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STS Consultants Ltd.
Consulting Engineers

HYDROGEOLOGIC STUDY UPDATE

FOR THE

CRANDON PROJECT

EXXON MINERALS COMPANY

JUNE, 1984

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Exxon Minerals Company
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Project

Hydrogeologic Study Update
Crandon Project

STS Job 12959

June 26, 1984



STS Consultants Ltd.

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STS Consultants Ltd.
Consulting Engineers
540 Lambeau
Green Bay, Wisconsin 54303
(414) 494-9656

June 26, 1984

Exxon Minerals Company
P. O. Box 813
Rhinelander, Wisconsin 54501

Attention: Mr. Carlton C. Schroeder,
Project Engineer

STS Job 12959

RE: Hydrogeologic Study Update for the Crandon Project.

Gentlemen:

We are pleased to submit this narrative report and associated drawings 12959-1 through 19 which constitute the 1984 Hydrogeologic Study Update for the Crandon Project. This report and drawings are contained in two volumes. Fifty (50) copies have been delivered to the above address. This work has been completed in accordance with your contract No. 21678.

We have appreciated this opportunity to be of service. Please contact us if we can be of further assistance.

Yours very truly,

STS CONSULTANTS LTD.

James A. Senger

James A. Senger, CPGS
Senior Environmental Geologist

William M. Perpich

William M. Perpich, P. E.
Regional Vice President

JAS/cs

TABLE OF CONTENTS

Page

I. PURPOSE AND SCOPE OF STUDY....1

II. SUMMARY OF RESULTS....2

III. FIELD AND LABORATORY PROCEDURES
A. Quality Control....4
B. Drilling and Cuttings Analysis....4
C. Split-Spoon Sampling....6
D. Geophysical Logging....9
E. Piezometer Installations....11
F. Field Permeability Tests....15
G. Grain Size Analysis....17
H. Water Contents....18

IV. DEFINITION OF GLACIAL DEPOSITS
A. Glacial Till....19
B. Basal Till....22
C. Coarse-Grained Stratified Drift....22
D. Fine-Grained Stratified Drift....25
E. Lacustrine....25

V. INTERPRETATIONS AND RESULTS
A. Map Construction....29
B. Soil Boring Logs....31
C. Field and Laboboratory Data Interpretations
1) Split-spoon Sampling....31
2) Drill Cuttings Analysis....31
3) Geophysical Logging....32
4) Field Permeability Tests....36
5) Drill Rig Performance....43

VI. HYDROGEOLOGY
A. General Groundwater Flow Characteristics....45
B. Mine Waste Disposal Facility (MWDF) Area....45
C. Flow Boundaries....49

VII. RE-EVALUATION OF SOIL SAMPLES FROM EARLIER BORINGS
A. G-40 Series....50
B. G-41 Series....50

VIII. FIELD PERMEABILITY TESTS IN OLDER WELLS....55

IX. REFERENCES....59

X. GLOSSARY....60

TABLE OF CONTENTS (cont'd)

XI. APPENDICES

A - General Notes
Composite Soil Boring Logs for EX-1 through 16
Well Installation Diagrams for EX-1 through 16
Soil Boring Logs for RP-1 through 15
Summary of Driller's Observations during Well Point Installations
Well Installation Diagrams for WP-1 through 7
Unified Soil Classification Chart

B - Gradation Curves - 1) EX Borings
2) G-40 Series
3) G-41 series
4) RP Borings

C - Field Permeability Test Data - 1) EX Piezometers
(Hydraulic Conductivity Test) 2) Well Points
3) Older Wells, G-40, G-41, DM, DW, BE

D - Summary of Well Elevations and Coordinate Locations
Water Level Measurements on 4-27-84 and 5-24-84

LIST OF FIGURES

Page

Figure 1: P200 Distribution for Various Glacial Deposits.....20
Figure 2: Composite Gradation Curve for Glacial Till.....21
Figure 3: Composite Gradation Curve for Basal Till.....23
Figure 4: Composite Gradation Curve for Coarse-Grained Stratified Drift...24
Figure 5: Composite Gradation Curve for Fine-Grained Stratified Drift.....26
Figure 6: Composite Gradation Curve for Lacustrine Deposits.....28
Figure 7: Field Permeability Test Results Distributions for Various Glacial Deposits.....44

LIST OF TABLES

Page

Table 1: Summary of EX Drilling Program.....7
Table 2: Summary of Piezometer Installations at EX Locations.....12
Table 3: Statistical Analysis of Field Permeability Test Data.....37
Table 4: Field Permeability Test Summary - EX Wells.....38, 39, 40, 41
Table 5: Field Permeability Test Summary - Well Points.....42
Table 6: Summary of Vertical Groundwater Gradients at EX Piezometers and Well Points.....46, 47
Table 7: Re-Evaluation Summary of Soil Samples from Earlier Bore Holes, G-40 Series.....51
Table 8: Re-Evaluation Summary of Soil Samples from Earlier Bore Holes, G-41 Series.....52, 53, 54
Table 9: Field Permeability Test Summary - G-40 and G-41 Wells.....56
Table 10: Field Permeability Test Summary - DM and DW Wells.....57
Table 11: Field Permeability Test Summary - BE Wells.....58

LIST OF DRAWINGS

12959-1	Soil Boring and Piezometer Location Map
12959-2	Geologic Cross-Section Index
12959-3	Geologic Cross-Sections A-A', B-B', C-C', D-D'
12959-4	Geologic Cross-Sections E-E', F-F', G-G', H-H'
12959-5	Geologic Cross-Sections I-I', J-J', K-K', L-L', M-M'
12959-6	Top of Bedrock Contour Map
12959-7	Saturated Aquifer Isopach Contour Map
12959-8	Bottom of Aquifer Contour Map
12959-9	Groundwater Potentiometric Surface Contours
12959-10	Geologic Cross-Sections A-A', B-B', C-C', D-D' with Piezometer Data
12969-11	Geologic Cross-Sections E-E', F-F', G-G', H-H' with Piezometer Data
12959-12	Geologic Cross-Sections I-I', J-J', K-K', L-L', M-M' with Piezometer Data
12959-13	Expanded Geologic Cross-Sections of Skunk Lake
12959-14	Expanded Geologic Cross-Sections of Deep Hole Lake
12959-15	Expanded Geologic Cross-Sections of Duck Lake
12959-16	Expanded Geologic Cross-Sections of Little Sand Lake
12959-17	Expanded Geologic Cross-Sections of Little Sand Lake & Oak Lake
12959-18	Expanded Geologic Cross-Sections across Hemlock Creek
12959-19	Expanded Geologic Cross-Sections across Swamp Creek

I. PURPOSE AND SCOPE OF STUDY

Exxon Minerals Company is presently conducting studies to determine the feasibility of developing a mine/mill complex for the mining and processing of ores from a sulfide deposit of zinc and copper located in Forest County, Wisconsin. This proposed development is known as the Crandon Project. As part of the continuing environmental impact study, Exxon has completed several studies to determine the impact of the proposed development on surface and groundwaters (D'Appolonia, 1982 and Golder Associates, 1981 and 1982). In cooperation with the Wisconsin Department of Natural Resources, Exxon agreed to additional hydrogeologic study to further define the soils and groundwater flow system.

The scope of this additional hydrogeologic work included soil borings, geophysical logging of selected boreholes, piezometer installations, field permeability tests, and laboratory testing of new and old soil samples to determine grain size. This report includes the results of field and laboratory work. It provides additional definition of the type and extent of glacial deposits, as well as updated drawings showing the groundwater potentiometric surface and aquifer thickness. Revised geologic cross-sections and a bedrock surface contour map are also presented.

II. SUMMARY OF RESULTS

The additional soil borings, piezometer installations, field and laboratory tests have substantially confirmed the conclusions of previous reports (Golder Associates, 1982). This work has provided additional insight and definition of the glacial geology and groundwater flow system at the Crandon Project.

Five categories of glacial deposits have been defined. Glacial till is found throughout the site consisting primarily of slightly silty fine to medium sand and silty fine to coarse sand with varying amounts of gravel. Slightly finer grained basal till deposits are found less extensively on the bedrock surface. An extensive layer of glacial outwash exists across the site. These outwash deposits were divided into two categories, fine and coarse-grained stratified drift. The fine-grained stratified drift consists primarily of uniformly sorted fine sands; whereas the coarse-grained stratified drift consists of well to poorly-graded sands and gravels. The outwash deposits are at least one order of magnitude (10x) more permeable than the other glacial deposits.

Lacustrine sediments found at the Crandon Project include both those deposited at the bottom of existing lakes, as well as those deposited in lakes during glacial times. The five lakes closest to the Crandon formation are perched. The surface water level in Little Sand, Oak, Duck, Skunk and Deep Hole Lakes is higher than the surrounding groundwater levels, and therefore, these surface waters are discharge zones in the groundwater flow system.

Groundwater flows from the proposed MWDF upland areas southeast of the proposed mine site in a radial direction and discharges to Ground Hemlock Lake, Hemlock Creek, Swamp Creek and Rolling Stone Lake and its associated streams and wetlands. Significant upward vertical gradients have been measured along both Hemlock and Swamp Creeks indicating that these areas are groundwater flow boundaries with no significant underflow. The majority of groundwater flow to these discharge areas is through the fine and coarse-grained stratified drift units. The predominantly horizontal flow is recharged vertically by flow downward through the surficial till and upward through the basal till and lacustrine deposits near the bedrock surface.

III. FIELD AND LABORATORY PROCEDURES

A. Quality Control

STS provided an experienced Field Geologist on a full-time basis to observe and document the split-spoon sampling and piezometer installations. Field boring logs and well installation diagrams were prepared by the STS geologist. Piezometer depths were selected by Exxon and STS personnel. After the completion of EX-4 and EX-5, a meeting was held with the Wisconsin DNR to review the piezometer placement and installation procedures.

STS provided an experienced Senior Technician to conduct the field permeability tests. Duplicate tests were conducted in selected wells by the Wisconsin DNR with comparable results.

Laboratory testing was conducted in accordance with applicable ASTM specifications which are referenced herein.

B. Drilling and Cuttings Analysis

The drilling program included sixteen (16) soil borings and multiple piezometer installations at the EX locations (EX-1 through EX-16). At these locations, the drilling and piezometer installations were completed by Denny's Drilling, Inc. of Duluth, Minnesota with Lusier's Well Drilling, Inc. of Oconto Falls, Wisconsin as a subcontractor. The EX locations were selected by Exxon and the Wisconsin DNR. The actual field locations were staked and access was provided by Exxon.

In general, the boreholes were drilled with a Schramm Model T-64HB rotary drilling rig utilizing both air and mud rotary techniques. Casing was installed to stabilize the top of the borehole. These techniques produced a borehole with approximately a 15.9 cm (6 1/4-inch) diameter. Water utilized in the drilling process was obtained from an on-site well owned by Exxon. A liquid polymer (Drispac and Quik-Trol) was added to the bentonite drilling mud to improve cuttings removal and wall cake and to increase sample recovery.

Fifteen (15) shallower soil borings were completed by STS in the proposed water reclaim pond area (RP-1 through RP-15). These borings were completed utilizing either a track-mounted CME 55 or Mobile B-61 rotary drilling rig. The boreholes were advanced utilizing either power augers or rotary drilling procedures with wash water and Revert drilling mud. No wells were installed in the RP borings. All of these boreholes were grouted with a bentonite/cement slurry upon completion.

Shallow well points were installed at 7 locations (WP-1 through WP-7) by STS adjacent to groundwater discharge areas utilizing either power augers or the wash boring technique. Two well points at different elevations were installed at each location. No drilling muds were used for the well point installations. The locations for the well points, reclaim pond borings and EX borings are presented on drawing 12959-1.

Samples of the cuttings were collected from the circulating drilling mud from the EX borings. These samples were collected either by the STS field

geologist or driller at approximate 1.5 meter (5-foot) intervals. The samples were rinsed with clear water to remove some of the drilling mud residue. They were then placed in a small plastic vial, labeled and stored in moisture-proof core boxes for later shipment to the Wisconsin Geological and Natural History Survey. The cuttings were most useful when viewed immediately after collection because drilling fluid polymers allowed the collection of intact clumps of cohesive soil. These clumps of cohesive material break down with time.

C. Split-Spoon Sampling

Table 1 presents a summary of the EX drilling program. The borings ranged in depth from 35.7 meters (117 feet) at EX-4 to 93.0 meters (305 feet) at EX-12. In general, the deepest borings were in the proposed mine waste disposal facility (MWDF) area (Borings EX-9 through EX-16). All of the borings were extended to the bedrock except EX-16 which was located adjacent to an older boring G41-C15, which penetrated the bedrock.

Split-spoon soil samples were collected in each boring. The number of samples and sampling interval for each boring are presented on Table 1. Samples were collected at 1.5 meter (5-foot) intervals at EX-4 to provide a detailed soil boring log to compare with the geophysical log. For most of the other EX borings, split-spoon samples were collected every 3.0 meters (10 feet) with the exception of borings EX-7, 15 and 16 which were geophysically logged and had only 3 or 4 control samples taken approximately every 18.3 meters (60 feet).

FOR DETAILED LOCATION OF THESE AND ADDITIONAL BORINGS IN THIS AREA, SEE DRAWING NO 050-1-81330, FIGURE 2.3

PROPOSED MWDF

EX-2 OFFSET 33,632E, 689,532N

NOTE: ELEVATIONS IN METERS MSL

250 0 250 500 750 1000

SCALE IN METERS

LEGEND

- TEST BORING LOCATION
- TEST BORING INCLUDING GROUNDWATER OBSERVATION WELL
- TEST BORING INCLUDING MULTIPLE GROUNDWATER OBSERVATION WELL
- WELL DATA PROVIDED BY U.S.G.S.
- GOLDER ASSOCIATES TEST PIT LOCATION
- GOLDER ASSOCIATES TEST WELL LOCATION
- DAMES & MOORE TEST WELL LOCATION
- CRANDON FORMATION
- EX BORINGS AND PIEZOMETER LOCATIONS
- WP WELL POINT LOCATIONS
- RECLAIM POND BORINGS

NOTE

SUPERVISION OF BORINGS AND GROUNDWATER OBSERVATION WELL INSTALLATION DETERMINED BY THE FOLLOWING DESIGNATION PREFIXES:

G	GOLDER ASSOCIATES
DM	DAMES & MOORE
DW	DAMES & MOORE
BE	BRAUN ENGINEERING TESTING
X	EXXON MINERALS COMPANY
STS	SOIL TESTING SERVICES OF WISCONSIN, INC.
AR,RR	SOIL TESTING SERVICES OF WISCONSIN, INC.
CDM	CAMP DRESSER & McKEE, INC.
EX	STS CONSULTANTS LTD.

REVISED	DATE	BY	DESCRIPTION
	6-21-84	J.J.T.	EX, WP, RP LOCATIONS

STS DRWG 12959-1

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

EXXON MINERALS COMPANY
CRANDON PROJECT

TITLE
SOIL BORING AND PIEZOMETER LOCATION MAP

SCALE AS SHOWN	STATE WISCONSIN		COUNTY FOREST
DRAWN BY CAB	DATE 4-12-82	CHECKED BY CB	DATE 4-12-82
APPROVED BY	DATE 4-12-82	APPROVED BY	DATE
APPROVED BY	DATE	EXXON	DATE
DRAWING NO 050-1-81333		SHEET OF	REVISION NO

DESIGN PRODUCTS CO.

TABLE 1

Summary of EX Drilling Program
Crandon Project

Boring	Total Depth Ft.	Total Depth M.	Number of Split-Spoon Samples	Approximate Sampling Interval Ft.	Approximate Sampling Interval M.	Geophysical Logging	Depth to Bedrock Ft.	Depth to Bedrock M.
EX-1	133	40.5	13	10	3.0	No	131.5	40.1
EX-2	192	58.5	19	10	3.0	No	192	58.5
EX-3	162	49.4	16	10	3.0	No	156	47.5
EX-4	117	35.7	22	5	1.5	Yes	117	35.7
EX-5	186	56.7	16	10	3.0	Yes	154	46.9
EX-6	196	59.7	19	10	3.0	No	190	57.9
EX-7	169	51.5	3	60	18.3	Yes	160	48.8
Ex-8	175	53.3	18	10	3.0	No	174	53.0
EX-9	280	85.3	26	10	3.0	No	270	82.3
EX-10	256	78.0	24	10	3.0	No	250	76.2
EX-11	285	86.9	31	10	3.0	No	281	85.6
EX-12	305	93.0	29	10	3.0	No	300	91.4
EX-13	235	71.6	25	10	3.0	Yes	234	71.3
EX-14	283	86.3	28	10	3.0	No	281	85.6
EX-15	235	71.6	4	60	18.3	Yes	225	68.6
EX-16	145	44.2	3	60	18.3	Yes	-	-

The samples were collected using a 7.6 cm (3-inch) OD, 6.3 cm ID split-spoon sampler which was 61 cm (24 inches) long. At the EX locations, the split-spoon sampler was driven by an air hammer. The length of penetration and recovery were plotted on the soil boring logs in Appendix A. In Boring EX-11, the split-spoon sampler was increased to 122 cm in length to obtain larger samples of the glacial till near the proposed base grade of the MWDF.

For the split-spoon samples collected by STS in the RP borings, the sampling procedure involved driving a 7.6 cm (3-inch) OD split-spoon sampler 61 cm (24 inches) with a 136 kg (300-pound) hammer freefalling a distance of 76 cm (30 inches). The number of blows required to drive the sampler the final 30.5 cm (1 foot) was recorded and is indicated on the boring logs with the crossed circle.

Each sample from the EX borings was divided into three representative portions. One portion was placed in a small glass jar to be stored at the Exxon field office. Another portion was placed in a sealed plastic bag to be used for water content determination. The remaining portion of the sample was placed in a large mason jar and shipped to the STS laboratory in Green Bay, Wisconsin for grain size analyses.

Each of the samples recovered from the boreholes was examined by an experienced geologist to determine the major and minor soil components, degree of saturation, and any conspicuous lenses and seams found in the sample. The soils were then classified according to the Unified Soil Classification System. The capitalized symbol in parentheses on the boring

logs is the appropriate group symbol according to this classification system. A chart describing the properties of the various groups under this classification system is contained in Appendix A.

Upon completion of the sample classification, the geologist grouped the samples by type as shown on the soil boring logs. The strata contact lines represent approximate boundaries between soil types; whereas changes in the soil types insitu may be gradual in both the horizontal and vertical directions.

Core samples of the bedrock were obtained in selected borings with N-size, double-tube core barrels with either diamond or carbide bits. All bedrock samples were logged and handled by Exxon. Information concerning the bedrock cores can be obtained from Rowe, 1984.

D. Geophysical Logging

Six (6) EX borings (EX-4, 5, 7 , 13, 15 and 16) were geophysically logged using mechanical, nuclear and sonic devices. The geophysical logging was completed by Snyder Brothers, Inc. of Grayville, Illinois. The logging was conducted in the uncased boreholes which were filled with bentonite drilling mud. Borings EX-4 and 5 were logged first so that the logging results could be compared to the soil boring logs developed by conventional split-spoon sampling.

The logging procedure first involved determining borehole diameter by using a three-pronged mechanical device (caliper). When no obvious borehole obstructions were evident, the next device, which was used for natural gamma and the neutron log, was lowered into the borehole. The actual logging was conducted from the bottom to the top of the borehole. After the neutron and natural gamma log, the bulk density log (gamma-gamma) and the sonic velocity logs (P and S waves) were completed.

The logging results from EX-4 and EX-5 were jointly reviewed by Exxon, STS, representatives of the Wisconsin DNR, Wisconsin Geological and Natural History Survey, and the U. S. Geological Survey. From a qualitative standpoint, it was decided that the neutron and bulk density logs provided useful information. However, conventional split-spoon sampling was completed in the MWDF area at the request of the DNR. Therefore, the geophysical logging was limited to boreholes on the fringe of the study area and in selected older wells.

It was beyond the scope of this report to provide a quantitative analysis of all the geophysical logs. The final geophysical logs were submitted to Exxon by the logging contractor after the application of correction factors and other raw data processing. Only the natural gamma and neutron logs are presented on the composite soil boring logs in Appendix A for the 6 EX borings. A discussion of the qualitative interpretations made from these logs by STS and Exxon personnel is included in a subsequent section of this report.

E. Piezometer Installations

Table 2 presents a summary of the 67 piezometers that were installed at the 16 EX boring locations. Three to five piezometers were installed at each location. Where possible, 2 piezometers were installed in a single borehole. The deepest borehole at each location was designated A, and the progressively shallower boreholes were designated B, C, and D. Within a single borehole, the lowest piezometer was designated L with the upper piezometer designated U. For example, the lowest piezometer in the deepest borehole at EX-1 was designated EX-1AL and the uppermost piezometer in the shallower borehole was EX-1BU.

The specific construction details for each piezometer installation are shown on Field Well Installation Diagrams in Appendix A. Each piezometer consisted of 5.1 cm (2-inch) diameter, Schedule 40 PVC riser pipe with solvent-welded belled couplings. Prior to placing the well screen in the borehole, approximately 61 cm (2 feet) of pea gravel were placed. A 91.5 cm (3-foot) length of well screen with No. 20 slot was then inserted in the borehole. Typically, Barafos was pumped into the well screen area to help disperse the bentonite wall cake. Pea gravel was then placed around the well screen and approximately 61 cm (2 feet) above the well screen.

In the first few piezometer installations (EX-4, 5, 15 and 16), bentonite pellets were placed above the pea gravel to seal the piezometer tip into a particular soil stratum. Grout was then placed to fill the annulus to the next piezometer or to the ground surface. The grout consisted of a mixture

TABLE 2

Summary of Piezometer Installations
EX-Locations
Crandon Project

Boring	Total Number of Wells at Location	Piezometer Depths (ground surface to well tip) AL Ft.	AL M.	AU Ft.	AU M.	BL Ft.	BL M.	BU Ft.	BU M.	CL Ft.	CL M.	DL Ft.	DL M.
EX-1	4	129	39.3	106	32.3	45	13.7	20	6.1	-	-	-	-
EX-2	4*	155	47.2	73	22.2	35	10.7	-	-	45	13.7	-	-
EX-3	5	147	44.8	113	34.4	73	22.2	43	13.1	11	3.4	-	-
EX-4	5	117.5	35.8	94.5	28.8	65.5	20.0	40	12.2	26	7.9	-	-
EX-5	5**	186	56.7	163	49.7	110	33.5	58	17.7	73	22.2	-	-
EX-6	4	178	54.2	122	37.2	85	25.9	30	9.1	-	-	-	-
EX-7	4	159.5	48.6	-	-	110	33.5	70	21.3	9.5	2.9	-	-
EX-8	4	164	50.0	105	32.0	75	22.9	13	4.0	-	-	-	-
EX-9	4	278	84.7	246	75.0	190	57.9	135	41.1	-	-	-	-
EX-10	4	248	75.6	197	60.0	145	44.2	95	28.9	-	-	-	-
EX-11	5	270	82.3	225	68.6	172	52.4	140	42.7	100	30.5	-	-
EX-12	4	294	89.6	235	71.6	184	56.1	122	37.2	-	-	-	-
EX-13	5	231	70.4	-	-	191	58.2	144	43.9	107	32.6	73	22.2
EX-14	4	268	81.7	203	61.9	165	50.3	115	35.0	-	-	-	-
EX-15	3	222.5	67.8	120	36.6	50	15.2	-	-	-	-	-	-
EX-16	3	142	43.3	107	32.6	70	21.3	-	-	-	-	-	-

* EX-2BL was dry and replaced by EX-2CL

** EX-5BU was dry and replaced by EX-5CL

of 7 gallons of water for each 94-pound bag of Type I Portland Cement with 2 pounds of bentonite powder. Two pounds of calcium chloride were also added to the grout to accelerate hardening. The grout was placed by using a tremie pipe. However, problems developed with the grout displacing the bentonite pellet seal and entering the well screen. On the remaining installations, the cement grout and bentonite pellets were replaced with Benseal, a granulated bentonite. The Benseal was mixed with EZ Mud, a polymer, to retard swelling long enough to allow the driller to pump the mixture through a tremie pipe to the desired depth in the borehole. Benseal worked satisfactorily and reduced the waiting time between piezometer installations in a single borehole.

The shallowest piezometer at each multiple installation was designed as a water table observation well. It typically consisted of 5.1 cm (2-inch) diameter PVC with a 4.6 to 6.1-meter (15 to 20-foot) long well screen with No. 20 slot in pea gravel backfill.

All the piezometers were developed after installation using compressed air for approximately 30 minutes. In addition, prior to conducting permeability tests, a plunger was used in each of the piezometers to surge the well screen at the request of the Wisconsin DNR.

After review of the field permeability test results, 17 piezometers were selected for further development. Most of these were located within fine sand layers. It appeared that the surging caused fine sand to enter the well screen and fill a portion of the riser pipe. These partially plugged

wells were successfully redeveloped by using both water and compressed air to remove the fine sand.

Elevations for the top of the PVC and ground surface together with location coordinates for all the piezometers were determined by Inman, Foltz & Associates, Inc. of Minocqua, Wisconsin. The survey data are presented in Appendix D. In addition, water level measurements were collected by Exxon personnel for all the old and new wells during April and May, 1984. A summary of the water level measurements is presented in Appendix D.

STS installed 14 well points at 7 locations (WP-1 through WP-7). Each location consisted of one shallow (water table) and one deep piezometer. Well Installation Diagrams for these well points are presented in Appendix A. The shallow well points typically ranged in depth from 1.5 to 3.0 meters (5 to 10 feet) and consisted of a 1.2 to 2.4-meter (4 to 8-foot) length of PVC well screen with No. 10 slot. The shallow well points were installed within an auger hole and pea gravel was placed adjacent to the well screen. The PVC well screen was attached to a galvanized riser pipe and the annulus was sealed with a bentonite slurry. The lower well points were approximately 10.1 meters (33 feet) deep and consisted of 5.1 cm (2-inch) diameter galvanized pipe with a 91.5 cm (3-foot) long stainless steel well point with No. 10 slot. In general, the borehole was advanced to 9.0 meters (30 feet) and then the well point was driven the final 91.5 cm (3 feet). The borehole annulus was then sealed with grout. The well points were not developed.

F. Field Permeability Tests

Field permeability (hydraulic conductivity) tests were conducted by STS in 51 EX piezometers, 7 well points, and 27 older wells. Where possible, both rising and falling head tests were conducted in each well. Falling head tests only were conducted in piezometers sealed into very low permeability formations such as bedrock. In the small diameter older BE series wells, rising head tests only were conducted by using compressed air to remove the water column and then the rate of water level recovery was manually recorded. Except for the old small diameter wells, the field permeability tests were conducted using a pressure transducer and data logger.

The general procedures involved placing the 25 psi transducer approximately 6.1 meters (20 feet) below the static water level. The model PT-105V pressure transducer was connected to the Enviro Labs model DL120 data logger which has a microprocesser capable of being programmed to take and store transducer readings at any intervals from 10 seconds to 24 hours. Once the data logger was programmed to begin logging, a solid 2.54 cm (1-inch) diameter PVC slug approximately 4.6 meters (15 feet) long was dropped into the borehole to displace the column of water. Once the falling head test was completed, the slug was removed and a rising head test was conducted. The data logger recorded the transducer readings in percent of the 25 psi rating. After the test was completed, the data were printed out.

The raw transducer data and well construction details were input to a computer program developed by STS to calculate field permeability (hydraulic

conductivity). The program is based on the methodology developed by the Department of Navy (1971) known as the DM-7 Method. The DM-7 formula does not take into consideration changes in screen length or drainage from unsaturated gravel packs so field permeability tests were not conducted in the shallow water table piezometers or upper well points. The DM-7 formula is as follows:

$$K = \frac{r^2}{2L}\left[\ln \frac{L}{R}\right]\left[\frac{\ln H1/H2}{t2-t1}\right]$$

K = permeability
r = standpipe radius
L = gravel pack length
R = gravel pack radius
H - head level
t - time

This formula is applicable when the radius of the intake point of the piezometer differs from the radius of the standpipe. For the EX piezometers, the radius of the intake point is the radius of the borehole or gravel pack which is 7.937 cm (3.125 inches). The radius of the standpipe is only 2.54 cm (1 inch). Also, in all the EX piezometers, the gravel pack length exceeds the screen length. Therefore, the gravel pack length was used in the formula since water entering the entire gravel pack is immediately reflected in head level changes in the standpipe.

The first step in using the DM-7 method is plotting the data on semi-log arithmic graph paper, with the head ratio on the log scale and time on the arithmetic scale. Ideally, the data will plot as a straight line. Two points are then selected from this line and used in the formula. When the

data plots as a straight line, any two points can be selected to determine permeability. However, if the data plots as a curved line, interpretation is required. In general, two points from the straightest portion of the curve were selected near the beginning of the test. This resulted in a higher permeability value than if two points were selected from the later portion (more horizontal portion) of the curve.

For each falling or rising head test, the STS program printed the data and results on three sheets. These sheets are compiled in Appendix C. The first sheet provides a summary of the well construction details and permeability results. The second sheet is the graphical plot of the head ratio versus time. The third sheet is a summary of the field data (transducer readings).

G. Grain Size Analyses

Grain size analyses were completed on 200 samples from the EX borings, 30 samples from the RP borings, and 130 samples from the older G40 and G41 series borings. Sieve analysis was completed on each sample in accordance with ASTM D 421 (Preparation of Soil Samples for Particle Size Analysis). Hydrometer analysis was completed on samples with more than 25 percent passing the No. 200 sieve in accordance with ASTM D 422 (Particle Size Analysis of Soils). The results of the grain size analyses were plotted on gradation curves presented in Appendix B.

All of the samples from EX-4 and EX-5 were analyzed for grain size. In the other EX borings, representative samples were selected by a geologist to avoid duplicate testing of similar samples.

G. Water Contents

Water or moisture contents of all the samples collected from the EX borings were determined in accordance with ASTM D 2216 (Laboratory Determination of Water Content of Soils). The water content of soil is defined as the weight of the water divided by the weight of the dry soil in percent. The true moisture content from samples of non-cohesive sands and gravels is difficult to obtain because the samples have an opportunity to drain during the split-spoon sampling process. To the extent possible, the field geologist attempted to preserve a relatively undisturbed sample in a plastic bag. However, the moisture contents from the more cohesive fine-grained soils should be considered more accurate than the results from the coarser non-cohesive sands and gravels.

IV. DEFINITION OF GLACIAL DEPOSITS

This section of the report describes five general types of glacial deposits found at the Crandon Project. Each is distinguished by particle size distribution, shape of the gradation curve, percent passing the No. 200 sieve (P200), degree of sorting, and depositional features which can be seen in representative samples. The terminology for these five general categories, glacial till, basal till, coarse-grained stratified drift, fine-grained stratified drift and lacustrine is consistent with previous reports. However, refinements have been made to some of the definitions used previously (Golder Associates, 1982).

Figure 1 presents the P200 distribution for the various glacial deposits at the Crandon Project based on the gradation curves for samples from the EX borings. Eighty (80) samples of the glacial till were analyzed and had an average P200 of 20 percent within a range of 6 to 45 percent. The majority of the samples had a P200 in the range of 10 to 30 percent (Figure 1).

A. Glacial Till

Figure 2 is a composite gradation curve for the 80 samples of the glacial till. All the samples were either classified as SM-SP or SM under the Unified Soil Classification System. Typically, the samples were described as slightly silty fine to medium sand to silty fine to coarse sand. Gradation curves from the glacial till samples have a characteristic shape. The till consists of a well-graded mixture (poorly sorted) of silt, sand, gravel and cobbles with only a trace of clay (less than 10 percent). The glacial till deposits are extensive across the site and form many upland areas.

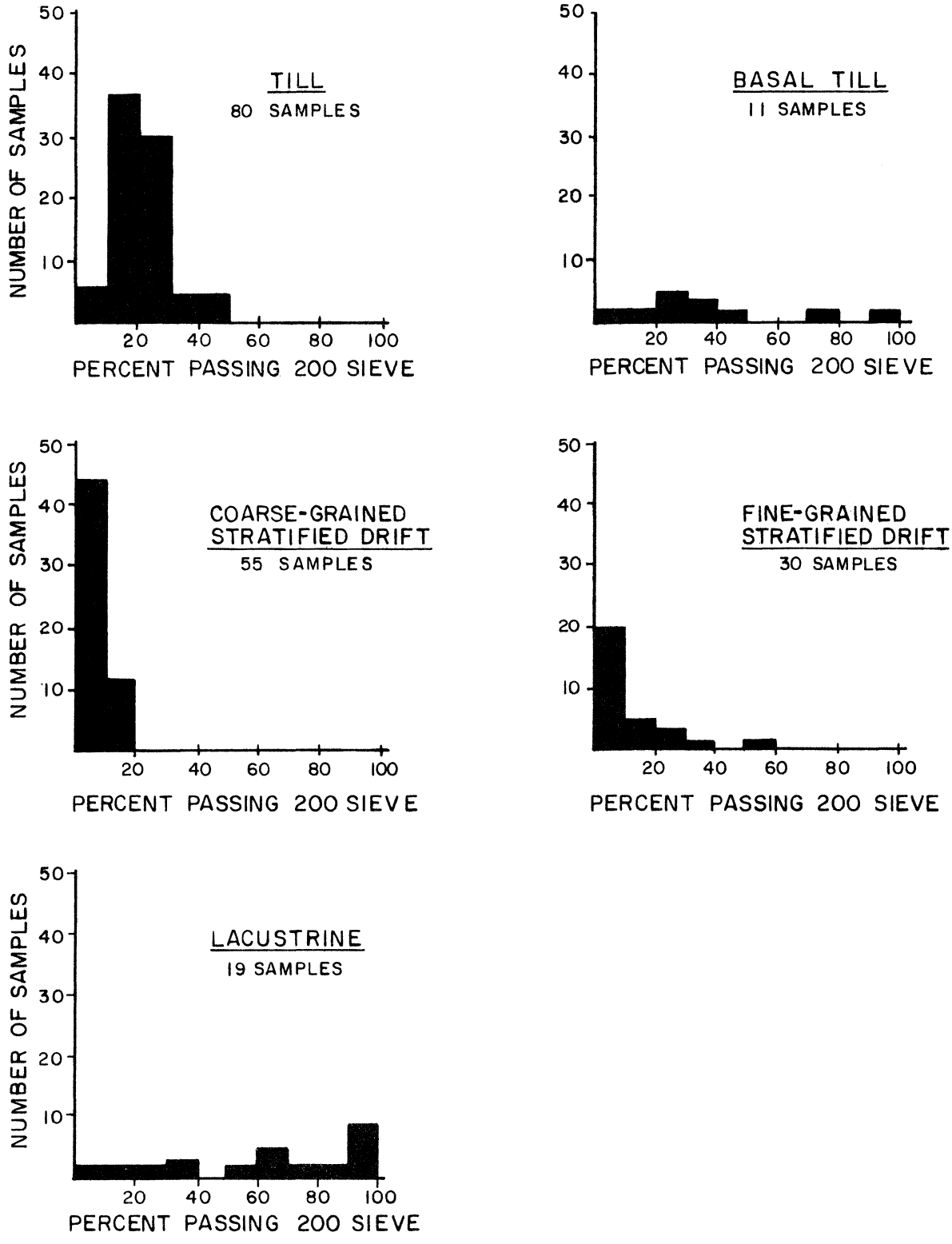
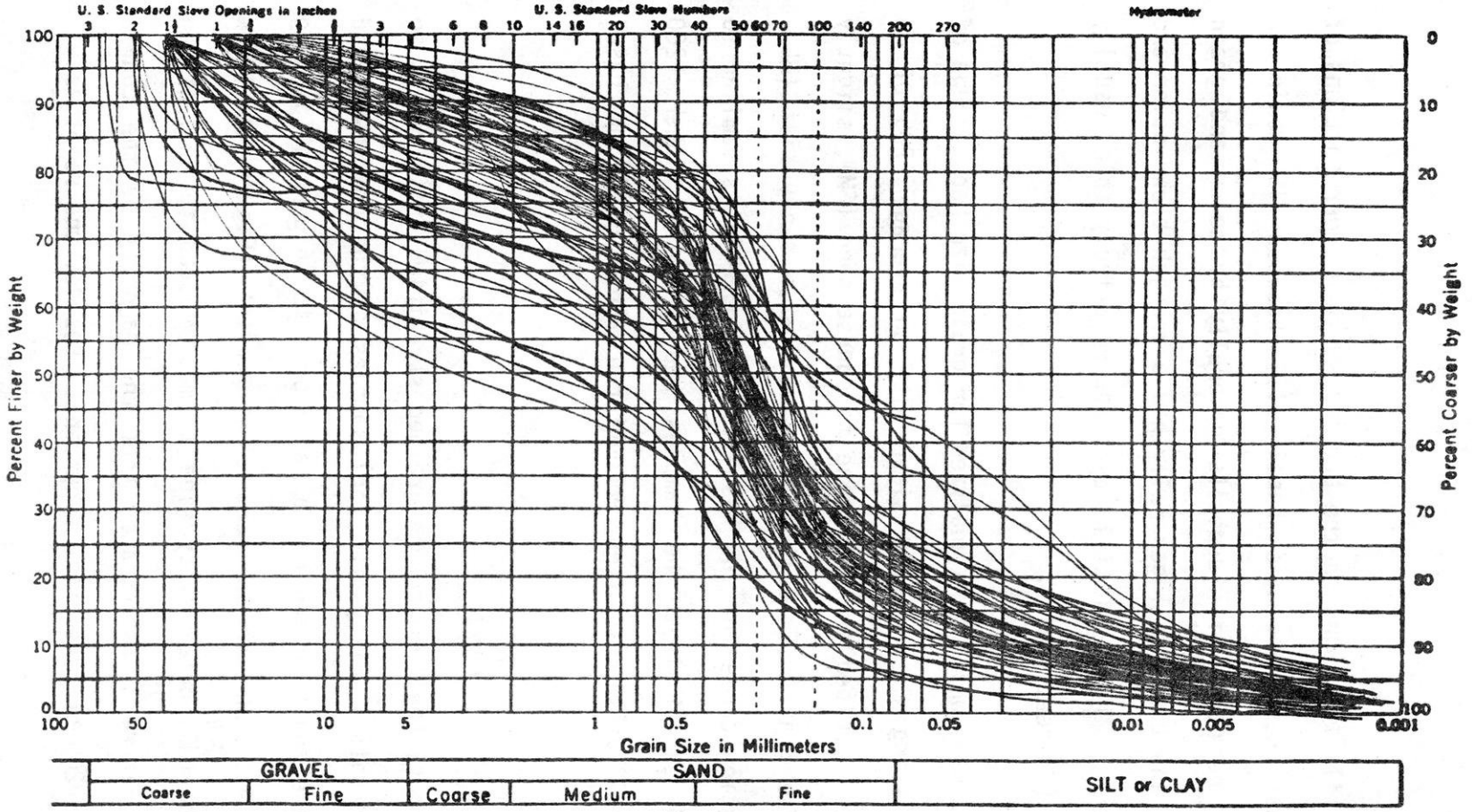


FIGURE 1 : P200 DISTRIBUTION FOR VARIOUS GLACIAL DEPOSITS CRANDON PROJECT

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J.J.T.	J.A.S.	5-25-84	12959

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
					Glacial Till SM-SP, SM

FIGURE 2
COMPOSITE GRADATION CURVES
EXXON MINERALS COMPANY
CRANDON PROJECT

STS Consultants Ltd.
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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	6-4-84	12959

FIGURE 2

BBS09302

B. Basal Till

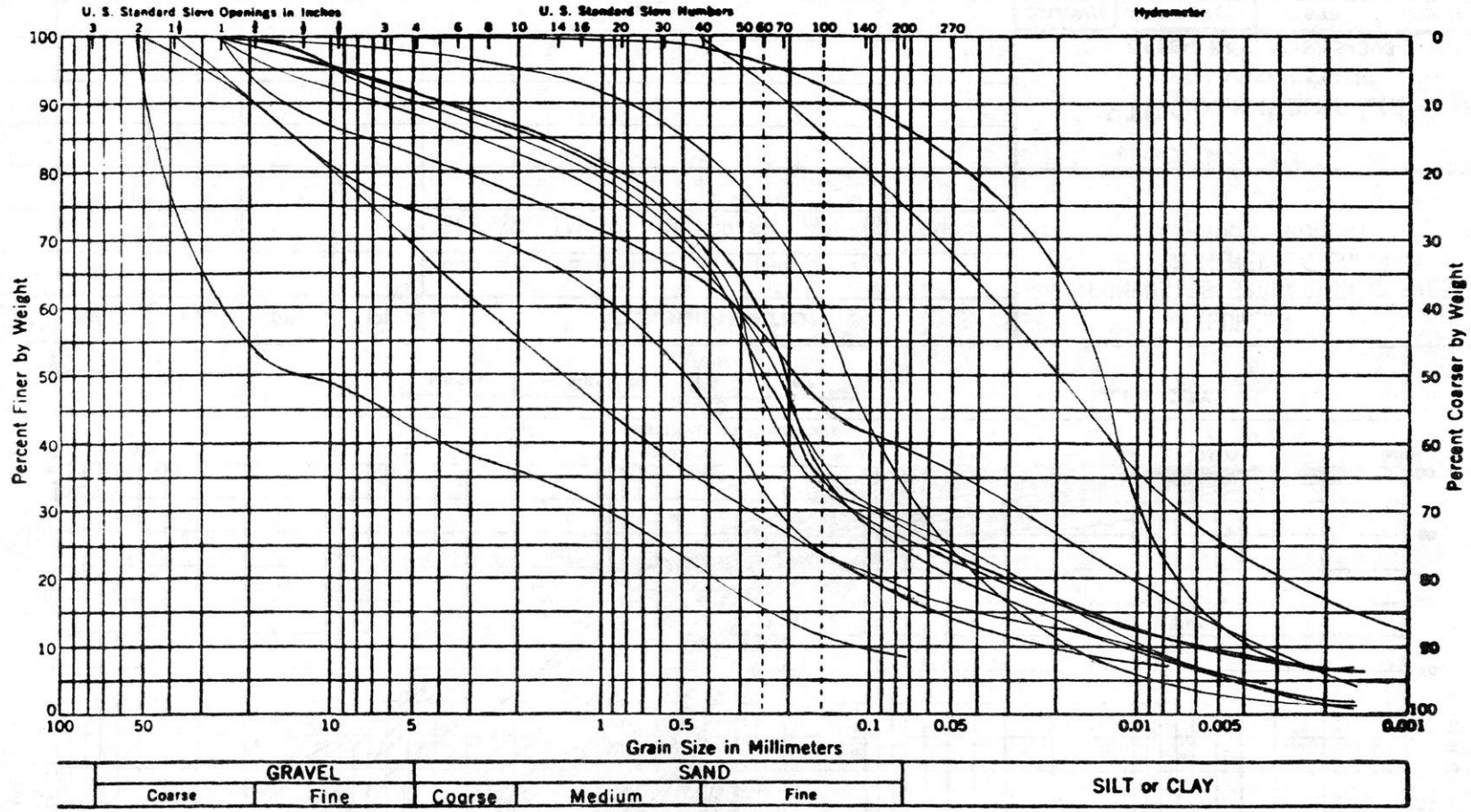
A layer of glacial till was found on the bedrock surface under portions of the site. It was designated as basal till because it could be distinguished from the other till deposits generally by color and grain size distribution. The basal till generally had a reddish brown color and a higher P200 content. The basal till layer was relatively thin, usually less than 10 meters (30 feet) thick.

The 11 basal till samples which were analyzed for grain size had a range of 9 to 90 percent passing the No. 200 sieve with an average P200 of 36 percent. They were described as silty fine to coarse sand (SM), slightly silty fine to coarse gravel (GM-GP), or fine to coarse sandy silt (ML). The composite gradation curve for the basal till (Figure 3) is similar to the surficial till except that the samples had slightly higher P200 content. The basal till was often encountered above or below basal lacustrine deposits.

C. Coarse-Grained Stratified Drift

As used in this report, the term coarse-grained stratified drift refers to glacial outwash deposits. Fifty-five (55) samples of the coarse-grained stratified drift were analyzed and had a range of 1 to 16 percent passing the No. 200 sieve with an average P200 of 7 percent (Figure 4). The samples ranged from well-sorted silty fine to medium sand to well-graded sand and gravel. Figure 1 illustrates that the majority of the coarse drift samples had a P200 of less than 10 percent. Besides the relatively

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
					Basal Till SM, ML, GM-GP

FIGURE 3
COMPOSITE GRADATION CURVES
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CRANDON PROJECT

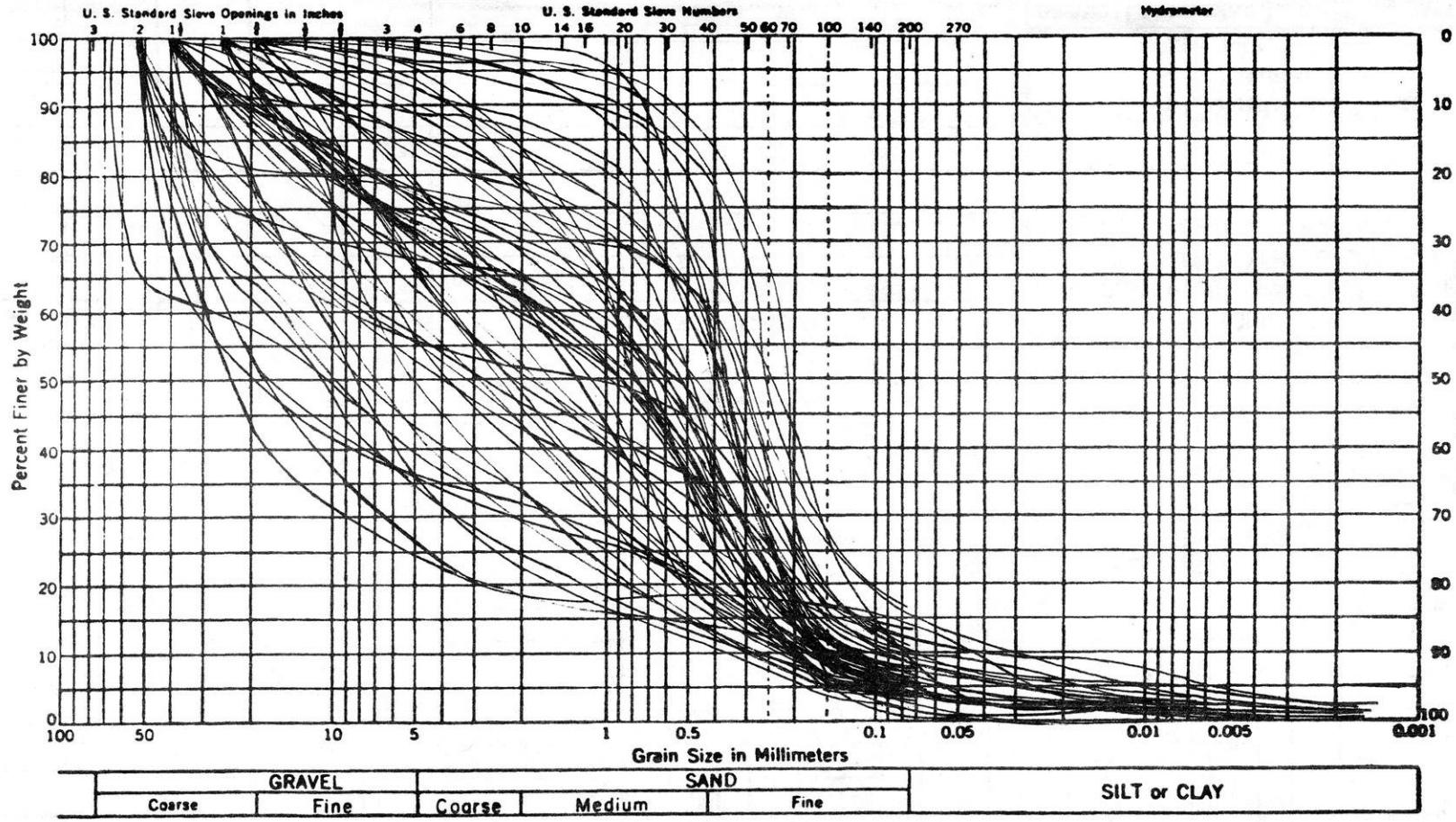
STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	6-4-84	12959

FIGURE 3

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
					Coarse Grained Stratified Drift
					SP, SW, SM-SP, SM, GP-GM, GP, GW, GM

FIGURE 4
COMPOSITE GRADATION CURVES
EXXON MINERALS COMPANY
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	6-4-84	12959

FIGURE 4

BBS09302

low P200 content, the coarse-grained stratified drift samples were distinguished by the presence of stratification indicating fluvial deposition which was absent in the till samples.

D. Fine-Grained Stratified Drift

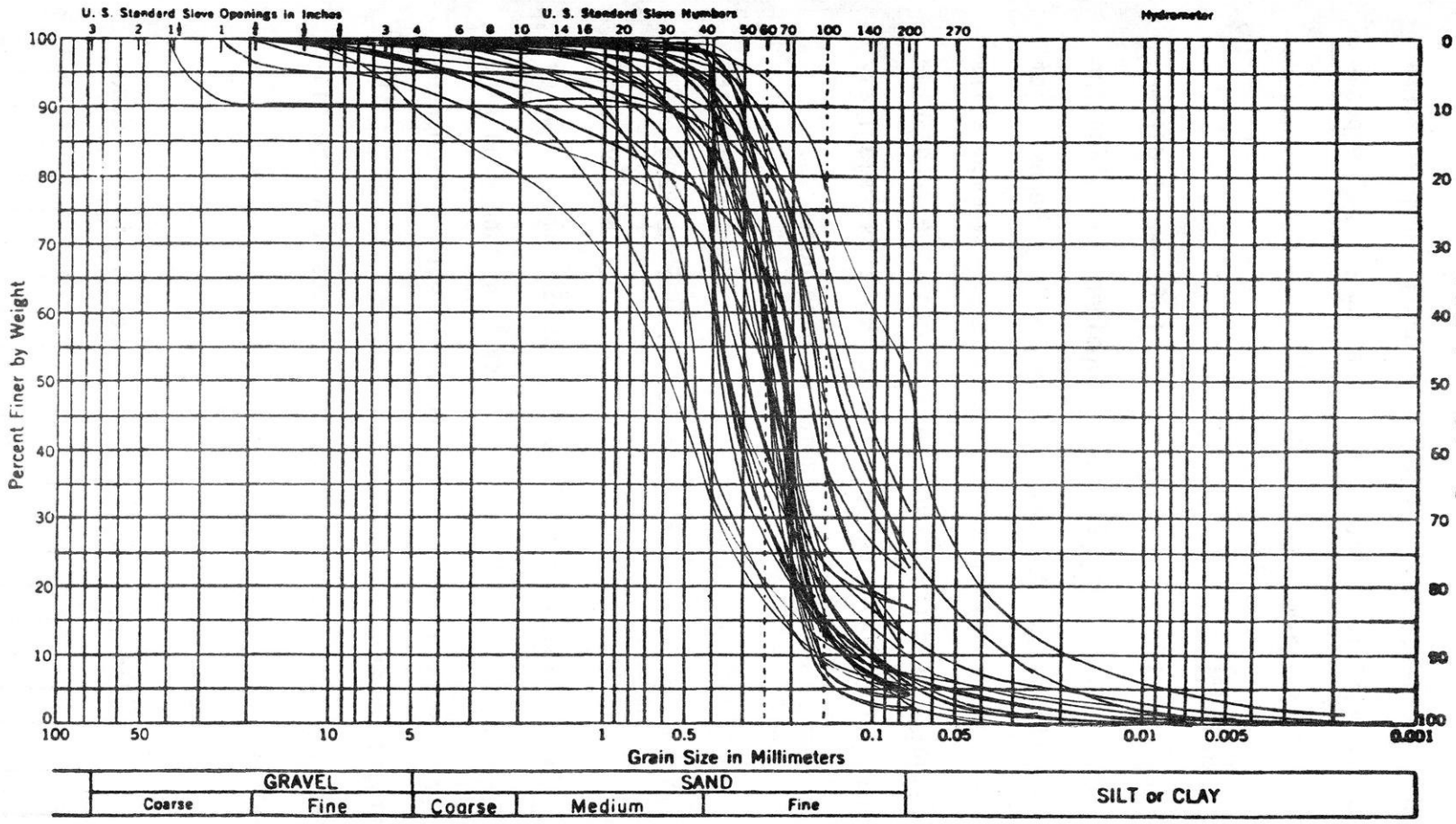
The definition of fine-grained stratified drift used in this report differs from the one used by Golder Associates (1982). The Golder definition for fine-grained stratified drift included primarily fine-grained deposits of glacial lacustrine origin consisting of very fine sands and varved silts and clays. Instead, STS has placed the varved deposits into the lacustrine category and has defined the fine-grained stratified drift as relatively well-sorted, uniformly-graded, fine-grained glacial outwash deposits.

Figure 5 is the composite gradation curve for 30 fine-grained stratified drift samples from the EX borings. These samples had an average P200 of 11 percent within a range of 2 to 51 percent. Under the Unified Soil Classification System, these samples were classified as SP, SM-SP, SM or ML. They were generally described as fine sand, silty fine sand, and fine sandy silt. The fine-grained stratified drift, together with the coarse-grained stratified drift, form what is called the aquifer material at the Crandon Project. These are glacial outwash deposits as opposed to the glacial till or fine-grained lake deposits.

D. Lacustrine

The lacustrine category includes relatively fine-grained sediments deposited at the bottom of lakes, both during glacial times and more recent

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
					Fine Grained Stratified Drift
					SP, SM-SP, SM, ML

FIGURE 5
COMPOSITE GRADATION CURVES
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	6-4-84	12959

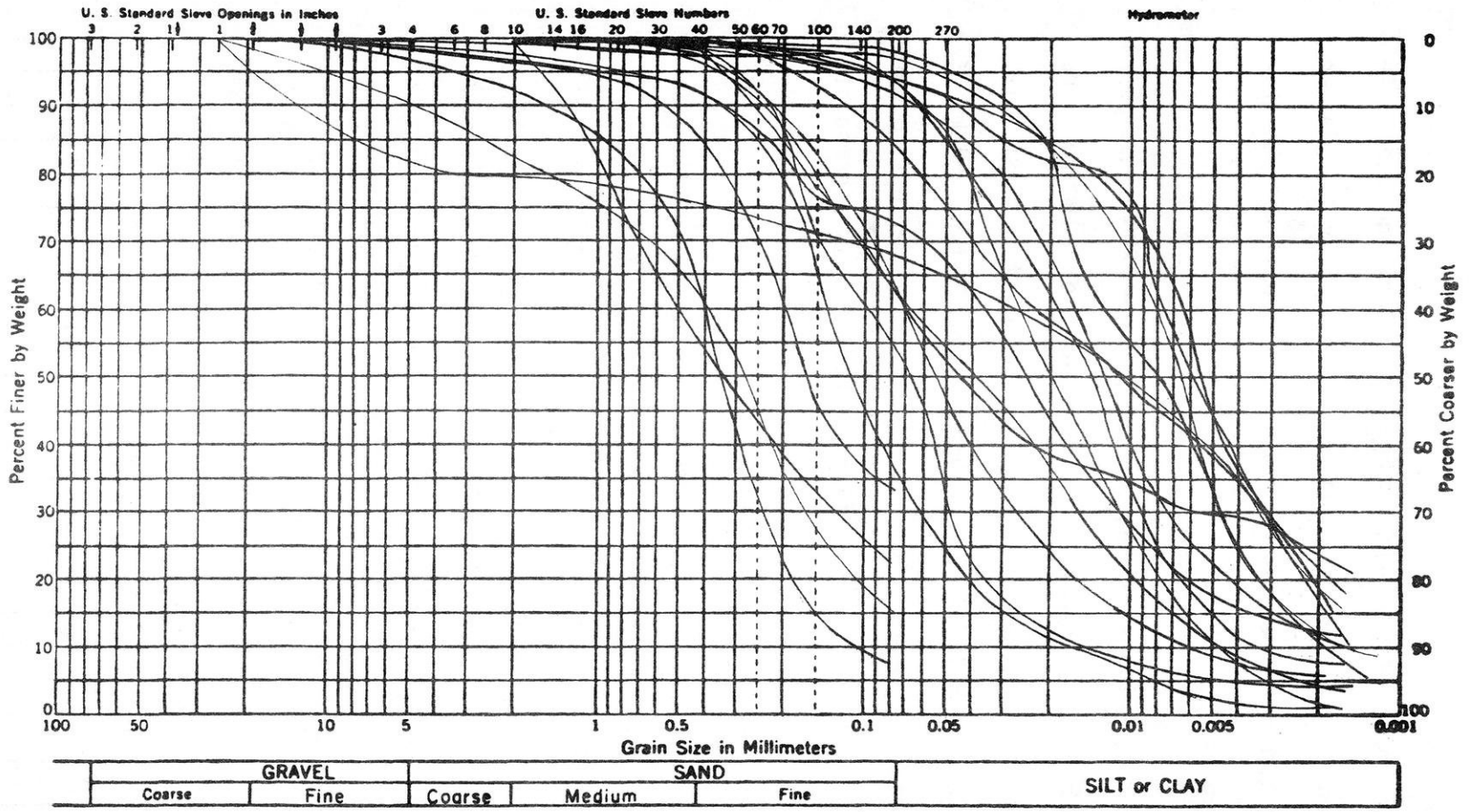
FIGURE 5

BBS09302

(post-glacial) deposits under Little Sand, Oak, Skunk, Duck and Deep Hole Lakes. The definition of lacustrine sediments in the previous Golder reports included only the more recent (post-glacial) deposits under the present lakes and wetlands.

The 19 samples of the lacustrine sediments had an average P200 of 66 percent within a range of 9 to 98 percent. The lacustrine sediments were characterized by their fine-grained nature and presence of varves. The varves were generally very thin layers (less than 0.5 centimeters thick) of very fine sand, silt and moderate to high plasticity clay reflecting the seasonal and annual fluctuations in deposition. Figure 6 is a composite drawing of the lacustrine gradation curves.

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
					Lacustrine SM-SP, SM, ML, CL
					Note: Gradation Curves Represent
					Composite Samples and Not Individual
					Varves

FIGURE 6
COMPOSITE GRADATION CURVES
EXXON MINERALS COMPANY
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	6-4-84	12959

FIGURE 6

BBS09302

V. INTERPRETATIONS AND RESULTS

A. Map Construction

Included within the project scope of work were revisions and updating of the geologic cross-sections, bedrock contour map, base of aquifer contour map and saturated aquifer thickness contour map. The lithologic and stratigraphic interpretations were the basic element of these maps. Five tools aided the geologist in the lithologic interpretations and in the assignment to one of the five glacial deposit types described in Section IV.

1. Split-spoon soil samples
2. Drill cuttings
3. Geophysical logging
4. Permeability testing
5. Drill rig performance

Thirteen (13) new geologic cross-sections were prepared to illustrate the soil conditions (drawings 12959-3 through 5). The index for the geologic cross-sections is presented on drawing 12959-2. The cross-sections illustrate the interpreted stratigraphy of the Crandon Project using the five categories described previously; glacial till, basal till, coarse-grained stratified drift, fine-grained stratified drift and lacustrine. The cross-sections were based on results from the new EX borings as well as older G40, G41, CDM and DM borings. The 13 new geologic cross-sections were the basis for construction of a revised bedrock surface contour map, saturated aquifer thickness contour map and base of aquifer contour map presented in drawings 12959-6 to 8, respectively.

Drawing 12959-6 is a revised bedrock surface contour map. Under the proposed MWDF southeast of the mine/mill site, the bedrock surface ranges in elevation from 430 to 440 meters above mean sea level. The high point in the bedrock surface is at approximate elevation 470 meters under the proposed plant site. This drawing is different from that presented earlier by Golder Associates (1982) in that it shows a bedrock trough extending eastward from north of the plant site across Hemlock Creek. Along the axis of this trough, the bedrock surface is at approximately elevation 400 to 410 meters above mean sea level. It is likely that this bedrock trough represents a paleodrainage channel (Rowe, 1984).

A saturated aquifer isopach contour map was prepared (drawing 12959-7) which shows the thickness in meters of both the fine and coarse-grained stratified drift below the water table. Drawing 12959-8 is a contour map showing the elevation of the base of the aquifer. The aquifer thickness ranges from more than 70 meters near Walsh Lake to 0 meters near the proposed mine/mill site. Under the proposed MWDF, the aquifer ranges in thickness from 10 to 30 meters.

The revised aquifer thickness drawing is different from the one presented by Golder Associates (1982) in that the aquifer thickness has been reduced in the area under Little Sand, Duck and Deep Hole Lakes. Golder had estimated an aquifer thickness generally greater than 40 meters in this area. However, based on a review of the gradation curves from older samples, the aquifer thickness was revised to approximately 20 to 40 meters.

FOR DETAILED LOCATION OF THESE AND ADDITIONAL BORINGS IN THIS AREA, SEE DRAWING NO 050-1-81330, FIGURE 2.3

NORTH

LEGEND

- TEST BORING LOCATION
- TEST BORING INCLUDING GROUNDWATER OBSERVATION WELL
- TEST BORING INCLUDING MULTIPLE GROUNDWATER OBSERVATION WELL
- WELL DATA PROVIDED BY U.S.G.S.
- GOLDER ASSOCIATES TEST PIT LOCATION
- GOLDER ASSOCIATES TEST WELL LOCATION
- DAMES & MOORE TEST WELL LOCATION
- CRANDON FORMATION
- EX BORINGS AND PIEZOMETER LOCATIONS
- WP WELL POINT LOCATIONS
- RECLAIM POND BORINGS

NOTE

SUPERVISION OF BORINGS AND GROUNDWATER OBSERVATION WELL INSTALLATION DETERMINED BY THE FOLLOWING DESIGNATION PREFIXES:

G	GOLDER ASSOCIATES
DM	DAMES & MOORE
DW	DAMES & MOORE
BE	BRAUN ENGINEERING TESTING
X	EXXON MINERALS COMPANY
STS	SOIL TESTING SERVICES OF WISCONSIN, INC.
AR,RR	SOIL TESTING SERVICES OF WISCONSIN, INC.
CDM	CAMP DRESSER & McKEE, INC.
EX	STS CONSULTANTS LTD.

NOTE: ELEVATIONS IN METERS MSL

250 0 250 500 750 1000

SCALE IN METERS

REVISED	DATE	BY	DESCRIPTION
	6-21-84	J.J.T.	EX, WP, RP LOCATIONS

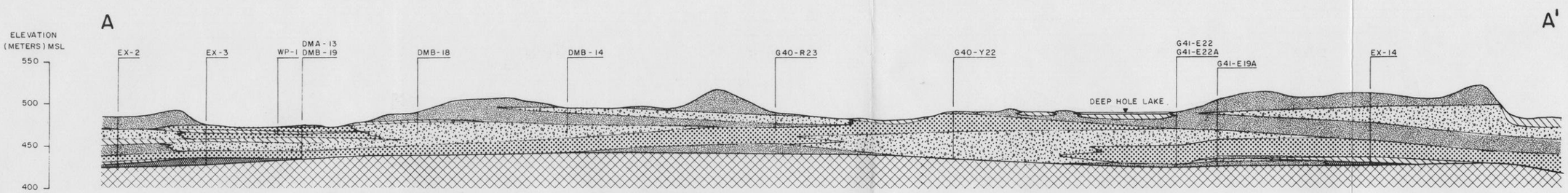
STS DRWG. 12959-2

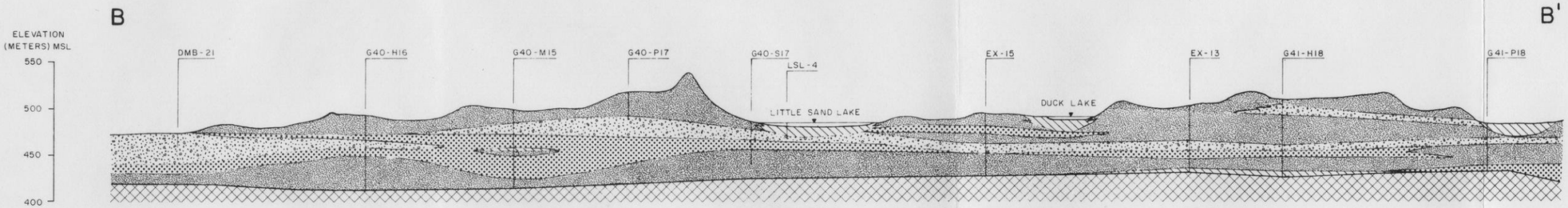
STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

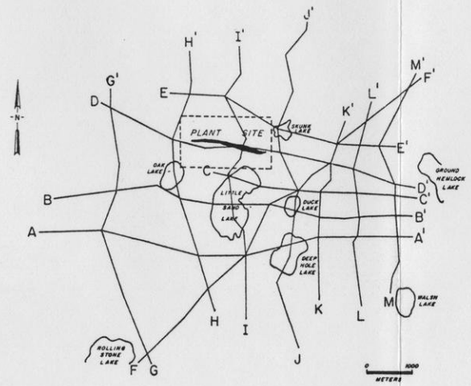
EXXON MINERALS COMPANY
CRANDON PROJECT

TITLE
GEOLOGIC CROSS-SECTION INDEX

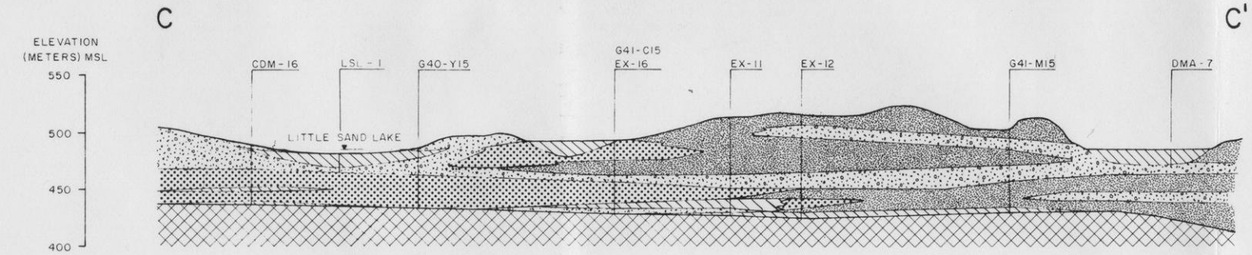
SCALE AS SHOWN	STATE WISCONSIN	COUNTY FOREST	
DRAWN BY CAB	DATE 4-12-82	CHECKED BY DB	DATE 4-12-82
APPROVED BY [illegible]	DATE 7-12-82	APPROVED BY	DATE
APPROVED BY	DATE	EXXON	DATE
DRAWING NO 050-1-81333	SHEET — OF —		REVISION NO

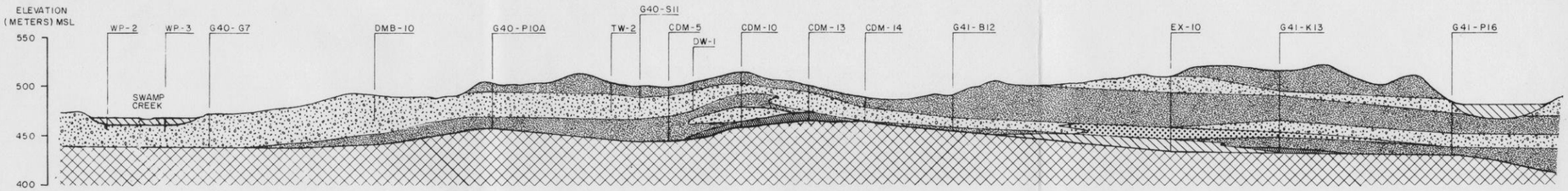






CROSS-SECTION INDEX





LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL

NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

250 0 250 500 750 1000

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION: 5X

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ph.414-494-9656

SCALE: AS NOTED	DATE: 6-7-84	DRAWN BY: J.J.T.	APPROVED BY: J.A.S.

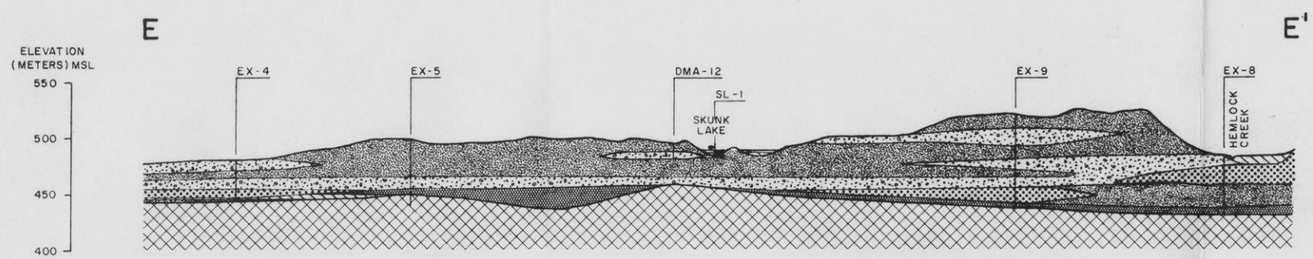
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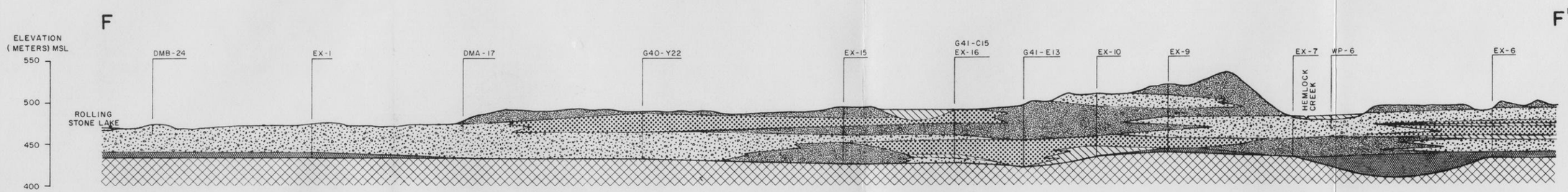
HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

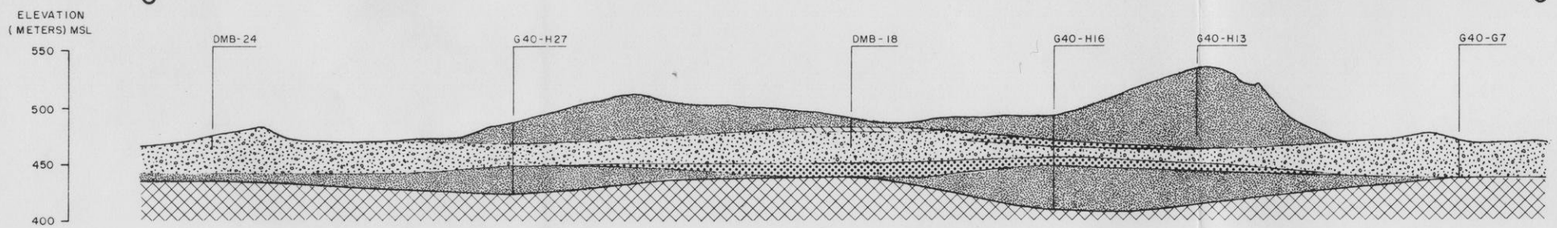
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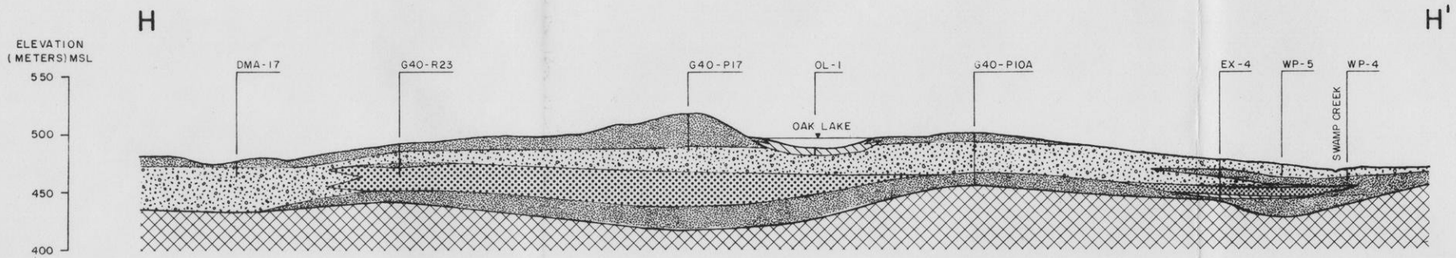
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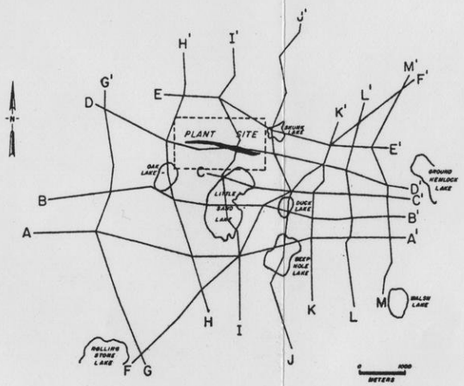
GGS INC.











CROSS-SECTION INDEX

LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL

NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

250 0 250 500 750 1000

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION: 5X

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

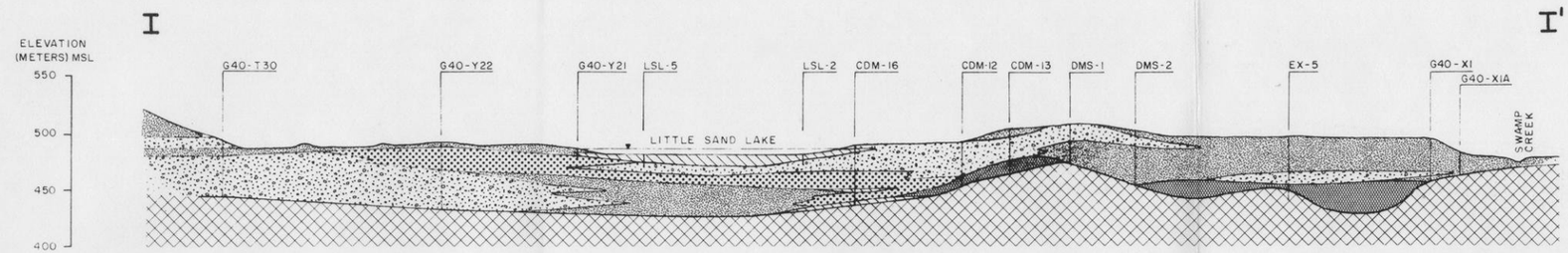
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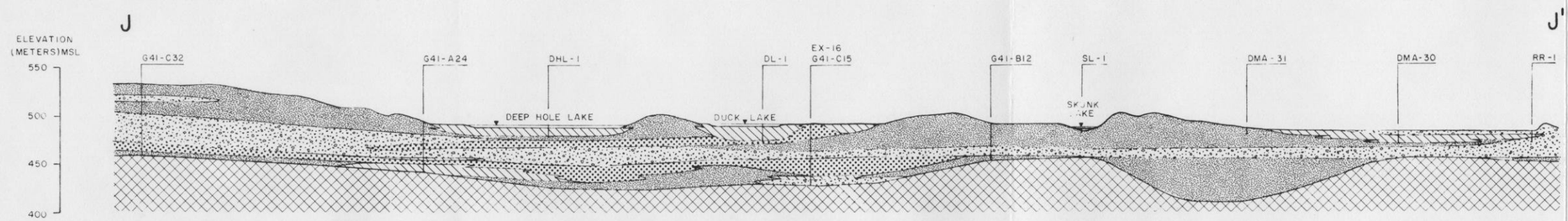
REVISIONS* DATE	BY	DESCRIPTION

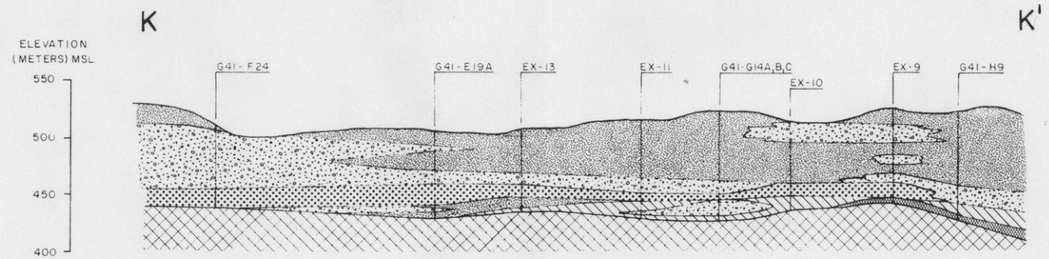
HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

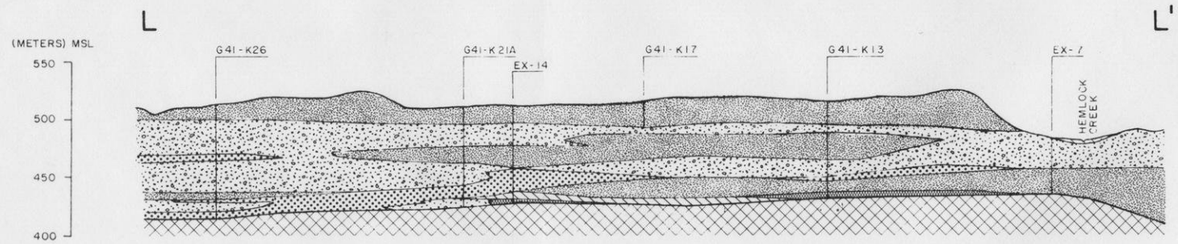
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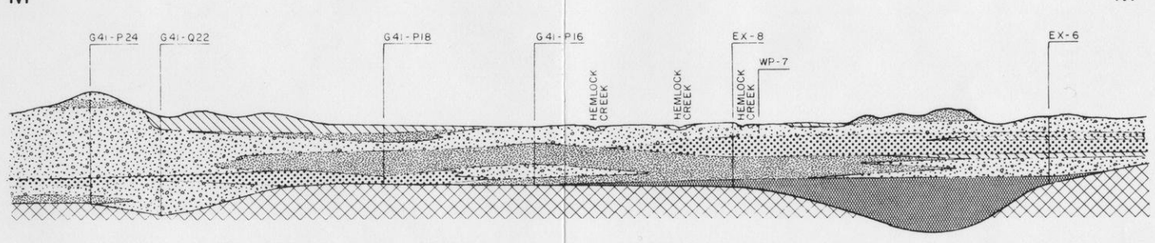
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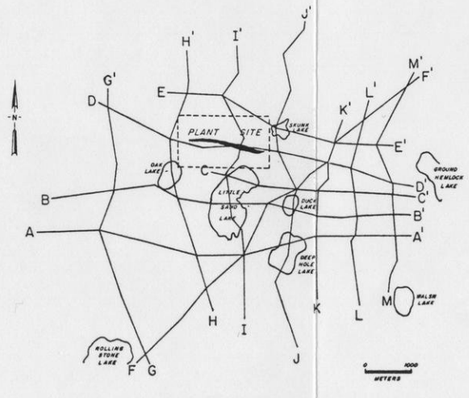












CROSS-SECTION INDEX

LEGEND

- LACUSTRINE
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NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

250 0 250 500 750 1000

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION: 5X

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

SCALE: AS NOTED	DATE: 6-7-84	DRAWN BY: J.J.T	APPROVED BY: J.A.S.

REVISIONS: DATE	BY	DESCRIPTION

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

GEOLOGIC CROSS-SECTIONS I-I', J-J', K-K', L-L', AND M-M'

DRAWING NUMBER: 12959-5

GCB INC

NORTH

LEGEND

430 BEDROCK CONTOURS IN METERS ABOVE MSL

CRANDON FORMATION

250 0 250 500 750 1000

SCALE IN METERS

REVISED	DATE	BY	DESCRIPTION

STS DRWG. 12959-6

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wiscons-
ph.414.494.9656

EXXON MINERALS COMPANY
CRANDON PROJECT

TITLE
TOP OF BEDROCK CONTOUR MAP

SCALE AS SHOWN	STATE WISCONSIN		COUNTY FOREST, LANGLADE		
DRAWN BY J.J.T.	DATE 6-21-84	CHECKED BY	DATE		
APPROVED BY J.A.S.	DATE	APPROVED BY	DATE		
APPROVED BY R. ROWE	DATE	EXXON	DATE		
DRAWING NO.			SHEET — OF —	REVISION NO.	

DESIGN PRODUCTS CO.

E 690,000 E 691,000 E 692,000 E 693,000 E 694,000 E 695,000 E 696,000 E 697,000 E 698,000

N 38,000 N 37,000 N 36,000 N 35,000 N 34,000 N 33,000 N 32,000

ZERO AQUIFER THICKNESS

ZERO AQUIFER THICKNESS SITE

NORTH

LEGEND

~20~ CONTOURS IN METERS

CRANDON FORMATION

AREA WHERE AQUIFER ABSENT

NOTE: THE AQUIFER THICKNESS CONTOURS SHOWN REFLECT BOTH FINE AND COARSE GRAINED STRATIFIED DRIFT BELOW THE WATER TABLE

250 0 250 500 750 1000

SCALE IN METERS

REVISED	DATE	BY	DESCRIPTION

STS DRWG. 12959-7

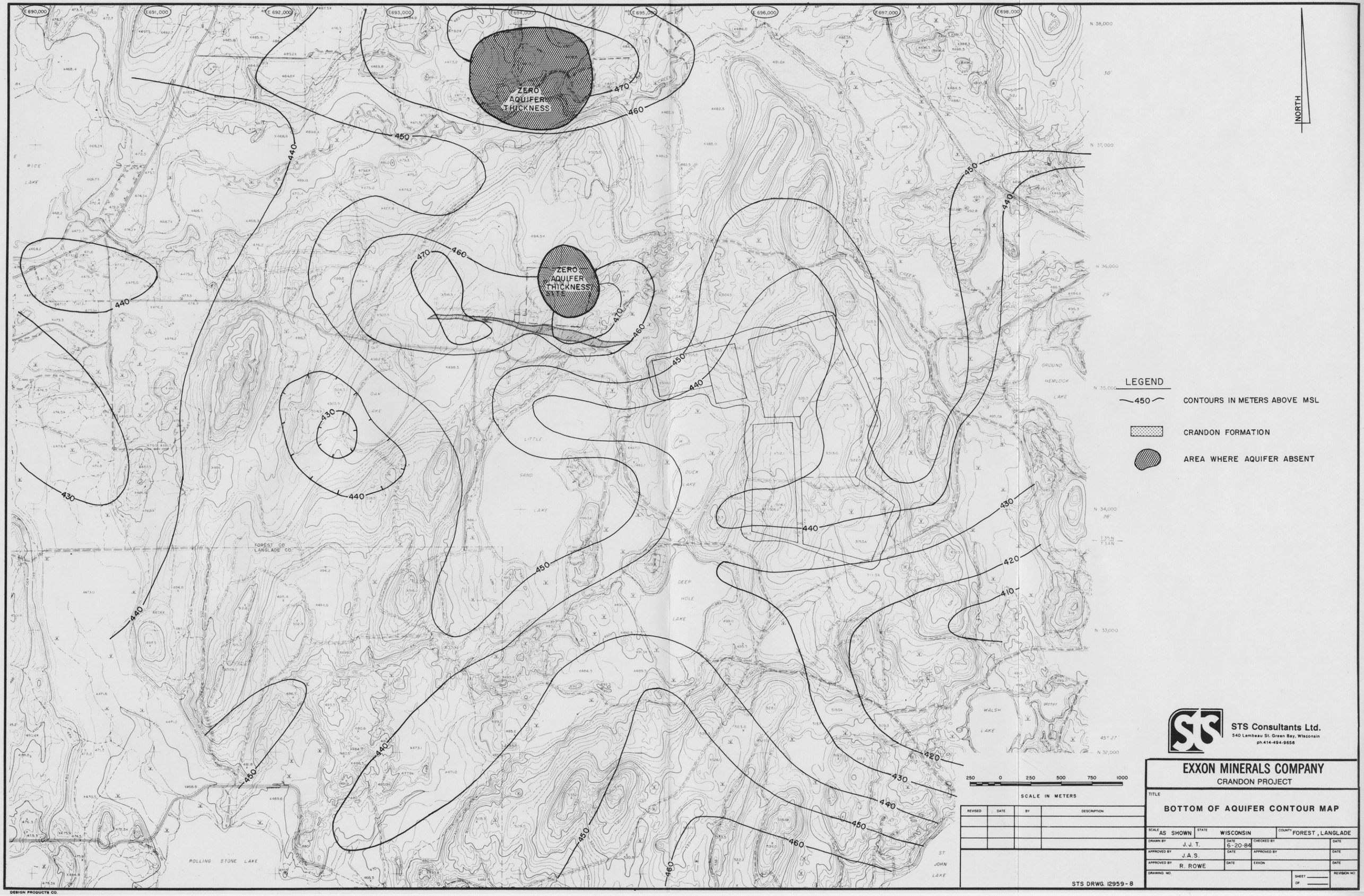
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540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

EXXON MINERALS COMPANY
CRANDON PROJECT

TITLE
SATURATED AQUIFER ISOPACH CONTOUR MAP

SCALE AS SHOWN	STATE WISCONSIN		COUNTY FOREST, LANGLADE	
DRAWN BY J.J.T.	DATE 6-21-84	CHECKED BY		DATE
APPROVED BY J.A.S.	DATE	APPROVED BY		DATE
APPROVED BY R. ROWE	DATE	EXXON		DATE
DRAWING NO.			SHEET OF	REVISION NO.

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REVISED	DATE	BY	DESCRIPTION

STS DRWG. 12959-8

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ph.414-494-9656

EXXON MINERALS COMPANY
CRANDON PROJECT

TITLE
BOTTOM OF AQUIFER CONTOUR MAP

SCALE AS SHOWN	STATE WISCONSIN		COUNTY FOREST, LANGLADE		
DRAWN BY J. J. T.	DATE 6-20-84	CHECKED BY	DATE		
APPROVED BY J.A.S.	DATE	APPROVED BY	DATE		
APPROVED BY R. ROWE	DATE	EXXON	DATE		
DRAWING NO.		SHEET ___ OF ___	REVISION NO.		

DESIGN PRODUCTS CO.

Accordingly, the revised base of aquifer map (12959-8) shows the aquifer bottom in this area at approximately elevation 450 meters compared to the previous drawing by D'Appolonia (1982) which showed the aquifer bottom at elevation 430 meters.

B. Soil Boring Logs

Detailed soil boring logs for the EX borings are presented in Appendix A. These logs include the description of the soil samples obtained from split-spoons and cuttings, results of water content and P200 determinations, and field permeability tests. The interpreted geologic units are presented adjacent to the soil descriptions.

C. Field and Laboratory Data Interpretation

1. Split-Spoon Sampling Prior to removing the sample from the open split-spoon sampler, the geologist visually examined it for any stratification and degree of sorting which aided in determining its geologic origin. The till samples were generally poorly-sorted cohesive mixtures of silt, sand and gravel. Drift samples were generally less cohesive uniformly-sorted or well-graded mixtures of sand and gravel. Varves were evident in the lacustrine samples. Sample recovery was greater in the cohesive soils compared to non-cohesive soils. Catchers were used in the shoe of the split-spoon to improve sample recovery.

2. Drill Cuttings Analysis - The samples of cuttings collected from the EX borings aided the geologist in determining lithology. The addition of polymer to the drilling mud resulted in soils sticking together in clumps.

Since the clumps still contained their fine-grained matrix, they were more useful in identifying the original lithology. It was important, however, to log the cuttings shortly after collection, because the clumps lost their cohesive properties within a few hours. The cuttings were used in addition to the split-spoon sampling and geophysical logging to help define the strata contact lines shown on the boring logs.

Mud consistency had to be monitored by the field geologist to ensure the cuttings were accurately interpreted. If the drilling mud was thickened, the texture of the cuttings became coarser because some of the fine gravel that had accumulated around the bit was being removed from the hole. The most reliable results from the cuttings were obtained from a strainer placed at the outlet from the casing to the mud tank. The sediments collected in the strainer were rinsed and any cohesive clumps were noted. The cohesive clumps were indicative of the soil type at the bottom of the borehole more so than any coarse sand and gravel particles that may have been derived from higher portions of the borehole.

3. Geophysical Logging - Keys and MacCary (1971) provided a thorough discussion of the theory and interpretation of the various geophysical logs. The caliper log is a record of the diameter of the drill hole. In Boring EX-4, the caliper log accurately reflected the changes between cohesive (till) and non-cohesive (drift) soils. This was the result of caving of the borehole wall in non-cohesive soils which was promoted by the plunging action of the split-spoon sampler. Boring EX-4 was sampled at 1.5 meter (5-foot) intervals. However, in the other EX borings in which only 3

or 4 control samples were taken, the caliper log did not record any washouts and was not useful for selecting piezometer depths.

The natural gamma log is the record of the amount of natural gamma radiation that is emitted by the soils. The major gamma emitting radio isotope is Potassium-40. Potassium, which contains about 0.012 percent Potassium-40, is abundant in feldspars and micas which decompose readily to clay. Therefore, clayey soils have much higher natural gamma activity than quartz sands. The natural gamma logs for the 7 EX borings that were geophysically logged are attached to the composite soil boring logs in Appendix A. On these logs, the natural gamma radiation increases to the right and accordingly, clay content increases to the right.

The changes observed in the natural gamma logs were generally very subtle. Natural gamma count did increase slightly in lacustrine deposits and at the top of the bedrock. Occasional spikes in the natural gamma log could be attributed to large boulders. For example, a large boulder was encountered from 27.1 to 28.0 meters (89 to 92 feet) in EX-7. This boulder, which likely contained a large percentage of feldspars, was detected by the gamma log.

Another useful log was the gamma-gamma log or density log. The gamma-gamma log is a record of the intensity of gamma radiation from a source in the probe after it is backscattered and attenuated within the borehole and surrounding soil. The main use of the gamma-gamma log is for the measurement of bulk density. Bulk density decreases to the right on the log. This log was useful since subtle differences between the bulk density of

the till and drift materials could be distinguished. Similar to the natural gamma log, the changes were often subtle and had to be viewed along with the other logs to confirm the interpretations.

The most useful geophysical tool was the neutron log which is also presented in Appendix A. The device has a neutron source and a detector arranged so that the output is primarily a function of the hydrogen ion content of the borehole environment. Neutron logs are used chiefly for the measurement of moisture content above the water table and total porosity below the water table. Neutrons that are emitted from the radioactive source are thermalized by hydrogen ions and accordingly, the higher the water content, the lesser the neutron radiation which returns to the detector. The neutron log is presented on a logarithmic scale. Porosity increases to the left as the neutron count decreases. The device is calibrated using limestone so that the porosity read from the log is actually percent of limestone porosity and not the true porosity of the soil formation.

In general, the fine-grained stratified drift had the highest porosity which can be attributed to the uniform sorting. The glacial till showed the lowest porosity with the coarse-grained stratified drift intermediate between the fine-grained stratified drift and the till. The break between the fine-grained stratified drift and glacial till was usually readily identifiable. For example, the neutron log for boring EX-16 shows the contact between the fine-grained stratified drift and glacial till at approximately 16.5 meters (54 feet). The neutron log from EX-15 shows the fine-

grained stratified drift from 13.7 to 22.5 meters (45 to 74 feet). This same log also reveals a coarse-grained stratified drift unit from 32.9 to 42.7 meters (108 to 140 feet) and it also shows the variability of some of the glacial till deposits. Higher porosity spikes within the glacial till deposits probably represent fine sand stringers.

The neutron log was also very useful in locating the water table; however, the results were occasionally misleading. Typically, the neutron log showed a large deflection to the left when the device encountered saturated soils. This was interpreted as being the water table. However, the capillary fringe had to be taken into account. The neutron log does not distinguish between the saturated capillary fringe above the water table and below the water table. Therefore, in the fine-grained soils such as some of the glacial tills, the capillary fringe could be 1 to 2 meters (3 to 6 feet) long. For example, on EX-5, a large deflection was noted on the neutron log at approximately 16.5 meters (54 feet). Well EX5-BU was installed to 17.7 meters (58 feet). This well was dry and had to be replaced by well EX-5CL which was installed to a depth of 22.2 meters (73 feet). The actual water table was at a depth of approximately 18.3 meters (60 feet).

The moisture contents determined in the laboratory on soil samples generally agreed with the results of the neutron logging. Soils with the highest porosity were expected to have the highest water contents. Laboratory water contents of soil samples typically ranged from 18 to 25 percent for the fine-grained stratified drift and lacustrine sediments.

Water contents for the glacial till ranged from 8 to 13 percent.

In summary, the geophysical logging provided valuable information when used in conjunction with other sources of data in selecting the piezometer depths. It provided a continuous record of the soil strata which was missed by conventional split-spoon sampling. It also showed whether or not a split-spoon sample was representative of the entire stratum from which it was taken. Occasionally, a split-spoon sample was located at a spike or unusual deflection on the log, indicating that the actual sample may not have been representative of the entire stratum.

4. Field Permeability Tests - Table 3 presents the results of the statistical analyses of the field permeability test data for the five geologic units. Only the data from the EX piezometers were used in preparing this table. In addition, only the highest permeability value from either the falling or rising head test was used. The geometric means and standard deviations were determined using methods described in Tuma, (1979).

The coarse-grained stratified drift had the greatest permeability with the fine-grained stratified drift being slightly less permeable. These two units are most important in terms of groundwater flow because of their permeability. The glacial till and basal till had average permeabilities about 1 order of magnitude less than the drift units. The lacustrine sediments had the lowest average permeabilities.

Table 4 presents a summary of the field permeability test data which were used in preparing Table 3. Table 5 presents the field permeability test results from the 7 well point installations.

TABLE 3

Field Permeability Test Data
Crandon Project

Statistical Analysis

Geologic Unit	Number of Tests	Range, cm/sec.	Arthimetic Mean, cm/sec.	Geometric Mean, cm/sec.	Standard Deviation cm/sec.
Coarse drift	15	1×10^{-2} to 1×10^{-3}	4×10^{-3}	3×10^{-3}	3×10^{-3}
Fine drift	12	6×10^{-3} to 7×10^{-4}	2×10^{-3}	1×10^{-3}	7×10^{-4}
Till	10	3×10^{-3} to 9×10^{-6}	6×10^{-4}	2×10^{-4}	9×10^{-4}
Basal till	7	9×10^{-4} to 9×10^{-5}	4×10^{-4}	3×10^{-4}	3×10^{-4}
Lacustrine *	4	5×10^{-4} to 1×10^{-5}	2×10^{-4}	9×10^{-5}	2×10^{-4}

* These values are representative only for glacial lacustrine deposits and not for the recent deposits under Little Sand, Skunk, Oak, Deep Hole and Duck Lakes.

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TABLE 4

Field Permeability Test Summary
Crandon Project

EX Wells

Well	Test Type	Geologic Unit	Permeability cm/sec.
EX 1AL	Fall	Basal till	9×10^{-5}
	Rise		4×10^{-5}
EX 1AU	Fall	Coarse drift	6×10^{-3}
	Rise		4×10^{-3}
EX 1BL	Fall	Coarse drift	6×10^{-3}
	Rise		6×10^{-3}
EX 2AL	Fall	Fine drift	7×10^{-4}
	Rise		6×10^{-4}
EX 2AU	Fall	Coarse drift	4×10^{-3}
	Rise		5×10^{-3}
EX 3AL	Fall	Basal till	3×10^{-4}
EX 3AU	Fall	Fine drift	1×10^{-3}
	Rise		8×10^{-4}
EX 3BL	Fall	Coarse drift	1×10^{-3}
	Rise		1×10^{-3}
EX 3BU	Fall	Fine drift	2×10^{-3}
	Rise		1×10^{-3}
EX 4AL	Fall	Basal till	7×10^{-4}
	Rise		6×10^{-4}
EX 4AU	Fall	Fine drift	1×10^{-3}
EX 4BL	Fall	Coarse drift	1×10^{-3}
	Rise		1×10^{-3}
EX 4BU	Fall	Till	7×10^{-4}
	Rise		3×10^{-4}
EX 5AL	Fall	Bedrock	1×10^{-7}
EX 5AU	Fall	Bedrock	2×10^{-6} *
EX 5BL	Fall	Coarse drift	1×10^{-2}
EX 6AL	Fall	Basal till	3×10^{-4}
	Rise		1×10^{-4}

* Well not stabilized at time of test

TABLE 4

Well	Test Type	Geologic Unit	Permeability cm/sec.
EX 6AU	Fall	Coarse drift	3×10^{-3}
	Rise		4×10^{-3}
EX 6BL	Fall	Fine drift	2×10^{-3}
	Rise		1×10^{-3}
EX 7AL	Fall	Basal till	9×10^{-4}
	Rise		7×10^{-4}
EX 7BL	Fall	Till	1×10^{-3}
	Rise		1×10^{-3}
EX 7BU	Fall	Coarse drift	1×10^{-3}
	Rise		1×10^{-3}
EX 8AL	Fall	Basal till	1×10^{-4}
	Rise		7×10^{-5}
EX 8AU	Fall	Till	2×10^{-4}
	Rise		2×10^{-4}
EX 8BL	Fall	Fine drift	2×10^{-3}
	Rise		1×10^{-3}
EX 8BU	Fall	Coarse drift	1×10^{-3}
EX 9AL	Fall	Bedrock	2×10^{-8}
EX 9AU	Fall	Fine drift	6×10^{-3}
	Rise		3×10^{-3}
EX 9BL	Fall	Coarse drift	1×10^{-4}
	Rise		2×10^{-3}
EX 10AL	Fall	Lacustrine	2×10^{-6}
	Rise		1×10^{-5}
EX 10AU	Fall	Fine drift	1×10^{-3}
EX 10BL	Fall	Till	2×10^{-5}
	Rise		2×10^{-5}
EX 11AL	Fall	Coarse drift	2×10^{-3}
	Rise		1×10^{-3}

TABLE 4

Well	Test Type	Geologic Unit	Permeability cm/sec.
EX 11AU	Fall	Fine drift	1×10^{-3}
	Rise		2×10^{-4}
EX 11BL	Fall	Coarse drift	5×10^{-3}
	Rise		6×10^{-3}
EX 11BU	Fall	Till	1×10^{-4}
	Rise		3×10^{-5}
EX 12AL	Fall	Lacustrine	7×10^{-5}
	Rise		2×10^{-4}
EX 12AU	Fall	Till	1×10^{-3}
	Rise		3×10^{-3}
EX 12BL	Fall	Coarse drift	1×10^{-5} **
	Rise		6×10^{-5}
EX 13AL	Fall	Lacustrine	4×10^{-4}
	Rise		5×10^{-4}
EX 13BL	Fall	Fine drift	2×10^{-4} *
	Rise		8×10^{-4}
EX 13BU	Fall	Coarse drift	9×10^{-4}
	Rise		3×10^{-3}
EX 13CL	Fall	Till	6×10^{-5}
	Rise		3×10^{-5}
EX 14AL	Fall	Lacustrine	3×10^{-5}
	Rise		7×10^{-5}
EX 14AU	Fall	Fine drift	2×10^{-3}
	Rise		2×10^{-3}
EX 14BL	Fall	Till	5×10^{-5}
	Rise		2×10^{-5}
EX 15AL	Fall	Basal till	2×10^{-4}
	Rise		2×10^{-4}
EX 15AU	Fall	Coarse drift	4×10^{-3}
	Rise		4×10^{-3}

* Well not stabilized at time of report

** Did not use data in statistical analysis - well plugged

TABLE 4

Well	Test Type	Geologic Unit	Permeability cm/sec.
EX 16AL	Fall	Fine drift	1×10^{-3}
	Rise		1×10^{-3}
EX 16AU	Fall	Coarse drift	4×10^{-3}
	Rise		6×10^{-3}
EX 16BL	Fall	Till	9×10^{-6}
	Rise		1×10^{-6}

TABLE 5

Field Permeability Test Summary
Crandon Project

Well Points

Well	Test Type	Geologic Unit*	Permeability cm/sec.
WP-1L	Fall	Fine drift	2×10^{-3}
	Rise		4×10^{-3}
WP-2L	Fall	Lacustrine/coarse drift	5×10^{-6}
	Rise		2×10^{-4}
WP-3L	Fall	Coarse drift	7×10^{-3}
	Rise		9×10^{-3}
WP-4L	Fall	Till	6×10^{-6}
WP-5L	Flowing well	Coarse drift	
WP-6L	Fall	Coarse drift	4×10^{-3}
WP-7L	Fall	Lacustrine/coarse drift	5×10^{-6}
	Rise		4×10^{-5}

* No split-spoon samples taken. Geologic unit estimated from drill cuttings and adjacent stratigraphy.

Figure 7 illustrates the distribution of the field permeability test results for the various glacial deposits. The majority of the results from both the fine and coarse-grained stratified drift units were in the range of 1 to 5 x 10^{-3} cm/sec.

Forty-three (43) of the EX piezometers had both rising and falling head tests. Of this total, 21 had essentially the same results for both of the tests. Thirteen (13) piezometers had the falling head greater than the rising head test. The remaining 9 piezometers had the rising head greater than the falling head test. In a properly developed well which has stabilized, the falling and rising head tests should be similar. Using these test results as a guide, several EX piezometers were selected for redevelopment. In general, the redevelopment work improved the correlation between the falling and rising head tests.

5. Drill Rig Performance - The driller provided useful information to the field geologist regarding drill rig performance. Unusual vibrations often indicated cobbles or boulders. Variations in the rate of drilling often reflected changes in strata such as between drift/till and till/bedrock.

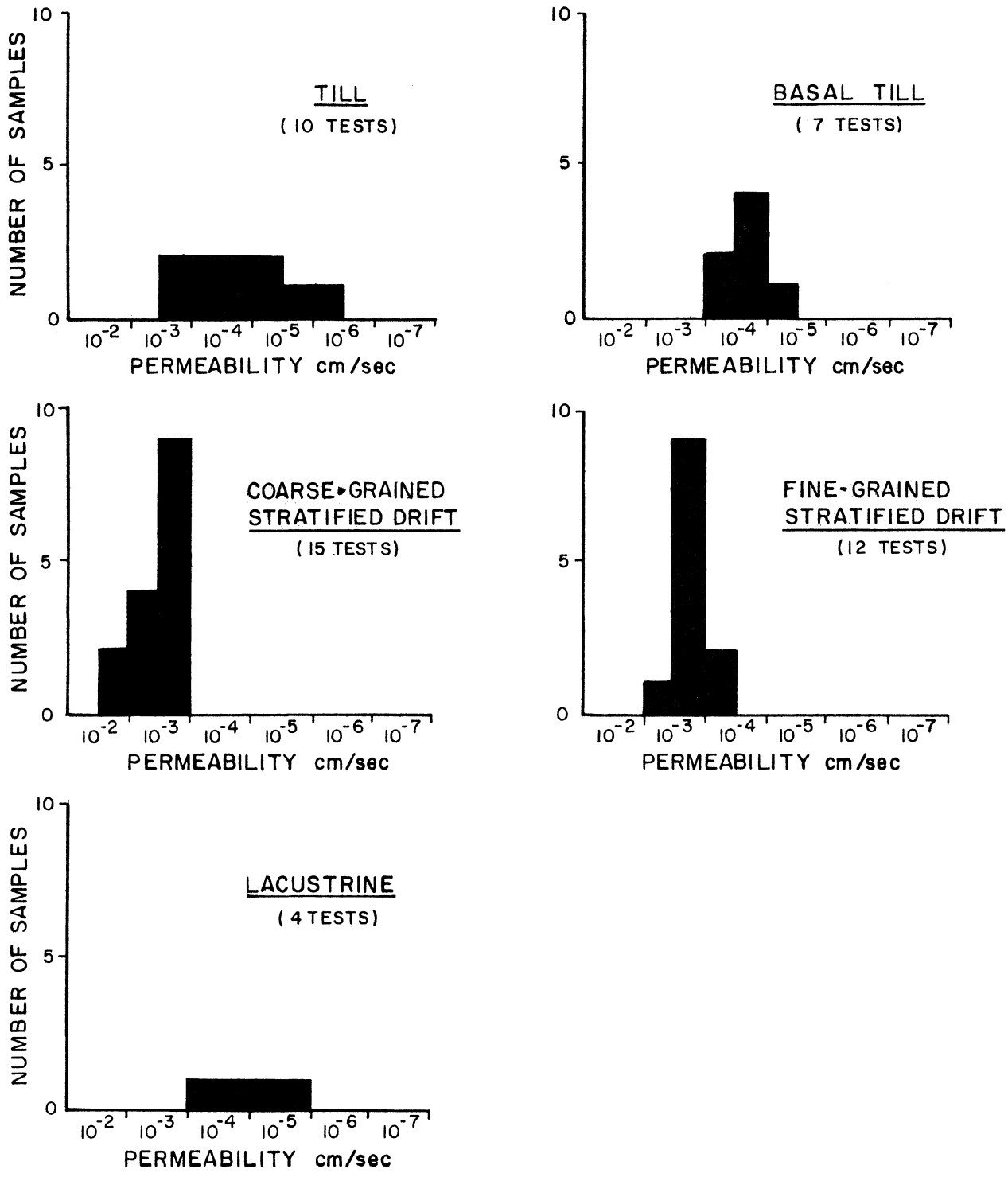


FIGURE 7: FIELD PERMEABILITY TEST RESULTS DISTRIBUTIONS FOR VARIOUS GLACIAL DEPOSITS - CRANDON PROJECT

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GREEN BAY, WIS. 54303

J.J.T.	J.A.S.	6-7-84	12959

VI. HYDROGEOLOGY

A. General Groundwater Flow Characteristics

Drawing 12959-9 is the groundwater potentiometric surface (water table) contour map which was constructed using water level measurements collected in both the old and new wells during April and May, 1984. It is very similar to the previous map prepared by Golder Associates (1982). The water table slopes from an approximate high elevation of 485 meters under the MWDF southeast of the mine/mill site to a low point at approximately elevation 468 meters where Swamp Creek enters Rice Lake west of the mine/mill site. Groundwater flow, in general, is perpendicular to the contours shown on drawing 12959-9 such that the groundwater flows from upland or recharge areas to lowland discharge areas. The horizontal gradient in the water table generally becomes steeper nearer the groundwater discharge areas.

B. Mine Waste Disposal Facility (MWDF) Area

Table 6 presents a summary of the vertical groundwater gradients at the EX piezometers and well points. This information is also presented on the geologic cross-sections (drawings 12959-10 through 12). The average gradient between two piezometers was determined by subtracting the head of the upper piezometer from the head of the lower piezometer and dividing by the distance between the gravel pack midpoints. When the water table piezometer was involved, the midpoint was half the distance between the potentiometric surface and the bottom of the gravel pack. The maximum gradient between piezometers was determined by subtracting the head of the upper

TABLE 6

Summary of Vertical Groundwater Gradients At
EX Piezometers and Well Points
(5-24-84)

EX Piezometer	Head Difference (M)	Average Length Between Gravel Packs (M)	Minimum Length Between Gravel Packs (M)	Average Gradient	Maximum Gradient
1AL - 1AU	0.05	7.24	4.88	0.007	0.010
1AU - 1BL	0.00	18.59	16.46	none	none
1BL - 1BU	-0.16	8.96	5.49	-0.018	-0.029
2AL - 2AU	-0.19	24.99	22.85	-0.008	-0.008
2AU - 2BL	-0.12	10.92	9.45	-0.011	-0.013
3AL - 2AU	-0.05	10.36	8.23	-0.005	-0.006
3AU - 3BL	0.00	12.19	10.06	none	none
3BL - 3BU	0.01	9.14	7.01	none	none
3BU - 3CL	0.25	10.08	7.93	0.025	0.032
4AL - 4AU	0.13	7.01	4.72	0.019	0.027
4AU - 4BL	-0.12	8.84	6.86	-0.014	-0.018
4BL - 4BU	-0.06	7.77	5.64	-0.008	-0.011
4BU - 4CL	-0.44	5.21	1.83	-0.085	-0.240
5AL - 5AU	not stabilized	-	-	-	-
5AU - 5BL	not stabilized	-	-	-	-
5BL - 5CL	-0.53	12.53	9.14	-0.042	-0.058
6AL - 6AU	0.00	17.07	14.94	none	none
6AU - 6BL	-0.61	11.28	9.14	-0.054	-0.067
6BL - 6BU	0.26	17.36	14.63	0.015	0.018
7AL - 7BL	0.26	14.63	12.50	0.018	0.021
7BL - 7BU	1.39	11.58	9.60	0.120	0.145
7BU - 7CL	-0.01	19.52	16.76	none	none
8AL - 8AU	0.53	17.98	15.85	0.030	0.033
8AU - 8BL	0.94	9.14	7.01	0.103	0.134
8BL - 8BU	-0.02	19.26	17.06	none	none
9AL - 9AU	0.65	9.75	7.62	0.067	0.085
9AU - 9BL	-0.01	17.07	14.93	none	none
9BL - 9BU	-0.09	19.24	14.63	-0.005	-0.006
10AL-10AU	-0.07	15.09	12.80	-0.005	-0.006
10AU-10BL	0.08	16.15	13.72	0.005	0.006
10BL-10BU	-0.35	17.16	14.17	-0.020	-0.025
11AL-11AU	0.00	13.11	10.36	none	none
11AU-11BL	0.02	16.15	14.02	none	none
11BL-11BU	-0.04	9.75	7.62	-0.004	-0.005
11BU-11CL	-0.03	16.24	7.01	none	none
12AL-12AU	-0.03	18.44	15.85	none	none
12AU-12BL	0.07	15.09	12.50	0.005	0.006
12BL-12BU	-0.11	22.42	16.76	-0.005	-0.007
13AL-13BL	not stabilized	-	-	-	-
13BL-13BU	not stabilized	-	-	-	-
13BU-13CL	-0.10	11.74	8.23	-0.009	-0.012
13CL-13DL	-0.02	10.48	7.93	none	none

NORTH

LEGEND

482 — CONTOURS IN METERS ABOVE MSL APRIL, 1984

CRANDON FORMATION

GROUNDWATER FLOW DIRECTION

NOTE: DATA FROM APRIL 27, 1984 FOR OLDER WELLS
DATA FROM MAY 24, 1984 FOR EX WELLS

250 0 250 500 750 1000

SCALE IN METERS

REVISED	DATE	BY	DESCRIPTION

STS DRWG. 12959 - 9

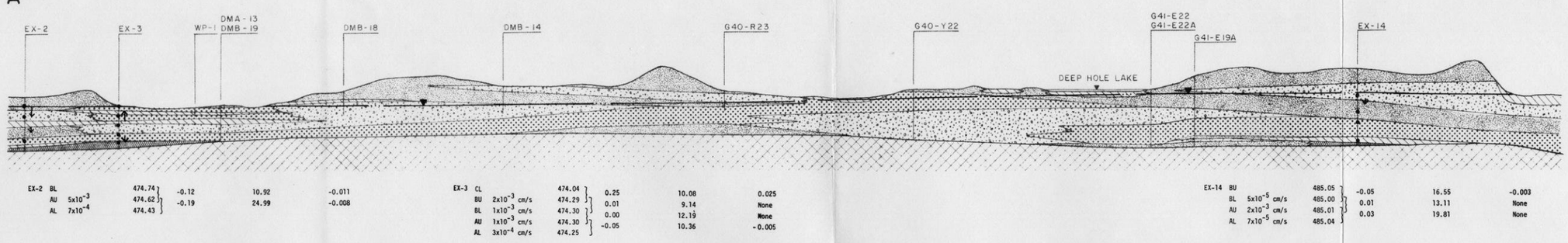
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540 Lambeau St. Green Bay, Wisconsin
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EXXON MINERALS COMPANY
CRANDON PROJECT

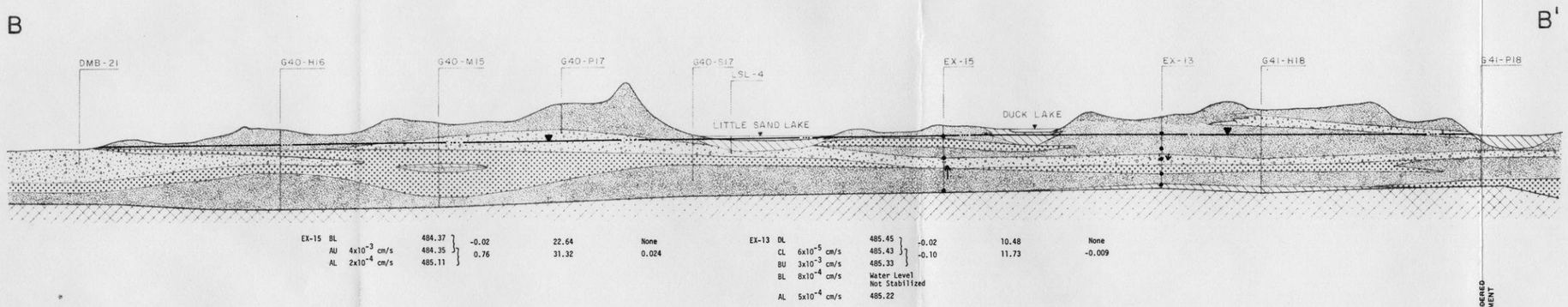
TITLE
GROUNDWATER POTENTIOMETRIC CONTOURS

SCALE AS SHOWN	STATE WISCONSIN		COUNTY FOREST, LANGLADE
DRAWN BY J.J.T.	DATE 6-20-84	CHECKED BY	DATE
APPROVED BY J.A.S.	DATE	APPROVED BY	DATE
APPROVED BY R. ROWE	DATE	EXXON	DATE
DRAWING NO.		SHEET OF	REVISION NO

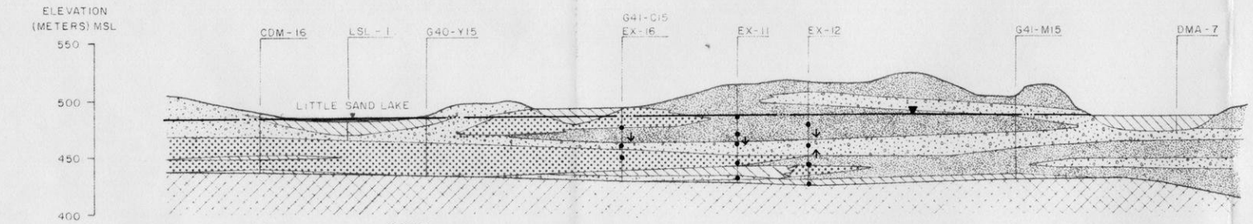
DESIGN PRODUCTS CO.



EX-2	BL	5×10^{-3}	474.74	-0.12	10.92	-0.011			
	AU		474.62	-0.19	24.99	-0.008			
	AL	7×10^{-4}	474.43						
EX-3	CL		474.04	0.25	10.08	0.025			
	BU	2×10^{-3} cm/s	474.29	0.01	9.14	None			
	BL	1×10^{-3} cm/s	474.30	0.00	12.19	None			
	AU	1×10^{-3} cm/s	474.30	-0.05	10.36	-0.005			
	AL	3×10^{-4} cm/s	474.25						
EX-14	BU		485.05	-0.05	16.55	-0.003			
	BL	5×10^{-5} cm/s	485.00	0.01	13.11	None			
	AU	2×10^{-3} cm/s	485.01	0.03	19.81	None			
	AL	7×10^{-5} cm/s	485.04						

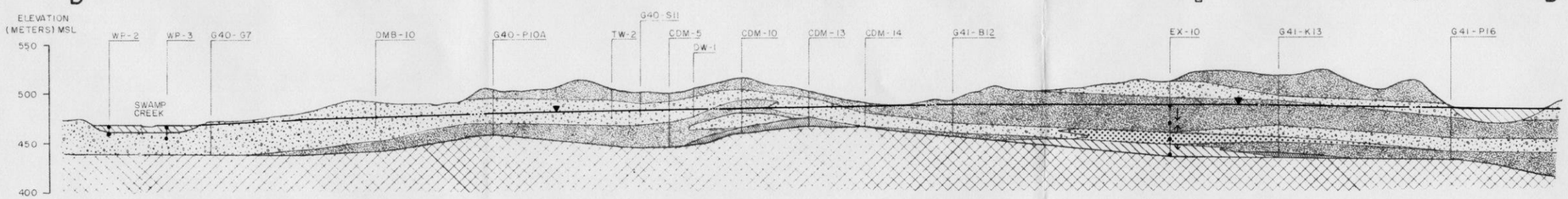


EX-15	BL		484.37	-0.02	22.64	None			
	AU	4×10^{-3} cm/s	484.35	0.76	31.32	0.024			
	AL	2×10^{-4} cm/s	485.11						
EX-13	DL		485.45	-0.02	10.48	None			
	CL	6×10^{-5} cm/s	485.43	-0.10	11.73	-0.009			
	BU	3×10^{-3} cm/s	485.33						
	BL	8×10^{-4} cm/s	Water Level Not Stabilized						
	AL	5×10^{-4} cm/s	485.22						



EX-12	BU		485.91	-0.11	22.42	-0.005			
	BL	None	485.80	0.07	15.09	0.005			
	AU	3×10^{-3} cm/s	485.87	-0.03	18.44	None			
	AL	2×10^{-4} cm/s	485.84						
EX-16	BL	9×10^{-6} cm/s	485.94	-0.14	18.09	-0.008			
	AU	6×10^{-3} cm/s	485.80	0.02	10.82	None			
	AL	1×10^{-3} cm/s	485.82						
EX-11	CL		485.83	-0.03	16.24	None			
	BU	1×10^{-4} cm/s	485.80	-0.04	9.75	-0.004			
	BL	6×10^{-3} cm/s	485.76	0.02	16.15	None			
	AU	1×10^{-3} cm/s	485.78	0.00	13.11	None			
	AL	2×10^{-3} cm/s	485.78						

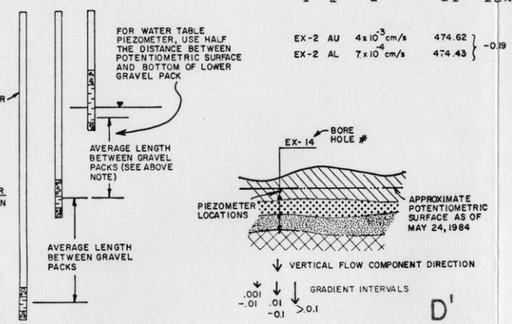
AVE. GRADIENT = $\frac{\text{HEAD}_{\text{LOWER}} - \text{HEAD}_{\text{UPPER}}}{\text{AVE. LENGTH BETWEEN GRAVEL PACKS}}$



EX-10	BU		486.54	-0.35	17.16	-0.020			
	BL	2×10^{-5} cm/s	486.19	0.08	16.15	0.005			
	AU	1×10^{-3} cm/s	486.27	-0.07	15.09	-0.005			
	AL	1×10^{-5} cm/s	486.20						

LEGEND

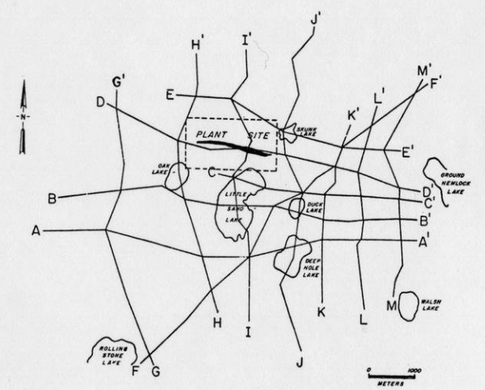
DISTANCES USED IN AVERAGE GRADIENT CALCULATIONS



HOLE #	PIEZOMETER #	FIELD PERMEABILITY	POTENTIOMETRIC HEAD ON 5-24-84	HEAD DIFFERENCE (IF 5-24 VALUE IS CONSIDERED ZERO BECAUSE OF INSTRUMENT ACCURACY)	AVE. LENGTH BETWEEN GRAVEL PACKS (meters)	AVE. HEAD GRADIENT +UPWARD -DOWNWARD
EX-2	AU	4×10^{-3} cm/s	474.62	-0.19	25.0	-0.008
EX-2	AL	7×10^{-4} cm/s	474.43			

LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE APRIL, 1984



CROSS-SECTION INDEX

250 0 250 500 750 1000

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION: 5X

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ph.414-494-9656

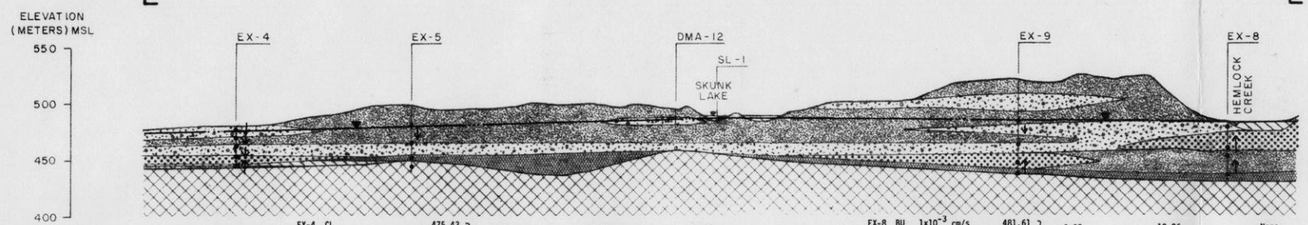
SCALE: AS NOTED	DATE: 6-22-84	DRAWN BY: J.J.T.	APPROVED BY: J.A.S.

REVISIONS: DATE	BY:	DESCRIPTION:

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

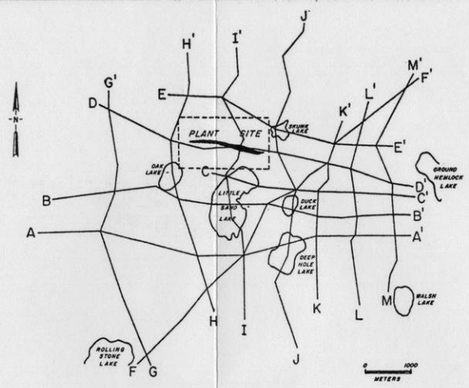
GEOLOGIC CROSS-SECTIONS A-A' B-B' C-C' D-D' WITH PIEZOMETER DATA

DRAWING NUMBER: 12959-10

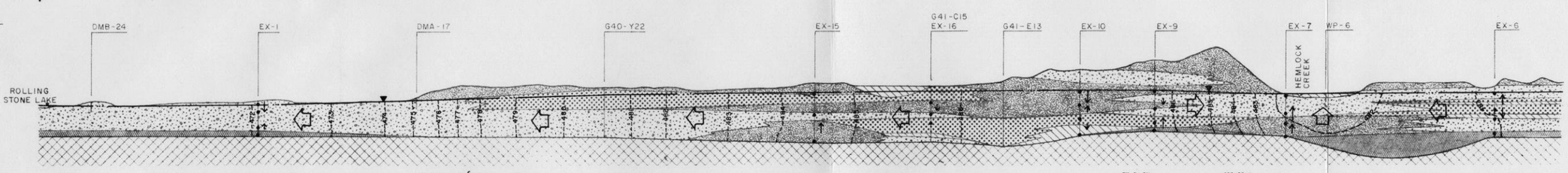


EX-4	CL		475.43	-0.44	5.21	-0.085	
	BU	7×10^{-4} cm/s	474.99	-0.06	7.77	-0.008	
	BL	1×10^{-3} cm/s	474.93	-0.12	8.84	-0.014	
	AU	1×10^{-3} cm/s	474.81	0.13	7.01	0.019	
	AL	7×10^{-4} cm/s	474.94				
EX-5	CL		479.46	-0.53	12.53	-0.042	
	BL	1×10^{-2} cm/s	478.93				
	AU	2×10^{-6} cm/s	Water Level Not Stabilized				
	AL	1×10^{-7} cm/s	478.48				

EX-8	BU	1×10^{-3} cm/s	481.61	-0.02	19.26	None	
	BL	2×10^{-3} cm/s	481.59	0.94	9.14	0.103	
	AU	2×10^{-4} cm/s	482.53	0.53	17.98	0.030	
	AL	1×10^{-4} cm/s	483.06				
EX-9	BU		486.14	-0.09	19.24	-0.005	
	BL	2×10^{-3} cm/s	486.05	-0.01	17.07	None	
	AU	6×10^{-3} cm/s	486.04	0.65	9.75	0.067	
	AL	2×10^{-8} cm/s	486.69				



CROSS-SECTION INDEX

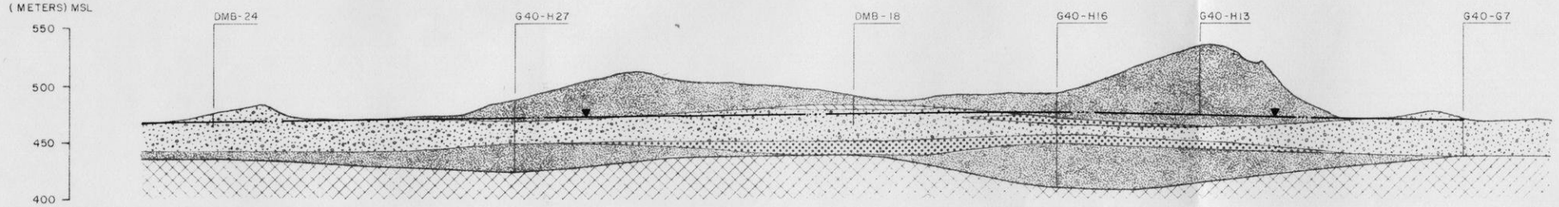


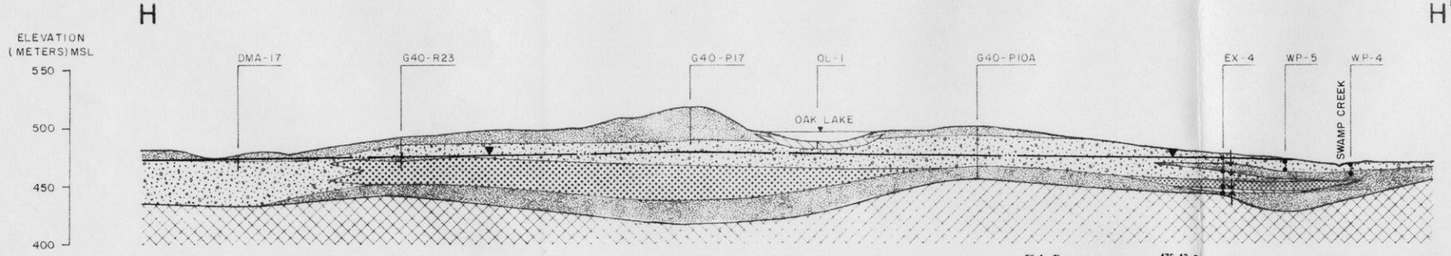
EX-1	BU		472.14	-0.16	8.96	-0.010	
	BL	6×10^{-3} cm/s	471.98	0.00	18.59	None	
	AU	6×10^{-3} cm/s	471.98	+0.05	7.24	0.007	
	AL	9×10^{-5} cm/s	472.03				
EX-15	BL		484.37	-0.02	22.64	None	
	AU	4×10^{-3} cm/s	484.35	0.76	31.32	0.024	
	AL	2×10^{-4} cm/s	485.11				

EX-16	BL	9×10^{-6} cm/s	485.94	-0.14	18.09	-0.008	
	AU	6×10^{-3} cm/s	485.80	0.02	10.82	None	
	AL	1×10^{-3} cm/s	485.82				
EX-10	BU		486.54	-0.35	17.16	-0.020	
	BL	2×10^{-5} cm/s	486.19	0.08	16.15	0.005	
	AU	1×10^{-3} cm/s	486.27	-0.07	15.09	-0.005	
	AL	1×10^{-5} cm/s	486.20				

EX-9	BU		486.14	-0.09	19.24	-0.005	
	BL	2×10^{-3} cm/s	486.05	-0.01	17.07	None	
	AU	6×10^{-3} cm/s	486.04	0.65	9.75	0.067	
	AL	2×10^{-8} cm/s	486.69				
EX-7	CL		481.61	-0.01	19.52	None	
	BU	1×10^{-3} cm/s	481.60	1.39	11.58	0.120	
	BL	1×10^{-3} cm/s	482.07	0.26	14.63	0.018	
	AL	9×10^{-4} cm/s	482.33				

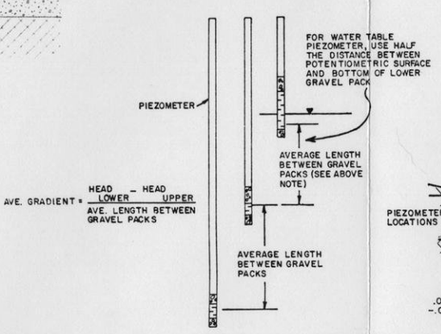
EX-6	BU		483.33	0.26	17.36	0.015	
	BL	2×10^{-3} cm/s	483.59	-0.61	11.28	-0.054	
	AU	4×10^{-4} cm/s	482.98	0.00	17.07	None	
	AL	3×10^{-4} cm/s	482.98				

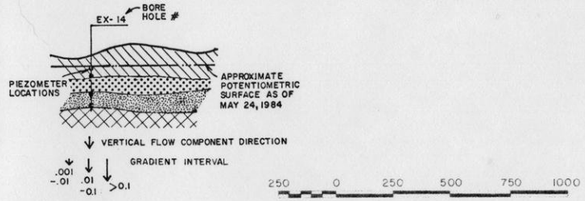




EX-4	CL		475.43	-0.44	5.21	-0.085	
	BU	7×10^{-4} cm/s	474.99	-0.06	7.77	-0.008	
	BL	1×10^{-3} cm/s	474.93	-0.12	8.84	-0.014	
	AU	1×10^{-3} cm/s	474.81	0.13	7.01	0.019	
	AL	7×10^{-4} cm/s	474.94				

DISTANCES USED IN AVERAGE GRADIENT CALCULATIONS





LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE APRIL, 1984
- ESTIMATED EQUIPOTENTIAL LINES
- OVERALL GROUNDWATER FLOW DIRECTION

HOLE #	PIEZOMETER #	FIELD PERMEABILITY	POTENTIOMETRIC HEAD ON 5-24-84	HEAD DIFFERENCE (IF < 0.05 VALUE IS CONSIDERED ZERO BECAUSE OF INSTRUMENT ACCURACY)	AVE. LENGTH BETWEEN GRAVEL PACKS (meters)	AVE. HEAD GRADIENT +UPWARD -DOWNWARD
EX-2	AU	4×10^{-3} cm/s	474.62	-0.19	25.0	-0.008
EX-2	AL	7×10^{-4} cm/s	474.43			

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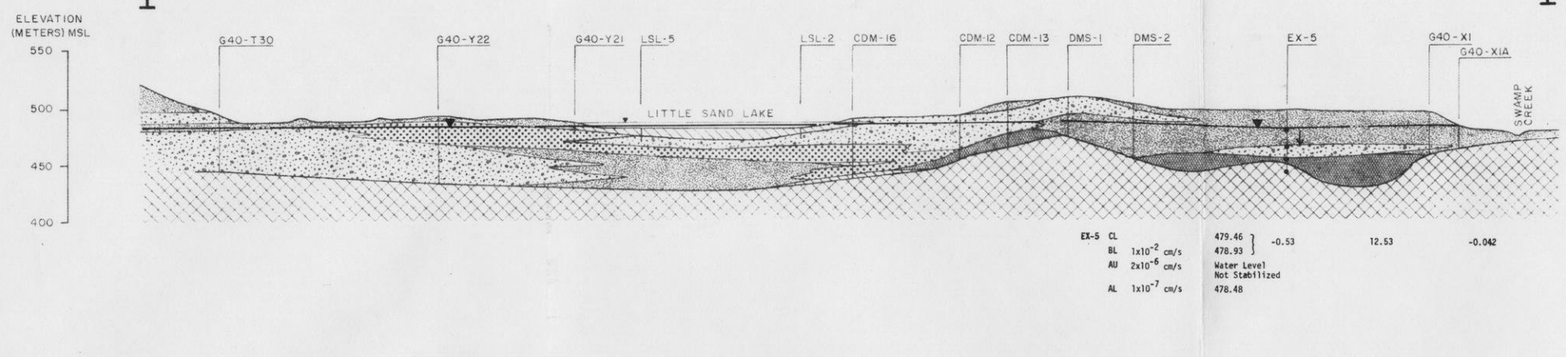
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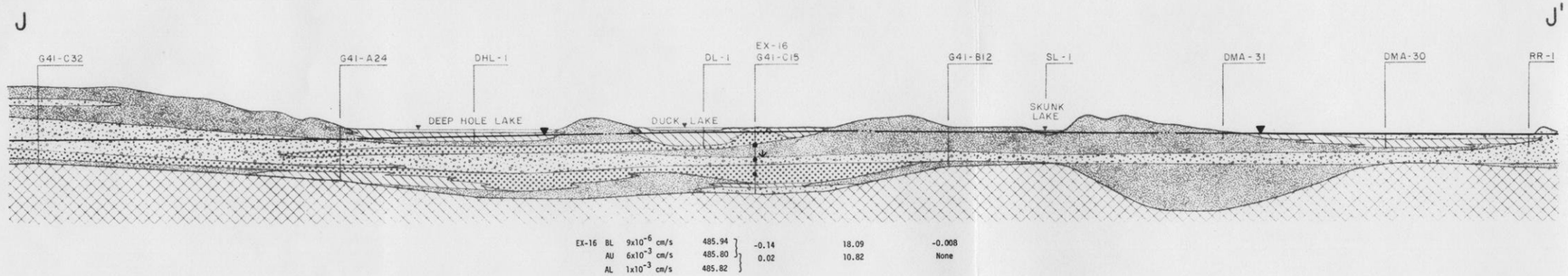
REVISIONS* DATE	BY	DESCRIPTION

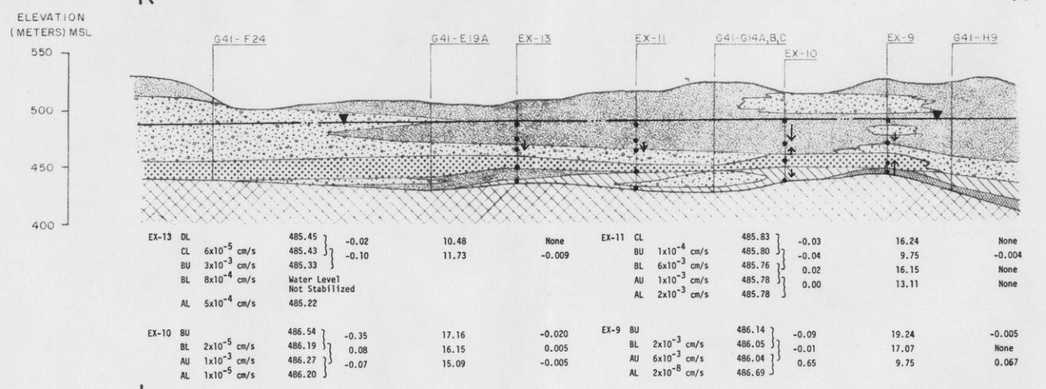
HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

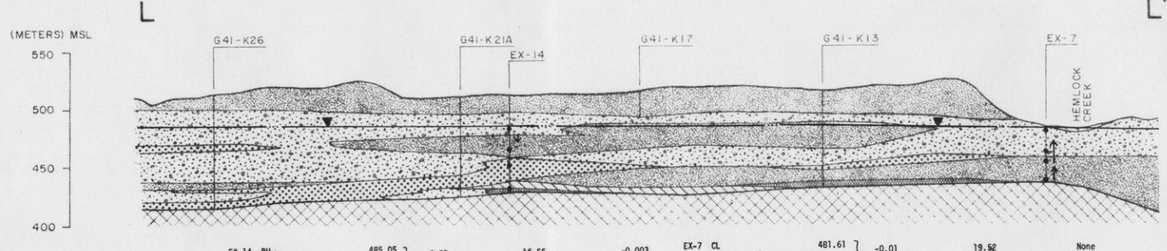
GEOLOGIC CROSS-SECTIONS E-E', F-F', G-G', H-H' WITH PIEZOMETER DATA

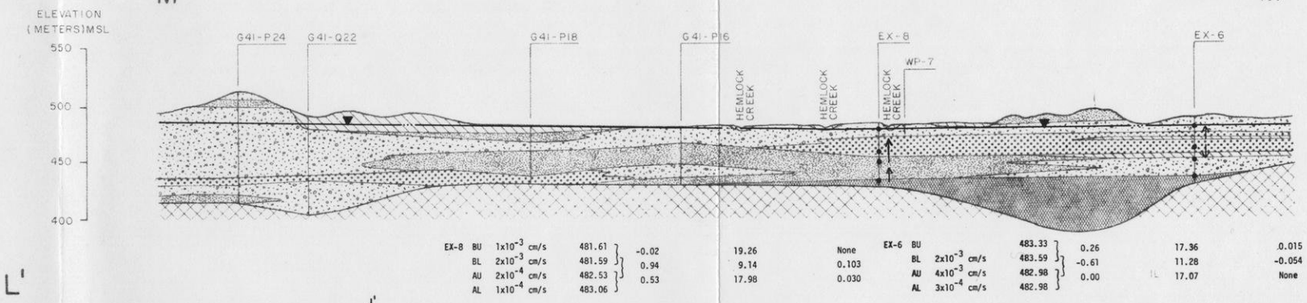
DRAWING NUMBER: 12959-11

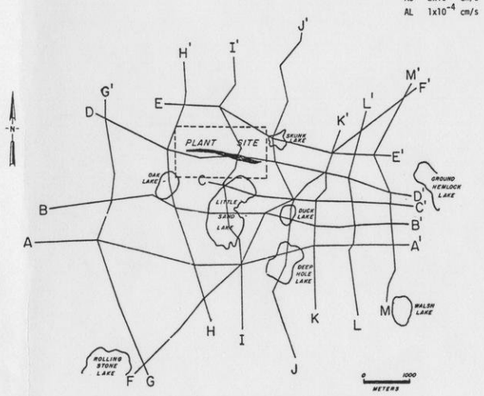






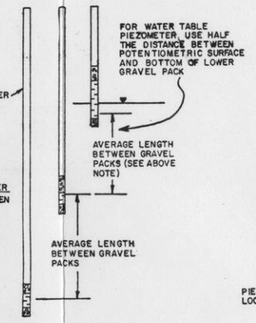




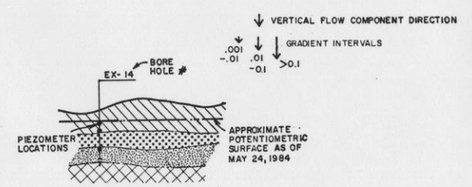


CROSS-SECTION INDEX

DISTANCES USED IN AVERAGE GRADIENT CALCULATIONS



HOLE #	PIEZOMETER #	FIELD PERMEABILITY	POTENTIOMETRIC HEAD ON 5-24-84	HEAD DIFFERENCE (IF LESS THAN 0.1 IS CONSIDERED ZERO BECAUSE OF INSTRUMENT ACCURACY)	AVE. LENGTH BETWEEN GRAVEL PACKS (meters)	AVE. HEAD GRADIENT +UPWARD -DOWNWARD
EX-2	AU	4×10^{-3} cm/s	474.62	-0.19	25.0	-0.008
EX-2	AL	7×10^{-3} cm/s	474.43			



LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE APRIL, 1984

250 0 250 500 750 1000

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION: 5X

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

SCALE: AS NOTED	DATE: 6-22-84	DRAWN BY: J.J.T.	APPROVED BY: J.A.S.

REVISIONS: DATE | BY: | DESCRIPTION:

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

GEOLOGIC CROSS-SECTIONS I-I, J-J, K-K, L-L, M-M WITH PIEZOMETER DATA

DRAWING NUMBER: 12959-12

Page 2

TABLE 6

Summary of Vertical Groundwater Gradients At
EX Piezometers and Well Points
(5-24-84)

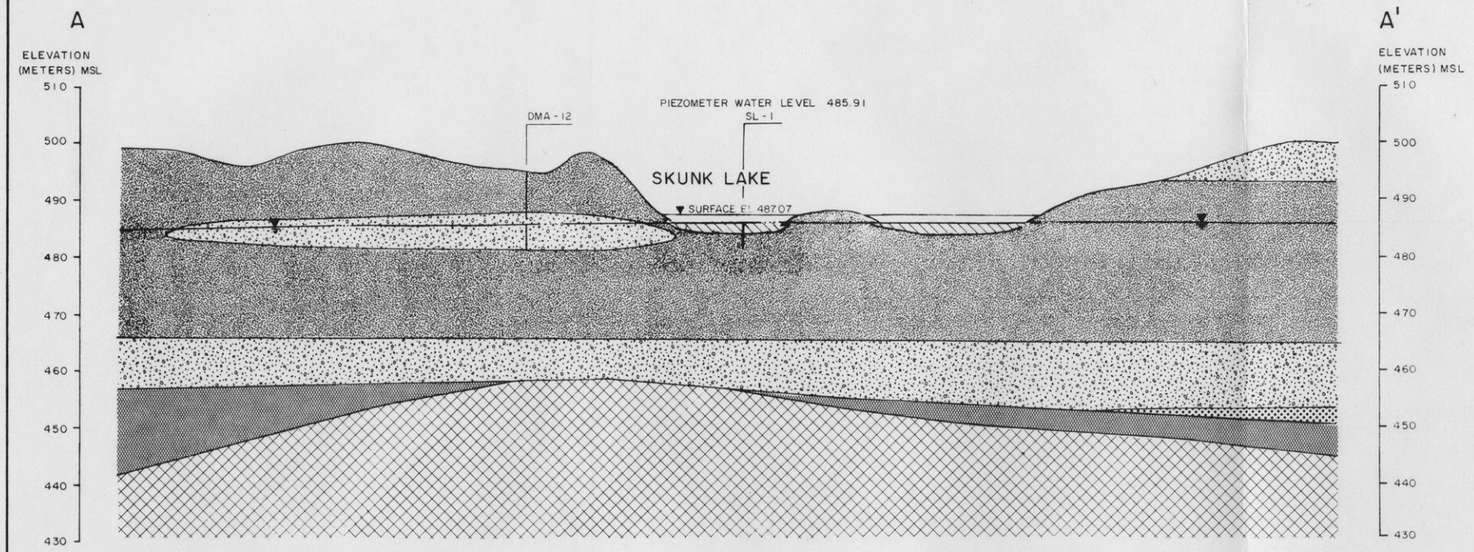
EX Piezometer	Head Difference (M)	Average Length Between Gravel Packs (M)	Minimum Length Between Gravel Packs (M)	Average Gradient	Maximum Gradient
14AL-14AU	0.03	19.81	17.68	none	none
14AU-14BL	0.01	13.11	10.97	none	none
14BL-14BU	-0.05	16.55	11.58	-0.003	-0.004
15AL-15AU	0.76	31.32	28.80	0.024	0.026
15AU-15BL	-0.02	22.64	19.20	none	none
16AL-16AU	0.02	10.82	8.53	none	none
16AU-16BL	-0.14	18.09	9.14	-0.008	-0.015
WP1L-WP1U	-0.23	-	7.31	-	-0.032
WP2L-WP2U	-0.20	-	7.19	-	-0.028
WP3L-WP3U	0.00	-	5.79	-	none
WP4L-WP4U	0.19	-	5.73	-	0.033
WP5L-WP5U	WP5L is flowing		-	-	-
WP6L-WP6U	-1.14	-	7.16	-	-0.159
WP7L-WP7U	0.06	-	7.31	-	0.008

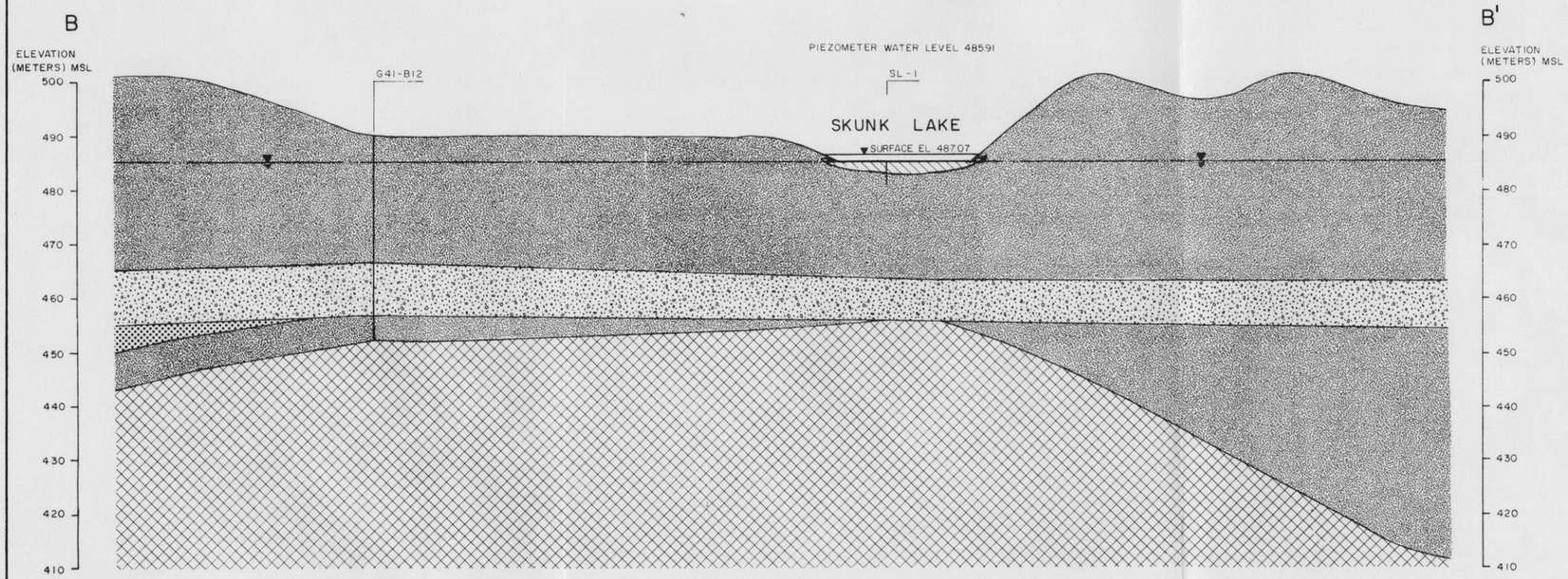
NOTES: 1) Positive value indicates upward gradient
2) Negative value indicates downward gradient
3) No significant gradient if head difference is $\leq$0.03 M.

piezometer from the head of the lower piezometer and dividing by the minimum distance between gravel packs. A positive gradient indicates an upward vertical flow component while a negative value indicates a downward component.

In general, the gradients were relatively small and it appears that horizontal flow predominates across the site. The MWDF area is a recharge area. Downward gradients were measured in the surficial till deposits. No significant vertical gradients were measured in the coarse and fine-grained stratified drift units underlying the till. This indicates that the groundwater flow is predominantly horizontal in the aquifer materials. It appears that the flow in the drift is being recharged by groundwater from both the surficial and basal till units. At piezometer nests EX-1, 4, 9, and 15, downward gradients were noted from the surficial till to the drift and upward gradients were noted from the basal till to the drift. Equipotential lines were sketched on cross-section F-F' (12959-11) which is parallel to groundwater flow to illustrate the predominantly horizontal flow through the drift units. Also, it is likely that seasonal fluctuations will cause reversals in some of the small vertical gradients presented on Table 6.

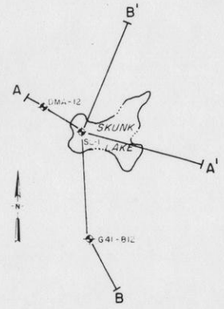
There are five perched lakes at the site. The surface water level is above the regional potentiometric surface in Little Sand, Skunk, Duck, Deep Hole, and Oak Lakes. Drawings 12959-13 through 17 present expanded geologic cross-sections of the various lakes showing the relative elevations of the





LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE



CROSS-SECTION INDEX
SKUNK LAKE
NOT TO SCALE

NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORING MAY VARY

0 50 100 150 200 250
HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

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ph.414-494-9656

SCALE: AS NOTED	DATE: 6-18-84	DRAWN BY: J.J.T.	APPROVED BY: J.A.S.

REVISIONS: DATE	BY	DESCRIPTION

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

EXPANDED GEOLOGIC CROSS-SECTIONS OF SKUNK LAKE

DRAWING NUMBER: 12959-13

GGB INC

A

ELEVATION (METERS) MSL

530 520 510 500 490 480 470 460 450 440 430 420

G40-Y22

DEEP HOLE LAKE

▼ SURFACE ELEV. 489.32

A'

ELEVATION (METERS) MSL

530 520 510 500 490 480 470 460 450 440 430 420

B

ELEVATION (METERS) MSL

510 500 490 480 470 460 450 440 430 420 410

G41-A24

PIEZOMETER WATER LEVEL 484.0
DHL-1

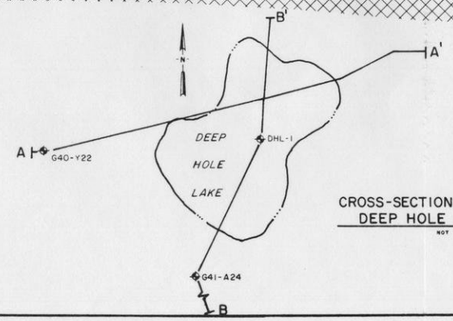
DEEP HOLE LAKE

▼ SURFACE ELEV. 489.32

B'

ELEVATION (METERS) MSL

510 500 490 480 470 460 450 440 430 420 410



CROSS-SECTION INDEX
DEEP HOLE LAKE
NOT TO SCALE

LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE

NOTE PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

0 50 100 150 200 250

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

SCALE: AS NOTED	DATE: 6-19-84	DRAWN BY: J.J.T.	APPROVED BY: J.A.S.

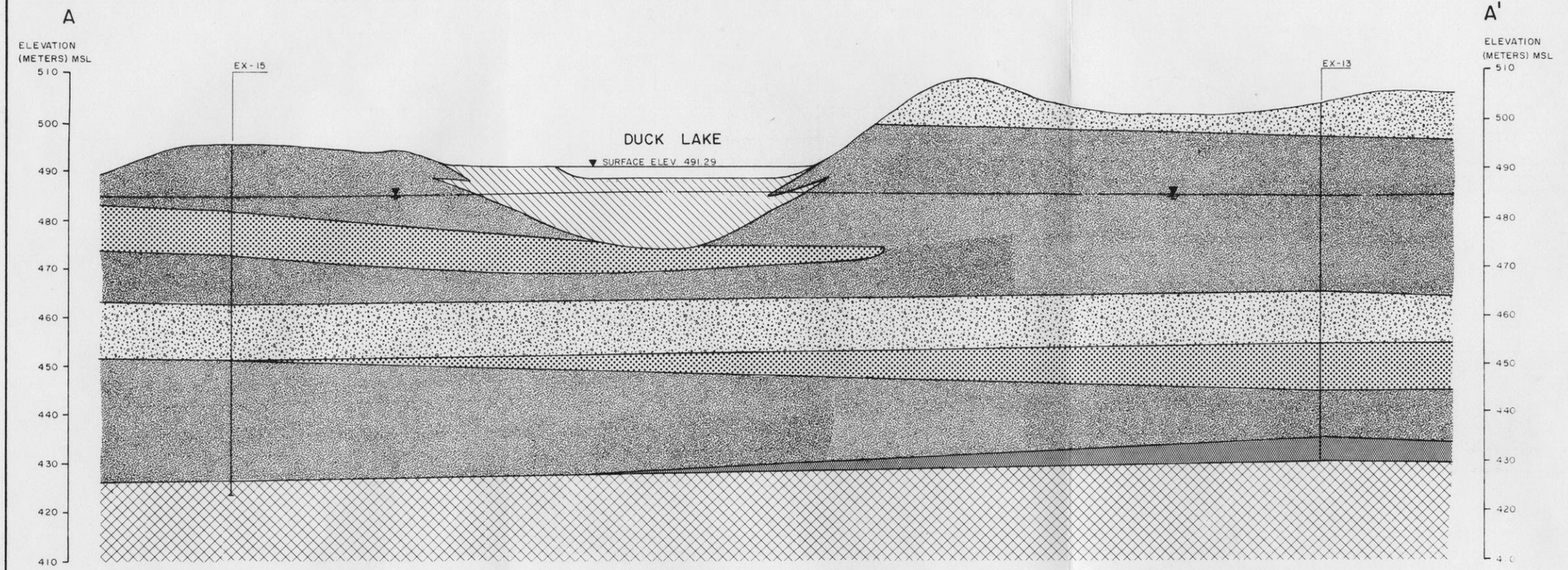
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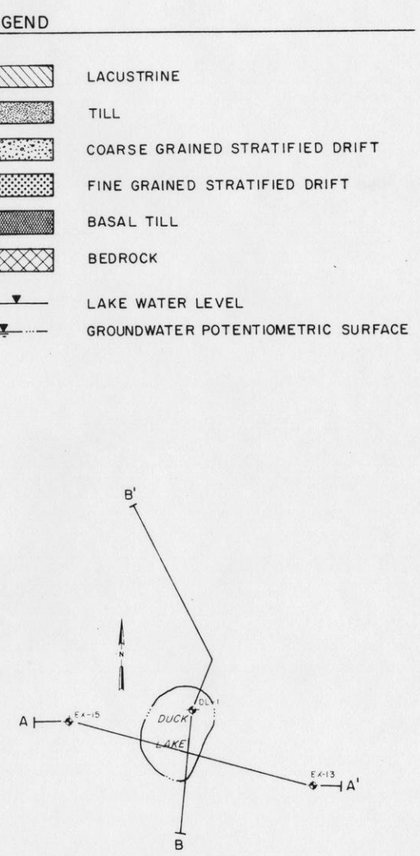
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CRANDON PROJECT

EXPANDED GEOLOGIC CROSS-SECTIONS OF DEEP HOLE LAKE

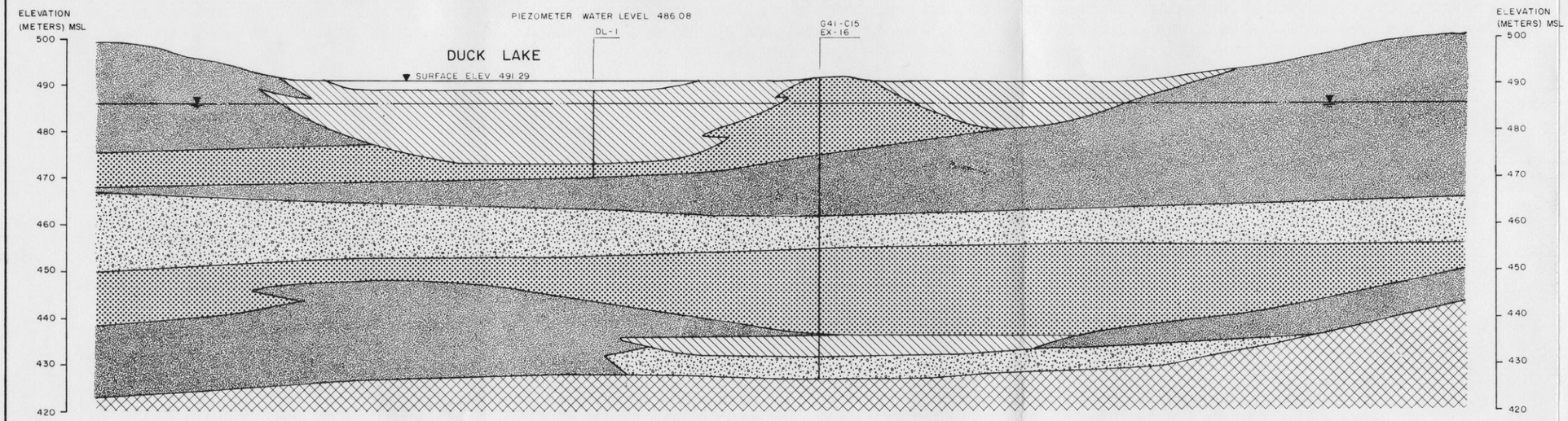
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GCB INC





CROSS-SECTION INDEX
DUCK LAKE
NOT TO SCALE



NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

0 50 100 150 200 250
HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

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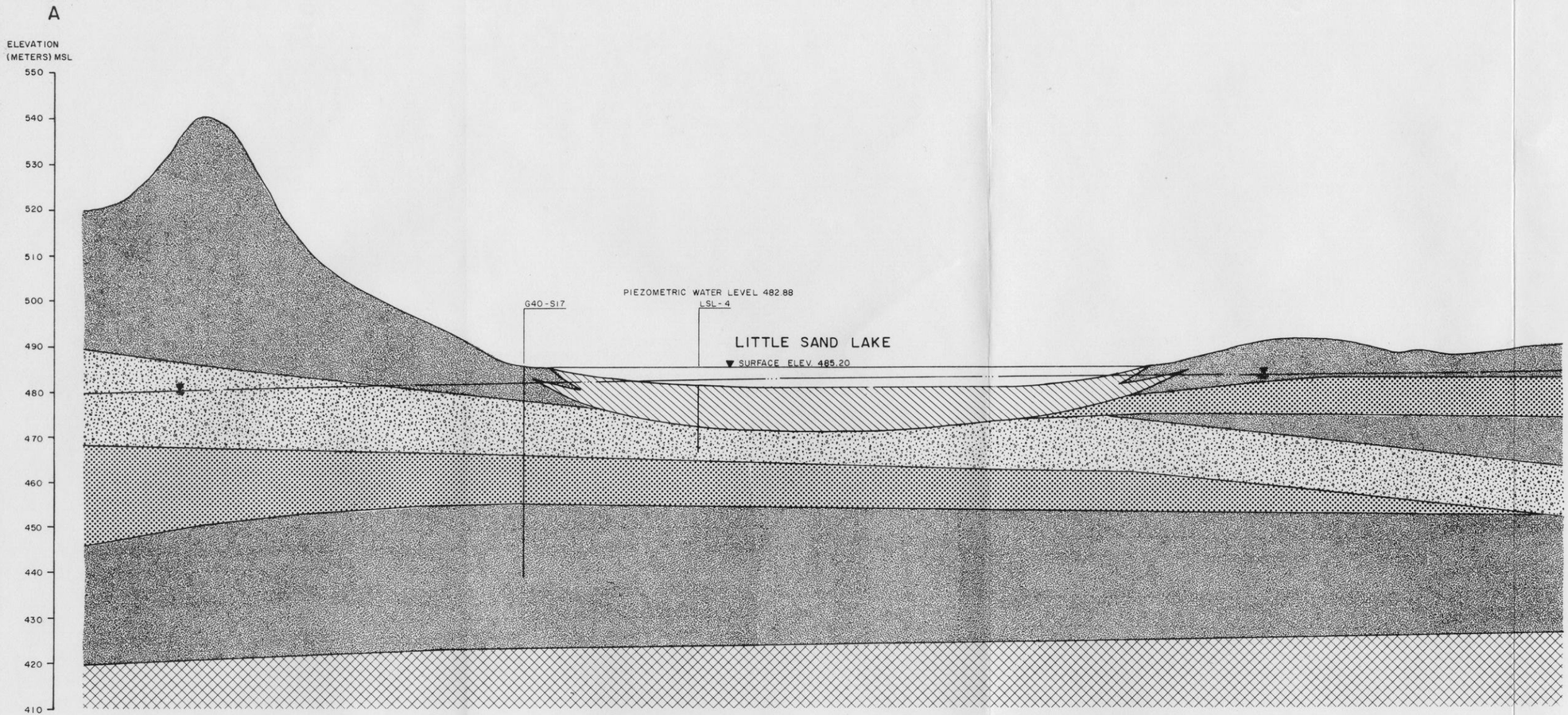
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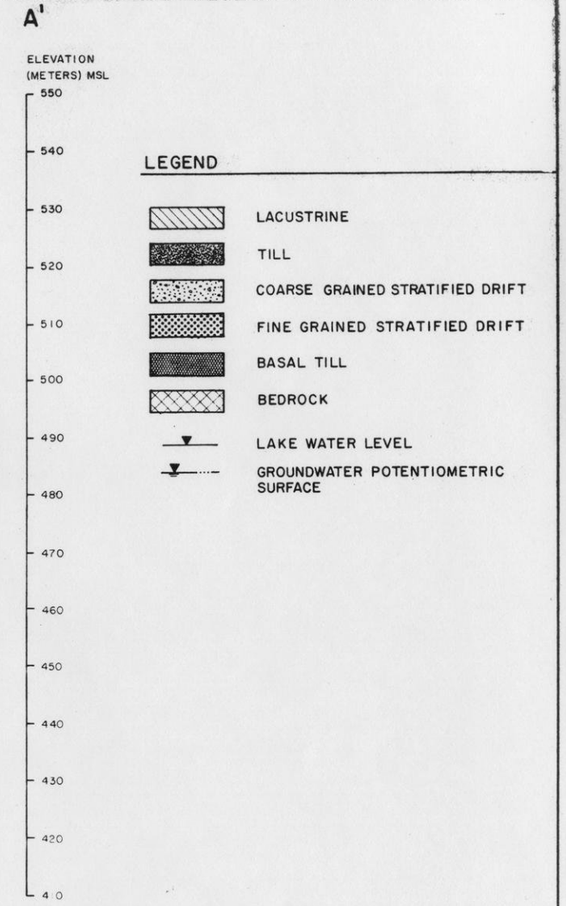
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EXXON MINERALS COMPANY
CRANDON PROJECT

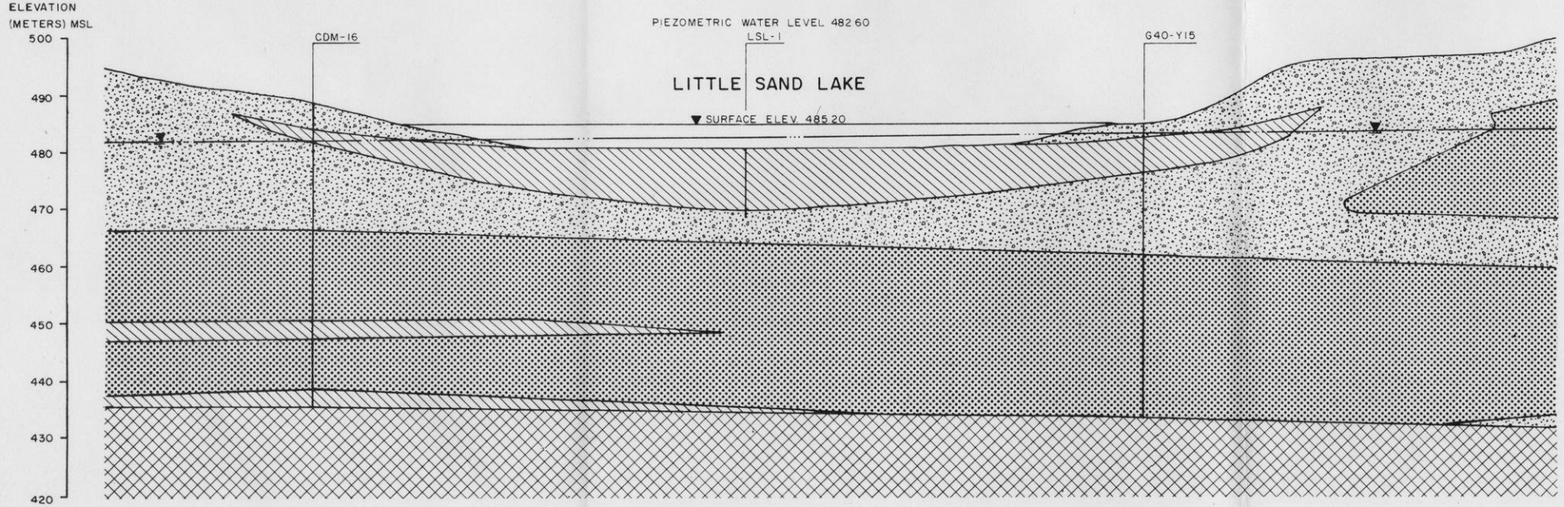
EXPANDED GEOLOGIC CROSS-SECTIONS OF DUCK LAKE

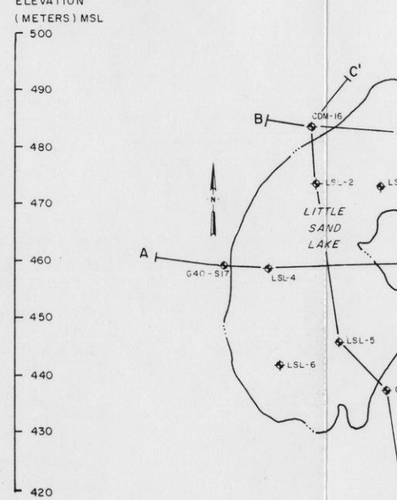
DRAWING NUMBER: 12959-15

GGB INC









CROSS-SECTION INDEX
LITTLE SAND LAKE
NOT TO SCALE

NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

0 50 100 150 200 250
HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
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REVISIONS DATE	BY:	DESCRIPTION:

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

EXPANDED GEOLOGIC CROSS-SECTIONS OF LITTLE SAND LAKE

DRAWING NUMBER: 12959-16

GGS INC.

