DEC 2 1 1988

December 16, 1988

Mr. Fred Crabill
Florida Crushed Stone Company
Post Office Box 300
Leesburg, Florida 32749-0300

Dear Mr. Crabill:

The Department of Environmental Regulation has reviewed the supplementary material provided by your letter of November 28, 1988, concerning the solid waste landfill to be constructed at your CPL facility located near Brooksville. The plans and specifications dated May 1988 together with the supplementary material provides reasonable assurance that water quality standards will be protected and that the landfill would be in conformance with the conditions of certification for PA 82-17. The Department has no objection to your proceeding with this project.

Sincerely,

HSO

Hamilton S. Oven, Jr., P.E.
Administrator, Siting
Coordination Section
Division of Air Resources
Management

cc: Kim Ford

RECEIVED
DEC 22 1988
WASTE MANAGEMENT

FCS

FLORIDA CRUSHED STONE COMPANY

RECEIVED
DEC 22 1988
WASTE MANAGEMENT

December 1, 1988

RECEIVED
DEC 2 1988
DER - BAQM

EXPRESS MAIL

Mr. Hamilton Oven
DEPARTMENT OF ENVIRONMENTAL REGULATION
Power Plant Site Certification
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

DEC 21 1988
TAMPA

Dear Mr. Oven:

As referenced in my letter of November 28, 1988 to you, Florida Crushed Stone (FCS) has reviewed the requirements for financial responsibility associated with the proposed landfill to be located at FCS's CPL facility.

Attached please find the cost estimate for closure of the referenced landfill site as required by 17-7.076 (1) F.A.C. This estimate was prepared by the FCS Engineering Department, which is knowledgeable with current earthmoving costs. Also as referenced in 17-7.076 (3) F.A.C., FCS will supply proof of financial responsibility as a condition of the landfill approval.

I believe that this letter along with my letter of November 28, 1988 has supplied all of the information requested for approval of the landfill. Should this not be correct, please contact me immediately.

I would appreciate any immediate review that you and your staff can give this project.

Sincerely,

Fred

Fred Crabill
Environmental Manager

RECEIVED
DEC 5 1988
EA, SOLID WASTE

ls
Enclosure

cc: Richard Entorf
Dennis Kenney
Roger Sims
Bill Nelson
Steve Sandbrook
Larry Sellers
Dick Lindgren
Jim Edwards

Division Plant: C.P.L.

Project Title: Solid Waste Dump Site

Location: Gay Mine

Description: Cover Material - Topsoil & Turfing (6 Year Staged Closure)

Estimate sheet 1 of 1

A. R. number

Initiator's Name	Date
Engineering	12-1-88
Approved by	Date

	Estimated Quanities	Unit Used	Unit Price	Amount
1) 1'-6" Cover Material	9600	$Yd.^3$	3.00	28,800
2) 6" Topsoil Cover	3200	$Yd.^3$	6.00	19,200
3) Turfing - Seed, Fertilizer, Mulch	4	Ac.	1800	7,200
4) Indefinite annual maintenance - seed, washout repair, fertilizer, groundwater monitoring, collection and analysis for 1st five years.	L.S.	---	---	10,000

COMMENT:

Subtotal:	65,200
*Contingencies (10%)	6,800
Estimated Project Cost	72,000

*Contingent Project Costs for permits, sales tax, supplies, utilities, sub-contractors, etc. should be listed.

FLORIDA CRUSHED STONE COMPANY

RECEIVED
NOV 30 1988
DER - BAQM

November 28, 1988

Mr. Hamilton S. Oven, Jr.
DEPARTMENT OF ENVIRONMENTAL REGULATION
Power Plant Site Certification
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Oven:

This letter is in response to your letter of September 6, 1988, concerning the design of the solid waste landfill to be constructed at Florida Crushed Stone's CPL facility located near Brooksville, Florida.

The following responses have been prepared to correspond to the comments found in Mr. John Reese's August 29, 1988 memo. The responses are presented in the same order as are Mr. Reese's comments.

Page 4, Item A.

As indicated on Page 4 of the proposed plans and specifications report, the results of the laboratory tests on the clayey soil proposed for use in constructing the liner are found in Appendix 1. The test report from PSI, Inc., dated February 12, 1988, indicates a permeability for sample 1 of 1.45×10^{-8} and a permeability for sample 2 of 9.52×10^{-8} centimeters per second. Sample 1 was compacted to 95% of the maximum density as determined by modified proctor test procedure ASTM D1557. Sample 2 was compacted to 90% as determined by a standard proctor test. The leakance coefficient of a clay liner composed of 1×10^{-7} centimeters per second permeability and three feet thick is 3.33×10^{-8} centimeters per second per foot (Kb). One foot of the compacted clay material with a permeability of 1.45×10^{-8} centimeters per second indicates a lower leakance coefficient value of 1.45×10^{-8} centimeters per

POST OFFICE BOX 300 / LEESBURG, FLORIDA 32749-0300 / PHONE (904) 787-0608 / TELEX #5101006745 / FAX # 904/728-5001

second per foot, thus exceeding the required specification. The existence of the minimum leakance coefficient requirement of 3.33 x 10^{-8} centimeters per second per foot will be established by testing the permeability of cores taken from the clay liner compacted in place by the U.S. Army Corps of Engineering falling head method. Testing frequency will be at least 1 test per 20,000 square feet of liner. An analysis indicating the composition of the bag house dust is attached. The bag house dust permeability is indicated by the results of consolidation testing reported by PSI, Inc. and dated April 5, 1988 as found in Appendix 1 of the report. The report of results indicates permeabilities ranging from 2.02 x 10^{-8} centimeters per second to 5.7 x 10^{-9} centimeters per second depending upon the load applied, however, the load applied in compacting the 2 foot thick layer of bag house dust to at least 95% of the maximum density as determined by ASTM D 1557 (as specified on page 4 of the report) will certainly exceed the lowest loading associated with highest permeability determined by the consolidation test of 2.02 x 10^{-8} centimeters per second . Using this maximum permeability value, a leakance coefficient of 1.01 x 10^{-8} centimeters per second per foot is calculted for the 2 foot layer of bag house dust. The computed harmonic mean vertical permeability of the bag house dust layer and the clay liner is 1.79 x 10^{-9} centimeters per second.

Page 4, Item B

As indicated on Page 4, the bag house dust will be compacted to at least 95% of the maximum density as determined by modified proctor test ASTM D 1557. As illustrated by the report of moisture density relationship for the bag house dust found in Appendix 1, the bag house dust must have a considerable moisture content in order for it to achieve the 95% compaction level. Water will be added to the bag house dust during compaction, as nessary to meet this specification.

The soils report contained in Appendix 1, contains construction methods and specifications for construction of the liner. In addition to these, a representative of Imperial Testing Laboratories will be onsite during the excavation of material to be used for construction of the liner. We will provide visual quality control and oversee stockpiling of visually suitable material. After stockpiling is complete, a minimum of three vertically integrated samples will be taken from the stockpile, for compaction and permeability testing by the falling head method of the U.S. Army Corps of Engineers. The bag house dust is intended to serve as a protective layer for the clay liner lying beneath it, but will, as indicated above, provide a very low permeability liner in itself. Imperial Testing Laboratories will perform all the required soil testing and quality control functions. Mr Terry R. Ritter, P.E., and Mr. Sonny Gulati, P.E. of Imperial Testing will be overseeing the quality control and testing aspects of the project. After the installation of the clay liner over the entire area, the 2 foot layer of the bag house dust will then be placed and compacted in minimum 6 inch lifts. Testing of

the bag house dust in our laboratory indicates that once wetted and compacted, it becomes very stable and resistant to deformation. Because of this, we feel the 2 foot layer of bag house dust will provide sufficient protection for the underlying clay liner. After the 2 foot layer of bag house dust has been placed and compacted, additional dust will be dumped in dry and uncompacted at the west end of the landfill. The spreading out of this dust will occur by machinery pushing the dust outward from the central pile and spreading it over the entire area. This will compact the dry dust and minimize the movement of equipment on the compaced bag house dust layer.

Page 5, Item C.

To address the question regarding characteristics of the bag house waste and coal pile runoff sludge, samples of each were obtained by Florida Crushed Stone and transmitted to Imperial Testing Laboratories. A composite sample was obtained by mixing a portion of the coal pile runoff sludge with the sample of bag house dust in the porportions expected to occur in the landfill as indicated on Page 2 of the report. This composite sample was then subjected to EP toxicity analysis, the results of which are attached. It should be noted that all of the reported levels are far below EP toxicity standards for the parameters indicated. There will be no disposal of fly ash and bottom ash in the landfill. The site certification document governing this facility, in addressing ash, requires only that the ash be stored in an area to prevent the infiltration of leachate. The landfill is specifically designed for this purpose and will only be used for storage of any fly ash and bottom ash which

exceeds the capacity of the silos adjacent to the CPL facility constructed for this purpose. This is anticipated to occur only under unusual operating conditions. At this time, fly ash is not classified as a hazardous waste. As discussed previously, bulldozers will be employed to spread and compact the bag house dust as necessary after it has been dumped on to the compacted liners. The maximum slope permitted will be 10% and slopes are expected to normally be much less than this.

Page 5, Item D

In a telephone conference with Mr. Hamilton Oven, he indicated that FCS did not have to address questions concerning review by the Southwest Florida Water Management District. As stated in the report, we do not expect any leachate, that is, water which has been allowed to percolate through the bag house dust, to be generated because of very low permeability of this material. However, storm water that has come in contact with the waste will be generated. This storm water will be collected in the runoff collection sump and utilized as the source for the proposed sprinkler dust system. Stormwater generated in excess of the 100 year storm will be pumped via an existing pipeline to the Florida Crushed Stone settling pond system, where it will undergo dilution. The tremendous dilution in the 1100 acre pond system along with the EP toxicity analysis which indicated the leachate would meet drinking water standards for the tested parameters is the basis for our contention that no water quality violations will occur from leachate generated by the landfill.

Page 12, Item N

As indicated on Page 12 of the report, no bottom ash or fly ash will be disposed of in the landfill. As discussed earlier in this letter, bottom ash and fly ash may be stored in the landfill area until reuse in the cement product. Also as discussed earlier, the landfill to be constructed will have a low permeability liner and a stormwater collection system. Once again, at this time, fly ash is not classified as a hazardous waste.

Page 12, Item M

The proposed dust control sprinkler system will be utilized during placement of waste to control dust. In addition, bag house dust will be discharged into enclosed containers which will be transported to the landfill on a truck dedicated for this purpose. A revised drawing of the landfill plans is attached which shows the proposed installation of a 4 inch diameter well which will supply up to 25 gallons per minute to the runoff collection sump as a source of water for dust control during times when runoff water is not available.

Page 14, Water Quality Standards

The clay liner of the runoff collection sump will be tested as previously outlined to establish the inplace saturated hydraulic conductivity. Also as previously discussed, the water quality of the runoff is expected to meet the appropriate drinking water parameter standards.

Page 14, Item A

The final cover is planned for placement all during one episode after waste disposal has ceased at the landfill. This plan allows for maximum utilization of space and will not increase leachate generation due to the very low permeability of the material to be disposed. In addition, as previously discussed, leachate is not expected to violate water quality standards. The elevation of the outflow pipe structure to be installed at closure is shown on the attached revised drawings. Calculations illustrating the attached adequacy of the stormwater storage capacity are also shown on the revised drawings. The topographic low to the north where discharge from the stormwater retention basin will occur when the 100 year storm event is exceeded, is an old mine pit not a sinkhole. In addition, the quality of runoff is not expected to be any different after closure than it is presently, since native clay soils which currently exist on and around the site will be used as the cover material. No waste will be exposed so that stormwater can be no longer be considered leachate.

Page 17, Financial Responsibility

FCS is currently reviewing the appropriate financial responsibility requirements found in F.A.C 17-7.076 and will be forwarding the required information shortly.

Foundation Analysis, Hydrogeologic Survey and Groundwater Monitoring Plan

The Paleokarst feature is an apparent ancient solution feature which had been filled over thousands of years with a thick sequence of clay beds. The filling of this past void over thousands of years with insoluble clay material now makes it an area of increased stability and highly impermeable sediment. The revised drawings showing the groundwater flow direction are attached and show water level contours which indicate the background and downgradient monitor wells have been properly located. This drawing also indicates that the proposed monitoring well, CPL 12, is located downgradient of the runoff collection sump to monitor it as was our intent. In our experience we have found jet pumps to be useful and reliable in water quality sampling. In fact, the current approved groundwater monitoring plan for the CPL coal pile and runoff collection sump utilizes jet pumps to secure the water quality from the deep water tables throughout the site. No water quality problems are apparent utilizing these pumps after almost two years of monitoring the coal pile storage area. Threaded PVC is used as drop pipe when the jet pumps are installed.

Other than the financial responsibility information, I believe that information has been supplied which answers all of the comments. Should this not be the case, please contact me immediately.

FCS will appreciate any expediated review that you and the solid waste staff can give this project.

Sincerely,

Fred

Fred Crabill
Environmental Manager

ls
cc: Richard Entorf
Bill Nelson
Steve Sandbrook
Dick Lindgren
Jack Gries
Jim Edwards, Imperial Testing Labs
Roger Sims, Holland & Knight

INTERNATIONAL ENVIRONMENTAL SERVICES, INC.
IES
105 South [redacted]xander St. • Plant City, Florida 33566 • (8[redacted]54-2373
Tampa (813) [redacted]-0879 • Florida Wats 1-800-282-9585 • FAX [redacted]3) 754-3789
Miami Office 1-800-537-9875

CERTIFIED ANALYSIS

TO: IMPERIAL TESTING LABS
ATTN: JIM EDWARDS
P. O. BOX 947
LAKELAND, FL. 33802

PROJECT NO. 10-6-ITL-22

SAMPLED BY: CLIENT

DATE COLLECTED: 10-6-88

DATE COMPLETED: 10-13-88

LAB NO. 10-6-ITL-22

INVOICE NO.

IDENTIFICATION:

COMPOSITE BAG HOUSE DUST AND COAL SLUDGE

LAB I.D.	106ITL22
CLIENT I.D.	

E. P. TOXICITY METALS

Arsenic	<0.50
Barium	<1.0
Cadmium	0.003
Chromium	0.030
Lead	0.007
Mercury	<0.001
Selenium	<1.0
Silver	<0.001
Nitrate	0.1

Results expressed in ☐ mg/l (ppm) unless otherwise noted.
☒ mg/kg (ppm)

State of Florida Certification: E84160 and HRS 84308

Certified By: [signature]
Chemist

METHODS: "Standard Methods for the Examination of Water and Wastewater", Latest Edition, APHA, AWWA, and WPCF and/or other EPA approved methods which meet FDER protocol, unless otherwise designated.

prestige printing pp-5864 8/88

Baghouse Dust

1.08% Moist.
40.0% Loss

FLORIDA CRUSHED STONE KRUPP POLYSIUS POLAB I

Sample analysis for X-Ray 1 Sort : SORT 60 CEMENT Date : 22-SEP-88
Source: CEMENT MILL Time : 09:55:18

Laboratory number : 1.

SiO2	Al2O3	Fe2O3	CaO
9.41	2.50	1.99	84.45

MgO	SO3	K2O
0.58	0.51	0.22

LSF	SM	AM	SUM
274.35	2.10	1.26	100.06

C3S	C2S	C3A	C2F	C4AF
251.23	-162.45	3.26	0.00	6.06

September 6, 1988

Fred Crabill
Florida Crushed Stone Company
P.O. Box 300
Leesburg, Florida 32749-0300

SEP 9 1988

Dear Mr. Crabill:

Attached please find a copy of comments prepared by the Department's Solid Waste Section concerning the design of the solid waste landfill at your Brooksville plant. If you have any questions concerning this matter, you may wish to contact myself or Mr. Reese at (904) 488 0300.

Sincerely,

Hamilton S. Oven, Jr., P.E.
Administrator, Siting
Coordination Section
Division of Air Resources
Management

Encl:

SEP 9 1988
DISTRICT

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

FOR ROUTING TO OTHER THAN THE ADDRESSEE
To: Buck Oven Locn: Rm 309 TT
To: _____ Locn: _____
To: _____ Locn: _____
From: _____ Date: _____

TO: Hamilton S. Oven, P. E. Administrator
Power Plant Certification

THROUGH: Bill Hinkley, Administrator
Solid Waste Section

FROM: John A. Reese, Engineer IV
Solid Waste Section

RECEIVED
SEP 2 1988
DER - BAQM

DATE: August 29, 1988

SUBJECT: Florida Crushed Stone/CPL Proposed Solid Waste Landfill

The following comments are offered on the subject landfill application.

