHARDT

DEPTH FT	STRATA	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6"	RECOVERY RQD %	COLOR	CONSISTENCY HARDNESS	DESCRIPTION MATERIAL DESCRIPTION	CLASS USCS	HNU	REMARKS
0		1	SS	1 2 / 3 5	75	DARK BROWN TO RED/BRN	LOOSE	FILL THIN (2 IN.) TOPSOIL COVER OVER DISTURBED SILTY CLAY, TRACE RED BRICK, SAND AND GRAVEL		0	ROOTS
		2	SS	4 4 / 5 4	80				ML	0	MEDIUM PLASTIC VERY MOIST
5		3	SS	5 7 / 12 8	60		MEDIUM DENSE		SM	0	
		4	SS	2 3 / 4 2	70					0	
10		5	SS	3 4 / 7 4	80	BLACK, RED/BRN	MEDIUM STIFF	PEAT ORGANIC SILT WITH DECAYED PLANT MATTER MIXED WITH SILTY CLAY	OH	0	MEDIUM PLASTIC W/ CLAY SEAMS
12		6	SS	3 4 / 5 7	90				CL	0	MOIST
		7	SS	2 3 / 4 7	100	RED/BRN	MEDIUM STIFF	SILTY CLAY	CL	0	VERY MOIST
15		8	SS	2 3 / 4 8	100					0	MEDIUM PLASTICITY
16								BOREHOLE COMPLETE AT 16 FEET			
20											
25											
30											
35											

A-3205

COMMENTS

PROJECT NO. 35246.
BORING NO. OMW-B3

URS CONSULTANTS, Inc.

TEST BORING LOG
BORING NO. OMW-C1

PROJECT: DUNLOP
CLIENT: DUNLOP
BORING CONTRACTOR: BUFFALO DRILLING CO.
GROUND WATER:

DATE	TIME	LEV	TYPE

	CAS.	SAMP	CORE	TUBE
TYPE		SS		
DIA.		2 IN.		
WT.		140 lb		
FALL		30 IN		

* POCKET PENETROMETER READING

SHEET NO. 1 OF 1
JOB NO.: 35246.
BORING LOCATION: FILL AREA C
GROUND ELEVATION: 601.039 FT
DATE STARTED: 5/2/91
DATE FINISHED: 5/2/91
DRILLER: CHARLES NICOMETI
GEOLOGIST: MICHAEL GUTMANN
REVIEWED BY: DUANE LENHARDT

DEPTH FT	STRATA	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6"	RECOVERY ROD %	DESCRIPTION: COLOR	CONSISTENCY HARDNESS	MATERIAL DESCRIPTION	CLASS USCS	HNU	REMARKS
0.5						BLACK	SOFT	ORGANIC SILT	OL		
		1	SS	1 2 / 4 5	100	RED/BRN MOTTLED YLW-BRN GRAY	MEDIUM STIFF	SILTY CLAY TRACE FINE GRAVEL	CL	0	WET, WATER AT SURFACE
4		2	SS	3 5 / 13 15	75					0	VERY MOIST HIGH PLASTICITY
5		3	SS	8 24 / 35 51	80	RED/BRN MOTTLED GRAY	HARD	SILTY CLAY TRACE FINE GRAVEL SOME DESICCATION CRACKS		0	MOIST
		4	SS	8 13 / 25 30	80		VERY STIFF			0	MEDIUM PLASTICITY
10		5	SS	9 25 / 37 55	100		HARD			0	
		6	SS	7 11 / 16 25	100		VERY STIFF		CL	0	SLIGHTLY MOIST
14		7	SS	3 9 / 15 22	100		STIFF			0	
15		8	SS	5 11 / 15 19	100	RED/BRN	VERY STIFF	SILTY CLAY TRACE FINE GRAVEL	CL	0	MOIST MEDIUM PLASTICITY
		9	SS	6 10 / 15 18	100					0	
18								BOREHOLE COMPLETE AT 18 FEET			
20											
25											
30											
35											

A-3205

COMMENTS

PROJECT NO. 35246
BORING NO. OMW-C1

URS CONSULTANTS, Inc.

