Coble's Sandrock, Inc.
5833 FOSTER STORE ROAD
LIBERTY, NORTH CAROLINA 27298

COBLE'S SANDROCK
CONSTRUCTION AND DEMOLITION LANDFILL
PERMIT NO. 01-05

C&D LANDFILL PHASES 1 AND 2
PARTIAL CLOSURE

CONSTRUCTION QUALITY ASSURANCE

AUGUST 2013

PREPARED BY:

2211 WEST MEADOWVIEW ROAD SUITE 101
GREENSBORO, NORTH CAROLINA 27407
PHONE: (336) 323-0092
FAX: (336) 323-0093
WWW.JOYCEENGINEERING.COM
JEI PROJECT NO. 419.1201.12/TASK 02
NORTH CAROLINA CORPORATE LIC: C-0782

JOYCE ENGINEERING

2211 West Meadowview Road
Suite 101
Greensboro, NC 27407

tel: 336-323-0092
fax: 336-323-0093

www.JoyceEngineering.com

January 8, 2016

Edward F. Mussler III, P.E.
Permitting Branch Supervisor
Division of Waste Management - Solid Waste Section
NC Department of Environmental Quality
1646 Mail Service Center
217 W Jones Street
Raleigh, NC 27699-1646

Re: **CQA Report for the Cobles Sandrock 2013 Landfill Partial Closure**

Dear Ed:

Joyce Engineering is pleased to provide you with responses to your email asking to clarify items regarding the Cobles Sandrock landfill partial closure in the 2013 CQA report. Below are your questions and our responses.

1. *In the record drawing that was submitted has a table of phase sizes on it, and there is a mistake in the acreage in the table. Can we get that fixed?*

   The record drawing table has been corrected (attached) to reflect the permitted acreages and the acreage of each Phase's partial closure. In addition, we added a column to the table to show the excluded acreages from the permitted limits of waste. The excluded areas were approved by the Solid Waste Section in the Financial Assurance of 2014.

2. *The CQA report for the partial closure was certified and sent in and the friction test was not in it. This test was specified in the approved plan. How can we address this?*

   The friction angle testing was omitted from the preconstruction soil testing based on our experience with cohesive soils, short length of the side slopes and our engineering judgement. The engineer certified the CQA report without the soil friction angle testing results.

Sincerely,
JOYCE ENGINEERING, INC.

Hannu Kemppinen, P.G.
Senior Project Consultant

Attachment: revised *Record Final Cover* drawing

C: Brenda and Kent Coble, Coble Sandrock C&D Landfill
Butch Joyce, Joyce Engineering

NORTH CAROLINA PROFESSIONAL SEAL L-3492 LAND SURVEYOR MICHAEL R. STOUT

ALAMANCE COUNTY:
NORTH CAROLINA:

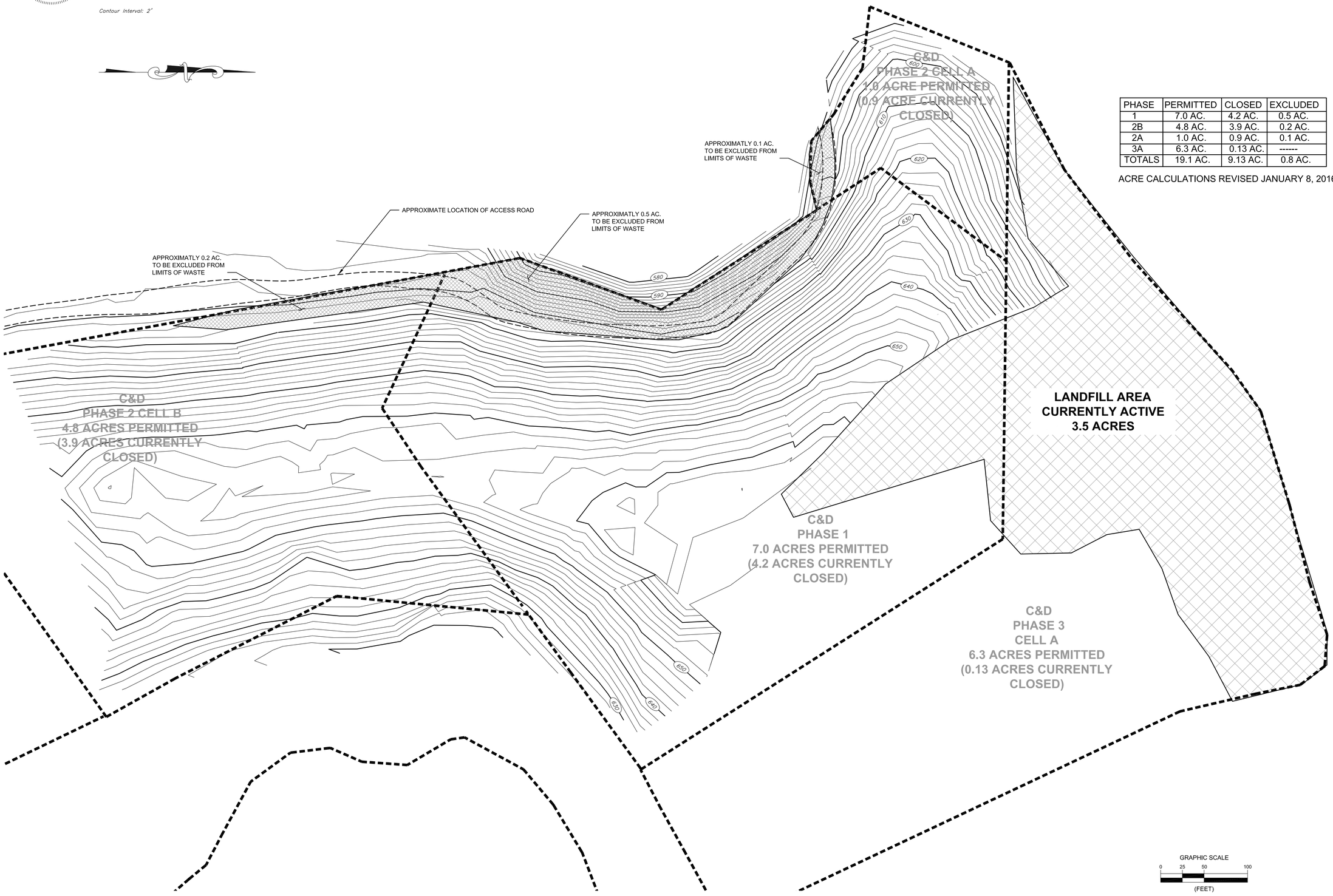
I, Michael R. Stout, certify that the contours shown on this plan were obtained by field surveys conducted under my supervision, on the dates listed.

Original Survey by Mike Stout, dated August 4, 2014.
Professional Land Surveyor
License No. L-3492

Contour Interval: 2'

PHASE	PERMITTED	CLOSED	EXCLUDED
1	7.0 AC.	4.2 AC.	0.5 AC.
2B	4.8 AC.	3.9 AC.	0.2 AC.
2A	1.0 AC.	0.9 AC.	0.1 AC.
3A	6.3 AC.	0.13 AC.	------
TOTALS	19.1 AC.	9.13 AC.	0.8 AC.

ACRE CALCULATIONS REVISED JANUARY 8, 2016.



RECORD FINAL COVER

Chao, Ming-tai

From: Hannu Kemppinen <hkemppin@joyceengineering.com>
Sent: Friday, January 08, 2016 4:20 PM
To: Ed Mussler
Cc: Brenda Coble (brendalcoble@bellsouth.net); Leonard Joyce
Subject: RE: Cobles Questions
Attachments: RTC Cobles CQA 2013.pdf

Ed,

In response to your recent correspondence with Butch Joyce over the Coble's C&D landfill permit renewal, Joyce Engineering has prepared the attached document to address your questions regarding the CQA report submitted in 2013 for the landfill partial closure. Please let us know if there are issues needing further clarification. We will be glad to assist in way to help with issuing the permit.

- Hannu

Hannu Kemppinen, PG | *Senior Project Consultant* |
JOYCE ENGINEERING
Richmond, VA – Greensboro, NC – Charlotte, NC – Charleston, SC | 2211 W. Meadowview Rd., Ste. 101, Greensboro, NC 27407 |
tel: (336) 323-0092 | direct: (336) 790-2252 | mobile: (336) 209-7156 | **www.JoyceEngineering.com**

From: Mussler, Ed [mailto:ed.mussler@ncdenr.gov]
Sent: Monday, December 28, 2015 3:35 PM
To: Leonard Joyce
Subject: Cobles Questions

Butch,
I've worked on the Cobles issue with my staff and think we are close to being done. I don't think everything that was asked for was out of line, detail benefits the operator as well as the regulator, but think we can live with getting most of that type of stuff the next time there is a permit action.
We are drafting a permit with conditions to clarify all the various acreages, additions , subtractions, etc. and will send it to you and the Cobles for a quick review. If everyone is in agreement then we can proceed with issuing a permit.
I would like to point out that the Section has yet to receive some bonds that are required for the financial assurance and this may be an issue in the future.
We see where the CQA report from a couple of years ago was certified, but a test that was in the specifications for friction was not run. At this point we are inclined to accept the engineer's certification, should there be a problem with stability then the engineer can address it .
I hope that the draft can be sent on by the end of the week.
Regards
Ed

Edward F. Mussler III, P.E.
Permitting Branch Supervisor
Division o fWaste Management- Solid Waste Section
NC Department of Environmental Quality

919-707-8281 office
000 000 0000 mobile
Ed.mussler@ncdenr.gov

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Email correspondence to and from this address is subject to the North Carolina Public Records Law and may be disclosed to third parties.

JOYCE ENGINEERING

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fax: 336/323-0093

www.JoyceEngineering.com

August 16, 2013

Mr. Geoff Little, Environmental Engineer II
North Carolina Department of Environmental and Natural Resources
Permitting Branch, Solid Waste Section
1646 Mail Service Center
Raleigh, NC 27699

RE: Construction Quality Assurance Certification Report
Coble's Sandrock C&D Landfill, Phases 1 & 2 Partial Closure
NC DENR Permit #01-05
Alamance County, North Carolina
JEI Project 419.1201.12, Task 01

Dear Geof:

This letter is to certify that to the best of my knowledge and belief, the Phases 1 & 2 Partial Closure of the Coble's C&D Landfill has been constructed in conformance with the permitted plans and specifications.

The enclosed certification report presents an accumulation of field, laboratory, and other quality assurance data for the closure construction. It is our understanding that the enclosed construction quality assurance documentation was compiled in accordance with North Carolina Solid Waste Regulations, 15A NCAC 13B and fulfills the submittal requirements listed in the General Permit Conditions (Permit Module I) of Permit 01-05.

On behalf of Cobles C&D Landfill, we would like to thank you in advance for your assistance in reviewing this construction quality assurance certification report.

Sincerely,
JOYCE ENGINEERING, INC.

Evan Andrews, P.E.
Regional Manager

NORTH CAROLINA PROFESSIONAL SEAL 27446 ENGINEER EVAN E ANDREWS

Enclosure
Copy: Mr. Kent Coble, w/ enclosure
Hannu Kemppinen, P.G., w/ enclosure (Joyce Engineering, Inc.)

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1.0 INTRODUCTION

This report, prepared by Joyce Engineering, Inc. (JOYCE) on behalf of Cobles Sandrock, Inc. (Cobles) addresses the quality assurance procedures and activities conducted during partial closure construction of the Phases 1 and 2 at the Cobles C&D landfill in Alamance County, North Carolina. The documents comprising this report were compiled for the C&D landfill closure construction with North Carolina Solid Waste Management Regulations, 15A NCAC 13B and the Phase 3 Permit to Construct # 01-05.

Cobles acted as the General Contractor and performed all closure construction earth work during 2012 and 2013.

JOYCE provided third party construction quality assurance program. Geotechnics assisted JOYCE in the field soil testing and collected samples for soil materials laboratory testing. The soils laboratory testing was conducted at Geotechnics, Inc. in Raleigh, NC.

Michael Stout Surveying of Ramseur, NC provided survey for the partial closure project.

2.0 CONSTRUCTION QUALITY ASSURANCE PROGRAM

2.1 Scope of Work

The overall goals of the CQA program are to ensure that proper construction techniques and methods are employed, and to verify that the earth materials used meet the requirements of the specifications. Moreover, the CQA program helps to identify and define problems that may occur during construction and allow corrective measures to be implemented. At the completion of the closure construction the certifying engineer prepares a certification report to document that the closure work was conducted in accordance with the design standards and specifications.

2.2 Roles and Responsibilities

Cobles retained Joyce Engineering, Inc. to provide construction quality assurance during the landfill partial closure construction. As an independent consultant from the Owner/Contractor, JOYCE, along with the construction field representative Geotechnics provided observation and documentation of the closure earthwork construction. A representative of Geotechnics visited the site regularly to follow the closure work progression by testing each acre-lift in the field and collecting soil samples for laboratory testing. Per the approved CQA Plan, Cobles retained a surveyor to provide periodic survey of the work to establish and maintain lines and grades.

2.3 Earthwork

Cobles began the construction in mid-April 2012 by first grading the west side of the landfill to prepare the surface for closure. The surveyor verified the existing intermediate cover thickness to be a minimum of 12 inches prior to Cobles commencing the construction of low permeability soil layer. The surveyed locations are shown on Drawing 1 – Intermediate Cover.

Following the grading and survey of the intermediate cover thickness Cobles proceeded with low permeability soil or infiltration layer construction. Soil material was tested to identify site soil

suitability for the layer construction and meet the permitted hydraulic conductivity of 1.0E-05 cm/sec. Starting from the south and progressing north along the west side the infiltration layer was constructed in three lifts approximately one acre at a time. The east side closure followed the same sequence. The work was conducted utilizing the landfill heavy equipment; excavator, track loader, compactor, and truck or a pan to deliver the soil to each acre.

2.3.1 Infiltration Layer Testing and Results

Pre-construction soil samples were collected and submitted to laboratory testing for identifying index properties of the soil proposed for the landfill partial closure work. The laboratory testing results are compiled in Appendix I.

Cobles constructed the first acre as a test pad on the south end of the west side slope. The test pad was constructed in three lifts and each lift was tested in the field and laboratory. The field testing included moisture and density testing with nuclear methods and a drive cylinder test to verify the nuclear gauge readings. Two Shelby tubes were pushed into the soil to collect undisturbed soil samples of the low-permeability material for laboratory testing.

The infiltration layer was constructed in three lifts each six inches in compacted thickness. The first acre was constructed as a test pad and the testing results were used for the first acre to minimize testing fees and redundant testing. The field testing records of the infiltration layer construction including nuclear gauge testing, drive cylinder, undisturbed permeability sample (Shelby tube), and daily field reports are included in Appendix II.

Soil infiltration layer construction CQA testing included in-place wet density, moisture content by nuclear method (ASTM D6938), calculated dry density and percent compaction with a Troxler Model 3440 portable nuclear gauge. A density of soil in place by drive cylinder method (ASTM D 2937) was used to collect a sample of soil to verify the nuclear gauge test results for each acre lift. If the nuclear gauge moisture readings were found to deviate significantly from the moisture percentage by direct heating method, the dry density and in-place compaction percentage were re-calculated to verify compaction of the soil. If the placed soils were found not to meet the specification in a given area, the Contractor was informed of the test results and asked to re-work the soil. Following the soil re-work, the area was subjected to CQA testing verification. With satisfactory nuclear gauge readings at the randomly selected test locations the field personnel pushed a drive cylinder to collect the moisture-density verification sample and a Shelby tube to collect the undisturbed sample for laboratory hydraulic conductivity test (ASTM D5084).

The partial closure construction was divided into 11 areas each approximately one acre in size to track the construction and field testing. The field and laboratory testing included a total of 33 acre lifts. Each lift was tested at a minimum of 5 locations by nuclear method, one drive cylinder and one Shelby tube. A total 165 nuclear tests, 33 drive cylinders and 33 low-permeability tests were required. The infiltration layer was found mostly to meet the moisture-compaction requirement but some areas were reworked and retested. Acre 7 Lift 3 and Acre 11 Lift 2 initially failed the undisturbed hydraulic conductivity testing in the laboratory. The failed acre-lifts were disked, re-compacted, and re-graded; and retested in the field and laboratory. The final hydraulic conductivity tests passed the criteria for infiltration layer and the results are included in Appendix III and in the summary table.

2.3.2 Protective Cover – Erosion Layer

An 18-inch thick cover soil layer was placed over the completed infiltration layer. The soil was spread in two lifts and tracked up and down the slope with the earth moving equipment to achieve a nominal compaction of about 90 percent so that vegetation can develop a proper root system deep in the soil. Following placement of the protective erosion layer, the closed side slopes were seeded and the grass well established during 2013 growing season.

2.3.3 Passive Gas Vents

Eleven passive landfill gas vents were installed during the partial closure construction of Phases 1 and 2. Cobles excavated pits near the top edge of the infiltration layer to place perforated PVC pipes in the top layer of the waste. The 10 inch vent pipes were installed to a depth 5 to 6 feet below the infiltration cap. The excavated gas vent pit was filled with #57 stone. Low permeability soil was then placed over the stone to close the infiltration layer. Top soil was placed over the worked area to provide a continuous layer of the protective cover.

Due to C&D LF waste content, drilling using traditional bucket auger methods for the construction of passive gas vents was deemed impossible. This change to the landfill gas vent drawing detail was submitted to the SWS for review and approval. The drawing is included in Appendix V.

2.3.4 Construction Survey

Cobles retained Michael Stout Surveying of Ramseur, NC to provide the survey for the landfill partial closure work. After grading and dressing the intermediate cover the prepared surface was then surveyed using a 50 x 50 foot grid. The top of intermediate cover thus served as base grades for the infiltration layer construction. At the completion of the three lifts of infiltration soil layer construction the surface was then graded and surveyed. Protective cover was placed over the infiltration layer. Once again, Cobles graded the surface to final grades and the surface was surveyed according to the original survey grid locations. The three surveys are included in Appendix V.

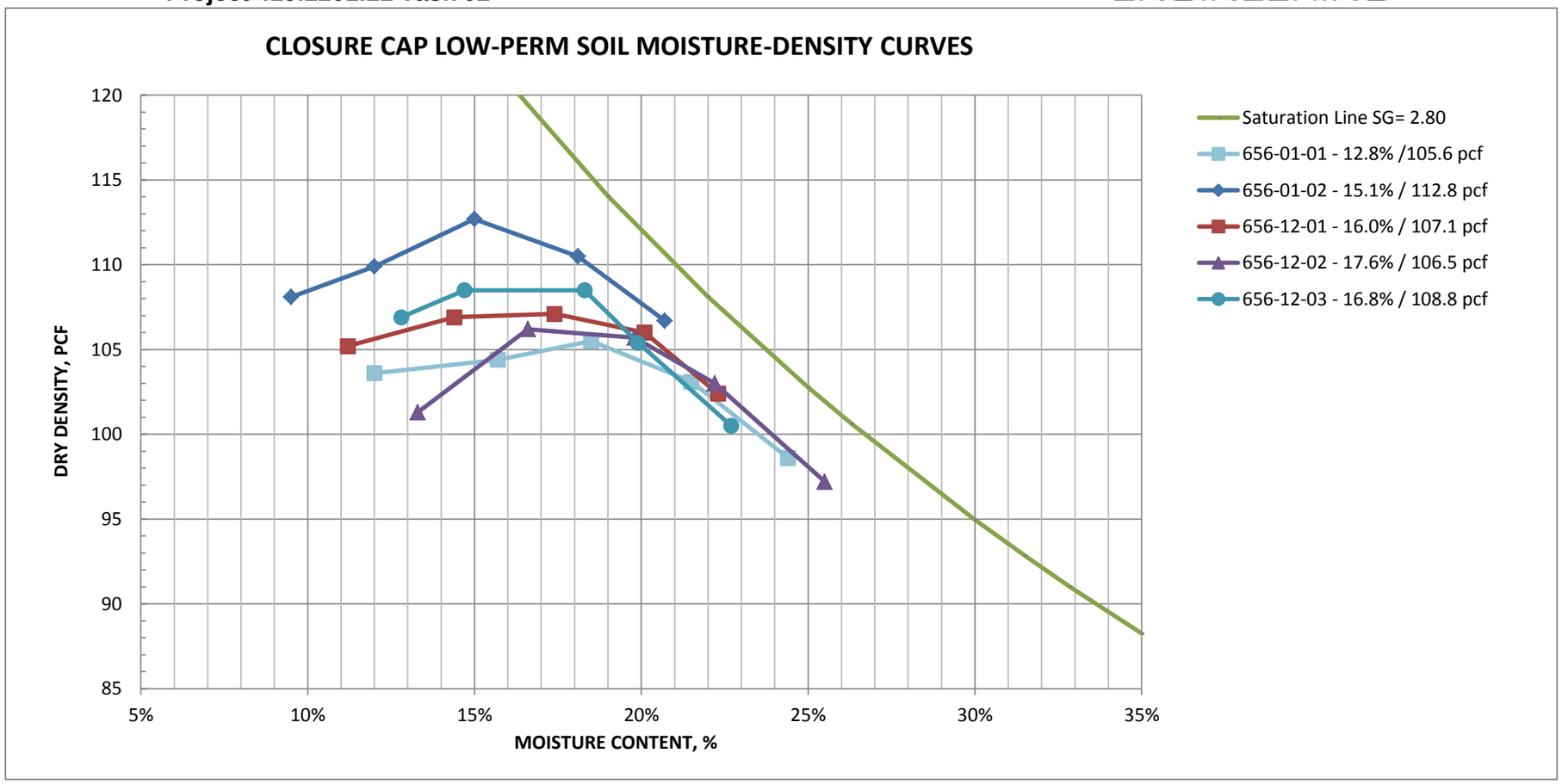
The infiltration layer thickness meets and exceeds the minimum required thickness of 1.5 feet. In order to ensure adequate thickness of the infiltration layer, some areas were constructed thicker than required. This was identified following the top of clay survey and adjustments were made to the required thickness of the erosion layer. The total section thickness of the infiltration and vegetative layer section is a minimum of three feet; however the survey for the erosion layer thickness shows some areas less than the permitted 1.5 feet. The same soil material was used for both layers and this report reflects our acceptance of the extra clay layer thickness replacing the shortage of erosion layer in certain areas. In Joyce's professional opinion, this condition will not compromise the performance of the cap in any way nor be detrimental to the establishment of grass or long term maintenance of the cover.

The closure construction was conducted on assumed acre basis on 11 acre lifts. The closure construction survey encompasses total area of 426,983 square feet or 9.8 acres. The area west of the landfill toe of slope as shown on the drawings is permitted area, but was not included in this partial closure work. The area is heavily vegetated and need to be cleared for final closure construction. The Cobles intend to address the area during the next closure construction activities.

END OF REPORT

APPENDIX 1 – LABORATORY TESTING RESULTS

Coble's Sandrock CDLF Partial Closure 2012
Project 419.1201.11 Task 02



LAB ID		MOISTURE-DENSITY RELATIONS						SIEVING ANALYSIS				ATTERBERG LIMITS					
		Mold / Speciment					Proctor	Sieve Sizes							Permeability		
Partial Closure		1	2	3	4	5	OMC/MDD	#4	#40	#200	USCS	LL	PL	PI	K=cm/sec	%M	DD
2012-656-01-01	MC	12.0%	15.7%	18.5%	21.5%	24.4%	**18.2%**	100.0%	87.8%	66.7%	ML	37	30	7	1.1E-06	20.5%	104.3
	DD	103.6	104.4	105.5	103.1	98.6	**105.6**										
2012-656-01-02	MC	9.5%	12.0%	15.0%	18.1%	20.7%	**15.1%**	90.6%	69.9%	54.9%	CL	39	25	14	4.7E-07	17.6%	106.2
	DD	108.1	109.9	112.7	110.5	106.7	**112.8**										
2012-656-12-01	MC	11.2%	14.4%	17.4%	20.1%	22.3%	**16%**	96.2%	81.0%	66.9%	ML	39	30	9	4.7E-06	17.9%	102.2
	DD	105.2	106.9	107.1	106.0	102.4	**107.1**										
2012-656-12-02	MC	13.3%	16.6%	19.8%	22.2%	25.5%	**17.6%**	94.4%	71.6%	54.5%	ML	41	27	14	1.1E-06	18.7%	102.3
	DD	101.3	106.2	105.7	103.0	97.2	**106.5**										
2012-656-12-03	MC	12.8%	14.7%	18.3%	19.9%	22.7%	**16.8%**	96.6%	68.7%	45.8%	SM	38	28	10	4.6E-06	18.9%	103.4
	DD	106.9	108.5	108.5	105.4	100.5	**108.8**										

April 27, 2012

Project No. 2012-656-01

Mr. Hannu Kemppinen
Joyce Engineering, Inc.
Greensboro, NC 27407
Hannu@joyceengineering.com

Transmittal
Laboratory Test Results
Coble SR

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was faxed to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

geotechnics
INTEGRITY IN TESTING

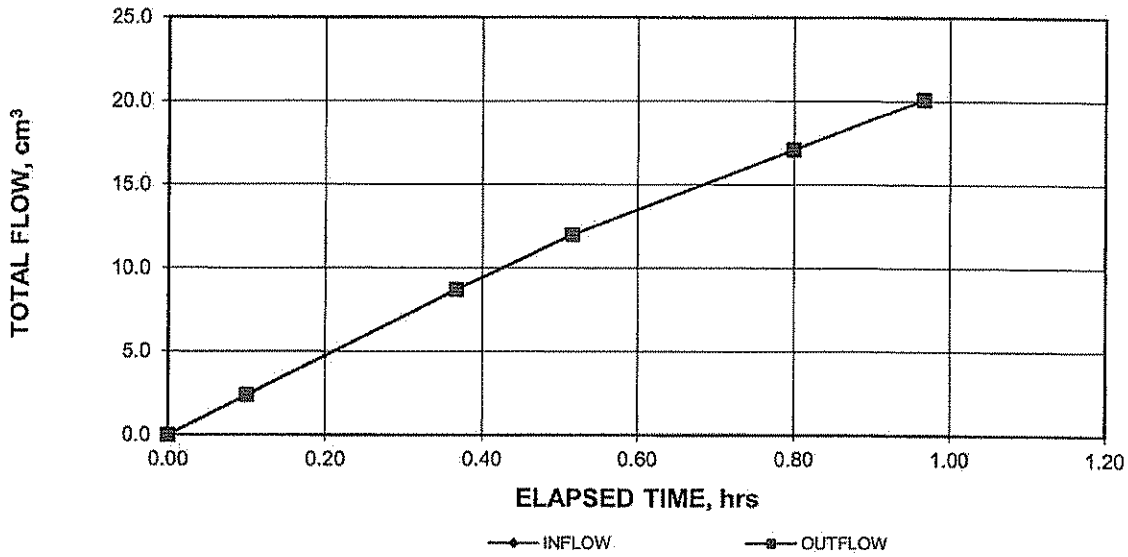
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

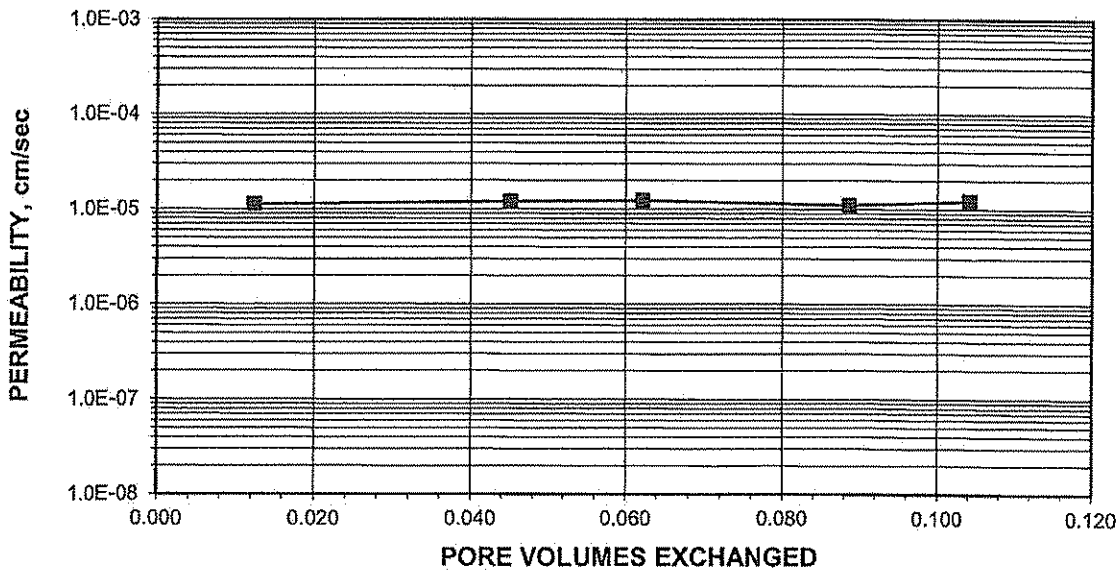
Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	LOW PERM S1
Lab ID No.	2012-656-01-01		

AVERAGE PERMEABILITY = 1.2E-05 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.2E-07 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 4/24/2012 Checked By: GSM Date: 4/27

2200 Westinghouse Blvd. - Suite 103 - Raleigh, NC 27604 - Phone (919) 876-0405 - Fax (919) 876-0460 - www.geotechnics.net

geotechnics
INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	LOW PERM S1
Lab ID No.	2012-656-01-01		

Specific Gravity	2.70 Assumed
Sample Condition	Remolded

Visual Description: BROWN SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	273	822
Wt. of Tare & WS (gm.)	123.24	460.52
Wt. of Tare & DS (gm.)	109.21	389.22
Wt. of Tare (gm.)	37.08	136.94
Wt. of Water (gm.)	14.03	71.30
Wt. of DS (gm.)	72.13	252.28
Moisture Content (%)	**19.5**	**28.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2474.00	NA
Wt. of Tube (gm.)	1635.00	NA
Wt. of WS (calc.)(gm.)	839.00	900.89
Length 1 (in.)	4.003	4.014
Length 2 (in.)	4.003	4.033
Length 3 (in.)	4.003	4.083
Top Diameter (in.)	2.870	2.934
Middle Diameter (in.)	2.870	2.944
Bottom Diameter (in.)	2.870	2.974
Average Length (in.)	4.00	4.04
Average Area (in.^{2})	6.47	6.84
Sample Volume (cm^3)	424.37	453.08
Unit Wet Wt. (gm./ cm^3)	1.98	1.99
Unit Wet Wt. (pcf)	123.4	124.1
Unit Dry Wt. (pcf)	103.3	96.8
Unit Dry Wt. (gm./ cm^3)	1.66	1.55
Void Ratio, e	0.63	0.74
Porosity, n	0.39	0.43
Pore Volume (cm^3)	164.2	192.9
Total Wgt. Of Sample After Test		906.30

Tested By: BW Date: 4/24/2012 Checked By: GEM Date: 4/27

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-01 PERMflow w header.xls]Sheet1
2200 Westinghouse Blvd. - Suite 103 - Raleigh, NC 27604 - Phone (919) 876-0405 - Fax (919) 876-0460 - www.geotechnics.net

geotechnics
INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	LOW PERM S1
Lab ID No.	2012-656-01-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	10.27
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.49
Cell (psi)	45.0	Sample Area (cm^2), A	44.12
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.897
Hydraulic Gradient	10.27	Outflow Burette Area (cm^2), a-out	0.878
		B Parameter (%)	95

AVERAGE PERMEABILITY = 1.2E-05 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.2E-07 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
4/26/2012	10	36	0.00	0.0	0.0	127.9	0	23.7	NA
4/26/2012	10	42	0.10	2.4	2.4	122.5	0	23.7	1.1E-05
4/26/2012	10	58	0.37	8.7	8.7	108.4	0	23.8	1.2E-05
4/26/2012	11	7	0.52	12.0	12.0	101.0	0	23.8	1.2E-05
4/26/2012	11	24	0.80	17.1	17.1	89.6	0	23.8	1.1E-05
4/26/2012	11	34	0.97	20.1	20.1	82.9	1	23.8	1.2E-05

Tested By: BW Date: 4/24/2012 Checked By: GEM Date: 4-27-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-01 PERMflow w header.xls]Sheet1

2200 Westinghouse Blvd. - Suite 103 - Raleigh, NC 27604 - Phone (919) 876-0405 - Fax (919) 876-0460 - www.geotechnics.net

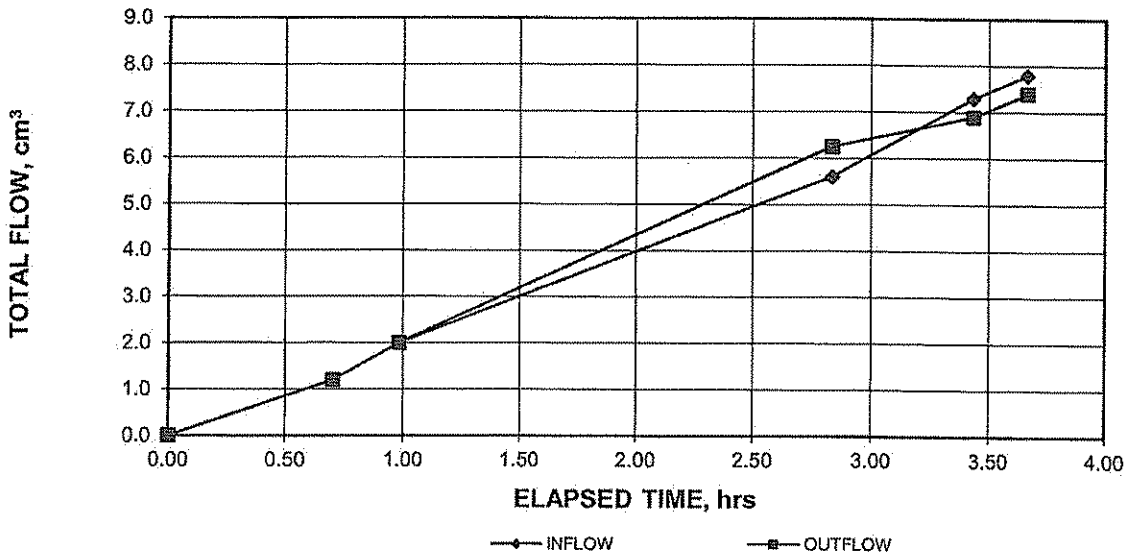
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

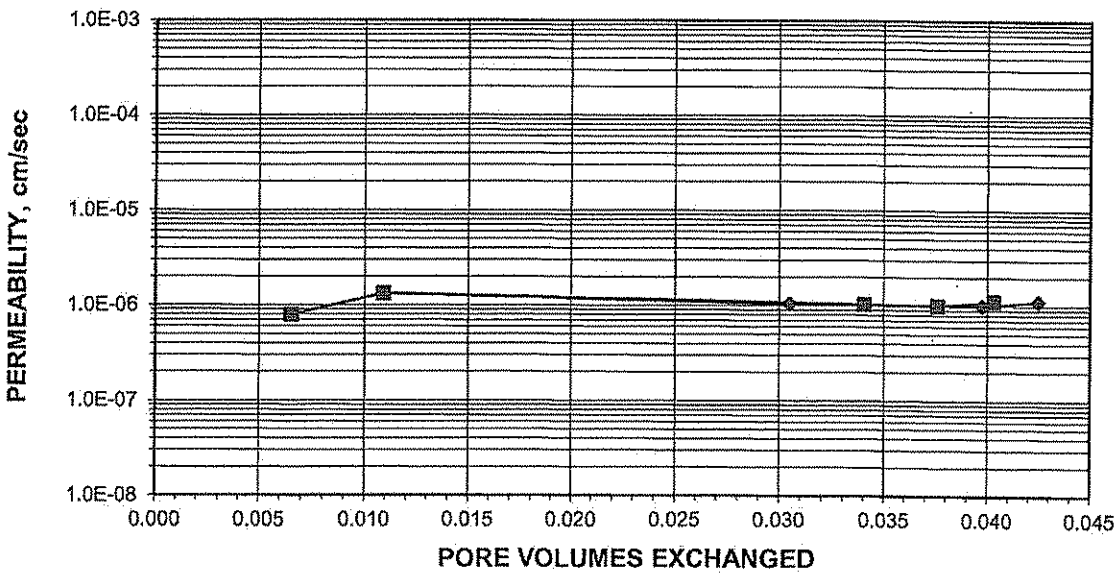
Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	LOW PERM ~~R2~~ S2
Lab ID No.	2012-656-01-01		

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 4/24/2012 Checked By: BW Date: 5/7/12

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	LOW PERM ~~R2~~ S2
Lab ID No.	2012-656-01-01		