C

ELEVATION (METERS) MSL

510 500 490 480 470 460 450 440 430 420

G40-Y22 G40-Y21 LSL-5 LSL-2 CDM-16

LITTLE SAND LAKE

▼ SURFACE ELEV. 485.2

C'

ELEVATION (METERS) MSL

510 500 490 480 470 460 450 440 430 420

A

ELEVATION (METERS) MSL

530 520 510 500 490 480 470 460 450 440 430 420 410

G40-PI7 PIEZOMETER WATER LEVEL - DRY OL-1 G40-PIOA

OAK LAKE

▼ SURFACE ELEV. 497.88

A'

ELEVATION (METERS) MSL

530 520 510 500 490 480 470 460 450 440 430 420 410

A

G40-PIOA

OL-1

OAK LAKE

G40-PI7

A

CROSS-SECTION INDEX
OAK LAKE
NOT TO SCALE

C'

B

CDM-16 LSL-1 G40-Y15 B'

LSL-2 LSL-3

LITTLE SAND LAKE

G40-SI7 LSL-4 A'

LSL-5

LSL-6 G40-Y21

G40-Y22

C

CROSS-SECTION INDEX
LITTLE SAND LAKE
NOT TO SCALE

LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- ▼ LAKE WATER LEVEL
- ▼ GROUNDWATER POTENTIOMETRIC SURFACE

NOTE: PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

0 50 100 150 200 250

HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

SCALE: AS NOTED	DATE: 6-19-84	DRAWN BY: J.J.T.	APPROVED BY: J.A.S

REVISIONS: DATE	BY	DESCRIPTION

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

EXPANDED GEOLOGIC CROSS-SECTIONS OF LITTLE SAND LAKE AND OAK LAKE

DRAWING NUMBER: 12959-17

surface water and potentiometric surface. Additional information concerning the soils under the lakes can be found in reports by STS Consultants Ltd. (1982 and 1984).

C. Flow Boundaries

Significant upward gradients were measured at EX-7 and EX-8 adjacent to Hemlock Creek. In addition, upward gradients were noted at well points WP-4 and WP-5 adjacent to Swamp Creek. WP-5 was a flowing well. This indicates that both Hemlock and Swamp Creeks are groundwater discharge areas. The gradient data indicate that Hemlock Creek is a flow boundary with no significant underflow. From the MWDF area, groundwater either flows to the east-northeast and discharges to Hemlock Creek or it flows to the north-northwest and discharges to Swamp Creek or it flows to the west-southwest and discharges to Rolling Stone Lake and its associated streams and wetlands. Drawings 12959-18 and 19 are expanded geologic cross-sections of selected locations across Hemlock and Swamp Creeks.

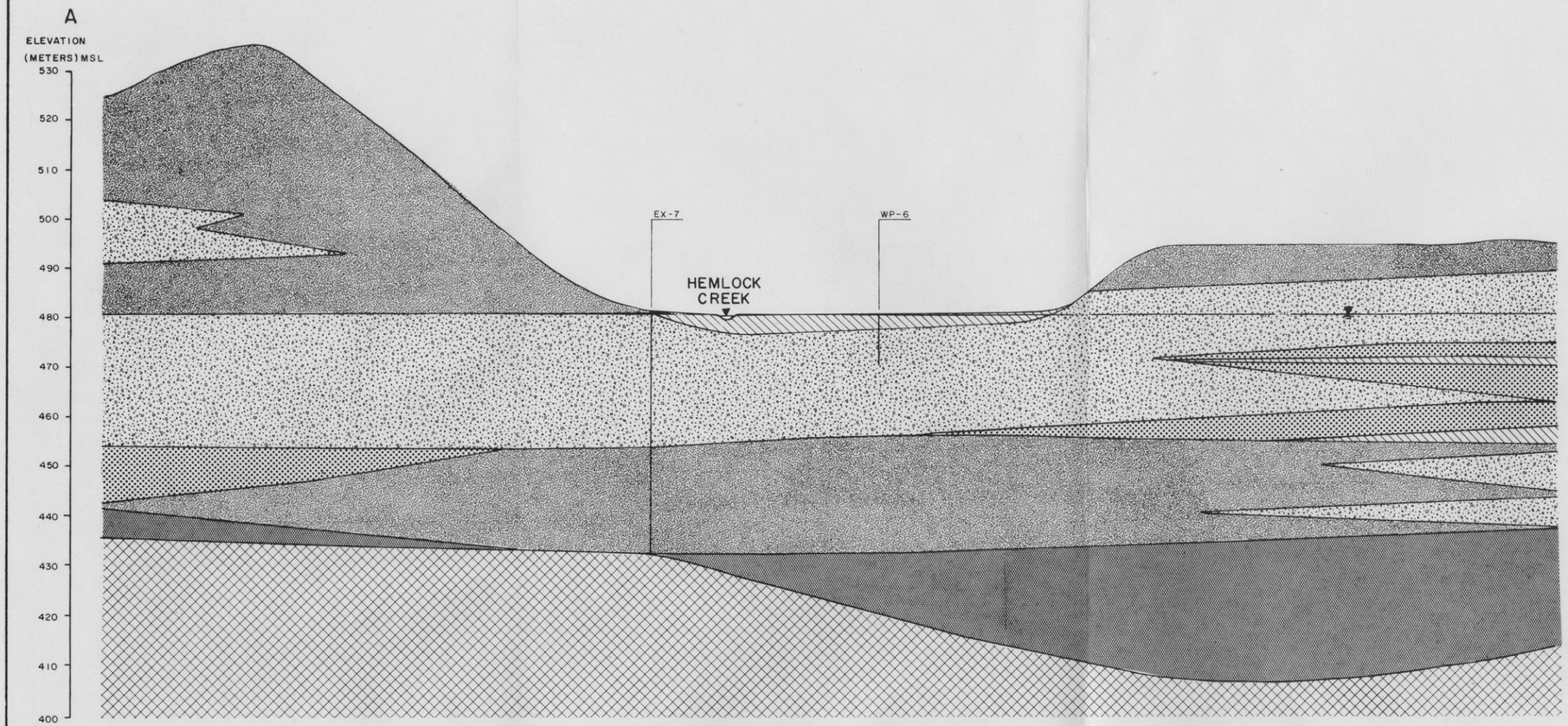
VII. RE-EVALUATION OF SOIL SAMPLES FROM EARLIER BORINGS

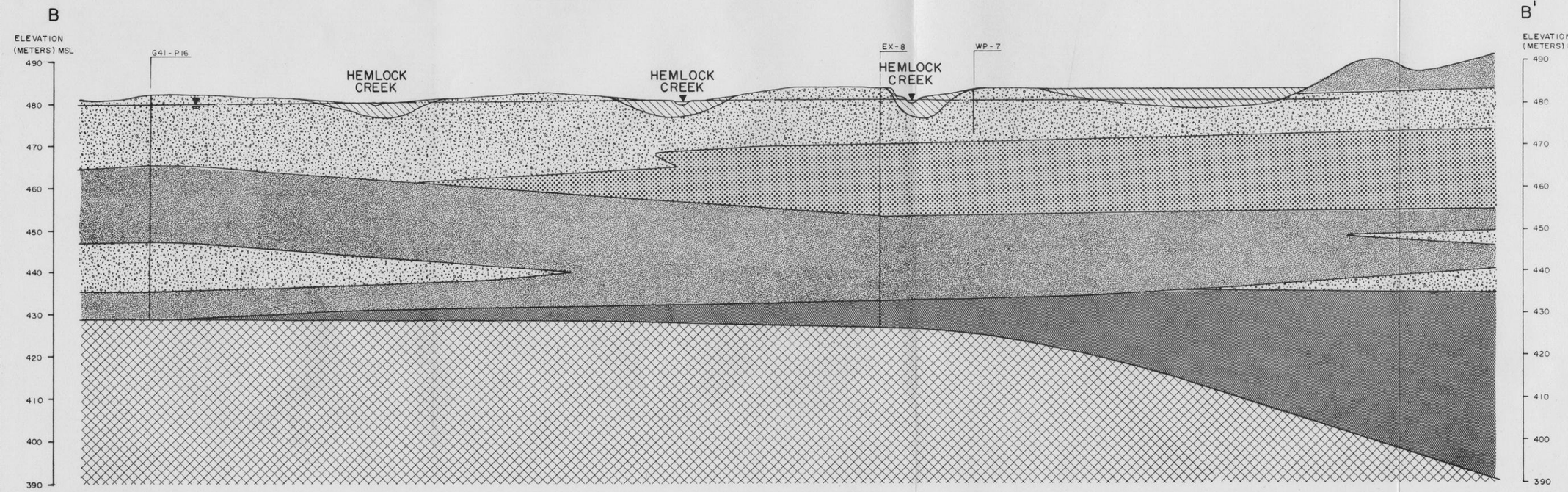
A. G-40 Series

Split-spoon samples from selected older borings were reviewed for possible grain size analysis. A sample was selected for testing if it visually appeared to be a borderline classification such as between SM and SM-SP or SP and SM-SP. Also, a sample was tested if the previous classification differed significantly from the STS reclassification. Table 7 presents a summary of the samples which were tested. Changes in the classification were primarily a result of the P200 content actually being different than what was visually estimated.

B. G-41 Series

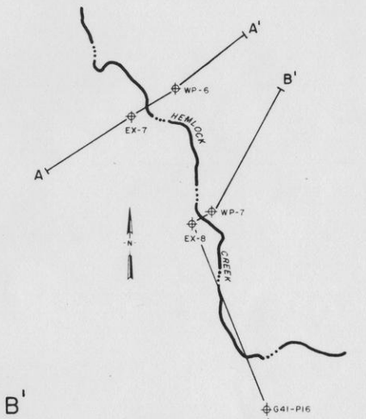
Table 8 presents a summary of the re-evaluation of soil samples from the G-41 series. Again, any differences in classifications could be attributed to the P200 content. Gradation curves are in Appendix B. This information was used in making stratigraphic interpretations during the preparation of the revised geologic cross-sections.





LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE



CROSS-SECTION INDEX
HEMLOCK CREEK
NOT TO SCALE

NOTE PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

0 50 100 150 200 250
HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

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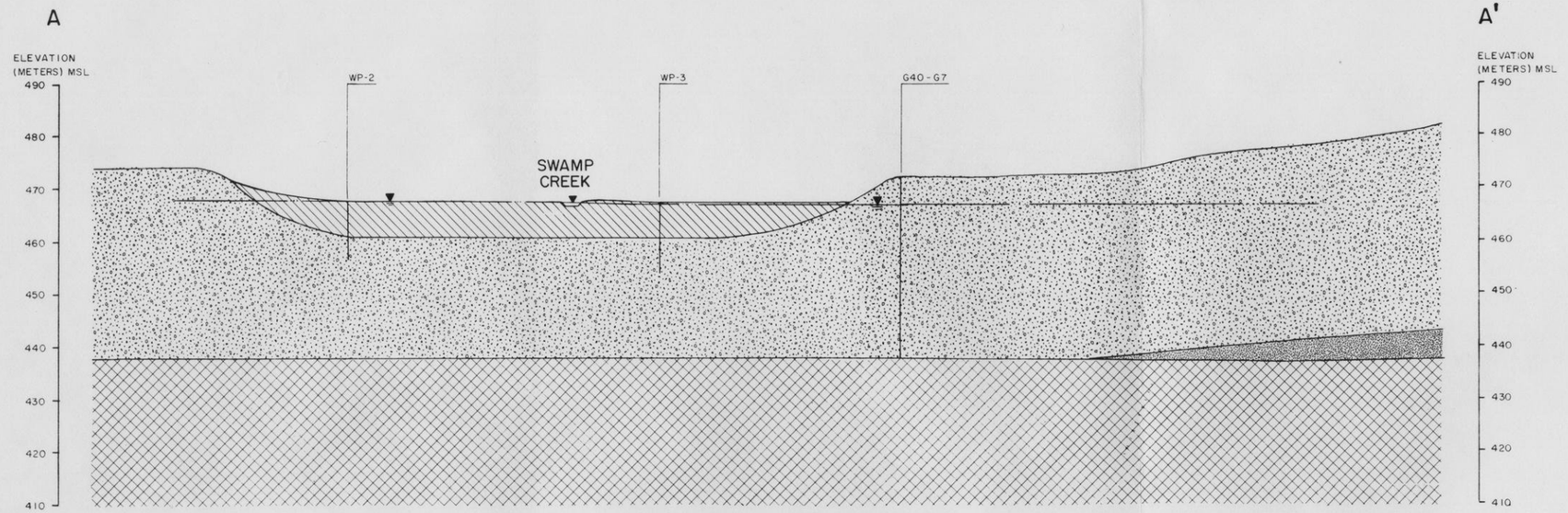
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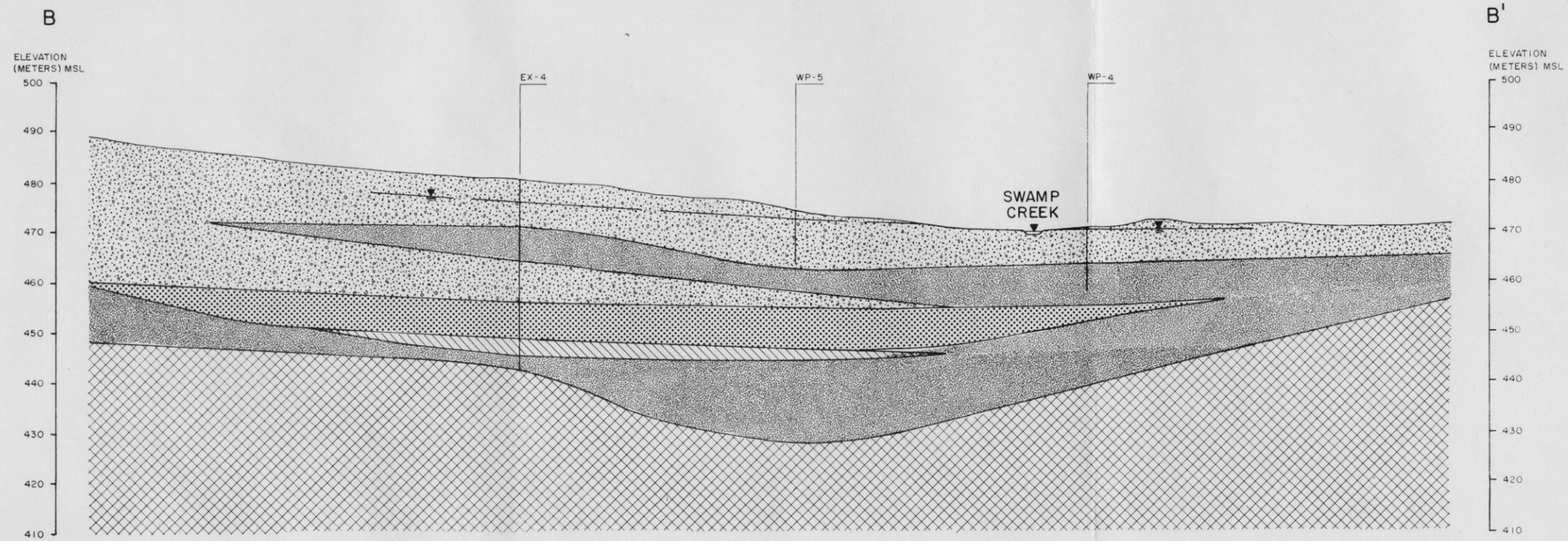
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EXXON MINERALS COMPANY
CRANDON PROJECT

EXPANDED GEOLOGIC CROSS-SECTIONS OF HEMLOCK CREEK

DRAWING NUMBER: 12959-18

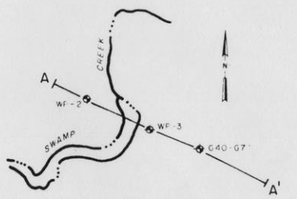
17241
GGB INC.

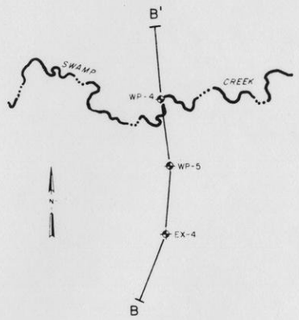




LEGEND

- LACUSTRINE
- TILL
- COARSE GRAINED STRATIFIED DRIFT
- FINE GRAINED STRATIFIED DRIFT
- BASAL TILL
- BEDROCK
- LAKE WATER LEVEL
- GROUNDWATER POTENTIOMETRIC SURFACE





CROSS-SECTION INDEX
SWAMP CREEK
NOT TO SCALE

NOTE PROJECTIONS OF SOIL STRATA BASED ON DATA FROM BORING LOCATIONS. SOIL CONDITIONS BETWEEN BORINGS MAY VARY.

0 50 100 150 200 250
HORIZONTAL SCALE IN METERS
VERTICAL EXAGGERATION 5x

STS Consultants Ltd.
540 Lambeau St. Green Bay, Wisconsin
ph.414-494-9656

SCALE AS NOTED	DATE 7-13-84	DRAWN BY J.J.T	APPROVED BY J.A.S.

REVISIONS* DATE	BY	DESCRIPTION

HYDROGEOLOGIC STUDY UPDATE
EXXON MINERALS COMPANY
CRANDON PROJECT

EXPANDED GEOLOGIC CROSS-SECTIONS OF SWAMP CREEK

DRAWING NUMBER: 12959-19

TABLE 7

Re-Evaluation Summary of Soil Samples
From Earlier Bore Holes
G-40 Series

Boring	Sample	Depth to Top of Sample Ft.	Depth to Top of Sample M.	Previous Visual Classification	P200	Actual Unified Classification
G40-D24	3	10	3.0	SM-SP	30	SM
D24	11	50	15.2	SM-SP	22	SM
D24	19	90	27.4	SP	6	SM-SP
D24	27	160	48.8	SM-SP	16	SM
H16	20	90	27.4	SP	6	SM-SP
H16	26	140	42.7	SM-ML	24	SM
H16	34	220	67.1	SM	35	SM
H27	8	35	10.7	SM	16	SM
H27	14	65	19.8	SM-SP	9	SM-SP
H27	19	90	27.4	SM-SP	7	SM-SP
M15	11	45	13.7	SM	21	SM
M15	21	95	29.0	SP	9	SM-SP
P10A	7	130	39.6	SM	15	SM
S17	5	50	15.2	GM-GP	4	GP
S17	11	110	33.5	SM	7	SM-SP
S17	15	150	45.7	SM	22	SM
S17A	5	20	6.1	SM	13	SM
T30	16	153	46.6	SM	21	SM
X1	5	40	12.2	SM	19	SM
X1	8	70	21.3	SM	6	SM-SP
X1	11	102	31.1	SM-SP	9	SM-SP
X1	13	122	37.2	SM	37	SM
Y15	4	30	9.1	SM	15	SM
Y22	11	102	31.1	SP	4	SP
Y22	15	143	43.6	SP	52	ML
Y26	5	40	12.2	SP	10	SM-SP
Y26	13	120	36.6	SM	30	SM

TABLE 8

Re-Evaluation Summary of Soil Samples
From Earlier Bore Holes
G-41 Series

Boring	Sample	Depth to Top of Sample Ft.	M.	Previous Visual Classification	P200	Actual Unified Classification
G41-A23	10	46	14.0	SP	3	SP
A24	2	10	3.0	SM-SP	7	SM-SP
A24	5	30	9.1	SM-SP	24	SM
A24	6	41	12.5	SM-SP	9	SM-SP
A24	8	60	18.3	SP	8	SM-SP
A24	10	80	24.4	SP	4	SP
A24	12	101	30.8	GP	3	GP
A24	17	151	46.0	SP-ML	21	SM
A24	19	172	54.4	GP	7	GP-GM
B12	2	10	3.0	SP	13	SM
B12	4	30	9.1	GP-GC	13	SM-GM
B12	5	40	12.2	SM	18	SM
B12	8	70	21.3	SM	10	SM-SP
B12	12	110	33.5	SM	17	SM
C15	2	5	1.5	SP	17	SM
C15	5	15	4.6	SP	3	SP
C15	12	48	14.6	ML	75	ML
C15	14	58	17.7	GM-SM	13	SM
C15	17	75	22.9	SM	22	SM
C15	21	95	29.0	SM	18	SM
C15	26	140	42.7	SM-SP	6	SM-SP
C15	28	160	48.8	SM	14	SM
C15	29	170	51.8	SM	97	ML
C15	32	200	61.0	SM-SP	8	SM-SP
C32	3	18	5.5	SM	25	SM
C32	6	50	15.2	SP	13	SM
C32	14	130	39.6	SM-SP	7	SM-SP
C32	16	151	46.0	SP	4	SP
C32	17	161	49.1	SM	23	SM
C32	20	193	58.8	SP	8	SM-SP
C32	21	205	62.5	SP	4	SP
C32	24	232	70.7	SM	35	SM
E17	28	195	59.4	SM-SP	11	SM-SP
E17	32	234	71.3	ML	52	ML
E19A	3	20	6.1	SM-SP	16	SM
E19A	4	30	9.1	SM-SP	28	SM
E19A	10	90	27.4	SM	17	SM
E19A	12	110	33.5	SM-SP	7	SM-SP
E19A	18	170	51.8	SP	3	SP
E19A	19	180	54.9	SM	30	SM
E19A	24	232	70.7	GM-GP	7	SM-SP

TABLE 8

Boring	Sample	Depth to Top of Sample Ft.	Depth to Top of Sample M.	Previous Visual Classification	P200	Actual Unified Classification
G41-E22A	5	41	12.5	SM	29	SM
E22	9	60	18.3	SC	15	SM
E22	17	140	42.7	SM-SP	7	SM-SP
E22	22	190	57.9	SM-SP	7	SM-SP
E22	24	209	63.7	SM-SP	84	ML
G13	5	43	13.1	SM	14	SM
G13	12	110	33.5	SP	8	SM-SP
G13	13	120	36.6	SM	21	SM
G13	18	170	51.8	SM	23	SM
G13	23	220	67.1	SM	23	SM
G13	25	240	73.1	SP	4	SP
G13	31	300	91.4	ML	92	CL
G15	3	54	16.5	SM-GM	10	GP-GM
G15	5A	65	19.8	SM	26	SM
G15	15	132	40.2	SM	17	SM
G15	20	183	55.8	SM-SP	13	SM
H9	3	21	6.4	SM	18	SM
H9	5	40	12.2	SM-SP	13	SM
H9	8	70	21.3	SM	14	SM
H9	10	90	27.4	GP	7	SM-SP
H9	15	140	42.7	SM	20	SM
H9	16	150	45.7	SM	22	SM
H9	21	200	61.0	SM-SP	8	SM-SP
H18B	2	10	3.0	SM	22	SM
H18B	6	50	15.2	SP	2	GP
H18B	8	70	21.3	SM	25	SM
H18B	13	120	36.6	SM	15	SM
H18B	16	150	45.7	SP	8	SM-SP
H18B	17	160	48.8	SP	6	SM-SP
H18B	22	210	64.0	SM	24	SM
H18B	27	260	79.2	ML	98	ML-CL
K17	6	24	7.3	SM	7	SM-SP
K17	12	54	16.5	SM-SP	11	SM-SP
K17	16	74	22.5	SM-SP	19	SM
M11	2	10	3.0	SP	2	SP
M11	5	38	11.6	SP	2	SP
M11	8	68	20.7	SM	37	SM
M15	5	40	12.2	SP-GP	8	SM-SP
M15	10	90	27.4	SM	36	SM
M15	13	121	36.9	SP	8	SM-SP
M15	16	150	45.7	SP-GP	8	SM-SP
M15	18	170	51.8	SM-SP	10	SM-SP
P16	4	30	9.1	SP-GP	4	GP
P16	6	50	15.2	SM	17	SM

TABLE 8

Boring	Sample	Depth to Top of Sample Ft.	Depth to Top of Sample M.	Previous Visual Classification	P200	Actual Unified Classification
G41-P16	9	80	24.4	SM	11	SM-SP
P16	10	90	27.4	SM	16	SM
P16	16	148	45.1	SM	20	SM
P18	4	15	4.6	ML	95	ML
P18	7	30	9.1	SM	17	SM
P18	12	55	16.8	SM-SP	8	SM-SP
P18	18	85	25.9	SM	13	SM
P18	21	100	30.5	SM	15	SM
Q22	3	20	6.1	SM	47	SM
Q22	6	48	14.6	SP	2	SP
Q22	8	70	21.3	SP-GP	7	SM-SP
Q22	13	123	37.5	SP-GP	6	SM-SP
Q22	14	129	39.3	SP	3	SP
Q22	15	138	42.1	SP	2	SP
Q22	18	169	51.5	ML	73	ML
Q22	22	209	63.7	SP	3	SP
Q22	23	219	66.7	SP-GP	3	GP

VIII. FIELD PERMEABILITY TESTS IN OLDER WELLS

Tables 9, 10 and 11 present the results from the field permeability tests in the older G-40, G-41, DM, DW, and BE wells. The field data are presented in Appendix C. These tests were conducted at the request of the WDNR and the results are presented herein for completeness. However, the data should be interpreted with caution since the construction of the older wells is substantially different than the EX piezometers. The older wells have longer well screens and gravel packs. Also, some were installed across different soil strata, whereas the EX piezometers were installed within one stratum.

TABLE 9

Field Permeability Test Summary
Crandon Project

G-40 and G-41 Wells

Well	Test Type	Permeability cm/sec.
G40-M15	Fall	1×10^{-4}
	Rise	8×10^{-5}
G40-S17	Fall	4×10^{-4}
	Rise	8×10^{-4}
G41-E17	Fall	1×10^{-3}
	Rise	1×10^{-3}
G41-E19A	Fall	6×10^{-4}
	Rise	2×10^{-3}
G41-E22A	Fall	6×10^{-4}
	Rise	9×10^{-4}
G41-M11	Fall	2×10^{-3}
	Rise	1×10^{-3}
G41-P16	Fall	4×10^{-5}
	Rise	5×10^{-5}
G41-P18	Fall	2×10^{-7}

TABLE 10

Field Permeability Test Summary
Crandon Project

DM and DW Wells

Well	Test Type	Permeability cm/sec.
DMS-1	Fall	5×10^{-5}
	Rise	2×10^{-5}
DMI-2L	Fall	1×10^{-4}
DW-1L	Rise	1×10^{-7}
DW-1U	Rise	3×10^{-7}
DW-1A	Fall	3×10^{-6}
DW-3U	Fall	8×10^{-4}
DW-3L	Rise	1×10^{-5}

TABLE 11

Field Permeability Test Summary
Crandon Project

BE Wells

Well	Test Type	Permeability cm/sec.
BE 211-1	Rise	2×10^{-5}
BE 211-1 (Test #2)	Rise	3×10^{-5}
BE 211-2L	Rise	2×10^{-6}
BE 211-3U	Rise	1×10^{-5}
BE 211-3L	Rise	2×10^{-5}
BE 213-1	Rise	5×10^{-5}
BE 213-2	Rise	1×10^{-4}
BE 213-3L	Rise	7×10^{-5}
BE 216-1	Rise	2×10^{-5}
BE 216-2	Rise	4×10^{-6}
BE 216-3U	Rise	7×10^{-6}
BE 216-3L	Rise	1×10^{-5}

IX. REFERENCES

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X. GLOSSARY

1. Aquifer	soil or rock strata capable of yielding usable quantities of water to wells. As used in this report, it includes both fine and coarse-grained stratified drift.
2. Barafos	trademark of NL Baroid Industries. It contains a barium phosphate detergent which is used to disperse the bentonite wall cake adjacent to the well screen.
3. Basal Till	glacial till deposit found on the bedrock surface.
4. Benseal	trademark of NL Baroid Industries. It is a granulated bentonite.
5. Bentonite	clay mineral montmorillonite which has a great ability to absorb water and swell.
6. Drispac	trademark of Minex, Inc. It is added to the bentonite drilling mud to improve borehole wall cake and sample recovery.
7. EZ Mud	trademark of NL Baroid Industries. It is a liquid polymer added to Benseal to retard swelling.
8. Glacial Till	non-sorted, non-stratified sediment deposited directly by a glacier.
9. Lacustrine	as used in this report, it refers to soil (usually fine-grained) deposited at the bottom of lakes, both glacial and recent deposits under Little Sand, Oak, Skunk, Deep Hole and Duck Lakes.
10. Outwash	soil deposited by meltwater streams flowing from a glacier. Deposits are usually stratified.
11. Piezometer	groundwater observation well sealed into a particular soil or rock stratum used to measure groundwater head or hydrostatic pressure.
12. Perched Lake	the surface water level is above the groundwater potentiometric surface (water table).
13. Potentiometric Surface Map	subsurface contour map showing the elevation of the water table.

14.Quik-Trol	trademark of NL Baroid Industries. It is a drilling mud additive to improve cuttings removal and wall cake.
15.Stratified Drift	synonymous with glacial outwash.
16.Tremie Pipe	usually a small diameter pipe used to conduct bentonite or grout into the borehole annulus.
17.Varves	a series of thin layers of soil representing seasonal sedimentation typically found in lacustrine deposits.

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS : Split Spoon – 1 3/8" I.D., 2" O.D., unless otherwise noted
ST : Shelby Tube – 2" O.D., unless otherwise noted
PA : Power Auger
DB : Diamond Bit – NX: BX: AX
AS : Auger Sample
JS : Jar Sample
VS : Vane Shear
OS : Osterberg Sampler – 3" Shelby Tube
HS : Hollow Stem Auger
WS : Wash Sample
FT : Fish Tail
RB : Rock Bit
BS : Bulk Sample
PM : Pressuremeter test - in situ

Standard "N" Penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2 inch OD split spoon, except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:

WL : Water Level
WCI : Wet Cave In
DCI : Dry Cave In
WS : While Sampling
WD : While Drilling
BCR : Before Casing Removal
ACR : After Casing Removal
AB : After Boring

Geologic Units:

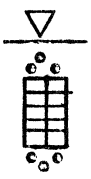
FD: Fine-grained stratified drift
CD: Coarse-grained stratified drift
BT: Basal till
T: Glacial till
L: Lacustrine

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence of ground water elevations must be sought.

GRADATION DESCRIPTION & TERMINOLOGY:

Coarse Grained or Granular Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays or clayey silts if they are cohesive, and silts if they are non-cohesive. In addition to gradation, granular soils are defined on the basis of their relative in-place density and fine grained soils on the basis of their strength or consistency, and their plasticity.

Major Component Of Sample	Size Range	Descriptive Term(s) (Of Components Also Present in Sample)	Percent of Dry Weight
Boulders	Over 8 in. (200mm)	Trace	1 – 9
Cobbles	8 in. to 3 in. (200mm to 75mm)	Little	10 – 19
Gravel	3 in. to #4 sieve (75mm to 2mm)	Some	20 – 34
Sand	#4 to #200 sieve (2mm to .074mm)	And	35 – 50
Silt	Passing #200 sieve (0.074mm to 0.005mm)		
Clay	Smaller than 0.005mm		



groundwater level 5-24-84

well screen with pea gravel backfill.

CONSISTENCY OF COHESIVE SOILS:

Unconfined Comp. Strength, Qu, tsf	Consistency
< 0.25	Very Soft
0.25 – 0.49	Soft
0.50 – 0.99	Medium (Firm)
1.00 – 1.99	Stiff
2.00 – 3.99	Very Stiff
4.00 – 8.00	Hard
>8.00	Very Hard

RELATIVE DENSITY OF GRANULAR SOILS:

N – Blows/ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50 – 80	Very Dense
80+	Extremely Dense

APPENDIX A

Composite Soil Boring Logs, EX-1 through EX-16

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon Project

LOG OF BORING NUMBER: EX-1

Feet: N-104151 E-2273714 Meters: N-31745 E-693029

WELL INSTALLATION
TOP STANDPIPE EL. +

DESCRIPTION OF MATERIAL

SURFACE ELEVATION 1555.48-ft. 474.111-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Brown silty fine to coarse sand (SM) - trace to little gravel			15			40	
10					5-24-84 ▽							
	2	SS				BU		17			13	
20												
	3	SS						22			-	
30	4	SS			Brown slightly silty fine to coarse gravel (GP-GM) - little fine to coarse sand - boulders from 26 to 28.5' - coarse drift		CD	12			8	
40	5	SS			Brown slightly silty fine to coarse sand (SM-SP) - some gravel - coarse drift	BL		10			-	$6x10^{-3}$
50	6	SS						8			6	
60	7	SS					CD	11			6	
70	8	SS						13			-	
80	9	SS						13			-	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 2-28-84
BORING COMPLETED 2-29-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE Green Bay
DRAWN BY
SHEET 1 OF 2
APP'D. BY JAS
STS JOB NO. 12959

BL 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon Project

LOG OF BORING NUMBER EX-1

Feet: N-104151 E-2273714 Meters: N-31745 E-693029

SURFACE ELEVATION 155.48-ft. 474.111-m

WELL INSTALLATION TOP STANDPIPE EL. +

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
90												
	10	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel - coarse drift		CD	13			9	
100												
	11	SS				AU		14			-	$6x10^{-3}$
110					Reddish brown silty fine to coarse sand (SM) - trace gravel - basal till							
	12	SS						16			32	
120												
	13	SS					BT	13			-	
130						AL						$9x10^{-5}$
132.8	14	SS			Bedrock - sample logged by Exxon							
					End of boring in bedrock Boring advanced to 132.8' by rock bit and bentonite mud.							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR		ACR	
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 2-28-84
BORING COMPLETED 2-29-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE Green Bay
DRAWN BY SD SHEET 2 OF 2
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon Project

LOG OF BORING NUMBER: EX-2

Feet: N-110340 E-2262240

Meters: N-33632 E-689532

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1592.11-ft. 485.276-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Brown silty fine to coarse sand (SM) - trace to some gravel - glacial till			-			16	
10	2	SS						6			16	
20	3	SS					T	8			-	
30	4	SS			5-24-84 ▽	CL		10			-	
40	5	SS						10			21	
50	6	SS			Brown silty fine to medium sand (SM) - coarse drift			11			16	
60	7	SS					CD	16			–	
70	8	SS			Brown slightly silty fine to medium sand (SM-SP) - coarse drift	AU		17			6	5×10^{-3}
80	9	SS					CD	18			8	
90					Brown very fine sandy silt (ML) - lacustrine							

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-26-84

BORING COMPLETED 3-28-84

RIG Denny's Drilling

FOREMAN Denny

STS OFFICE 540 Lambeau Street Green Bay, WI. 494-9656

DRAWN BY SD

SHEET 1 OF 3

APP'D. BY JAS

STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

LOG OF BORING NUMBER: EX-2

Feet: N-110340 E-2262240 Meters: N-33632 E-689532

SITE LOCATION: Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +_____

SURFACE ELEVATION 1592.11-ft. 485.276-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
90												
	10	SS			Brown very fine sandy silt (ML) - lacustrine		L	22			55	
100					Reddish brown silty clay (CL) - includes varves of gray silt and very fine sand - lacustrine							
	11	SS					L	14			85	
110					Reddish brown silty fine to coarse sand (SM) - trace gravel - glacial till							
	12	SS						11			24	
120												
	13	SS					T	12			-	
130												
	14	SS						11			-	
140												
	15	SS						10			30	
150					Brown silty fine to medium sand (SM) - fine drift							
	16	SS				AL		14			14	7×10^{-4}
160							FD					
	17	SS						21			31	
170												
					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-26-84
BORING COMPLETED 3-28-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 2 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon Project

LOG OF BORING NUMBER: EX-2

Feet: N-110340 E-2262240

Meters: N-33632 E-689532

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1592.11-ft. 485.276-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
170	18	SS			Reddish brown silty clay (CL-CH) - varves of gray silt and high plasticity clay - lacustrine		L	25			96	
180	19	SS			Grayish brown silty fine to coarse sand (SM) - little gravel - weathered boulders - basal till		BT	9			-	
190												
192					End of boring on bedrock Boring advanced to 192' by rock bit and bentonite mud.							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-26-84
BORING COMPLETED 3-28-84
RIG Denny' Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street, Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 3 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL. 5 983

STS Consultants Ltd.

OWNER Exxon Minerals Company

LOG OF BORING NUMBER EX-3

PROJECT NAME Piezometer Installations

Feet N-110285 E-2263941 Meters N-33615 E-690051

SITE LOCATION Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1559.09-ft. 475.212-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel			7			6	
10					5-24-84 ▽	CL						
	2	SS			Brown fine sand (SP) - fine drift		FD	22			2	
20	3	SS			Reddish brown silty clay (CL) - varves of gray sandy silt (ML) - lacustrine		L	29			75	
30	4	SS			Reddish brown silty fine sand (SM) - varves of gray silt and red clay - lacustrine		L	20			34	
40	5	SS			Brown slightly silty fine sand (SM-SP) - fine drift	BU	FD	19			--	$2x10^{-3}$
50	6	SS						18			7	
60	7	SS			Brown silty fine to coarse sand (SM) - trace gravel, glacial till, boulder from 64.0 to 65.0 feet		T	12			45	
70	8	SS			Brown slightly silty fine to coarse sand (SM-SP) - waterbearing - coarse drift	BL	CD	11			8	$1x10^{-3}$
80	9	SS						12			-	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL	BCR		ACR		
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-29-84
BORING COMPLETED 3-31-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 1 OF 2
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-3 Continued

Feet: M-110285 E-2263941 | Meters: N-33615 E-690051

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1559.09-ft. 475.212-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
90												
	10	SS			Brown slightly silty fine to coarse sand (SM-SP) - waterbearing - coarse drift		CD	15			--	
100												
	11	SS			Brown silty fine sand (SM) - fine drift	AU	FD	18			23	
110												
	12	SS						19			--	1×10^{-3}
120												
	13	SS						20			24	
130												
	14	SS			Reddish brown silty fine to coarse sand (SM) - trace to a little gravel - basal till		BT	14			--	
140												
	15	SS				AL		10			29	3×10^{-4}
150												
	16	SS						11			40	
160					Weathered bedrock - cuttings logged by Exxon							
162					End of Boring in Bedrock Boring advanced to 162.0 feet with rockbit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-29-84
BORING COMPLETED 3-31-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 2 OF 2
APP'D. BY JAS STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER	Exxon Minerals Company
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin
LOG OF BORING NUMBER	EX-4
Feet	N-119912 E-2274288
Meters	N-36549 E-693204
WELL INSTALLATION	TOP STANDPIPE EL. +

SURFACE ELEVATION 1573.87-ft. 479.717-m

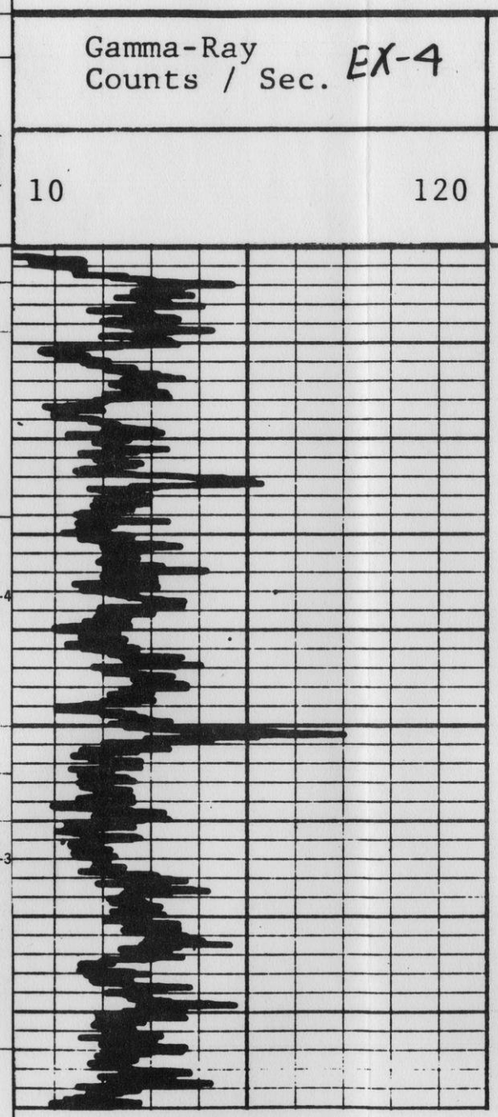
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Brown silty fine to medium sand (SM) - trace of fine gravel			8			25	
	2	SS			Brown slightly silty fine sand (SM-SP) - trace of fine gravel			9			10	
10	3	SS						6			4	
	4	SS			Brown fine to coarse sand (SP) - trace to some fine gravel- coarse drift 5-24-84 ▽	CL	CD	7			5	
20	NR											
30	5	SS						10			11	
	6	SS			Brown slightly silty fine to coarse sand (SM-SP)- trace to some fine gravel - glacial till	BU	T	11			10	$7x10^{-4}$
40	7	SS			Boulders from 42.0 to 43.0 feet and 47.0 to 48.0 feet			5			10	
	8	SS						9			7	
50	9	SS			Brown slightly silty fine gravel (GM-GP) - some fine to coarse sand		CD	8			6	
	10	SS			Brown slightly silty fine sand (SM-SP) - trace of fine gravel		CD	13			9	
60	11	SS			Brown silty fine sand (SM)		CD	13			16	
	12	SS			Driller's note: Obstruction at 60.0 feet probable boulder		BL	13			12	$1x10^{-3}$
70	13	SS			Brown slightly silty fine to coarse sand (SM-SP)- trace of fine gravel- coarse drift		CD	12			9	
	14	SS						13			6	
80	15	SS						12			7	
	16	SS			Brown slightly silty fine sand (SM-SP)		FD	21			7	
90					CONTINUED							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

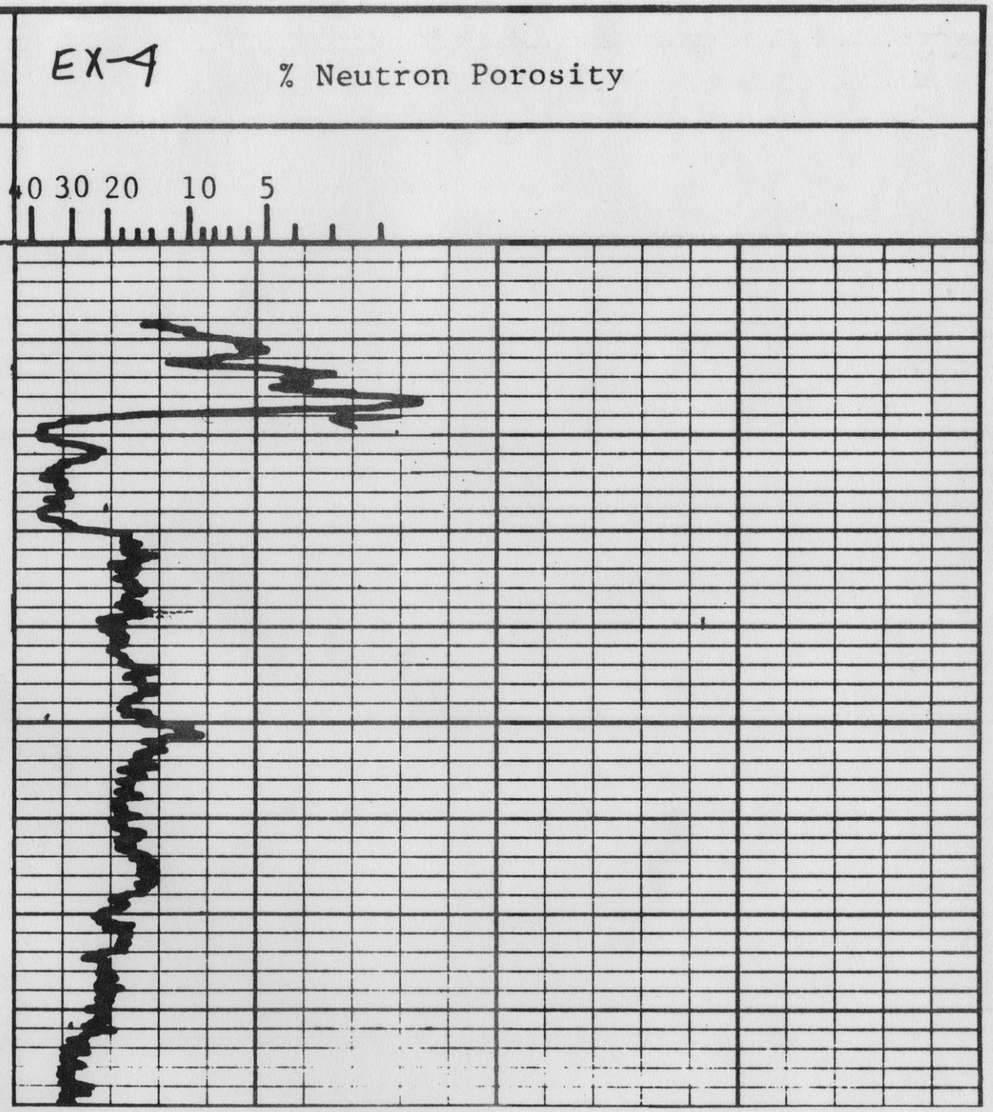
BORING STARTED	1-30-84
BORING COMPLETED	2-2-84
RIG	Denny's Drilling
FOREMAN	Denny
STS OFFICE	540 Lambeau Street Green Bay, Wi. 54303
DRAWN BY	JAS
SHEET	1 OF 2
APP'D. BY	JAS
STS JOB NO.	12959

BL: 5-983



DEPTH

50



STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon, Wisconsin

LOG OF BORING NUMBER: EX-4 Continued

Feet: M-119912 E-2274288 — Meters: N-36549 E-693204

WELL INSTALLATION
TOP STANDPIPE EL. +

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					SURFACE ELEVATION 1573.87-ft. 479.717-m							
					CONTINUED	AU		21			5	$1x10^{-3}$
	17	SS										
100	18	SS			Brown slightly silty fine sand (SM-SP)-fine drift		FD	17			8	
	19	SS						15			8	
	20	SS			Reddish brown silty clay (CL), seams of fine sand		BL	21			63	
110	21	SS			Reddish brown fine to coarse sand (SM) - trace of fine gravel - glacial till	AL	BT	10			28	$7x10^{-4}$
117	22	SS			Weathered bedrock							
					End of boring in bedrock Boring advanced to 117.0 feet by rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	1-30-84	STS OFFICE	540 Lambeau Street Green Bay, Wi. 54303
BORING COMPLETED	2-2-84		
RIG	Denny's Drilling	DRAWN BY JAS	SHEET 2 OF 2
FOREMAN	Denny	APP'D. BY JAS	STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER	Exxon Minerals Company
PROJECT NAME	Piezometer Installation
SITE LOCATION	Crandon, Wisconsin
LOG OF BORING NUMBER	EX-5
Feet	N-119857 E-2276790
Meters	N-36533 E-693967

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1632.50-ft. 497.587-m

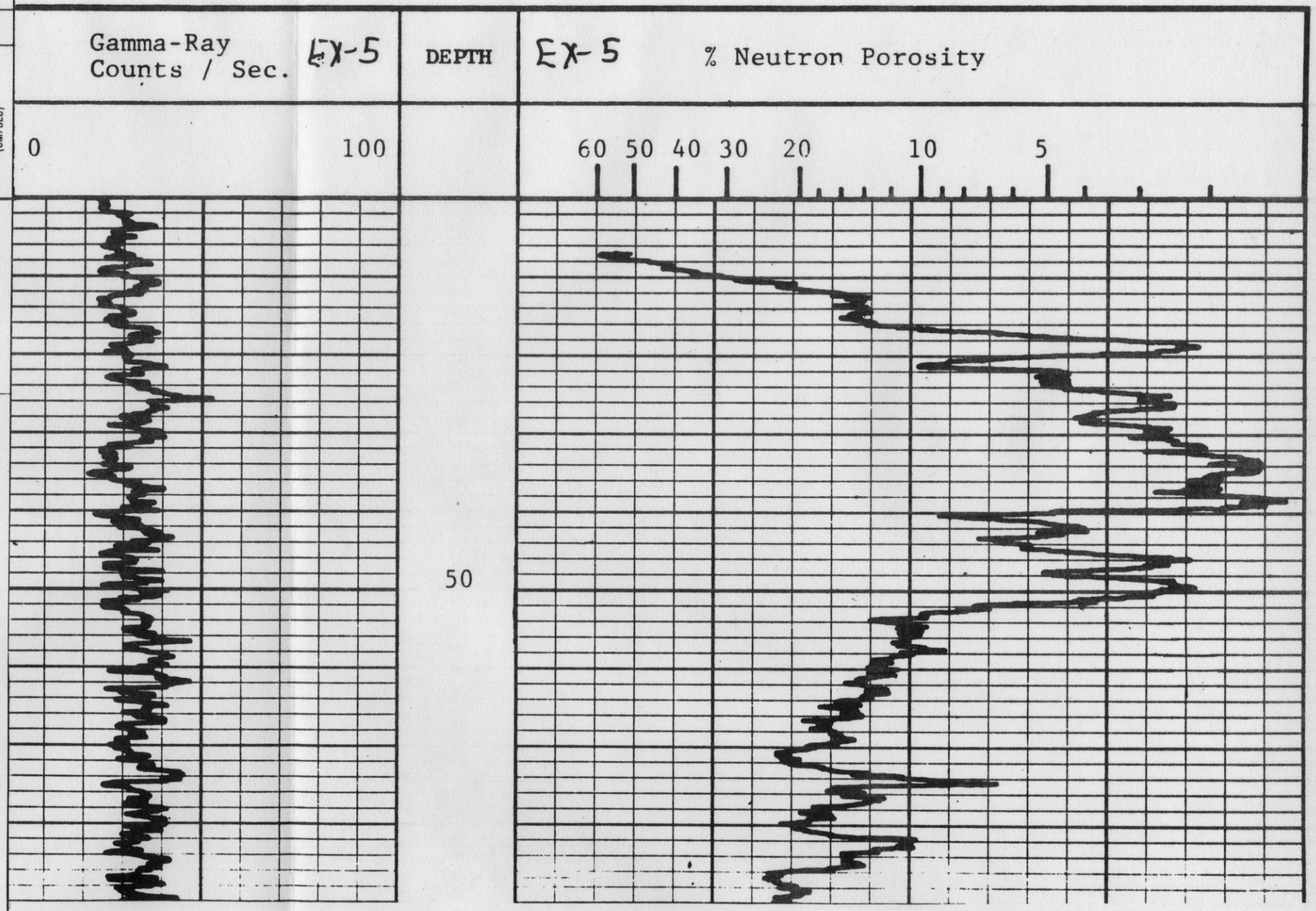
DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS						15			36	
10	2	SS			Brown silty fine to medium sand (SM) - trace to some gravel - glacial till		T	6			26	
20	3	SS						5			16	
30	4	SS			Brown slightly silty fine to medium sand (SM-SP)- trace to some gravel		T	8			7	
40	5	SS						8			13	
50	6	SS						8			13	
60	7	SS			5-24-84 ▽ Brown silty fine to coarse sand (SM) - trace of fine gravel - glacial till		T	10			20	
70	8	SS					CL	10			17	
80	9	SS						9			23	
90	10	SS			CONTINUED			11			20	

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	1-30-84	STS OFFICE	540 Lambeau Street Green Bay, Wi. 54303
BORING COMPLETED	2-1-84	DRAWN BY	JAS
RIG	Lusiers	SHEET	1 OF 2
FOREMAN	Keith	APP'D. BY	JAS
		STS JOB NO.	12959

BL: 5-983



STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

SITE LOCATION Crandon, Wisconsin

LOG OF BORING NUMBER EX-5 Continued

Feet N-119857 E-2276790 Meters N-36533 E-693967

WELL INSTALLATION TOP STANDPIPE EL. +

SURFACE ELEVATION 1632.50-ft. 497.587-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					CONTINUED							
100	11	SS			Brown silty fine to coarse sand (SM) - trace of fine gravel		T	8			14	
110	12	SS			Brown fine to coarse sand and gravel (GP and SP) coarse drift	BL	CD	10			4	$1x10^{-2}$
120	13	SS						9			2	
130	14	SS			Brown slightly silty fine to coarse sand (SM-SP)- trace of fine gravel		CD	11			10	
140	15	SS			Reddish brown silty fine to coarse sand (SM) - trace of fine gravel - glacial till		BT	11			26	
150	16	SS						10			27	
160					Weathered bedrock Bedrock core logged by Exxon		AU					$2x10^{-6}$
170					End of boring in bedrock Boring advanced to 156.0 feet by rock bit and bentonite mud - Boring advanced from 156.0 to 186.0 feet by diamond bit and core barrel		AL					$1x10^{-7}$
180												

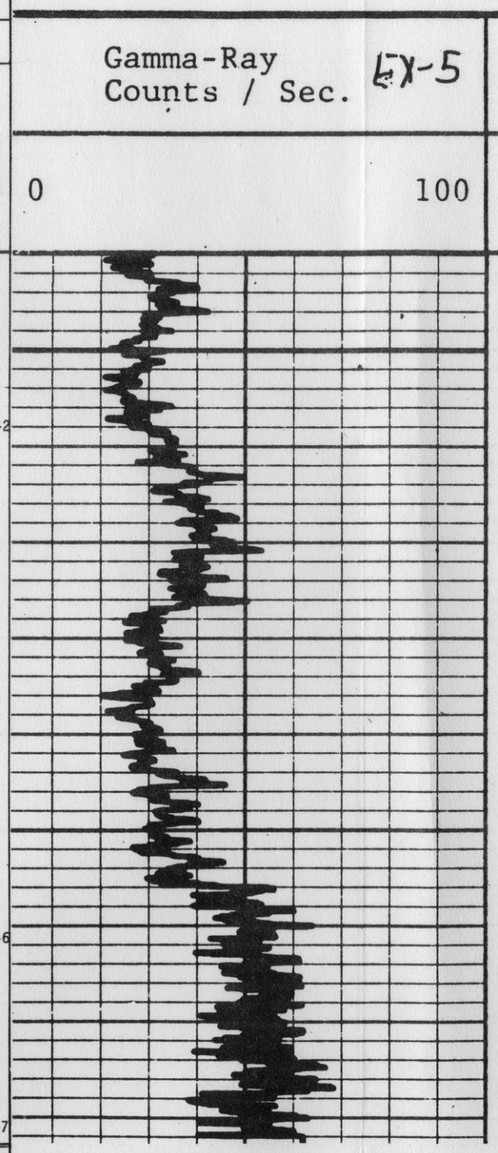
The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

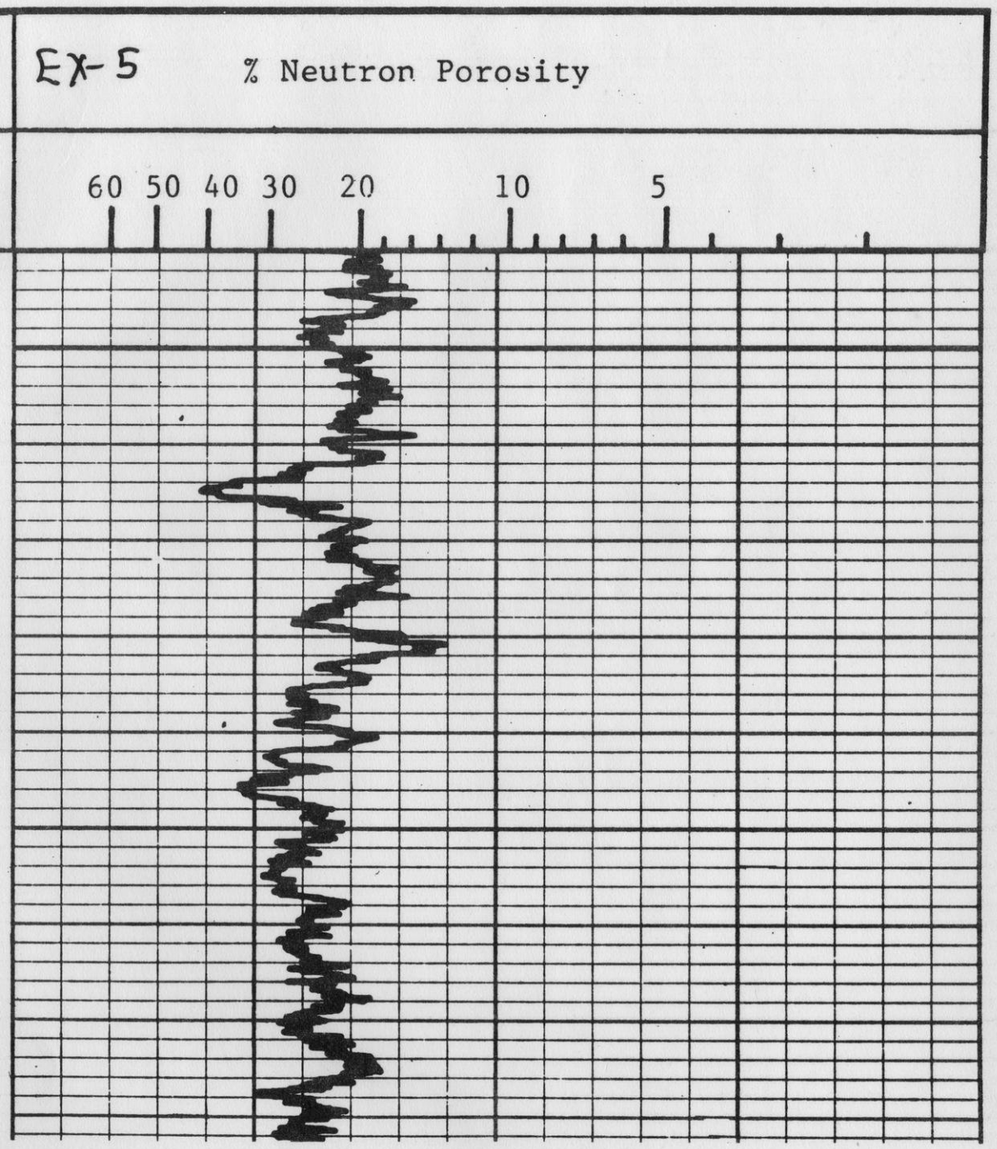
WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 1-30-84
BORING COMPLETED 2-1-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Street Green Bay, Wi. 54303
DRAWN BY JAS SHEET 2 OF 2
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983





STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

SITE LOCATION
Crandon Project

LOG OF BORING NUMBER
EX-6

Feet N-120340 E-2289928
Meters N-36680 E-697972

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1606.94-ft. 489.796-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Brown fine to coarse sand (SP) - some gravel - coarse drift			19			-	
10	2	SS					CD	5			4	
20	3	SS			5-24-84 ▽	BU		16			-	
30	4	SS						13			-	
40	5	SS			Brown fine sand (SP) - fine drift		FD	24			3	
50	6	SS						31			-	
60	7	SS			Brown fine sandy silt (ML) - varves of fine sand - lacustrine		L	17			64	
70	8	SS			Brown slightly silty fine sand (SM-SP) - fine drift		FD	20			9	
80	9	SS			Brown fine sand (SP) - fine drift	BL	FD	21			4	2×10^{-3}
90												

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR		ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-3-84
BORING COMPLETED 3-5-84
RIG Denny's Drilling
FOREMAN

STS OFFICE 540 Lambeau Street Green Ba, WI. 414-494-9656
DRAWN BY SD
SHEET 1 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL: 5 983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

LOG OF BORING NUMBER: EX-6

Feet: N-120340 E-2289928 Meters: N-36680 E-697972

SITE LOCATION: Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1606.94-ft. 489.796-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
90												
	10	SS			Brown silty fine sand (SM) - occasional silt lenses - fine drift		FD	22			27	
100												
	11	SS			Dark brown clayey silt (ML) - lacustrine		L	23			-	
110												
	12	SS						25			96	
120					Brown slightly silty fine to coarse sand (SM-SP) - some gravel - coarse drift	AU						$4x10^{-3}$
	13	SS					CD	10			7	
130												
	14	SS						11			-	
140					Brown fine to coarse gravel (GP) - some fine to coarse sand - coarse drift							
	15	SS					CD	17			4	
150												
	16	SS			Brown slightly silty fine to coarse gravel (GP-GM) - some fine to coarse sand - coarse drift		CD	11			6	
160					Brown slightly silty fine to coarse sand (SP-SM) some gravel - coarse drift - boulder from 161' to 164.5'							
	17	SS					CD	13			6	
					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL			BCR			ACR
WL T. PIPE	DATE	TIME	WL T. PIPE	DATE	TIME	

BORING STARTED 3-3-84
BORING COMPLETED 3-5-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 2 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-6

Feet: N-120340 E-2289928
Meters: N-36680 E-697972

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1606.94-ft. 489.796-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
170												
	18	SS			Brown to greenish gray slightly silty fine to coarse gravel (GM-GP) - some fine to coarse sand - basal till	AL	BT	8			-	$3x10^{-4}$
180	19	SS						10			9	
190					Weathered bedrock - cuttings logged by Exxon							
196					End of boring Boring advanced to 196' by rock bit and bentonite mud.							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-3-84
BORING COMPLETED 3-5-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 3 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company	**LOG OF BORING NUMBER** EX-7
PROJECT NAME Piezometer Installations	Feet N-117862 E-2286791 Meters N-35924 E-697015
SITE LOCATION Crandon Project	

WELL INSTALLATION
TOP STANDPIPE EL. +

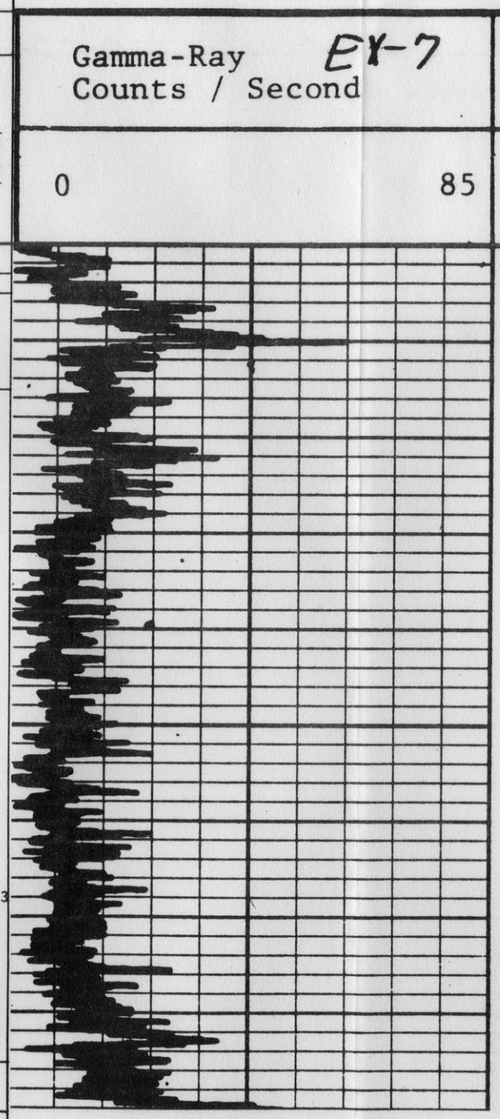
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					SURFACE ELEVATION 1580.35-ft. 481.692-m							
					Reddish brown silty fine sand (SM) - trace gravel fill							
					Black peat (PT) and organic silt - bog deposit ▽ 5-24-84							
10					Brown fine sand (SP) - waterbearing - fine drift	CL	FD					
20					Brown slightly silty fine to medium sand (SM-SP) - trace gravel - waterbearing - coarse drift							
30												
40												
50							CD					
60	1	SS						22			9	
70						BU						$1x10^{-3}$
80												
90					Brown silty fine to medium sand (SM) - trace gravel, occasional 1/4" thick clay seams, boulders from 89-92' and from 142.0 to 142.5 feet - glacial till							
					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

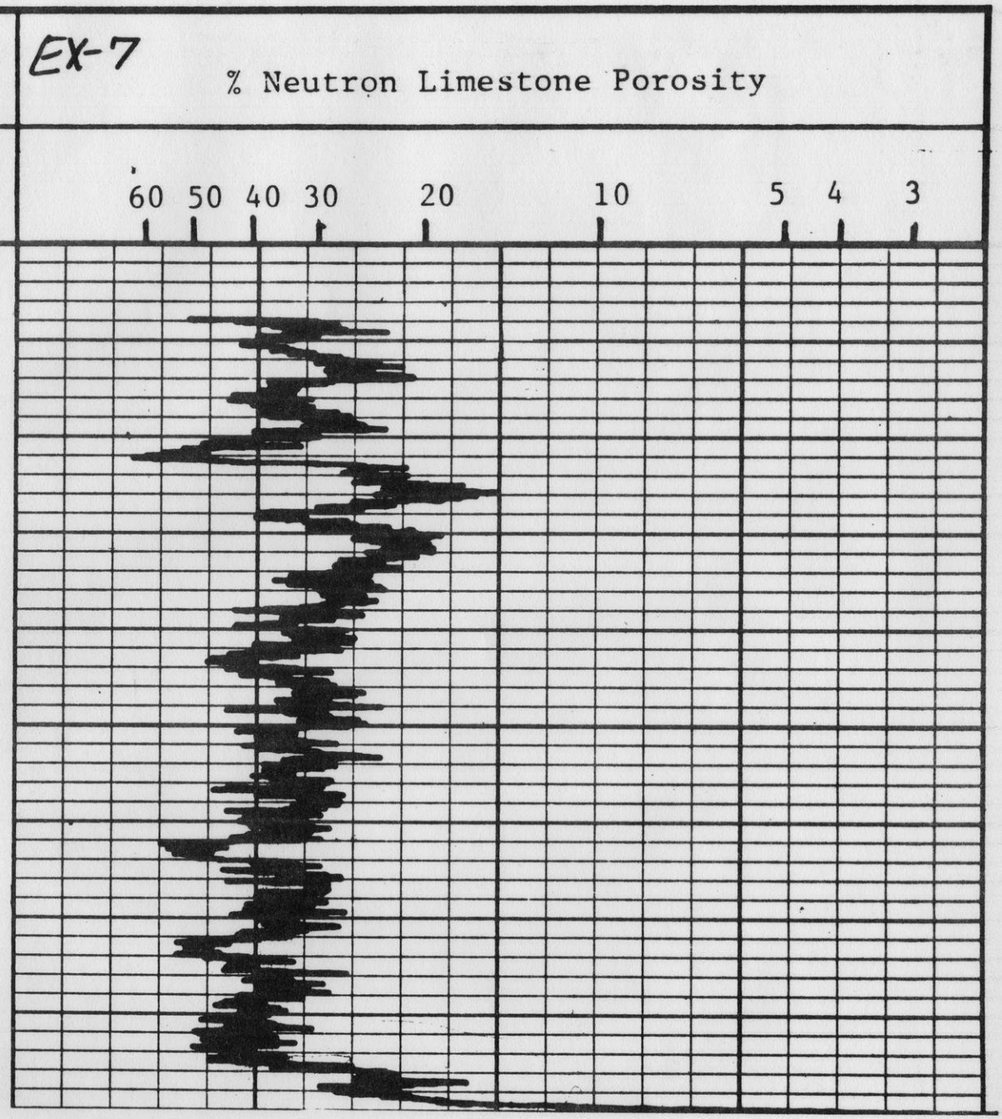
BORING STARTED	2-9-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
BORING COMPLETED	2-10-84	DRAWN BY	SMD
RIG	Lusiers	SHEET	1 OF 2
FOREMAN	Keith	APP'D. BY	JAS
		STS JOB NO.	12959

BL: 5-983



DEPTH

50



STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-7 Continued

Feet: N-117862 E-2286791 Meters: N-35924 E-697015

SITE LOCATION Crandon Project

WELL INSTALLATION TOP STANDPIPE EL. +

SURFACE ELEVATION 1580.35-ft. 481.692-m

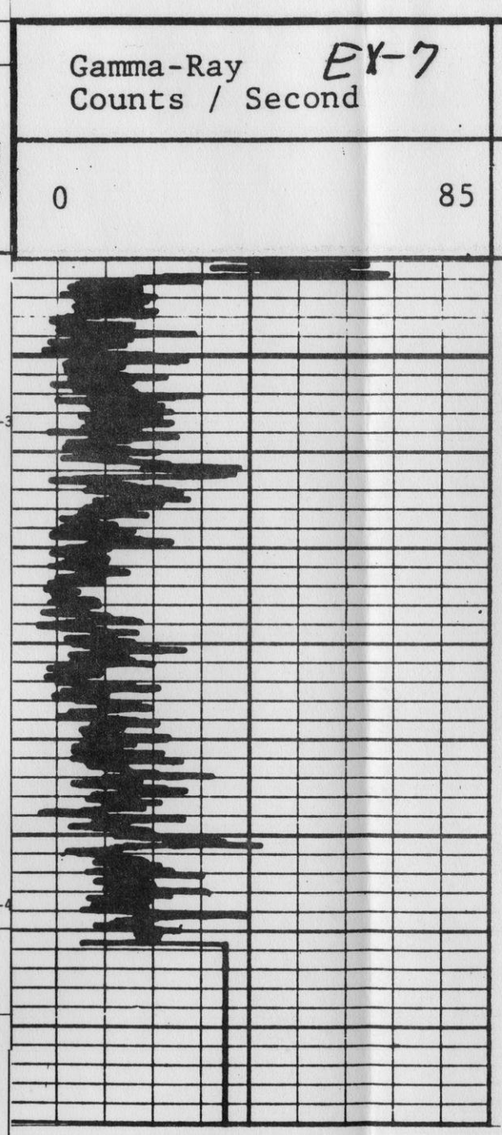
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
100					Brown silty fine to medium sand (SM) - trace gravel, occasional 1/4" thick clay seams, boulder from 142.0 to 142.5 feet - glacial till	BL	T					$1x10^{-3}$
110												
120	2	SS						13			41	
130												
140												
150												
160						AL						$9x10^{-4}$
	3	SS			Weathered bedrock - core logged by Exxon			10			12	
169					End of Boring Boring advanced to 163.0 feet with rock bit and bentonite mud Boring advanced from 163.0 to 169.0 feet with carbide bit and core barrel							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

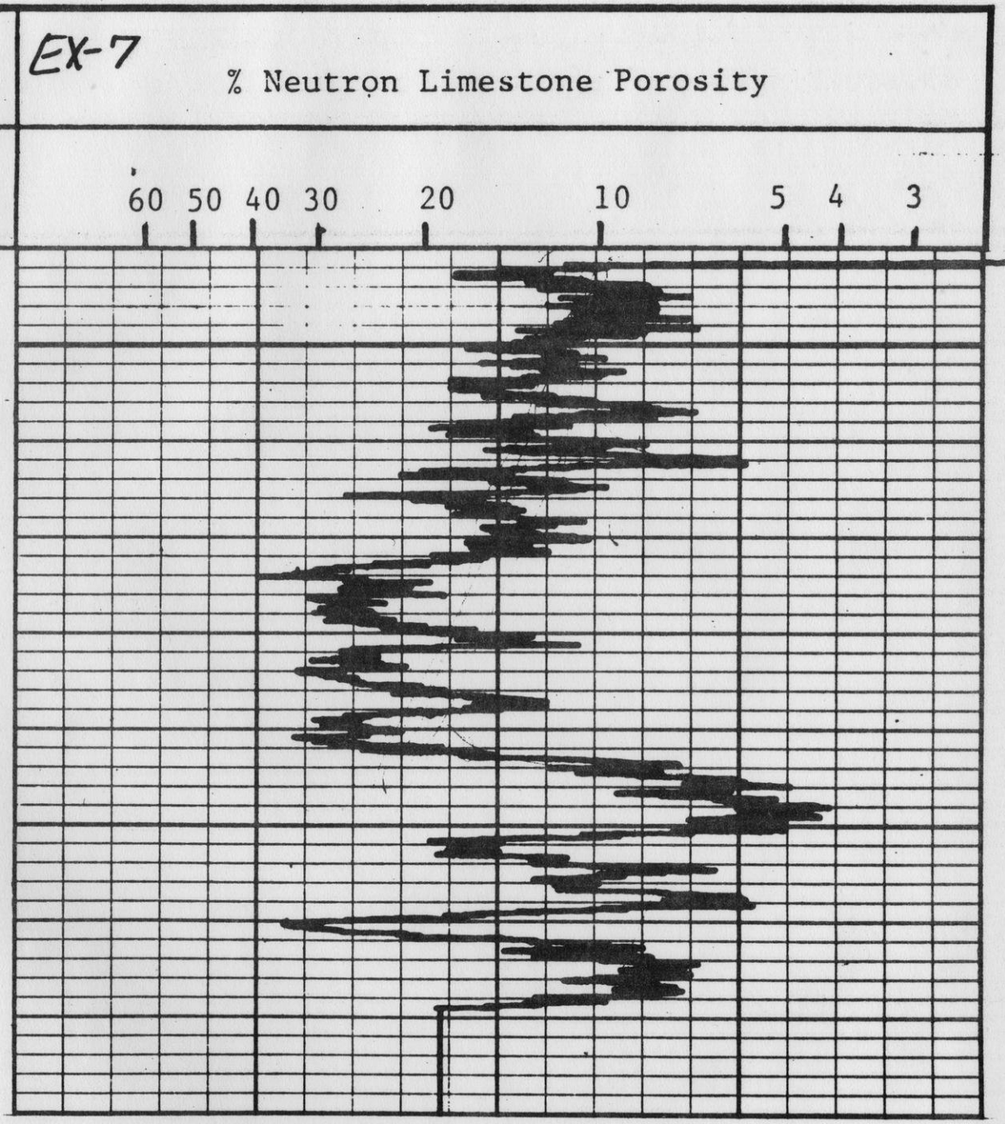
WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-9-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
BORING COMPLETED	2-10-84	DRAWN BY	SMD
RIG	Lusiers	SHEET	2 OF 2
FOREMAN	Keith	APP'D. BY	JAS
		STS JOB NO.	12959

BL: 5-983



DEPTH



STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

SITE LOCATION
Crandon Project

LOG OF BORING NUMBER
EX-8

Feet: N-116362 E-2287655
Meters: N-35467 E-697279

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1586.46-ft. 483.554-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Brown fine to medium sand (SP) - trace coarse sand and gravel.			4			3	
10					5-24-84 ▽	BU						1×10^{-3}
	2	SS					CD	16			-	
20	3	SS			Brown slightly silty fine to coarse sand (SM-SP) - some gravel - coarse drift		CD	21			10	
30	4	SS			Brown fine sand (SP) - fine drift		FD	22			-	
40	5	SS						25			3	
50	6	SS						22			-	
					Brown silty fine sand (SM) - fine drift							
60	7	SS					FD	23			-	
70	8	SS				BL		21			13	2×10^{-3}
80	9	SS						22			-	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-12-84
BORING COMPLETED 3-14-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street, Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 1 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-8

Feet: N-116362 E-2287655
Meters: N-35467 E-697279

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1586.46-ft. 483.554-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
90												
	10	SS			Brown to reddish brown silty fine to coarse sand (SM) - some gravel - glacial till		T	8			30	
100												
	11	SS				AU		9			-	$2x10^{-4}$
					Brown slightly silty fine to coarse sand (SM-SP) - little gravel - glacial till		T					
110												
	12	SS						10			11	
120												
	13	SS						10			-	
130												
	14	SS						10			11	
140												
	15	SS			Brown silty fine to coarse sand (SM) - little gravel - glacial till - boulders from 145 to 146', 148 to 149', and 150 to 151'.		T	10			21	
150												
	16	SS			Reddish brown silty fine to coarse sand (SM) - some gravel - basal till		BT	9			-	
160						AL						$1x10^{-4}$
	17	SS						10			19	
170												
					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL T. PIPE	DATE	TIME	WL T. PIPE	DATE	TIME

BORING STARTED 3-12-84
BORING COMPLETED 3-14-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 2 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

SITE LOCATION
Crandon Project

LOG OF BORING NUMBER
EX-8

Feet: N-116362 E-2287655
Meters: N-35467 E-697279

WELL INSTALLATION
TOP STANDPIPE EL. +_____

SURFACE ELEVATION 1586.46-ft. 483.554-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
170					Reddish brown silty fine to coarse sand (SM) - some gravel - basal till							
174	18	SS			Weathered bedrock - sample logged by Exxon			11			-	
					End of boring in bedrock Boring advanced to 175' with rock bit and bentonite mud.							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-12-84
BORING COMPLETED 3-14-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 3 OF 3
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

LOG OF BORING NUMBER EX-9

PROJECT NAME Piezometer Installations

Feet N-116461 E-2284725 Meters N-35497 E-696386

SITE LOCATION Crandon Project

WELL INSTALLATION TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1708.86-ft. 520.862-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	A	SS			Brown fine to coarse sand (SP) - coarse drift		CD	5			3	
10	1	SS			Reddish brown silty fine to coarse sand (SM) - some gravel, glacial till		T	6			13	
20	2	SS										
30	3	SS						4			17	
40	4	SS						6			--	
	4A	SS										
50	5	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel - coarse drift		T	6			11	
60	6	SS						9			--	
70	7	SS						11			6	
80	8	SS						5			--	
90					Brown fine to coarse gravel (GP) and fine to coarse sand (SP) - coarse drift							

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-16-84
BORING COMPLETED 3-21-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 1 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-9 Continued

Feet N-116461 E-2284725 Meters N-35497 E-696386

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

DESCRIPTION OF MATERIAL

SURFACE ELEVATION 1708.86-ft. 520.862-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
90												
	9	SS			Brown fine to coarse gravel (GP) and fine to coarse sand (SP) - coarse drift			8			4	
100												
	10	SS			Reddish brown silty fine to coarse sand (SM) - some gravel - glacial till		T	8			20	
110												
	11	SS			5-24-84 ▽			7			--	
120												
	12	SS				BU		9			19	
130												
	13	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel - waterbearing - coarse drift			11			6	
140							CD					
	14	SS						13			9	
150												
	15	SS						9			--	
160												
	16	SS			Reddish brown silty fine to coarse sand (SM) - a little gravel - glacial till		T	9			21	
170												

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-16-84
BORING COMPLETED 3-21-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 2 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

LOG OF BORING NUMBER EX-9

PROJECT NAME Piezometer Installations

Feet: N-116461 E-2284725 Meters: N-35497 E-696386

SITE LOCATION Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

DESCRIPTION OF MATERIAL

SURFACE ELEVATION 1708.86-ft. 520.862-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
170												
	17	SS		LS	Reddish brown silty fine to coarse sand (SM) - a little gravel - glacial till		T	10			--	
180	17A	SS										
	18	SS			Dark reddish brown slightly silty fine to coarse sand (SM-SP) - some gravel - coarse drift	BL	CD	10			11	$2x10^{-6}$
190	19	SS						14			--	
200					Brown silty fine to coarse sand (SM) - trace gravel - coarse drift							
	20	SS					CD	14			13	
210												
	21	SS			Brown silty fine to medium sand (SM) - fine drift			21			--	
220												
	22	SS					FD	20			--	
230												
	23	SS						18			--	
240												
	24	SS				AU		20			--	$6x10^{-3}$
250					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL * PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-16-84
BORING COMPLETED 3-21-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 3 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-9 Continued

Feet: N-116461 E-2284725
Meters: N-35497 E-696386

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1708.86-ft. 520.862-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
250												
	25	SS		11	Brown silty fine to medium sand (SM) - fine drift		FD	17			17	
260	26	SS			Reddish brown fine to coarse sandy silt (ML) - trace gravel - basal till		BT	13			--	
270					Bedrock	AL						2×10^{-8}
280					End of Boring in Bedrock Boring advanced to 280.0 feet with rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-16-84
BORING COMPLETED 3-21-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau, Green Bay, WI 54303
DRAWN BY SMD
SHEET 4 OF 4
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-10

Feet N-115111 E-2284239 Meters N-35086 E-696237

SITE LOCATION Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1674.93-ft. 510.520-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
10	1	SS			Brown silty fine to medium sand (SM) - trace gravel		CD	19			-	
20	2	SS			Reddish brown fine to coarse sand (SP) - little gravel - coarse drift			15			37	
30	3	SS					CD	8			4	
40	4	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel - coarse drift		CD	5			6	
50	5	SS			Reddish brown silty fine to coarse sand (SM) - trace to little gravel - glacial till		T	9			24	
60	6	SS						10			24	
70	7	SS						9			-	
80	8	SS			5-24-84 ▽	BU		12			-	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-13-84
BORING COMPLETED 3-15-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD SHEET 1 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-10

Feet N-115111 E-2284239 Meters N-35086 E-696237

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1674.93-ft. 510.520-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
90												
	9	SS			Reddish brown silty fine to coarse sand (SM) - trace to little gravel - glacial till	BU	T	14			25	
100												
	10	SS						9			14	
110												
	11	SS						8			-	
120												
	12	SS						10			-	
130												
	13	SS						11			20	
140						BL						$2x10^{-5}$
	14	SS						10			-	
150												
	15	SS						10			-	
160												
	16	SS						7			-	
170					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL	BCR			ACR	
WL T PIPE	DATE	TIME	WL T PIPE	DATE	TIME

BORING STARTED 3-13-84
BORING COMPLETED 3-15-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD SHEET 2 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-10

Feet: N-115111 E-2284239 Meters: N-35086 E-696237

SITE LOCATION Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1674.93-ft. 510.520-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
170					Continued							
	17	SS			Brown slightly silty fine to medium sand (SM-SP) - trace gravel - fine drift		FD	13			6	
180												
	18	SS						19			6	
190												
	19	SS				AU		18			-	1×10^{-3}
200												
	20	SS						17			-	
210												
	21	SS			Brown silty fine sand (SM) - with thin silt seams - lacustrine		L	17			38	
220												
230	22	SS			Brown silt (ML) - lacustrine		L	22			93	
	23	SS			Reddish brown silty clay (CL) - with varves of gray very fine sandy silt (ML) - lacustrine		L	21			92	
240												
250	24	SS			Brown slightly silty fine to medium sand (SM-SP) with thin seams of coarse sand - lacustrine		L	14			9	
					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-13-84
BORING COMPLETED 3-15-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Street, Green Bay, WI. 414-494-9656
DRAWN BY SD SHEET 3 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-10

Feet N-115111 E-2284239 Meters N-35086 E-696237

SITE LOCATION Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1674.93-ft. 510.520-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
250					Continued	AL						$1x10^{-5}$
256					Weathered bedrock							
					End of boring Boring advanced to 256' with rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL	BCR			ACR	
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-13-84
BORING COMPLETED 3-15-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Street Green Bay, WI. 414-494-9656
DRAWN BY SD
SHEET 4 OF 4
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

LOG OF BORING NUMBER EX-11

PROJECT NAME Piezometer Installations

Feet N-113254 E-2283698 Meters N-34520 E-696073

SITE LOCATION Crandon Project

WELL INSTALLATION TOP STANDPIPE EL. +

SURFACE ELEVATION 1682.05-ft. 512.690-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS						15			20	
10	2	SS						5			22	
20	3	SS			Brown to reddish brown silty fine to coarse sand (SM) - trace to some gravel - glacial till		T	9			17	
30	4	SS						9			26	
40	5	SS						9			22	
	6	SS						9			22	
50	7	SS						8			24	
	8	SS						8			22	
60	9	SS						9			20	
	10	SS						8			16	
70	11	SS						17			--	
80	12	SS					CL	9			25	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL: BCR			ACR		
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-20-84
BORING COMPLETED 3-24-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 1 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL. 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-11 Continued

Feet N-113254 E-2283698 Meters N-34520 E-696073

SITE LOCATION Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1682.05-ft. 512.690-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
90												
					5-24-84 ▽	CL						
	13	SS						11			--	
100												
	14	SS			Brown to reddish brown silty fine to coarse sland (SM) - trace to some gravel - glacial till		T	9			--	
110												
	15	SS						9			--	
120												
	16	SS						10			15	
130												
	17	SS				BU		11			--	1×10^{-4}
140												
	18	SS						9			--	
150												
	19	SS						8			18	
160												
	20	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel - coarse drift		CD	6			7	
170												

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL			BCR		ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-20-84
BORING COMPLETED 3-24-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau, Green Bay, WI 54303
DRAWN BY SMD SHEET 2 OF 4
APP'D BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-11 Continued

Feet: N-113254 E-2283698 Meters: N-34520 E-696073

SITE LOCATION Crandon Project

WELL INSTALLATION TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1682.05-ft. 512.690-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
170						BL						$6x10^{-3}$
	21	SS			Brown slightly silty fine to coarse sand (SM-SP)- some gravel - coarse drift		CD	11			--	
180												
	22	SS						12			6	
190												
	23	SS						20			--	
200												
	24	SS						21			4	
210					Brown fine sand (SP) - fine drift		FD					
	25	SS						22			--	
220						AU						$1x10^{-3}$
	26	SS						23			--	
230												
	27	SS			Reddish brown silty fine to medium sand (SM) - lacustrine		L	22			22	
240												
	28	SS						23			--	
250												

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-20-84
BORING COMPLETED 3-24-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 3 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon Project

LOG OF BORING NUMBER: EX-11 Continued

Feet: N-113254 E-2283698 Meters: N-34520 E-696073

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1682.05-ft. 512.690-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
250					Reddish brown silty fine to medium sand (SM) - lacustrine							
	29	SS			Reddish brown silty clay (CL) with varves of gray silt (ML) - lacustrine		L	27			96	
260					Brown slightly silty fine to coarse sand (SM-SP)- some gravel - coarse drift	AL	CD	10			11	$2x10^{-3}$
	30	SS										
270					Reddish brown silty clay (CL) with varves of gray silt - lacustrine		L	26			98	
	31	SS										
280					Weathered bedrock - cuttings logged by Exxon							
285					End of Boring in Bedrock Boring advanced to 285.0 feet with rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL			BCR		ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-20-84
BORING COMPLETED 3-24-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau, Green Bay, WI 54303
DRAWN BY SMD SHEET 4 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-12

Feet N-113,156 E-2,284,707 Meters N-34,490 E-696,380

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1687.76-ft. 514.430-m.

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
10	1	SS			Brown slightly silty fine to coarse sand (SM-SP)- trace gravel - glacial till		T	12			8	
20	2	SS			Reddish brown to brown silty fine to coarse sand (SM) - a little gravel - glacial till boulder from 14.0 to 15.0 feet		T	8			31	
	3	SS						7			20	
30					Grayish brown silty fine to coarse gravel (GM) - coarse drift		CD					
40	4	SS						15			14	
50	5	SS			Grayish brown fine to coarse gravel and sand (GW-SW), trace silt - coarse drift		CD	8			2	
60	6	SS						6			3	
70	7	SS			Reddish brown silty fine to coarse sand (SM) - trace to some gravel - glacial till		T	12			43	
80	8	SS						13			15	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR		ACR	
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-2-84
BORING COMPLETED 3-5-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD
SHEET 1 OF 4
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

LOG OF BORING NUMBER: EX-12 Continued

Feet: N-113,156 E-2,284,707 Meters: N34,490 E-696,380

SITE LOCATION: Crandon Project

WELL INSTALLATION TOP STANDPIPE EL. +

SURFACE ELEVATION 1687.76 ft. 514.430-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
90	9	SS						20			14	
					5-24-84 ▽							
100	10	SS			Reddish brown silty fine to coarse sand (SM) - trace to some gravel - glacial till			11			--	
110	11	SS				BU	T	11			25	
120	12	SS						7			--	
130	13	SS						10			--	
140	14	SS						9			14	
150	15	SS						9			--	
160	16	SS						8			--	
170					Brown slightly silty fine to coarse sand (SM-SP) and gravel - coarse drift							

Continued

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 3-2-84

BORING COMPLETED 3-5-83

RIG Lusiers

FOREMAN Keith

STS OFFICE 540 Lambeau Green Bay, WI 54303

DRAWN BY SMD

SHEET 2 OF 4

APP'D. BY JAS

STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER
Exxon Minerals Company

PROJECT NAME
Piezometer Installations

LOG OF BORING NUMBER
EX-12 Continued

Feet N-113,156 E-2,284,707 Meters N-34,490 E-696,380

SITE LOCATION
Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1687.76-ft. 514,430-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
170												
	17	SS						11			--	
180	18	SS			Brown slightly silty fine to coarse sand (SM-SP) and gravel - coarse drift	BL	CD	9			--	
190	19	SS						11			7	
200	20	SS			Brown slightly silty fine sand (SM-SP) - fine drift		FD	21			6	
210	21	SS			Brown silty fine to coarse sand (SM), trace to a little gravel - glacial till		T	10			25	
220	22	SS						9			17	
230	23	SS				AU		13			--	$3x10^{-3}$
240	24	SS			Reddish brown silty fine sand (SM) - fine drift		FD	20			17	
250					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-2-84
BORING COMPLETED 3-5-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY SMD SHEET 3 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

LOG OF BORING NUMBER EX-12 Continued

Feet: N-113,156 E-2,284,707 Meters: N-34,490 E-696,380

SITE LOCATION: Crandon Project

WELL INSTALLATION
TOP STANDPIPE EL. +_____

SURFACE ELEVATION 1687.76-ft. 514,430-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
250												
	25	SS		LS	Reddish brown silty fine sand (SM) - fine drift		FD	--			--	
260												
	26	SS						13			--	
270					Reddish brown silty fine to coarse sand (SM), trace gravel - glacial till		T	11			25	
	27	SS										
280					Grayish brown very fine sandy silt (ML) with varves of reddish brown silty clay (CH) - high plasticity - lacustrine	AL	L	21			62	2×10^{-4}
290	28	SS										
	29	SS						26			96	
300					Weathered bedrock							
305					End of Boring in Bedrock Boring advanced to 305.0 feet with rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 3-2-84
BORING COMPLETED 3-5-84
RIG Lusiers
FOREMAN Keith

STS OFFICE 540 Lambeau, Green Bay, WI 54303
DRAWN BY SMD SHEET 4 OF 4
APP'D. BY JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER	Exxon Minerals Company
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin

LOG OF BORING NUMBER: EX-13

Feet: N-111,555 E-2,283,499 — Meters: N-34,002 E-696-012

WELL INSTALLATION TOP STANDPIPE EL. +

SURFACE ELEVATION 1657.32-ft. 505.152-m

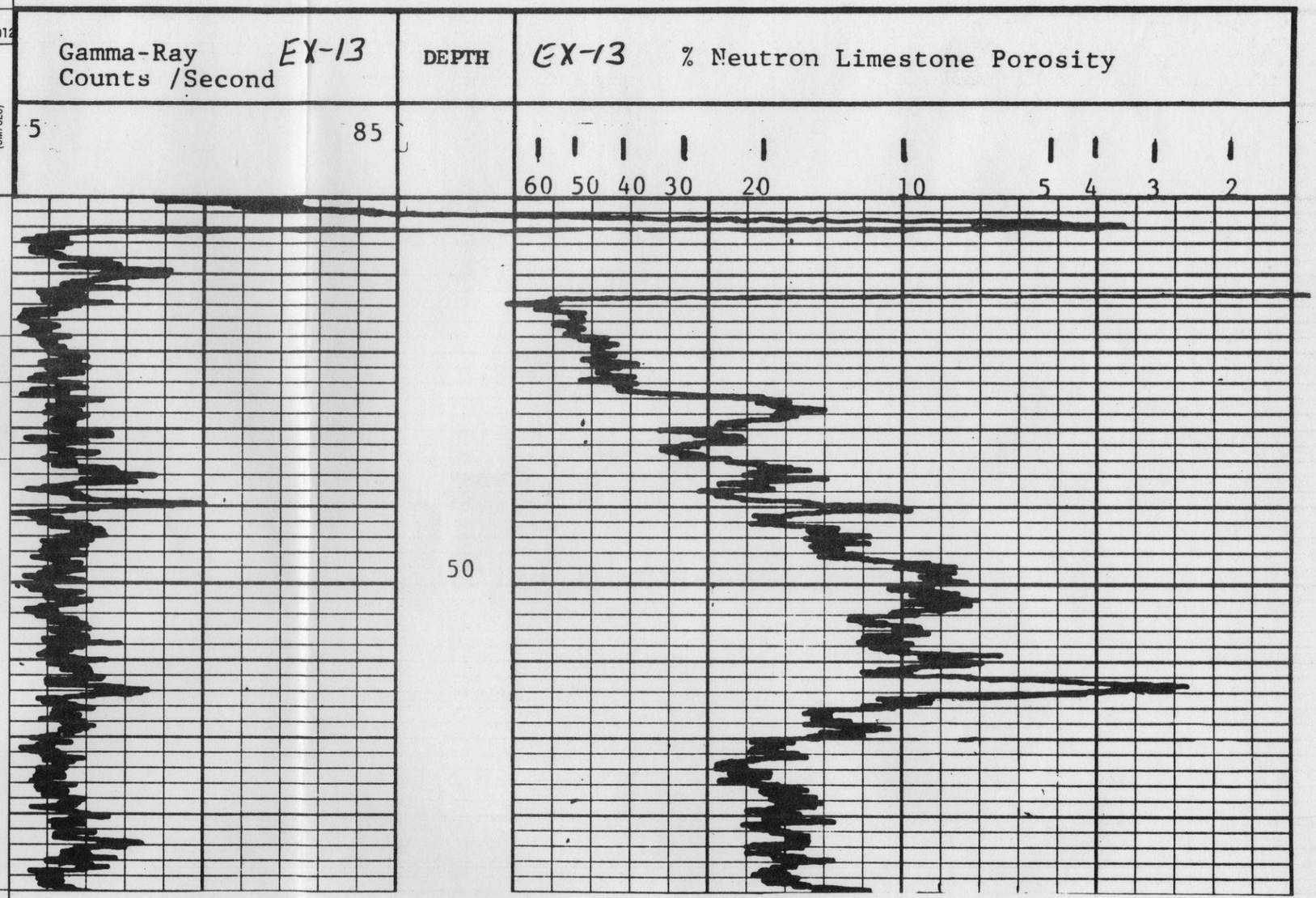
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
10	1A	SS			Reddish brown fine to coarse gravel and sand (GW-SW), coarse drift		CD	12			-	
	2A	SS						14			4	
20	3A	SS			Reddish brown silty fine to coarse sand (SM), a little gravel, glacial till		T	5			46	
	4A	SS			Reddish brown slightly silty fine to coarse sand (SM-SP) some gravel, glacial till			11			11	
30	5A	SS					T	9			11	
	6A	SS						7			17	
40	7A	SS						11			19	
50	8A	SS			Reddish brown silty fine to coarse sand (SM), trace to a little gravel, glacial till		T	10			21	
60	9A	SS					DL	9			-	
70	10A	SS			5-24-84 ▽			11			15	
80	11A	SS						11			-	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL			BCR		ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-15-84
BORING COMPLETED	2-22-84
RIG	Lusiers
FOREMAN	Ken
STS OFFICE	540 Lambeau, Green Bay, WI 54303
DRAWN BY	
SHEET	1 OF 3
APP'D. BY	JAS
STS JOB NO.	12959

BL: 5-983



STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

SITE LOCATION Crandon, Wisconsin

LOG OF BORING NUMBER EX-13

Feet: N-111,555 E-2,283,499 Meters: N34,002 E-696,012

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1657.32-ft. 505,152-m

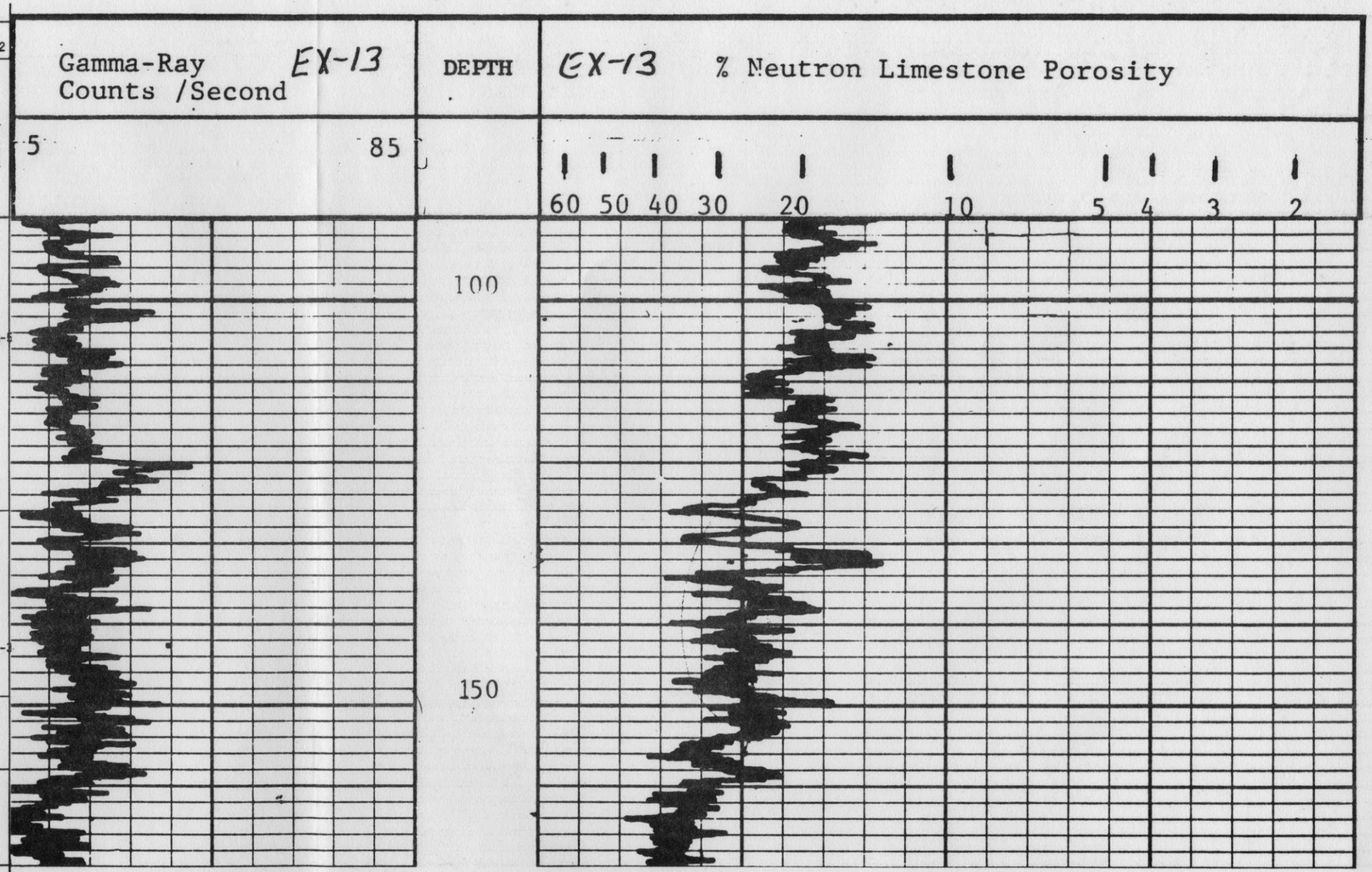
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT. %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY. K (CM/SEC)
	12A	SS		11			T	11			24	
100												
	13A	SS		11	Reddish brown silty fine to coarse sand (SM), trace to a little gravel, glacial till	CL		11			13	6×10^{-5}
110	14A	SS		11				11			16	
120	15A	SS		11				11			-	
130	16A	SS		11	Brown slightly silty fine to coarse sand (SM-SP), some gravel, coarse drift		CD	9			6	
140	17A	SS		11		BU		12			-	3×10^{-2}
150	1	SS		11	Brown slightly silty fine to coarse gravel (GM-GP), some fine-coarse sand, coarse drift		CD	11			6	
160	2	SS		11	Brown slightly silty fine to coarse sand (SM-SP), trace gravel, fine drift		FD	12			6	
170					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL	BCR		ACR		
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-15-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
BORING COMPLETED	2-22-84	DRAWN BY	SHEET 2 OF 3
RIG	Lusiers	APP'D. BY JAS	STS JOB NO. 12959
FOREMAN	Ken		

BL: 5-983



STS Consultants Ltd.

OWNER Exxon Minerals Company

LOG OF BORING NUMBER EX-13

PROJECT NAME Piezometer Installations

Feet: N-111,555 E-2,283,499 Meters: N-34,002 E-696,012

SITE LOCATION Crandon, Wisconsin

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1657.32-ft. 505,152-m

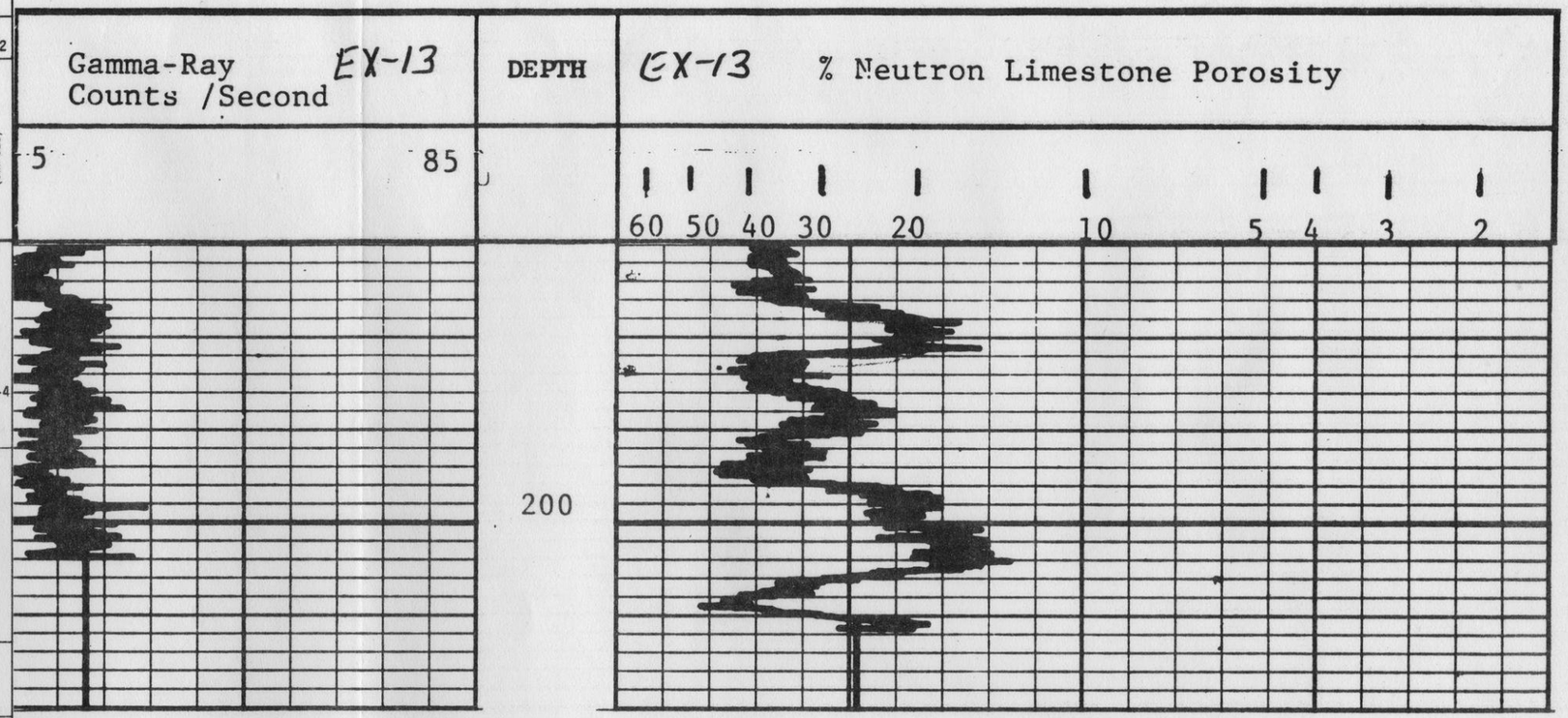
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
180	3	SS			Brown slightly silty fine to coarse sand (SM-SP), trace gravel, fine drift		FD	18			6	
	4	SS				BL		19			6	8×10^{-4}
190	5	SS			Reddish brown silty fine to coarse sand (SM), trace to some gravel, glacial till		T	12			27	
200	6	SS						10			25	
210	7A	SS			Reddish brown slightly silty fine to coarse sand (SM), trace gravel, glacial till		T	16			6	
220	7B	SS										
230	8	SS			Reddish brown silty clay (CL) with varves of grayish brown clayey silt (ML) and red clay (CH), lacustrine		AL	L 26			69	5×10^{-4}
235					Bedrock End of boring in bedrock Boring advanced to 235 feet with rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-15-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
BORING COMPLETED	2-22-84	DRAWN BY	SHEET 3 OF 3
RIG	Lusiers	APP'D. BY JAS	STS JOB NO. 12959
FOREMAN	Ken		

BL: 5-983



STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-14

Feet N-110251 E-2286304 Meters N-33605 E-696867

SITE LOCATION Crandon, Wisconsin

WELL INSTALLATION
TOP STANDPIPE EL. + _____

SURFACE ELEVATION 1682.67-ft. 512.879-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
	1	SS			Yellowish brown clayey silt (ML) with thin seams of fine sand		T	21			69	
10	2	SS			Reddish brown silty fine to coarse sand (SM), some gravel, glacial till		T	6			21	
20	3	SS			Brown slightly silty fine to coarse sand (SM-SP), some gravel, glacial till		T	9			8	
30	4	SS			Brown silty fine to coarse sand (SM), a little gravel, glacial till, boulders from 30-31' and 39-40'		T	7			19	
40	5	SS						6			13	
50	6	SS						10			7	
60	7	SS			Brown slightly silty fine to coarse sand (SM-SP), some gravel, coarse drift, boulders from 50-52', 62-63' and 79-80'		CD	11			6	
70	8	SS						6			6	
80	9	SS						10			7	
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-17-84
BORING COMPLETED	2-22-84
RIG	Denny's Drilling
FOREMAN	Denny

STS OFFICE	540 Lambeau, Green Bay, WI 54303
DRAWN BY	SHEET 1 OF 4
APP'D. BY	JAS STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: EX-14
PROJECT NAME: Piezometer Installations	Feet: N-110251 E-2286304 / Meters: N-33605 E-696867
SITE LOCATION: Crandon, Wisconsin	

WELL INSTALLATION
TOP STANDPIPE EL. +

DESCRIPTION OF MATERIAL

SURFACE ELEVATION 1682.67-ft. 512.879-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
90					Continued							
100	10	SS			5-24-84 ▽ Brown slightly silty fine to coarse sand (SM-SP), some gravel, coarse drift, boulders from 50-52', 62-63' and 79-80'		CD	8			-	
110	11	SS				BU		11			6	
	12	SS						17			-	
120	13	SS						9			17	
130	14	SS			Reddish brown silty fine to coarse sand (SM), trace to a little gravel, glacial till, boulder from 141-142'		T	10			-	
140	15	SS						8			14	
150	16	SS						7			-	
160	17	SS				BL		8			-	$5x10^{-5}$
170					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-17-84
BORING COMPLETED	2-22-84
RIG	Denny's Drilling
FOREMAN	Denny
STS OFFICE	540 Lambeau Green Bay, WI 54303
DRAWN BY	
SHEET	2 OF 4
APP'D. BY	JAS
STS JOB NO.	12959

BL: 5-983

STS Consultants Ltd.

OWNER: Exxon Minerals Company

PROJECT NAME: Piezometer Installations

SITE LOCATION: Crandon, Wisconsin

LOG OF BORING NUMBER: EX-14

Feet: N-110251 E-2286304 Meters: N-33605 E-696867

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1682.67-ft. 512.879-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					Continued							
170												
	18	SS			Reddish brown silty fine to coarse sand (SM), trace to a little gravel, glacial till, boulder from 141-142'		T	10			16	
180												
	19	SS			Brown slightly silty fine sand (SM-SP), fine drift	AU	FD	17			6	
190												
	20	SS						16			-	
200												$2x10^{-3}$
	21	SS						14			-	
210												
	22	SS						18			11	
220												
	23	SS			Brown silty fine sand (SM), fine drift		FD	19			22	
230												
	24	SS						17			-	
240												
	25	SS			Brown very fine sandy silt (ML), fine drift		FD	20			52	
250												
					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED 2-17-84
BORING COMPLETED 2-22-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY
SHEET 3 OF 4
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER Exxon Minerals Company

PROJECT NAME Piezometer Installations

LOG OF BORING NUMBER EX-14

Feet N-110251 E-2286304 Meters N-33605 E-696867

SITE LOCATION Crandon, Wisconsin

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1682.67-ft. 512.879-m

DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
250												
	26	SS			Reddish brown fine sandy silt (ML) with varves of red clayey silt with moderate plasticity, lacustrine		L	20			-	
260												
	27	SS			Brown silty fine to coarse sand (SM) with thin seams of fine sandy silt, trace gravel, transition zone between lacustrine and basal till	AL	L	14			14	$7x10^{-5}$
270												
	28	SS			Dark brown silty fine to coarse sand (SM), some gravel, trace clay, basal till		BT	8			18	
280												
283					Bedrock							
					End of boring in bedrock Boring advanced to 283 feet with rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T PIPE	DATE	TIME	WL-T PIPE	DATE	TIME

BORING STARTED 2-17-84
BORING COMPLETED 2-22-84
RIG Denny's Drilling
FOREMAN Denny

STS OFFICE 540 Lambeau Green Bay, WI 54303
DRAWN BY
SHEET 4 OF 4
APP'D. BY JAS
STS JOB NO. 12959

BL: 5-983

STS Consultants Ltd.

OWNER	Exxon Minerals
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin

LOG OF BORING NUMBER EX-15

Feet N-112443 E-2280005 Meters N-34273 E-694947

WELL INSTALLATION TOP STANDPIPE EL. +

SURFACE ELEVATION 1626.64-ft. 495.801-m

DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
10					Brown silty fine to medium sand (SM), trace to some gravel, glacial till		T					
20												
30						BL						
40					5-24-84 ▽							
50					Brown fine sand (SP), trace silt, fine drift		FD					
60	1	SS						19			3	
70												
80					Brown silty fine to coarse sand (SM), trace to some gravel, glacial till, boulder at 86-87'		T					
					Continued							

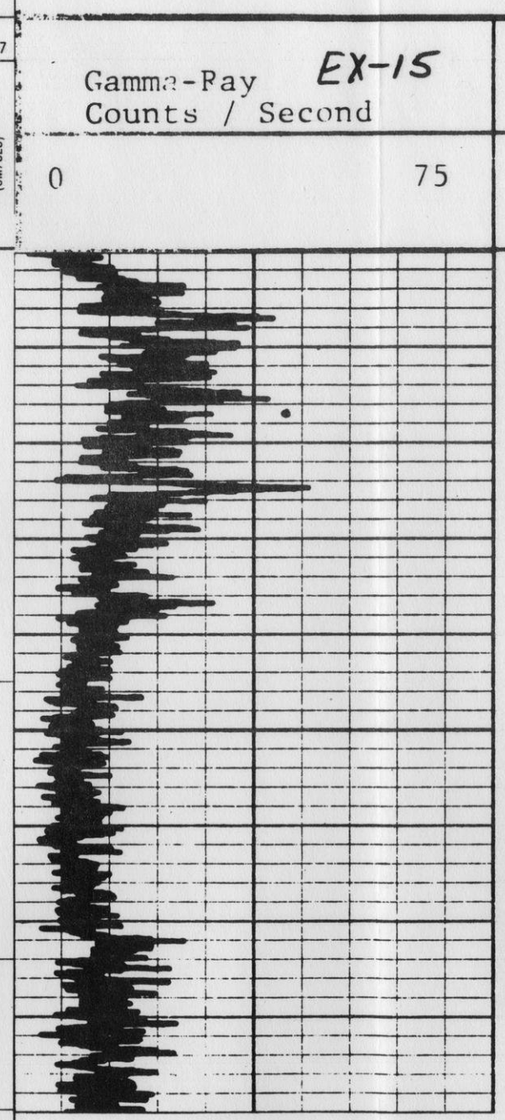
The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

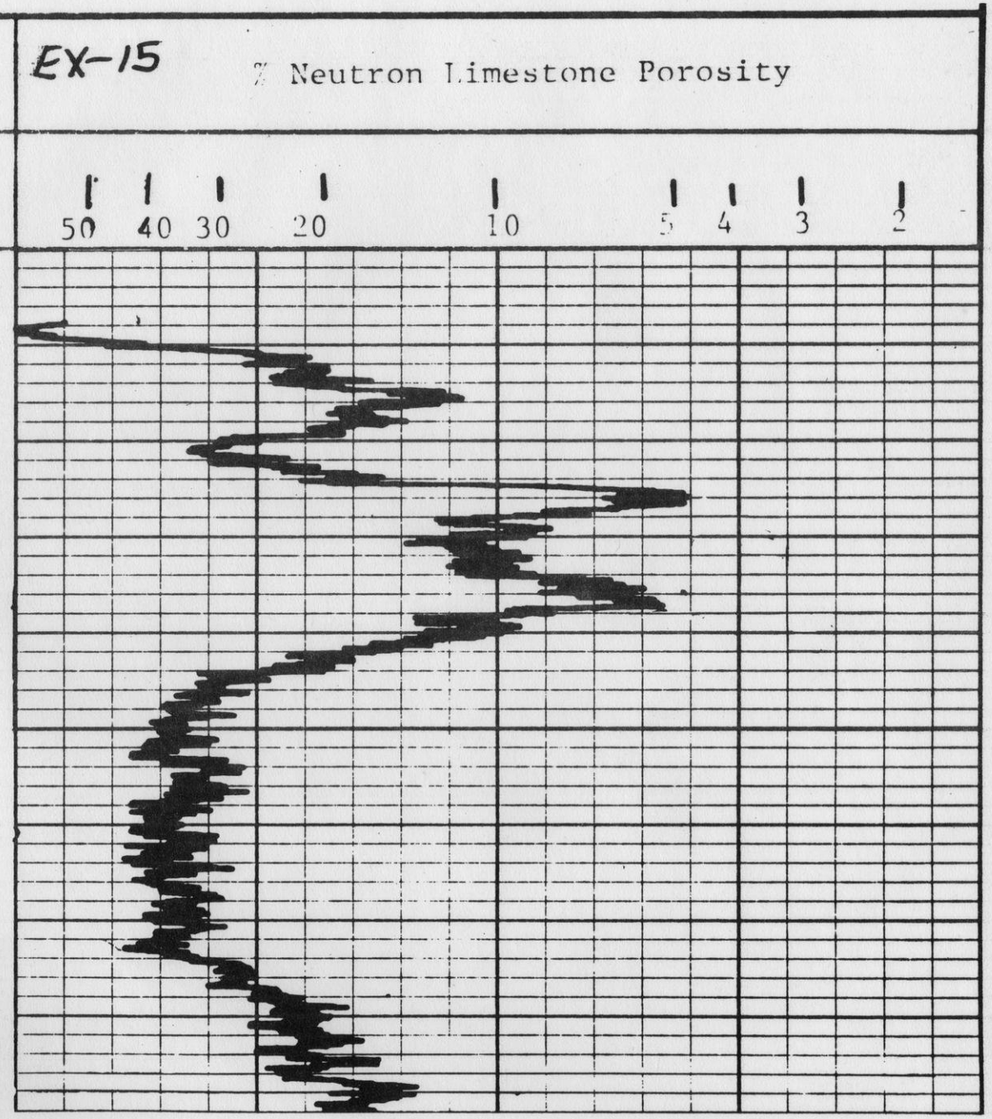
BORING STARTED	2-8-84
BORING COMPLETED	2-10-84
RIG	Denny's Drilling
FOREMAN	Denny

STS OFFICE	540 Lambeau Green Bay, WI 54303
DRAWN BY	SHEET 1 OF 3
APP'D. BY JAS	STS JOB NO. 12959

BL: 5-983



DEPTH



STS Consultants Ltd.

OWNER	Exxon Minerals
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin
LOG OF BORING NUMBER	EX-15
Feet	N-112443 E-2280005
Meters	N-34273 E-694947

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1626.64-ft. 495.801-m

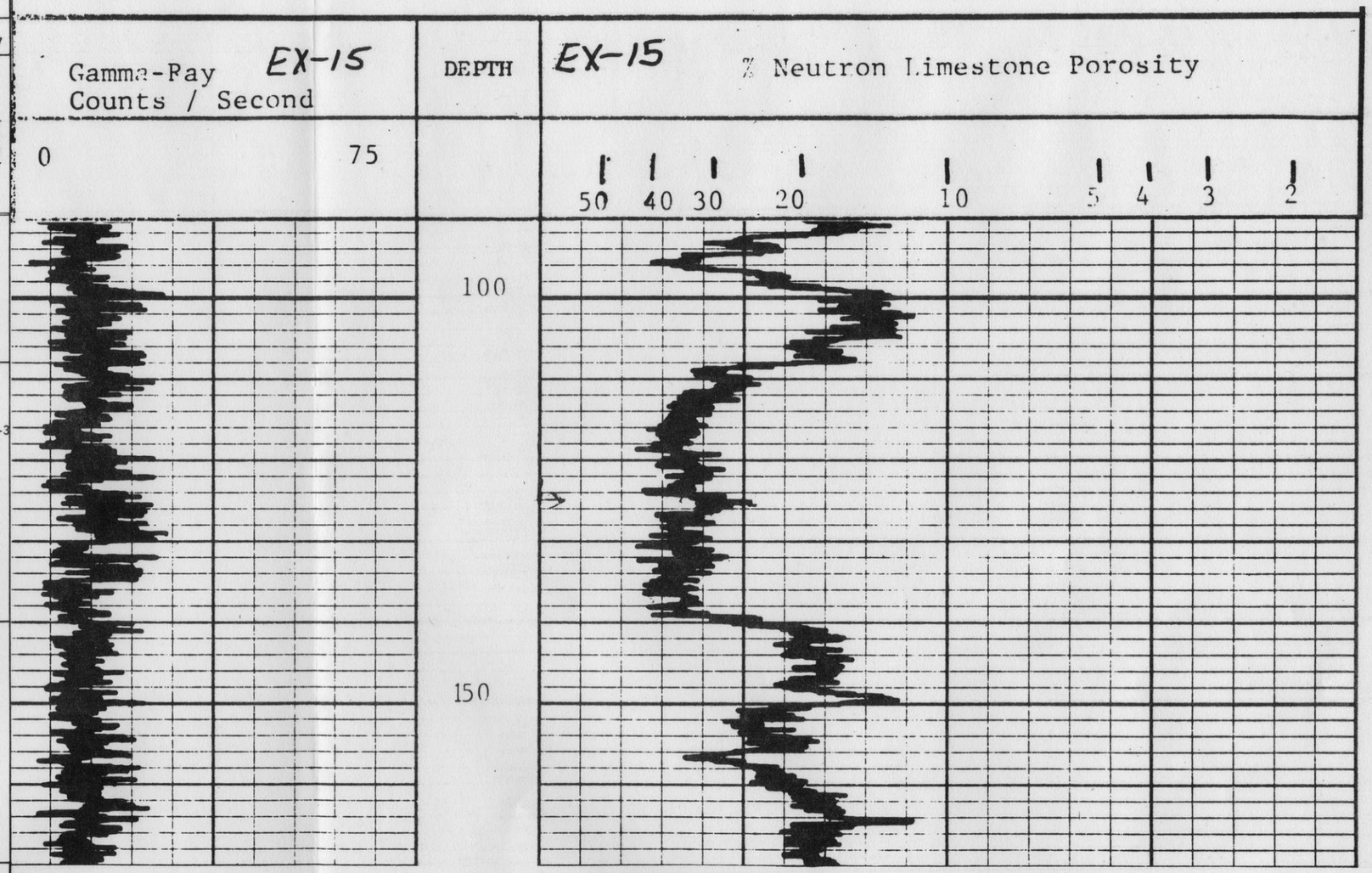
DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
110					Brown silty fine to coarse sand (SM), trace to some gravel, glacial till, boulder at 86-87'		T					
120	2	SS			Dark grayish brown silty medium to coarse sand (SM), some gravel, coarse drift	AU	CD	-			11	$4x10^{-3}$
130												
140					Reddish brown silty fine to coarse sand (SM), trace to some gravel, basal till, boulder from 151-152'		BT					
150												
160												
170					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-8-84
BORING COMPLETED	2-10-84
RIG	Denny's Drilling
FOREMAN	Ken
STS OFFICE	540 Lambeau Green Bay, WI 54303
DRAWN BY	
SHEET	2 OF 3
APP'D. BY	JAS
STS JOB NO.	12959

BL: 5-983



STS Consultants Ltd.

OWNER	Exxon Minerals
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin
LOG OF BORING NUMBER	EX-15
Feet	N-112443 E-2280005
Meters	N-34273 E-694947

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION : 1626.64-ft. 495.801-m

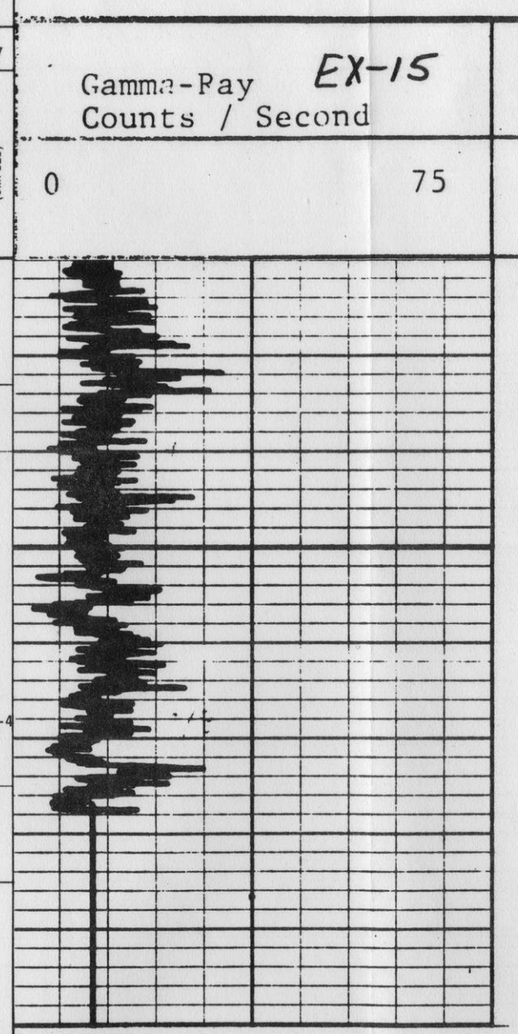
DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT. %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
180					Reddish brown silty fine to coarse sand (SM), trace to some gravel, basal till, boulder from 151-152'		BT					
	3	SS			Reddish brown clayey silt (ML), with varves of fine silty sand and silty clay, lacustrine		L	22			90	
190												
200					Reddish brown silty fine to coarse sand (SM), trace to some gravel, basal till grading to clayey silt (ML) above bedrock		BT					
210												
220	4	SS					AL	14			74	$2x10^{-4}$
230					Bedrock							
235					End of boring in bedrock Boring advanced to 235 feet with rock bit and bentonite mud							

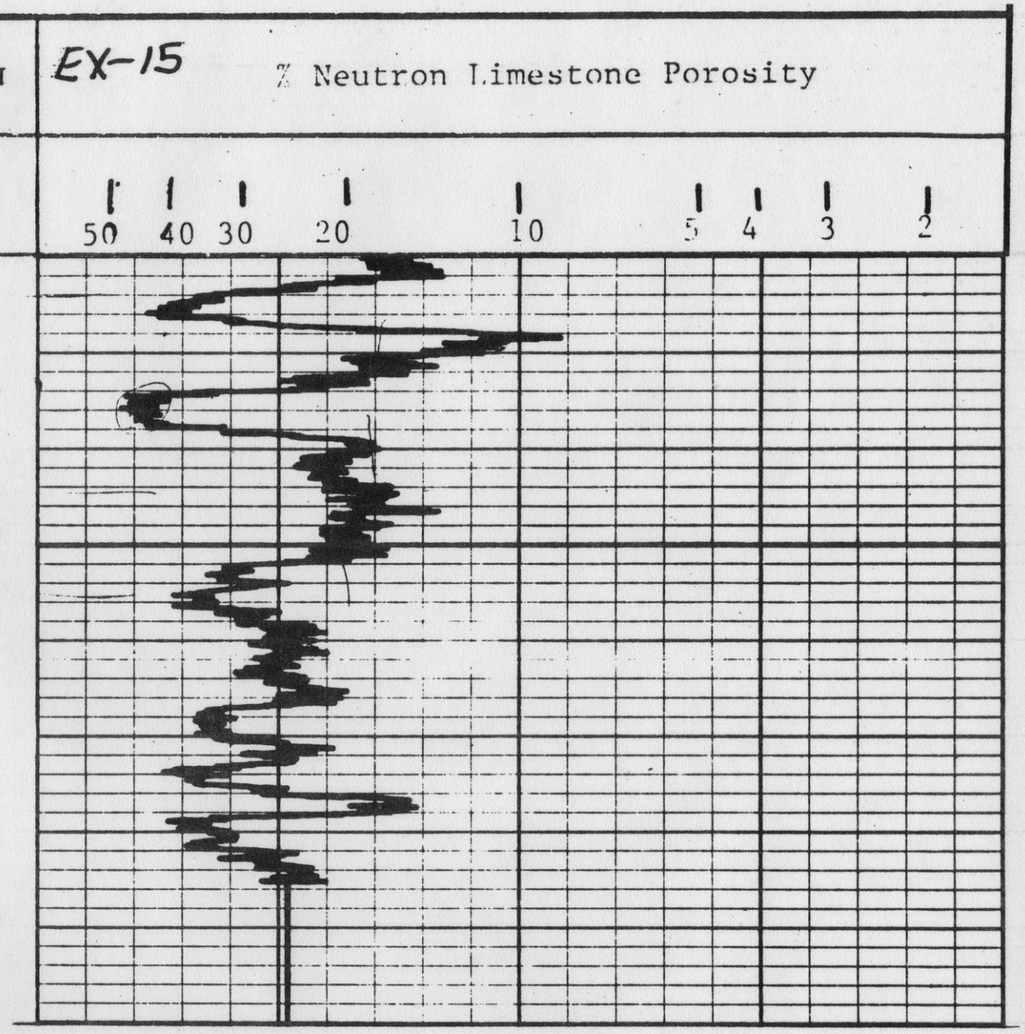
The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL		BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-8-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
BORING COMPLETED	2-10-84	DRAWN BY	
RIG	Denny's Drilling	SHEET	3 OF 3
FOREMAN	Ken	APP'D. BY	JAS
		STS JOB NO.	12959

BL: 5-983





STS Consultants Ltd.

OWNER	Exxon Minerals
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin

LOG OF BORING NUMBER: EX-16

Feet: N-113316 E-2282043 Meters: N-34539 E-695568

WELL INSTALLATION
TOP STANDPIPE EL. +

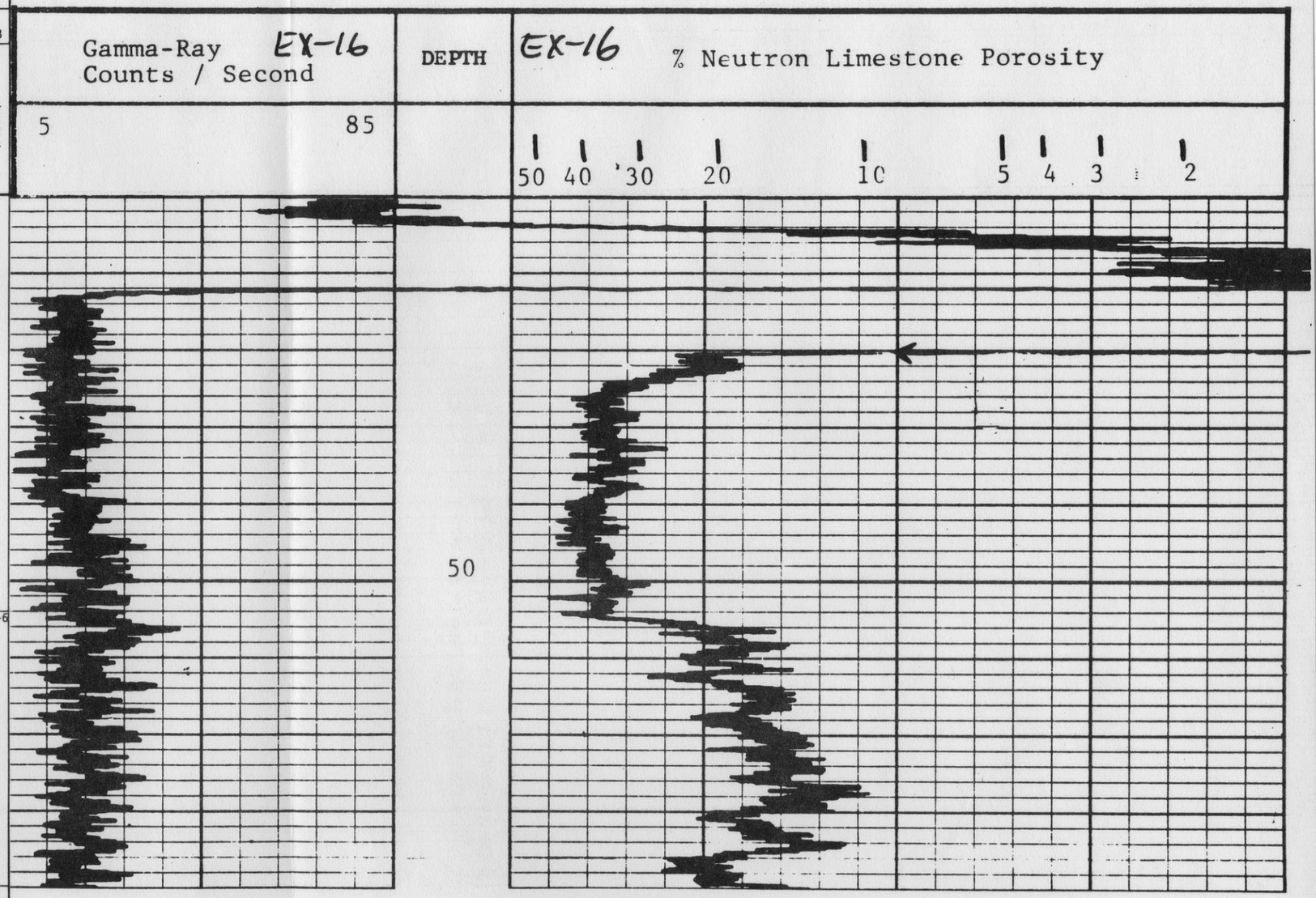
DEPTH FEET / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
					SURFACE ELEVATION 1614.70-ft. 492.162-m							
10												
20					5-24-84 ▽ Brown fine sand (SP), trace coarse sand, fine drift		FD					
30												
40												
50												
60							BL					$9x10^{-6}$
70	1	SS			Brown silty fine to medium sand (SM), trace gravel, glacial till		T	14			22	
80												
90					Continued							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL			BCR			ACR
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME	

BORING STARTED	2-9-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
BORING COMPLETED	2-9-84		
RIG	Lusiers	DRAWN BY	SMD
FOREMAN	Keith	APP'D. BY	JAS
		SHEET	1 OF 2
		STS JOB NO.	12959

BL: 5-983



STS Consultants Ltd.

OWNER	Exxon Minerals
PROJECT NAME	Piezometer Installations
SITE LOCATION	Crandon, Wisconsin
LOG OF BORING NUMBER	EX-16
Feet	N-113316 E-2282043
Meters	N-34539 E-695568

WELL INSTALLATION
TOP STANDPIPE EL. +

SURFACE ELEVATION 1614.70-ft. 492.162-m

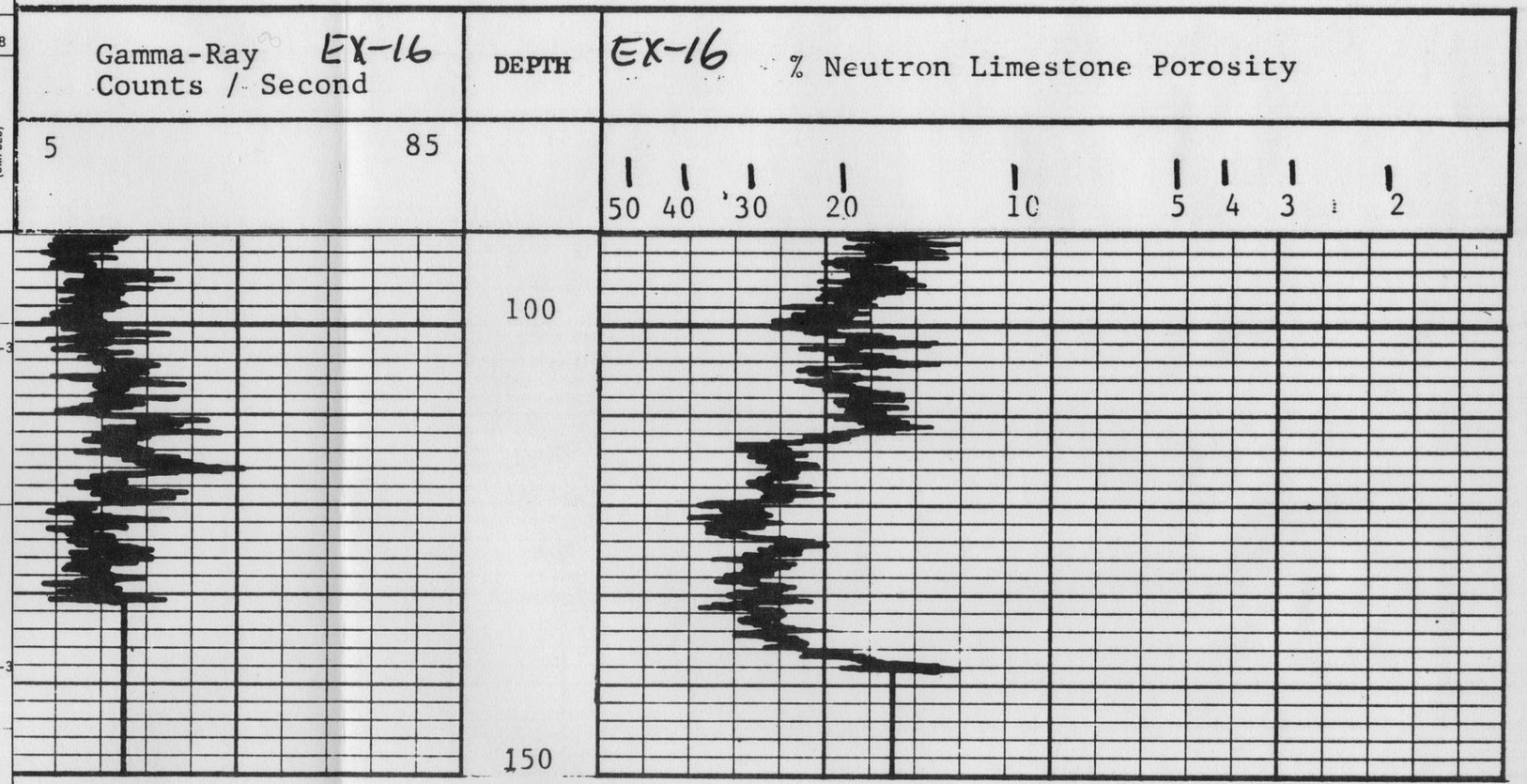
DEPTH FEET ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	PIEZOMETER ID	GEOLOGIC UNIT	WATER CONTENT, %	UNIT DRY WEIGHT (LBS/FT³)	LIQUID/PLASTIC LIMIT LL/PL	PERCENT PASSING #200 SIEVE	PERMEABILITY, K (CM/SEC)
100					Brown silty fine to medium sand (SM), trace gravel, glacial till		T					
110	2	SS			Brown slightly silty fine to coarse sand (SM-SP) some gravel, coarse drift	AU	CD	13			9	$6x10^{-3}$
120												
130					Brown slightly silty fine sand (SM-SP), trace gravel, fine drift		FD					
140	3	SS				AL		21			6	$1x10^{-3}$
145					End of boring at 145 feet in fine drift Boring advanced to 145 feet by rock bit and bentonite mud							

The stratification lines represent the approximate boundary between soil types. In situ, the transition may be gradual. Water levels were measured at the times indicated. Water levels may vary seasonally.

WL			BCR		
WL-T. PIPE	DATE	TIME	WL-T. PIPE	DATE	TIME

BORING STARTED	2-9-84
BORING COMPLETED	2-9-84
RIG	Lusiers
FOREMAN	Keith
STS OFFICE	540 Lambeau Green Bay, WI 54303
DRAWN BY	SMD
SHEET	2 OF 2
APP'D. BY	JAS
STS JOB NO.	12959

BL: 5-983

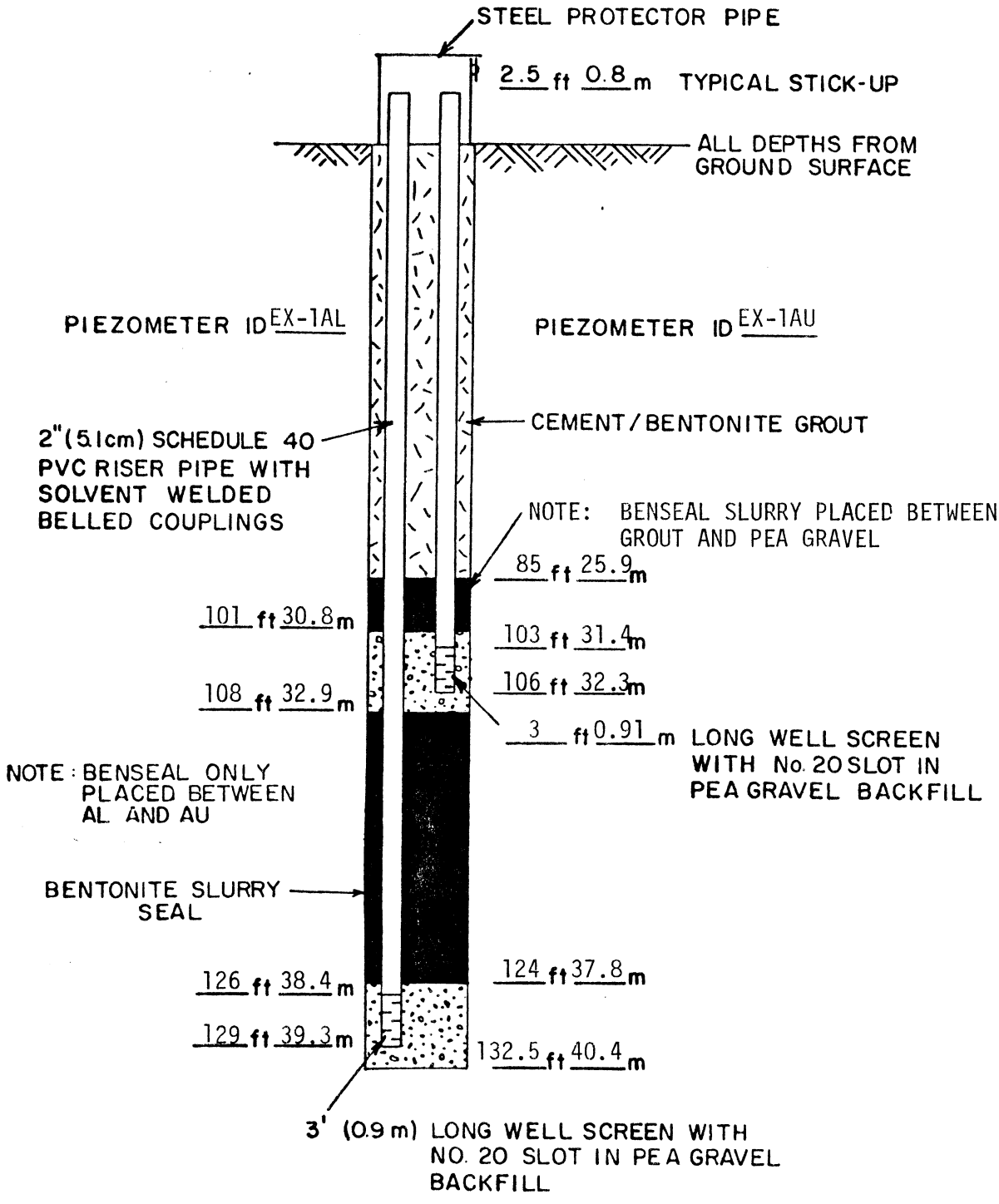


APPENDIX A

Well Installation Diagrams, EX-1 through EX-16

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-1AL & AU DATE INSTALLED 2/29-3/1/84 DRILL RIG Schramm

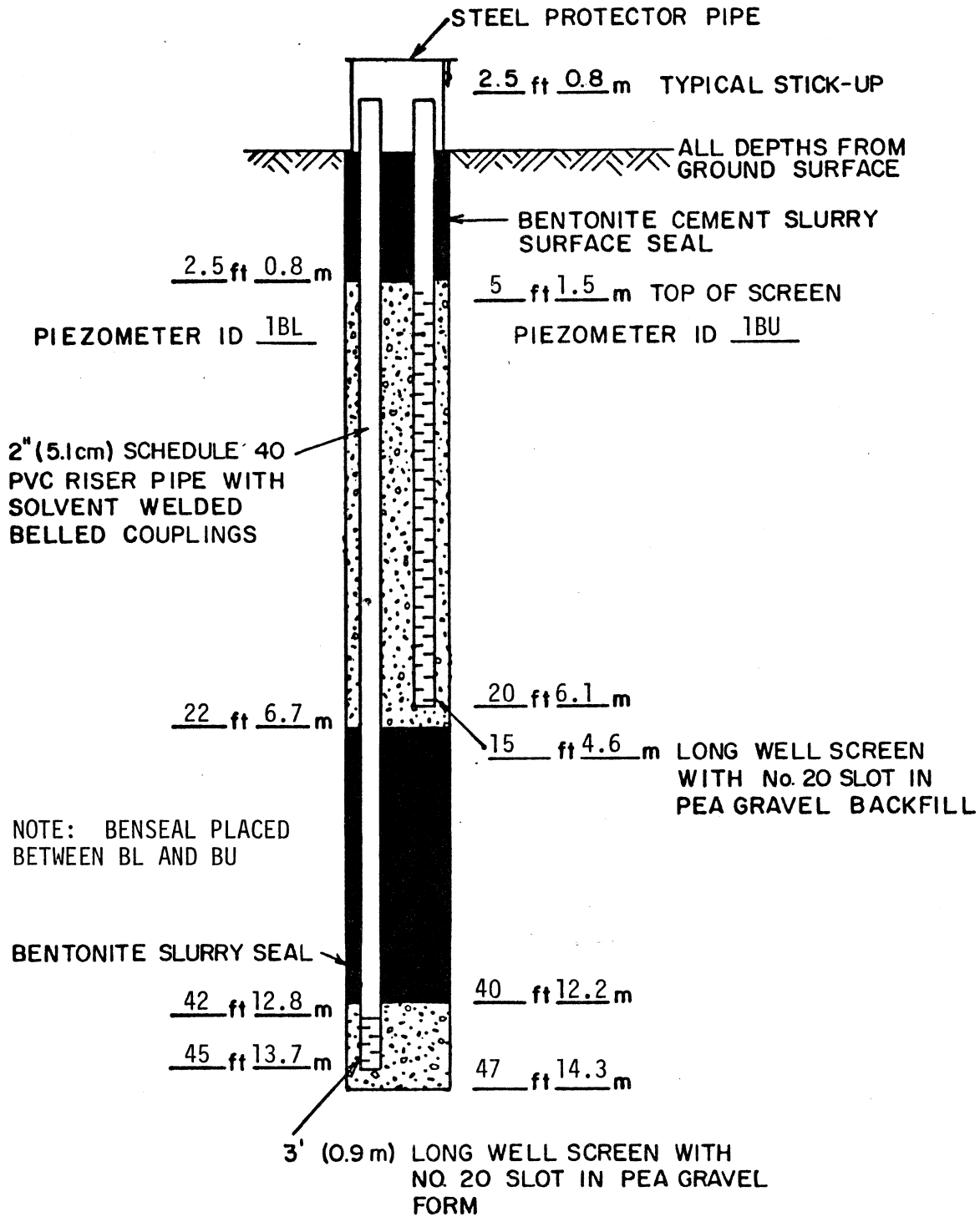
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-1BL & BU DATE INSTALLED 3-1-84 DRILL RIG Schramm

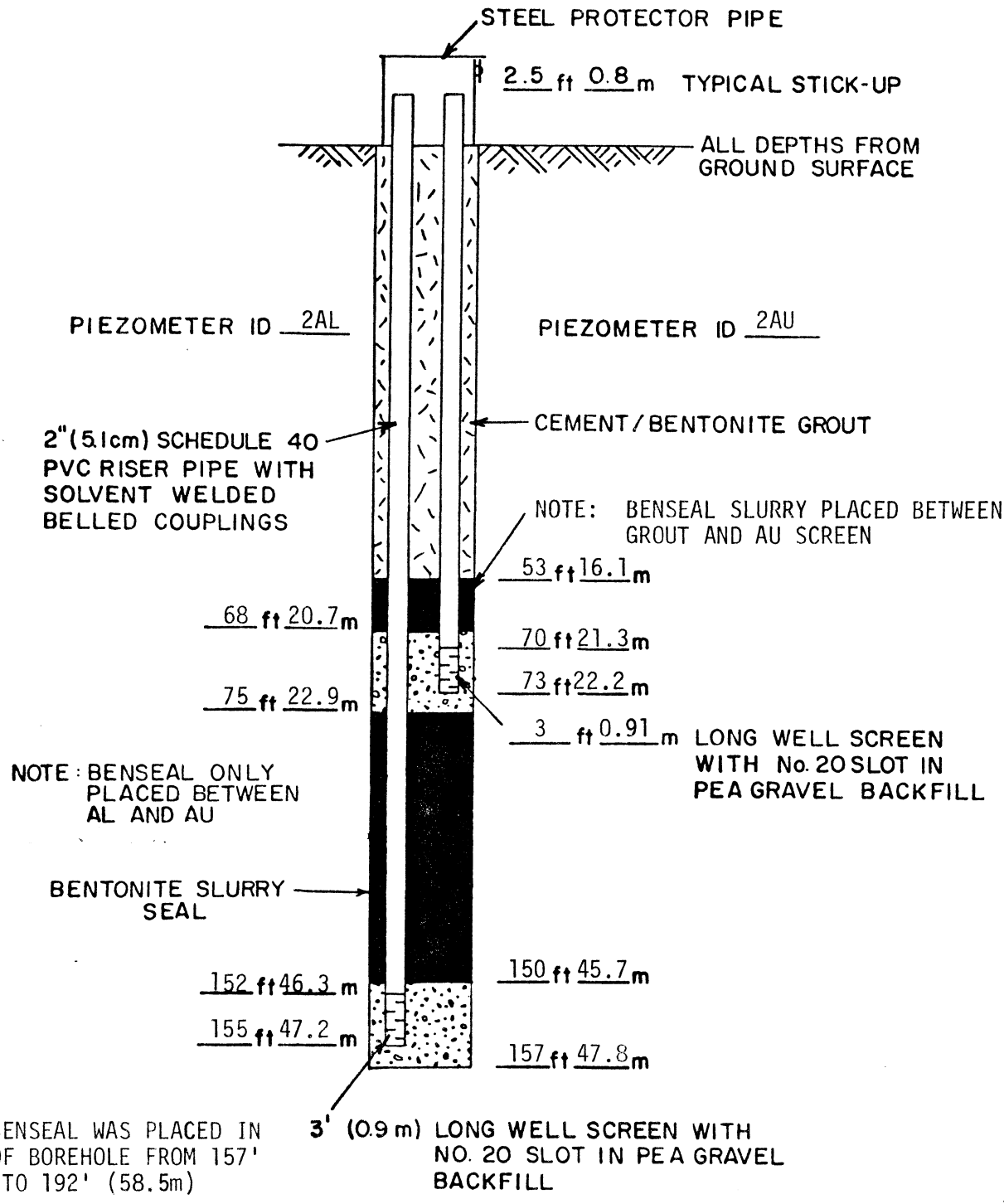
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-2AL & AU DATE INSTALLED 3-27-84 DRILL RIG Schramm

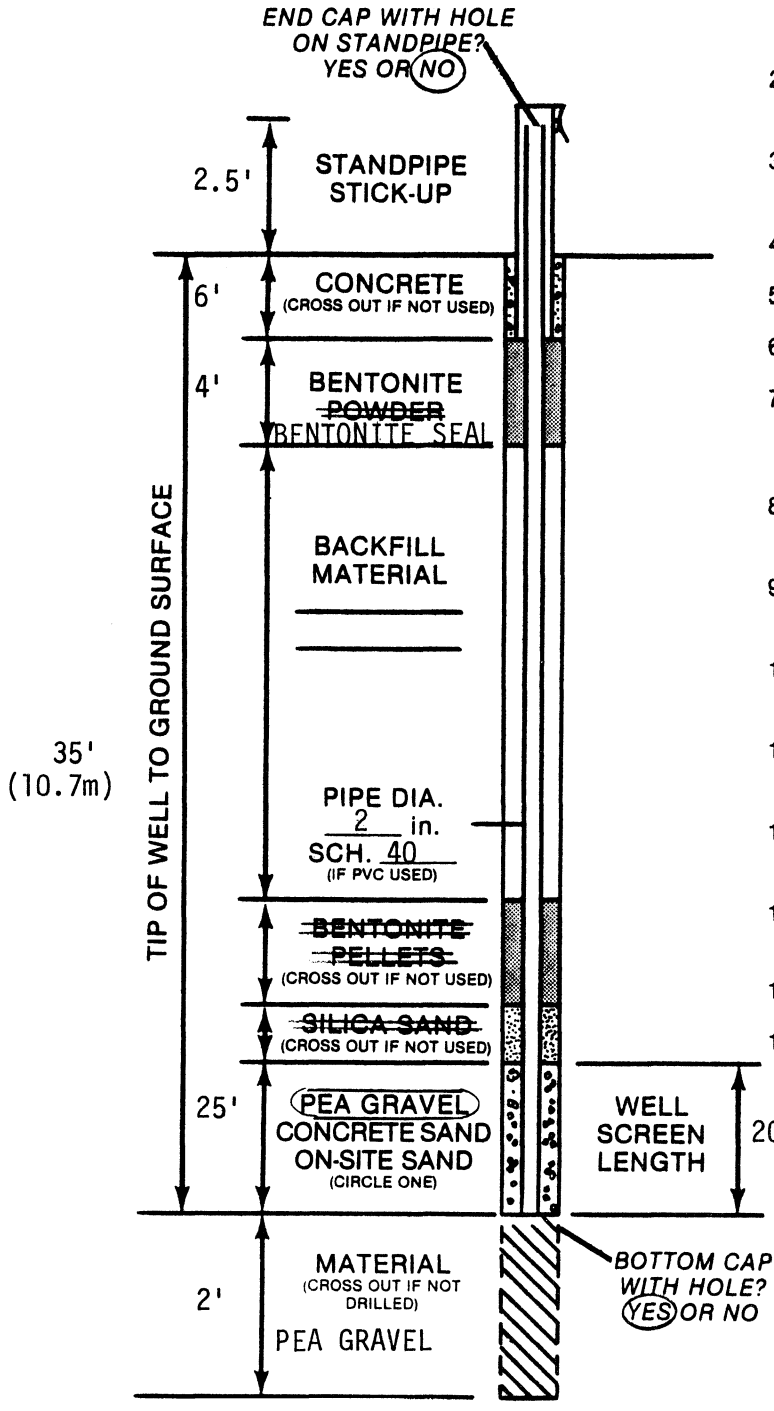
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon- Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID.) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID.) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE 4-27-84, Dry Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

NOTE: WELL REPLACED BY EX-2CL

Well No. EX-2BL DATE INSTALLED 3-27-84 DRILL RIG Schramm

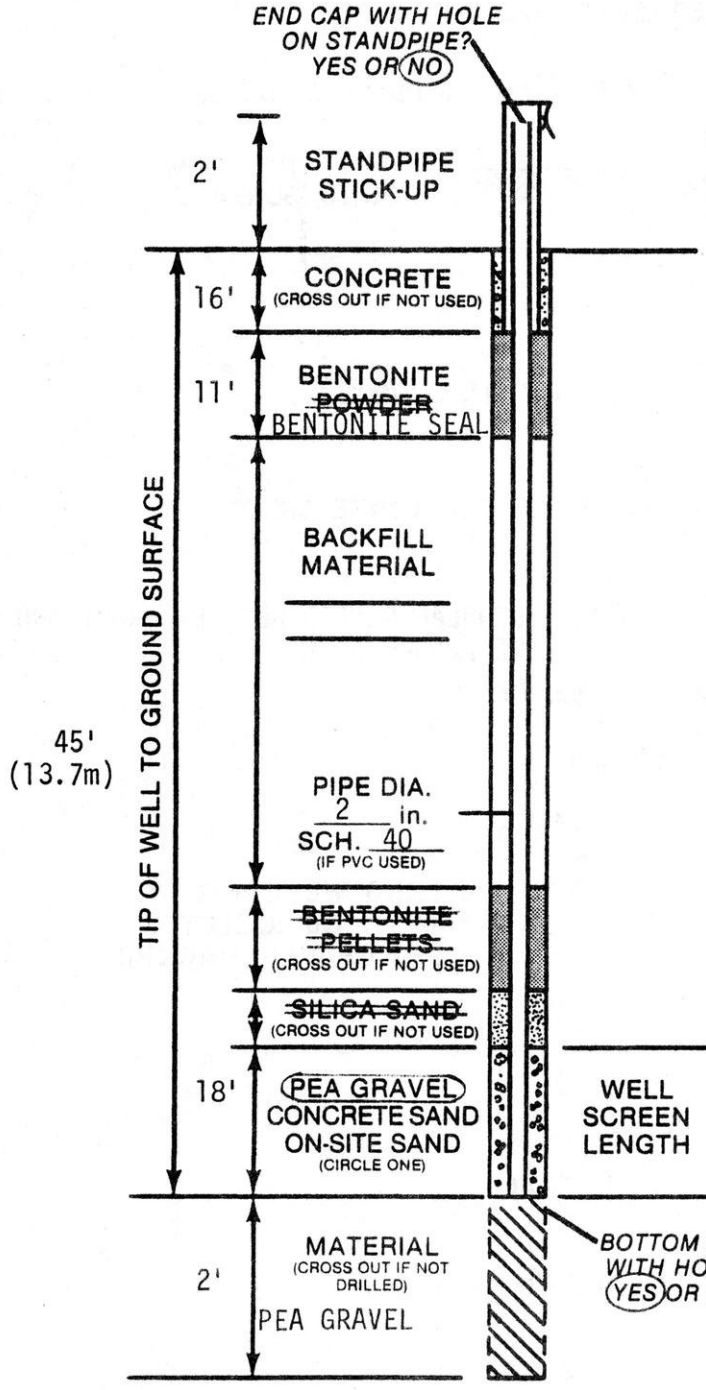
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-2CL DATE INSTALLED 5-17-84 DRILL RIG Schramm

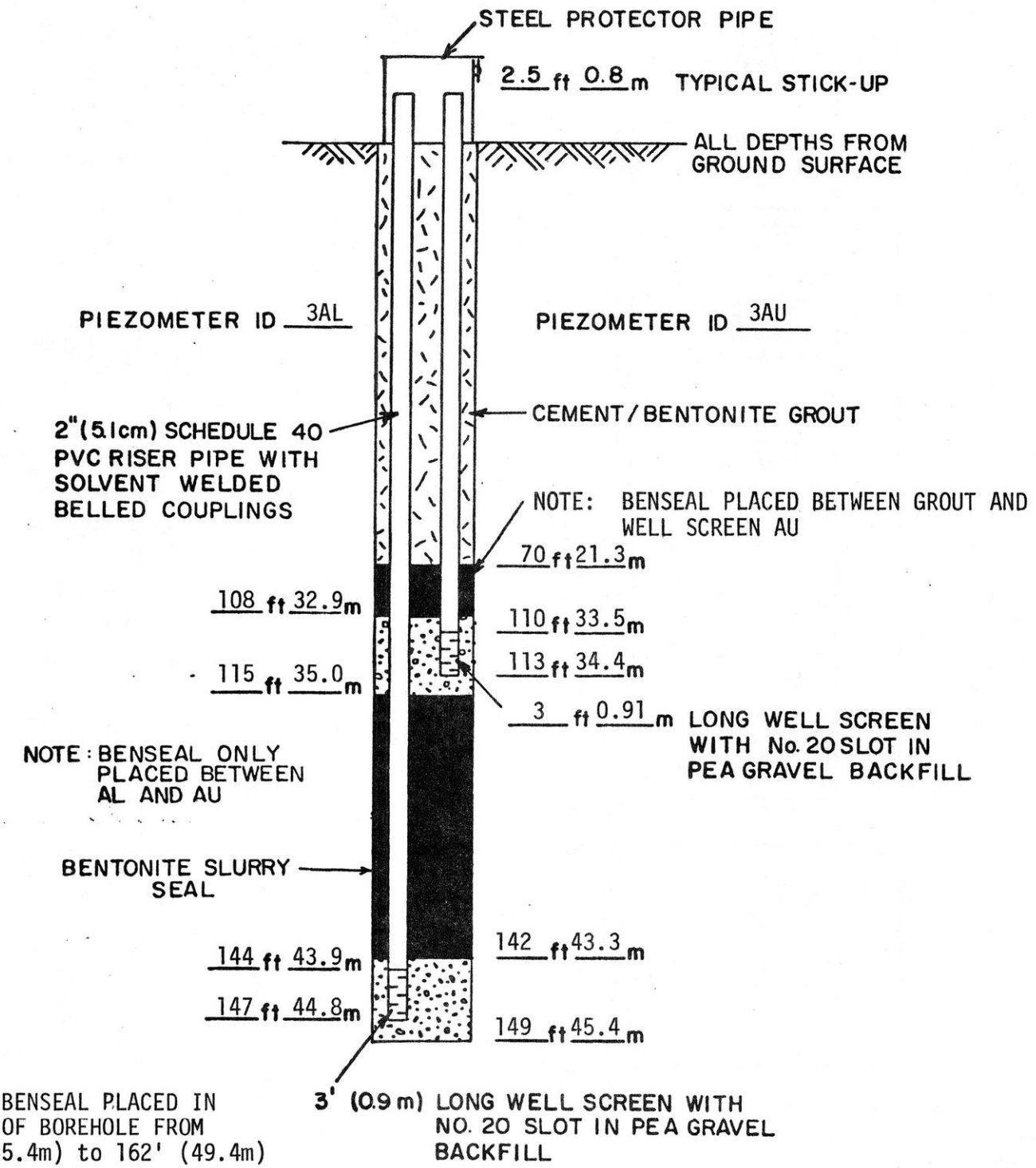
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-3AL & AU DATE INSTALLED 3-30-84 DRILL RIG Schramm

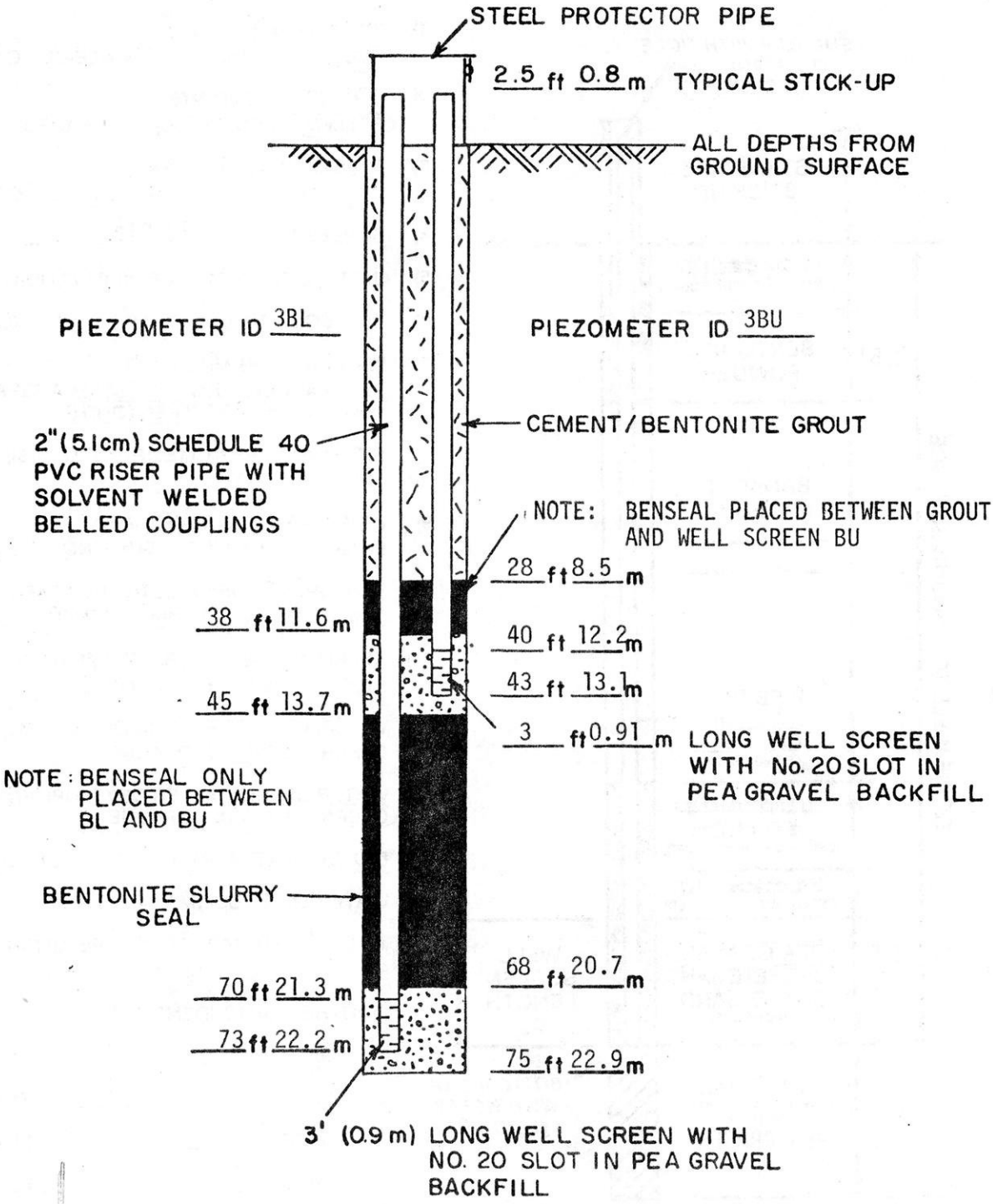
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-3BL & BU DATE INSTALLED 3-30-84 DRILL RIG Schramm