TEST BORING LOG
BORING NO. OMW-C5

PROJECT: DUNLOP
CLIENT: DUNLOP
BORING CONTRACTOR: BUFFALO DRILLING CO.
GROUND WATER:

DATE	TIME	LEV	TYPE

	CAS.	SAMP	CORE	TUBE
TYPE		SS		
DIA.		2 IN		
WT.		140 lb		
FALL		30 IN		

* POCKET PENETROMETER READING

SHEET NO. 1 OF 1
JOB NO. : 35246
BORING LOCATION: FILL AREA C
GROUND ELEVATION: 601.39 FT
DATE STARTED: 4/30/91
DATE FINISHED: 5/1/91
DRILLER: CHARLES NICOMETI
GEOLOGIST: MICHAEL GUTMANN
REVIEWED BY: DUANE LENHARST

DEPTH FT	STRATA	SAMPLE NO.	TYPE	BLOWS PER 6"	RECOVERY / RQD %	COLOR	CONSISTENCY / HARDNESS	MATERIAL DESCRIPTION	CLASS USCS	HNU	REMARKS
		1	SS	3 4 / 7 7	70	BLACK AND BROWN	MEDIUM DENSE	FILL SANDY SILT, SOME CLAY SOME GLASS	SM	0	MOIST
2		2	SS	4 7 / 12 13	75	RED-BROWN	STIFF	SILTY CLAY TRACE FINE GRAVEL FEW DESICCATION CRACKS		0	SLIGHTLY MOIST
5		3	SS	9 15 / 19 21	65	MOTTLED GRAY	VERY STIFF			0	LOW PLASTICITY FEW ROOT STAINS
		4	SS	9 19 / 21 30	70					0	
		5	SS	9 15 / 20 25	60				CL	0	
10		6	SS	9 13 / 20 21	70					0	MOIST
		7	SS	9 13 / 17 25	90					0	
15		8	SS	12 12 / 15 24	95					0	
16		9	SS	7 12 / 14 18	90	RED-BRN	VERY STIFF	SILTY CLAY TRACE FINE GRAVEL		0	SLIGHTLY MOIST
20		10	SS	9 13 / 17 25	90					0	
		11	SS	10 18 / 23 21	100					0	
		12	SS	10 10 / 10 13	100		STIFF		CL	0	
25		13	SS	4 7 / 11 11	100					0	MEDIUM PLASTICITY
		14	SS	7 6 / 9 13	100					0	
30		15	SS	7 7 / 10 11	100					0	
32		16	SS	WOR / 3 4	100	RED-BROWN	SOFT	SILTY CLAY	CL	0	VERY MOIST HIGH PLASTICITY
								BOREHOLE COMPLETE AT 32 FEET			
35											

A-3205

COMMENTS

PROJECT NO. 35246.
BORING NO. OMW-C5

URS CONSULTANTS, Inc.

TEST BORING LOG
BORING NO. OMW-C6

PROJECT: DUNLOP
CLIENT: DUNLOP
BORING CONTRACTOR: BUFFALO DRILLING CO.
GROUND WATER:

DATE	TIME	LEV	TYPE

	CAS.	SAMP	CORE	TUBE
TYPE		SS		
DIA.		2 IN.		
WT.		140 lb		
FALL		30 IN		

* POCKET PENETROMETER READING

SHEET NO. 1 OF 1
JOB NO. : 35246
BORING LOCATION: FILL AREA C
GROUND ELEVATION: 600.449 FT
DATE STARTED: 5/2/91
DATE FINISHED: 5/2/91
DRILLER: CHUCK NICOMETI
GEOLOGIST: MICHAEL GUTMANN
REVIEWED BY: DUANE LENHARDT

DEPTH FT	STRATA	SAMPLE NO.	SAMPLE TYPE	BLOWS PER 6"	RECOVERY ROD %	COLOR	CONSISTENCY HARDNESS	DESCRIPTION MATERIAL DESCRIPTION	CLASS USCS	HNU	REMARKS
2		1	SS	10 20 / 4 6	70	BLACK BROWN	MEDIUM DENSE	FILL SANDY SILT, SOME CLAY BRICK FRAGMENTS & SLAG	SM	0	VERY MOIST
5		2	SS	5 16 / 16 22	90	RED/ BRN MOTTLED GRAY	VERY STIFF	SILTY CLAY TRACE FINE GRAVEL SOME DESICCATION CRACKS		0	SLIGHTLY MOIST
		3	SS	7 14 / 30 50	100					0	
		4	SS	12 27 / 29 4	100		HARD		CL	0	MEDIUM PLASTICITY
10		5	SS	15 24 / 29 36	90					0	SLIGHTLY MOIST
12		6	SS	8 17 / 24 35	90		VERY STIFF			0	
		7	SS	11 17 / 22 29	100	RED/ BRN	VERY STIFF	SILTY CLAY TRACE FINE GRAVEL		0	
15		8	SS	6 11 / 16 23	100				CL	0	MOIST
		9	SS	11 11 / 14 18	100					0	
20								BOREHOLE COMPLETE AT 18 FEET			
25											
30											
35											