Specific Gravity	2.70 Assumed
Sample Condition	Remolded

Visual Description: BROWN SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	828	827
Wt. of Tare & WS (gm.)	282.18	500.82
Wt. of Tare & DS (gm.)	257.27	428.81
Wt. of Tare (gm.)	136.03	136.40
Wt. of Water (gm.)	24.91	72.01
Wt. of DS (gm.)	121.24	292.41
Moisture Content (%)	**20.5**	**24.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2489.81	NA
Wt. of Tube (gm.)	1635.26	NA
Wt. of WS (calc.)(gm.)	854.55	883.48
Length 1 (in.)	4.003	4.049
Length 2 (in.)	4.003	4.010
Length 3 (in.)	4.003	4.021
Top Diameter (in.)	2.870	2.976
Middle Diameter (in.)	2.870	2.889
Bottom Diameter (in.)	2.870	2.937
Average Length (in.)	4.00	4.03
Average Area (in.^{2})	6.47	6.76
Sample Volume (cm^3)	424.37	446.13
Unit Wet Wt. (gm./ cm^3)	2.01	1.98
Unit Wet Wt. (pcf)	125.7	123.6
Unit Dry Wt. (pcf)	104.3	99.2
Unit Dry Wt. (gm./ cm^3)	1.67	1.59
Void Ratio, e	0.62	0.70
Porosity, n	0.38	0.41
Pore Volume (cm^3)	161.8	183.6
Total Wgt. Of Sample After Test		881.84

Tested By: BW Date: 4/24/2012 Checked By: BW Date: 5/7/12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-01 PERMflow w header R2.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	LOW PERM ~~R2~~ S2
Lab ID No.	2012-656-01-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	43.5	Sample Length (cm), L	10.23
Bottom Cap (psi)	45.0	Sample Diameter (cm)	7.45
Cell (psi)	50.0	Sample Area (cm^2), A	43.62
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.897
Hydraulic Gradient	10.31	Outflow Burette Area (cm^2), a-out	0.878
		B Parameter (%)	96

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
4/26/2012	11	23	0.00	0.0	0.0	127.9	0	24.2	NA
4/26/2012	12	5	0.70	1.2	1.2	125.2	0	24.2	7.9E-07
4/26/2012	12	22	0.98	2.0	2.0	123.4	0	24.2	1.3E-06
4/26/2012	14	13	2.83	5.6	6.3	114.6	0	24.3	1.0E-06
4/26/2012	14	49	3.43	7.3	6.9	112.0	0	24.3	1.0E-06
4/26/2012	15	3	3.67	7.8	7.4	110.9	1	24.3	1.1E-06

Tested By: BW Date: 4/24/2012 Checked By: BW Date: 5/7/12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-01 PERMflow w header R2.xls]Sheet1

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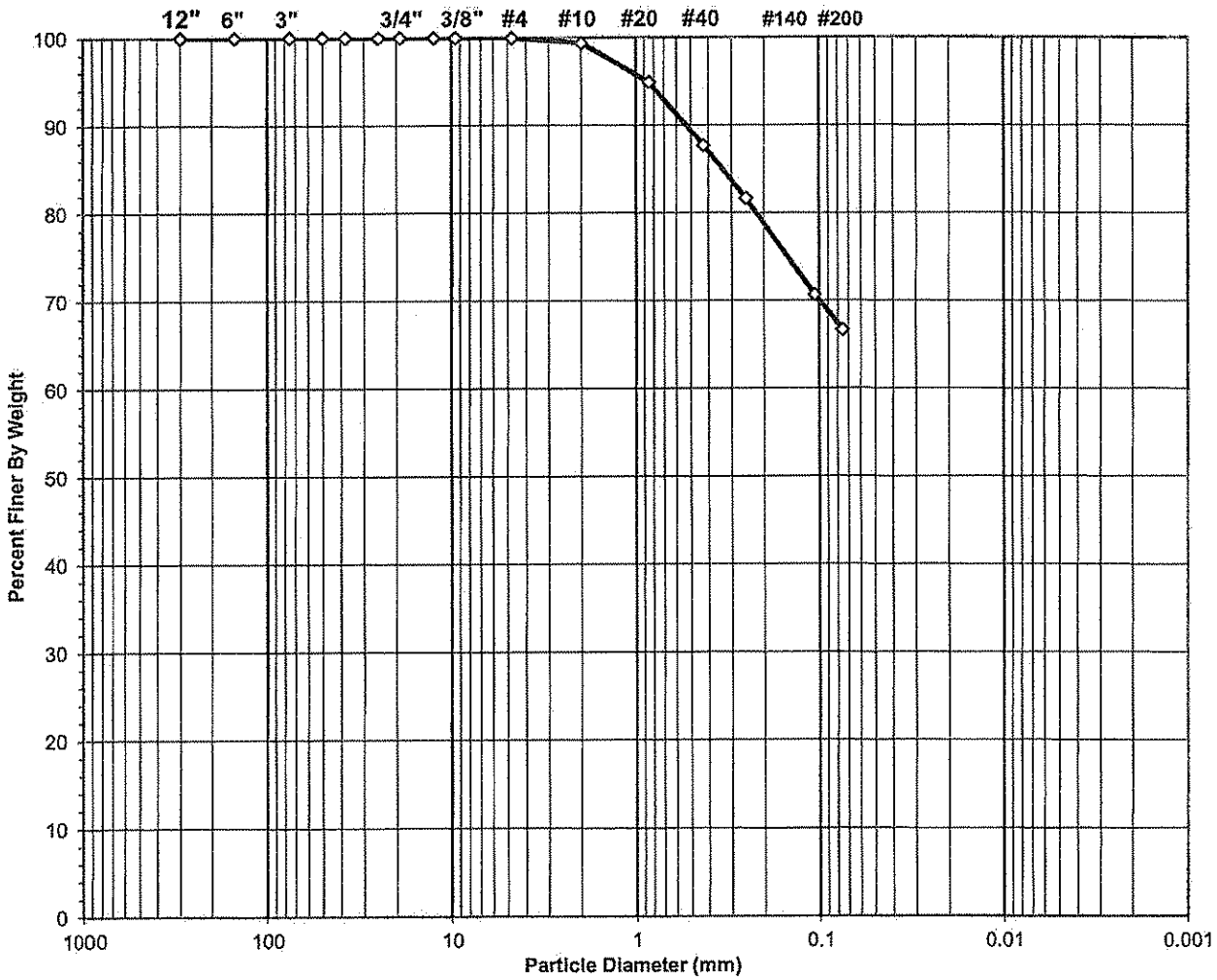
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	LOW PERM
Lab ID	2012-656-01-01	Soil Color	**LIGHT BROWN**

	SIEVE ANALYSIS		*HYDROMETER*
USCS	**gravel**	**sand**	**silt and clay**



USCS Symbol ***ML, TESTED***

USCS Classification SANDY SILT

Tested By SD Date 4/17/2012 Checked By CJM Date 4-19-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-01 SIEVON REV 4 wHeader.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	LOW PERM
Lab ID	2012-656-01-01	Soil Color	**LIGHT BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	200	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	712.72	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	638.62	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	171.61	Weight of Tare (gm)	NA
Weight of Water (gm)	74.10	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	467.01	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**15.9**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	NA	Weight of the Dry Specimen (gm)	467.01
Dry Weight - 3/4" Sample (gm)	155.4	Weight of minus #200 material (gm)	311.66
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	155.35
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.50	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	0.00	0.0	0.0	100.0	**100.0**
#4	4.75	0.17	0.0	0.0	100.0	**100.0**
#10	2.00	2.61	0.6	0.6	99.4	**99.4**
#20	0.850	21.02	4.5	5.1	94.9	**94.9**
#40	0.425	33.60	7.2	12.3	87.7	**87.7**
#60	0.250	28.15	6.0	18.3	81.7	**81.7**
#140	0.106	51.27	11.0	29.3	70.7	**70.7**
#200	0.075	18.53	4.0	33.3	66.7	**66.7**
Pan	-	311.66	66.7	100.0	-	-

Tested By SD Date 4/17/2012 Checked By GEM Date 4-19-12

 DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-656 JOYCE\2012-656-01-01 SIEVON REV 4 wHeader.xls]Sheet1*

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10 (SOP - S4A)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	LOW PERM
Lab ID	2012-656-01-01	Soil Description	**LIGHT BROWN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

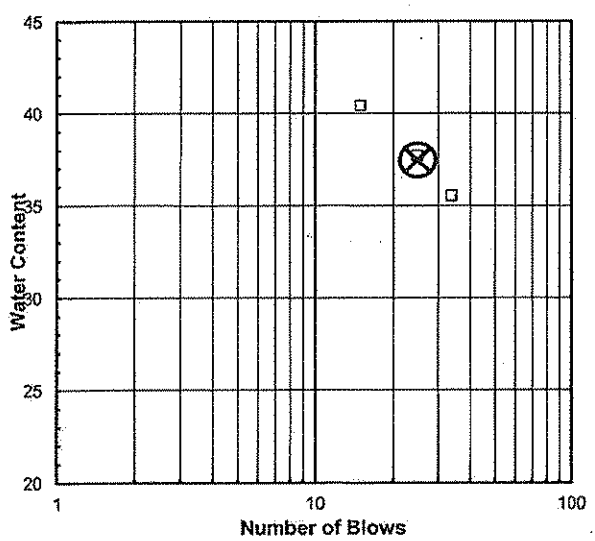
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	W-5	V-2	3M	MULTIPOINT
Wt. of Tare & WS (gm)	24.49	24.84	22.78	
Wt. of Tare & DS (gm)	22.15	22.32	20.70	
Wt. of Tare (gm)	15.56	15.63	15.55	
Wt. of Water (gm)	2.3	2.5	2.1	
Wt. of DS (gm)	6.6	6.7	5.2	
Moisture Content (%)	**35.5**	**37.7**	**40.4**	
Number of Blows	**34**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	Z-4	1M	
Wt. of Tare & WS (gm)	23.51	21.96	
Wt. of Tare & DS (gm)	21.70	20.59	
Wt. of Tare (gm)	15.63	15.90	
Wt. of Water (gm)	1.8	1.4	
Wt. of DS (gm)	6.1	4.7	
Moisture Content (%)	**29.8**	**29.2**	**0.6**

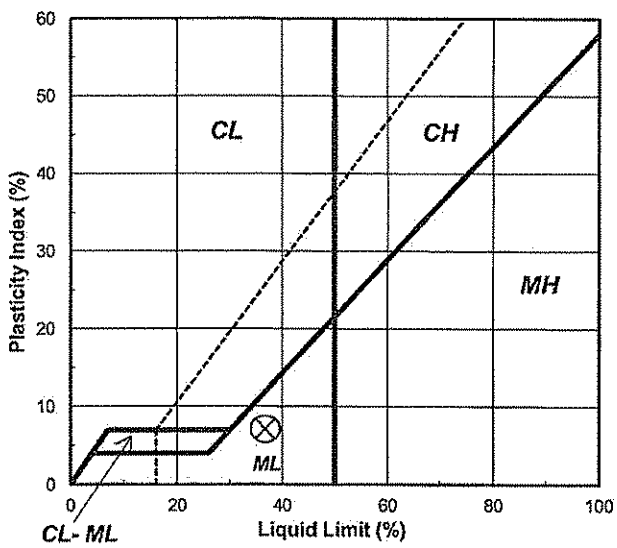
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**37**
Plastic Limit (%)	**30**
Plasticity Index (%)	**7**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By SD *Date* 4/17/2012 *Checked By* GZM *Date* 4-19-12

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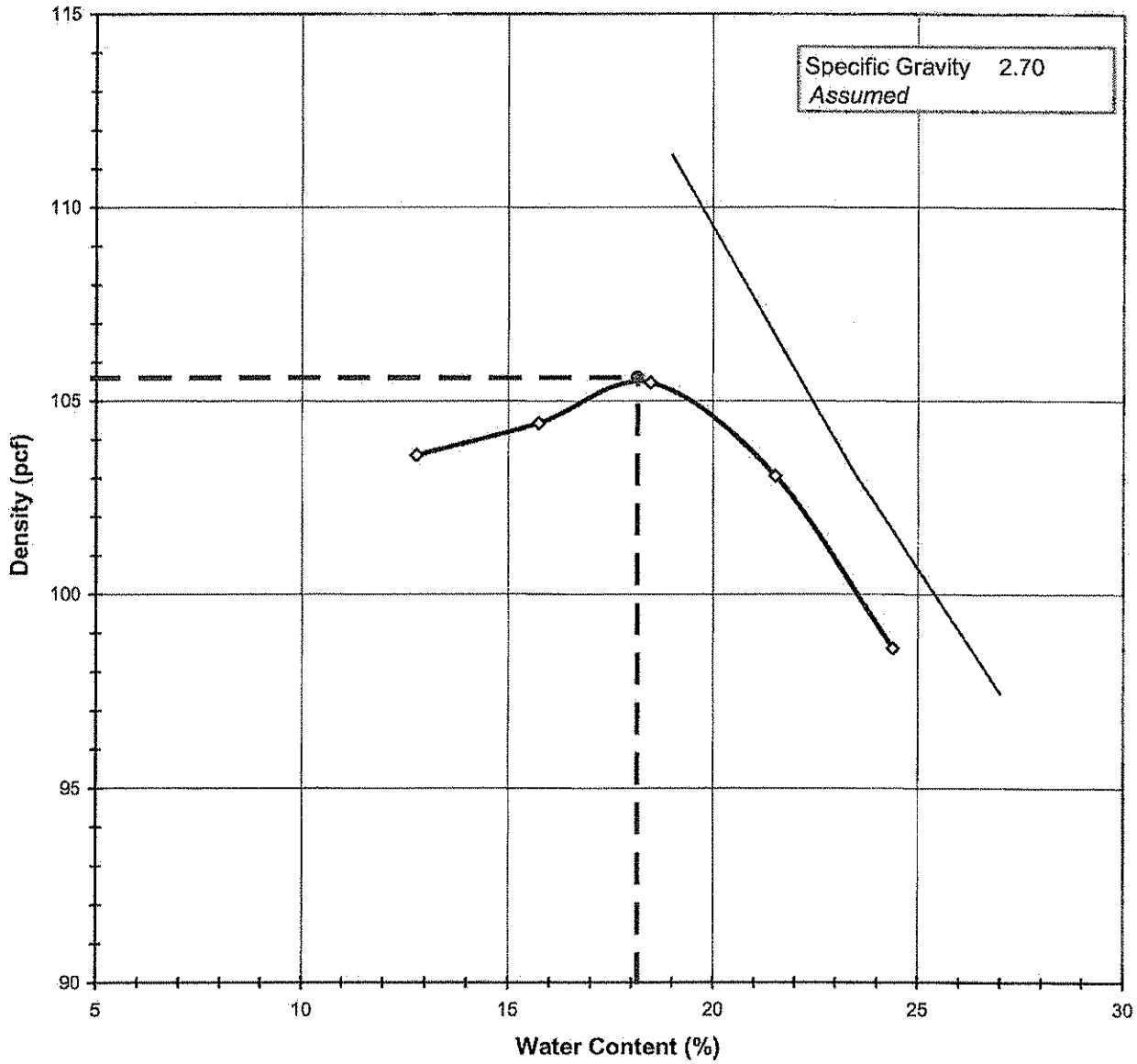
MOISTURE DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	LOW PERM
Lab ID	2012-656-01-01	Test Method	**STANDARD**

Visual Description LIGHT BROWN TAN SANDY SILT

Optimum Water Content 18.2
Maximum Dry Density 105.6



Tested By SD *Date* 4/16/2012 *Checked By* MK *Date* 4/17

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INTEGRITY IN TESTING

MOISTURE - DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	LOW PERM
Lab ID	2012-656-01-01		

Visual Description LIGHT BROWN TAN SANDY SILT

Total Weight of the Sample (gm)	20550
As Received Water Content(%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	Not included
Procedure Used	A

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	172
Mold diameter		4"
Weight of the Mold		4290
Volume of the Mold(cc)		941

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	6052	6112	6174	6179	6140
Wt.of Mold (gm)	4290	4290	4290	4290	4290
Wt. of WS	1762	1823	1885	1889	1850
Mold Volume (cc)	941	941	941	941	941

Moisture Content / Density

Tare Number	315	300	317	311	318
Wt. of Tare & WS (gm)	465.60	489.30	502.60	491.60	436.90
Wt. of Tare & DS (gm)	425.33	437.80	437.41	419.50	368.32
Wt. of Tare (gm)	110.50	110.60	84.40	84.70	87.10
Wt. of Water (gm)	40.27	51.50	65.19	72.10	68.58
Wt. of DS (gm)	314.83	327.20	353.01	334.80	281.22

Wet Density (gm/cc)	1.87	1.94	2.00	2.01	1.97
Wet Density (pcf)	116.8	120.9	124.9	125.3	122.7
Moisture Content (%)	**12.8**	**15.7**	**18.5**	**21.5**	**24.4**
Dry Density (pcf)	**103.6**	**104.4**	**105.5**	**103.1**	**98.6**

Zero Air Voids

Moisture Content (%)	19.0	23.5	27.0
Dry Unit Weight (pcf)	111.4	103.1	97.4

Tested By SD *Date* 4/16/2012 *Checked By* [illegible] *Date* 4/17

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DCN:CT-S12-DATE:12/11/00 REVISION:5 \\SERVER\Data-Drive\Data Sheets\2012-656-01-01 Proctor w Headers.XLS]Sheet1

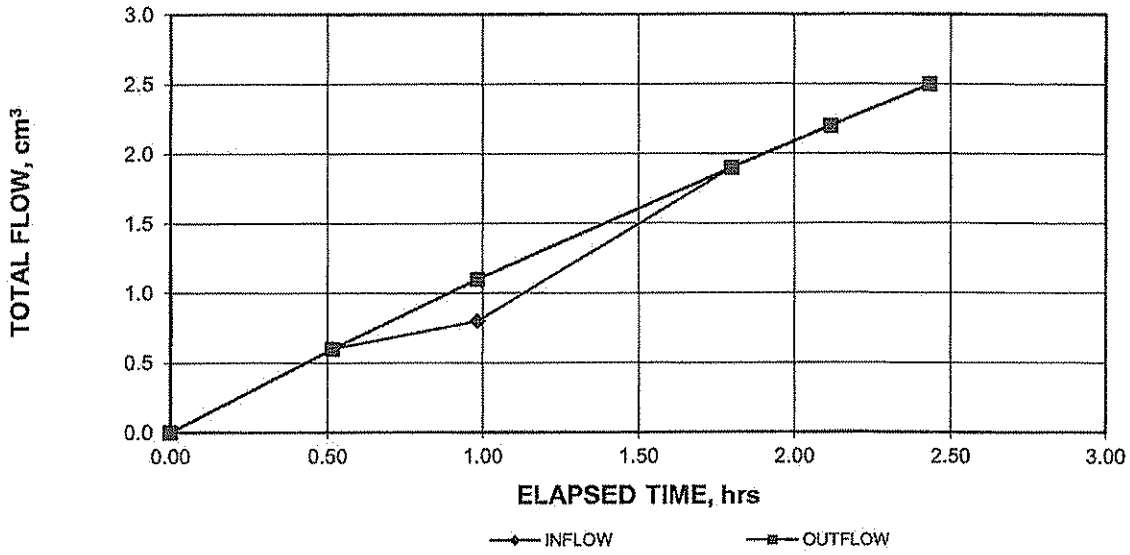
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

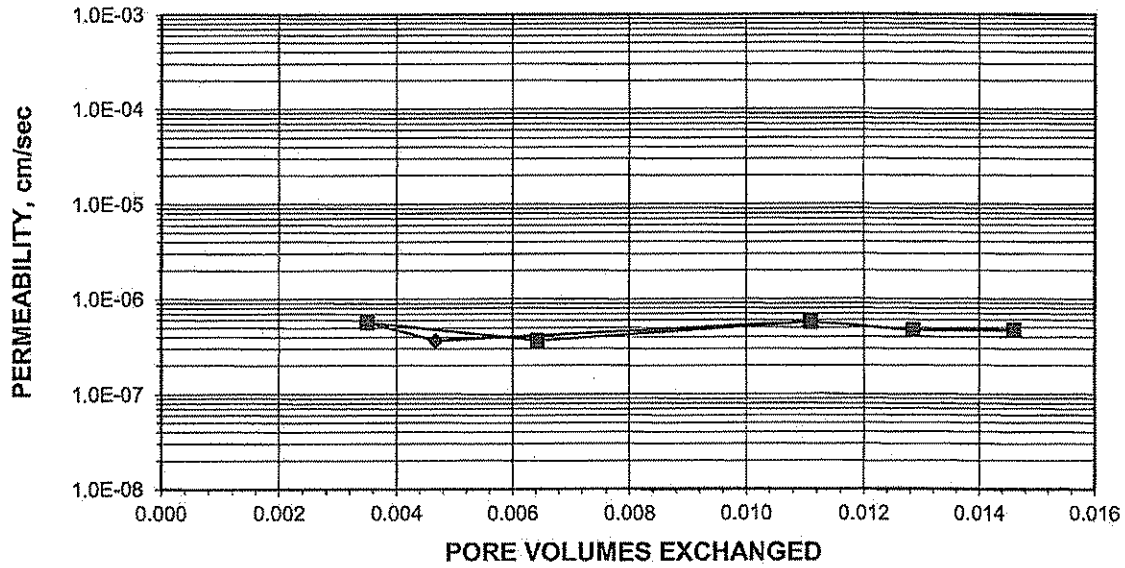
Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	~~INTERIOR COVER~~ LOW PERM S2
Lab ID No.	2012-656-01-02		

AVERAGE PERMEABILITY = 4.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.7E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 4/24/2012 Checked By: GZM Date: 4-27-12

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	~~INTERIOR COVER~~ LOW PERM S2
Lab ID No.	2012-656-01-02		
		Specific Gravity	2.70 Assumed
		Sample Condition	Remolded

Visual Description: BROWN SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	270	810
Wt. of Tare & WS (gm.)	104.07	467.77
Wt. of Tare & DS (gm.)	94.09	404.99
Wt. of Tare (gm.)	37.48	114.54
Wt. of Water (gm.)	9.98	62.78
Wt. of DS (gm.)	56.61	290.45
Moisture Content (%)	**17.6**	**21.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	849.20	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	849.20	877.97
Length 1 (in.)	4.003	4.051
Length 2 (in.)	4.003	4.041
Length 3 (in.)	4.003	4.041
Top Diameter (in.)	2.870	2.899
Middle Diameter (in.)	2.870	2.903
Bottom Diameter (in.)	2.870	2.906
Average Length (in.)	4.00	4.04
Average Area (in.^{2})	6.47	6.62
Sample Volume (cm^3)	424.37	438.56
Unit Wet Wt. (gm./ cm^3)	2.00	2.00
Unit Wet Wt. (pcf)	124.9	125.0
Unit Dry Wt. (pcf)	106.2	102.8
Unit Dry Wt. (gm./ cm^3)	1.70	1.65
Void Ratio, e	0.59	0.64
Porosity, n	0.37	0.39
Pore Volume (cm^3)	157.0	171.2
Total Wgt. Of Sample After Test		925.06

Tested By: BW Date: 4/24/2012 Checked By: GEM Date: 4-27-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-02 GM PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-01	Sample No.	~~INTERIOR COVER~~ LOW PERM S2
Lab ID No.	2012-656-01-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	10.27
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.37
Cell (psi)	50.0	Sample Area (cm^2), A	42.69
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	10.27	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	99

AVERAGE PERMEABILITY = 4.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.7E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
4/26/2012	8	26	0.00	0.0	0.0	127.4	0	22.8	NA
4/26/2012	8	57	0.52	0.6	0.6	126.1	0	23.0	5.7E-07
4/26/2012	9	25	0.98	0.8	1.1	125.4	0	23.3	3.7E-07
4/26/2012	10	14	1.80	1.9	1.9	123.4	0	23.6	5.7E-07
4/26/2012	10	33	2.12	2.2	2.2	122.8	0	23.7	4.7E-07
4/26/2012	10	52	2.43	2.5	2.5	122.2	1	23.7	4.7E-07

Tested By: BW Date: 4/24/2012 Checked By: GBM Date: 4-27-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-02 GM PERM\flow w header.xls]Sheet1

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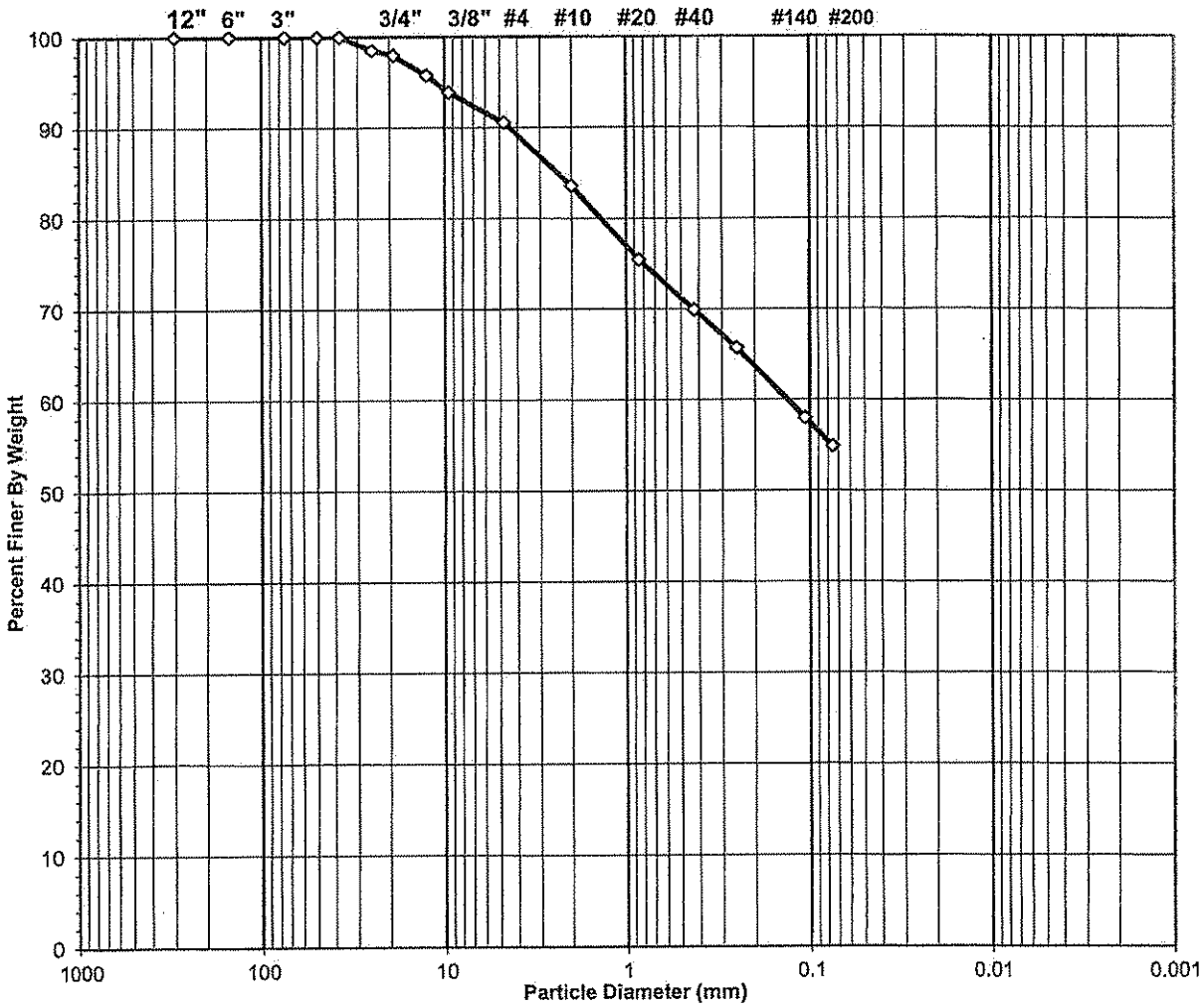
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	~~INTERIOR COVER~~
Lab ID	2012-656-01-02	Soil Color	LIGHT BROWN
			LOW PERM S2

	SIEVE ANALYSIS		HYDROMETER
USCS	gravel	sand	silt and clay



USCS Symbol ***CL, TESTED***

USCS Classification SANDY LEAN CLAY

Tested By SD Date 4/17/2012 Checked By GAM Date 4-19-12

 DCN: CT-S3A DATE 6-25-98 REVISION 2 *Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-01-02 J-SIEVEON WHeader.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA LOW PERM S2
Project No.	2012-656-01	Sample No.	~~INTERIOR COVER~~
Lab ID	2012-656-01-02	Soil Color	**LIGHT BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	840	Tare No.	314
Wgt.Tare + Wet Specimen (gm)	819.78	Wgt.Tare + Wet Specimen (gm)	651.09
Wgt.Tare + Dry Specimen (gm)	746.03	Wgt.Tare + Dry Specimen (gm)	615.21
Weight of Tare (gm)	262.57	Weight of Tare (gm)	84.88
Weight of Water (gm)	73.75	Weight of Water (gm)	35.88
Weight of Dry Soil (gm)	483.46	Weight of Dry Soil (gm)	530.33
Moisture Content (%)	**15.3**	**Moisture Content (%)**	**6.8**

Wet Weight -3/4" Sample (gm)	14699	Weight of the Dry Specimen (gm)	483.46
Dry Weight - 3/4" Sample (gm)	12753.5	Weight of minus #200 material (gm)	270.70
Wet Weight +3/4" Sample (gm)	280.99	Weight of plus #200 material (gm)	212.76
Dry Weight + 3/4" Sample (gm)	263.18		
Total Dry Weight Sample (gm)	13016.7	**J - Factor (Percent Finer than 3/4")**	**0.9798**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	Accumulated **Percent Finer (%)**
12"	300	0.00		0.0	0.0	100.0	**100.0**
6"	150	0.00		0.0	0.0	100.0	**100.0**
3"	75	0.00		0.0	0.0	100.0	**100.0**
2"	50	0.00	(*)	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00		0.0	0.0	100.0	**100.0**
1"	25	206.34		1.5	1.5	98.5	**98.5**
3/4"	19	74.65		0.5	2.0	98.0	**98.0**
1/2"	12.5	10.90		2.3	2.3	97.7	**95.8**
3/8"	9.5	9.21		1.9	4.2	95.8	**93.9**
#4	4.75	16.51		3.4	7.6	92.4	**90.6**
#10	2	34.49		7.1	14.7	85.3	**83.6**
#20	0.85	40.08	(**)	8.3	23.0	77.0	**75.4**
#40	0.425	27.21		5.6	28.6	71.4	**69.9**
#60	0.25	20.83		4.3	32.9	67.1	**65.7**
#140	0.106	38.06		7.9	40.8	59.2	**58.0**
#200	0.075	15.47		3.2	44.0	56.0	**54.9**
Pan	-	270.70		56.0	100.0	-	-

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By SD Date 4/17/2012 Checked By GEM Date 4-19-12

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10 (SOP - S4A)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA LOW AERM S2
Project No.	2012-656-01	Sample No.	~~INTERIOR COVER~~
Lab ID	2012-656-01-02	Soil Description	**LIGHT BROWN LEAN CLAY**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description. (Minus No. 40 sieve material, Airdried)

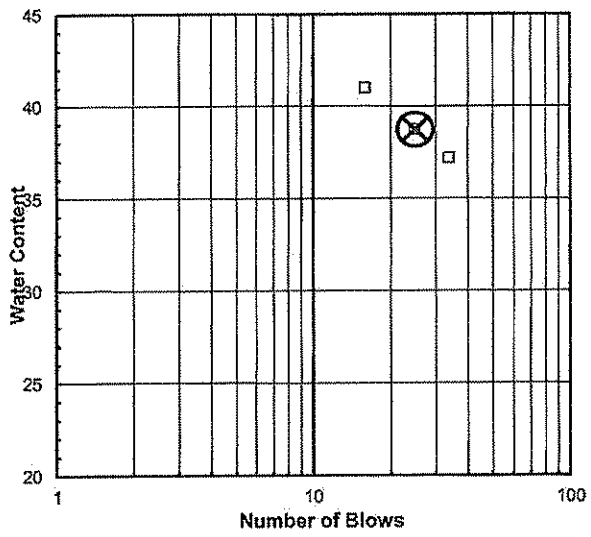
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	K	A-L	T	MULTIPOINT
Wt. of Tare & WS (gm)	23.82	23.81	24.78	
Wt. of Tare & DS (gm)	21.49	21.49	21.99	
Wt. of Tare (gm)	15.22	15.50	15.18	
Wt. of Water (gm)	2.3	2.3	2.8	
Wt. of DS (gm)	6.3	6.0	6.8	
Moisture Content (%)	**37.2**	**38.7**	**41.0**	
Number of Blows	**34**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	O	A-I	
Wt. of Tare & WS (gm)	21.98	21.70	
Wt. of Tare & DS (gm)	20.63	20.47	
Wt. of Tare (gm)	15.18	15.40	
Wt. of Water (gm)	1.4	1.2	
Wt. of DS (gm)	5.5	5.1	
Moisture Content (%)	**24.8**	**24.3**	**0.5**

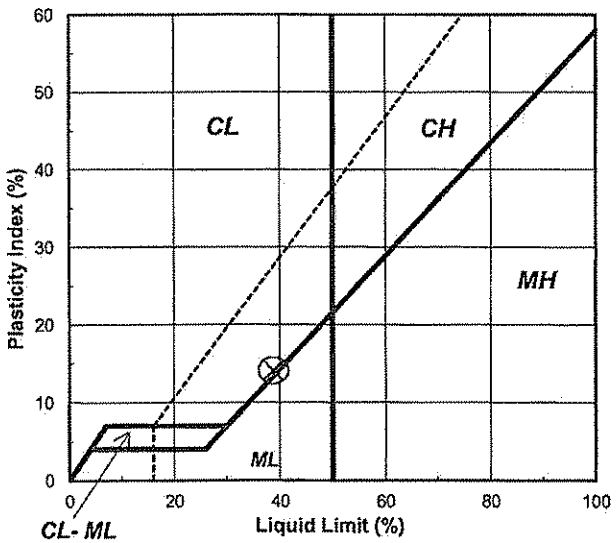
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**39**
Plastic Limit (%)	**25**
Plasticity Index (%)	**14**
USCS Symbol	**CL**

Flow Curve



Plasticity Chart



Tested By SD *Date* 4/17/2012 *Checked By* GBM *Date* 4-19-12

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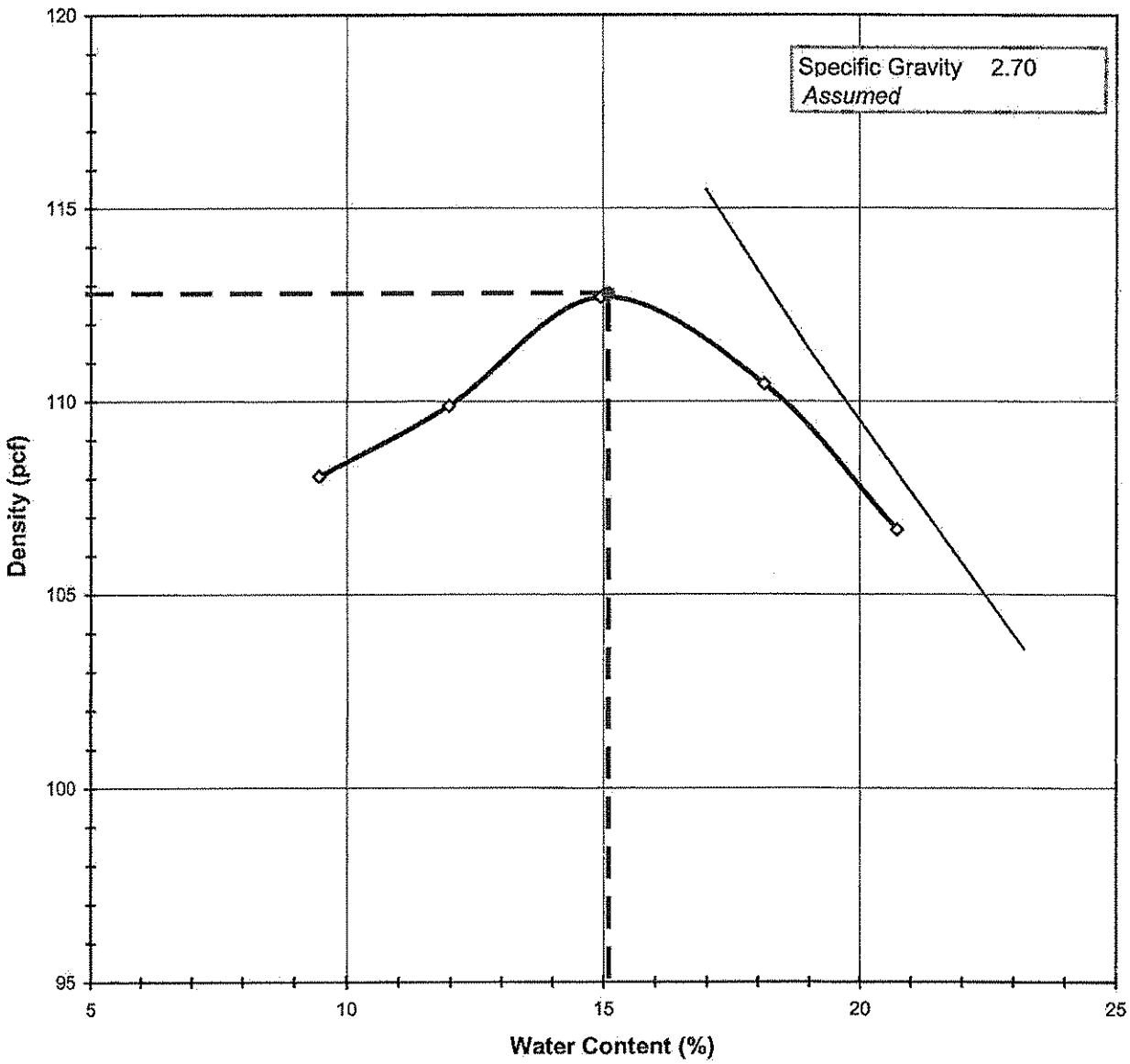
MOISTURE DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA LOW PERM S2
Project No.	2012-656-01	Sample No.	~~INTERM. COVER~~
Lab ID	2012-656-01-02	Test Method	**STANDARD**

Visual Description BROWN TAN SILTY SAND

Optimum Water Content **15.1**
Maximum Dry Density **112.8**



Tested By SD *Date* 4/16/2012 *Checked By* AMS *Date* 4/20

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-01	Sample No.	~~INTERM. COVER~~ LOW PERM S2
Lab ID	2012-656-01-02		

Visual Description BROWN TAN SILTY SAND

Total Weight of the Sample (gm)	15350
As Received Water Content(%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	NA
Percent Retained on 3/8"	NA
Percent Retained on #4	NA
Oversize Material	INC.
Procedure Used	B

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	172
Mold diameter		4"
Weight of the Mold		4290
Volume of the Mold(cc)		941

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	6074	6146	6244	6258	6233
Wt.of Mold (gm)	4290	4290	4290	4290	4290
Wt. of WS	1784	1856	1954	1968	1943
Mold Volume (cc)	941	941	941	941	941

Moisture Content / Density

Tare Number	303	807	809	811	804
Wt. of Tare & WS (gm)	478.90	405.90	417.40	475.10	528.50
Wt. of Tare & DS (gm)	447.12	373.73	378.08	418.46	455.79
Wt. of Tare (gm)	111.70	105.00	115.10	106.10	105.10
Wt. of Water (gm)	31.78	32.17	39.32	56.64	72.71
Wt. of DS (gm)	335.42	268.73	262.98	312.36	350.69

Wet Density (gm/cc)	1.90	1.97	2.08	2.09	2.06
Wet Density (pcf)	118.3	123.0	129.5	130.5	128.8
Moisture Content (%)	**9.5**	**12.0**	**15.0**	**18.1**	**20.7**
Dry Density (pcf)	**108.1**	**109.9**	**112.7**	**110.5**	**106.7**

Zero Air Voids

Moisture Content (%)	17.0	19.0	23.2
Dry Unit Weight (pcf)	115.5	111.4	103.6

Tested By SD *Date* 4/16/2012 *Checked By* MPS *Date* 4/20

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October 8, 2012

Project No. 2012-656-12

Mr. Hannu Kemppinen
Joyce Engineering, Inc.
Greensboro, NC 27407
Hannu@joyceengineering.com

Transmittal
Laboratory Test Results
Coble SR

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens which were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectively submitted,
Geotechnics, Inc.