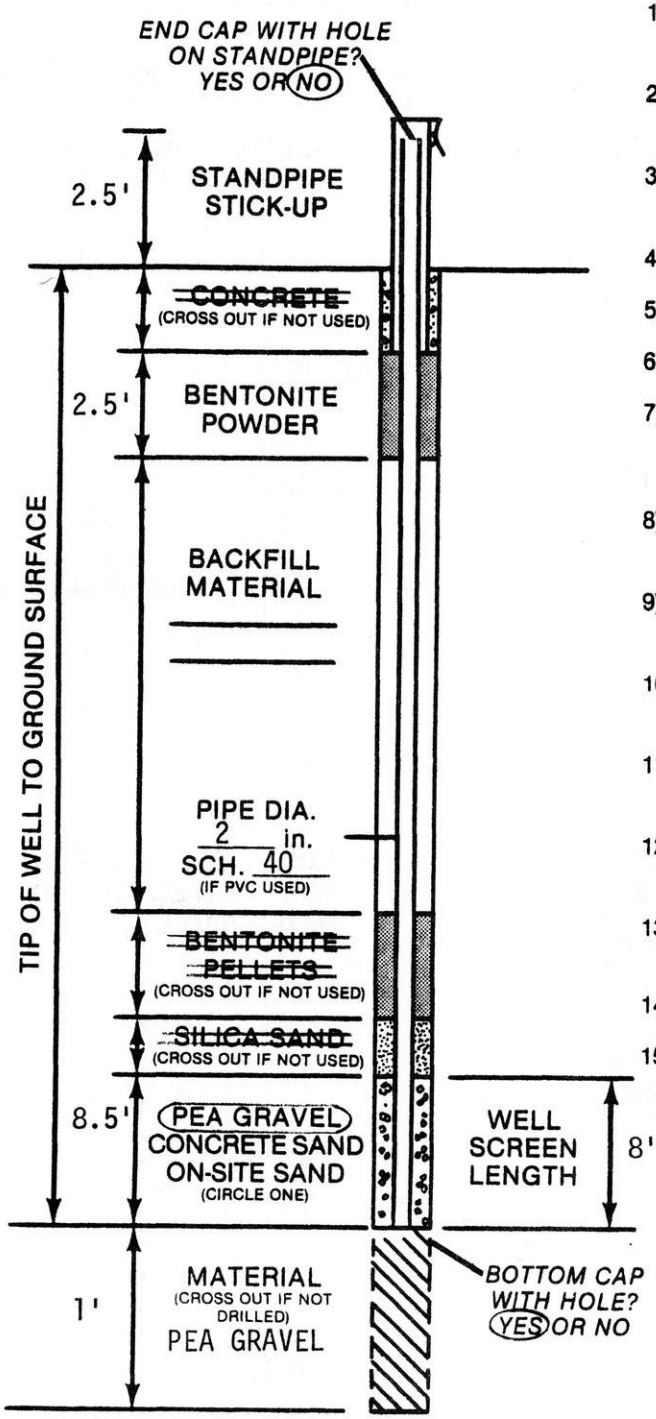
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR,) TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-3CL DATE INSTALLED 3-31-84 DRILL RIG Schramm

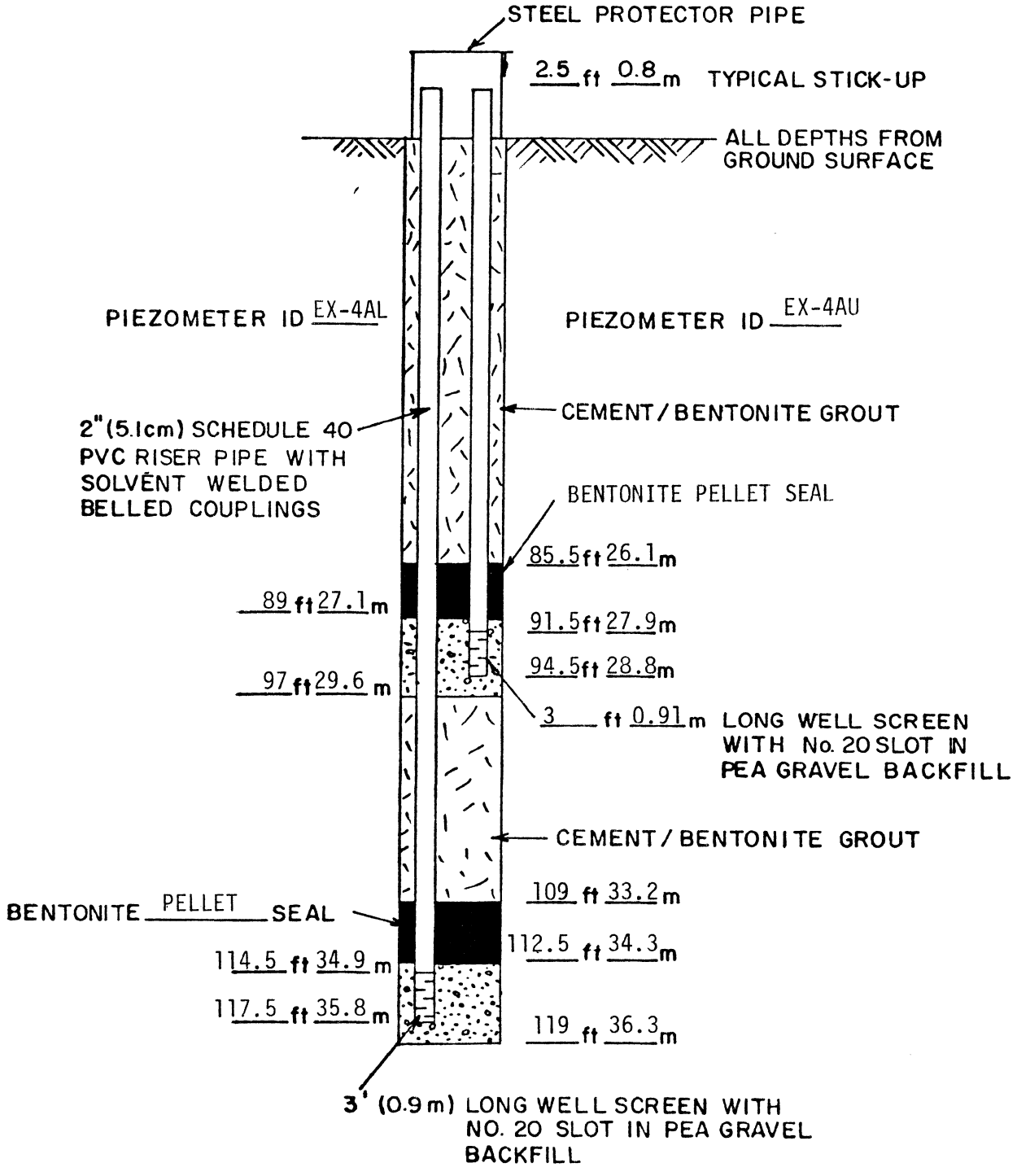
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-4AL & AU DATE INSTALLED 2/6-2/8/84 DRILL RIG Schramm

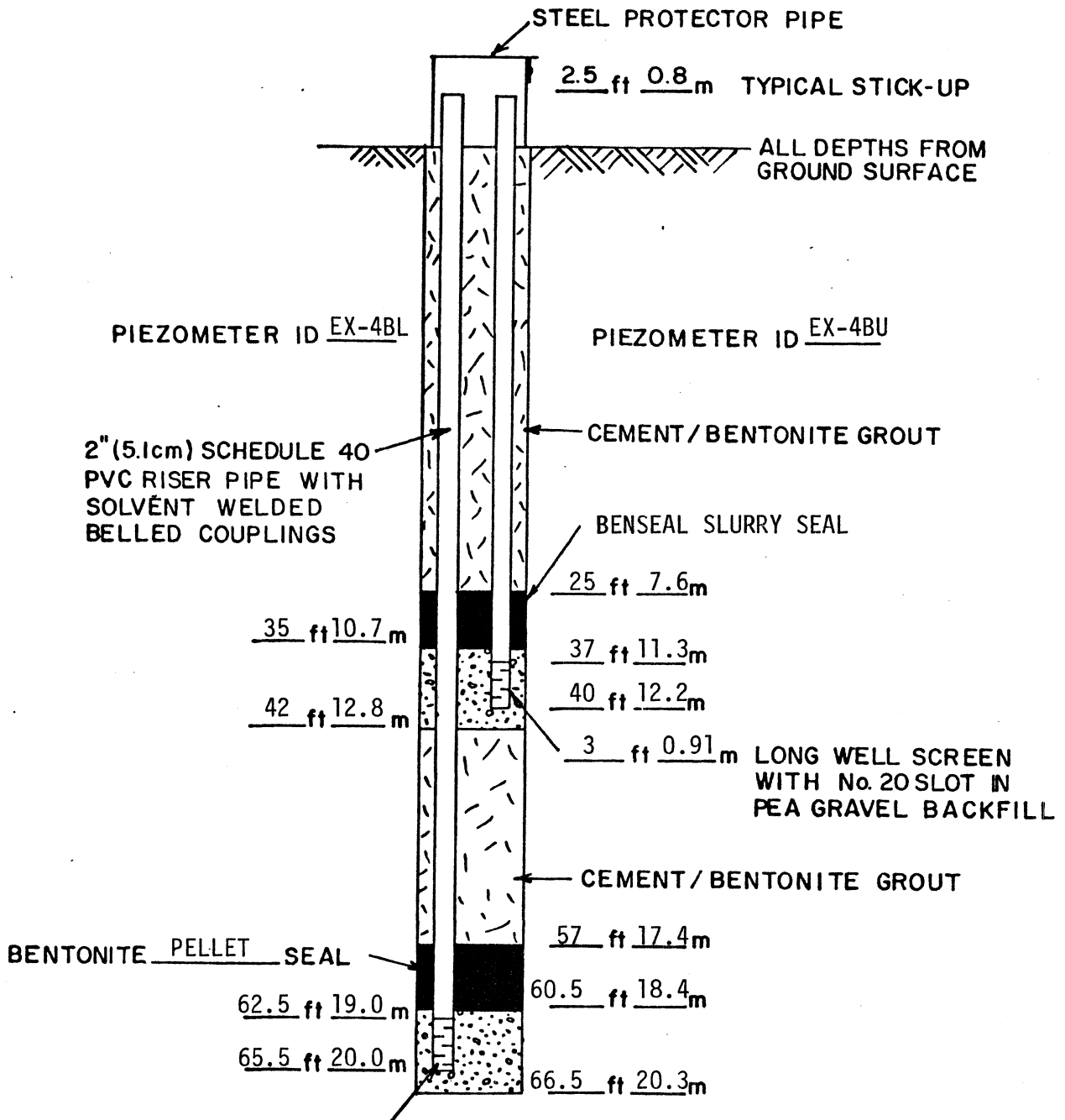
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: CEMENT GROUT PLACED IN BOTTOM OF BOREHOLE FROM 66.5' (20.3m) TO 117' (35.7m) - BOREHOLE OBSTRUCTION BELOW BL WELL SCREEN

Well No. EX-4BL & BU DATE INSTALLED 2/6-2/8/84 DRILL RIG Schramm

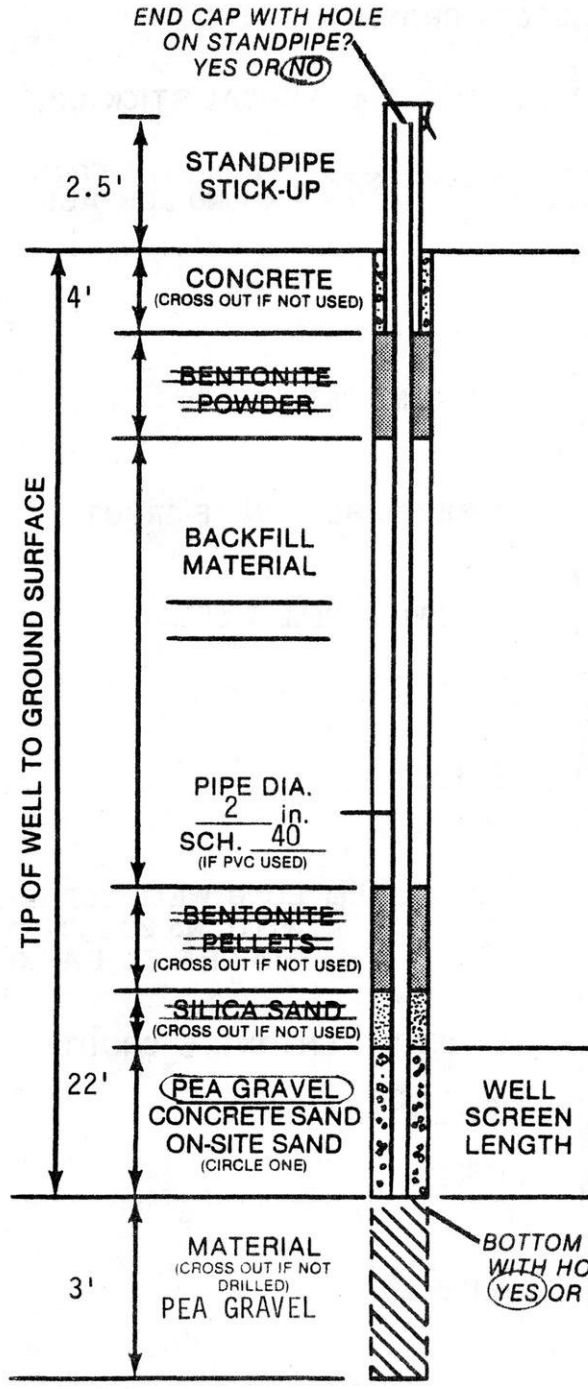
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC), GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED), COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC), GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.), OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID), OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR), TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-4CL DATE INSTALLED 2-7-84 DRILL RIG Schramm

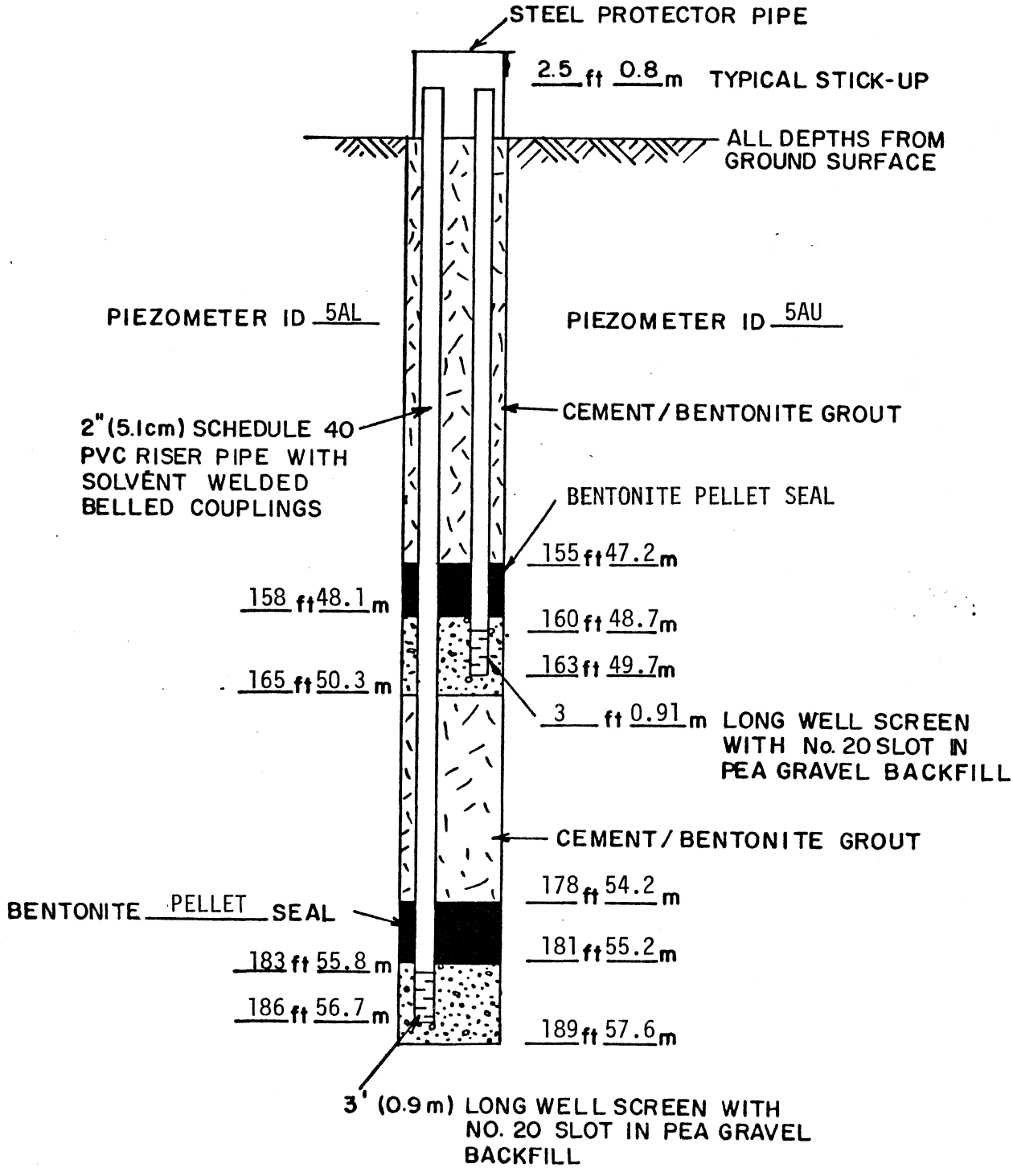
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-5AL & AU DATE INSTALLED 2/7-2/8/84 DRILL RIG Schramm

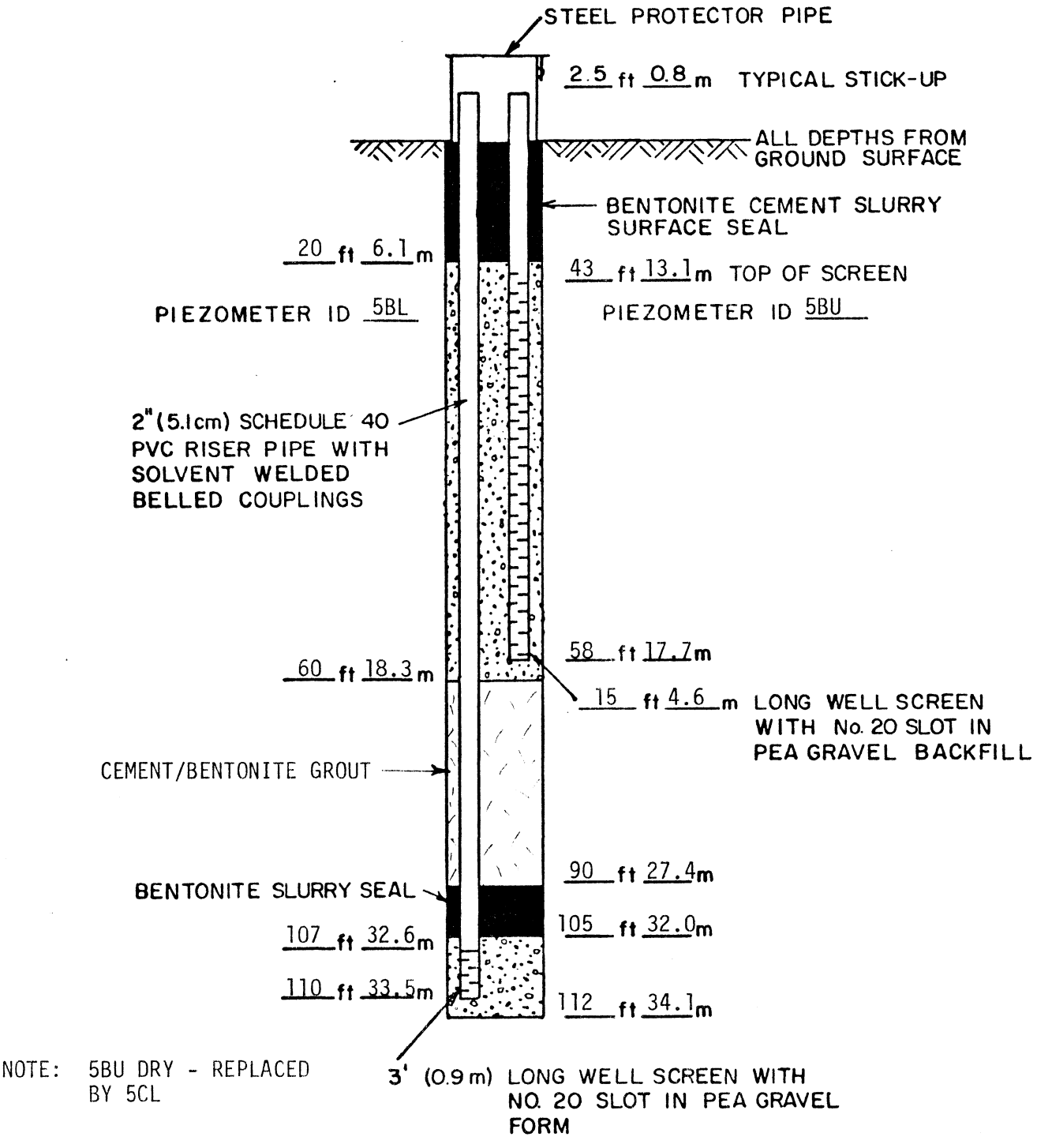
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: 5BU DRY - REPLACED BY 5CL

Well No. EX-5BL & BU DATE INSTALLED 2/15-2/16/84 DRILL RIG Schramm

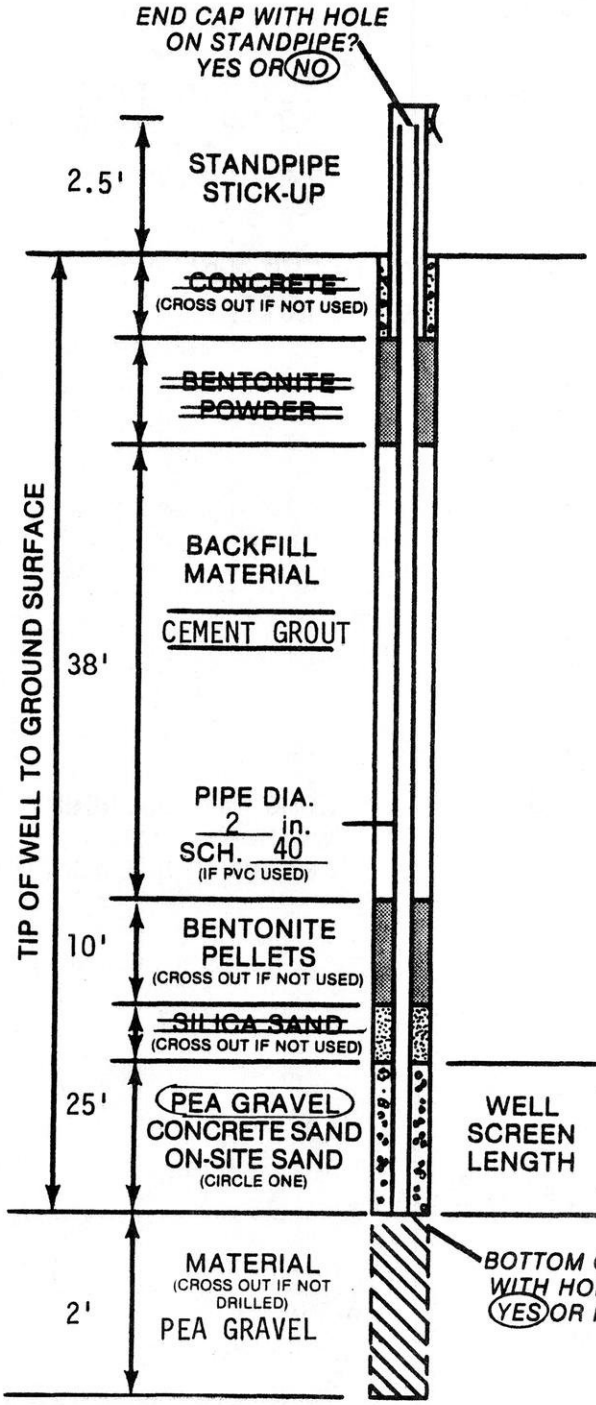
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-5CL DATE INSTALLED 4-3-84 DRILL RIG Schramm

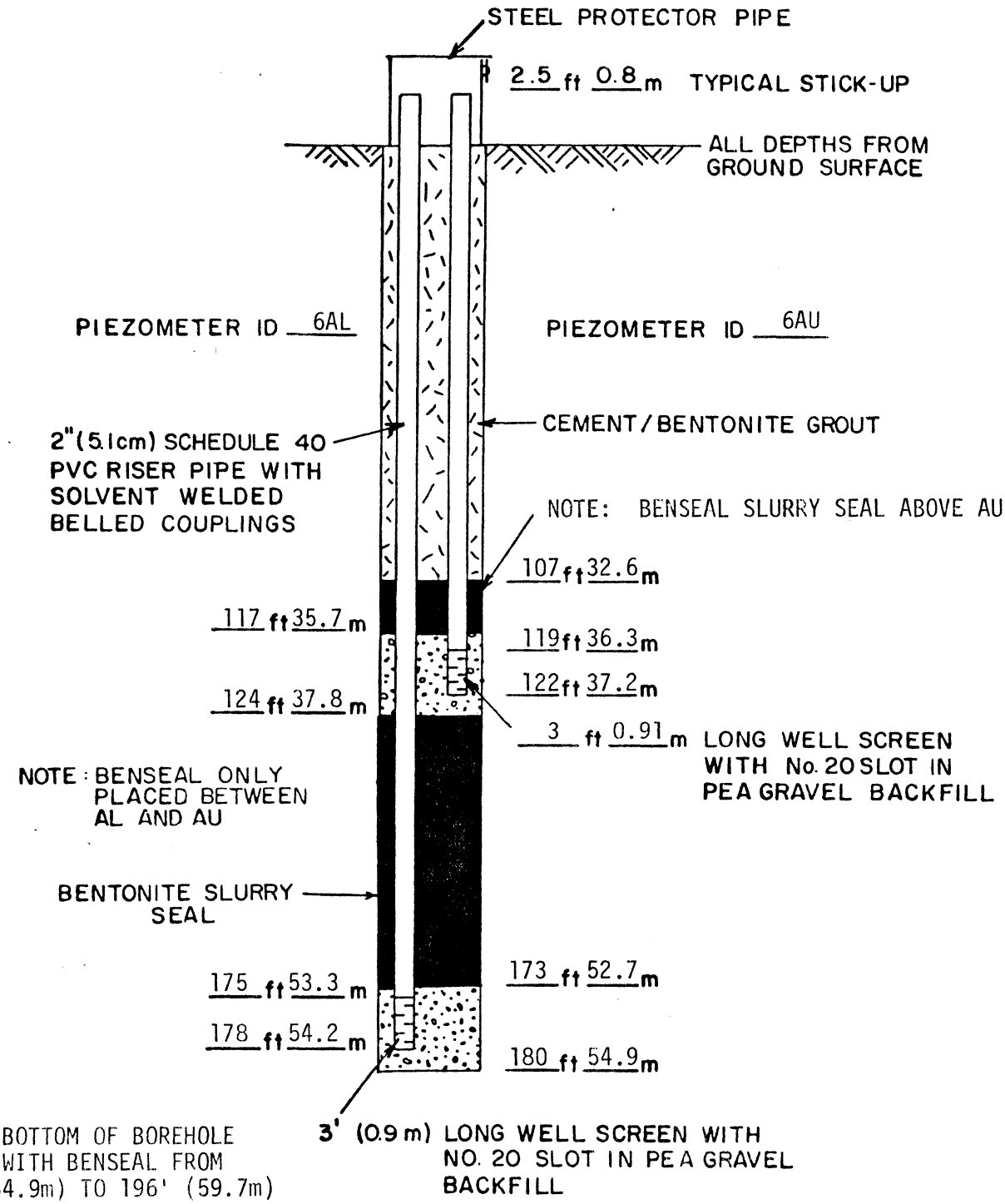
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-6AL & AU DATE INSTALLED 3/6-3/7/84 DRILL RIG Schramm

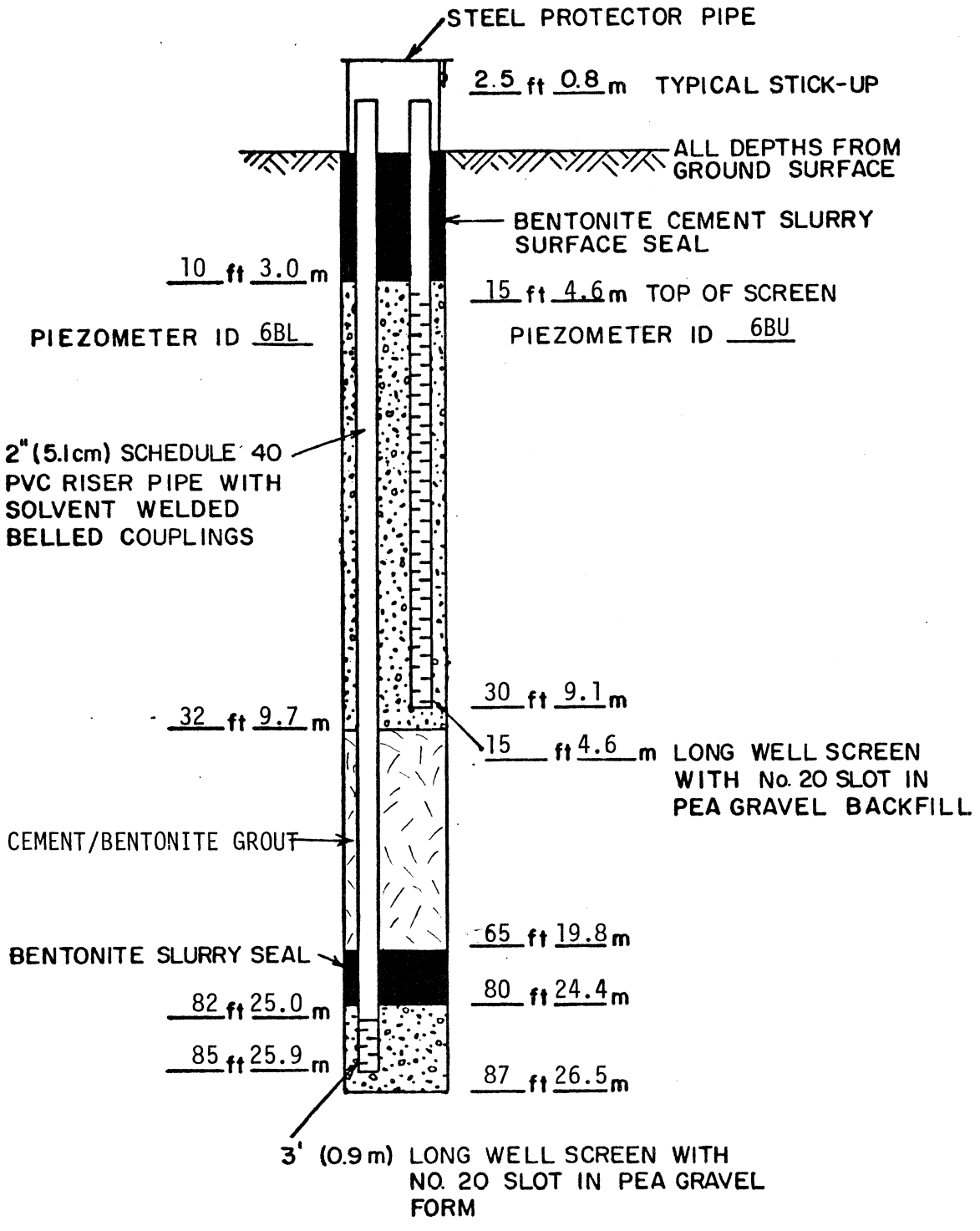
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-6BL & BU DATE INSTALLED 3-7-84 DRILL RIG Schramm

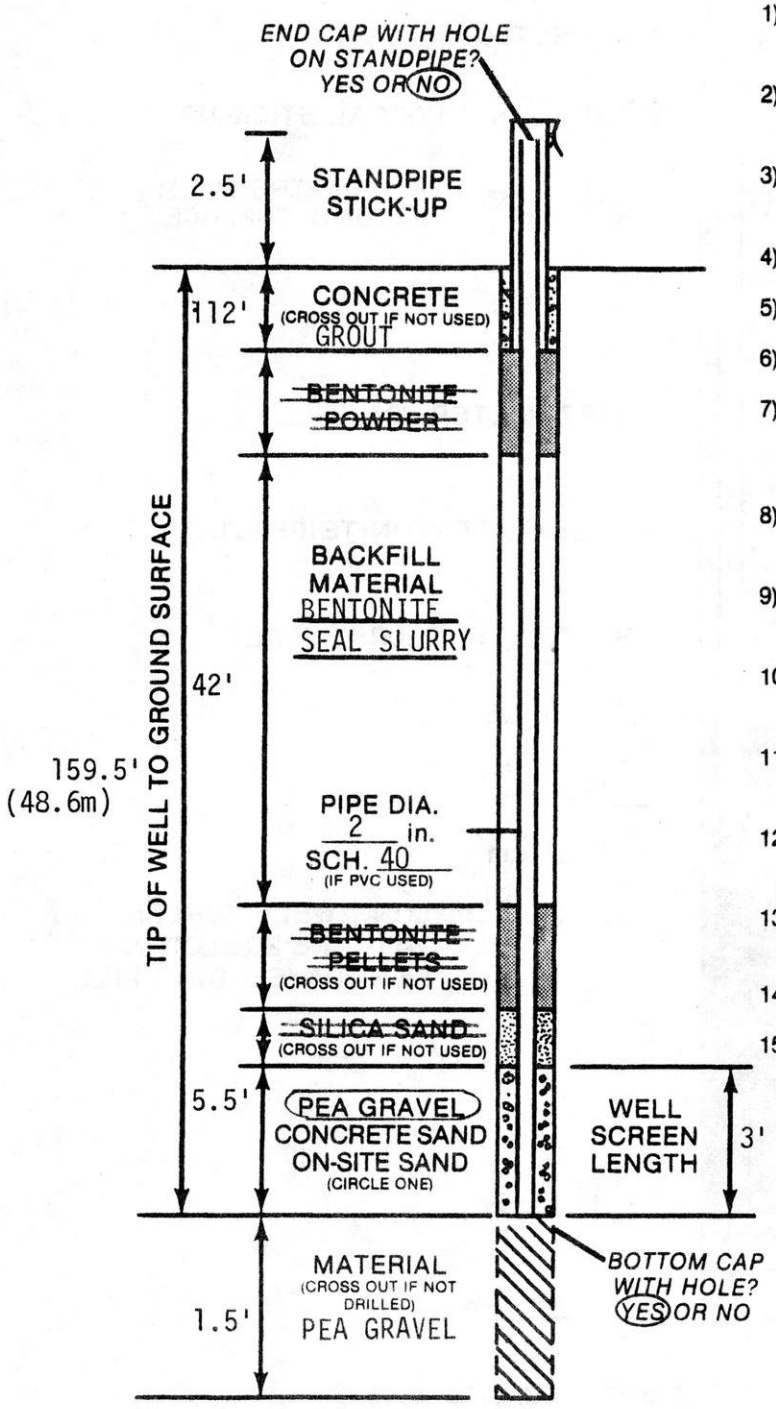
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR,) TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-7AL DATE INSTALLED 3-8-84 DRILL RIG Schramm

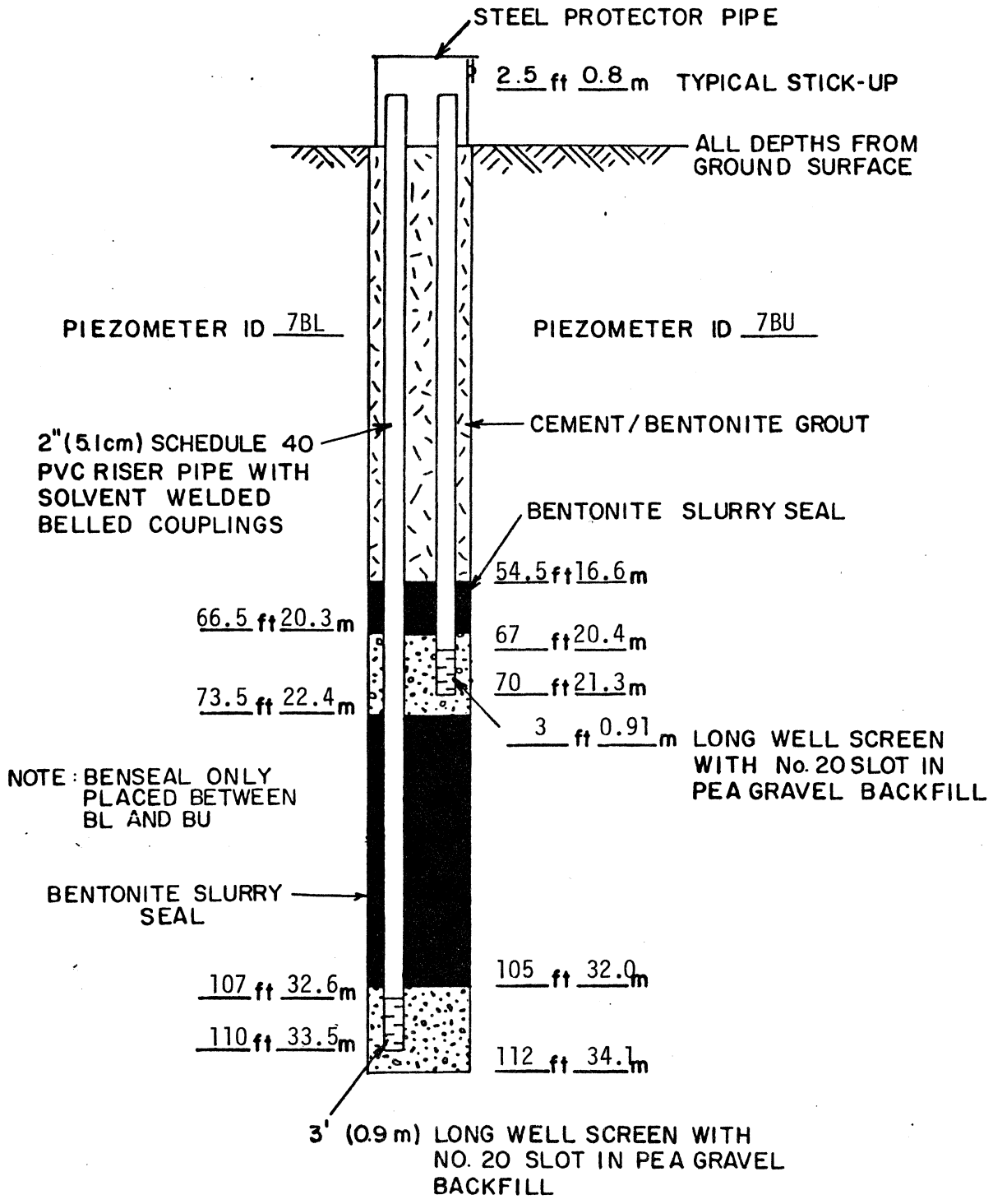
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-7BL & BU DATE INSTALLED 3-9-84 DRILL RIG Schramm

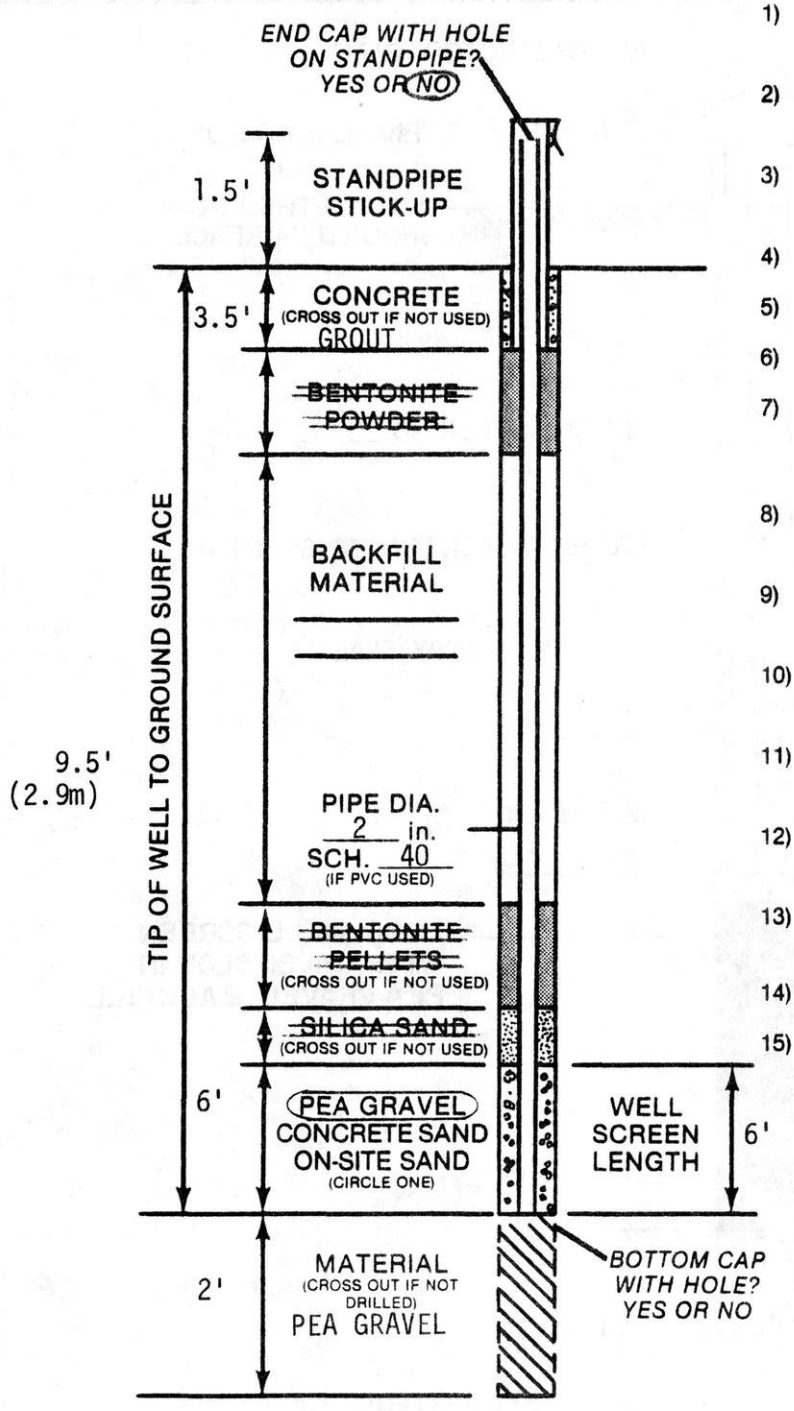
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? No - Air Rotary
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
(CLEAR,) TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
(CLEAR,) TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. Well Point At EX-7 (EX-7CL) DATE INSTALLED 3-8-84 DRILL RIG Schramm

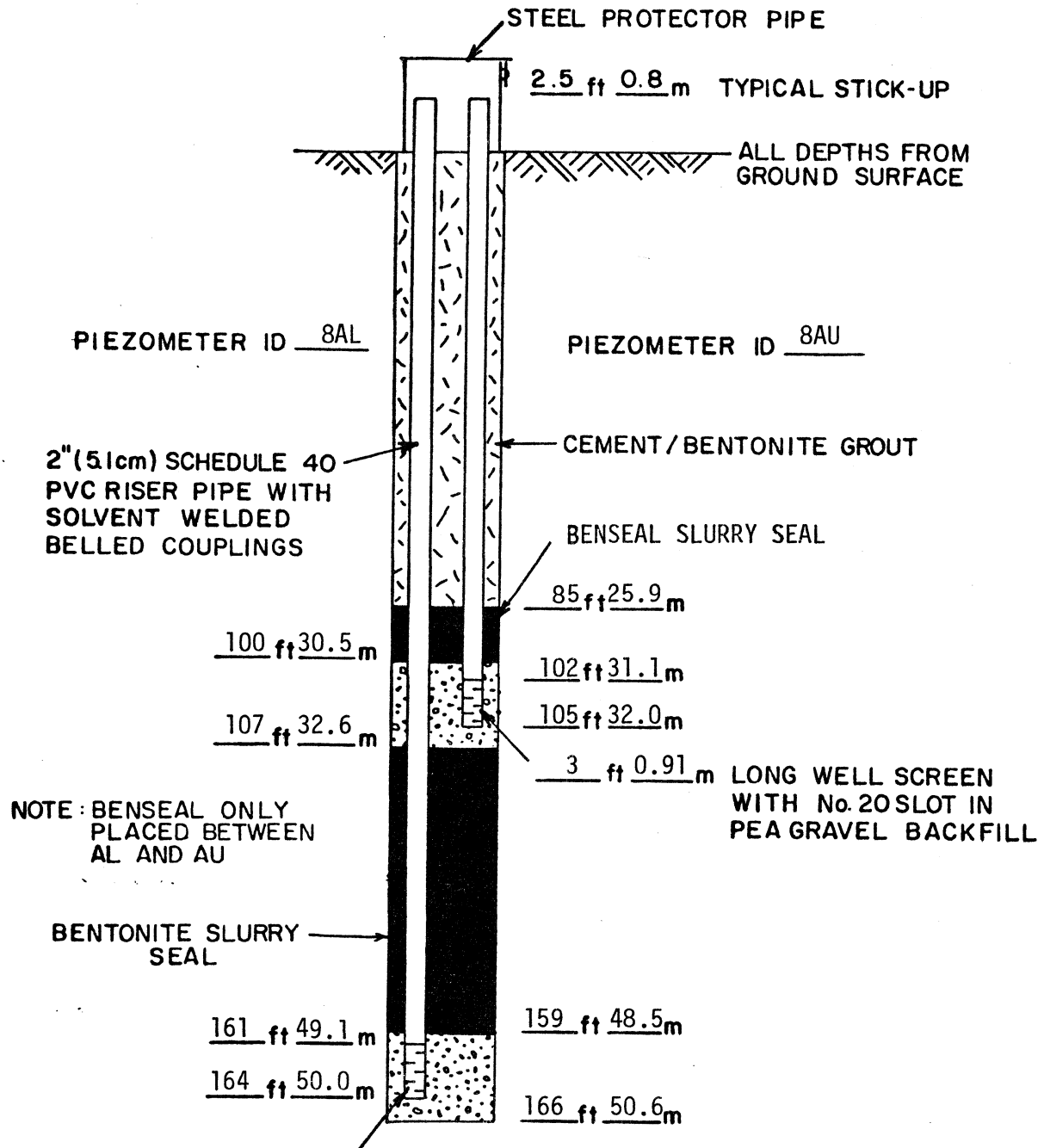
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: BENSEAL PLACED IN BOTTOM OF BOREHOLE FROM 166' (50.6m) TO 175' (53.3m)

Well No. EX-8AL & AU DATE INSTALLED 3-14-84 DRILL RIG Schramm

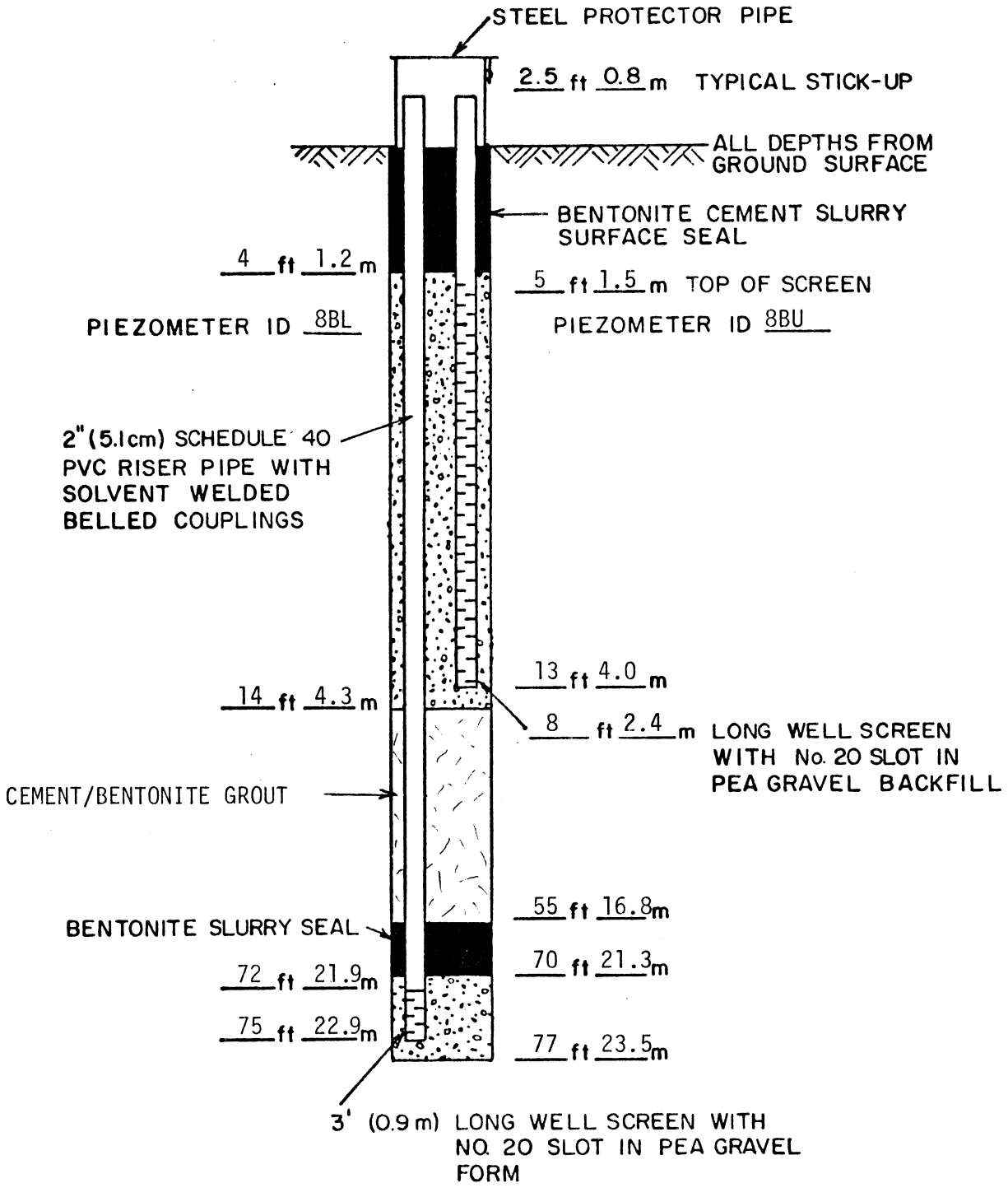
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-8BL & BU DATE INSTALLED 3-12-84 DRILL RIG Schramm

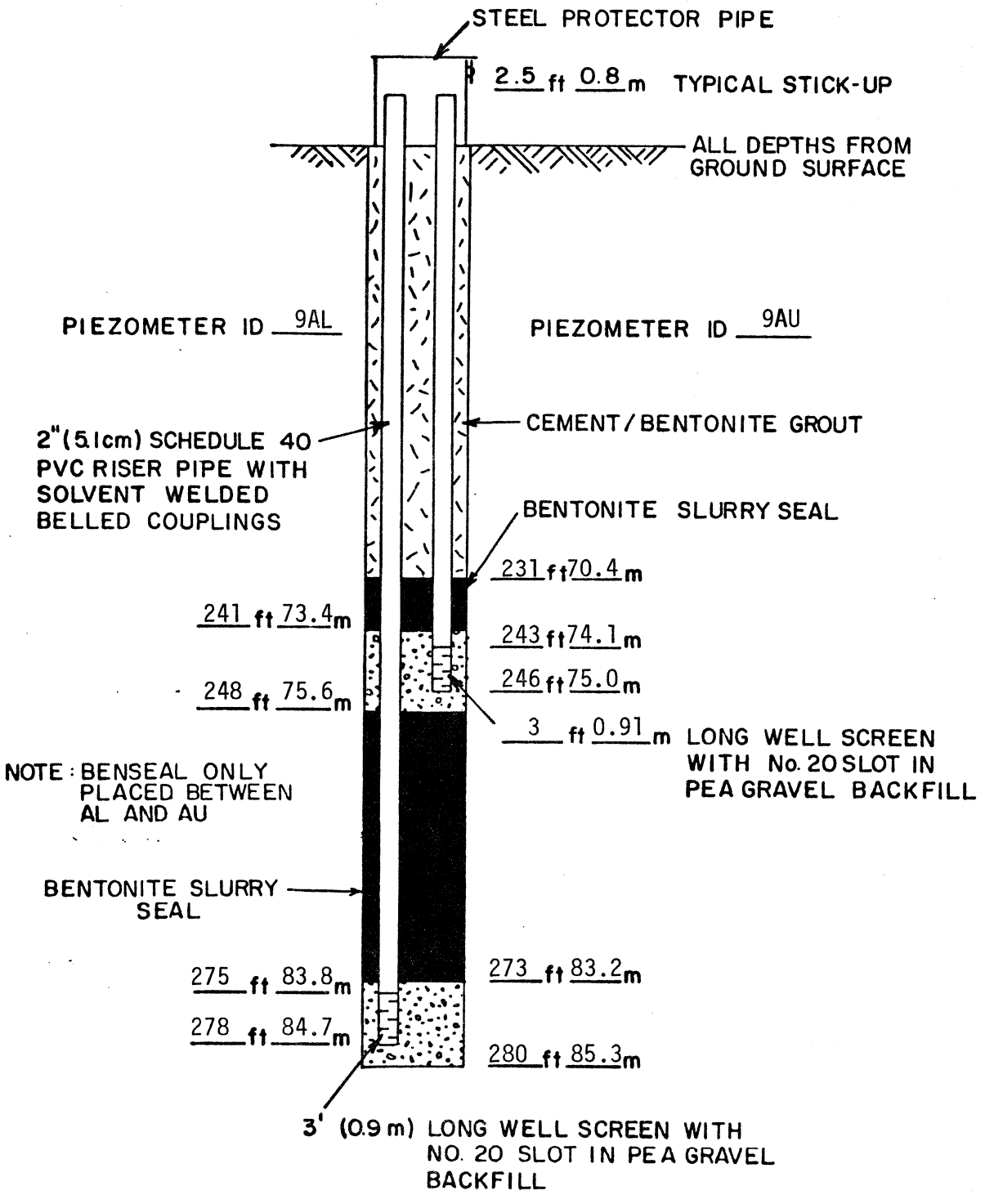
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-9AL & AU DATE INSTALLED 3-21-84 DRILL RIG Schramm

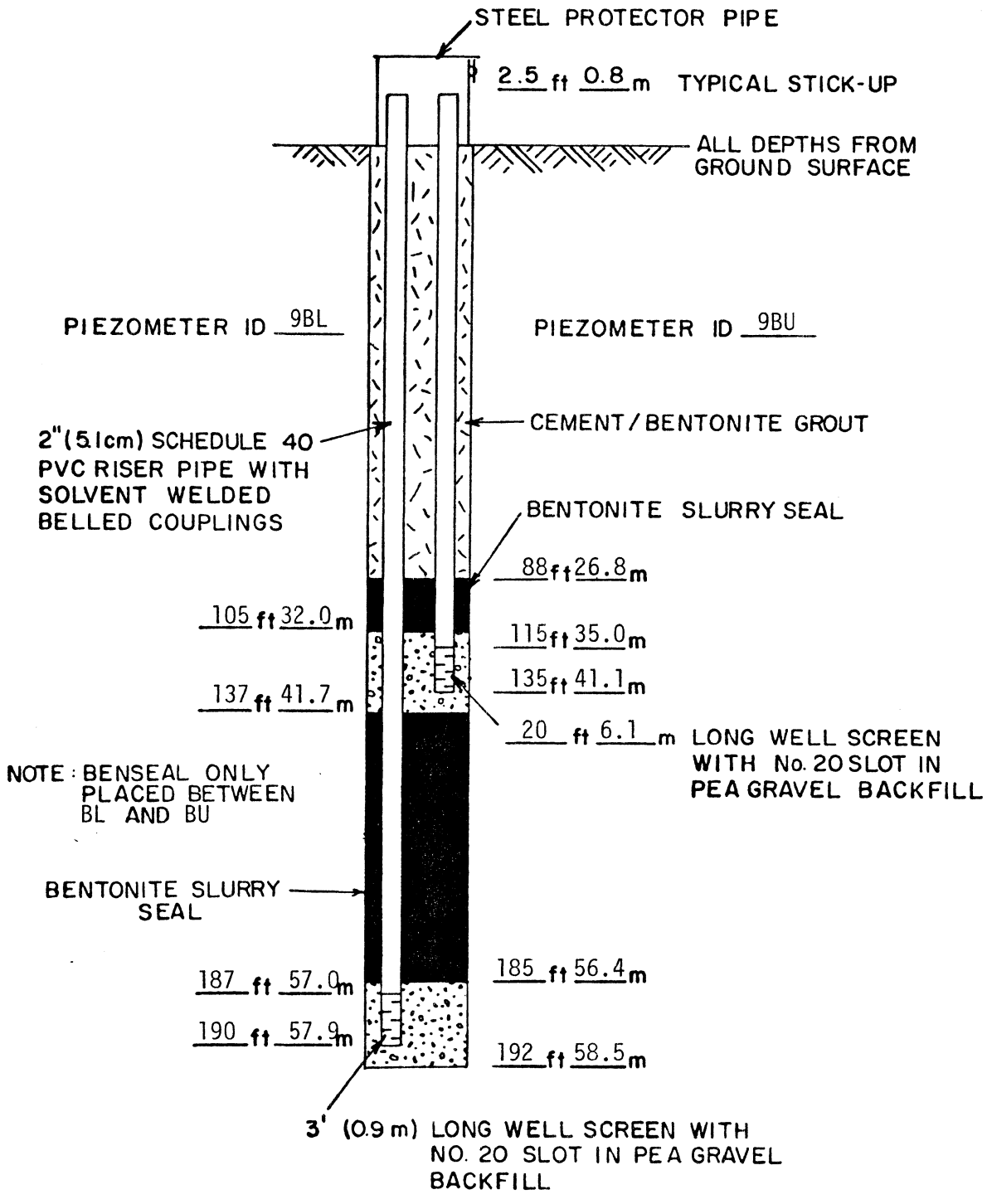
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-9BL & BU DATE INSTALLED 3-30-84 DRILL RIG Schramm

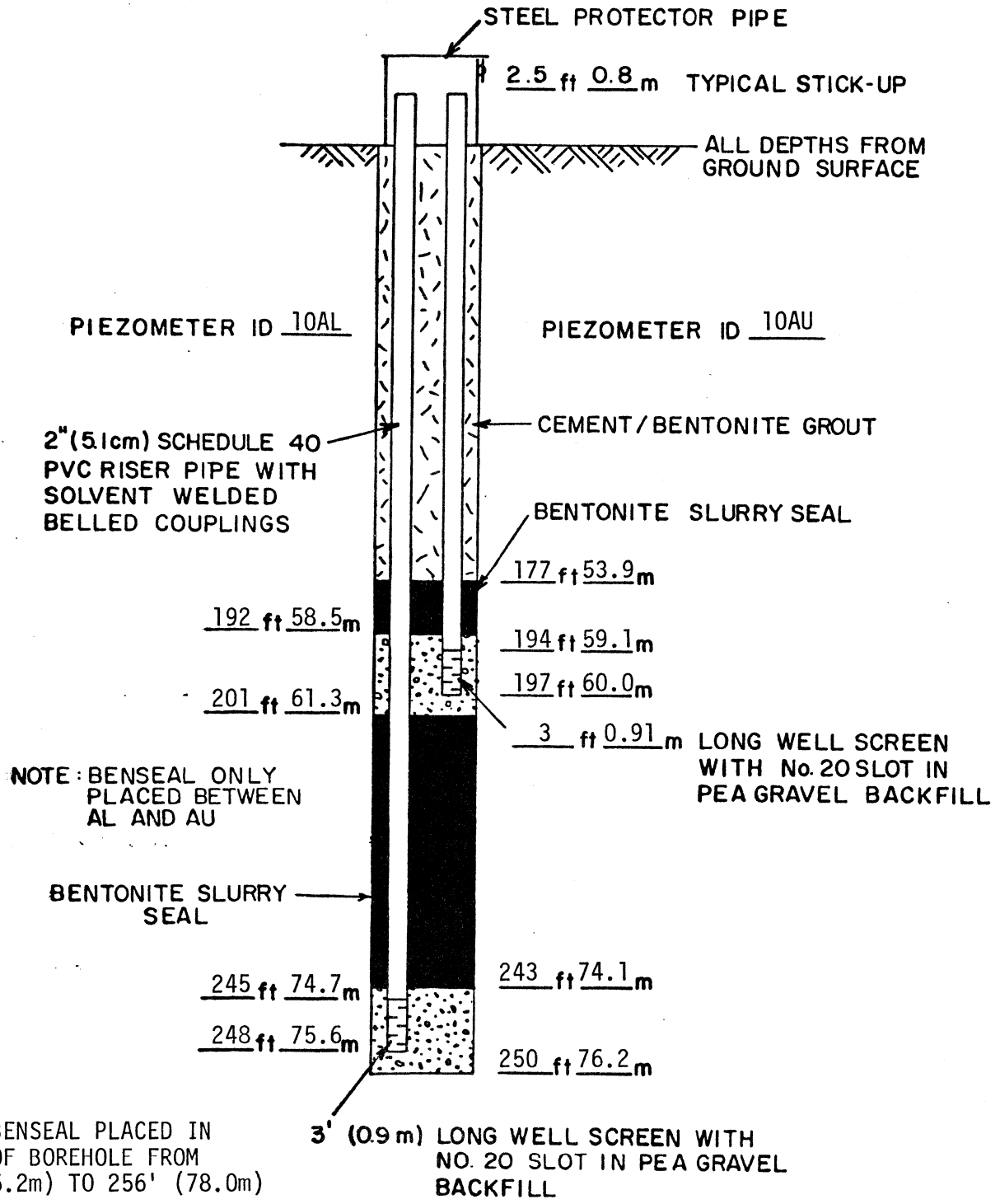
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: BENSEAL PLACED IN BOTTOM OF BOREHOLE FROM 250' (76.2m) TO 256' (78.0m)

Well No. EX-10AL & AU DATE INSTALLED 3-16-84 DRILL RIG Schramm

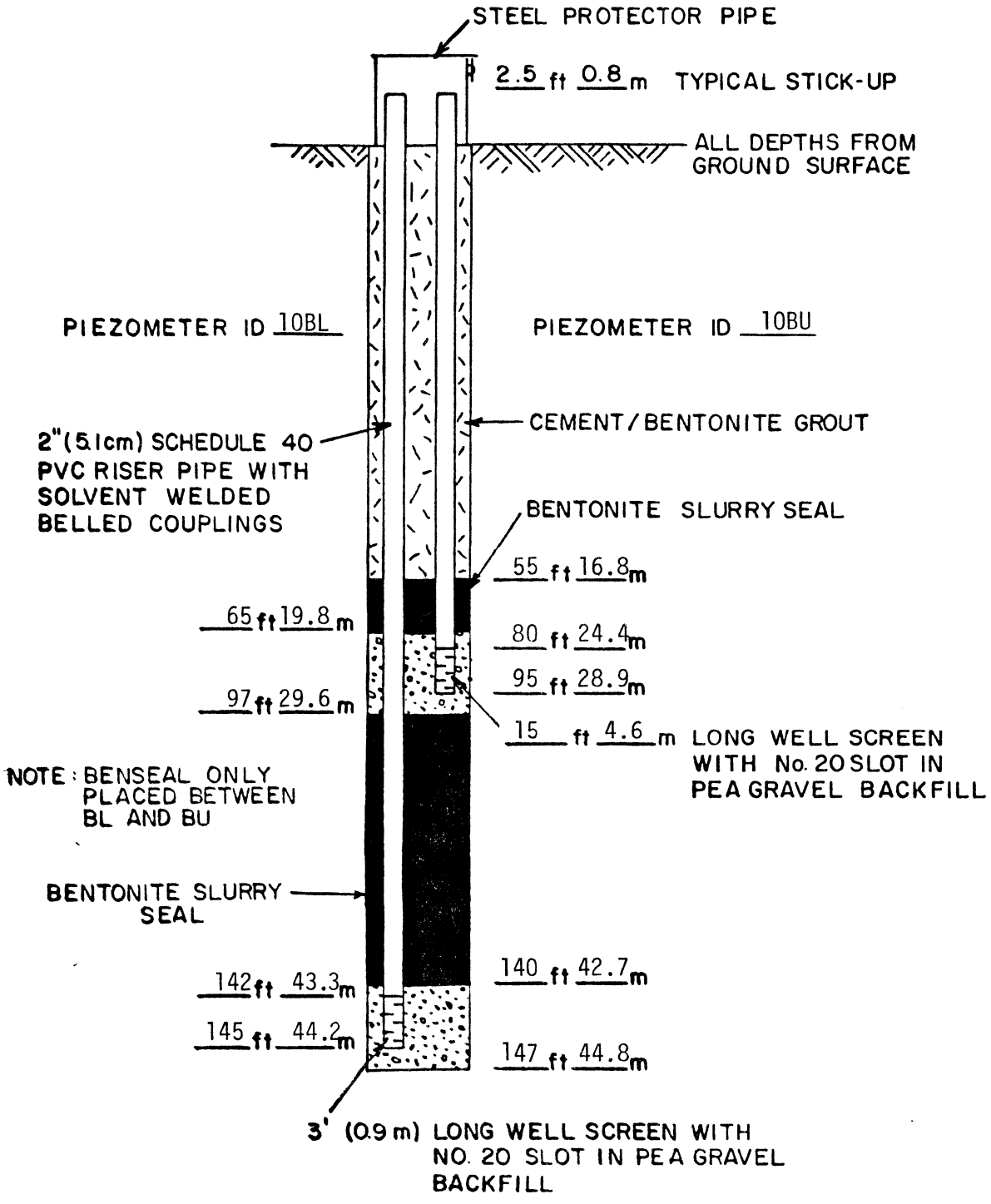
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-10BL & BU DATE INSTALLED 3-16-84 DRILL RIG Schramm

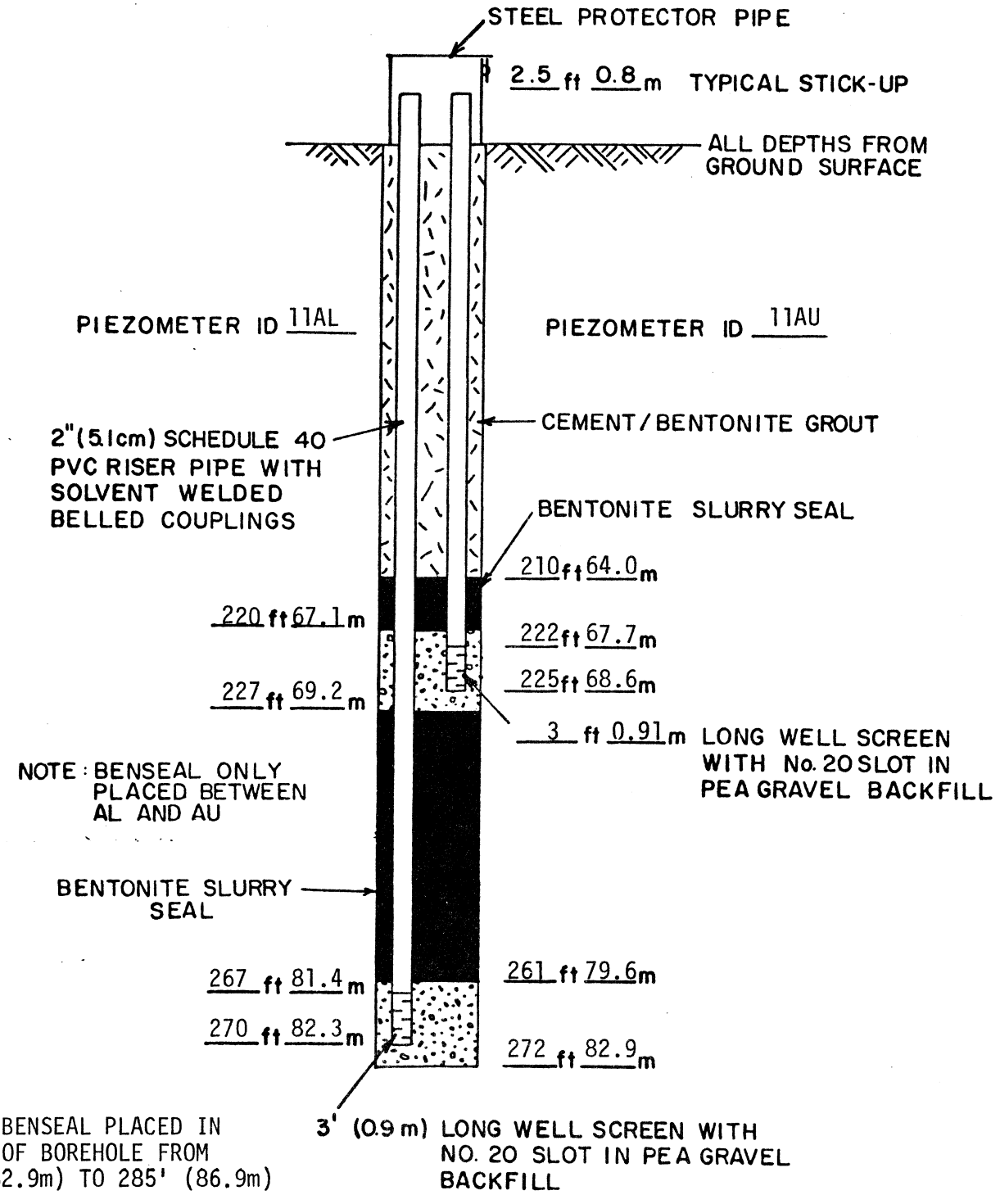
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: BENSEAL PLACED IN BOTTOM OF BOREHOLE FROM 272' (82.9m) TO 285' (86.9m)

Well No. EX-11AL & AU DATE INSTALLED 3-24-84 DRILL RIG Schramm

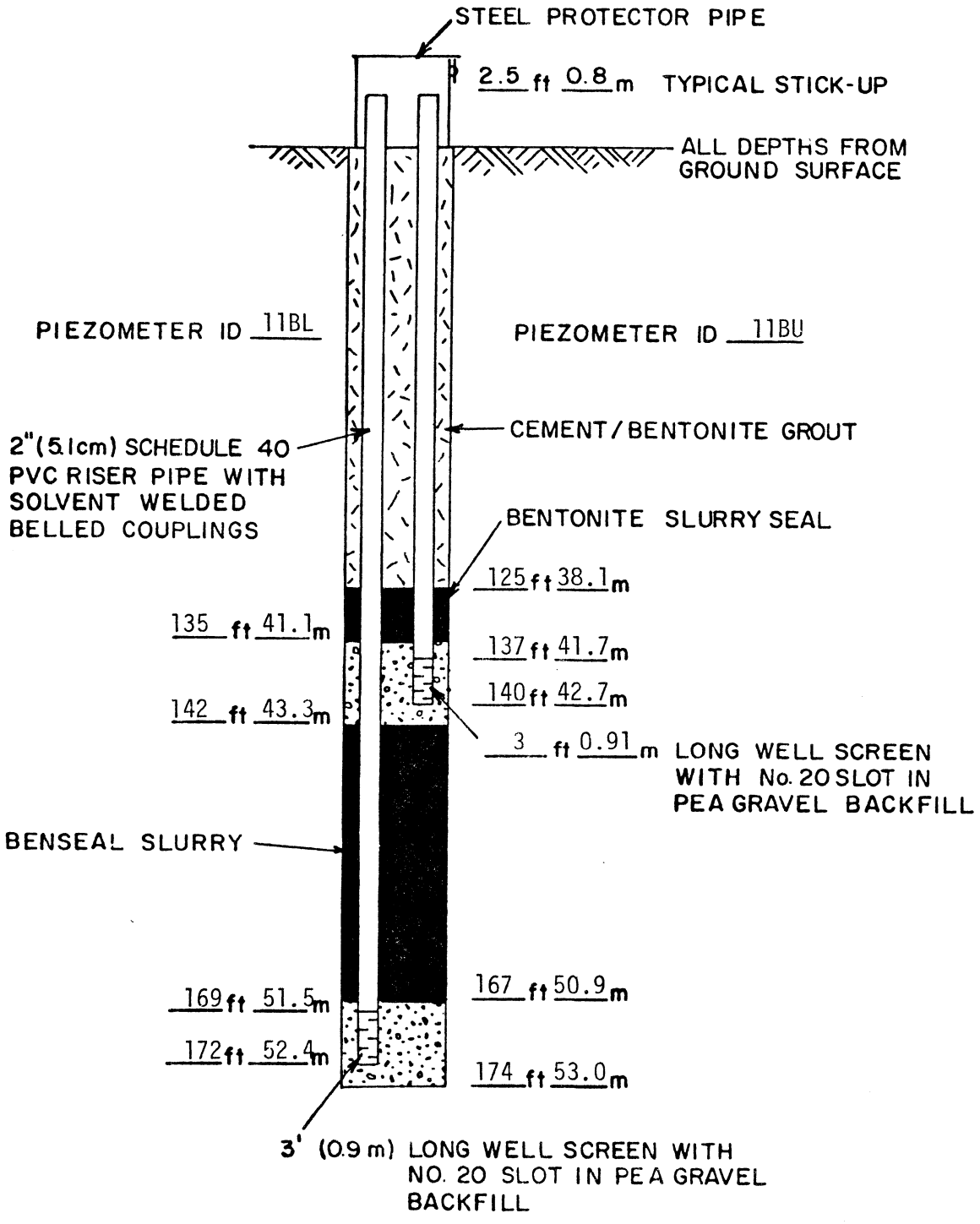
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-11BL & BU DATE INSTALLED 3-25-84 DRILL RIG Schramm

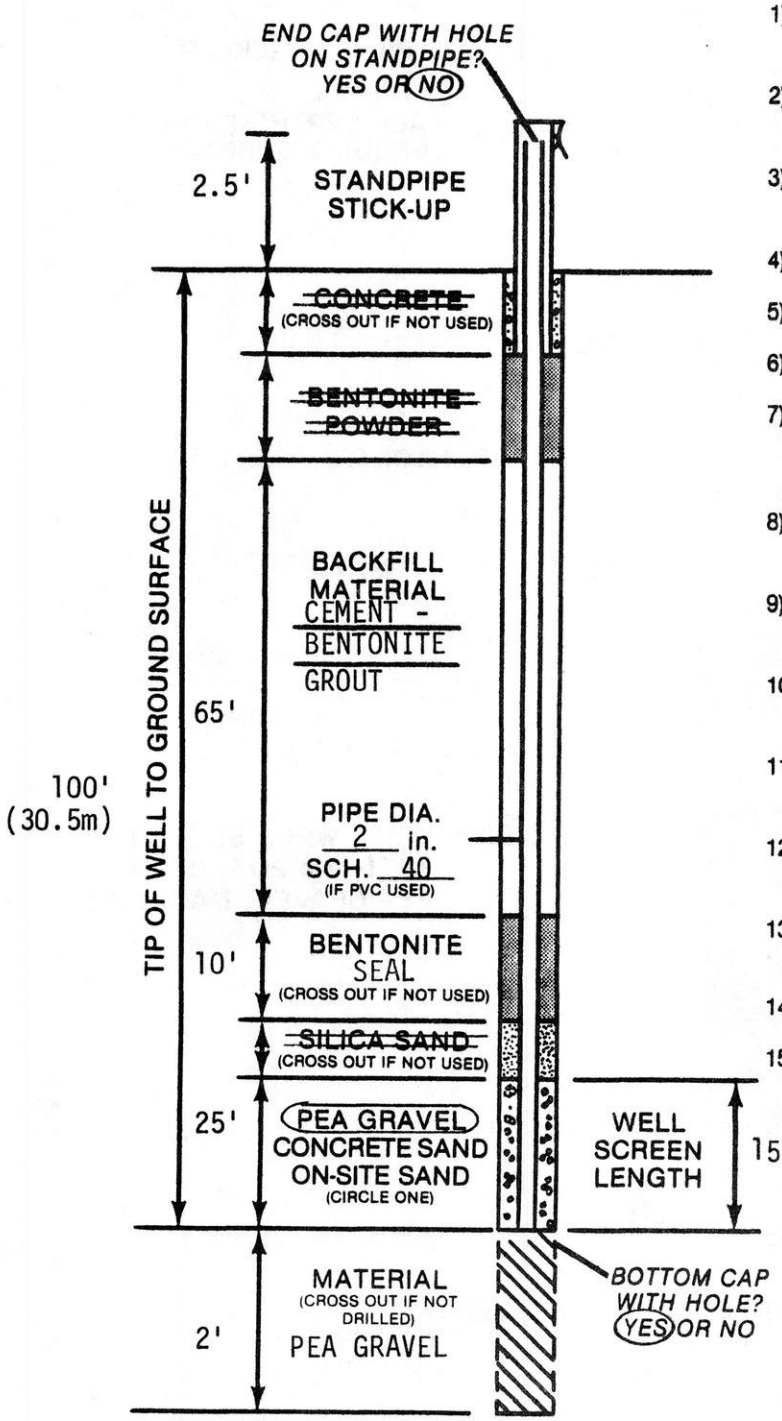
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-11CL DATE INSTALLED 3-27-84 DRILL RIG Schramm

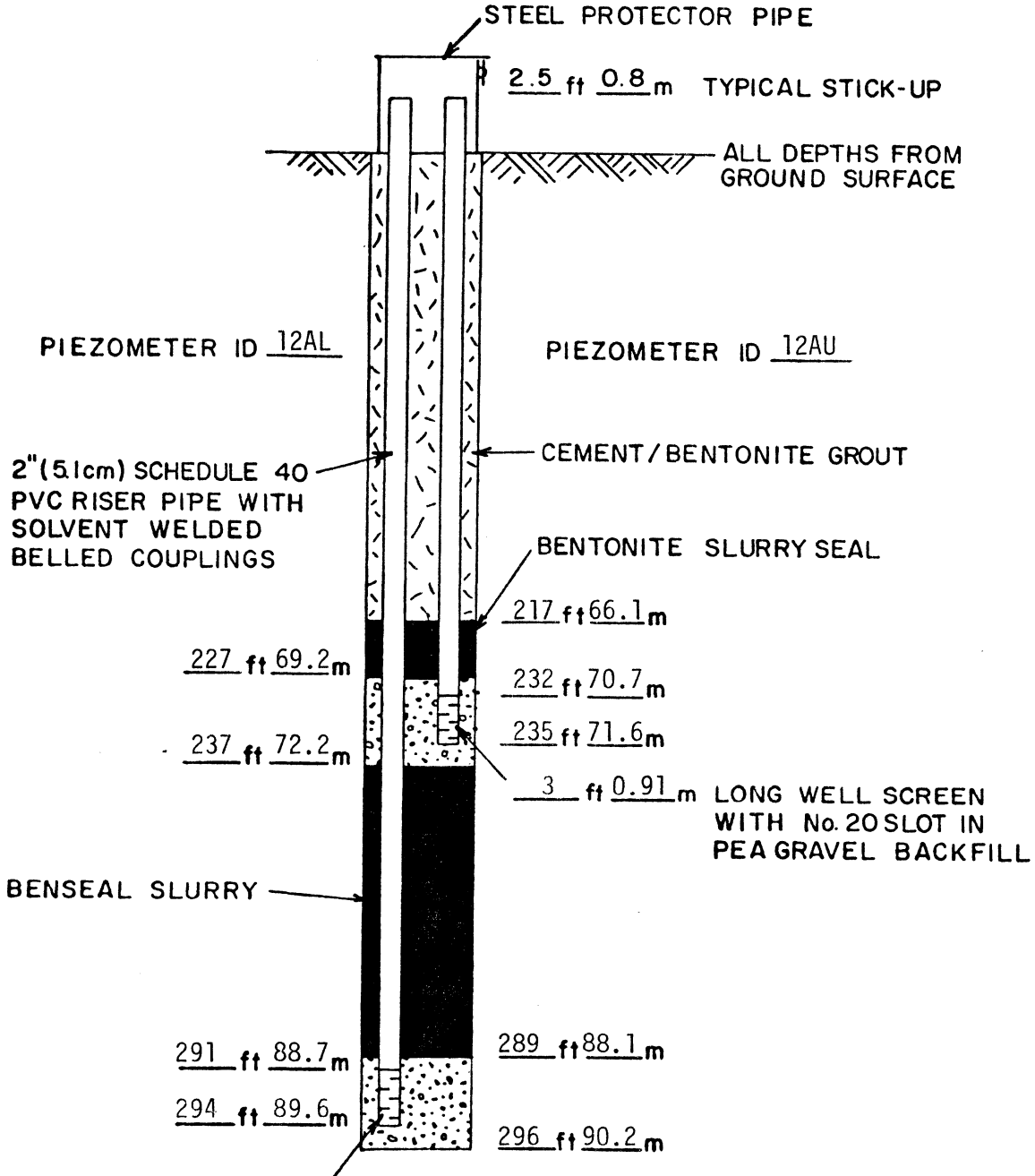
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: BENSEAL PLACED IN BOTTOM OF BOREHOLE FROM 296' (90.2m) TO 305' (93.0m)

Well No. EX-12AL & AU DATE INSTALLED 3/2-3/7/84 DRILL RIG Schramm

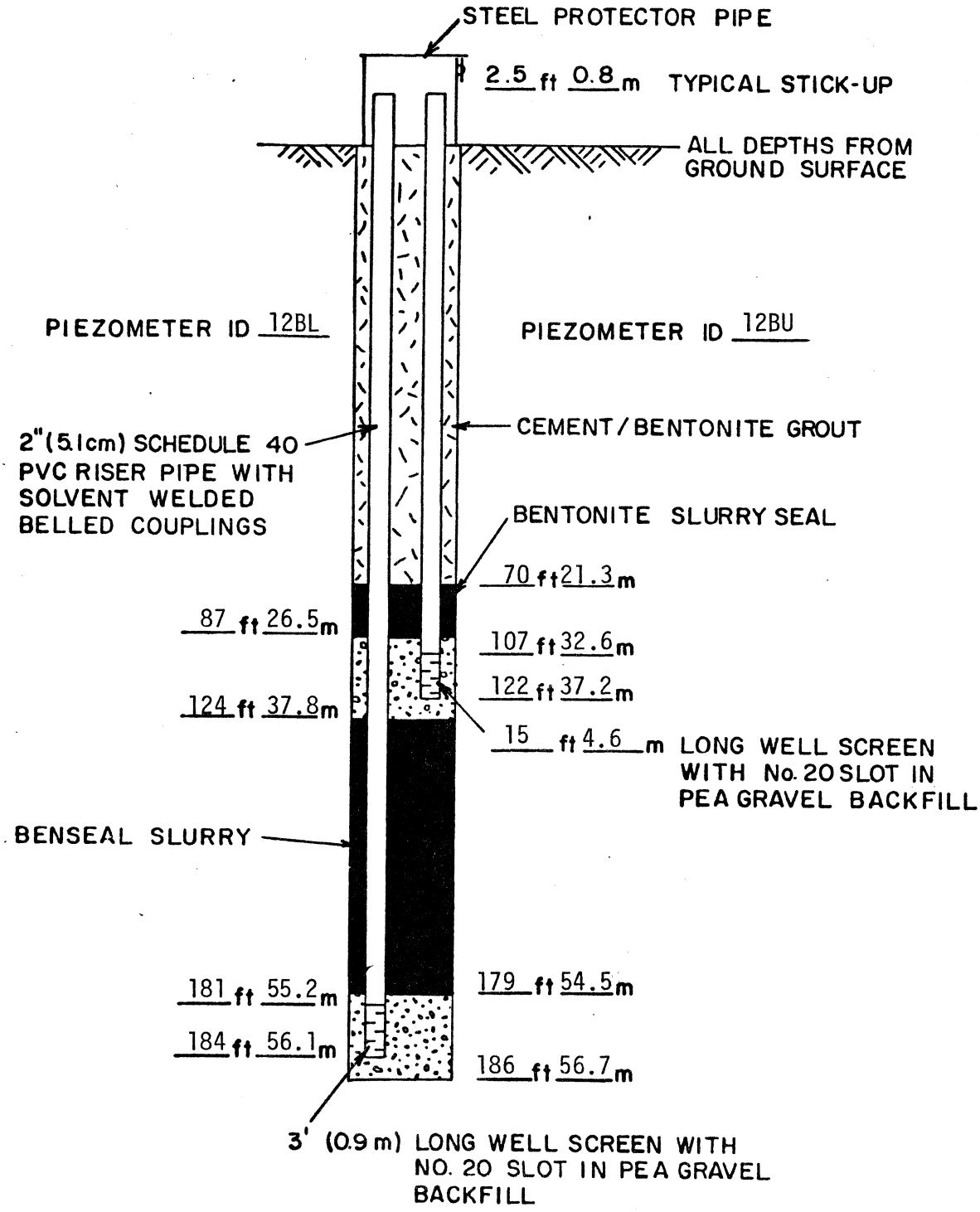
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-12BL & BU DATE INSTALLED 3-7-84 DRILL RIG Schramm

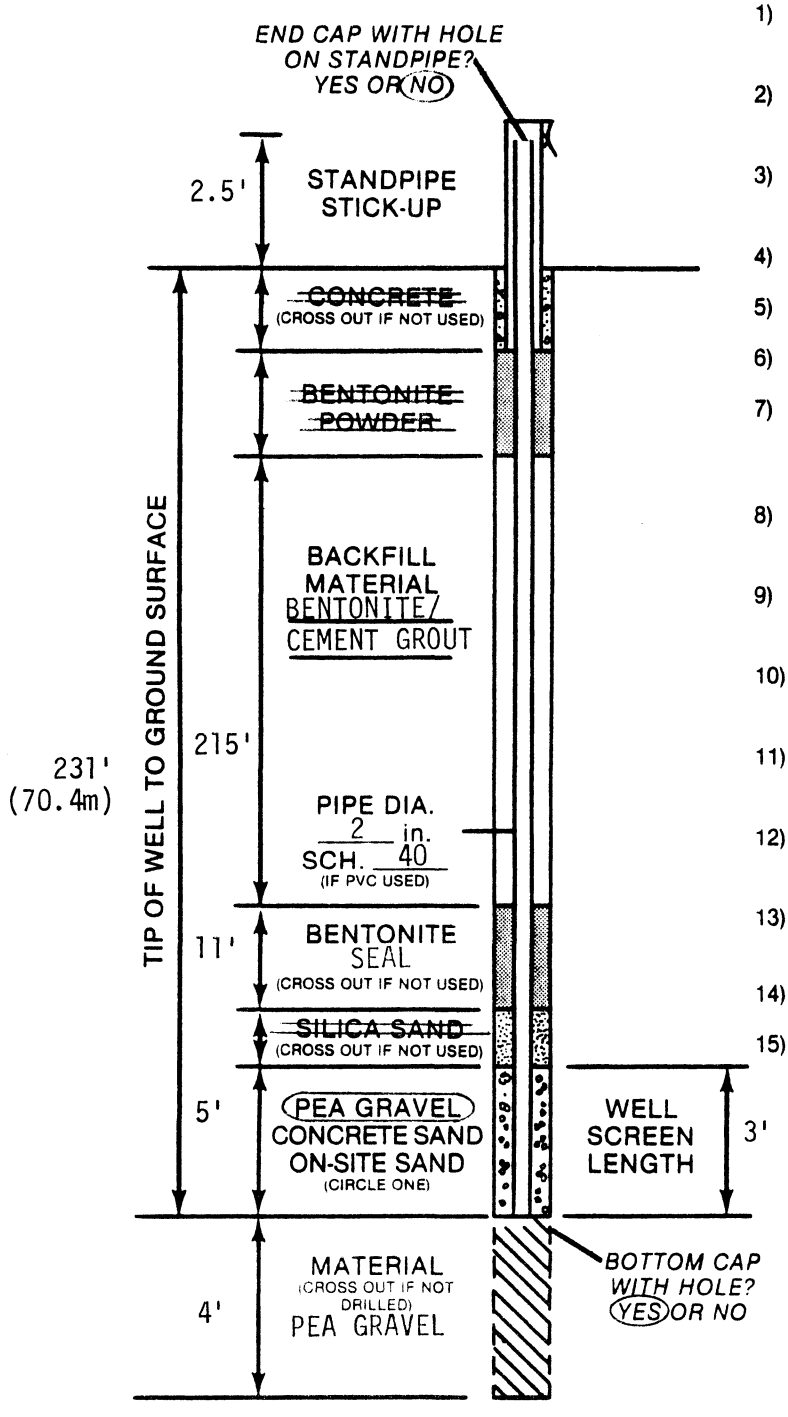
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-13AL DATE INSTALLED 2-20-84 DRILL RIG Schramm

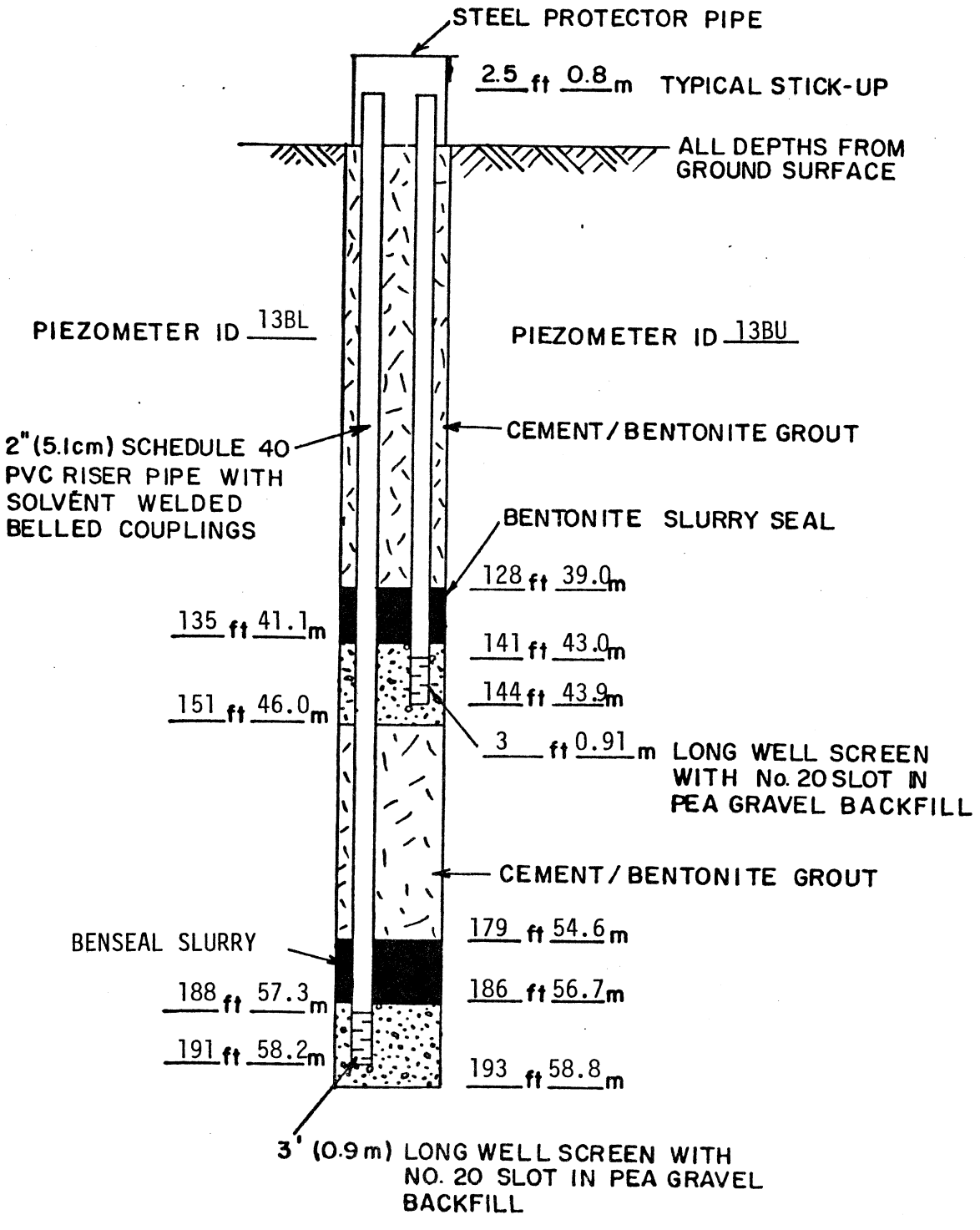
DRILLER Lusier DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-13BL & BU DATE INSTALLED 2/21-2/22/84 DRILL RIG Schramm

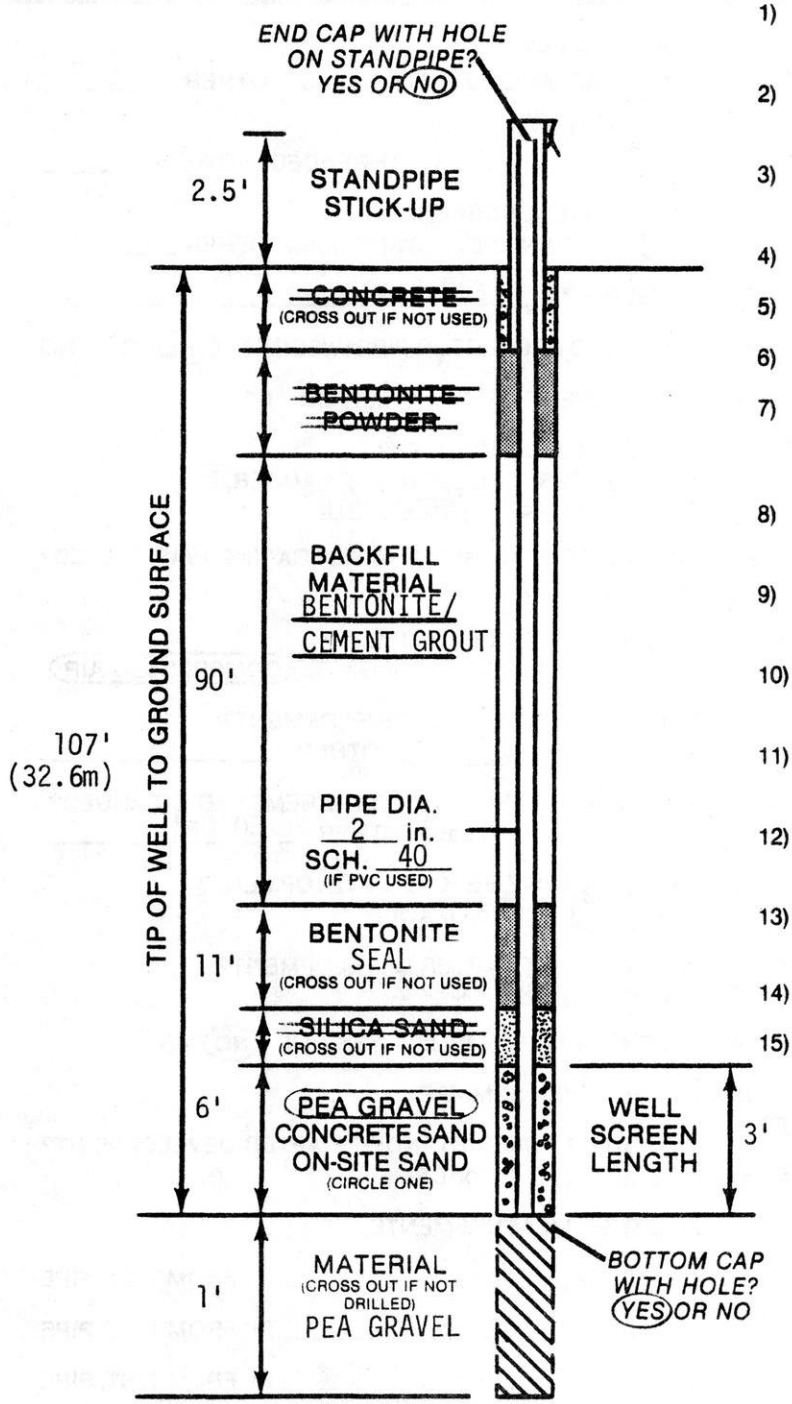
DRILLER Lusiers DRILL CREW Ken

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER, WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-13CL DATE INSTALLED 2-27-84 DRILL RIG Schramm

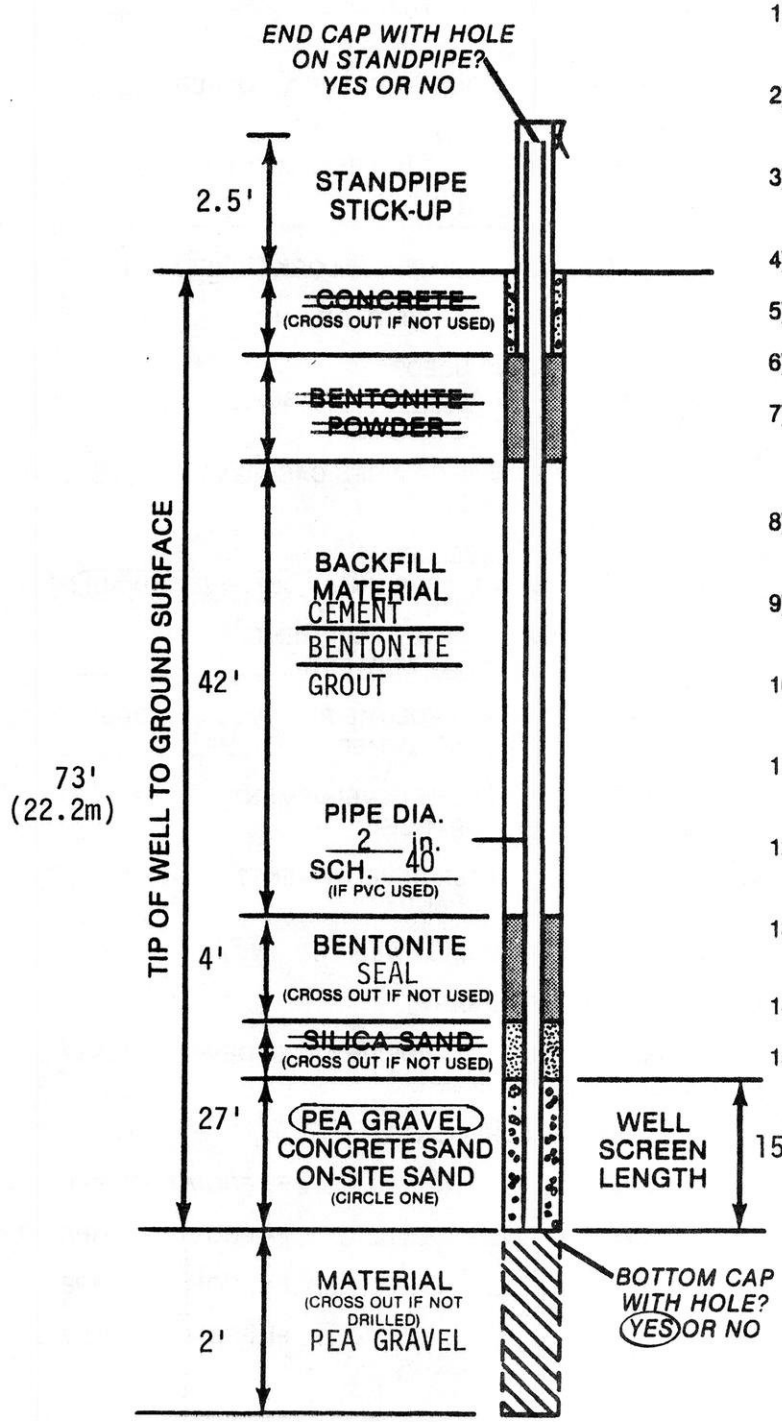
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-13DL DATE INSTALLED 2-29-84 DRILL RIG Schramm

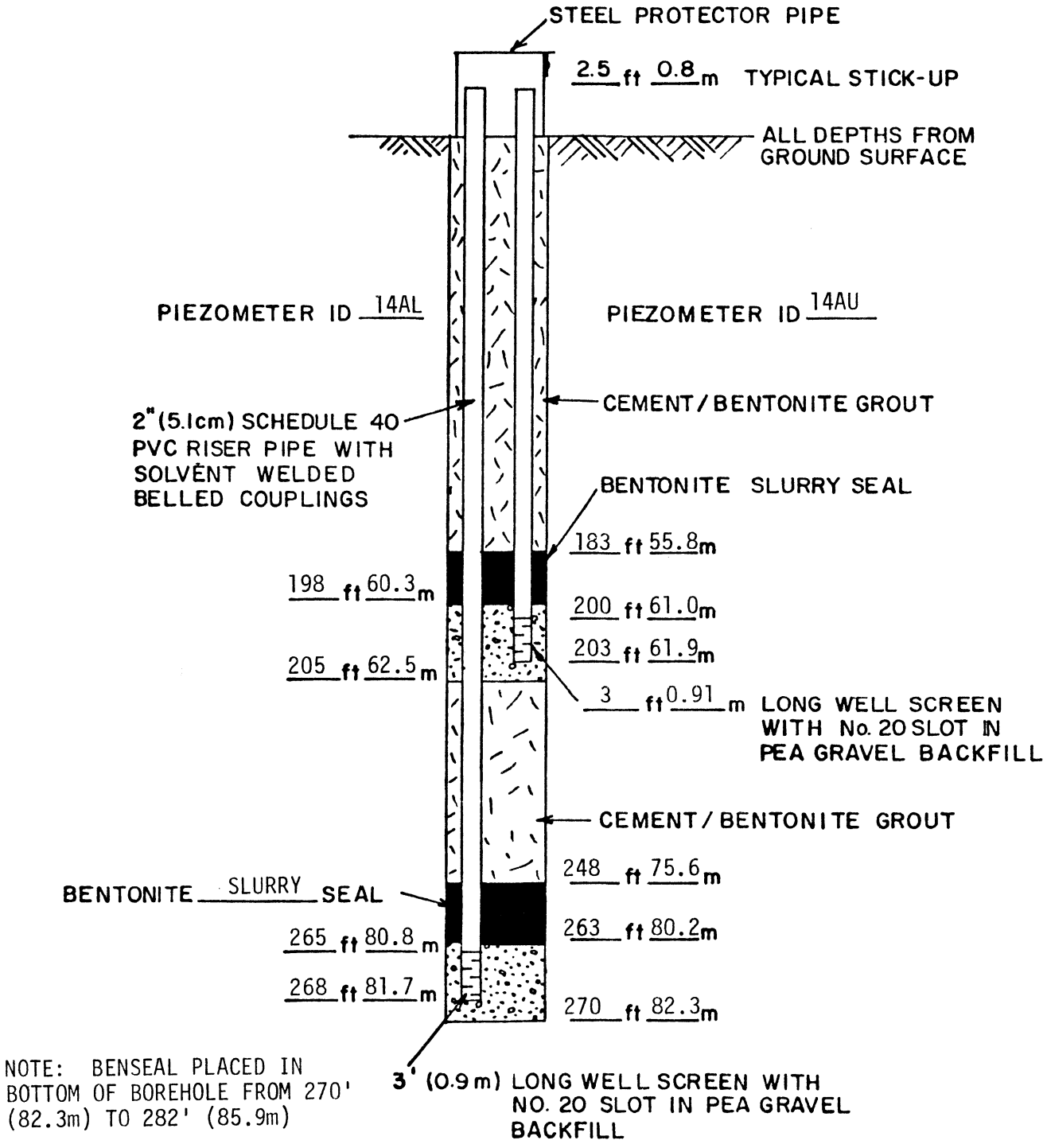
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: BENSEAL PLACED IN BOTTOM OF BOREHOLE FROM 270' (82.3m) TO 282' (85.9m)

Well No. EX-14AL & AU DATE INSTALLED 2-23-84 DRILL RIG Schramm

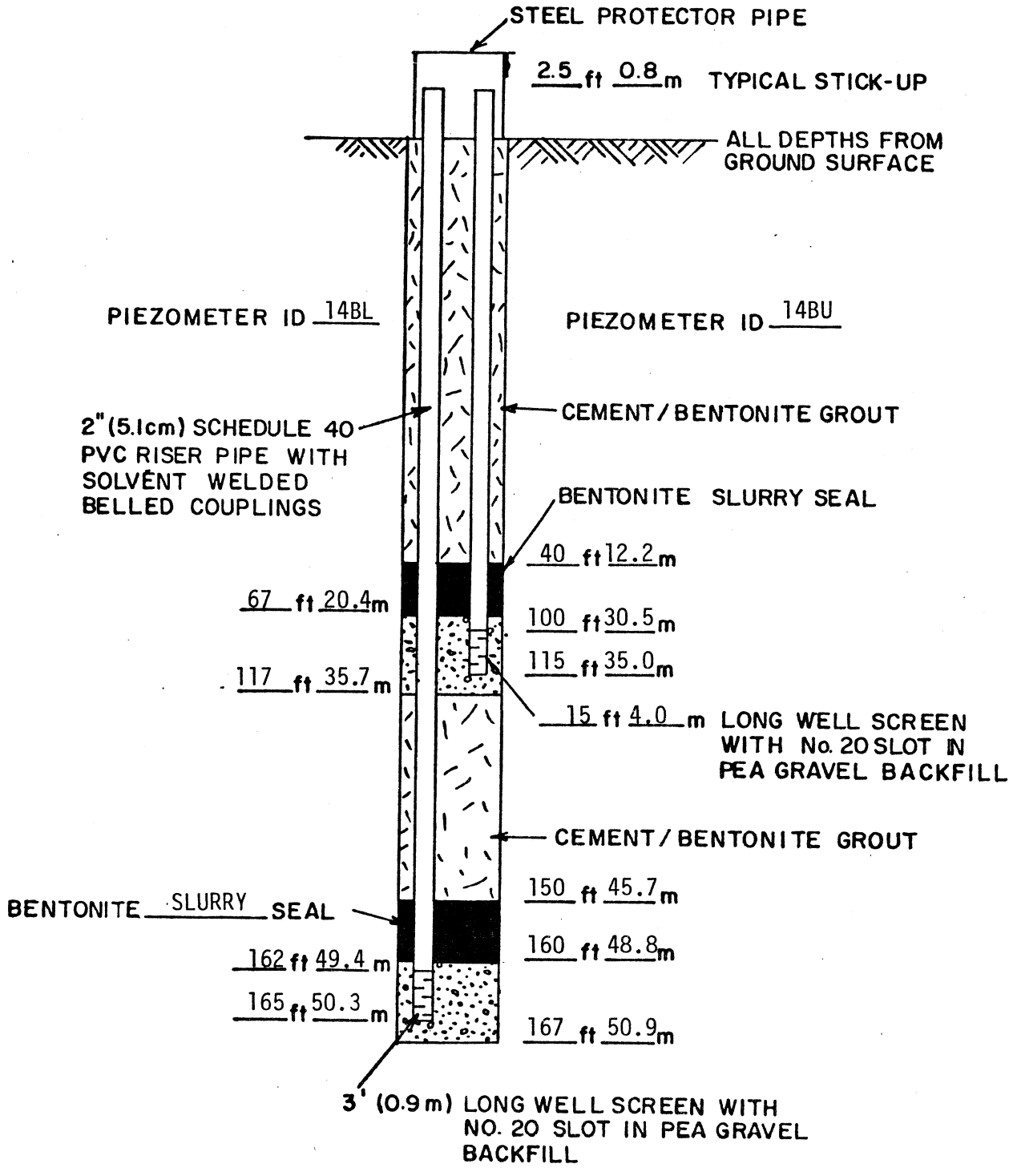
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-14BL & BU DATE INSTALLED 2-25-84 DRILL RIG Schramm

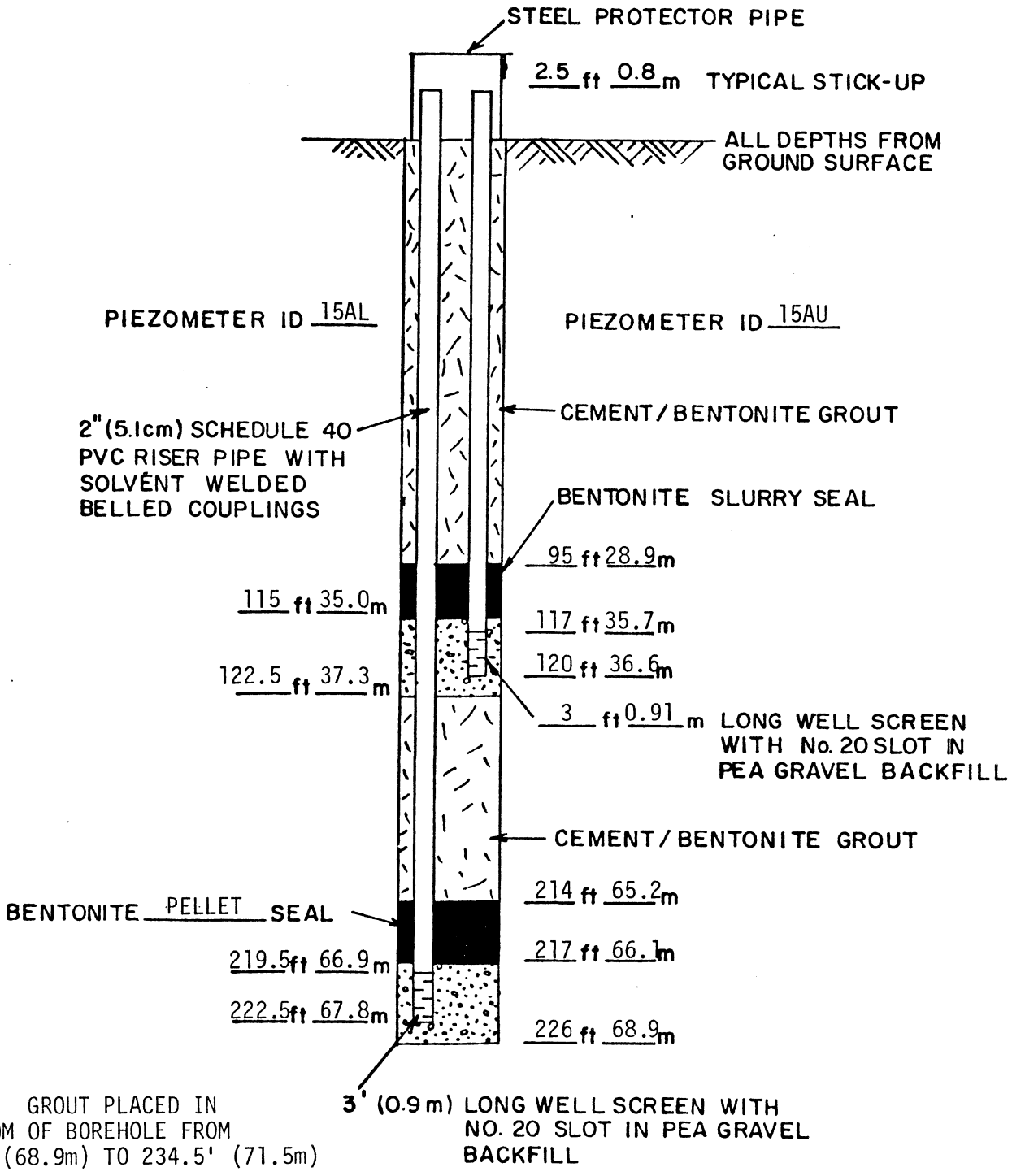
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



NOTE: GROUT PLACED IN BOTTOM OF BOREHOLE FROM 226' (68.9m) TO 234.5' (71.5m)

Well No. EX-15AL & AU DATE INSTALLED 2/10-2/12/84 DRILL RIG Schramm

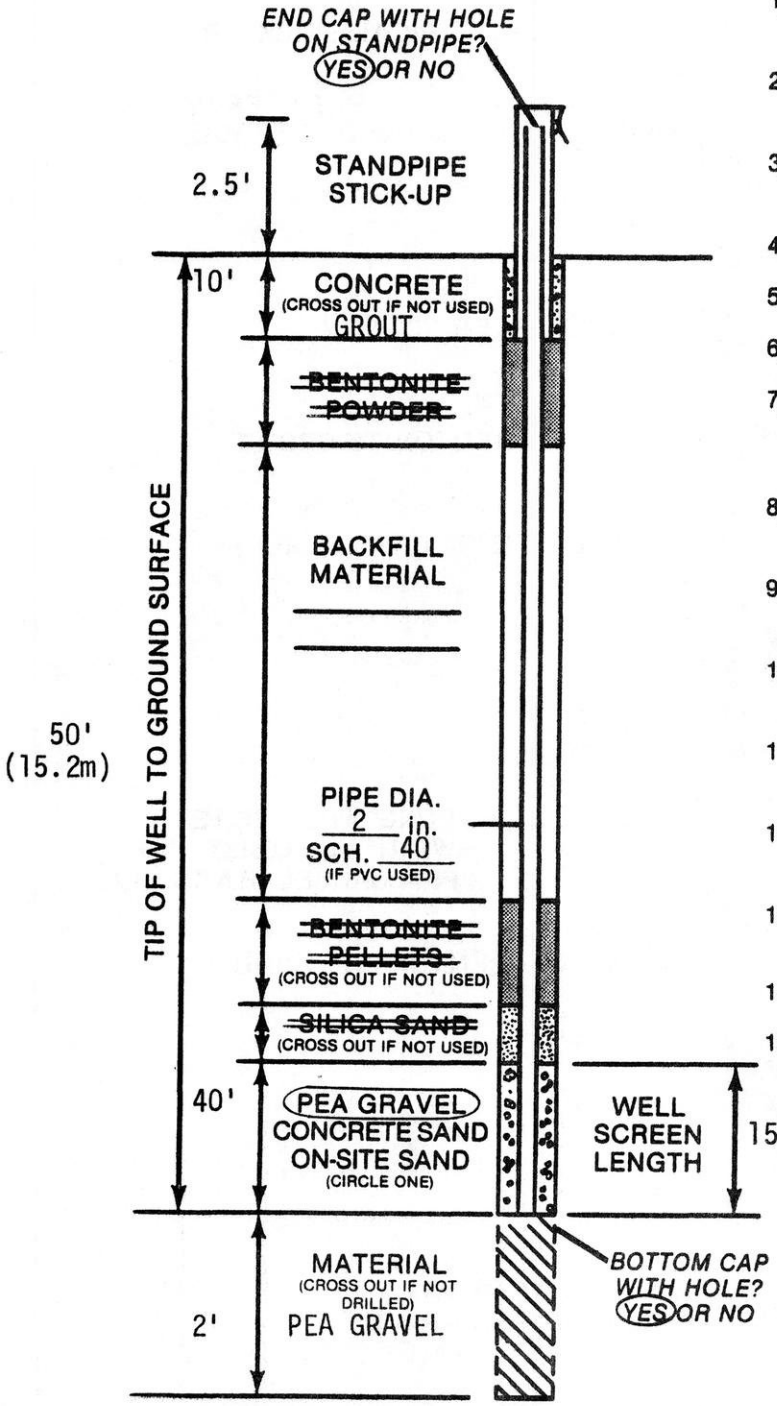
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 50 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-15BL DATE INSTALLED 2-11-84 DRILL RIG Schramm

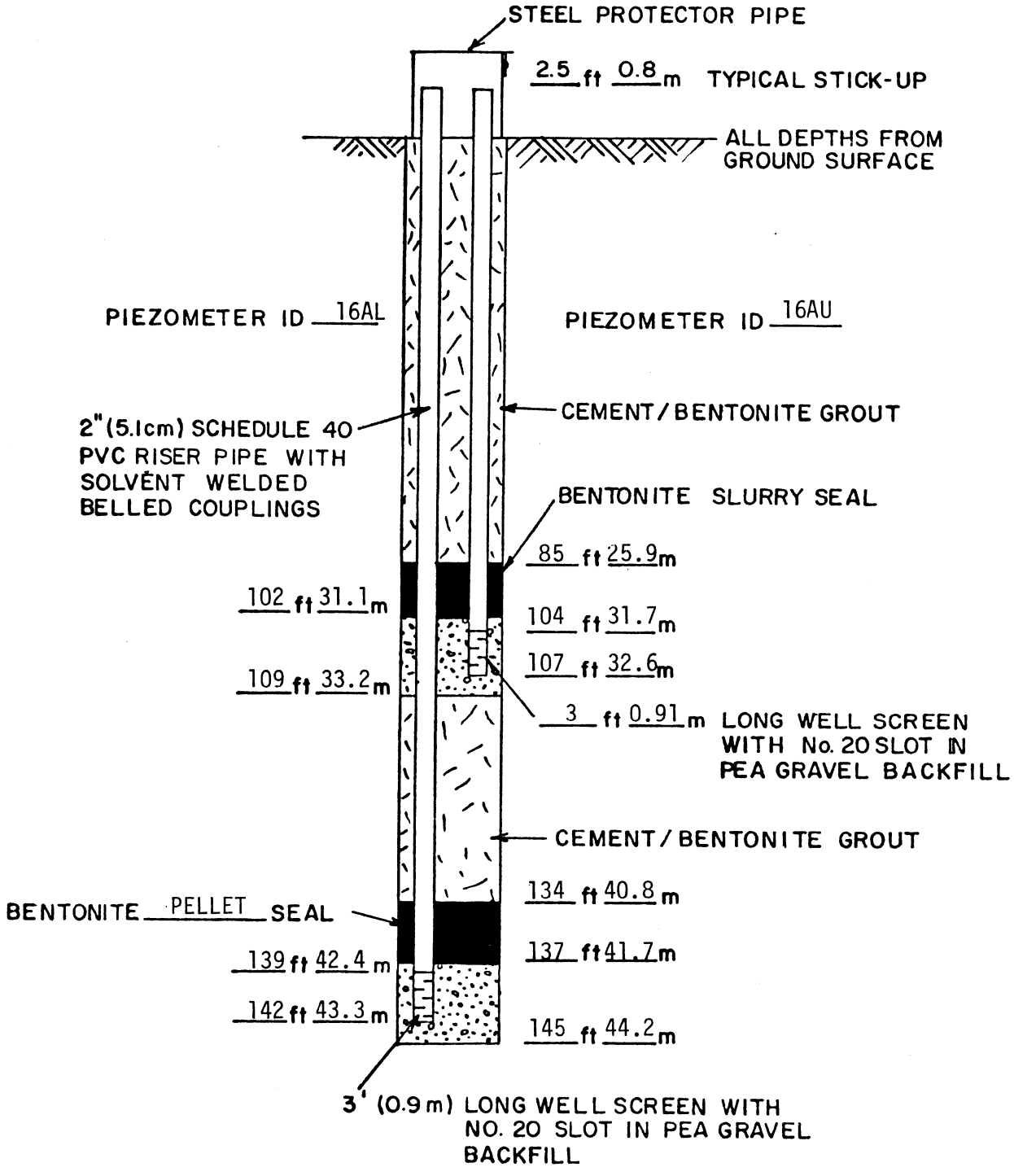
DRILLER Denny's Drilling DRILL CREW Denny

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



Well No. EX-16AL & AU DATE INSTALLED 2/13-2/14/84 DRILL RIG Schramm

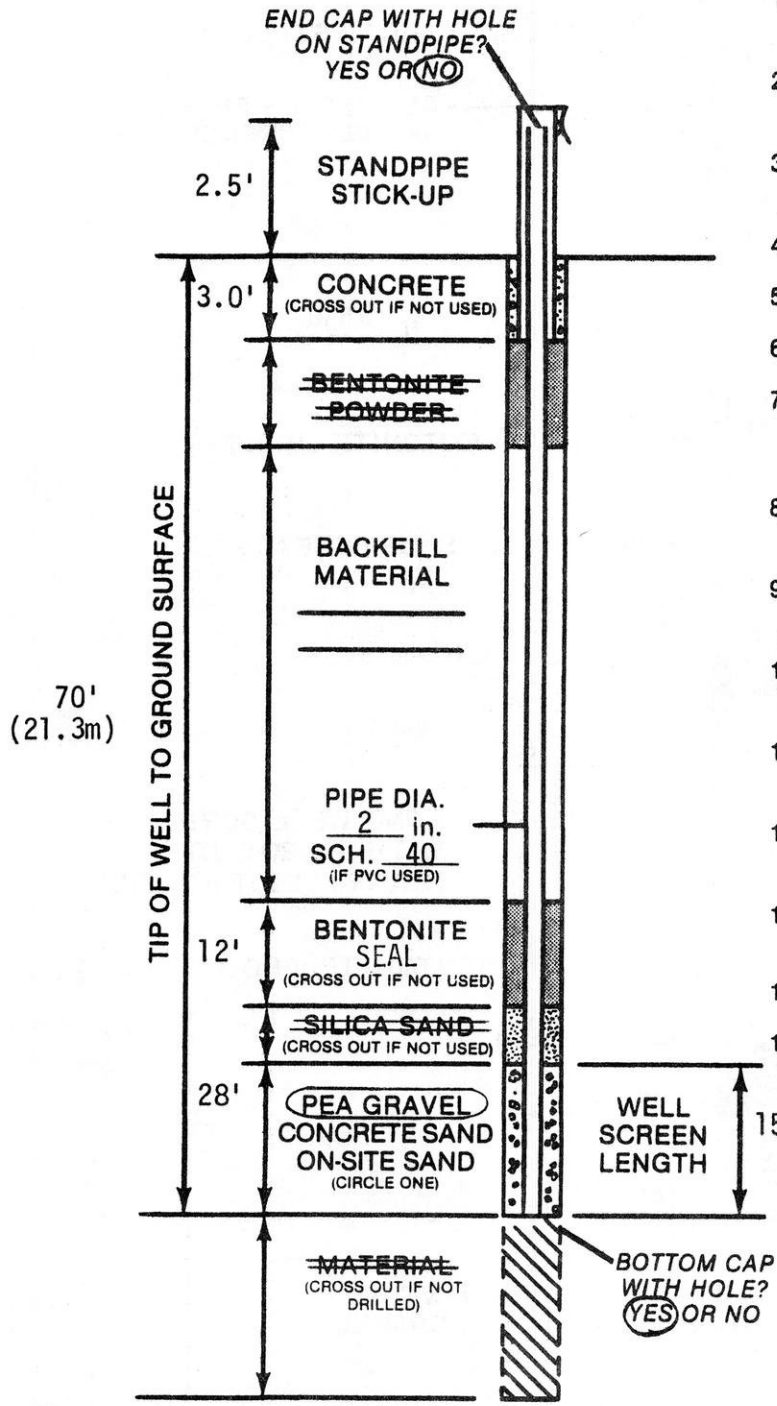
DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
(PVC,) GALVANIZED, STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
(BELLED,) COUPLINGS, THREADED, OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #20 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? (YES) OR NO

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
SOLID AUGER, HOLLOW STEM AUGER,
WATER, REVERT, (BENTONITE)

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED?
BAILING, PUMPING, SURGING, (COMPRESSED AIR)

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., (30 min.,) OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER 100 Gal.

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, (TURBID,) OPAQUE

14) DID THE WATER SMELL? YES OR (NO)

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. EX-16BL DATE INSTALLED 3-1-84 DRILL RIG Schramm

DRILLER Lusiers DRILL CREW Keith

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

APPENDIX A

Soil Boring Logs, RP-1 through RP-15

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-1
PROJECT NAME: Reclaim Pond Borings	Feet: N-115604 E-2280542 — Meters: N-35236 E-695111
SITE LOCATION: Crandon Project	

SURFACE ELEVATION 1634.71-ft. 498.261-m

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT (10 20 30 40 50)
5					Brown silty fine to coarse sand (SM) - some gravel - very dense - boulder from 18.0 to 19.0 feet		
10							
15							
20	1	3" SS					⊗54
	2	3" SS			Brown slightly silty fine to coarse gravel (GM-GP) - some fine to coarse sand - very dense - cobble from 21.3 to 21.7 feet		⊗62
25							
27.5	3	3" SS					⊗105/½" BNCG.
					End of Boring Boring advanced to 27.5 feet with roller bit and Revert drilling mud 10.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 2-21-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 2-22-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG Bomb FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-2
PROJECT NAME: Reclaim Pond Borings	Feet: N-115652 E-2281119 — Meters: N-35251 E-695286
SITE LOCATION: Crandon Project	

SURFACE ELEVATION 1642.51-ft. 500.638-m

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)

DEPTH ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	STANDARD PENETRATION BLOWS / FT.
5					Reddish brown to brown silty fine to coarse sand (SM) - little gravel - extremely dense		
10							
15							
20							
25	1	SS					50/6" 100/.2'
30	2	SS					100/6"
34	3	SS					100/6"
					End of Boring Boring advanced to 34.0 feet with roller bit and Revert drilling mud 12.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-8-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-8-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN BZ	APP'D BY JAS	STS JOB NO. 12991

BL.3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-3
PROJECT NAME: Reclaim Pond Borings	Feet: N-115712 E-2281620 / Meters: N-35269 E-695439

SITE LOCATION: Crandon Project

SURFACE ELEVATION 1642.48-ft. 500.629-m

DEPTH ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
5					Brown silty fine to coarse sand (SM) - trace to some gravel - extremely dense - cobble from 14.5 to 15.0 feet		
10							
15							
20							
25	1	3" SS					⊗ 82/6"
	2	3" SS					⊗ 120/6"
30							
33.5	3	3" SS					⊗ 139/6"
					End of Boring Boring advanced to 33.5 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WI	BORING STARTED 3-12-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WI BCR ARC	BORING COMPLETED 3-12-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WI	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL 3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-4
PROJECT NAME: Reclaim Pond Borings	Feet: N-115903 E-2282534 — Meters: N-35327 E-695718

SITE LOCATION: Crandon Project

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
					SURFACE ELEVATION 1659.07-ft. 505.686-m		
5					Brown silty fine to coarse sand (SM) - little to some gravel - very dense to extremely dense - cobbles from 16.5 to 17.0 feet and 21.5 to 22.0 feet		
10							
15							
20							
25	1	SS					⊗ 71
	2	SS					⊗ 110/6"
30					Brown slightly silty fine to coarse sand (SM-SP) - some gravel - extremely dense		
33.7	3	SS					⊗ 100/.2'
					End of Boring Boring advanced to 33.7 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-7-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WI BCR ARC	BORING COMPLETED 3-7-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WI	RIG DR-2 FOREMAN BZ	APP'D BY JAS	STS JOB NO. 12991

BL 3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-5
PROJECT NAME: Reclaim Pond Borings	Feet: N-115119 E-2280901 — Meters: N-35088 E-695220

SITE LOCATION: Crandon Project

DEPTH ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
					SURFACE ELEVATION 1644.62-ft. 501.281-m		
5					Brown silty fine to coarse sand (SM) - little to some gravel - extremely dense - cobble from 31.0 to 31.5 feet		
10							
15							
20							
25							
30	1	SS					⊗ 100/6"
35	2	SS					⊗ 100/6"
40	3	SS					⊗ 100/6"
					End of Boring Boring advanced to 40.0 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-8-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-9-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN BZ	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-6
PROJECT NAME: Reclaim Pond Borings	Feet: N-115346 E-2281381 / Meters: N-35158 E-695366
SITE LOCATION: Crandon Project	

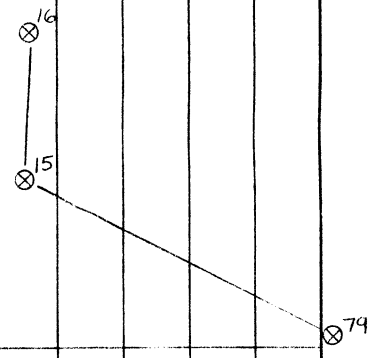
SURFACE ELEVATION 1644.51-ft. 501.248-m

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³
0					Brown silty fine to coarse sand (SM) - trace to some gravel - medium dense to very dense - boulder from 13.5 to 14.5 feet	
5						
10						
15	1	SS				
20	2	SS				
25						
27.5	3	SS			End of Boring Boring advanced to 27.5 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5)

PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS / FT (10 20 30 40 50)



Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-10-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-10-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN BZ	APP'D BY JAS	STS JOB NO. 12911

BL.3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-7
PROJECT NAME: Reclaim Pond Borings	Feet: N-115410 E-2281782 Meters: N-35177 E-695489
SITE LOCATION: Crandon Project	

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
					SURFACE ELEVATION 1636.08-ft. 498.678-m		
5					Brown silty fine to coarse sand (SM) - trace to some gravel - very dense to extremely dense		
10	1	3" SS					⊗ 104
15	2	3" SS					⊗ 100/2" BNCG.
20							
21.5	3	3" SS					⊗ 51
					End of Boring Boring advanced to 21.5 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-12-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-12-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-8
PROJECT NAME: Reclaim Pond Borings	Feet: N-115562 E-2282668 — Meters: N-35223 E-695759
SITE LOCATION: Crandon Project	

DEPTH ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³
					SURFACE ELEVATION 1654.91-ft. 504.418-m	
5					Brown silty fine to coarse sand (SM) - trace to some gravel - medium dense to extremely dense - cobble from 14.0 to 14.5 feet	
10						
15						
20	1	3" SS				
25	2	3" SS				
30	3	3" SS				
30.5					End of Boring Boring advanced to 30.5 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion	

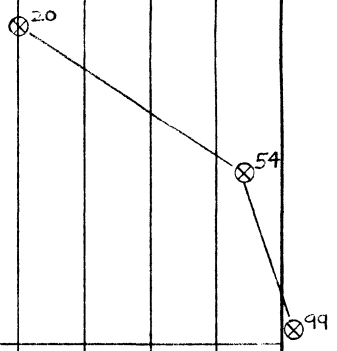
UNCONFINED COMPRESSIVE STRENGTH TONS/FT² — 1 2 3 4 5

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT %

10 20 30 40 50

STANDARD PENETRATION BLOWS / FT.

10 20 30 40 50



Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-2-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-2-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-9
PROJECT NAME: Reclaim Pond Borings	Feet: N-114750 E-2280723 — Meters: N-34976 E-695166
SITE LOCATION: Crandon Project	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)

DEPTH ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	STANDARD PENETRATION BLOWS / FT.
					SURFACE ELEVATION 1654.67-ft. 504.344-m		
5					Brown silty fine to coarse sand (SM) - trace to some gravel - very dense to extremely dense - boulder from 14.0 to 16.0 feet		
10							
15							
20							
25	1	SS					63
30	2	SS					100/6"
34	3	SS					111/6"
					End of Boring Boring advanced to 34.0 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-9-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-9-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN BZ	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

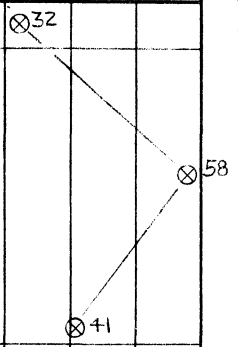
OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-10
PROJECT NAME: Reclaim Pond Borings	Feet: N-114892 E-2281336 Meters: N-35019 E-695353
SITE LOCATION: Crandon Project	

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³
					SURFACE ELEVATION 1625.80-ft. 495.545-m	
	1	SS			Brown fine sandy silt (ML) - trace gravel - trace of roots - dense - topsoil	
5	2	SS			Brown silty fine to coarse sand (SM) - little gravel - dense to very dense	
10						
11.5	3	SS				
					End of Boring Boring advanced to 11.5 feet with power auger Borehole grouted upon completion	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)



Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-9-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-9-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN BZ	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-11
PROJECT NAME: Reclaim Pond Borings	Feet: N-115033 E-2282358 Meters: N-35062 E-695664

SITE LOCATION: Crandon Project

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
					SURFACE ELEVATION 1630.33-ft. 496.926-m		
	1	3" SS			Brown fine sandy silt (ML) - little gravel - trace roots - loose - topsoil		⊗4
5	2	3" SS			Brown silty fine to coarse sand (SM) - some gravel - medium dense		⊗25
10							
11.5	3	3" SS					⊗25
					End of Boring Boring advanced to 11.5 feet with power auger Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WI	BORING STARTED 3-1-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-1-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL:3 1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-12
PROJECT NAME: Reclaim Pond Borings	Feet: N-115000 E-2282868 / Meters: N-35052 E-695820

SITE LOCATION: Crandon Project

SURFACE ELEVATION 1648.79-ft. 502.552-m

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
5					Brown silty fine to coarse sand (SM) - some gravel - extremely dense		
10							
15							
	1	3" SS					58/6" 100/2"
20							
	2	3" SS					100/5" BNCG.
25							
26.4	3	3" SS					125/5"
					End of Boring Boring advanced to 26.0 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-1-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-1-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-13
PROJECT NAME: Reclaim Pond Borings	Feet: N-114509 E-2282328 Meters: N-34902 E-695655

SITE LOCATION: Crandon Project

SURFACE ELEVATION 1620.30-ft. 493.868-m

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
	1	3" SS			Brown fine sandy silt (ML) - trace gravel, trace clay, trace roots - loose - topsoil		⊗6
5					Brown silty fine to coarse sand (SM) - little gravel - medium dense		
7.5	2	3" SS					⊗20
					End of Boring Boring advanced to 6.0 feet with power auger Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL

WL	BORING STARTED 3-1-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-1-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL:3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-14
PROJECT NAME: Reclaim Pond Borings	Feet: N-115863 E-2281985 — Meters: N-35315 E-695550
SITE LOCATION: Crandon Project	

UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5)

PLASTIC LIMIT % — WATER CONTENT % — LIQUID LIMIT % (10 20 30 40 50)

STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)

DEPTH ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³
					SURFACE ELEVATION 1645.44-ft. 501.531-m	
5					Brown silty fine to coarse sand (SM) - some gravel - very dense	
10						
15	1	3" SS				
					Brown slightly silty fine to coarse sand (SM-SP) - some gravel - extremely dense	
20	2	3" SS				
23.8	3	3" SS			Brown silty fine to coarse sand (SM) - some gravel - extremely dense	
					End of Boring Boring advanced to 23.0 feet with roller bit and Revert drilling mud 13.0 feet of HW casing used Borehole grouted upon completion	

54 — 91 — 105/4

Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 2-29-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 2-29-84	DRAWN BY SMD	SHEET NO 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL.3-1183

STS Consultants Ltd.

OWNER: Exxon Minerals Company	LOG OF BORING NUMBER: RP-15
PROJECT NAME: Reclaim Pond Borings	Feet: N-115462 E-2282287 Meters: N-35193 E-695642
SITE LOCATION: Crandon Project	

DEPTH / ELEVATION	SAMPLE NO.	SAMPLE TYPE	SAMPLE DISTANCE	RECOVERY	DESCRIPTION OF MATERIAL	UNIT DRY WT. LBS./FT³	UNCONFINED COMPRESSIVE STRENGTH TONS/FT² (1 2 3 4 5) / PLASTIC LIMIT % / WATER CONTENT % / LIQUID LIMIT % (10 20 30 40 50) / STANDARD PENETRATION BLOWS / FT. (10 20 30 40 50)
					SURFACE ELEVATION 1642.23-ft. 500.553-m		
5					Brown slightly silty fine to coarse sand (SM-SP) - some gravel - medium dense		
10							
15	1	3" SS					⊗ 24
	2	3" SS			Brown silty fine to coarse sand (SM) and gravel - very dense to extremely dense		⊗ 59
20							
23.5	3	3" SS					⊗ 10 1/6"
					End of Boring Boring advanced to 23.0 feet with roller bit and Revert drilling mud 7.0 feet of HW casing used Borehole grouted upon completion		Note: 300 lb. Hammer used

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION MAY BE GRADUAL.

WL	BORING STARTED 3-2-84	STS OFFICE	540 Lambeau Green Bay, WI 54303
WL BCR ARC	BORING COMPLETED 3-2-84	DRAWN BY SMD	SHEET NO. 1 OF 1
WL	RIG DR-2 FOREMAN EVH	APP'D BY JAS	STS JOB NO. 12991

BL-3-1183

APPENDIX A

Summary of Driller's Observations During Well Point Installations

APPENDIX A

Summary of Driller's Observations During Well Point Installations

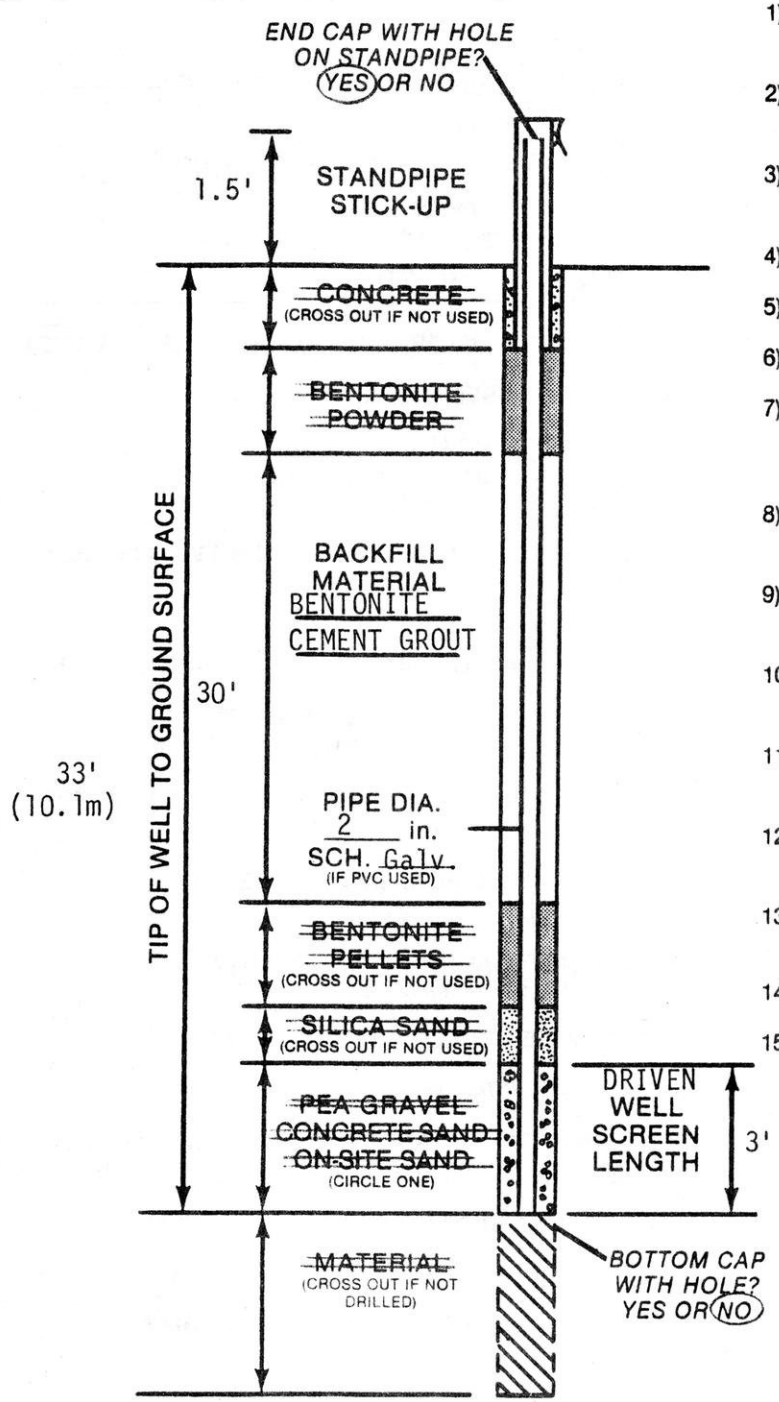
Location	Depth Ft.	Depth M.	Soil Description
WP-1	0	0	Peat
	1	0.3	Grayish brown silty fine to medium sand
	30.0	9.1	
WP-2	0	0	Peat and green organic silt
	24.0	7.3	Brown medium to coarse sand
	29.5	9.0	
WP-3			No observations
WP-4			No observations
WP-5	0	0	Peat
	5.0	1.5	Brown silty fine to medium sand with gravel
	29.5	9.0	
WP-6	0	0	Peat
	10.0	3.0	Brown silty fine to medium sand with gravel
	33.0	10.1	
WP-7	0	0	Brown silty fine to medium sand with gravel
	30.0	9.1	

APPENDIX A

Well Installation Diagrams for WP-1 through WP-7

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-1L DATE INSTALLED 3-15-84 DRILL RIG Bomb 55

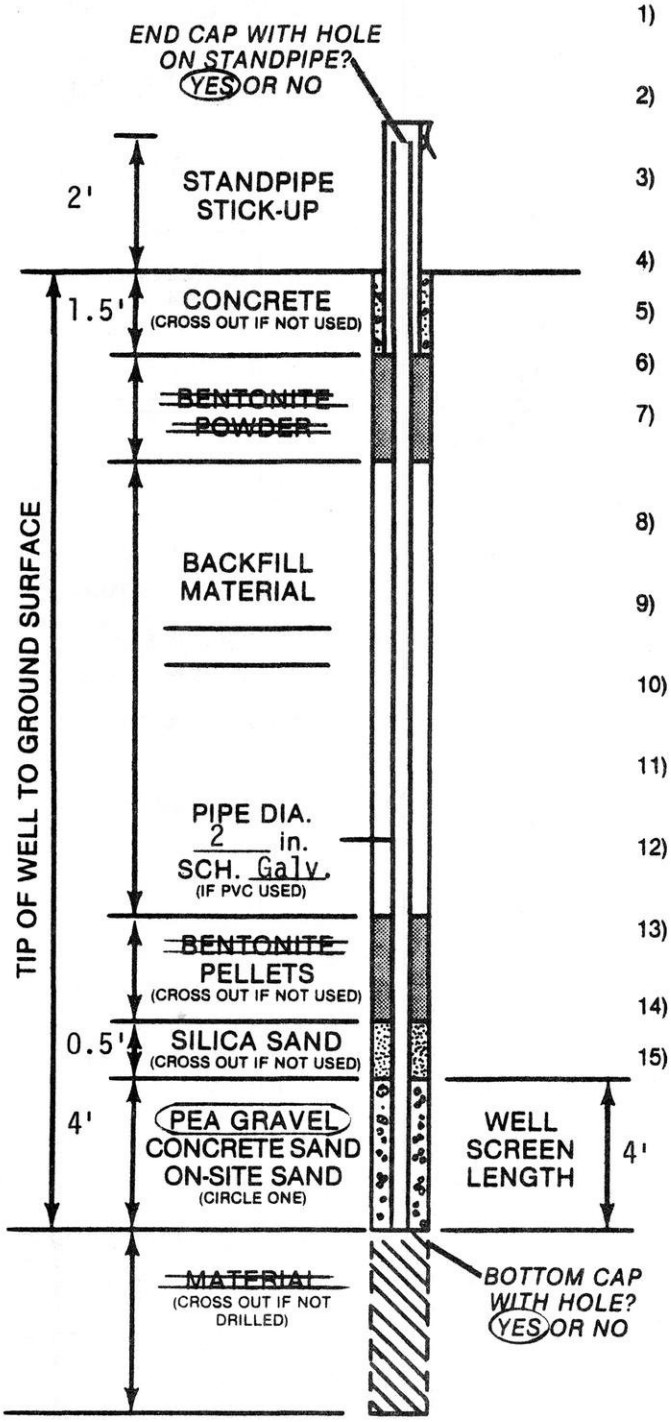
DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED), STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED), OTHER _____

3) TYPE OF WELL SCREEN
(PVC), GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED?
(SOLID AUGER), HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-1U DATE INSTALLED 3-15-84 DRILL RIG Bomb 55

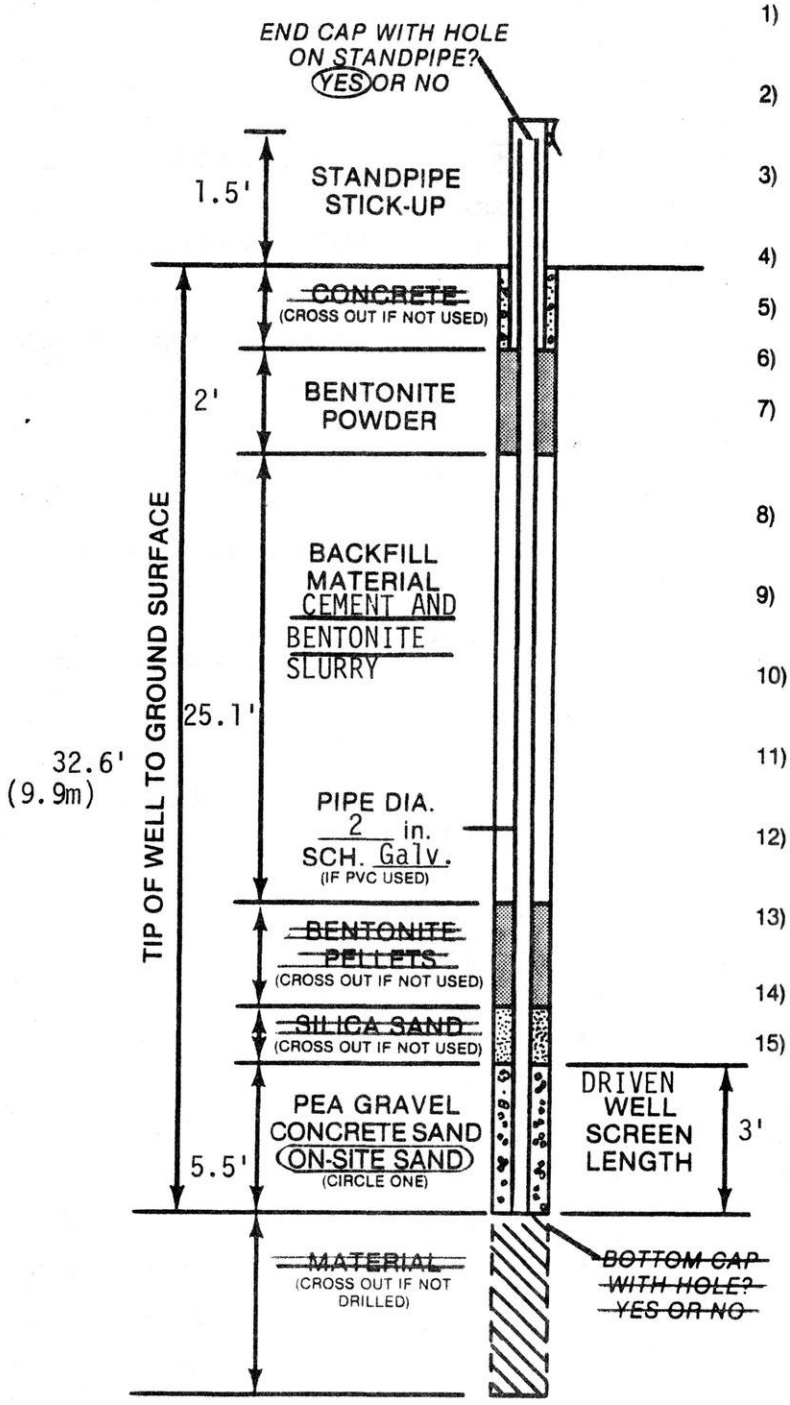
DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-2L DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

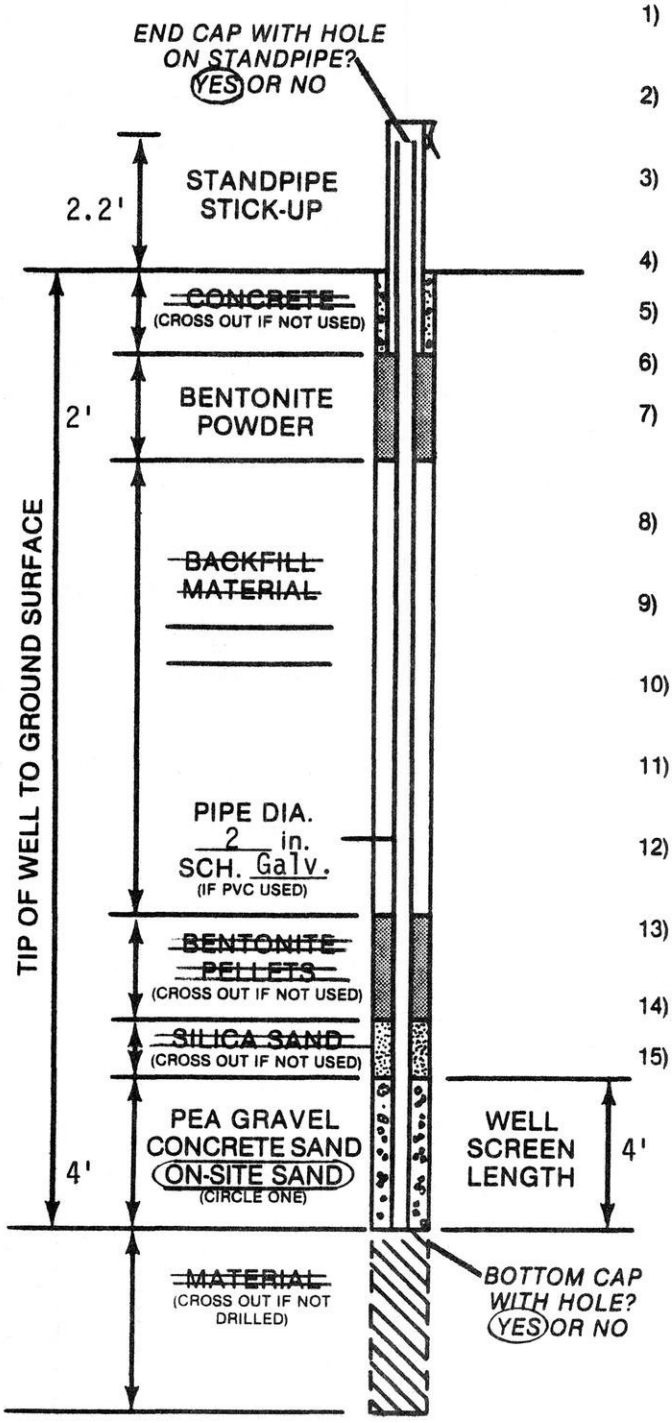
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-2U DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

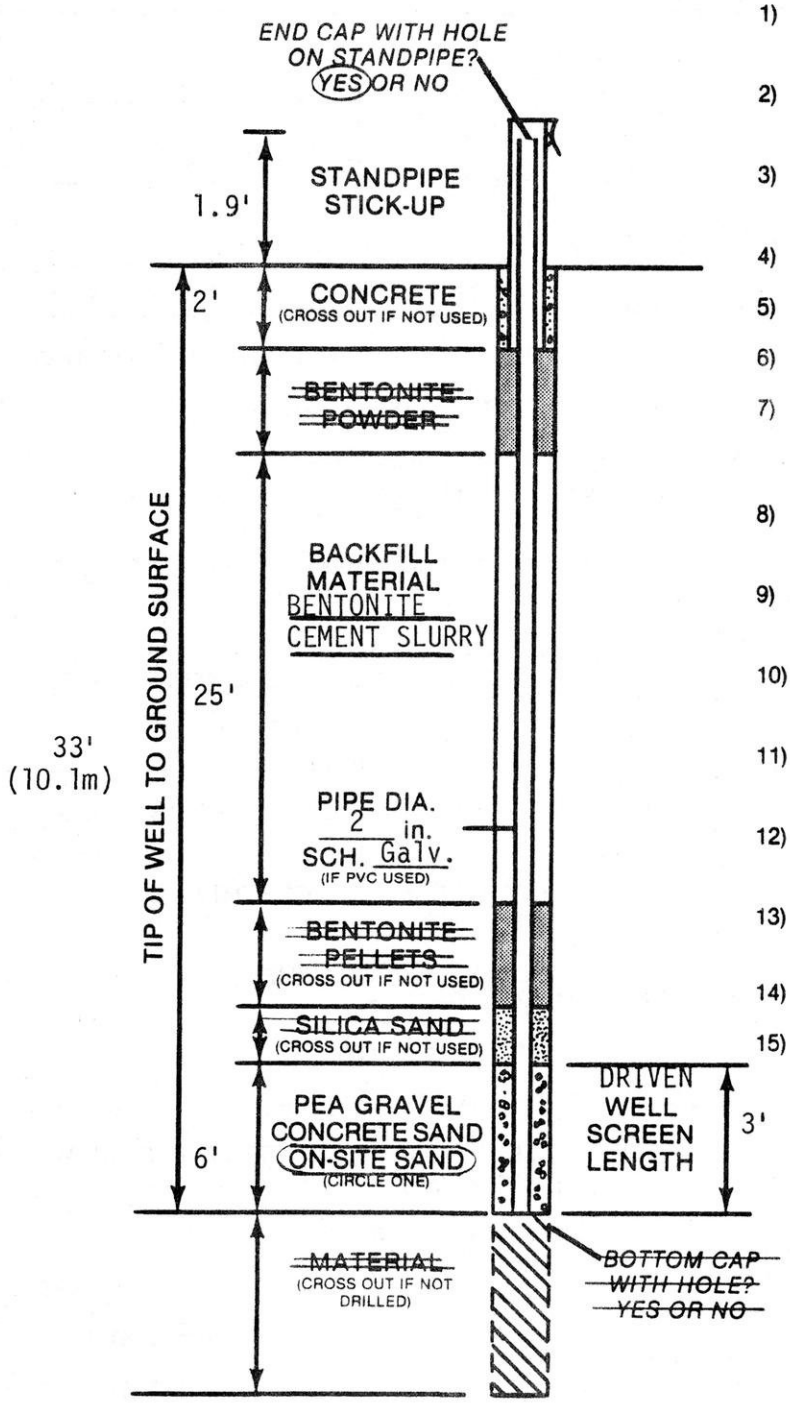
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

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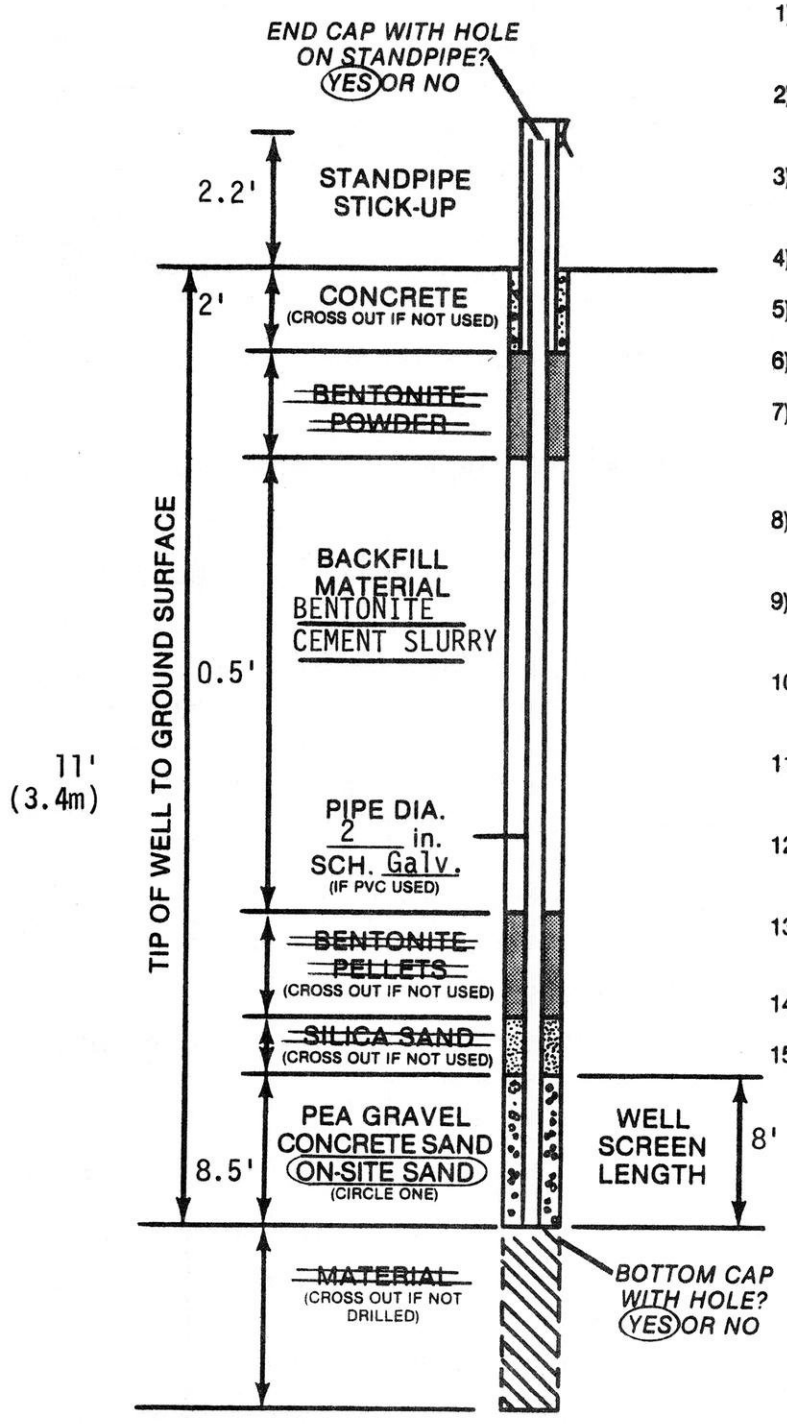
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-3U DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

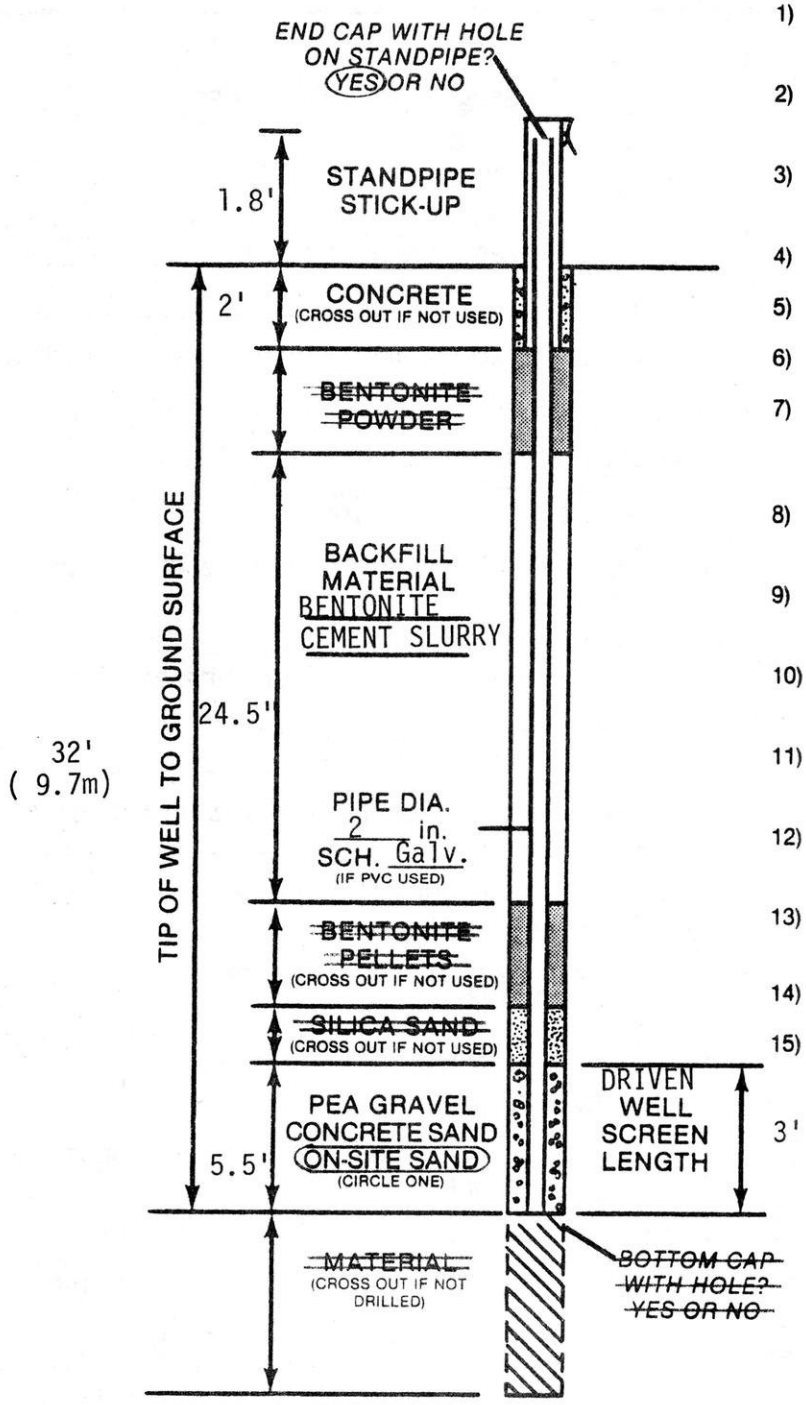
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-4 Lower DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

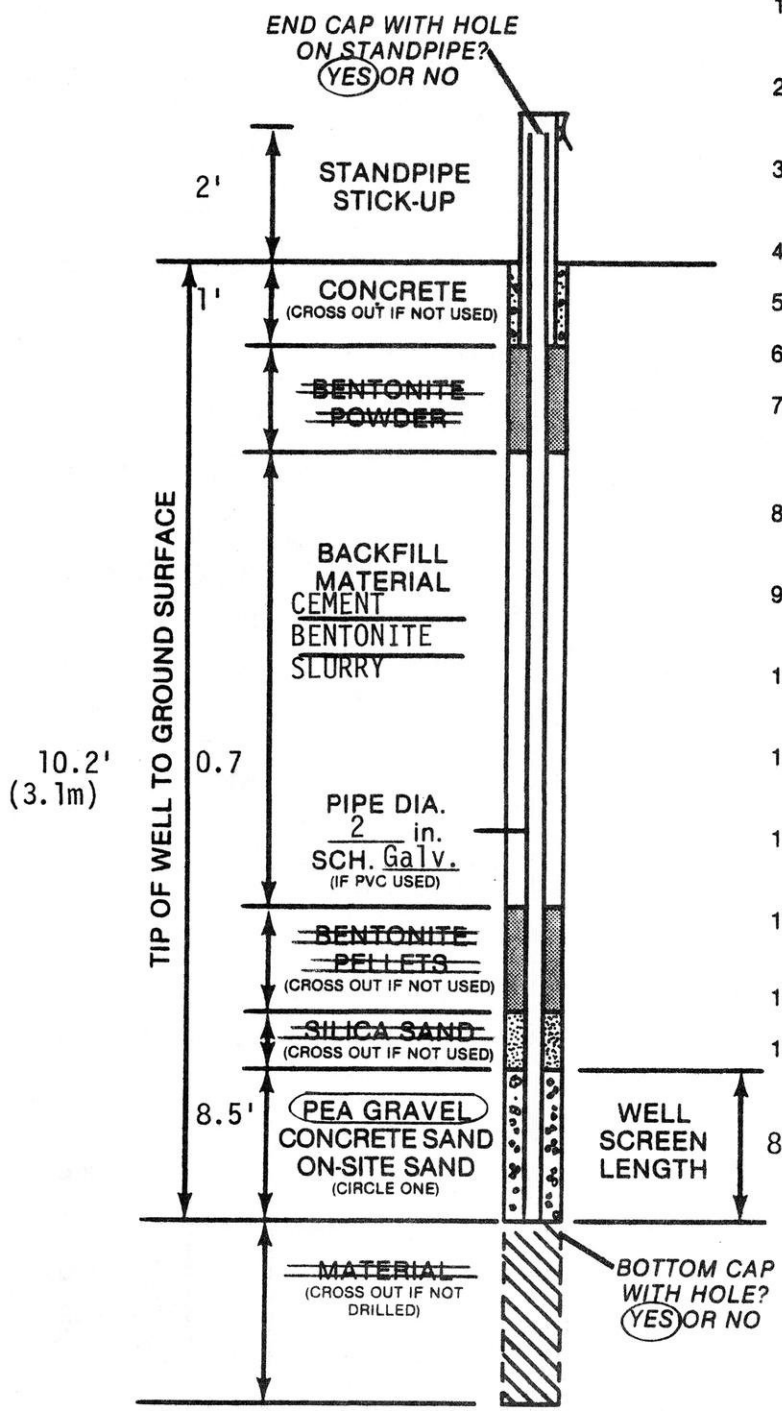
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER,
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-4U DATE INSTALLED 3-29-84 DRILL RIG Bomb 55

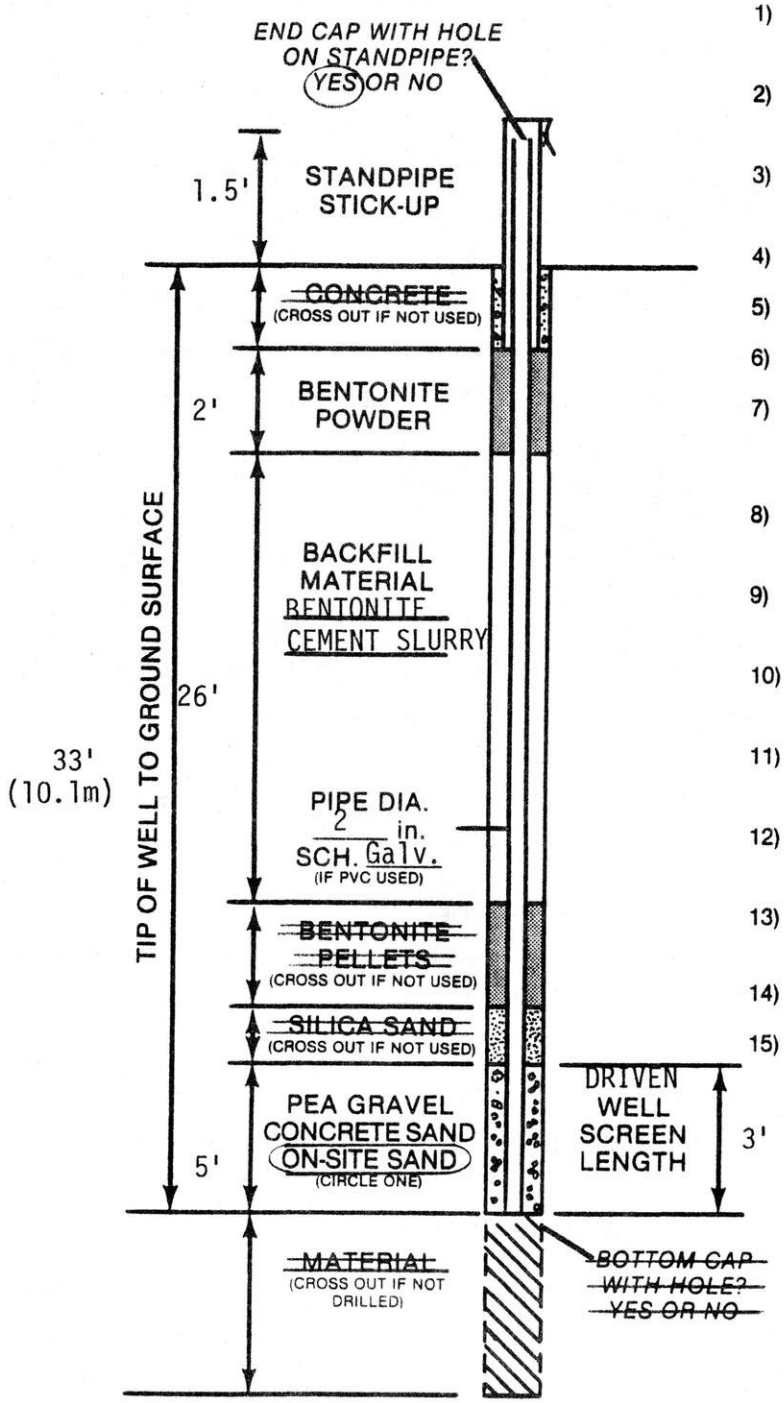
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED? YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
FLOWING Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-5L DATE INSTALLED 4-2-84 DRILL RIG Bomb 55

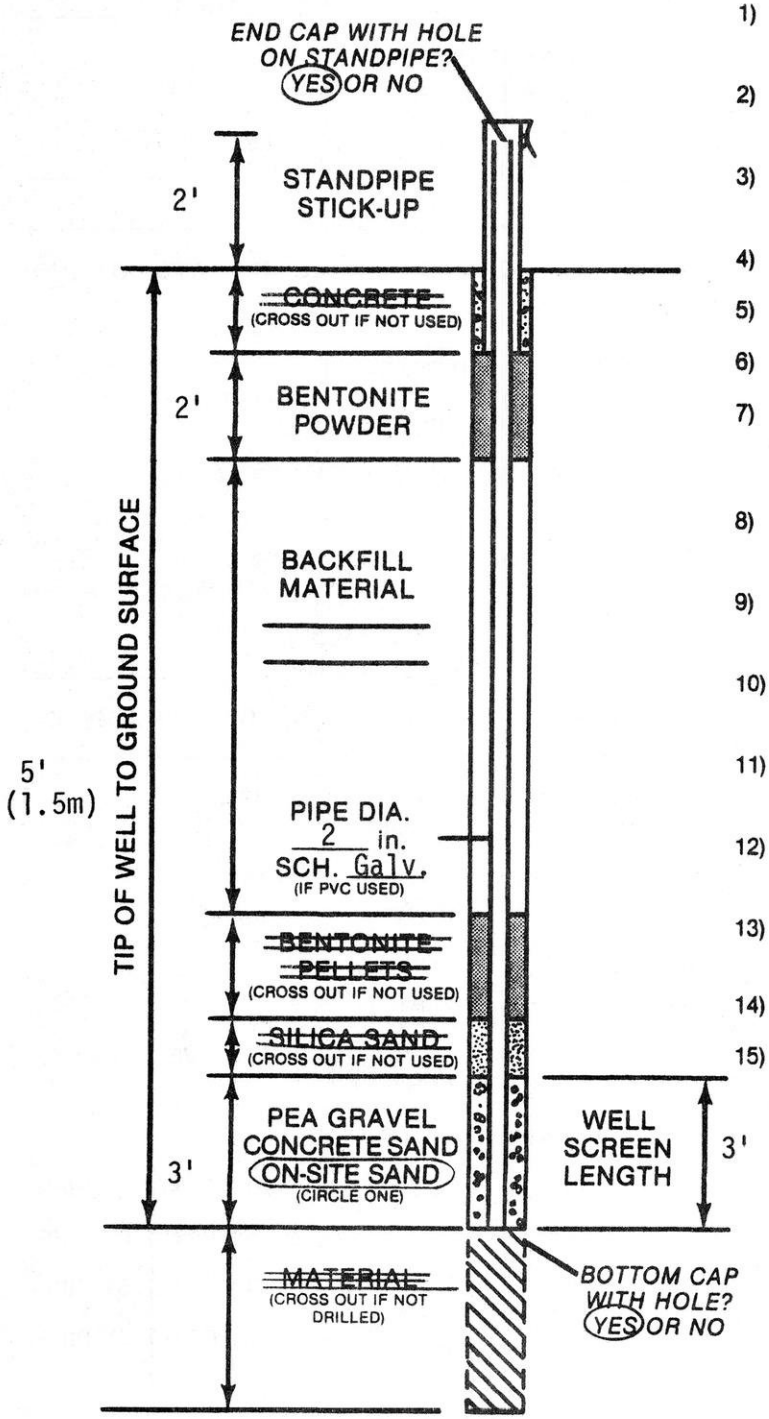
DRILLER T.T. DRILL CREW W.K.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER,
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-5U DATE INSTALLED 4-2-84 DRILL RIG CME -55

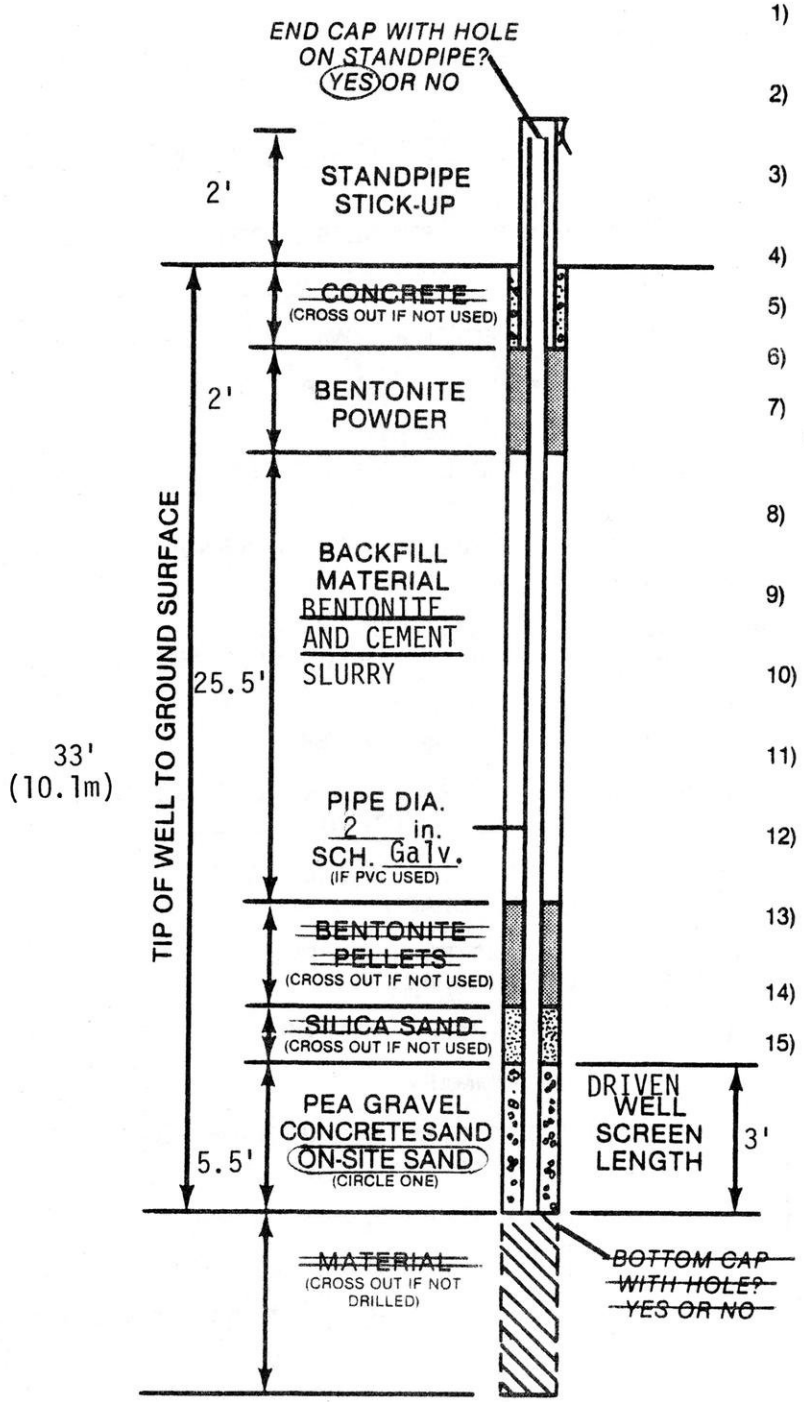
DRILLER T.T. DRILL CREW W.K.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-6L DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

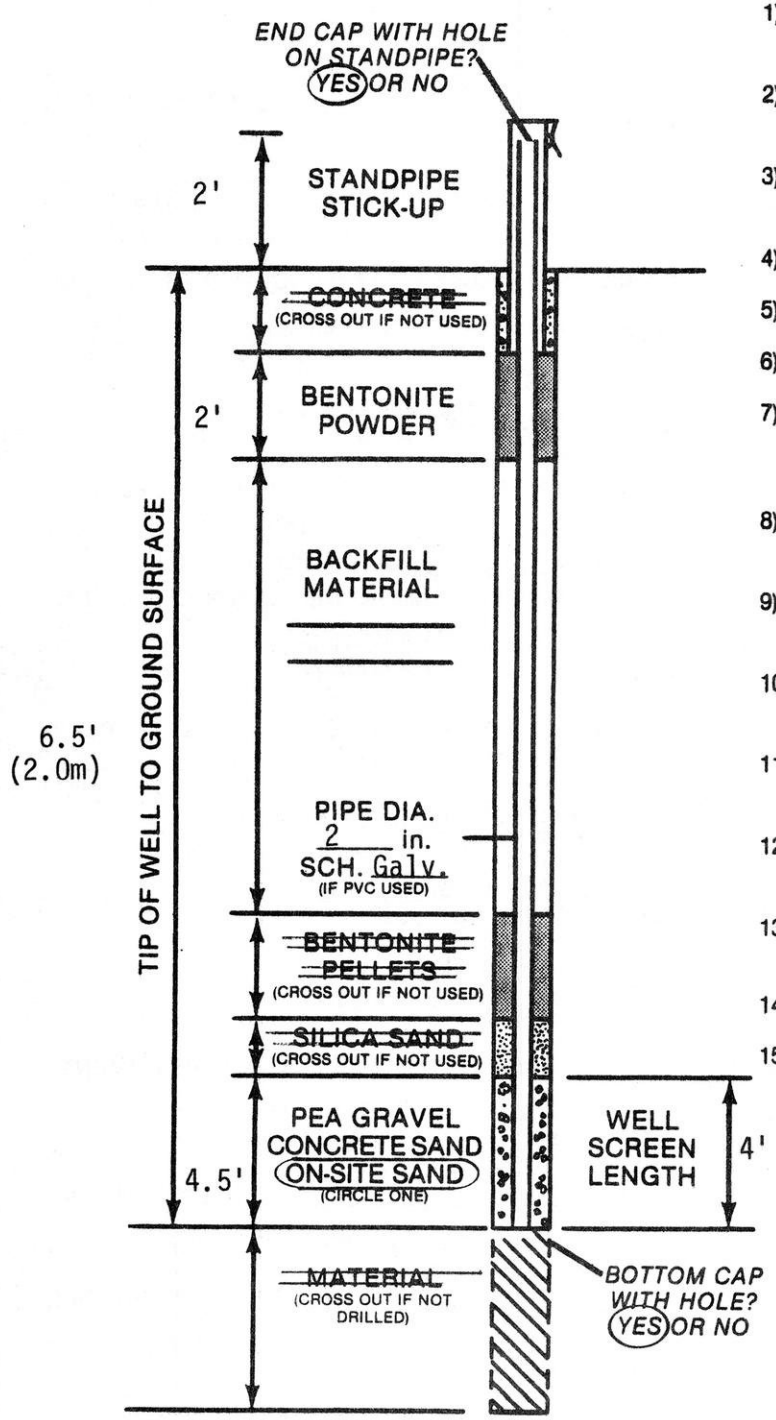
DRILLER T.I. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? No
(SOLID AUGER,) HOLLOW STEM AUGER, WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-6U DATE INSTALLED 3-30-84 DRILL RIG Bomb 55

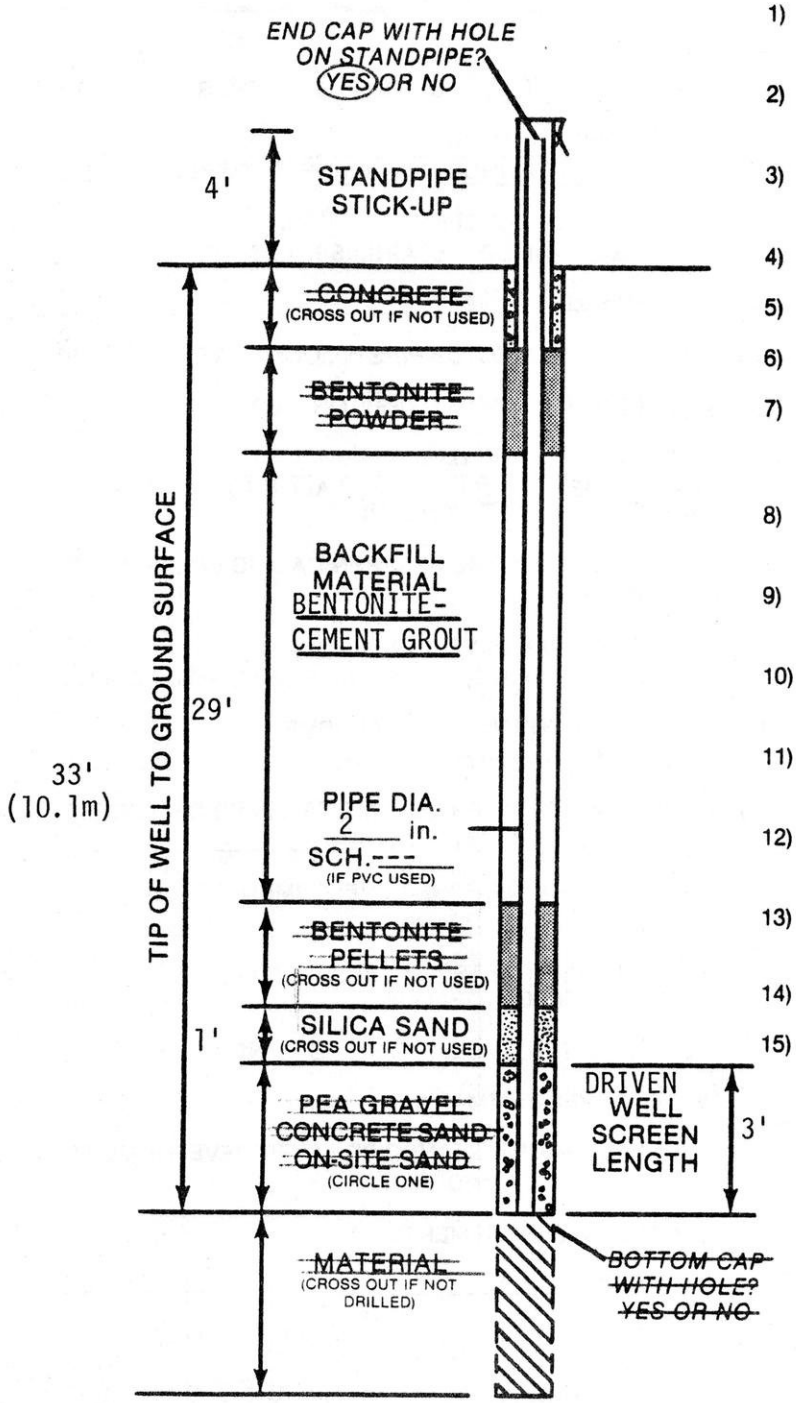
DRILLER T.T. DRILL CREW M.J.