PROPOSED SOLID WASTE LANDFILL PLANS AND SPECIFICATIONS

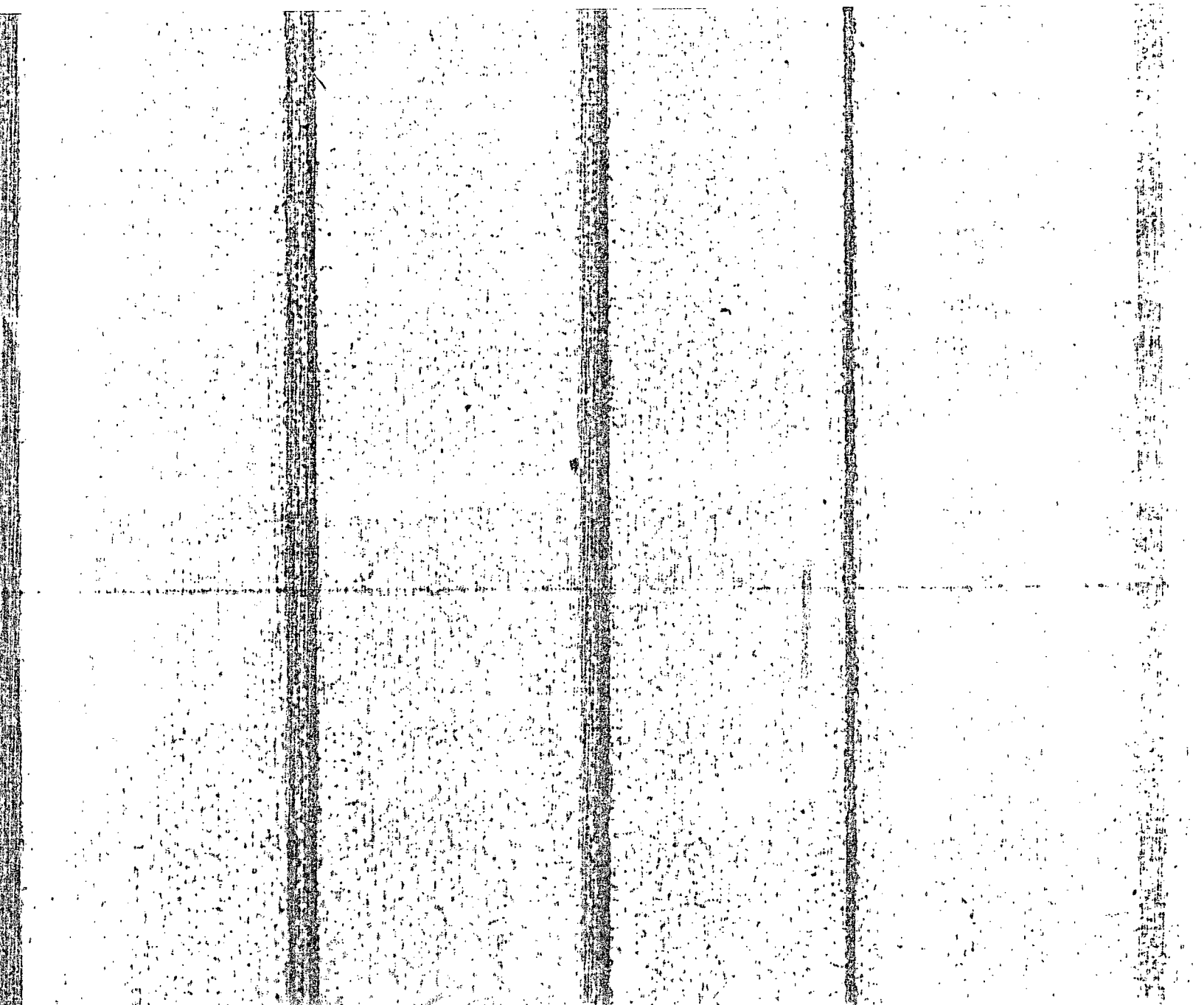
Page 4, Item A, Landfill Performance and Design Standards: The 12 inch thick clayey soil has a vertical permeability lower than $1X10^{-7}$ cm/sec, confirmed by laboratory test. What is the permeability and was it determined in the laboratory or in place on site? Florida Administrative Code Rule 17-7.050(3)(d) requires 3 feet of soil liner with an in-place saturated hydraulic conductivity of not greater than $1X10^{-7}$ cm/sec or equivalent. It is not clear that this equivalency is established in-place. What is the composition and permeability of the baghouse dust compacted in-place?

Page 4, Item B. Liner Quality Control Plan: If the baghouse dust is dry when placed on the day base how will it prevent the clay layer from drying and cracking?

The liner quality control plan does not include specifications and construction methods that may be used to construct the liner, such as quality control of soil mixing for construction of the liner. It is not clear whether the clay layer and the baghouse dust together are to form the liner on whether the clay liner above is intended to serve that purpose.

Page 12, Item [redacted] Dust Control Methods, [redacted] control during transport and placement of waste are not addressed. How will water be supplied for dust control during times when runoff water is not available?

Page 14, Water Quality Standards; As mentioned previously, stormwater coming in contact with the waste is considered leachate. Ref. Florida Administrative Code Rule 17-7.050(4)(h),3. Sheet 3 of the drawings, cross-section A-A, seems to indicate the water retention pond will have the same 1 foot clay liner as the landfill. The permeability of the liner is questionable since it was developed in a laboratory. F.A.C. rule 17-7.050(4)(d),1.,a., requires 3 feet of soil with an in-place saturated hydraulic conductivity not greater than $1X10^{-7}$ cm/sec, or equivalent and must be compatible with the leachate that may be generated. Water quality of the runoff has not been established and no treatment has been discussed. The applicant should demonstrate that, "any potential contaminants contained in the stormwater runoff would be subject to dilution such that no violations of state water quality standards are anticipated."



17-7.050(5)(o).

The elevation of the outflow pipe structure to be installed at closure should be shown on the drawings and information provided about the adequacy of stormwater storage capacity. Proposed discharge to an existing topographic low raises the question, is this an old sinkhole that could be a conduit to an aquifer?

Page 17, Financial Responsibility; information provided does not include proof of financial responsibility in accordance with F.A.C. 17-7.076(3).

FOUNDATION ANALYSIS, HYDROGEOLOGIC SURVEY AND GROUND WATER MONITORING PLAN

It is suggested that the ground water plan be evaluated by the Ground Water Protection Bureau , but the following items were noted;

1. Page 7, Exploratory wells; What is th nature of the paleolsarst feature that underlies the landfill?

2. Page 7, Ground Water Flow; A water contour level map should be provided to insure proper location of background and downgradient monitoring wells. Monitoring well CPL 12 does not appear to be located downgradient of the runoff collection pond. The pond is probably a critical point to monitor.

3. Page 9, Water Quality Sampling and Analysis; jet pumps are not appropriate for water sampling. PVC pipe with threaded joints should be used instead of glued joints.

JAR/tkm

cc: Barry Swihart
Kim Ford

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

DISTRICT ROUTING SLIP

TO: Kim Ford DATE: 9/6/88

	C.C. TO:
___ PENSACOLA – NORTHWEST DISTRICT	
___ PANAMA CITY – Northwest District Branch Office	
___ TALLAHASSEE – Northwest District Branch Office	
✓ TAMPA – SOUTHWEST DISTRICT	
___ ORLANDO – ST. JOHNS RIVER DISTRICT	
___ JACKSONVILLE – St. Johns River Subdistrict	
___ GAINESVILLE – St. Johns River Subdistrict Branch Office	
___ FORT MYERS – SOUTH FLORIDA DISTRICT	
___ PUNTA GORDA – South Florida Branch Office	
___ MARATHON – South Florida Branch Office	
___ WEST PALM BEACH – South Florida Subdistrict	
___ PORT ST. LUCIE – South Florida Subdistrict Branch Office	

COMMENTS:

Reply Optional ☐ Reply Required ☐ Info. Only ☐
Date Due: _____ Date Due: _____

F. Y. I.

SEP 0 8 1988
SOUTH WEST
TAMPA

FROM: Buck Avery TEL.:

Rev. 5/80

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

FOR ROUTING TO OTHER THAN THE ADDRESSEE

To: Kim Ford Loctn: Tampa

To: _____ Loctn: _____

To: _____ Loctn: _____

From: _____ Date: _____

TO: Hamilton S. Oven, P. E. Administrator
Power Plant Certification

THROUGH: Bill Hinkley, Administrator
Solid Waste Section

FROM: John A. Reese, Engineer IV
Solid Waste Section

RECEIVED
SEP 8 1988

DATE: August 29, 1988

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The liner quality control plan does not include specifications and construction methods that may be used to construct the liner, such as quality control of soil mixing for construction of the liner. It is not clear whether the clay layer and the baghouse dust together are to form the liner on whether the clay liner above is intended to serve that purpose.

The organizational structure and authority of the quality control personnel should be described. The third party soils testing organization should be identified. If the liner and dust cover are to be emplaced over te entire area at one time, how will the integrity of this area be maintained?

Page 5, Item C, Leachate control and removal system performance: What are the characteristics of the baghouse waste and coal pile runoff sludge that are to be disposed of in this landfill? How will they interact? An analysis of the wastes should be provided.

Fly ash and bottom ash will also be "stored" in the landfill. Fly ash alone may be a hazardous waste. Storage or disposal of fly ash and bottom ash are not addressed in the application.

The final slopes are shown on the drawings but not the slopes of the material as it is being filled. This is critical information if precipitation runoff control is the proposed method of leachate control.

Page 5, Item D, Surface Water Management Performance; Has this surface water control been reviewed by the water management district? Because stormwater will come into contact with the waste it must be treated as leachate. The treatment, unspecified, must be appropriate for the expected leachate. No treatment is indicated.

Page 12, Item N, Litter Control Devices; Bottom ash and fly ash are included in the types of waste to be disposed of in the landfill. On page 2 only baghouse waste and coal pile runoff sludge are given as wastes to be disposed of, the composition of each is unknown. Inclusions of fly ash, a possible hazardous waste, and bottom ash, require a lined landfill with leachate collection system.

Page 12, Item M, Dust Control Methods; Dust control during transport and placement of waste are not addressed. How will water be supplied for dust control during times when runoff water is not available?

Page 14, Water Quality Standards; As mentioned previously, stormwater coming in contact with the waste is considered leachate. Ref. Florida Administrative Code Rule 17-7.050(4)(h),3. Sheet 3 of the drawings, cross-section A-A, seems to indicate the water retention pond will have the same 1 foot clay liner as the landfill. The permeability of the liner is questionable since it was developed in a laboratory. F.A.C. rule 17-7.050(4)(d),1.,a., requires 3 feet of soil with an in-place saturated hydraulic conductivity not greater than $1X10^{-7}$ cm/sec, or equivalent and must be compatible with the leachate that may be generated. Water quality of the runoff has not been established and no treatment has been discussed. The applicant should demonstrate that, "any potential contaminants contained in the stormwater runoff would be subject to dilution such that no violations of state water quality standards are anticipated."

Page 14, Item A, Closure Plan; final cover should be placed over each section of the landfill, as it is completed to design specifications, to reduce leachate generation. Ref. F.A.C. 17-7.050(5)(o).

The elevation of the outflow pipe structure to be installed at closure should be shown on the drawings and information provided about the adequacy of stormwater storage capacity. Proposed discharge to an existing topographic low raises the question, is this an old sinkhole that could be a conduit to an aquifer?

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JAR/tkm

cc: Barry Swihart
Kim Ford

Kim Ford

FCS

FLORIDA CRUSHED STONE COMPANY

July 19, 1988

JUL 21 1988

Mr. Hamilton Oven
DEPARTMENT OF ENVIRONMENTAL
REGULATION
2600 Blair Stone Road
Tallahassee, FL 32301

Dear Mr. Oven:

Attached please find two (2) copies of the plans and specifications for Florida Crushed Stone Company's (FCS) proposed solid waste landfill. This facility is to contain the baghouse dust and bottom sludge from the coal pile runoff collection sump at FCS's CPL operation located near Brooksville, Florida. The CPL operation was approved by the Final Order of Certification Number PA 82-17 and the proposed landfill is the one that you and I discussed a few months ago.

It is FCS's understanding that a formal landfill application would not be required to be submitted, nor would a formal permit be granted due to the nature of the project and its association with approved order PA 82-17. However, the information submitted has been assembled in the same format and headings as found in a landfill application. By copy of this letter I have forwarded a set of the plans and specifications to Mr. Kim Ford at the Department's Tampa office, for his review.

Should you or your staff have any questions on this matter, please do not hesitate to contact me.

Sincerely,

Fred Crabill

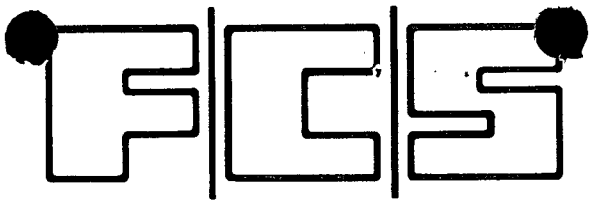
Fred Crabill
Environmental Manager

SOUTH WEST DISTRICT
TAMPA
JUL 20 1988
D. E. R.

ls

Enclosures

POST OFFICE BOX 300 / LEESBURG, FLORIDA 32749-0300 / PHONE (904) 787-0608 / TELEX #5101006745 / FAX # 904/728-5001



DISTRIBUTION:

cc: Richard Entorf
Bill Nelson
Dennis Kenney w/Encl
Steve Sandbrook w/Encl
Jack Gries w/Encl
Jim Edwards w/Encl
Lawrence Sellers w/Encl
Kim Ford w/Encl

RECEIVED
JUL 21 1988

FLORIDA CRUSHED STONE/CPL
PROPOSED SOLID WASTE LANDFILL
PLANS AND SPECIFICATIONS

Prepared for
FLORIDA CRUSHED STONE CEMENT/POWER/LIME FACILITY
Brooksville, Florida

Prepared by
Florida Crushed Stone Company Engineering Department
Leesburg, Florida
and
Imperial Testing Laboratories
Water Resource Consultants
Lakeland, Florida

May 1988

D. E.
JUL 20 1988
SOUTH WEST DISTRICT
TAMPA

TABLE OF CONTENTS

LIST OF APPENDICES

FOUNDATION ANALYSIS

The foundation analysis, hydrogeologic survey and groundwater monitoring plan are contained in a report which may be found in Appendix 1.

FACILITY ZONING CONFORMANCE

The solid waste disposal facility is to be used for entirely private disposal. The disposal site and all the land within one mile of it are owned by Florida Crushed Stone Company (FCS) and is zoned for mining. This zoning classification permits disposal of the intended subject solid waste.

FACILITY DESIGN

A. Aerial Photographs

Aerial photographs showing the proposed landfill site and the surrounding land use within one mile of the site are shown on Drawing 198-1-126, sheets 1 and 5 of 5 in Appendix 2.

B. Plot Plan

The proposed solid waste landfill plot plan, Drawing 198-1-126, sheet 3 of 5 is found in Appendix 2. The dimensions and legal description of the designated landfill area are shown on Drawing 198-1-126, sheet 4 of 5, Appendix 2. The location and bottom elevation of the monitor wells are shown on Drawing 198-1-126, sheet 2 of 5, Appendix 2.

C. Topographic Map

A topographic map of the proposed landfill site is shown on Drawing 198-1-126, sheet 2 of 5, Appendix 2. Proposed fill and borrow areas, access roads, drainage grades, typical cross sections, and other pertinent information are shown on the plot plan, Drawing 198-1-126, Sheet 3 of 5.

D. Report

The proposed solid waste landfill is to be used for the disposal of solid waste materials from the Cement/Power/Lime (CPL) facility only. The two types of waste materials to be disposed of in the landfill are baghouse dust collected from the CPL baghouse facility and bottom sludge from the coal pile runoff collection sump. It is estimated that the annual disposal of baghouse dust will be 40,000 tons and bottom sludge will be 100 tons. Based on the planned total disposal capacity of 235,000 tons, the anticipated life of this site is on the order of 6.0 ± years. The actual life of the site could be more or less depending upon the actual generation and disposal rate of the baghouse dust. The 40,000 tons per year disposal rate is the best available estimate for a waste material that is not currently being generated. There are contingency plans for storage of fly ash and bottom ash within the landfill area. However, this is currently anticipated to be only temporary storage since plans call for these by-products to be entirely reused in the CPL cement

facility.

Construction of the landfill facility is anticipated to begin in September 1988 with completion in January 1989 at which time the facility will be ready to receive wastes. The estimated construction cost is $126,000. The estimated closing cost is $42,000.

The locations of samples taken of the proposed cover material are shown on Drawing 198-1-126, sheet 2 of 5, Appendix 2. The three samples were thoroughly intermixed and two representative samples selected from the composite field sample. One of these samples was compacted in accord with ASTM D 1557, whereas ASTM D 698 was used to compact and prepare the other sample for the determination of vertical permeability, the results of which are included in Appendix 1. These results indicate that the material has sufficiently low permeability when properly compacted to serve as the landfill and runoff collection sump liner.

E. Groundwater Monitoring Plan

Hydrogeologic survey, foundation analysis and groundwater monitoring plan are contained in a report which is included in Appendix 1.

LANDFILL PERFORMANCE AND DESIGN STANDARDS

A. Liner Performance

Local clayey soil has been selected for the base liner. The

subsurface investigation, Appendix 1 report, indicates that the material selected for the liner has high shear strength and it is our opinion that the base liner would not experience excessive consolidation settlement during its installation and/or during the operational phase of this facility. Additionally, our settlement computations indicate that the base liner would not crack or undergo excessive differential settlement due to the load bearing or stress intensity imposed by the disposed waste.

The base liner would consist of a 12 inch thick layer of local clayey soil which in turn would be overlain by a 24 inch thick lift of baghouse dust. Both of these layers would be compacted to at least 95% of the maximum density as determined by modified proctor test procedure (ASTM D 1557). The laboratory test on the clayey soil, Appendix 1 report, confirmed that the vertical permeability was lower than the desired design standard of 1×10^{7} cm/sec, thereby meeting the specification requirement.

B. Liner quality control plan

In order to maintain the structural integrity of the base liner (to prevent dessication and cracking), it would be immediately covered with a 2 foot thick layer of baghouse dust. The clay liner as well as the baghouse dust cover would both be compacted and tested in accordance with test procedure ASTM D 2922. Compaction would continue until a

desired field density of 95% of maximum compaction is achieved. The base liner would cover the entire storage-facility area. One field density would be taken for every 2000 square feet of surface area for each lift of material placed. The lift thickness would be limited to a maximum of 12 inches.

C. Leachate control and removal system performance

No leachate is expected to be generated in the landfill due to the nature of the waste materials. Specifically as the baghouse dust consolidation tests show, Appendix 1, the permeability of the material even at low loading levels is very near that of the compacted liner itself and an order of magnitude lower than is necessary for liner material. This very low permeability in conjunction with the gentle slopes of the waste material surface will result in very limited penetration by moisture into the waste material and nearly total runoff of precipitation. The baghouse dust will be in a dry state when dumped into the landfill and may absorb some moisture at the waste surface from precipitation and sprinkling to control dust. However, the head necessary to induce water seepage into the waste material is not available at such low permeability values.