Michael P. Smith
Regional Manager

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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SPECIFIC GRAVITY

ASTM D 854-10

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR LF	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID	2012-656-12-01	Visual Description	**TAN SILT**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	R 347	R 345
Weight of Pycnometer + Soil + Water (gm)	700.28	699.26
Temperature, T (°Celsius)	25.7	25.6
Weight of Pycnometer + Water (gm)	669.00	667.94
Tare Number	206	376
Weight of Tare + Dry Soil (gm)	165.35	156.57
Weight of Tare (gm)	115.35	106.57
Weight of Dry Soil (gm)	50.00	50.00
Specific Gravity of Soil @ T	2.671	2.677
Specific Gravity of Water @ T	0.9969	0.9969
Conversion Factor for Temperature T	0.9987	0.9987
Specific Gravity @ 20° Celsius	2.675	2.681

Average Specific Gravity @ 20° Celsius	2.68

Tested By SFS *Date* 10/3/2012 *Checked By* BW *Date* 10-4-12

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SPECIFIC GRAVITY

ASTM D 854-10

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR LF	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID	2012-656-12-02	Visual Description	**BROWN SANDY SILT**
			(MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	R 347	R 345
Weight of Pycnometer + Soil + Water (gm)	699.85	698.98
Temperature, T (°Celsius)	26.3	25.9
Weight of Pycnometer + Water (gm)	668.92	667.90
Tare Number	331	334
Weight of Tare + Dry Soil (gm)	150.99	156.13
Weight of Tare (gm)	100.99	106.13
Weight of Dry Soil (gm)	50.00	50.00
Specific Gravity of Soil @ T	2.622	2.643
Specific Gravity of Water @ T	0.9967	0.9968
Conversion Factor for Temperature T	0.9985	0.9986
Specific Gravity @ 20° Celsius	2.626	2.647

Average Specific Gravity @ 20° Celsius	2.64

Tested By SFS *Date* 10/2/2012 *Checked By* BW *Date* 10-4-12

DCN: CT-S5 Date: 03/24/05 Revision: 10R *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-02 Specific Gravity Soils 1Raleigh (1.2)wHeaders.xls]Sheet1*

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SPECIFIC GRAVITY

ASTM D 854-10

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR LF	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-03	Visual Description	**REDDISH BROWN SILTY SAND** (MInus No.4 sieve material, airdried)

Replicate Number	**1**	**2**
Pycnometer ID	R 344	R 346
Weight of Pycnometer + Soil + Water (gm)	698.95	699.4
Temperature, T (°Celsius)	25.7	25.7
Weight of Pycnometer + Water (gm)	667.67	668.13
Tare Number	373	372
Weight of Tare + Dry Soil (gm)	155.1	153.83
Weight of Tare (gm)	105.1	103.83
Weight of Dry Soil (gm)	50.00	50.00
Specific Gravity of Soil @ T	2.671	2.670
Specific Gravity of Water @ T	0.9969	0.9969
Conversion Factor for Temperature T	0.9987	0.9987
Specific Gravity @ 20° Celsius	2.675	2.673

Average Specific Gravity @ 20° Celsius	2.67

Tested By SFS *Date* 10/3/2012 *Checked By* BW *Date* 10-4-12

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10 (SOP - S4A)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID	2012-656-12-01	Soil Description	**TAN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

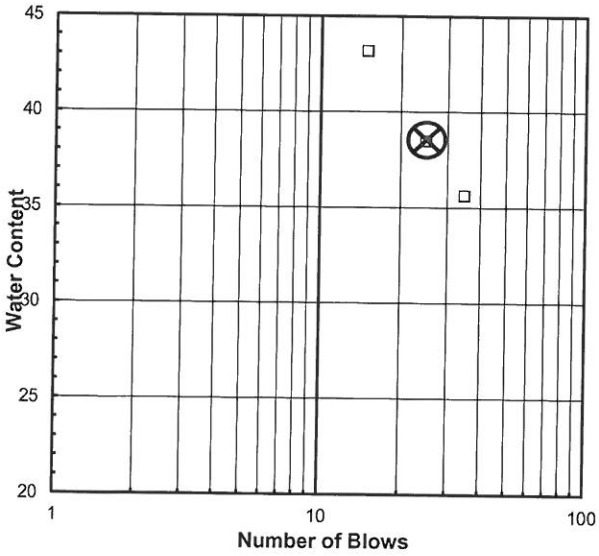
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	B	U	G	MULTIPOINT
Wt. of Tare & WS (gm)	26.82	26.33	25.10	
Wt. of Tare & DS (gm)	23.77	23.25	22.08	
Wt. of Tare (gm)	15.20	15.24	15.08	
Wt. of Water (gm)	3.1	3.1	3.0	
Wt. of DS (gm)	8.6	8.0	7.0	
Moisture Content (%)	**35.6**	**38.5**	**43.1**	
Number of Blows	**35**	**25**	**15**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	A-M	K	
Wt. of Tare & WS (gm)	23.05	23.40	
Wt. of Tare & DS (gm)	21.27	21.48	
Wt. of Tare (gm)	15.37	15.22	
Wt. of Water (gm)	1.8	1.9	
Wt. of DS (gm)	5.9	6.3	
Moisture Content (%)	**30.2**	**30.7**	**-0.5**

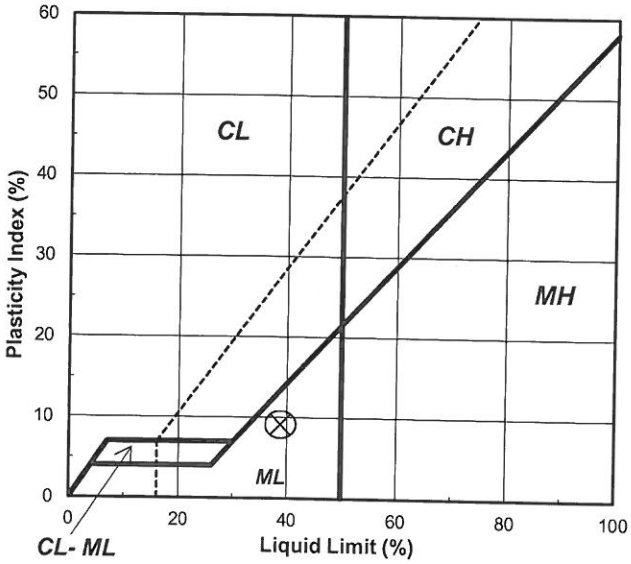
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**39**
Plastic Limit (%)	**30**
Plasticity Index (%)	**9**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By BW *Date* 10/2/2012 *Checked By* BW *Date* 10/3/12

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10 (SOP - S4A)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID	2012-656-12-02	Soil Description	**REDDISH BROWN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

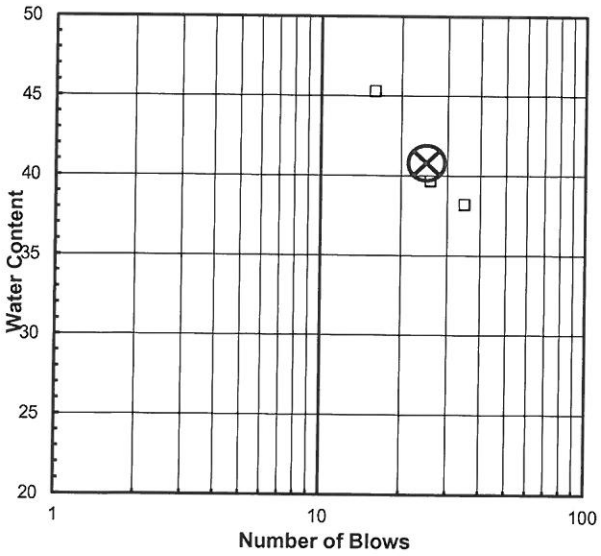
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	BB	AB	H	MULTIPOINT
Wt. of Tare & WS (gm)	26.59	26.45	26.58	
Wt. of Tare & DS (gm)	23.54	23.37	23.00	
Wt. of Tare (gm)	15.55	15.60	15.09	
Wt. of Water (gm)	3.1	3.1	3.6	
Wt. of DS (gm)	8.0	7.8	7.9	
Moisture Content (%)	**38.2**	**39.6**	**45.3**	
Number of Blows	**35**	**26**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	L	A-C	
Wt. of Tare & WS (gm)	22.42	21.87	
Wt. of Tare & DS (gm)	20.92	20.55	
Wt. of Tare (gm)	15.23	15.60	
Wt. of Water (gm)	1.5	1.3	
Wt. of DS (gm)	5.7	5.0	
Moisture Content (%)	**26.4**	**26.7**	**-0.3**

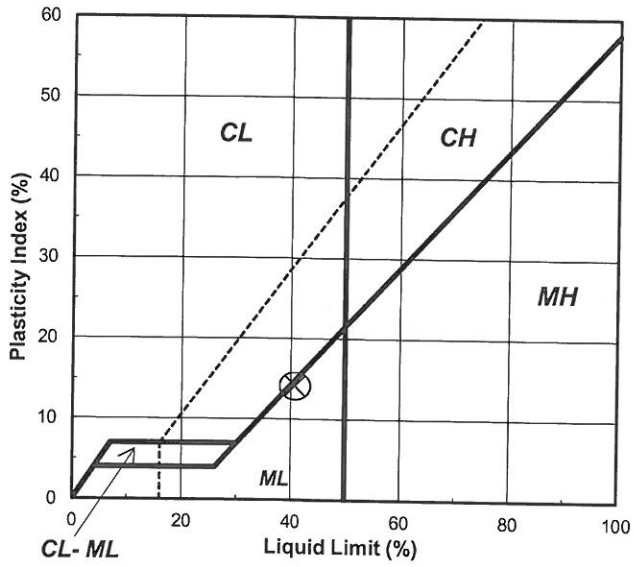
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**41**
Plastic Limit (%)	**27**
Plasticity Index (%)	**14**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By *BW* *Date* *10/2/2012* *Checked By* BW *Date* 10-3-12

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ATTERBERG LIMITS

ASTM D 4318-10 / AASHTO T89-10 (SOP - S4A)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-03	Soil Description	**REDDISH BROWN SILT**

Note: The USCS symbol used with this test refers only to the minus No. 40 sieve material. See the "Sieve and Hydrometer Analysis" graph page for the complete material description.

(Minus No. 40 sieve material, Airdried)

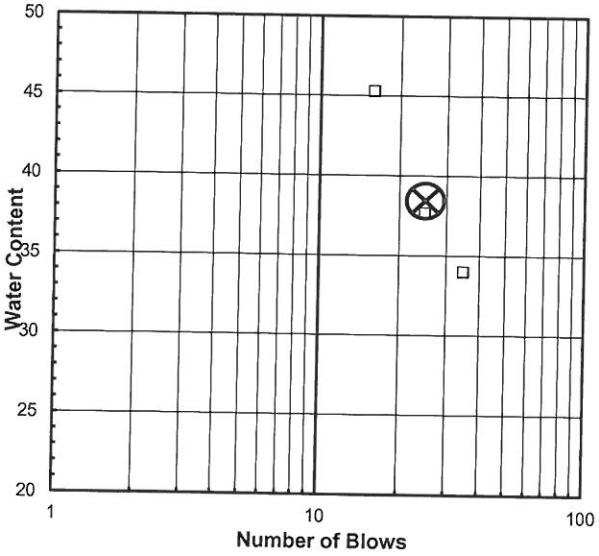
Liquid Limit Test	**1**	**2**	**3**	
Tare Number	A1	C	H	MULTIPOINT
Wt. of Tare & WS (gm)	24.73	29.25	26.58	
Wt. of Tare & DS (gm)	22.38	25.41	23.00	
Wt. of Tare (gm)	15.46	15.21	15.09	
Wt. of Water (gm)	2.4	3.8	3.6	
Wt. of DS (gm)	6.9	10.2	7.9	
Moisture Content (%)	**34.0**	**37.6**	**45.3**	
Number of Blows	**35**	**25**	**16**	

Plastic Limit Test	**1**	**2**	**Range**
Tare Number	AK	AD	
Wt. of Tare & WS (gm)	23.63	22.50	
Wt. of Tare & DS (gm)	21.87	20.92	
Wt. of Tare (gm)	15.53	15.37	
Wt. of Water (gm)	1.8	1.6	
Wt. of DS (gm)	6.3	5.6	
Moisture Content (%)	**27.8**	**28.5**	**-0.7**

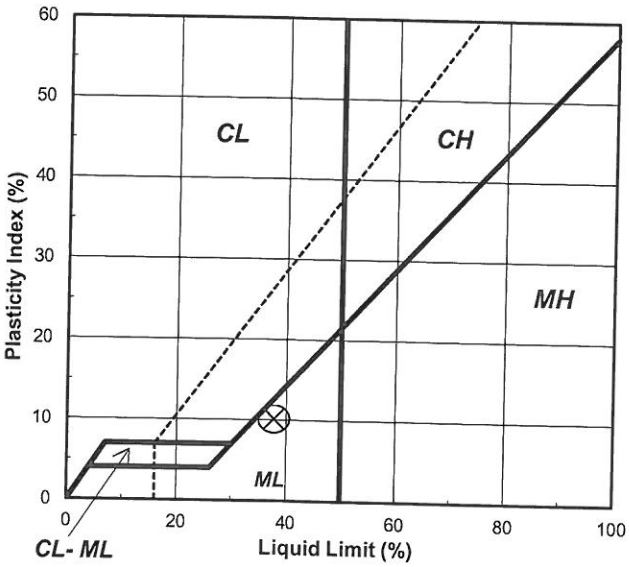
Note: The acceptable range of the two Moisture contents is ± 2.6

Test Results	
Liquid Limit (%)	**38**
Plastic Limit (%)	**28**
Plasticity Index (%)	**10**
USCS Symbol	**ML**

Flow Curve



Plasticity Chart



Tested By BW *Date* 10/2/2012 *Checked By* BW *Date* 10/3/12

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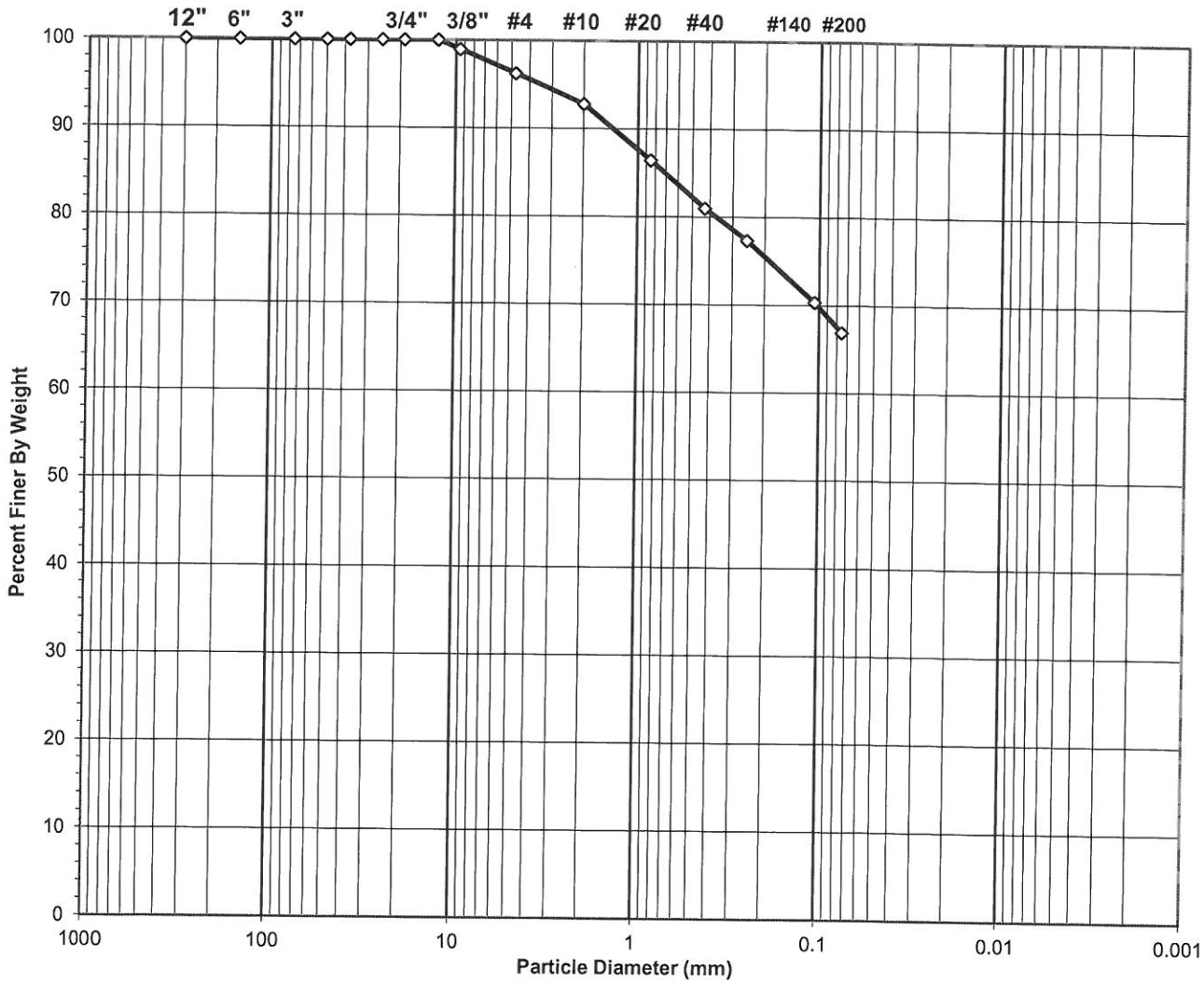
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID	2012-656-12-01	Soil Color	**TAN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***ML, TESTED***

USCS Classification SANDY SILT

Tested By SFS Date 9/28/2012 Checked By BW Date 10-2-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-01 SIEVON REV 4 wHeader.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID	2012-656-12-01	Soil Color	**TAN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	838	Tare No.	NA
Wgt.Tare + Wet Specimen (gm)	1182.03	Wgt.Tare + Wet Specimen (gm)	NA
Wgt.Tare + Dry Specimen (gm)	1097.38	Wgt.Tare + Dry Specimen (gm)	NA
Weight of Tare (gm)	261.60	Weight of Tare (gm)	NA
Weight of Water (gm)	84.65	Weight of Water (gm)	NA
Weight of Dry Soil (gm)	835.78	Weight of Dry Soil (gm)	NA
Moisture Content (%)	**10.1**	**Moisture Content (%)**	**NA**

Wet Weight -3/4" Sample (gm)	22500	Weight of the Dry Specimen (gm)	835.78
Dry Weight - 3/4" Sample (gm)	276.5	Weight of minus #200 material (gm)	559.25
Wet Weight +3/4" Sample (gm)	NA	Weight of plus #200 material (gm)	276.53
Dry Weight + 3/4" Sample (gm)	0.00		
Total Dry Weight Sample (gm)	NA		

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)	Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00	0.0	0.0	100.0	**100.0**
6"	150	0.00	0.0	0.0	100.0	**100.0**
3"	75	0.00	0.0	0.0	100.0	**100.0**
2"	50	0.00	0.0	0.0	100.0	**100.0**
1 1/2"	37.5	0.00	0.0	0.0	100.0	**100.0**
1"	25.0	0.00	0.0	0.0	100.0	**100.0**
3/4"	19.0	0.00	0.0	0.0	100.0	**100.0**
1/2"	12.50	0.00	0.0	0.0	100.0	**100.0**
3/8"	9.50	8.66	1.0	1.0	99.0	**99.0**
#4	4.75	22.78	2.7	3.8	96.2	**96.2**
#10	2.00	28.70	3.4	7.2	92.8	**92.8**
#20	0.850	53.02	6.3	13.5	86.5	**86.5**
#40	0.425	45.73	5.5	19.0	81.0	**81.0**
#60	0.250	30.25	3.6	22.6	77.4	**77.4**
#140	0.106	58.57	7.0	29.6	70.4	**70.4**
#200	0.075	28.82	3.4	33.1	66.9	**66.9**
Pan	-	559.25	66.9	100.0	-	-

Tested By SFS Date 9/28/2012 Checked By BW Date 10-2-12

DCN: CT-S3C DATE 6-25-98 REVISION: 2 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-01 SIEVON REV 4 wHeader.xls]Sheet1*

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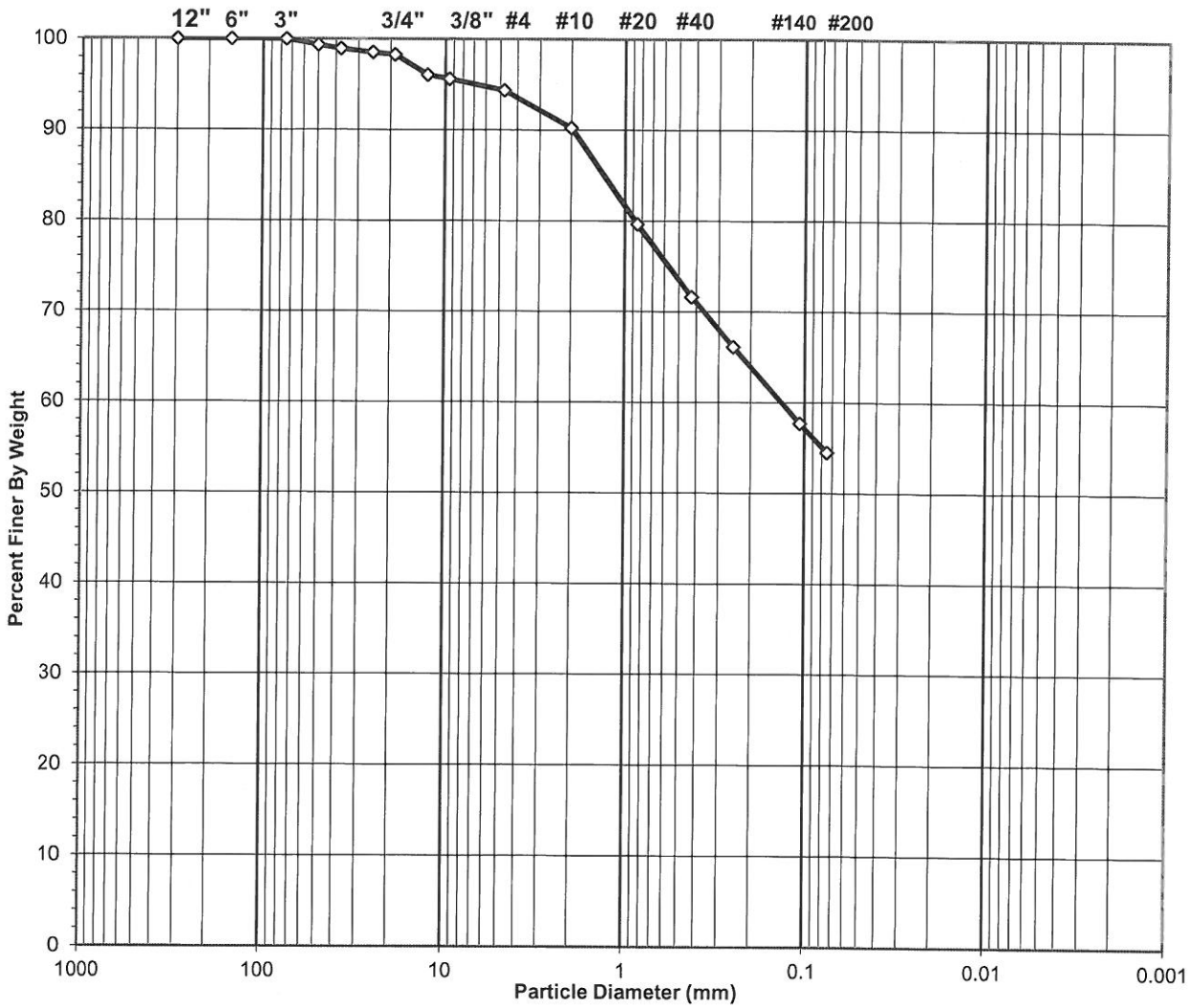
SIEVE ANALYSIS
ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-02	Soil Color	**BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***ML, TESTED***

USCS Classification SANDY SILT

Tested By SFS Date 10/1/2012 Checked By BW Date 10-3-12

 DCN: CT-S3A DATE 6-25-98 REVISION 2 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-02 J-SIEVEON WHeader.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (SOP-S3)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-02	Soil Color	**BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	201	Tare No.	SS-1
Wgt.Tare + Wet Specimen (gm)	1020.98	Wgt.Tare + Wet Specimen (gm)	477.94
Wgt.Tare + Dry Specimen (gm)	876.43	Wgt.Tare + Dry Specimen (gm)	459.62
Weight of Tare (gm)	170.59	Weight of Tare (gm)	94.46
Weight of Water (gm)	144.55	Weight of Water (gm)	18.32
Weight of Dry Soil (gm)	705.84	Weight of Dry Soil (gm)	365.16
Moisture Content (%)	**20.5**	**Moisture Content (%)**	**5.0**

Wet Weight -3/4" Sample (gm)	24050	Weight of the Dry Specimen (gm)	705.84
Dry Weight - 3/4" Sample (gm)	19962.0	Weight of minus #200 material (gm)	391.36
Wet Weight +3/4" Sample (gm)	365.16	Weight of plus #200 material (gm)	314.48
Dry Weight + 3/4" Sample (gm)	347.72		
Total Dry Weight Sample (gm)	20309.7	**J - Factor (Percent Finer than 3/4")**	**0.9829**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.0	0.0	100.0	**100.0**
6"	150	0.00		0.0	0.0	100.0	**100.0**
3"	75	0.00		0.0	0.0	100.0	**100.0**
2"	50	136.94	(*)	0.6	0.6	99.4	**99.4**
1 1/2"	37.5	85.83		0.4	1.0	99.0	**99.0**
1"	25	91.29		0.4	1.5	98.5	**98.5**
3/4"	19	51.10		0.2	1.7	98.3	**98.3**
1/2"	12.5	16.04		2.3	2.3	97.7	**96.1**
3/8"	9.5	3.16		0.4	2.7	97.3	**95.6**
#4	4.75	8.93		1.3	4.0	96.0	**94.4**
#10	2	29.76		4.2	8.2	91.8	**90.2**
#20	0.85	76.07	(**)	10.8	19.0	81.0	**79.6**
#40	0.425	57.54		8.2	27.1	72.9	**71.6**
#60	0.25	39.45		5.6	32.7	67.3	**66.1**
#140	0.106	60.60		8.6	41.3	58.7	**57.7**
#200	0.075	22.93		3.2	44.6	55.4	**54.5**
Pan	-	391.36		55.4	100.0	-	-

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By SFS Date 10/1/2012 Checked By BW Date 10-3-12

DCN: CT-S3A DATE 5-17-00 REVISION 3 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-02 J-SIEVEON WHeader.xls]Sheet1*

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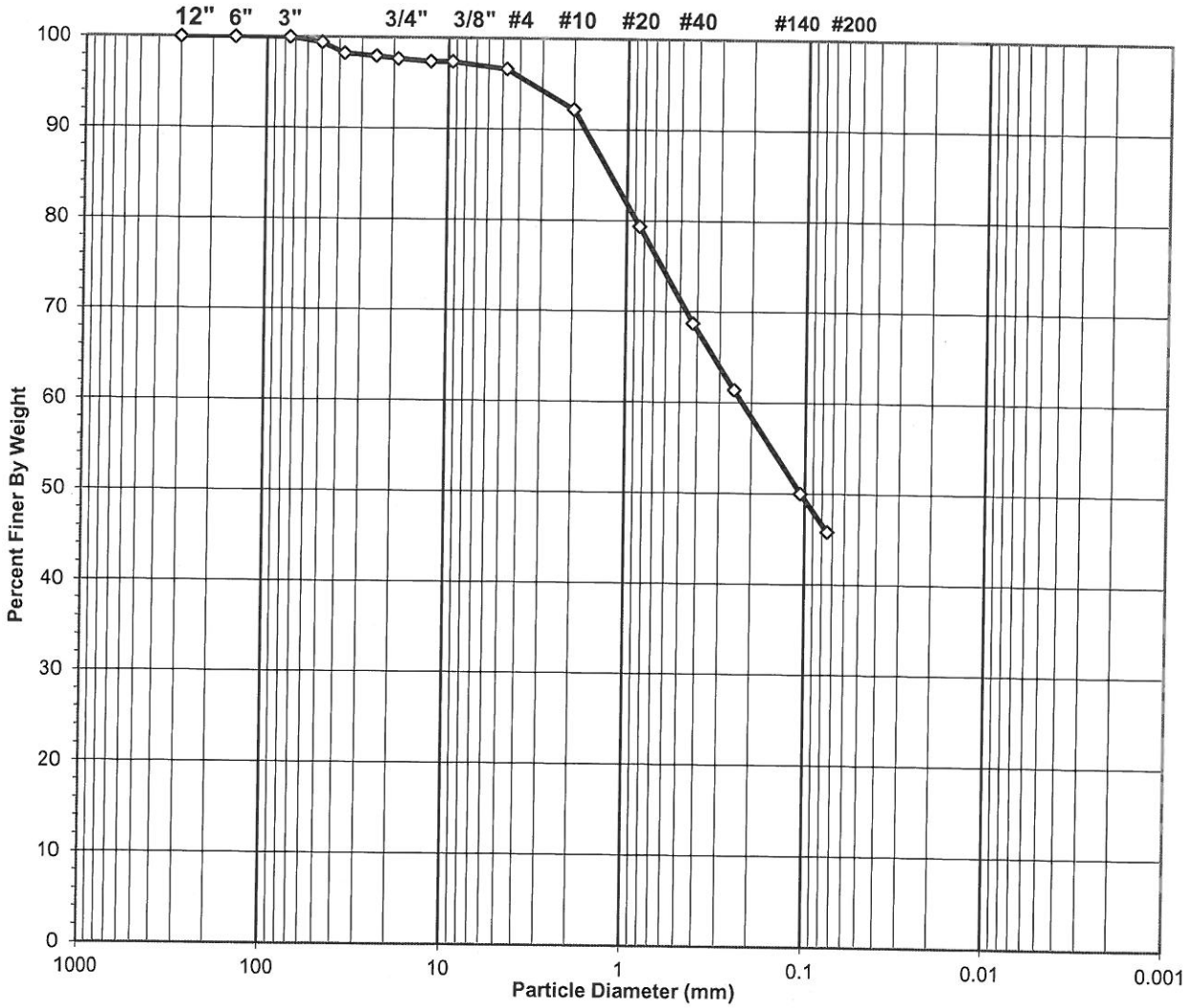
SIEVE ANALYSIS
ASTM D 422-63 (2007)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-03	Soil Color	**REDDISH BROWN**

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



USCS Symbol ***SM, TESTED***

USCS Classification SILTY SAND

Tested By SFS Date 10/1/2012 Checked By BW Date 10-3-12

 DCN: CT-S3A DATE 6-25-98 REVISION 2 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-03 J-SIEVON wHeader.xls]Sheet1*

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WASH SIEVE ANALYSIS

ASTM D 422-63 (2007)

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-03	Soil Color	**REDDISH BROWN**

Moisture Content of Passing 3/4" Material		Water Content of Retained 3/4" Material	
Tare No.	P12	Tare No.	822.00
Wgt.Tare + Wet Specimen (gm)	1263.20	Wgt.Tare + Wet Specimen (gm)	708.33
Wgt.Tare + Dry Specimen (gm)	1128.56	Wgt.Tare + Dry Specimen (gm)	689.70
Weight of Tare (gm)	196.32	Weight of Tare (gm)	136.94
Weight of Water (gm)	134.64	Weight of Water (gm)	18.63
Weight of Dry Soil (gm)	932.24	Weight of Dry Soil (gm)	552.76
Moisture Content (%)	**14.4**	**Moisture Content (%)**	**3.4**

Wet Weight -3/4" Sample (gm)	25650	Weight of the Dry Specimen (gm)	932.24
Dry Weight - 3/4" Sample (gm)	22413.0	Weight of minus #200 material (gm)	437.22
Wet Weight +3/4" Sample (gm)	552.74	Weight of plus #200 material (gm)	495.02
Dry Weight + 3/4" Sample (gm)	534.72		
Total Dry Weight Sample (gm)	22947.7	**J - Factor (Percent Finer than 3/4")**	**0.9767**