JOB/CLIENT Exxon - Crandon STS JOB No. 12991

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, COUPLINGS, (THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
PVC, GALVANIZED, (STAINLESS,) OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? YES OR (NO)

7) WAS DRILLING MUD USED? NO
SOLID AUGER, HOLLOW STEM AUGER,
(WATER,) REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR (NO)

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-7L DATE INSTALLED 3-14-84 DRILL RIG Bomb 55

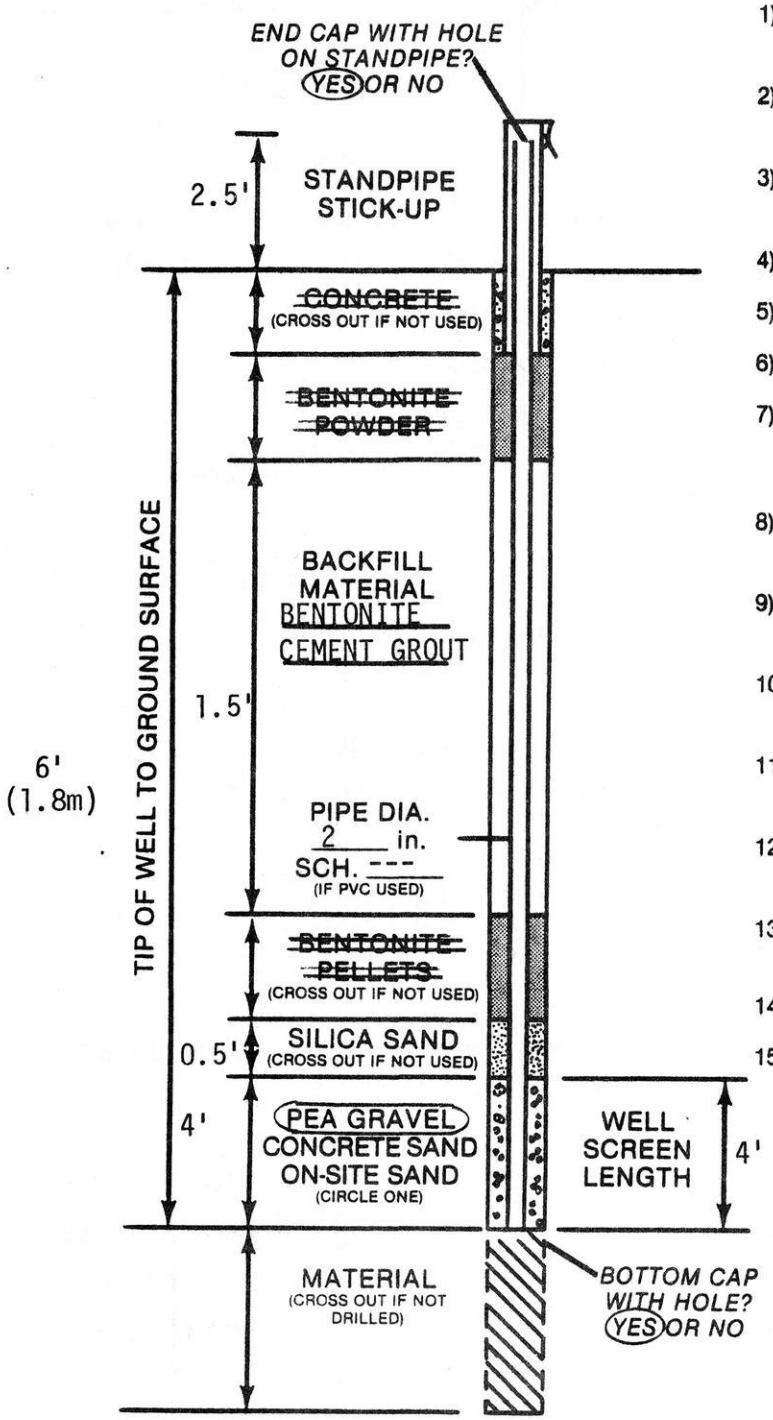
DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

STS Consultants Ltd.

FIELD WELL INSTALLATION DIAGRAM



1) TYPE OF PIPE?
PVC, (GALVANIZED,) STAINLESS, OTHER _____

2) TYPE OF PIPE JOINTS?
BELLED, (COUPLINGS, THREADED,) OTHER _____

3) TYPE OF WELL SCREEN
(PVC,) GALVANIZED, STAINLESS, OTHER _____

4) SCREEN SIZE #10 Slot

5) INSTALLED PROTECTOR PIPE W/LOCK? YES OR (NO)

6) WAS SOLVENT USED? (YES) OR NO

7) WAS DRILLING MUD USED? No
SOLID AUGER, (HOLLOW STEM AUGER,)
WATER, REVERT, BENTONITE

8) DID STANDPIPE COME UP WHEN CASING WAS PULLED?
YES OR NO

9) HOW WAS WELL DEVELOPED? None
BAILING, PUMPING, SURGING, COMPRESSED AIR

10) TIME SPENT FOR WELL DEVELOPMENT?
5 min., 15 min., 30 min., OTHER _____

11) APPROXIMATE WATER VOLUME REMOVED OR ADDED?
5 gal., 10 gal., 15 gal., OTHER _____

12) WATER CLARITY BEFORE DEVELOPMENT?
CLEAR, TURBID, OPAQUE

13) WATER CLARITY AFTER DEVELOPMENT?
CLEAR, TURBID, OPAQUE

14) DID THE WATER SMELL? YES OR NO

15) WATER LEVEL SUMMARY

1) DEPTH FROM T. STANDPIPE AFTER DEVELOPMENT?
_____ Ft. or DRY

2) OTHER MEASUREMENTS:

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

DATE _____, _____ Ft. FROM T, ST. PIPE

Well No. WP-7U DATE INSTALLED 3-14-84 DRILL RIG Bomb 55

DRILLER R.L. DRILL CREW S.O.

JOB/CLIENT Exxon - Crandon STS JOB No. 12959

FW: 1-983

UNIFIED SOIL CLASSIFICATION SYSTEM

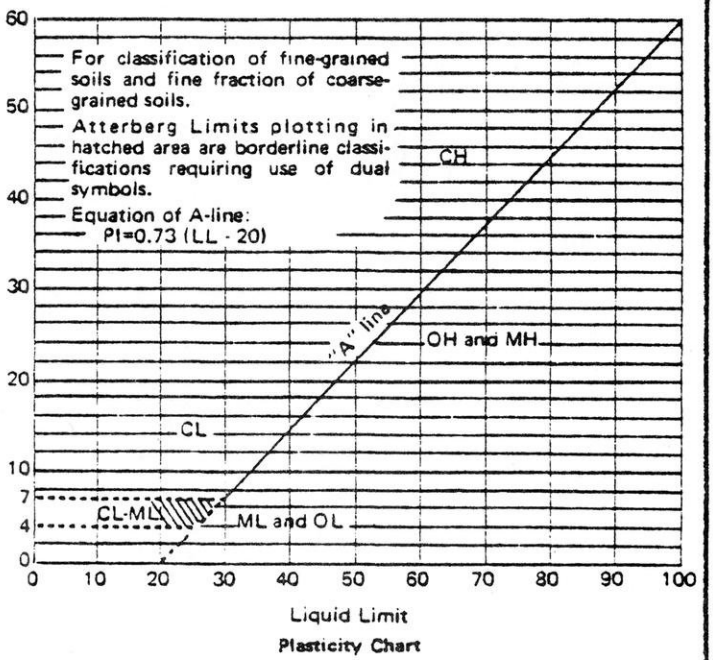
Major divisions			Group symbols	Typical names	Laboratory classification criteria
Coarse-grained soils (More than half of material is *larger* than No. 4 sieve size)	Gravels (More than half of coarse fraction larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW
		Gravels with fines (Appreciable amount of fines)	GM d / u	Silty gravels, gravel-sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
			GC	Clayey gravels, gravel-sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3
			SP	Poorly graded sands, gravelly sands, little or no fines	Not meeting all gradation requirements for SW
		Sands with fines (Appreciable amount of fines)	SM d / u	Silty sands, sand-silt mixtures	Atterberg limits below "A" line or P.I. less than 4
			SC	Clayey sands, sand-clay mixtures	Atterberg limits above "A" line with P.I. greater than 7
Fine-grained soils (More than half of material is *smaller* than No. 200 sieve)	Silts and clays (Liquid limit less than 50)		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity	
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	
			OL	Organic silts and organic silty clays of low plasticity	
	Silts and clays (Liquid limit greater than 50)		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts	
			CH	Inorganic clays of high plasticity, fat clays	
			OH	Organic clays of medium to high plasticity, organic silts	
	Highly organic soils		Pt	Peat and other highly organic soils	

Determine percentages of sand and gravel from grain-size curve.
Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 per cent	GW, GP, SW, SP
More than 12 per cent	GM, GC, SM, SC
5 to 12 per cent	*Borderline* cases requiring dual symbols

Above "A" line with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols

Limits plotting in hatched zone with P.I. between 4 and 7 are *borderline* cases requiring use of dual symbols.



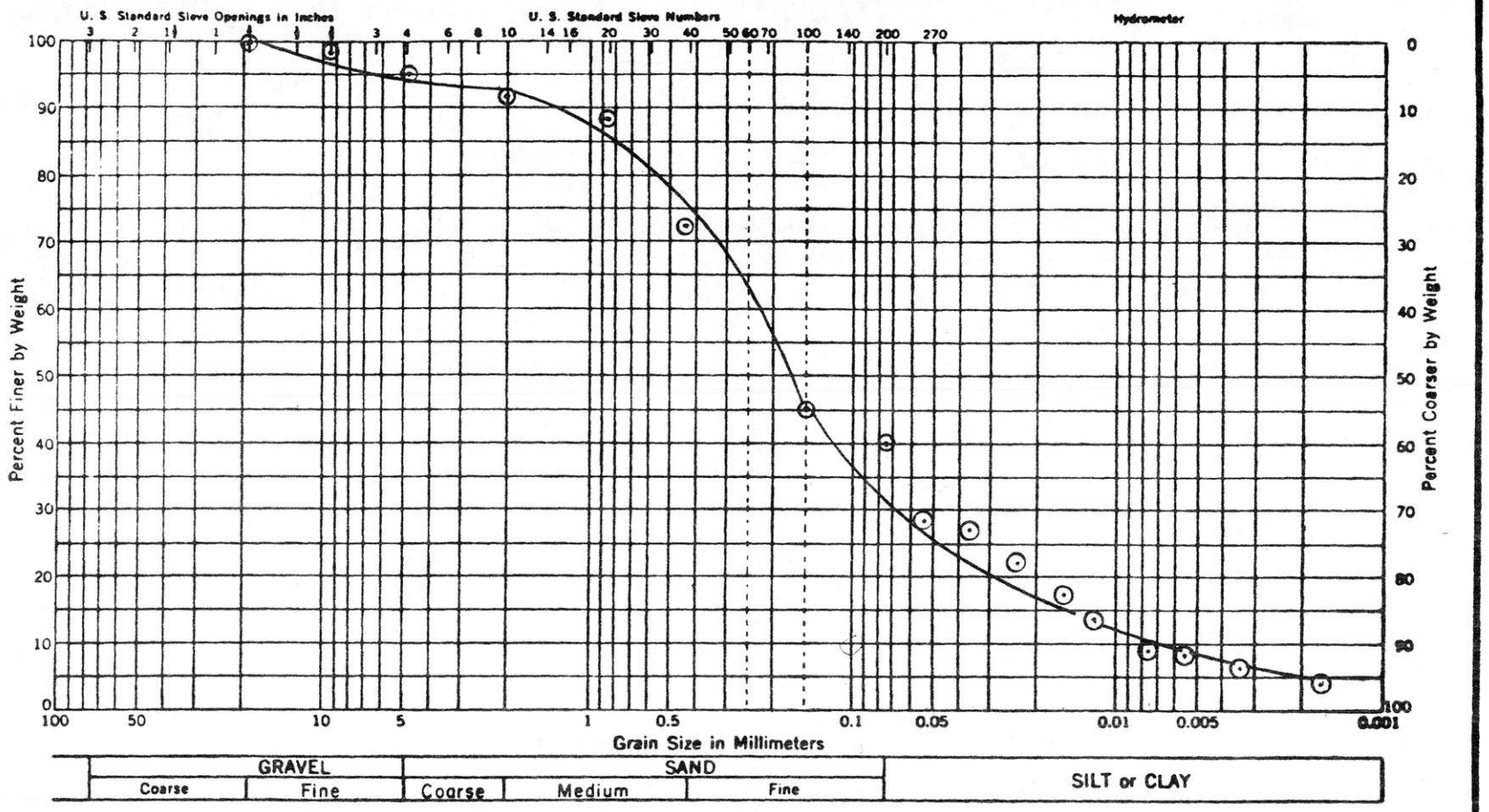
Plasticity Chart

APPENDIX B

Gradation Curves for EX Borings

Gradation Curves for EX Borings

UNIFIED CLASSIFICATION SYSTEM



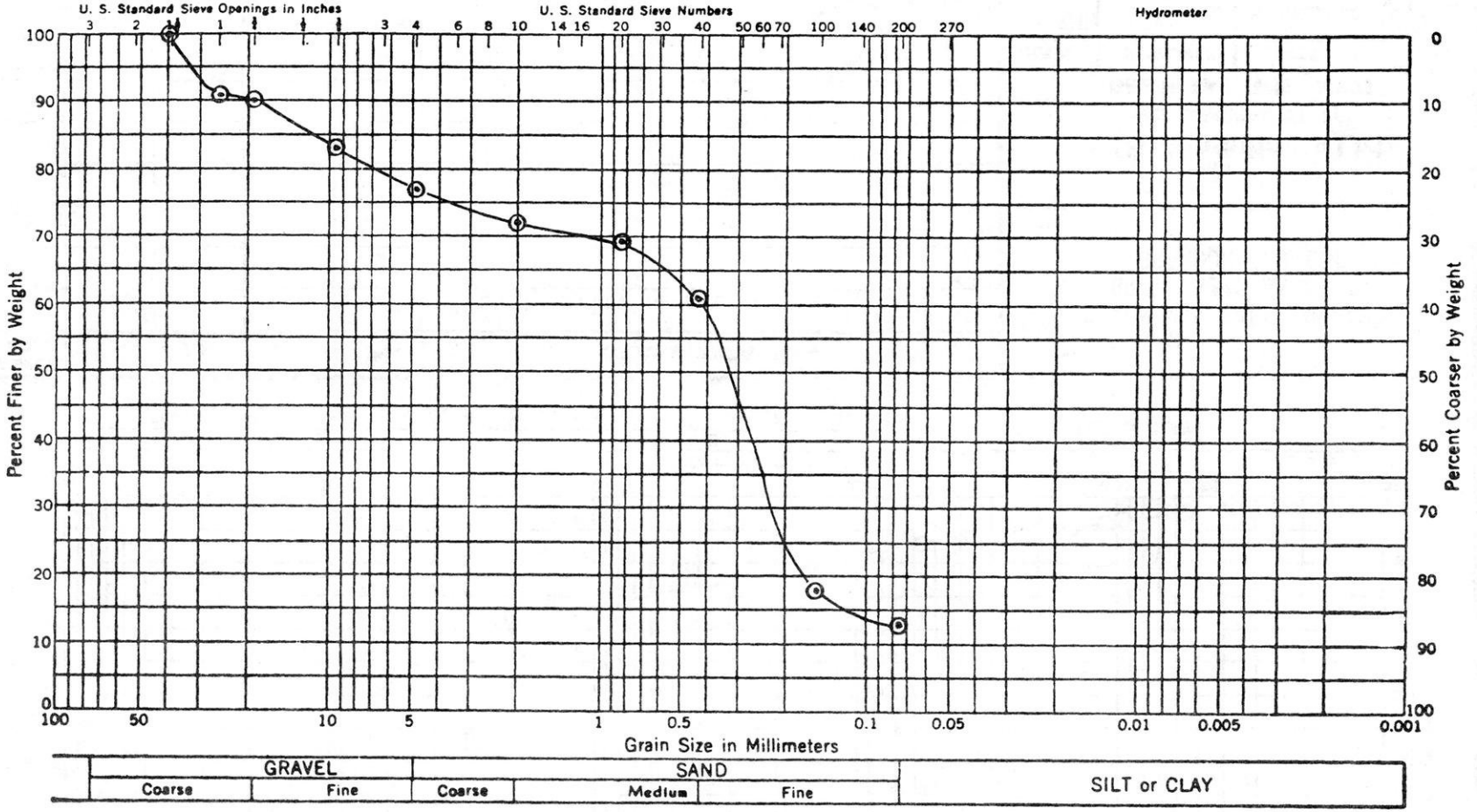
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX1	15.1				Silty fine to coarse sand (SM)
S-1					
0-2'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX1	S-2	11.5-14'							Silty fine to coarse sand (SM)
									W.C. 16.9

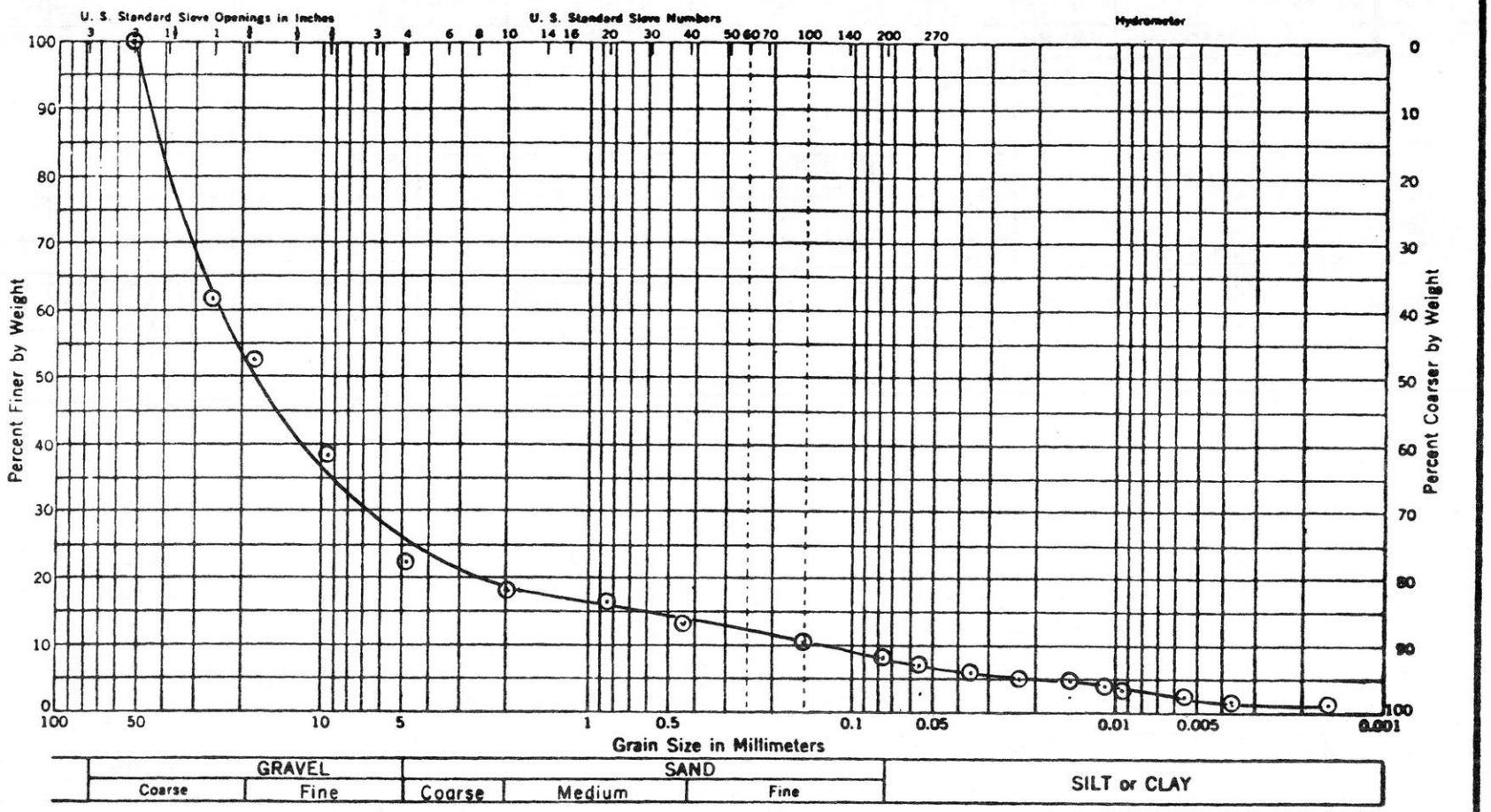
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



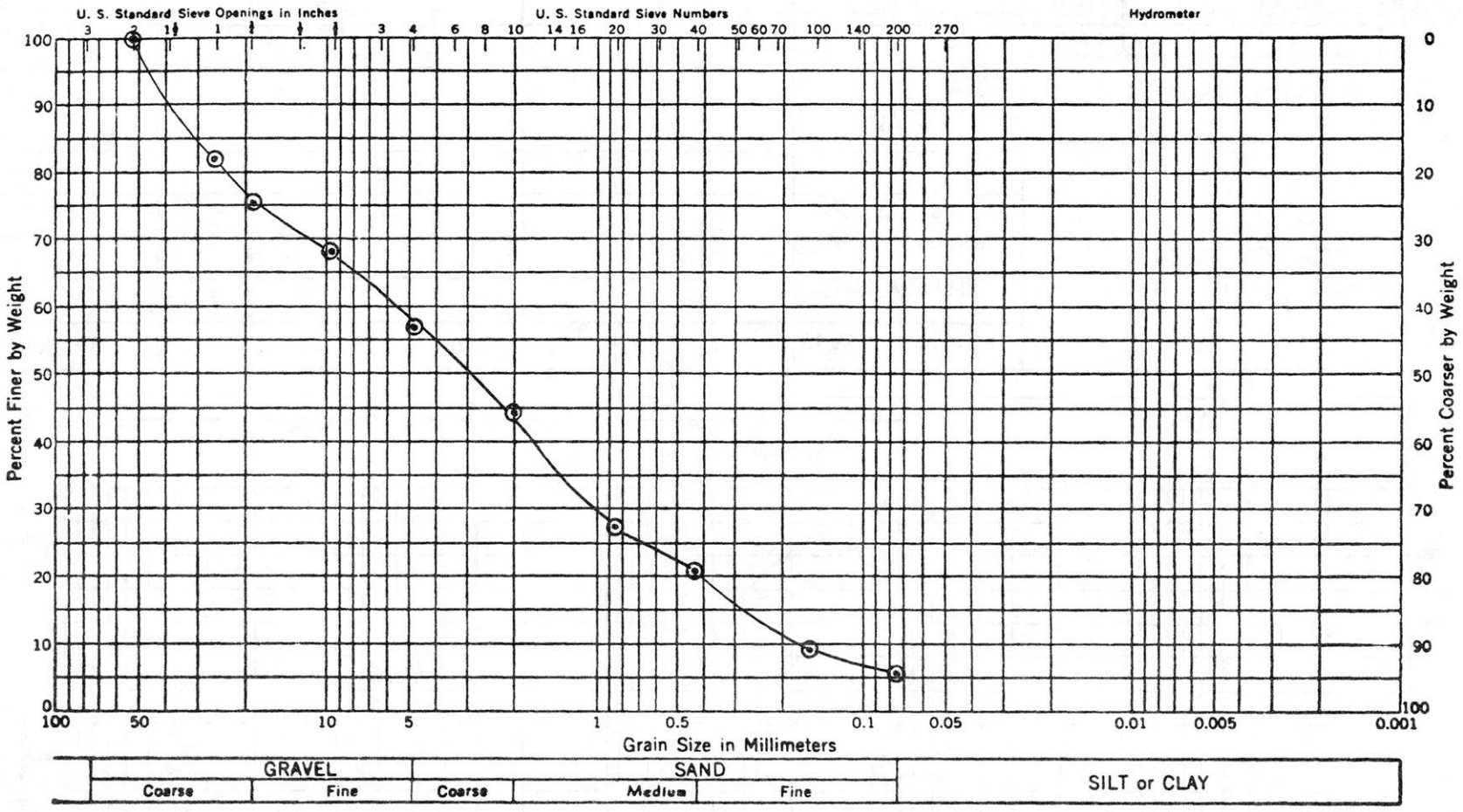
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX1	12.2				Slightly silty fine to coarse gravel
S-4					(GP-GM)
30.5-32.5'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302



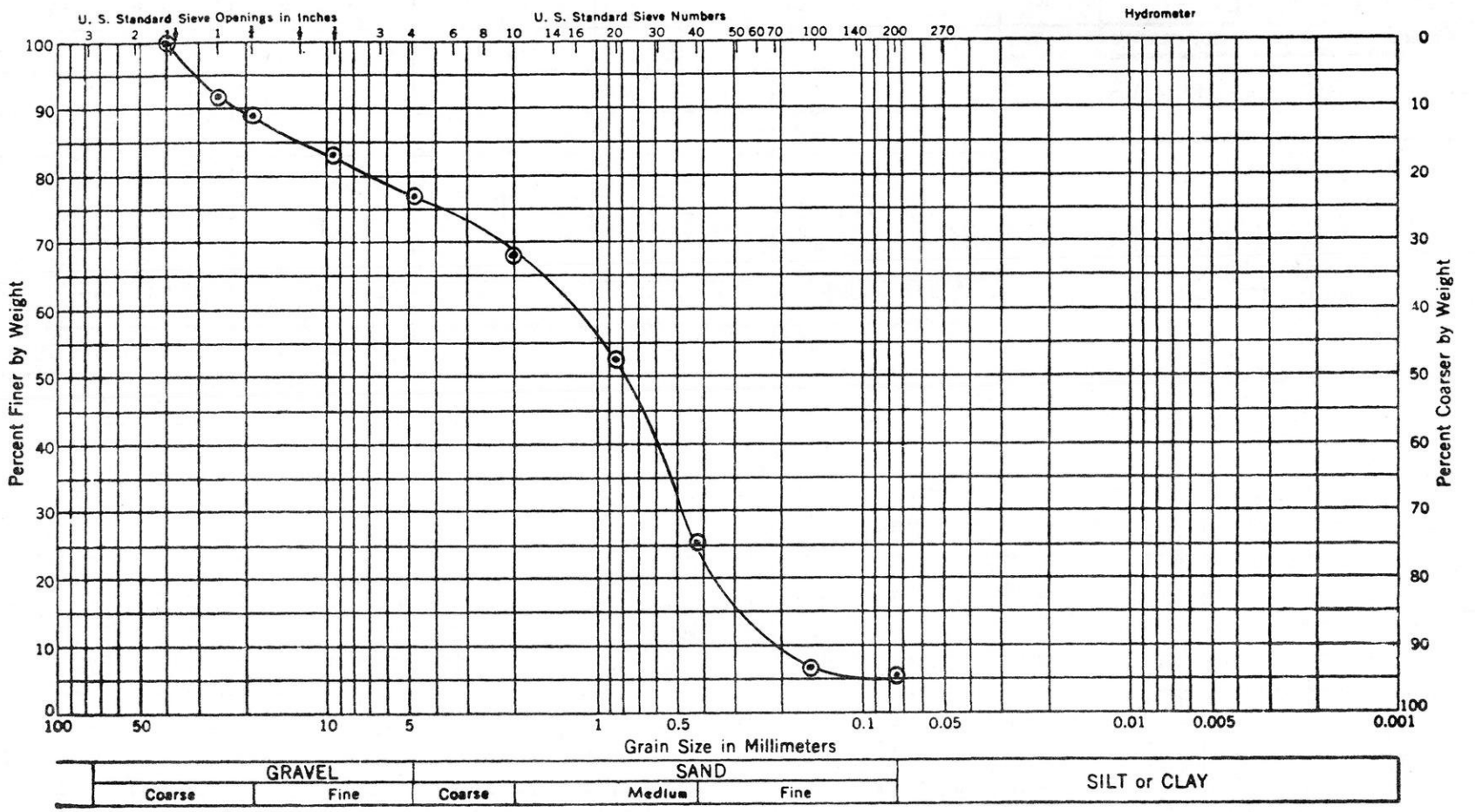
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX1	S-6	51-53'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 8.3

EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478



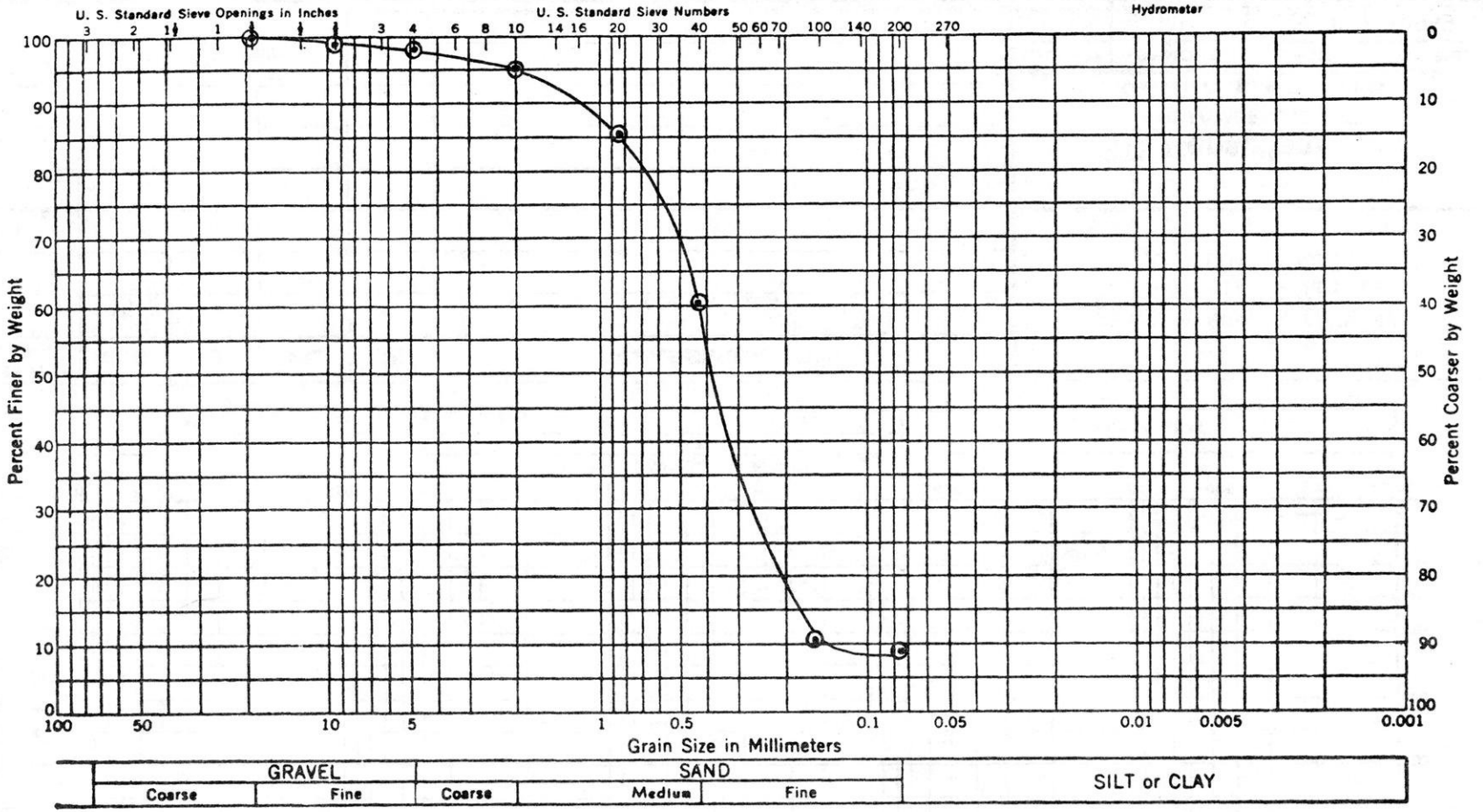
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX1	S-7	61.5-63.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 17.3

EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX1	S-10	92-94'							Slightly silty fine to medium sand (SM-SP)
									W.C. 13.0

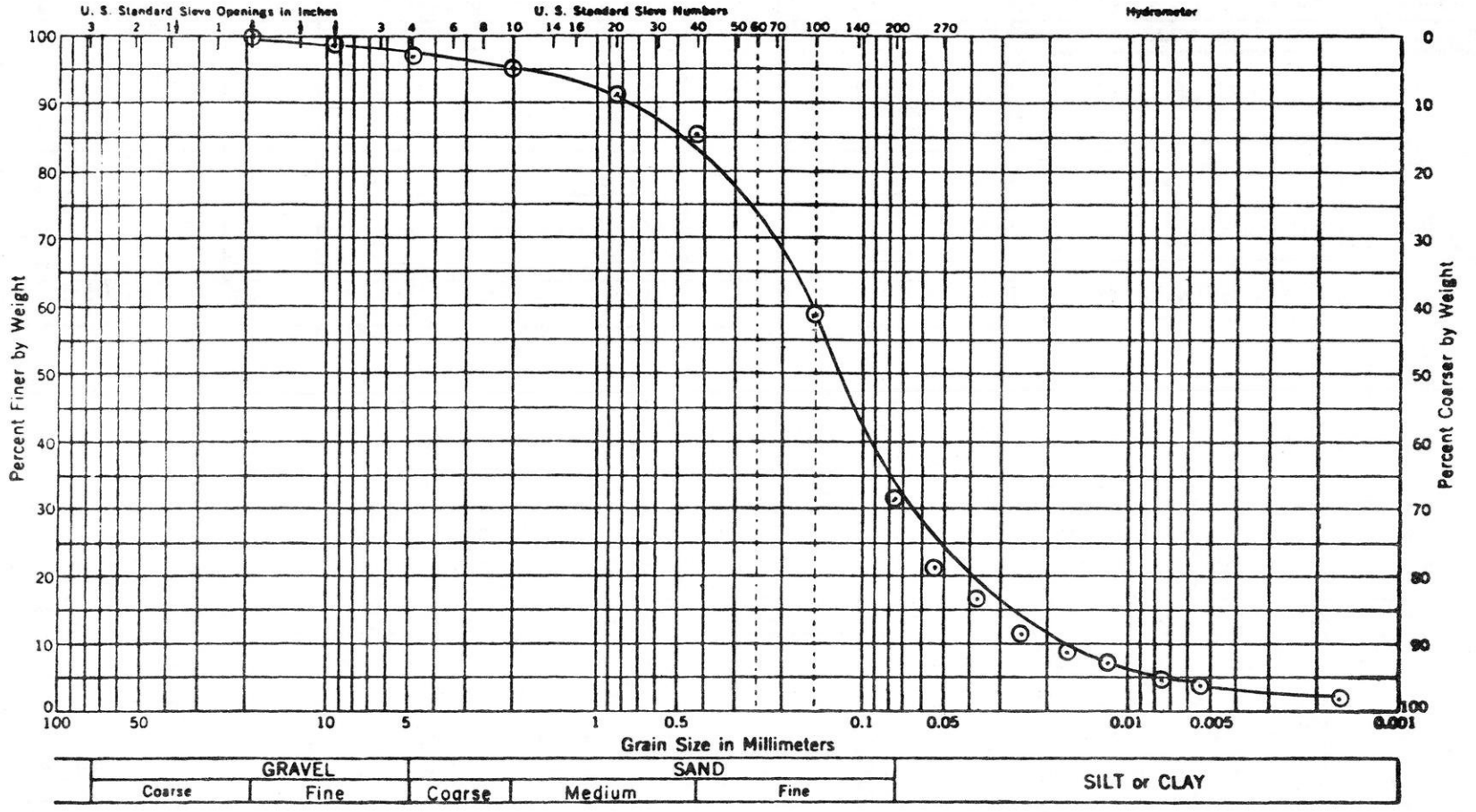
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SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX1	15.8				Silty fine to coarse sand (SM)
S-12					
112.5-114.5'					

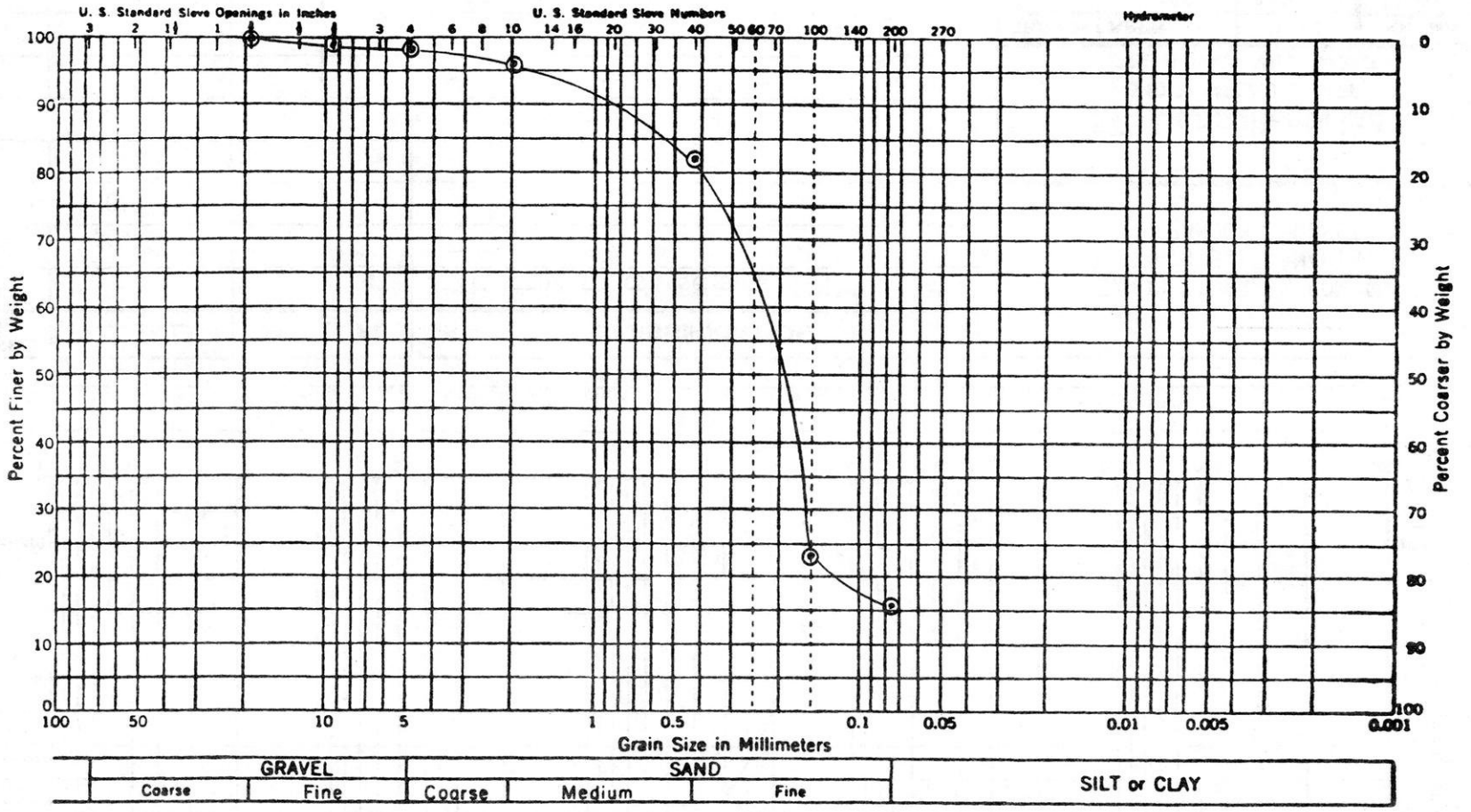
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	10.9				Silty fine to medium sand (SM)
S-1					
1.0-3.0'					

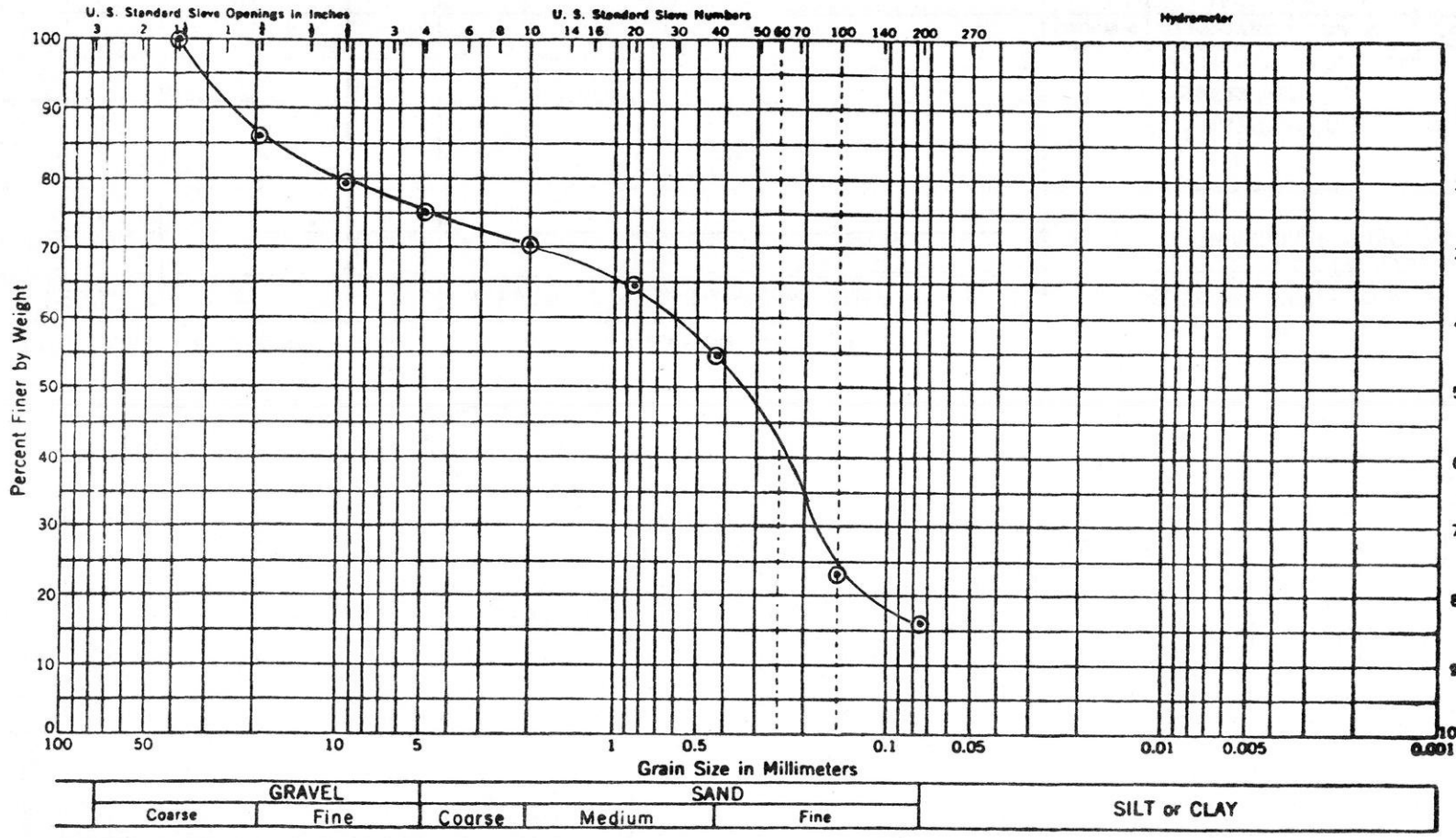
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	6.2				Silty fine to coarse sand (SM)
S-2					
10.0-	12.0'				

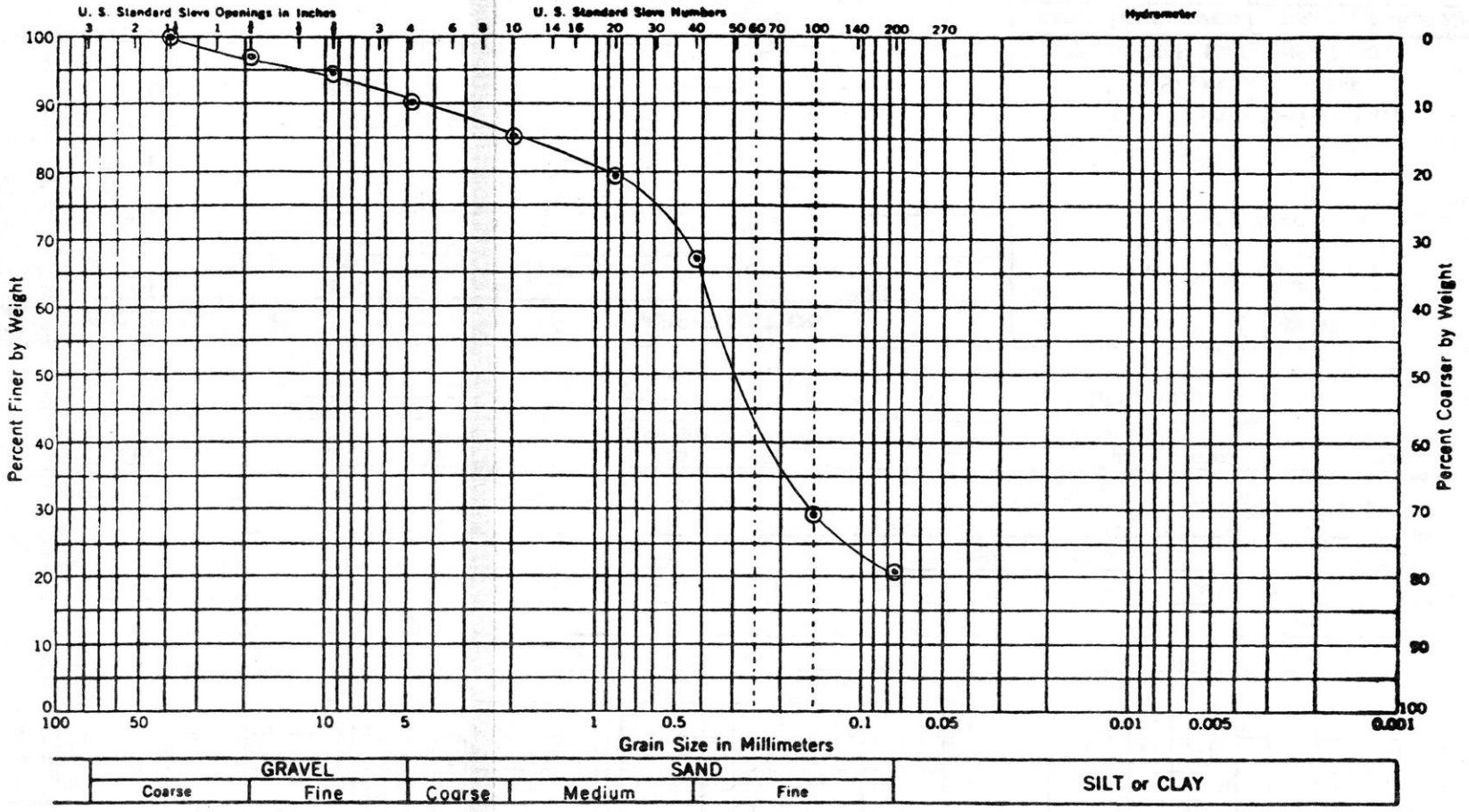
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	10.2				Silty fine to coarse sand (SM)
S-5					
40.0-42.0'					

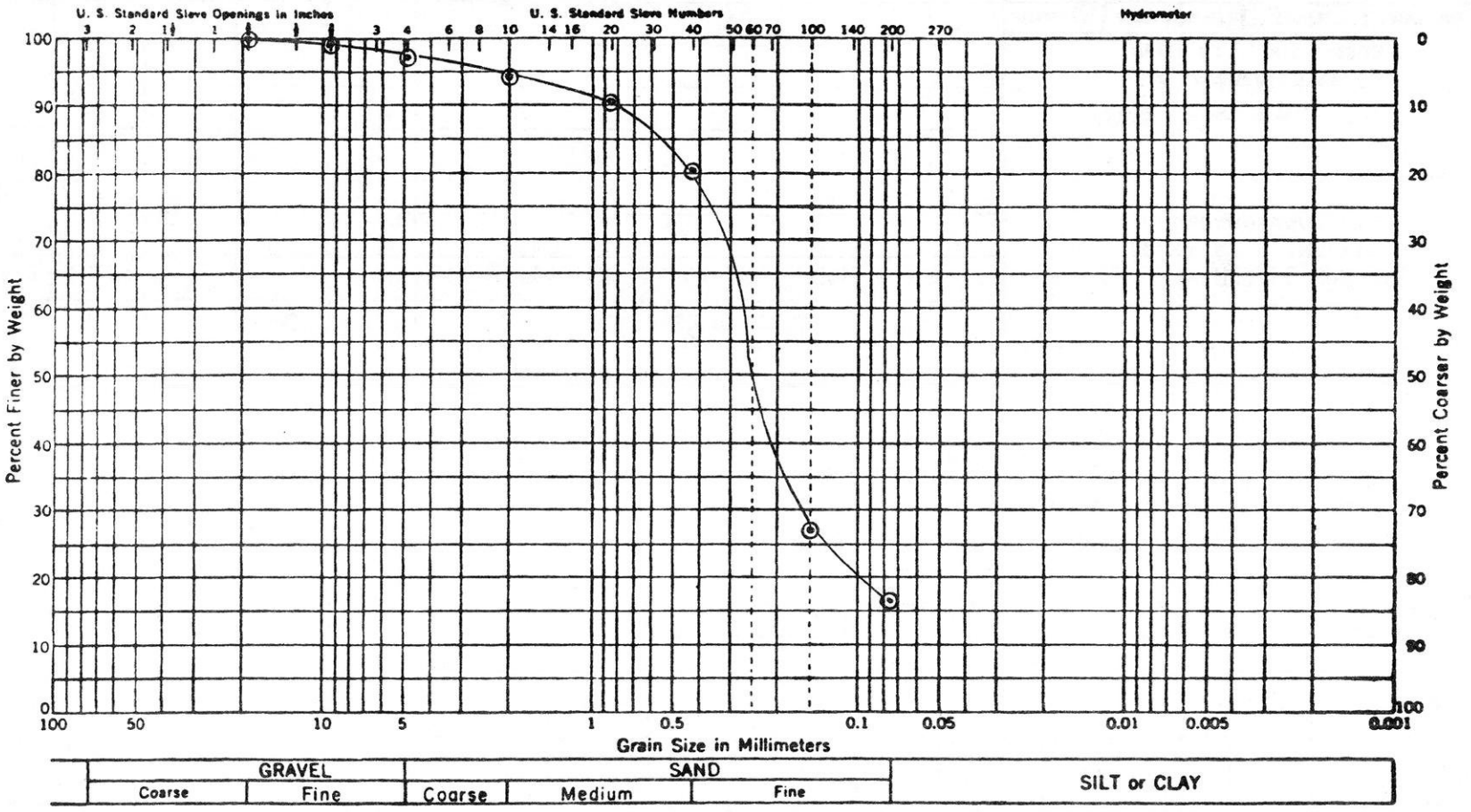
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CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	11.1				Silty fine to medium sand (SM)
S-6					
50.0-52.0'					

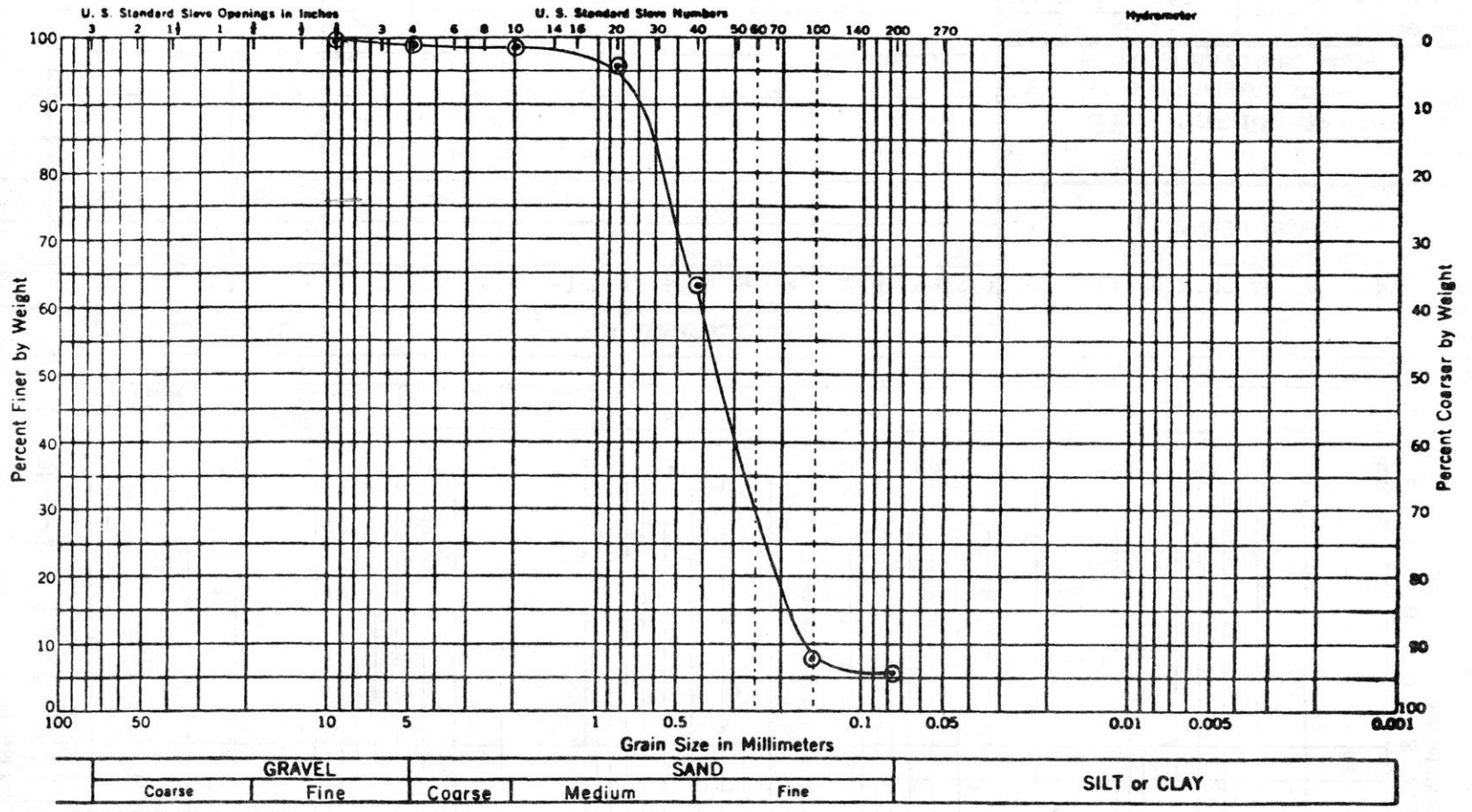
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2					Slightly silty fine to medium sand (SM-SP)
S-8					
70.5-71.5'					

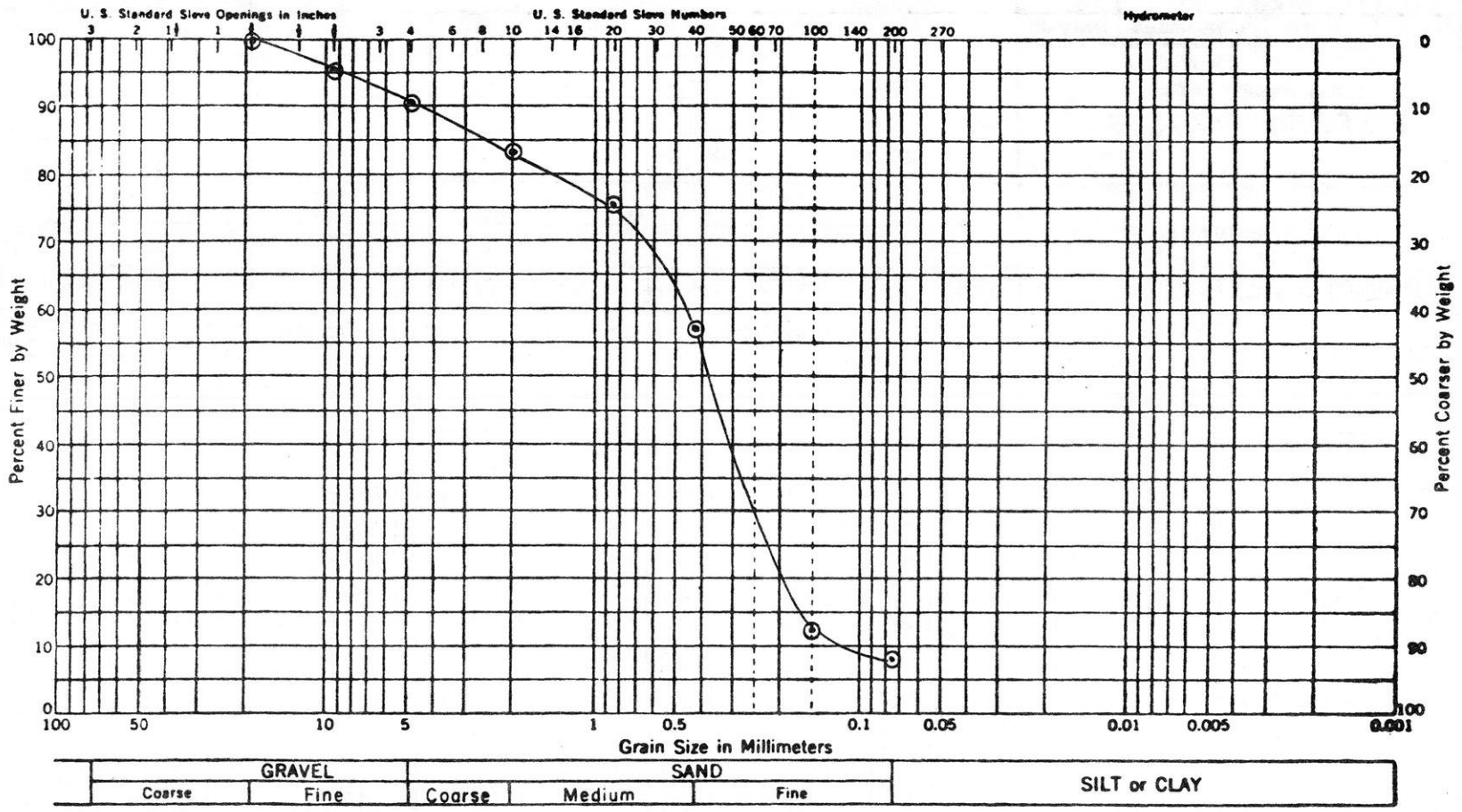
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	17.7				Slightly silty fine to coarse sand (SM-SP)
S-9					
81.0-	82.5'				

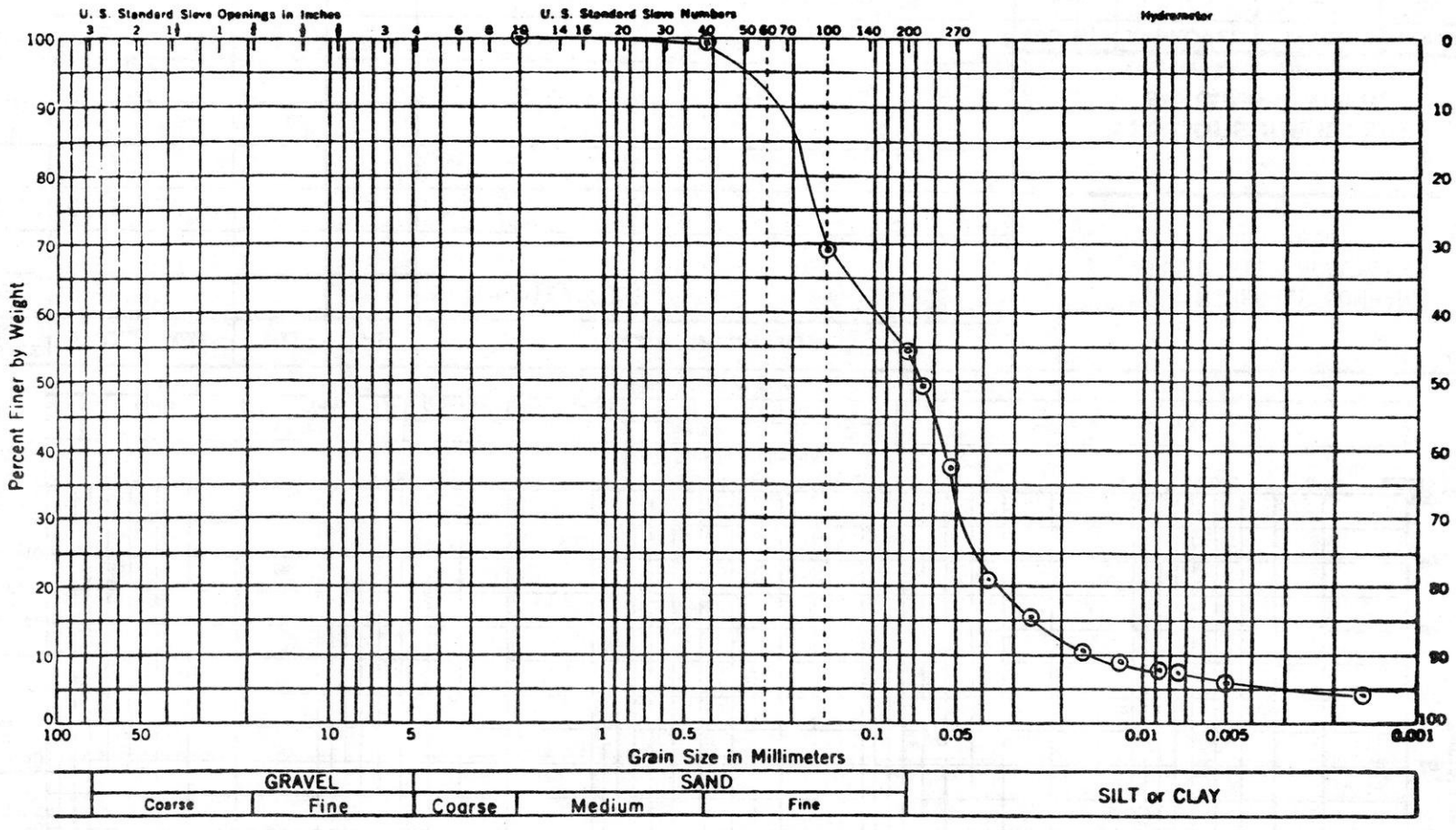
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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	22.4				Very fine sandy silt (ML)
S-10					
91.0-	92.5'				

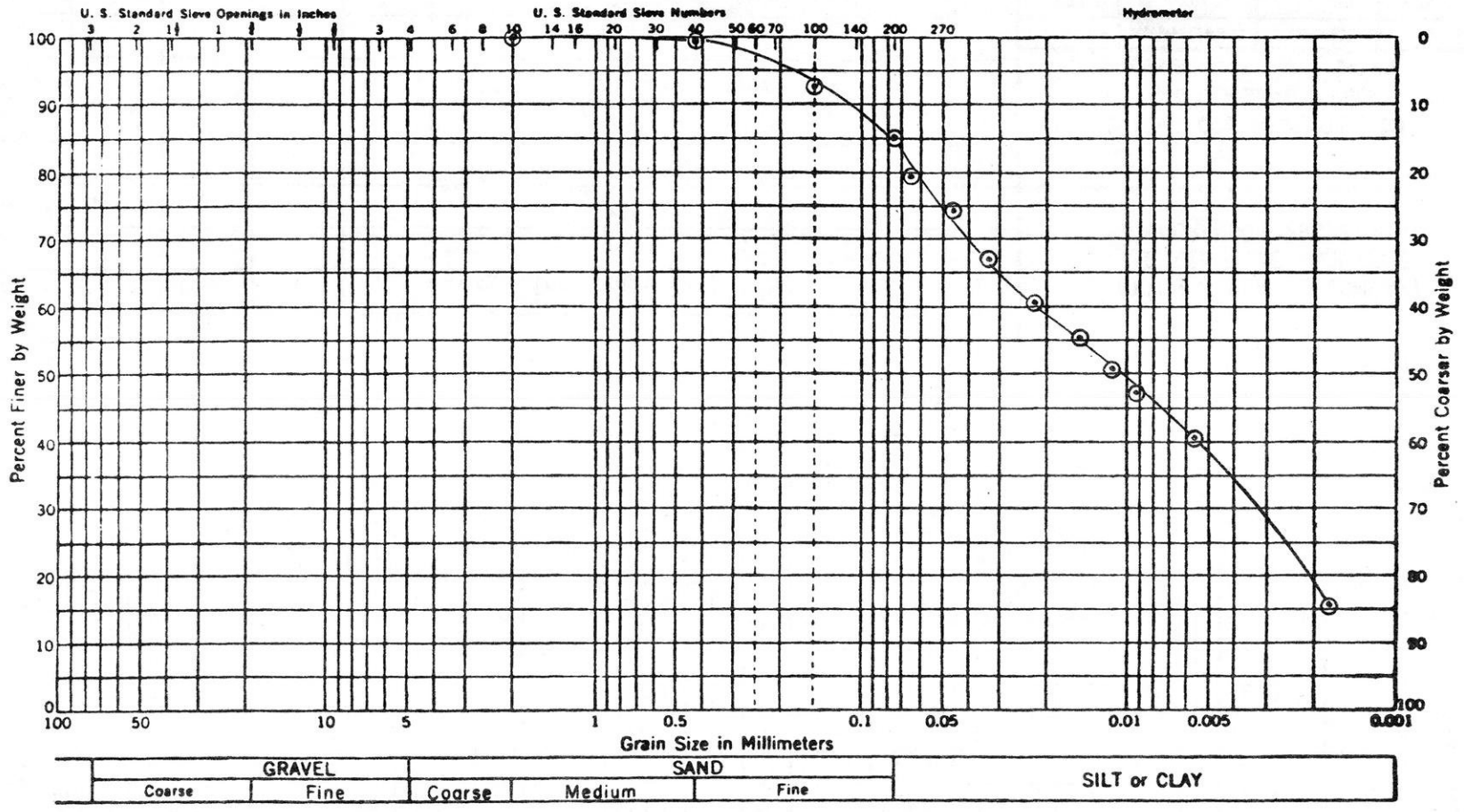
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	14.1				Silty clay (CL)
S-11					
101.5-103.5'					

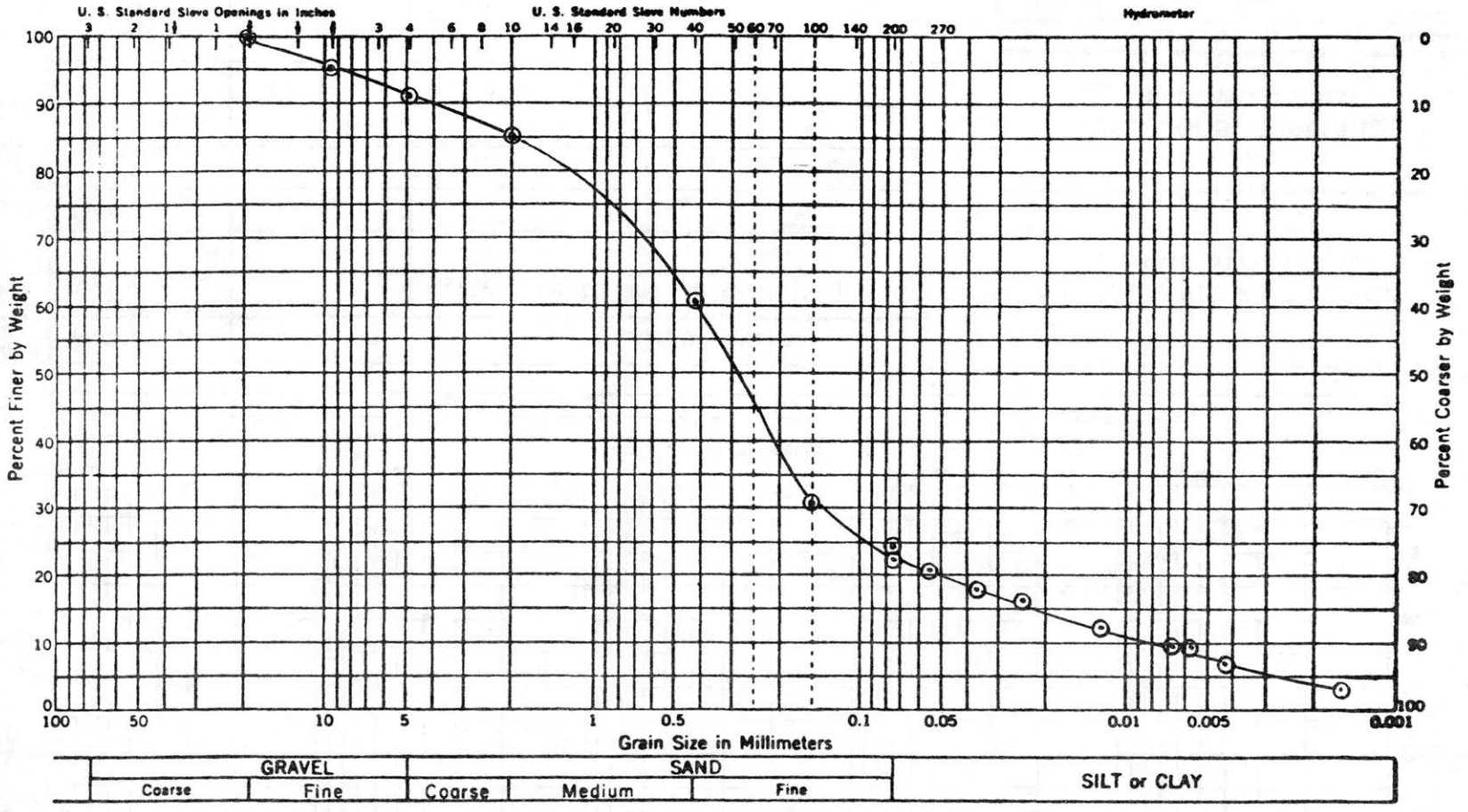
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	10.6				Silty fine to coarse sand (SM)
S-12					
112.0-	113.5'				

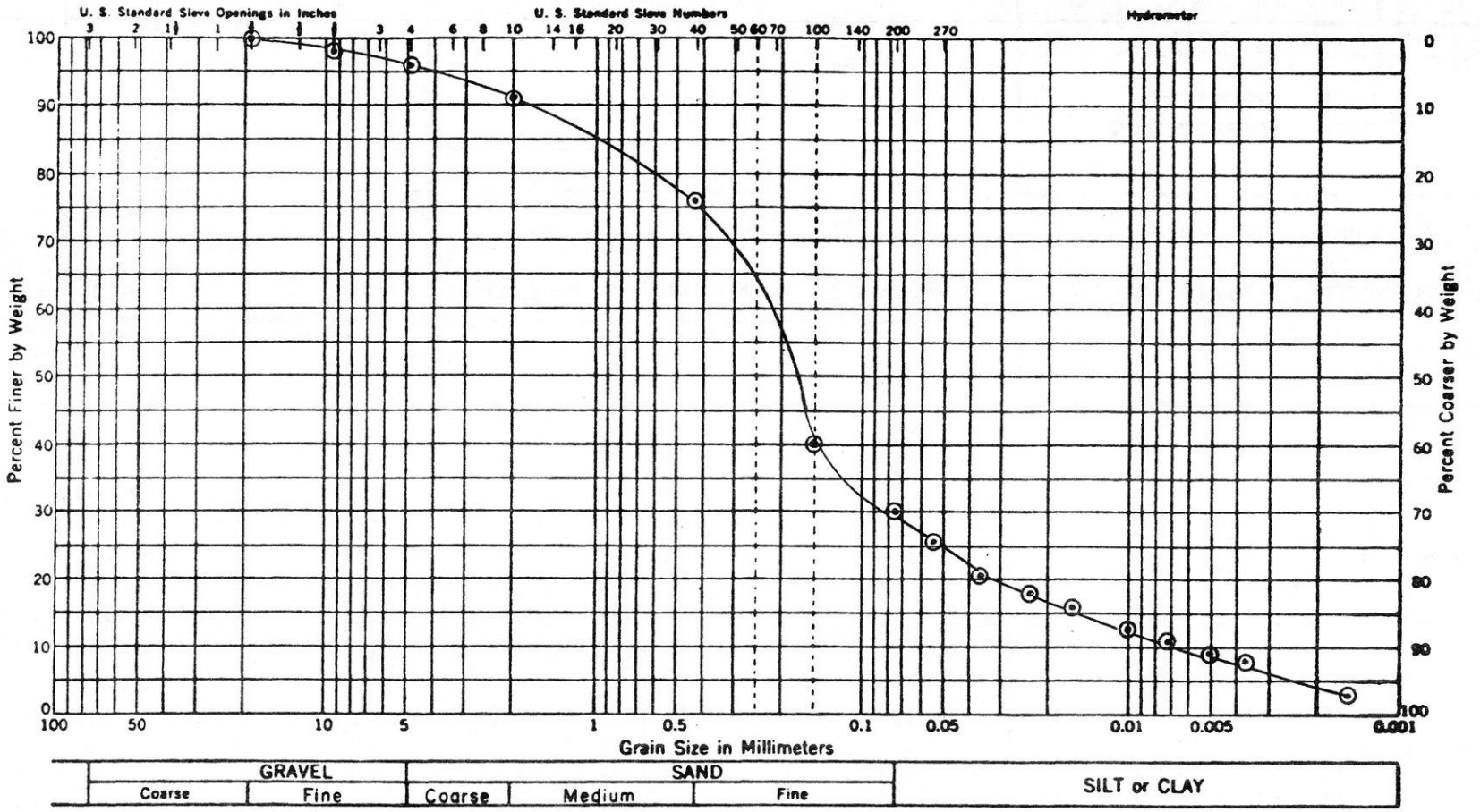
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	10.1				Silty fine to medium sand (SM)
S-15					
142.0-144.0'					

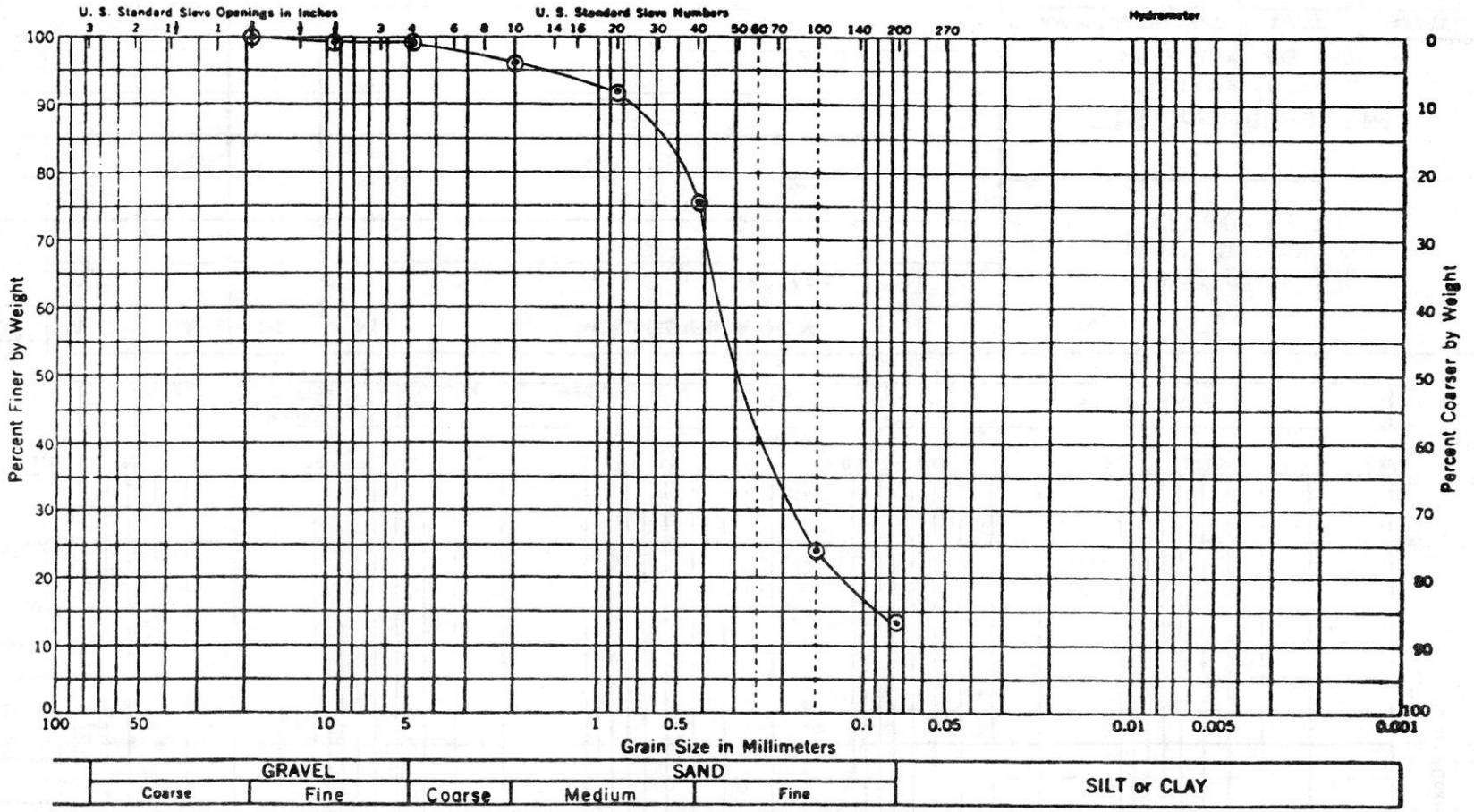
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	13.7				Silty fine to medium sand (SM)
S-16					
153.0-155.0'					

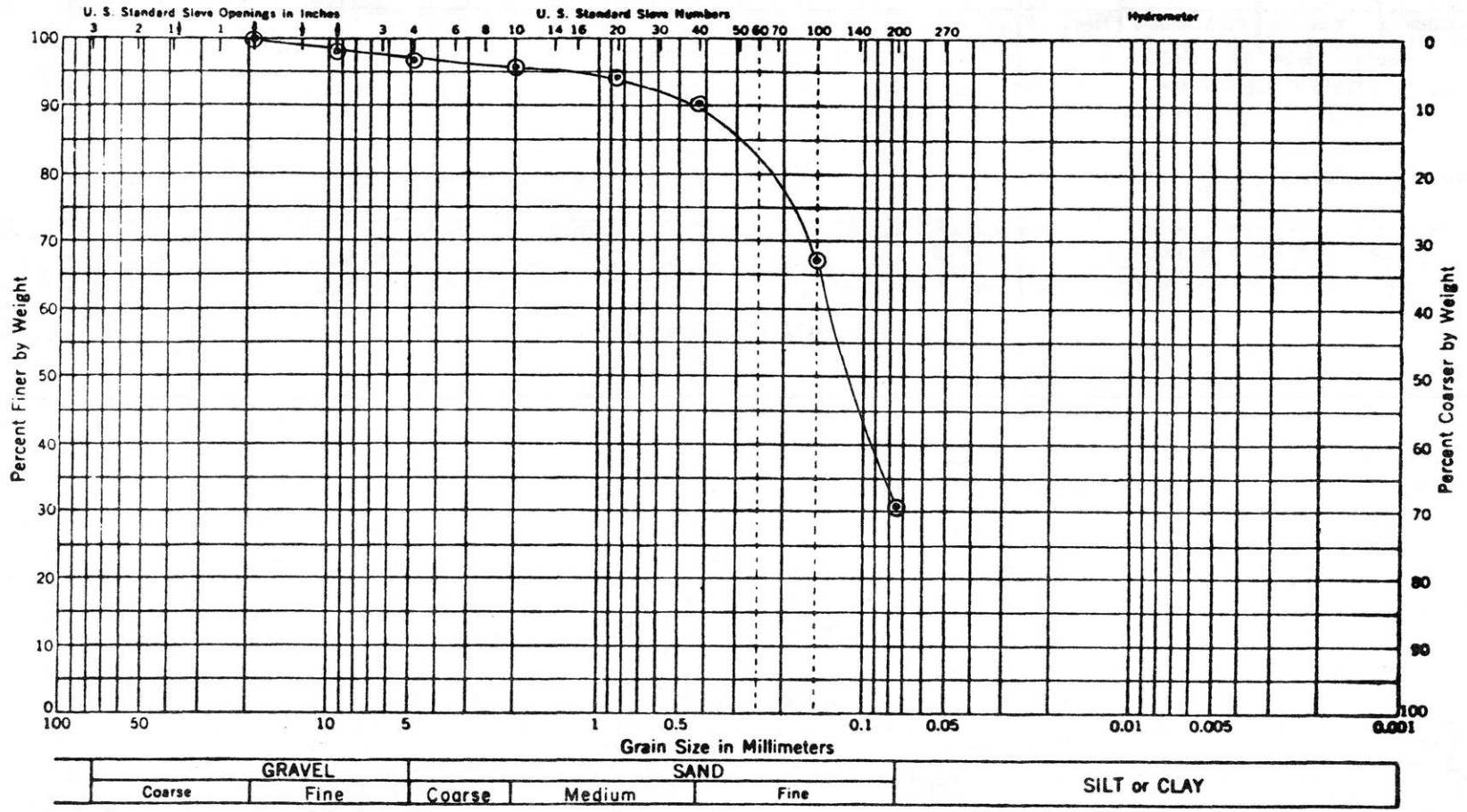
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	20.7				Silty fine to medium sand (SM)
S-17					
163.0-164.6'					

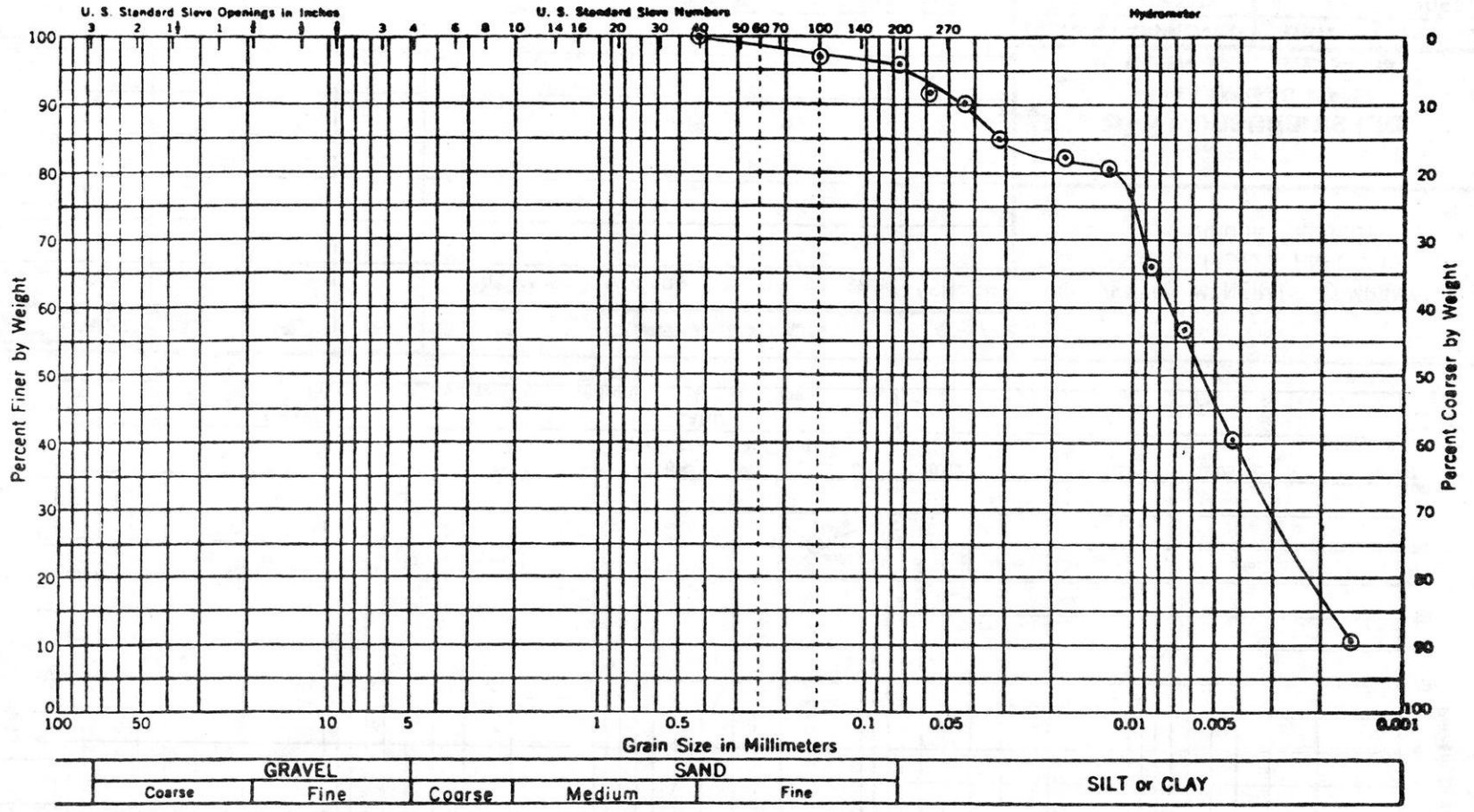
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-2	25.3				Silty clay (CL)
S-18					
173.0-	175.0'				

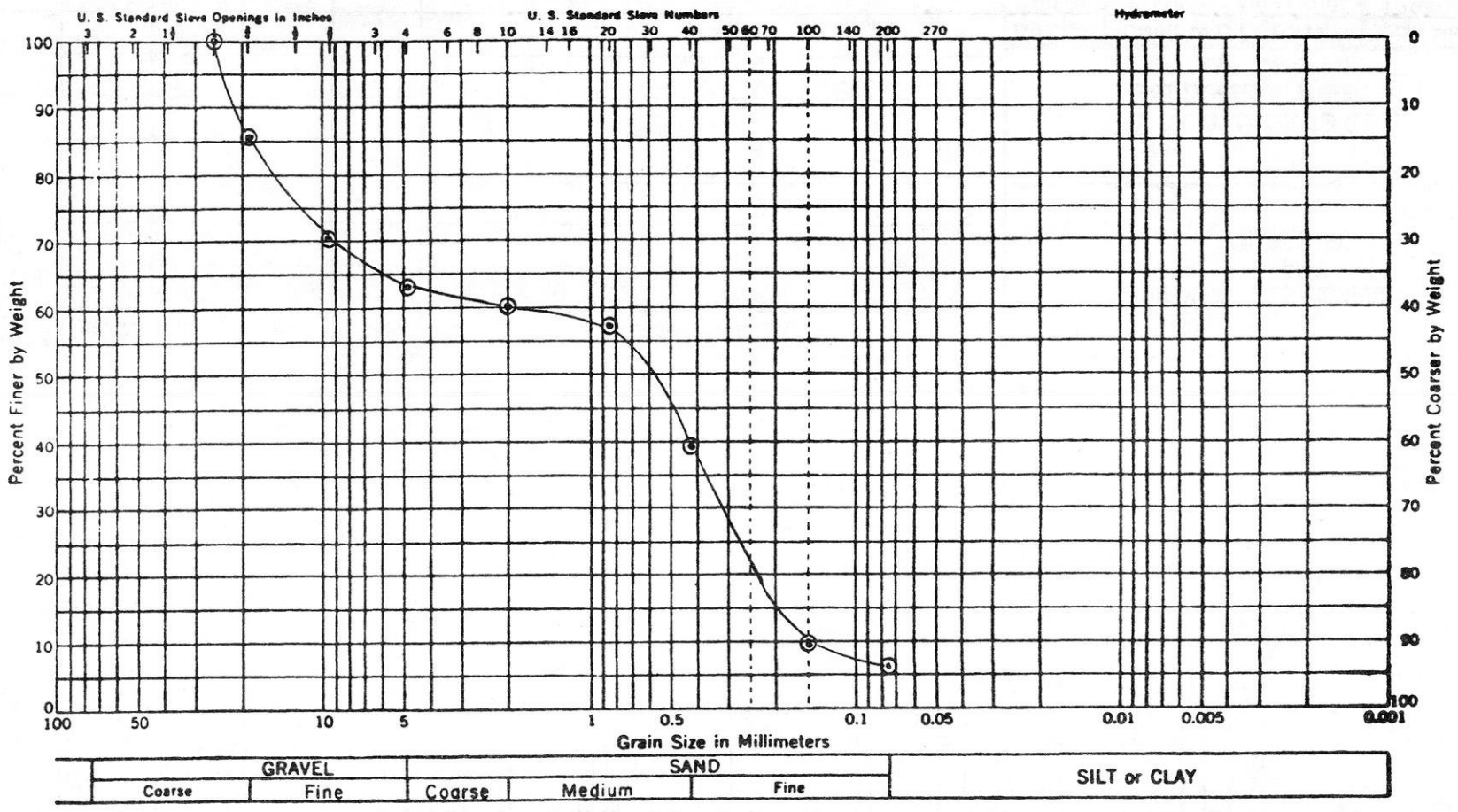
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	7.2				Slightly silty fine to coarse sand (SM-SP)
S-1					
1.0-3.0'					

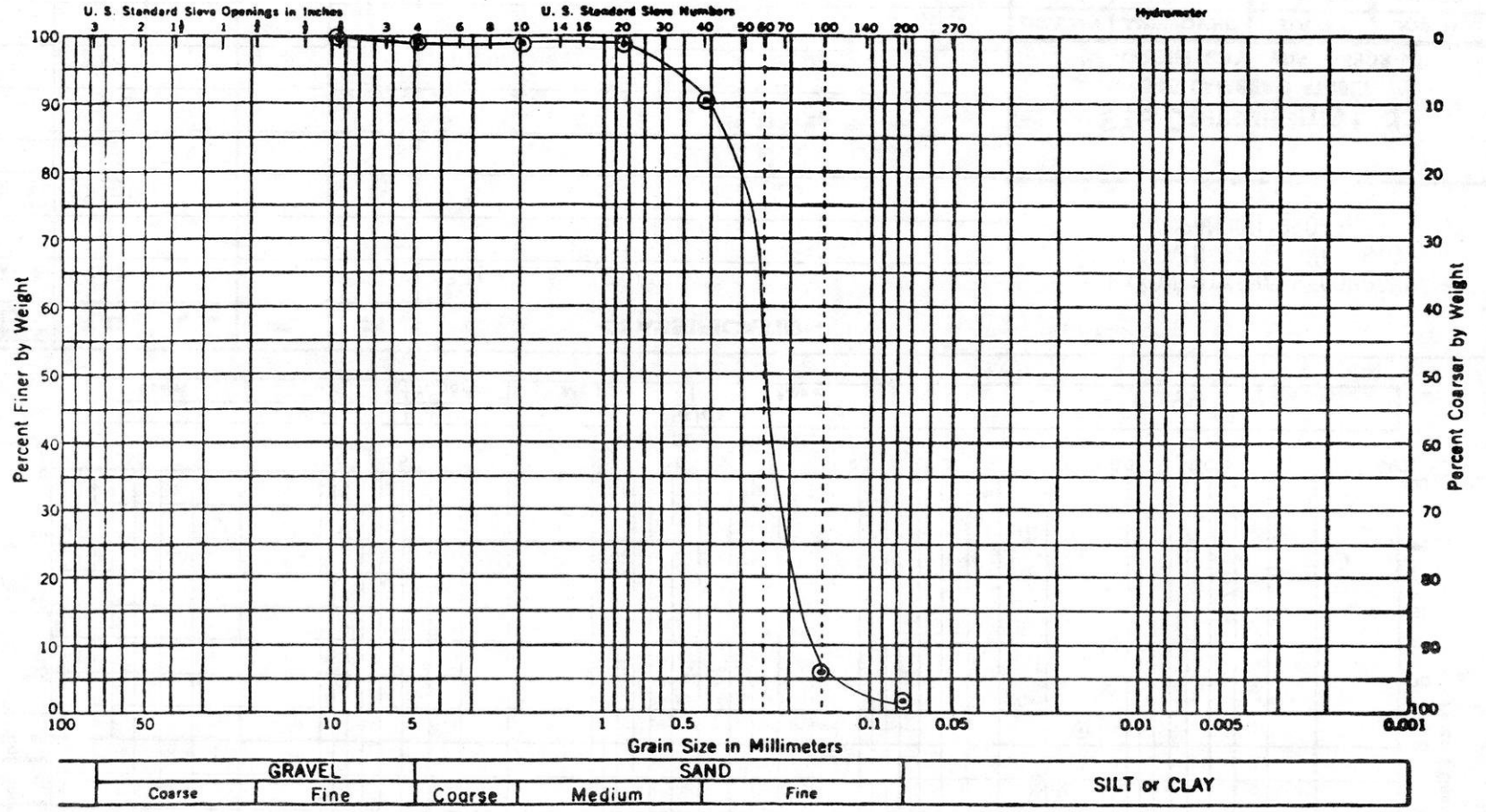
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	21.7				Fine sand (SP)
S-2					
10.0-	12.0'				

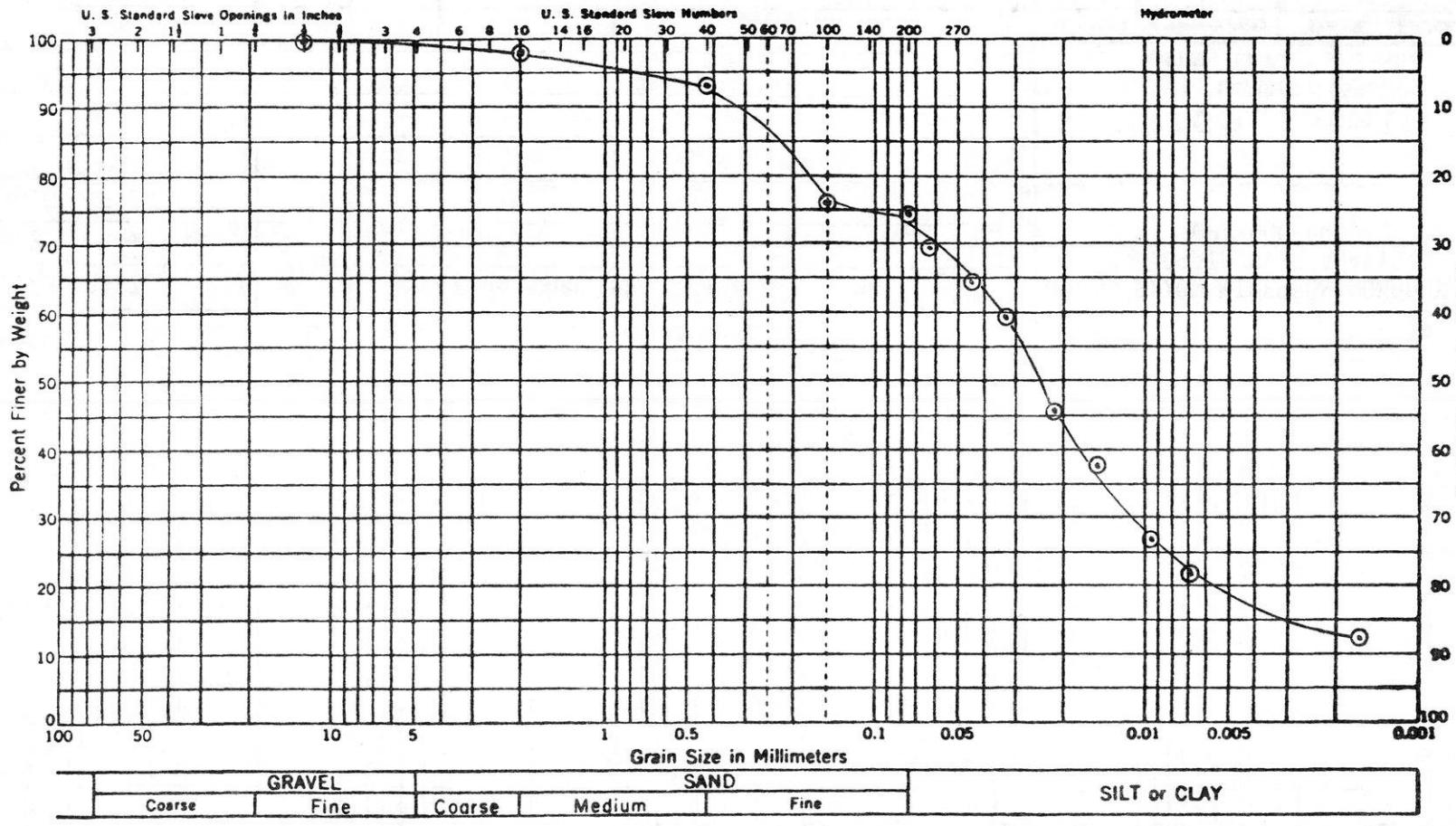
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	29.4				Silty clay (CL)
S-3					
19.5-	21.5'				

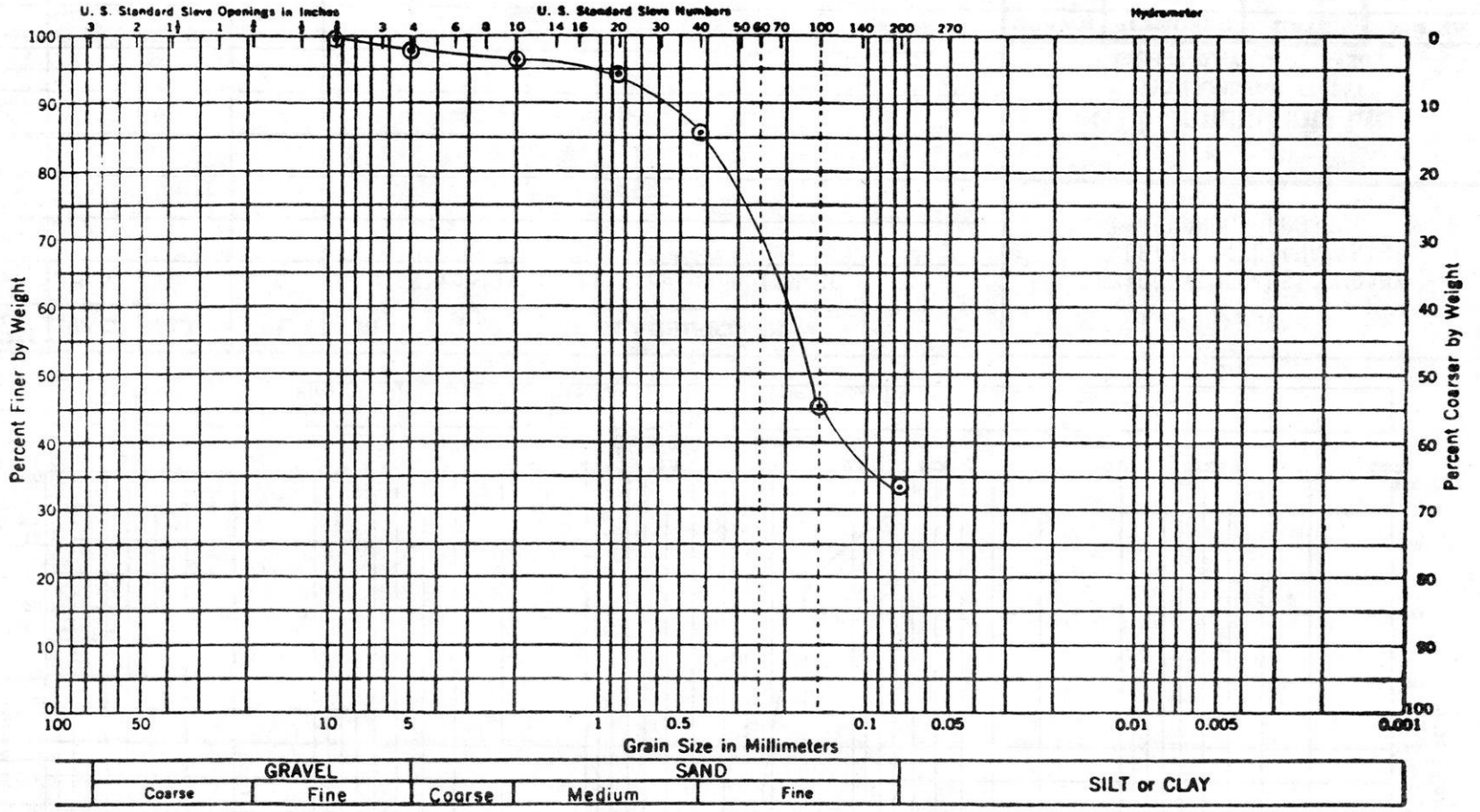
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	19.7				Silty fine sand (SM)
S-4					
29.5-31.5'					

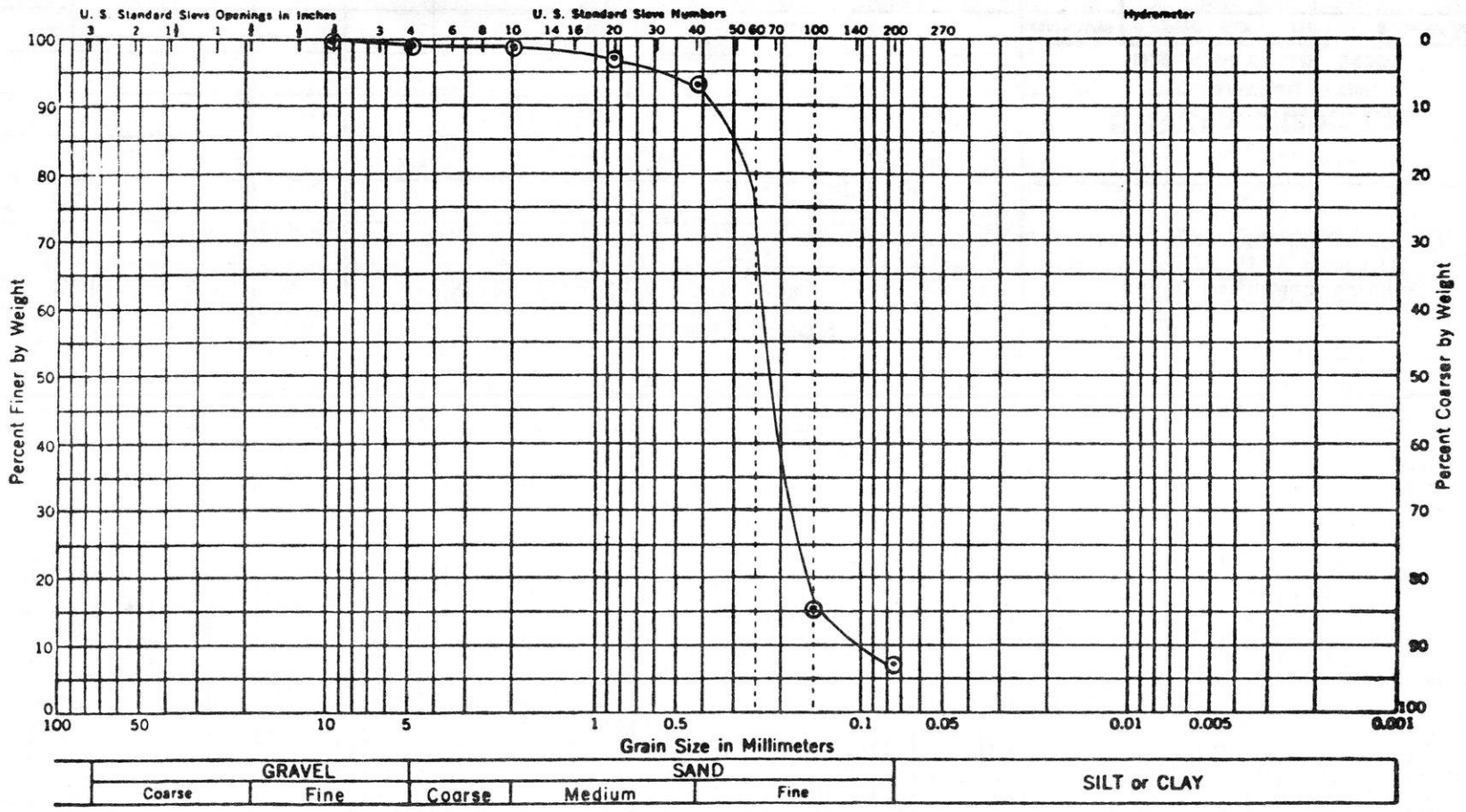
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	18.5				Slightly silty fine sand (SM-SP)
S-6					
50.0-	52.1'				

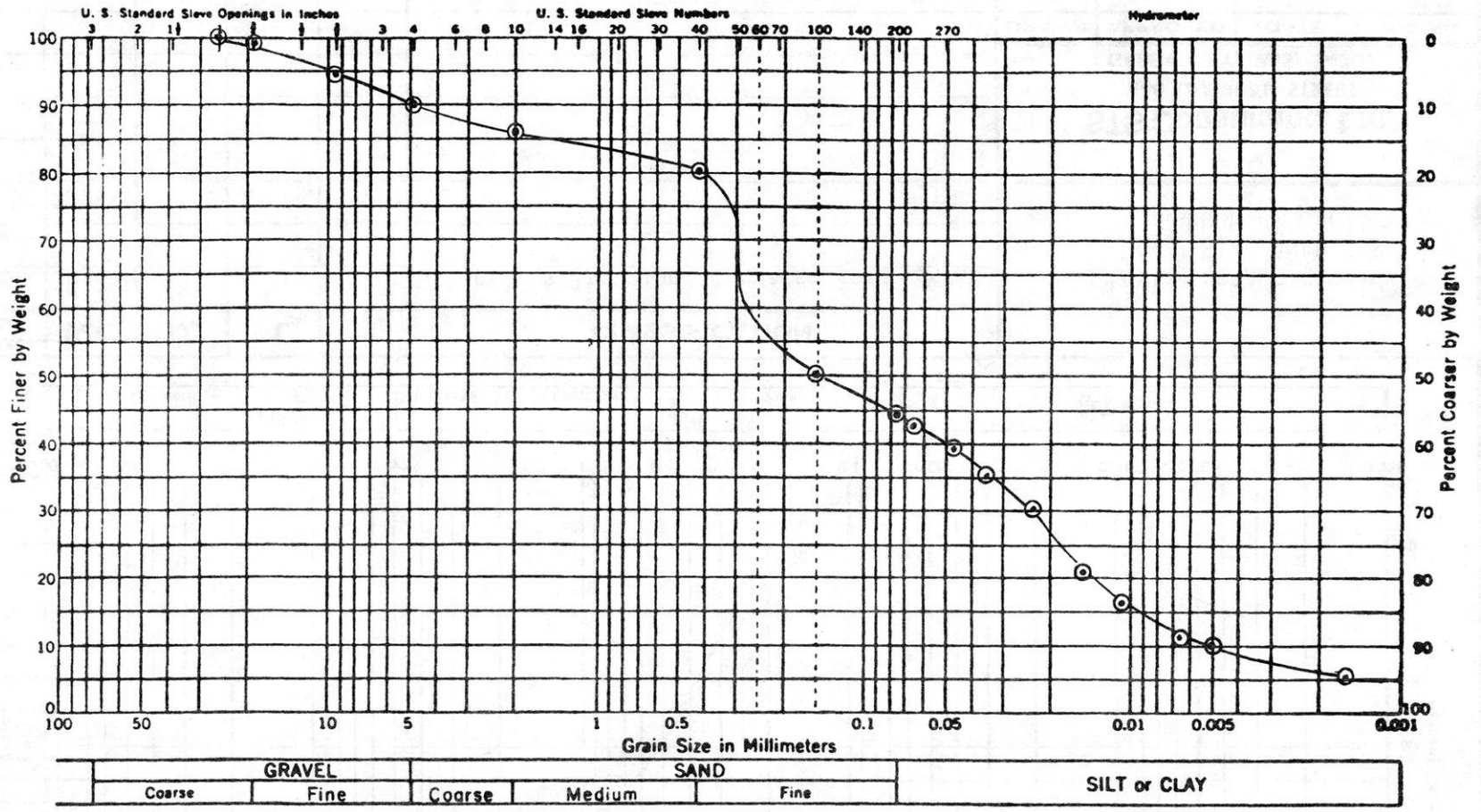
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	11.7				Silty fine to coarse sand (SM)
S-7					
60.5-	62.5'				

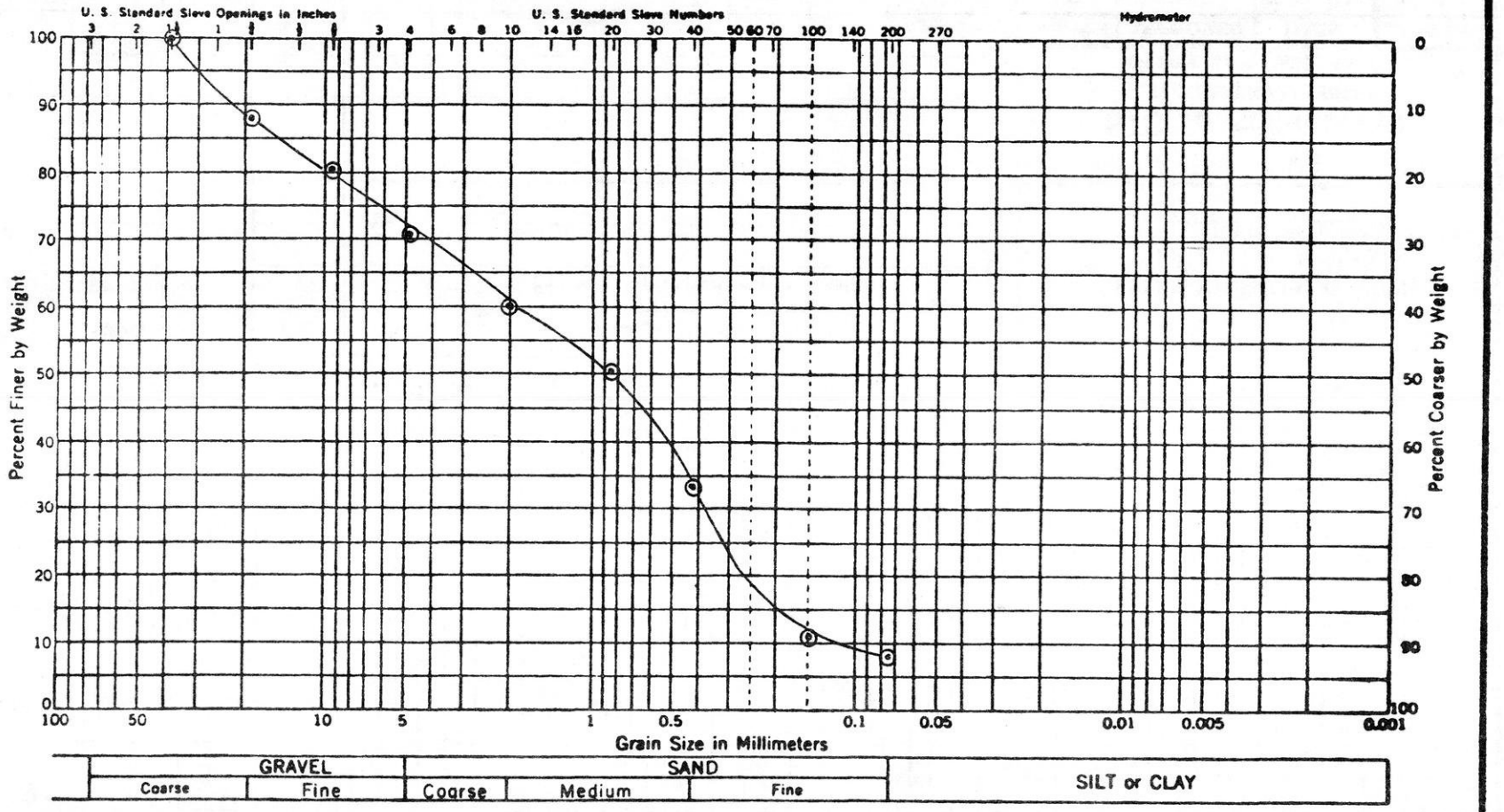
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	10.7				Slightly silty fine to coarse sand (SM-SP)
S-8					
70.5-	72.5'				

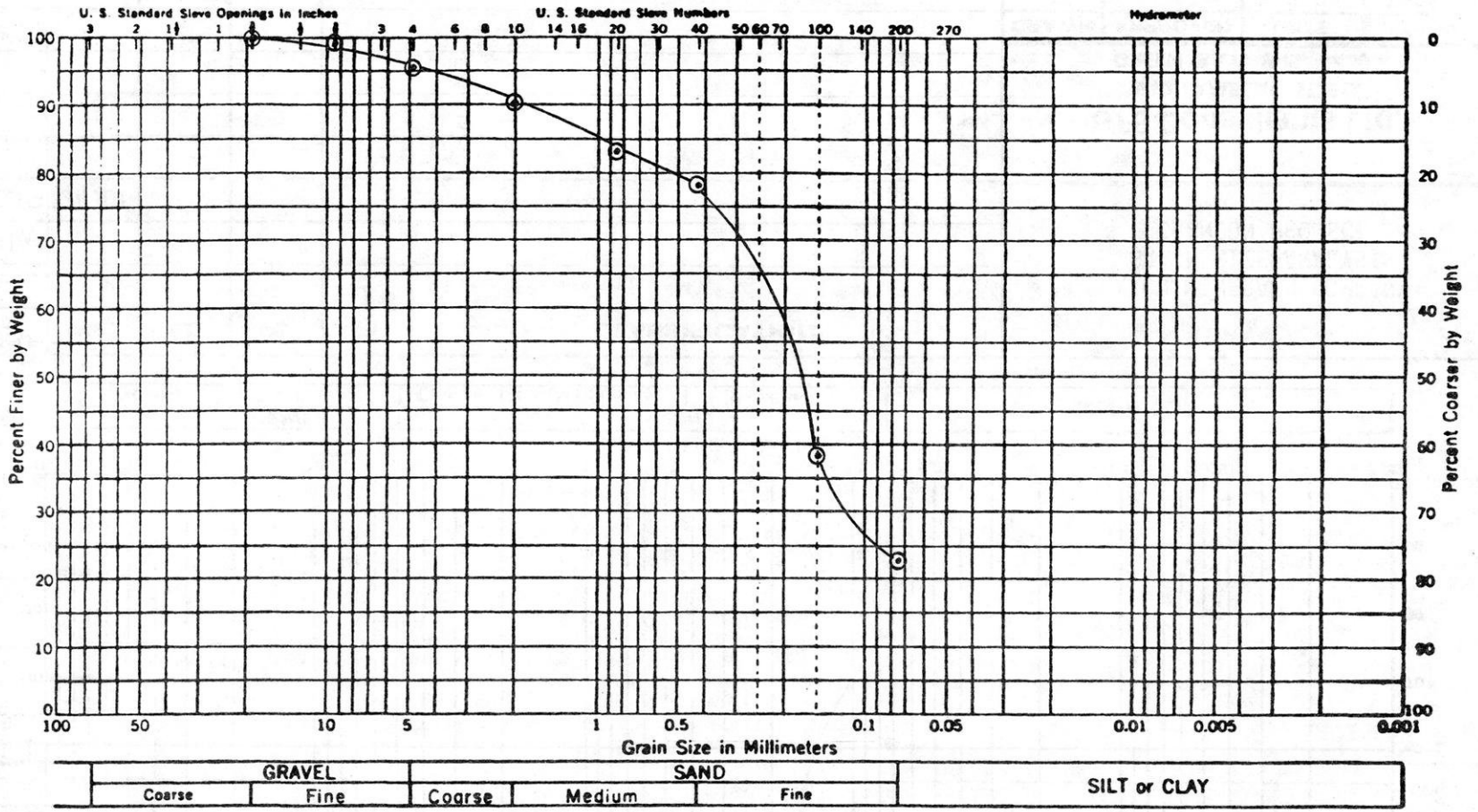
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	18.0				Silty fine to medium sand (SM)
S-11					
101.5-103.5'					

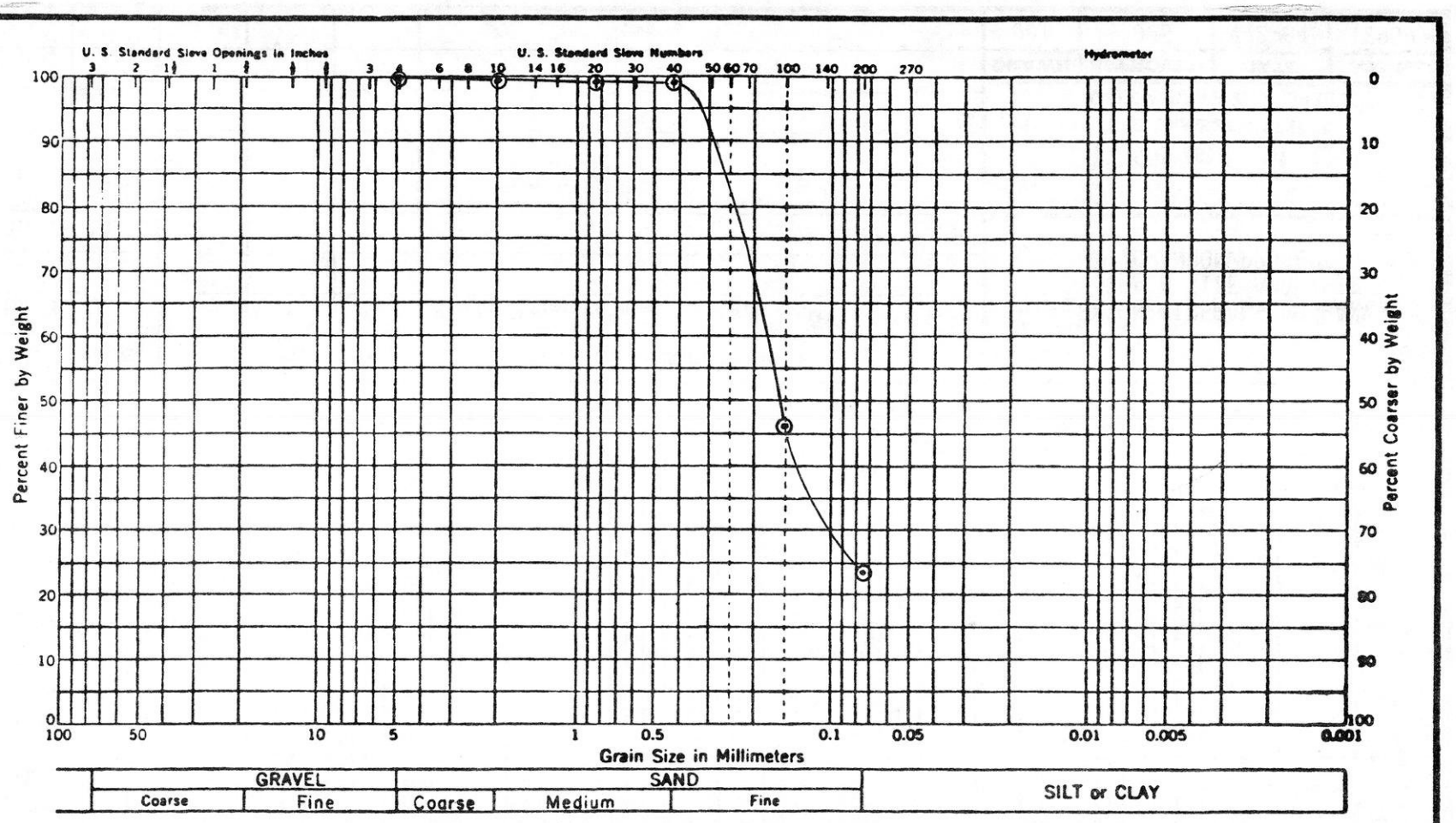
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	20.2				Silty fine sand (SM)
S-13					
122.0-124.0'					

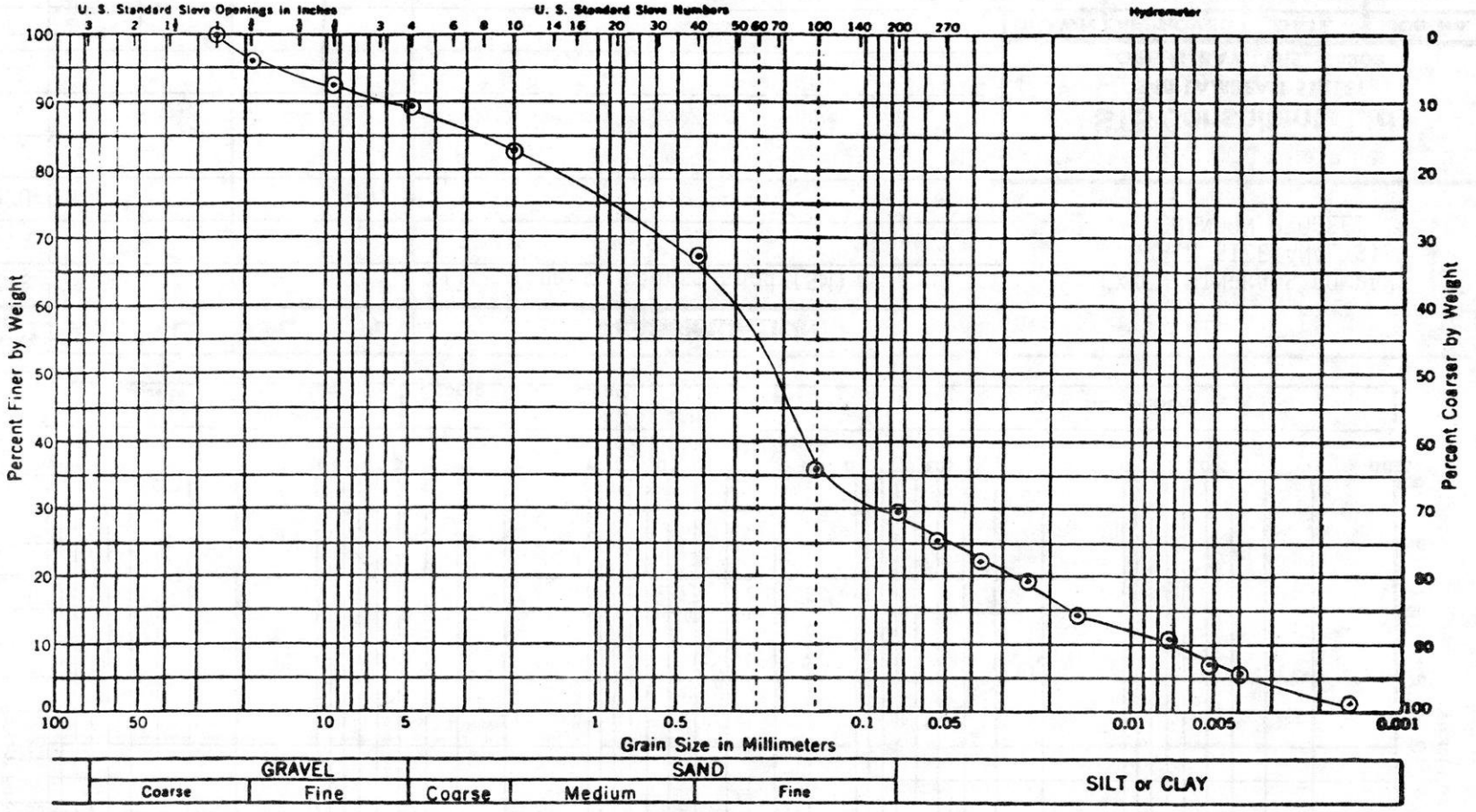
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	9.6				Silty fine to coarse sand (SM)
S-15					
144.5-148.75'					

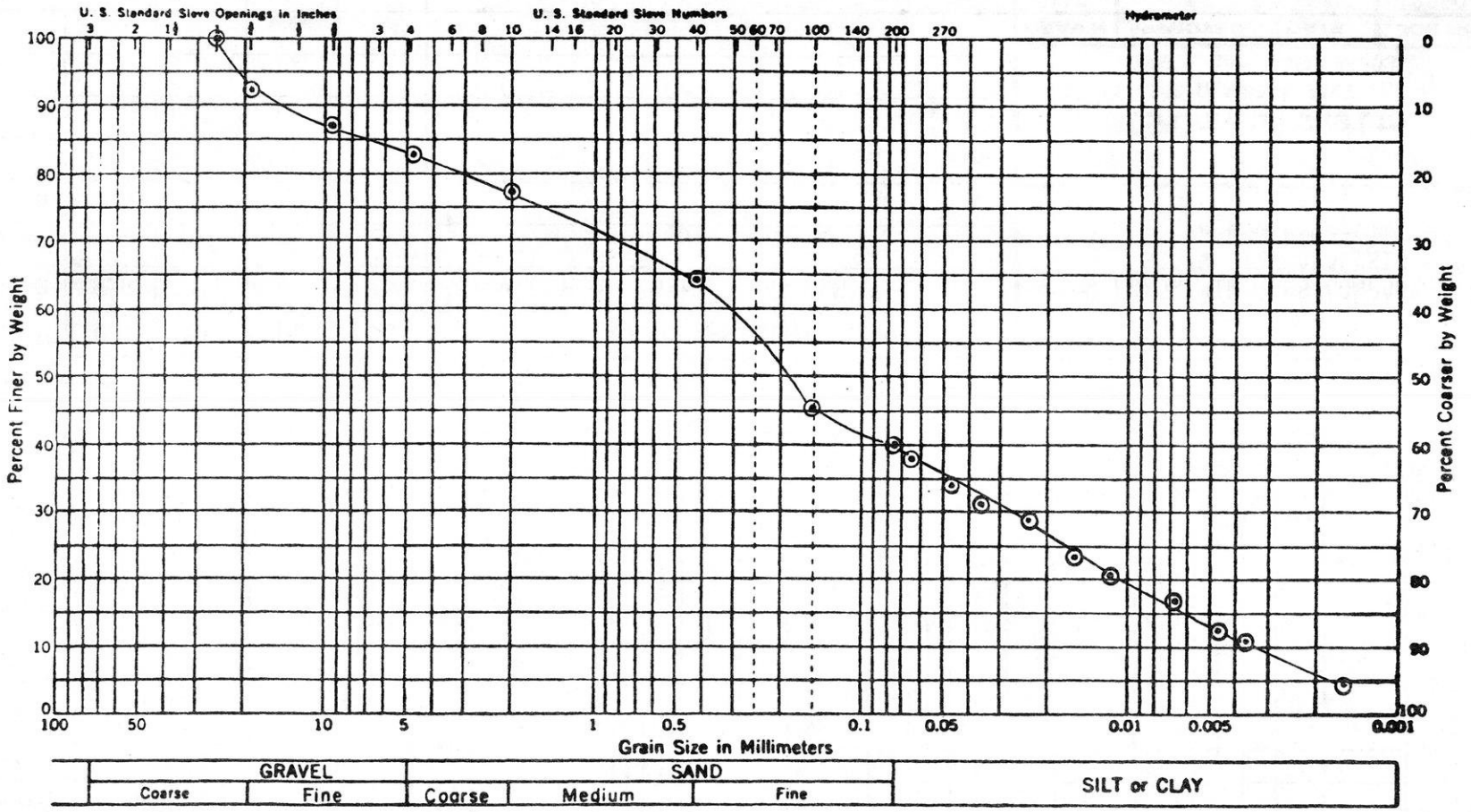
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-3	11.0				Silty fine to coarse sand (SM)
S-16					
153.0-154.1'					

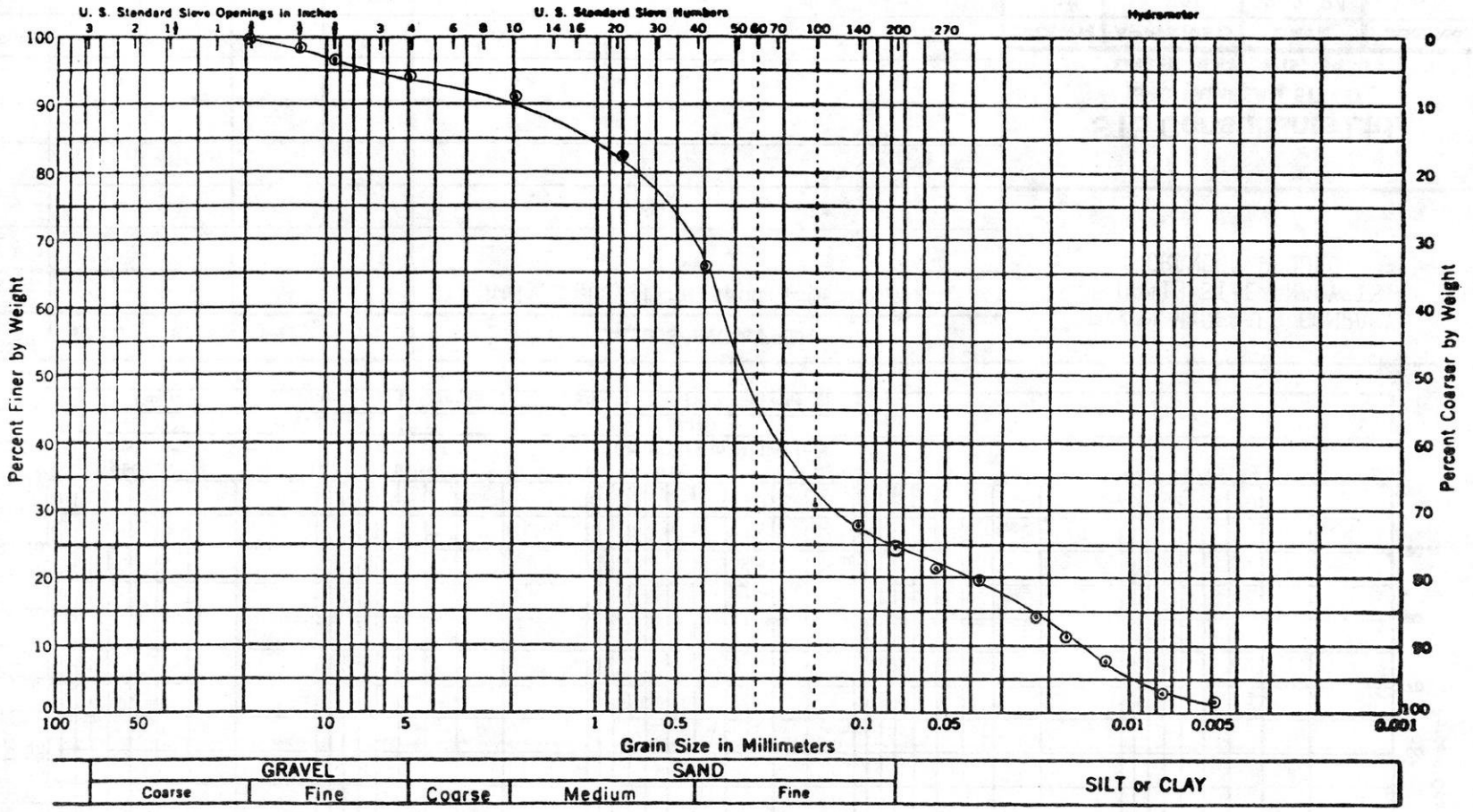
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	8				Silty fine to medium sand (SM)
S-1					
1-3'					

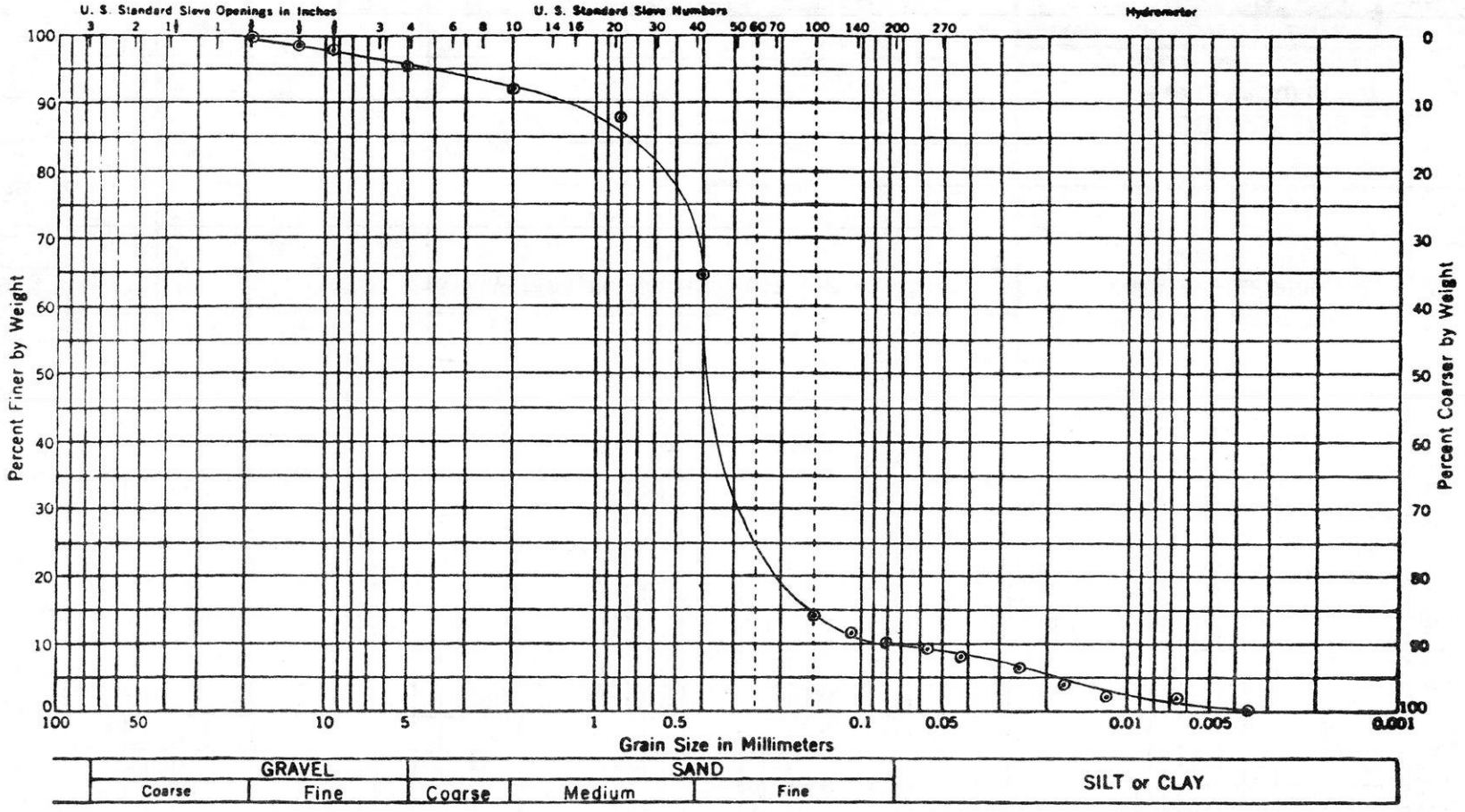
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	9				Slightly silty fine sand (SM-SP)
S-2					
5-7'					

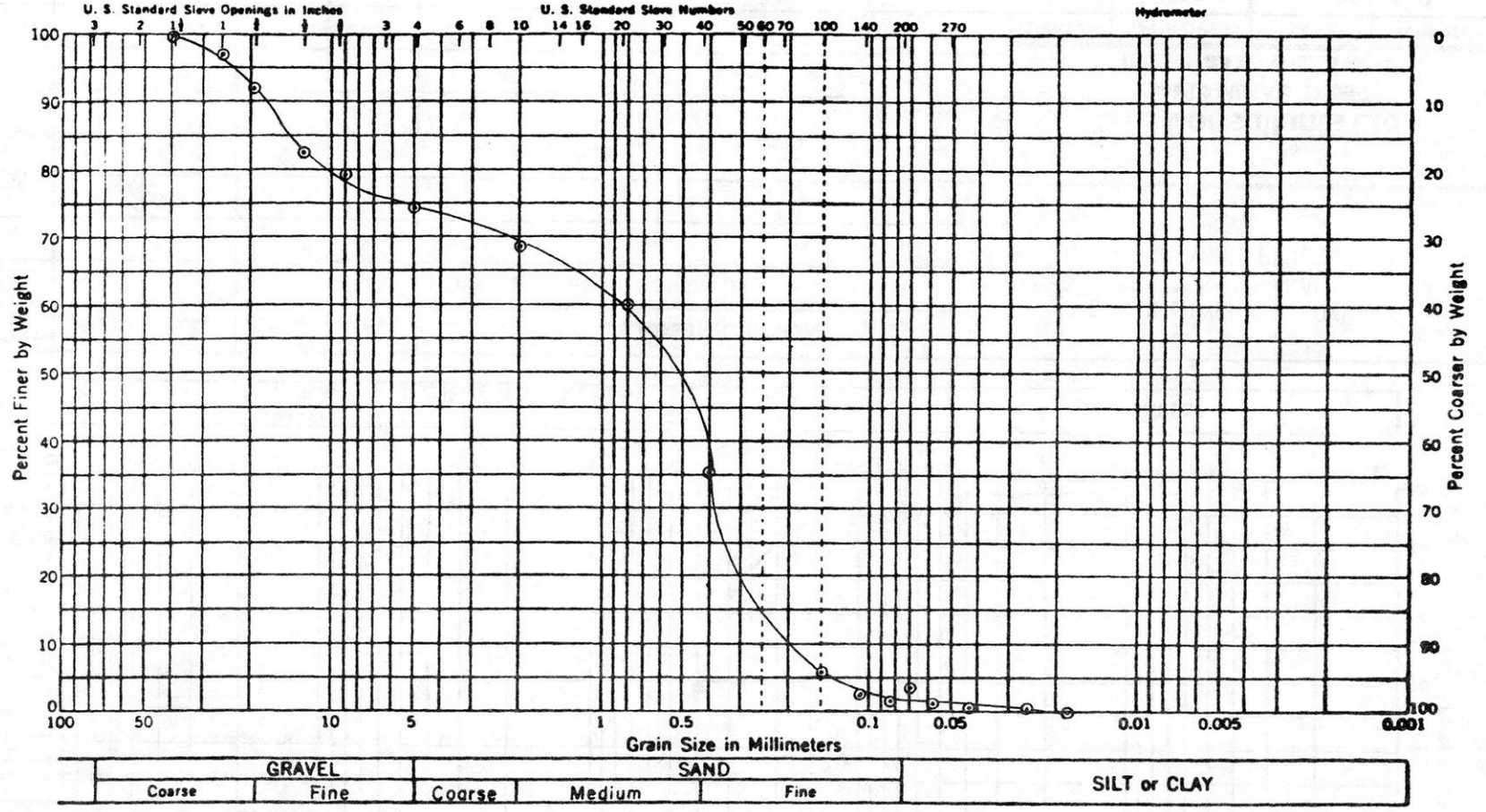
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	6				Fine to coarse sand (SP)
S-3					
10-12'					

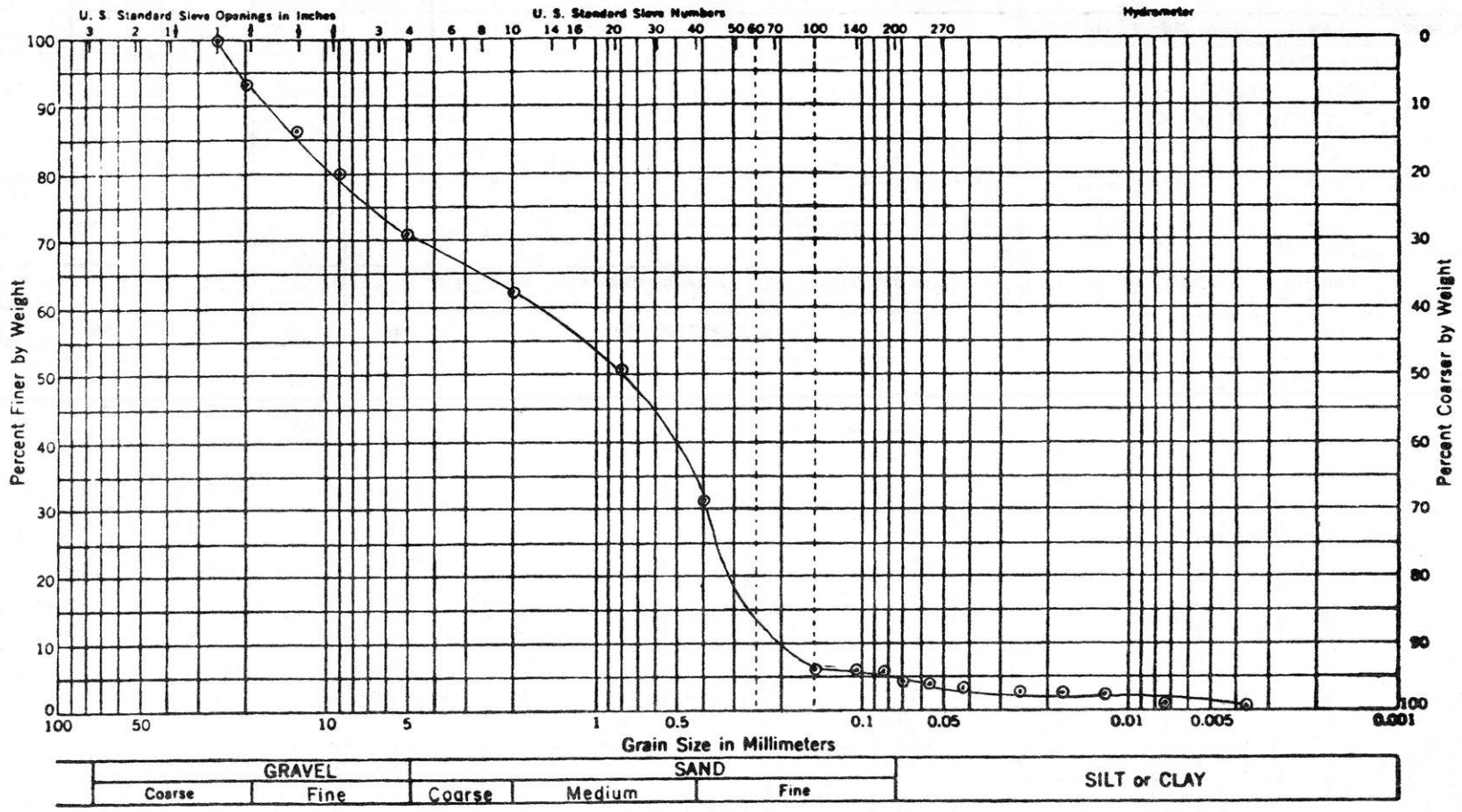
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	7 '				Fine to coarse sand (SP)
S-4					
15-17'					