A-3205

COMMENTS

PROJECT NO. 35246.
BORING NO. OMW-C6

APPENDIX C

INFILTRATION CALCULATIONS

****
****

DUNLOP HELP INFILTRATION ANALYSIS, BY M.O. NOV 6, 1992
CASE 1A: 6" TOPSOIL(LDL-SOIL TYPE 3), 18" CLAY(BS)

****
****

FAIR GRASS

LAYER 1

LATERAL DRAINAGE LAYER

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.0831	VOL/VOL
WILTING POINT	=	0.0326	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4556	VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.009300000034	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	200.0	FEET

LAYER 2

BARRIER SOIL LINER

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4300	VOL/VOL
FIELD CAPACITY	=	0.3663	VOL/VOL
WILTING POINT	=	0.2802	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300	VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000100000	CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	56.74	
TOTAL AREA OF COVER	=	43560.	SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00	INCHES
UPPER LIMIT VEG. STORAGE	=	2.7420	INCHES
INITIAL VEG. STORAGE	=	2.7398	INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR BUFFALO NEW YORK

MAXIMUM LEAF AREA INDEX = 2.00
START OF GROWING SEASON (JULIAN DATE) = 138
END OF GROWING SEASON (JULIAN DATE) = 279

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.24	2.78	3.00	3.10	3.22	2.52
	2.97	3.67	2.91	2.87	4.35	3.33
STD. DEVIATIONS	0.56	0.64	1.20	0.97	0.86	0.72
	0.91	1.47	1.29	1.38	1.52	0.34
RUNOFF						
TOTALS	1.977	1.795	1.885	0.520	0.255	0.211
	0.171	0.212	0.247	0.367	1.995	1.866
STD. DEVIATIONS	0.936	0.535	1.362	0.558	0.102	0.065
	0.086	0.088	0.110	0.349	1.831	0.878
EVAPOTRANSPIRATION						
TOTALS	0.447	0.563	2.106	2.447	3.199	2.907
	3.166	3.380	2.125	1.819	0.869	0.511
STD. DEVIATIONS	0.119	0.136	0.227	0.771	0.747	0.684
	1.030	1.184	0.775	0.491	0.084	0.189
LATERAL DRAINAGE FROM LAYER 1						
TOTALS	0.2961	0.2611	0.2506	0.1578	0.1124	0.0607
	0.0132	0.0215	0.0091	0.0557	0.1784	0.2853
STD. DEVIATIONS	0.0065	0.0179	0.0112	0.0526	0.0306	0.0180

	0.0107	0.0256	0.0138	0.0614	0.1003	0.0200

PERCOLATION FROM LAYER 2

TOTALS	0.1398	0.1265	0.1362	0.1252	0.1246	0.1130
	0.0380	0.0427	0.0388	0.0830	0.1201	0.1390
STD. DEVIATIONS	0.0005	0.0028	0.0009	0.0041	0.0032	0.0043
	0.0287	0.0433	0.0292	0.0405	0.0193	0.0016

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	37.97	(1.831)	137824.	100.00
RUNOFF	11.500	(1.963)	41745.	30.29
EVAPOTRANSPIRATION	23.539	(1.593)	85447.	62.00
LATERAL DRAINAGE FROM LAYER 1	1.7019	(0.1278)	6178.	4.48
PERCOLATION FROM LAYER 2	1.2270	(0.0303)	4454.	3.23
CHANGE IN WATER STORAGE	0.000	(1.166)	0.	0.00

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	2.53	9183.9
RUNOFF	1.788	6489.6
LATERAL DRAINAGE FROM LAYER 1	0.0100	36.1
PERCOLATION FROM LAYER 2	0.0046	16.8
HEAD ON LAYER 2	6.4	
SNOW WATER	2.92	10597.0

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4570

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0214

****

****

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	2.74	0.4570
2	7.74	0.4300
SNOW WATER	0.00	

****
****

****
****

DUNLOP HELP NFILTRATION ANALYSIS, BY M.O. NOV 6,1992
CASE 3A: 6" TOPSOIL(VPL), 24" FILL(LDL) - BOTH SOIL TYPE 3
18" CLAY(BS)

****
****

FAIR GRASS

LAYER 1

VERTICAL PERCOLATION LAYER

THICKNESS	=	6.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.0831	VOL/VOL
WILTING POINT	=	0.0326	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4004	VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.009300000034	CM/SEC