Sieve Size	Sieve Opening (mm)	Wgt.of Soil Retained (gm)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.0	0.0	100.0	**100.0**
6"	150	0.00		0.0	0.0	100.0	**100.0**
3"	75	0.00		0.0	0.0	100.0	**100.0**
2"	50	138.18	(*)	0.6	0.6	99.4	**99.4**
1 1/2"	37.5	276.40		1.2	1.7	98.3	**98.3**
1"	25	69.12		0.3	2.0	98.0	**98.0**
3/4"	19	69.04		0.3	2.3	97.7	**97.7**
1/2"	12.5	2.64		0.3	0.3	99.7	**97.4**
3/8"	9.5	0.00		0.0	0.3	99.7	**97.4**
#4	4.75	7.48		0.8	1.1	98.9	**96.6**
#10	2	42.07		4.5	5.6	94.4	**92.2**
#20	0.85	122.57	(**)	13.1	18.7	81.3	**79.4**
#40	0.425	101.52		10.9	29.6	70.4	**68.7**
#60	0.25	69.90		7.5	37.1	62.9	**61.4**
#140	0.106	108.58		11.6	48.8	51.2	**50.0**
#200	0.075	40.26		4.3	53.1	46.9	**45.8**
Pan	-	437.22		46.9	100.0	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" sieve analysis is based on the Weight of the Dry Specimen*

Tested By SFS Date 10/1/2012 Checked By BW Date 10-3-12

DCN: CT-S3A DATE 5-17-00 REVISION 3 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-03 J-SIEVON wHeader.xls]Sheet1*

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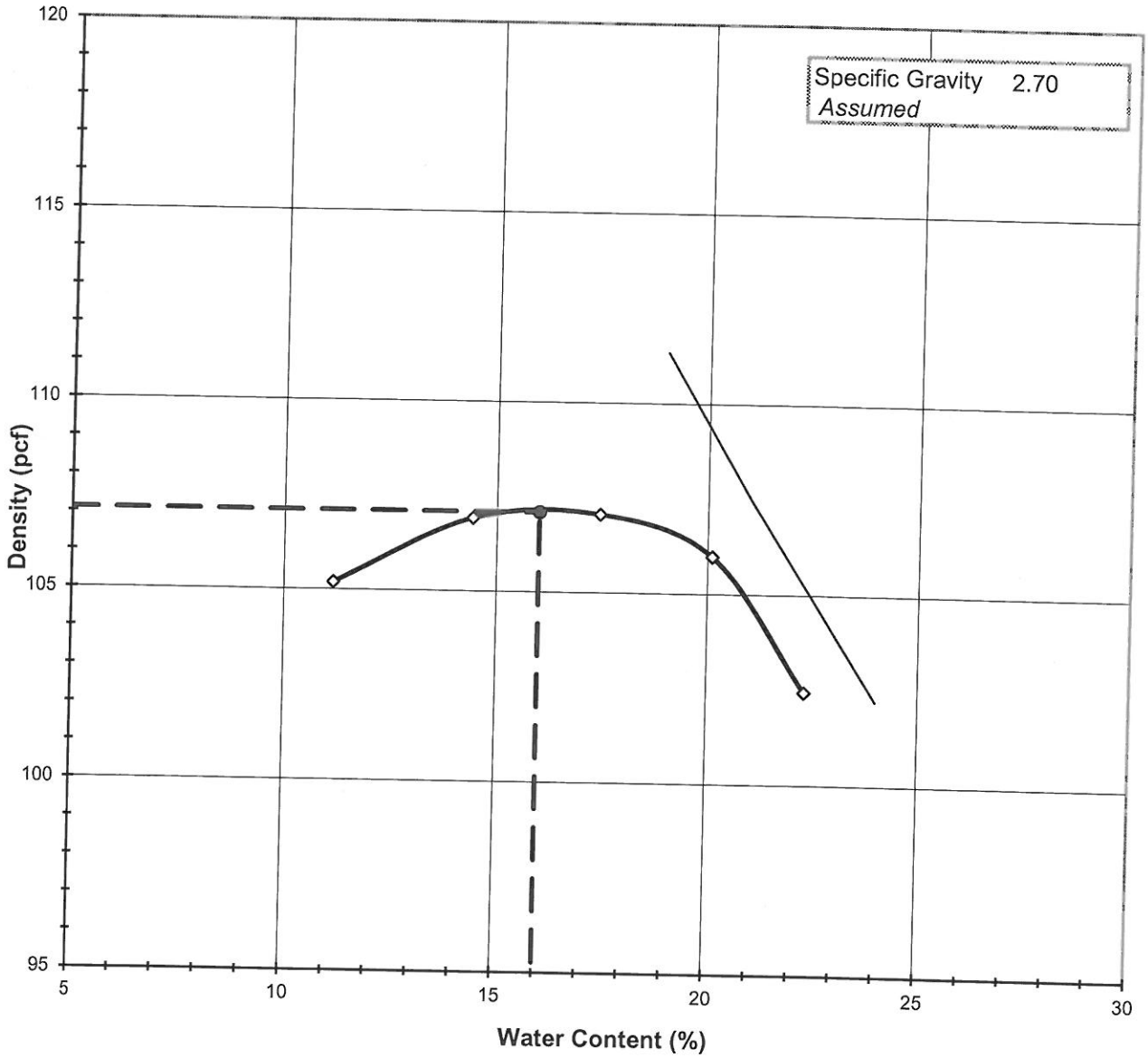
MOISTURE DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID	2012-656-12-01	Test Method	**STANDARD**

Visual Description TAN SANDY SILT

Optimum Water Content **16.0**
Maximum Dry Density **107.1**



Tested By JBD *Date* 9/28/2012 *Checked By* RW *Date* 10/4/12

DCN:CT-S12 DATE:12/11/00 REVISION 5

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID	2012-656-12-01		

Visual Description TAN SANDY SILT

Total Weight of the Sample (gm)	22500
As Received Water Content(%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	0
Percent Retained on 3/8"	0
Percent Retained on #4	1
Oversize Material	INC.
Procedure Used	A

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	172
Mold diameter		4"
Weight of the Mold		4284
Volume of the Mold(cc)		941

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	6047	6129	6180	6204	6174
Wt.of Mold (gm)	4284	4284	4284	4284	4284
Wt. of WS	1764	1846	1897	1920	1890
Mold Volume (cc)	941	941	941	941	941

Moisture Content / Density

Tare Number	307	827	803	818	8010
Wt. of Tare & WS (gm)	742.15	656.60	407.40	523.10	573.30
Wt. of Tare & DS (gm)	678.75	591.01	362.27	458.52	493.52
Wt. of Tare (gm)	110.41	136.40	103.60	137.30	136.10
Wt. of Water (gm)	63.40	65.59	45.13	64.58	79.78
Wt. of DS (gm)	568.34	454.61	258.67	321.22	357.42

Wet Density (gm/cc)	1.87	1.96	2.02	2.04	2.01
Wet Density (pcf)	116.9	122.4	125.7	127.3	125.3
Moisture Content (%)	**11.2**	**14.4**	**17.4**	**20.1**	**22.3**
Dry Density (pcf)	**105.2**	**106.9**	**107.1**	**106.0**	**102.4**

Zero Air Voids

Moisture Content (%)	19.0	21.0	24.0
Dry Unit Weight (pcf)	111.4	107.5	102.2

Tested By JBD *Date* 9/28/2012 *Checked By* BW *Date* 10/4/12

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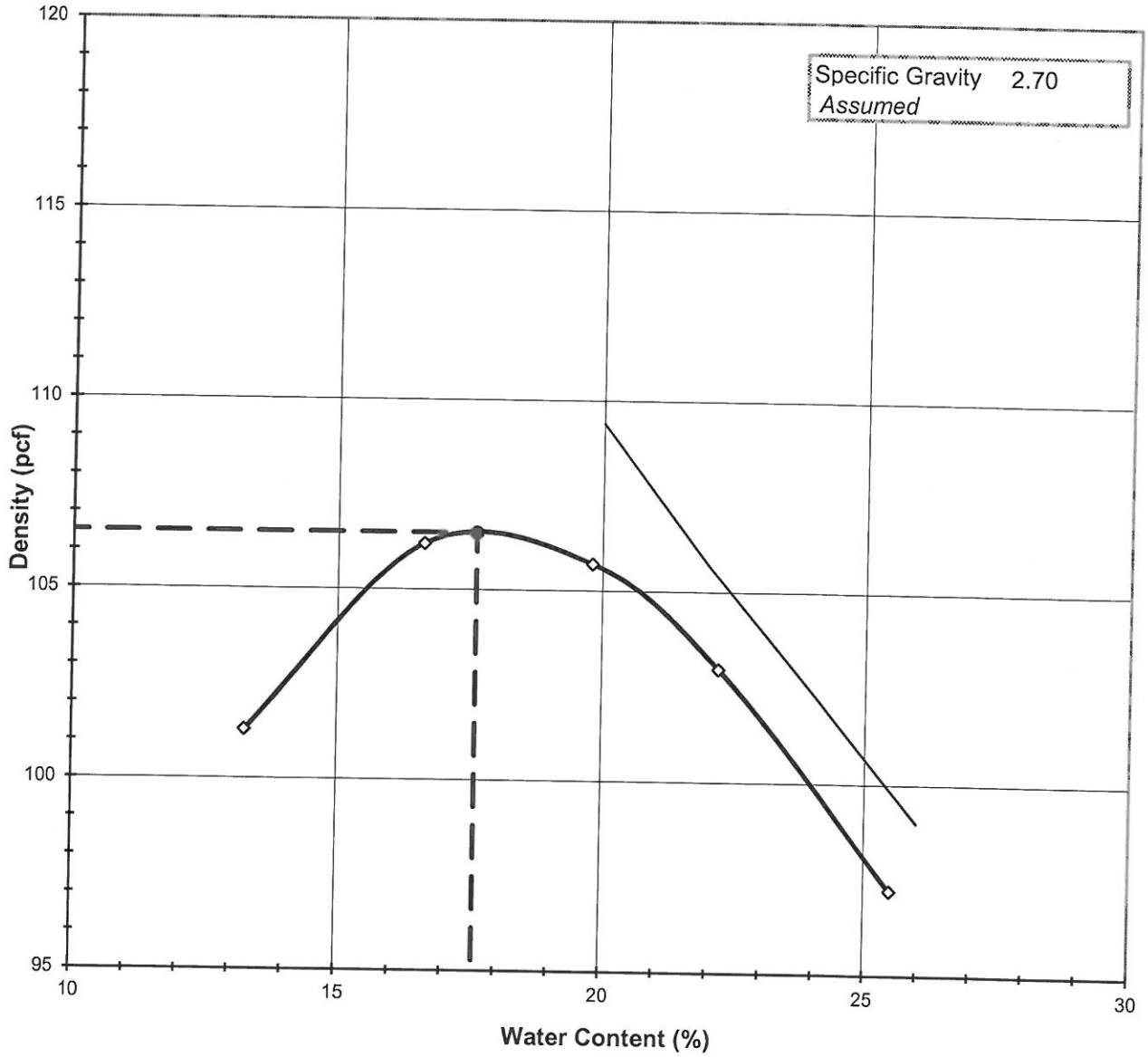
MOISTURE DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID	2012-656-12-02	Test Method	**STANDARD**

Visual Description BROWN SANDY SILT

Optimum Water Content **17.6**
Maximum Dry Density **106.5**



Tested By SFS *Date* 10/2/2012 *Checked By* BW *Date* 10/4/12

DCN:CT-S12 DATE:12/11/00 REVISION 5

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID	2012-656-12-02		

Visual Description BROWN SANDY SILT

Total Weight of the Sample (gm)	24050
As Received Water Content(%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	2
Percent Retained on 3/8"	2
Percent Retained on #4	4
Oversize Material	INC.
Procedure Used	A

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	172
Mold diameter		4"
Weight of the Mold		4284
Volume of the Mold(cc)		941

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	6014	6152	6194	6182	6124
Wt.of Mold (gm)	4284	4284	4284	4284	4284
Wt. of WS	1731	1868	1910	1898	1840
Mold Volume (cc)	941	941	941	941	941

Moisture Content / Density

Tare Number	300	317	304	305	312
Wt. of Tare & WS (gm)	795.81	1049.91	819.29	872.73	780.45
Wt. of Tare & DS (gm)	715.55	912.34	702.17	729.63	639.06
Wt. of Tare (gm)	111.08	84.54	110.87	85.05	84.61
Wt. of Water (gm)	80.26	137.57	117.12	143.10	141.39
Wt. of DS (gm)	604.47	827.80	591.30	644.58	554.45

Wet Density (gm/cc)	1.84	1.98	2.03	2.02	1.96
Wet Density (pcf)	114.7	123.9	126.6	125.8	122.0
Moisture Content (%)	**13.3**	**16.6**	**19.8**	**22.2**	**25.5**
Dry Density (pcf)	**101.3**	**106.2**	**105.7**	**103.0**	**97.2**

Zero Air Voids

Moisture Content (%)	17.0	19.0	23.2
Dry Unit Weight (pcf)	115.5	111.4	103.6

Tested By SFS *Date* 10/2/2012 *Checked By* BW *Date* 10/3/12

DCN:CT-S12 DATE:12/11/00 REVISION 5

Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-02 Proctor wHeaders.xls]Sheet1

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INTEGRITY IN TESTING

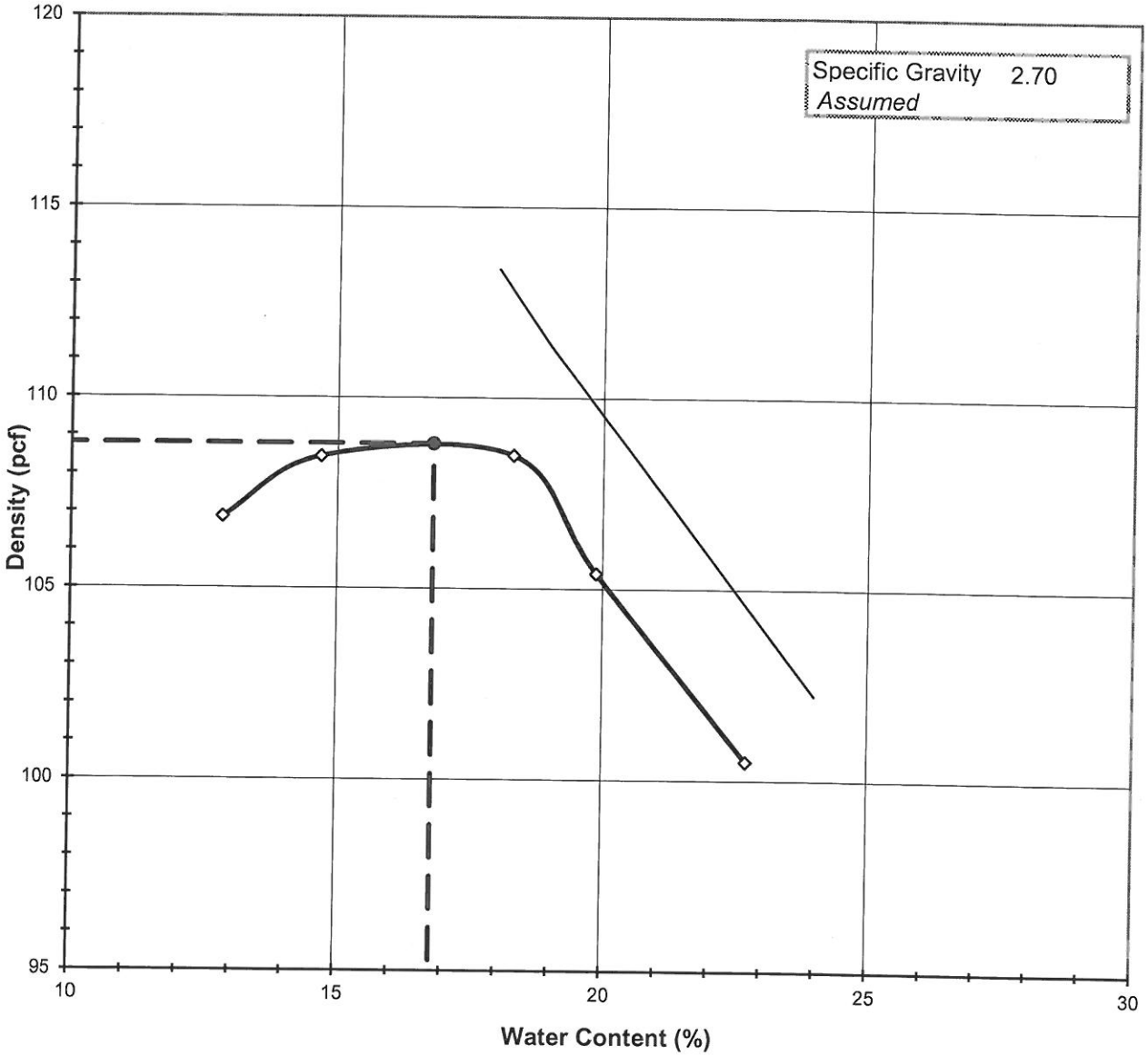
MOISTURE DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-03	Test Method	**STANDARD**

Visual Description REDDISH BROWN SILTY SAND

Optimum Water Content **16.8**
Maximum Dry Density **108.8**



Tested By SFS *Date* 10/2/2012 *Checked By* BW *Date* 10-3-12

DCN:CT-S12 DATE:12/11/00 REVISION 5 *Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-03 Proctor wHeaders.xls]Sheet1*

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MOISTURE - DENSITY RELATIONSHIP

ASTM D698-07e1 SOP-S12

Client	JOYCE ENGINEERING	Boring No.	NA
Client Reference	COBLE SR	Depth (ft)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID	2012-656-12-03		

Visual Description REDDISH BROWN SILTY SAND

Total Weight of the Sample (gm)	25650
As Received Water Content(%)	NA
Assumed Specific Gravity	2.70
Percent Retained on 3/4"	2
Percent Retained on 3/8"	3
Percent Retained on #4	4
Oversize Material	INC.
Procedure Used	A

TestType		**STANDARD**
Rammer Weight (lbs)		5.5
Rammer Drop (in)		12
Rammer Type		MECHANICAL
Machine ID	R	174
Mold ID	R	172
Mold diameter		4"
Weight of the Mold		4284
Volume of the Mold(cc)		941

Mold / Specimen

Point No.	**1**	**2**	**3**	**4**	**5**
Wt. of Mold & WS (gm)	6102	6160	6220	6189	6144
Wt.of Mold (gm)	4284	4284	4284	4284	4284
Wt. of WS	1819	1876	1936	1906	1860
Mold Volume (cc)	941	941	941	941	941

Moisture Content / Density

Tare Number	307	303	309	310	368
Wt. of Tare & WS (gm)	831.06	833.79	878.31	810.13	826.45
Wt. of Tare & DS (gm)	749.11	741.33	759.36	694.11	694.03
Wt. of Tare (gm)	110.45	111.55	109.58	110.40	111.36
Wt. of Water (gm)	81.95	92.46	118.95	116.02	132.42
Wt. of DS (gm)	638.66	629.78	649.78	583.71	582.67

Wet Density (gm/cc)	1.93	1.99	2.06	2.02	1.98
Wet Density (pcf)	120.6	124.4	128.4	126.4	123.3
Moisture Content (%)	**12.8**	**14.7**	**18.3**	**19.9**	**22.7**
Dry Density (pcf)	**106.9**	**108.5**	**108.5**	**105.4**	**100.5**

Zero Air Voids

Moisture Content (%)	18.0	19.0	24.0
Dry Unit Weight (pcf)	113.4	111.4	102.2

Tested By SFS *Date* 10/2/2012 *Checked By* BW *Date* 10-3-12

DCN:CT-S12 DATE:12/11/00 REVISION 5

Z:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-03 Proctor wHeaders.xls]Sheet1

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PERMEABILITY TEST

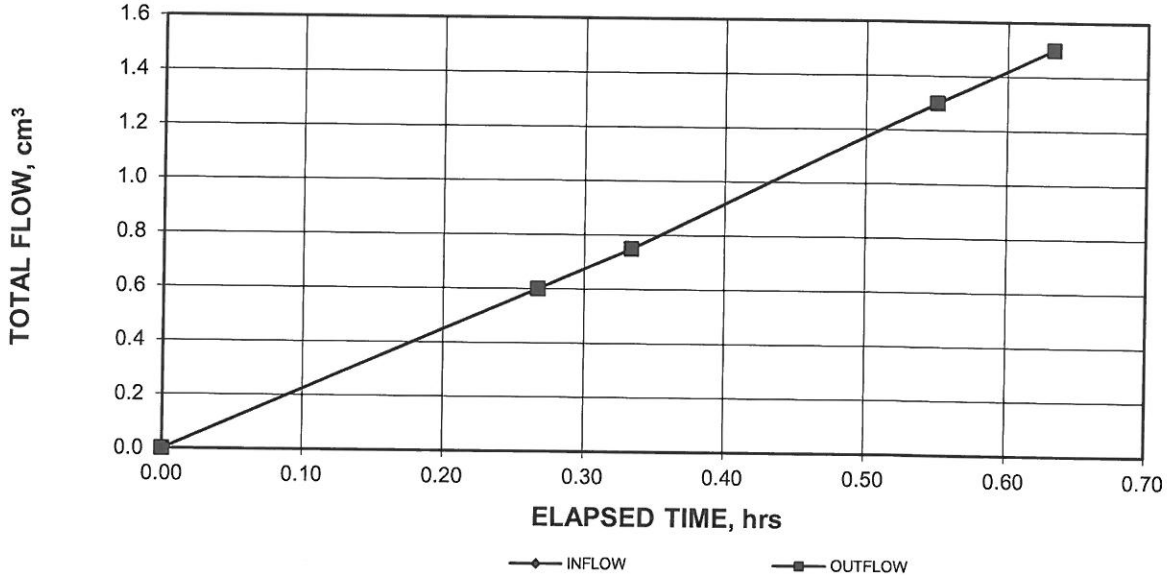
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID No.	2012-656-12-02		

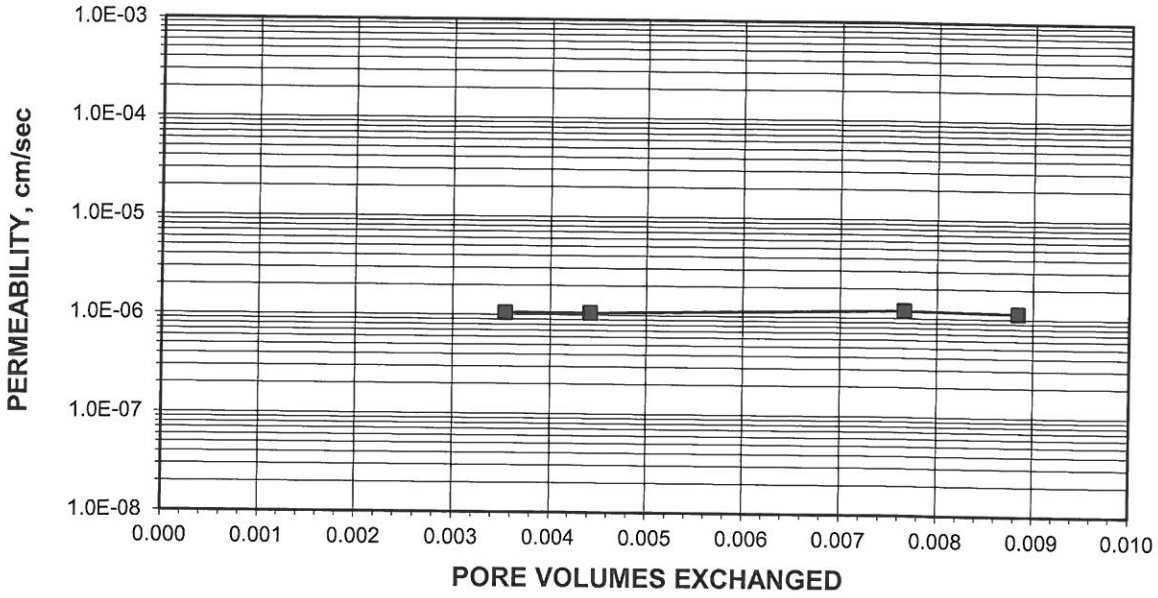
AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 10/4/2012 Checked By: GJM Date: 10-8-12

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID No.	2012-656-12-02		

Specific Gravity 2.64 Measured

Sample Condition Remolded

Visual Description: BROWN SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	818	824
Wt. of Tare & WS (gm.)	331.00	429.98
Wt. of Tare & DS (gm.)	300.45	372.76
Wt. of Tare (gm.)	137.21	135.44
Wt. of Water (gm.)	30.55	57.22
Wt. of DS (gm.)	163.24	237.32
Moisture Content (%)	**18.7**	**24.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2460.12	NA
Wt. of Tube (gm.)	1634.69	NA
Wt. of WS (calc.)(gm.)	825.43	862.95
Length 1 (in.)	4.003	4.054
Length 2 (in.)	4.003	4.008
Length 3 (in.)	4.003	4.086
Top Diameter (in.)	2.869	2.883
Middle Diameter (in.)	2.869	2.886
Bottom Diameter (in.)	2.869	2.879
Average Length (in.)	4.00	4.05
Average Area (in.^{2})	6.46	6.53
Sample Volume (cm^3)	424.07	433.08
Unit Wet Wt. (gm./ cm^3)	1.95	1.99
Unit Wet Wt. (pcf)	121.5	124.4
Unit Dry Wt. (pcf)	102.3	100.2
Unit Dry Wt. (gm./ cm^3)	1.64	1.61
Void Ratio, e	0.61	0.64
Porosity, n	0.38	0.39
Pore Volume (cm^3)	160.7	169.7
Total Wgt. Of Sample After Test		866.13

Tested By: BW Date: 10/4/2012 Checked By: GJM Date: 10-8-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-12-02 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-2
Lab ID No.	2012-656-12-02		

Pressure Heads (Constant)

Top Cap (psi)	38.5
Bottom Cap (psi)	40.0
Cell (psi)	45.0
Total Pressure Head (cm)	105.5
Hydraulic Gradient	10.25

Final Sample Dimensions

Sample Length (cm), L	10.29
Sample Diameter (cm)	7.32
Sample Area (cm^2), A	42.11
Inflow Burette Area (cm^2), a-in	0.877
Outflow Burette Area (cm^2), a-out	0.886
B Parameter (%)	96

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/5/2012	11	8	0.00	0.0	0.0	129.0	0	24.6	NA
10/5/2012	11	24	0.27	0.6	0.6	127.6	0	24.7	1.1E-06
10/5/2012	11	28	0.33	0.8	0.8	127.3	0	24.7	1.1E-06
10/5/2012	11	41	0.55	1.3	1.3	126.1	0	24.7	1.2E-06
10/5/2012	11	46	0.63	1.5	1.5	125.6	1	24.7	1.1E-06

Tested By: BW Date: 10/4/2012 Checked By: GDM Date: 10-8-12

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PERMEABILITY TEST

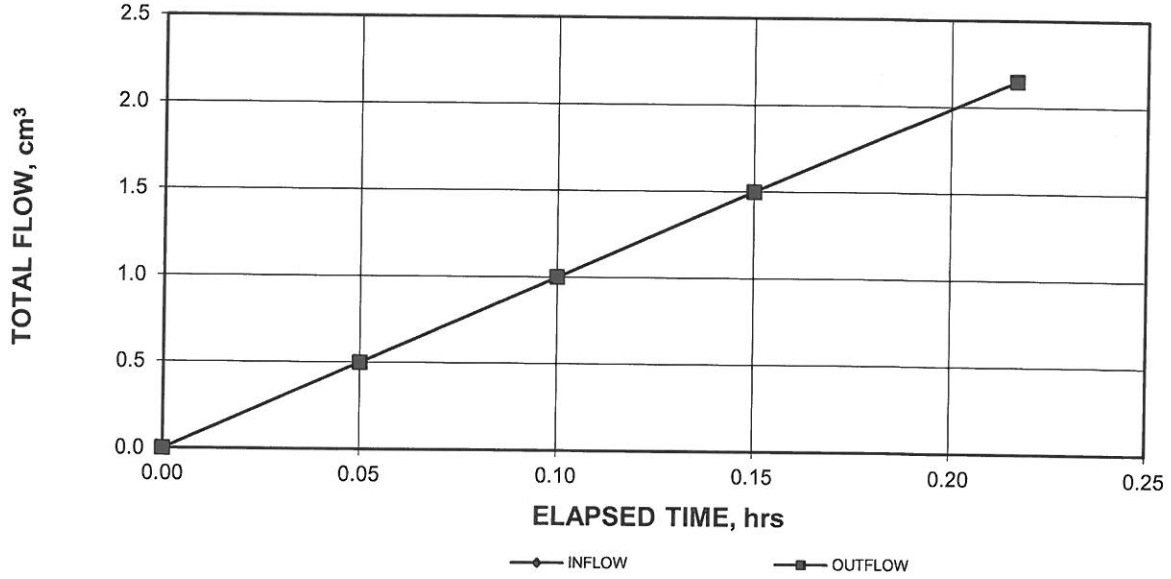
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID No.	2012-656-12-01		

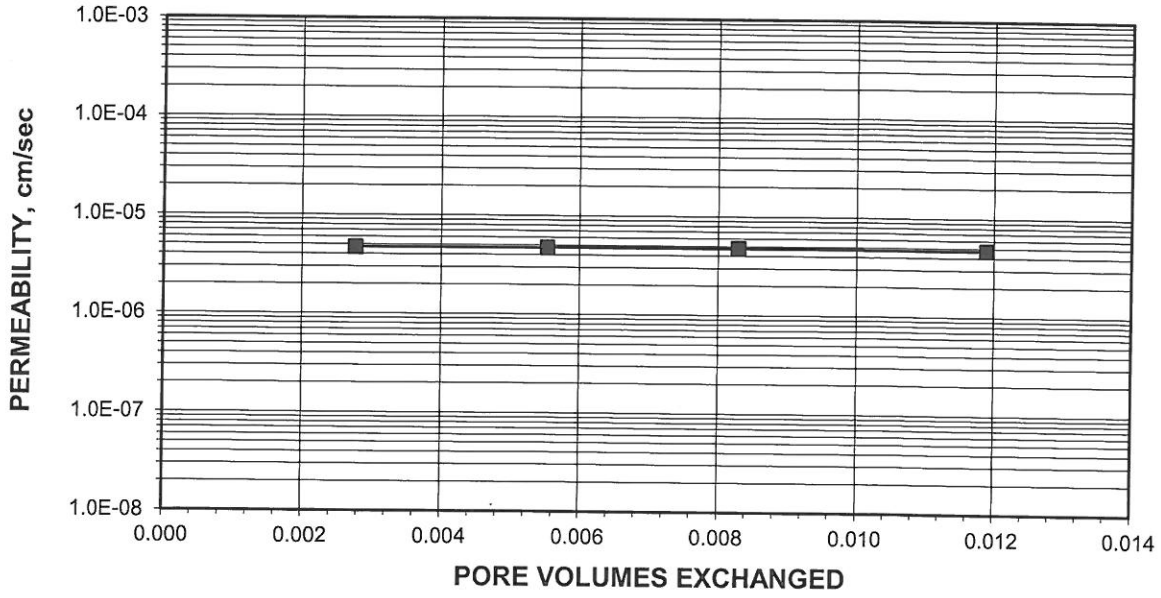
AVERAGE PERMEABILITY = 4.7E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 4.7E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 10/4/2012 Checked By: GEM Date: 10-8-12

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID No.	2012-656-12-01		

Specific Gravity 2.68 Measured

Sample Condition Remolded

Visual Description: TAN SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	8010	8010
Wt. of Tare & WS (gm.)	315.33	441.37
Wt. of Tare & DS (gm.)	288.09	379.83
Wt. of Tare (gm.)	135.97	135.98
Wt. of Water (gm.)	27.24	61.54
Wt. of DS (gm.)	152.12	243.85
Moisture Content (%)	**17.9**	**25.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2452.42	NA
Wt. of Tube (gm.)	1634.12	NA
Wt. of WS (calc.)(gm.)	818.30	869.17
Length 1 (in.)	4.003	4.101
Length 2 (in.)	4.003	4.103
Length 3 (in.)	4.003	4.071
Top Diameter (in.)	2.869	2.893
Middle Diameter (in.)	2.869	2.896
Bottom Diameter (in.)	2.869	2.880
Average Length (in.)	4.00	4.09
Average Area (in.^{2})	6.46	6.56
Sample Volume (cm^3)	424.07	439.73
Unit Wet Wt. (gm./ cm^3)	1.93	1.98
Unit Wet Wt. (pcf)	120.5	123.4
Unit Dry Wt. (pcf)	102.2	98.5
Unit Dry Wt. (gm./ cm^3)	1.64	1.58
Void Ratio, e	0.64	0.70
Porosity, n	0.39	0.41
Pore Volume (cm^3)	165.1	180.8
Total Wgt. Of Sample After Test		869.92

Tested By: BW Date: 10/4/2012 Checked By: GJM Date: 10-8-12

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-1
Lab ID No.	2012-656-12-01		

Pressure Heads (Constant)

Top Cap (psi)	38.5
Bottom Cap (psi)	40.0
Cell (psi)	45.0
Total Pressure Head (cm)	105.5
Hydraulic Gradient	10.15

Final Sample Dimensions

Sample Length (cm), L	10.39
Sample Diameter (cm)	7.34
Sample Area (cm^2), A	42.31
Inflow Burette Area (cm^2), a-in	0.897
Outflow Burette Area (cm^2), a-out	0.878
B Parameter (%)	95

AVERAGE PERMEABILITY = 4.7E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 4.7E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/5/2012	12	17	0.00	0.0	0.0	129.0	0	24.8	NA
10/5/2012	12	20	0.05	0.5	0.5	127.9	0	24.8	4.7E-06
10/5/2012	12	23	0.10	1.0	1.0	126.8	0	24.8	4.8E-06
10/5/2012	12	26	0.15	1.5	1.5	125.6	0	24.8	4.8E-06
10/5/2012	12	30	0.22	2.2	2.2	124.2	1	24.8	4.7E-06

Tested By: BW Date: 10/4/2012 Checked By: GEM Date: 10-8-12

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PERMEABILITY TEST

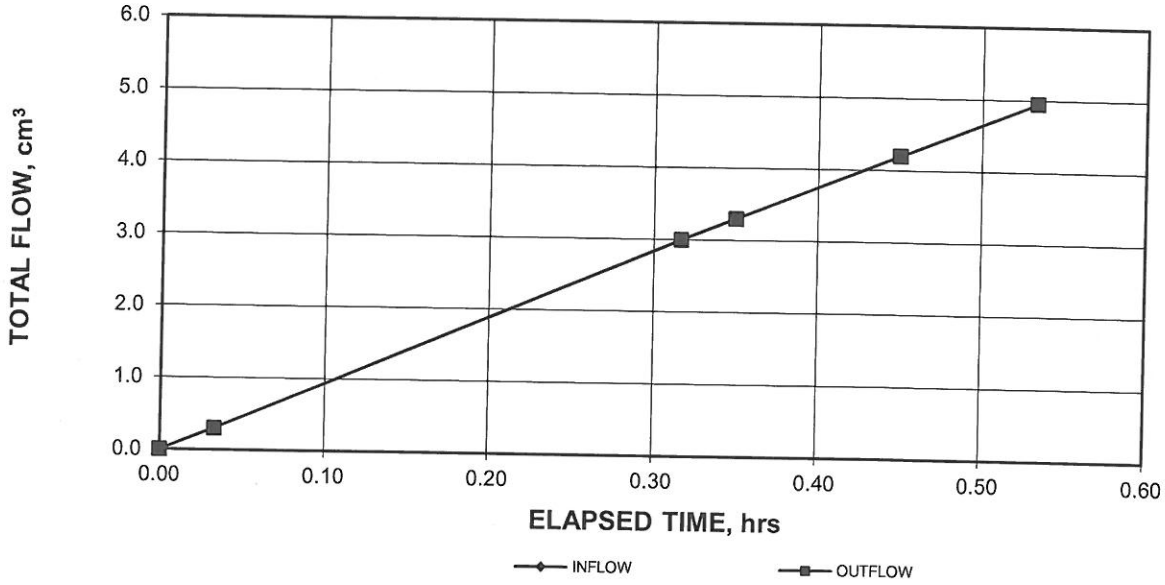
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID No.	2012-656-12-03		

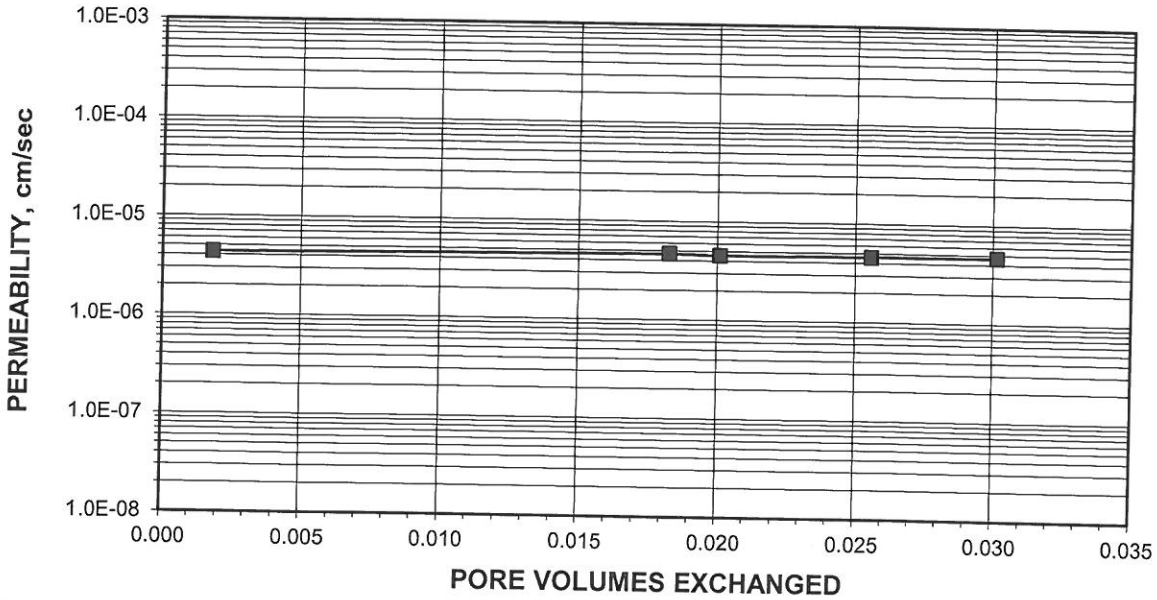
AVERAGE PERMEABILITY = 4.6E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 4.6E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 10/4/2012 Checked By: GM Date: 10-8-12

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID No.	2012-656-12-03		

Specific Gravity 2.67 Measured

Sample Condition Remolded

Visual Description: REDDISH BROWN SILTY SAND

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	6	825
Wt. of Tare & WS (gm.)	79.93	454.34
Wt. of Tare & DS (gm.)	73.06	396.13
Wt. of Tare (gm.)	36.63	137.07
Wt. of Water (gm.)	6.87	58.21
Wt. of DS (gm.)	36.43	259.06
Moisture Content (%)	**18.9**	**22.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	2469.20	NA
Wt. of Tube (gm.)	1633.99	NA
Wt. of WS (calc.)(gm.)	835.21	860.59
Length 1 (in.)	4.003	4.038
Length 2 (in.)	4.003	4.054
Length 3 (in.)	4.003	4.071
Top Diameter (in.)	2.869	2.847
Middle Diameter (in.)	2.869	2.868
Bottom Diameter (in.)	2.869	2.871
Average Length (in.)	4.00	4.05
Average Area (in.^{2})	6.46	6.43
Sample Volume (cm^3)	424.07	427.41
Unit Wet Wt. (gm./ cm^3)	1.97	2.01
Unit Wet Wt. (pcf)	122.9	125.7
Unit Dry Wt. (pcf)	103.4	102.6
Unit Dry Wt. (gm./ cm^3)	1.66	1.64
Void Ratio, e	0.61	0.62
Porosity, n	0.38	0.38
Pore Volume (cm^3)	160.9	164.2
Total Wgt. Of Sample After Test		867.01

Tested By: BW Date: 10/4/2012 Checked By: GAM Date: 10-8-12

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	NA
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-12	Sample No.	P-3
Lab ID No.	2012-656-12-03		

Pressure Heads (Constant)

Top Cap (psi)	38.5
Bottom Cap (psi)	40.0
Cell (psi)	45.0
Total Pressure Head (cm)	105.5
Hydraulic Gradient	10.24

Final Sample Dimensions

Sample Length (cm), L	10.30
Sample Diameter (cm)	7.27
Sample Area (cm^2), A	41.50
Inflow Burette Area (cm^2), a-in	0.897
Outflow Burette Area (cm^2), a-out	0.878
B Parameter (%)	100

AVERAGE PERMEABILITY = 4.6E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 4.6E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/5/2012	11	5	0.00	0.0	0.0	127.9	0	24.6	NA
10/5/2012	11	7	0.03	0.3	0.3	127.2	0	24.6	4.3E-06
10/5/2012	11	24	0.32	3.0	3.0	121.2	0	24.7	4.7E-06
10/5/2012	11	26	0.35	3.3	3.3	120.5	0	24.7	4.6E-06
10/5/2012	11	32	0.45	4.2	4.2	118.5	0	24.7	4.6E-06
10/5/2012	11	37	0.53	5.0	5.0	116.8	1	24.7	4.7E-06

Tested By: BW Date: 10/4/2012 Checked By: GEM Date: 10-8-12

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APPENDIX 2 – DAILY FIELD REPORTS

Day:	**Friday**
Date:	**13-Apr**
Log No.:	**1**
Page:	**1**

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INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kempinenn
Site Location:	Kimesville, NC	**Time on Site:**	**Arrived:** 9:45 **Departed:** 3:00
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	65

Contractor's Equipment:

Contractor's Personnel:

Description of Daily Activities & Events

- Arrived on site checked in at scale house and met with Hannu Kemmpinen of Joyce.
- Hannu explained the site status and we then walked the area to be tested. The area was approximately 4 acres and included a test pad.
- Hannu directed the testing on-site and identified the test locations. Several tests were taken over the 4 acre area.
- Compaction testing with Nuclear Density gauge and Drive Cylinders was perfromed.(see attached)
- Four shelby tube samples were taken for permeability testing.