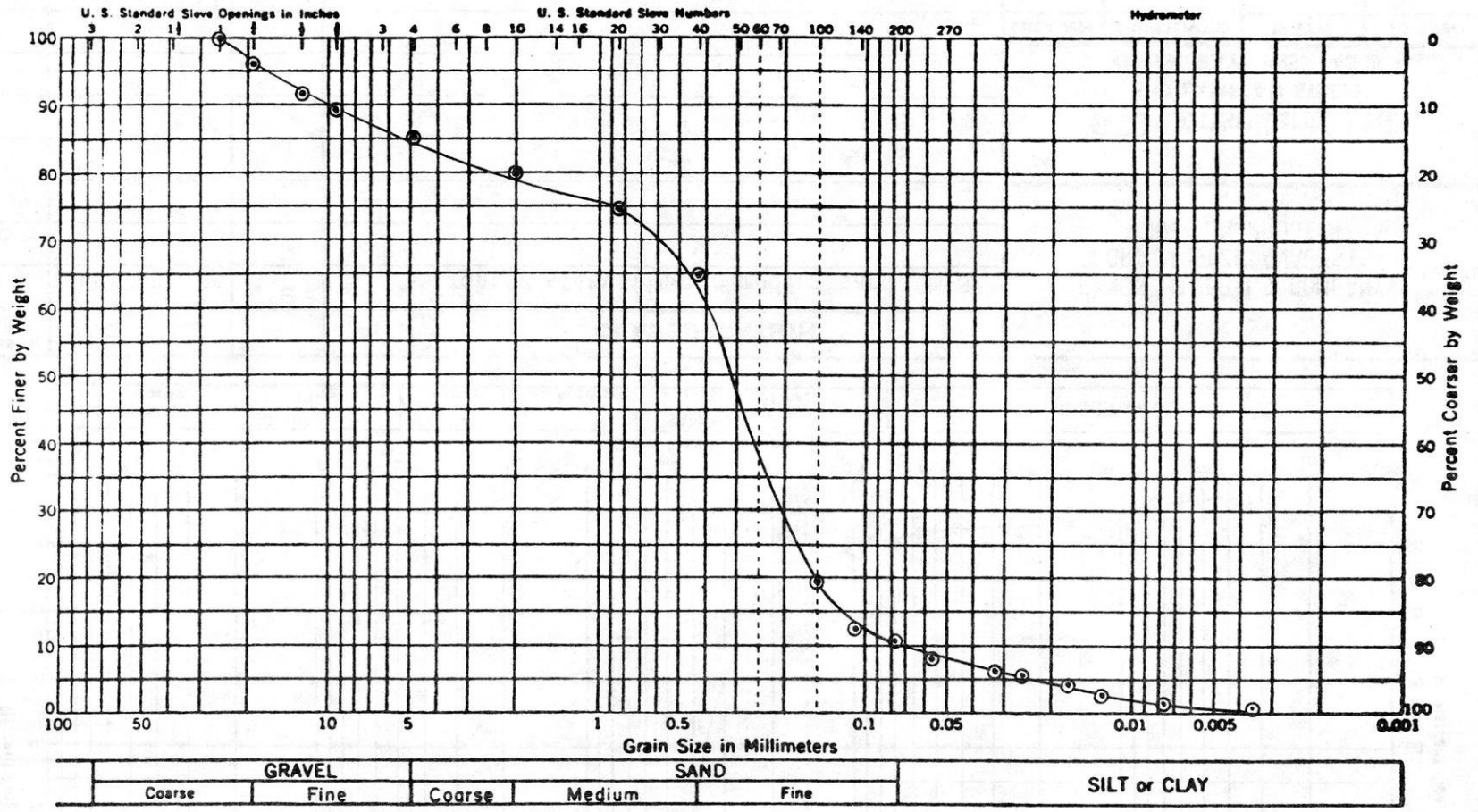
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	10				Slightly silty fine to medium sand (SM-SP)
S-5					
28-30'					

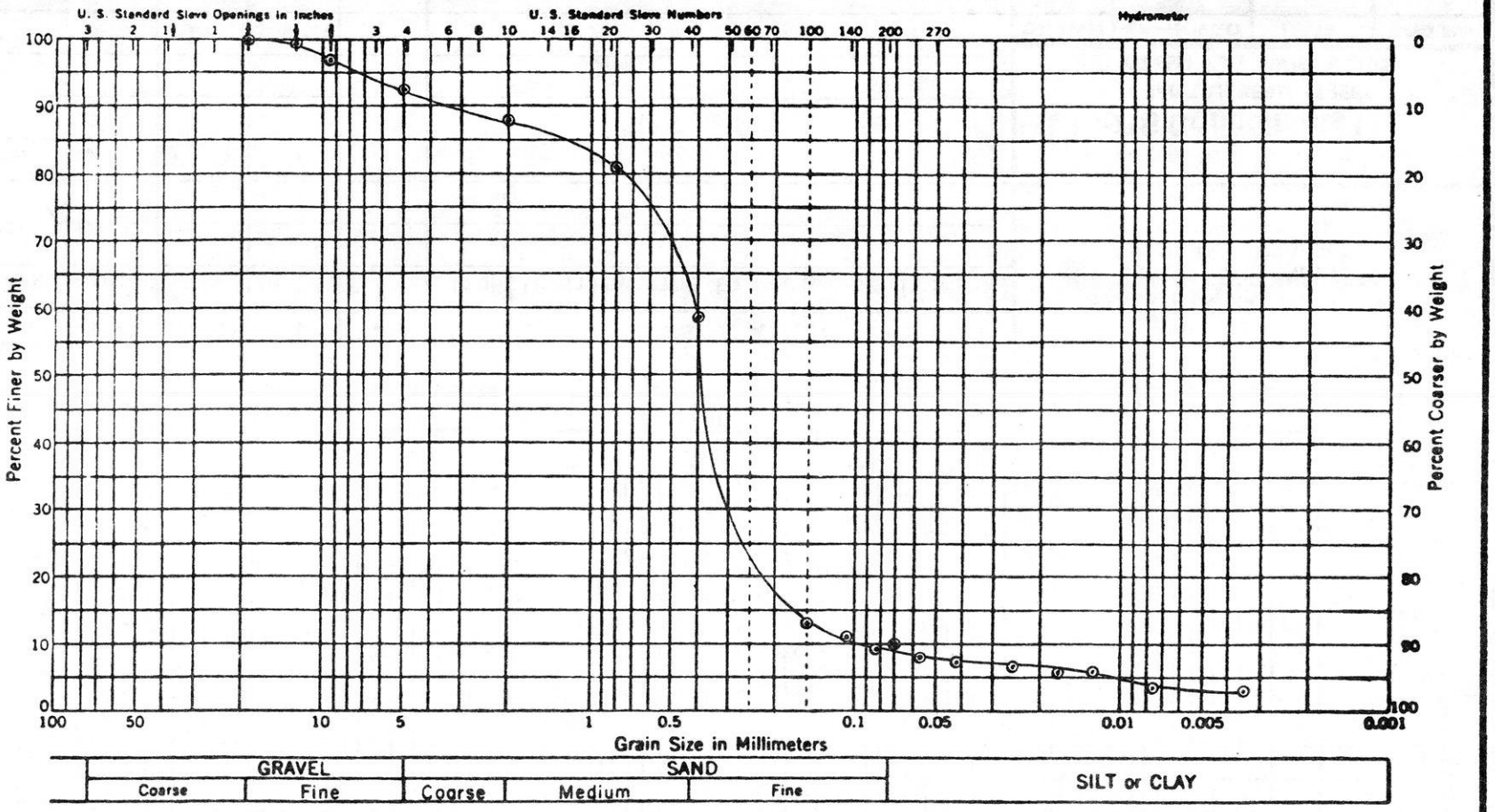
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	11				Slightly silty fine to medium sand (SM-SP)
S-6					
35-37'					

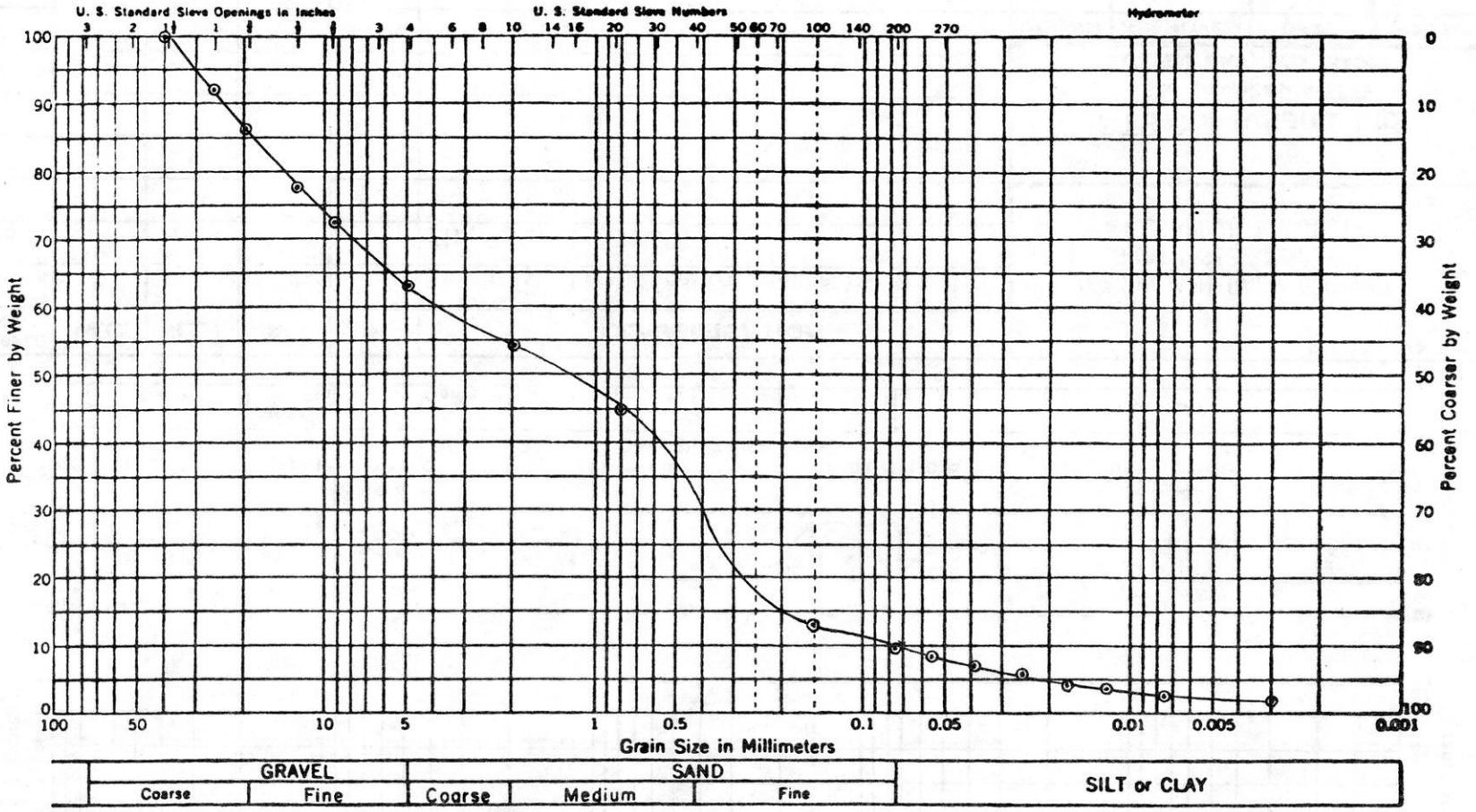
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	5				Slightly silty fine to coarse sand and
S-7					fine gravel (SM-SP)
40-41.5'					

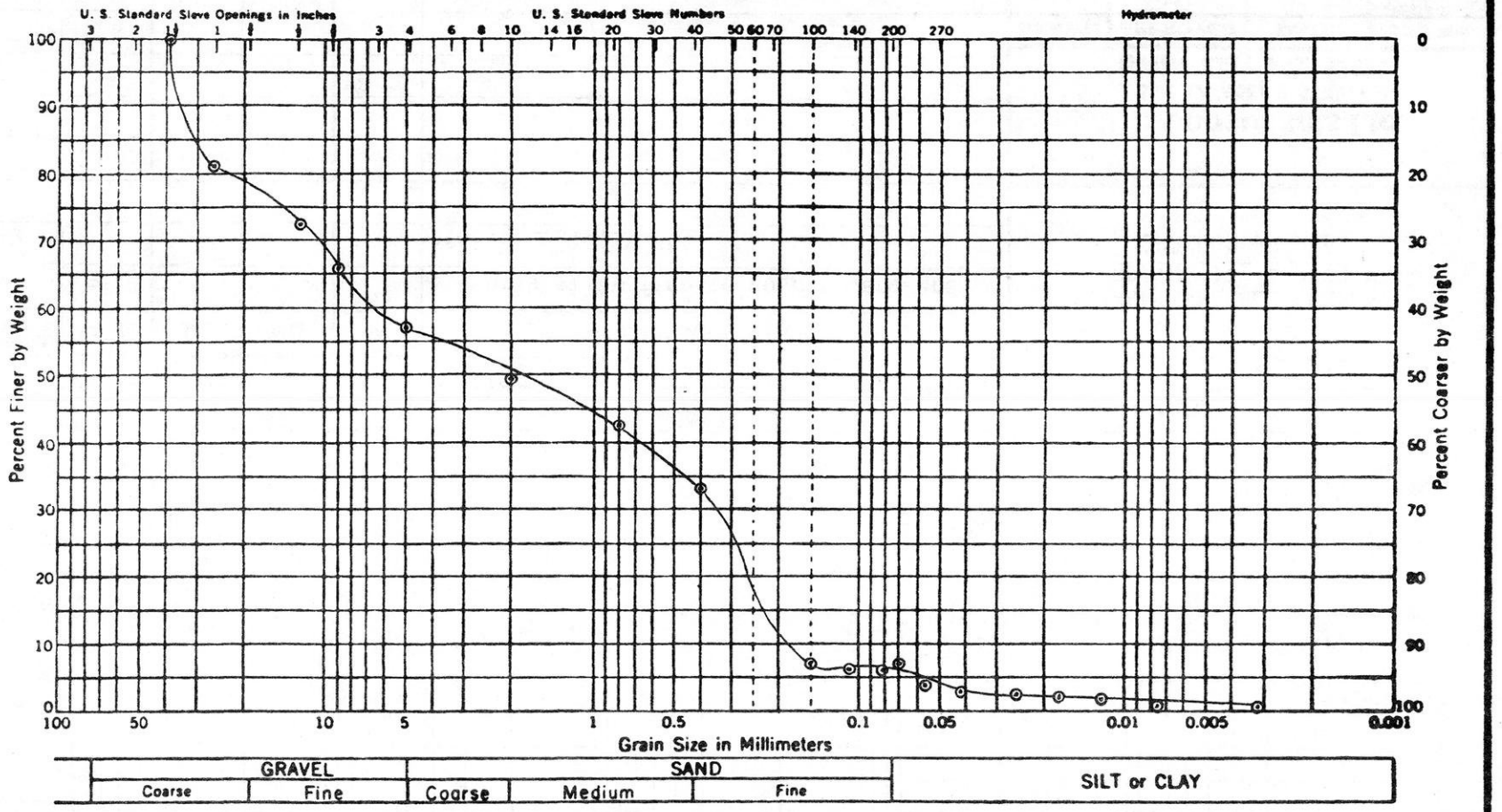
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	9				Slightly silty fine to coarse sand and
S-8					fine gravel (SM-SP)
45-47'					

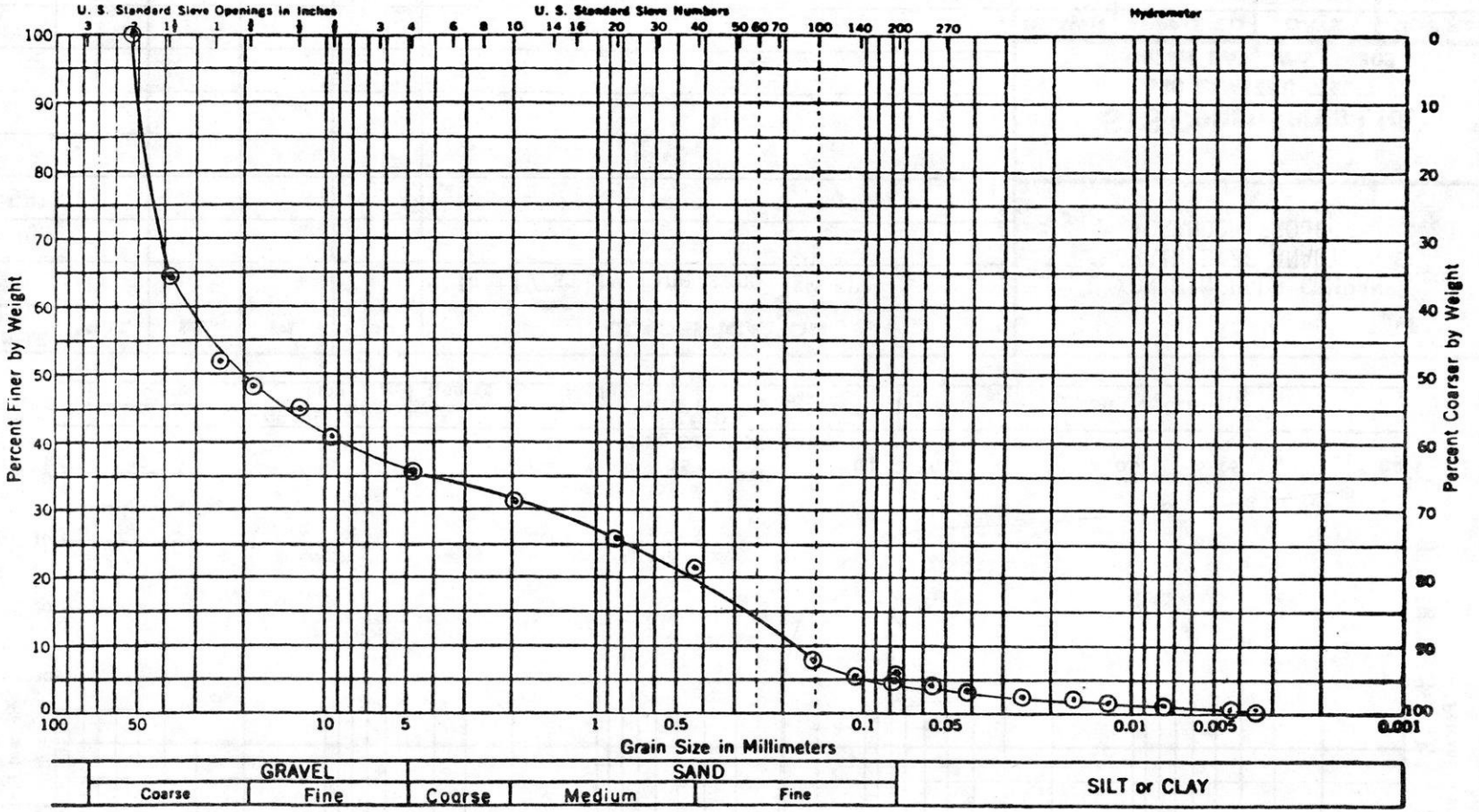
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	8				Slightly silty fine gravel and fine to
S-9					coarse sand (GM-GP)
51.5-53.0					

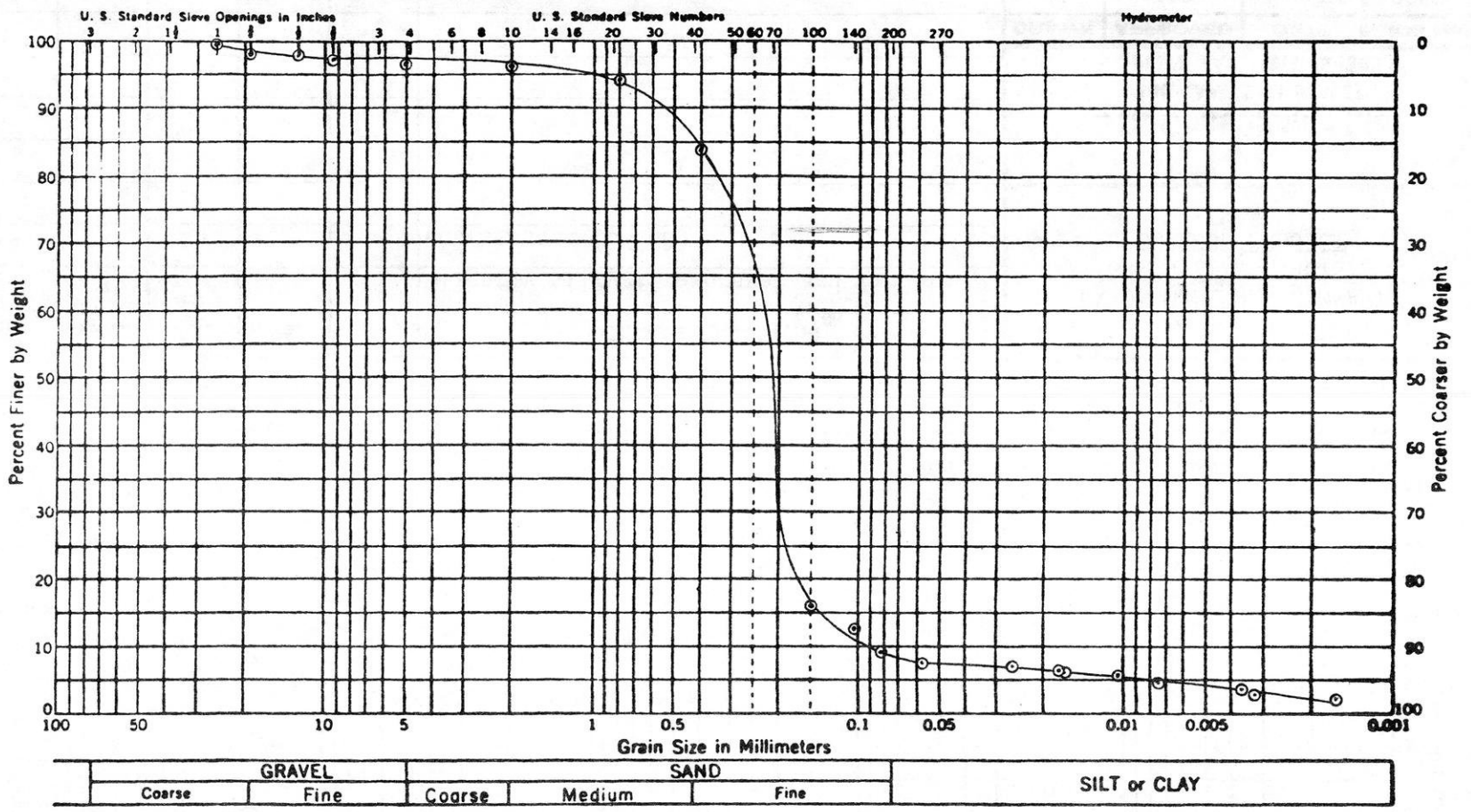
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	13				Slightly silty fine sand (SM-SP)
S-10					
56-58'					

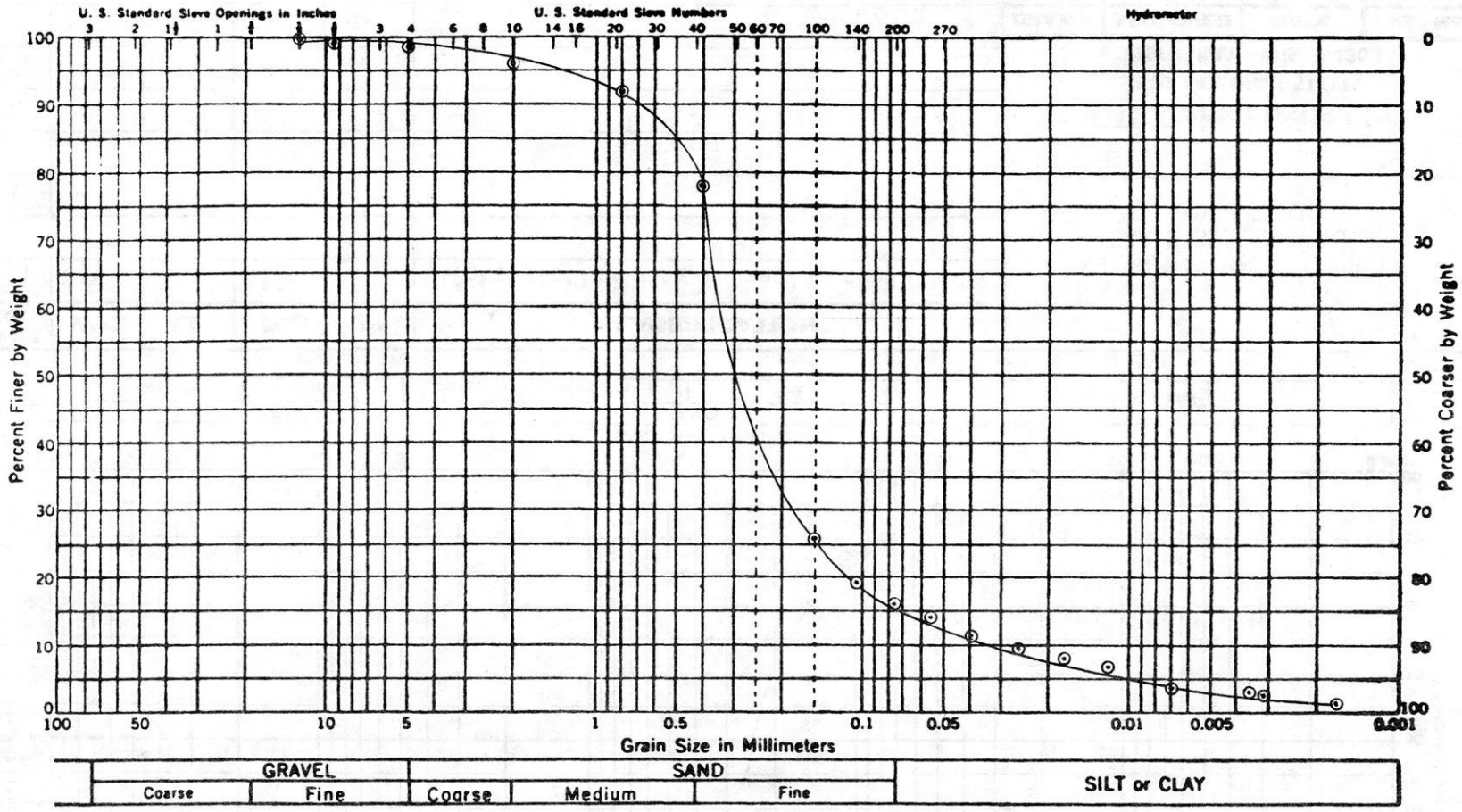
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	13				Silty fine sand (SM)
S-11					
61-63'					

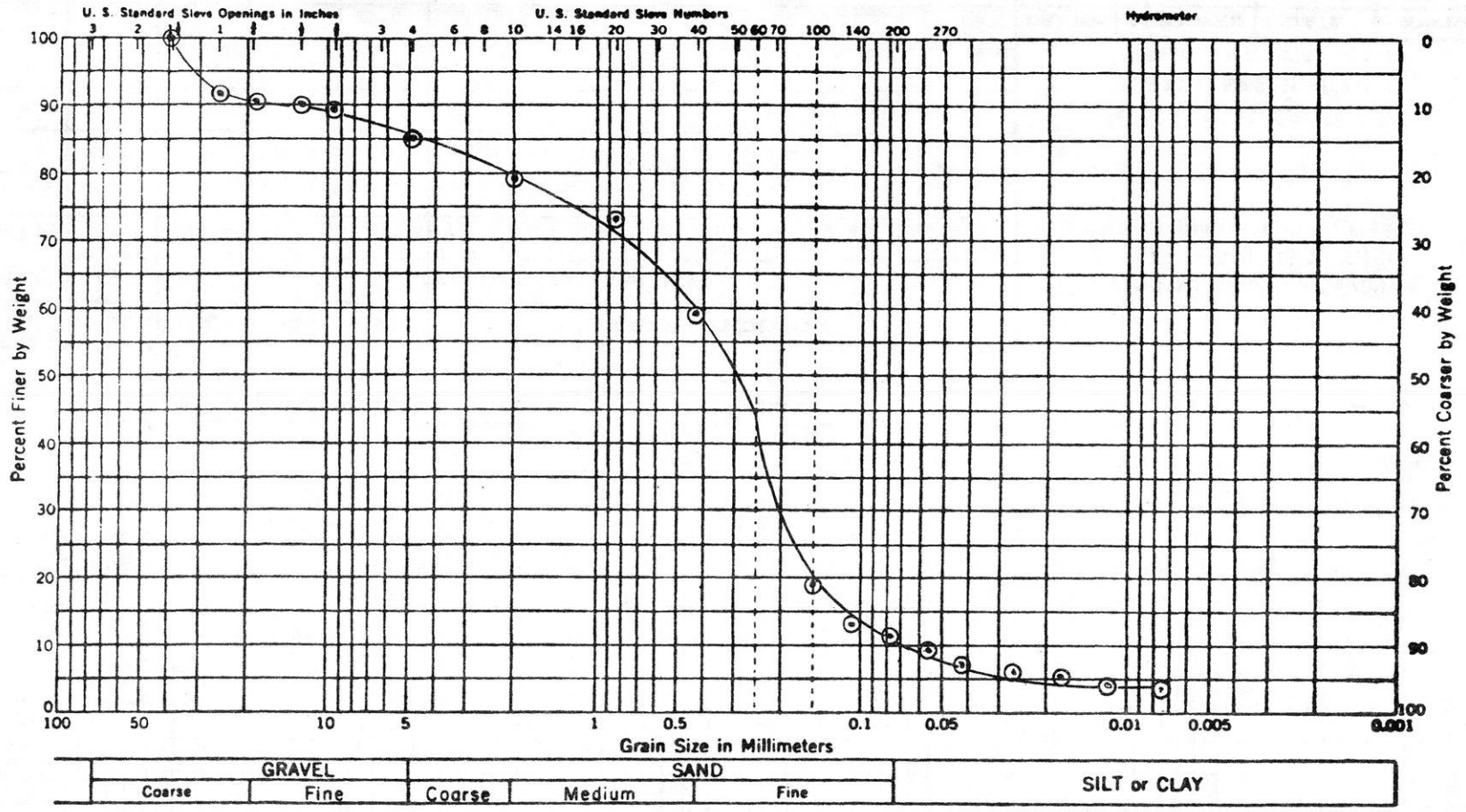
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	13				Slightly silty fine to medium sand (SM-SP)
S-12					
66-68'					

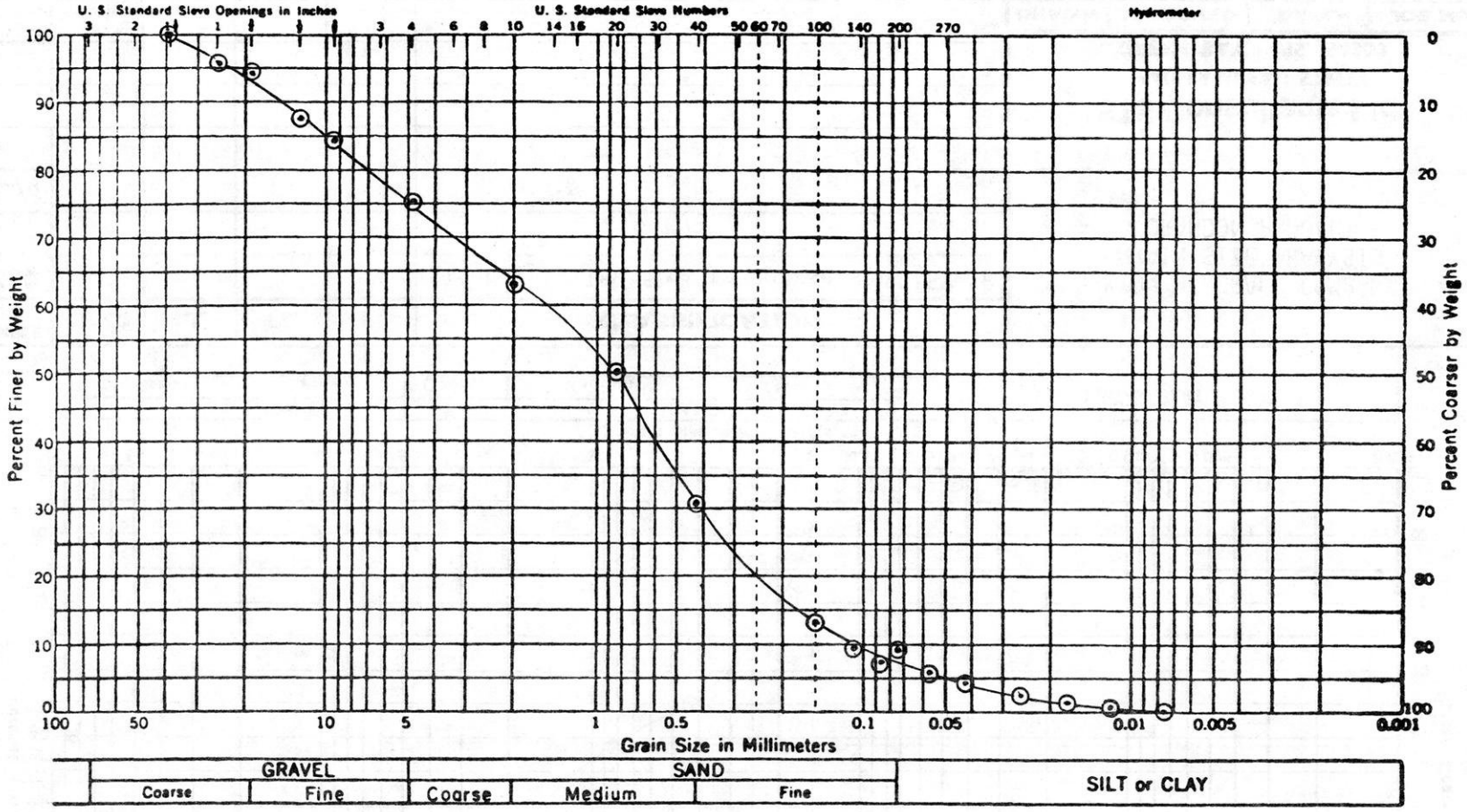
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	12				Slightly silty fine to coarse sand (SM-SP)
S-13					
72-74'					

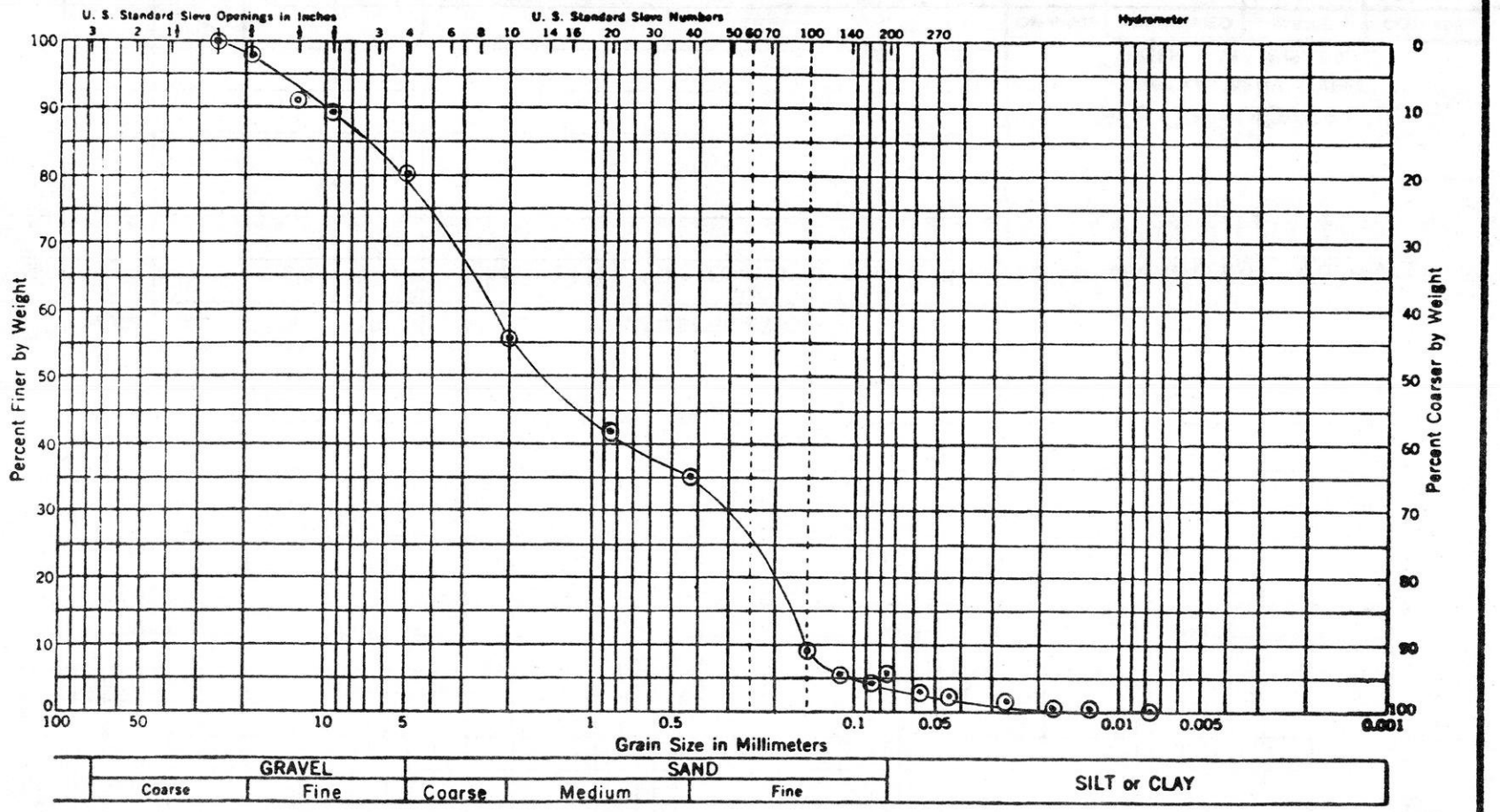
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	13				Slightly silty fine to coarse sand (SM-SP)
S-14					
77-79'					

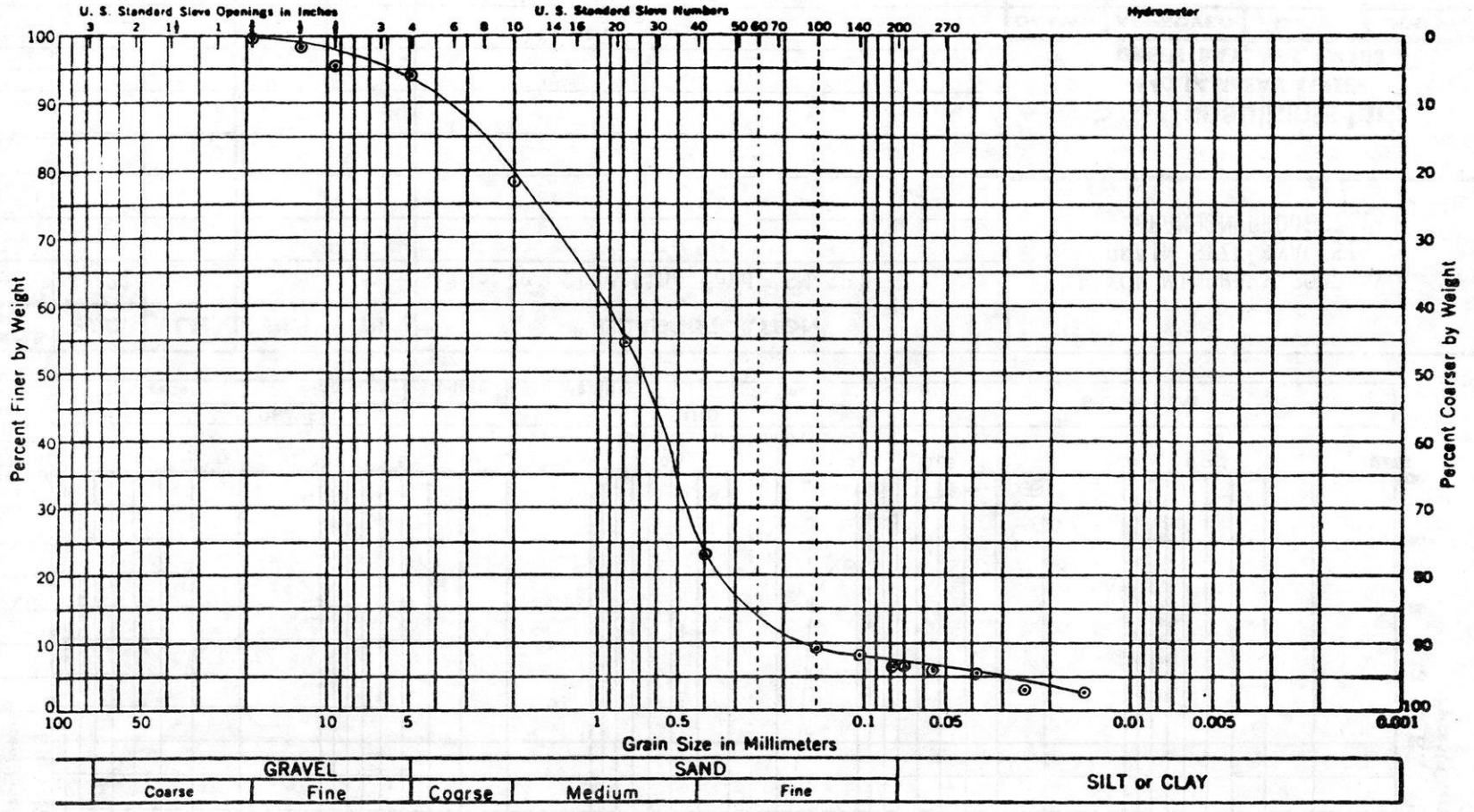
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	12				Slightly silty fine to coarse sand (SM-SP)
S-15					
82-84'					

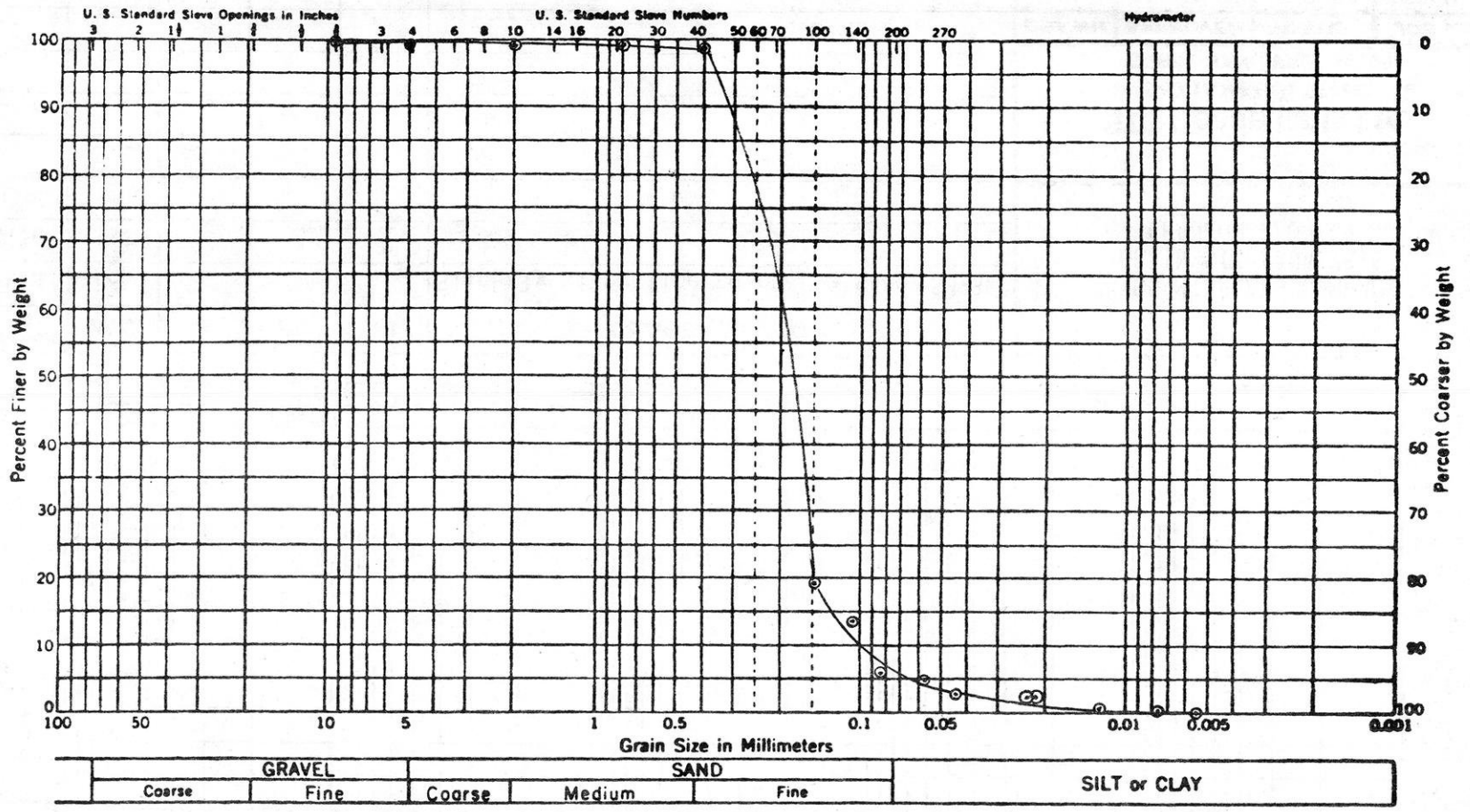
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	21				Slightly silty fine sand (SM-SP)
S-16					
37-89'					

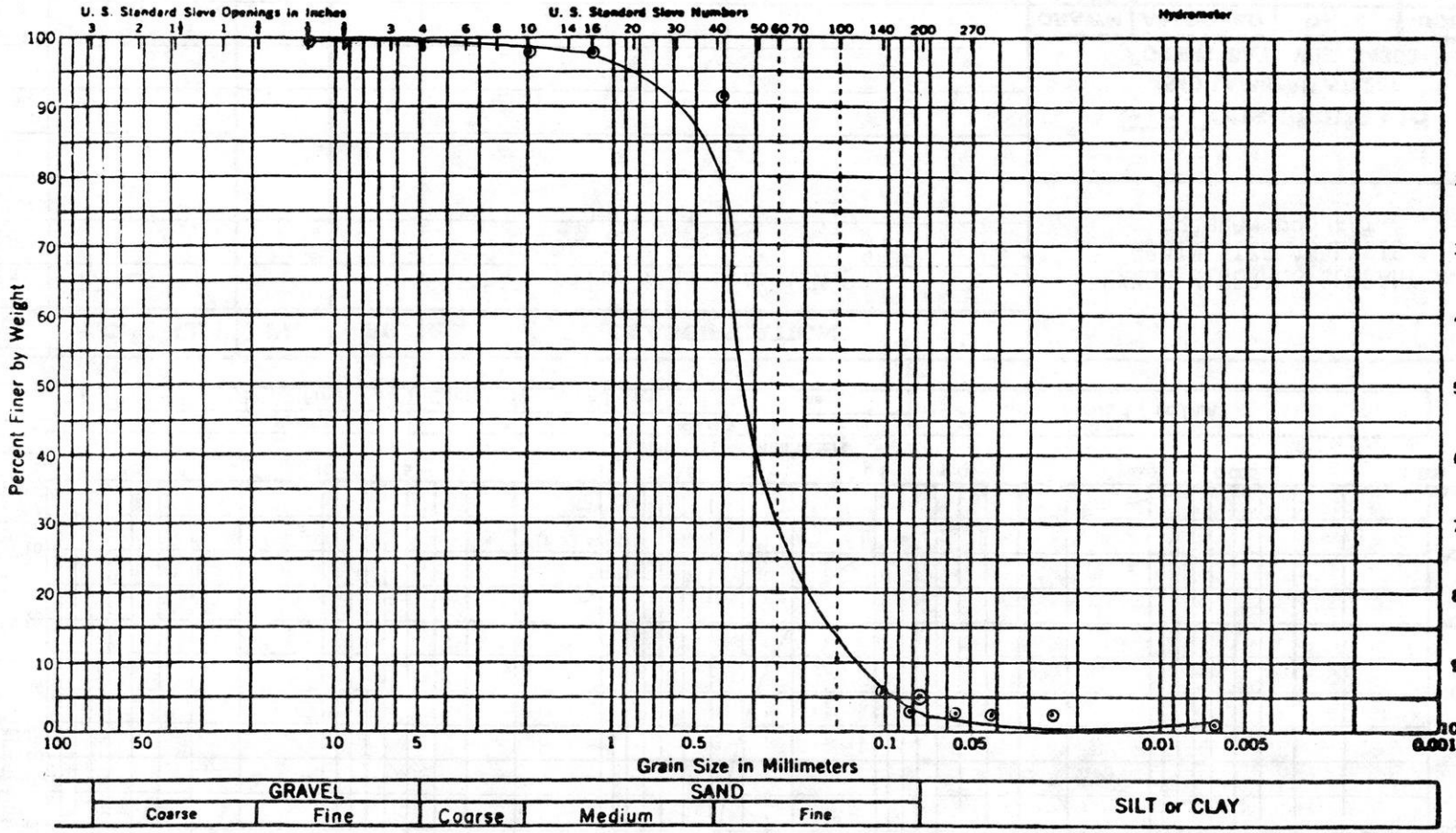
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	21				Slightly silty fine sand (SM-SP)
S-17					
92-94'					

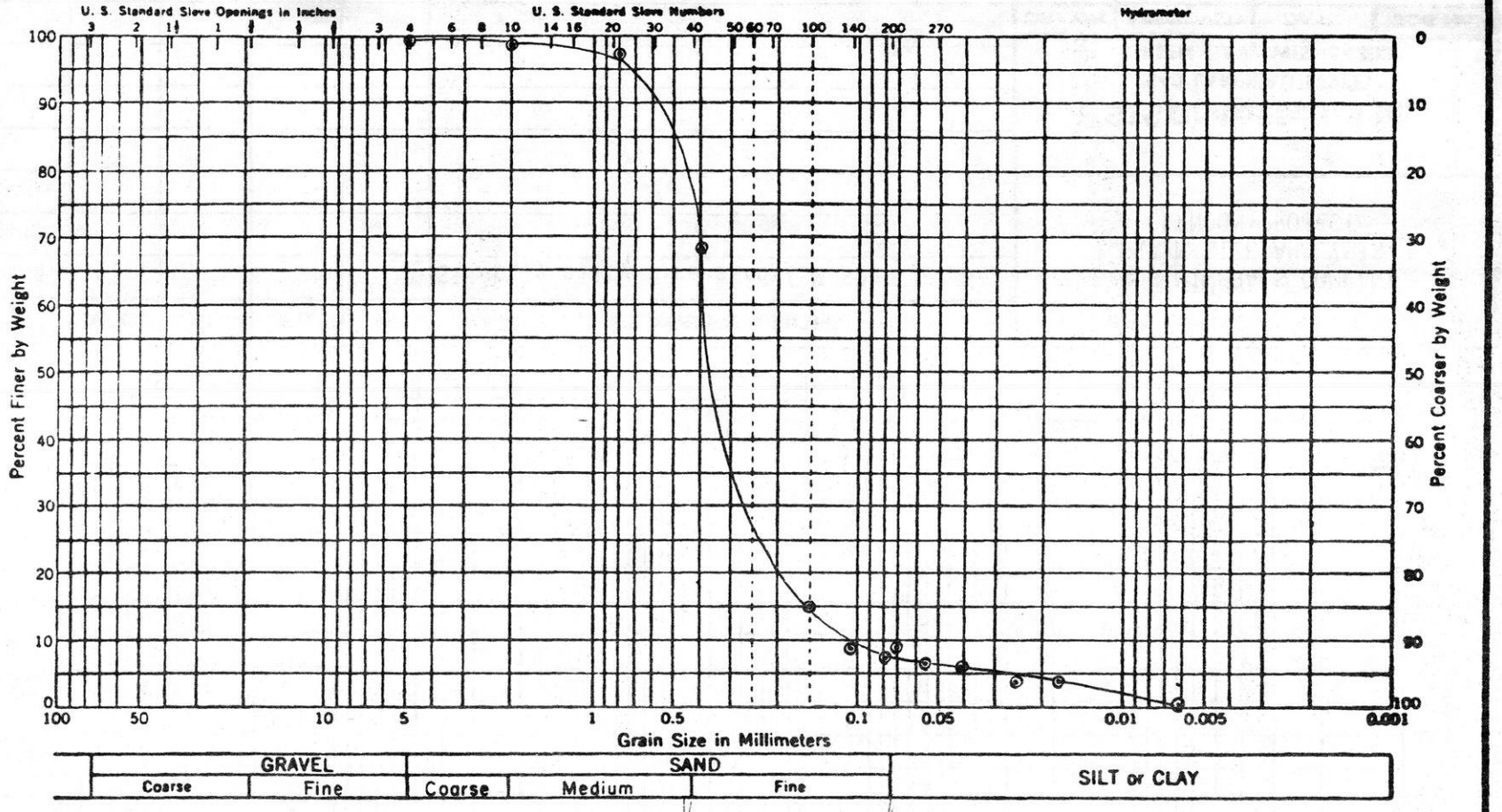
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	17				Slightly silty fine sand (SM-SP)
S-18					
97-99'					

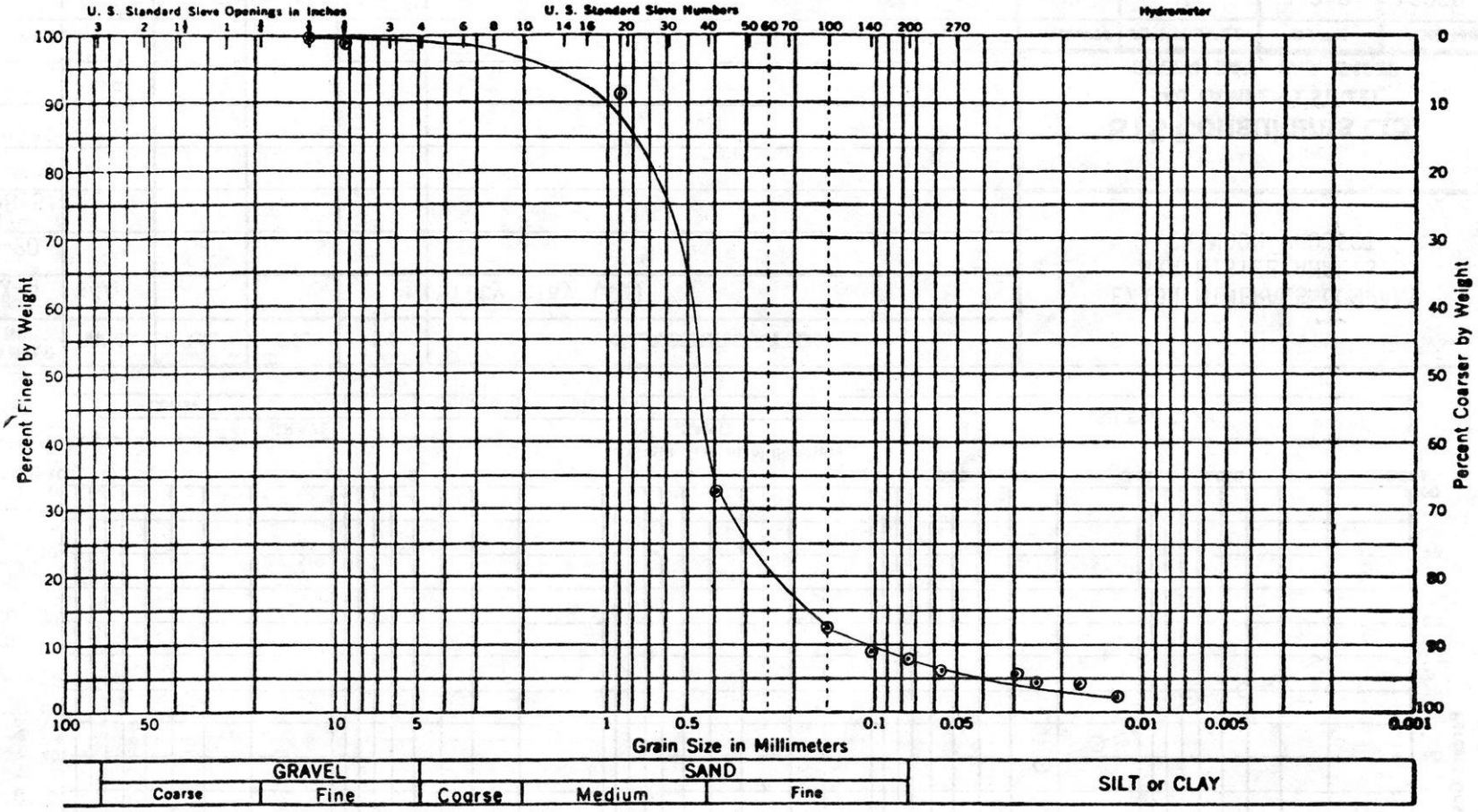
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	15				Slightly silty fine sand (SM-SP)
S-19					
102-104'					

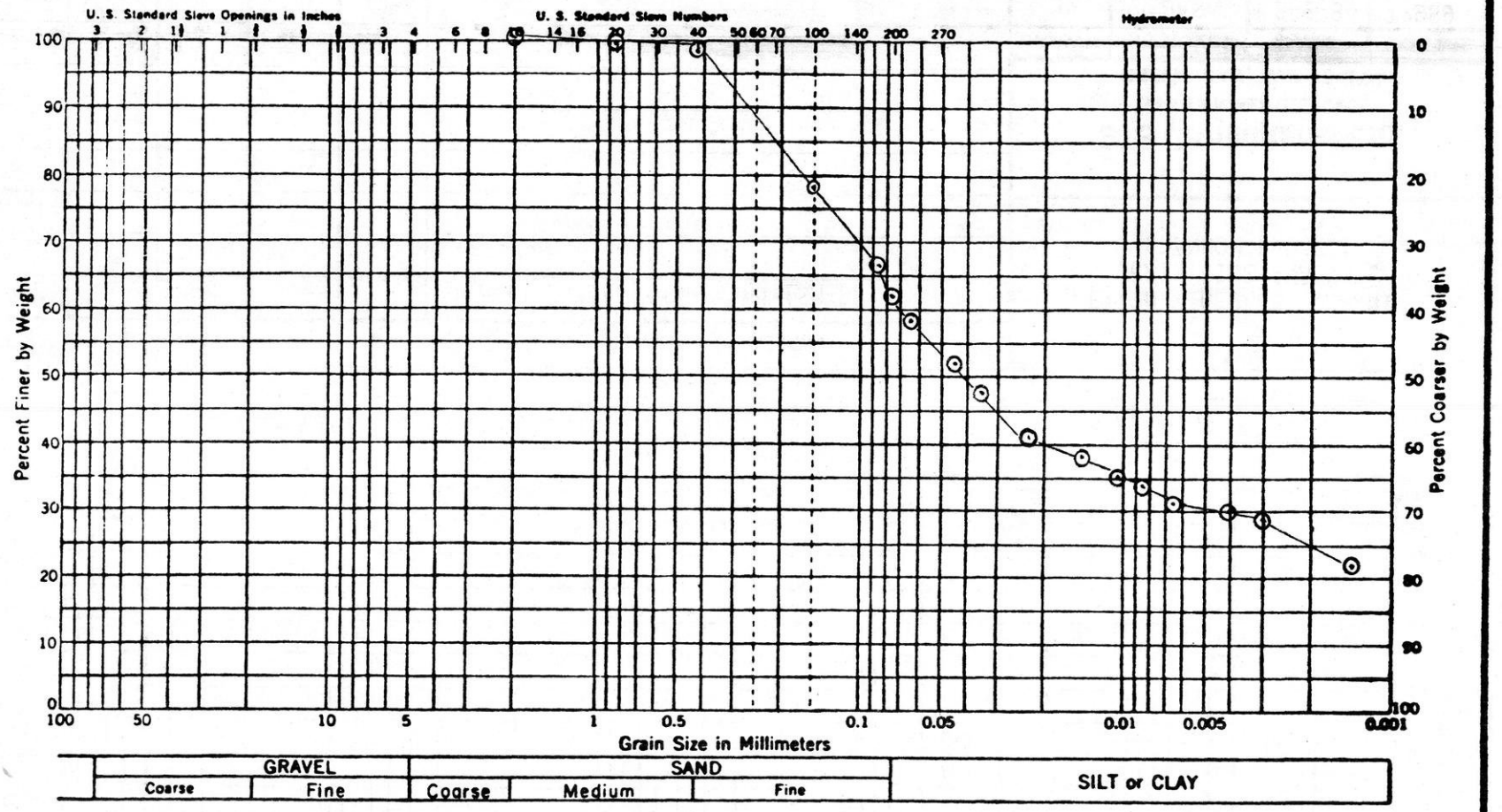
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	21				Silty clay (CL)
S-20					
107-108.5'					

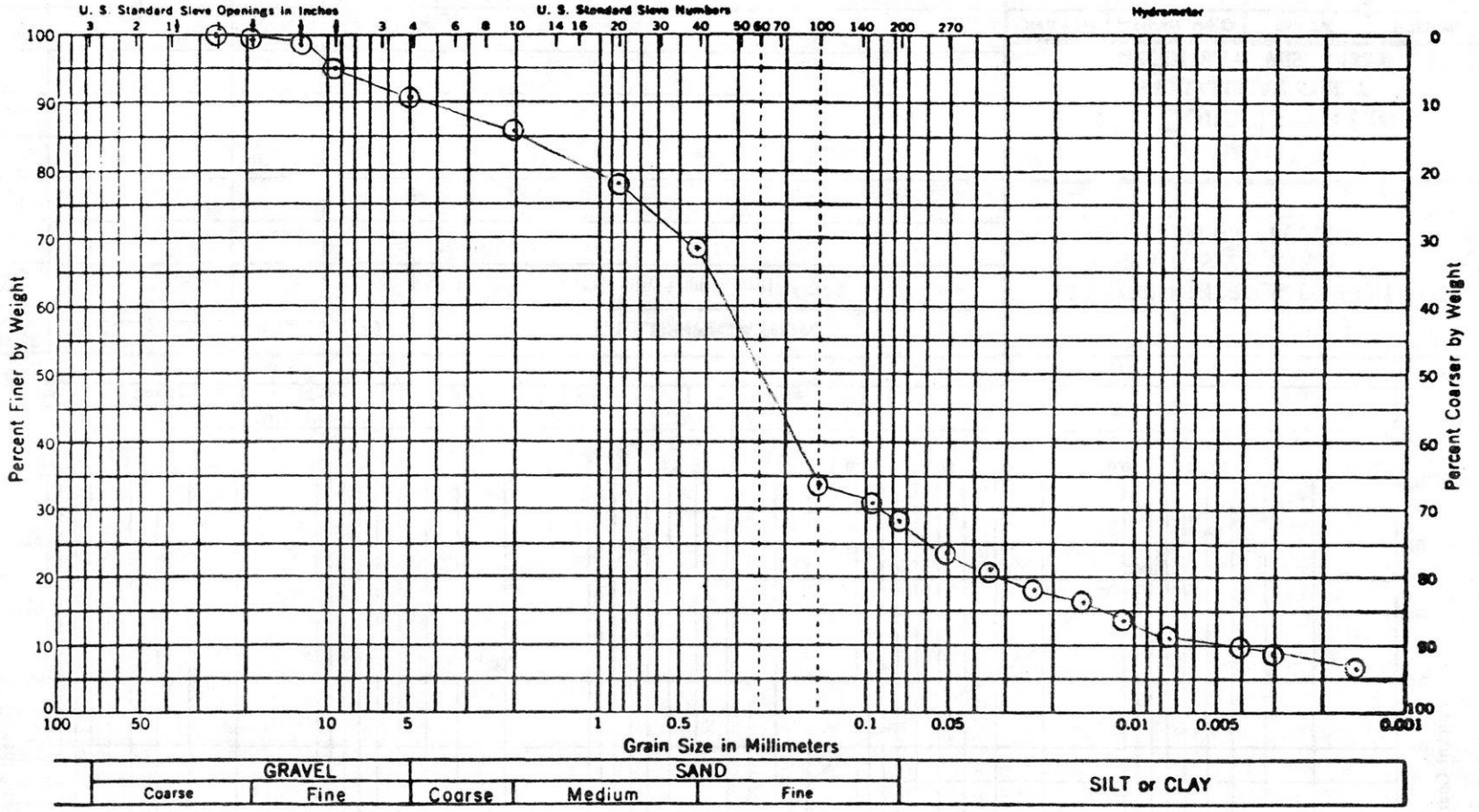
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-4	10				Silty fine to coarse sand (SM)
S-21					
12-14'					

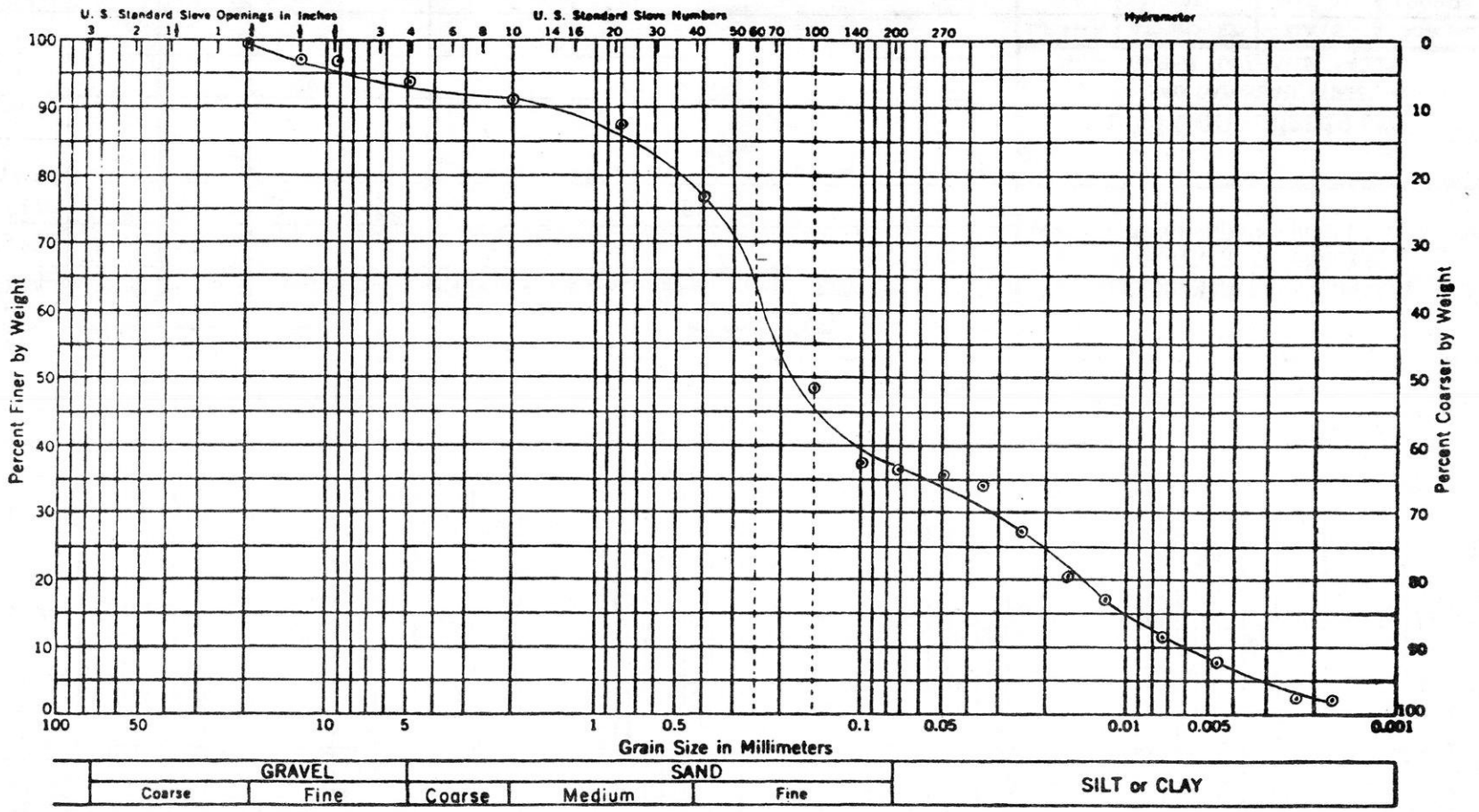
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	15				Silty fine to medium sand (SM)
S-1					
0-2'					

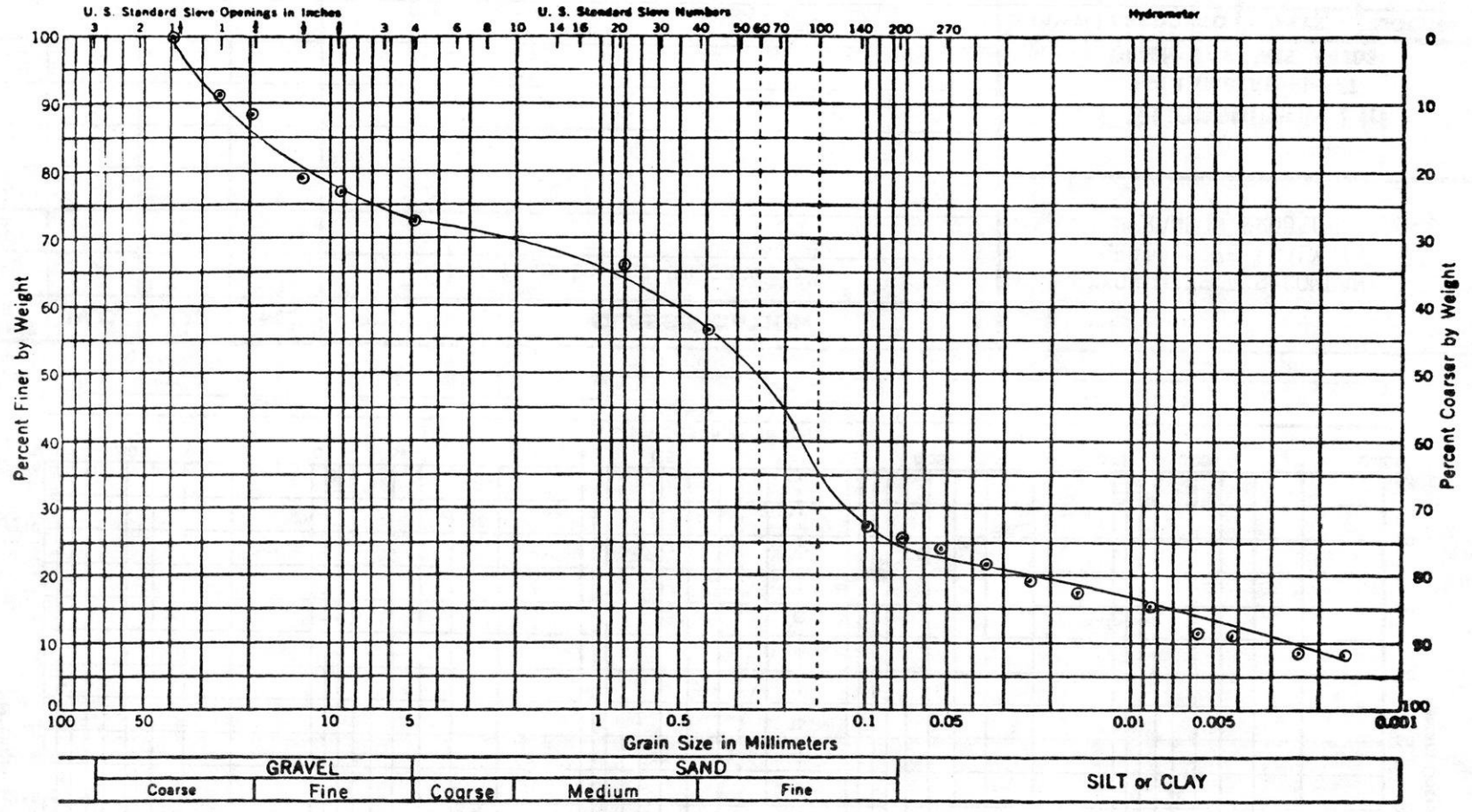
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	6				Silty fine to medium sand (SM)
S-2					
10-12'					

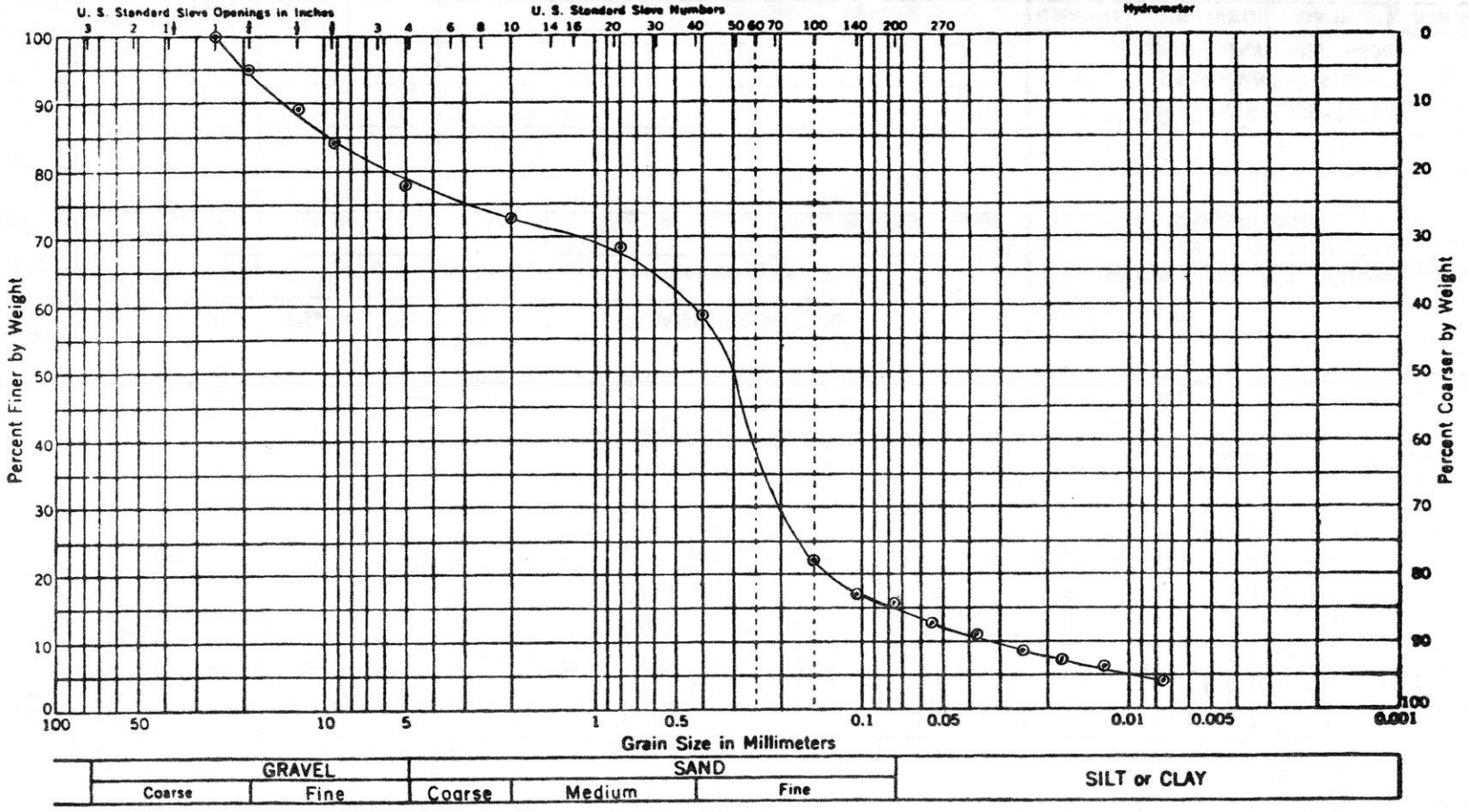
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	5				Silty fine to medium sand (SM)
S-3					
20-22'					

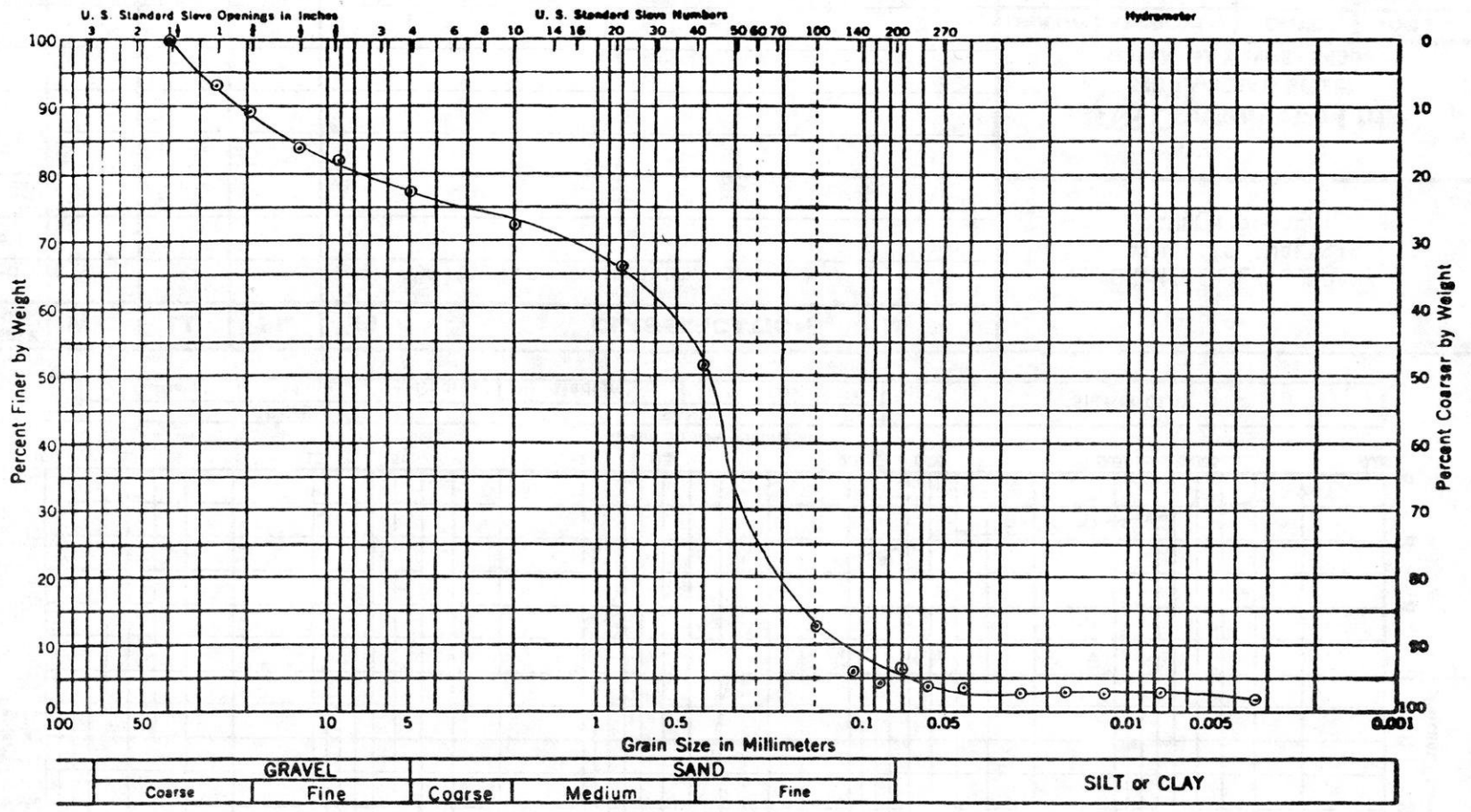
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	8				Slightly silty fine to medium sand (SM-SP)
S-4					
30-32'					

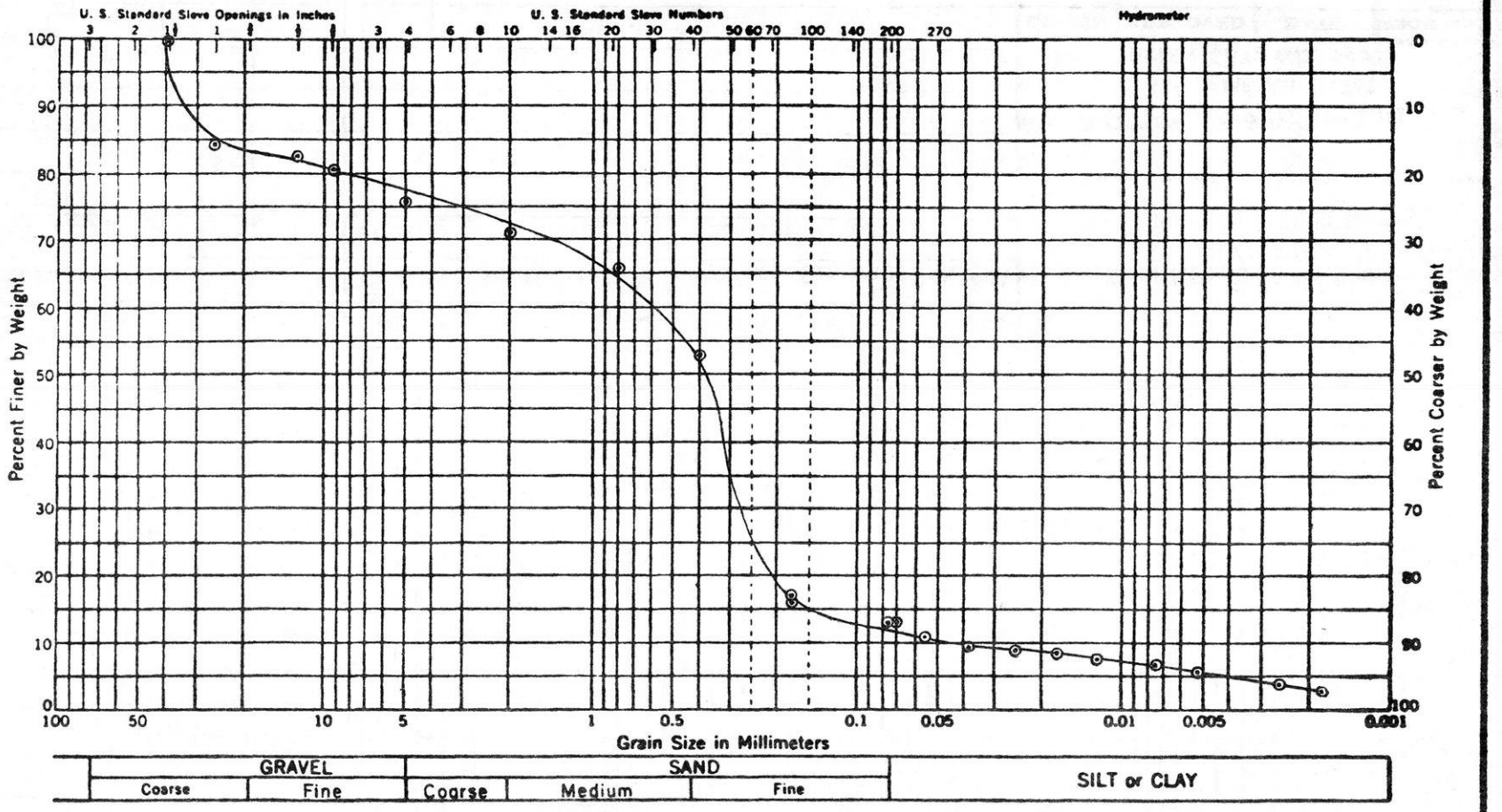
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	8				Silty fine to medium sand (SM)
S-5					
40-42'					

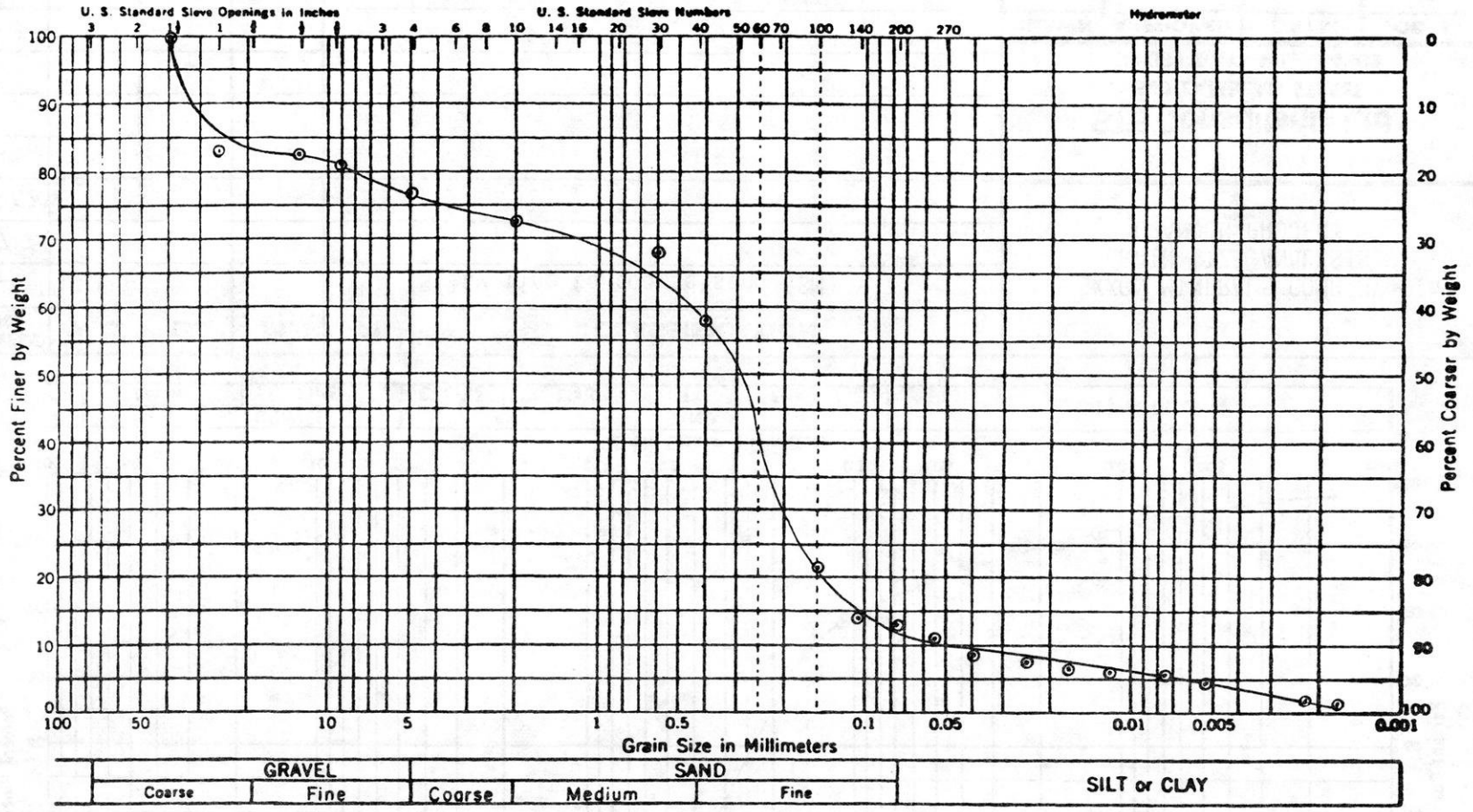
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	8				Silty fine to medium sand (SM)
S-6					
50-52'					

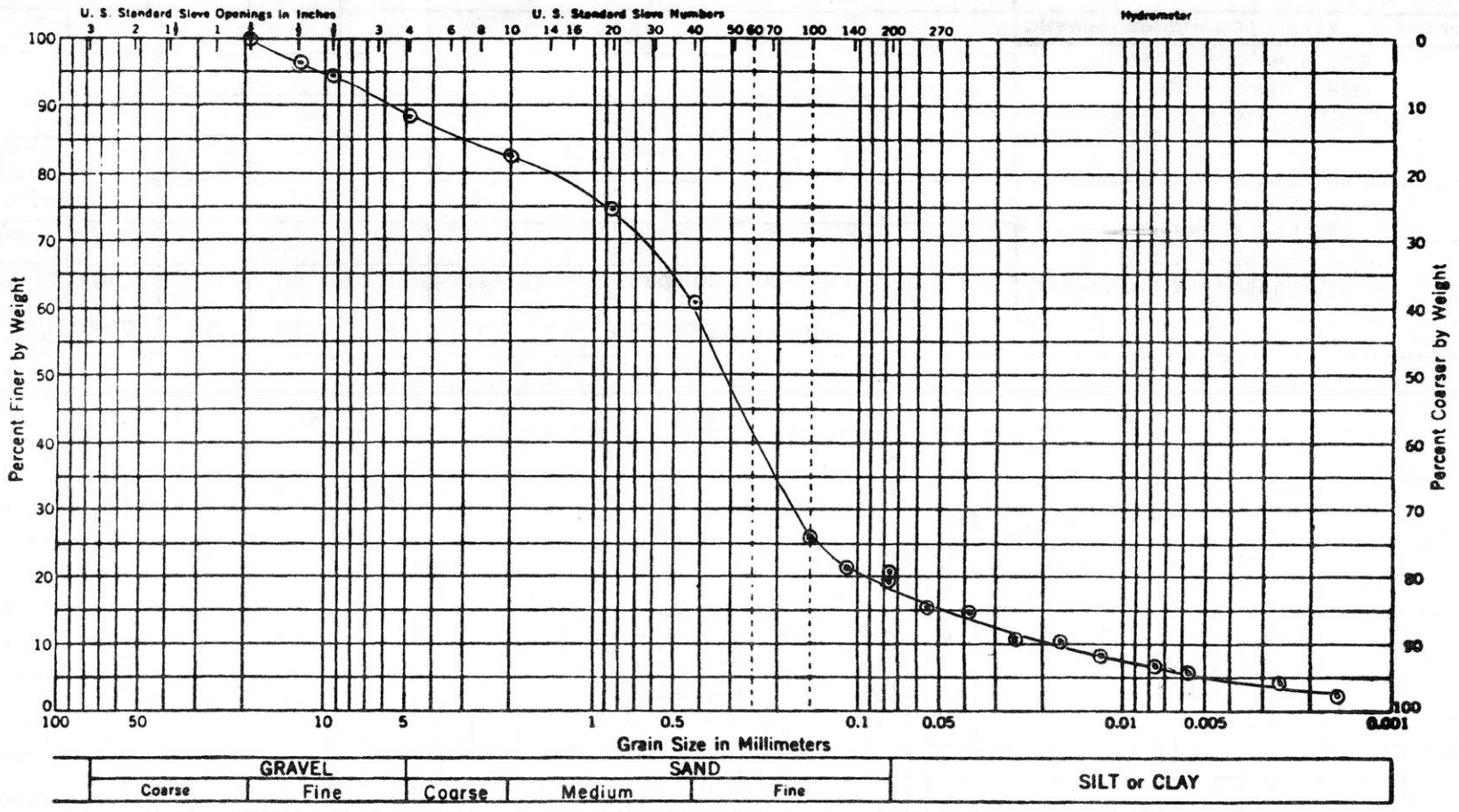
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	10				Silty fine to coarse sand (SM)
S-7					
60-62'					

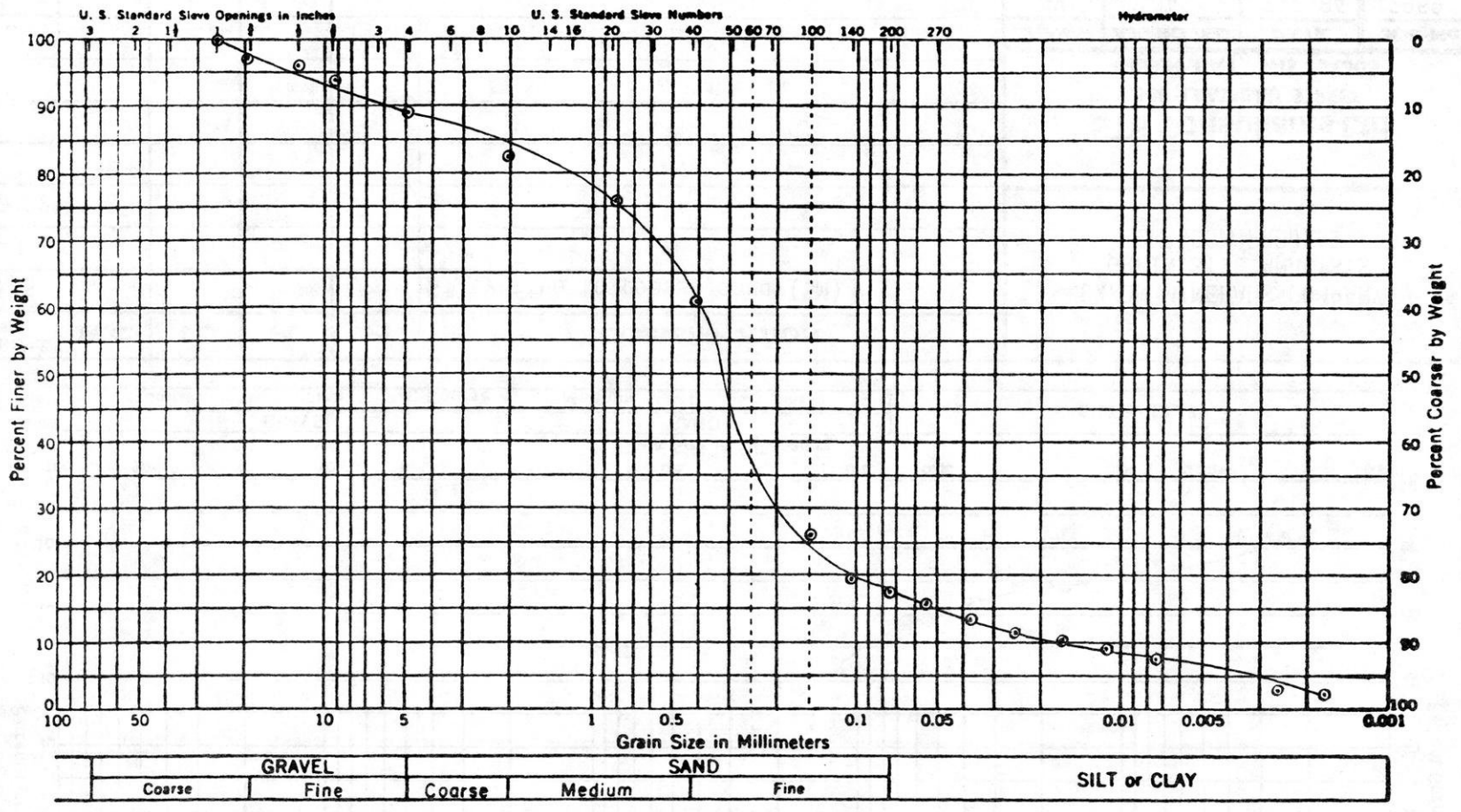
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	10				Silty fine to coarse sand (SM)
S-8					
70-72'					

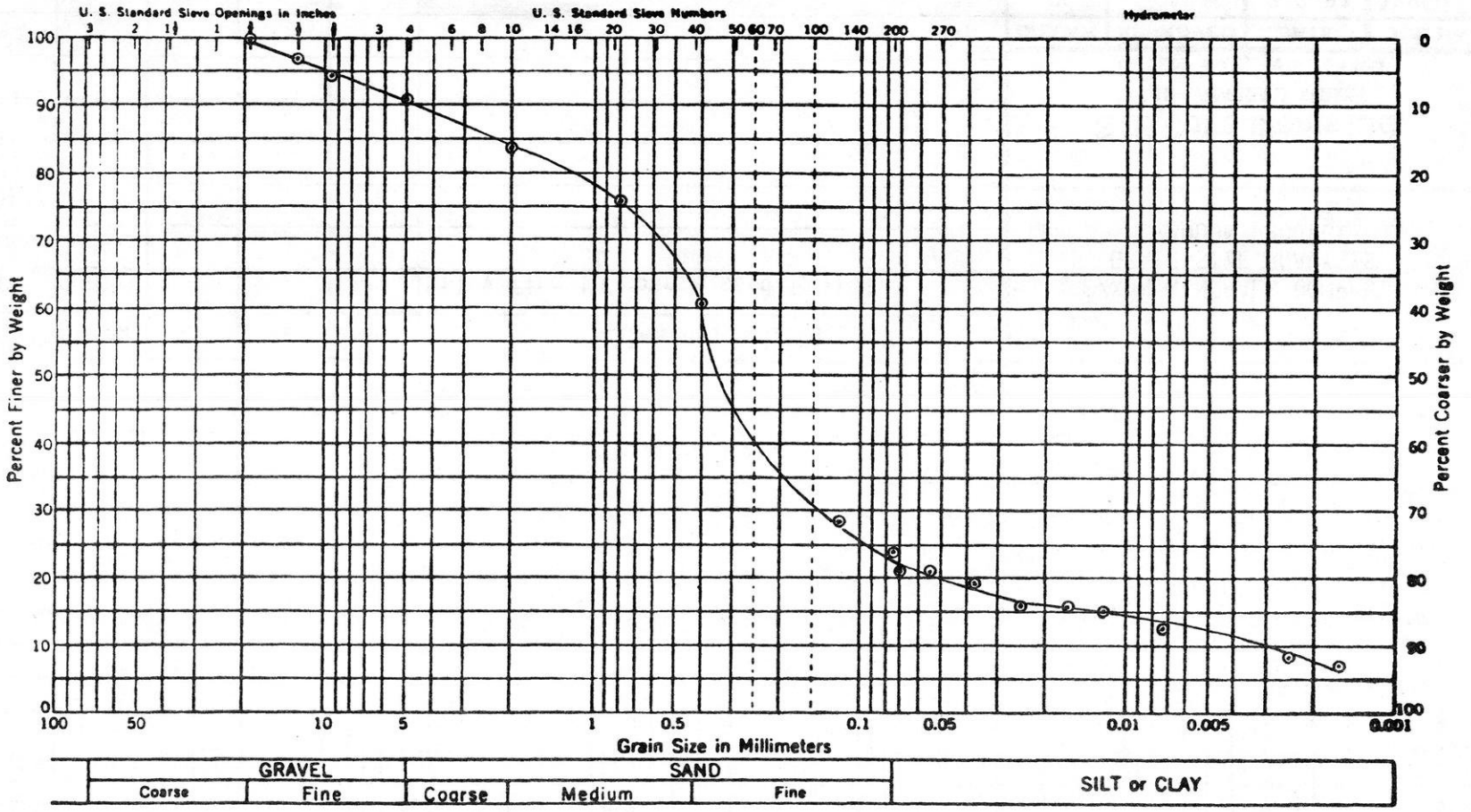
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	9				Silty fine to coarse sand (SM)
S-9					
80-82'					

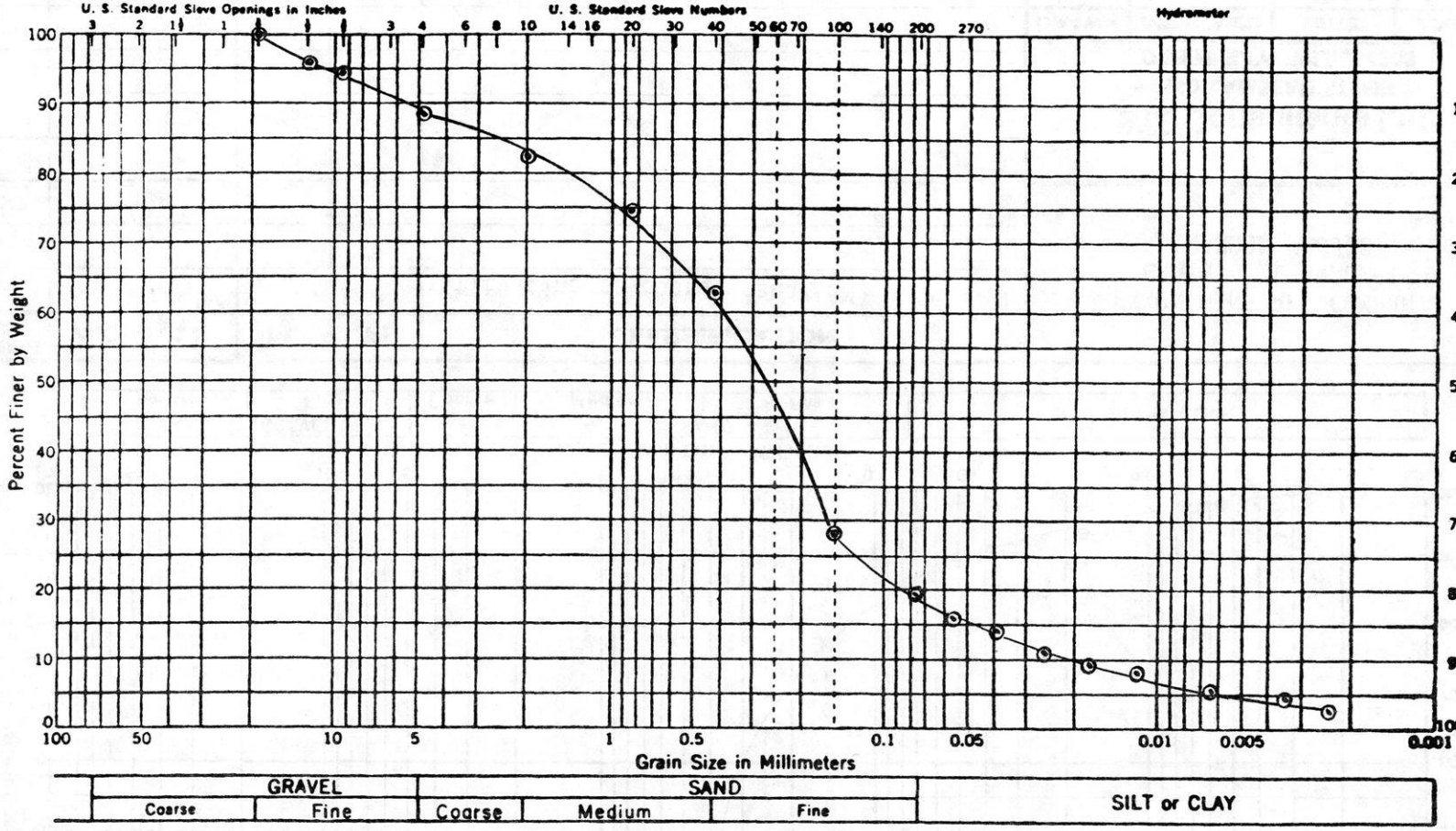
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	11				Silty fine to coarse sand (SM)
S-10					
90-92'					

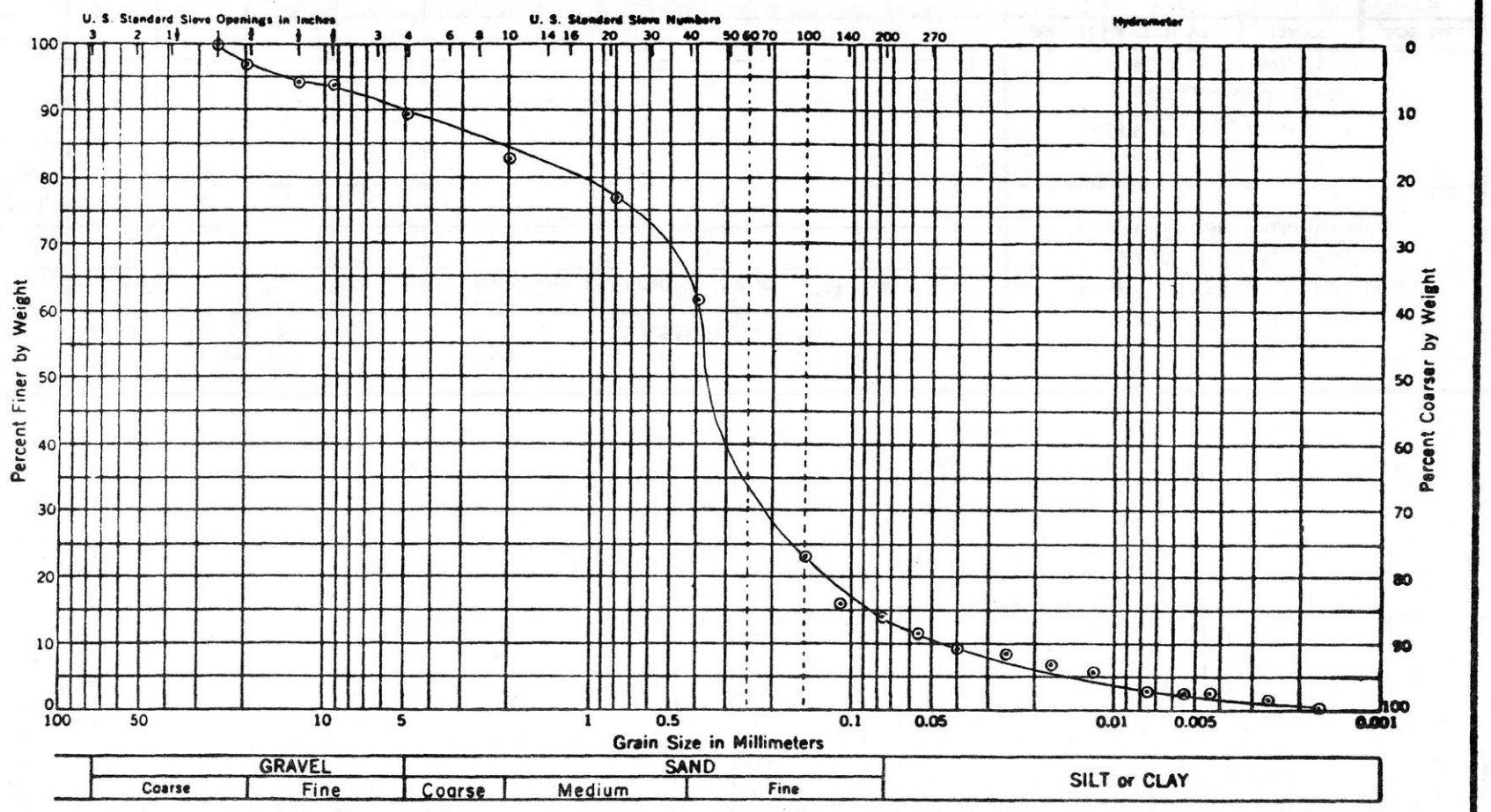
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	8				Silty fine to coarse sand (SM)
S-11					
100-102'					

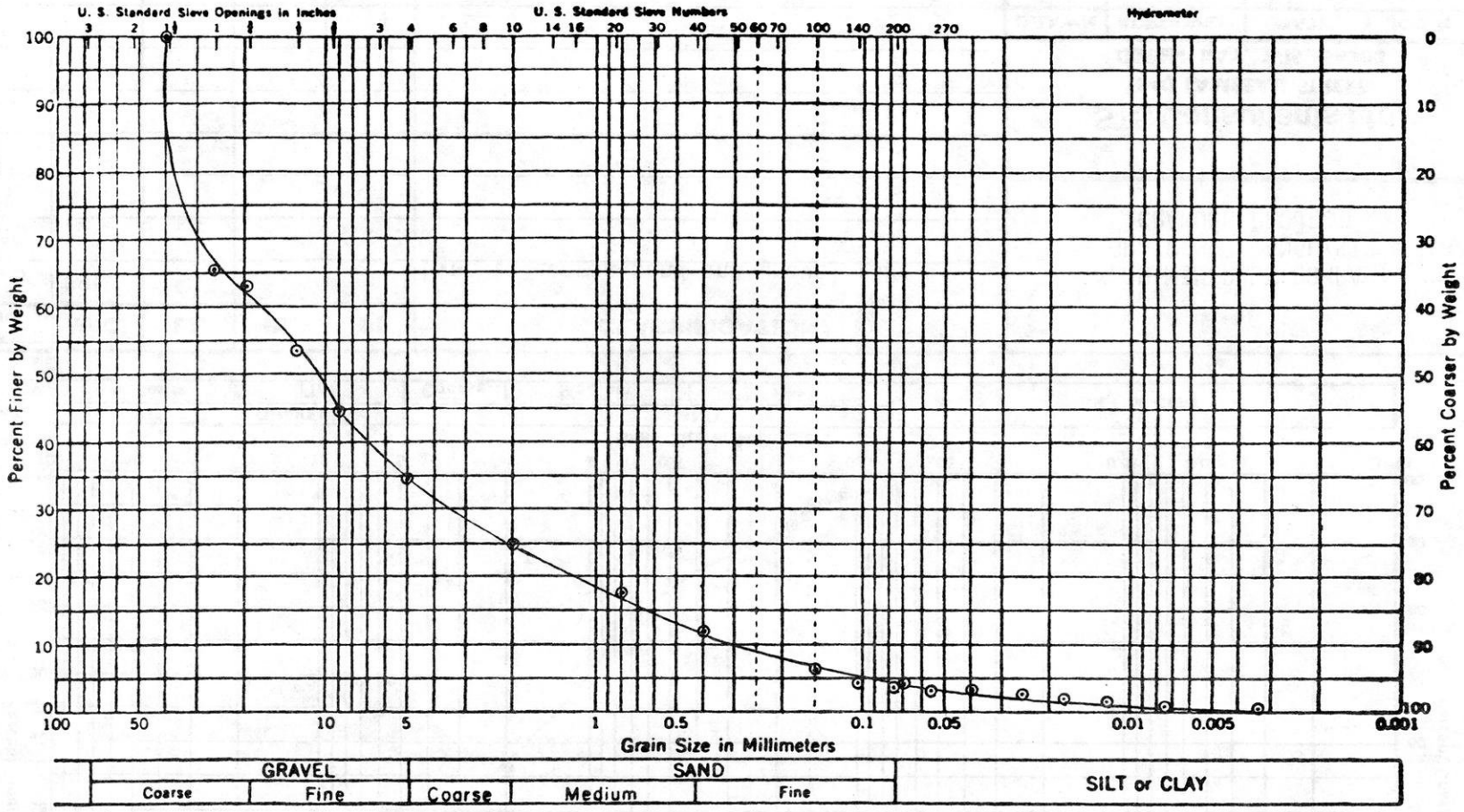
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	10				Fine to coarse sand and gravel (GW)
S-12					
110-112'					

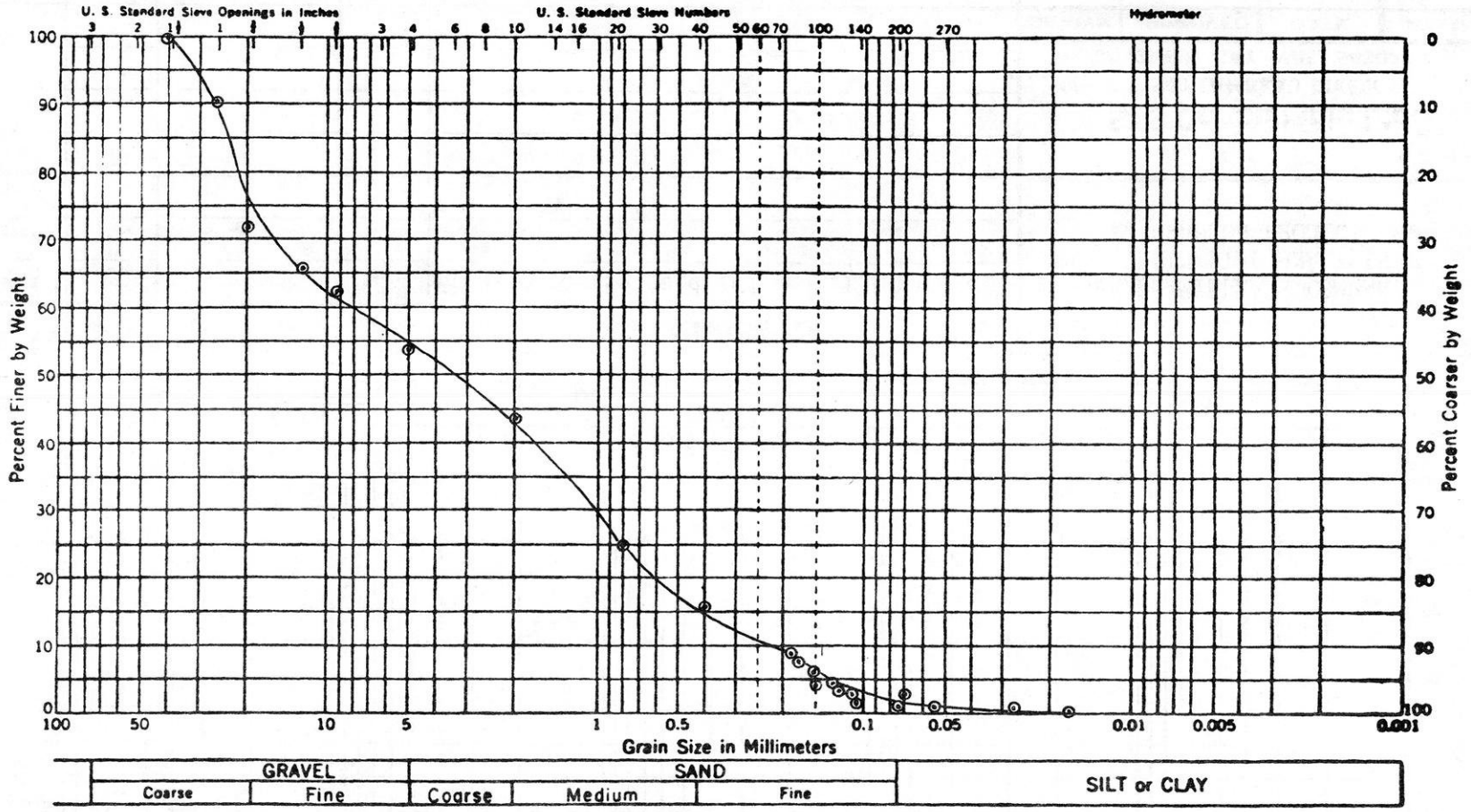
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	9				Fine to coarse sand and gravel (SP)
S-13					
121-123'					

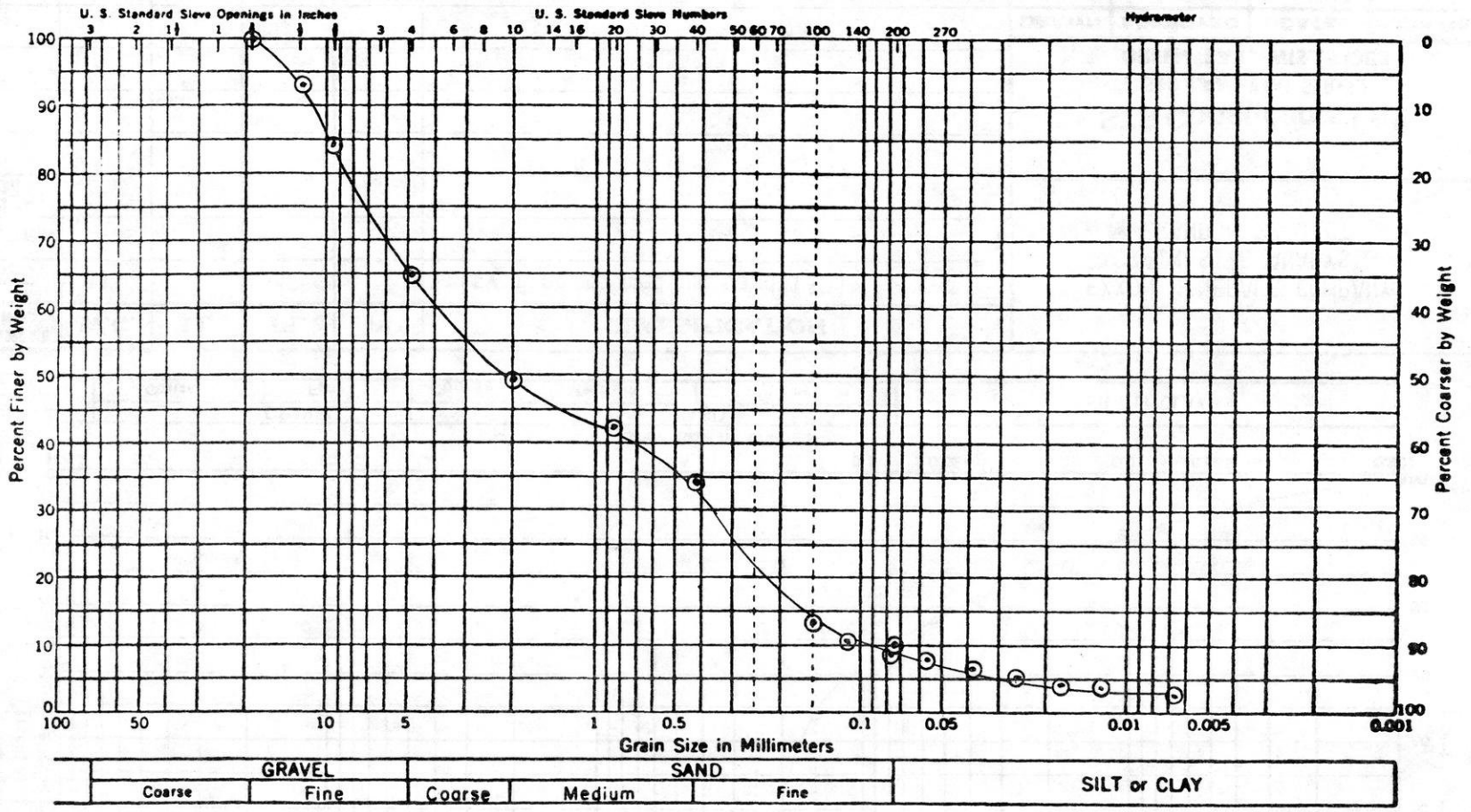
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	11				Slightly silty fine to coarse sand (SM-SP)
S-14					
131-132'					

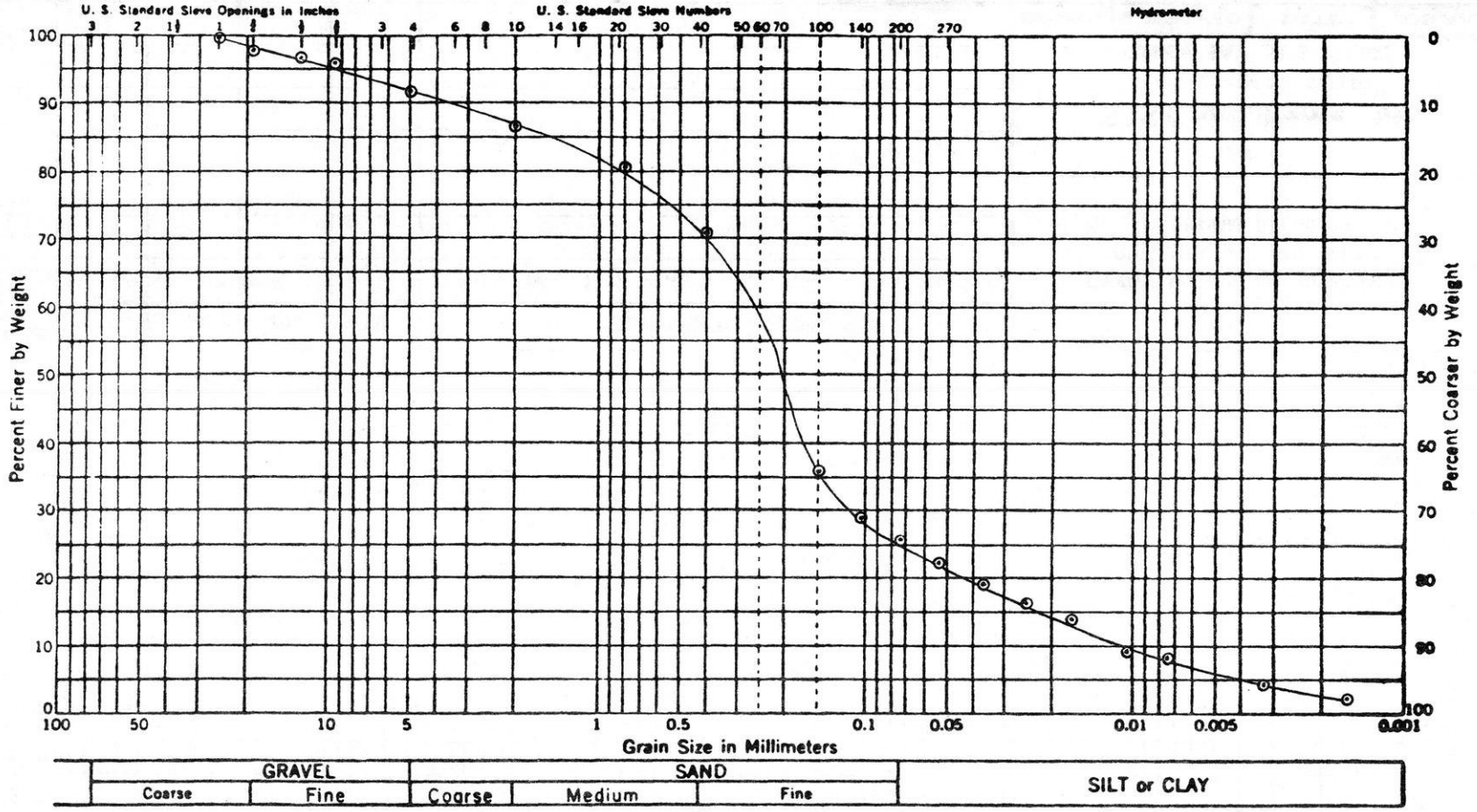
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	11				Silty fine to medium sand (SM)
S-15					
142-144'					

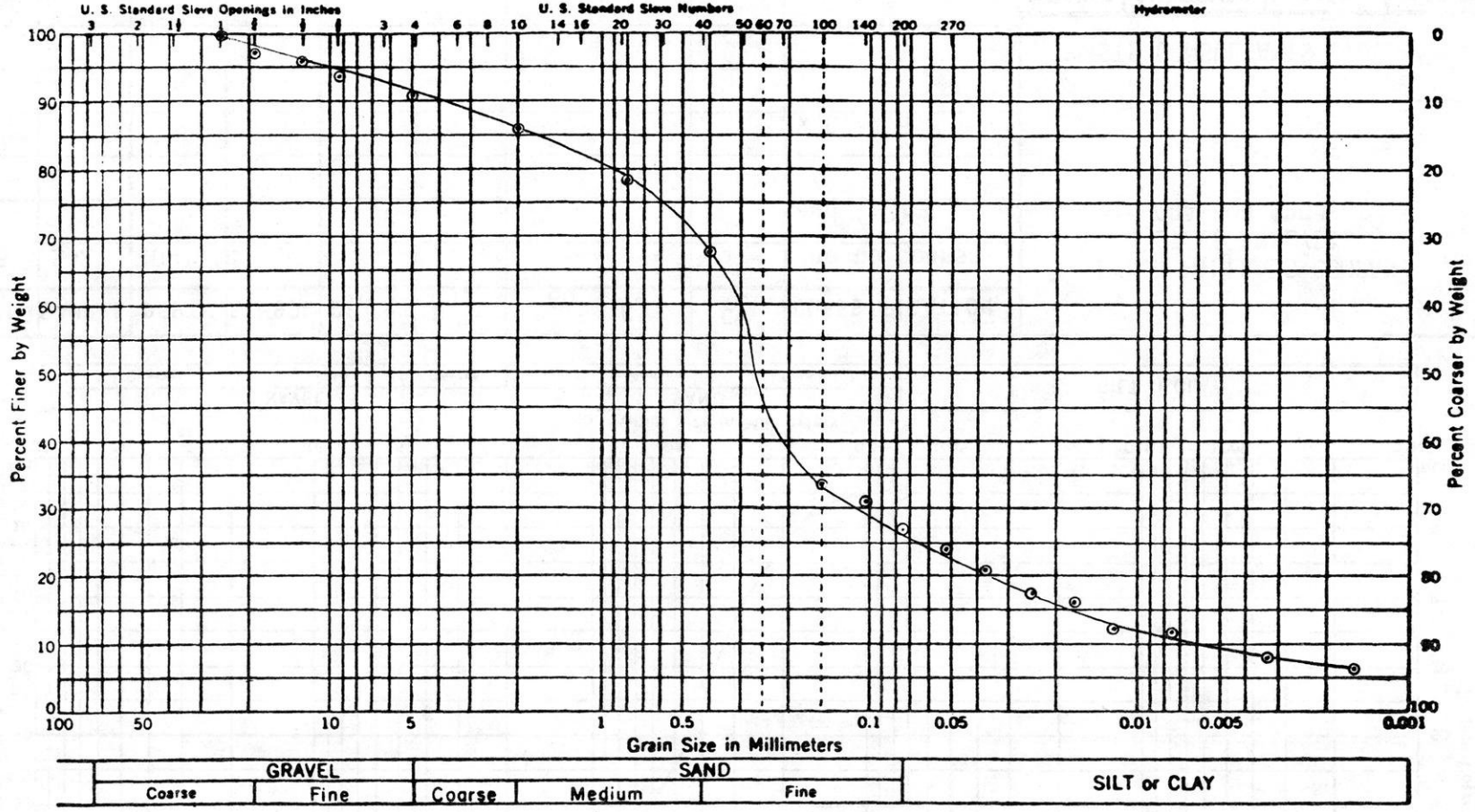
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CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
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UNIFIED CLASSIFICATION SYSTEM



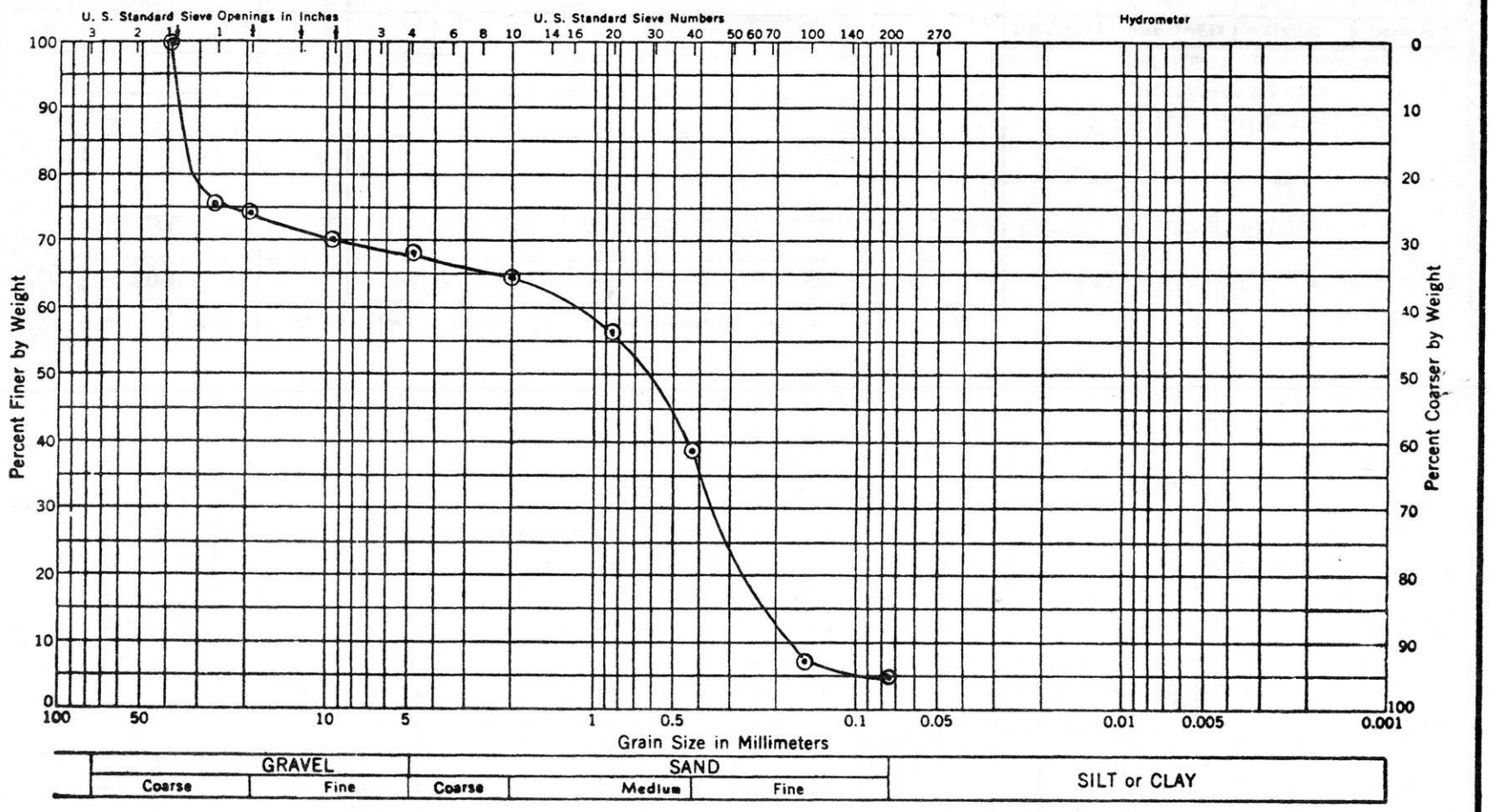
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-5	10				Silty fine to coarse sand (SM)
S-16					
152-154'					

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GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JV	JAS	2-2-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-2	10-12'							Fine to coarse sand (SP)

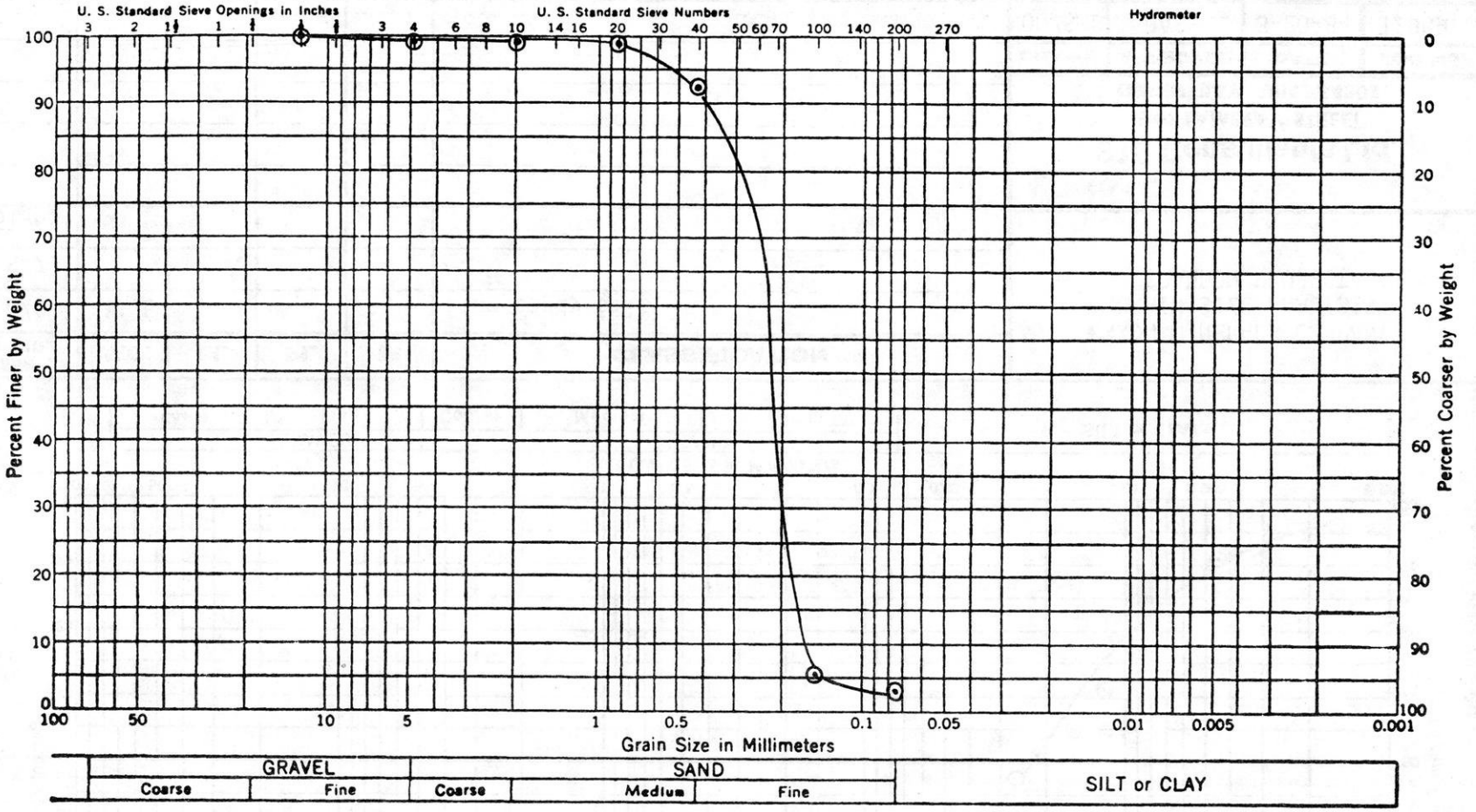
W.C. 4.5

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SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-5	40.5-44.5'							Fine sand (SP)
									W.C. 23.9

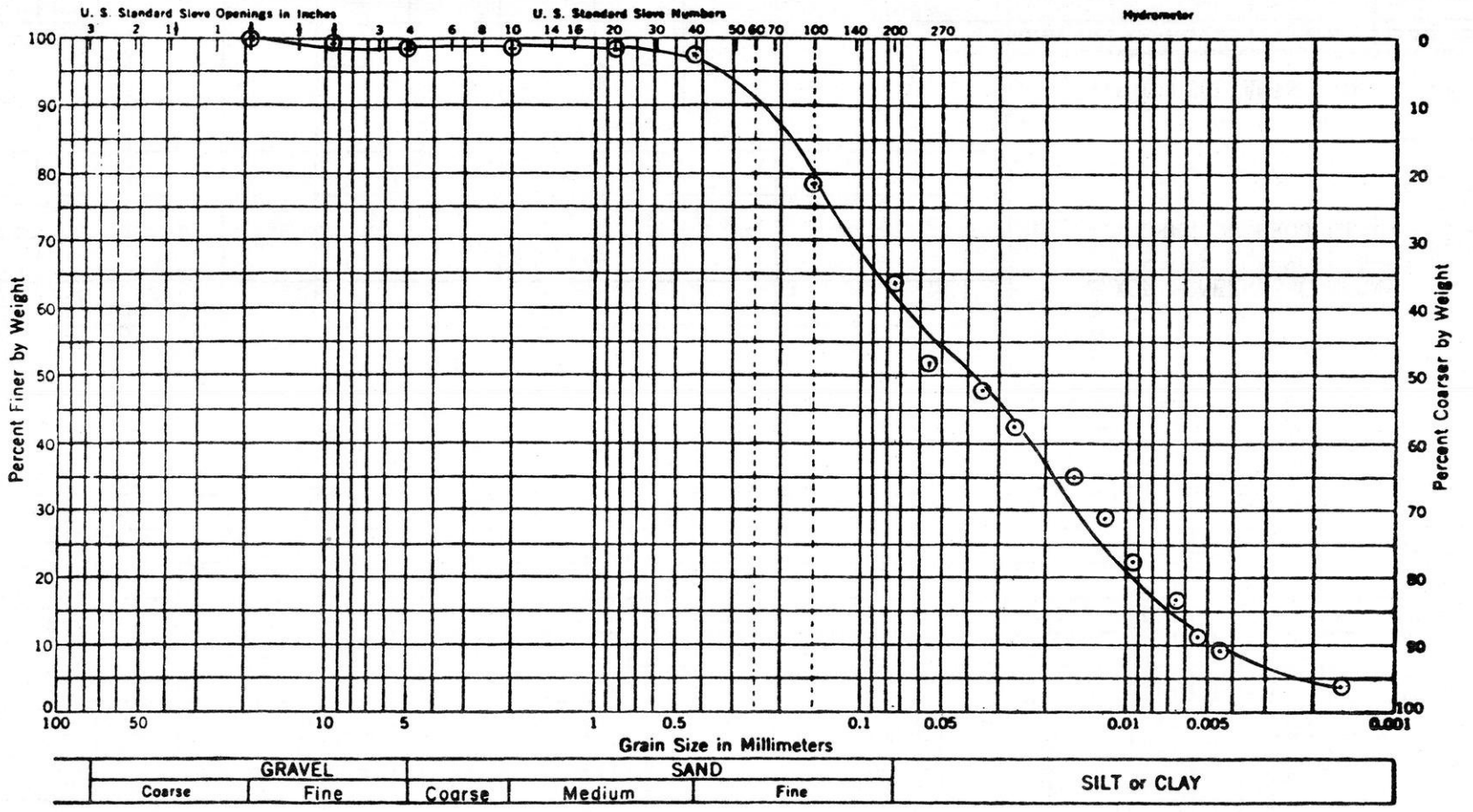
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX6	11.5				Fine sandy silt (ML)
S-7					
61-65'					

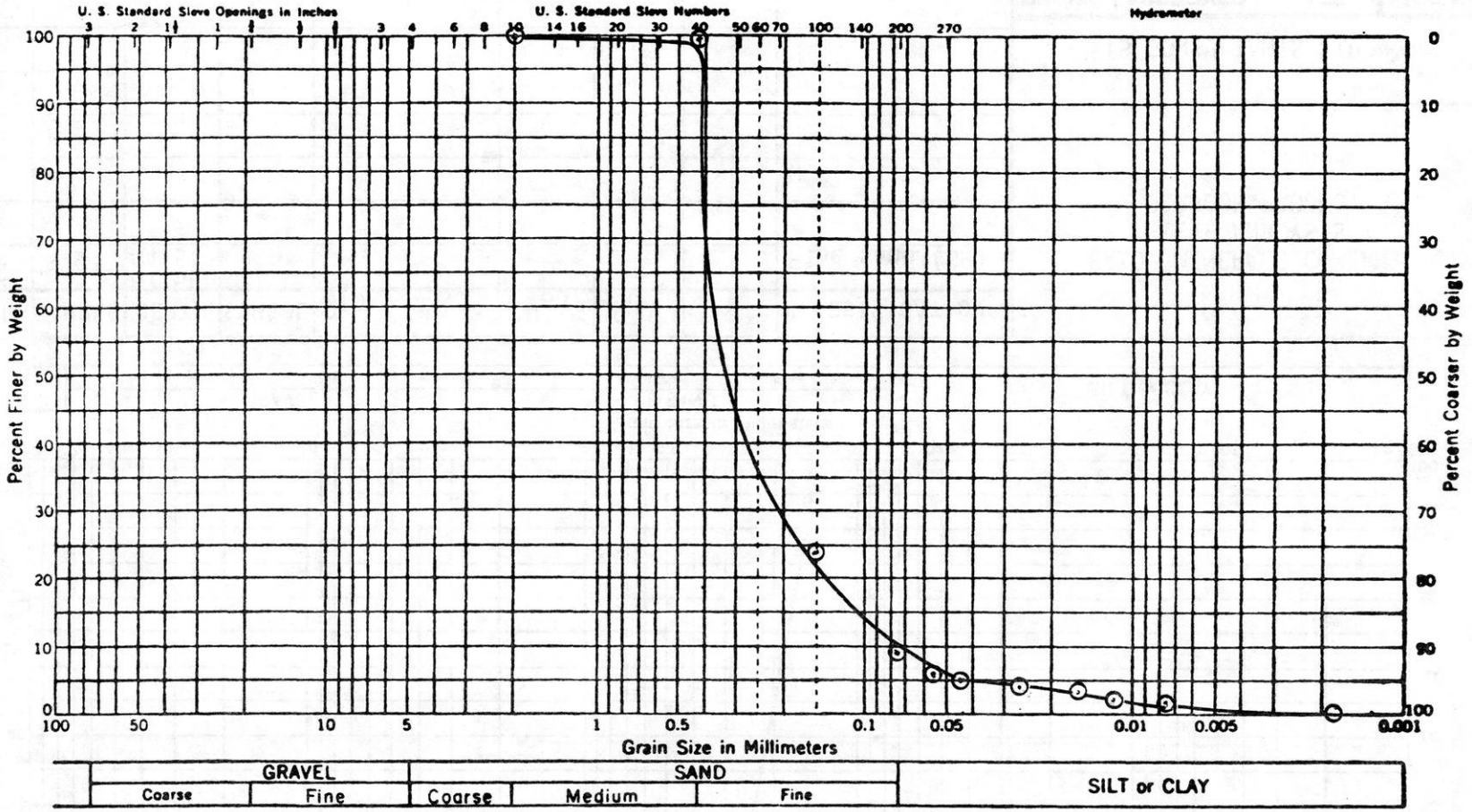
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



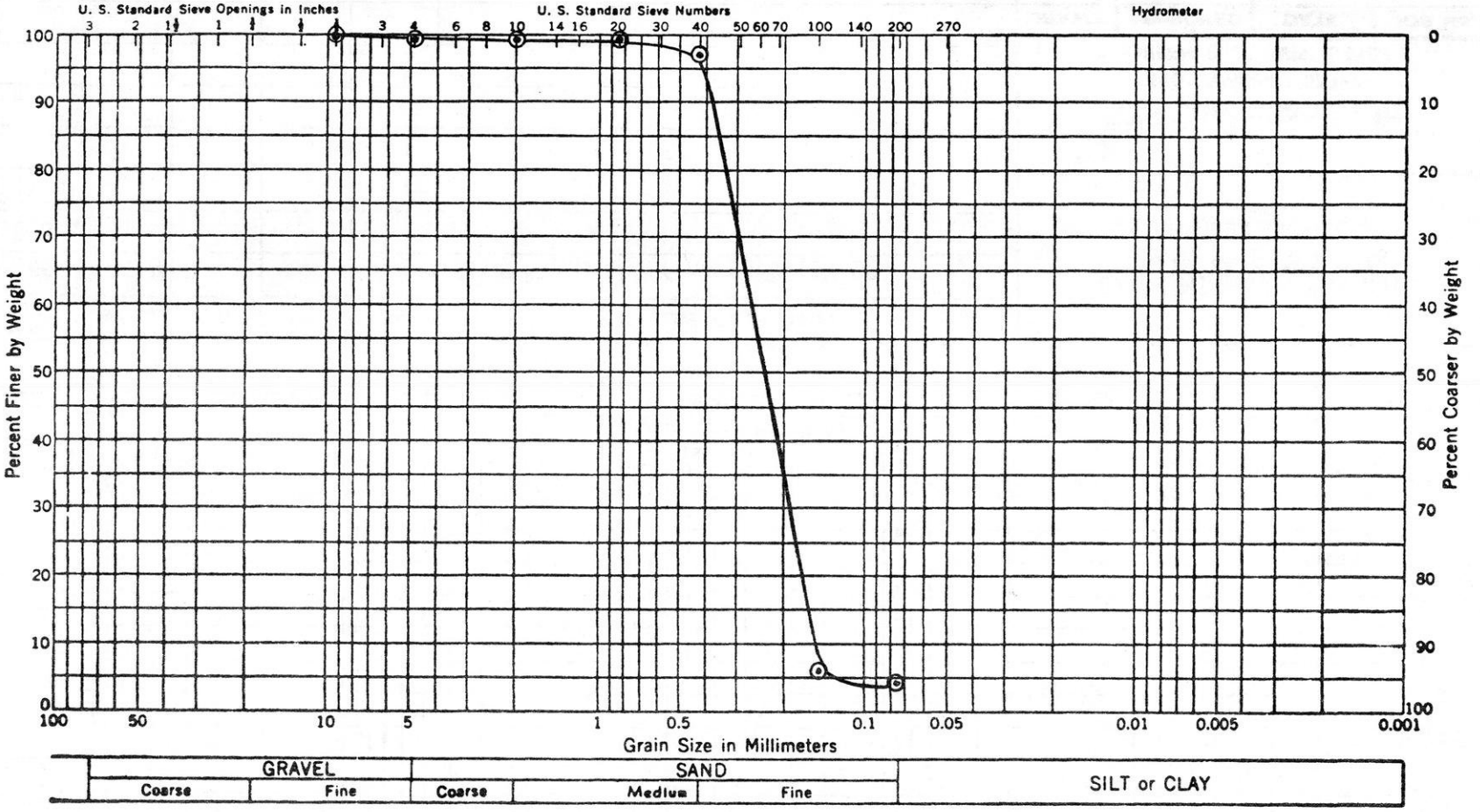
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX6	19.9				Slightly silty fine sand (SM-SP)
S-8					
71-74'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-9	81.5-84.5'							Fine sand (SP)
									W.C. 21.5

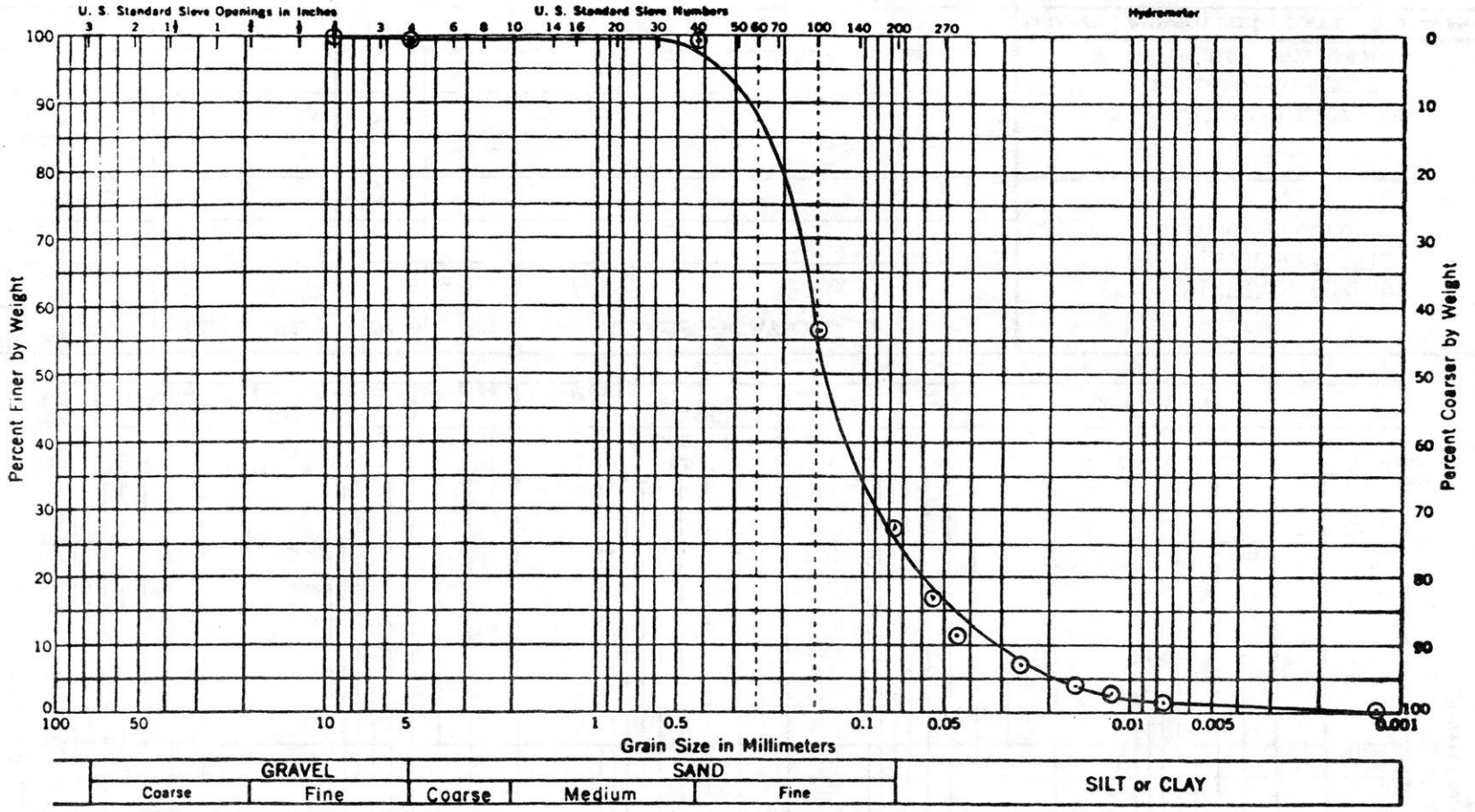
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX6	21.9				Silty fine sand (SM)
S-10					
90.5-92.5'					

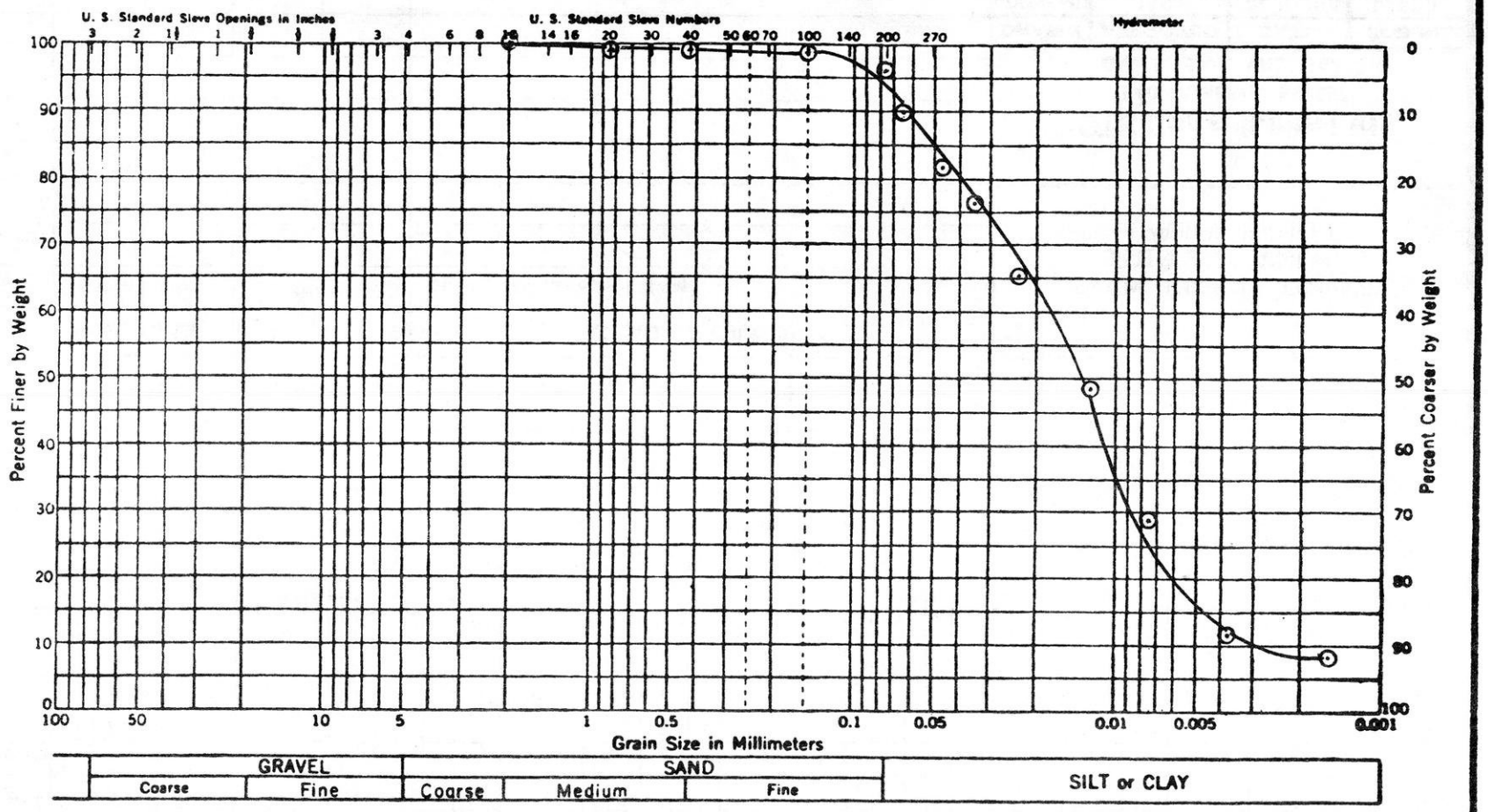
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



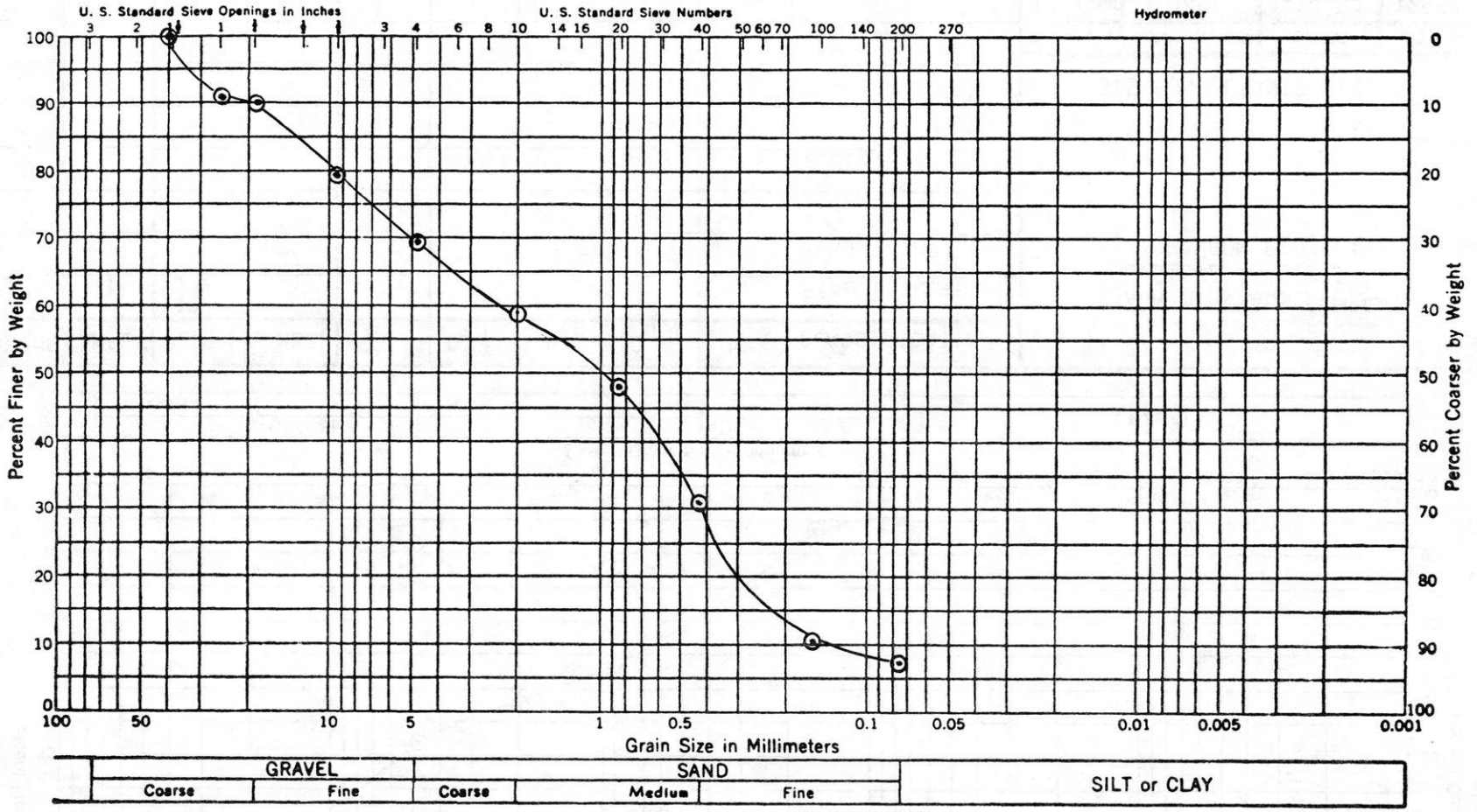
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX6	25.5				Clayey silt (ML)
S-12					
111-114'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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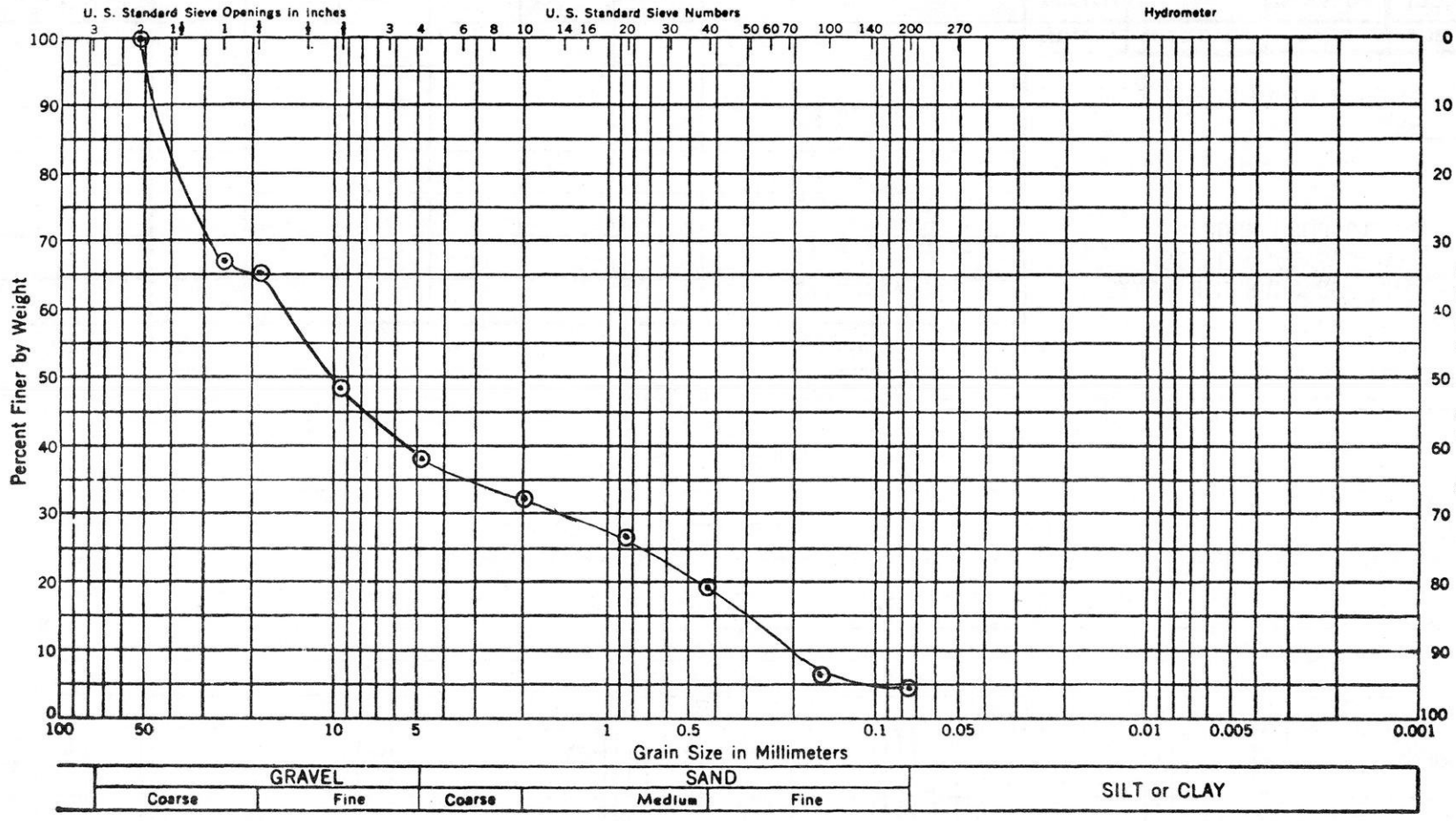
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-13	121.5-124'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 10.5

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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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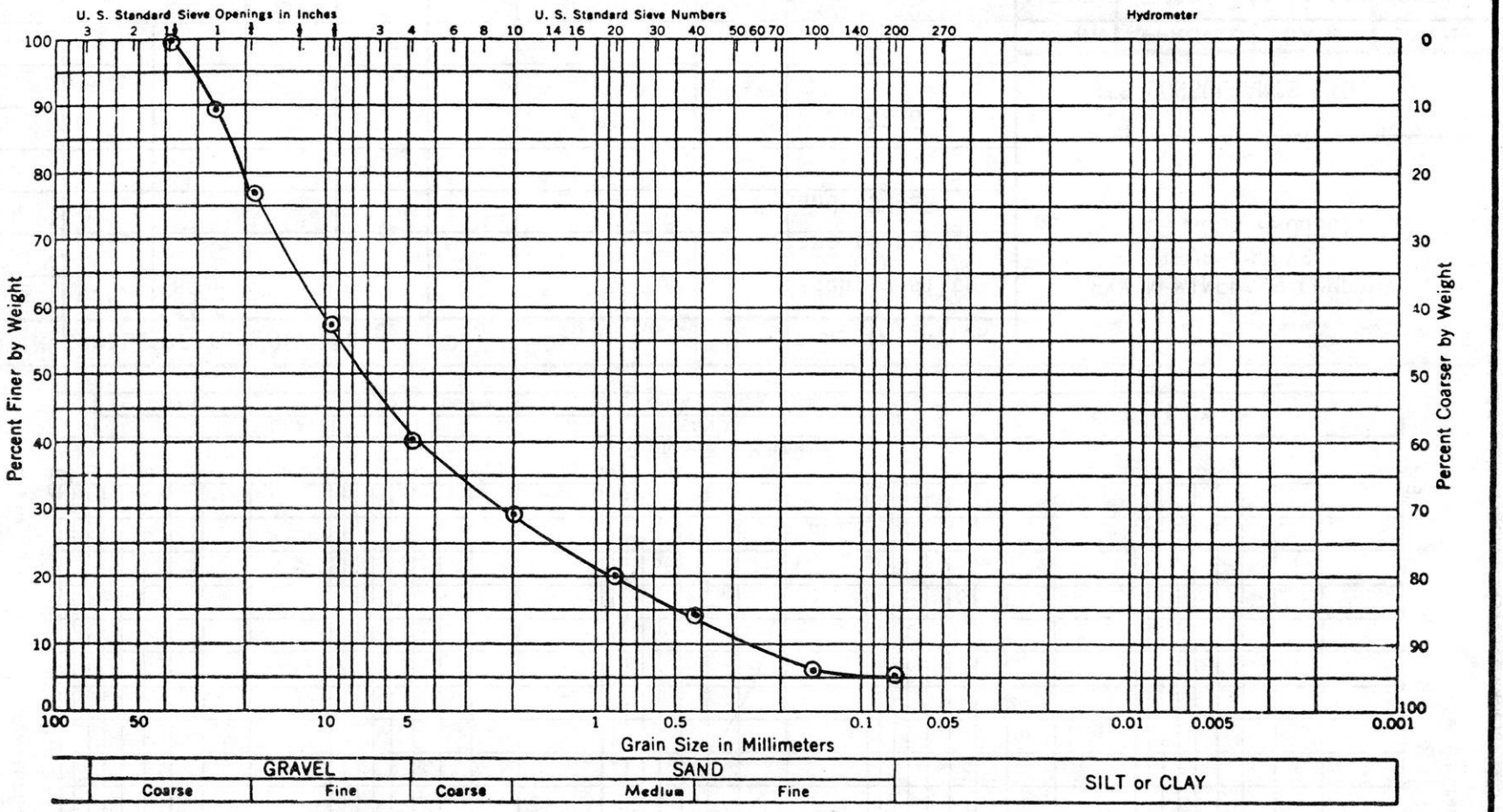
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-15	142-143'							Fine to coarse gravel (GP)
									W.C. 17.2