D. Surface Water Management System Performance

As the plot plan Drawing 198-1-126, sheet 3 of 5, (Appendix 2) shows, the dike around the landfill area will prevent

surface water flow onto the waste. Stormwater runoff from the waste will be encouraged to drain to the riser structure by the liner slope, waste spreading, and plan toe ditch configuration. From this point, the runoff will be carried by pipe to the runoff collection sump. Here the runoff will be stored and used as a source for sprinkler water to prevent dust emissions off the waste pile. Sprinkling will increase evaporation and evaporation is expected to occur from the sump's water surface. The sump capacity has been designed to contain the 100 year storm. If this level of storage volume is exceeded, a 2,000 gallon per minute float actuated emergency pumping system will begin operating and pump the excess stormwater via existing pipe line to an 1100 ± acre tailing pond and water storage system adjacent to the site. The discharge into the pond system would occur into pond number 1.

Waste material which settles in the runoff collection sump will be periodically removed and placed back in the landfill.

E. Gas Control System Performance

Because there is to be no organic waste disposed of in the landfill, the need for a gas control system is not anticipated or planned.

OPERATIONS PLAN

A. Designation of Responsible Person(s)

The responsible person(s) for the waste site are as follows:

1. Steven D. Sandbrook - (on site)
   Safety and Environmental Manager
   Florida Crushed Stone
   Cement/Power/Lime Division
   Post Office Box 1508
   Brooksville, Florida 34605
   (904) 799-7881

2. Fred Crabill
   Corporate Environmental Manager
   Florida Crushed Stone
   Post Office Box 300
   Leesburg, Florida 34279
   (904) 787-0608

3. Jack Gries, P.E.
   Chief Engineer/Engineer of Record
   Florida Crushed Stone
   Post Office Box 300
   Leesburg, Florida 34279
   (904) 787-0608

B. Contingency Operations

In the event that the waste landfill site becomes temporarily inaccessible or the equipment is temporarily non-functional, the contingency plan will be as follows:

1. Site Failure

Holding silos on site will be temporarily utilized to contain the material until the problem has been corrected.

2. Equipment Failure

The FCS mining division (Florida Crushed Stone - Gay Mine),

will be contacted and their mobile equipment work force will be utilized.

C. Controlling the Type of Waste Received at the Site

The landfill site is located well within FCS's mine property where access is controlled through locked security gates and manned security guardhouses at the two main entrances to the property. The landfill is for the sole intended use of CPL and will also have a locked gate to control access.

As discussed in the next section, item D, the haul unit operator will be trained by the CPL designated responsible person in the type of waste to be placed into the landfill. All of these items will control the type of waste to be placed in the landfill.

D. Weighing or Measuring Incoming Waste

As previously discussed, two types of materials will be disposed of in the landfill; baghouse dust and bottom sludge from the coal pile runoff collection sump. Both of these wastes will be generated onsite at the CPL facility. These waste products will be delivered to the landfill by a haul unit dedicated to receive the waste.

Before and after the haul unit is loaded it will be weighed at the CPL truck scale prior to proceeding to the landfill site for unloading. The operator of the haul unit will receive a scale ticket after each weighing and this ticket will contain the tare weight of the haul unit; gross weight of the haul unit; the net weight of loaded material;

loading time and date; and operator's signature.

The designated responsible person will train the operator as to the types of waste to be received at the landfill site and the operator will mark the type of waste received on each scale ticket.

At the end of each twenty-four hour period, the weight scale tickets will be submitted to the designated responsible person at CPL. This individual will then calculate the net weight of each waste material handled for the preceeding calendar day and will record this weight in a log book. During holidays and weekends, these calculations will be performed on the next workday.

E. Vehicle Traffic Control and Unloading

This facility will not be open to the public. Its sole intended use is strictly for CPL. All access roads leading to and from the waste site are well within the property boundaries of FCS. Security service is provided at the entrance to plant site for CPL, therefore, no unauthorized entry will be permitted.

F. Method and Sequence of Filling Waste

Waste materials for disposal will be carried in covered dump trucks or tanker trucks/trailers. The wastes will be dumped from the elevated access road on the west side of the landfill as shown on Drawing number 198-1-126, sheet 3 of 5 (Appendix 2). Periodically as the waste thickness accumulates, bulldozers or other equipment suitable for

spreading the waste will be employed. This equipment will spread the waste evenly over the bottom of the landfill.

G. Waste Compaction and Application of Cover

The waste material will be spread evenly with bulldozers. Based on our laboratory tests on the baghouse dust, it is our opinion that the process of spreading will compact the material to a dry density on the order of 90 pcf (approximately 90% of the maximum dry density as determined by standard proctor test precedure, ASTM 698). Once the dumped waste material reaches the desired maximum height, it would be covered with a 18" thick, compacted cover of a clayey soil comparable to the clay base liner material. Additionally, during and after compaction of the waste material a water sprinkler will be in operation to control dust emisions.

H. Operations of Gas, Leachate, and Storm Water Controls

Due to the nature of the waste materials being generated and placed in the landfill, no leachates or gases will be generated.

The operation of the storm water pumping facilities will be monitored continuously by plant personnel. A 2000 gpm electric powered pump will be manually controlled and will be activated by operating personnel if the water level exceeds an elevation of 111.0 feet.

I. Groundwater Monitoring

The monitoring will be conducted according to the protocol and schedule given in the approved groundwater monitoring plan for the landfill.

J. All Weather Access Roads

All access roads are owned and maintained by FCS. Since this is private property, no trespassing is allowed and is enforced by routine security inspections.

There will be a 28' wide access road servicing the waste disposal facility. This road will be equipped with a security gate to limit access to authorized individuals.

Proper drainage systems for the roadway will be constructed so as to eliminate any water build-up.

K. Effective Barrier

The waste disposal site is located within secured boundaries of FCS. The disposal site access road will be secured by a locked gate. Security guards are posted at two (2) out of the three (3) passable entrances. The remaining gate can only be operated with a pass key. Routine security checks shall be conducted to insure that no unauthorized entry occurs into the mine property or waste disposal site.

L. Signs Indicating Name of Operating Authority, Traffic Flow, Hours of Operation, and Charges for Disposal (if any)

This facility is not open to the public, it is for the sole use of CPL.

Identification signs denoting this fact will be posted at the entrance to the facility and at various locations around the perimeter of the site.

An identification sign will be posted at the entrance to the waste disposal site and will read as follows: "Do Not Enter, Restricted Area, Florida Crushed Stone Company, Cement/Power/Lime Division, Waste Landfill Facility, Authorized Entry Only."

M. Dust Control Methods

Dust control methods will be a sprinkler system utilized to keep the materials moisture content at a level that will not allow dust emissions. The sprinkler system will be supplied from the 2.2 million gallon capacity drainage retention sump.

N. Litter Control Devices

A trash recepticle will be placed at the entrance to the facility to control littering.

This is a solid waste landfill FOR the storage of bottom ash, fly ash, and a disposal area for baghouse dust and coal runoff sludge generated by the CPL facility. It will not be used for trash disposal.

O. Fire Protection and Fire Fighting Facilities

The waste to be landfilled is non-explosive and non-combustible. The local fire department is located approximately 4 miles from the entrance of the facility. The access roads surrounding the site shall serve as effective

fire break.

P. Attendant

This facility is not open to the public, but is for FCS use only. Therefore, an attendant will not be posted at this site.

Q. Communication Facilities

Each operator hauling the waste product to the site will be equipped with a two-way radio. In the event the operator needs assistance, he will contact the central control room operator who will dispatch the appropriate persons and equipment to his aid.

R. Adequate In-Service and Reserve Equipment

The mobile equipment work force is as follows:

-In-Service-

1 - 1981 Ten wheeler diesel Mack truck equipped with 40 cubic yard capacity steel roll-off containers.

1 - D-6 Caterpillar diesel bulldozer

-Reserve Equipment-

1 - 1979 six wheeled 7500 diesel GMC truck with a 7 cubic yard dump bed

1 - D-6 Caterpillar diesel bulldozer

S. Safety Devices on Equipment to Shield and Protect Operators

The bulldozer will be equipped with roll over protective structures, seatbelts and other safety equipment. The operators and truck drivers will wear disposable jumpsuits, hard-hats, safety goggles, appropriate respiratory protection and other safety equipment as required when working directly

with the waste material.

WATER QUALITY STANDARDS

As previously discussed no leachate is expected to be generated. Surface runoff will be contained within the runoff collection sump and utilized as a source of sprinkler water. The combination of the large storage volume available, evaporation from the sump water surface and the increased evaporation due to sprinkling of the waste materials surface for dust control is anticipated to result in evaporation of all stormwater generated except under extreme storm events. Any excess storm water will be pumped via the existing pipe line to an existing FCS waste tailing disposal pond system. In the 1100 ± acre disposal pond system, any potential contaminants contained in the stormwater runoff would be subject to dilution such that no violations of state water quality standards are anticipated.

CLOSURE

A. Closure Plan

1. Design

The closure design plan is shown on Drawing 198-1-126, sheet 3 of 5. The existing topography is shown on Drawing 198-1-126, sheet 2 of 5. Details regarding the cover materials characteristics may be found in Section D of Facility Design, Section B of Landfill Performance and Design Standards and Section G of Operations Plan. The final cover will be placed over the entire surface in one continuous work project. The final cover will be seeded with vegetation to control erosion. The vegetational

species planted will be drought resistant and such that the roots do not penetrate the seal and provide a channel for moisture infiltration.

As discussed in Section C of Landfill Performance and Design Standards, no leachate is anticipated to be generated because of the low permeability of the waste material. No water which has had the opportunity to come into contact with the waste material is expected to exist after the final cover is placed on the waste pile.

The groundwater monitoring plan and sampling schedule will be adjusted as appropriate and approved by the DER depending upon the groundwater contamination and monitoring history of the landfill.

Stormwater after closure will continue to be collected in the runoff collection sump. An outflow pipe structure of similar hydraulic capacity to the inflow pipe structure will be installed in the north dike of the runoff collection sump. The pipe will replace the function of the emergency runoff transfer pump which will be used to remove excess runoff during extreme storm events while the landfill is in active operation. This outflow structure will be set at an elevation to maximize useful storage while preventing a possible overflow of the sump dikes as shown on Drawing 198-1-126, sheet 3 of 5. The runoff discharge through this outflow structure will drain by gravity to an existing topographic low to the

north which currently accepts stormwater runoff from the surrounding area.

Access will continue to be controlled in the same manner as during operation of landfill.

2. Final Use

When the Resource Recovery and Management Facility is in its closure phase, it shall be aesthetically contoured into a vacant, improved pastureland area. It shall also be planted with rye grass to prevent erosion and provide habitat for small ground dwelling animals.

The solid waste landfill cover will be planted with suitable vegetative species and available for use as improved pasture.

3. Closure Operations

The closure operations are as generally described in the previous two sections. The final cover and all other closure operations will be completed in 180 days after the final waste disposal on the site. The closure procedures described in 17-7.074 will be followed.

4. Post-Closure

After closure monthly inspections by FCS personnel will be conducted to verify proper access control, sufficient vegetative cover, lack of erosion and proper stormwater system operation. After the first year such inspections will be reduced to quarterly or semiannually depending

upon the maintenance needs indicated by the monthly inspections. In general the frequency of maintenance during the first year will be used to adjust the frequency of inspections thereafter as appropriate.

The frequency of groundwater monitoring will be adjusted as appropriate considering the facilities monitoring and contamination history. Monitoring wells and/or associated equipment which is destroyed or fails to operate will be replaced within sixty days of discovery after immediate notification to the DER in writing.

5. Financial Responsibility

We have estimated the cost of closing the facility as follows:

clay cover material	$19,200
top soil	12,800
seed, fertilizer and mulch	4,800
runoff discharge culvert	1,500
project management/contingency	3,700
Total	$42,000

These estimated costs include all installation labor costs.

The longterm care annual cost have been estimated as follows:

seed, erosion maintenance, fertilizer and management	$1,000
groundwater monitoring, collection and analysis	1,000
	$2,000

The financial responsibility for the Solid Waste Disposal Site belongs to FCS. The correct mailing address is:

Florida Crushed Stone Company
Post Office Box 300
1616 South 14th Street
Leesburg, Florida 32749-0300
Telephone # (904) 787-0608

B. Closure plan schedule

As provided in 17-7.071, at least one year prior to the projected date when waste will no longer be accepted, a schedule for cessation of waste acceptance and closure of the landfill will be provided to the DER by FCS.

FOUNDATION ANALYSIS, HYDROGEOLOGIC SURVEY AND GROUNDWATER MONITORING PLAN
PROPOSED CPL 4.6 ACRE SOLID WASTE STORAGE/DISPOSAL LANDFILL CELL
BROOKSVILLE, HERNANDO COUNTY, FLORIDA

Prepared for

Florida Crushed Stone
Cement/Power/Lime Facility
Brooksville, Florida

Prepared by

Imperial Testing Laboratories
Consulting Engineers
Lakeland, Florida

April 1988

TABLE OF CONTENTS

LIST OF APPENDICES

FOUNDATION ANALYSIS

Introduction

Imperial Testing Laboratories (ITL) is pleased to present this report of our subsurface soil evaluation and foundation analysis of the proposed landfill. This work was performed in general accordance with your authorization of November 1987. The purpose of our subsoil investigation was to determine the stratification and engineering properties of subsurface soils beneath the proposed project area with respect to the suitability of the tract for the proposed landfill. Additionally, to evaluate the potential for future sinkhole development on the site as well as provide bearing value recommendations for the design of the landfill facility. This report contains the results of our investigation and recommendations regarding the tract's suitability, the existence of sinkhole(s) and the potential for future sinkhole development at the site.

Boring locations were selected and staked in the field by a representative of ITL in coordination with the client. The layout of the proposed facility along with the boring locations are presented on Florida Crushed Stone (FCS) Drawings 198-1-126, sheets 2 & 3 of 5. The scope of this investigation was coordinated with Mr. Fred Crabill, Environmental Manager, and Mr. Jack Gries, P.E. Chief Engineer for FCS.

Project Information

Furnished information indicates that the southern 4.6 acres of the designated waste management tract is being considered for the construction of a waste storage/disposal facility. Although a projection has been made, the volume per unit time of waste material for disposal is not well known. Eventually it may be necessary to use the entire tract for waste disposal. The waste material to be stored/disposed at this facility would, predominantly, be baghouse dust generated by the nearby Cement/Power/Lime (CPL) facility. This material consists of cement dust and fly ash captured by the bag type filtration system used by the facility. Fly ash and bottom ash are reused in the cement making process and FCS does not believe any of this material will be disposed of at the facility although temporary storage at the site is possible.

We also understand that the design of the proposed landfill facility incorporates a very low permeability clay liner under and around the waste material.

Based on the data provided to us by the client, we understand that the maximum height of the dumped waste would be on the order of 36 $\pm$ feet with side slopes of the order of 3:1.

Scope of Work

The scope of work related to this project has included performing numerous standard penetration test borings, visually inspecting the soil samples recovered in the field, and performing a geotechnical evaluation of the site based on the assimilated data. This report presents the field data collected during the exploration program and a site specific geotechnical evaluation concerning site suitability, and stability of subsoils with respect to the potential for sinkhole development. Additionally, our comments on the net allowable bearing pressure settlement performance, and general earthwork requirements are also included in this report.

Subsurface Exploration Procedures

Our subsurface investigation consisted of a total of three (3) standard penetration test borings to depths varying from 25 to 35 feet below the existing ground elevation. Field exploration was performed on March 11, 1988 utilizing our truck mounted rotary drill rig. These borings were advanced with the use of a drilling bit in conjunction with wash water or drilling fluid. The field exploration was supervised by a qualified engineering representative of our firm. Additionally, a total of seven (7) shallow test borings were drilled on November 24, 1987. The purpose of this investigation was to determine the uniformity of impermeable clay cover and to evaluate the in-situ clayey soils with respect to providing a satisfactory clay liner.

Representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with American Society for Testing and Materials (ASTM) specification D 1586-67. A copy of this procedure is included in the Appendix A. The standard penetration test results are the result of recorded blow counts with a 140 pound hammer falling freely thirty (30) inches, driving drill rods attached to a standard 2" O.D. sampler. In the standard manner, the sampler is seated six (6) inches into the bottom of the test hole and then advanced an additional twelve (12) inches. All advancement of the sampler is accomplished by the dynamic effort of the hammer. Blows are applied until eighteen (18) inches of penetration is reached or until an excessive blow count is attained. The sampler is then removed from the test hole opened, and the soil sample sealed in a glass jar.

A qualified engineering representative of our firm maintained a field log of the soil samples recovered in the field. All the soil samples were sealed, labeled and brought to our laboratory for further testing, as necessary.

The soil samples were visually inspected and classified on the basis of texture and plasticity in accordance with the Unified Soil Classification System (USCS).

Finally, it is our opinion that the actual transition between soil stratas is often gradual thereby implying the the boundaries between soil type as indicated on the attached boring logs are approximate.

We have stored all the soil samples recovered in the field in our laboratory. If you wish these samples to be retained beyond a period of thirty (30) days from the release of this report, then please advise us in writing.

Site Location and Features

Location

The site is located near Brooksville, Hernando County, Florida.

Site Features

The site slopes downward towards the east and north. We have estimated that an elevation difference of 40 ± feet exists between the east-west limits of the site under consideration. Additionally, a hill (approximately 15 ± feet high) lies immediately adjacent to the western boundary of the site and a low area exists immediately north of the site.

Laboratory Testing Program

All the soil samples obtained during our field explorations were brought to our laboratory, inspected and further classified on the basis of USCS.