Prepared By:	MPS	**Date:**	4/13/12	**Checked By:**	**Date:** 5/10

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-01**	Geotechnics Representative : M. SMITH	Page : 1 OF 1
Date (s) : **13-Apr**	Reviewed By : NPS	Date : 5/10

Contractor : COBLE SR LF	Borrow Source : ON-SITE

Compaction Equipment : Scraper pans, track hoe, compactor

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 01	ACRE 1	LIFT 1	6"	656-01-01	105.6	18.2	**118.0**	**18.9**	**99.2**	**94.0%**	**90.0%**	
ND 02	ACRE 1	LIFT 1	6"	656-01-01	105.6	18.2	**122.9**	**20.7**	**101.8**	**96.4%**	**90.0%**	
ND 03	ACRE 1	LIFT 1	6"	656-01-01	105.6	18.2	**115.6**	**21.0**	**95.5**	**90.5%**	**90.0%**	
ND 04	ACRE 1	LIFT 1	6"	656-01-01	105.6	18.2	**113.4**	**20.4**	**94.2**	**89.2%**	**90.0%**	ST-TP-01, DC
ND 05	ACRE 2	LIFT 1	6"	656-01-02	112.8	15.1	**128.9**	**21.3**	**106.3**	**94.2%**	**90.0%**	ST-02-01, DC
ND 06	ACRE 2	LIFT 1	6"	656-01-01	105.6	18.2	**117.1**	**21.8**	**96.1**	**91.0%**	**90.0%**	
ND 07	ACRE 3	LIFT 1	6"	656-01-01	105.6	18.2	**116.1**	**21.3**	**95.7**	**90.6%**	**90.0%**	
ND 08	ACRE 3	LIFT 1	6"	656-01-01	105.6	18.2	**118.9**	**25.4**	**94.8**	**89.8%**	**90.0%**	
ND 09	ACRE 4	LIFT 1	6"	656-01-01	105.6	18.2	**115.8**	**24.2**	**93.2**	**88.3%**	**90.0%**	
ND 10	ACRE 4	LIFT 1	6"	656-01-01	105.6	18.2	**117.9**	**22.0**	**96.6**	**91.5%**	**90.0%**	
ND 11	ACRE 2	LIFT 1	6"	656-01-01	105.6	18.2	**118.6**	**22.5**	**96.8**	**91.7%**	**90.0%**	
ND 12	ACRE 2	LIFT 1	6"	656-01-01	105.6	18.2	**116.5**	**20.0**	**97.1**	**91.9%**	**90.0%**	
ND 13	ACRE 3	LIFT 1	6"	656-01-01	105.6	18.2	**120.5**	**22.1**	**98.7**	**93.5%**	**90.0%**	
ND 14	ACRE 3	LIFT 1	6"	656-01-01	105.6	18.2	**120.7**	**18.2**	**102.1**	**96.7%**	**90.0%**	ST-03-01, DC
ND 15	ACRE 3	LIFT 1	6"	656-01-02	112.8	15.1	**124.2**	**22.2**	**101.6**	**90.1%**	**90.0%**	
ND 16	ACRE 3	LIFT 1	6"	656-01-02	112.8	15.1	**123.8**	**23.7**	**100.1**	**88.7%**	**90.0%**	
ND 17	ACRE 2	LIFT 1	6"	656-01-02	112.8	15.1	**131.1**	**24.1**	**105.6**	**93.7%**	**90.0%**	
ND 18	ACRE 2	LIFT 1	6"	656-01-01	105.6	18.2	**115.0**	**19.6**	**96.2**	**91.1%**	**90.0%**	
ND 19	ACRE 4	LIFT 1	6"	656-01-02	112.8	15.1	**129.8**	**19.6**	**108.5**	**96.2%**	**90.0%**	
ND 20	ACRE 4	LIFT 1	6"	656-01-02	112.8	15.1	**130.9**	**24.4**	**105.2**	**93.3%**	**90.0%**	
ND 21	ACRE 4	LIFT 1	6"	656-01-02	112.8	15.1	**129.6**	**21.3**	**106.8**	**94.7%**	**90.0%**	ST-04-01, DC
ND 22	ACRE 4	LIFT 1	6"	656-01-02	112.8	15.1	**130.2**	**24.0**	**105.0**	**93.1%**	**90.0%**	
ND 23	ACRE 1	LIFT 1	6"	656-01-02	112.8	15.1	**126.7**	**21.7**	**104.1**	**92.3%**	**90.0%**	
ND 24	ACRE 1	LIFT 1	6"	656-01-02	112.8	15.1	**126.9**	**22.0**	**104.0**	**92.2%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
33260	3430	2431	644

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Report Number : **FDR-01**
Date (s) : 4/13/12

Drive Cylinder - ASTM D 2937

Test Information				
Test Number :	DC-01	DC-02	DC-03	DC-04
Nuclear Test Number :				
Location:	T.P.	ACRE 2	ACRE 3	ACRE 4
Depth (ft):	LIFT 1	LIFT 1	LIFT 1	LIFT 1
Date :	13-Apr	13-Apr	13-Apr	13-Apr
Mold				
Cylinder ID	Z	2	B	X
Weight of Cylinder (lbs.)	1.3	1.32	1.33	0.777
Volume of Cylinder (ft^3)	0.033	0.033	0.033	0.0164
Specimen				
Wt. of Cylinder & WS (lbs.)	5.54	5.46	5.38	2.88
Wt. of Cylinder (lbs.)	1.30	1.32	1.33	0.78
Wt. of WS	4.24	4.14	4.05	2.10
Cylinder Volume (ft^3)	0.033	0.033	0.033	0.016
Moisture / Density				
Tare Number	308	312	307	310
Wt. of Tare & WS (gm)	542.41	512.10	558.46	411.68
Wt. of Tare & DS (gm)	469.74	465.31	507.99	366.34
Wt. of Tare (gm)	88.58	84.58	110.87	110.25
Wt. of Water (gm)	72.67	46.79	50.47	45.34
Wt. of DS (gm)	381.16	380.73	397.12	256.09
Wet Density (pcf):	128.5	125.5	122.7	128.2
Moisture Content (%):	**19.1**	**12.3**	**12.7**	**17.7**
Dry Density (pcf):	**107.9**	**111.7**	**108.9**	**108.9**

Geotechnics Representative : M. SMITH

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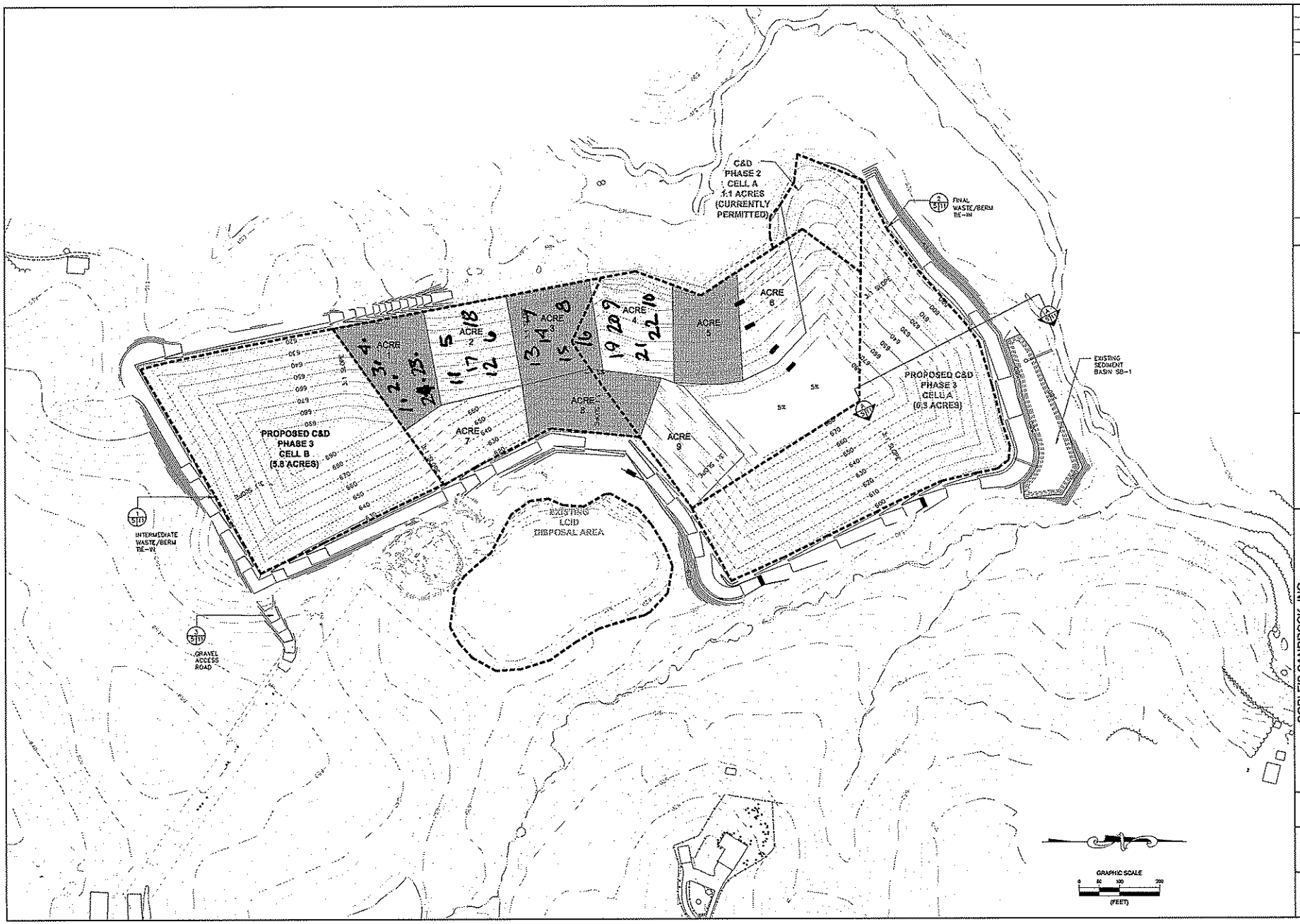

FDR-01
13-APR-2012

NO	DATE	REVISIONS AND RECORD OF ISSUE	BY	CK
1	10/11	REVISED CLOSURE GRADES	RWR	RFA

DESIGNED SC
DRAWN RB
CHECKED RA
APPROVED LA
DATE 11/10/07

JOYCE ENGINEERING
221 N. MEADOWVIEW ROAD
GREENSBORO, NC 27407
PHONE: (336) 323-0032
NC CORP LIC: C-0782

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COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

PROJECT NO.
419.20

SCALE
AS SHOWN

DRAWING NO.
01

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\Well sel\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Day:	**Friday**
Date:	**5/4/2012**
Log No.:	**2**
Page:	**1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kempinenn
Site Location:	Kimesville, NC	**Time on Site:**	**Arrived:** 11:10 AM **Departed:** 6:00 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	80

Contractor's Equipment: 1 - Cat D6 Dozer, 1 - Sheepfoot Trash Compactor, 1 - Skid Pan

Contractor's Personnel: ~3

Description of Daily Activities & Events

- Geotechnics rep. Shannon Sisell arrived on-site and met with Hannu Kempinenn. Hannu Kempinenn gave a summary of the site's history and direction for the day's objectives.
- Performed 25 Moisture/Density Test on previously compacted Sandy Clay Material as directed by Hannu Kempinenn. All test met the 90% required compaction (see FDR-02).
- Geotechnics rep. collected 5 Shelby Tubes.
- Geotechnics rep. collected 5 Drive Cylinders.
- Geotechnics rep. departed site.

Prepared By: SFS **Date:** 5/4/12 **Checked By:** RMS **Date:** 5-10-12

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-02**	Geotechnics Representative : SHANNON SISELL	Page : 1 OF 1
Date (s) : **5/3/2012**	Reviewed By :	Date :

Contractor : COBLE SR LF	Borrow Source : ON-SITE

Compaction Equipment : 1 - Cat D6 Dozer, 1 - Sheepfoot Trash Compactor, 1 - Skid Pan

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre 1	Lift 2	6"		112.8	15.1	**125.9**	**8.9**	**115.6**	**102.5%**	**90%**	%M Corrected
ND 2	Acre 1	Lift 2	6"		112.8	15.1	**118.8**	**11.0**	**107.1**	**94.9%**	**90%**	%M Corrected
ND 3	Acre 1	Lift 2	6"		112.8	15.1	**126.3**	**6.6**	**118.5**	**105.0%**	**90%**	%M Corrected
ND 4	Acre 1	Lift 2	6"		112.8	15.1	**120.6**	**10.4**	**109.2**	**96.8%**	**90%**	%M Corrected
ND 5	Acre 1	Lift 2	6"		112.8	15.1	**115.6**	**16.3**	**99.4**	**88.1%**	**90%**	%M Corrected
ND 6	Acre 2	Lift 1	6"		112.8	15.1	**121.2**	**17.8**	**102.9**	**91.2%**	**90%**	%M Corrected
ND 7	Acre 2	Lift 1	6"		105.6	18.2	**122.5**	**16.0**	**105.6**	**100.0%**	**90%**	%M Corrected
ND 8	Acre 2	Lift 1	6"		105.6	18.2	**114.6**	**12.6**	**101.8**	**96.4%**	**90%**	%M Corrected
ND 9	Acre 2	Lift 1	6"		105.6	18.2	**117.2**	**21.9**	**96.1**	**91.0%**	**90%**	%M Corrected
ND 10	Acre 2	Lift 1	6"		105.6	18.2	**121.0**	**23.8**	**97.7**	**92.6%**	**90%**	%M Corrected
ND 11	Acre 3	Lift 2	6"		105.6	18.2	**109.3**	**11.7**	**97.8**	**92.6%**	**90%**	%M Corrected
ND 12	Acre 3	Lift 2	6"		105.6	18.2	**116.1**	**17.8**	**98.5**	**93.3%**	**90%**	%M Corrected
ND 13	Acre 3	Lift 2	6"		105.6	18.2	**116.7**	**18.1**	**98.8**	**93.6%**	**90%**	%M Corrected
ND 14	Acre 3	Lift 2	6"		105.6	18.2	**124.1**	**10.7**	**112.2**	**106.2%**	**90%**	%M Corrected
ND 15	Acre 3	Lift 2	6"		105.6	18.2	**119.2**	**20.4**	**99.0**	**93.8%**	**90%**	%M Corrected
ND 16	Acre 4	Lift 2	6"		105.6	18.2	**118.4**	**16.4**	**101.7**	**96.3%**	**90%**	%M Corrected
ND 17	Acre 4	Lift 2	6"		112.8	15.1	**126.3**	**11.9**	**112.8**	**100.0%**	**90%**	%M Corrected
ND 18	Acre 4	Lift 2	6"		112.8	15.1	**124.3**	**16.2**	**107.0**	**94.9%**	**90%**	%M Corrected
ND 19	Acre 4	Lift 2	6"		112.8	15.1	**122.8**	**15.6**	**106.2**	**94.2%**	**90%**	%M Corrected
ND 20	Acre 4	Lift 2	6"		112.8	15.1	**122.0**	**12.9**	**108.1**	**95.8%**	**90%**	%M Corrected
ND 21	Acre 2	Lift 2	6"		112.8	15.1	**120.8**	**14.4**	**105.6**	**93.6%**	**90%**	%M Corrected
ND 22	Acre 2	Lift 2	6"		105.6	18.2	**117.5**	**13.4**	**103.6**	**98.1%**	**90%**	%M Corrected
ND 23	Acre 2	Lift 2	6"		105.6	18.2	**111.9**	**13.4**	**98.7**	**93.4%**	**90%**	%M Corrected
ND 24	Acre 2	Lift 2	6"		105.6	18.2	**117.7**	**13.8**	**103.4**	**97.9%**	**90%**	%M Corrected
ND 25	Acre 2	Lift 2	6"		112.8	15.1	**125.0**	**10.6**	**113.0**	**100.2%**	**90%**	%M Corrected

Gauge Number	Gauge Model	Density Count	Moisture Count
33260	3440	2438	639

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-02**	Geotechnics Representative : SHANNON SISELL	Page : 1 OF 1
Date (s) : **5/3/2012**	Reviewed By : MMS	Date : 5/10/12

Contractor : COBLE SR LF	Borrow Source : ON-SITE

Compaction Equipment : 1 - Cat D6 Dozer, 1 - Sheepfoot Trash Compactor, 1 - Skid Pan

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre 1	Lift 2	6"		112.8	15.1	**125.9**	**12.8**	**111.6**	**98.9%**	**90%**	
ND 2	Acre 1	Lift 2	6"		112.8	15.1	**118.8**	**13.4**	**104.8**	**92.9%**	**90%**	
ND 3	Acre 1	Lift 2	6"		112.8	15.1	**126.3**	**10.0**	**114.8**	**101.8%**	**90%**	
ND 4	Acre 1	Lift 2	6"		112.8	15.1	**120.6**	**11.2**	**108.5**	**96.1%**	**90%**	DC & ST
ND 5	Acre 1	Lift 2	6"		112.8	15.1	**115.6**	**12.7**	**102.6**	**90.9%**	**90%**	
ND 6	Acre 2	Lift 1	6"		112.8	15.1	**121.2**	**15.9**	**104.6**	**92.7%**	**90%**	
ND 7	Acre 2	Lift 1	6"		105.6	18.2	**122.5**	**17.5**	**104.3**	**98.7%**	**90%**	
ND 8	Acre 2	Lift 1	6"		105.6	18.2	**114.6**	**16.8**	**98.1**	**92.9%**	**90%**	
ND 9	Acre 2	Lift 1	6"		105.6	18.2	**117.2**	**14.9**	**102.0**	**96.6%**	**90%**	DC & ST
ND 10	Acre 2	Lift 1	6"		105.6	18.2	**121.0**	**22.2**	**99.0**	**93.8%**	**90%**	
ND 11	Acre 3	Lift 2	6"		105.6	18.2	**109.3**	**12.4**	**97.2**	**92.1%**	**90%**	
ND 12	Acre 3	Lift 2	6"		105.6	18.2	**116.1**	**20.0**	**96.8**	**91.6%**	**90%**	
ND 13	Acre 3	Lift 2	6"		105.6	18.2	**116.7**	**18.7**	**98.3**	**93.1%**	**90%**	DC & ST
ND 14	Acre 3	Lift 2	6"		105.6	18.2	**124.1**	**18.8**	**104.5**	**98.9%**	**90%**	
ND 15	Acre 3	Lift 2	6"		105.6	18.2	**119.2**	**23.0**	**96.9**	**91.8%**	**90%**	
ND 16	Acre 4	Lift 2	6"		105.6	18.2	**118.4**	**18.5**	**99.9**	**94.6%**	**90%**	
ND 17	Acre 4	Lift 2	6"		112.8	15.1	**126.3**	**12.0**	**112.8**	**100.0%**	**90%**	
ND 18	Acre 4	Lift 2	6"		112.8	15.1	**124.3**	**15.1**	**108.0**	**95.7%**	**90%**	DC & ST
ND 19	Acre 4	Lift 2	6"		112.8	15.1	**122.8**	**16.6**	**105.3**	**93.4%**	**90%**	
ND 20	Acre 4	Lift 2	6"		112.8	15.1	**122.0**	**11.2**	**109.7**	**97.3%**	**90%**	
ND 21	Acre 2	Lift 2	6"		112.8	15.1	**120.8**	**11.2**	**108.6**	**96.3%**	**90%**	DC & ST
ND 22	Acre 2	Lift 2	6"		105.6	18.2	**117.5**	**16.3**	**101.0**	**95.7%**	**90%**	
ND 23	Acre 2	Lift 2	6"		105.6	18.2	**111.9**	**16.0**	**96.5**	**91.3%**	**90%**	
ND 24	Acre 2	Lift 2	6"		105.6	18.2	**117.7**	**12.8**	**104.3**	**98.8%**	**90%**	
ND 25	Acre 2	Lift 2	6"		112.8	15.1	**125.0**	**14.1**	**109.6**	**97.1%**	**90%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
33260	3440	2438	639

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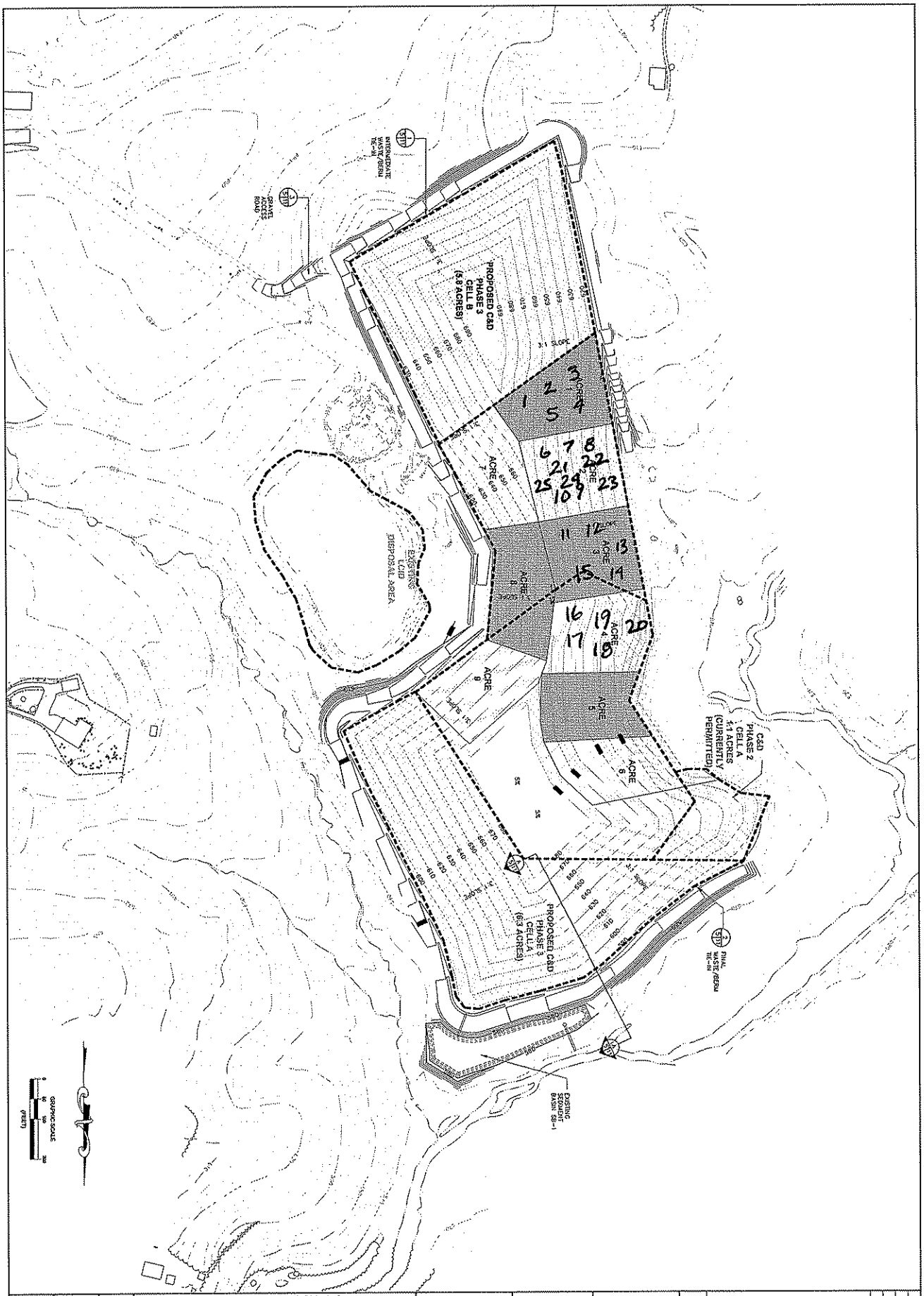

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

PROJECT NO. 419.20
SCALE AS SHOWN
DRAWING NO. 01

JOYCE ENGINEERING
3211 W. MEADOWVIEW ROAD
GREENSBORO, NC 27407
PHONE: (336) 323-0092
NC CORP LIC: C-0782

DESIGNED SC
DRAWN RB
CHECKED EA
APPROVED EA
DATE 8/15/07

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FDR-02
5-3-2012

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
1/17/11	REVISED CLOSURE GRADES	1	RWK	EEA	EEA

E:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Report Number : **FDR-02**
Date (s) : 5/3/12

Drive Cylinder - ASTM D 2937

Test Information					
Test Number :	1	2	3	4	5
Nuclear Test Number :	4	9	13	18	21
Location:	Acre 1	Acre 2	Acre 3	Acre 4	Acre 5
Depth (ft):	Lift 2	Lift 1	Lift 2	Lift 2	Lift 2
Date :	5/3/2012	5/3/2012	5/3/2012	5/3/2012	5/3/2012
Mold					
Cylinder ID	--	--	--	--	--
Weight of Cylinder (lbs.)	1.243	1.243	1.2475	1.2475	1.3915
Volume of Cylinder (ft^3)	0.033	0.033	0.033	0.033	0.033
Specimen					
Wt. of Cylinder & WS (lbs.)	5.33	5.13	5.13	5.45	5.38
Wt. of Cylinder (lbs.)	1.24	1.24	1.25	1.25	1.39
Wt. of WS	4.08	3.89	3.88	4.20	3.99
Cylinder Volume (ft^3)	0.033	0.033	0.033	0.033	0.033
Moisture / Density					
Tare Number	310	311	317	303	300
Wt. of Tare & WS (gm)	748.35	568.68	826.12	911.31	730.37
Wt. of Tare & DS (gm)	702.90	490.33	715.97	802.44	668.59
Wt. of Tare (gm)	110.30	84.39	84.39	111.38	110.72
Wt. of Water (gm)	45.45	78.35	110.15	108.87	61.78
Wt. of DS (gm)	592.60	405.94	631.58	691.06	557.87
Wet Density (pcf):	123.8	117.9	117.7	127.2	121.0
Moisture Content (%):	**7.7**	**19.3**	**17.4**	**15.8**	**11.1**
Dry Density (pcf):	**115.0**	**98.8**	**100.2**	**109.9**	**108.9**
Compaction (%):	**101.9%**	**93.6%**	**94.9%**	**97.4%**	**96.6%**

Geotechnics Representative : SHANNON SISELL

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Geotechnics
INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	JOYCE ENGINEERING
Client Reference	COBLES SANDROCK LANDFILL
Project No.	2012-656

Test Number:	1	2	3	4	5
Nuclear Test Number:	1	2	3	4	5
Location:	Acre 1	Acre 1	Acre 1	Acre 1	Acre 1
Depth:	Lift 2	Lift 2	Lift 2	Lift 2	Lift 2
Tare Number	806	811	ss-4	827	809
Wt. of Tare & WS (gm)	539.96	636.08	416.03	401.65	394.12
Wt. of Tare & DS (gm)	504.07	583.75	396.41	376.56	354.93
Wt. of Tare (gm)	101.99	106.11	100.03	136.21	114.82
Wt. of Water (gm)	35.89	52.33	19.62	25.09	39.19
Wt. of DS (gm)	402.08	477.64	296.38	240.35	240.11
Water Content (%)	**8.9**	**11.0**	**6.6**	**10.4**	**16.3**

Test Number:	6	7	8	9	10
Nuclear Test Number:	6	7	8	9	10
Location:	Acre 2	Acre 2	Acre 2	Acre 2	Acre 2
Depth:	Lift 1	Lift 1	Lift 1	Lift 1	Lift 1
Tare Number	818	Y-3	813	Z-14	A-5
Wt. of Tare & WS (gm)	327.35	304.48	287.95	291.46	322.92
Wt. of Tare & DS (gm)	298.61	276.04	268.22	256.75	279.71
Wt. of Tare (gm)	137.29	98.37	111.98	98.48	98.18
Wt. of Water (gm)	28.74	28.44	19.73	34.71	43.21
Wt. of DS (gm)	161.32	177.67	156.24	158.27	181.53
Water Content (%)	**17.8**	**16.0**	**12.6**	**21.9**	**23.8**

Notes : *NA*

Tested By *SFS* *Date* *5/3/2012* *Checked By* *MM* *Date* *5/10*

geotechnics
INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	JOYCE ENGINEERING
Client Reference	COBLES SANDROCK LANDFILL
Project No.	2012-656

Test Number:	11	12	13	14	15
Nuclear Test Number:	11	12	13	14	15
Location:	Acre 3	Acre 3	Acre 3	Acre 3	Acre 3
Depth:	Lift 2	Lift 2	Lift 2	Lift 2	Lift 2
Tare Number	820	821	822	802	314
Wt. of Tare & WS (gm)	354.70	323.26	313.24	308.35	292.69
Wt. of Tare & DS (gm)	331.76	294.86	286.19	288.63	257.46
Wt. of Tare (gm)	136.27	135.61	136.91	103.54	84.59
Wt. of Water (gm)	22.94	28.4	27.05	19.72	35.23
Wt. of DS (gm)	195.49	159.25	149.28	185.09	172.87
Water Content (%)	**11.7**	**17.8**	**18.1**	**10.7**	**20.4**

Test Number:	16	17	18	19	20
Nuclear Test Number:	16	17	18	19	20
Location:	Acre 4	Acre 4	Acre 4	Acre 4	Acre 4
Depth:	Lift 2	Lift 2	Lift 2	Lift 2	Lift 2
Tare Number	B-4	SS-5	305	SS-2	G-5
Wt. of Tare & WS (gm)	314.15	372.24	350.03	310.9	459.6
Wt. of Tare & DS (gm)	283.58	342.97	313.1	282.41	424
Wt. of Tare (gm)	97.52	97.5	84.66	99.9	147.41
Wt. of Water (gm)	30.57	29.27	36.93	28.49	35.6
Wt. of DS (gm)	186.06	245.47	228.44	182.51	276.59
Water Content (%)	**16.4**	**11.9**	**16.2**	**15.6**	**12.9**

Notes : *NA*

Tested By *SFS* *Date* *5/3/2012* *Checked By* *[illegible]* *Date* *5/10*

geotechnics
INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	JOYCE ENGINEERING
Client Reference	COBLES SANDROCK LANDFILL
Project No.	2012-656

Test Number:	21	22	23	24	25
Nuclear Test Number:	21	22	23	24	25
Location:	Acre 2	Acre 2	Acre 2	Acre 2	Acre 2
Depth:	Lift 2	Lift 2	Lift 2	Lift 2	Lift 2
Tare Number	315	308	398	318	312
Wt. of Tare & WS (gm)	366.96	318.70	309.03	324.96	319.95
Wt. of Tare & DS (gm)	334.74	291.42	282.41	296.03	297.37
Wt. of Tare (gm)	110.42	88.42	84.21	86.67	84.29
Wt. of Water (gm)	32.22	27.28	26.62	28.93	22.58
Wt. of DS (gm)	224.32	203	198.2	209.36	213.08
Water Content (%)	**14.4**	**13.4**	**13.4**	**13.8**	**10.6**

Notes : *NA*

Tested By *SFS* *Date* *5/3/2012* *Checked By* *Date* 5/10

Day:	Fri
Date:	18-May
Log No.:	4
Page:	1

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kempinenn
Site Location:	Kimesville, NC	**Time on Site:**	**Arrived:** 11:00 AM **Departed:** 5:00 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	70

Contractor's Equipment:

Contractor's Personnel:

Description of Daily Activities & Events

- Arrived on site checked in at scale house and met with Hannu Kemmpinen of Joyce.
- Hannu explained the site status and we then walked the area to be tested. The area was approximately 4 acres and included a test pad.
- Hannu informed technician where and number of test needed per acre. Several tests were taken over the 4 acre area.
- Compaction testing with Nuclear Density gauge and Drive Cylinders was perfromed.(see attached)
- Four shelby tube samples were taken for permeability testing.