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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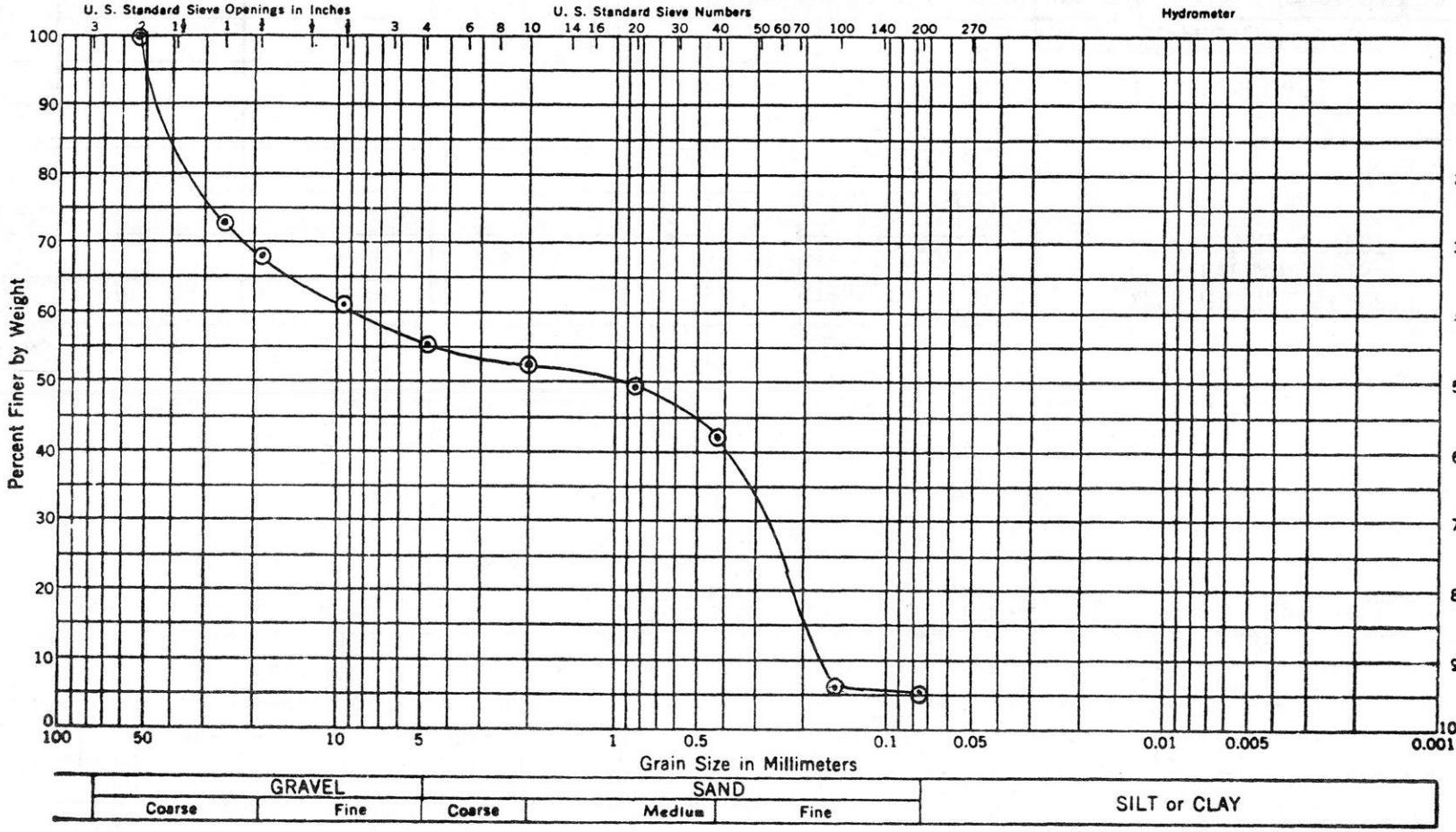
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX 6	S-16	153.5-155'							Slightly silty fine to coarse gravel (GM-GP)
									W.C. 11.2

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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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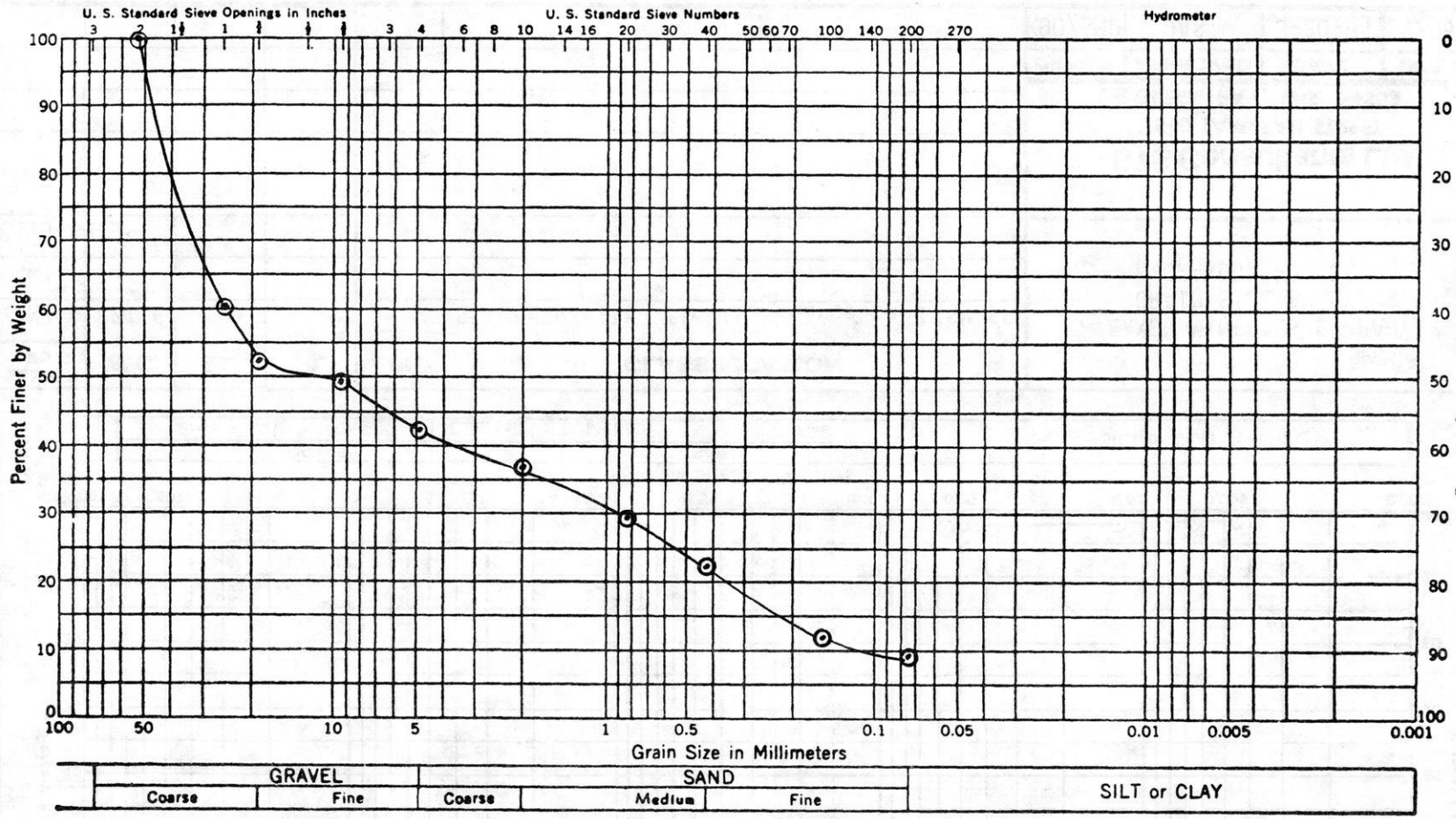
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-17	164.5-166.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 12.6

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX6	S-19	184-186'							Slightly silty fine to coarse gravel (GM-GP)
									W.C. 9.6

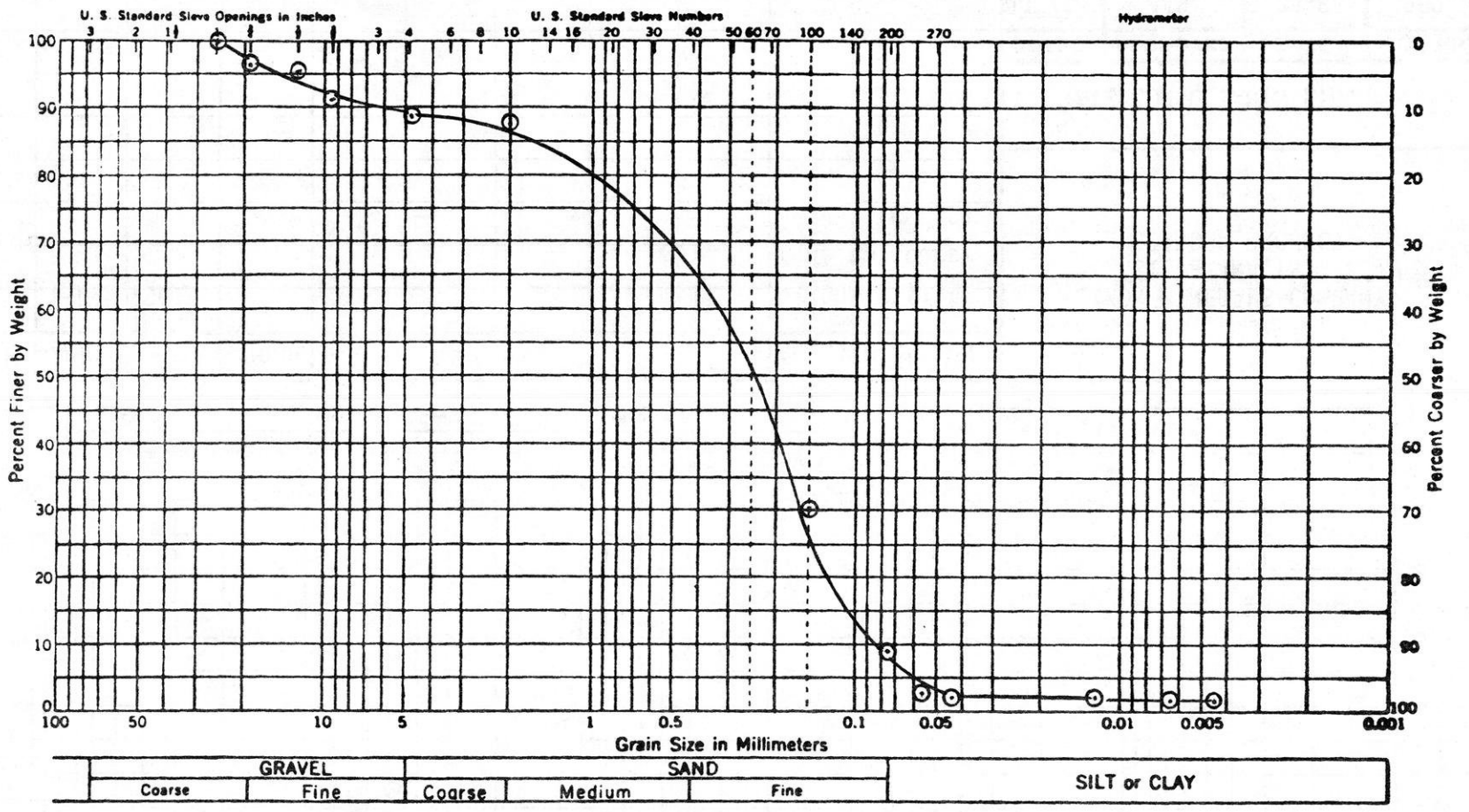
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SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX7	21.6				Slightly silty fine to coarse sand (SM-SP)
S-1					
61.5-63.5'					

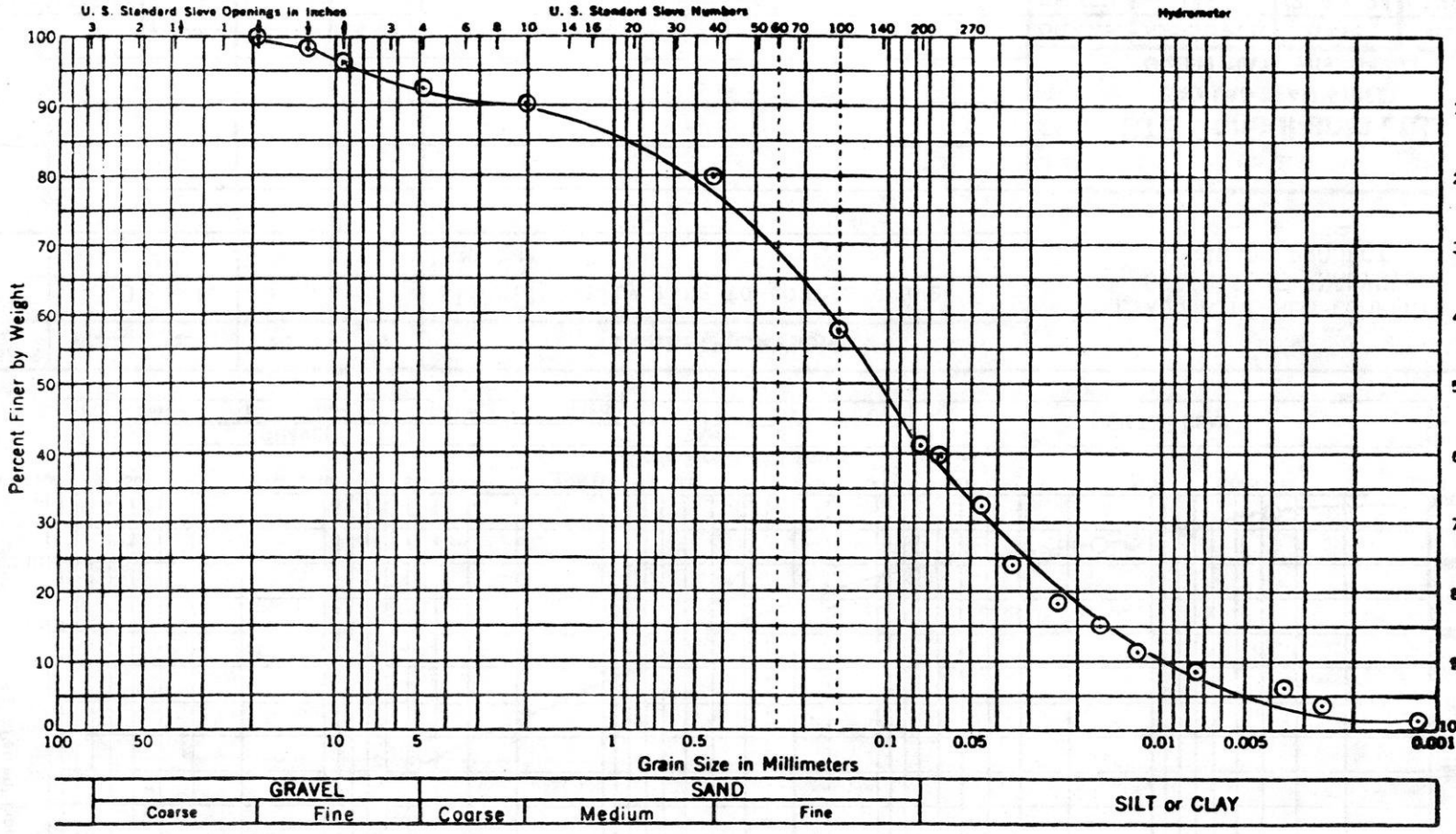
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX7	13.3				Silty fine to coarse sand (SM)
S-2					
120-122'					

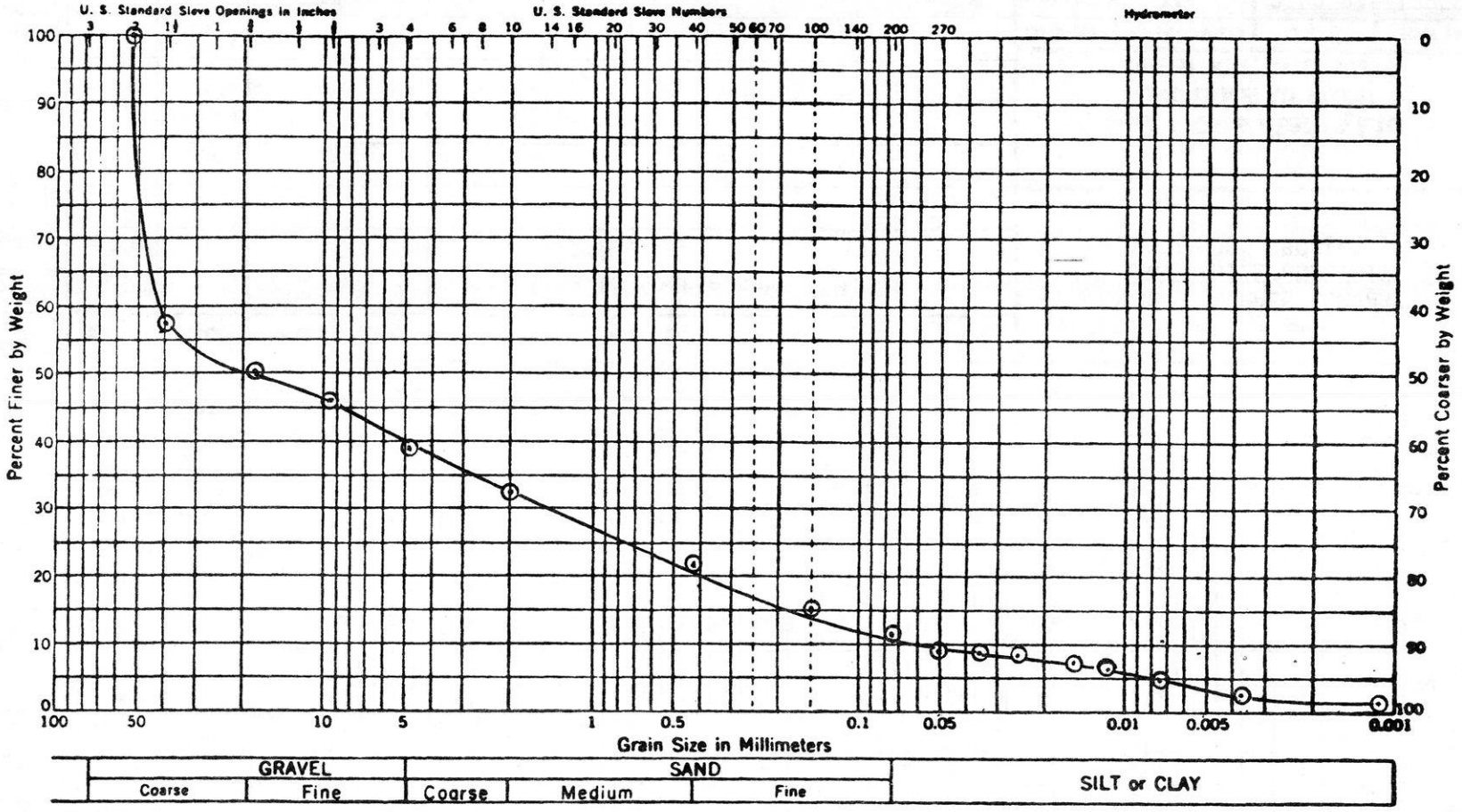
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX7	10.0				Slightly silty fine to coarse gravel
S-3					(GP-GM)
162-163'					

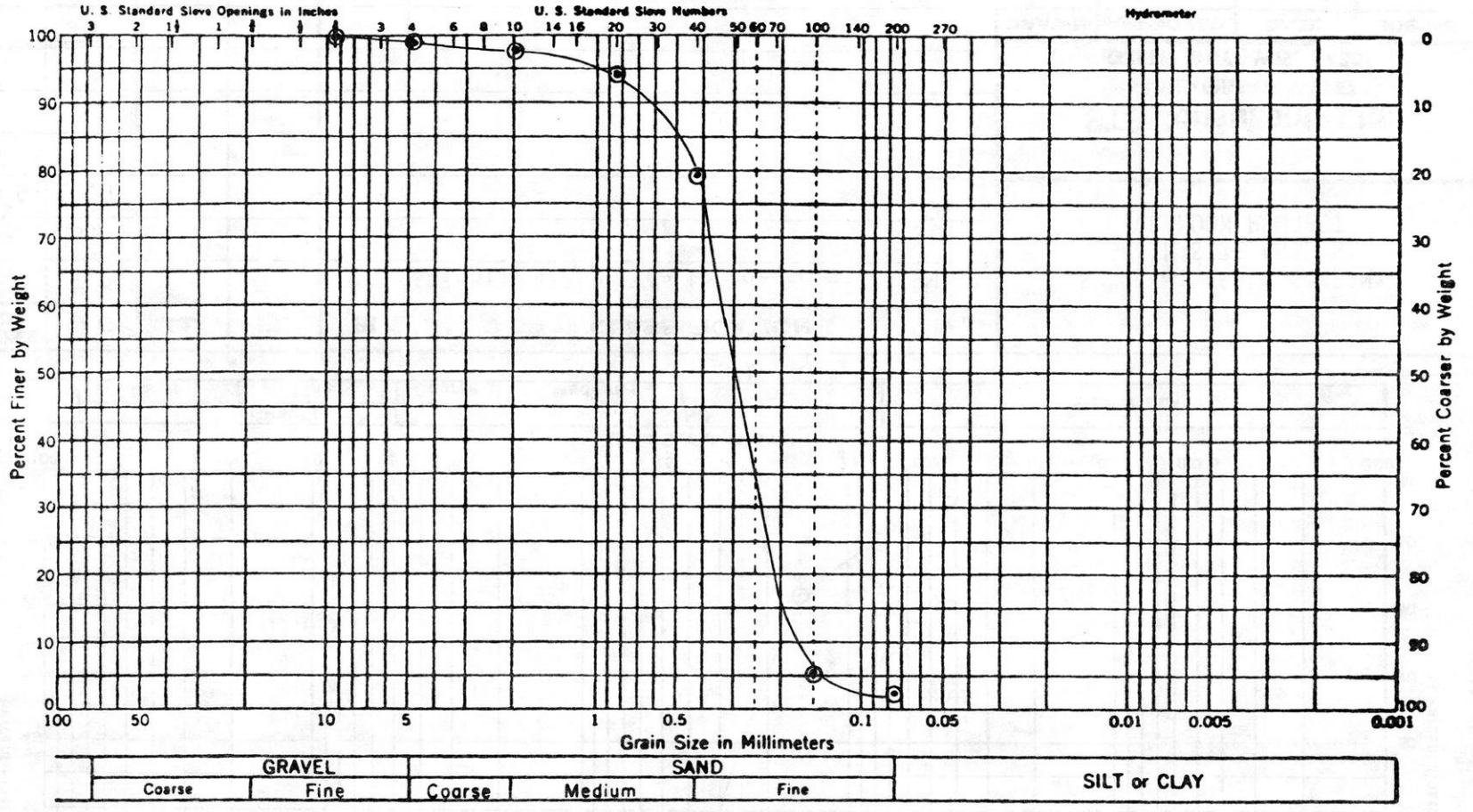
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	3.5				Fine to medium sand (SP)
S-1					
1.0-1.3'					

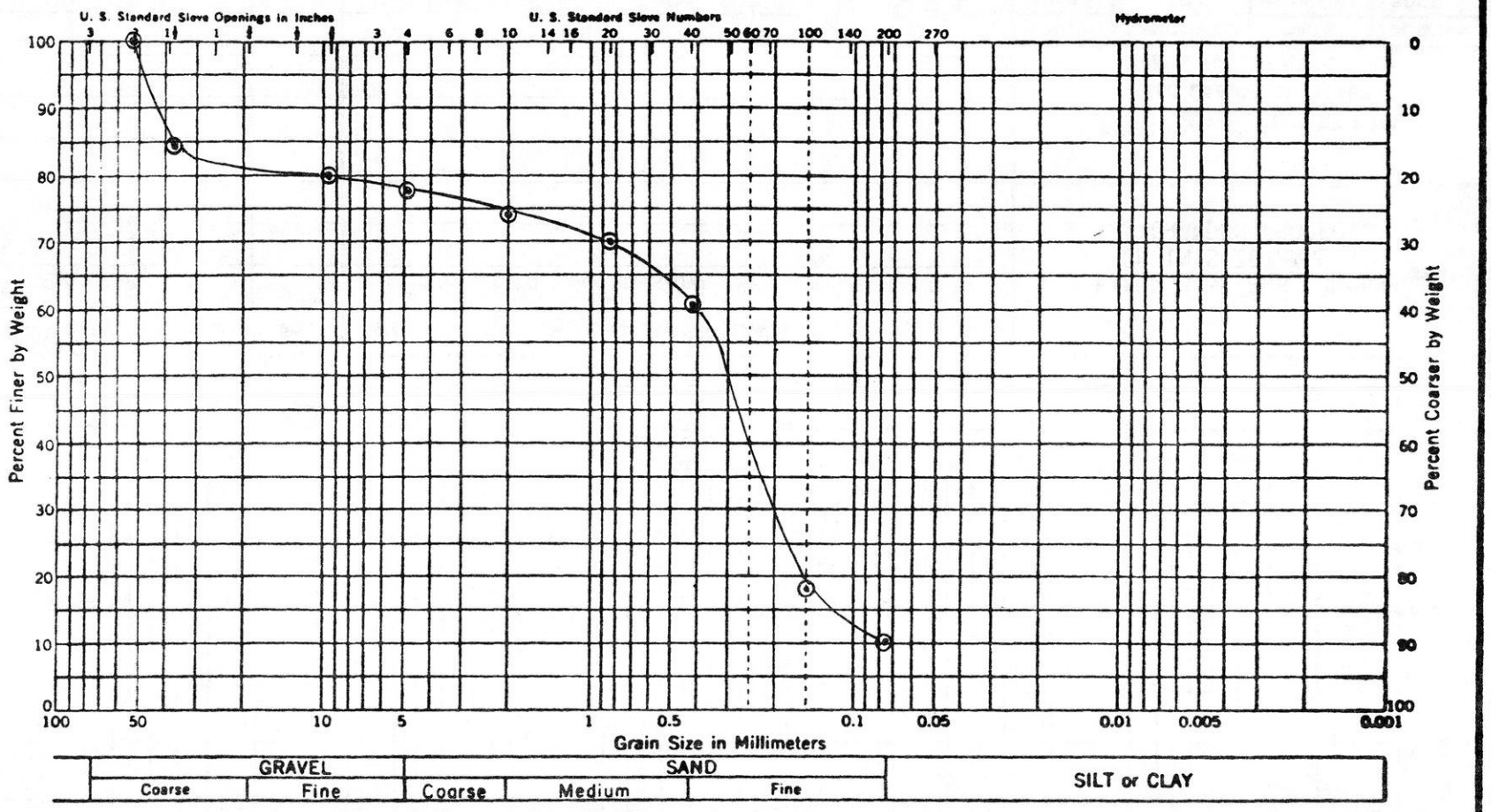
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	21.2				Slightly silty fine to coarse sand (SM-SP)
S-3					
20.0-	22.0'				

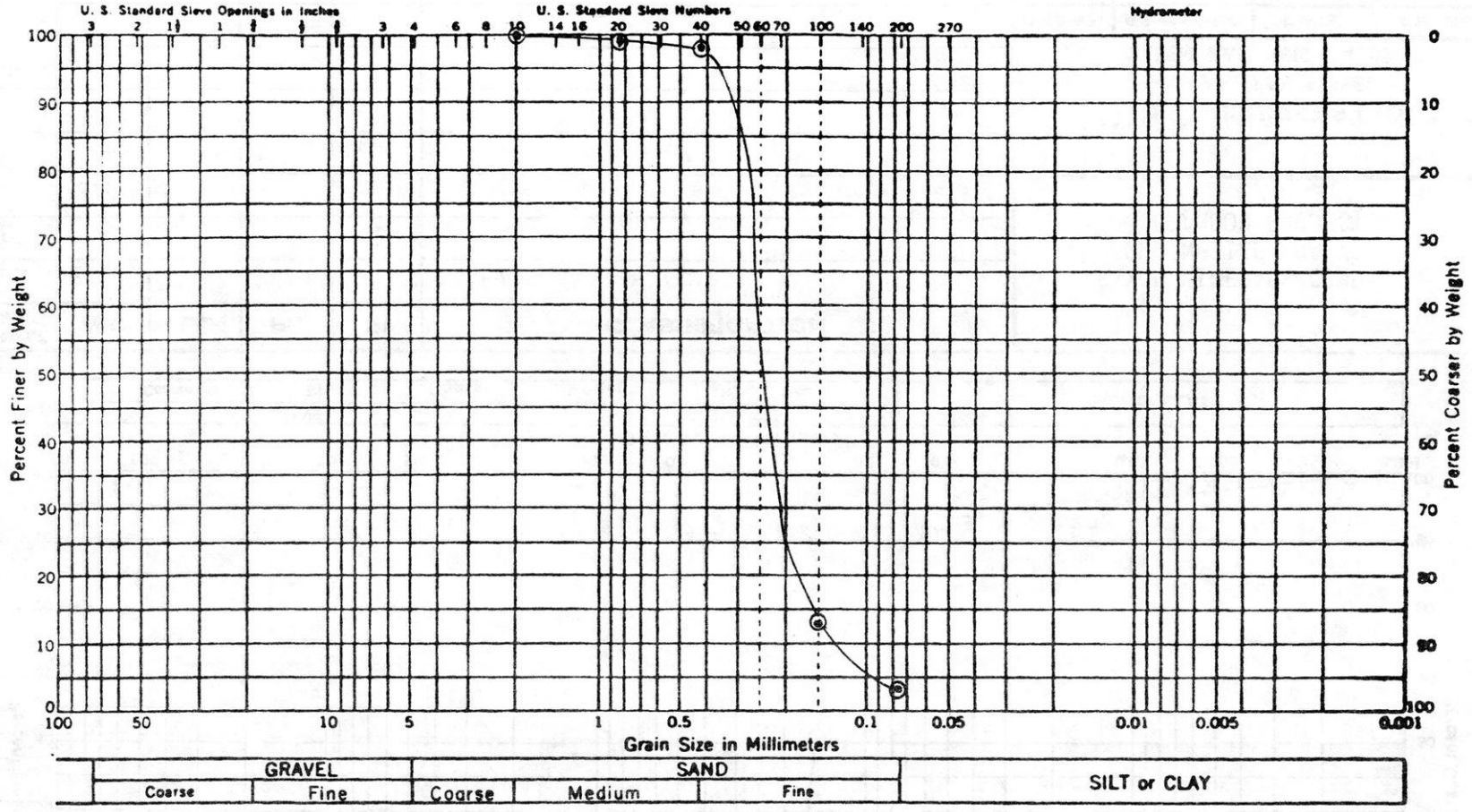
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	25.2				Fine sand (SP)
S-5					
40.0-	42.0'				

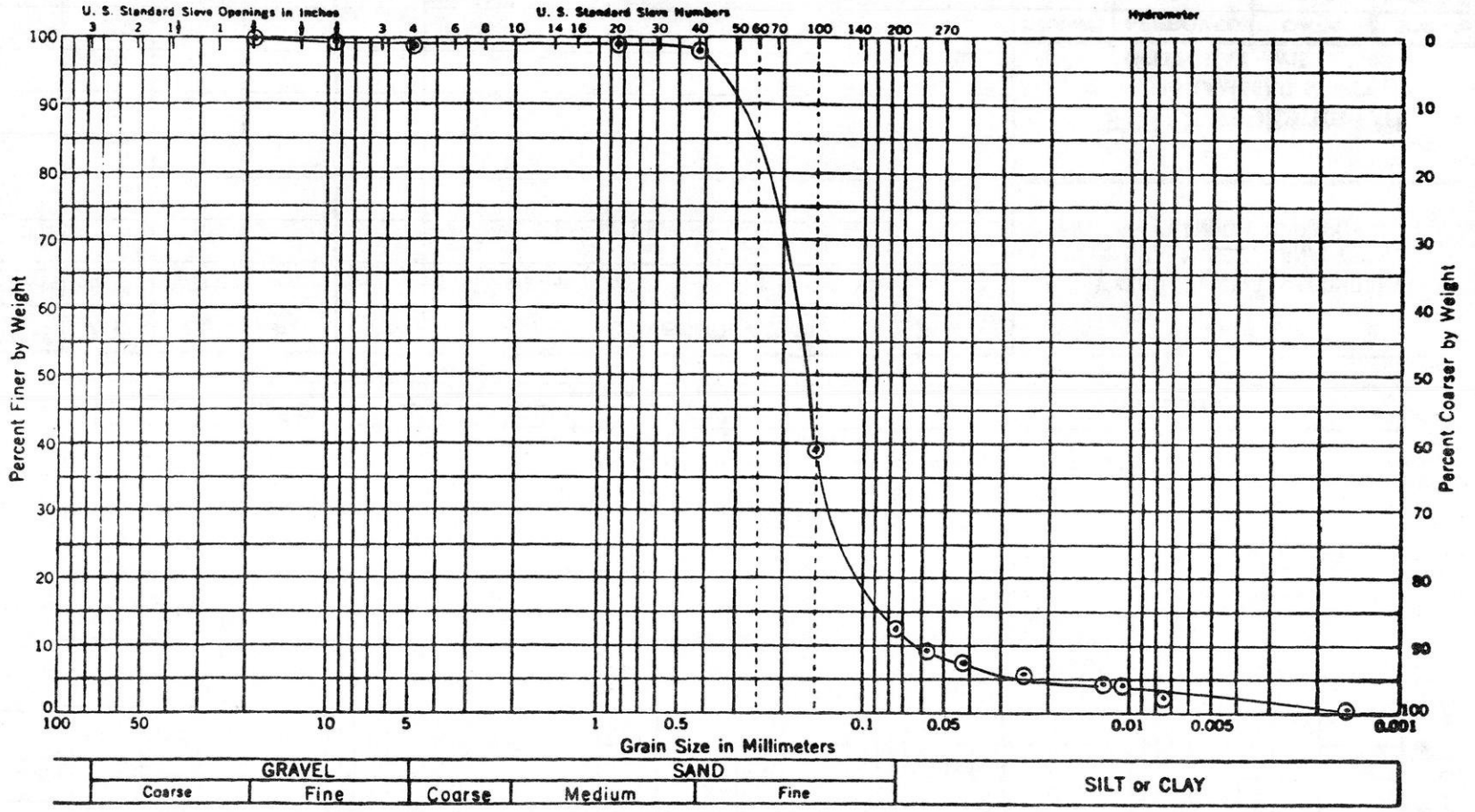
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	21.3				Silty fine sand (SM)
S-8					
71.0-	73.0'				

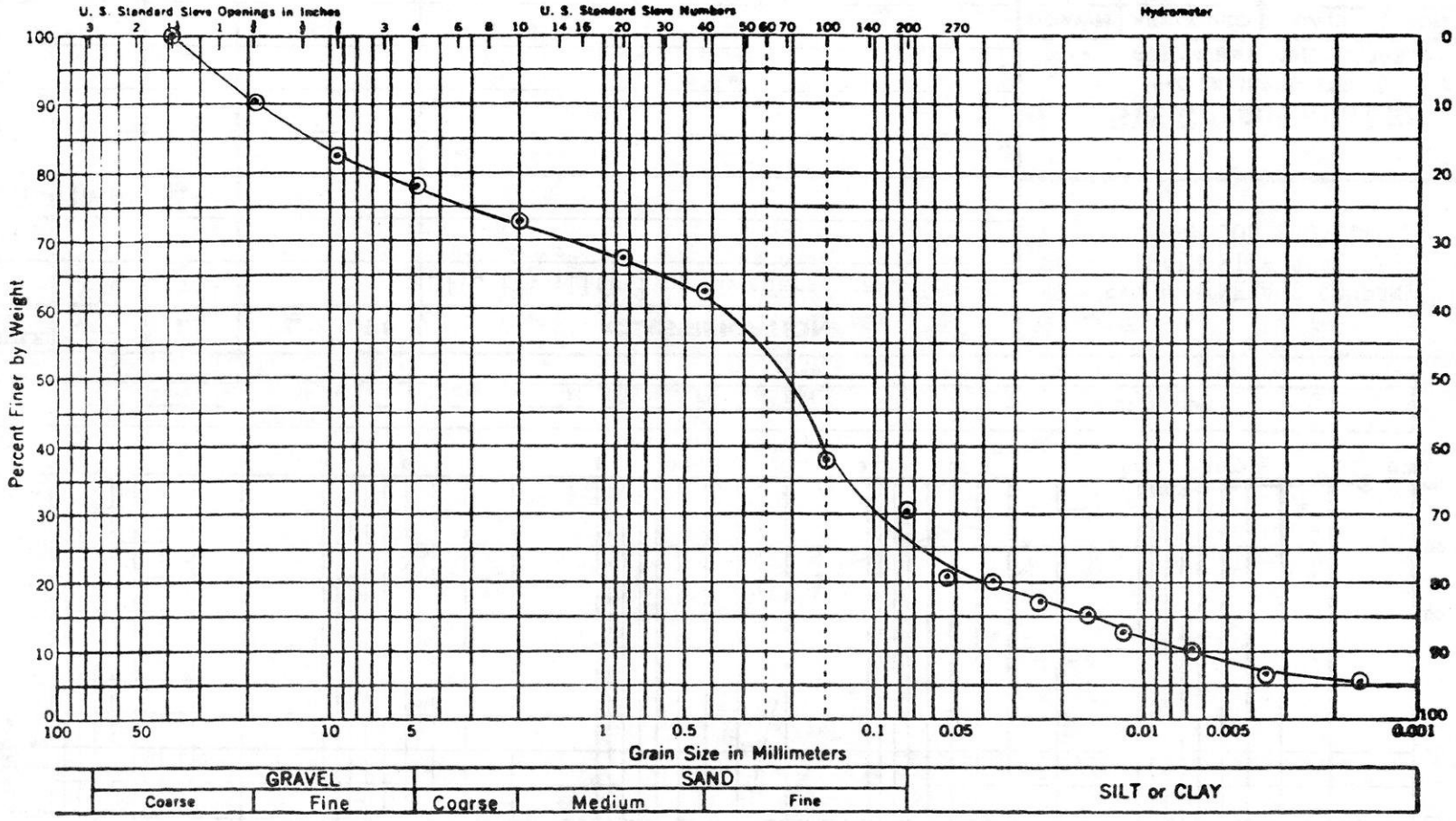
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	8.0				Silty fine to coarse sand (SM)
S-10					
92.0-	94.0'				

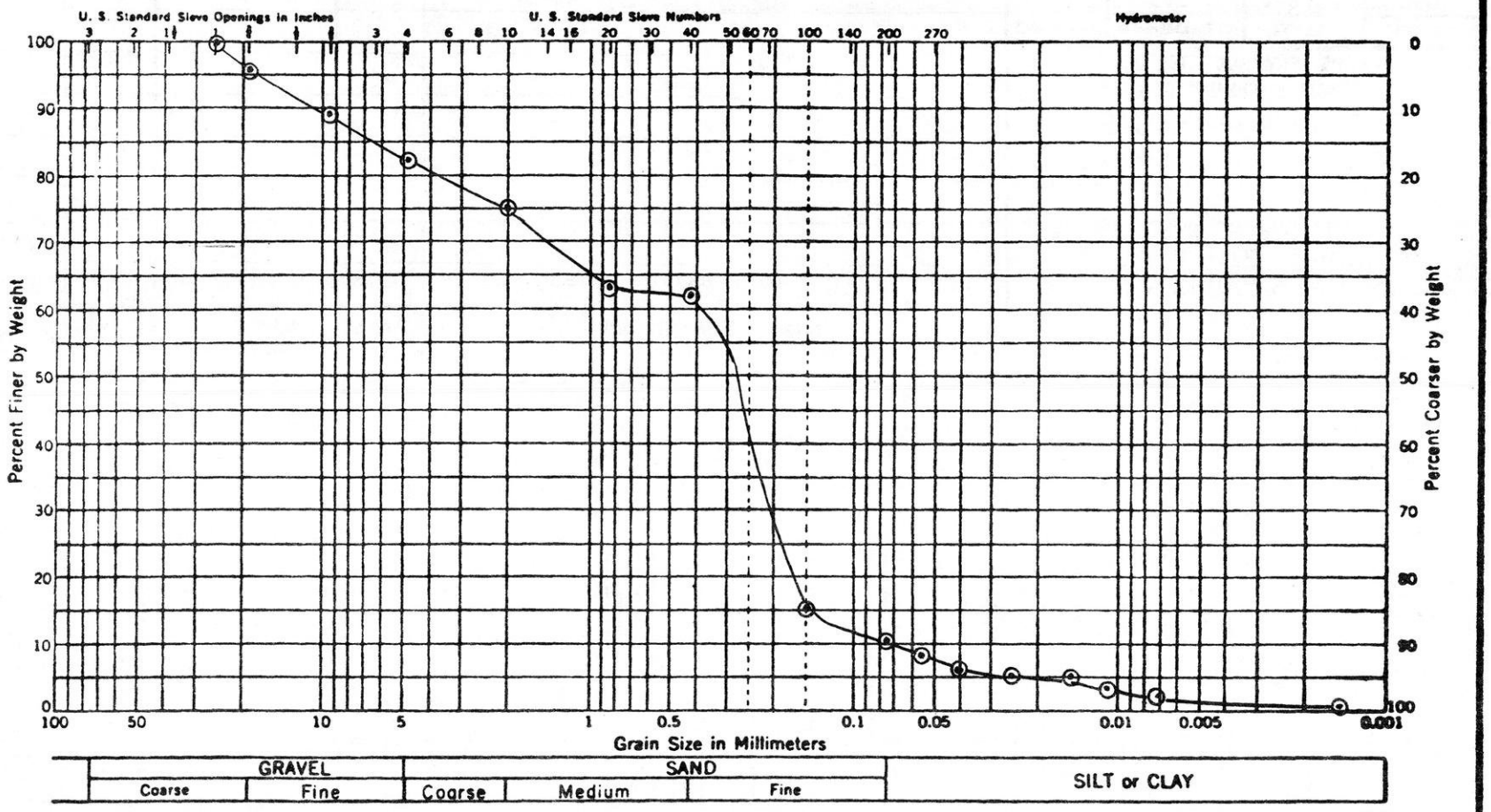
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	9.9				Slightly silty fine to coarse sand (SM-SP)
S-12					
112.0-114.0'					

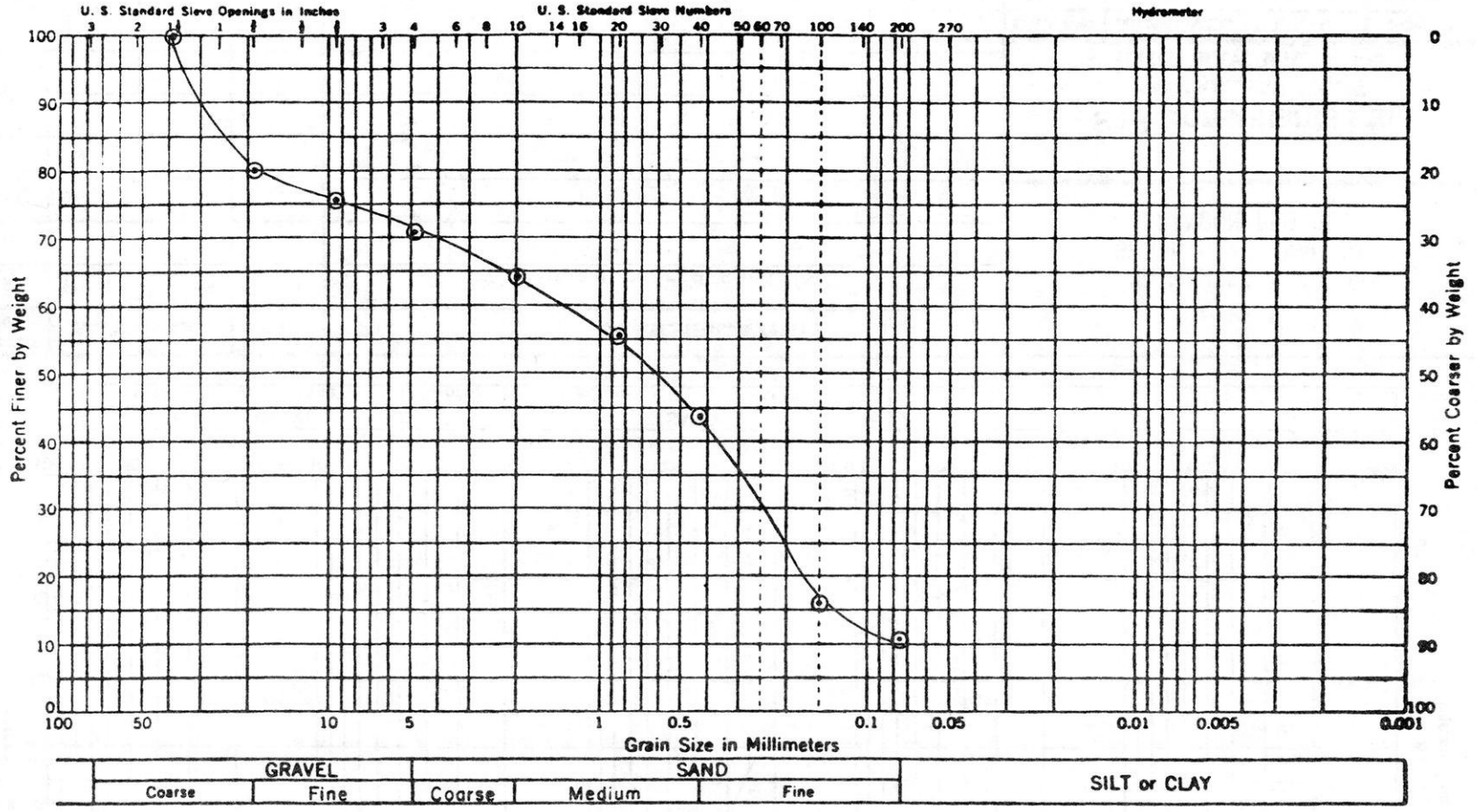
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	10.5				Slightly silty fine to coarse sand (SM-SP)
S-14					
133.0-135.0'					

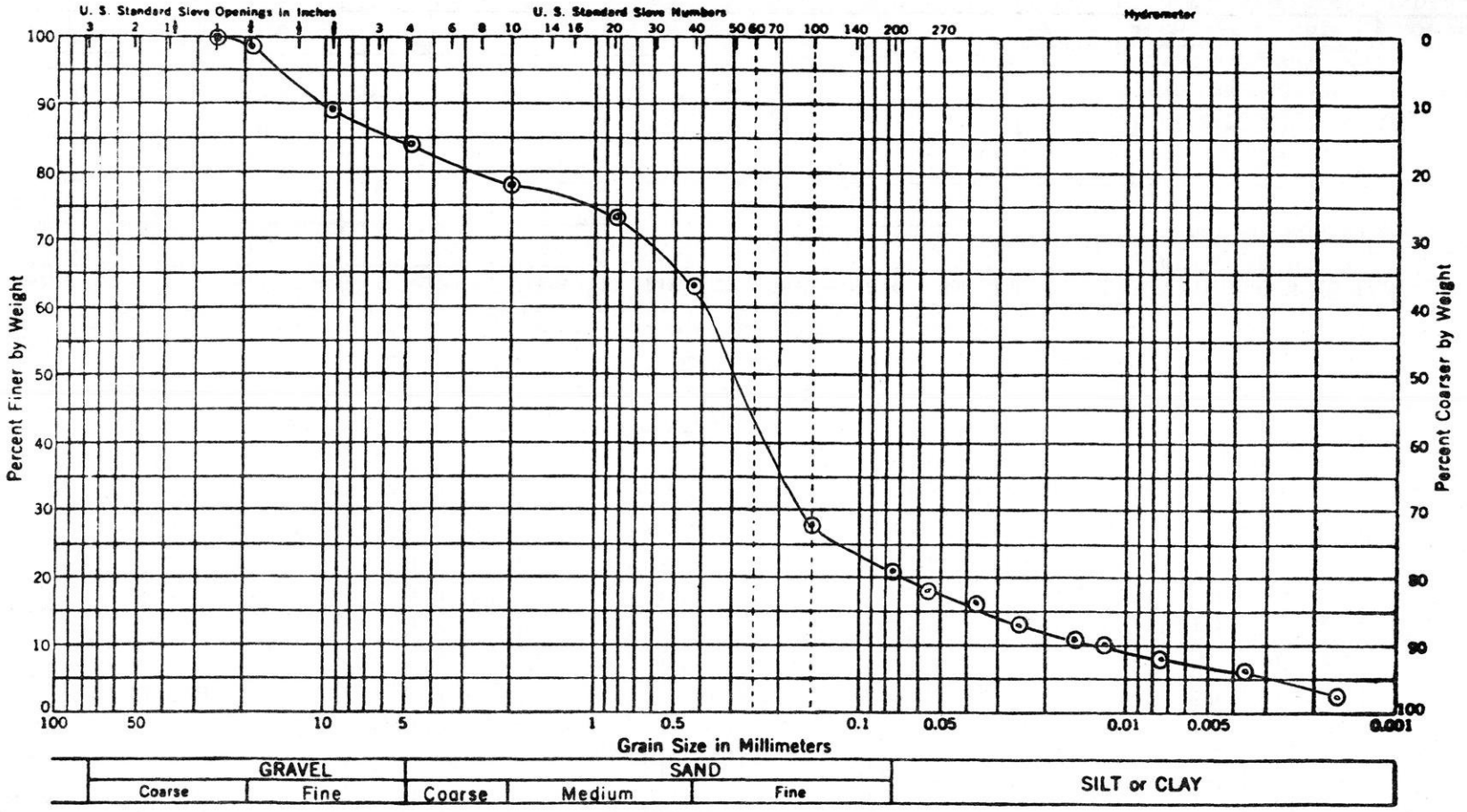
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	10.1				Silty fine to coarse sand (SM)
S-15					
143.0-145.0'					

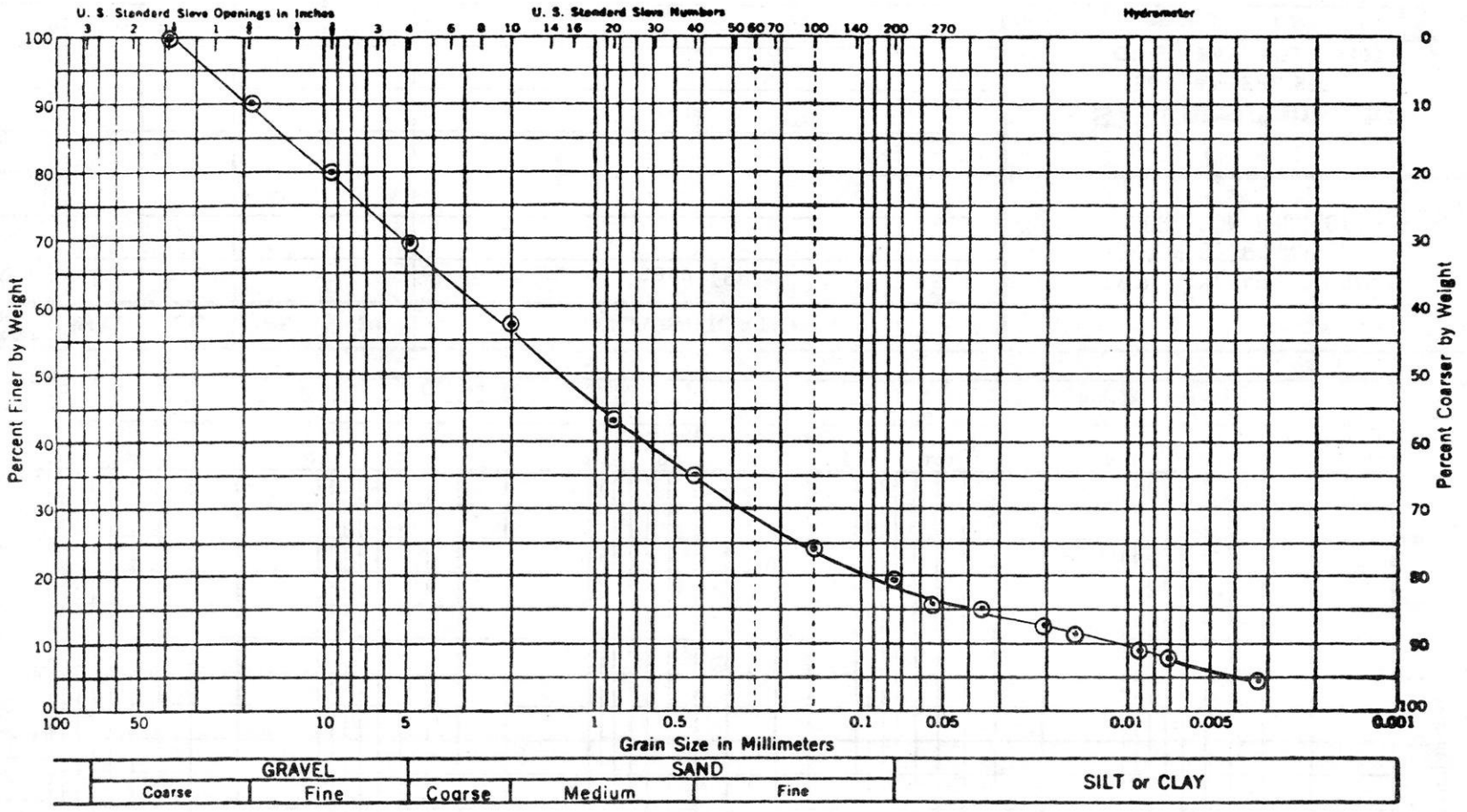
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-8	10.5				Silty fine to coarse sand (SM)
S-17					
164.0-166.0'					

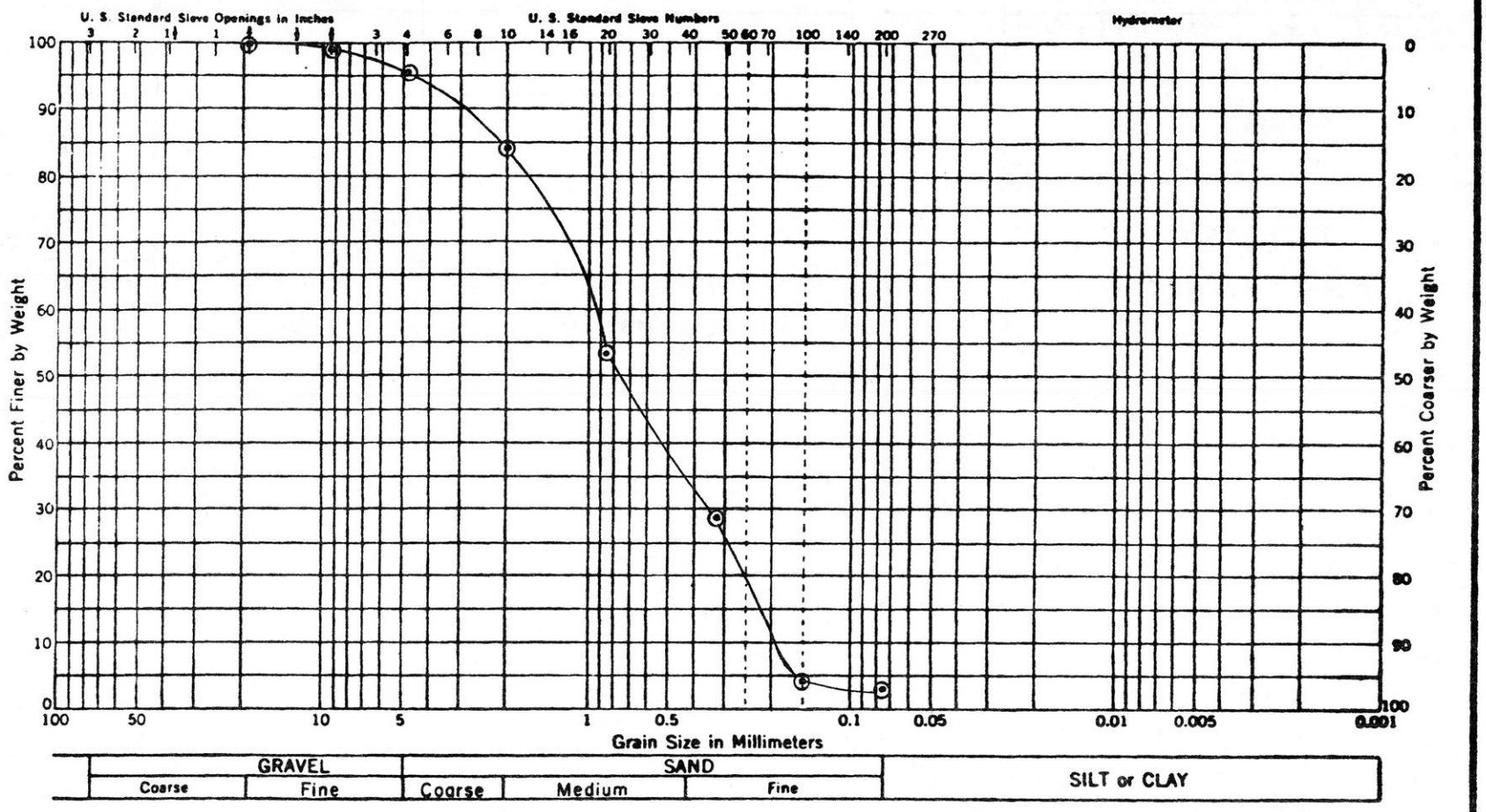
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	4.9				Fine to coarse sand (SP)
S-A					
4.0-6.0'					

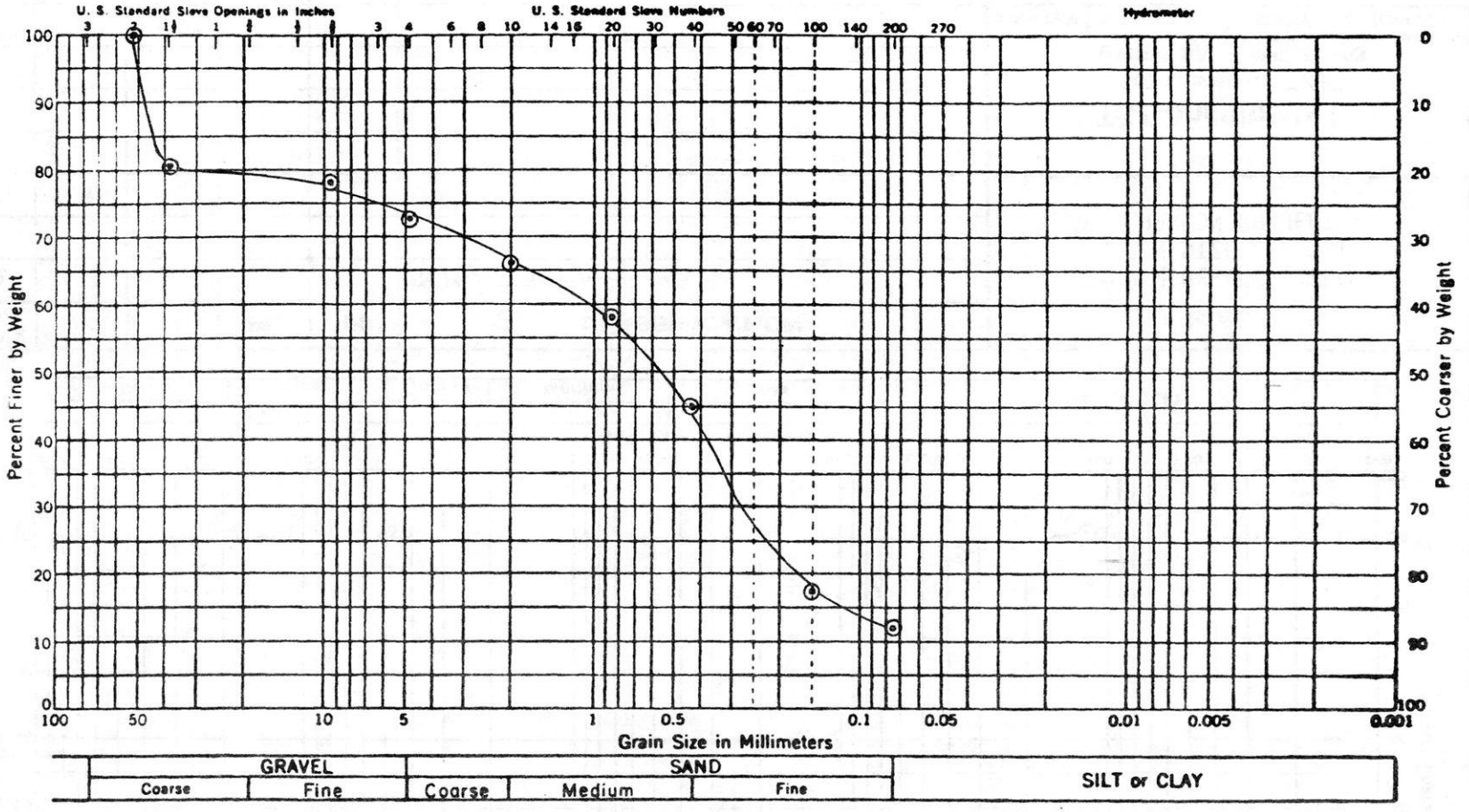
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	5.7				silty fine to coarse sand (SM)
S-2					
20.0-22.0'					

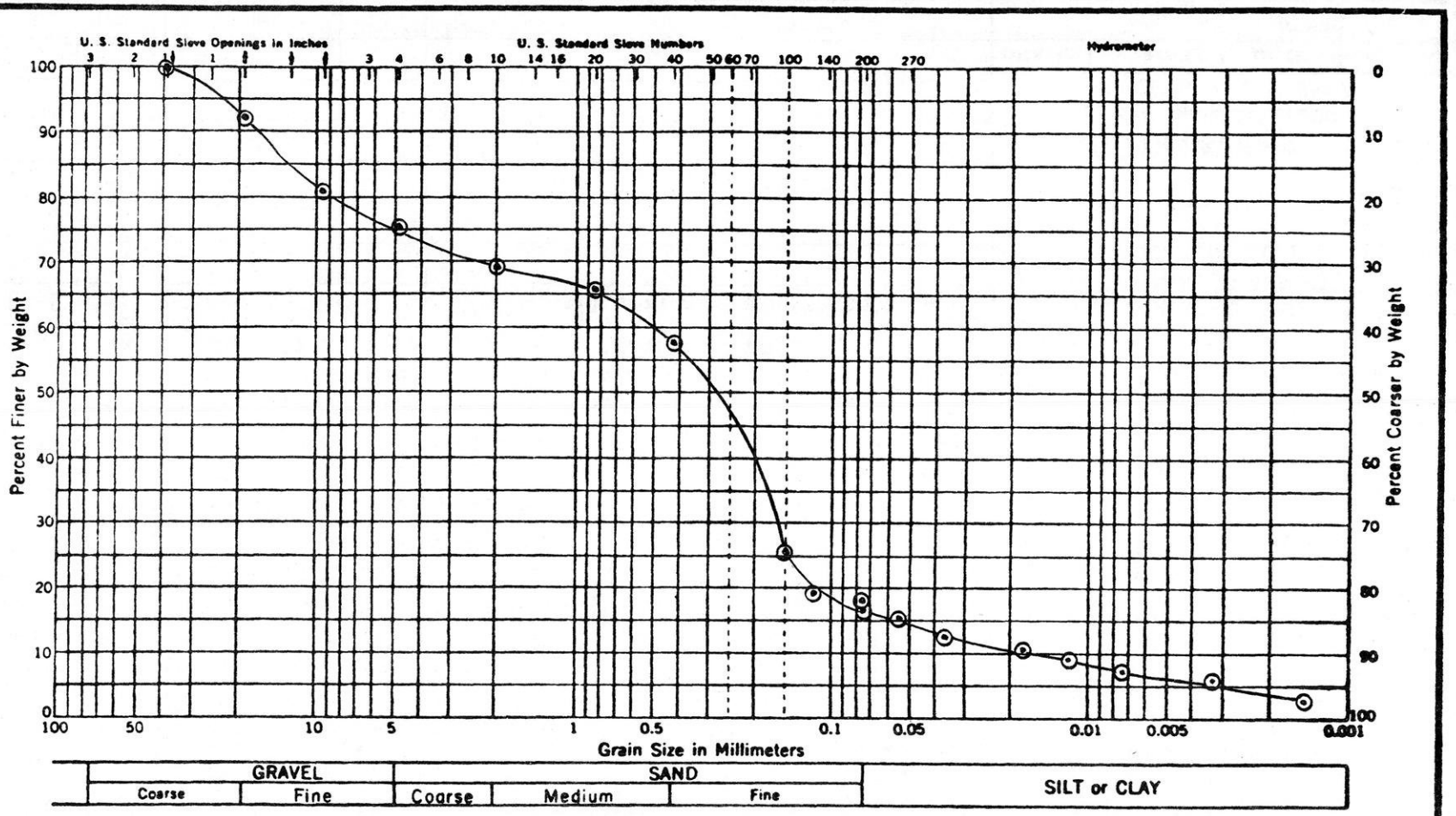
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	4.1				Silty fine to coarse sand (SM)
S-3					
30.1-	31.5'				

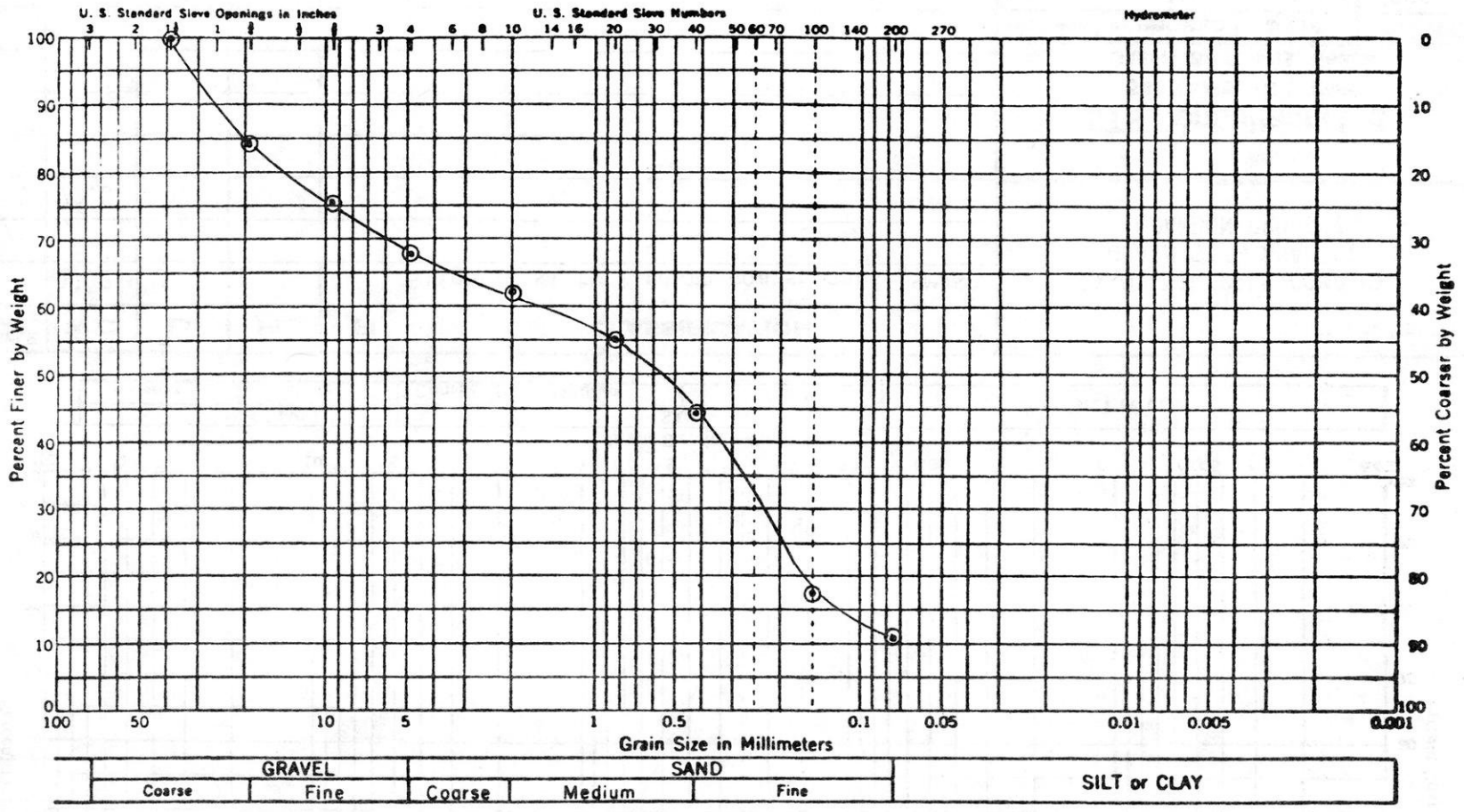
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	5.7				Slightly silty fine to coarse sand (SM-SP)
S-5					
50.5-52.0'					

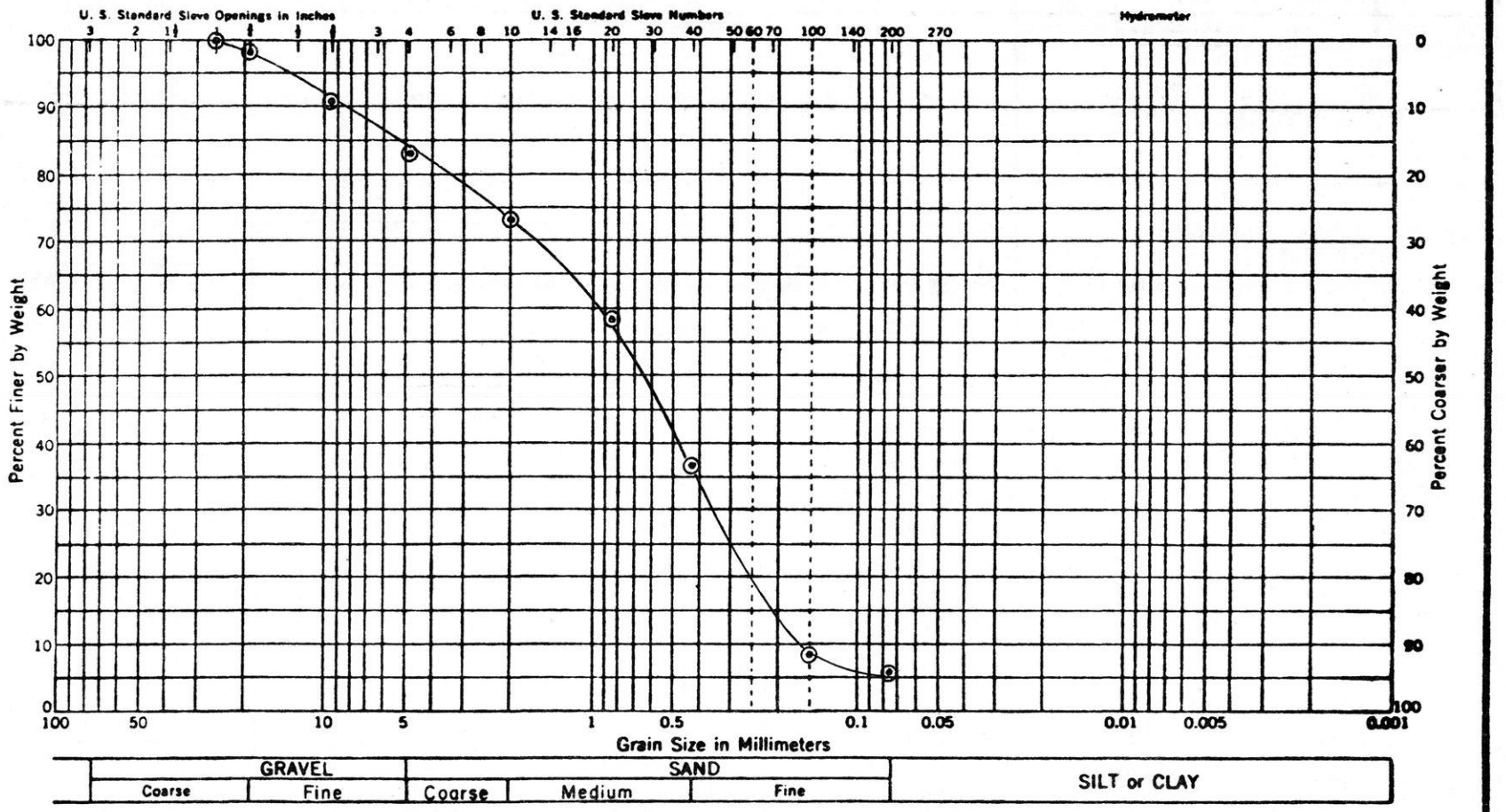
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	11.3				Slightly silty fine to coarse sand (SM-SP)
S-7					
70.5-	72.0′				

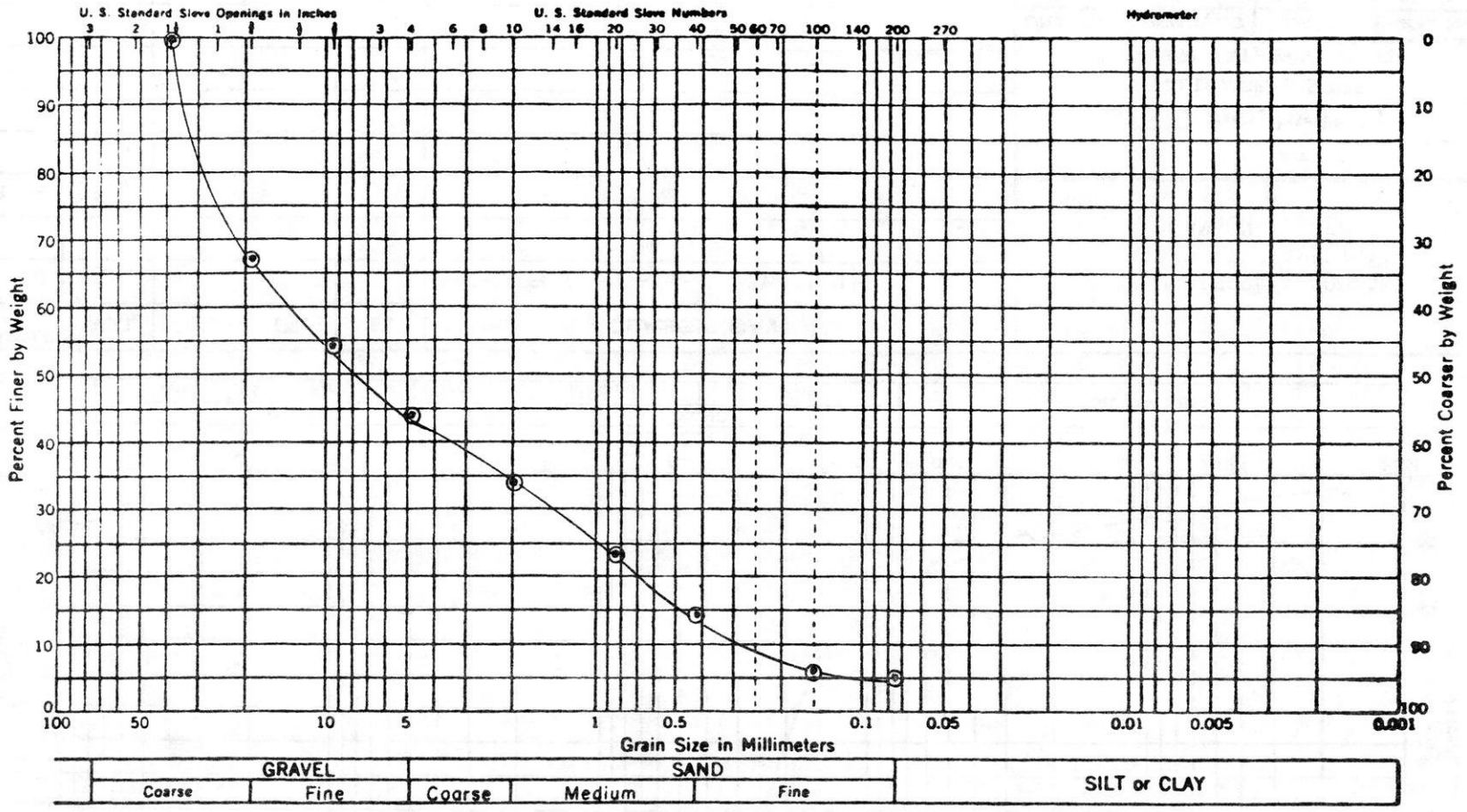
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	7.7				Fine to coarse gravel (GP)
S-9					
91.0-	93.0'				

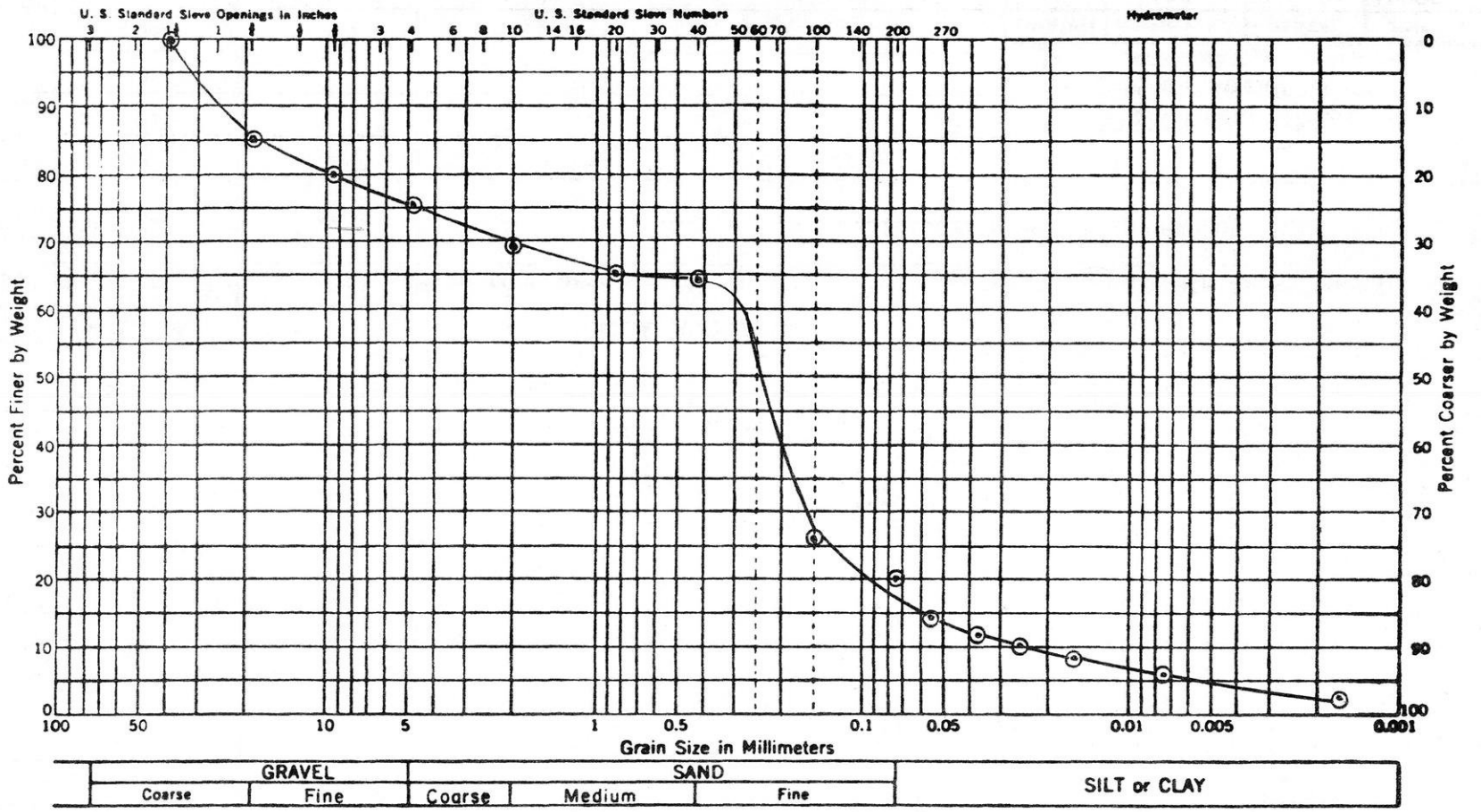
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	8.5				Silty fine to coarse sand (SM)
S-10					
101.5-103.5'					

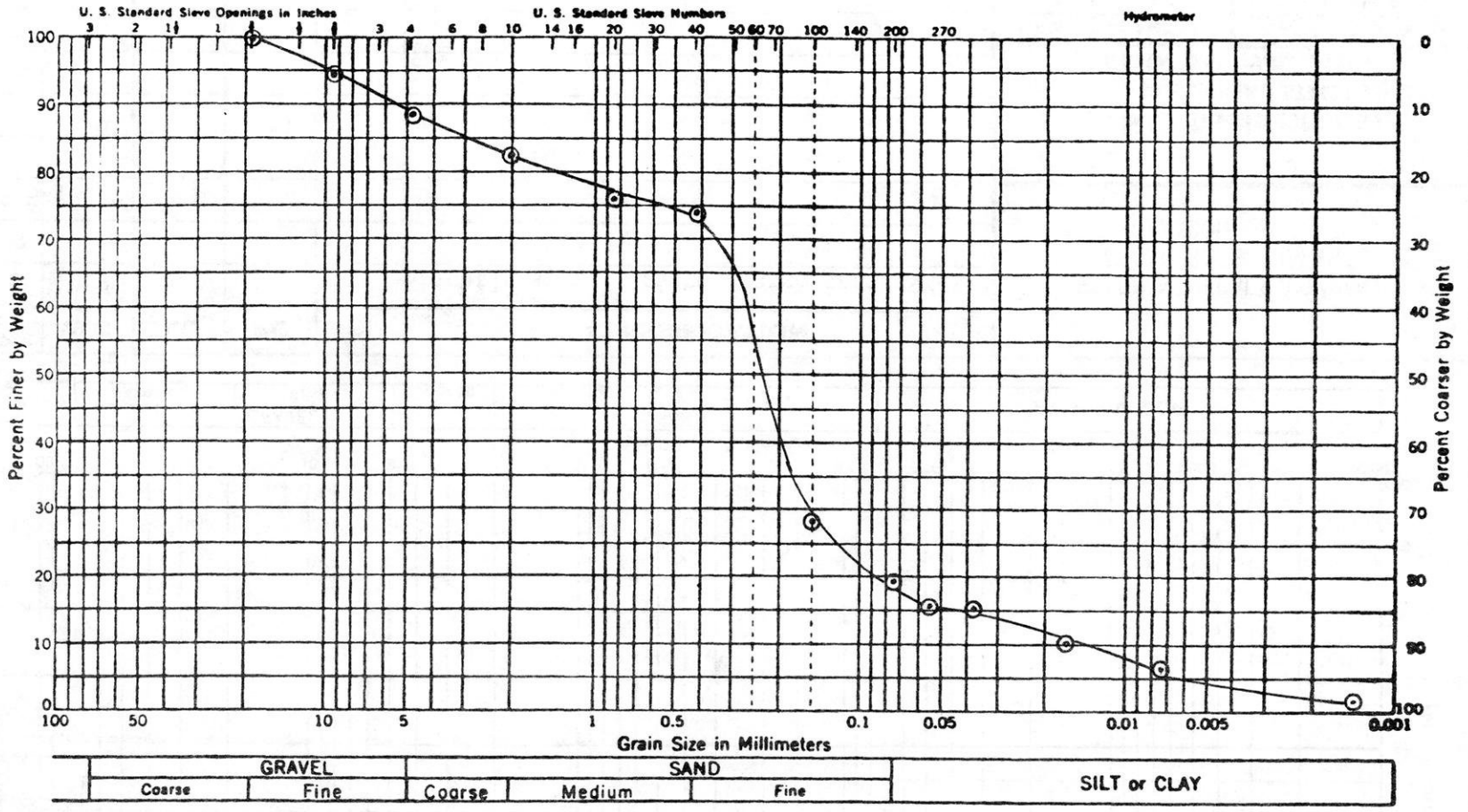
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	8.7				Silty fine to coarse sand (SM)
S-12					
123.0-124.5'					

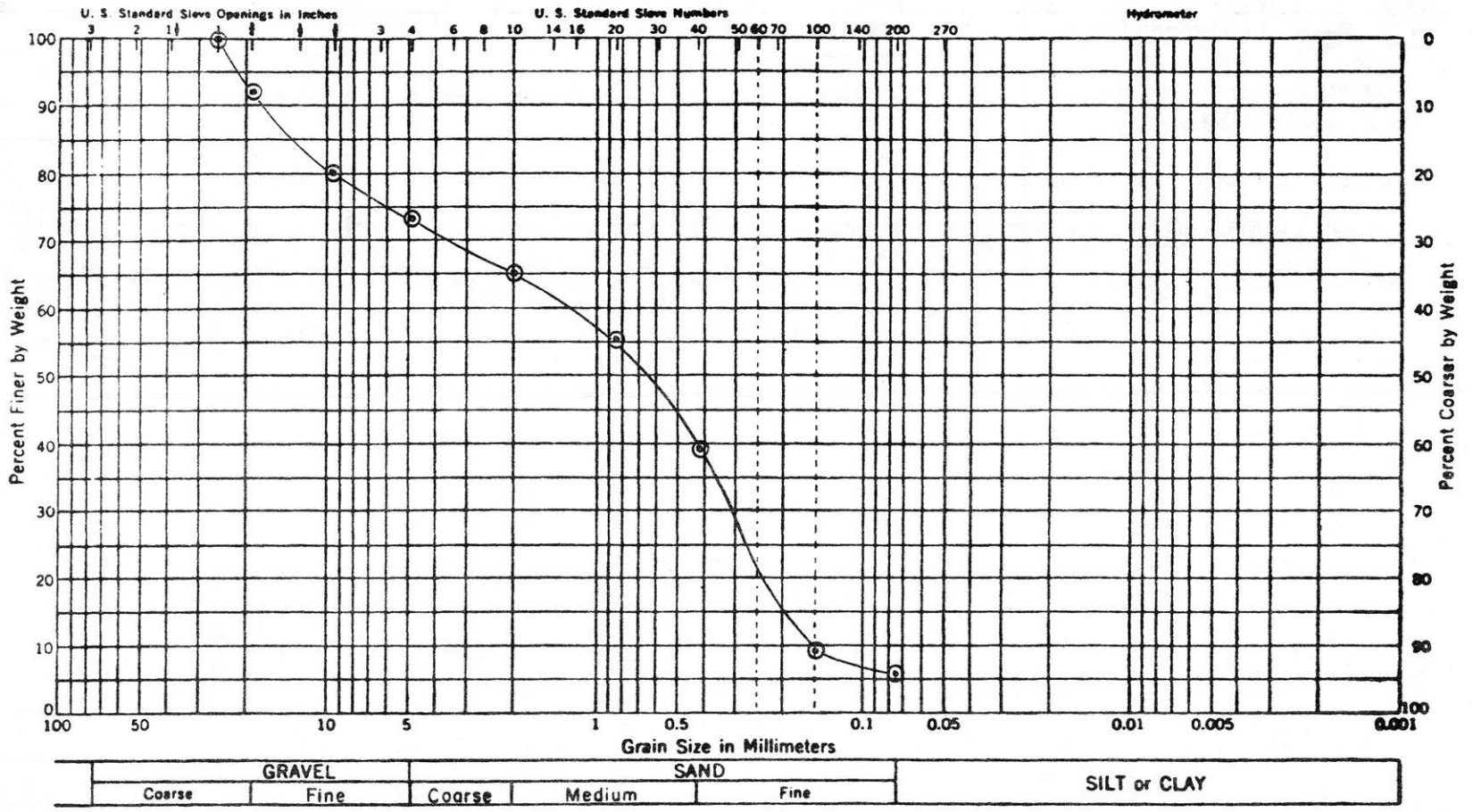
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	10.9				Slightly silty fine to coarse sand (SM-SP)
S-13					
133.5-135.0'					

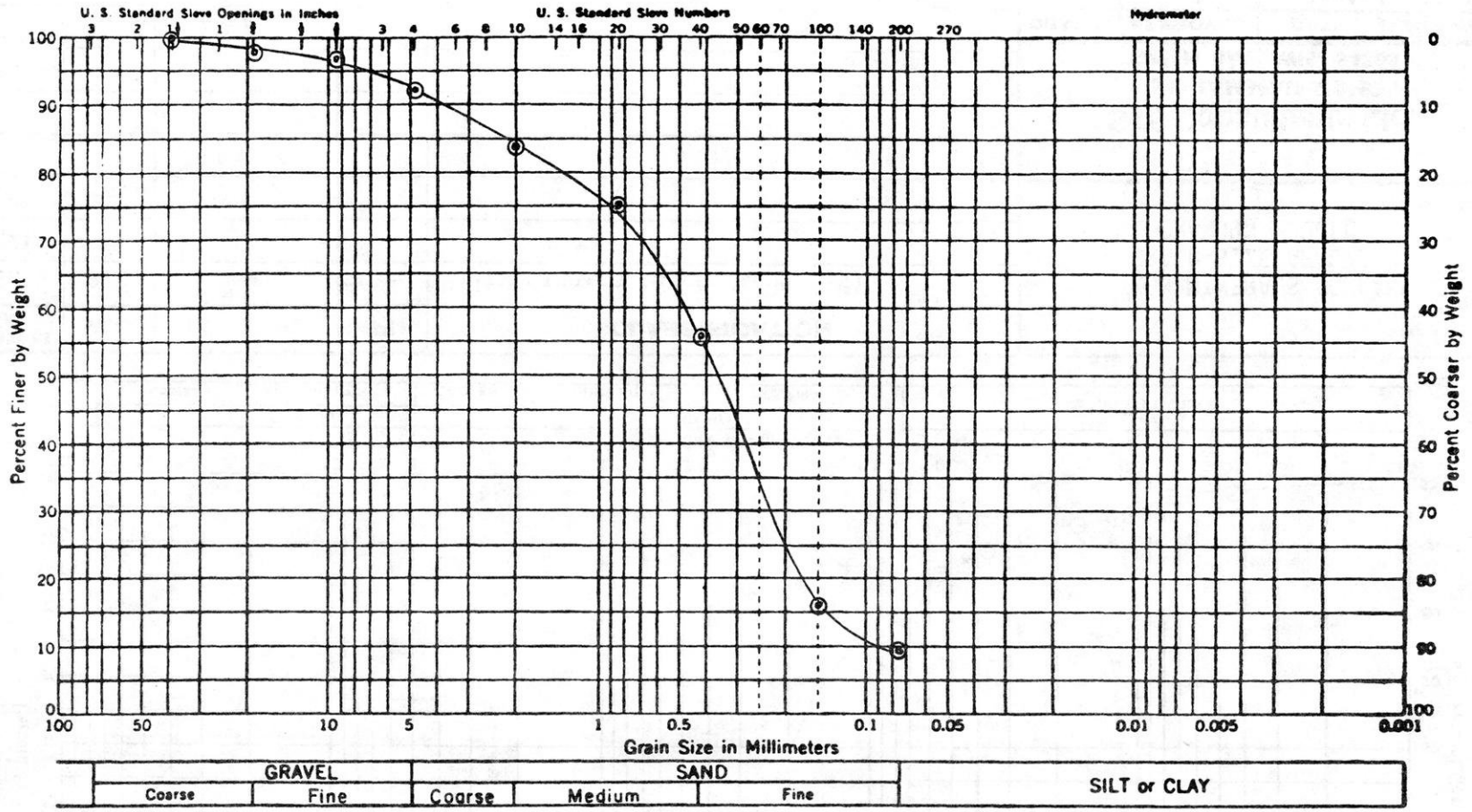
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	13.5				Slightly silty fine to coarse sand (SM-SP)
S-14					
142.5-144.5'					

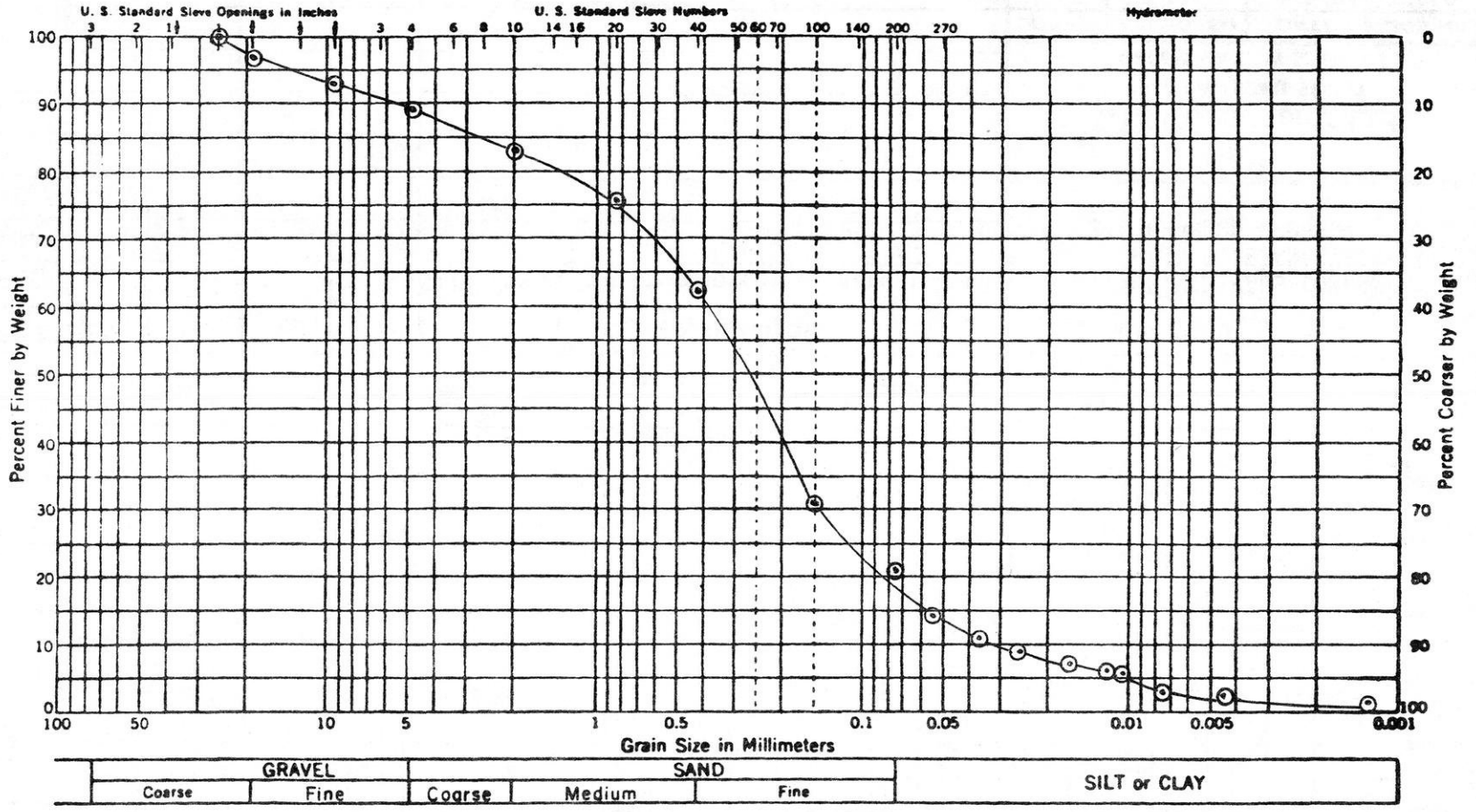
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	9.3				Silty fine to coarse sand (SM)
S-16					
163.0-165.0'					

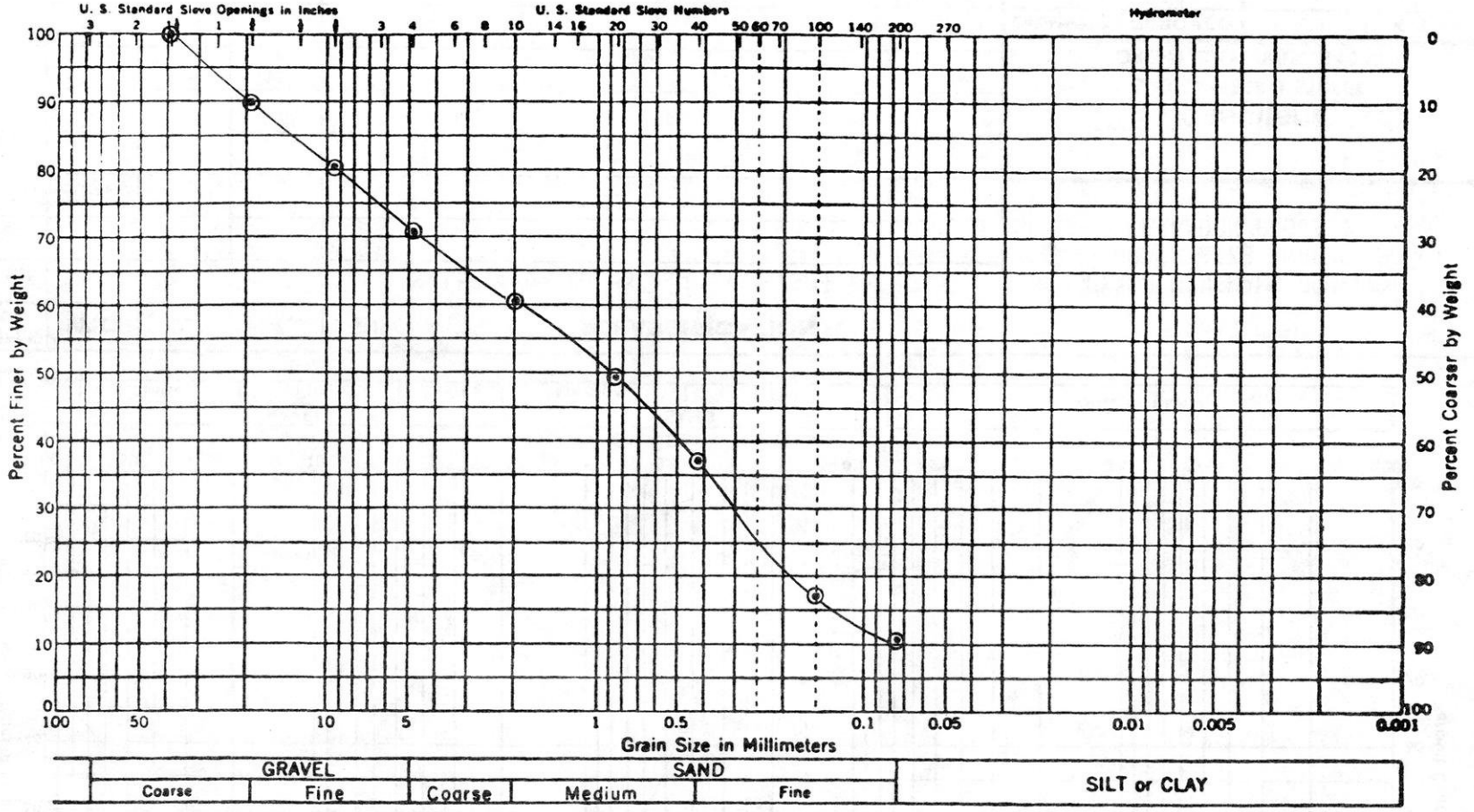
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	9.8				Slightly silty fine to coarse sand (SM-SP)
S-18					
185.0-186.5'					

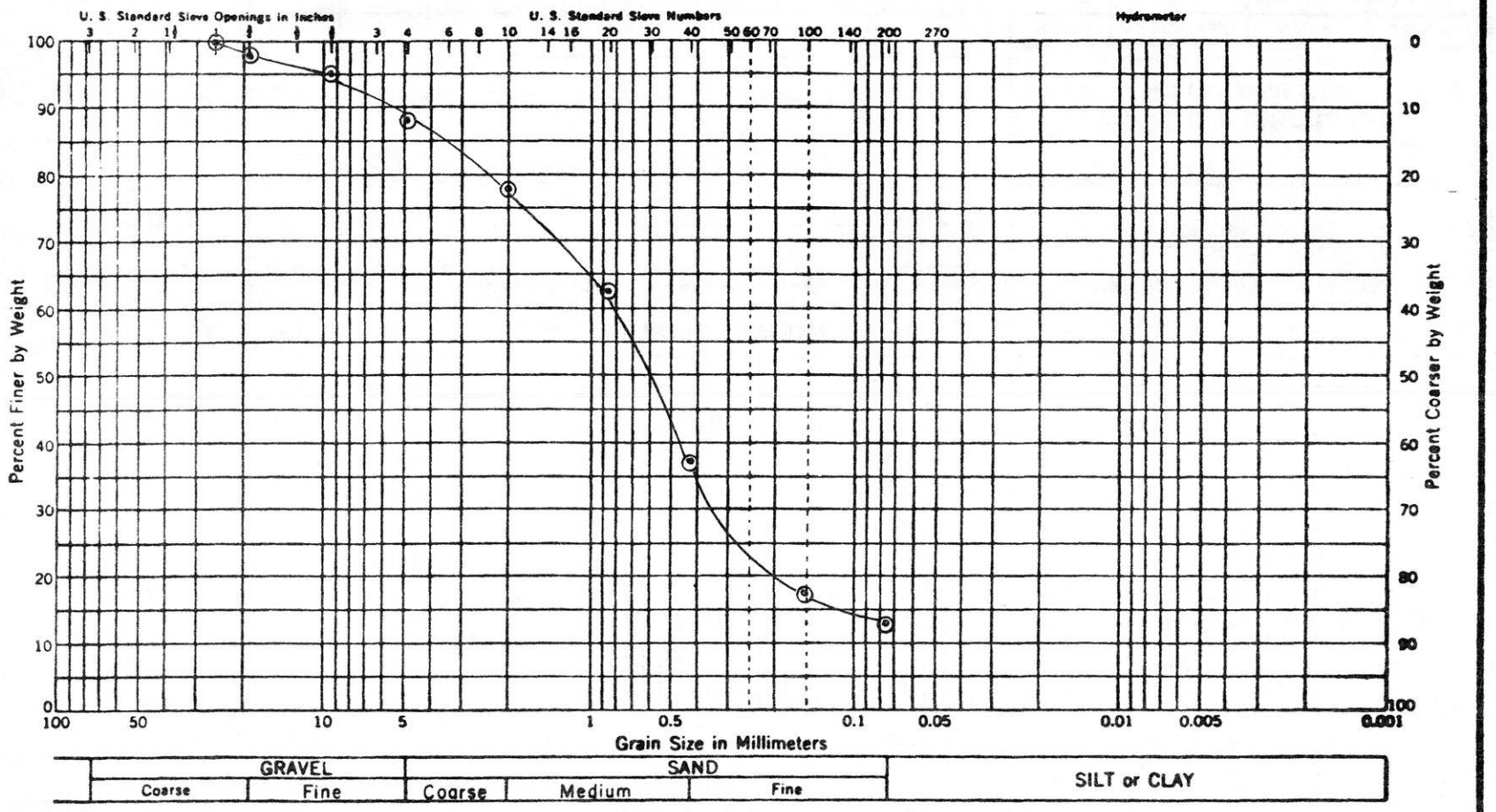
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	13.7				Silty fine to coarse sand (SM)
S-20					
203.0-205.0'					

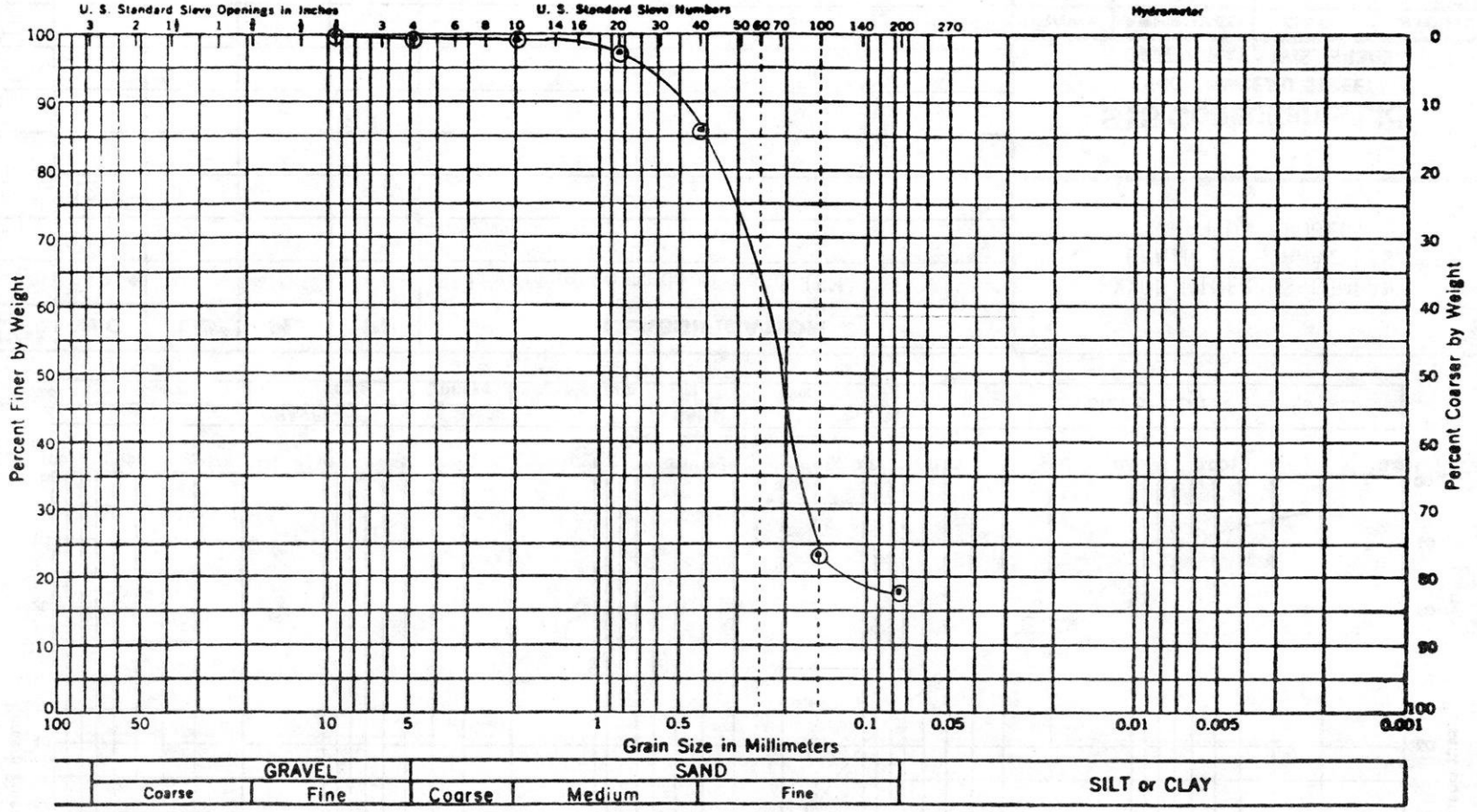
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-9	17.5				Silty fine to medium sand (SM)
S-25					
255.0-256.0'					

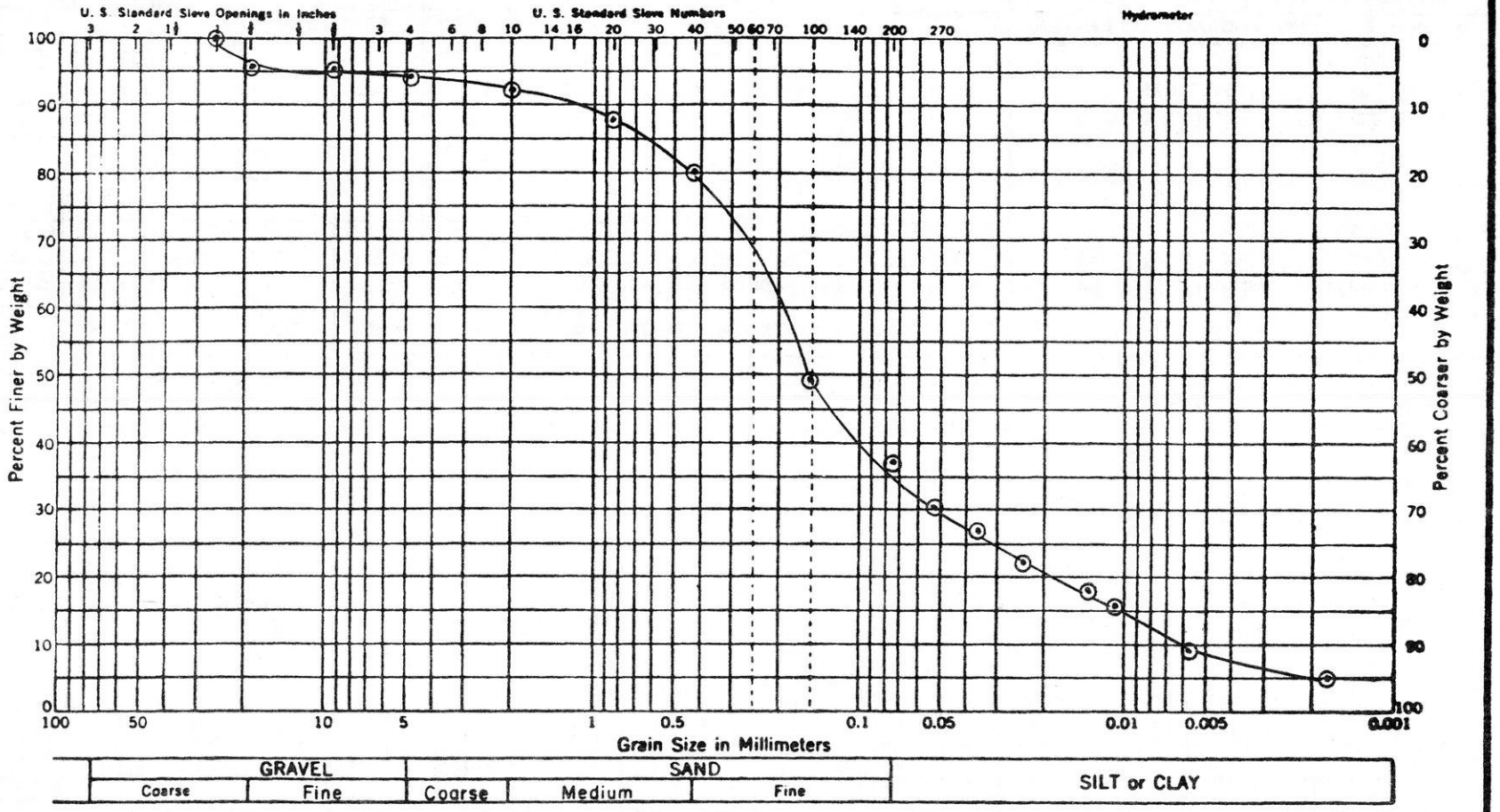
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	14.6				Silty fine to medium sand (SM)
S-1					
10.5-	12.5'				

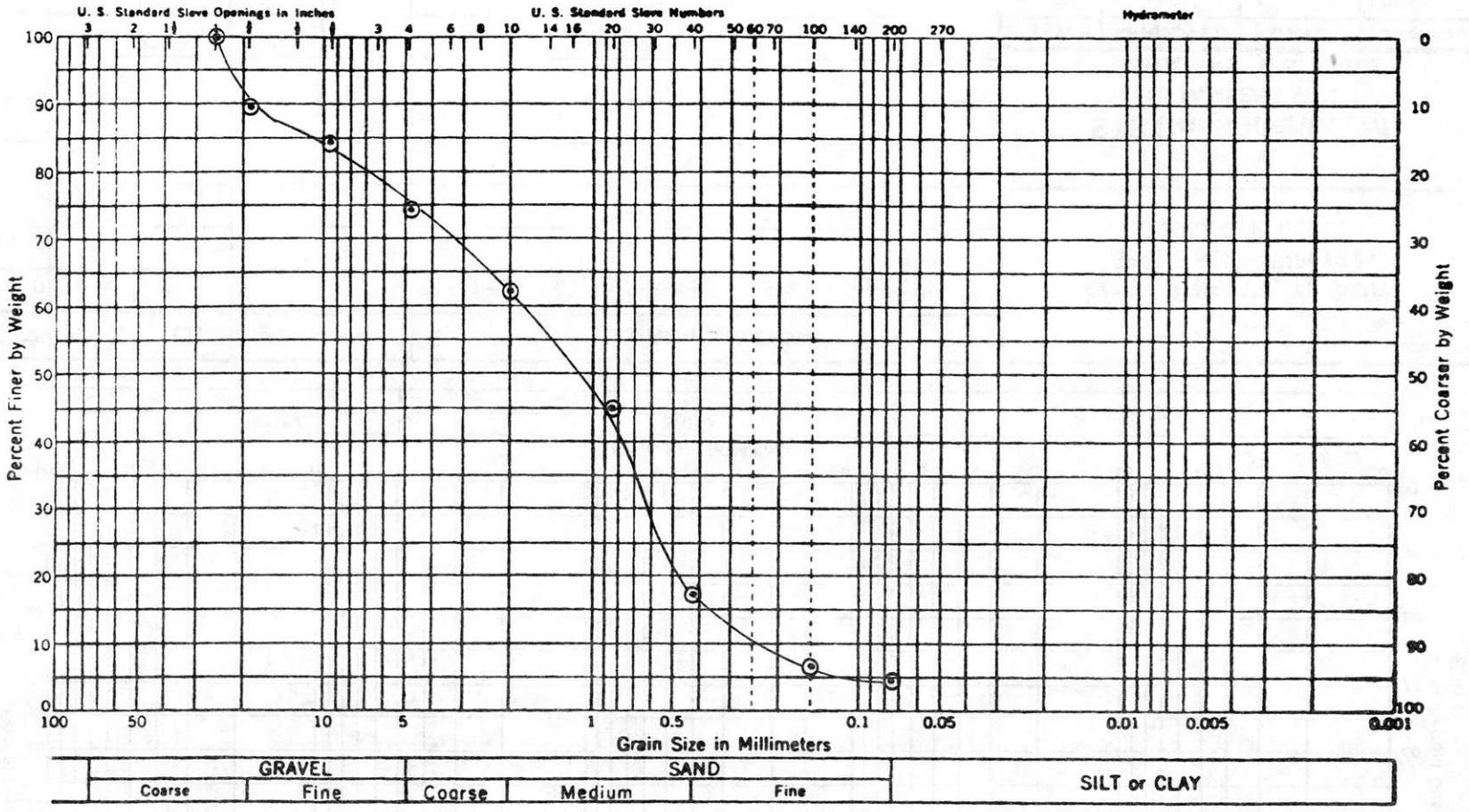
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	3.7				Fine to coarse sand (SP)
S-2					
20.5-22.5'					

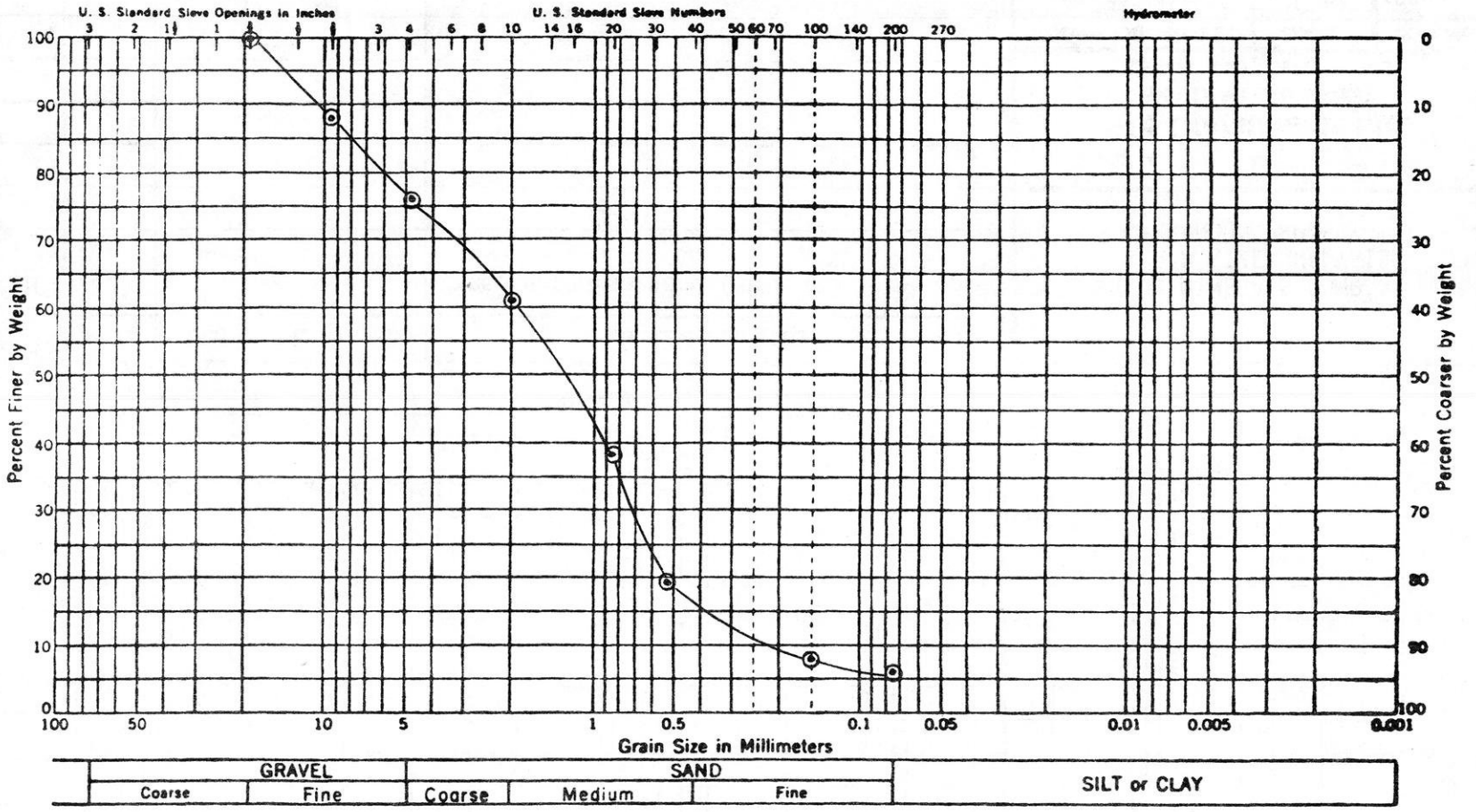
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	4.8				Slightly silty fine to coarse sand (SM-SP)
S-4					
41.5-	43.5'				

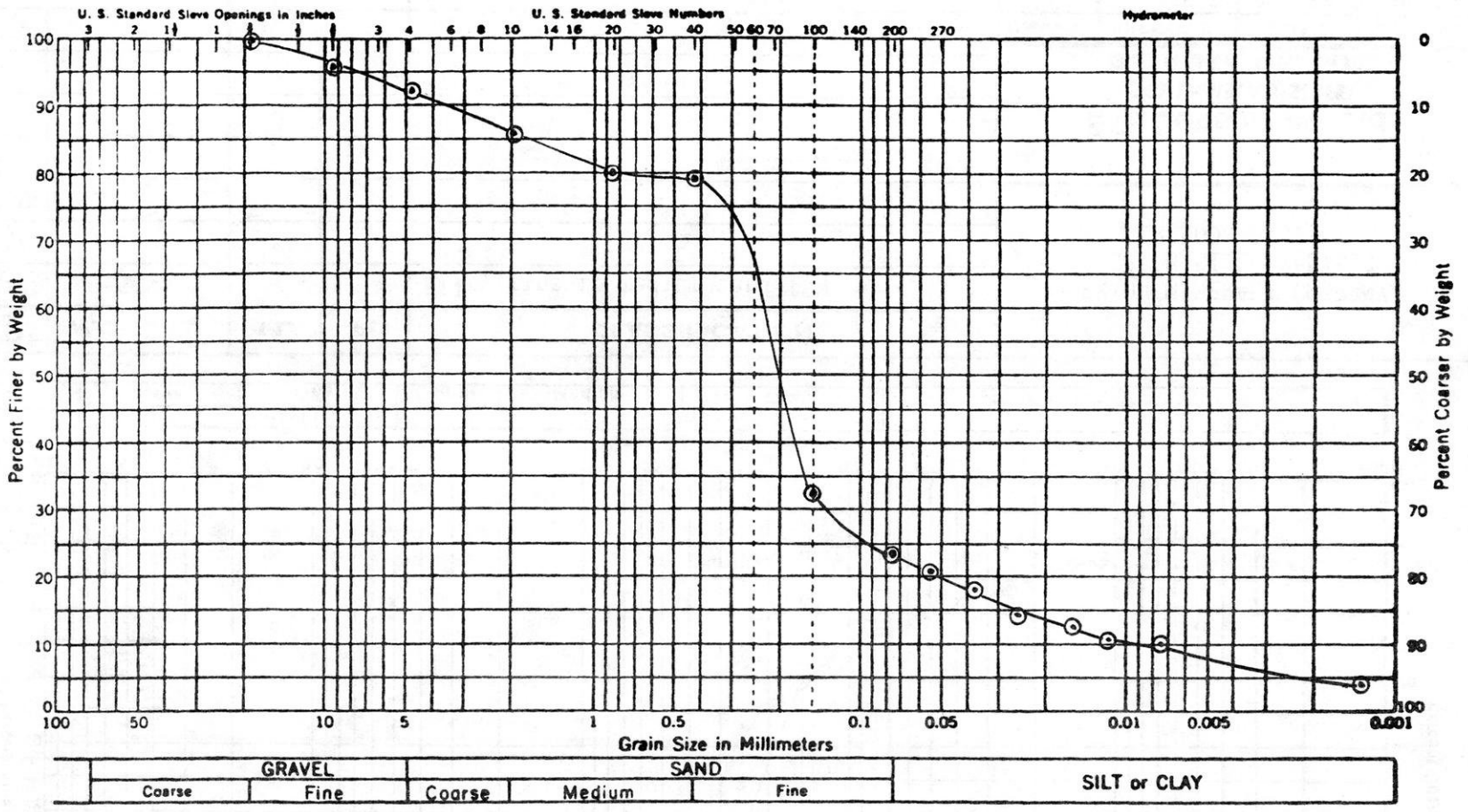
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	9.2				Silty fine to medium sand (SM)
S-5					
51.5-	53.5'				

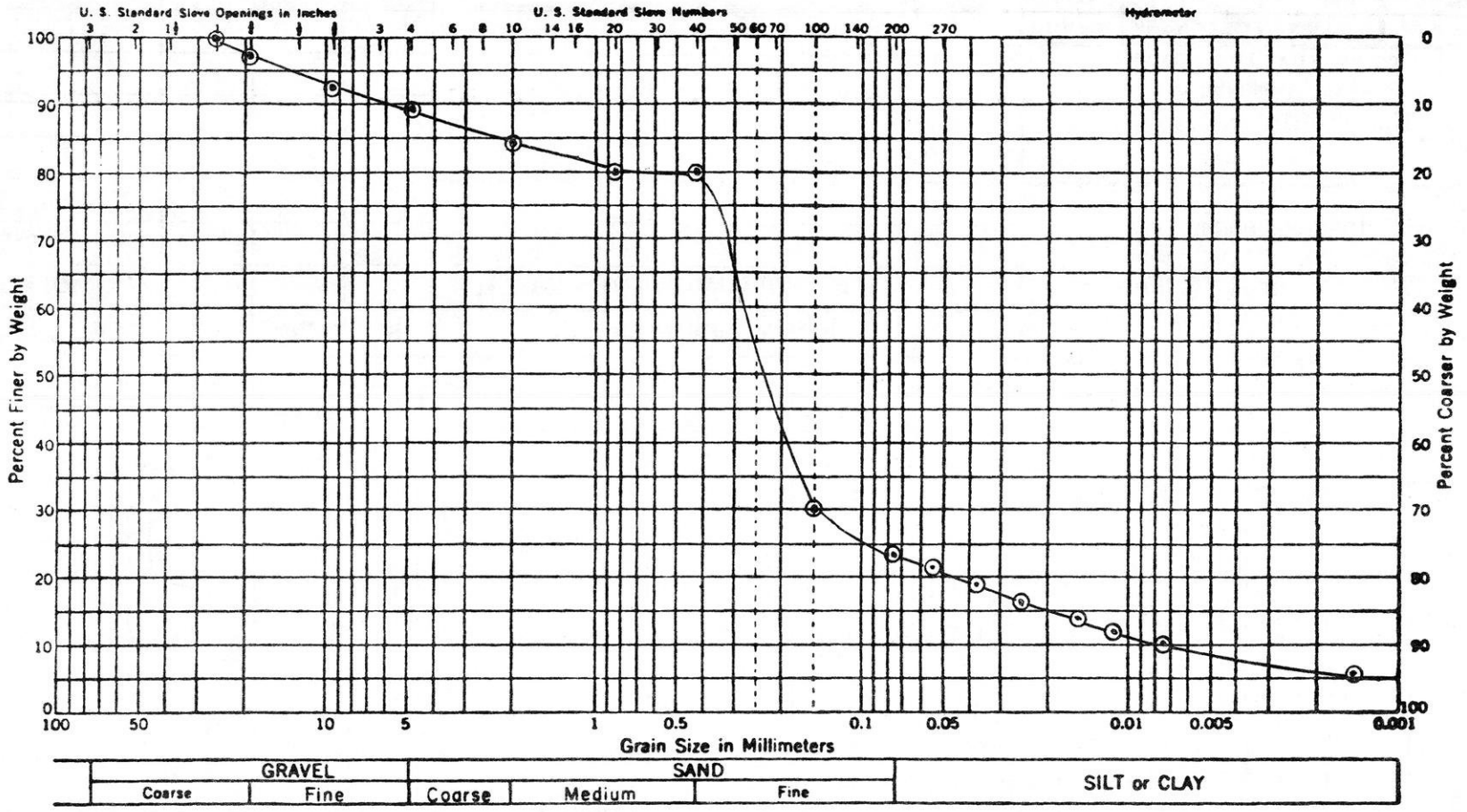
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	9.6				Silty fine to medium sand (SM)
S-6					
62.0-	64.0'				

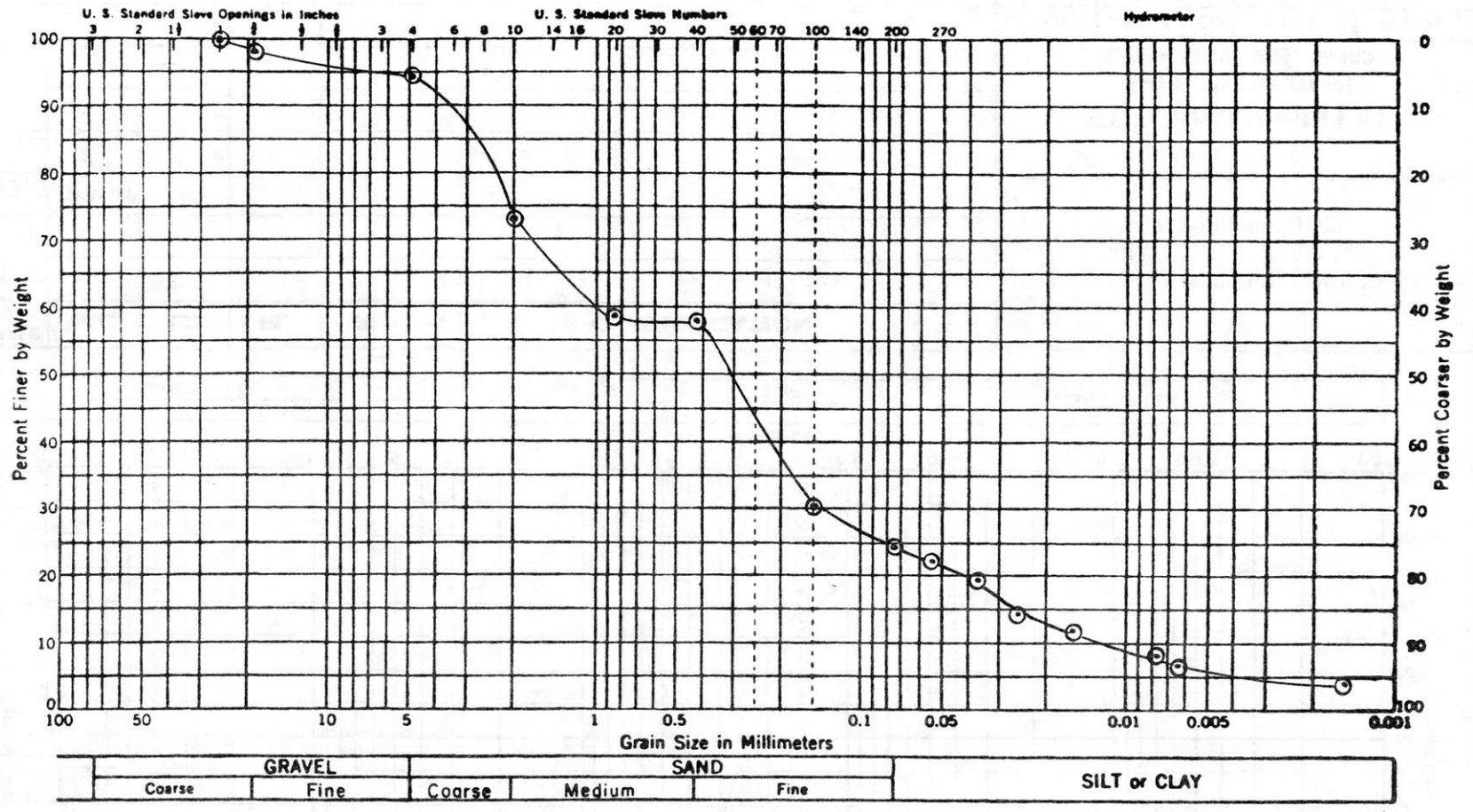
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	13.9				Silty fine to coarse sand (SM)
S-9					
92.5-	94.5'				

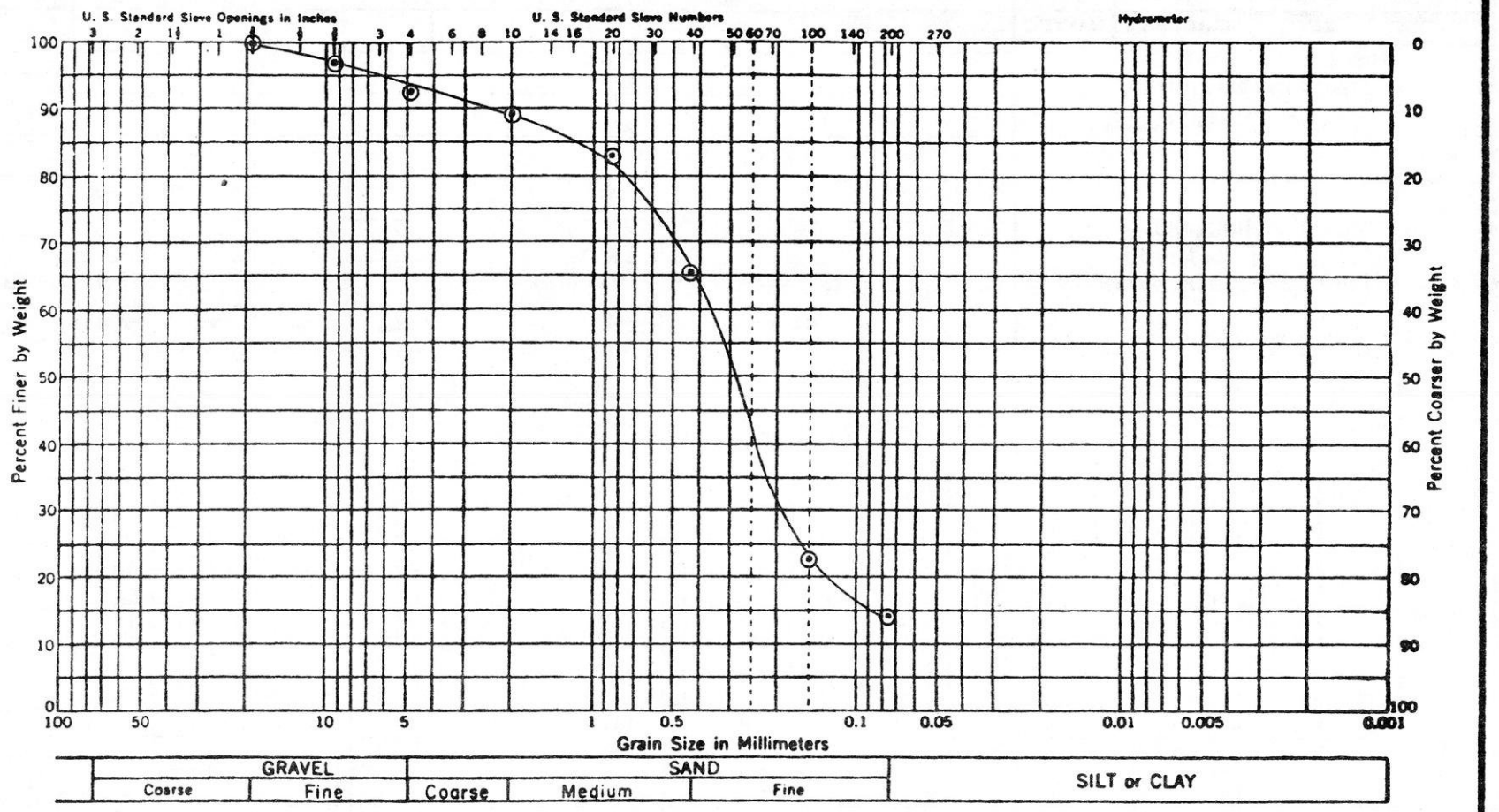
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	8.7				Silty fine to coarse sand (SM)
S-10					
103.0-105.0'					

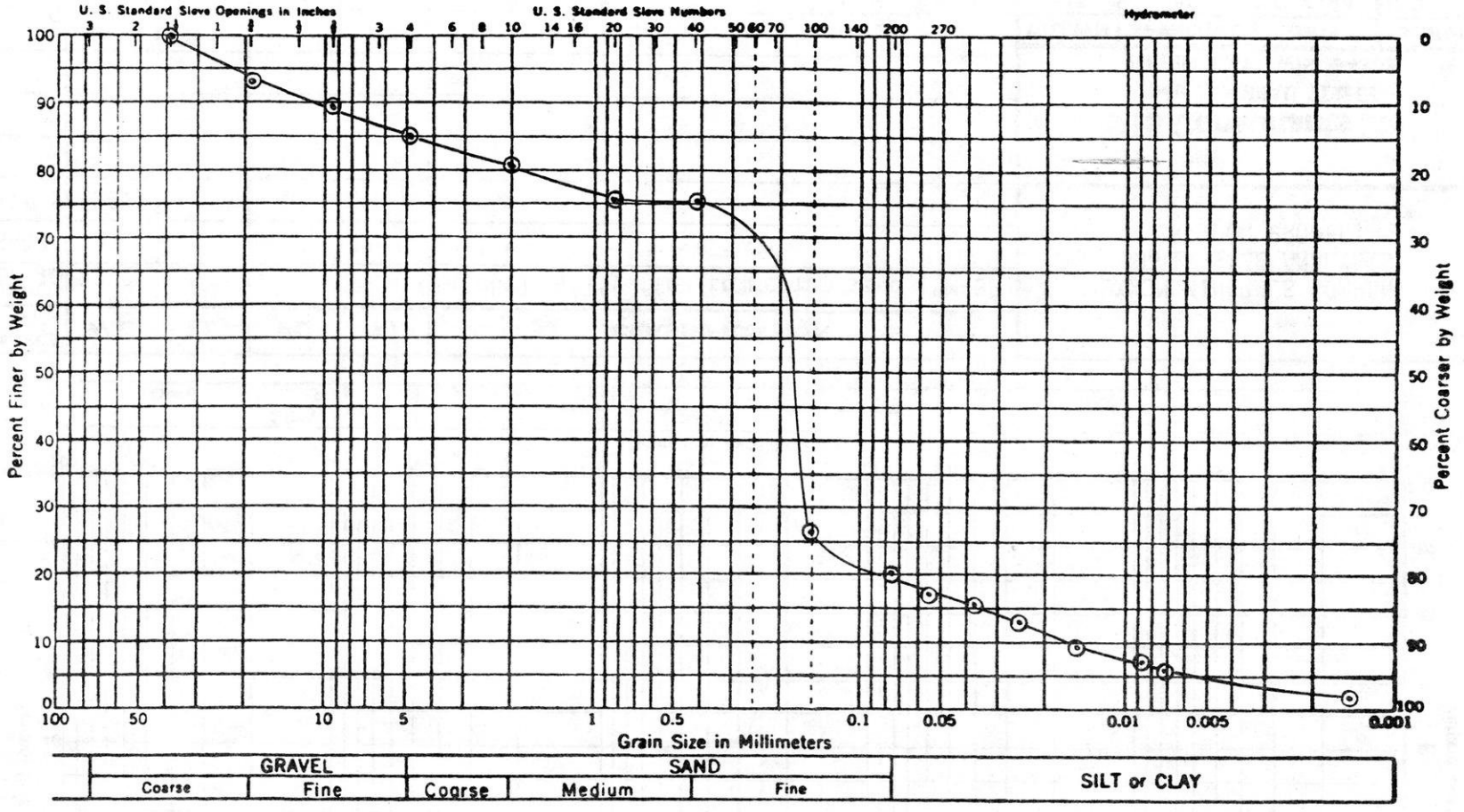
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	11.5				Silty fine to coarse sand (SM)
S-13					
133.5-135.5'					

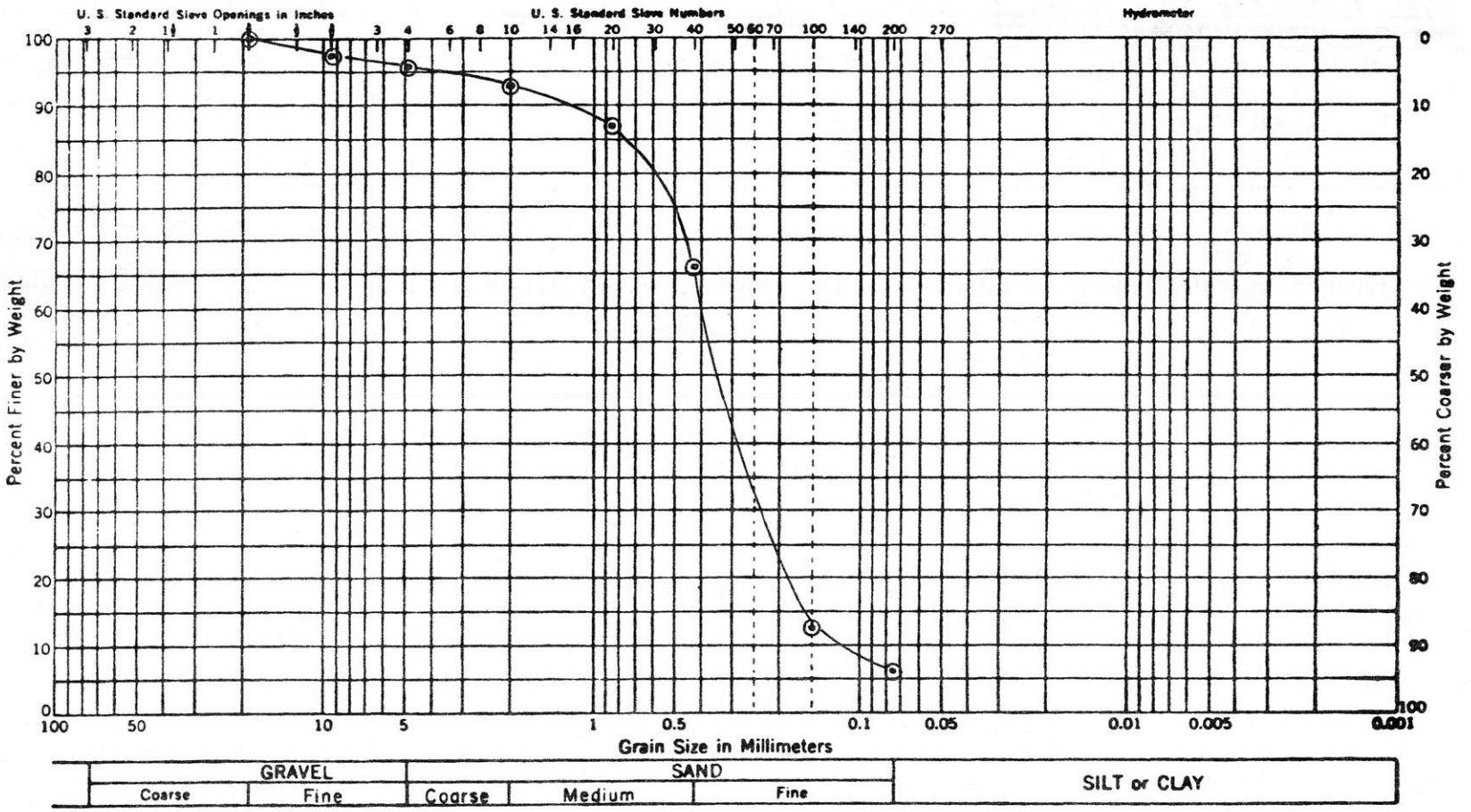
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	13.2				Slightly silty fine to medium sand (SM-SP)
S-17					
174.5-176.5'					

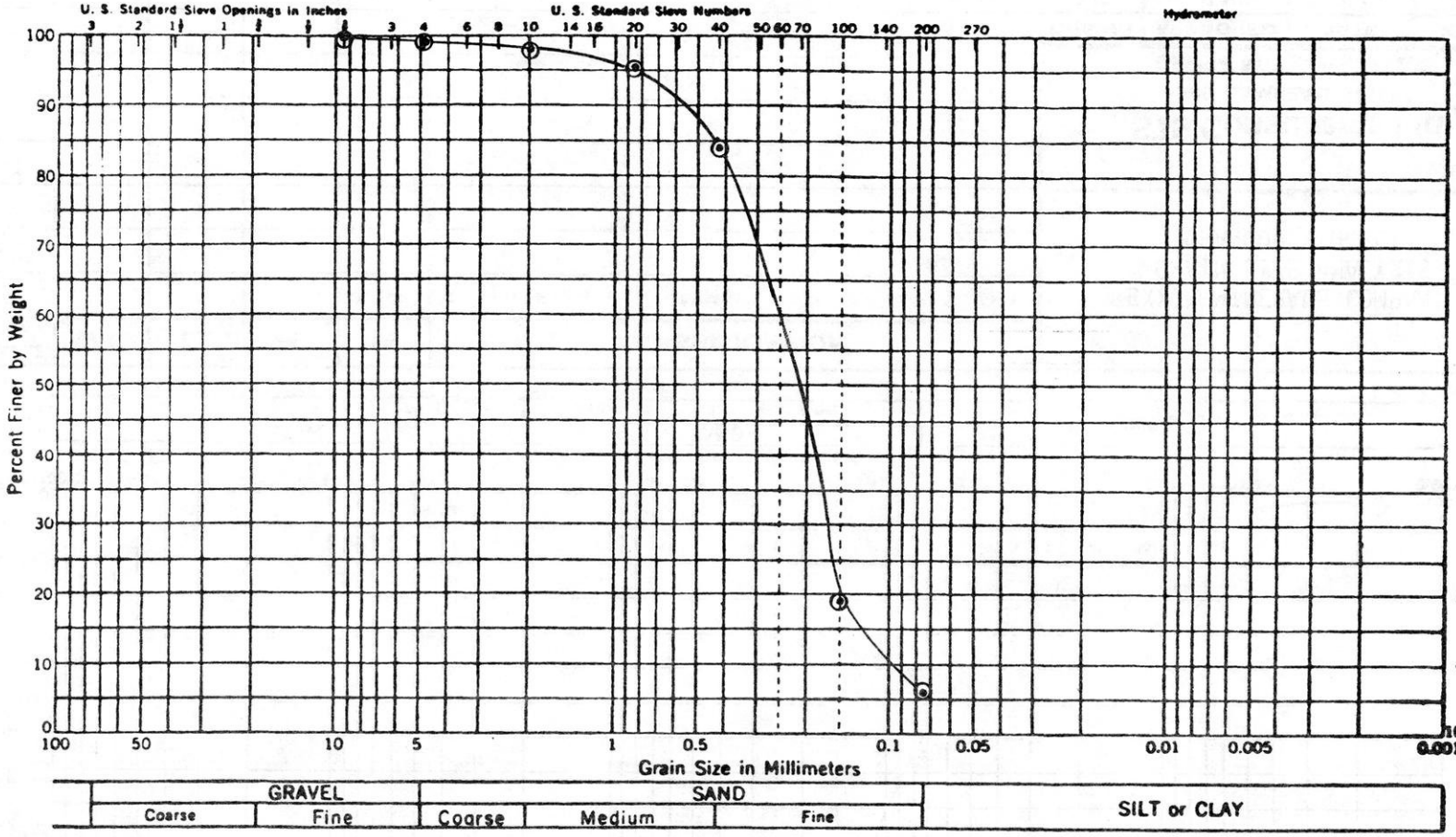
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	18.7				Slightly silty fine sand (SM-SP)
S-18					
185.0-186.5'					

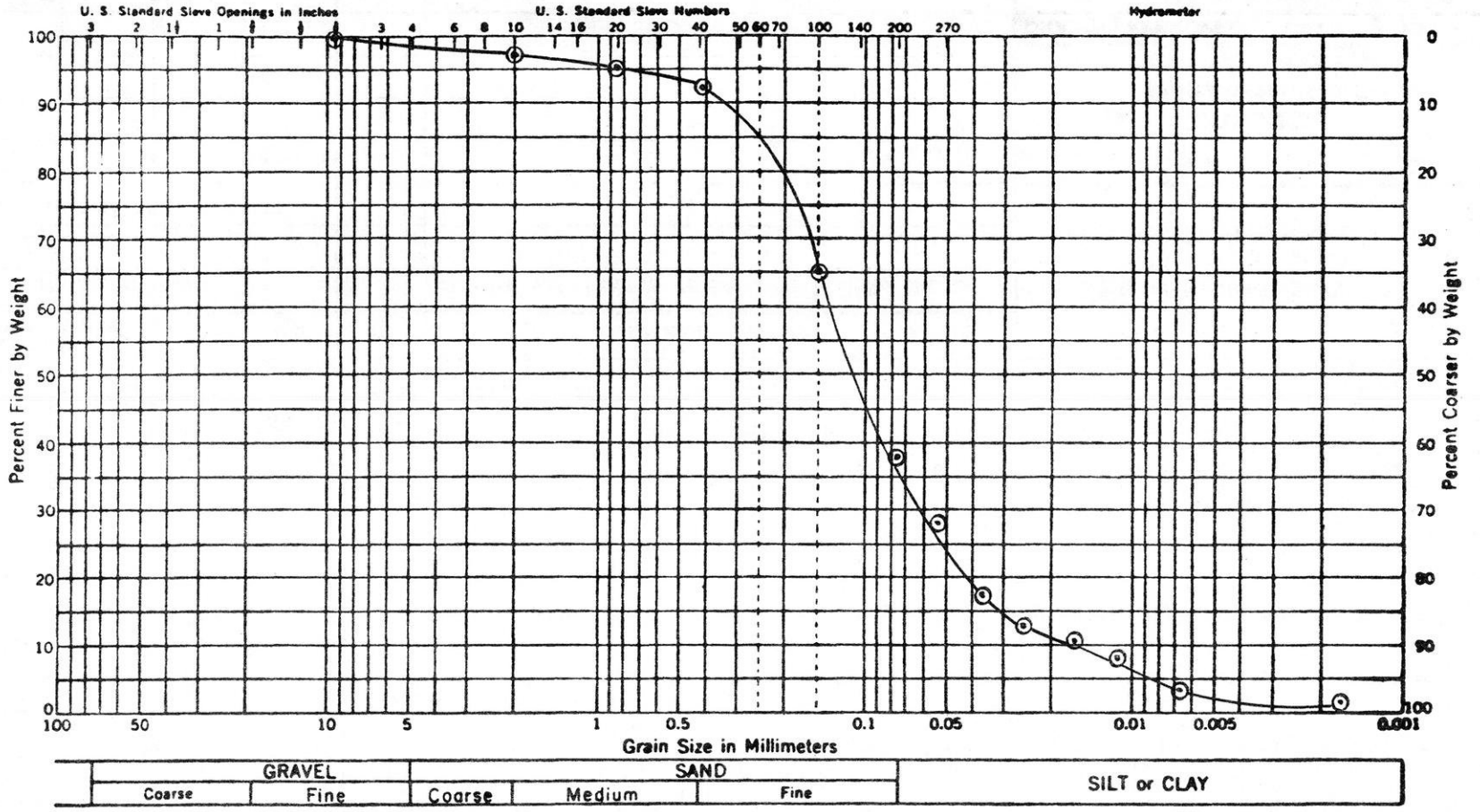
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	17.3				Silty fine sand (SM)
S-21					
215.5-217.0					

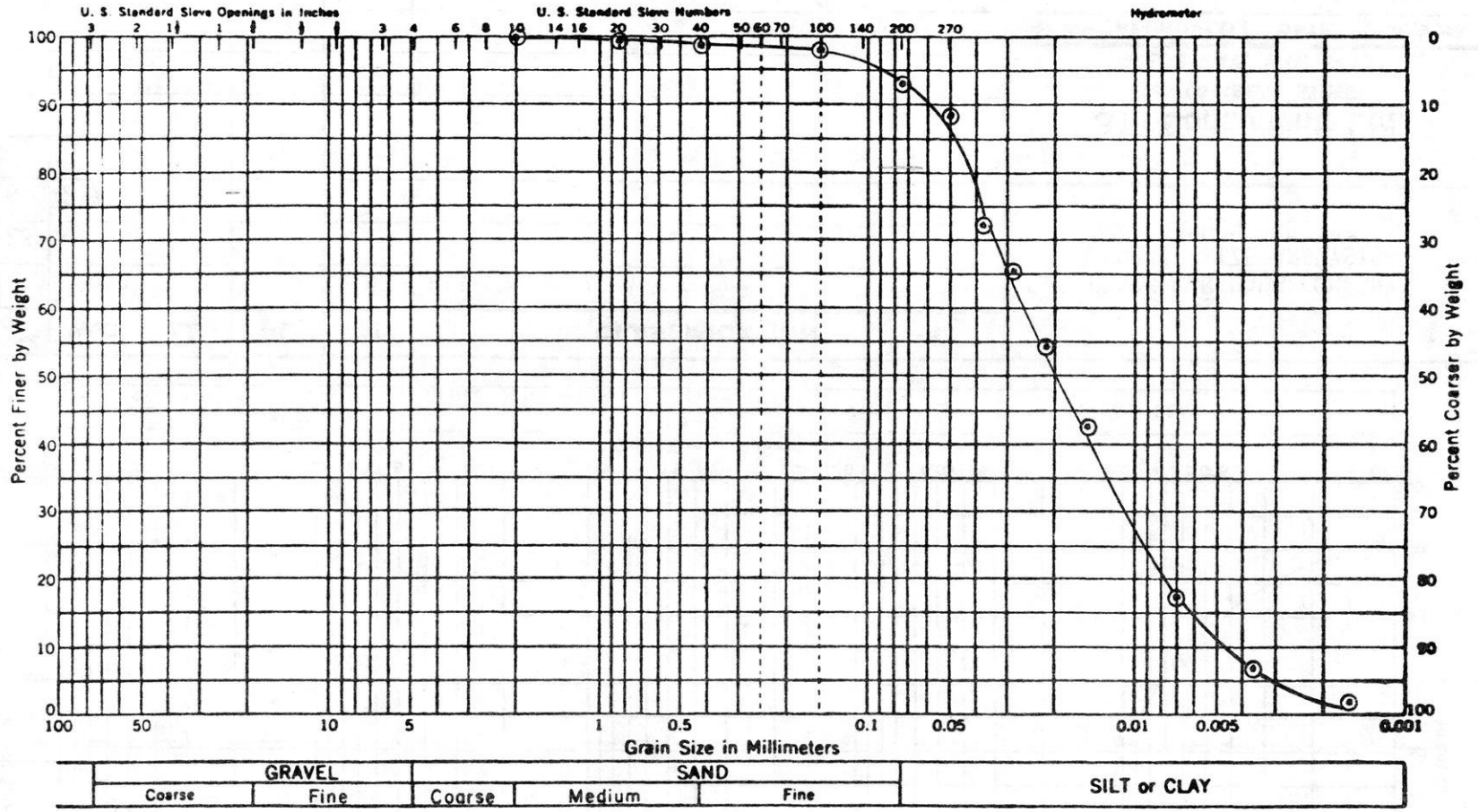
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	19.7				Silt (ML)
S-22					
228.0-229.0'					

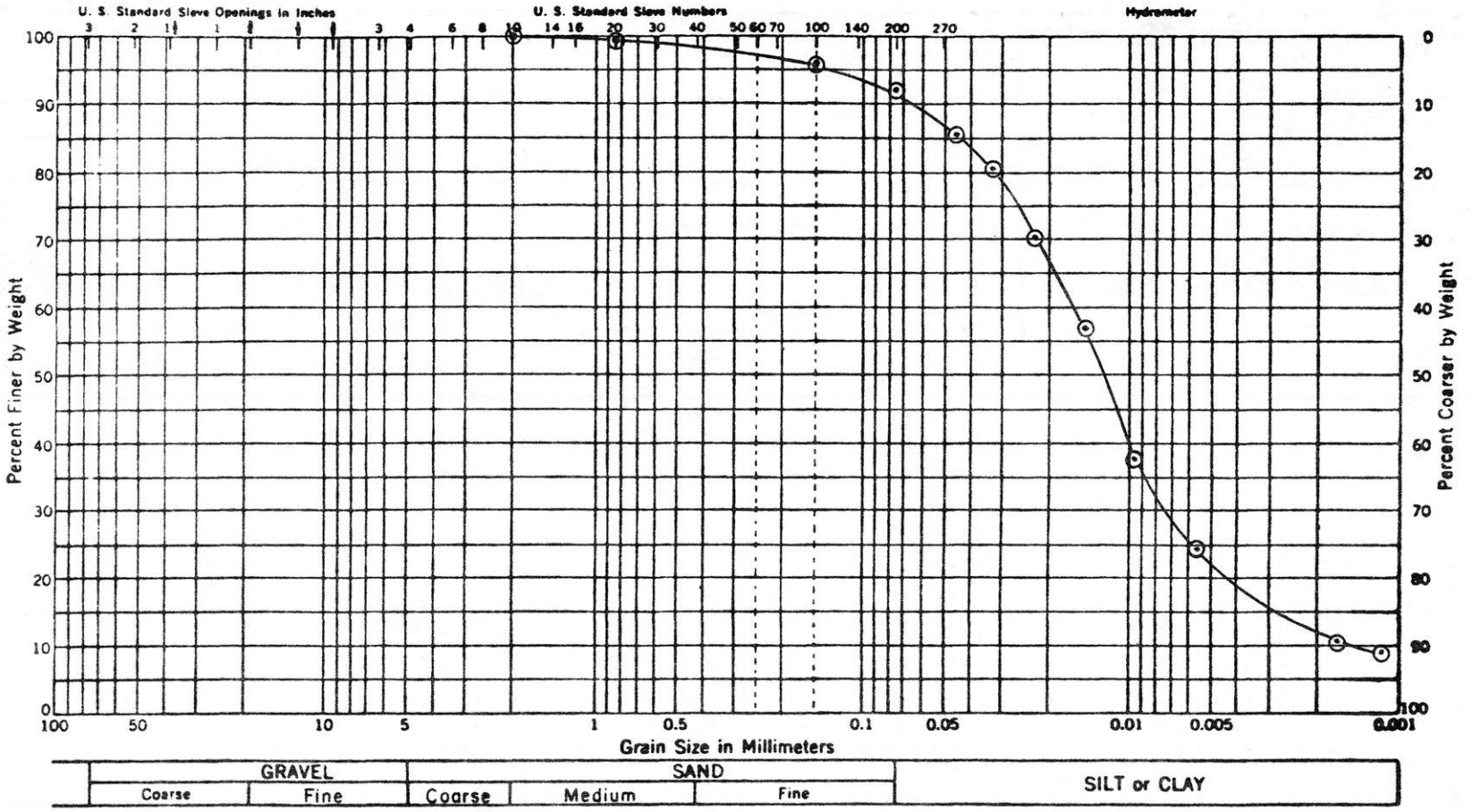
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	20.8				Silty clay (CL)
S-23					
236.0-237.0					

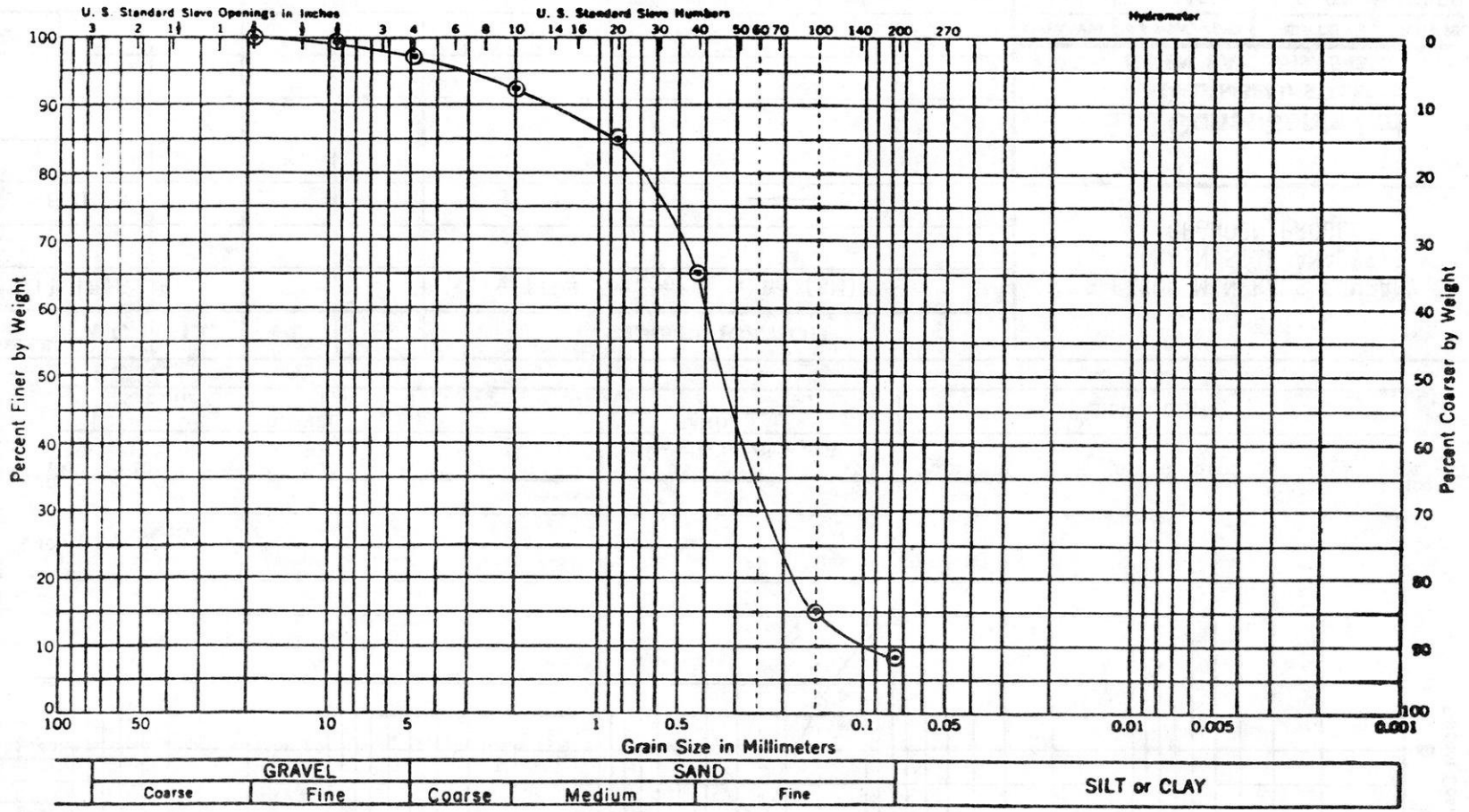
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-10	14.5				Slightly silty fine to medium sand (SM-SP)
S-24					
246.5-250.5'					