In order to determine the adequacy of clayey soils in terms of permeability, samples were recovered from shallow depths during our initial exploration (of November 1987). Laboratory tests such as conventional one dimensional consolidation and falling head permeability tests were performed on these clayey soils. The results of these tests are included in Appendices A and B

In view of the non-uniformity (in terms of thickness) of shallow clayey soils, it was concluded that in-situ clays could not provide an effective clay liner. Consequently, we were requested to evaluate local clayey materials to be used for the construction of a desired low permeability liner. Accordingly, a total of three local clay samples were delivered to our laboratory by an FCS representative. The samples being of uniform texture, were blended together to obtain a composite sample. Laboratory permeability tests were performed on two representative samples of the blended material. The results of these tests are included in the Appendix A.

Findings, Geotechnical Evaluation, Recommendations, and Conclusions

The following evaluation of the subsurface conditions has been based on the test borings data assimilated during this investigation. In evaluating the subsoil data, we have used previously established correlations between standard penetration resistance test values (N-values) and the engineering performance characteristics of soils similar to those encountered at this site.

Site Preparation and Fill Compaction

The project area and at least 10 feet beyond the proposed facility should be stripped of all vegetation, top soil and any other unsuitable material. Subsequent to stripping, earthwork operations consisting of cut and fill, should be performed to achieve the desired grade. Areas to receive fill should be proof-rolled with a vibratory drum-type compactor. Proof-rolling should continue until the soil, one (1) foot below the compacted surface is compacted to 95% field density as indicated by the modified proctor test (ASTM D 1557). Subsequently, the compacted area should be backfilled, to the desired elevation in controlled (compacted and tested) lifts, with approved liner material. The areas which needed undercutting should be compacted to desired density. The material obtained as a result of undercutting should be stockpiled separately and could be reused in areas to receive fill.

If local clayey material is used for fill and compacted with a large vibratory drum-type compactor, fill may be placed in 12 inch thick lifts. In the event that a medium size compactor is used, fill thickness should be restricted to a maximum of 8 inches.

Subsurface Conditions

Our subsurface investigation established the presence of generally uniform (in relation to depth) subsoil conditions. A thin layer of fine sand (SP) was encountered from surface to a depth of 2.0 feet. Its consistency varied from very loose to loose. This strata was underlain by a uniform layer of stiff to very stiff silty clay (CL). Borings B-2 and B-3 were found to have a very dense, sandy Limestone layer from 19 $\pm$ 2 feet to 23 $\pm$ 2 feet. No loss of drilling mud circulation was observed in any of the borings.

Groundwater Conditions

No groundwater table level was recorded up to the termination depth(s) in all of the soil borings.

Site Suitability

Based on our review and evaluation of the assimilated data, it is our opinion that the subsoils, within this project site, are competent for the construction of the proposed landfill facility. A net allowable bearing pressure of 3500 pounds per square foot (psf) can be achieved provided our guidelines and recommendations are specifically adhered to. It is based on our estimation of the unit weight of 90 pounds per cubic foot (pcf) for the waste material to be stored/disposed of at the site.

When the site has been prepared and graded as recommended above, all other landfill regulatory procedures can be followed.

Settlement

It is our opinion that the presence of subsoil movements at the project site will occur, within the critical stress zone, due to several interrelated stresses. The amount of movement (rearrangement) experienced by the subsoils is directly proportional to the imposed pressure intensity in addition to the consolidation characteristics of the subsoils within the critical stress zone. Settlement of subsoils on sand is predicted from empirical procedures based upon the Standard Penetration Resistance (N) as a measure of the in-situ relative density. We have estimated a total settlement of 2 $\pm$ inches, one half of which may be differential (between the corner and center of the surcharge loading) and recommend that it should be incorporated in the design and selection of the base liner.

Sinkhole Potential

Based on our review of the subsoil data assimilated as a result of our subsurface investigation in conjunction with the fact that no loss of drilling mud and/or sudden falling of the drill-rod was observed, it is our opinion that no sinkhole activity exists at the present time, under the project site. Further evaluation of the subsoils encountered during our well installation program, has revealed, in our opinion, that this area appears to be underlain by a paleokarst feature. This was revealed by the absence of limestone strata to a depth of 165 $\pm$ feet in the southern exploratory well whereas competent limestone stratas were encountered at shallow depths of 20 to 25 feet in the two wells on the north and west side of the site.

We have concluded that the potential for the development/reactivation of a collapse or erosion type sinkhole is minimal. Review of geology of the general area, data assimilated during this study along with applicable geologic data (already available) were used to arrive at this conclusion.

General Qualifications

This report has been prepared in order to comply with requirements of FAC 17-7 as specified in the FCS CPL Site Certification Document and to assist the engineer in the design of this project. The scope is limited to the specific project and location described herein, and our description of the project represents our understanding of the significant aspects relevant to soil and foundation characteristics. In the event that any changes in the design or location of the landfill as outlined in this report are planned, we should be informed so the changes can be reviewed and the conclusions of this report modified as necessary in writing by the soil and foundation engineer.

It is recommended that all construction operations dealing with earthwork and foundations be reviewed by an experienced soil engineer to provide information on which to base a decision whether the design requirements are fulfilled in the actual construction. If you wish, we would welcome the opportunity to provide field construction services for you during construction.

The analysis and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated on the boring location plan and from any other information discussed in this report. This report does not reflect any variations which may occur between these borings. In the performance of subsurface explorations, specific information is obtained at specific locations at specific times. However, it is a well-known fact that variations in soil and rock conditions exist on most sites between boring locations and also such situations as ground water levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If variations then appear evident, it will be necessary for a re-evaluation of the recommendations of this report after performing on-site observations during the construction period and noting the characteristics of any variations.

HYDROGEOLOGIC SURVEY AND GROUNDWATER MONITORING PLAN

Exploratory Wells

Three exploratory wells were drilled to investigate the site specific hydrogeologic regime. Details of their construction are given by the Construction and Lithologic Logs found in Appendix B. Two of the wells were constructed to penetrate approximately 20 feet into the Floridan aquifer. The third was constructed to penetrate approximately 50 feet into the aquifer with the expectation that this construction will allow use of this well as a permanent monitoring point.

The location of the three wells, CPL 8, 9 and 10 are shown on Drawing 198-1-126, sheet 2 of 5. Well CPL 9 is located to the north of the proposed landfill and also north of an east-west trending mine cut. The mine cut represents the past location of a now removed limestone ridge. Wells CPL 8 and 9 show a lithology of clay and sand-clay mixtures overlying biomicritic limestone containing alternating hard and soft layers similar to that indicated by the borings within the landfill site. The lithology logs indicate the limestone surface dips to the south. The lithology of CPL 10 indicates a much greater clayey sediment thickness overlying a substantial thickness of interbedded peat and sand with no limestone encountered to a depth of 165 feet. We interprete this lithology to indicate the landfill lies above the northern edge of a paleokarst feature.

The deep and shallow borings within the landfill site indicate firm clay and clay-sand mixture sediments. Shelby tube clay samples were taken from selected shallow borings and tested for vertical permeability. The results, given in Appendix B, indicate a low to very low permeability for the in-situ sediments beneath the landfill liner. The water production observed during air rotary drilling of the monitor wells and water level stabilization times observed after drilling indicates the underlying limestone to be moderately permeable.

Groundwater Flow

Water level measurements were taken in the three exploratory wells, Appendix B. Florida Crushed Stone personnel determined the elevation of the well measuring points in relation to NGVD, and the water level measurements were converted to NGVD elevations. The water level elevation observed indicates the Floridan aquifer potentiometric surface was the only water level encountered while drilling the exploratory wells. The water level measurements indicate a slight flow gradient to the northwest.

Past data from the USGS wells and the SWFWMD May and September potentiometric surface maps show that the regional groundwater flow direction in the Florida aquifer is to the northwest year round.

Proposed Groundwater Monitoring Wells

The proposed locations of the permanent solid waste landfill monitor wells are shown on Drawing 198-1-126, sheet 2 of 5. We propose to convert existing exploratory well CPL 10 to a permanent monitor well. Well CPL 12 would be constructed at a point approximately 100 feet from the northwestern edge of the lined stormwater runoff collection sump to serve as the primary lateral downgradient monitor. It would be constructed similarly to well CPL 9 so that samples could be taken from the screened interval about 20 feet into the aquifer. This monitoring level was selected in order to insure sufficient water in the wells for sampling and to allow early detection of any water quality changes. CPL 11 will be constructed to monitor at a depth approximately 50 feet into the aquifer and would become the primary vertical downgradient monitor. It will be located at the northwestern edge of the sump. CPL 10 will serve as the upgradient monitor and CPL 8 and 9 as water level monitors.

The hydrogeologic regime under the liner indicates that any leachate seeping through the liner would travel vertically until it intercepted the water table. Flow would then be laterally with some downward component towards the nearby mine production wells.

Water Quality Sampling and Analysis

Leachate chemical characteristics for the baghouse dust have not been determined. However, due to the very low permeability of this material, no leachate is expected to be generated. Very small quantities of coal pile runoff collection sump sludge will also be disposed of in the landfill. Therefore, we propose to determine background water quality for the list of parameters specified in the SCD for monitoring of the coal pile storage area. We believe this list is sufficiently comprehensive to cover chemical contamination concerns from baghouse dust leachate.

We propose to begin sampling and analysis for the site certification parameter's list immediately. We will continue sampling and analyzing well CPL 10 weekly until (utilizing a minimum of four samples) a 95% confidence level is established in the background water quality. As this criteria is met for each parameter, it would be dropped from further analysis. The exception to this would be for the following indicator parameters: TDS, pH, sulfates, chloride, iron and conductivity for which every sample would be analyzed.

The above proposed additional monitor wells CPL 11 and 12 would be sampled weekly and analyzed similarly until the statistically valid background water quality was established (for all parameters except the indicators) and then quarterly thereafter. Once landfilling begins at the facility, should the levels of the indicator parameters rise above their normal variance as established during the background period, then analysis for the

comprehensive parameters list would resume on specific wells as appropriate.

Each monitor well will be equipped with a dedicated electric jet pump installed with PVC drop pipe. Samples will be taken during the background period only after at least two casing volumes of water has been removed from the well and conductivity and temperature measurements have shown the water quality to be stabilized. The samples will be preserved and analyzed in accord with the latest addition of Standard Methods for the Analysis of Water and Wastewater by a laboratory certified by the State of Florida to perform such analyses. Results of the water quality analyses will be submitted to the Southwest Florida Water Management District and the DER Southwest District office within ten days of their receipt from the water quality laboratory, and quarterly summaries of the results of monitoring will be provided.

Respectfully submitted,

Jim R. Edwards, CPG #4640

Sonny Gulati, M.S.
Project Engineer

Terry R. Ritter 6/24/88
Terry R. Ritter, P.E.
Engineer

D. E. R.

JUL 20 1988

SOUTH WEST DISTRICT
TAMPA

APPENDIX A

AMERICAN SOCIETY FOR TESTING AND MATERIALS

1916 Race St., Philadelphia, Pa. 19103

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Standard Method for

THIN-WALLED TUBE SAMPLING OF SOILS[1]

ASTM Designation: D 1587 - 67

This Standard of the American Society for Testing and Materials is issued under the fixed designation D 1587; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

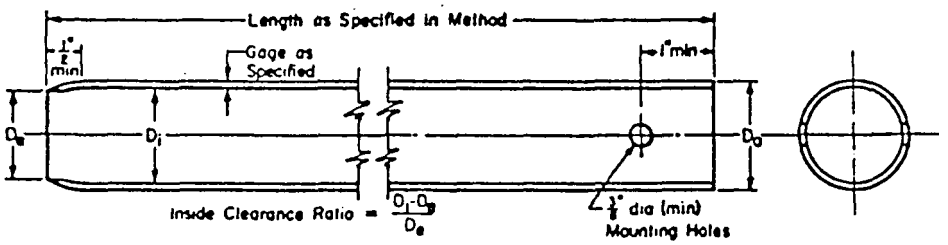
1.1 This method describes a procedure for using a thin-walled metal tube to recover relatively undisturbed soil samples suitable for laboratory tests. It is intended as a guide to more complete specifications to meet the needs of a particular job.

1.2 There are, in general, two types of samplers that use thin-walled tubes for sampling, namely, open-tube samplers, and piston samplers.[2] In general, piston samplers are better and can be used in almost all soils. Since the thin-walled tube requirements are the same for both types of samplers, the method described applies equally to both.

2. Apparatus

2.1 *Drilling Equipment*—Any drilling equipment may be used that provides a reasonably clean hole before insertion of the thin-walled tube; that does not disturb the soil to be sampled, and that can effect continuous and rapid penetration of the tube into the sampled soil.

2.2 *Thin-Walled Tubes*—Thin-walled tubes 2 to 5 in. (50.8 to 127 mm) in outside diameter and made of any materials having adequate strength and resistance to corrosion will be satisfactory (Fig. 1). Adequate resistance to corrosion can be provided by a suitable coating. Sizes other than these may be used, if specified.



NOTE 1—Minimum of two mounting holes on opposite sides for 2 to 3½ in. sampler.
NOTE 2—Minimum of four mounting holes spaced at 90 deg for samplers 4 in. and larger.
NOTE 3—Tube held with hardened screws.

TABLE OF METRIC EQUIVALENTS.

in.	mm	cm
⅜	6.77	...
½	12.7	1.27
1	25.4	2.54
2	...	5.08
3½	...	8.89
4	...	10.16

FIG. 1—Thin-Walled Tube for Sampling.

2.2.1 Tubes shall be of such a length that between five and ten times the diameter is available for penetration into sands and between ten and fifteen diameters is available for penetration into clays. Tubes shall be round and smooth, without bumps, dents, or scratches. They shall be clean, and free from rust and dirt. Seamless or welded tubes are permissible, but welds must not project at the seam. The cutting edge shall be machined as shown in Fig. 1 and shall be free from

TABLE 1—SUITABLE THIN-WALLED STEEL SAMPLE TUBES.[a]

Outside diameter:			
in.	2	3	5
mm	50.8	76.2	127
Wall thickness:			
Bwg	18	16	11
in.	0.049	0.065	0.120
mm	1.24	1.65	3.05
Tube length:			
in.	36	36	54
m	0.91	0.91	1.45
Clearance ratio, per cent	1	1	1

[a] The three diameters recommended in Table 1 are indicated for purposes of standardization, and are not intended to indicate that sampling tubes of intermediate or larger diameters are not acceptable. Lengths of tubes shown are illustrative. Proper lengths to be determined as suited to field conditions.

Under the standardization procedure of the Society, this method is under the jurisdiction of the ASTM Committee D-18 on Soil and Rock for Engineering Purposes. A list of members may be found in the ASTM Year Book.

Current edition issued Oct. 20, 1967. Originally issued 1958. Replaces D 1587 - 63 T.

[2] Hvorslev, M. J., *Surface Exploration and Sampling of Soils for Civil Engineering Purposes*, The Engineering Foundation, 345 East 47th St., New York, N. Y. 10017.

nicks. The inside clearance ratio shall be between 0.5 and 3 per cent.

2.2.2 Two vent holes ($\frac{1}{8}$ in. (9.1 mm) minimum) shall be provided in the sampler head. A coupling head with a check valve and a minimum of 0.6 in.^{2} (3.9 cm^2) venting to outside above check valve shall be used. Table 1 shows the dimensions of suitable thin-walled sample tubes.

2.3 *Sealing Wax*—Any wax shall be permitted for sealing that does not have appreciable shrinkage, or does not permit evaporation from the sample. Microcrystalline waxes are preferable to paraffin. Thin disks of steel or brass that are slightly smaller than the inside diameter of the tube are desirable for plugging both ends before sealing with wax. Cheesecloth and tape are needed. Suitable expanding packers may be used.

2.4 *Accessory Equipment*—Labels, data sheets, shipping containers, and other necessary supplies.

3. Procedure

3.1 Clean out the hole to sampling elevation using whatever method is preferred that will ensure that the material to be sampled is not disturbed. In saturated sands and silts withdraw the drill bit slowly to prevent loosening of the soil around the hole. Maintain the water level in the hole at or above ground water level.

3.2 The use of bottom discharge bits shall not be allowed but, any side discharge bit is permitted. The procedure of jetting through an open-tube sampler to clean out the hole shall not be allowed.

3.3 With the sampling tube resting on the bottom of the hole and the water level in the boring at the ground water level or above, push the tube into the soil by a continuous and rapid motion, without impact or twisting. In no case shall the tube be pushed further than the length provided for the soil sample. Allow about 3 in. (75 mm) in the tube for cuttings and sludge.

3.4 When the soils are so hard that a pushing motion will not penetrate the sampler sufficiently for recovery, and where recovery by pushing in sands is poor, use a driving hammer to drive the sampler. In such a case, record the weight, height, and number of blows. Before pulling the tube turn it at least two revolutions to shear the sample off at the bottom.

3.5 Repeat the sampling procedures described at intervals not longer than 5 ft (1.5 m) in homogeneous strata and at every change of strata.

4. Preparation for Shipment

4.1 Upon removal of the sampler tube, measure the length of sample in the tube and also the length penetrated. Remove disturbed material in the upper end of the tube before applying wax and measure the length of sample again. After removing at least 1 in. (25 mm) of soil from the lower end, and after inserting an impervious disk, seal both ends of the tube with wax applied in a way that will prevent wax from entering the sample. Where tubes are to be shipped some distance, tape the ends to prevent breakage of the seals. It is advisable to place cheesecloth around the ends after sealing and dip the ends several times in the melted wax.

4.2 Affix labels to the tubes giving job designation, sample location, boring number, sample number, depth, penetration, and recovery length. Record a careful description of the soil, noting composition, structure, consistency, color, and degree of moisture. Mark the tube and boring numbers in duplicate.