Prepared By:	AG	**Date:**	5/18/12	**Checked By:**	AWS	**Date:**	5/23

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Day:	Mon
Date:	21-May
Log No.:	5
Page:	1

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kempinenn
Site Location:	Kimesville, NC	**Time on Site:**	**Arrived:** 2:00 PM **Departed:** 4:00 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	77

Contractor's Equipment:

Contractor's Personnel:

Description of Daily Activities & Events

- Arrived on site, checked in at scale house.
- Technician completed all compaction testing started the previous Friday.
- Shelby tubes and drive cylinders samples were taken.
- Technician departed from jobsite.

Prepared By: AG **Date:** 5/21/12 **Checked By:** MPS **Date:** 5/23

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-04**	Geotechnics Representative : A. GAETA	Page : 1 OF 1
Date (s) : **5/18/12-5/21/12**	Reviewed By :	Date :

Contractor : COBLE SR LF	Borrow Source : ON-SITE

Compaction Equipment : Scraper pans, track hoe, compactor

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 01	ACRE 1	LIFT 3	6"	656-01-02	112.8	15.1	**125.4**	**18.6**	**105.7**	**93.7%**	**90.0%**	
ND 02	ACRE 1	LIFT 3	6"	656-01-02	112.8	15.1	**133.7**	**15.7**	**115.6**	**102.4%**	**90.0%**	ST-A1/TP-03, DC1
ND 03	ACRE 1	LIFT 3	6"	656-01-01	105.6	18.2	**121.4**	**22.1**	**99.4**	**94.2%**	**90.0%**	
ND 04	ACRE 1	LIFT 3	6"	656-01-01	105.6	18.2	**121.4**	**24.3**	**97.7**	**92.5%**	**90.0%**	
ND 05	ACRE 1	LIFT 3	6"	656-01-02	105.6	18.2	**120.3**	**19.2**	**100.9**	**95.6%**	**90.0%**	
ND 06	ACRE 2	LIFT 3	6"	656-01-01	105.6	18.2	**116.8**	**21.3**	**96.3**	**91.2%**	**90.0%**	
ND 07	ACRE 2	LIFT 3	6"	656-01-01	105.6	18.2	**124.6**	**21.7**	**102.4**	**97.0%**	**90.0%**	ST-A2-03
ND 08	ACRE 2	LIFT 3	6"	656-01-01	105.6	18.2	**118.0**	**21.6**	**97.0**	**91.9%**	**90.0%**	
ND 09	ACRE 2	LIFT 3	6"	656-01-02	112.8	15.1	**116.3**	**12.2**	**103.7**	**91.9%**	**90.0%**	DC2
ND 10	ACRE 2	LIFT 3	6"	656-01-01	105.6	18.2	**121.0**	**21.6**	**99.5**	**94.2%**	**90.0%**	
ND 11	ACRE 3	LIFT 3	6"	656-01-01	105.6	18.2	**119.1**	**23.3**	**96.6**	**91.5%**	**90.0%**	ST-A3-03
ND 12	ACRE 3	LIFT 3	6"	656-01-01	105.6	18.2	**115.1**	**12.8**	**102.0**	**96.6%**	**90.0%**	
ND 13	ACRE 3	LIFT 3	6"	656-01-01	105.6	18.2	**117.9**	**27.4**	**92.5**	**87.6%**	**90.0%**	
ND 14	ACRE 3	LIFT 3	6"	656-01-01	105.6	18.2	**116.3**	**12.2**	**103.7**	**98.2%**	**90.0%**	DC3
ND 15	ACRE 3	LIFT 3	6"	656-01-02	105.6	18.2	**124.6**	**24.0**	**100.5**	**95.2%**	**90.0%**	
ND 16	ACRE 4	LIFT 3	6"	656-01-02	112.8	15.1	**126.8**	**17.4**	**108.0**	**95.8%**	**90.0%**	ST-A4-03
ND 17	ACRE 4	LIFT 3	6"	656-01-02	105.6	18.2	**122.3**	**21.6**	**100.6**	**95.2%**	**90.0%**	
ND 18	ACRE 4	LIFT 3	6"	656-01-01	105.6	18.2	**120.3**	**19.1**	**101.0**	**95.7%**	**90.0%**	
ND 19	ACRE 4	LIFT 3	6"	656-01-02	105.6	18.2	**120.9**	**25.3**	**96.5**	**91.4%**	**90.0%**	
ND 20	ACRE 4	LIFT 3	6"	656-01-02	105.6	18.2	**121.4**	**24.3**	**97.7**	**92.5%**	**90.0%**	DC4

Gauge Number	Gauge Model	Density Count	Moisture Count
32387	3440	2782	91

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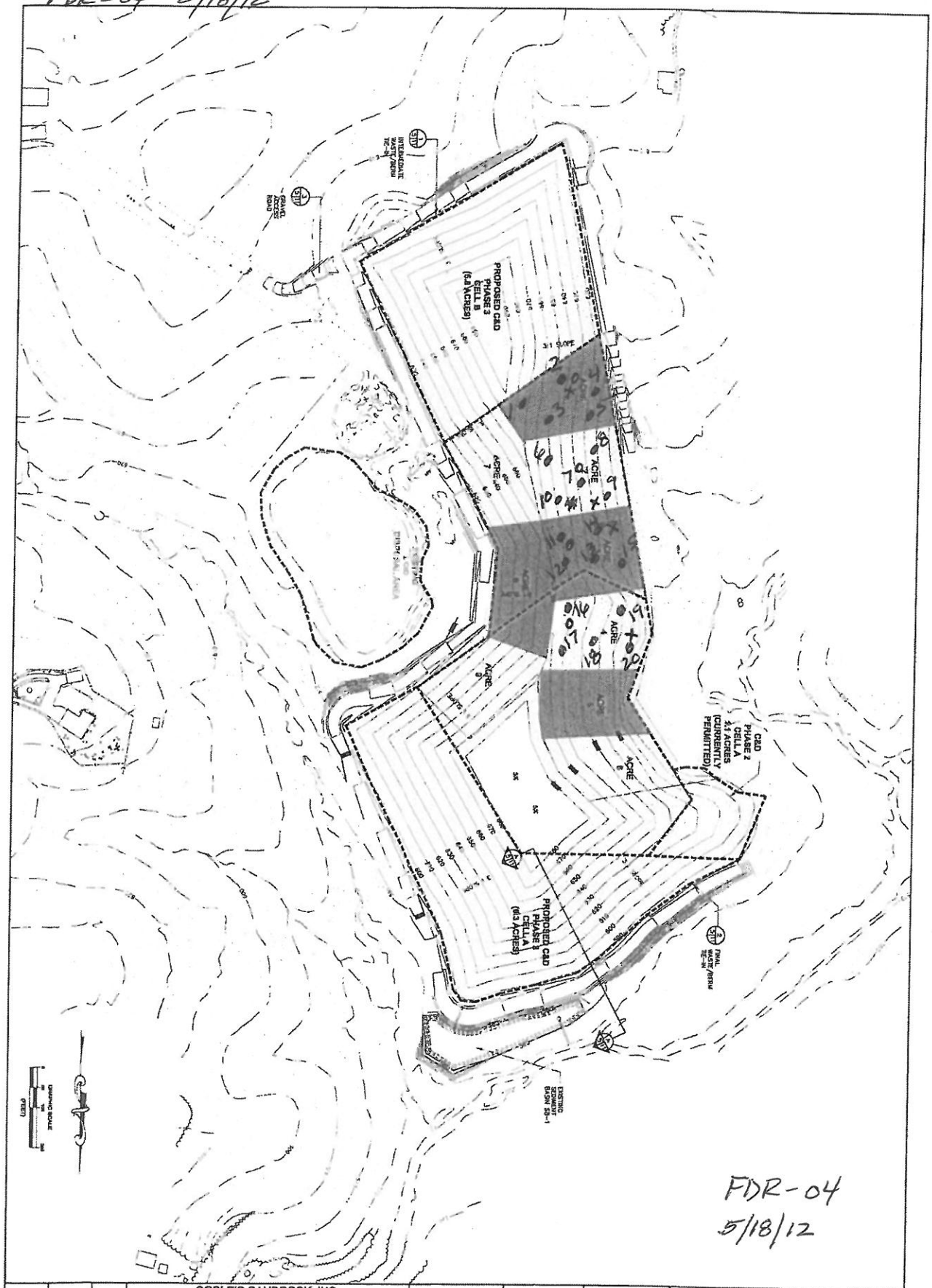
FDR-04 5/18/12



FDR-04
5/18/12

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

JOYCE ENGINEERING
5211 W. MEADOWVIEW ROAD
GREENSBORO, NC 27407
PHONE: (336) 333-0062
NC CORP LIC: C-0782

DESIGNED BC
DRAWN BB
CHECKED EA
APPROVED EA
DATE 8/1/07

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DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
1/1/01	REVISED CLOSURE GRADES	1	JWH	EEA	EEA

PROJECT NO. 419.20
SCALE AS SHOWN
DRAWING NO. 01

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Report Number : **FDR-04**
Date (s) : 5/21/12

Drive Cylinder - ASTM D 2937

Test Information				
Test Number :	DC-01	DC-02	DC-03	DC-04
Nuclear Test Number :	ND-02	ND-09	ND-14	ND-20
Location:	Acre 1	ACRE 2	ACRE 3	ACRE 4
Depth (ft):	LIFT 3	LIFT 3	LIFT 3	LIFT 3
Date :	21-May	21-May	21-May	21-May
Mold				
Cylinder ID	#3	#4	#5	#6
Weight of Cylinder (lbs.)	1.24	1.3	1.36	1.23
Volume of Cylinder (ft^3)	0.033	0.033	0.033	0.033
Specimen				
Wt. of Cylinder & WS (lbs.)	5.60	5.36	5.42	5.26
Wt. of Cylinder (lbs.)	1.24	1.30	1.36	1.23
Wt. of WS	4.36	4.06	4.06	4.03
Cylinder Volume (ft^3)	0.033	0.033	0.033	0.033
Moisture / Density				
Tare Number	820	809	805	807
Wt. of Tare & WS (gm)	376.70	360.80	361.60	358.80
Wt. of Tare & DS (gm)	340.20	329.60	330.57	309.98
Wt. of Tare (gm)	136.20	115.10	106.40	104.80
Wt. of Water (gm)	36.50	31.20	31.03	48.82
Wt. of DS (gm)	204.00	214.50	224.17	205.18
Wet Density (pcf):	132.1	123.0	123.0	122.1
Moisture Content (%):	**17.9**	**14.5**	**13.8**	**23.8**
Dry Density (pcf):	**112.1**	**107.4**	**108.1**	**98.6**

Geotechnics Representative : A. Gaeta

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Day:	**Friday**
Date:	**7/6/2012**
Log No.:	**6**
Page:	**1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Kimesville, NC	**Time on Site:**	**Arrived:** 8:30 AM **Departed:** 2:20 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title
Joyce Engineering, Inc	Mr. Hannu Kemppinen, P.G.

Weather Conditions:	Clear and Hot	**Temperature:**	102 degrees

Contractor's Equipment:

Contractor's Personnel:

Description of Daily Activities & Events

- Arrived on site checked in at scale house and met with Kent (Landfill owner) who then proceeded to drive me out to the site and show me the two areas (acre 5 and 6) to be tested. The areas were approximately 1 acre each that required 5 nuclear density tests each area.

- Geotechnic technician performed five nuclear density (ND) tests and one drive cylinder and shelby tube samples per acre. A total of 10 field density tests was performed.

- Mr. Hannu Kemppinen arrived on site to observe the site conditions and the testing. He asked the undersigned to collect a 5 gallon bucket of borrow soil and bring it back to the lab and put it on HOLD. The soil may be used later for another site. One 5 gallon bucket sample was collected and returned to the lab for possible testing.

- Two shelby tubes (one per area) were taken for permeability testing.

- Testing protocol was as follows:
  5 Nuclear density tests per acre
  1 Drive Cylinder per acre
  1Shelby tube per acre

- The undersigned left and retuned to the office.

Prepared By:	JAS	**Date:**	7/6/2012	**Checked By:**	RWS	**Date:**	7/11

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

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INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-05**	Geotechnics Representative : JAMES SCHIFF	Page : 1 OF 1
Date (s) : **7.6.12**	Reviewed By : MWS	Date : 7/11

Contractor : Coble SR LF	Borrow Source : On site borrow - Brown/Tan Sandy Silt or Silty Sand

Compaction Equipment : None working today

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 01	Acre 5	Lift 1	6"	656-01-01	105.6	18.2	**111.2**	**16.3**	**95.6**	**90.5%**	**90.0%**	
ND 02	Acre 5	Lift 1	6"	656-01-01	105.6	18.2	**110.5**	**16.5**	**94.8**	**89.8%**	**90.0%**	
ND 03	Acre 5	Lift 1	6"	656-01-01	105.6	18.2	**108.2**	**13.9**	**95.0**	**90.0%**	**90.0%**	ST-A5/DC1
ND 04	Acre 5	Lift 1	6"	656-01-01	105.6	18.2	**113.2**	**17.9**	**96.0**	**90.9%**	**90.0%**	
ND 05	Acre 5	Lift 1	6"	656-01-01	105.6	18.2	**106.2**	**11.7**	**95.1**	**90.0%**	**90.0%**	
ND 06	Acre-6	Lift 1	6"	656-01-01	105.6	18.2	**112.0**	**15.9**	**96.6**	**91.5%**	**90.0%**	
ND 07	Acre-6	Lift 1	6"	656-01-02	112.8	15.1	**117.9**	**10.8**	**106.4**	**94.3%**	**90.0%**	
ND 08	Acre-6	Lift 1	6"	656-01-01	105.6	18.2	**113.0**	**18.9**	**95.0**	**90.0%**	**90.0%**	ST-A6/DC2
ND 09	Acre-6	Lift 1	6"	656-01-02	112.8	15.1	**118.2**	**14.9**	**102.9**	**91.2%**	**90.0%**	
ND 10	Acre-6	Lift 1	6"	656-01-02	112.8	15.1	**117.9**	**9.7**	**107.5**	**95.3%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401-B	2241	561

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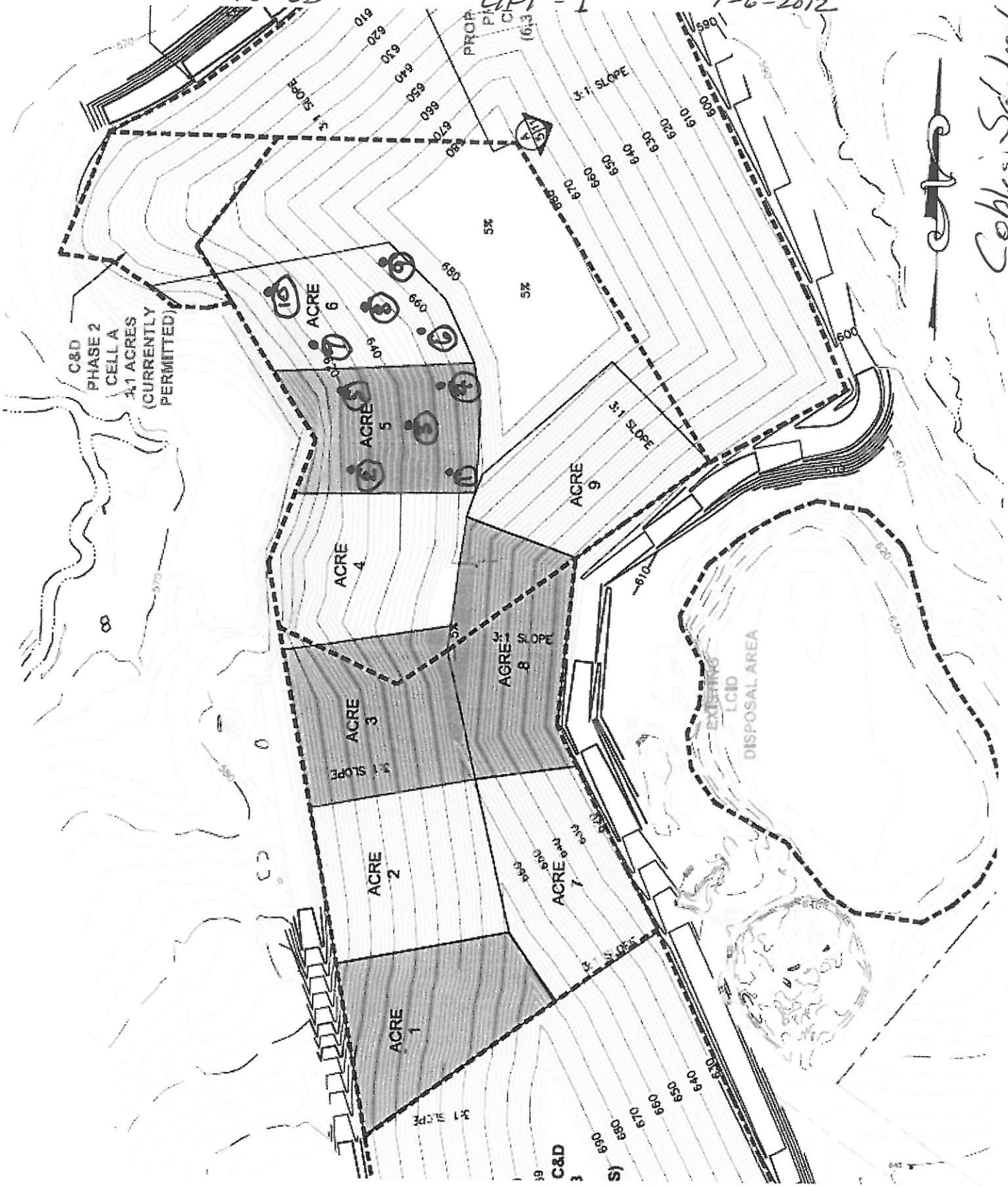
INTEGRITY IN TESTING

FDR-05 LFT-1 7-6-2012

Cobb's Landfill LF
Report No. FDR-05
July 6, 2012



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Client:	JOYCE ENGINEERING
Project Name :	COBLES SANDROCK LANDFILL
Project Number :	2012-656

Geotechnics
INTEGRITY IN TESTING

Report Number :	**FDR 05**
Date (s) :	7/6/12

Drive Cylinder - ASTM D 2937

Test Information		
Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-03	ND-08
Location:	Acre 5	ACRE 6
Depth (ft):	LIFT 1	LIFT 1
Date :	6-Jul	6-Jul
Mold		
Cylinder ID	#3	#5
Weight of Cylinder (lbs.)	1.224	1.358
Volume of Cylinder (ft^3)	0.033	0.033
Specimen		
Wt. of Cylinder & WS (lbs.)	4.72	5.08
Wt. of Cylinder (lbs.)	1.22	1.36
Wt. of WS	3.50	3.73
Cylinder Volume (ft^3)	0.033	0.033
Moisture / Density		
Tare Number	801	Y 1
Wt. of Tare & WS (gm)	480.51	444.32
Wt. of Tare & DS (gm)	441.56	395.00
Wt. of Tare (gm)	107.13	95.59
Wt. of Water (gm)	38.95	49.32
Wt. of DS (gm)	334.43	299.41
Wet Density (pcf):	105.9	112.9
Moisture Content (%):	**11.6**	**16.5**
Dry Density (pcf):	**94.9**	**96.9**

Geotechnics Representative : J SCHIFF

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geotechnics
INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	JOYCE ENGINEERING
Client Reference	COBLES SANDROCK LANDFILL
Project No.	2012-656

Test Number:	1	2	3
Nuclear Test Number:	ND-01	ND-07	ND-09
Location:	ACRE 5	ACRE 6	ACRE 6
Depth:	Lift 1	Lift 1	Lift 1
Tare Number	811	807	SS-2
Wt. of Tare & WS (gm)	465.19	471.22	495.47
Wt. of Tare & DS (gm)	414.92	441.74	455.92
Wt. of Tare (gm)	106.36	104.77	99.44
Wt. of Water (gm)	50.27	29.48	39.55
Wt. of DS (gm)	308.56	336.97	356.48
Water Content (%)	**16.3**	**8.7**	**11.1**

Test Number:	
Nuclear Test Number:	
Location:	
Depth:	
Tare Number	
Wt. of Tare & WS (gm)	
Wt. of Tare & DS (gm)	
Wt. of Tare (gm)	
Wt. of Water (gm)	
Wt. of DS (gm)	
Water Content (%)	

Notes : *NA*

Tested By *JS* *Date* *7/6/2012* *Checked By* *MDS* *Date* 7/11

Day:	**Friday**
Date:	**7/20/2012**
Log No.:	**7**
Page:	**1**

Geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock C&D LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering, Inc.	**Client Contact:**	Hannu K.
Site Location:	Alamance, NC	**Time on Site:**	**Arrived:** 11:20 AM **Departed:** 3:30 PM
General Contractor:	Cobles Sandrock	**Superintendent:**	Kent Coble

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Cloudy	**Temperature:**	88

Contractor's Equipment: 2- Trash Compacting Rolles, 1- D6 CAT Dozer, 2- Pan Loaders

Contractor's Personnel: ~4

Description of Daily Activities & Events

- Geotechnics representative, Shannon Sisell, arrived onsite.
- Performed 15 nuclear moisture/density test at location Acre 5&6 of Lift 2 (see FDR-06 for results).
- Performed 2 drive cylinder test to verify gauge readings (see results).
- Collected 2 Shelby Tube Samples, one per acre.
- Geotechnics rep. departed site

Prepared By: SFS **Date:** 7/20/2012 **Checked By:** [illegible] **Date:** 7/23

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK C&D LF
Project Number : 2012-656

Geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number :	**FDR - 06**	Geotechnics Representative :	Shannon F. Sisell	Page :	1 of 1
Date (s) :	**Friday, 7/20/12**	Reviewed By :	RMB	Date :	7/23

Contractor :	Cobles Sandrock	Borrow Source :	On-Site Borrow Pit

Compaction Equipment :	2- Trash Compacting Rollers, 1- D6 CAT Dozer, 2- Pan Loaders

Test Number	Test Location	Elevation / Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre 5	Lift 2	8"	2012-656-01-01	105.6	18.2	**118.6**	**17.0**	**101.4**	**96.0%**	**90%**	DC-01 / ST-01
ND 2	Acre 5	Lift 2	8"	2012-656-01-01	105.6	18.2	**108.3**	**12.2**	**96.5**	**91.4%**	**90%**	
ND 3	Acre 5	Lift 2	8"	2012-656-01-01	105.6	18.2	**111.0**	**17.5**	**94.5**	**89.5%**	**90%**	
ND 4	Acre 5	Lift 2	8"	2012-656-01-01	105.6	18.2	**112.3**	**18.0**	**95.2**	**90.1%**	**90%**	
ND 5	Acre 5	Lift 2	8"	2012-656-01-01	105.6	18.2	**112.1**	**16.1**	**96.6**	**91.4%**	**90%**	
ND 6	Acre 6	Lift 2	8"	2012-656-01-01	105.6	18.2	**110.1**	**15.6**	**95.2**	**90.2%**	**90%**	
ND 7	Acre 6	Lift 2	8"	2012-656-01-01	105.6	18.2	**117.6**	**15.6**	**101.7**	**96.3%**	**90%**	
ND 8	Acre 6	Lift 2	8"	2012-656-01-01	105.6	18.2	**116.5**	**17.6**	**99.1**	**90.0%**	**90%**	
ND 9	Acre 6	Lift 2	8"	2012-656-01-01	105.6	18.2	**116.7**	**14.8**	**101.7**	**96.3%**	**90%**	DC-02 / ST-02
ND 10	Acre 6	Lift 2	8"	2012-656-01-01	105.6	18.2	**120.6**	**16.2**	**103.8**	**98.3%**	**90%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3411	2232	569

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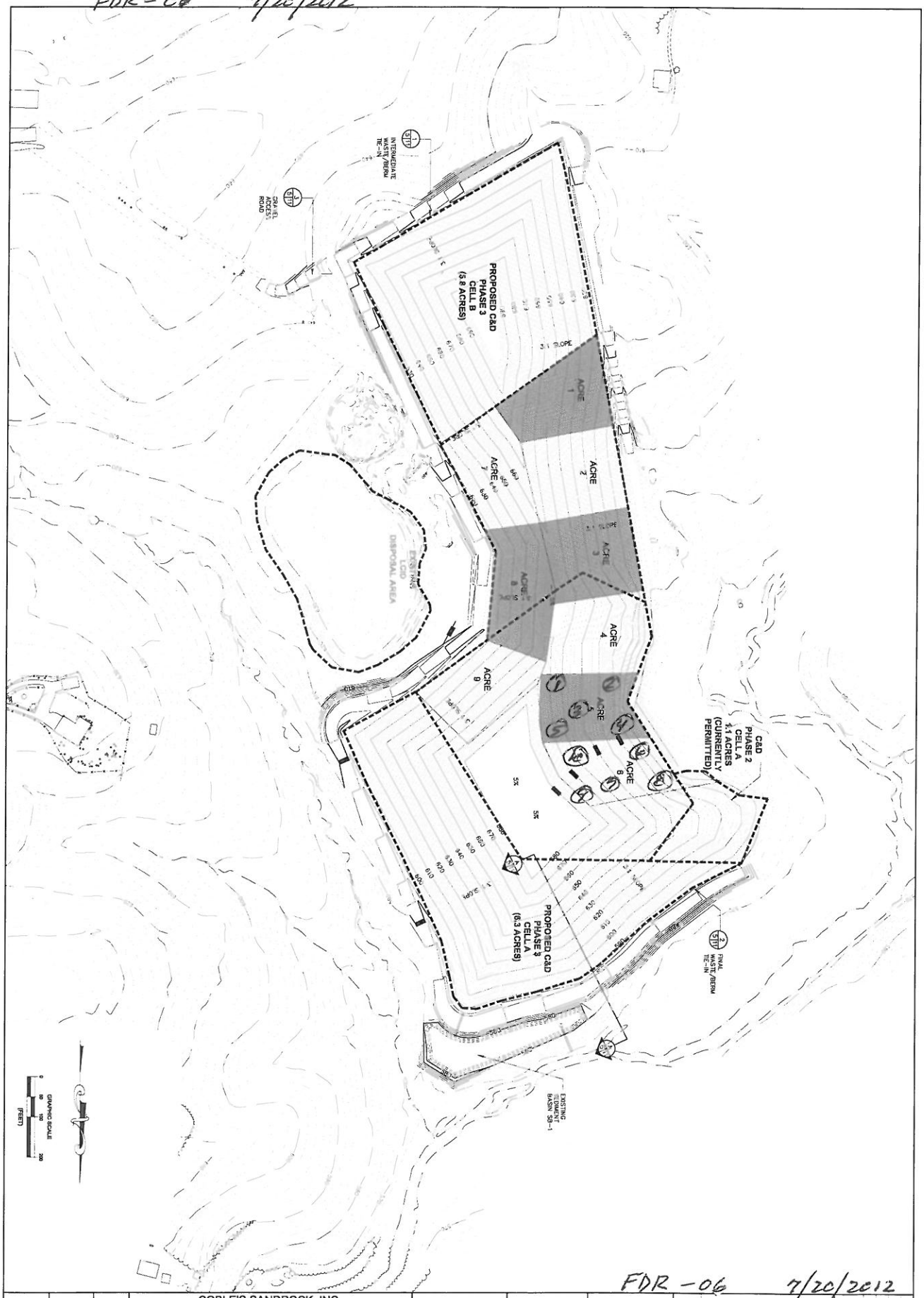
FDR-06 7/20/2012



FDR-06 7/20/2012

DRAWING NO. 01	SCALE AS SHOWN	PROJECT NO. 419.20	COBLE'S SANDROCK, INC. KIMESVILLE, NORTH CAROLINA LANDFILL PARTIAL CLOSURE ACRE MAP	JOYCE ENGINEERING 2211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0592 NC CORP LIC: C-0782	DESIGNED SC DRAWN RB CHECKED EA APPROVED EA DATE 6/15/07 © 2007 Joyce Engineering, Inc. All rights reserved.

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
1/17/11	REVISED CLOSURE GRADES	1	RMH	EEA	EEA

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Client:	JOYCE ENGINEERING
Project Name :	COBLES SANDROCK C&D LF
Project Number :	**2012-656**

geotechnics
INTEGRITY IN TESTING

Report Number :	**FDR-06**
Date (s) :	Friday, 7/20/12

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-1	ND-9
Location:	AC. 5	AC. 6
Depth (ft):	LIFT 2	LIFT 2
Date :	7/20/2012	7/20/2012

Mold

Cylinder ID	1	2
Weight of Cylinder (lbs.)	1.381	1.323
Volume of Cylinder (ft^3)	0.033	0.033

Specimen

Wt. of Cylinder & WS (lbs.)	5.21	5.22
Wt. of Cylinder (lbs.)	1.38	1.32
Wt. of WS	3.83	3.90
Cylinder Volume (ft^3)	0.033	0.033

Moisture / Density

Tare Number	310	304
Wt. of Tare & WS (gm)	465.32	461.32
Wt. of Tare & DS (gm)	431.98	421.09
Wt. of Tare (gm)	110.29	110.62
Wt. of Water (gm)	33.34	40.23
Wt. of DS (gm)	321.69	310.47
Wet Density (pcf):	116.0	118.1
Moisture Content (%):	**10.4**	**13.0**
Dry Density (pcf):	**105.1**	**104.5**
% Compaction:	**99.6%**	**99.0%**

Geotechnics Representative : Shannon F. Sisell

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INTEGRITY IN TESTING

MOISTURE CONTENT

ASTM D 2216 (SOP-S1)

Client	JOYCE ENGINEERING
Client Reference	COBLES SANDROCK C&D LF
Project No.	**2012-656**

Test Number:	.001	.002	.003	.004	.005
Nuclear Test Number:	ND-1	ND-2	ND-3	ND-4	ND-5
Location:	AC.-5	AC.-5	AC.-5	AC.-5	AC.-5
Depth:	-2"	-2"	-2"	-2"	-2"
Tare Number	802	825	819	SS-1	A-1
Wt. of Tare & WS (gm)	371.93	429.88	561.97	355.11	409.49
Wt. of Tare & DS (gm)	342.03	394.65	503.53	322.26	368.17
Wt. of Tare (gm)	103.63	136.99	135.48	93.49	93.58
Wt. of Water (gm)	29.9	35.23	58.44	32.85	41.32
Wt. of DS (gm)	238.4	257.66	368.05	228.77	274.59
Water Content (%)	**12.5**	**13.7**	**15.9**	**14.4**	**15.0**

Test Number:	.006	.007	.008	.009	.010
Nuclear Test Number:	ND-6	ND-7	ND-8	ND-9	ND-10
Location:	AC.-6	AC.-6	AC.-6	AC.-6	AC.-6
Depth:	-2"	-2"	-2"	-2"	-2"
Tare Number	312	317	809	307	368
Wt. of Tare & WS (gm)	425.72	381.90	356.81	331.49	368.14
Wt. of Tare & DS (gm)	386.19	344.54	320.02	302.89	335.48
Wt. of Tare (gm)	84.35	84.32	114.93	110.31	111.41
Wt. of Water (gm)	39.53	37.36	36.79	28.6	32.66
Wt. of DS (gm)	301.84	260.22	205.09	192.58	224.07
Water Content (%)	**13.1**	**14.4**	**17.9**	**14.9**	**14.6**

Notes : *NA*

Tested By *SFS* *Date* *7/20/2012* *Checked By* *MMS* *Date* *7/23*

Day:	**Tues.**
Date:	**7.31.12**
Log No.:	**08**
Page:	**1 of 1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock C&D LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering, Inc.	**Client Contact:**	Hannu K.
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 10:30am **Departed:** 12:30pm
General Contractor:	Cobles Sandrock	**Superintendent:**	Kent Coble

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Cloudy, Humid	**Temperature:**	80's

Contractor's Equipment: NA

Contractor's Personnel: NA

Description of Daily Activities & Events

- Geotechnics Rep. Jacob R. Buda arrived on site.
- Geotechnics Rep. performed CQA Moisture / Density testing of previously placed and compacted Low-perm Soil Liner material in Acres 5, 6, and 9 (see FDR-07 for results).
- Geotechnics Rep. obtained Undisturbed Shelby Tube samples from Acres 5, 6, and 9.
- Geotechnics Rep. departed the site.