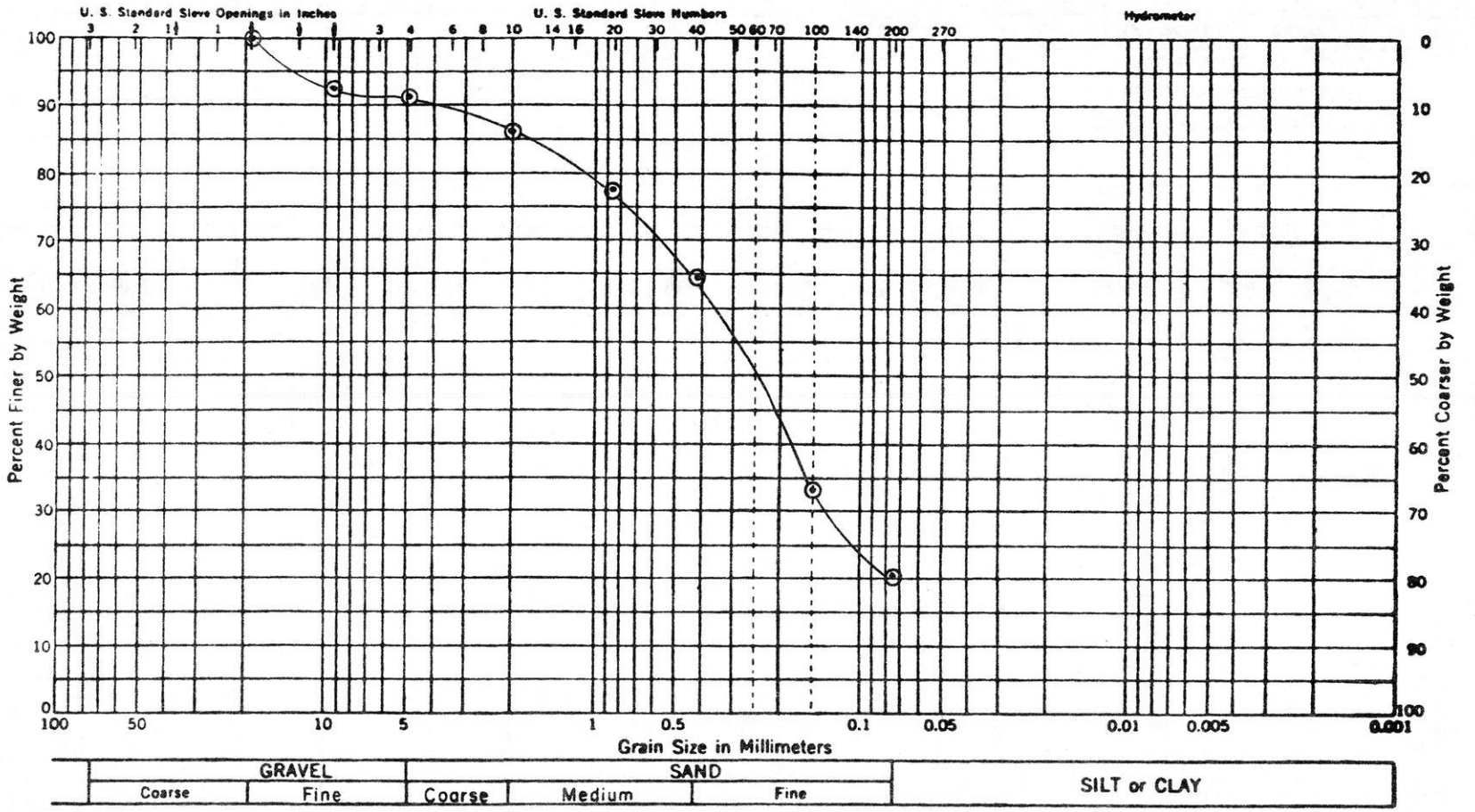
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	14.8				Silty fine to coarse sand (SM)
S-1					
4.0-6.0'					

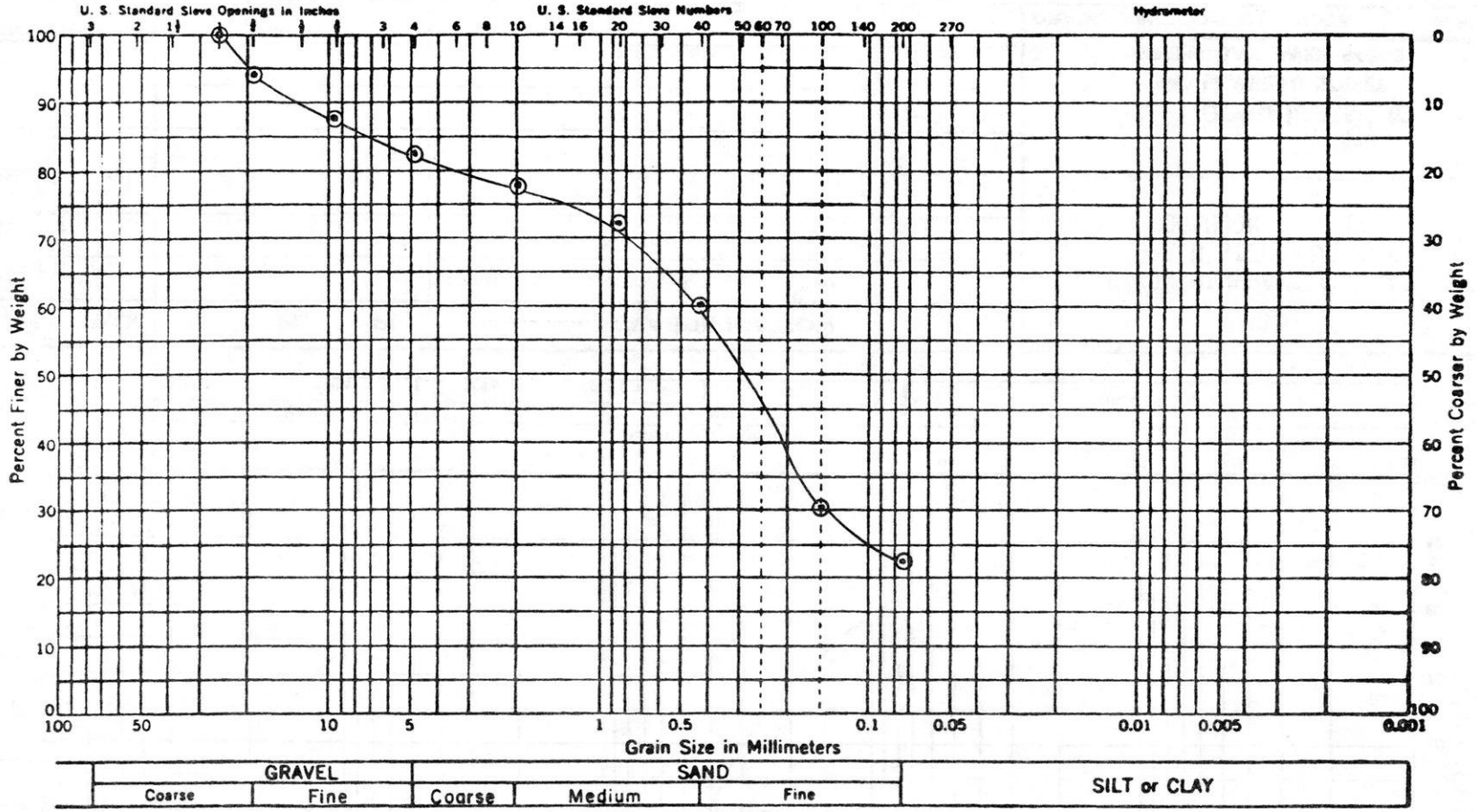
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	5.2				Silty fine to coarse sand (SM)
S-2					
10.0-	12.0'				

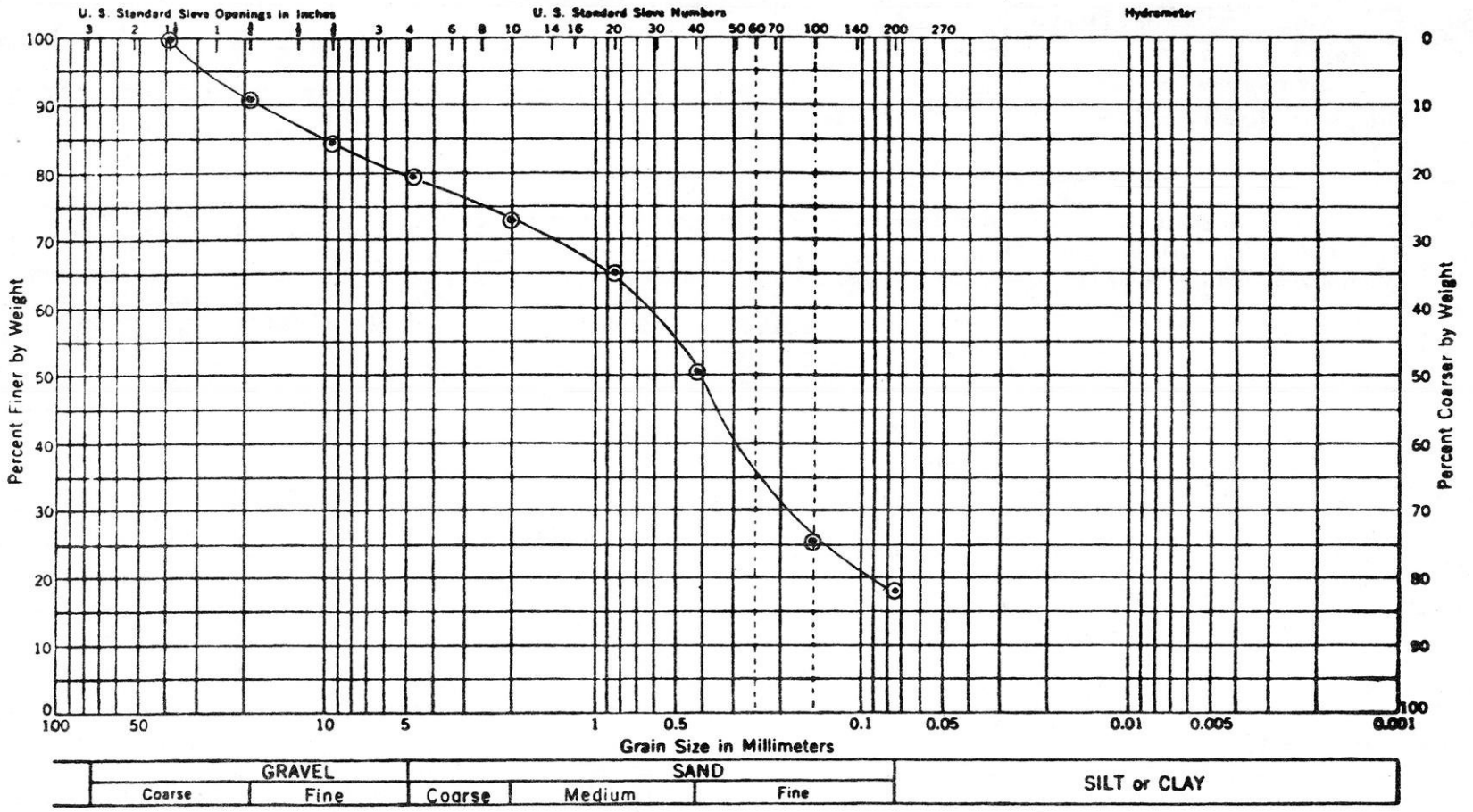
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	8.7				Silty fine to coarse sand (SM)
S-3					
20.6-	22.6'				

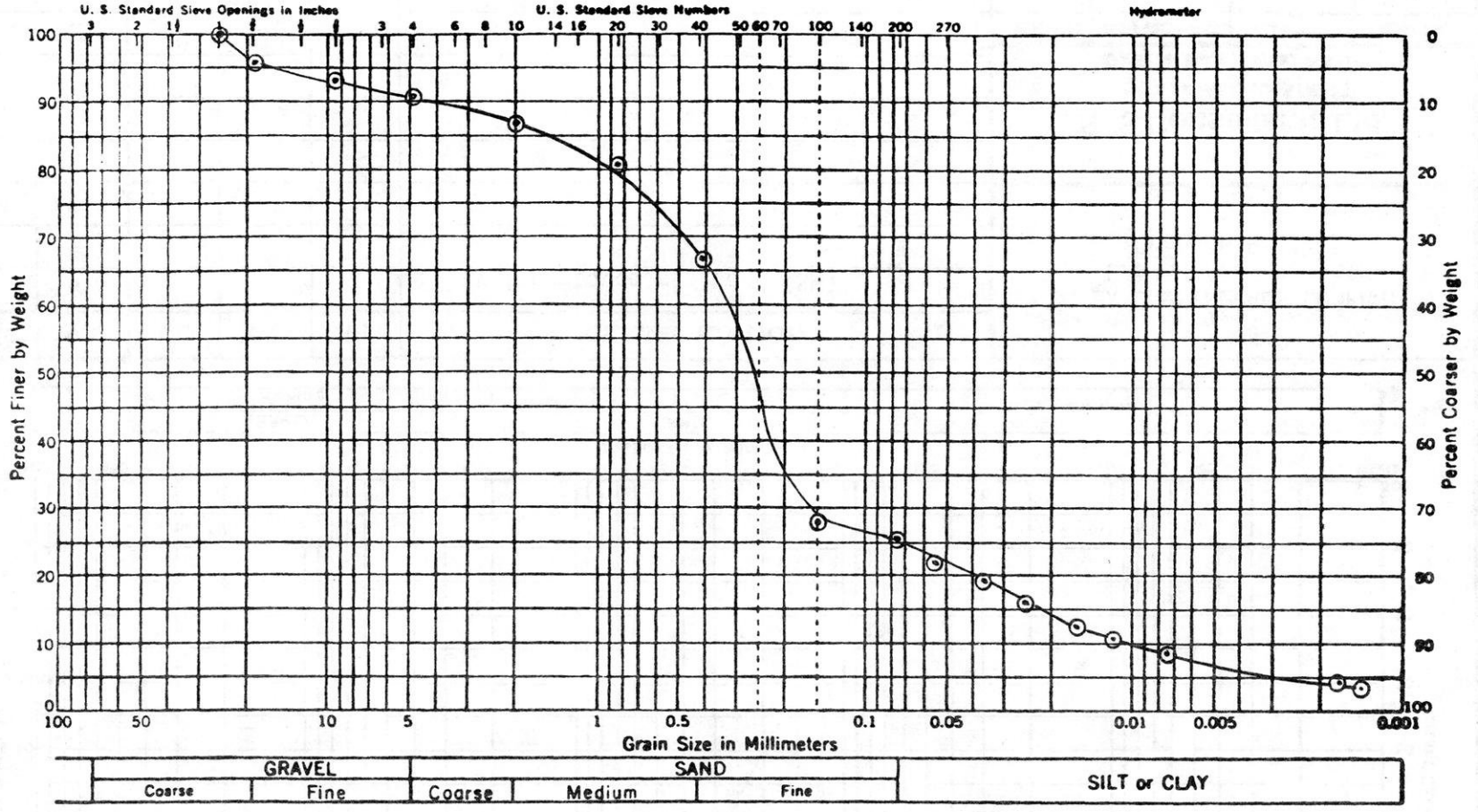
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
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BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	8.6				Silty fine to coarse sand (SM)
S-4					
30.5-32.5'					

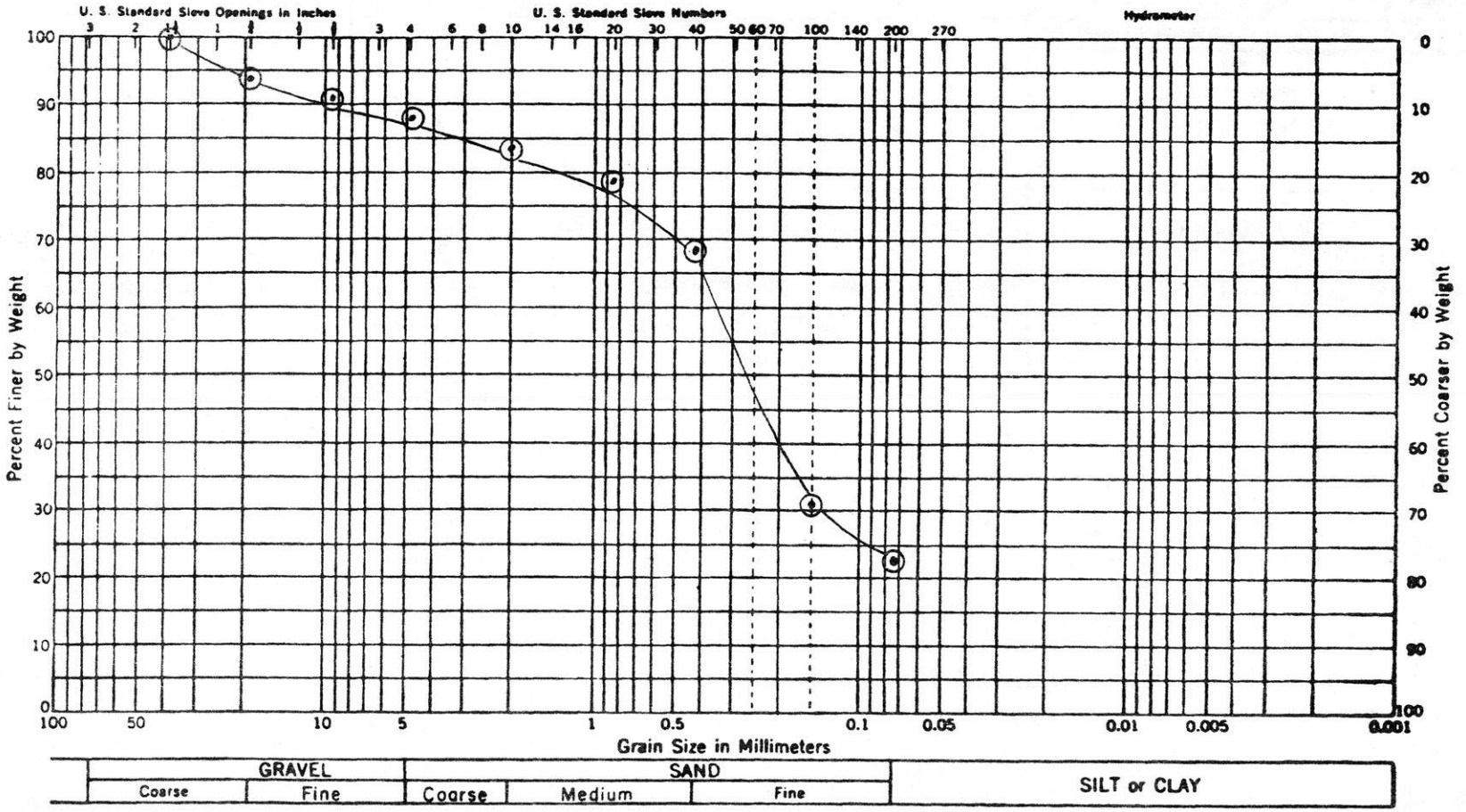
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 11	9.0				Silty fine to coarse sand (SM)
S-5					
41.0 -	45.0'				

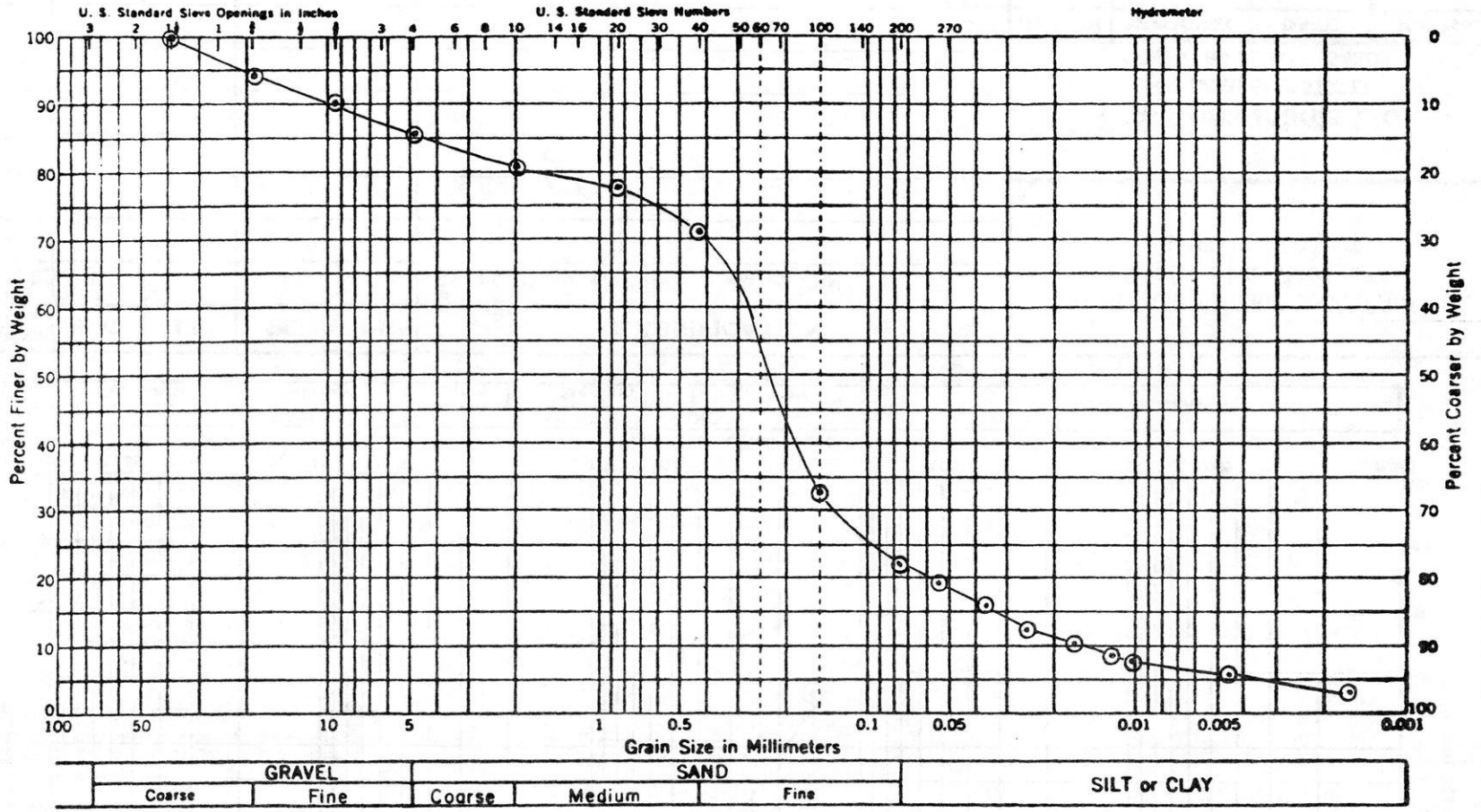
EXXON MINERALS COMPANY
Grain Size Analysis
Crandon Project

STS Consultants Ltd.
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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	9.0				Silty fine to coarse sand (SM)
S-6					
45.0-	49.0'				

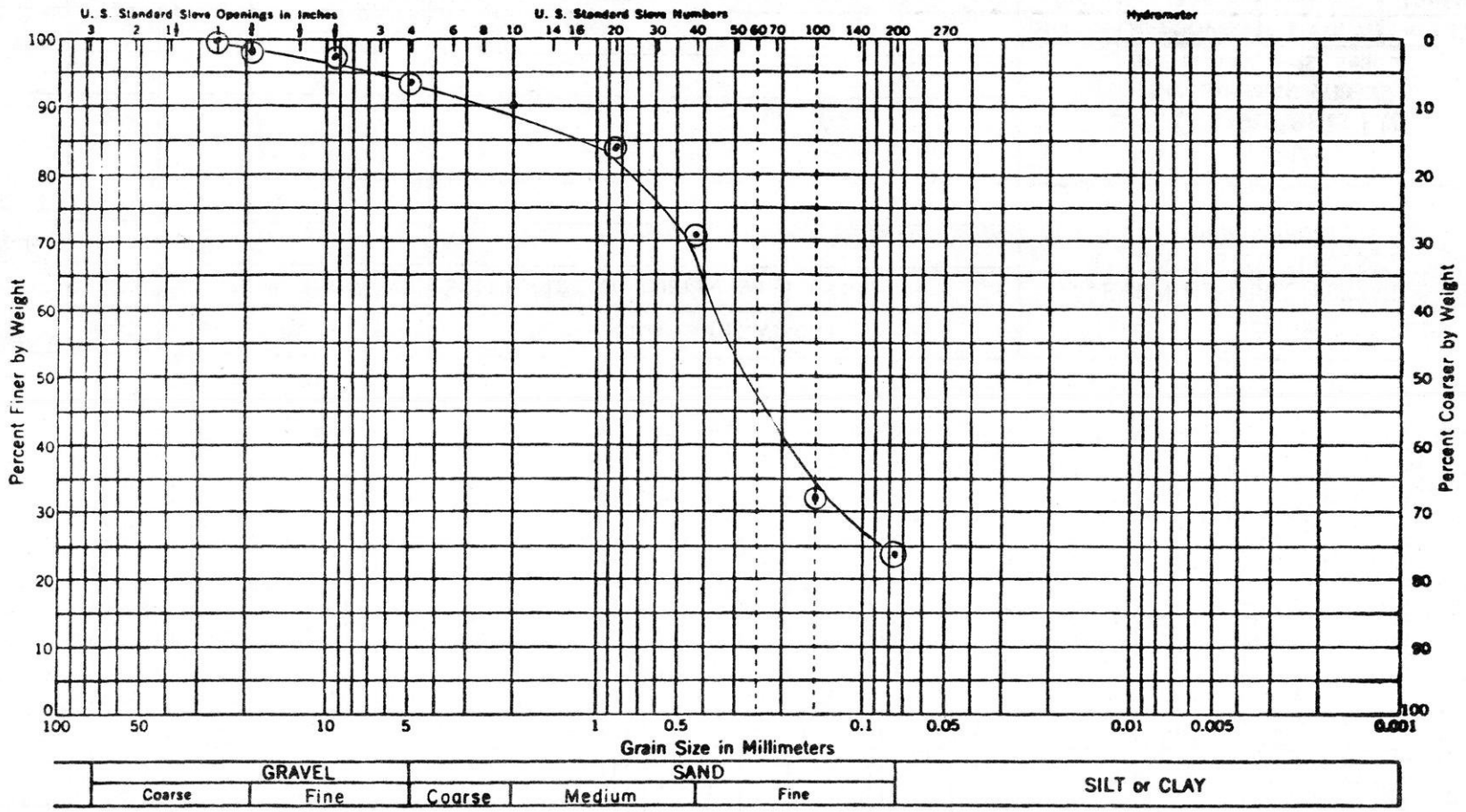
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 11	8.3				Silty fine to coarse sand (SM)
S-7					
50.0 -	54.0'				

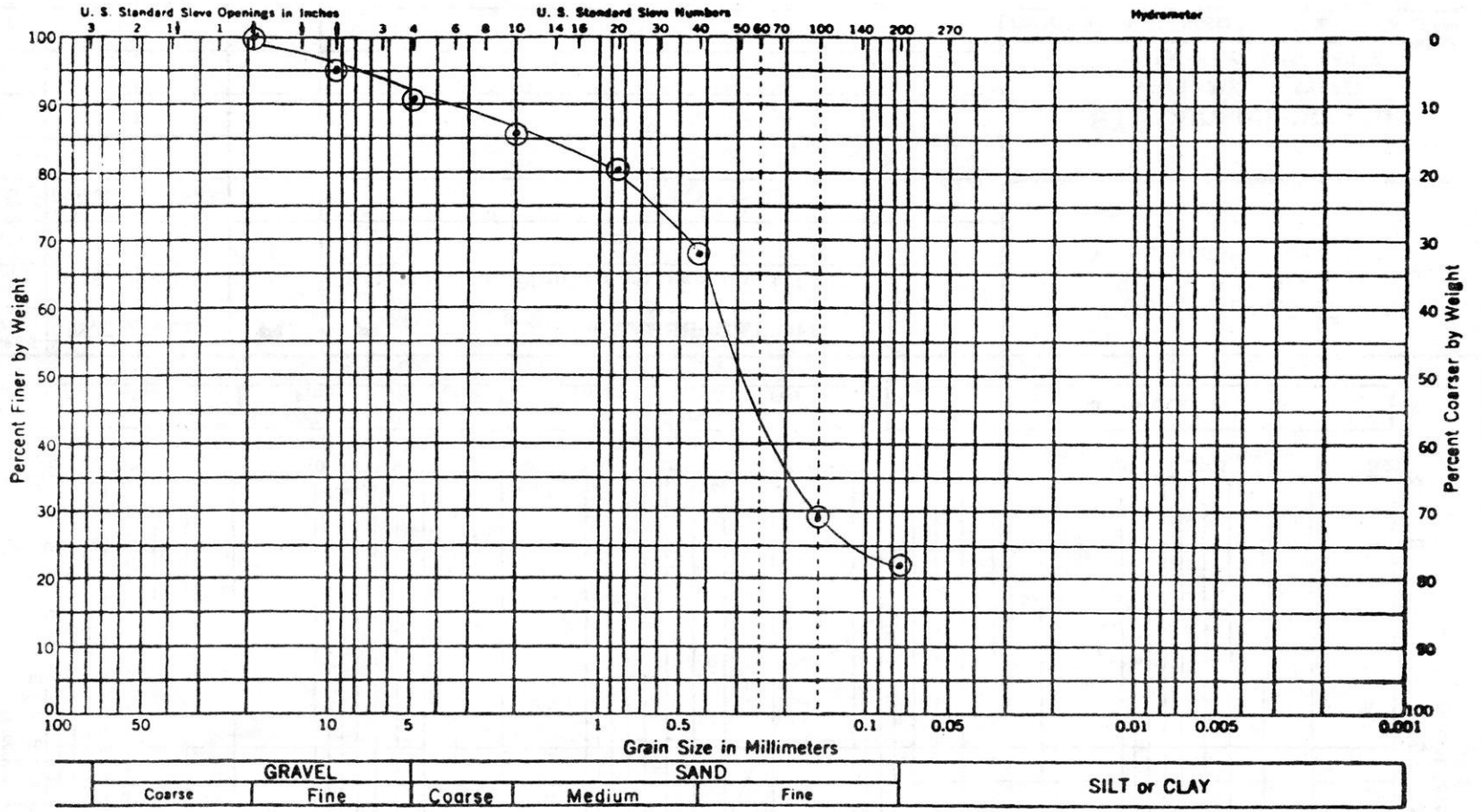
EXXON MINERALS COMPANY
Grain Size Analysis
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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 11	7.9				Silty fine to coarse sand (SM)
S-8					
55.0 -	57.0'				

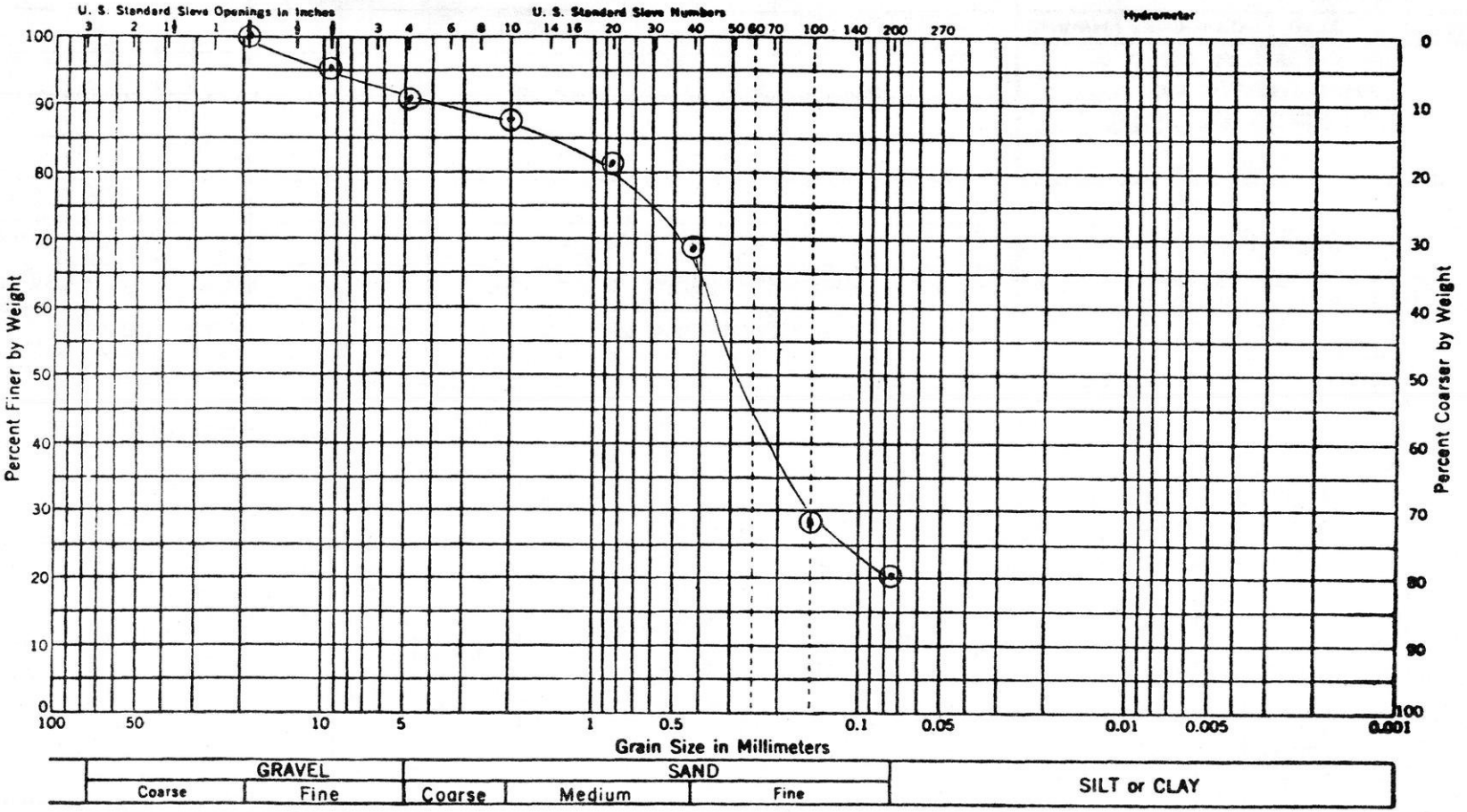
EXXON MINERALS COMPANY
Grain Size Analysis
Crandon Project

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 11	9.5				Silty fine to coarse sand (SM)
S-9					
60.0 -	64.0'				

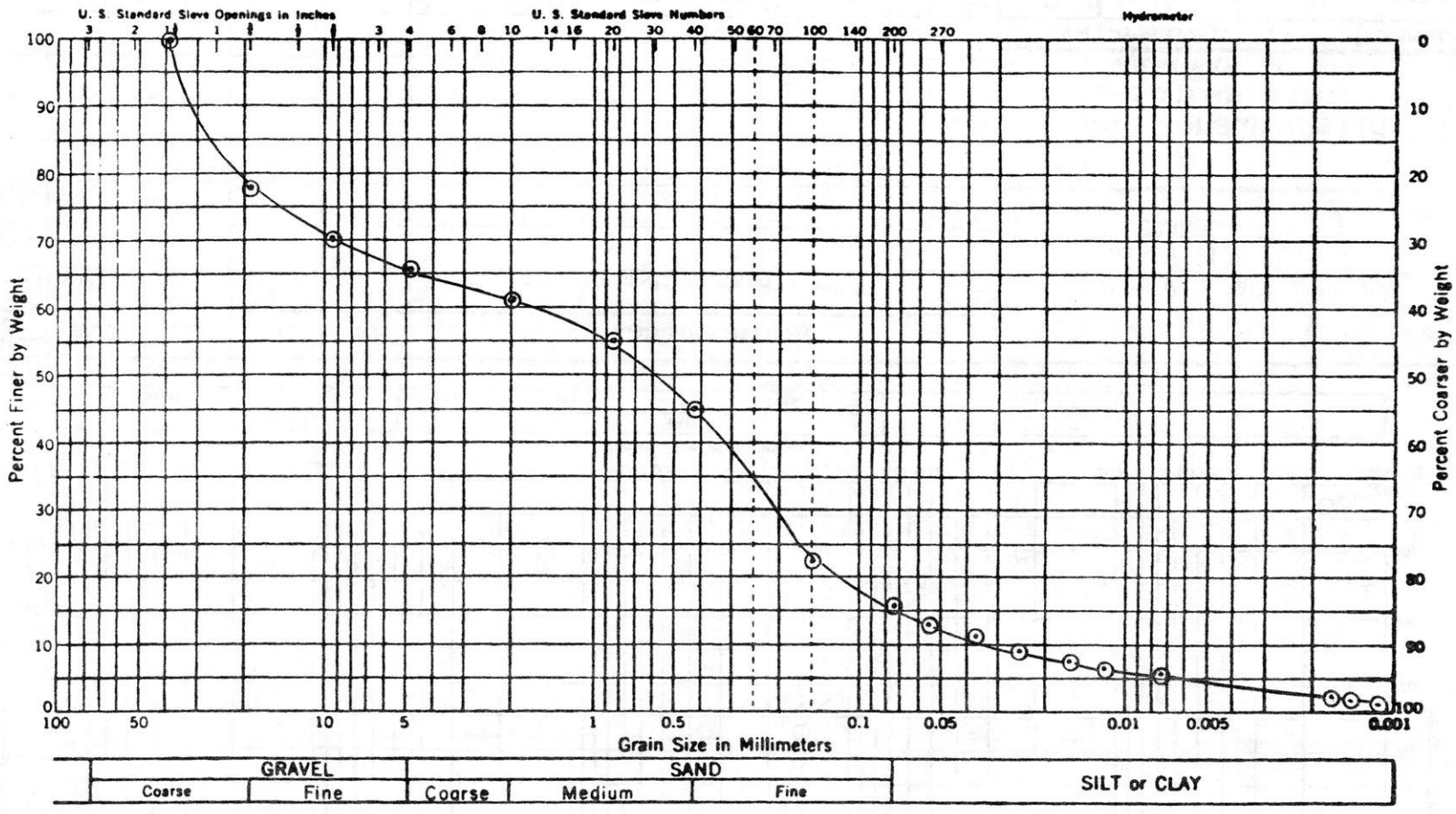
EXXON MINERALS COMPANY
Grain Size Analysis
Crandon Project

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	8.2				Silty fine to coarse sand (SM)
S-10					
65.0-69.0'					

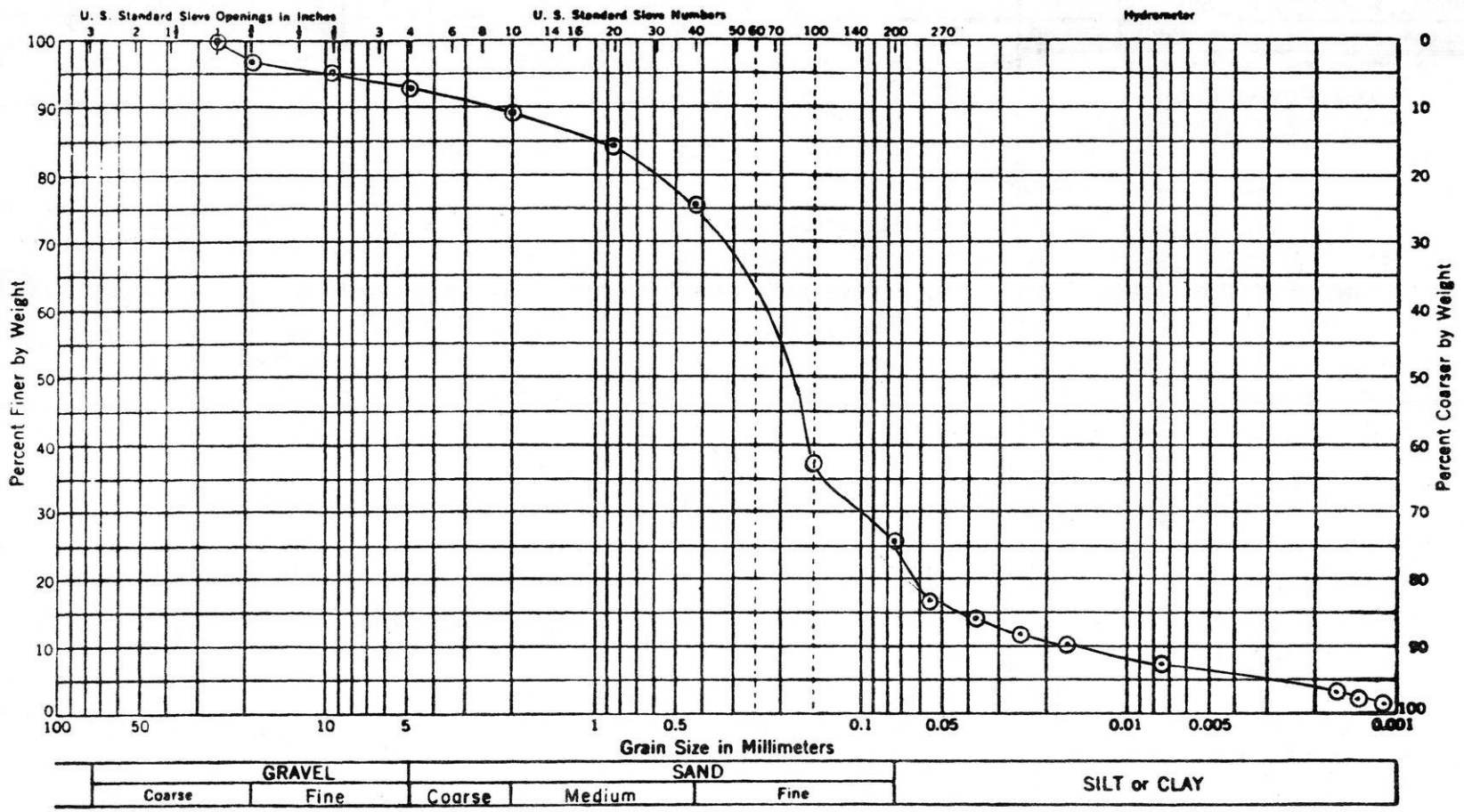
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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	9.1				Silty fine to medium sand (SM)
S-12					
82.5-	84.5'				

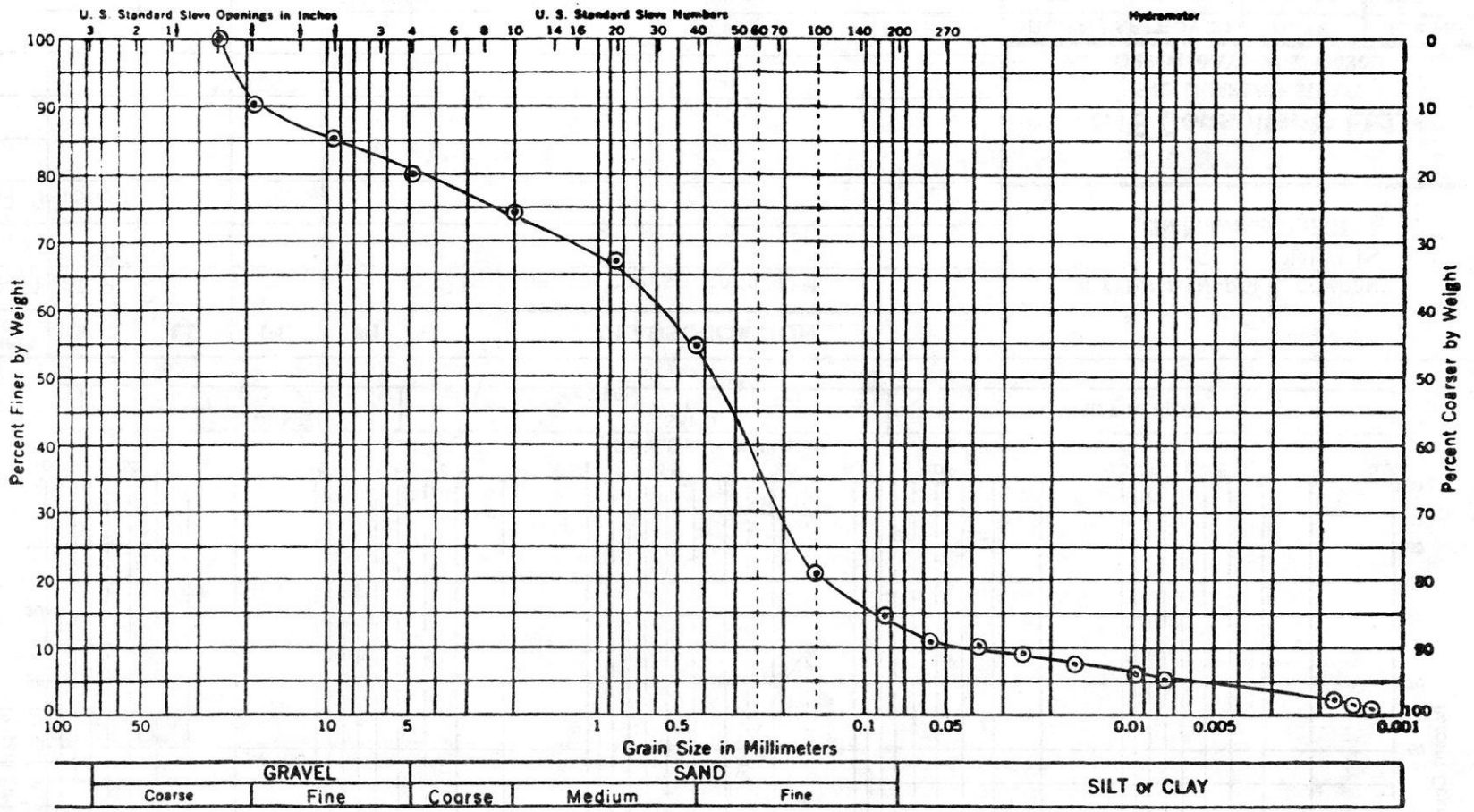
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	9.7				Silty fine to coarse sand (SM)
S-16					
123.5-125.5'					

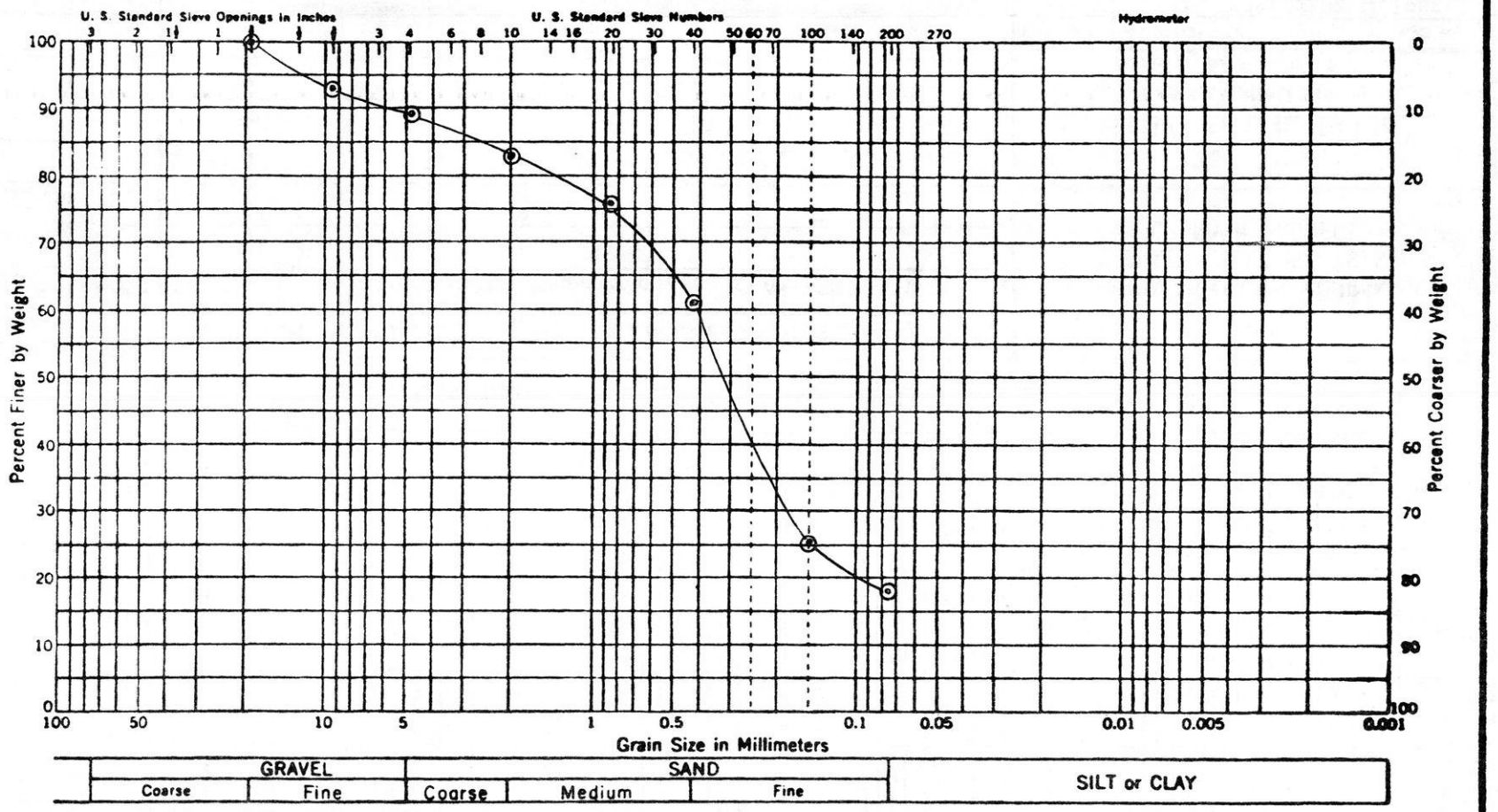
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	7.8				Silty fine to coarse sand (SM)
S-19					
154.0-156.0'					

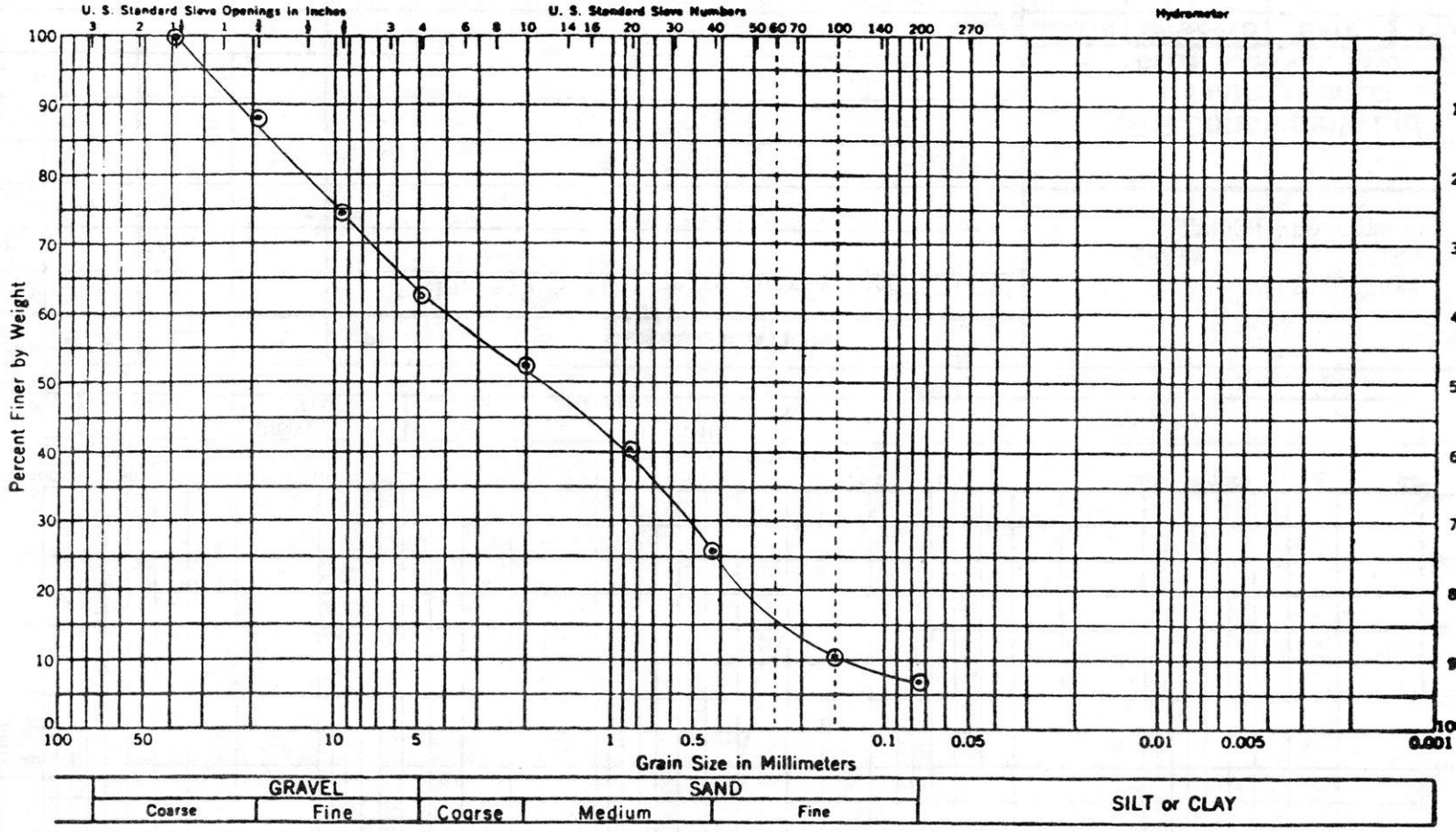
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	6.2				Slightly silty fine to coarse sand (SM-SP)
S-20					
164.5-166.5'					

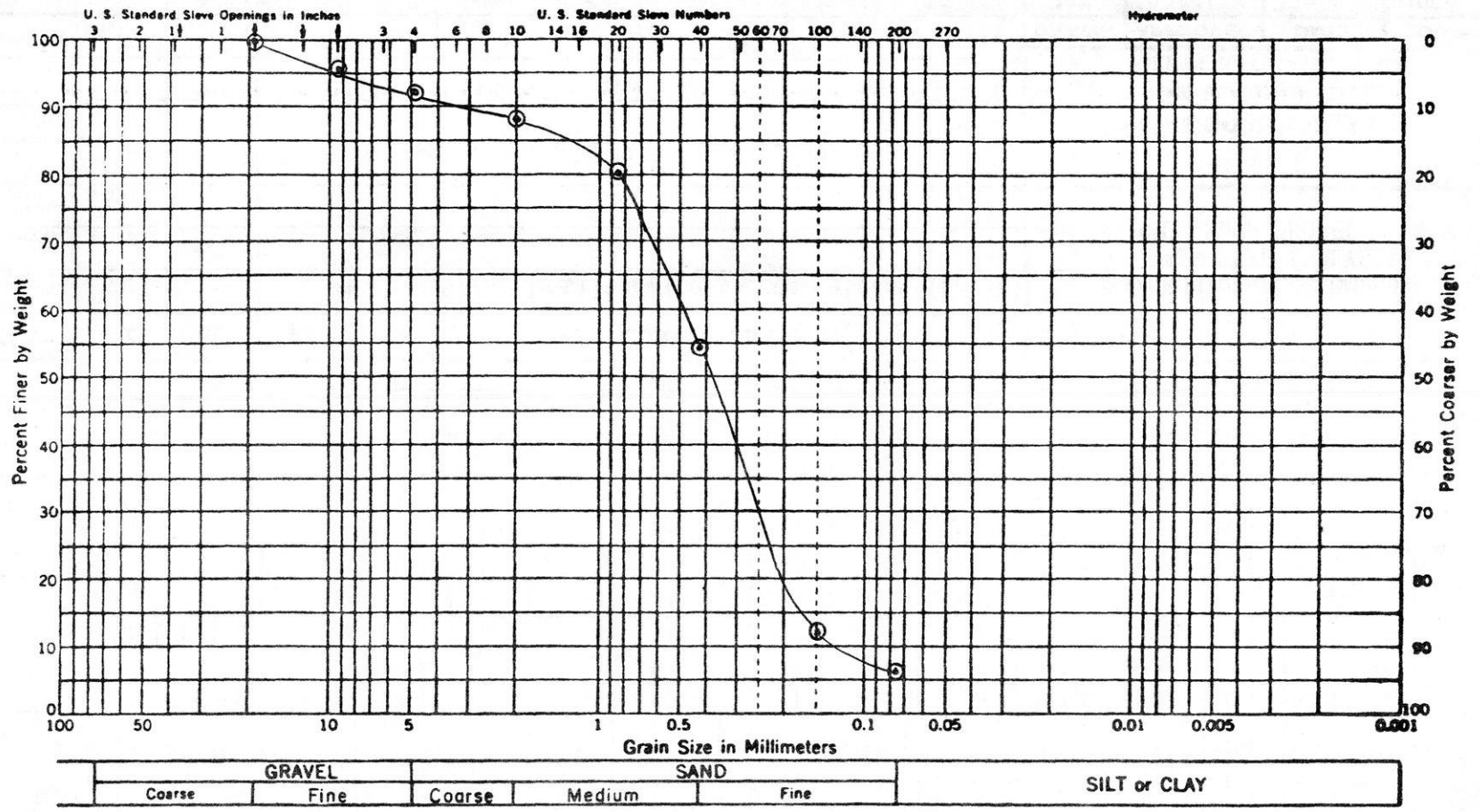
EXXON MINERALS COMPANY
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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	11.6				Slightly silty fine to coarse sand (SM-SP)
S-22					
185.0-187.0'					

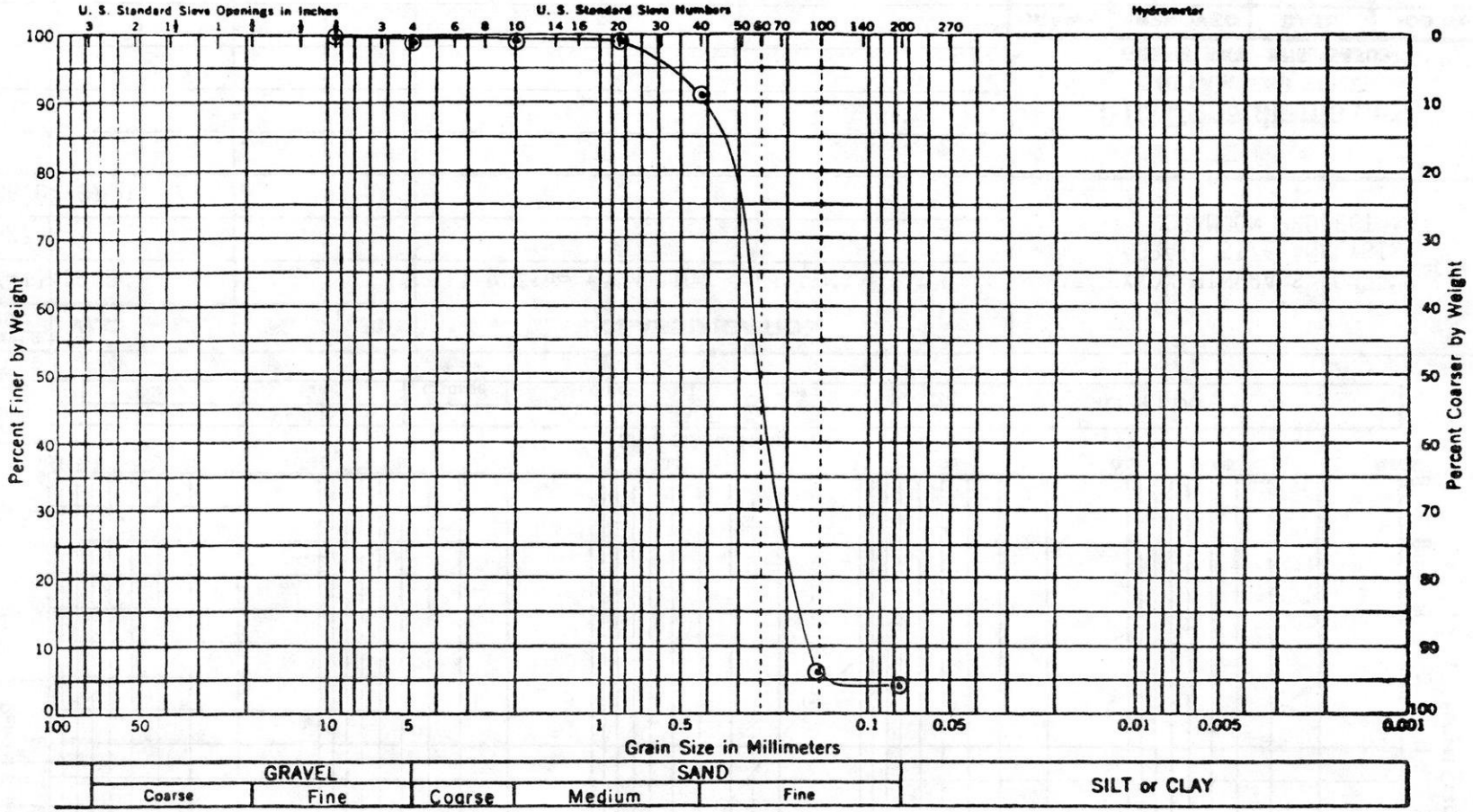
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	20.5				Fine sand (SP)
S-24					
205.5-207.5'					

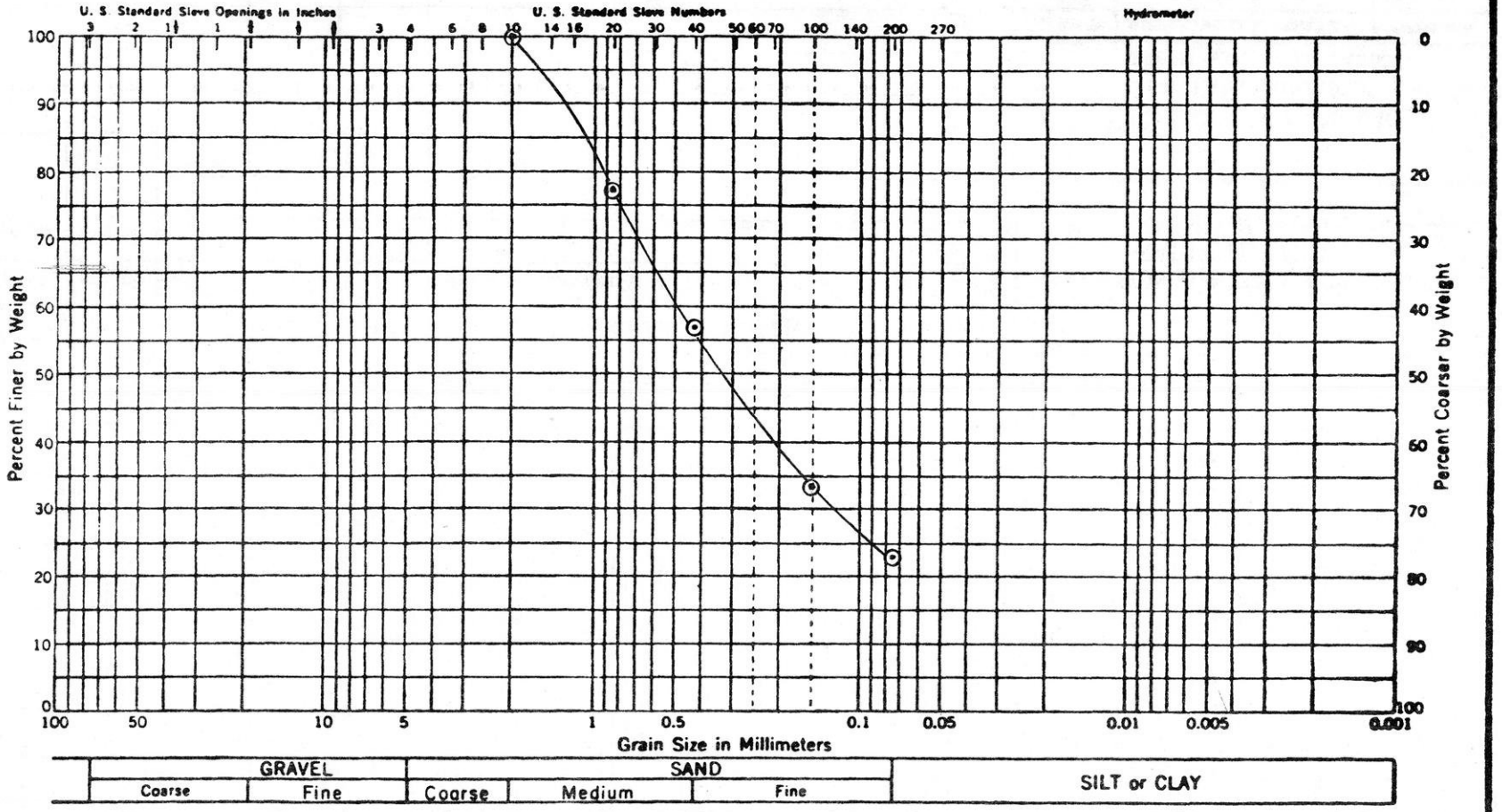
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	22.2				Silty fine to medium sand (SM)
S-27					
236.0-237.0'					

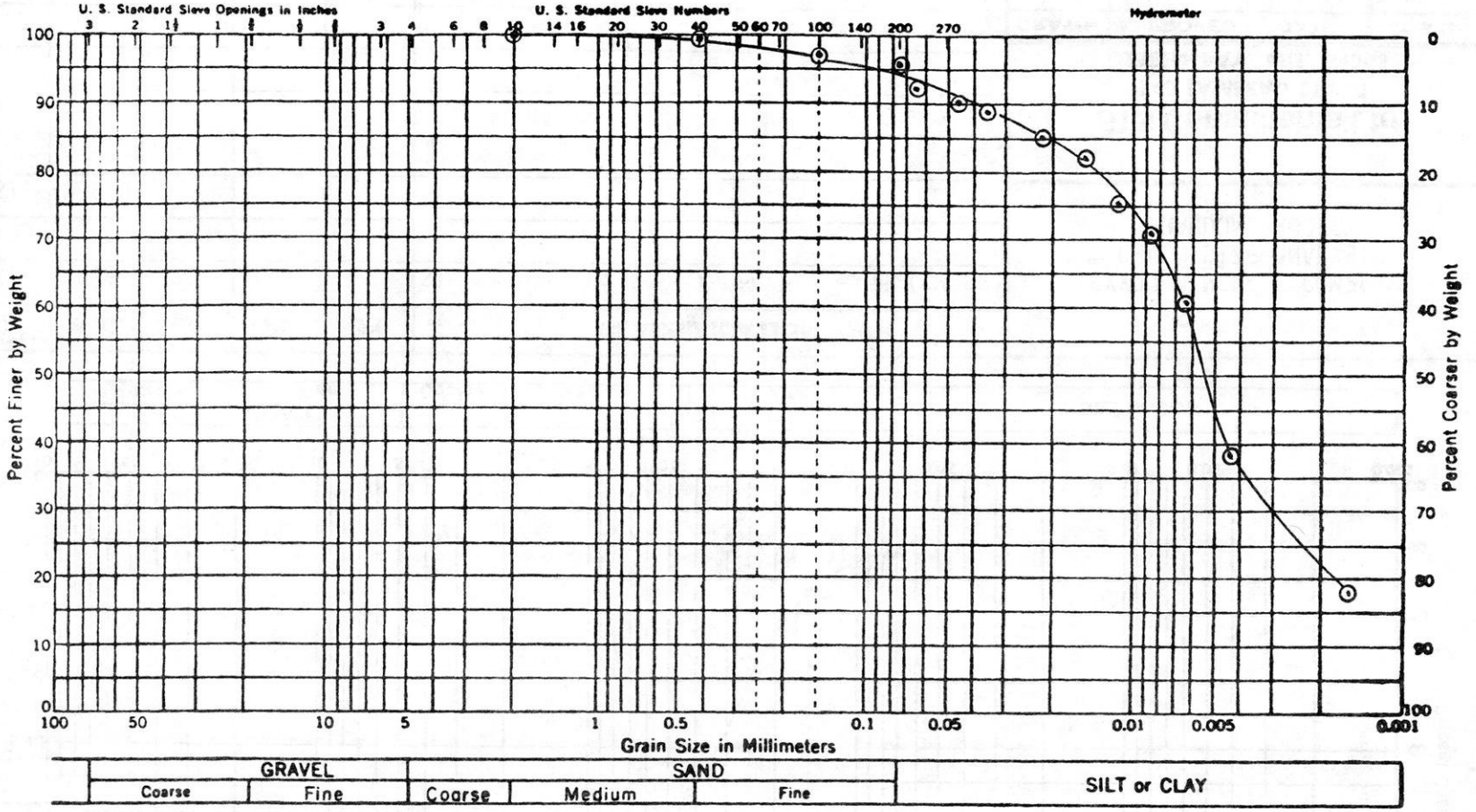
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	23.6				Silty clay (CL)
S-29					
256.5-258.5'					

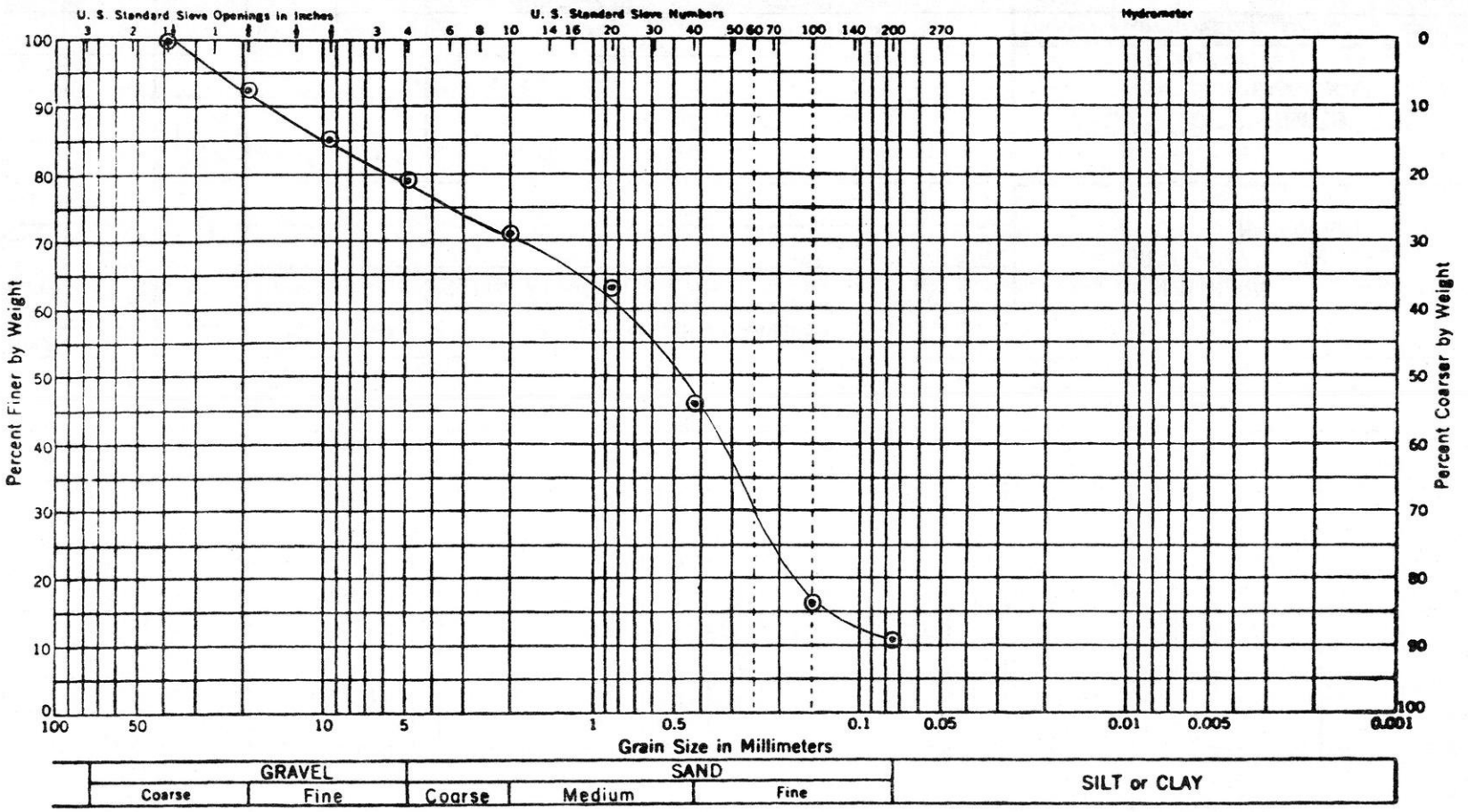
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	9.6				Slightly silty fine to coarse sand (SM-SP)
S-30					
267.0-269.0'					

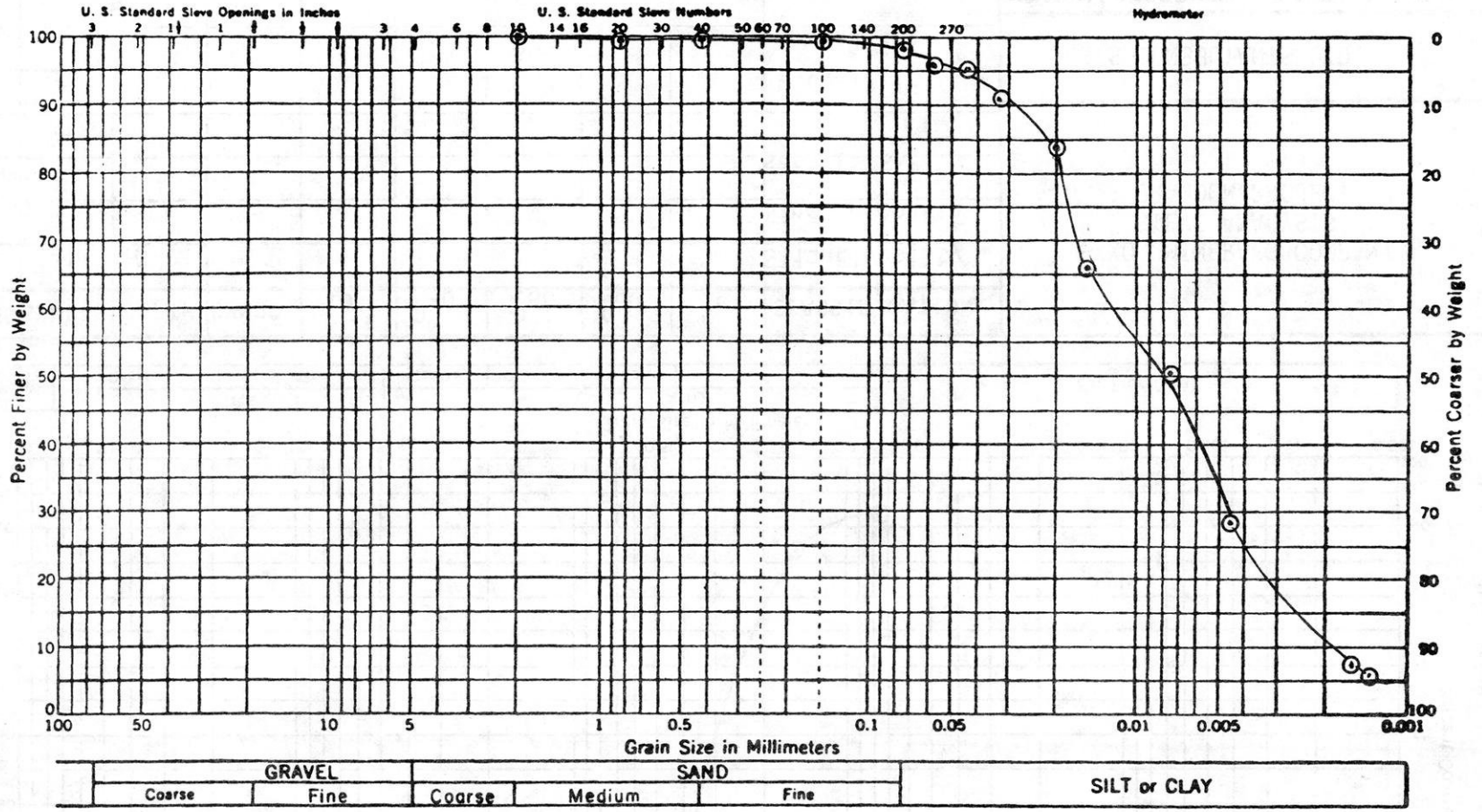
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



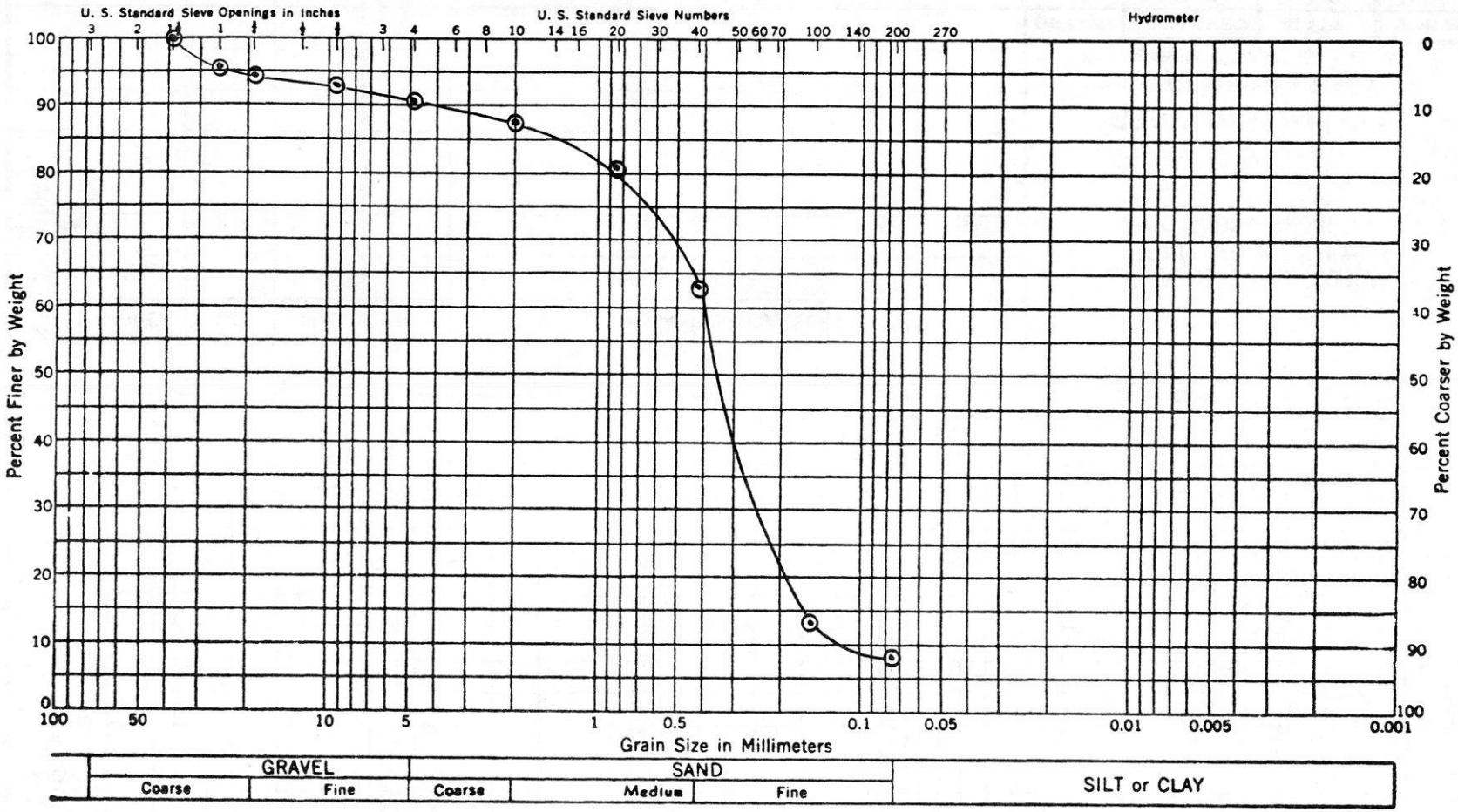
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-11	25.6				Silty clay (CL)
S-31					
277.0-278.5'					

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-1	10-12'							Slightly silty fine to coarse sand (SM-SP) W.C. 12.1

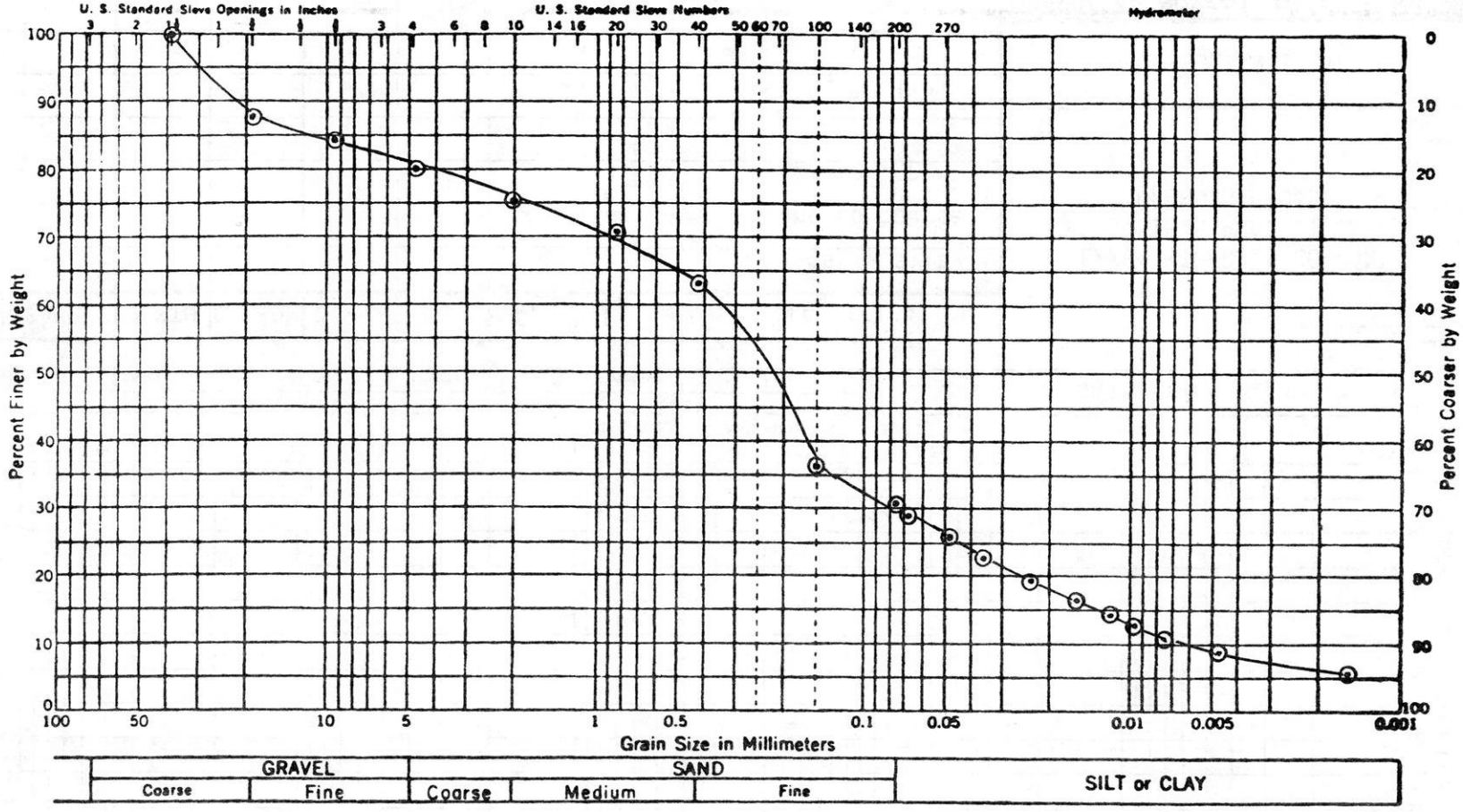
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



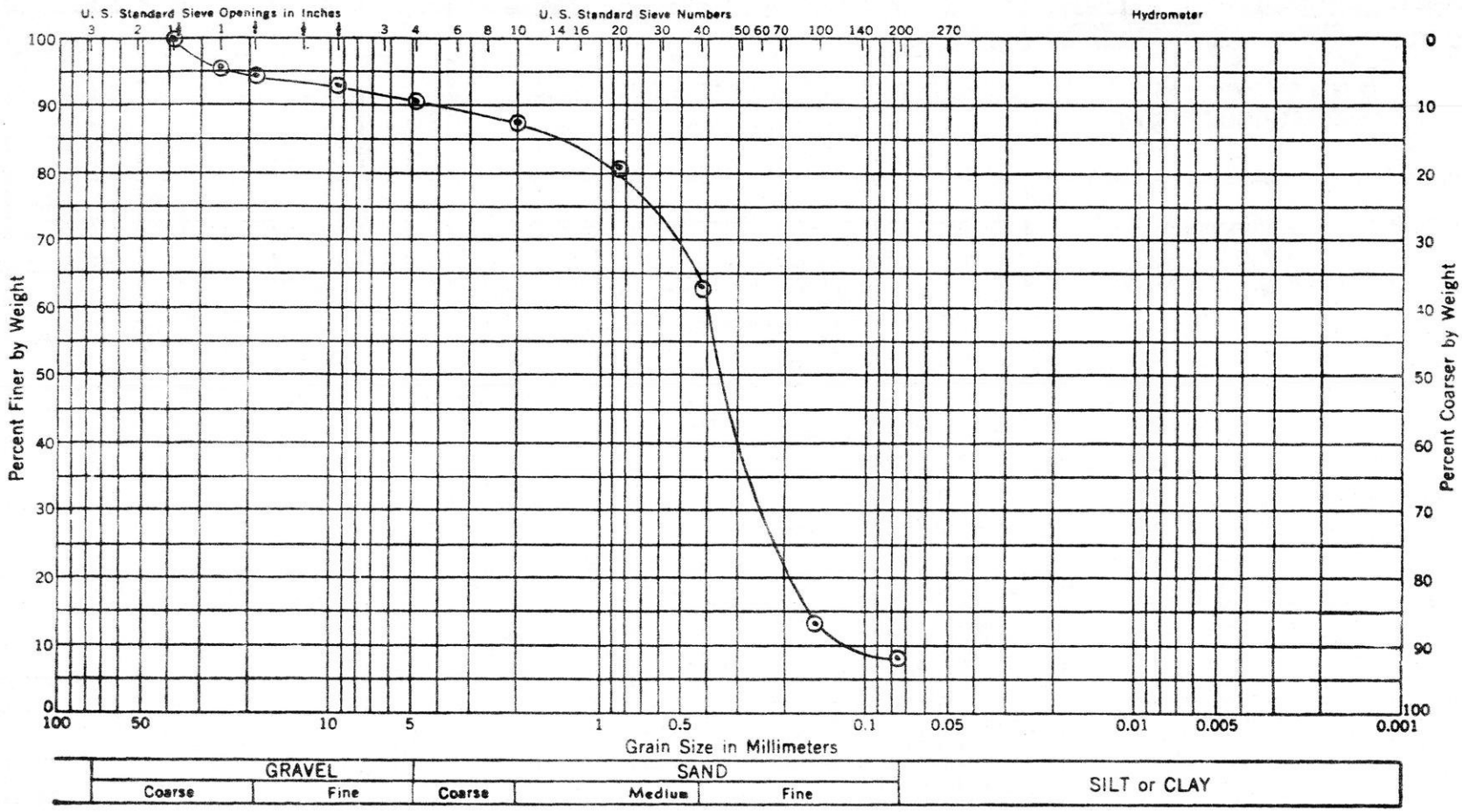
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-12	8.0				Silty fine to coarse sand (SM)
S-2					
20.0-	22.0'				

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-1	10-12'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 12.1

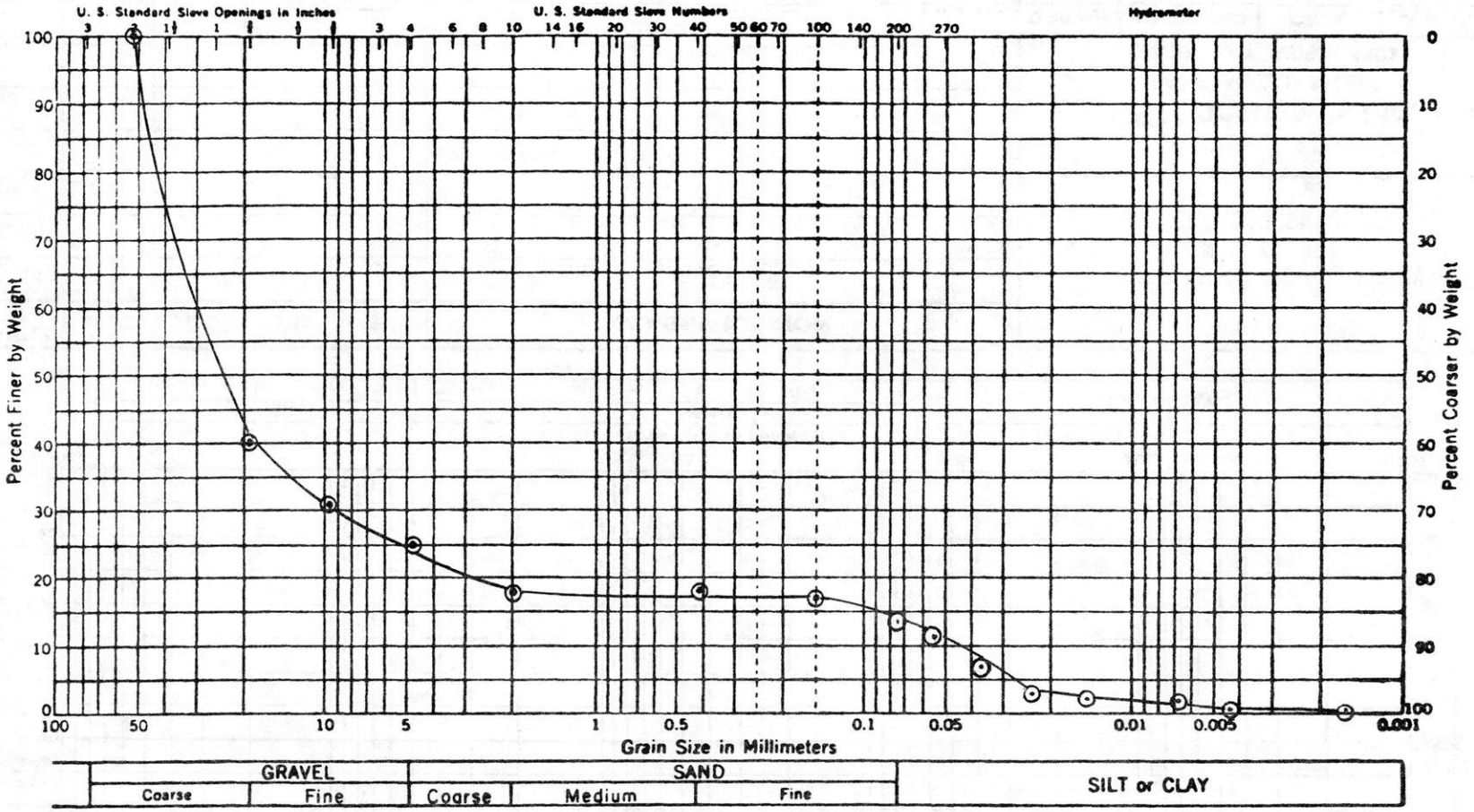
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-12	15.1				Silty fine to coarse gravel (GM)
S-4					
41.0-43.0'					

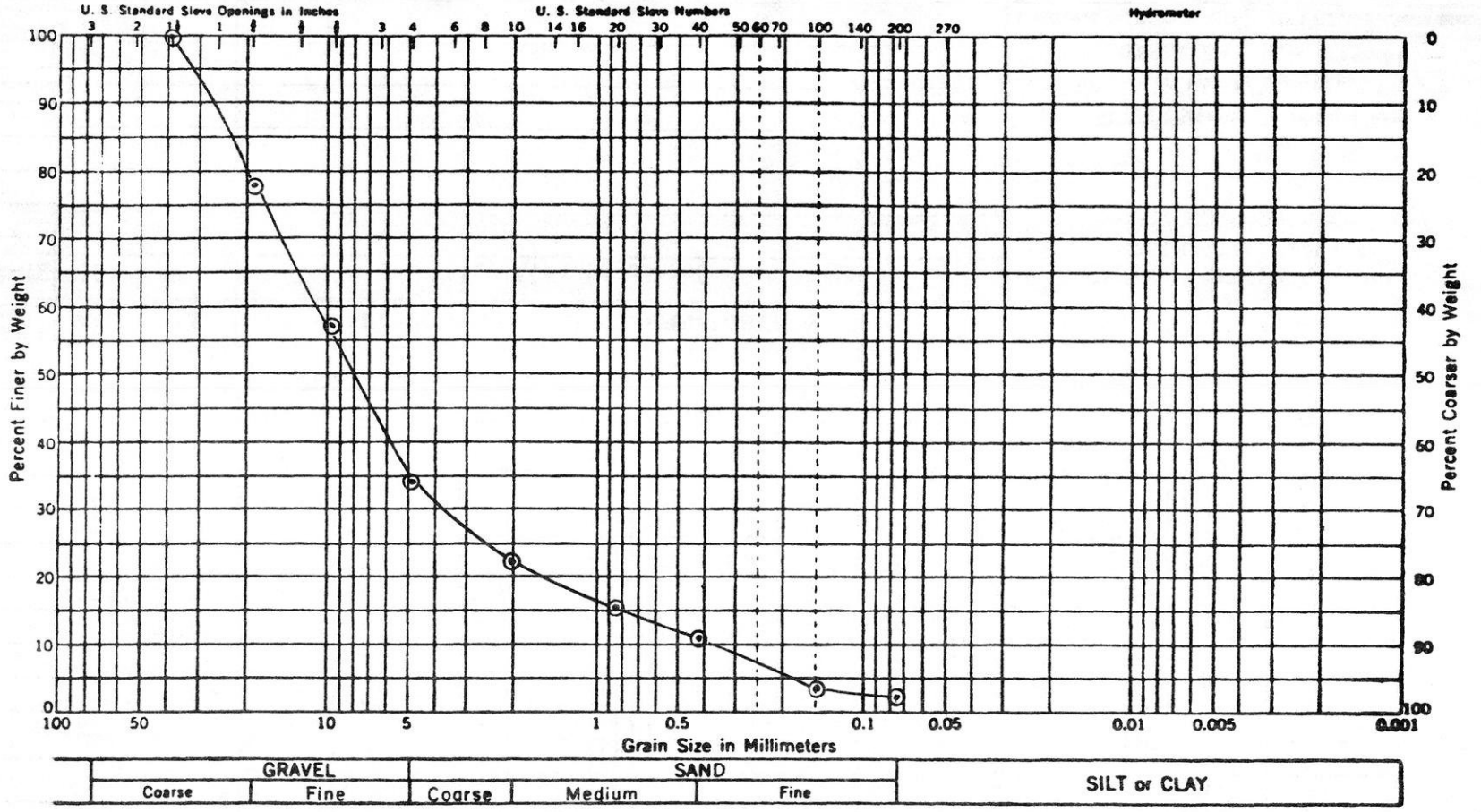
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-12	8.1				Fine to coarse gravel (GW)
S-5					
48.0-49.0'					

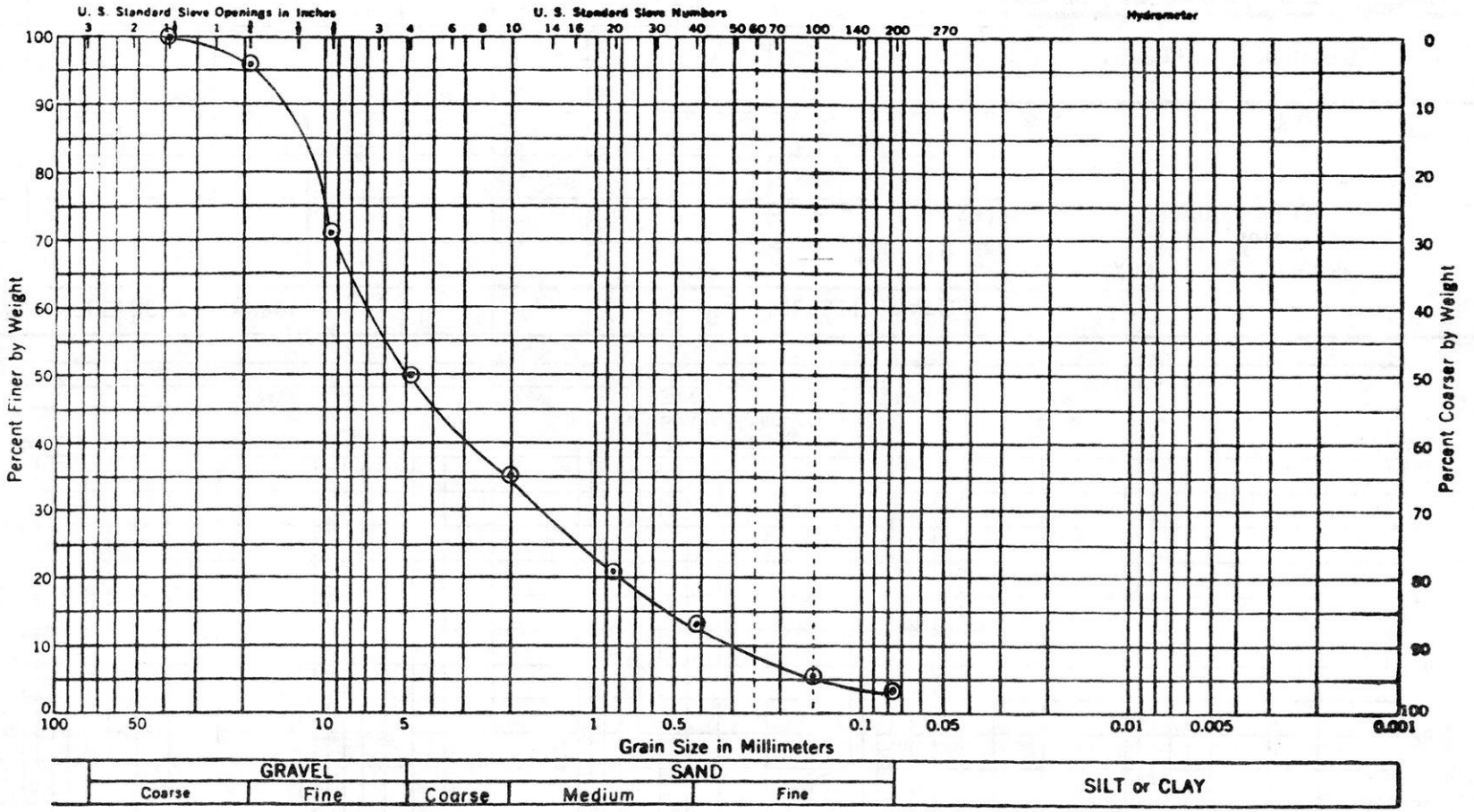
EXXON MINERALS COMPANY
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



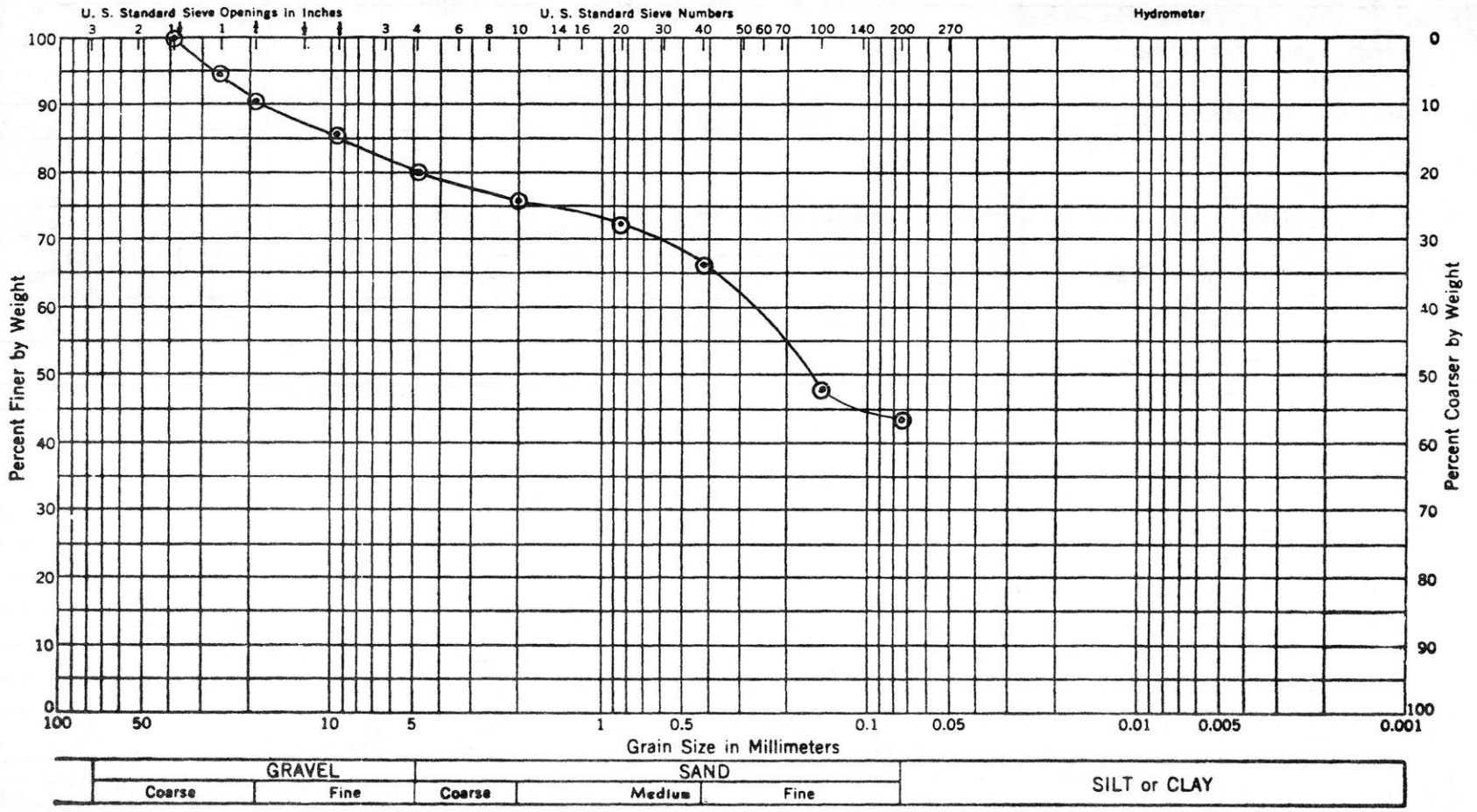
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-12	5.5				Fine to coarse sand and gravel (SW-GW)
S-6					
59.0-	60.0'				

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-7	69-70.5'							Silty fine to coarse sand (SM)
									W.C. 12.3

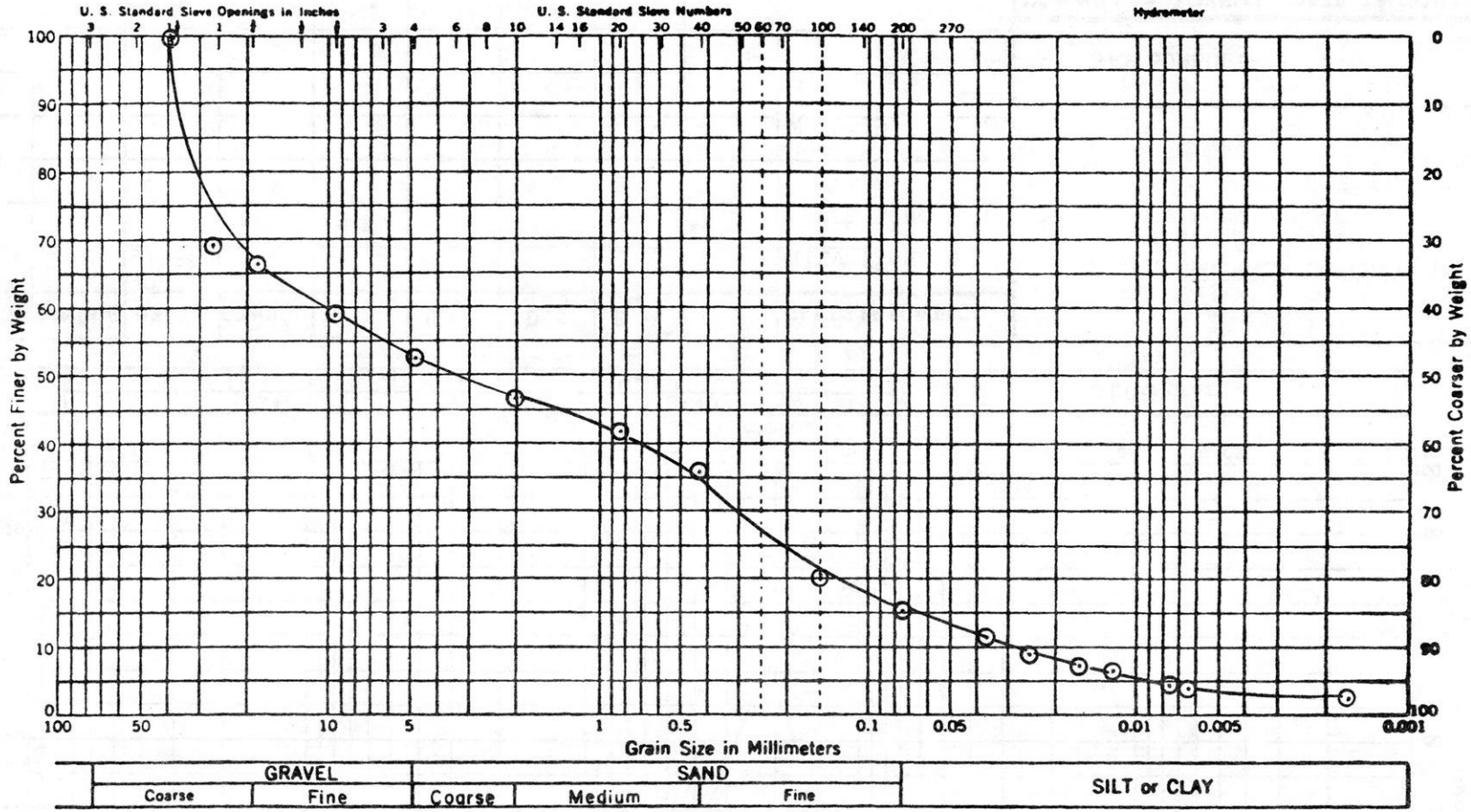
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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UNIFIED CLASSIFICATION SYSTEM



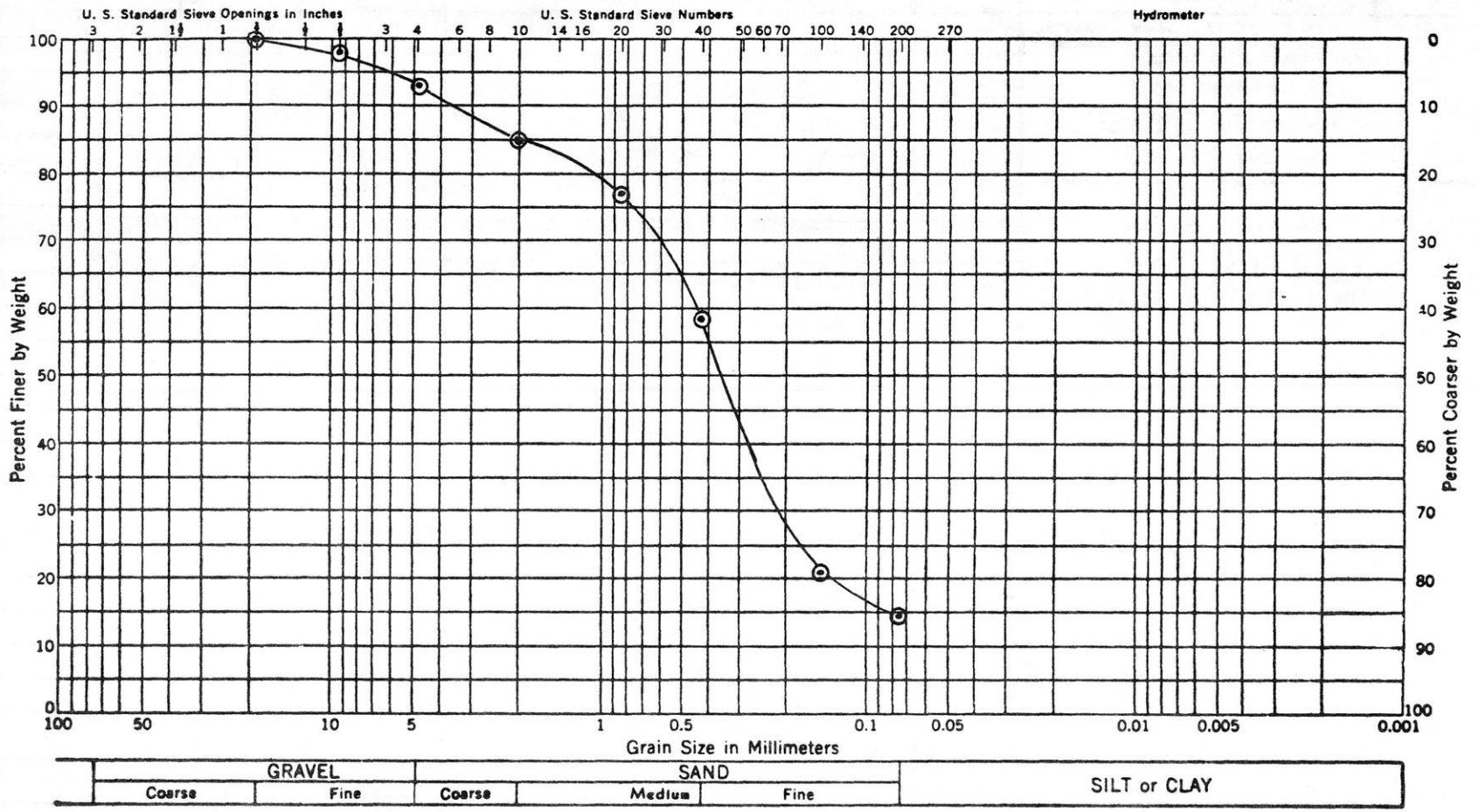
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX12	13.0				Silty fine to coarse sand (SM)
S-8					
80-81.5'					

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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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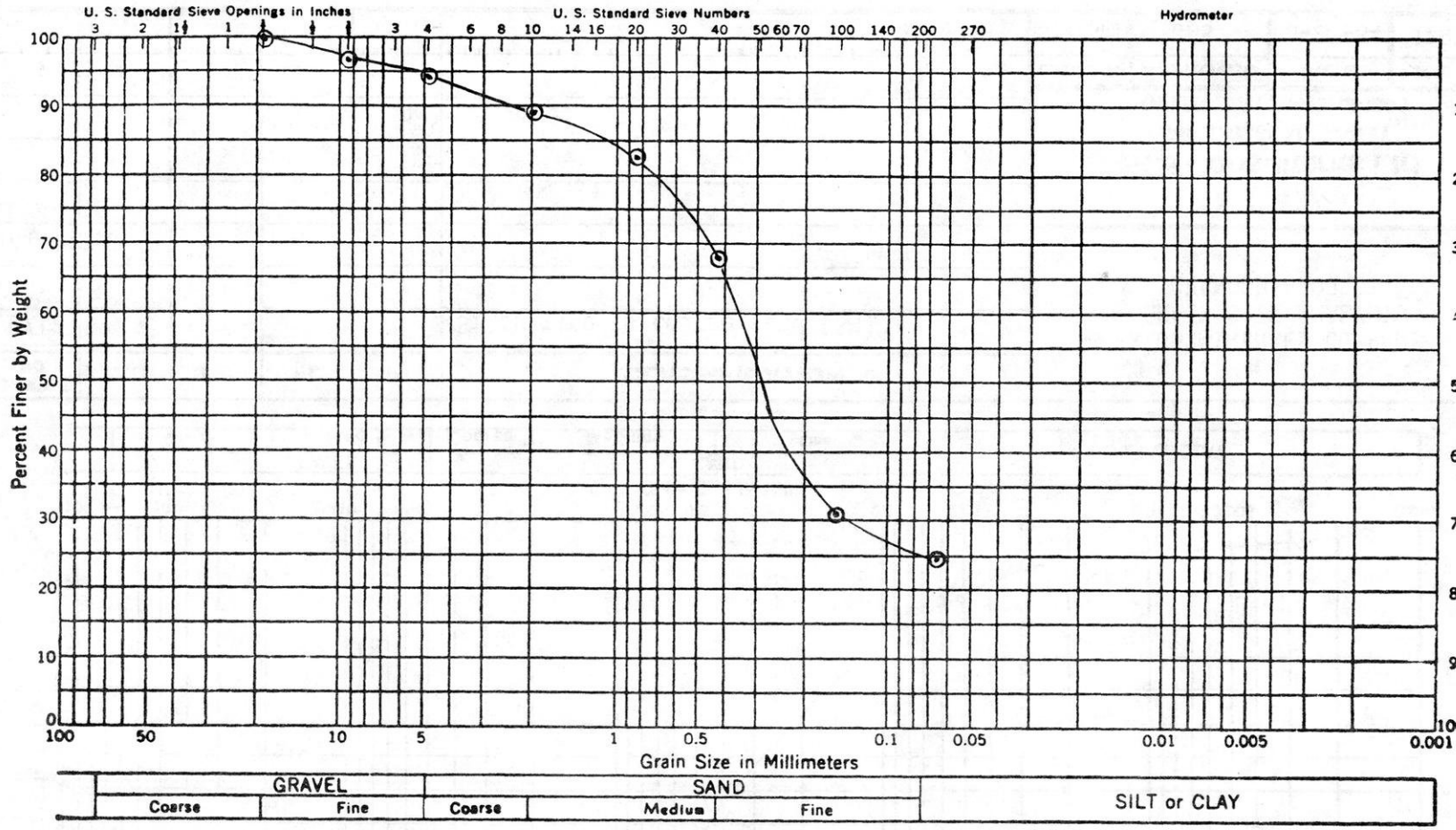
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-9	90-91.5'							Silty fine to coarse sand (SM)
									W.C. 19.7

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JJT/SMD	JAS	3-24-84	12959

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-11	110.5-112'							Silty fine to coarse sand (SM)
									W.C. 10.8

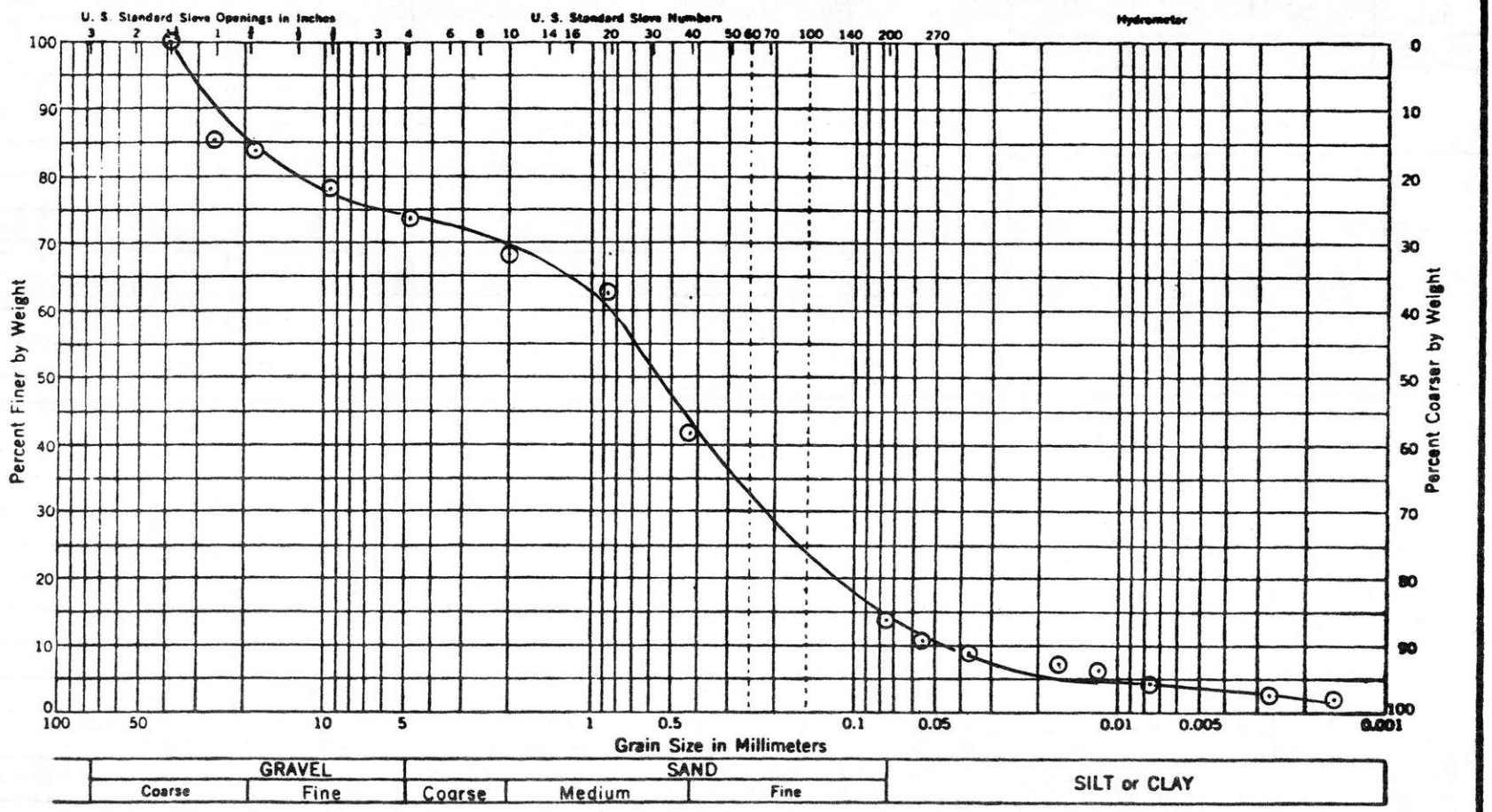
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SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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UNIFIED CLASSIFICATION SYSTEM



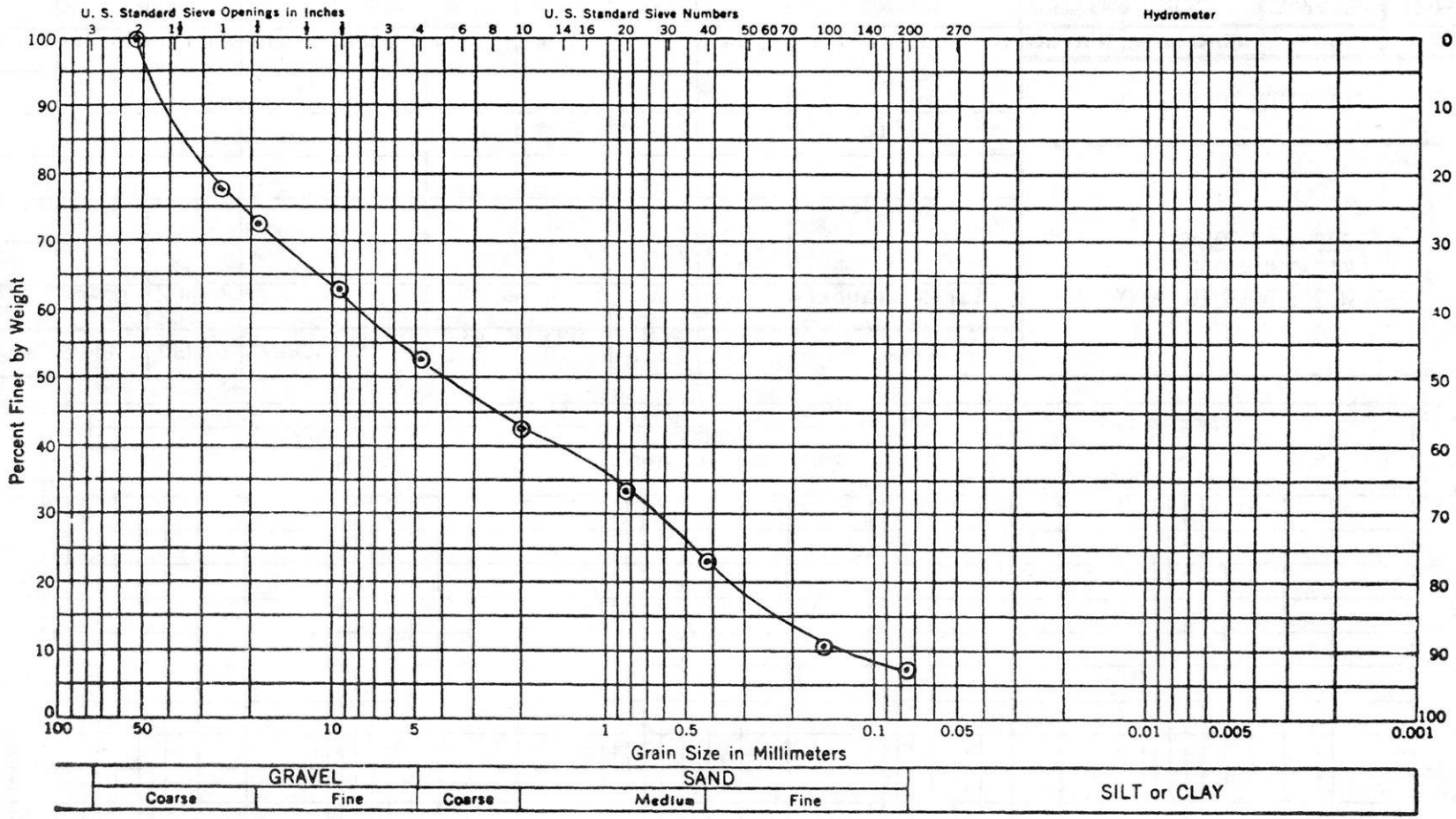
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX12	8.7				Silty fine to coarse sand (SM)
S-14					
141-142.5'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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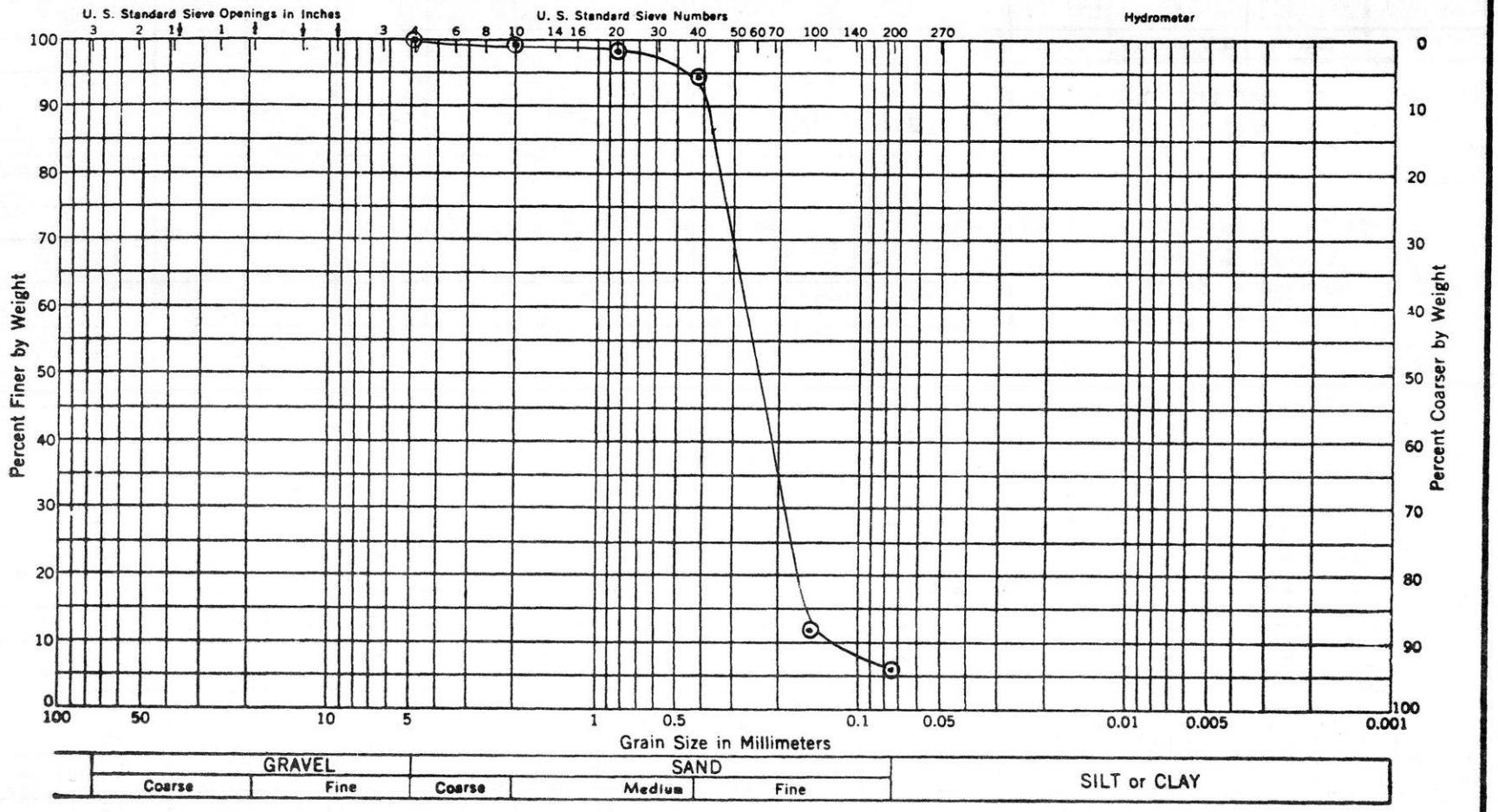
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-19	192.5-194'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 10.6

EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-20	203-204.5'							Slightly silty fine sand (SM-SP) W.C. 21.1

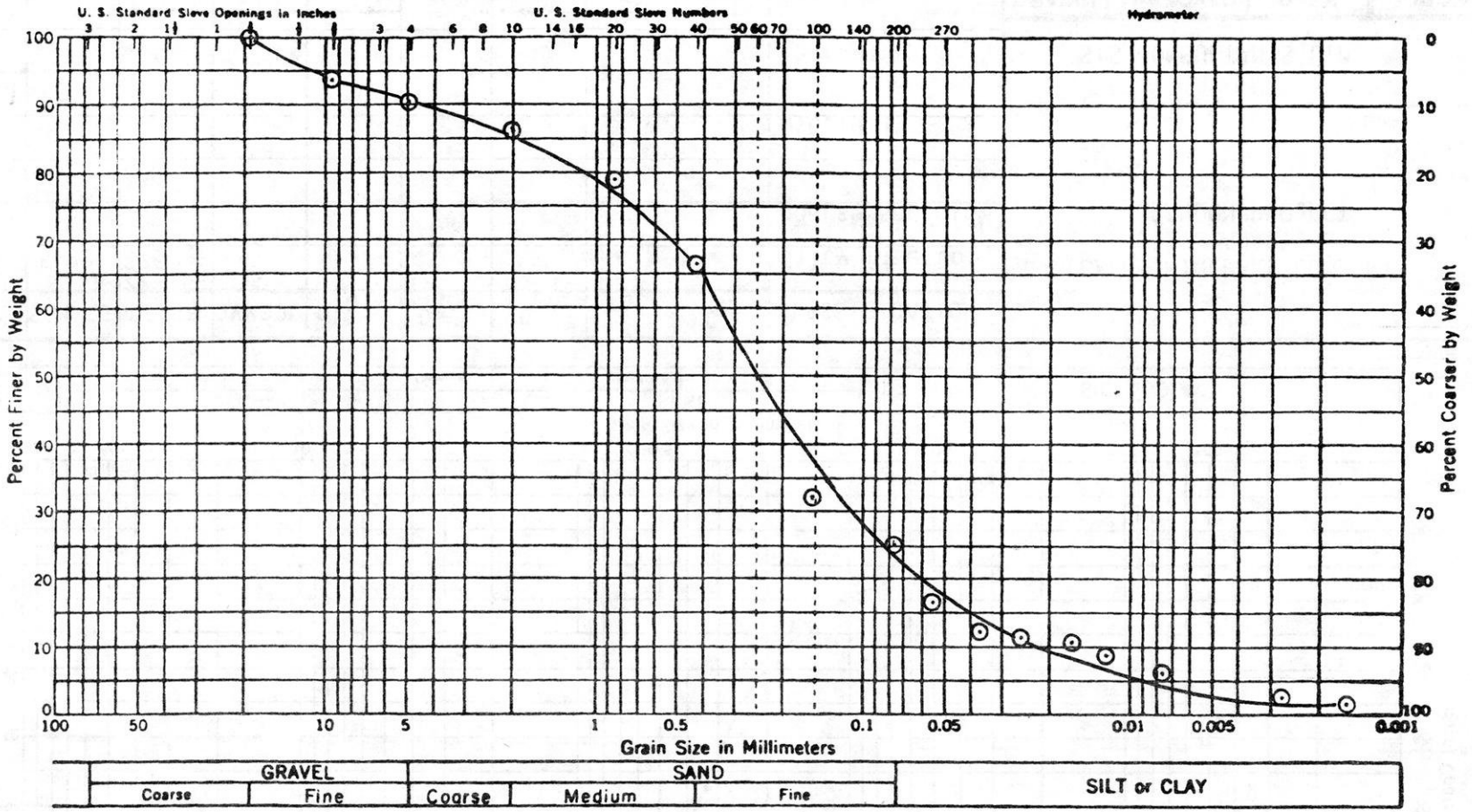
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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UNIFIED CLASSIFICATION SYSTEM



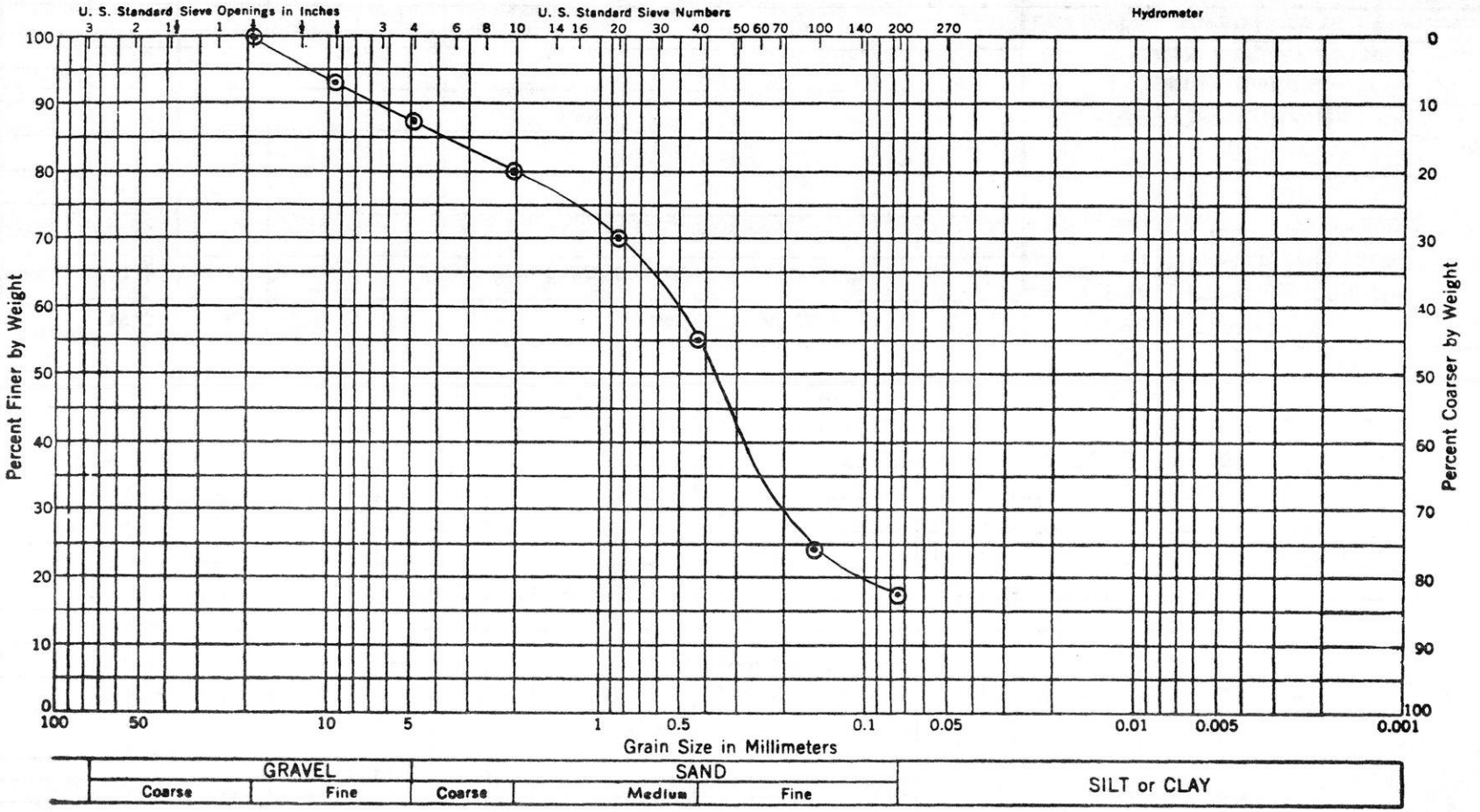
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX12	9.6				Silty fine to coarse sand (SM)
S-21					
213-21	4.5'				

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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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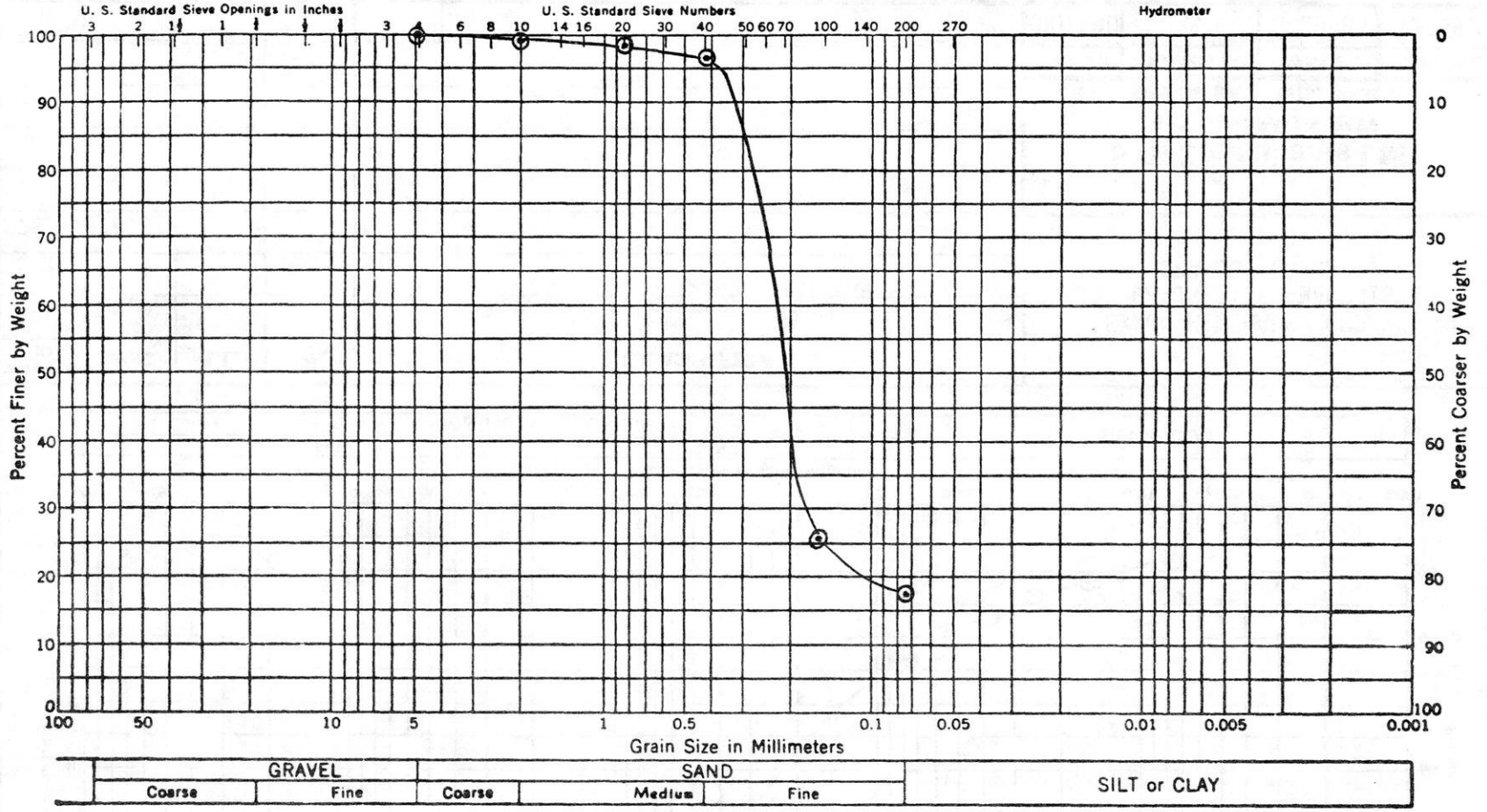
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-22	223.5-225'							Silty fine to coarse sand (SM)
									W.C. 9.1

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SIEVE ANALYSIS
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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX12	S-24	244.2-245.5'							Silty fine sand
									(SM)
									W.C. 20.0

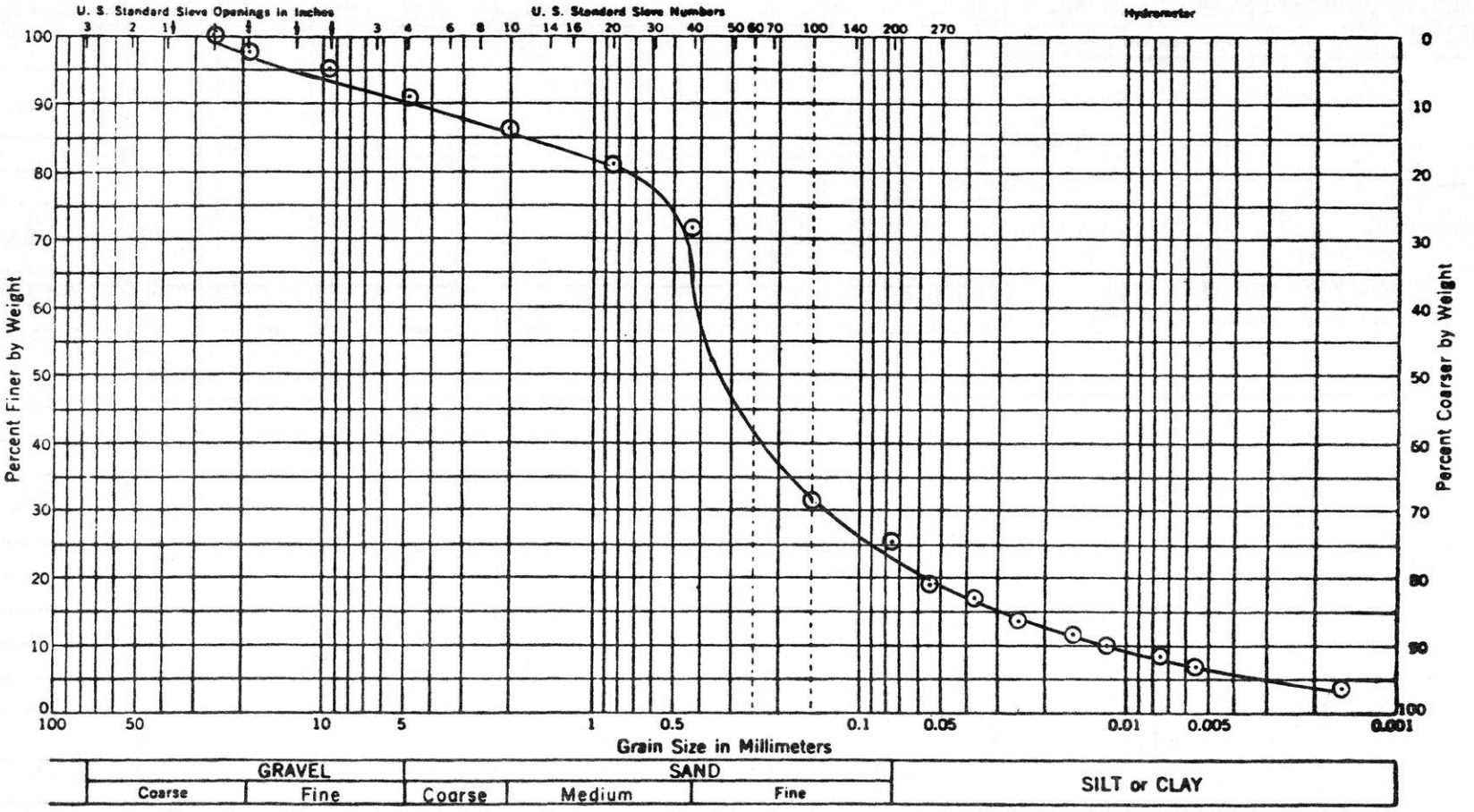
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX12	10.9				Silty fine to coarse sand (SM)
S-27					
274.5-276.5'					

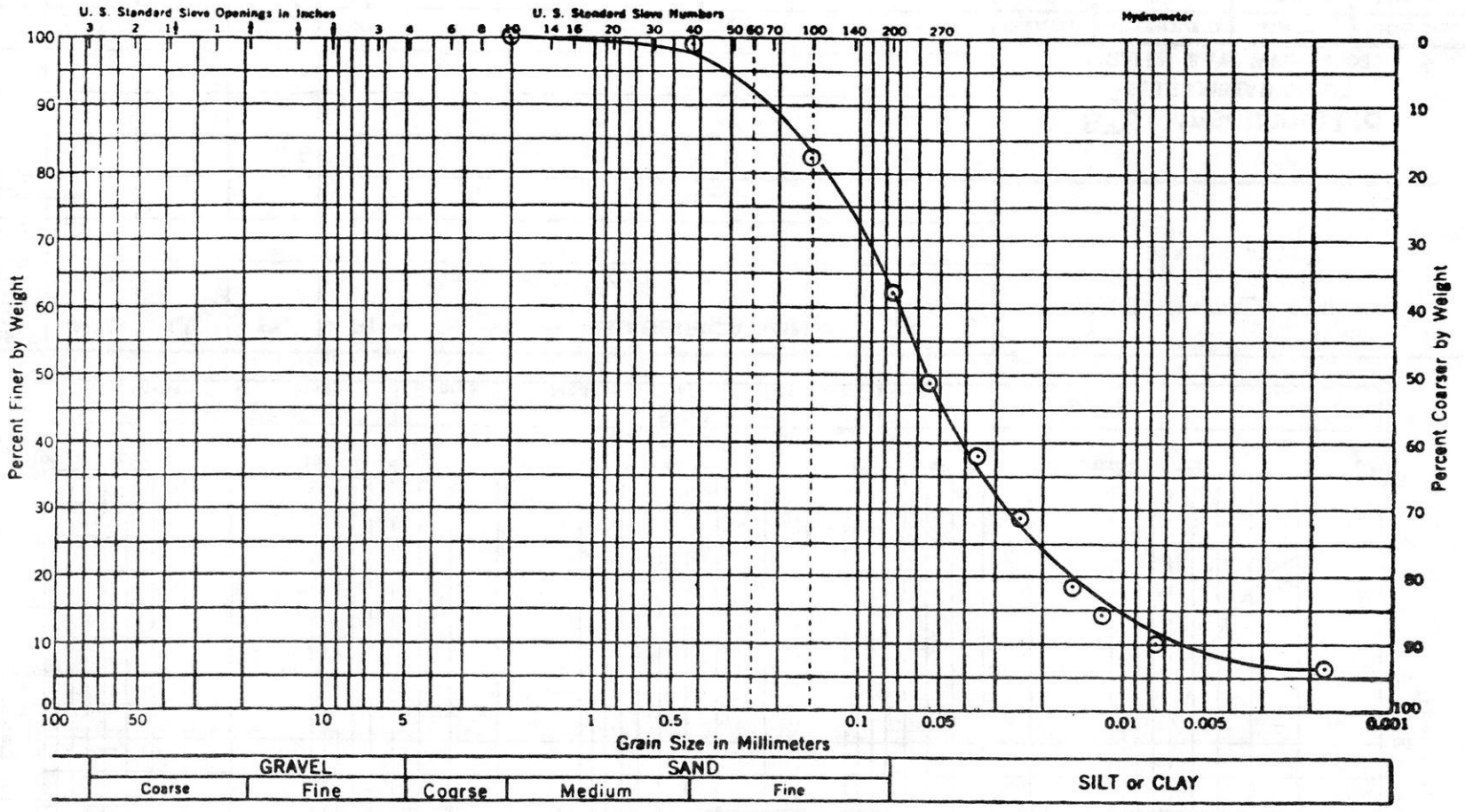
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX12	21.4				Very fine sandy silt (ML)
S-28					
285-287'					

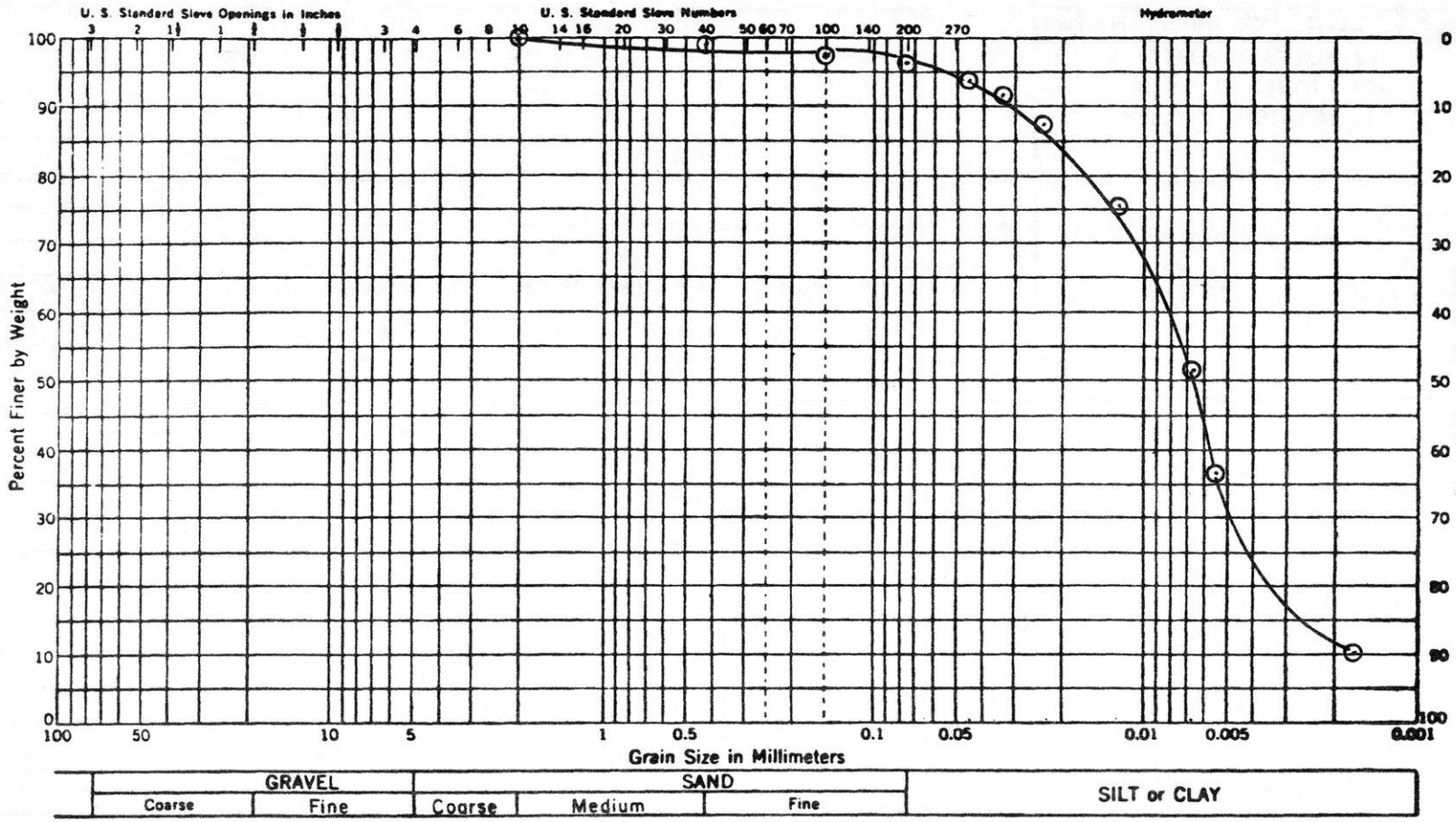
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX12	25.8				Clayey silt (ML)
S-29					
295-297'					

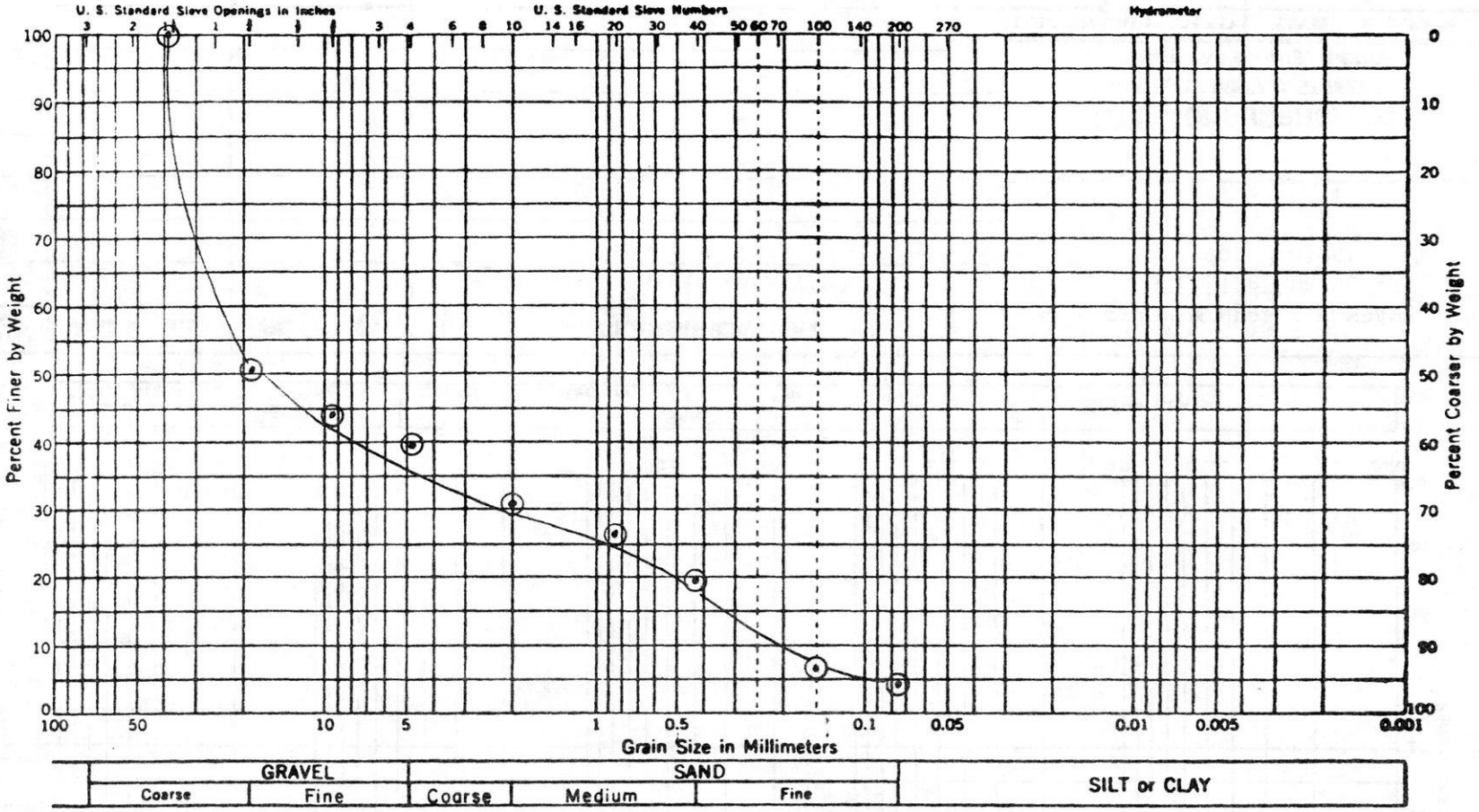
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 13	13.9				Fine to coarse gravel (GW)
S-2A					
15.0 -	16.5'				

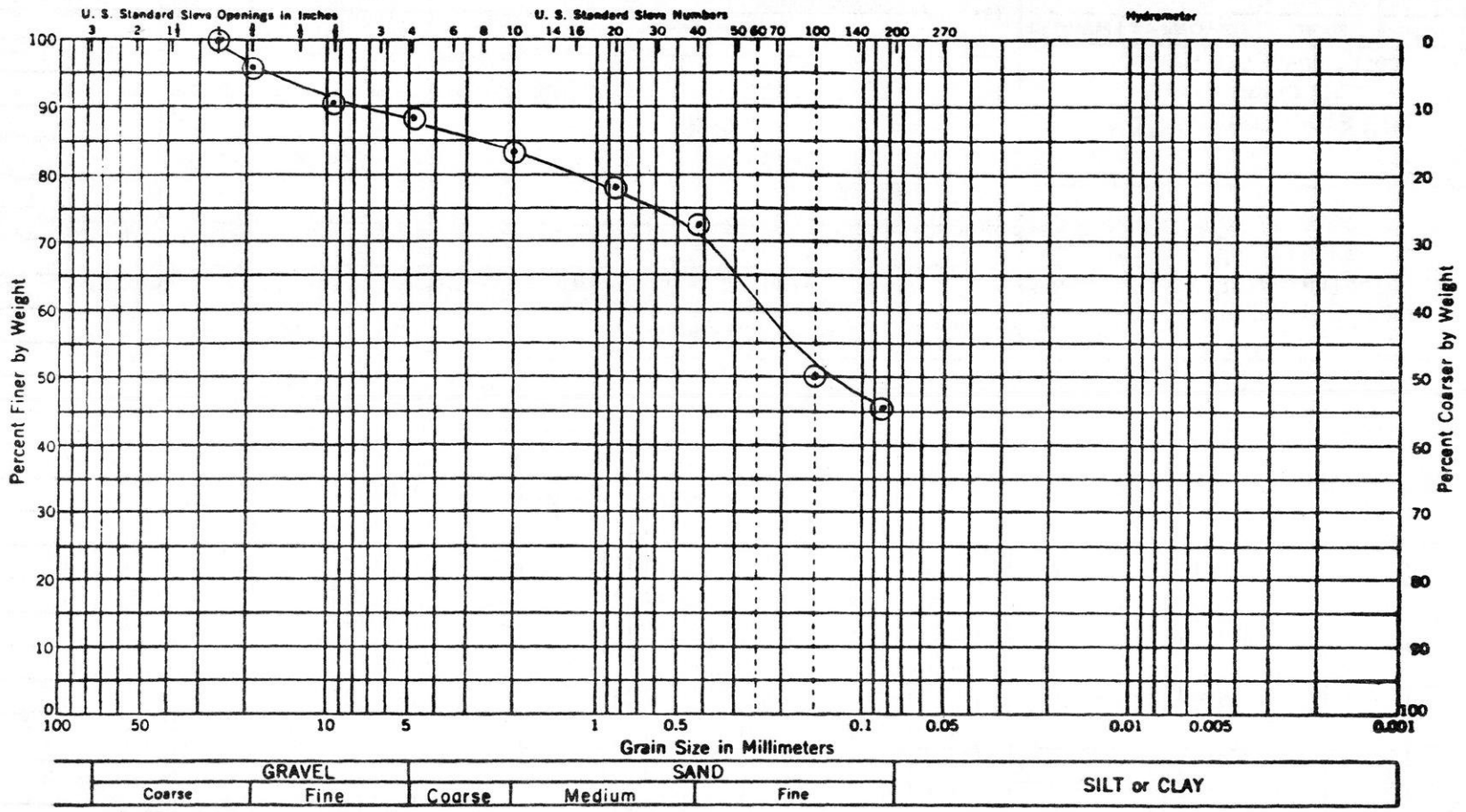
EXXON MINERALS COMPANY
Grain Size Analysis
Crandon Project

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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UNIFIED CLASSIFICATION SYSTEM



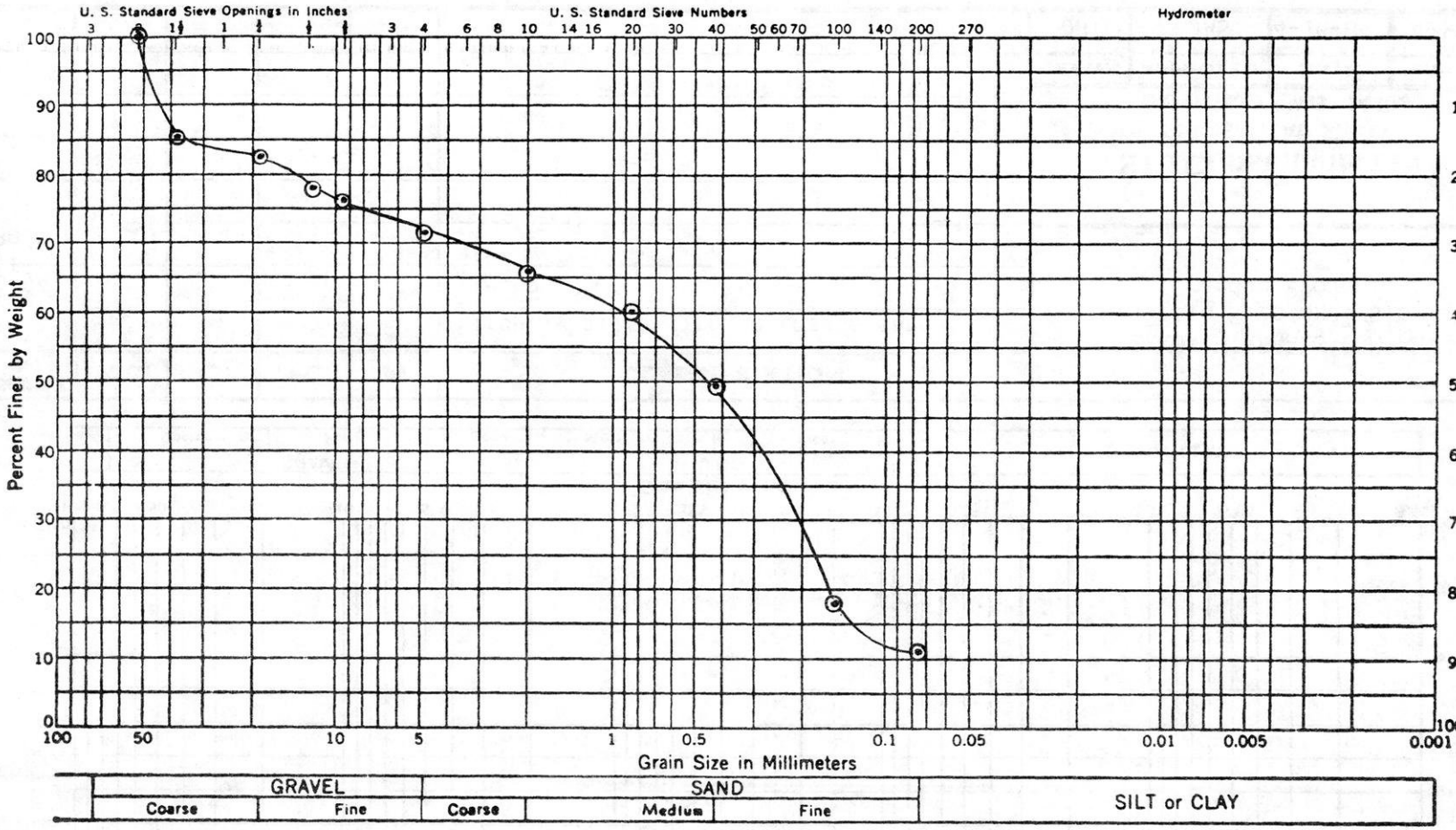
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 13	5.3				Silty fine to coarse sand (SM)
S-3A					
20.0 -	22.0'				

EXXON MINERALS COMPANY
Grain Size Analysis
Crandon Project

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13B	S-4A	25-27'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 10.7

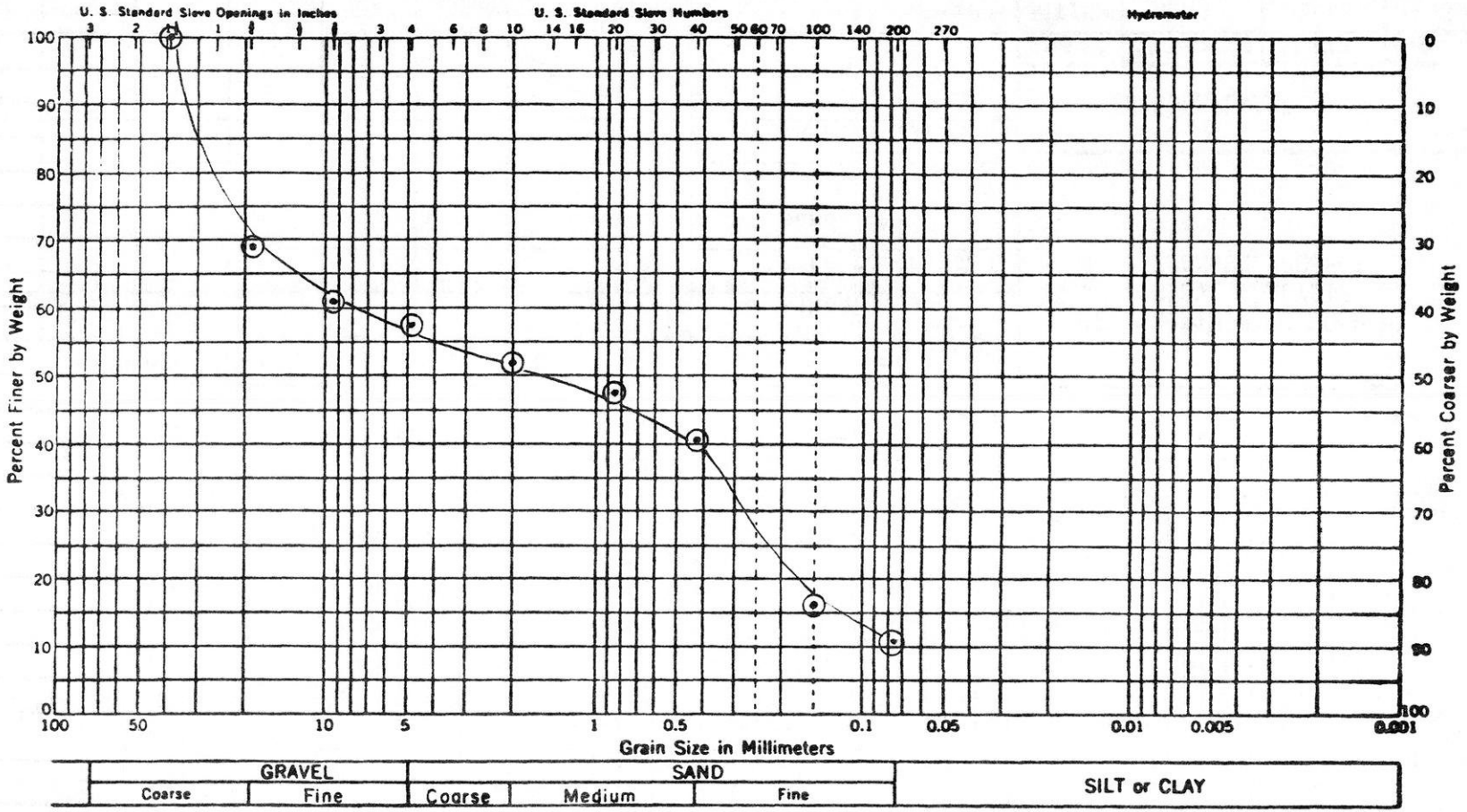
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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UNIFIED CLASSIFICATION SYSTEM