4.3 Do not allow tubes to freeze, and store in a cool place out of the sun at all times. Ship samples protected with suitable resilient packing material to reduce shock, vibration, and disturbance.

4.4 Using soil removed from the ends of the tube, make a careful description giving composition, condition, color and, if possible, structure and consistency.

5. Report

5.1 Data obtained in borings shall be recorded in the field and shall include the following:

5.1.1 Name and location of job,

5.1.2 Date of boring—start, finish,

5.1.3 Boring number and coordinate, if available,

5.1.4 Surface elevation, if available,

5.1.5 Sample number and depth,

5.1.6 Method of advancing sampler, penetration and recovery lengths,

5.1.7 Type and size of sampler,

5.1.8 Description of soil,

5.1.9 Thickness of layer,

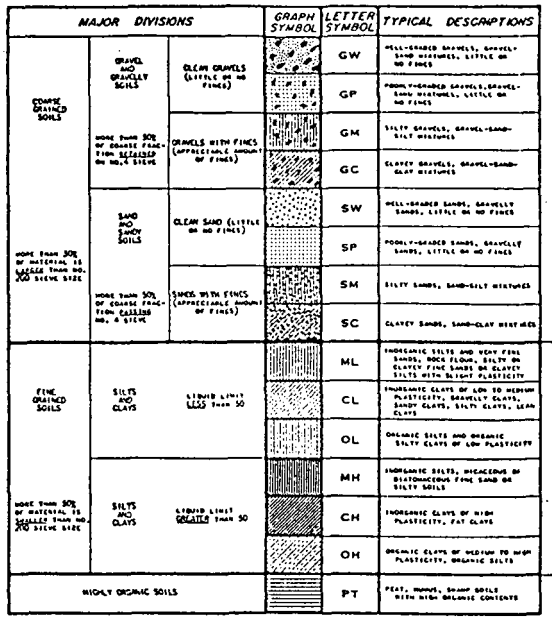
5.1.10 Depth to water surface; to loss of water; to artesian head; time at which reading was made,

5.1.11 Type and make of machine,

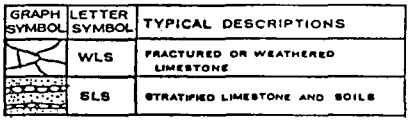
5.1.12 Size of casing, depth of cased hole,

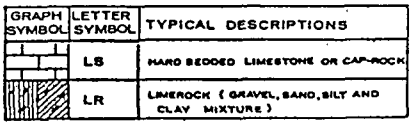
5.1.13 Names of crewmen, and

5.1.14 Weather, remarks.



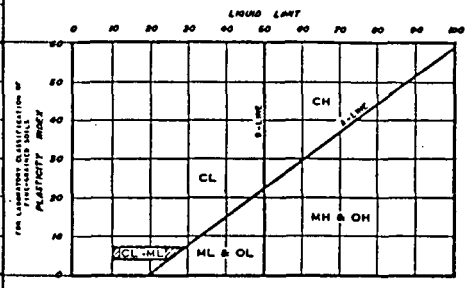
SOIL CLASSIFICATION CHART





ROCK CLASSIFICATION (FLORIDA) CHART

KEY TO SAMPLES



PLASTICITY CHART

UNIFIED SOIL CLASSIFICATION SYSTEM

TERMS DESCRIBING COMPACTNESS CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Conditions rated according to standard penetration test (SPT) as performed in the field.

DESCRIPTIVE TERM	BLOWS PER FOOT *
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	over 50

FINE GRAINED SOILS (major portion passing No. 200 sieve): includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	BLOWS PER FOOT *	UNCONFINED COMPRESSIVE STRENGTH ton/sq. ft.
Very Soft	0 - 2	Less than 0.25
Soft	3 - 4	0.25 to 0.50
Firm	5 - 8	0.50 to 1.00
Stiff	9 - 15	1.00 to 2.00
Very Stiff	16 - 30	2.00 to 4.00
Hard	over 30	4.00 and higher

* 140 pound weight having a free fall of 30 inches

NOTE: The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

Fissured - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.

Laminated - composed of thin layers of varying color and texture.

Interbedded - composed of alternate layers of different soil types.

Calcareous - containing appreciable quantities of calcium carbonate.

Well graded - having wide range in grain sizes and substantial amounts of all intermediate particle sizes.

Poorly graded - predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.

SYMBOLS AND TERMS USED ON BORING LOGS

Plate 3

Professional Service Industries, Inc.
Florida Testing Division

January 5, 1988

Imperial Testing Laboratories
P.O. Drawer B-6
Lakeland, FL 33802

Attn: Tony Alderete

Re: Consolidation Tests
PSI No.: 381-80003-1

Gentlemen:

Presented herein are the results of two (2) consolidations tests along with permeability results for each. Void ratio verses Load curves for each test is attached. The permeability results are listed below.

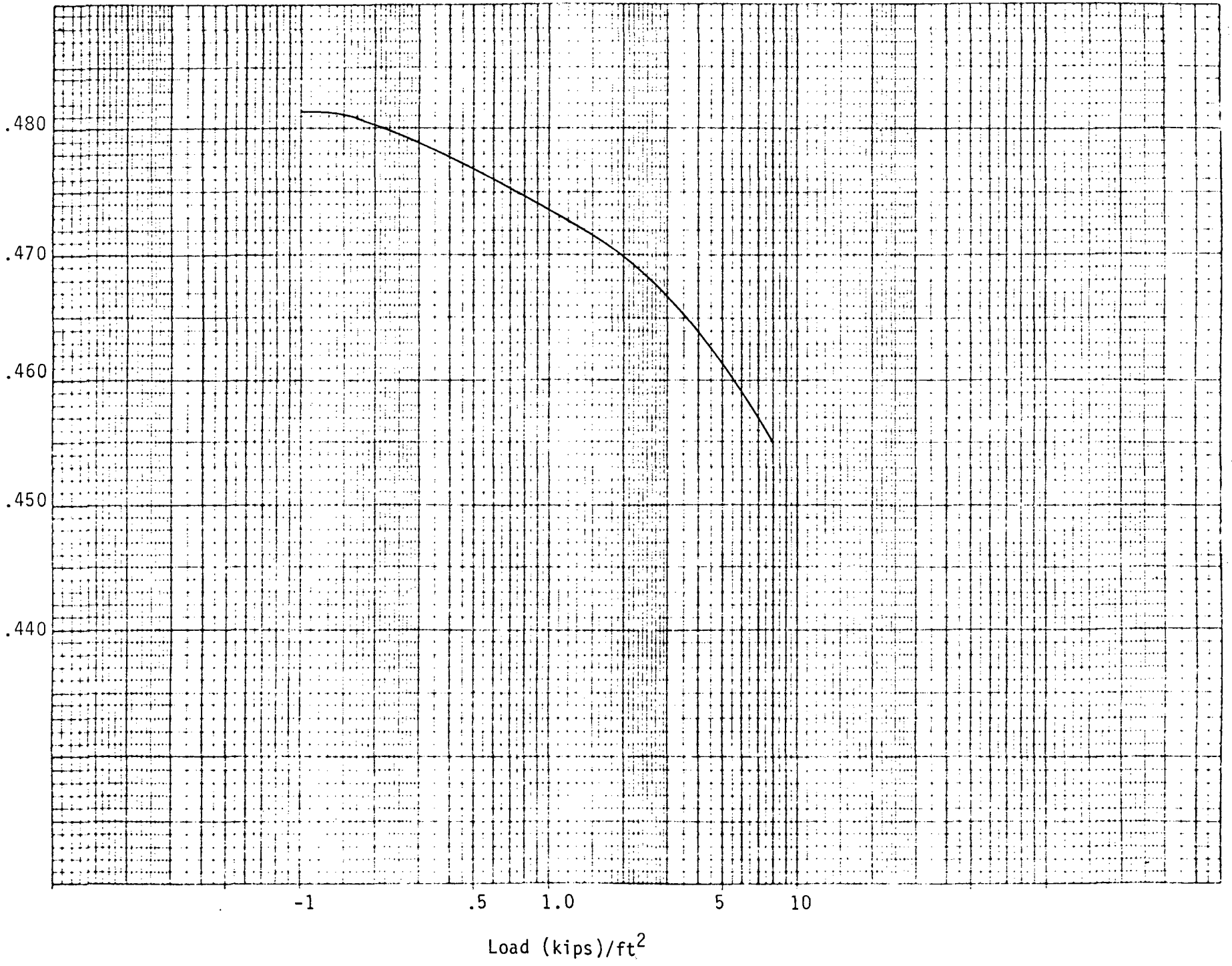
Boring	Description	Load (KSF)	Permeability (cm/sec)
No. 2	Tan & White fine sand with clay	0	1.3×10^{-6}
		0.2	8.2×10^{-7}
No. 4	Gray and Red clay with Limerock	0	6.2×10^{-7}
		0.2	1.2×10^{-8}

Should you have any questions regarding this report, do not hesitate to call.

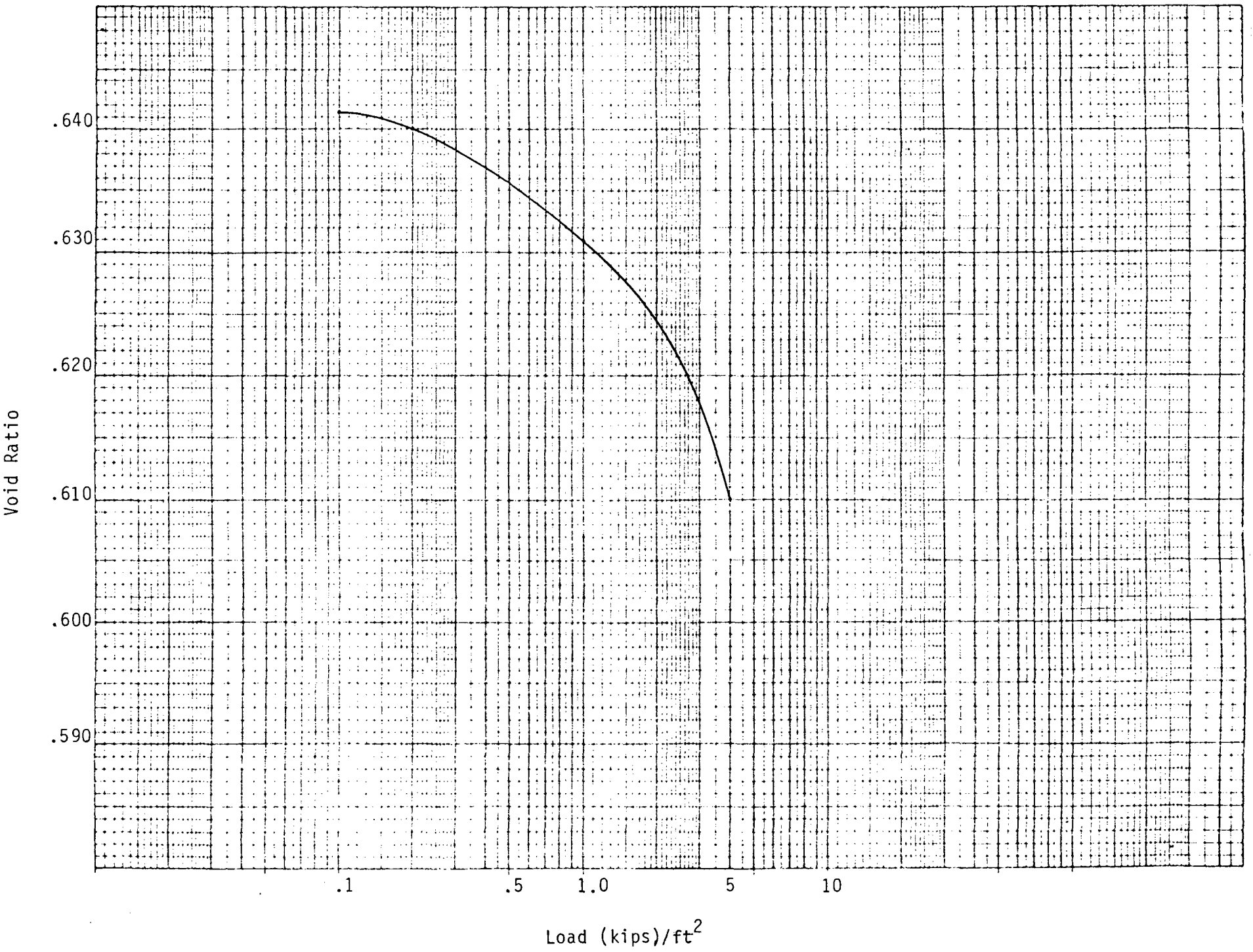
Respectfully submitted,

PSI/FLORIDA TESTING DIVISION

Sample No. 2



Sample No. 4



crm 020

Professional Service Industries, Inc.
Florida Testing Division

April 5, 1988

Imperial Testing Laboratories
P.O. Drawer B-6
Lakeland, FL 33802

Attn: Tony Alderete

Re: Consolidation Test
PSI File No.: 381-80003-4

Gentlemen:

Presented herein is the result of the consolidation test performed on the baghouse dust which was delivered to our office by Tony Alderete. The Permeability results are listed below.

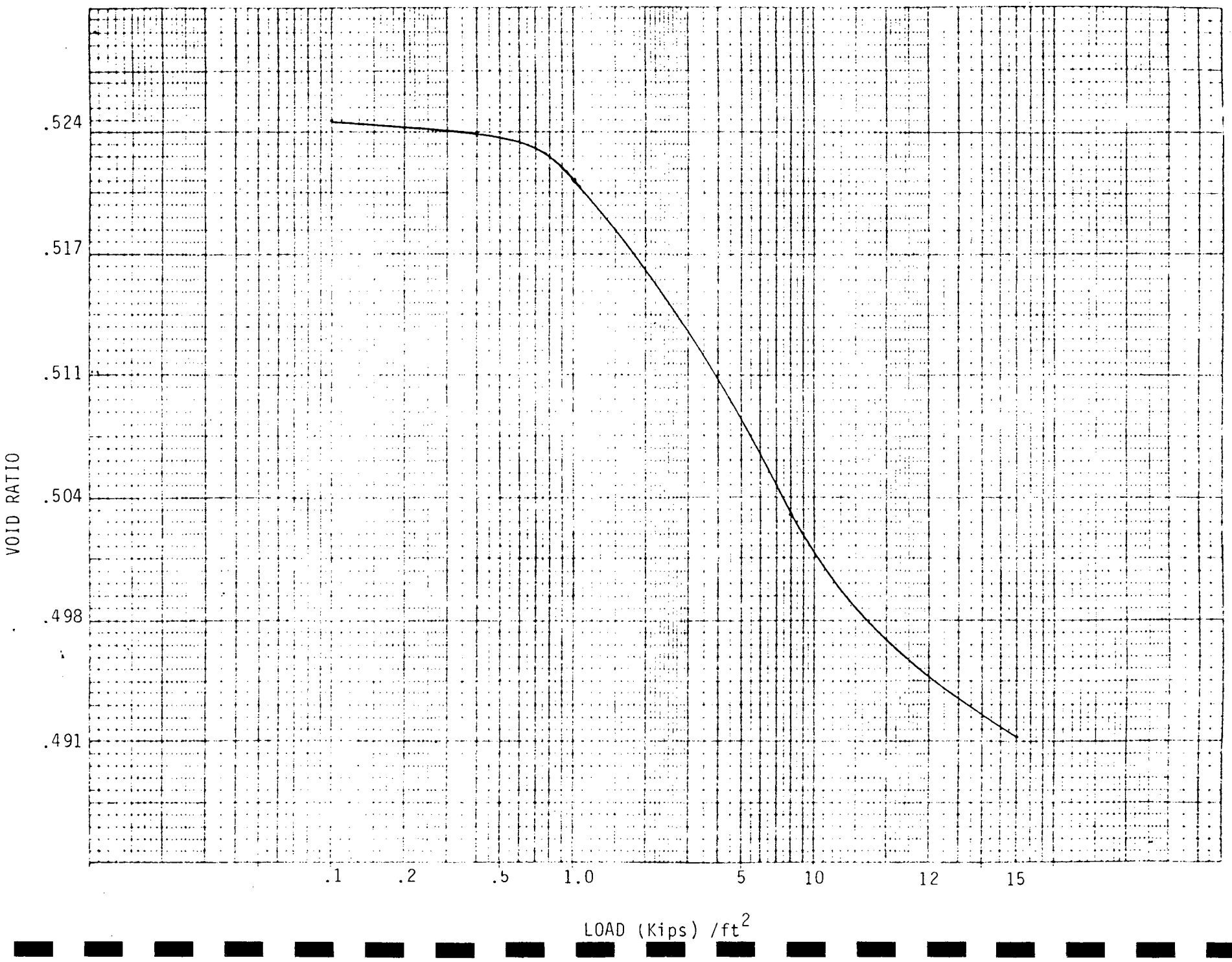
Description	Load (ksf)	Permeability (cm/sec)
Baghouse Dust	0.5	2.02×10^{-8}
	1.0	1.44×10^{-8}
	2.0	1.15×10^{-8}
	4.0	4.73×10^{-9}
	8.0	5.70×10^{-9}

Should you have any questions regarding this report, do not hesitate to call.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES

Scott S. Crandall
Division Manager
Construction Services


.524
.517
.511
.504
.498
.491
VOID RATIO
.1
.2
.5
1.0
5
10
12
15
LOAD (Kips) /ft^2

Imperial Testing Laboratories, Inc.
3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

REPORT OF BEARING TEST

Client Fla. Crushed Stone Date 10/29/87

Project Number 1299 Road Name

Job Begins Station Job Ends Station

Type of Construction Required Bearing

Station	Sample	Depth	Bearing	Lab	L. L.	P. I.	Remarks
*	1		83.2	20.8			Fly Ash
*	2		102.0	25.5			Bottom Ash
*	3		80.0	20.0			Bag House Dust