Prepared By:	JRB	**Date:**	7.31.12	**Checked By:**	JRB	**Date:**	**8.1.12**

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK C & D LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-07**	Geotechnics Representative : JACOB R. BUDA
Date (s) : **7.31.12**	Reviewed By : JRB Date: **8.1.12**

Contractor : COBLES SANDROCK	Borrow Source : Geotechnics Rep. was not present during placement operations

Gauge Number	Gauge Model	Compaction Equipment :	Geotechnics Rep. was not present during compaction operations
13957	3401-B		

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND - 01	ACRE 5	LIFT 3	6"	656-01-01	105.6	18.2	**120.2**	**19.2**	**100.8**	**95.5%**	**90.0%**	%M Corrected
ND - 02	ACRE 5	LIFT 3	6"	656-01-01	105.6	18.2	**113.7**	**17.8**	**96.5**	**91.4%**	**90.0%**	%M Corrected
DC - 01	ACRE 5	LIFT 3	NA	656-01-01	105.6	18.2	**114.8**	**17.8**	**97.5**	**92.3%**	**90.0%**	
ND - 03	ACRE 5	LIFT 3	6"	656-01-01	105.6	18.2	**117.8**	**18.6**	**99.3**	**94.1%**	**90.0%**	%M Corrected
ND - 04	ACRE 5	LIFT 3	6"	656-01-01	105.6	18.2	**116.4**	**17.4**	**99.1**	**93.9%**	**90.0%**	%M Corrected
ND - 05	ACRE 5	LIFT 3	6"	656-01-01	105.6	18.2	**119.8**	**19.0**	**100.7**	**95.3%**	**90.0%**	%M Corrected
ND - 06	ACRE 6	LIFT 3	6"	656-01-01	105.6	18.2	**118.2**	**16.5**	**101.5**	**96.1%**	**90.0%**	%M Corrected
ND - 07	ACRE 6	LIFT 3	6"	656-01-01	105.6	18.2	**120.2**	**16.0**	**103.6**	**98.1%**	**90.0%**	%M Corrected
DC - 02	ACRE 6	LIFT 3	NA	656-01-01	105.6	18.2	**121.5**	**16.0**	**104.7**	**99.2%**	**90.0%**	
ND - 08	ACRE 6	LIFT 3	6"	656-01-01	105.6	18.2	**119.4**	**16.1**	**102.8**	**97.4%**	**90.0%**	%M Corrected
ND - 09	ACRE 6	LIFT 3	6"	656-01-01	105.6	18.2	**116.9**	**16.8**	**100.1**	**94.8%**	**90.0%**	%M Corrected
ND - 10	ACRE 6	LIFT 3	6"	656-01-01	105.6	18.2	**115.1**	**17.2**	**98.2**	**93.0%**	**90.0%**	%M Corrected
ND - 11	ACRE 9	LIFT 1	6"	656-01-01	105.6	18.2	**115.9**	**18.2**	**98.1**	**92.9%**	**90.0%**	%M Corrected
ND - 12	ACRE 9	LIFT 1	6"	656-01-01	105.6	18.2	**117.3**	**18.0**	**99.4**	**94.1%**	**90.0%**	%M Corrected
DC - 03	ACRE 9	LIFT 1	NA	656-01-01	105.6	18.2	**116.7**	**18.0**	**98.9**	**93.7%**	**90.0%**	
ND - 13	ACRE 9	LIFT 1	6"	656-01-01	105.6	18.2	**119.9**	**16.8**	**102.7**	**97.2%**	**90.0%**	%M Corrected
ND - 14	ACRE 9	LIFT 1	6"	656-01-01	105.6	18.2	**114.7**	**17.2**	**97.9**	**92.7%**	**90.0%**	%M Corrected
ND - 15	ACRE 9	LIFT 1	6"	656-01-01	105.6	18.2	**115.7**	**17.1**	**98.8**	**93.6%**	**90.0%**	%M Corrected

Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK C & D LANDFILL
Project Number : 2012-656

Report Number : **FDR-07**
Date (s) : 7.31.12

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-01	DC-02	DC-03
Nuclear Test Number :	ND-02	ND-07	ND-12
Location:	ACRE 5	ACRE 6	ACRE 9
Depth (ft):	LIFT 3	LIFT 3	LIFT 1
Date :	7.31.12	7.31.12	7.31.12

Mold

Cylinder ID	JB-01	JB-02	JB-03
Weight of Cylinder (lbs.)	1.36	1.34	1.33
Volume of Cylinder (ft^3)	0.033	0.033	0.033

Specimen

Wt. of Cylinder & WS (lbs.)	5.15	5.35	5.18
Wt. of Cylinder (lbs.)	1.36	1.34	1.33
Wt. of WS	3.79	4.01	3.85
Cylinder Volume (ft^3)	0.033	0.033	0.033

Moisture / Density

Tare Number	368	311	368
Wt. of Tare & WS (gm)	321.04	305.77	311.19
Wt. of Tare & DS (gm)	289.43	275.23	280.75
Wt. of Tare (gm)	111.38	84.46	111.38
Wt. of Water (gm)	31.61	30.54	30.44
Wt. of DS (gm)	178.05	190.77	169.37
Wet Density (pcf):	114.8	121.5	116.7
Moisture Content (%):	**17.8**	**16.0**	**18.0**
Dry Density (pcf):	**97.5**	**104.7**	**98.9**

Geotechnics Representative : JACOB R. BUDA

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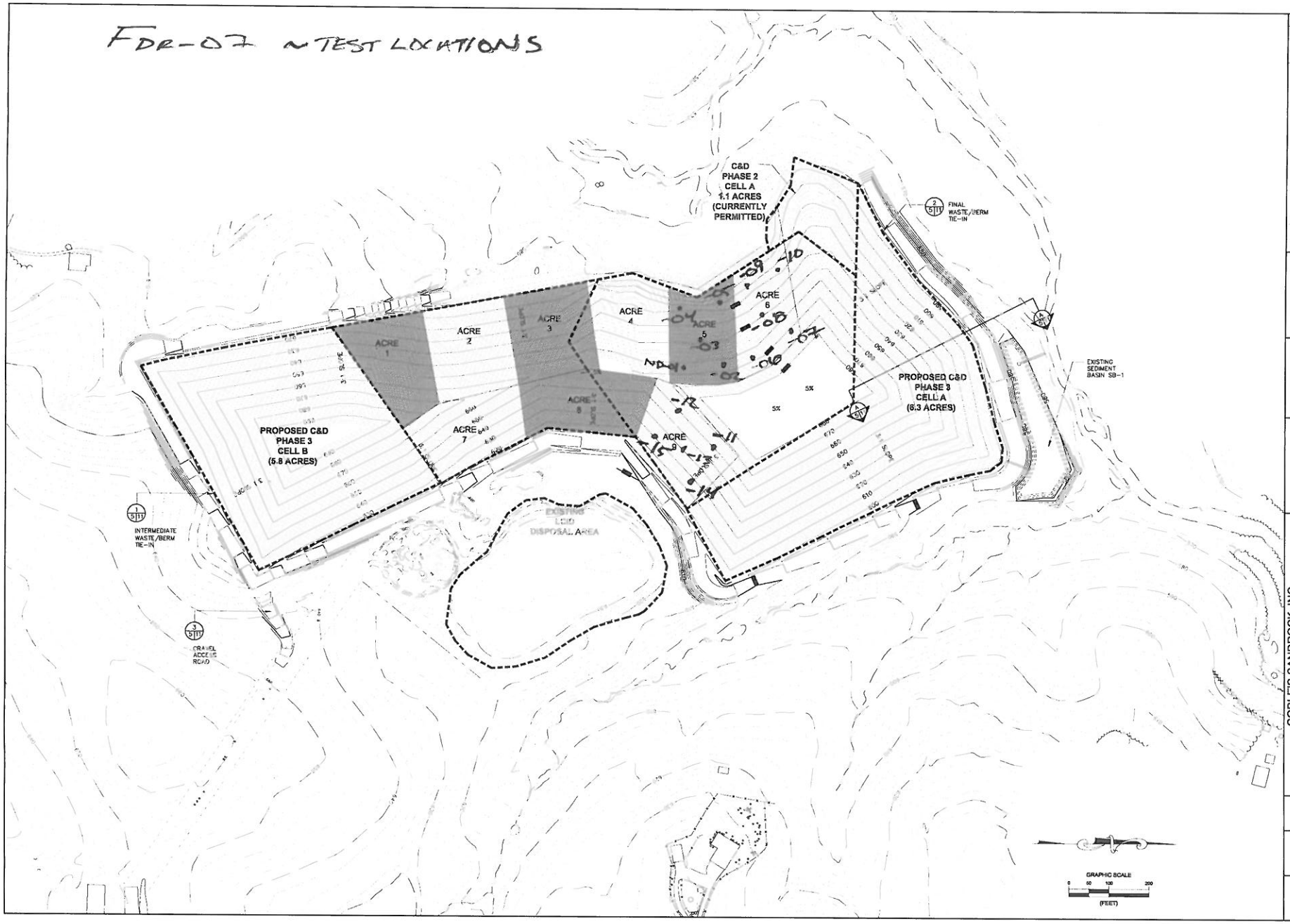
FDR-07 ~ TEST LOCATIONS



DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK.	APP.
11/7/11	REVISED CLOSURE GRADES	1	PWK	EA	EA

DESIGNED SC
DRAWN RB
CHECKED EA
APPROVED EA
DATE 8/16/07

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JOYCE ENGINEERING
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GREENSBORO, NORTH CAROLINA
PHONE (336) 323-0292
NC CORP LIC: C-0782

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

PROJECT NO. 419.20

SCALE AS SHOWN

DRAWING NO. 01

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Day:	**Friday**
Date:	**8.17.12**
Log No.:	**9**
Page:	**1 of 1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Coble Sandrock Landfill	**Project No.:**	
Client Name:	Joyce Engineering	**Client Contact:**	Hannu K.
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 2:30 PM **Departed:** 5:30PM
General Contractor:	Cobles	**Superintendent:**	Kent Coble

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	92

Contractor's Equipment:

Contractor's Personnel:

Description of Daily Activities & Events

- Geotechnics representative arrived at jobsite.
- Fill was previously placed and compacted, then tested for required compaction.
- Rep. performed nuclear density, drive cylinder and pushed shelby tubes for Acres 9 & 10.
- Geotechnics representative departed jobsite.

Prepared By:	AG	**Date:**	8.17.12	**Checked By:**	RWS	**Date:**	8/24

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Client: Joyce Engineering
Project Name : Coble's Sandrock Landfill
Project Number :

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INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-8**	Geotechnics Representative : Abram Gaeta	Page : 1 of 1
Date (s) : **8.17.12**	Reviewed By : MMS	Date : 8/24

Contractor : T & K Construction	Borrow Source : On-site

Compaction Equipment :

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre9	Lift 2	6"	656-01-01	105.6	18.2	**117.8**	**19.7**	**98.4**	**93.2%**	**90.0%**	
DC 1	Acre9	Lift 2	6"	656-01-01	105.6	18.2	**114.2**	**19.1**	**95.9**	**90.8%**	**90.0%**	Taken @ ND-1
ND 2	Acre9	Lift 2	6"	656-01-01	105.6	18.2	**120.5**	**16.6**	**103.3**	**97.9%**	**90.0%**	
ND 3	Acre9	Lift 2	6"	656-01-01	105.6	18.2	**117.3**	**18.3**	**99.2**	**93.9%**	**90.0%**	
ND 4	Acre9	Lift 2	6"	656-01-01	105.6	18.2	**115.3**	**20.9**	**95.4**	**90.3%**	**90.0%**	
ND 5	Acre9	Lift 2	6"	656-01-01	105.6	18.2	**114.0**	**18.5**	**96.2**	**91.1%**	**90.0%**	
ND 6	Acre10	Lift 1	6"	656-01-02	112.8	15.1	**127.5**	**7.6**	**118.5**	**105.0%**	**90.0%**	
ND 7	Acre10	Lift 1	6"	656-01-02	112.8	15.1	**117.0**	**9.4**	**106.9**	**94.8%**	**90.0%**	
DC 2	Acre10	Lift 1	6"	656-01-01	105.6	18.2	**113.3**	**14.9**	**98.6**	**93.4%**	**90.0%**	Taken @ ND-7
ND 8	Acre10	Lift 1	6"	656-01-02	112.8	15.1	**127.5**	**10.2**	**115.7**	**102.6%**	**90.0%**	
ND 9	Acre10	Lift 1	6"	656-01-02	112.8	15.1	**131.0**	**9.1**	**120.1**	**106.4%**	**90.0%**	
ND 10	Acre10	Lift 1	6"	656-01-02	112.8	15.1	**126.6**	**9.5**	**115.6**	**102.5%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
32387	R-361	2323	693

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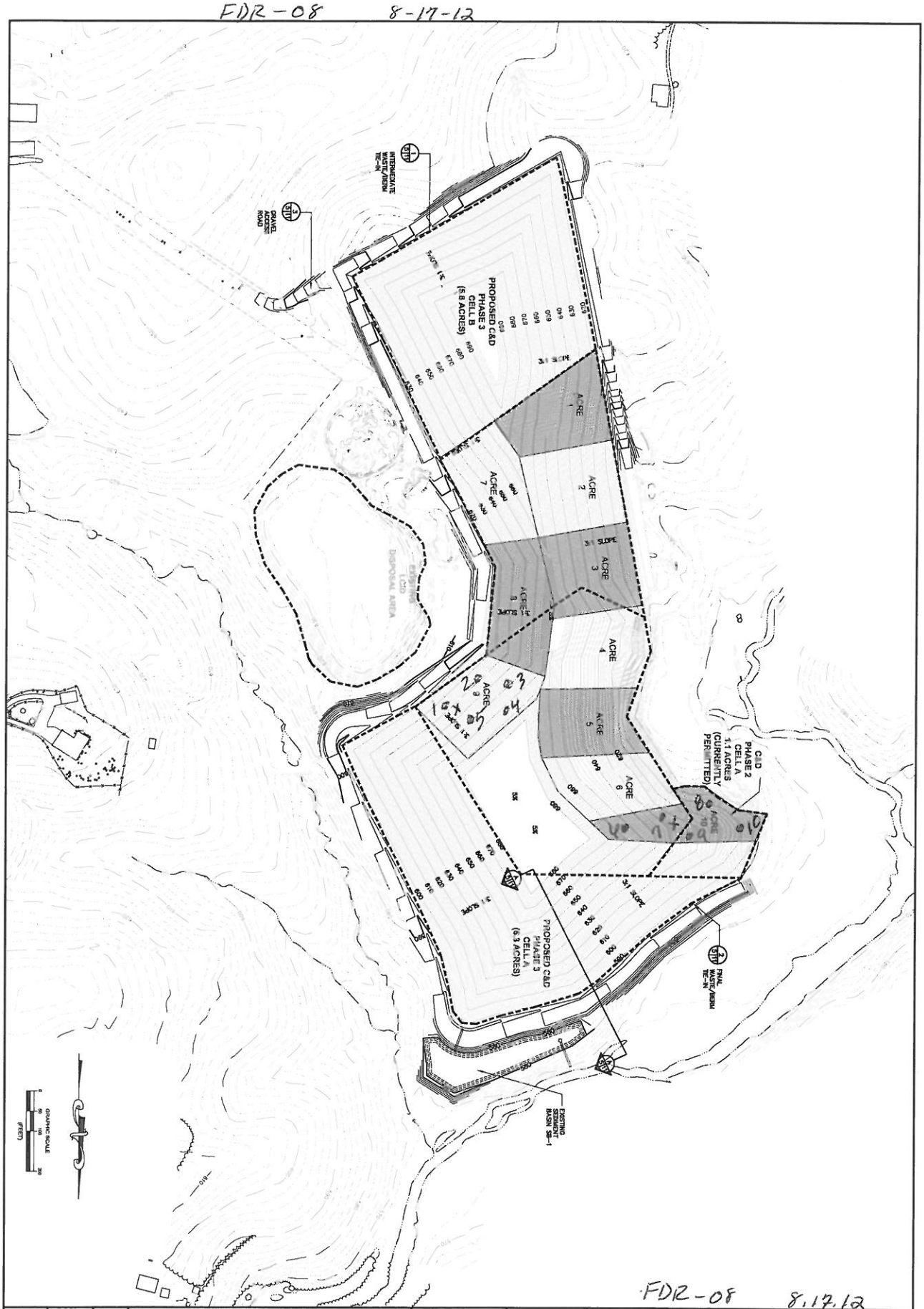
FDR-08 8-17-12



FDR-08 8.17.12

DRAWING NO. 01	SCALE AS SHOWN	PROJECT NO. 419.20	COBLE'S SANDROCK, INC. KIMESVILLE, NORTH CAROLINA	JOYCE ENGINEERING 2211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0352 NC CORP LIC: C-0782	DESIGNED SC DRAWN RB CHECKED EA APPROVED EA DATE 6/15/07		11/7/11	REVISED CLOSURE GRADES	1	RWH	EEA	EEA
			LANDFILL PARTIAL CLOSURE ACRE MAP			© 2007 Joyce Engineering, Inc. All rights reserved.	DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Client: Joyce Engineering
Project Name : Coble's Sandrock Landfill
Project Number :

Report Number : **FDR-08**
Date (s) : 8.17.12

Drive Cylinder - ASTM D 2937

Test Information		
Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-01	ND-07
Location:	Acre 9	Acre 10
Depth (ft):	Lift 2	Lift 1
Date :	8.17.12	8.17.12
Mold		
Cylinder ID	#2	#2
Weight of Cylinder (lbs.)	1.33	1.33
Volume of Cylinder (ft^3)	0.033	0.033
Specimen		
Wt. of Cylinder & WS (lbs.)	5.10	5.07
Wt. of Cylinder (lbs.)	1.33	1.33
Wt. of WS	3.77	3.74
Cylinder Volume (ft^3)	0.033	0.033
Moisture / Density		
Tare Number	#887	#887
Wt. of Tare & WS (gm)	192.00	181.80
Wt. of Tare & DS (gm)	161.20	158.20
Wt. of Tare (gm)	0.00	
Wt. of Water (gm)	30.80	23.60
Wt. of DS (gm)	161.20	158.20
Wet Density (pcf):	114.2	113.3
Moisture Content (%):	**19.1**	**14.9**
Dry Density (pcf):	**95.9**	**98.6**

Geotechnics Representative : Abram Gaeta

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Day:	**Friday**
Date:	**8.24.12**
Log No.:	**10**
Page:	**1 of 1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Coble Sandrock Landfill	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu K.
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 10:30 AM **Departed:** 2:30 PM
General Contractor:	Cobles	**Superintendent:**	Kent Coble

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	partly cloudy	**Temperature:**	85

Contractor's Equipment:

Contractor's Personnel:

Description of Daily Activities & Events

- Geotechnics representative arrived at jobsite checked in at scale house & met with Kent Coble.
- Closure fill was previously placed and compacted, then tested for required compaction.
- Rep. performed 5 nuclear densityper acre, drive cylinder and pushed shelby tubes for Acres 9 & 10.
- Acre 9 was tested for lift 3 and acre 10 for lift 2.
- Geotechnics representative departed jobsite.

Prepared By:	MB	**Date:**	24-Aug	**Checked By:**	MPS	**Date:**	8/27

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Client: Joyce Engineering
Project Name : Coble's Sandrock Landfill
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-9**	Geotechnics Representative : M BLACKLEY	Page : 1 of 1
Date (s) : **8.24.12**	Reviewed By : [illegible]	Date : 8/28

Contractor : COBLES	Borrow Source : On-site

Compaction Equipment :

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre9	Lift 3	6"	656-01-01	105.6	18.2	**113.3**	**19.1**	**95.1**	**90.1%**	**90.0%**	
ND 2	Acre9	Lift 3	6"	656-01-01	105.6	18.2	**117.3**	**24.0**	**94.6**	**89.6%**	**90.0%**	
DC 1	Acre9	Lift 3	6"	656-01-01	105.6	18.2	**116.7**	**21.9**	**95.7**	**90.7%**	**90.0%**	
ND 3	Acre9	Lift 3	6"	656-01-01	105.6	18.2	**118.5**	**22.9**	**96.4**	**91.3%**	**90.0%**	
ND 4	Acre9	Lift 3	6"	656-01-01	105.6	18.2	**119.9**	**21.0**	**99.1**	**93.8%**	**90.0%**	
ND 5	Acre9	Lift 3	6"	656-01-01	105.6	18.2	**116.7**	**20.5**	**96.8**	**91.7%**	**90.0%**	
ND 6	Acre10	Lift 2	6"	656-01-01	105.6	18.2	**122.8**	**19.3**	**102.9**	**97.5%**	**90.0%**	
DC 2	Acre10	Lift 2	6"	656-01-01	105.6	18.2	**126.4**	**14.2**	**110.7**	**104.8%**	**90.0%**	
ND 7	Acre10	Lift 2	6"	656-01-01	105.6	18.2	**119.0**	**16.7**	**102.0**	**96.6%**	**90.0%**	
ND 8	Acre10	Lift 2	6"	656-01-01	105.6	18.2	**125.2**	**21.5**	**103.0**	**97.6%**	**90.0%**	
ND 9	Acre10	Lift 2	6"	656-01-01	105.6	18.2	**116.1**	**27.2**	**91.3**	**86.4%**	**90.0%**	
ND 10	Acre10	Lift 2	6"	656-01-01	105.6	18.2	**123.2**	**19.7**	**102.9**	**97.5%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401B	2232	568

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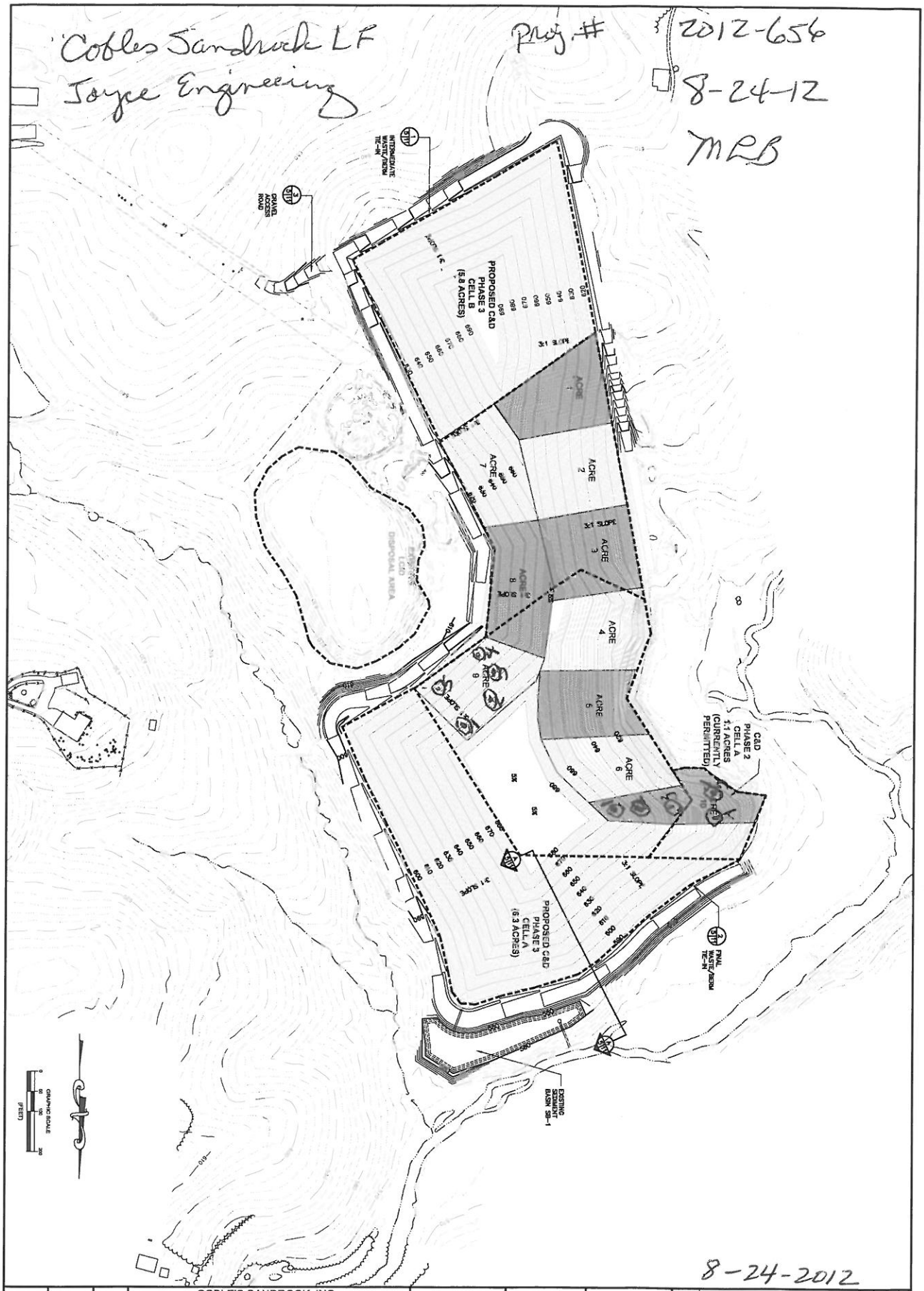
Cobles Sandrock LF
Joyce Engineering

Proj. # 2012-656
8-24-12
MLB



8-24-2012

PROJECT NO. 419.20	COBLE'S SANDROCK, INC. KIMESVILLE, NORTH CAROLINA	JOYCE ENGINEERING 2211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0092 NC CORP LIC: C-0782	DESIGNED SC DRAWN RB CHECKED EA APPROVED EA DATE 8/15/07
SCALE AS SHOWN	LANDFILL PARTIAL CLOSURE ACRE MAP		© 2007 Joyce Engineering, Inc. All rights reserved.
DRAWING NO. 01			

DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
1/07/11	REVISED CLOSURE GRADES	1	RWH	EEA	EEA

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Client:	Joyce Engineering
Project Name :	Coble's Sandrock Landfill
Project Number :	2012-656

Report Number :	**FDR-09**
Date (s) :	8.24.12

Drive Cylinder - ASTM D 2937

Test Information		
Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-02	ND-06
Location:	Acre 9	Acre 10
Depth (ft):	LIFT 3	LIFT 2
Date :	24-Aug	24-Aug
Mold		
Cylinder ID	1	2
Weight of Cylinder (lbs.)	1.39	1.32
Volume of Cylinder (ft^3)	0.033	0.033
Specimen		
Wt. of Cylinder & WS (lbs.)	5.24	5.49
Wt. of Cylinder (lbs.)	1.39	1.32
Wt. of WS	3.85	4.17
Cylinder Volume (ft^3)	0.033	0.033
Moisture / Density		
Tare Number	300	310
Wt. of Tare & WS (gm)	594.60	578.62
Wt. of Tare & DS (gm)	507.57	520.31
Wt. of Tare (gm)	110.81	110.31
Wt. of Water (gm)	87.03	58.31
Wt. of DS (gm)	396.76	410.00
Wet Density (pcf):	116.7	126.4
Moisture Content (%):	**21.9**	**14.2**
Dry Density (pcf):	**95.7**	**110.6**

Geotechnics Representative : M. BLACKLEY

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Day:	**Wed.**
Date:	**9.5.12**
Log No.:	**11**
Page:	**1**

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 10:30 AM **Departed:** 2:00 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Mostly Cloudy, Humid	**Temperature:**	88
Contractor's Equipment:	NA		
Contractor's Personnel:	NA		

Description of Daily Activities & Events

- Geotechnics Rep. Mark Blackley arrived onsite and checked in at scale house. Geotechnics Rep. was informed that approx. 5" of rain has accumulated on site since Friday, 8.31.12.
- Geotechnics Rep. proceeded to Acre 10 - Lift 3 area and checked for suitability of soil for testing. Acre 10 appeared acceptable for testing.
- 5 nuclear density tests were preformed with results of all 5 meeting the 90% compaction requirement. A drive cylinder and shelby tube sample was obtained at location ND-01.
- Acres 7 and 8 were scheduled for testing but no fill had been placed due to wet site conditions.
- Geotechnics Rep. departed the site.

Prepared By:	MB	**Date:**	9.5.12	**Checked By:**	JRB	**Date:**	9.12.12

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-10**	Geotechnics Representative : Mark Blackley	Page : 1 OF 1
Date (s) : **7.6.12**	Reviewed By : JRB	Date : 9.12.12

Contractor : Coble SR LF	Borrow Source :

Compaction Equipment :

Test Number	Test Location	Elevation / Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 01	Acre 10	Lift 3	6"	656-01-02	112.8	15.1	**126.3**	**19.1**	**106.0**	**94.0%**	**90.0%**	
ND 01	Acre 10	Lift 3	6"	656-01-02	112.8	15.1	**126.7**	**14.1**	**111.0**	**98.4%**	**90.0%**	
ND 02	Acre 10	Lift 3	6"	656-01-02	112.8	15.1	**122.8**	**15.2**	**106.6**	**94.5%**	**90.0%**	
ND 03	Acre 10	Lift 3	6"	656-01-02	112.8	15.1	**122.3**	**19.0**	**102.8**	**91.1%**	**90.0%**	
ND 04	Acre 10	Lift 3	6"	656-01-02	112.8	15.1	**123.5**	**16.7**	**105.8**	**93.8%**	**90.0%**	
ND 05	Acre 10	Lift 3	6"	656-01-02	112.8	15.1	**121.6**	**15.1**	**105.6**	**93.7%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401-B	2241	561

Client:	JOYCE ENGINEERING
Project Name :	COBLES SANDROCK LANDFILL
Project Number :	2012-656

Report Number :	**FDR-10**
Date (s) :	9.5.12

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-01
Nuclear Test Number :	ND-01
Location:	Acre 10
Depth (ft):	LIFT 3
Date :	9.5.12

Mold

Cylinder ID	2
Weight of Cylinder (lbs.)	1.32
Volume of Cylinder (ft^3)	0.033

Specimen

Wt. of Cylinder & WS (lbs.)	5.50
Wt. of Cylinder (lbs.)	1.32
Wt. of WS	4.18
Cylinder Volume (ft^3)	0.033

Moisture / Density

Tare Number	318
Wt. of Tare & WS (gm)	868.85
Wt. of Tare & DS (gm)	772.25
Wt. of Tare (gm)	86.60
Wt. of Water (gm)	96.60
Wt. of DS (gm)	685.65
Wet Density (pcf):	126.7
Moisture Content (%):	**14.1**
Dry Density (pcf):	**111.0**

Geotechnics Representative : Mark Blackley

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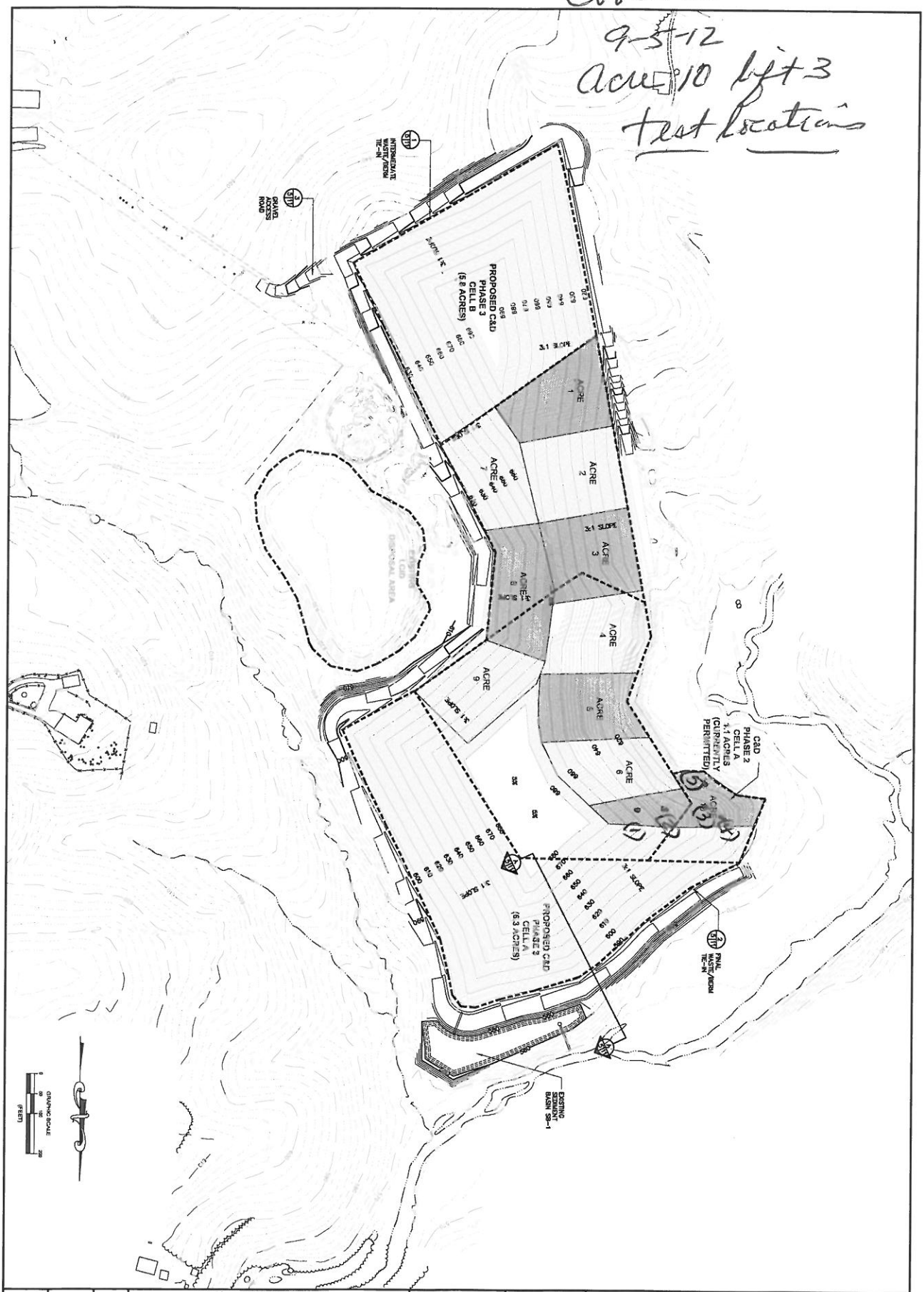
Coble LF
9-5-12
acre 10 lift 3
test locations



DRAWING NO. 01	SCALE AS SHOWN	PROJECT NO. 419.20	COBLE'S SANDROCK, INC. KIMESVILLE, NORTH CAROLINA LANDFILL PARTIAL CLOSURE ACRE MAP	JOYCE ENGINEERING 3211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0092 NC CORP LIC: C-0792	DESIGNED SC DRAWN RB CHECKED EA APPROVED EA DATE 8/15/07	© 2007 Joyce Engineering, Inc. All rights reserved.	11/07/11 REVISED CLOSURE GRADES 1 RWH EEA EEA DATE REVISIONS AND RECORD OF ISSUE NO BY CK APP

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout1

Day:	**Friday**
Date:	**9.14.12**
Log No.:	**12**
Page:	**1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 9:00 AM **Departed:** 12:15 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Partly Cloudy	**Temperature:**	80
Contractor's Equipment:	NA		
Contractor's Personnel:	NA		

Description of Daily Activities & Events

- Geotechnics Rep. Mark Blackley arrived onsite and checked in at scale house.
- Geotechnics Rep. proceeded to Acre 7 & 8 - Lift 1 area and checked for suitability of soil for testing. Acre 7 & 8 appeared acceptable for testing.
- 5 nuclear density tests were preformed per acre with results of all Meeting the 90% comp. req. Drive cylinders and shelby tube samples were obtained.
- Geotechnics Rep. departed the site.

Prepared By: MB **Date:** 9.14.12 **Checked By:** MDS **Date:** 9/25

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-11**	Geotechnics Representative : Mark Blackley	Page : 1 OF 1
Date (s) : **9/14/2012**	Reviewed By : MMS	Date : 9/25

Contractor : Coble SR LF	Borrow Source :

Compaction Equipment :

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre 8	Lift 1	6"	656-01-02	112.8	15.1	**129.3**	**16.7**	**110.8**	**98.2%**	**90.0%**	
DC 1	Acre 8	Lift 1	NA	656-01-01	105.6	18.2	**121.2**	**22.2**	**99.2**	**93.9%**	**90.0%**	DC-01 & ST-01
ND 2	Acre 8	Lift 1	6"	656-01-01	105.6	18.2	**119.1**	**21.7**	**97.9**	**92.7%**	**90.0%**	
ND 3	Acre 8	Lift 1	6"	656-01-01	105.6	18.2	**118.3**	**22.5**	**96.6**	**91.5%**	**90.0%**	
ND 4	Acre 8	Lift 1	6"	656-01-01	105.6	18.2	**121.5**	**23.3**	**98.5**	**93.3%**	**90.0%**	
ND 5	Acre 8	Lift 1	6"	656-01-01	105.6	18.2	**120.1**	**21.6**	**98.8**	**93.5%**	**90.0%**	
ND 6	Acre 7	Lift 1	6"	656-01-01	105.6	18.2	**117.8**	**18.8**	**99.2**	**93.9%**	**90.0%**	
DC 2	Acre 7	Lift 1	NA	656-01-01	105.6	18.2	**113.9**	**14.0**	**99.9**	**94.6%**	**90.0%**	
ND 7	Acre 7	Lift 1	6"	656-01-01	105.6	18.2	**118.0**	**19.0**	**99.2**	**93.9%**	**90.0%**	DC-02 & ST-02
ND 8	Acre 7	Lift 1	6"	656-01-02	112.8	15.1	**120.4**	**15.8**	**104.0**	**92.2%**	**90.0%**	
ND 9	Acre 7	Lift 1	6"	656-01-01	105.6	18.2	**120.9**	**22.7**	**98.5**	**93.3%**	**90.0%**	
ND 10	Acre 7	Lift 1	6"	656-01-01	105.6	18.2	**118.1**	**23.6**	**95.6**	**90.5%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401-B	2266	570

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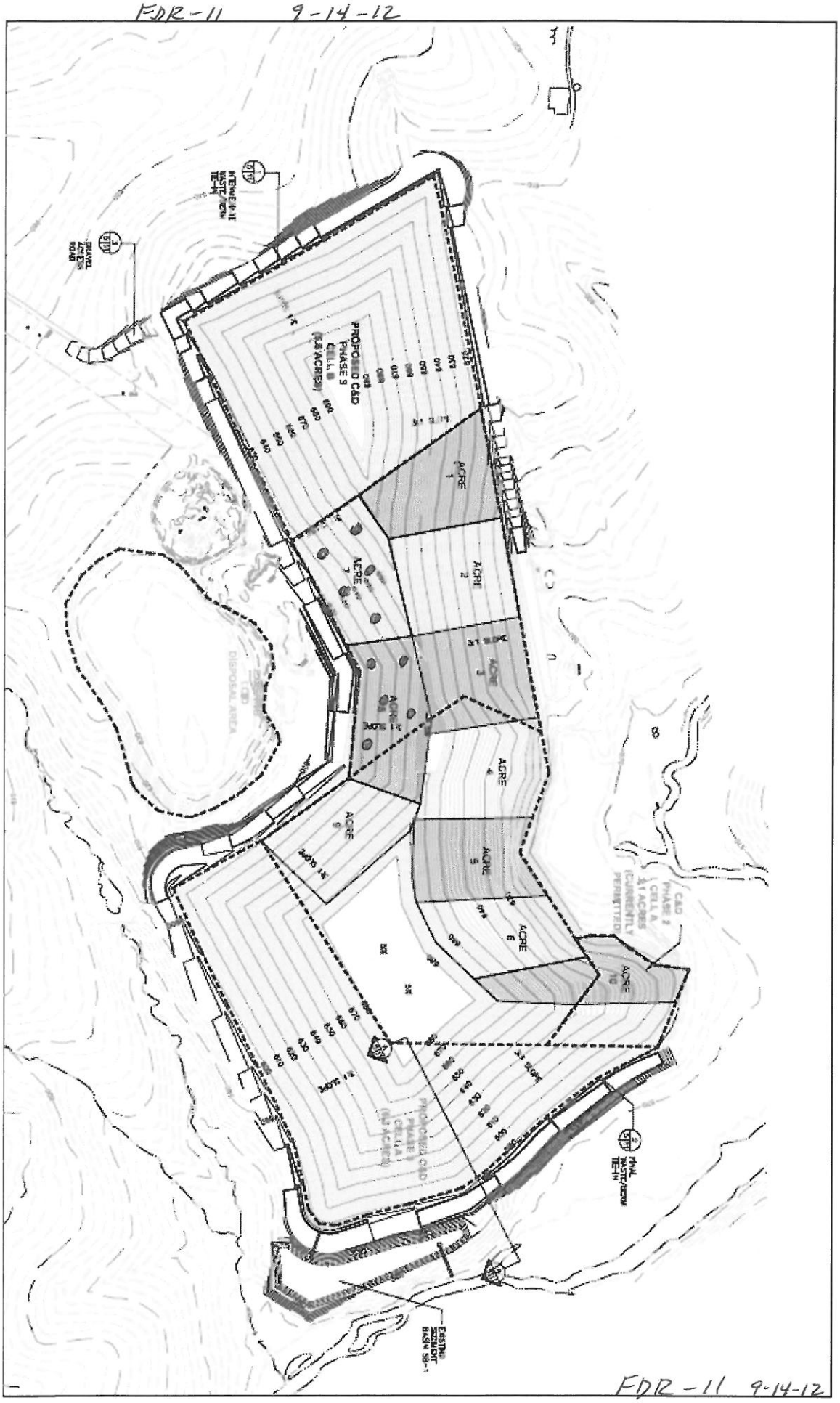
FDR-11 9-14-12



FDR-11 9-14-12

Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Report Number : **FDR-11**
Date (s) : 9.14.12

Drive Cylinder - ASTM D 2937

Test Information		
Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-01	ND-06
Location:	ACRE 8	ACRE 7
Depth (ft):	LIFT 1	LIFT 1
Date :	14-Sep	14-Sep
Mold		
Cylinder ID	1	2
Weight of Cylinder (lbs.)	1.3	1.24
Volume of Cylinder (ft^3)	0.033	0.033
Specimen		
Wt. of Cylinder & WS (lbs.)	5.30	5.00
Wt. of Cylinder (lbs.)	1.30	1.24
Wt. of WS	4.00	3.76
Cylinder Volume (ft^3)	0.033	0.033
Moisture / Density		
Tare Number	312	307
Wt. of Tare & WS (gm)	713.18	686.70
Wt. of Tare & DS (gm)	598.93	615.99
Wt. of Tare (gm)	84.41	110.44
Wt. of Water (gm)	114.25	70.71
Wt. of DS (gm)	514.52	505.55
Wet Density (pcf):	121.2	113.9
Moisture Content (%):	**22.2**	**14.0**
Dry Density (pcf):	**99.2**	**100.0**

Geotechnics Representative : Mark Blackley

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Day:	**Monday**
Date:	**9.24.12**
Log No.:	**13**
Page:	**1**

Geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 10:00 AM **Departed:** 11:20 AM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Clear	**Temperature:**	75
Contractor's Equipment:	NA		
Contractor's Personnel:	NA		

Description of Daily Activities & Events

- Geotechnics Rep. Mark Blackley arrived onsite and checked in at scale house.
- Geotechnics Rep. proceeded to Acre 7 & 8 - Lift 2 area and checked for suitability of soil for testing.
- Acre 7 & 8 appeared to be too wet for testing.
- 4 nuclear density tests were preformed with results showing low compaction and high moisture.
- Informed Kent of the failing results, area will need to dry, be reworked and recompacted.
- Geotechnics Rep. departed the site.