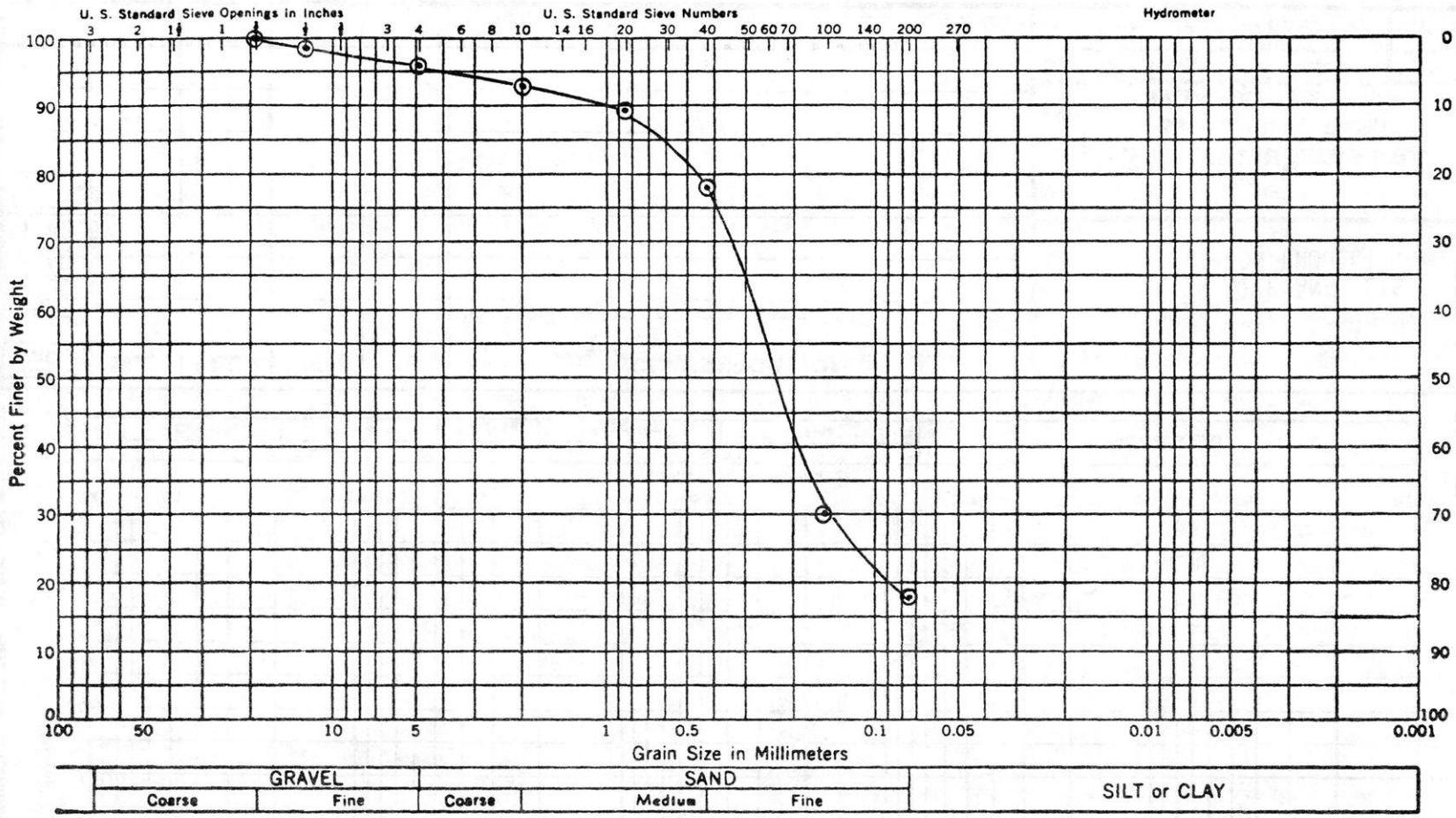
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 13	9.0				Slightly silty fine to coarse sand
S-5A					(SM-SP)
30.0 -	32.0'				

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Crandon Project

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13B	S-6A	35-37'							Silty fine to coarse sand (SM)
									W.C. 7.0

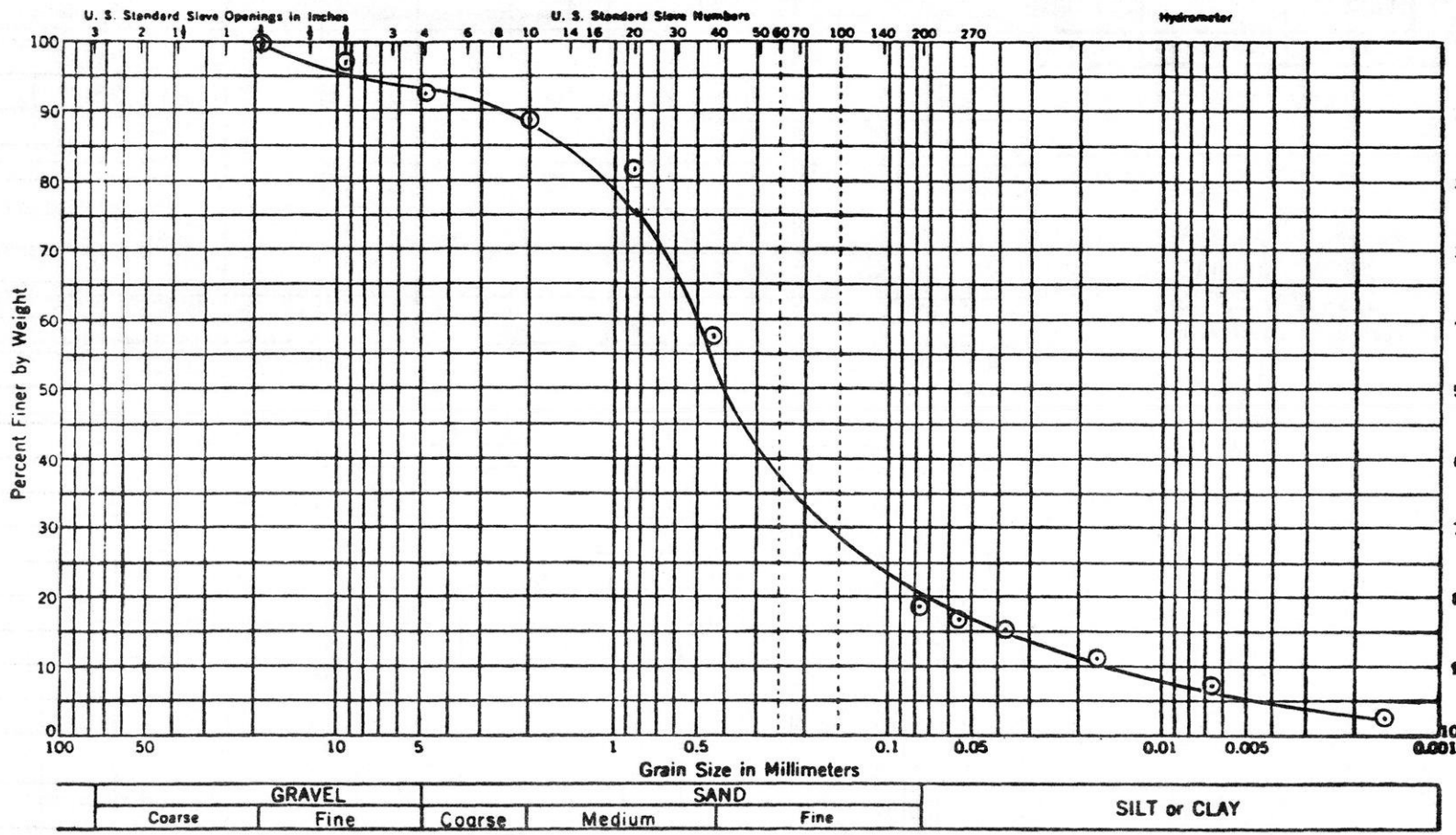
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13B	11.0				Silty fine to coarse sand (SM)
S-7A					
41-42.5'					

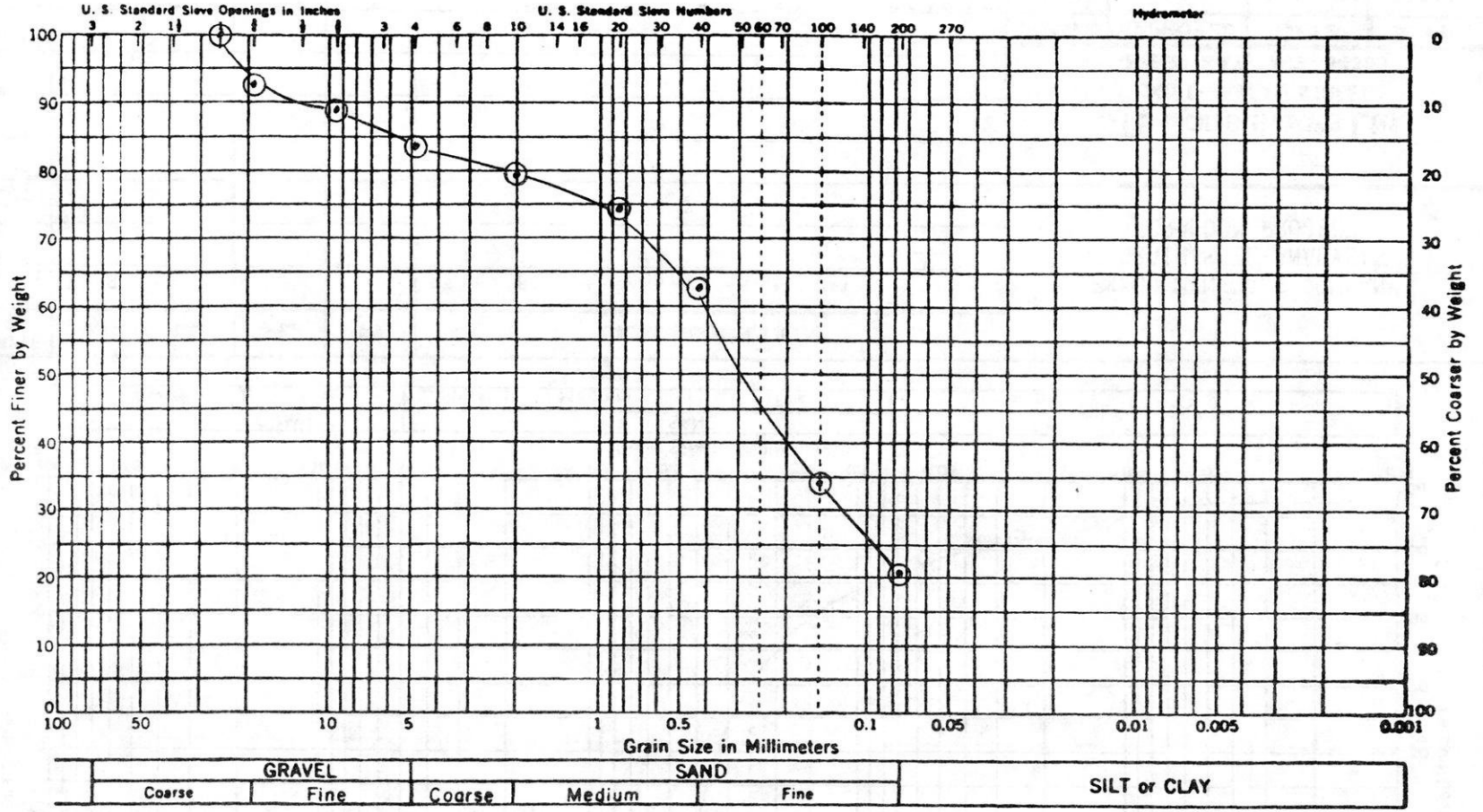
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX 13	10.0				Silty fine to coarse sand (SM)
S-8A					
51.0 -	52.5'				

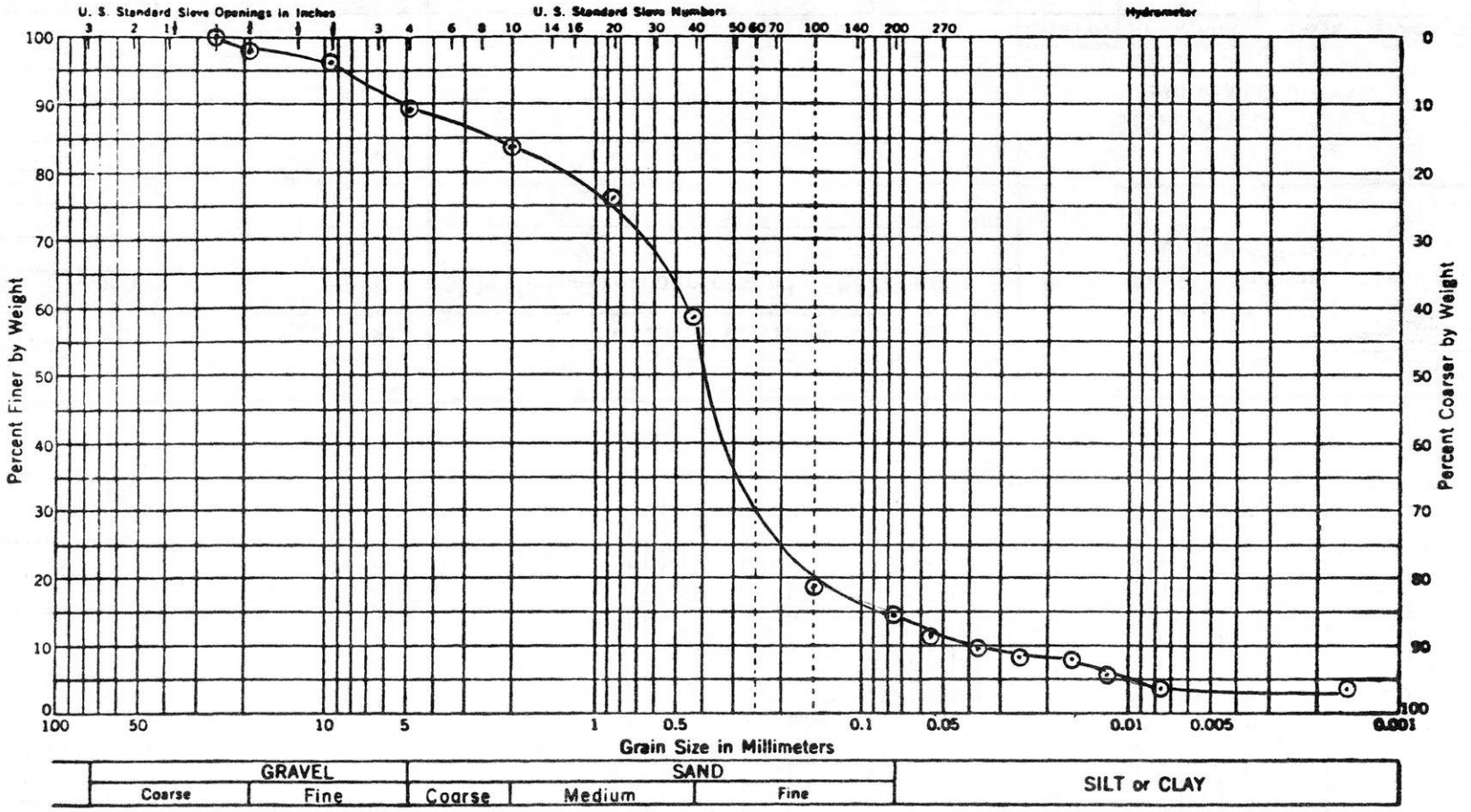
EXXON MINERALS COMPANY
Grain Size Analysis
Crandon Project

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-16-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13B	11.5				Silty fine to coarse sand (SM)
S-10A					
71-72.5'					

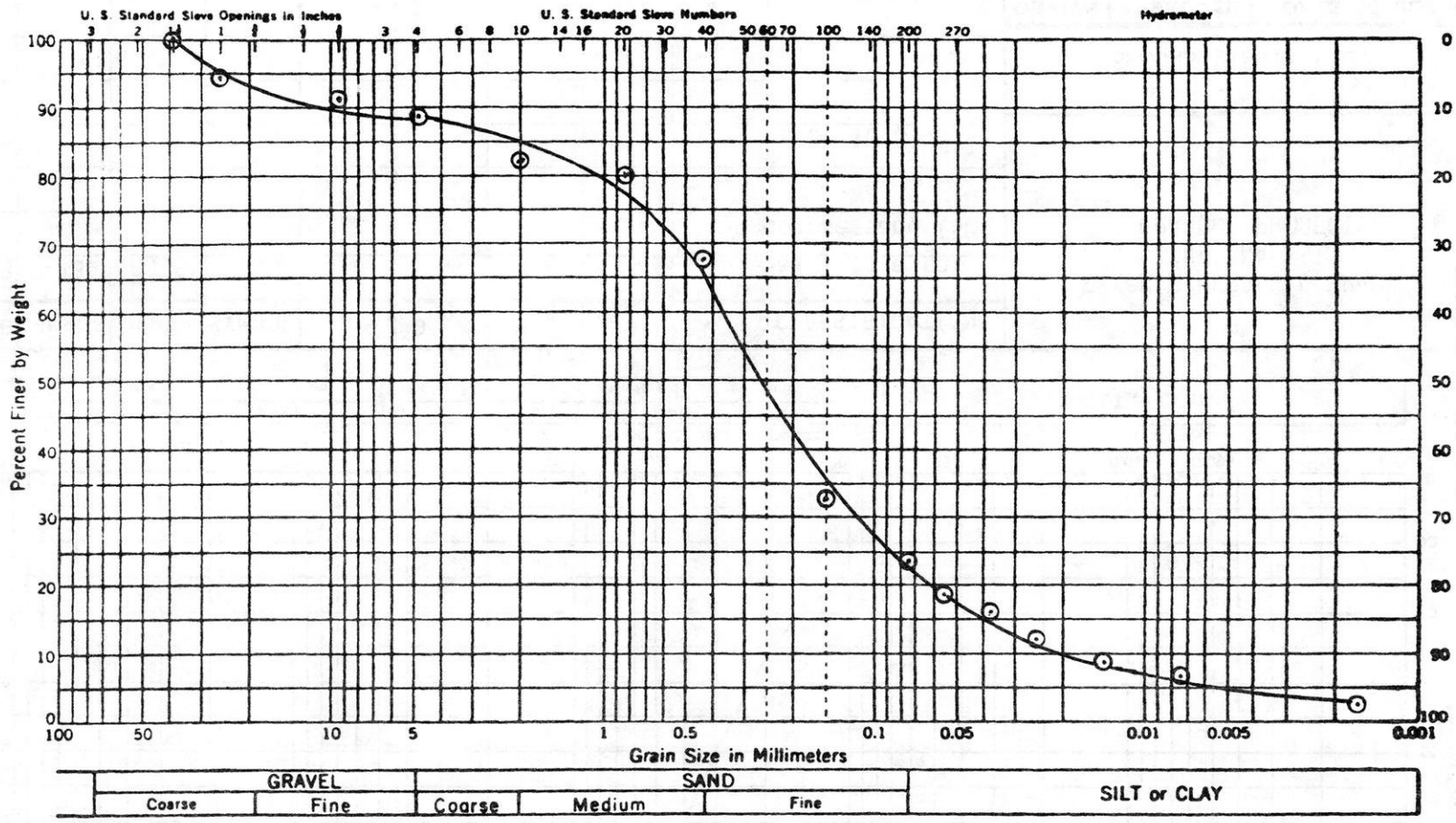
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



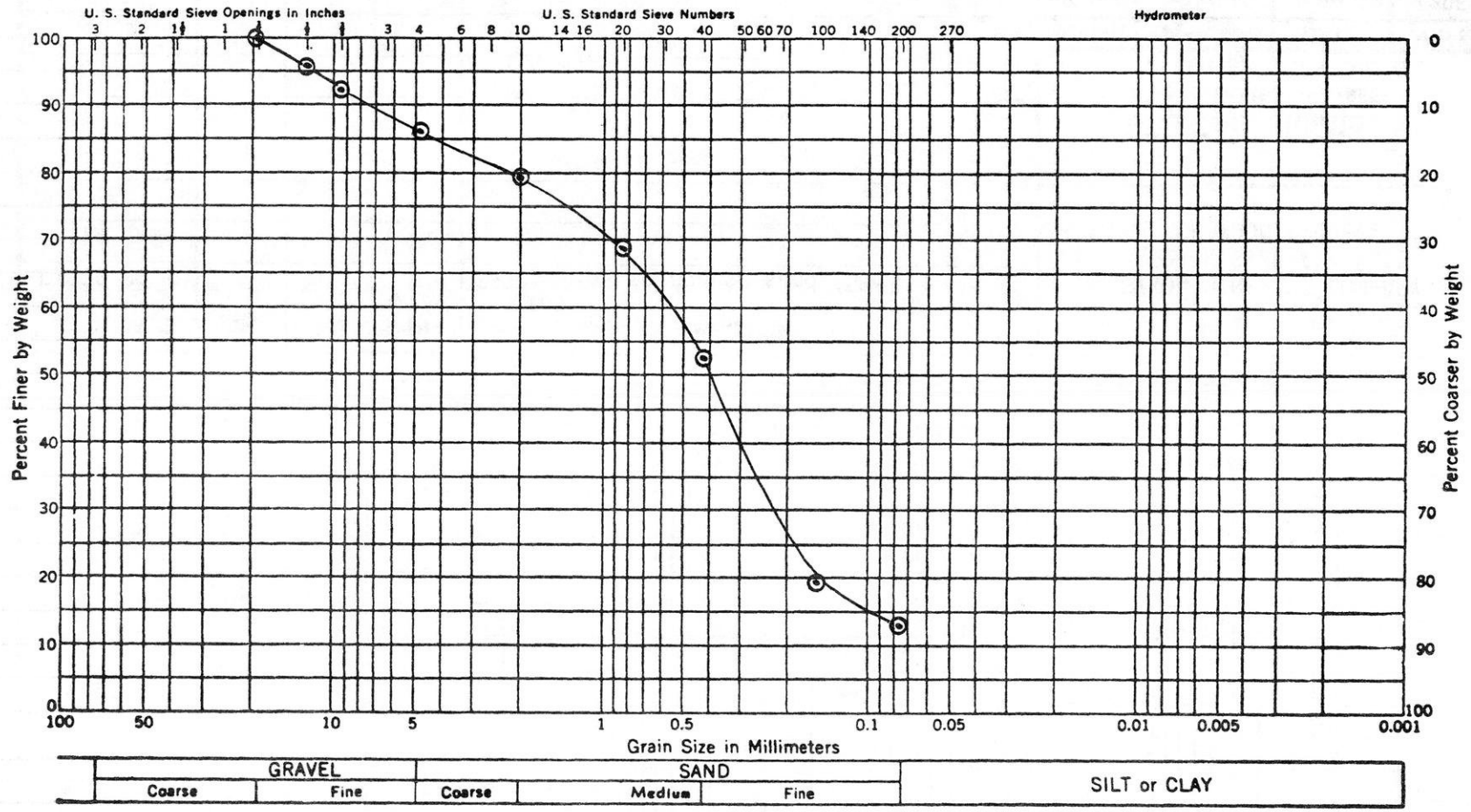
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13B	11.0				Silty fine to coarse sand (SM)
S-12A					
92-93.5					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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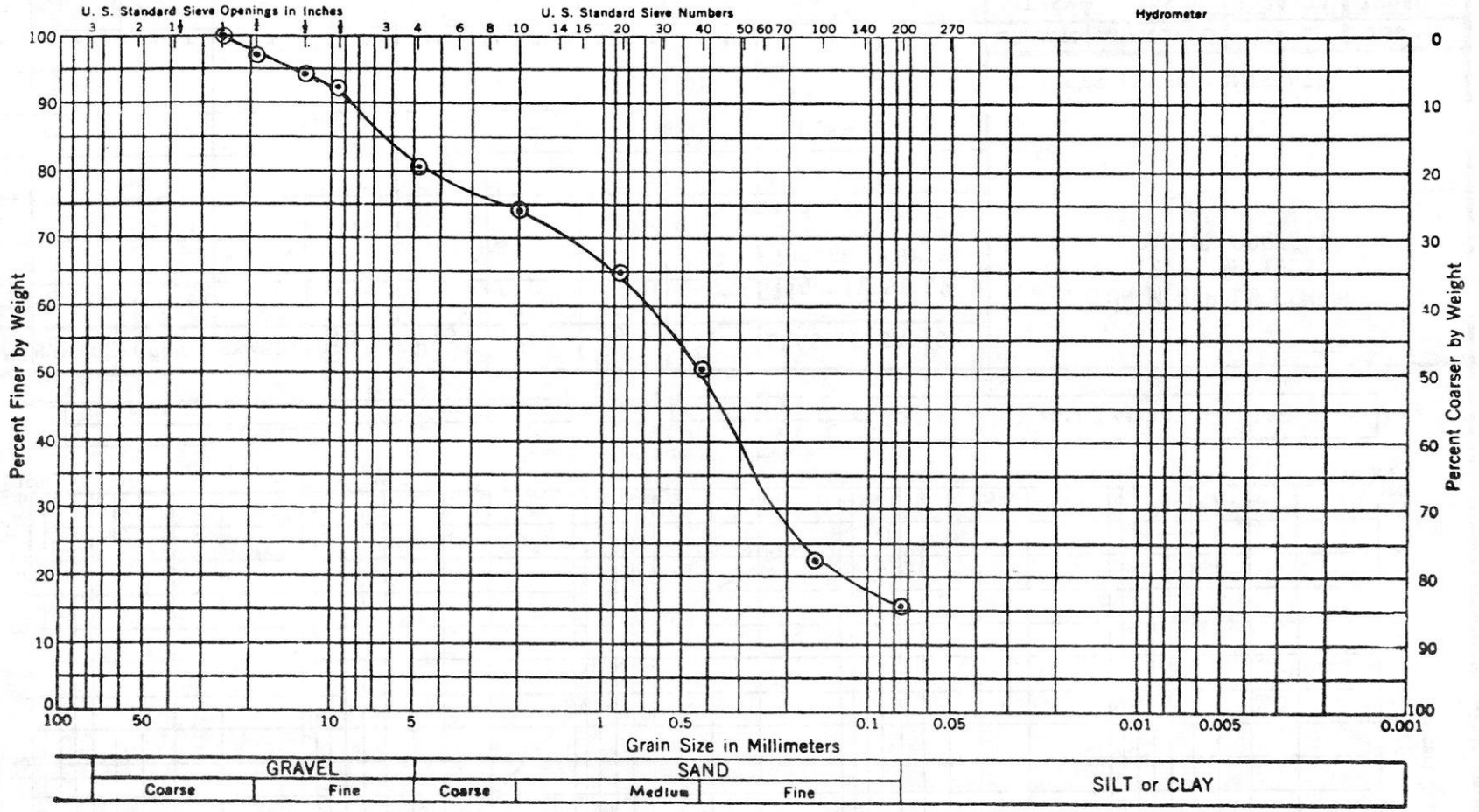
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13B	S-13A	102-103.5'							Silty fine to coarse sand (SM)
									W.C. 10.8

EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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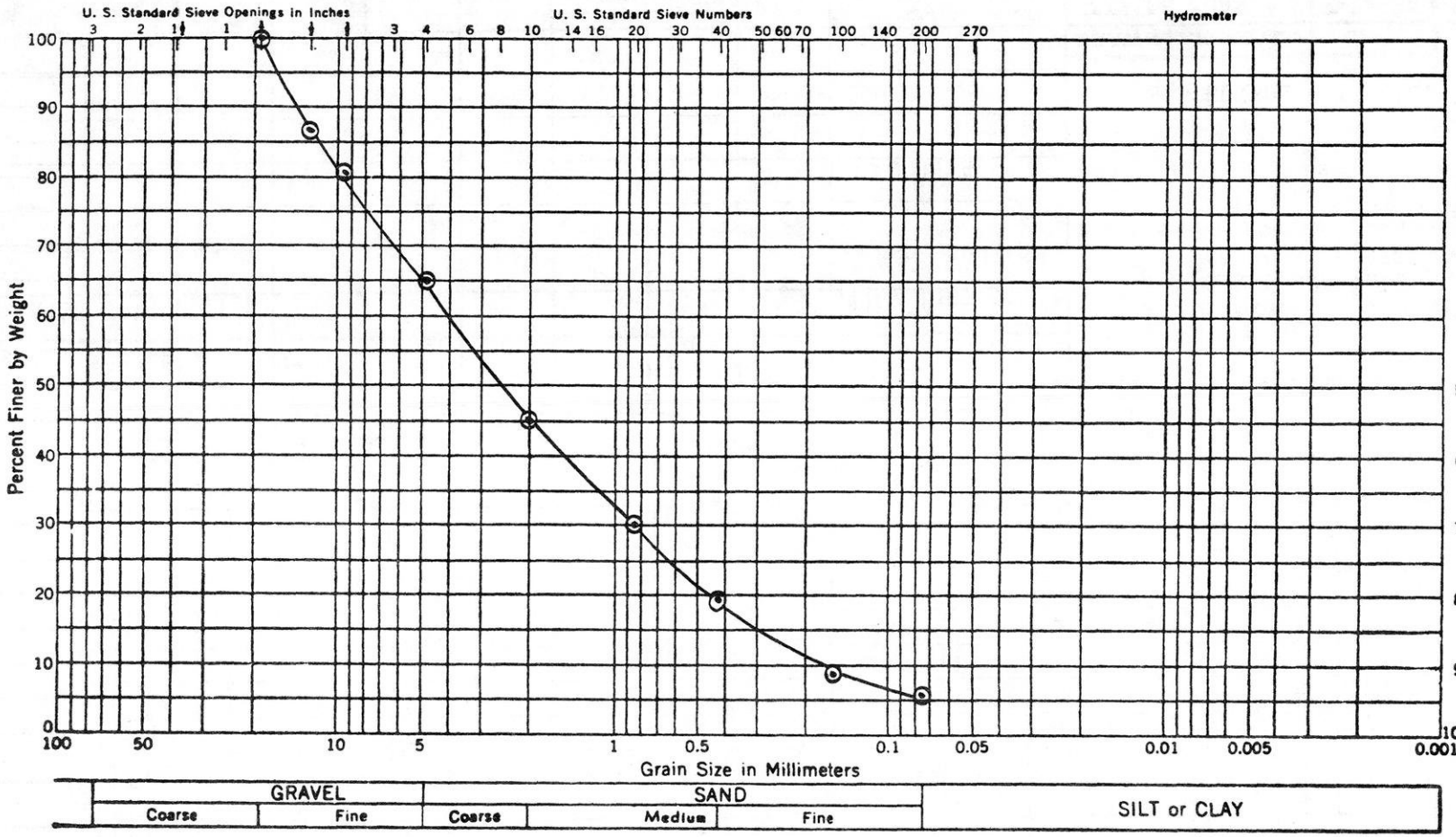
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13B	S-14A	110-111.5'							Silty fine to coarse sand (SM)
									W.C. 11.4

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SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13B	S-16A	131-132.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 9.0

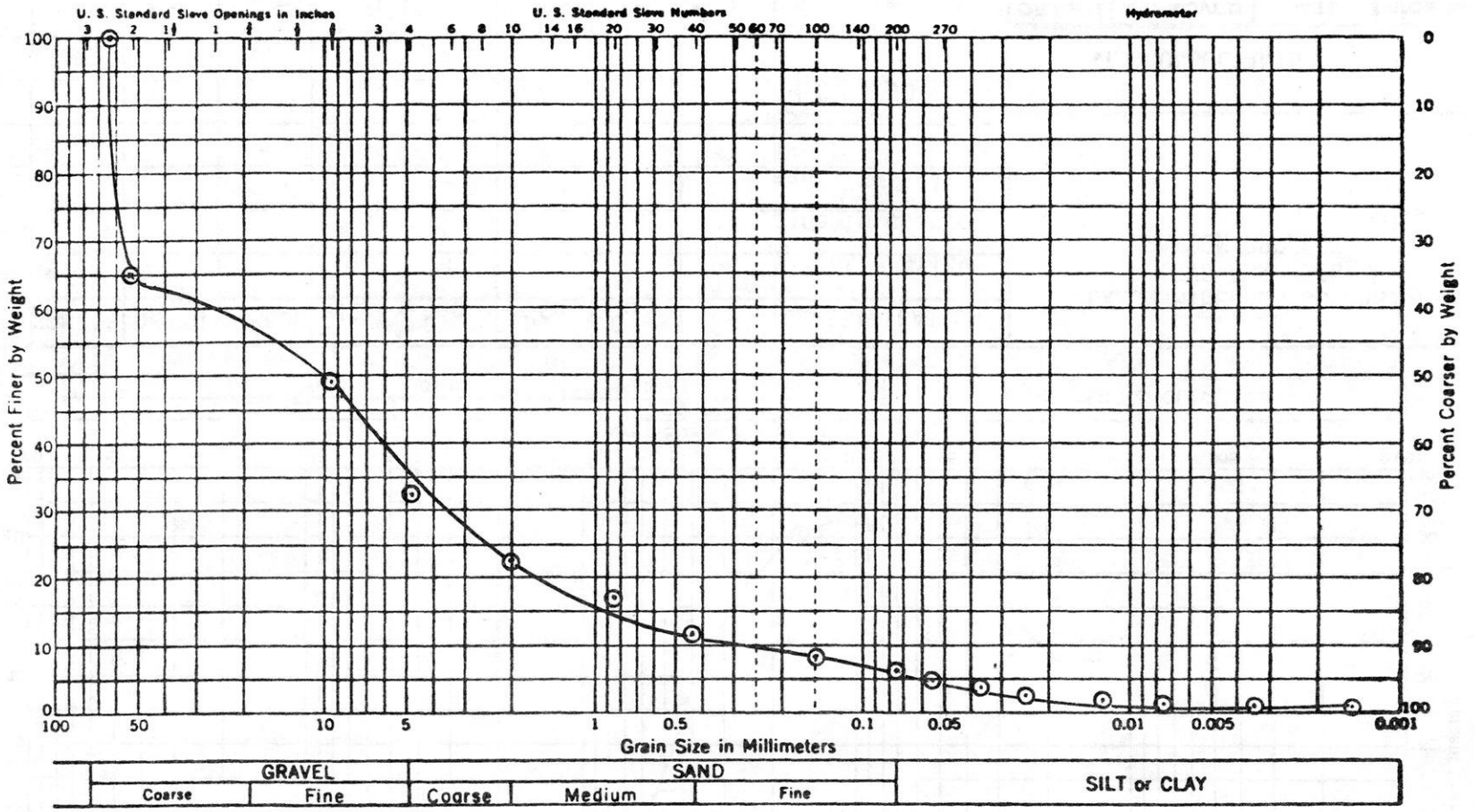
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

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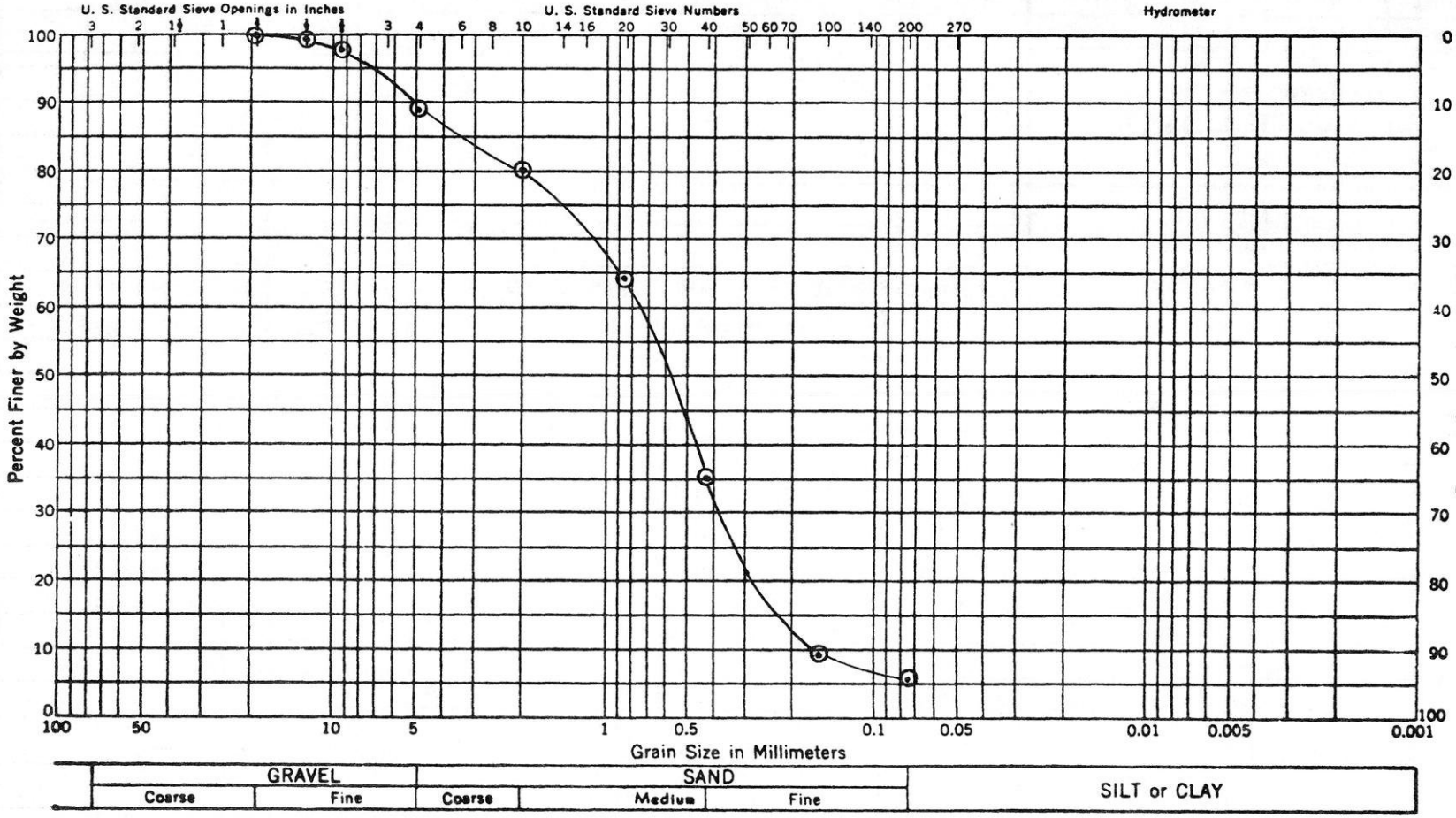
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13	11.3				Slightly silty fine to coarse gravel
S-1					(GP-GM)
152-153.5'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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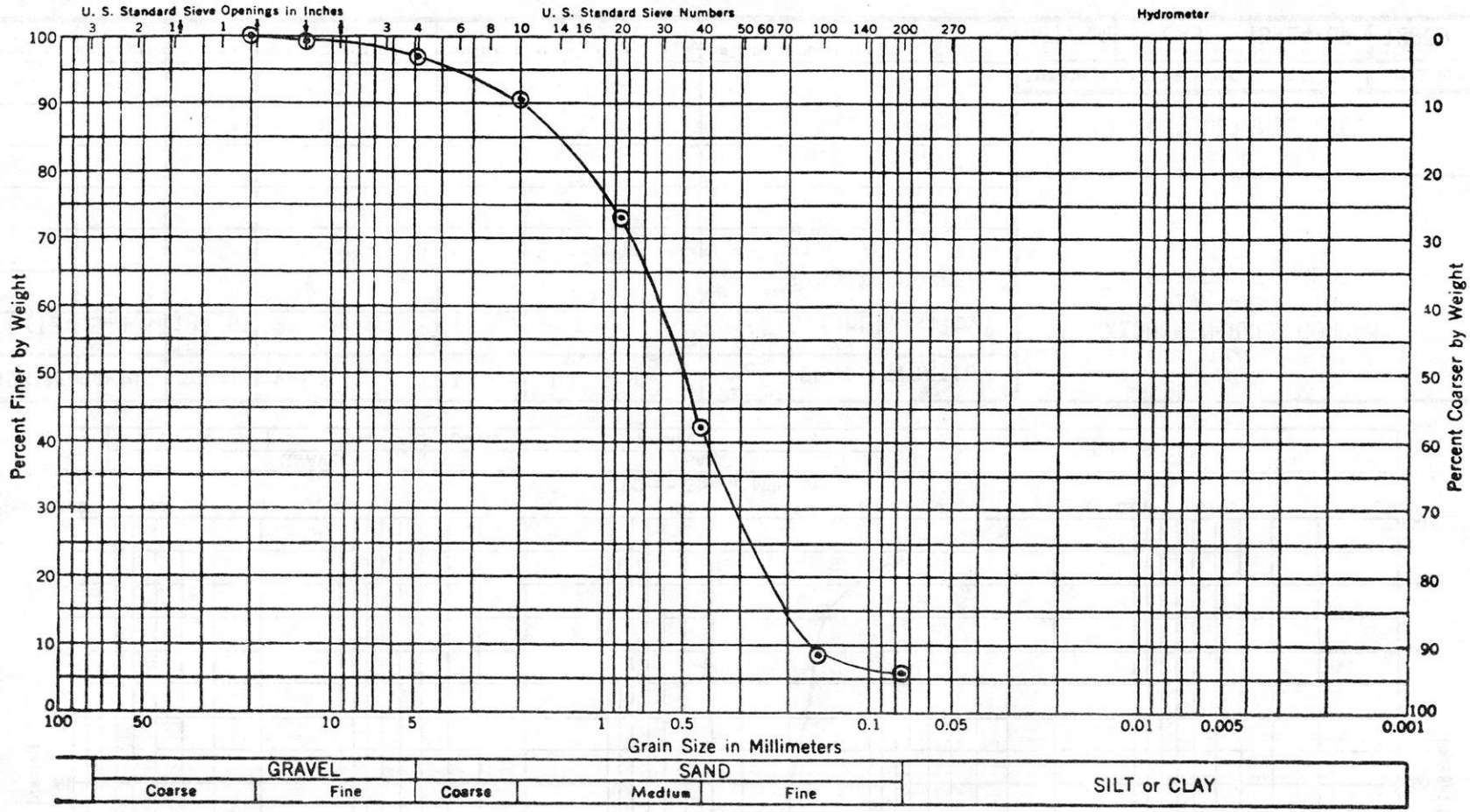
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13	S-2	162-163.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 12.0

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SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-23-84	12959

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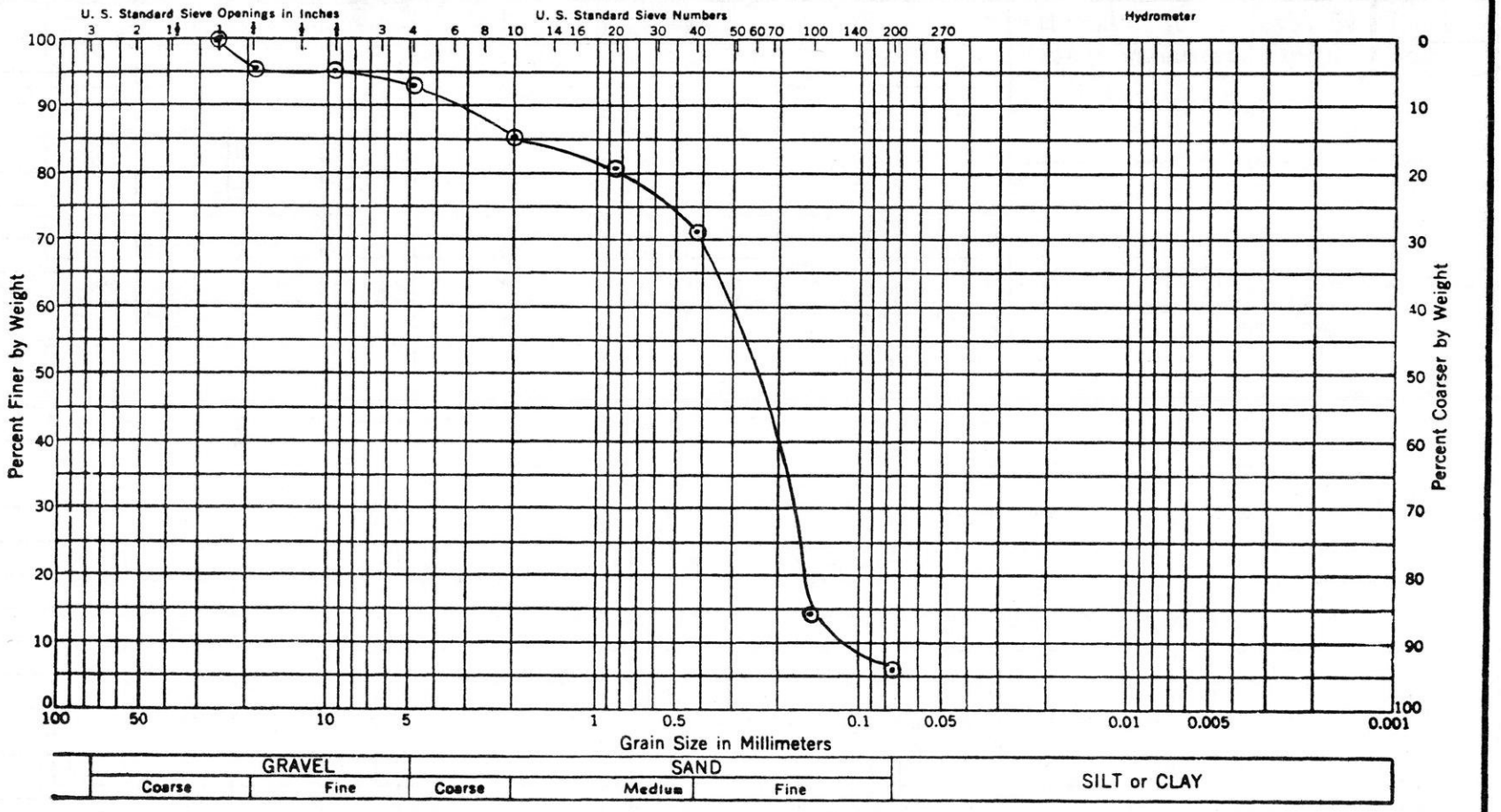
BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13	S-3	172-173.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 17.9

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SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-23-84	12959

BBS12478



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13	S-4	183-184.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 18.6

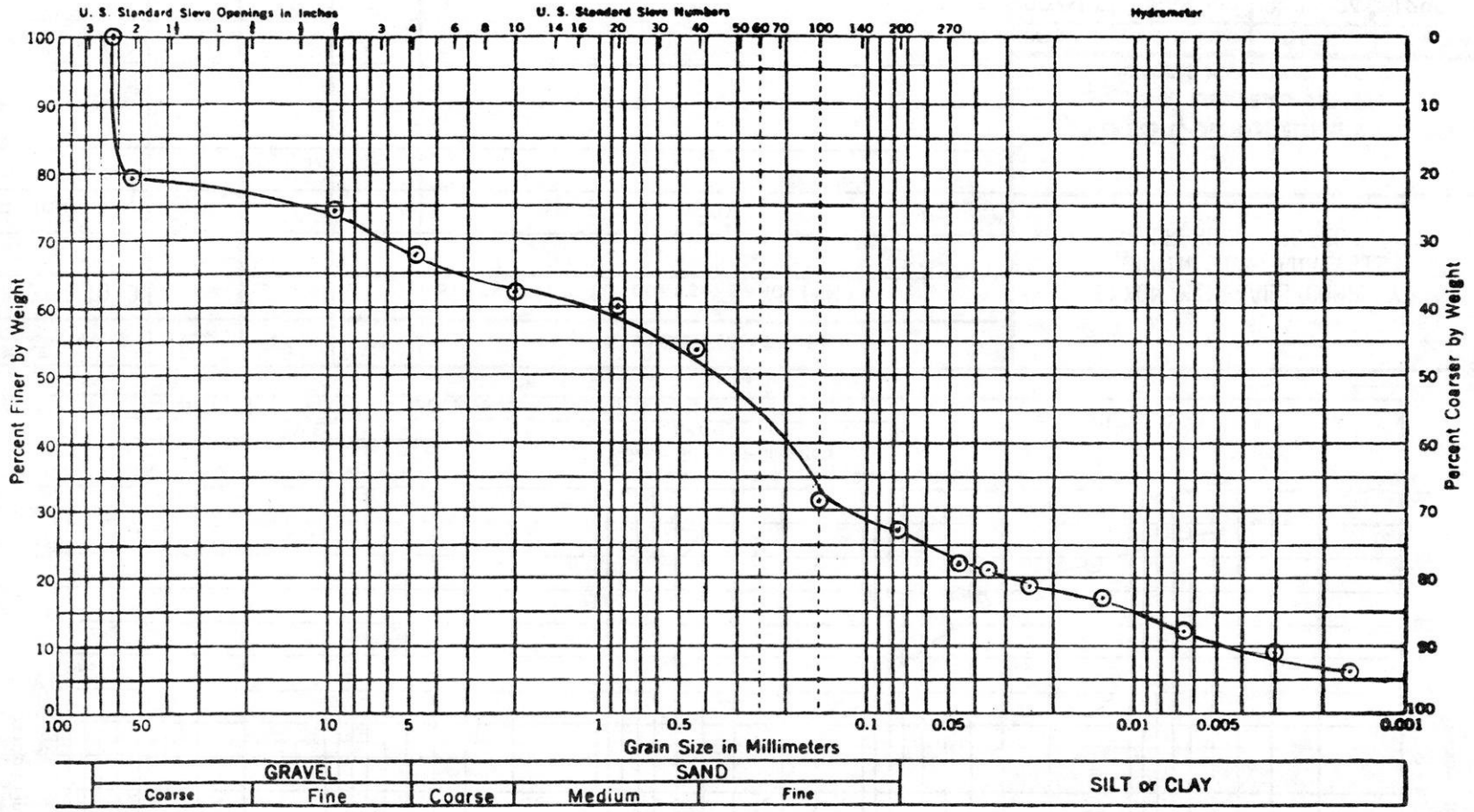
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13	12.2				Silty fine to coarse sand (SM)
S-5					
194-195'					

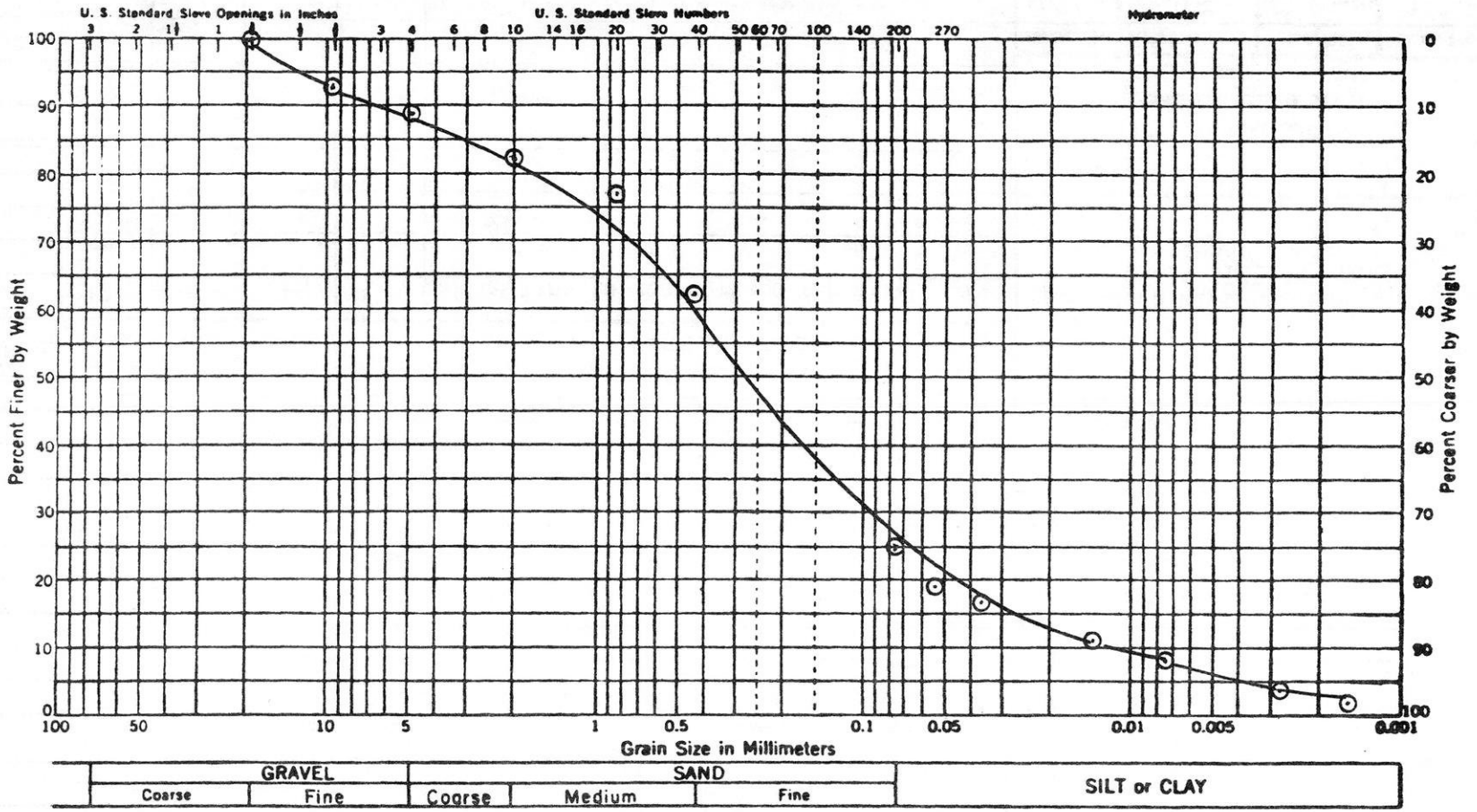
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



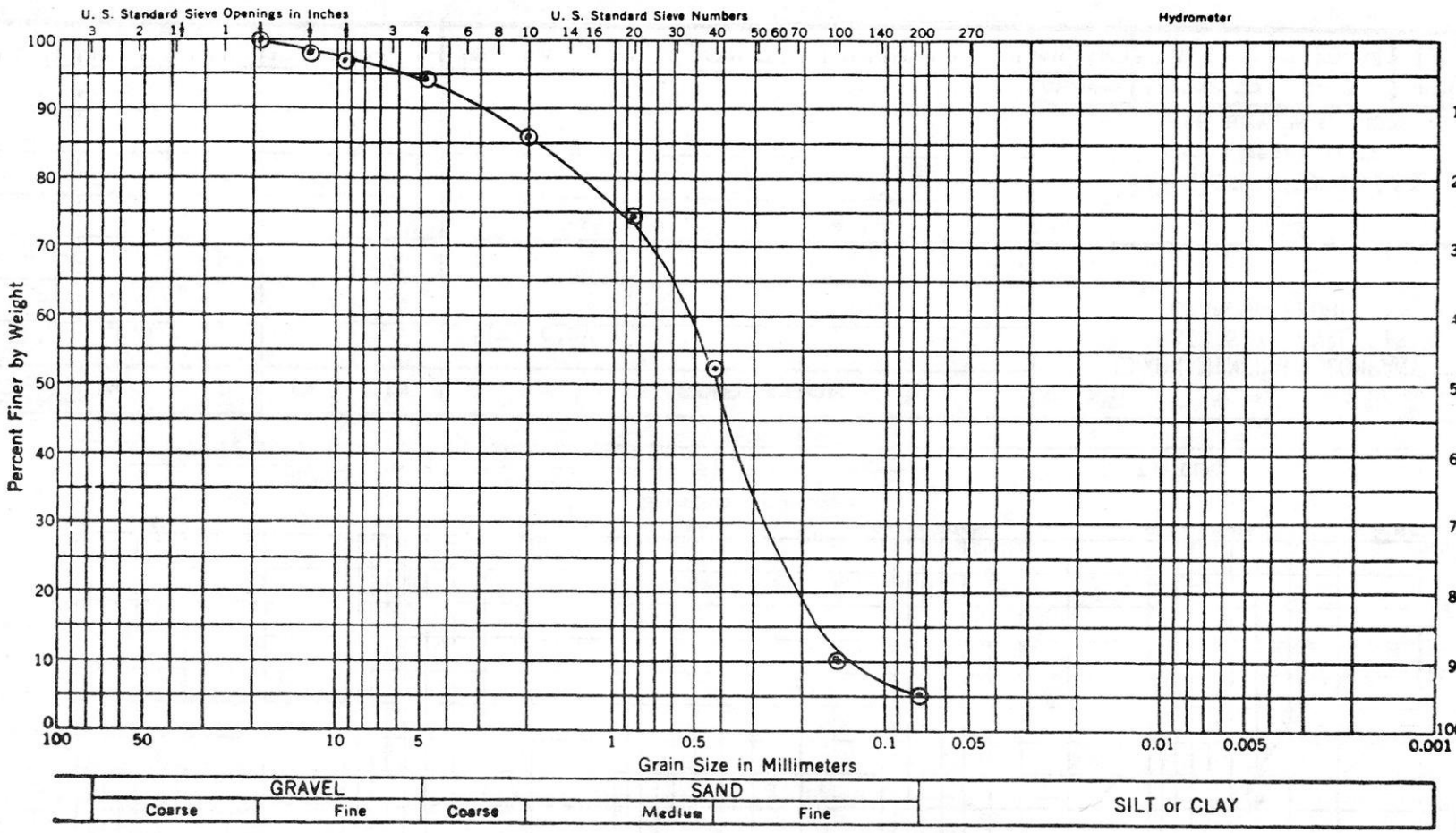
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13	10.3				Silty fine to coarse sand (SM)
S-6					
205-206'					

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GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302



BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX13	S-7B	215.6 216.5'							Slightly silty fine to coarse sand (SM-SP)
									W.C. 16.0

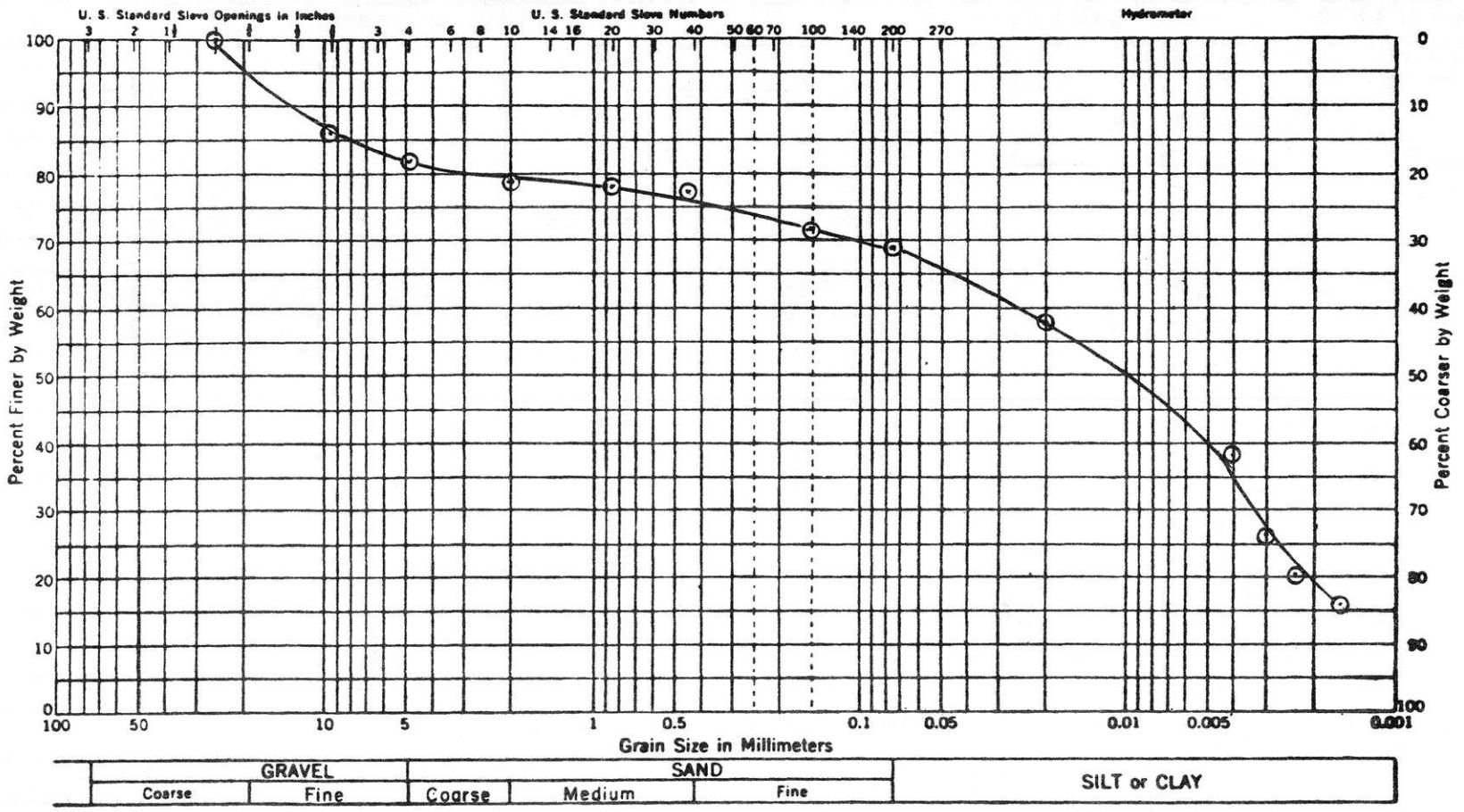
EXXON MINERALS COMPANY
SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX13	26.1				Silty clay (CL)
S-8					
226-226.5'					

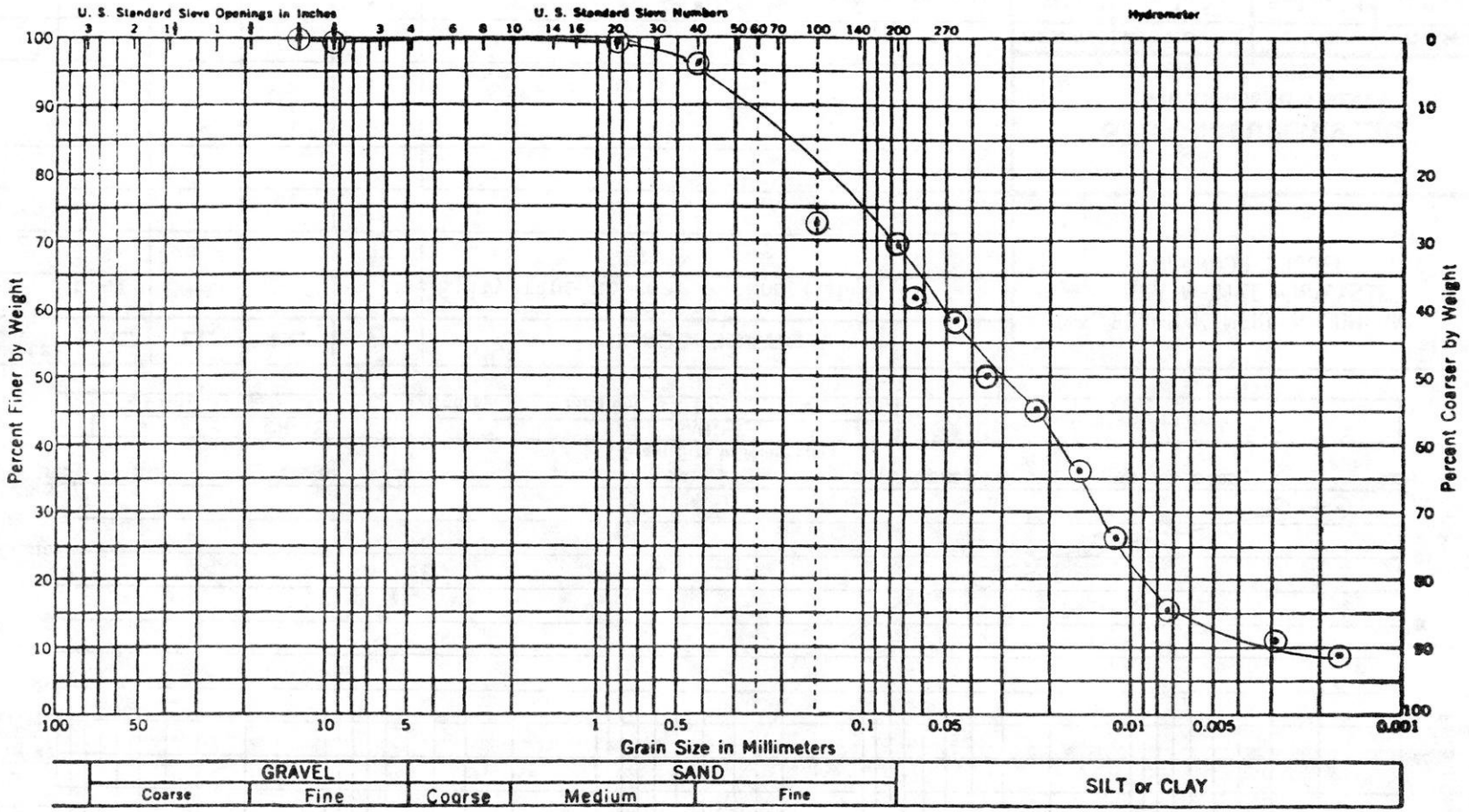
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

STS Consultants Ltd.
540 LAMBEAU STREET
GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	21.3%				Clayey silt (ML)
S-1					
2-4'					

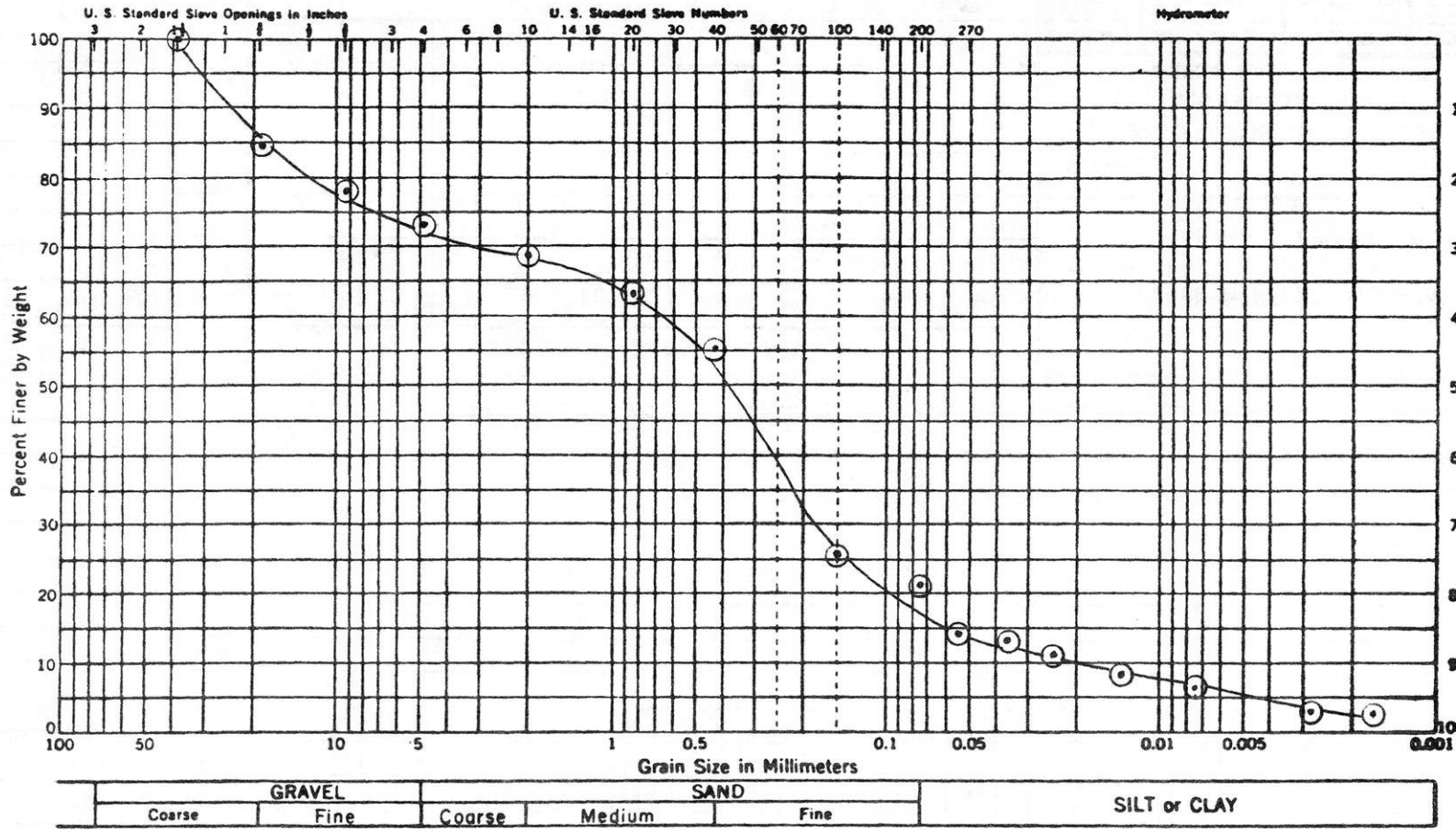
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	6.4%				Silty fine to coarse sand (SM)
S-2					
10-12'					

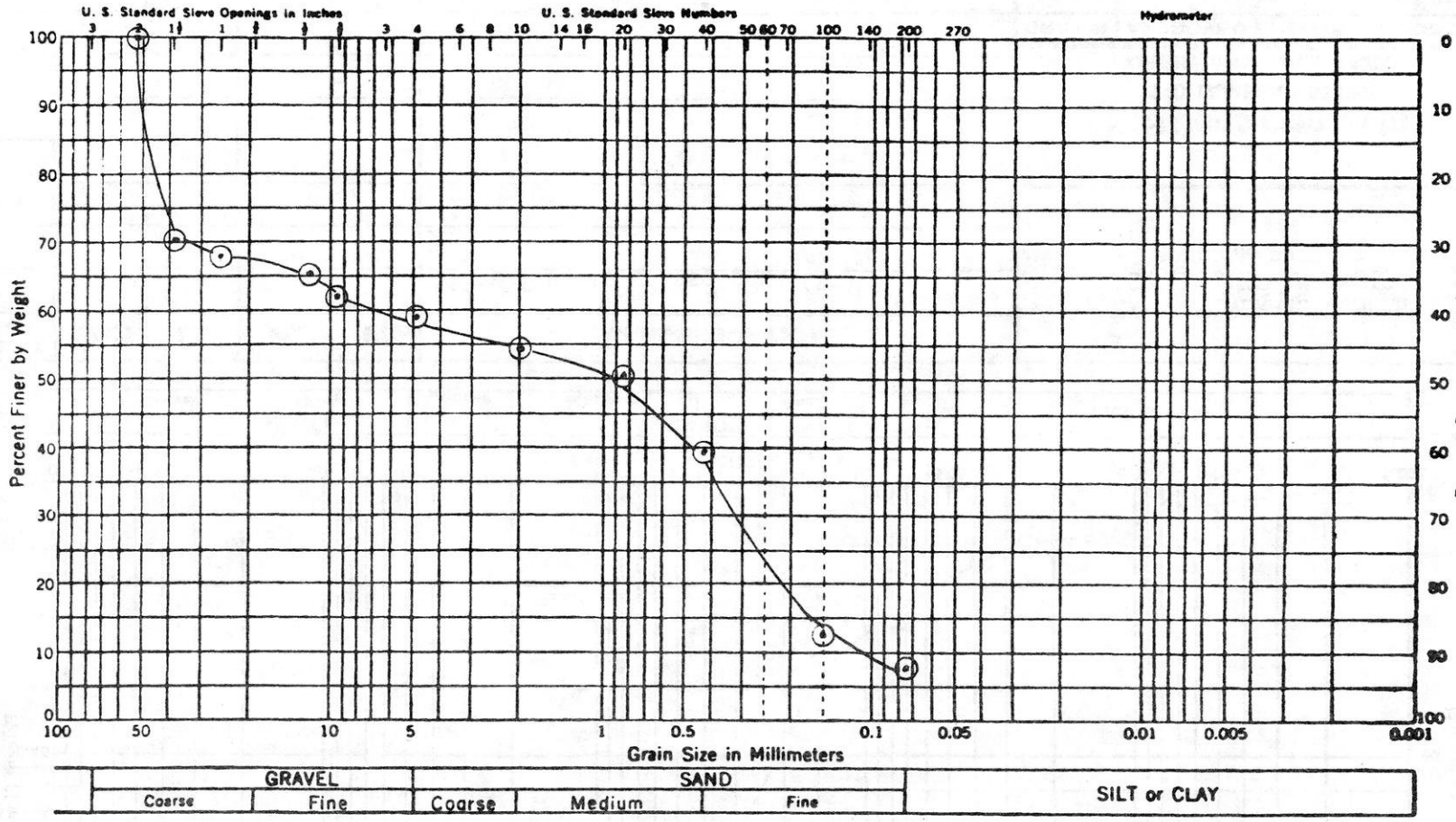
EXXON MINERALS COMPANY
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	9.0%				Slightly silty fine to coarse sand (SM-SP)
S-3					
21-22'					

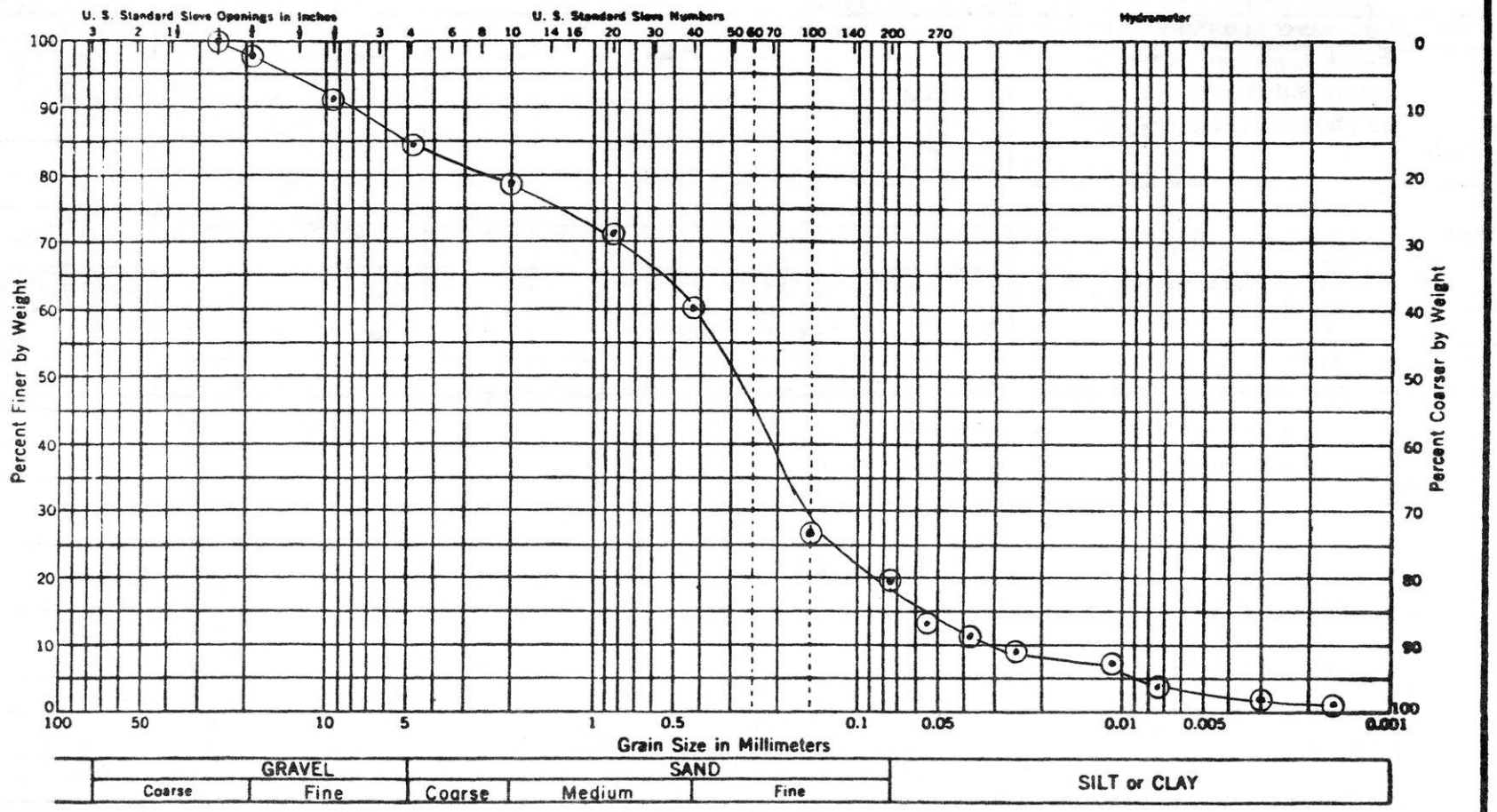
EXXON MINERALS COMPANY
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SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	7.2%				Silty fine to coarse sand (SM)
S-4					
30-31.5'					

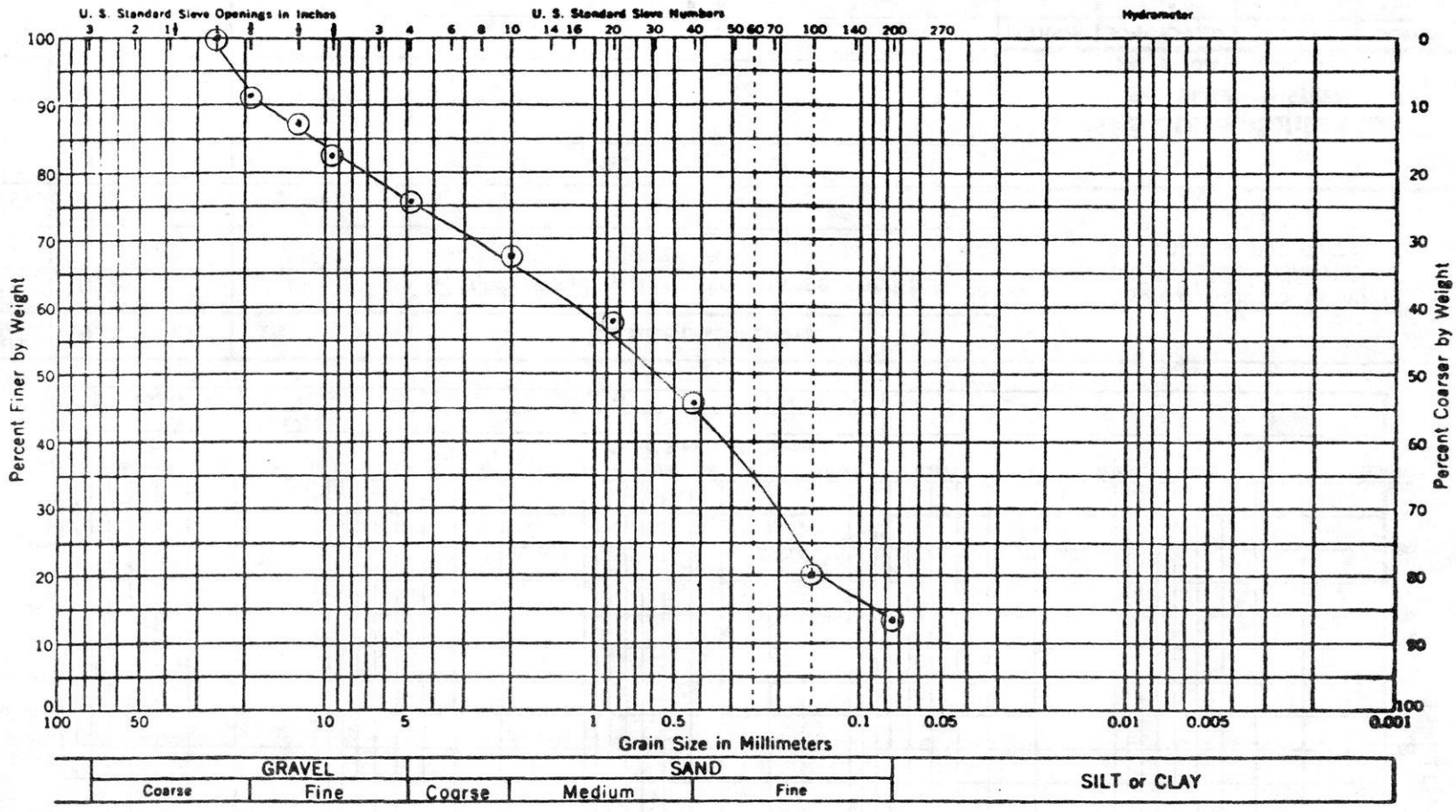
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CRANDON PROJECT

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SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	5.9%				Silty fine to coarse sand (SM)
S-5					
40-41.5'					

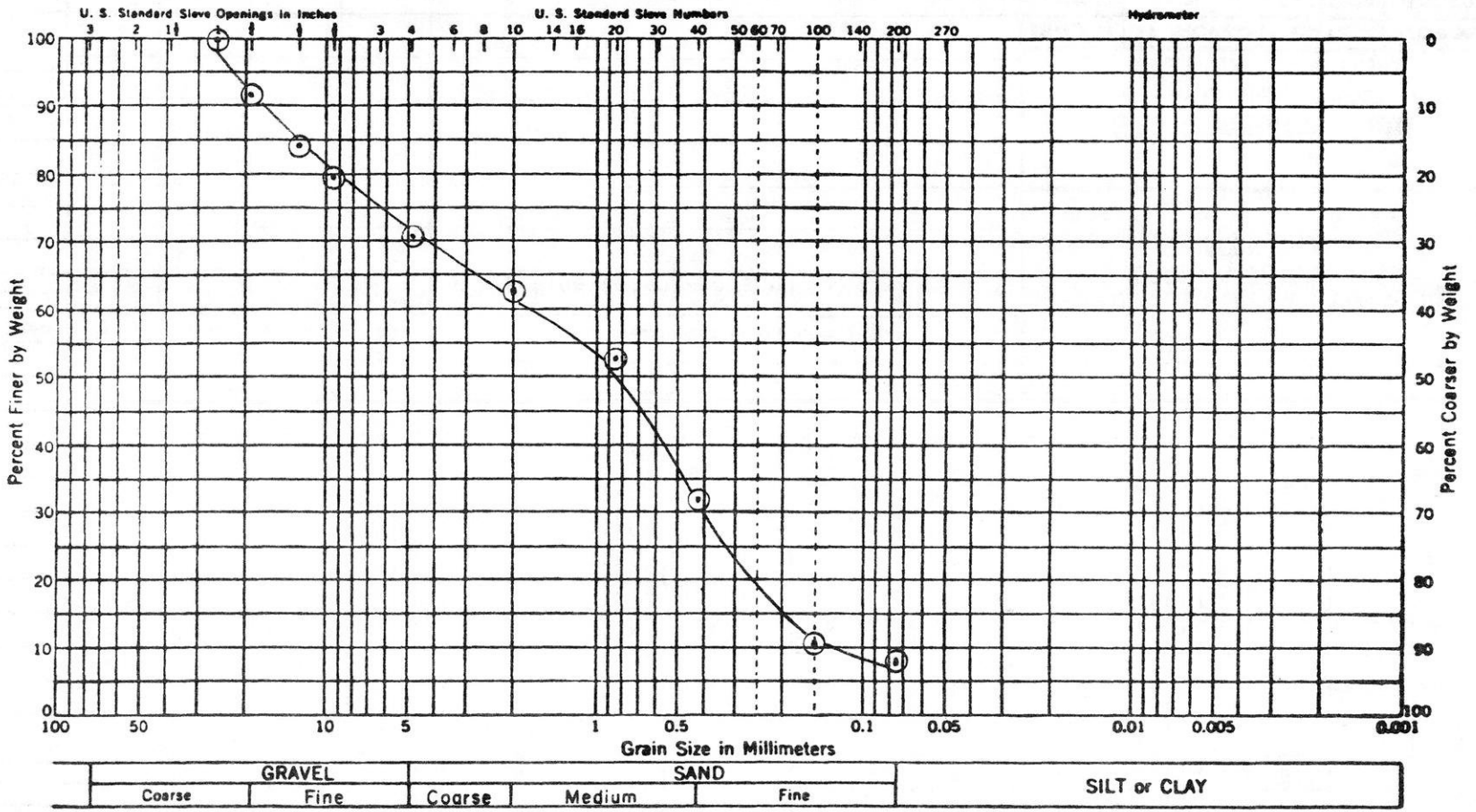
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SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	10.2%				Slightly silty fine to coarse sand (SM-SP)
S-6					
50.9-	51.9'				

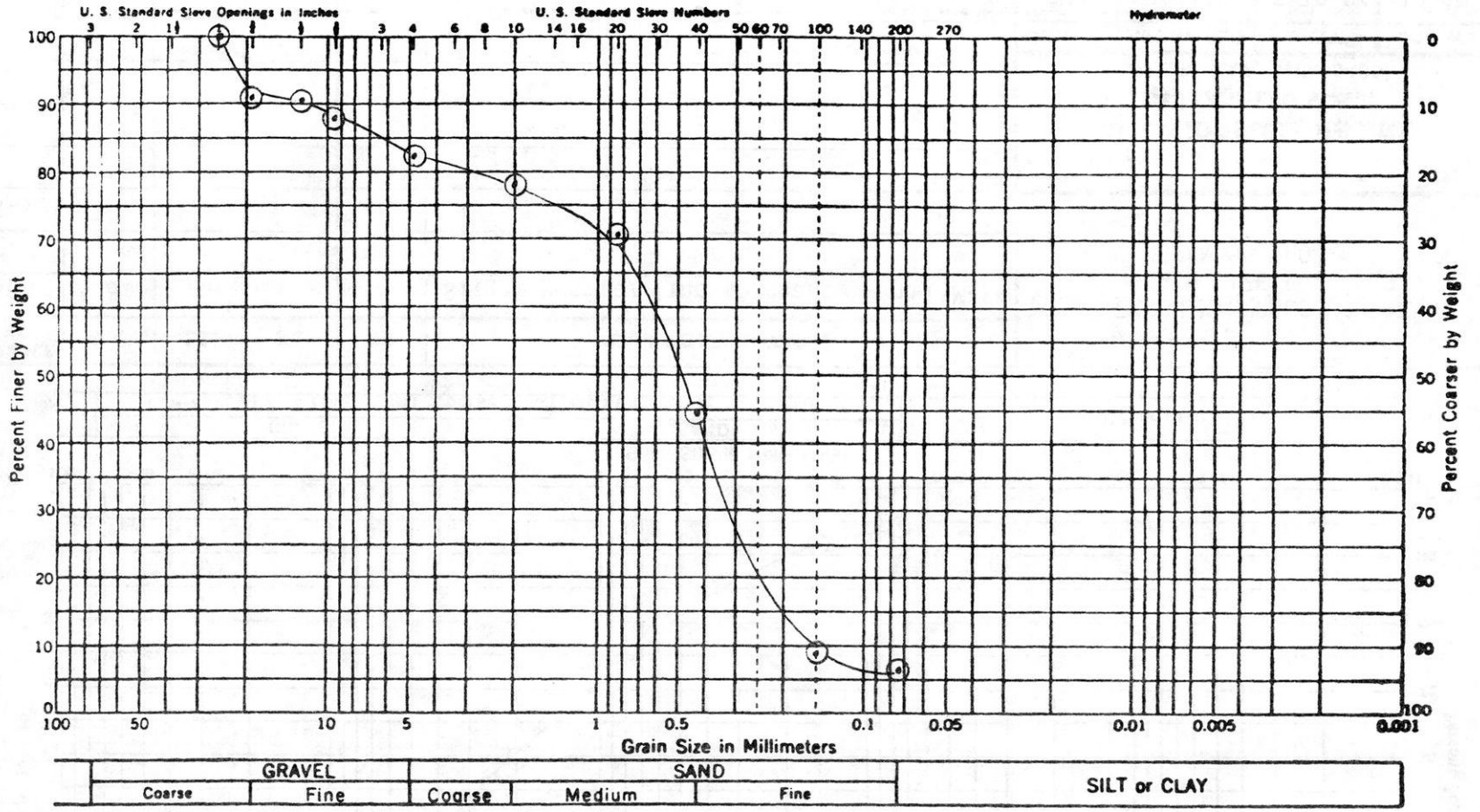
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SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	10.6%				Slightly silty fine to coarse sand (SM-SP)
S-7					
60.5-62.0'					

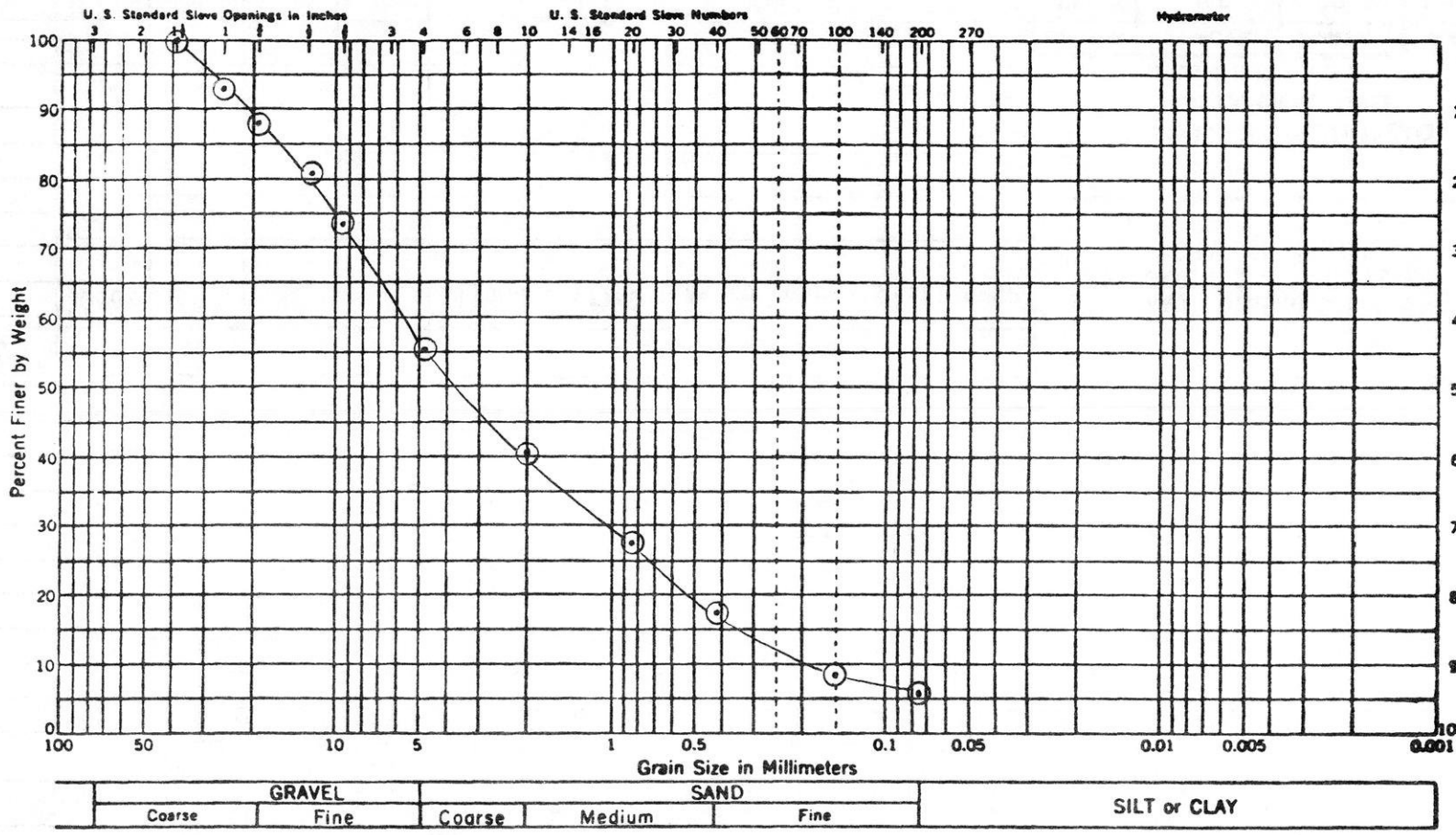
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



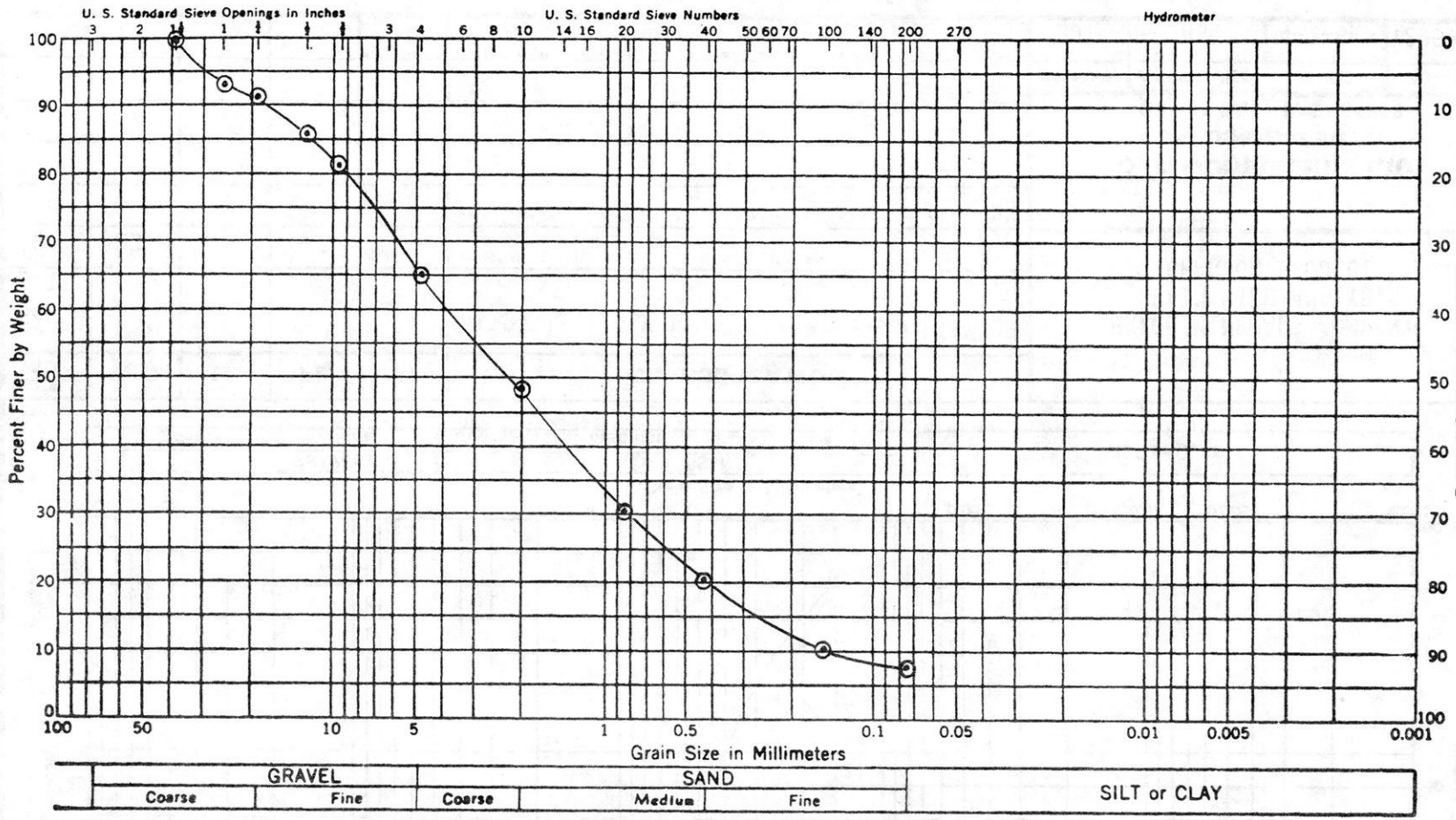
SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX14	5.6%				Slightly silty fine to coarse sand (SM-SP
S-8					
71-73'					

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DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	5-18-84	12959

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BORING	SAMPLE	DEPTH	SYMBOL	D_{10}	D_{30}	D_{60}	C_u	C_c	CLASSIFICATION
EX14	S-9	81-82'							Slightly silty fine to coarse sand (SM-SP)

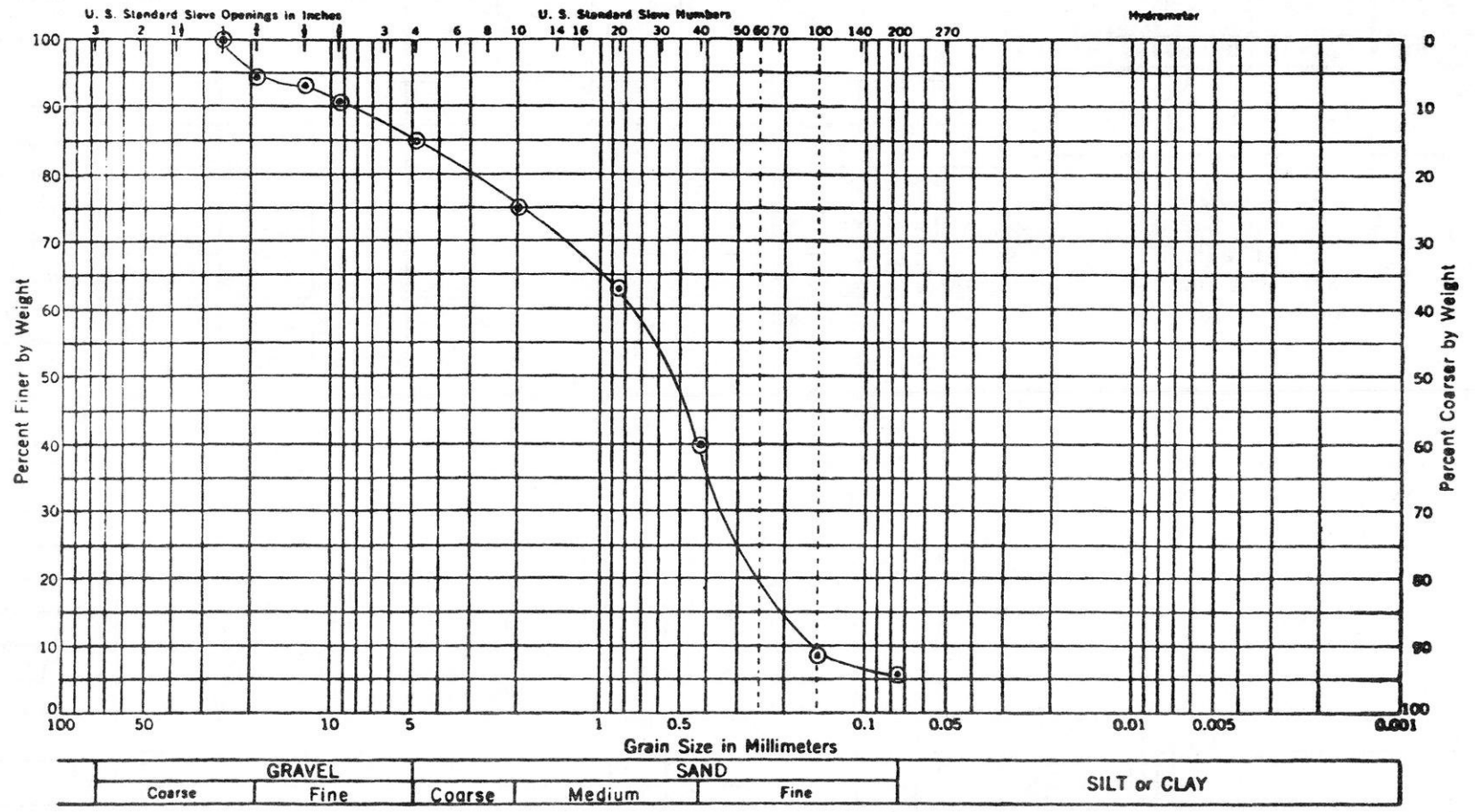
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SIEVE ANALYSIS
CRANDON PROJECT

STS CONSULTANTS LTD.

DRAWN	APPROVED	DATE	JOB No.
JJT/SMD	JAS	3-24-84	12959

BBS12478

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	11.2				Slightly silty fine to coarse sand (SM-SP)
S-11					
101.5-103.5'					

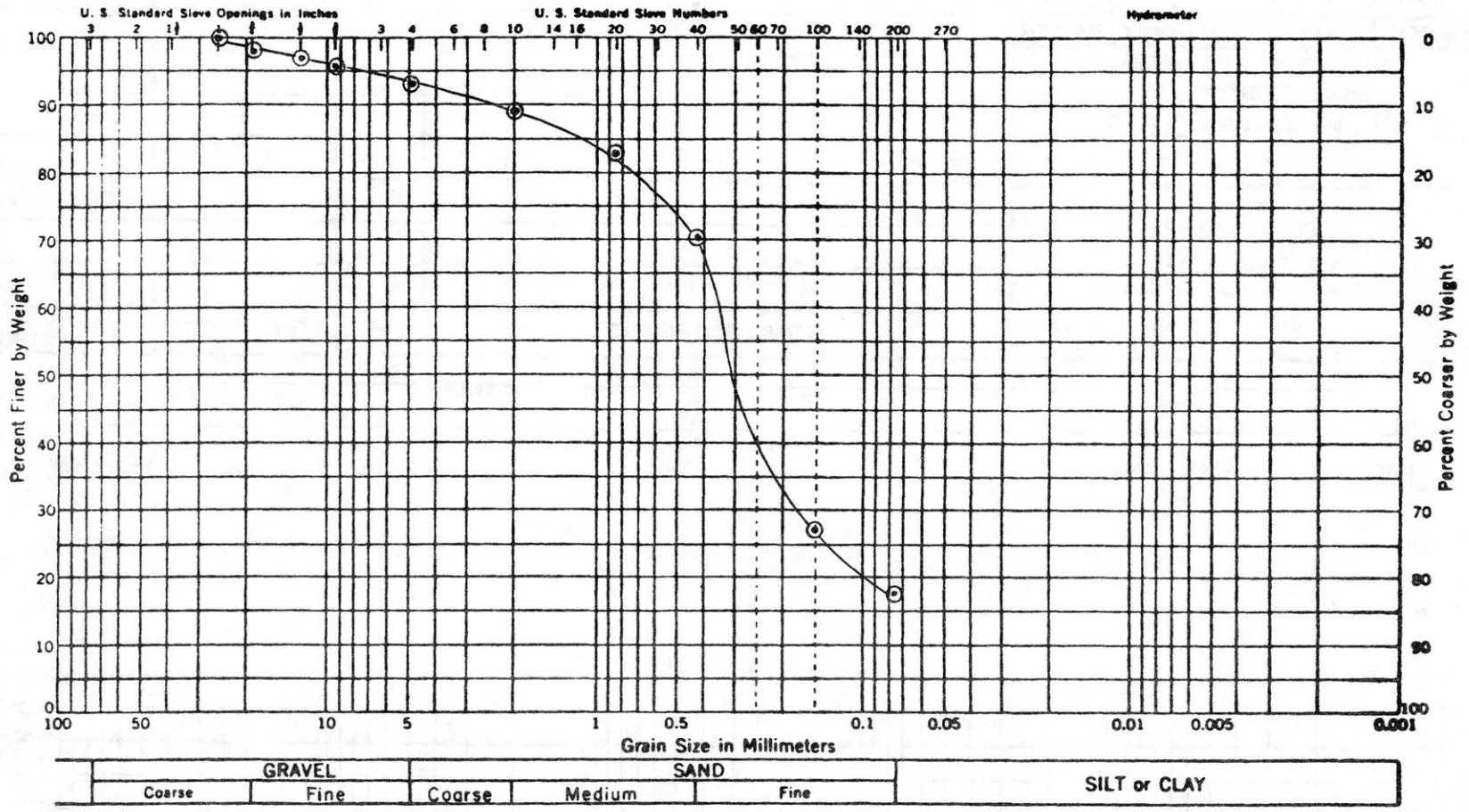
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	9.1				Silty fine to coarse sand (SM)
S-13					
122.0-124.0'					

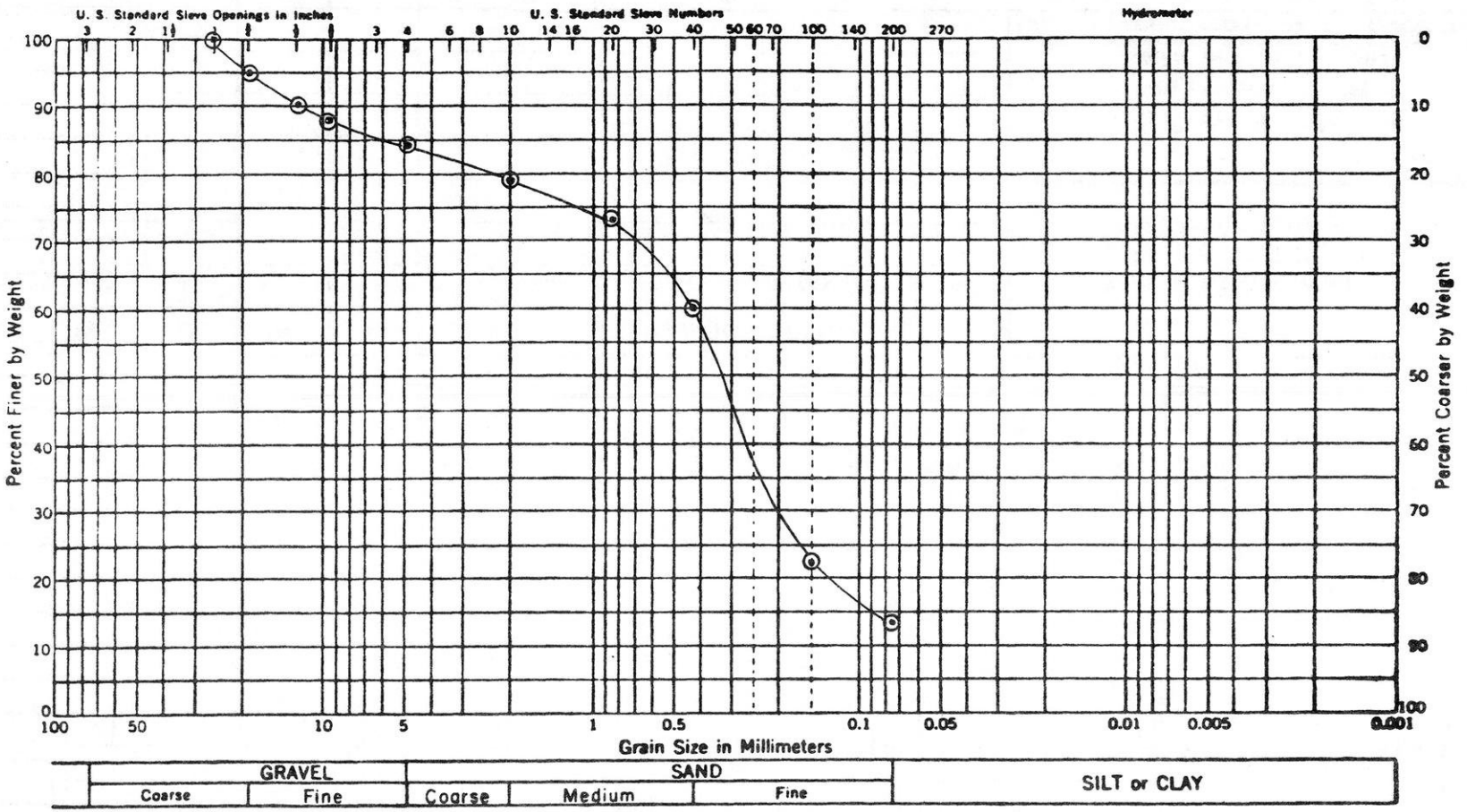
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	7.5				Silty fine to coarse sand (SM)
S-15					
142.5-144.5'					

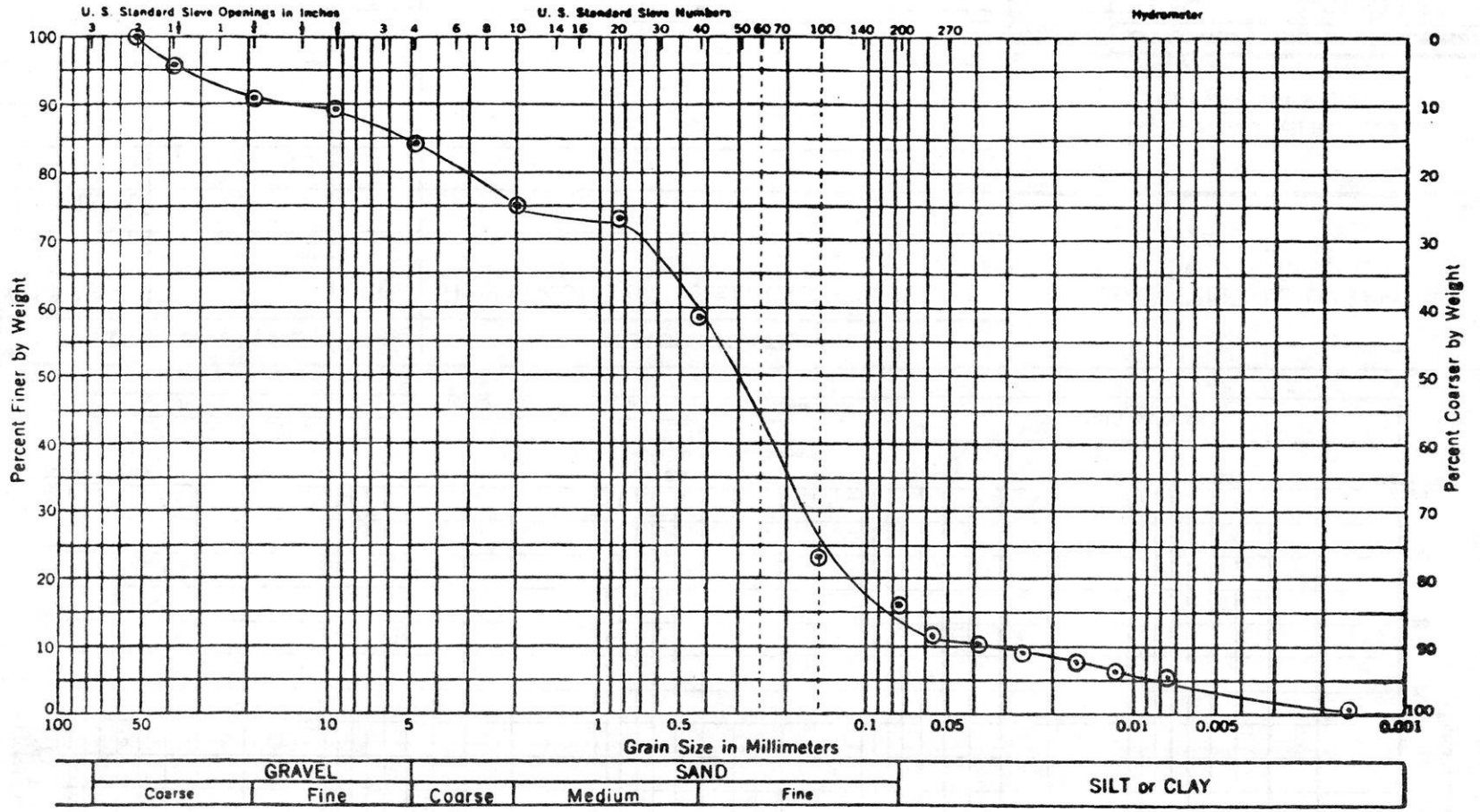
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	9.5				Silty fine to coarse sand (SM)
S-18					
173.0-175.0					

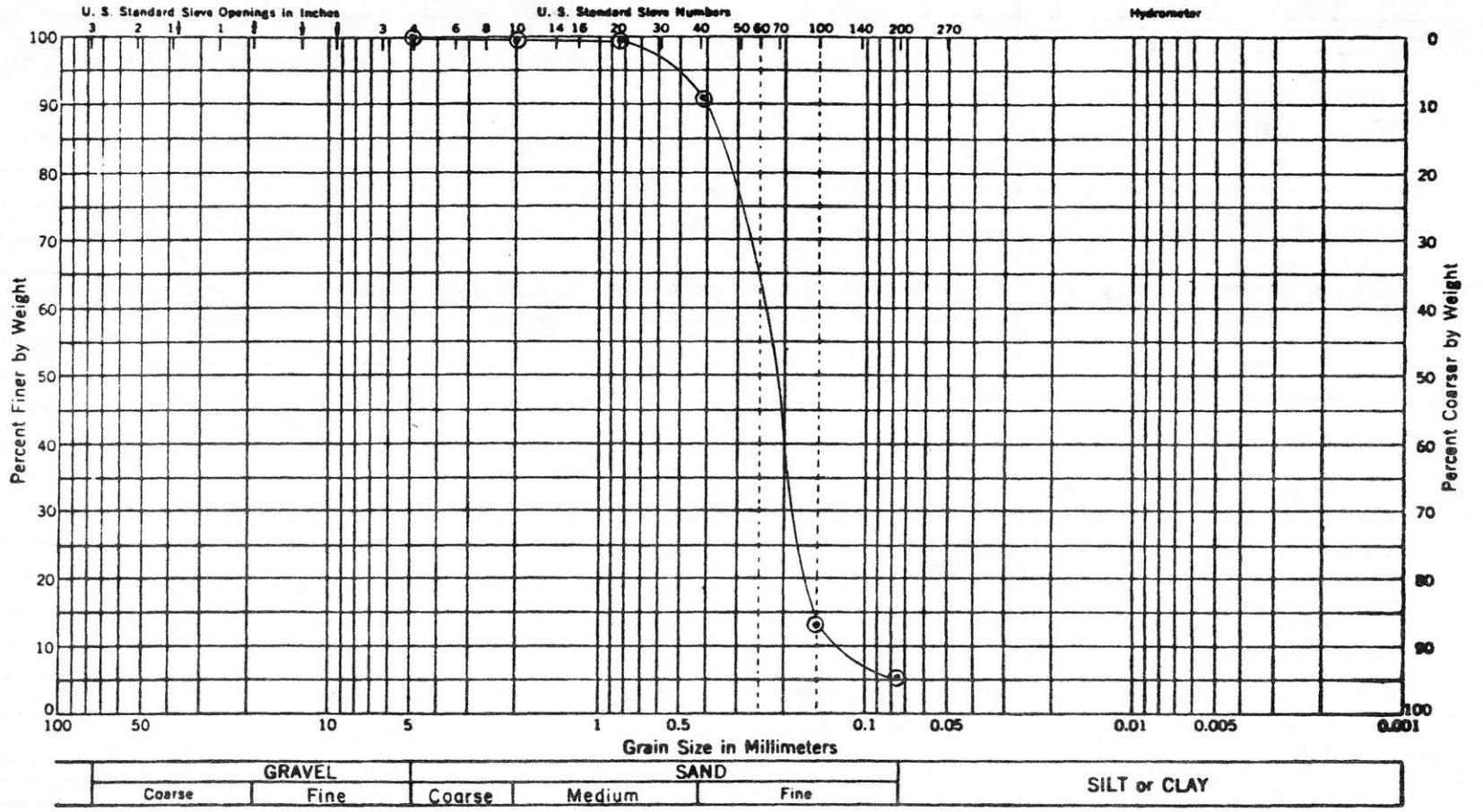
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	16.8				Slightly silty fine sand (SM-SP)
S-19					
183.5-185.5'					

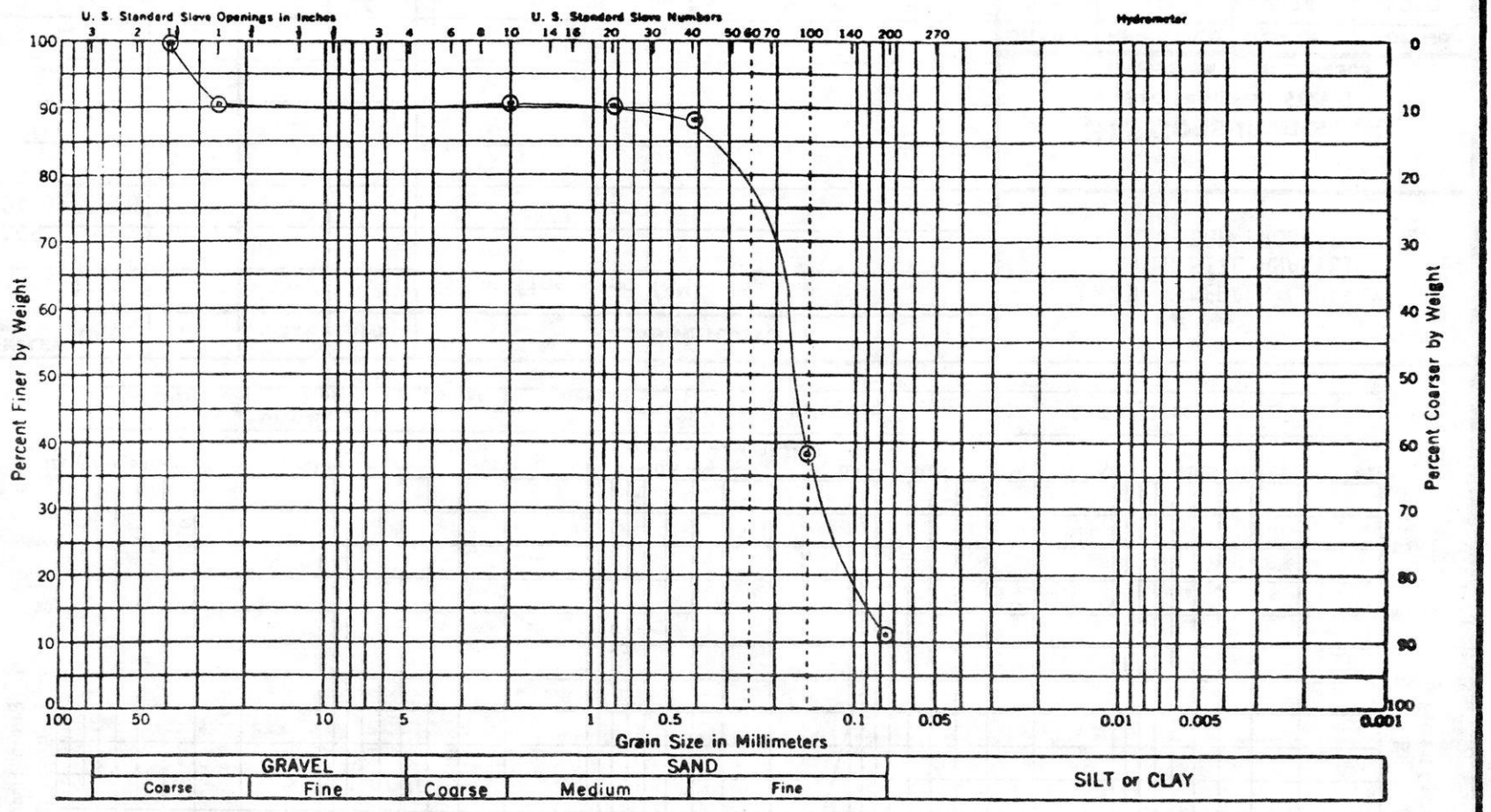
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	17.8				Slightly silty fine to medium sand (SM-SP)
S-22					
214.0-215.5'					

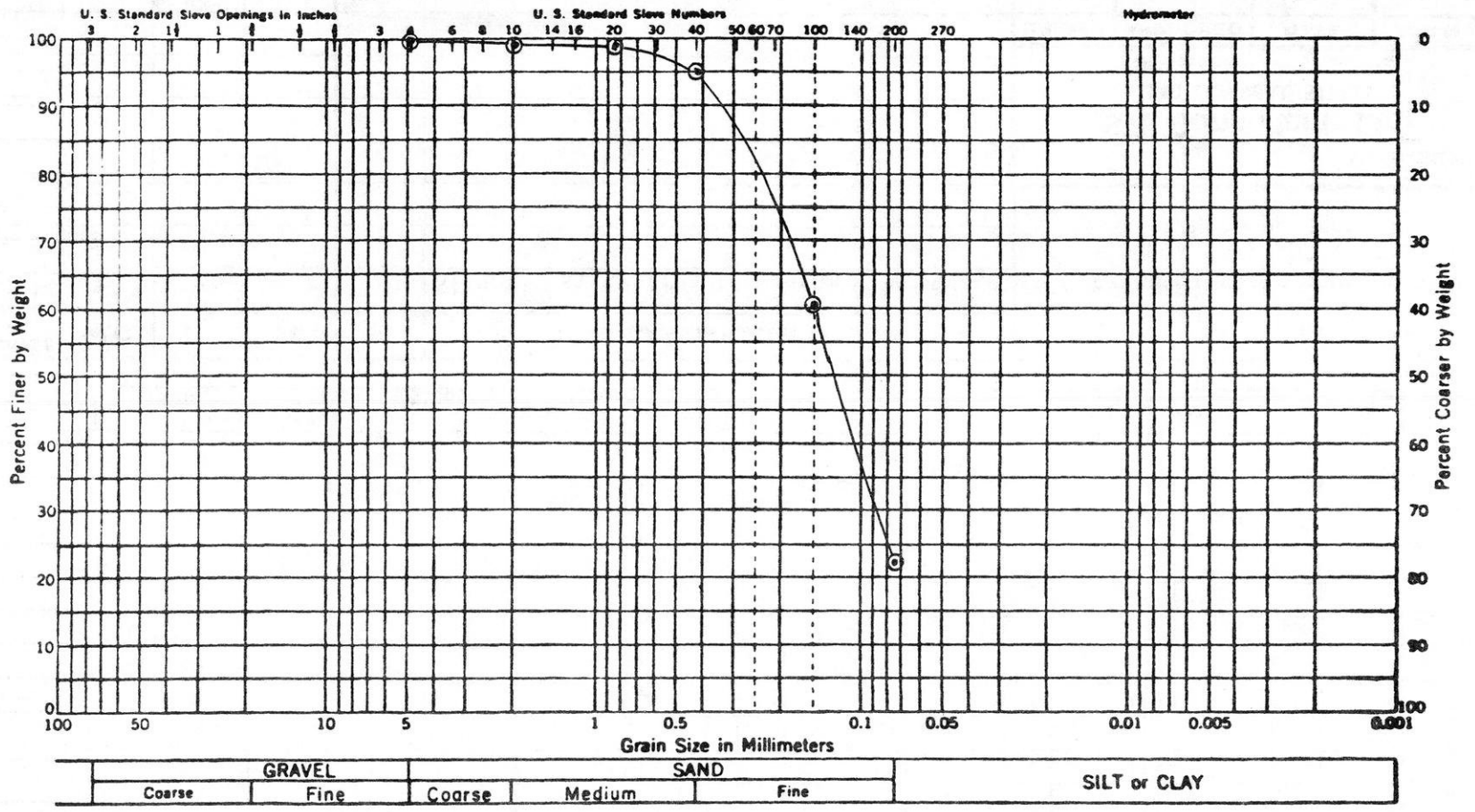
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	18.6				Silty fine sand (SM)
S-23					
224.5-226.0'					

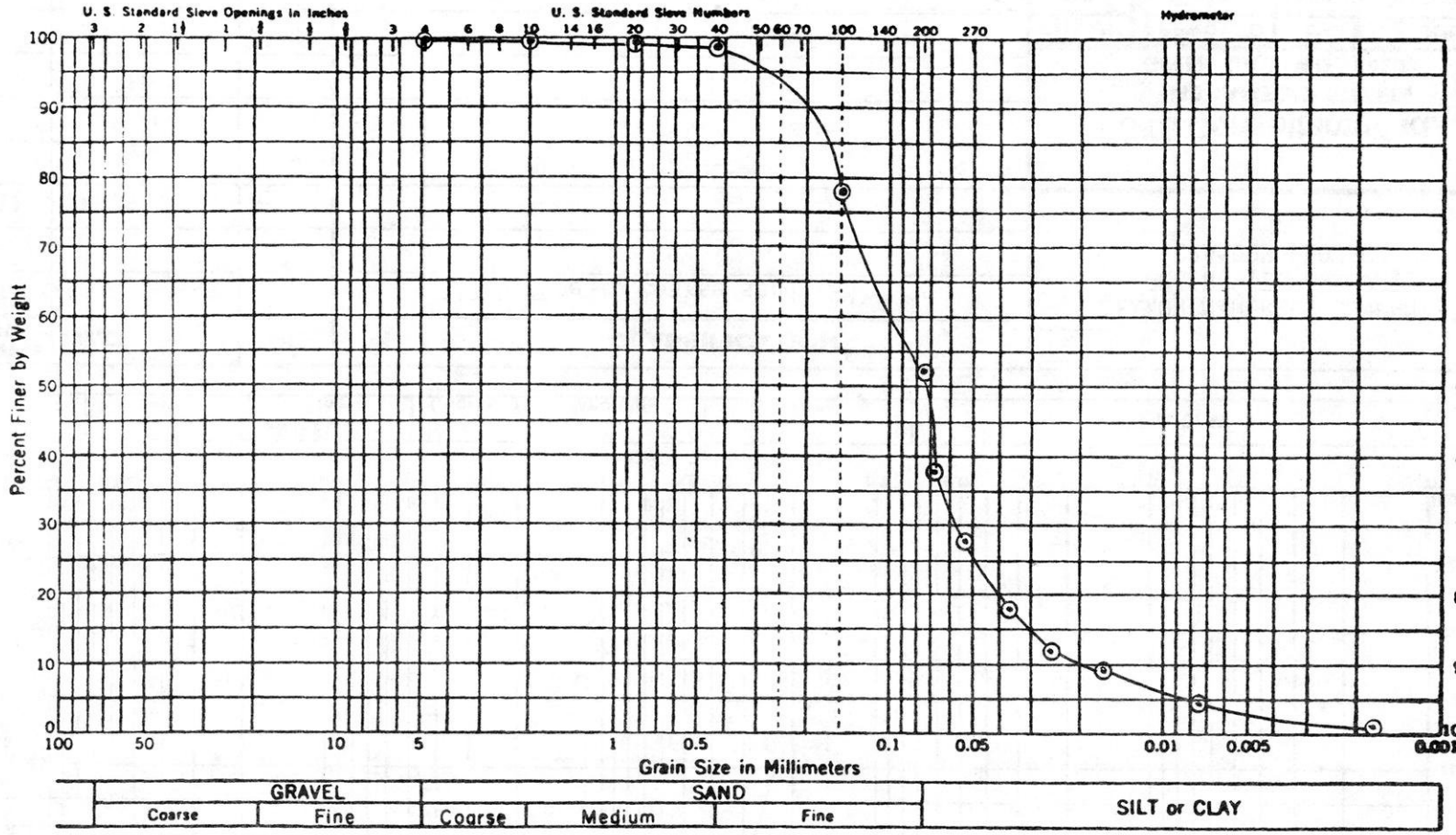
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	20.0				Fine sandy silt (ML)
S-25					
245.0-246.0'					

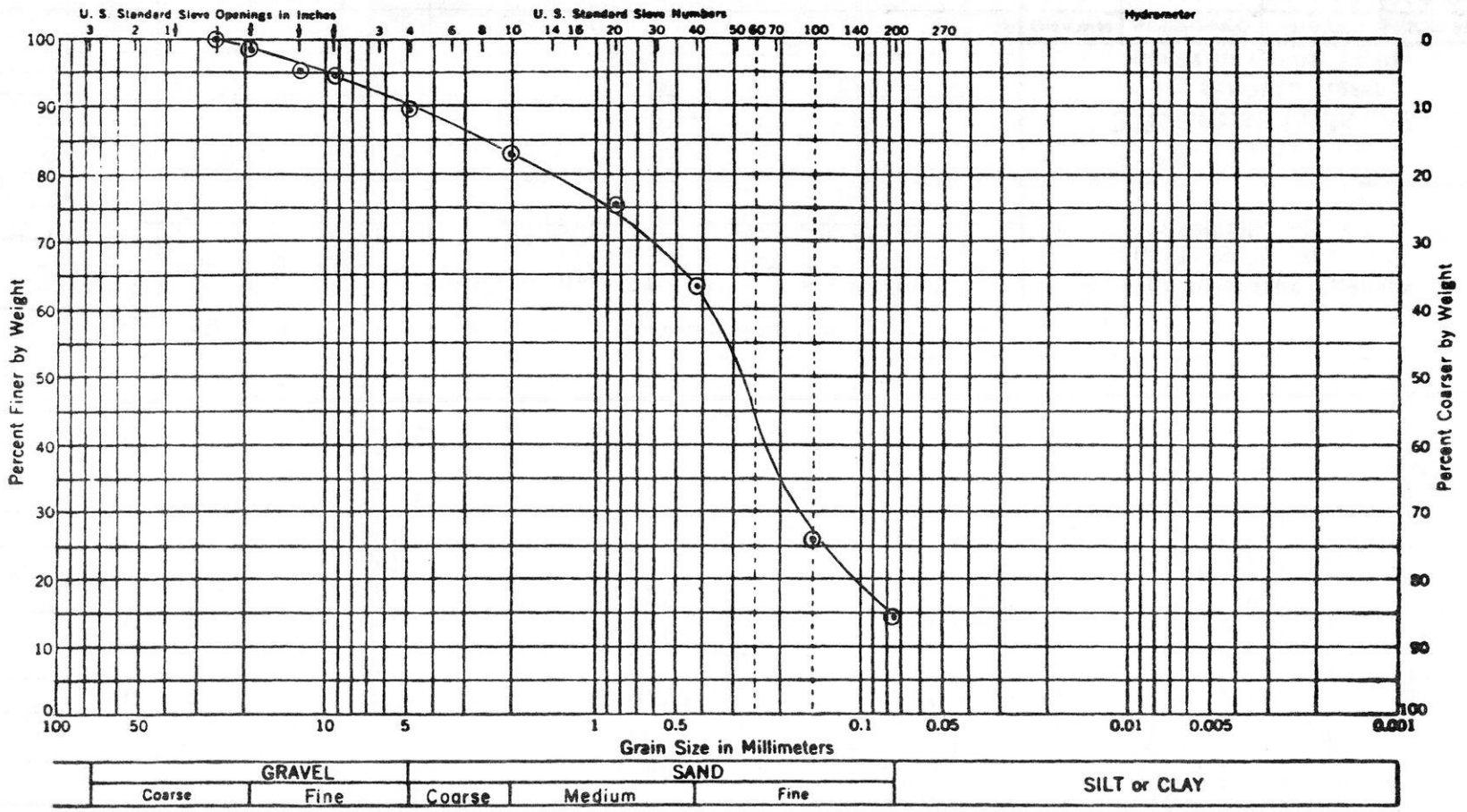
EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	13.7				Silty fine to coarse sand (SM)
S-27					
264.5-266.5'					

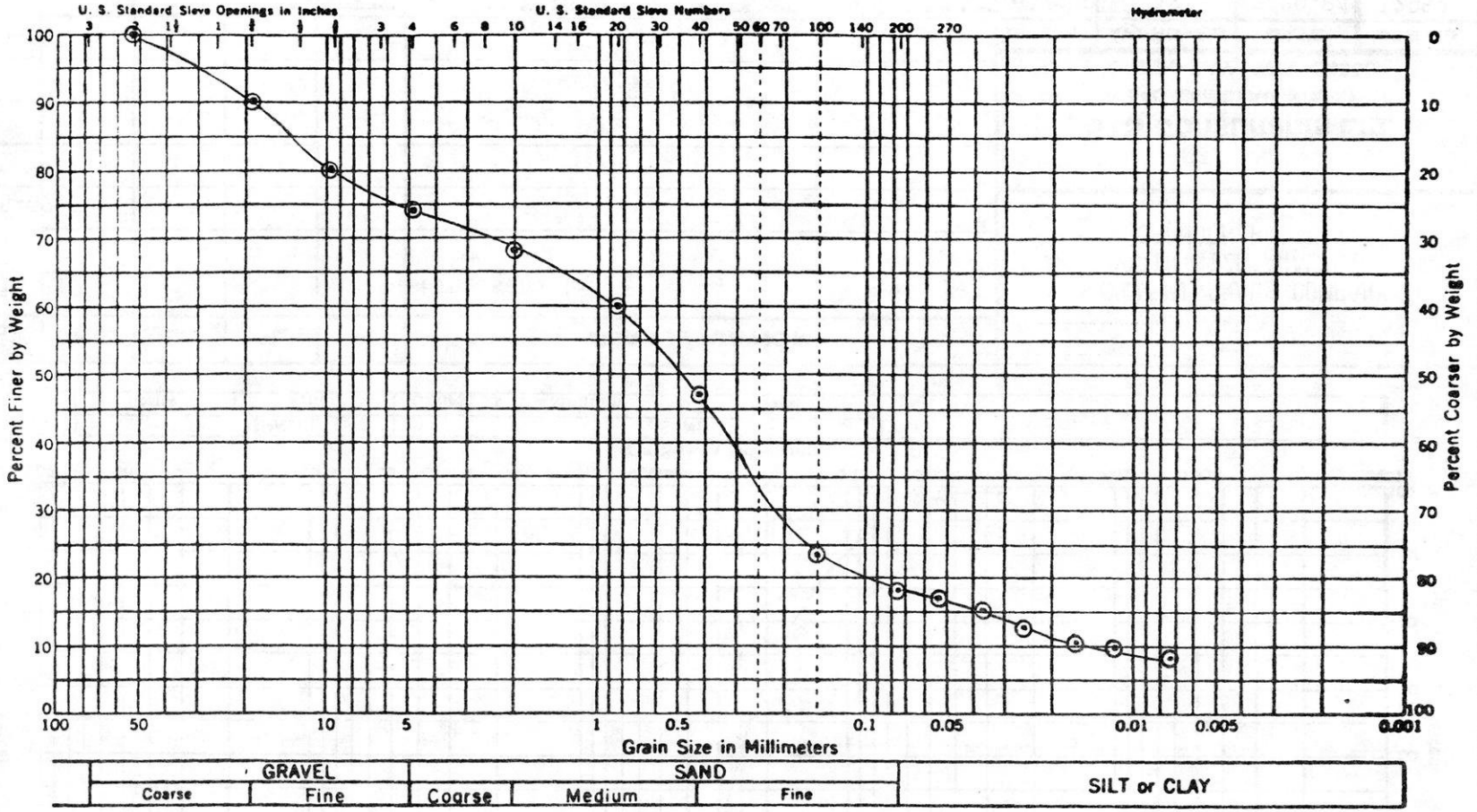
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JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX-14	7.6				Silty fine to coarse sand (SM)
S-28					
276.0-277.5'					

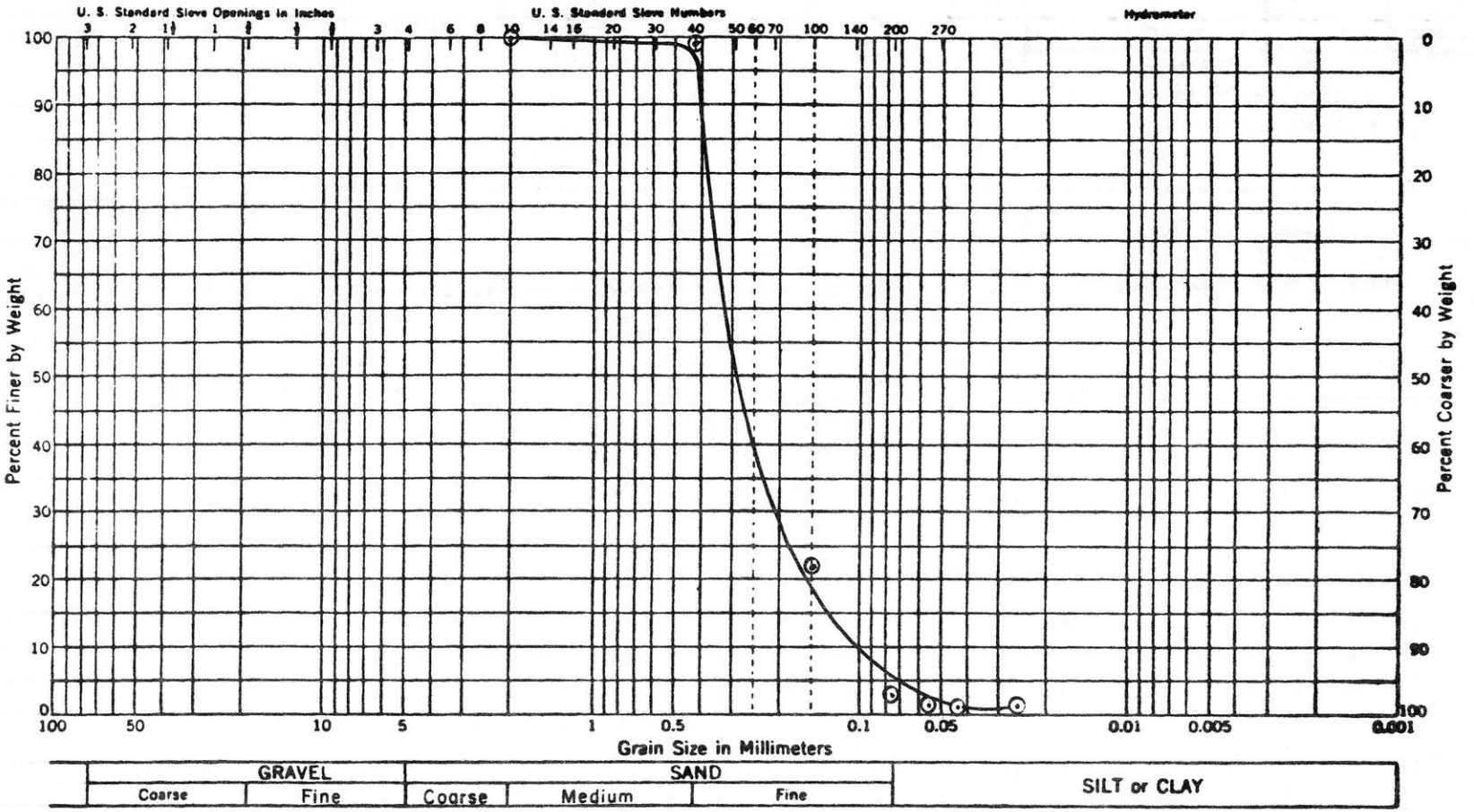
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
JJT	JAS	4-2-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX15	19.4				Fine sand (SP)
S-1					
61.5-63.5'					

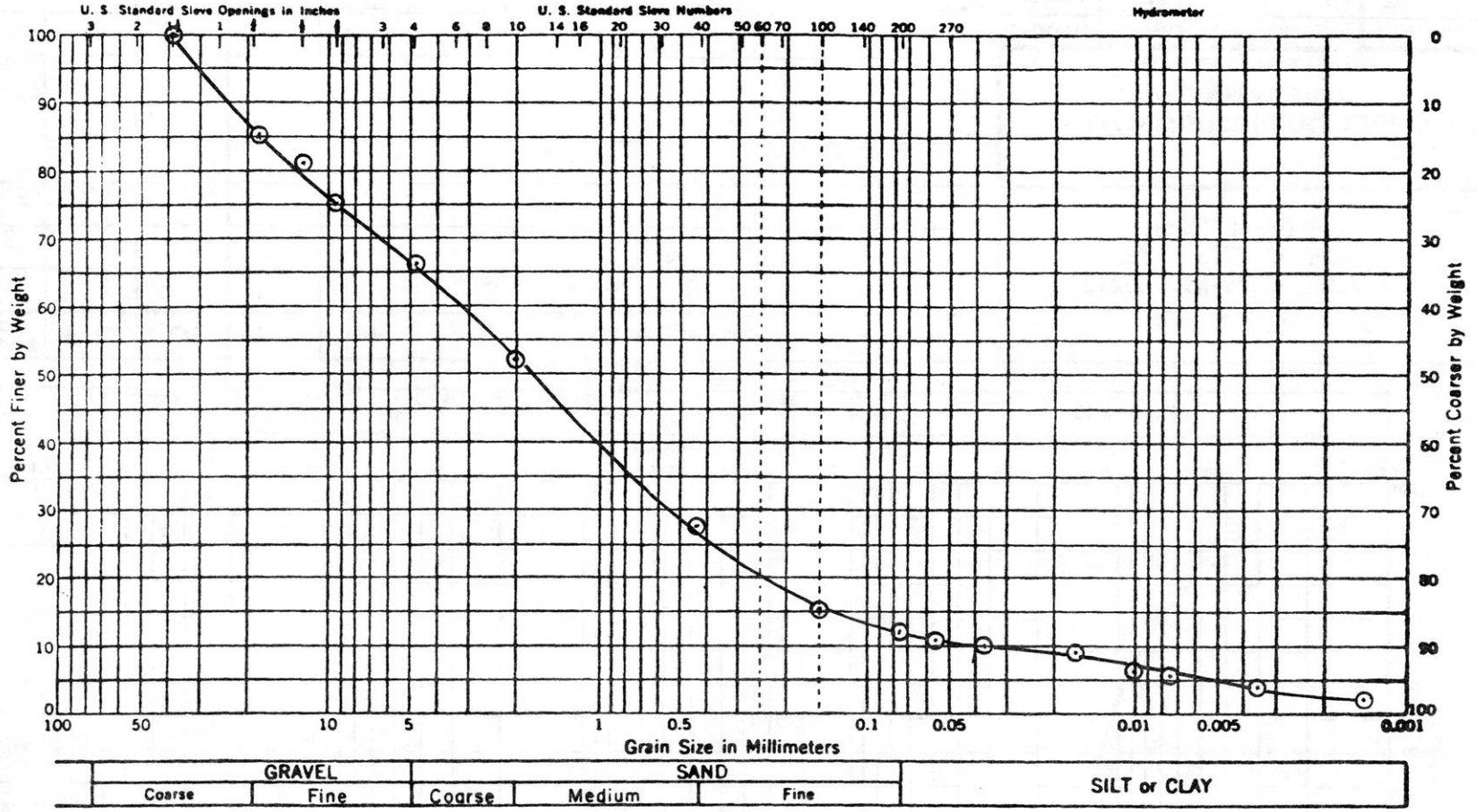
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX15					Silty fine to coarse sand (SM)
S-2					
122.5-124.5'					

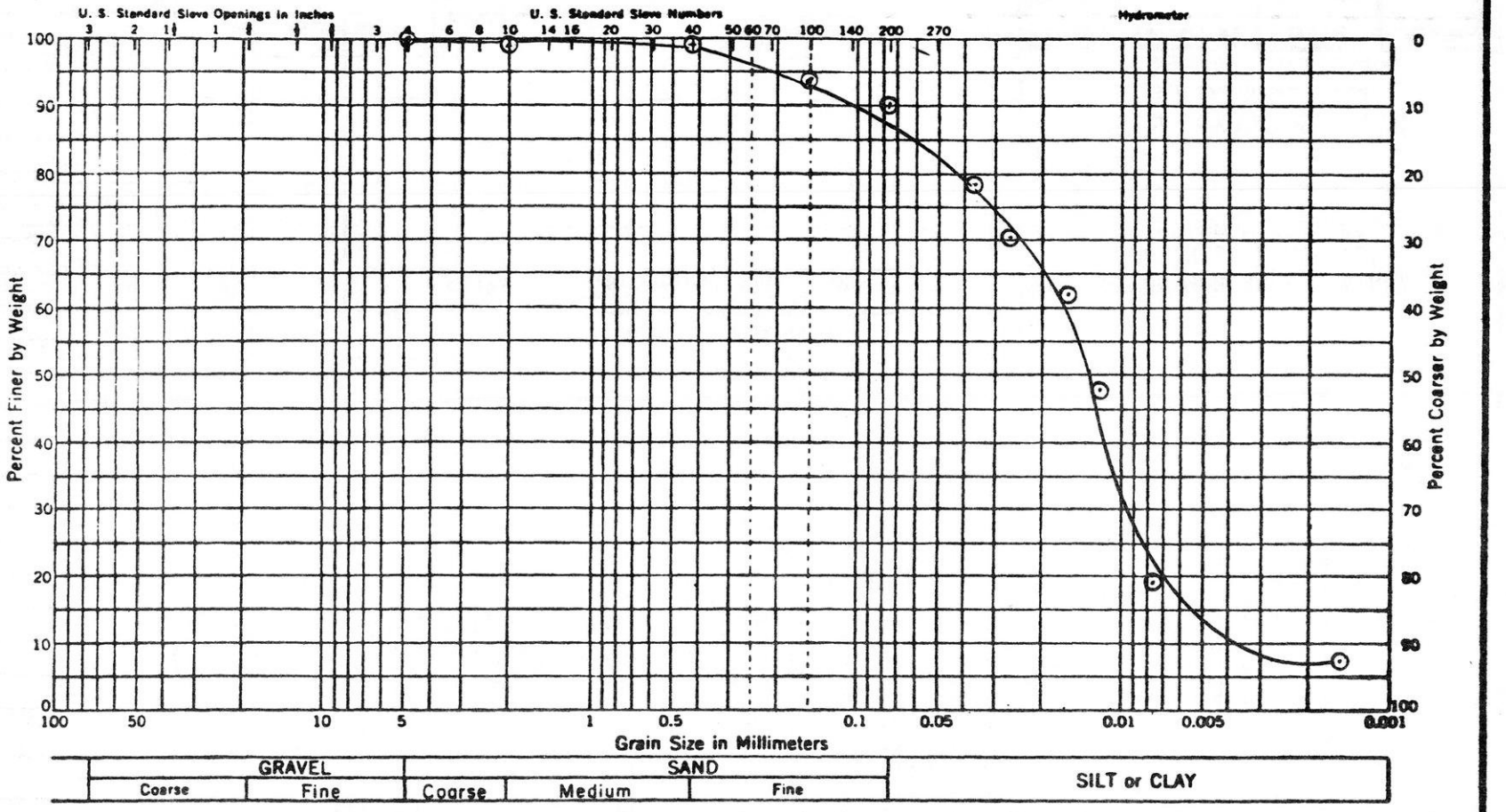
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX15	21.8				Clayey silt (ML)
S-3					
184.5-186.5'					

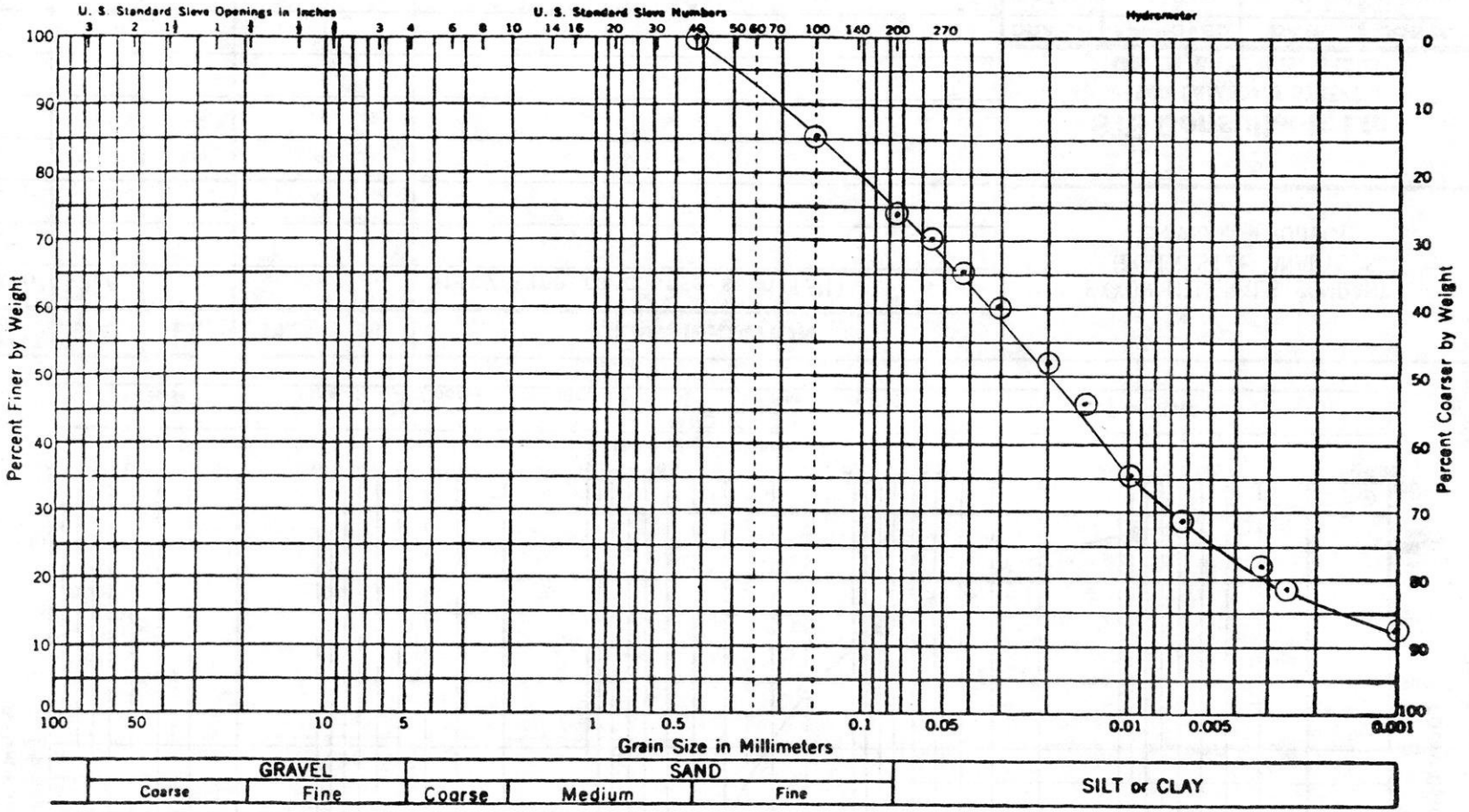
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KOO/SMD	JAS	3-20-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX15	14.3%				Clayey silt (ML) -
S-4					
222.5-224.5'					

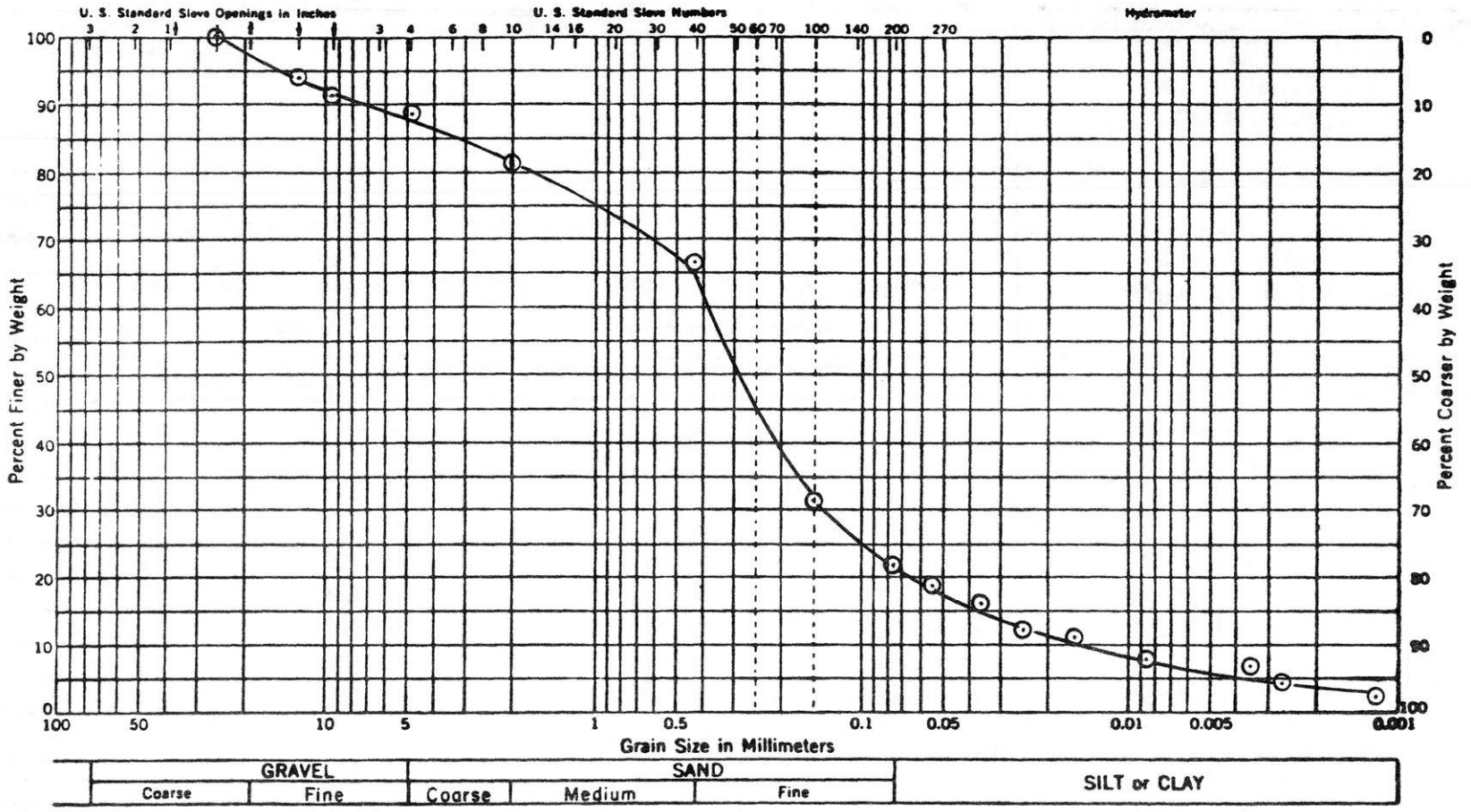
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CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
SMD	JAS	5-18-84	12959

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UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX16	13.6				Silty fine to coarse sand (SM)
S-1					
68-70'					

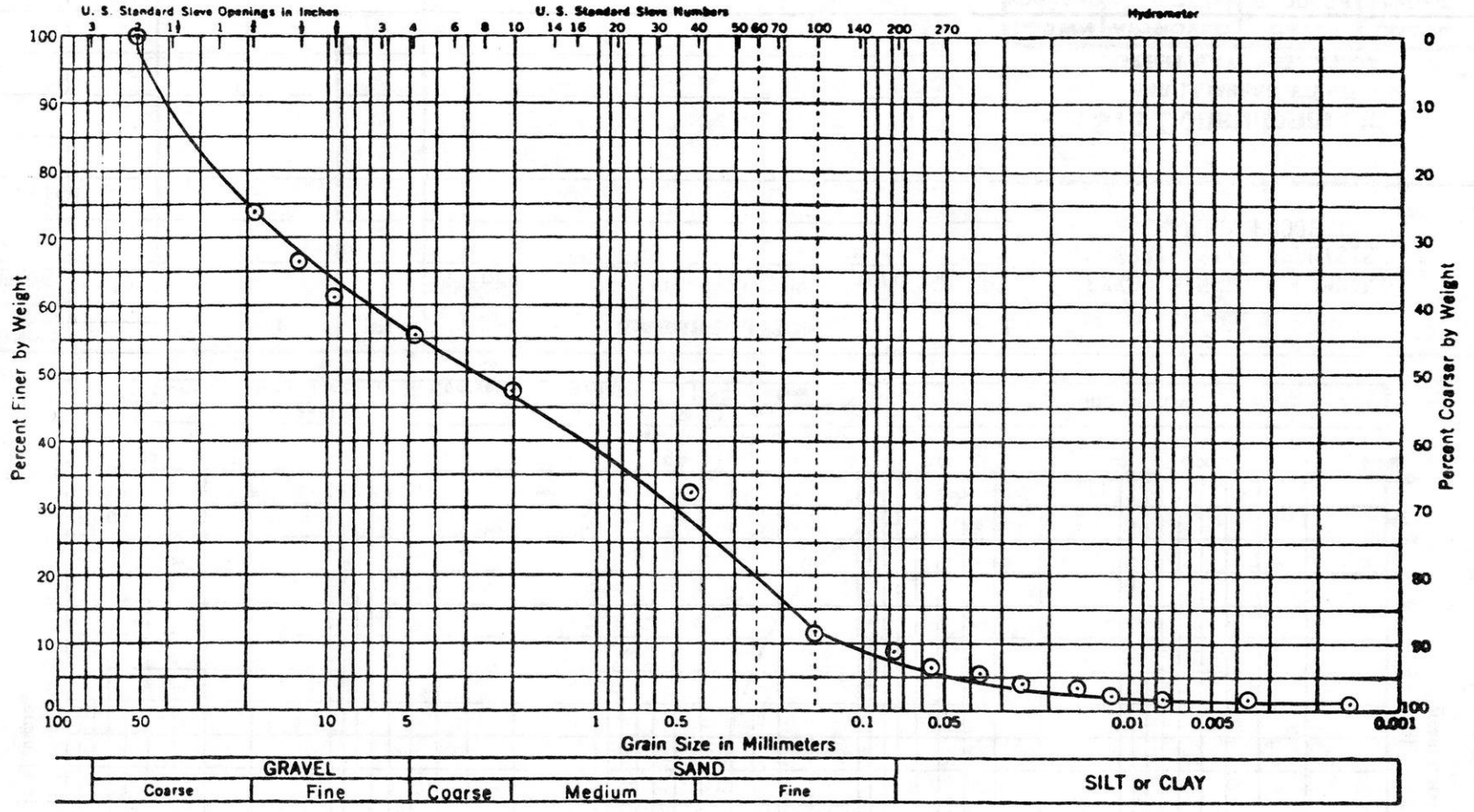
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CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX16	12.8				Slightly silty fine to coarse sand (SM-SP)
S-2					
110-112'					

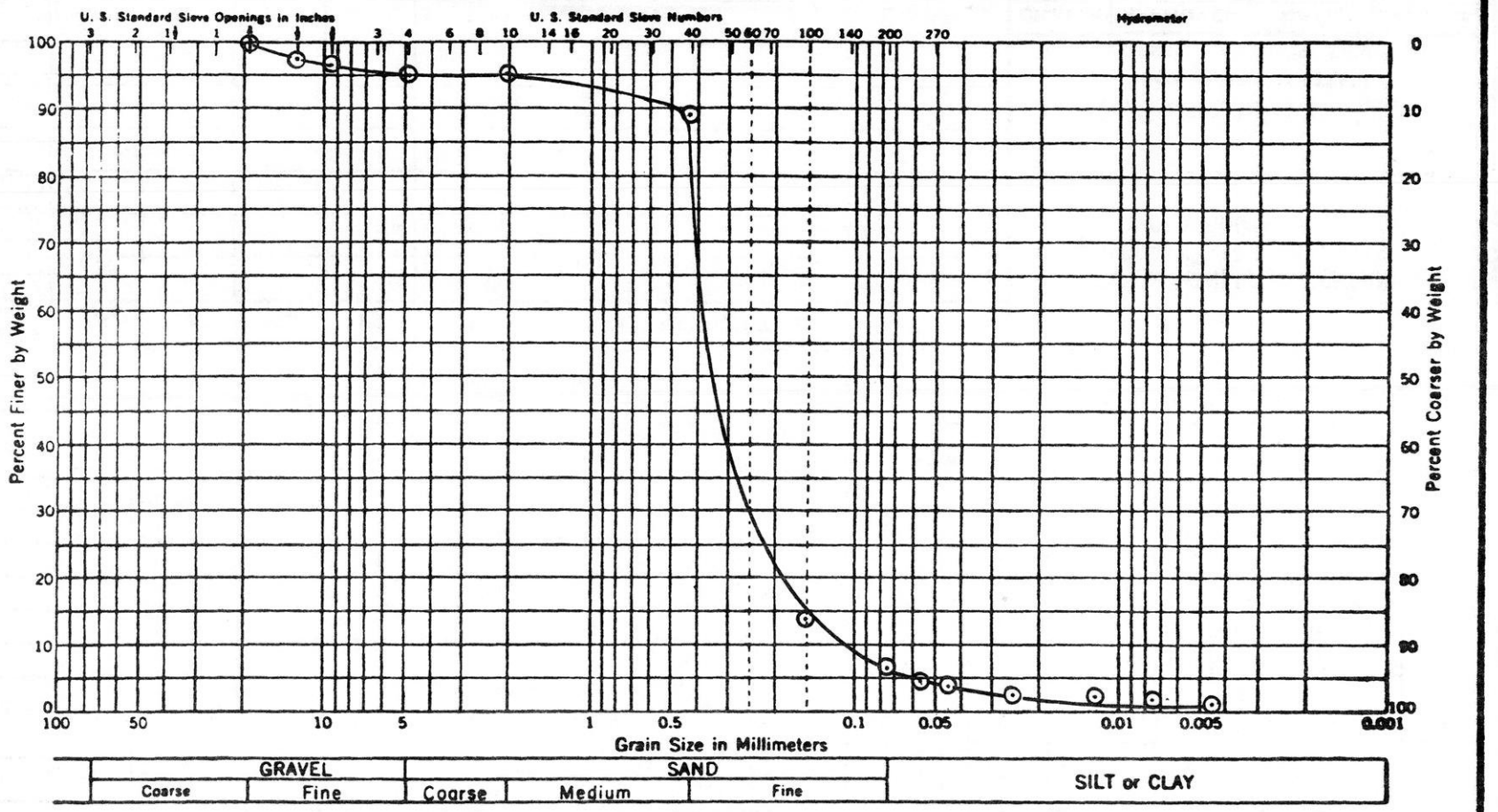
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GRAIN SIZE ANALYSIS
CRANDON PROJECT

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GREEN BAY, WIS. 54303

DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

BBS09302

UNIFIED CLASSIFICATION SYSTEM



SAMPLE NO.	W.C.	LL	PL	PI	CLASSIFICATION
EX16	21.2				Slightly silty fine to medium sand (SM-SP)
S-3					
140-142'					

EXXON MINERALS COMPANY
GRAIN SIZE ANALYSIS
CRANDON PROJECT

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DRAWN	APPROVED	DATE	JOB No.
KOO/SMD	JAS	3-20-84	12959

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