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TELEPHONE: (813) 682-4873

MOISTURE-DENSITY RELATIONSHIP OF SOILS REPORT

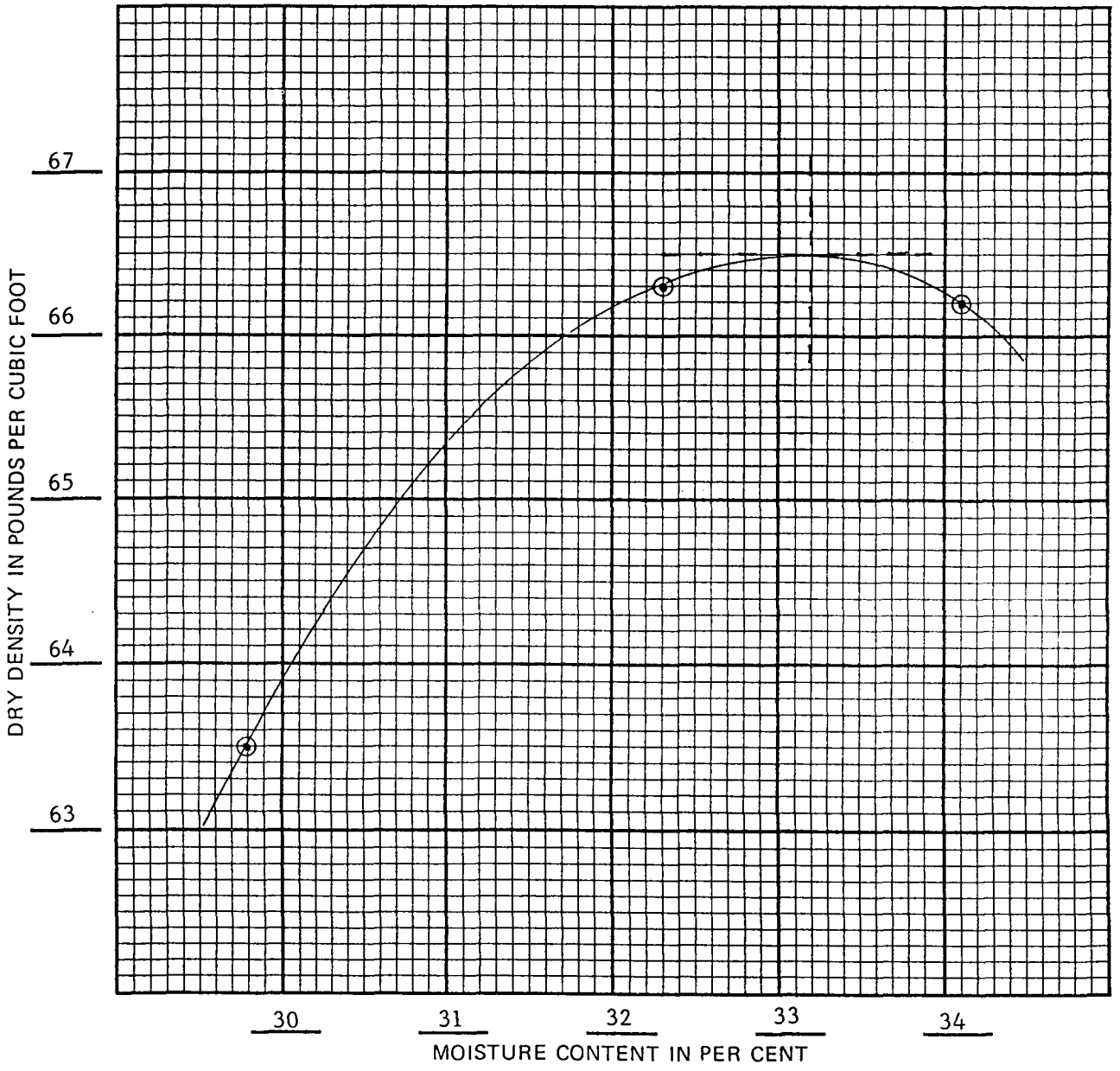
PROJECT LOCATION Fla. Crushed Stone - CPL Plant

JOB NUMBER 1299 DATE 10/29/87 TESTED BY B. Wheless & B. Rogers

PROCTOR TYPE X T-99, METHOD A ; _____ T-180, METHOD _____

MATERIAL TESTED AND CLASSIFICATION Bottom Ash

OPTIMUM MOISTURE 33.2 % MAXIMUM DRY DENSITY 66.5 #/cubic foot



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MOISTURE-DENSITY RELATIONSHIP OF SOILS REPORT

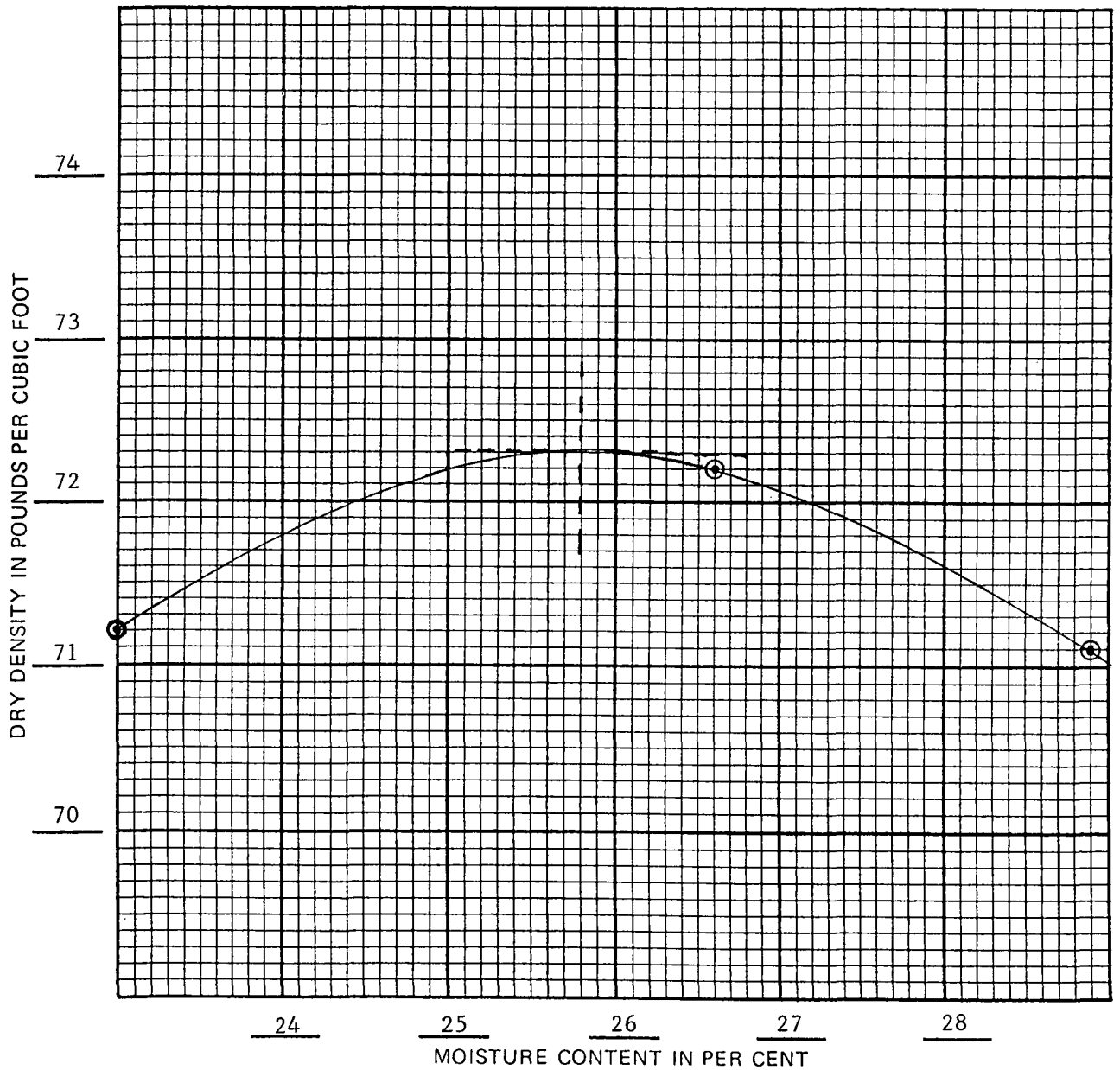
PROJECT LOCATION Fla. Crushed stone - CPL Plant

JOB NUMBER 1299 DATE 10/29/87 TESTED BY B. Wheless & B. Rogers

PROCTOR TYPE X T-99, METHOD A ; _____ T-180, METHOD _____

MATERIAL TESTED AND CLASSIFICATION Fly Ash

OPTIMUM MOISTURE 25.8 % MAXIMUM DRY DENSITY 72.3 #/cubic foot



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TELEPHONE: (813) 682-4873

MOISTURE-DENSITY RELATIONSHIP OF SOILS REPORT

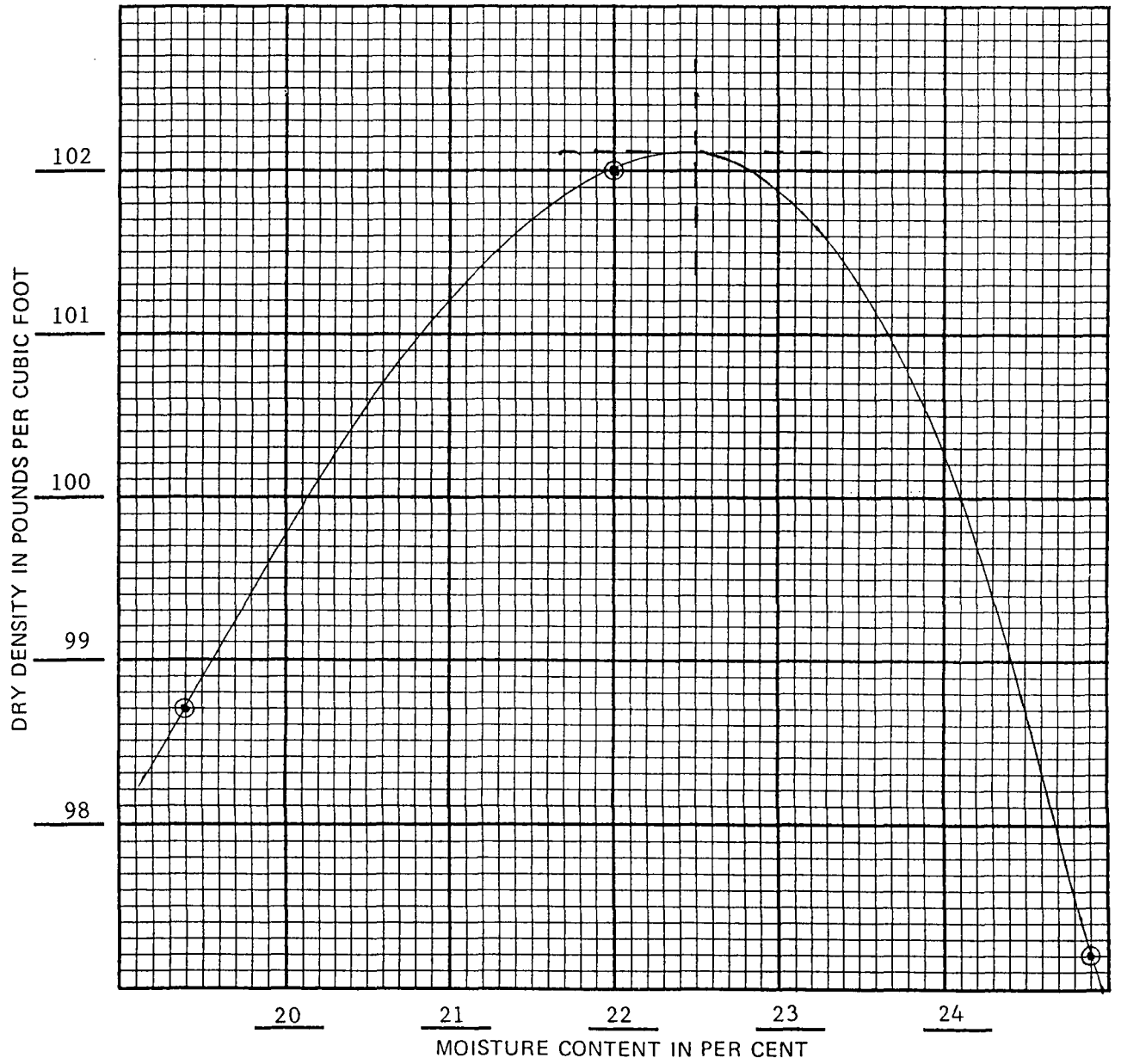
PROJECT LOCATION Fla. Crushed Stone - CPL Plant

JOB NUMBER _____ DATE 11/9/87 TESTED BY B. Rogers

PROCTOR TYPE X T-99, METHOD A ; _____ T-180, METHOD _____

MATERIAL TESTED AND CLASSIFICATION Bag House Dust

OPTIMUM MOISTURE 22.5 % MAXIMUM DRY DENSITY 102.1 #/cubic foot



Artcraft Printers of Lakeland

Comparison of Uncompacted and Compacted Material Densities

Material	ph	Dry Density(As received)	Max. Dry Density
Fly Ash	8.2	53.2#/cu. ft.	72.3#/cu. ft.
Bottom Ash	8.4	33.8#/cu. ft.	66.5#/cu. ft.
Bag House Dust	8.2	35.8#/cu. ft.	102.1#/cu. ft.

Professional Service Industries, Inc.
Florida Testing Division

February 12, 1988

Imperial Testing Laboratories
P.O. Box Drawer B-6
Lakeland, Florida 33802

Attn: Tony Alderete

Re: Permeability Tests
File No.: 381-80003-3

Gentlemen:

As requested by Mr. Tony Alderete, a vertical permeability was performed on the two (2) samples which were delivered to our office. Please find the permeability data on the summary of results under cover of this letter.

The vertical permeability tests were performed in general accordance with the falling head method used by the U.S Corps of Engineers. No confining pressures were used except for the water head pressure of approximately four (4) feet.

If you should have any questions, please do not hesitate to call.

Respectfully submitted,

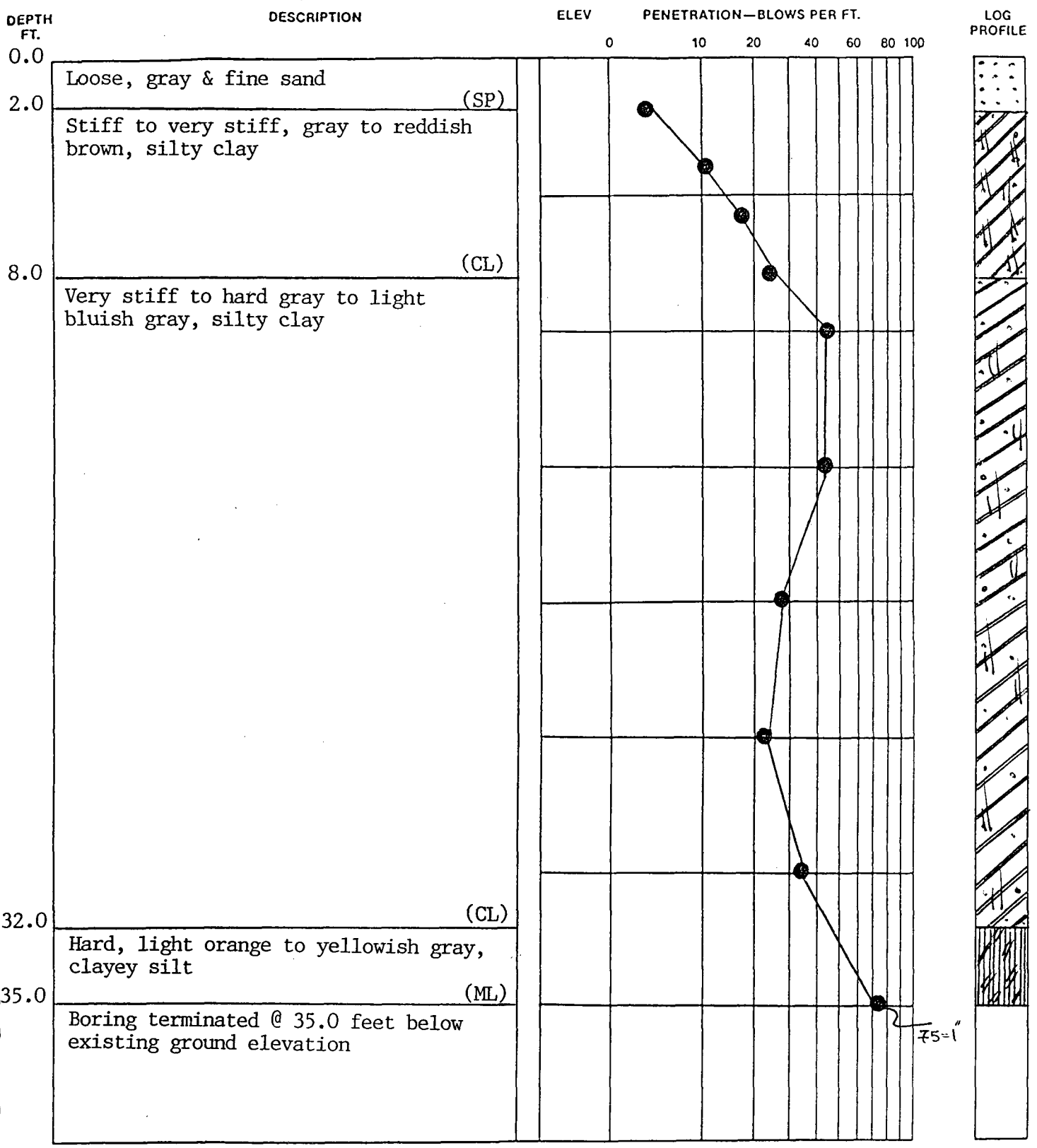
PROFESSIONAL SERVICE INDUSTRIES

Scott S. Crandall
Division Manager

6056 Ulmerton Road • Clearwater, FL 33520 • Phone: 813/531-1446

SUMMARY OF RESULTS

Sample No.	Flow Direction	Permeability (cm/sec)
1	Vertical	1.45×10^{-8}
2	Vertical	9.52×10^{-8}