LAYER 2

LATERAL DRAINAGE LAYER

THICKNESS	=	24.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.0831	VOL/VOL
WILTING POINT	=	0.0326	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4570	VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.003100000089	CM/SEC
SLOPE	=	2.00	PERCENT
DRAINAGE LENGTH	=	200.0	FEET

LAYER 3

BARRIER SOIL LINER

THICKNESS	=	18.00	INCHES
POROSITY	=	0.4300	VOL/VOL
FIELD CAPACITY	=	0.3663	VOL/VOL
WILTING POINT	=	0.2802	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.4300	VOL/VOL
SATURATED HYDRAULIC CONDUCTIVITY	=	0.000000100000	CM/SEC

GENERAL SIMULATION DATA

SCS RUNOFF CURVE NUMBER	=	56.74
TOTAL AREA OF COVER	=	43560. SQ FT
EVAPORATIVE ZONE DEPTH	=	20.00 INCHES
UPPER LIMIT VEG. STORAGE	=	9.1400 INCHES
INITIAL VEG. STORAGE	=	8.8176 INCHES

SOIL WATER CONTENT INITIALIZED BY PROGRAM.

CLIMATOLOGICAL DATA

SYNTHETIC RAINFALL WITH SYNTHETIC DAILY TEMPERATURES AND SOLAR RADIATION FOR BUFFALO NEW YORK

MAXIMUM LEAF AREA INDEX	= 2.00
START OF GROWING SEASON (JULIAN DATE)	= 138
END OF GROWING SEASON (JULIAN DATE)	= 279

NORMAL MEAN MONTHLY TEMPERATURES, DEGREES FAHRENHEIT

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
23.50	24.50	33.00	45.40	56.10	66.00
70.70	68.90	62.10	51.50	40.30	28.80

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.24	2.78	3.00	3.10	3.22	2.52
	2.97	3.67	2.91	2.87	4.35	3.33
STD. DEVIATIONS	0.56	0.64	1.20	0.97	0.86	0.72
	0.91	1.47	1.29	1.38	1.52	0.34
RUNOFF						
TOTALS	0.193	0.306	0.832	0.018	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.035
STD. DEVIATIONS	0.221	0.430	0.802	0.040	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.079
EVAPOTRANSPIRATION						

TOTALS	0.442	0.562	2.080	2.451	3.196	2.926
	5.453	4.344	2.249	1.844	0.832	0.496
STD. DEVIATIONS	0.115	0.134	0.219	0.775	0.750	0.647
	0.427	1.122	0.646	0.330	0.071	0.176

LATERAL DRAINAGE FROM LAYER 2

TOTALS	1.1430	1.1112	1.3933	1.0164	0.8309	0.6524
	0.4837	0.2773	0.2213	0.2091	0.3041	0.6275
STD. DEVIATIONS	0.4254	0.2532	0.0538	0.1915	0.1204	0.0503
	0.0332	0.0428	0.0107	0.0116	0.1636	0.4698

PERCOLATION FROM LAYER 3

TOTALS	0.2537	0.2384	0.2710	0.2464	0.2413	0.2184
	0.1992	0.1654	0.1513	0.1523	0.1635	0.2059
STD. DEVIATIONS	0.0273	0.0153	0.0024	0.0094	0.0081	0.0063
	0.0052	0.0075	0.0021	0.0023	0.0259	0.0435

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 5

	(INCHES)		(CU. FT.)	PERCENT
PRECIPITATION	37.97	(1.831)	137824.	100.00
RUNOFF	1.384	(0.408)	5024.	3.65
EVAPOTRANSPIRATION	26.875	(1.815)	97558.	70.78
LATERAL DRAINAGE FROM LAYER 2	8.2704	(0.8587)	30021.	21.78
PERCOLATION FROM LAYER 3	2.5066	(0.0715)	9099.	6.60
CHANGE IN WATER STORAGE	-1.069	(2.263)	-3879.	-2.81

****

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 5

	(INCHES)	(CU. FT.)
PRECIPITATION	2.53	9183.9
RUNOFF	0.891	3233.2

LATERAL DRAINAGE FROM LAYER 2	0.0529	192.2
PERCOLATION FROM LAYER 3	0.0091	33.2
HEAD ON LAYER 3	30.6	
SNOW WATER	2.99	10864.1

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.4570

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.0325

****

****

FINAL WATER STORAGE AT END OF YEAR 5

LAYER	(INCHES)	(VOL/VOL)
1	0.99	0.1645
2	7.09	0.2954
3	7.74	0.4300
SNOW WATER	0.00	

****

****