Imperial Testing Laboratories

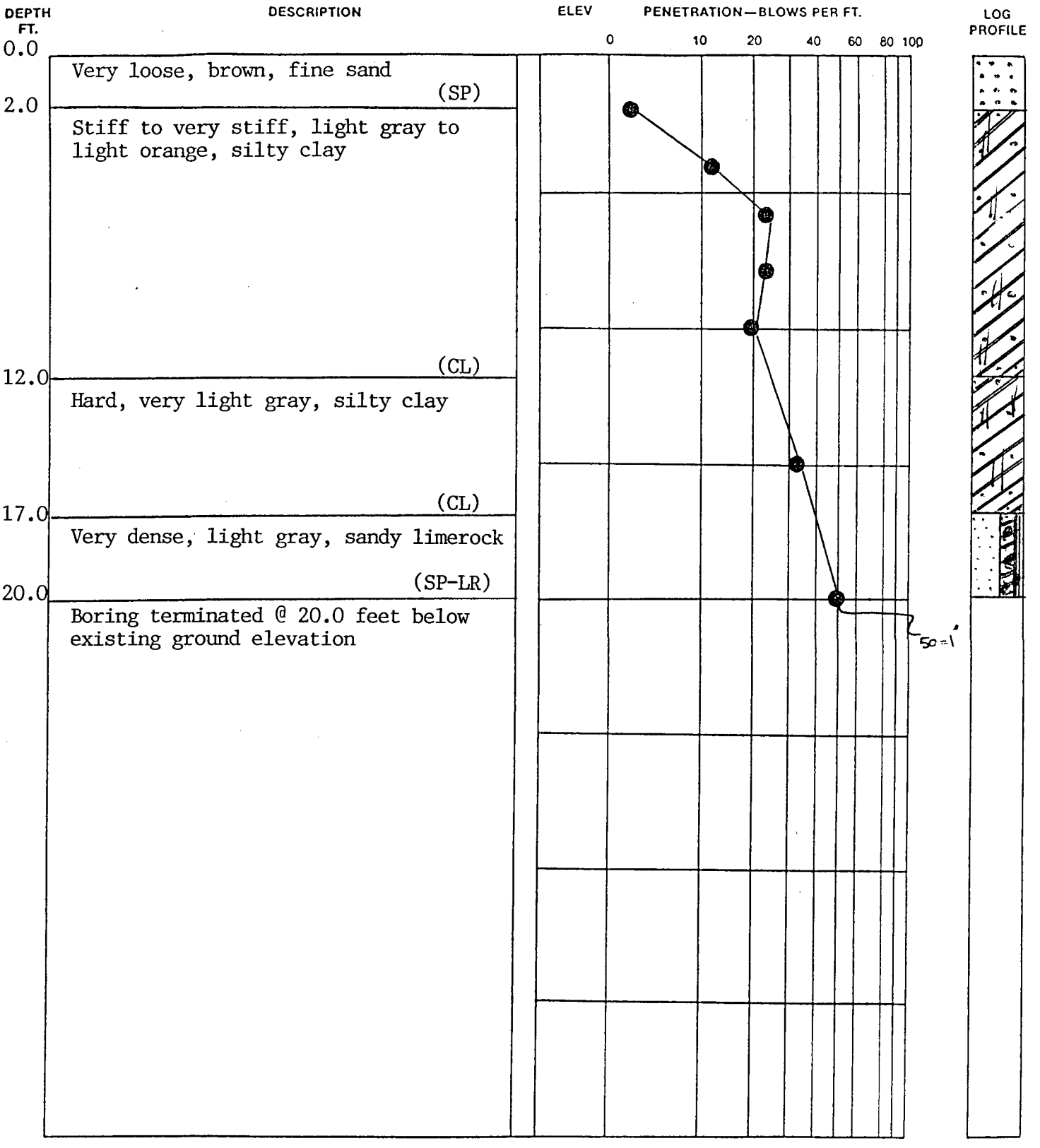
BORING AND SAMPLING MEETS ASTM D-1586
CORE DRILLING MEETS ASTM D-2113

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE; 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

BORING NO. DB-1
DATE DRILLED 3/11/88
JOB NO. 1299



Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

BORING NO. DB-2
DATE DRILLED 3/11/88
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Very loose, brown, fine sand (SP)	
2.0	Stiff to very stiff, reddish brown, silty clay (CL)	
6.0	Very stiff, dark gray, silty clay (CL)	
12.0	Medium dense, light gray, clayey limerock (CL-LR)	
17.0	Firm, light gray to brown sandy clay (CL)	
21.0	Very dense, light gray sandy limerock (SP-LR)	
25.0	Boring terminated @ 25.0 feet below existing ground elevation	

PENETRATION—BLOWS PER FT. 0 10 20 40 60 80 100

LOG PROFILE

Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

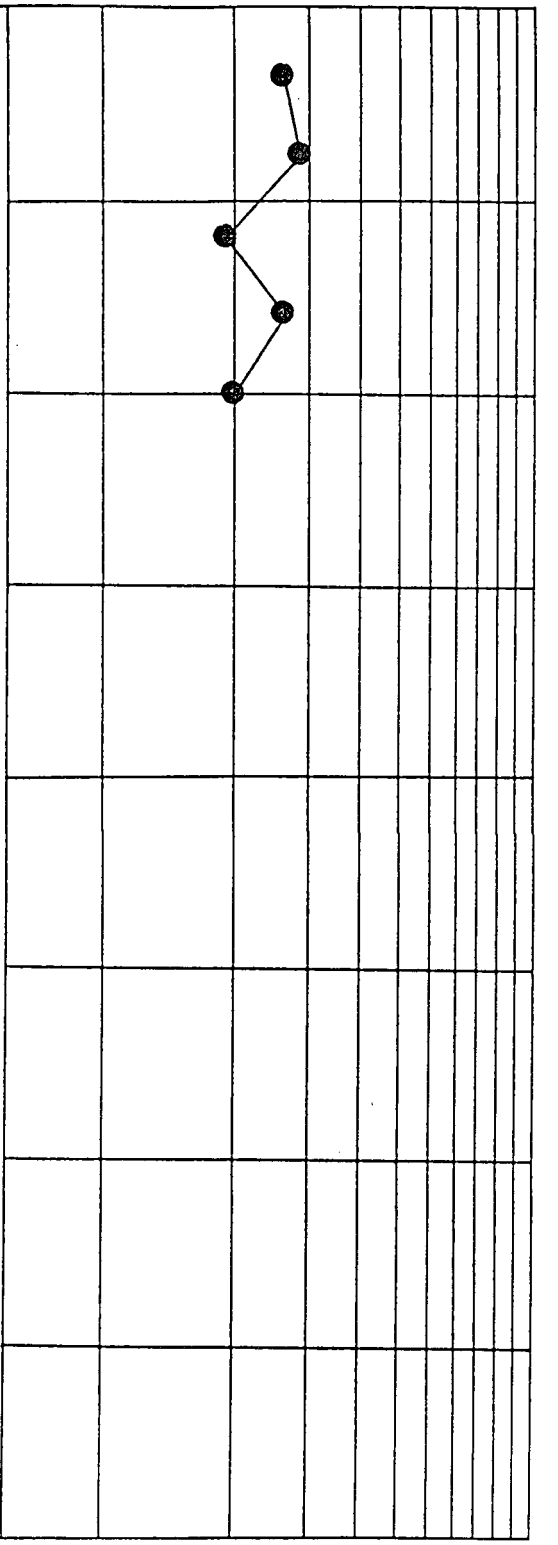
SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE; 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

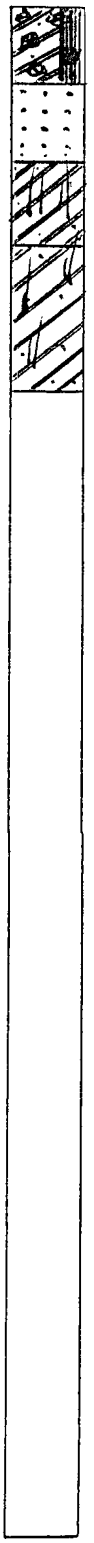
BORING NO. DB-3
DATE DRILLED 3/11/88
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Medium dense, light gray, limerock (LR)	
2.0	Medium dense, brown, fine sand (SP)	
4.0	Firm, dark brown, silty, clay (CL)	
6.0	Stiff to very stiff, dark brown, silty clay (CL)	
10.0	Boring terminated @ 10.0 feet below existing ground elevation	

PENETRATION—BLOWS PER FT.



LOG PROFILE



Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

BORING NO. SB-1
DATE DRILLED 11/25/87
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Soft, reddish-brown, slightly sandy clay (CL)	
2.0	Medium dense, brown, slightly silty fine sand (SP-SM)	
4.0	Very stiff, gray, very sandy clay (CL)	
6.0	Dense, light orange to reddish-brown, slightly clayey sand (SP-SC)	
10.0	Boring terminated @ 10.0 feet below existing ground elevation	

PENETRATION—BLOWS PER FT.

0 10 20 40 60 80 100

LOG PROFILE

Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE; 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

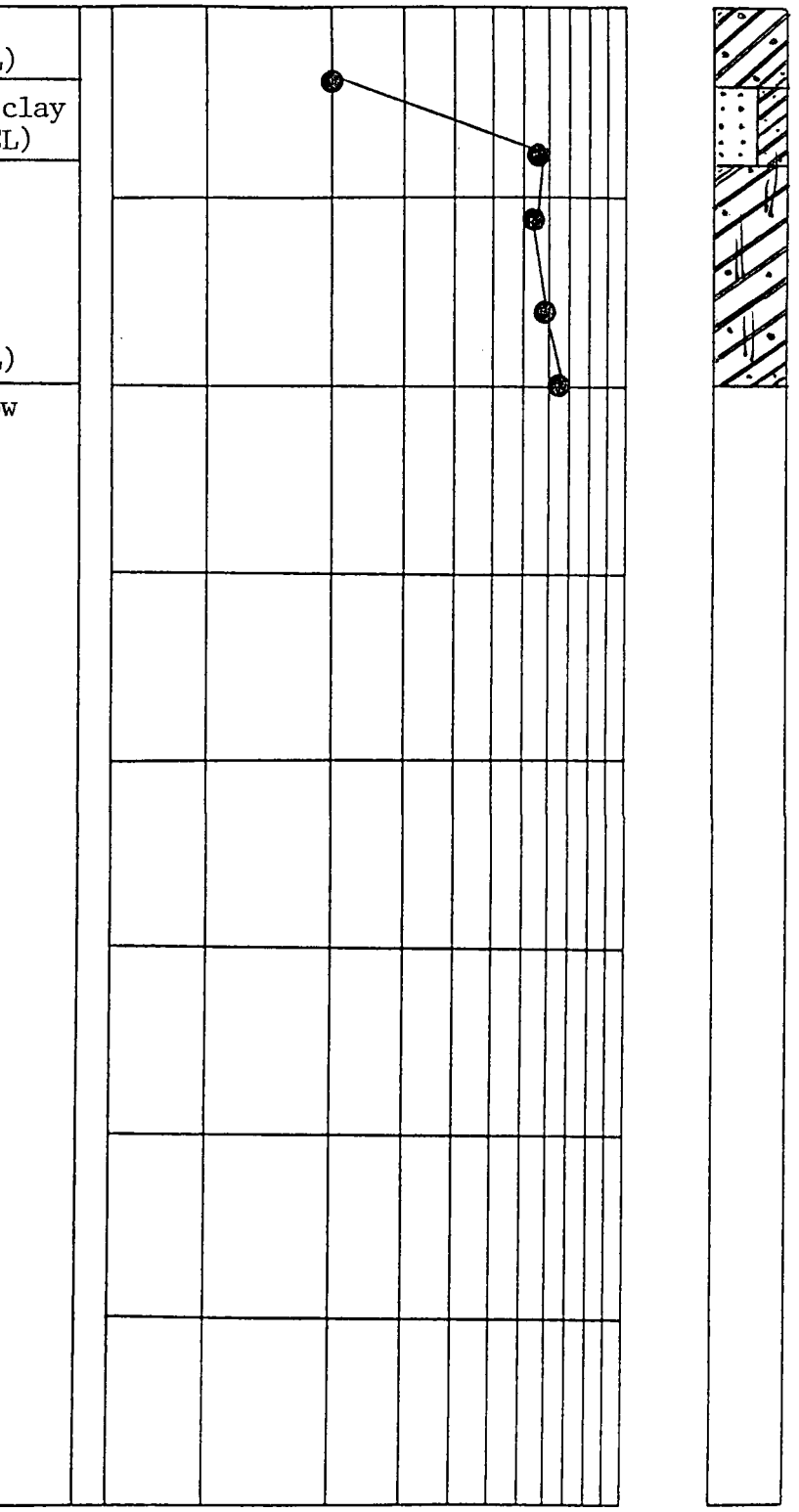
TEST BORING RECORD

BORING NO. SB-2
DATE DRILLED 11/25/87
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Stiff, gray, slightly sandy clay (CL)	
2.0	Very dense, brown, fine sand with clay (SP-CL)	
4.0	Hard, reddish brown, silty clay (CL)	
10.0	Boring terminated @ 10.0 feet below existing ground elevation	

PENETRATION—BLOWS PER FT. 0 10 20 40 60 80 100

LOG PROFILE



Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

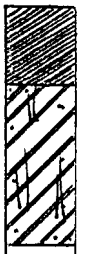
TEST BORING RECORD

BORING NO. SB-3
DATE DRILLED 11/25/87
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Stiff, gray, clay slighty plastic (CH)	
2.0	Hard, gray to reddish brown, silty clay (CL)	
6.0	Boring terminated @ 6.0 feet below exsiting ground elevation	

PENETRATION—BLOWS PER FT. 0 10 20 40 60 80 100

LOG PROFILE



Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

BORING NO. SB-4
DATE DRILLED 11/25/87
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV	PENETRATION—BLOWS PER FT. 0 10 20 40 60 80 100	LOG PROFILE
0.0	Firm, gray, clay with organics and iron inclusions (CL)			
2.0	Very stiff, gray to reddish brown, silty clay			
	(CL)			
8.0	Boring termianted @ 8.0 feet below existing ground elevation			

Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

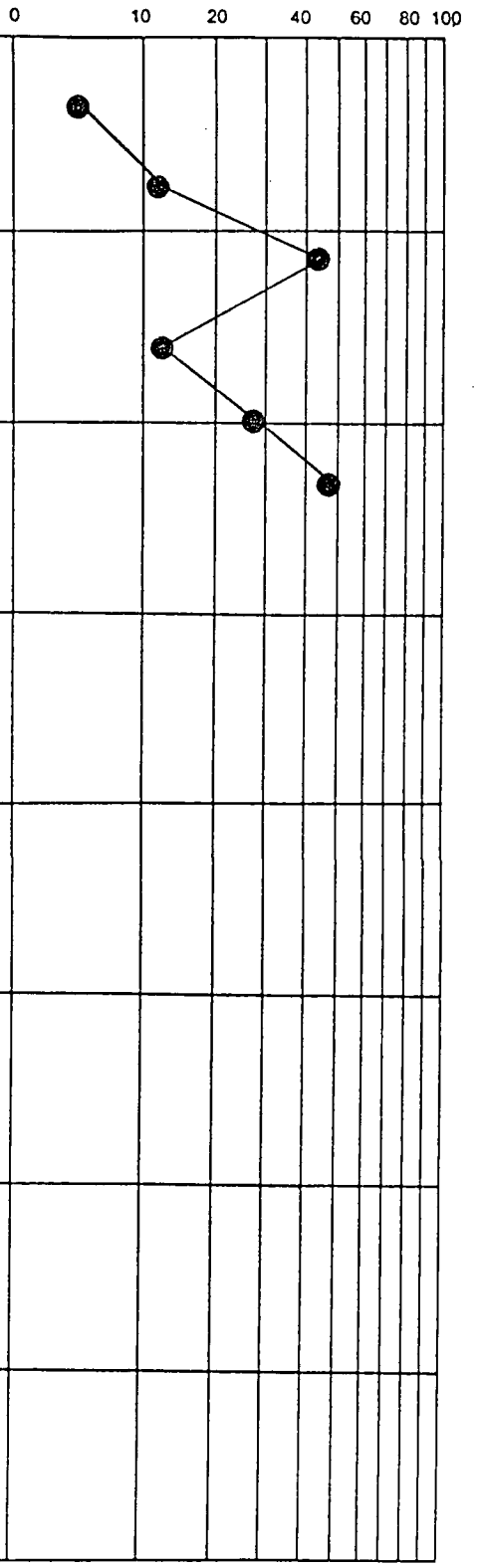
SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE; 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

BORING NO. SB-5
DATE DRILLED 11/25/87
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Loose, brown, fine sand with trace of organics (SP)	
2.0	Firm, gray, silty clay with sand (CL-SP)	
4.0	Stiff to hard, gray, highly plastic clay	
12.0	(CH)	
	Boring terminated @ 12.0 feet below existing ground elevation	

PENETRATION—BLOWS PER FT.



LOG PROFILE

Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

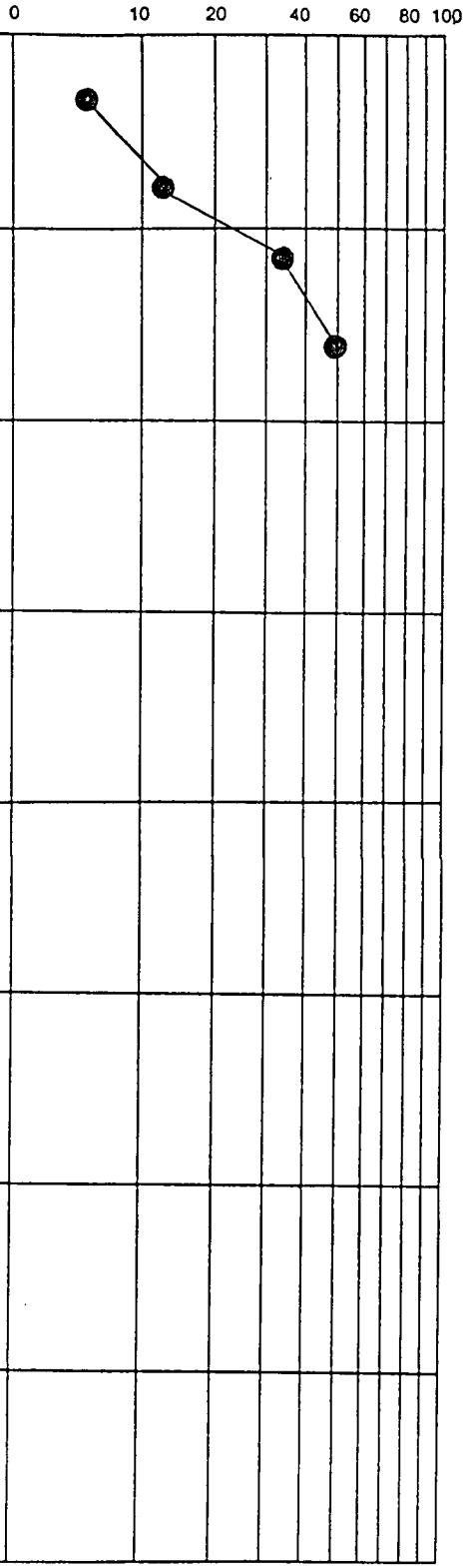
SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

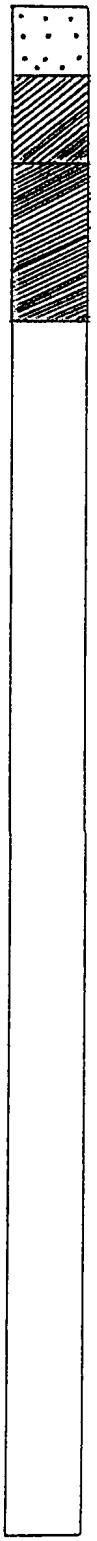
BORING NO. SB-6
DATE DRILLED 11/25/87
JOB NO. 1299

DEPTH FT.	DESCRIPTION	ELEV
0.0	Loose, light brown to gray, fine sand (SP)	
2.0	Stiff, gray, clay with iron stains (CH)	
4.0	Hard, gray, clay with high iron content	
8.0	(CH) Boring terminated @ 8.0 feet below existing ground elevation.	

PENETRATION—BLOWS PER FT.



LOG PROFILE



Imperial Testing Laboratories

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

PENETRATION IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

SPT SAMPLE
UNDISTURBED SAMPLE
| 50 | % ROCK CORE RECOVERY
WATER TABLE, 24 HR.
WATER TABLE, 1 HR.
LOSS OF DRILLING WATER

TEST BORING RECORD

BORING NO. SB-7
DATE DRILLED 11/25/87
JOB NO. 1299

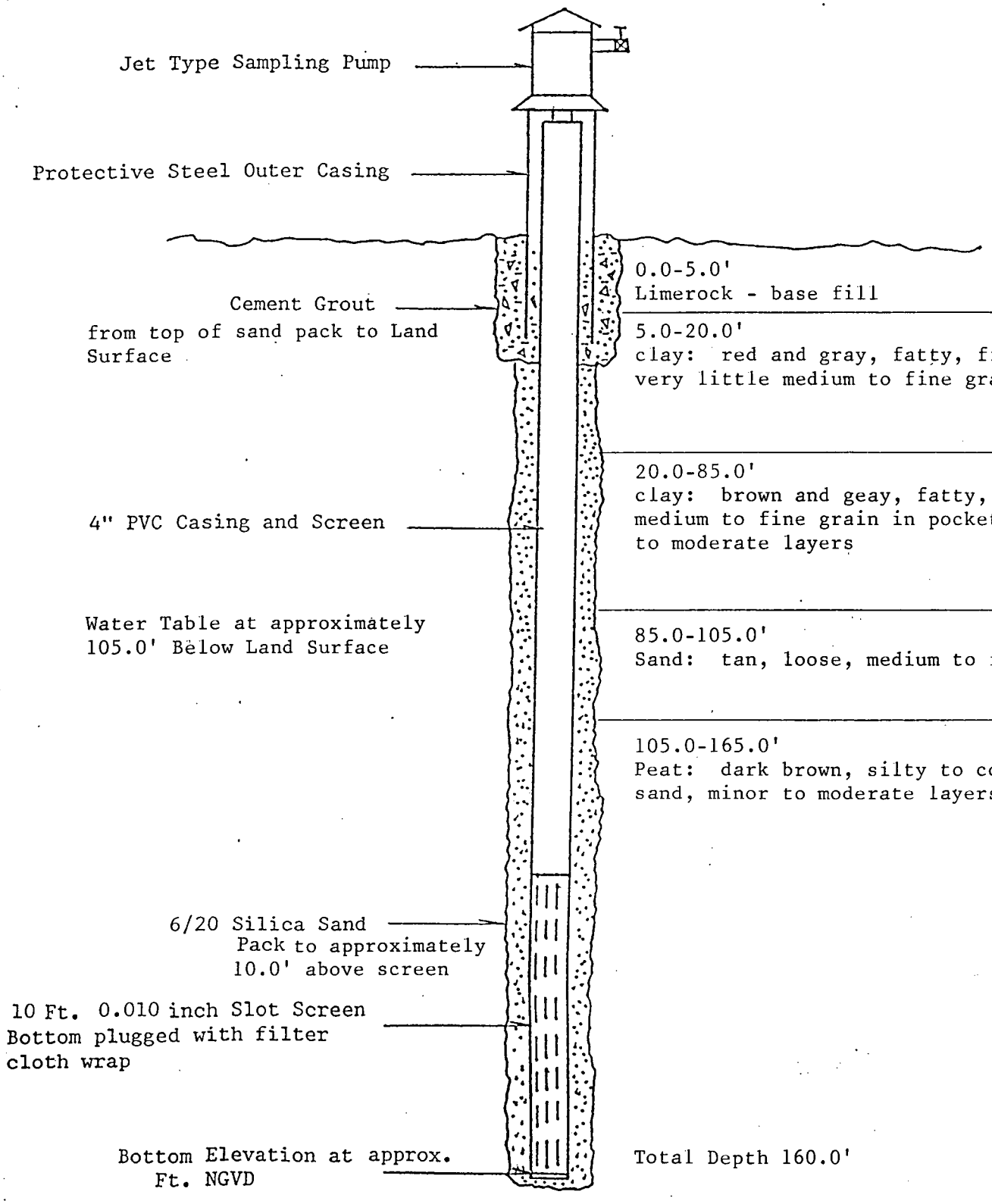
APPENDIX B

Imperial Testing Laboratories, Inc.
3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

MONITOR WELL CONSTRUCTION AND LITHOLOGY LOG

Well Number CPL10 South Well Installation Date: 5-4-88

Project Location: Florida Crushed Stone - Brooksville - Waste Storage Area

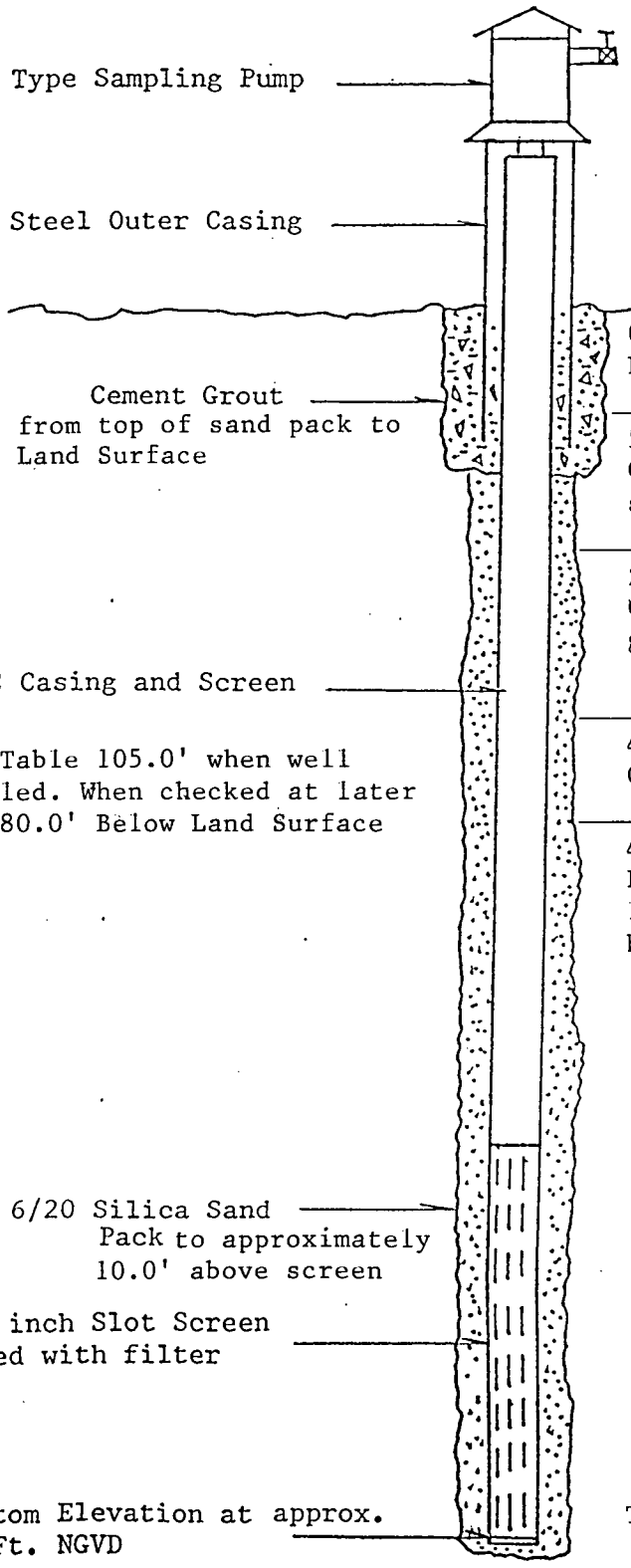


Imperial Testing Laboratories, Inc.
3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

MONITOR WELL CONSTRUCTION AND LITHOLOGY LOG

Well Number CPL8 Installation Date: 4-28-88

Project Location: Florida Crushed Stone - Brooksville - Waste Storage Area

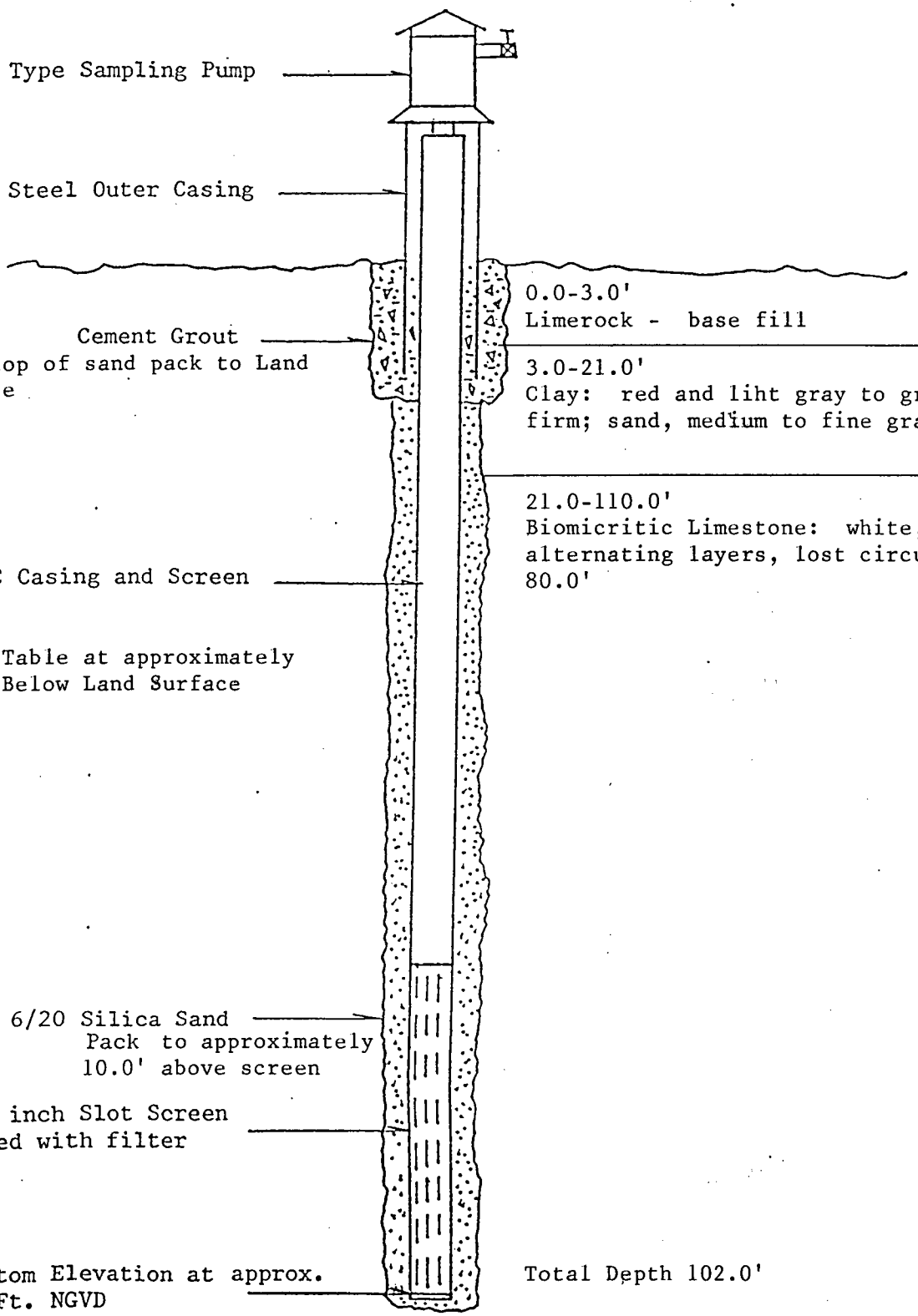


Imperial Testing Laboratories, Inc.
3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

MONITOR WELL CONSTRUCTION AND LITHOLOGY LOG

Well Number CPL9 North Well Installation Date: 5-3-88

Project Location: Florida Crushed Stone - Brooksville - Waste Storage Area



Professional Service Industries, Inc.
Florida Testing Division

January 18, 1988

Imperial Teating Laboratories
P.O. Box Drawer B-6
Lakelank, FL 33802

Attn: Tony Alderete

Re: Permeability Tests
File No.: 381-80003-2

Gentlemen:

As requested by Mr. Tony Alderete, a vertical permeability was performed on the five (5) soil samples which were delivered to our office. Please find the permeability data on the summary of results under cover of this letter.

The vertical permeability tests were performed in general accordance with the falling head method used by the U.S. Corps of Engineers. No confining pressures were used except for the water head pressure of approximately four (4) feet.

If you should have any questions, please do not hesitate to call.

Respectfully submitted,

PROFESSIONAL SERVICE INDUSTRIES

Scott S. Crandall
Division Manager

6056 Ulmerton Road • Clearwater, FL 33520 • Phone: 813/531-1446

SUMMARY OF RESULTS

Boring No.	Flow Direction	Permeability (cm/sec)
1	Vertical	2.07×10^{-8}
3	Vertical	9.98×10^{-6}
5	Vertical	6.15×10^{-5}
6	Vertical	4.95×10^{-6}
7	Vertical	3.67×10^{-5}

Imperial Testing Laboratories

3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

Water Level Measurements

Identification No: CPL 8 Station: FCS Waste Storage Area

Measuring Point: Top of casing west side (marked)

Elevation of Land Surface: Elevation of Measuring Point: 112.37

Depth of Well: 125.0' Depth of Casing: 115.0'

Date	Hour	Held	Wet	Depth to Water	Taped Ele.	Meas. By	Remarks
5/18/88	2:30	79.0'	.52	79.52	32.85	TA	

Imperial Testing Laboratories

3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

Water Level Measurements

Identification No: CPL 9 Station: FCS Waste Storage Area

Measuring Point: Top of casing east side (marked)

Elevation of Land Surface: Elevation of Measuring Point: 117.32

Depth of Well: 102.0' Depth of Casing: 92.0'

Date	Hour	Held	Wet	Depth to Water	Taped Ele.	Meas. By	Remarks
5/18/88	4:00	83.0'	.63	83.63	33.69	TA	

Imperial Testing Laboratories

3220 NEW TAMPA HIGHWAY • P. O. DRAWER BG • LAKELAND, FLORIDA 33802
TELEPHONE: (813) 682-4873

Water Level Measurements

Identification No: CPL 10 Station: FCS Waste Storage Area

Measuring Point: Top of casing south side.

Elevation of Land Surface: Elevation of Measuring Point: 124.11

Depth of Well: 160.0' Depth of Casing: 150.0'

Date	Hour	Held	Wet	Depth to Water	Taped Ele.	Meas. By	Remarks
5/18/88	5:30	87.0'	.05	87.05	37.06	TA	

Appendix 2