Prepared By: MB **Date:** 9.24.12 **Checked By:** BM **Date:** 9/26

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-12**	Geotechnics Representative : Mark Blackley	Page : 1 OF 1
Date (s) : **9/24/2012**	Reviewed By : MMS	Date : 9/26

Contractor : Coble SR LF	Borrow Source : on site

Compaction Equipment :

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND 1	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**118.7**	**27.8**	**92.9**	**88.0%**	**90.0%**	
ND 2	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**94.7**	**37.9**	**68.7**	**65.0%**	**90.0%**	
ND 3	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**107.7**	**21.8**	**88.4**	**83.7%**	**90.0%**	
ND 4	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**113.8**	**27.7**	**89.1**	**84.4%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401-B	2220	567

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Day:	**Wednesday**
Date:	**9/26/2012**
Log No.:	**14**
Page:	**1**

Geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 12:30 PM **Departed:** 3:30 PM
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	clear	**Temperature:**	85
Contractor's Equipment:	NA		
Contractor's Personnel:	NA		

Description of Daily Activities & Events

- Geotechnics Rep. Mark Blackley arrived onsite and checked in at scale house.
- Geotechnics Rep. proceeded to Acre 7 & 8 - Lift 2 area and checked for suitability of soil for testing. Acre 7 & 8 appeared to be ready for testing.
- 5 nuclear density tests were preformed per acre with results of all meeting the 90% comp. req. Drive cylinders and shelby tube samples were obtained.
- Bulk soil sampling was obtained.
- Geotechnics Rep. departed the site.

Prepared By: MB **Date:** 9/26/2012 **Checked By:** MBS **Date:** 9/28

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-13**	Geotechnics Representative : Mark Blackley	Page : 1 OF 1
Date (s) : **9/26/2012**	Reviewed By : MMS	Date : 9/28

Contractor : Coble SR LF	Borrow Source :

Compaction Equipment :

Test Number		Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND	1	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**126.3**	**24.2**	**101.7**	**96.3%**	**90.0%**	
DC	1	Acre 8	Lift 2	NA	656-01-01	105.6	18.2	**123.9**	**21.9**	**101.6**	**96.3%**	**90.0%**	DC-01 & ST-01
ND	2	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**117.5**	**20.9**	**97.2**	**92.0%**	**90.0%**	
ND	3	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**119.0**	**20.7**	**98.6**	**93.4%**	**90.0%**	
ND	4	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**122.2**	**22.5**	**99.8**	**94.5%**	**90.0%**	
ND	5	Acre 8	Lift 2	6"	656-01-01	105.6	18.2	**121.0**	**24.8**	**97.0**	**91.8%**	**90.0%**	
ND	6	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**119.1**	**20.6**	**98.8**	**93.5%**	**90.0%**	
ND	7	Acre 7	Lift 2	NA	656-01-01	105.6	18.2	**123.3**	**21.5**	**101.5**	**96.1%**	**90.0%**	
DC	2	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**122.4**	**18.4**	**103.4**	**97.9%**	**90.0%**	DC-02 & ST-02
ND	8	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**121.8**	**19.4**	**102.0**	**96.6%**	**90.0%**	
ND	9	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**118.6**	**20.1**	**98.8**	**93.5%**	**90.0%**	
ND	10	Acre 7	Lift 2	6"	656-01-01	105.6	18.2	**120.5**	**18.8**	**101.4**	**96.1%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401-B	2242	566

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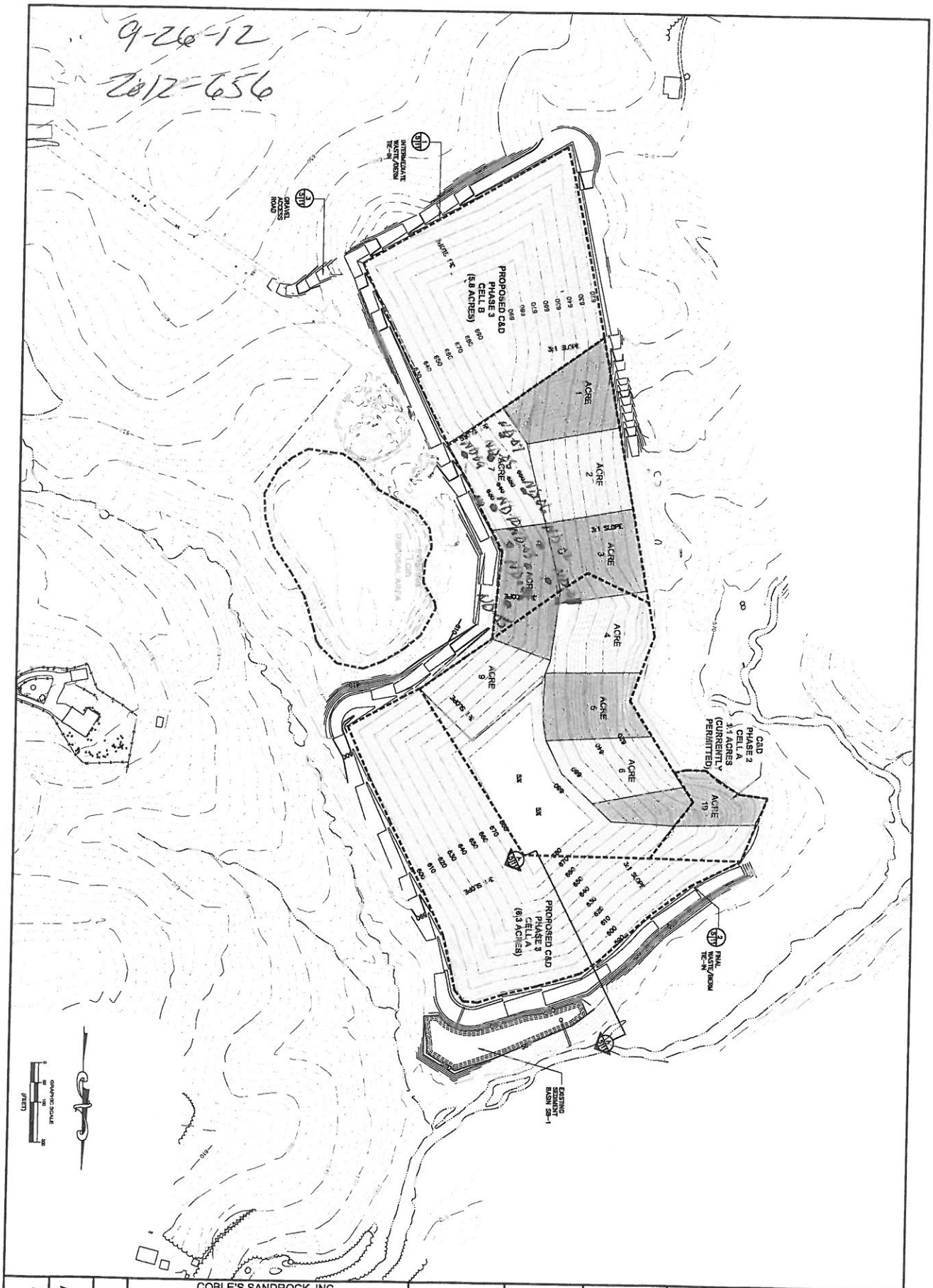
Cobles Sandrock LF

9-26-12

2012-656



DRAWING NO. 01	SCALE AS SHOWN	PROJECT NO. 419.20	COBLE'S SANDROCK, INC. KIMESVILLE, NORTH CAROLINA	JOYCE ENGINEERING 2211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0032 NC CORP LIC: C-0782	DESIGNED SC DRAWN RS CHECKED EA APPROVED EA DATE 6/15/07			
			LANDFILL PARTIAL CLOSURE ACRE MAP		© 2007 Joyce Engineering, Inc. All rights reserved	11/07/11	REVISED CLOSURE GRADES	1 RWH EEA EEA
						DATE	REVISIONS AND RECORD OF ISSUE	NO BY CK APP

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Client:	JOYCE ENGINEERING
Project Name :	COBLES SANDROCK LANDFILL
Project Number :	2012-656

Geotechnics
INTEGRITY IN TESTING

Report Number :	**FDR-13**
Date (s) :	9.26.12

Drive Cylinder - ASTM D 2937

Test Information		
Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-01	ND-07
Location:	ACRE 8	ACRE 7
Depth (ft):	LIFT 2	LIFT 2
Date :	26-Sep	26-Sep
Mold		
Cylinder ID	1	2
Weight of Cylinder (lbs.)	1.32	1.31
Volume of Cylinder (ft^3)	0.033	0.033
Specimen		
Wt. of Cylinder & WS (lbs.)	5.41	5.35
Wt. of Cylinder (lbs.)	1.32	1.31
Wt. of WS	4.09	4.04
Cylinder Volume (ft^3)	0.033	0.033
Moisture / Density		
Tare Number	318	307
Wt. of Tare & WS (gm)	940.17	702.00
Wt. of Tare & DS (gm)	786.69	610.22
Wt. of Tare (gm)	86.60	110.41
Wt. of Water (gm)	153.48	91.78
Wt. of DS (gm)	700.09	499.81
Wet Density (pcf):	123.9	122.4
Moisture Content (%):	**21.9**	**18.4**
Dry Density (pcf):	**101.7**	**103.4**

Geotechnics Representative : Mark Blackley MBS

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Day:	**Thurs.**
Date:	**10.18.12**
Log No.:	**15**
Page:	**1**

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 9:30am **Departed:** 12:30pm
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent Cobles

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Partly Cloudy to Cloudy	**Temperature:**	70
Contractor's Equipment:	NA		
Contractor's Personnel:	NA		

Description of Daily Activities & Events

- Geotechnics Rep. Mark Blackley arrived onsite and checked in at scale house.
- Geotechnics Rep. performed density tests including drive cylinder and shelby tubes on acres 7 and 8 - lift 3. 10 Nuclear density , 2 Drive Cylinder, and 2 Shelby tube tests were performed.
- All nuclear density tests meet or exceeded the 90% compaction requirements.
- Geotechnics Rep. departed the site and transported shelby tube and drive cylinder samples to Geotechnics laboratory facility for further testing.

Prepared By:	JRB	**Date:**	10.24.12	**Checked By:**	JRB	**Date:**	**10.24.12**

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number :	**FDR-14**	Geotechnics Representative :	Mark Blackley	Page :	1 of 1
Date (s) :	**10.18.12**	Reviewed By :	JRB	Date :	**10.24.12**

Contractor :	Coble SR LF	Borrow Source :	On-site

Compaction Equipment :

Test Number		Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
						MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND	1	Acre 8	Lift 3	6"	656-12-02	106.5	17.6	**125.2**	**25.8**	**99.5**	**93.4%**	**90.0%**	
DC	1	Acre 8	Lift 3	NA	656-12-02	106.5	17.6	**122.7**	**26.5**	**97.0**	**91.1%**	**90.0%**	DC-01 & ST-A8-03
ND	2	Acre 8	Lift 3	6"	656-12-02	106.5	17.6	**125.0**	**27.0**	**98.4**	**92.4%**	**90.0%**	
ND	3	Acre 8	Lift 3	6"	656-12-02	106.5	17.6	**120.2**	**22.8**	**97.9**	**91.9%**	**90.0%**	
ND	4	Acre 8	Lift 3	6"	656-12-02	106.5	17.6	**125.2**	**24.2**	**100.8**	**94.7%**	**90.0%**	
ND	5	Acre 8	Lift 3	6"	656-12-02	106.5	17.6	**127.4**	**25.0**	**101.9**	**95.7%**	**90.0%**	
ND	6	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**122.6**	**24.8**	**98.2**	**92.2%**	**90.0%**	
ND	7	Acre 7	Lift 3	5"	656-12-02	106.5	17.6	**123.6**	**22.3**	**101.1**	**94.9%**	**90.0%**	
DC	2	Acre 7	Lift 3	NA	656-12-02	106.5	17.6	**123.9**	**21.7**	**101.8**	**95.6%**	**90.0%**	DC-02 & ST-A7-03
ND	8	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**122.5**	**22.3**	**100.2**	**94.1%**	**90.0%**	
ND	9	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**123.8**	**24.4**	**99.5**	**93.4%**	**90.0%**	
ND	10	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**132.6**	**30.7**	**101.5**	**95.3%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
13957	3401-B	2248	573

Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Report Number : **FDR-14**
Date (s) : 10.18.12

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-01	DC-02
Nuclear Test Number :	ND-01	ND-07
Location:	ACRE 8	ACRE 7
Depth (ft):	LIFT 3	LIFT 3
Date :	10.18.12	10.18.12

Mold

Cylinder ID	1	2
Weight of Cylinder (lbs.)	1.31	1.32
Volume of Cylinder (ft^3)	0.033	0.033

Specimen

Wt. of Cylinder & WS (lbs.)	5.36	5.41
Wt. of Cylinder (lbs.)	1.31	1.32
Wt. of WS	4.05	4.09
Cylinder Volume (ft^3)	0.033	0.033

Moisture / Density

Tare Number	398	311
Wt. of Tare & WS (gm)	680.39	790.12
Wt. of Tare & DS (gm)	555.39	664.53
Wt. of Tare (gm)	84.39	84.75
Wt. of Water (gm)	125.00	125.59
Wt. of DS (gm)	471.00	579.78
Wet Density (pcf):	122.7	123.9
Moisture Content (%):	**26.5**	**21.7**
Dry Density (pcf):	**97.0**	**101.9**

Geotechnics Representative : Mark Blackley

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Cobles L.F.
10-18-12
2012-656

DRAWING NO. 01	SCALE AS SHOWN	PROJECT NO. 419.20	COBLE'S SANDROCK, INC. KIMESVILLE, NORTH CAROLINA	JOYCE ENGINEERING 2211 W. MEADOWVIEW ROAD GREENSBORO, NC 27407 PHONE: (336) 323-0032 NC CORP LIC: C-0782	DESIGNED SC DRAWN RB CHECKED EA APPROVED EA DATE 6/15/07
			LANDFILL PARTIAL CLOSURE ACRE MAP		© 2007 Joyce Engineering, Inc. All rights reserved.

NO	BY	CK	APP	DATE	REVISIONS AND RECORD OF ISSUE
1	RHM	EEA	EEA	11/07/11	REVISED CLOSURE GRADES

L:\Coble Sandrock\dwg\CLOSURE OCTOBER 2011\sheet set\ACRE MAP FOR CONTRACTOR.dwg Layout=Layout

Day:	**Thurs.**
Date:	**10.25.12**
Log No.:	**16**
Page:	**1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock LF	**Project No.:**	2012-656
Client Name:	Joyce Engineering	**Client Contact:**	Hannu Kemppinen
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 11:15am **Departed:** 12:15pm
General Contractor:	Cobles Sandrock LF	**Superintendent:**	Kent Cobles

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	70
Contractor's Equipment:	NA		
Contractor's Personnel:	NA		

Description of Daily Activities & Events

- Geotechnics Rep. Jacob R. Buda arrived on site.
- Geotechnics Rep. performed CQA Moisture / Density testing of Acre 7 - Lift 3. 5 Nuclear density and 1 Drive Cylinder tests were performed.
- Geotechnics Rep. obtained an Undisturbed Shelby Tube sample for laboratory testing.
- Geotechnics Rep. departed the site.

Prepared By:	JRB	**Date:**	10.25.12	**Checked By:**	JRB	**Date:**	**10.29.12**

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number :	**FDR-15**	Geotechnics Representative :	Jacob R. Buda	Page :	1 of 1
Date (s) :	**10.25.12**	Reviewed By :	JRB	Date :	**10.29.12**

Contractor :	Coble SR LF	Borrow Source :	On-site

Compaction Equipment :

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND - 1	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**127.0**	**20.2**	**105.7**	**99.2%**	**90.0%**	
ND - 2	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**125.5**	**19.7**	**104.8**	**98.4%**	**90.0%**	
ND - 3	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**124.6**	**21.7**	**102.4**	**96.1%**	**90.0%**	
DC - 1	Acre 7	Lift 3	NA	656-12-02	106.5	17.6	**123.9**	**19.3**	**103.9**	**97.5%**	**90.0%**	
ND - 4	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**125.4**	**18.9**	**105.5**	**99.0%**	**90.0%**	
ND - 5	Acre 7	Lift 3	6"	656-12-02	106.5	17.6	**126.3**	**20.1**	**105.2**	**98.7%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
24656	3430	2023	589

Client:	JOYCE ENGINEERING
Project Name :	COBLES SANDROCK LANDFILL
Project Number :	2012-656

Report Number :	**FDR-15**
Date (s) :	10.25.12

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-01
Nuclear Test Number :	ND-03
Location:	ACRE 7
Depth (ft):	LIFT 3
Date :	10.24.12

Mold

Cylinder ID	DC-01
Weight of Cylinder (lbs.)	1.32
Volume of Cylinder (ft^3)	0.033

Specimen

Wt. of Cylinder & WS (lbs.)	5.41
Wt. of Cylinder (lbs.)	1.32
Wt. of WS	4.09
Cylinder Volume (ft^3)	0.033

Moisture / Density

Tare Number	314
Wt. of Tare & WS (gm)	324.10
Wt. of Tare & DS (gm)	285.30
Wt. of Tare (gm)	84.70
Wt. of Water (gm)	38.80
Wt. of DS (gm)	200.60
Wet Density (pcf):	123.9
Moisture Content (%):	**19.3**
Dry Density (pcf):	**103.9**

Geotechnics Representative : Jacob R. Buda

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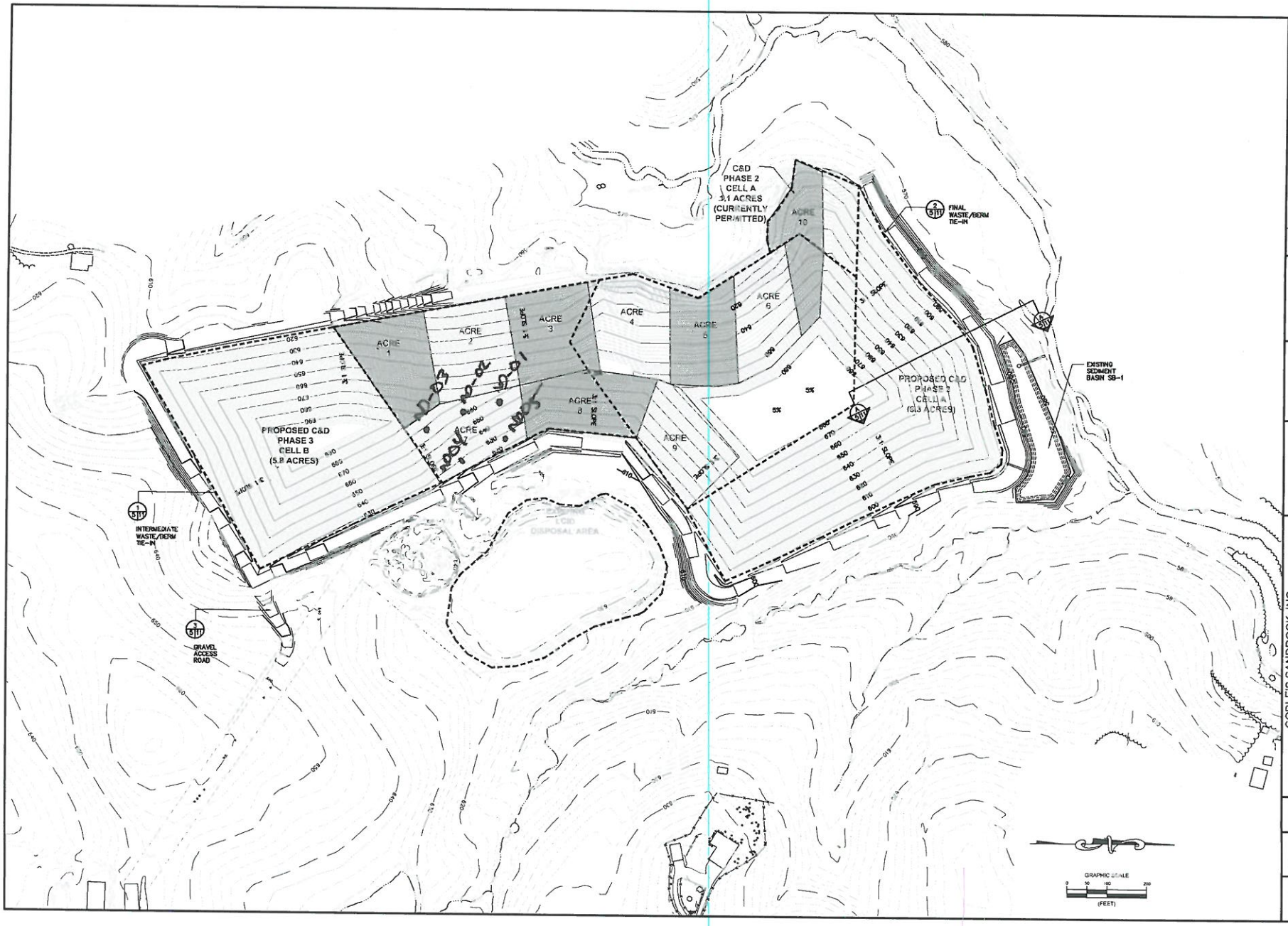

NO	BY	CK	APP
1		EA	KJA

REVISIONS AND RECORD OF ISSUE

DESIGNED SC
DRAWN RB
CHECKED EA
APPROVED EA
DATE 9/13/07

JOYCE ENGINEERING
2311 W. MEADOWVIEW ROAD
GREENSBORO, NC 27407
PHONE (336) 292-0000
NC CORP LIC. C-0782

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

PROJECT NO.
419.20

SCALE
AS SHOWN

DRAWING NO.
01

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Day:	**Monday**
Date:	**12.10.12**
Log No.:	**17**
Page:	**1 of 1**

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock C&D Landfill	**Project No.:**	2012-656
Client Name:	Joyce Enginneering	**Client Contact:**	Hannu K.
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 1:00 PM **Departed:** 3:15 PM
General Contractor:	Cobles Sandrock C&D Landfill	**Superintendent:**	Kent Cobles

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	56

Contractor's Equipment: N/A

Contractor's Personnel: N/A

Description of Daily Activities & Events

- Geotechnics representative Abe Gaeta arrived on jobsite.
- Geotechnics Rep. performed CQA Moisture / Density testing of Acre 11 - Lift 1. 5 Nuclear density and 1 Drive Cylinder tests were performed.
- Geotechnics Rep. obtained an Undisturbed Shelby Tube and 1 back-up sample for laboratory testing.
- Geotechnics representative departed jobsite.

Prepared By: AG **Date:** 12.10.12 **Checked By:** [illegible] **Date:** 12/13

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2012-656

Geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-15**	Geotechnics Representative : Abe Gaeta	Page : 1 of 1
Date (s) : **12.10.12**	Reviewed By : MWS	Date : 12/13

Contractor : Cobles Sandrock Landfill	Borrow Source : On-site

Compaction Equipment : Sheepsfoot trash compactor

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND - 01	Acre 11	Lift 1	6"	656-01-01	105.6	18.2	**121.8**	**22.7**	**99.3**	**94.0%**	**90.0%**	
DC - 02	Acre 11	Lift 1	N/A	656-01-01	105.6	18.2	**117.0**	**21.0**	**96.7**	**91.6%**	**90.0%**	Taken @ ND-1
ND - 02	Acre 11	Lift 1	6"	656-01-01	105.6	18.2	**120.1**	**21.6**	**98.8**	**93.5%**	**90.0%**	
ND - 03	Acre 11	Lift 1	6"	656-01-02	112.8	15.1	**121.3**	**13.6**	**106.8**	**94.7%**	**90.0%**	
ND - 04	Acre 11	Lift 1	6"	656-01-01	105.6	18.2	**124.8**	**25.7**	**99.3**	**94.0%**	**90.0%**	Shelby tube @ ND-04
ND - 05	Acre 11	Lift 1	6"	656-01-02	112.8	15.1	**126.5**	**20.3**	**105.2**	**93.2%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
24656	3430	2319	690

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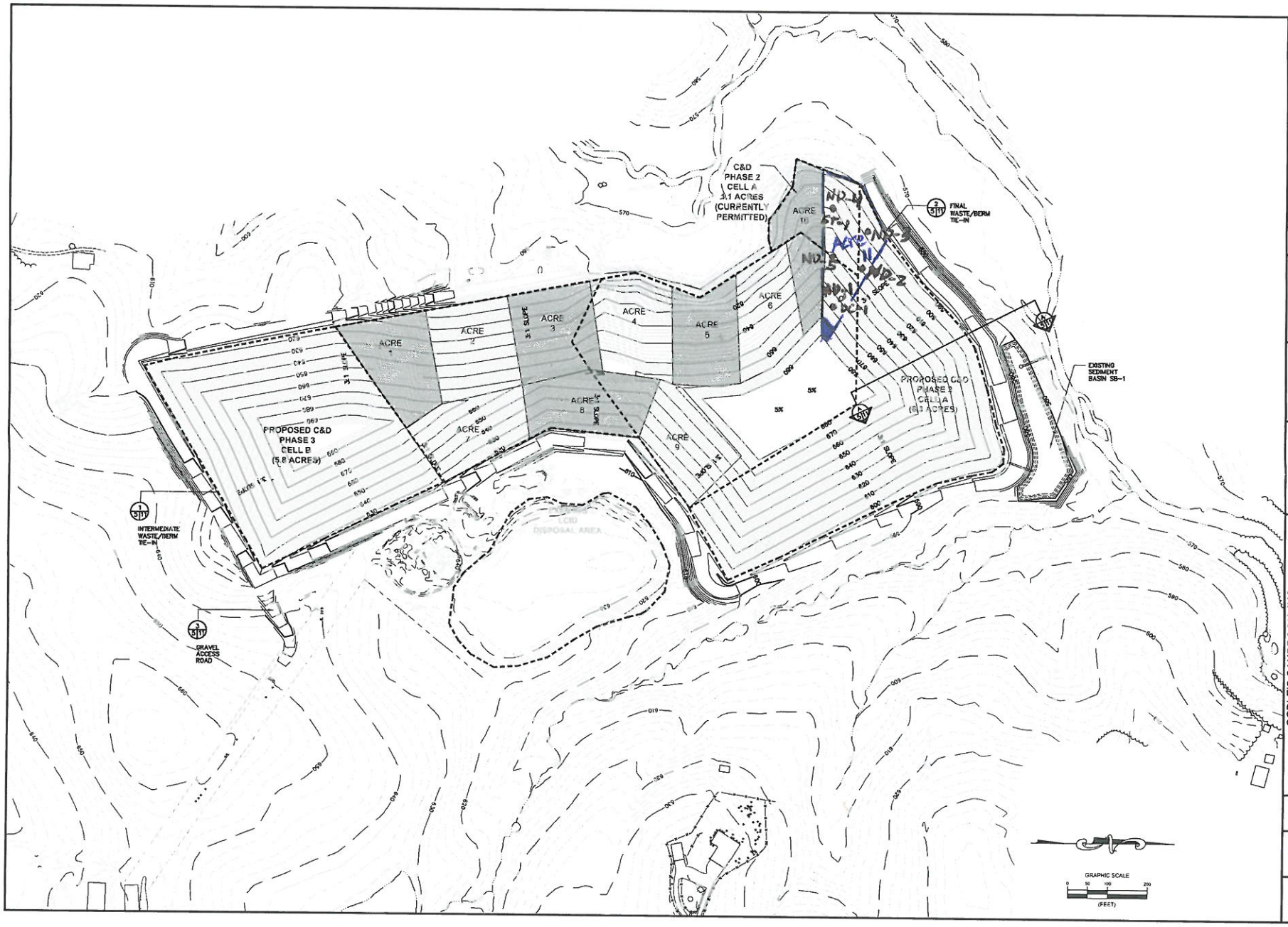

NO	BY	DK	APP
-	-	CJA	CJA

REVISIONS AND RECORD OF ISSUE

DATE

DESIGNED
DRAWN RB
CHECKED
APPROVED EA
DATE

JOYCE ENGINEERING
221 N. MULBERRY ROAD
GREENSBORO, NC
PHONE 324-0092
NC CORP. LIC. C-0672

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

PROJECT NO.
419.20

SCALE
AS SHOWN

DRAWING NO.
01

Client:	Joyce Engineering
Project Name :	Cobles Sandrock Landfill
Project Number :	2012-656

geotechnics
INTEGRITY IN TESTING

Report Number :	**DFR-17**
Date (s) :	12.10.12

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-02
Nuclear Test Number :	ND-01
Location:	Acre 11
Depth (ft):	Lift 1
Date :	12.10.12

Mold

Cylinder ID	#1
Weight of Cylinder (lbs.)	1.34
Volume of Cylinder (ft^3)	0.033

Specimen

Wt. of Cylinder & WS (lbs.)	5.20
Wt. of Cylinder (lbs.)	1.34
Wt. of WS	3.86
Cylinder Volume (ft^3)	0.033

Moisture / Density

Tare Number	#311
Wt. of Tare & WS (gm)	248.20
Wt. of Tare & DS (gm)	219.87
Wt. of Tare (gm)	84.90
Wt. of Water (gm)	28.33
Wt. of DS (gm)	134.97
Wet Density (pcf):	117.0
Moisture Content (%):	**21.0**
Dry Density (pcf):	**96.7**
Compaction (%)	91.6

Geotechnics Representative : Abe Gaeta

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Day:	Thursday
Date:	1.9.13
Log No.:	18
Page:	1 of 1

geotechnics
INTEGRITY IN TESTING

Daily Field Report

Project Name:	Cobles Sandrock C&D Landfill	**Project No.:**	2013-606
Client Name:	Joyce Enginneering	**Client Contact:**	Hannu K.
Site Location:	Liberty, NC	**Time on Site:**	**Arrived:** 12:30 PM **Departed:** 3:00 PM
General Contractor:	Cobles Sandrock C&D Landfill	**Superintendent:**	Kent Cobles

Other Firms / Sub-Contractor Represented On Site

Firm / Sub-Contractor	Representative's Name and Title

Weather Conditions:	Sunny	**Temperature:**	59

Contractor's Equipment: N/A

Contractor's Personnel: N/A

Description of Daily Activities & Events

- Geotechnics representative Abe Gaeta arrived on jobsite.
- Geotechnics Rep. performed CQA Moisture / Density testing of Acre 11 - Lift 2. (5) Nuclear density tests, and (1) Drive Cylinder test were performed onsite.
- Geotechnics Rep. obtained an Undisturbed Shelby Tube, and 1 back-up sample for laboratory testing.
- Geotechnics representative departed jobsite.

Prepared By: AG **Date:** 1.9.13 **Checked By:** MPS **Date:** 1/11

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Client: JOYCE ENGINEERING
Project Name : COBLES SANDROCK LANDFILL
Project Number : 2013-606

Geotechnics
INTEGRITY IN TESTING

Field Density Report

Report Number : **FDR-17**	Geotechnics Representative : Abe Gaeta	Page : 1 of 1	
Date (s) : **1.9.13**	Reviewed By : MPS	Date : 1/11	

Contractor : Cobles Sandrock Landfill	Borrow Source : On-site

Compaction Equipment : Sheepsfoot trash compactor

Test Number	Test Location	Elevation/ Lift	Rod Depth	Proctor I.D. No.	Proctor Data		Measured In Place			Compaction		Comments
					MDD pcf	Opt. %M	WD (pcf)	% M	DD (pcf)	% C	% Req.	
ND - 01	Acre 11	Lift 2	6"	656-01-02	112.8	15.1	**125.4**	**12.7**	**111.3**	**98.6%**	**90.0%**	
DC - 01	Acre 11	Lift 2	N/A	656-01-02	112.8	15.1	**122.4**	**9.4**	**111.9**	**99.2%**	**90.0%**	DC-01 & ST-01 taken @ ND-01
ND - 02	Acre 11	Lift 2	6"	656-01-01	105.6	18.2	**116.1**	**20.4**	**96.4**	**91.3%**	**90.0%**	
ND - 03	Acre 11	Lift 2	6"	656-01-02	112.8	15.1	**129.7**	**17.0**	**110.9**	**98.3%**	**90.0%**	
ND - 04	Acre 11	Lift 2	6"	656-01-02	112.8	15.1	**125.5**	**17.4**	**106.9**	**94.8%**	**90.0%**	
ND - 05	Acre 11	Lift 2	6"	656-01-02	112.8	15.1	**125.4**	**18.4**	**105.9**	**93.9%**	**90.0%**	

Gauge Number	Gauge Model	Density Count	Moisture Count
33260	3430	2407	648

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Client:	Joyce Engineering
Project Name :	Cobles Sandrock Landfill
Project Number :	2013-606

geotechnics
INTEGRITY IN TESTING

Report Number :	**DFR-18**
Date (s) :	1.9.13

Drive Cylinder - ASTM D 2937

Test Information

Test Number :	DC-01
Nuclear Test Number :	ND-01
Location:	Acre 11
Depth (ft):	Lift 2
Date :	1.9.13

Mold

Cylinder ID	#1
Weight of Cylinder (lbs.)	1.04
Volume of Cylinder (ft^3)	0.034

Specimen

Wt. of Cylinder & WS (lbs.)	5.20
Wt. of Cylinder (lbs.)	1.04
Wt. of WS	4.16
Cylinder Volume (ft^3)	0.034

Moisture / Density

Tare Number	SS-5
Wt. of Tare & WS (gm)	367.60
Wt. of Tare & DS (gm)	344.20
Wt. of Tare (gm)	95.00
Wt. of Water (gm)	23.40
Wt. of DS (gm)	249.20
Wet Density (pcf):	122.4
Moisture Content (%):	**9.4**
Dry Density (pcf):	**111.9**
Compaction (%)	99.2

Geotechnics Representative : Abe Gaeta

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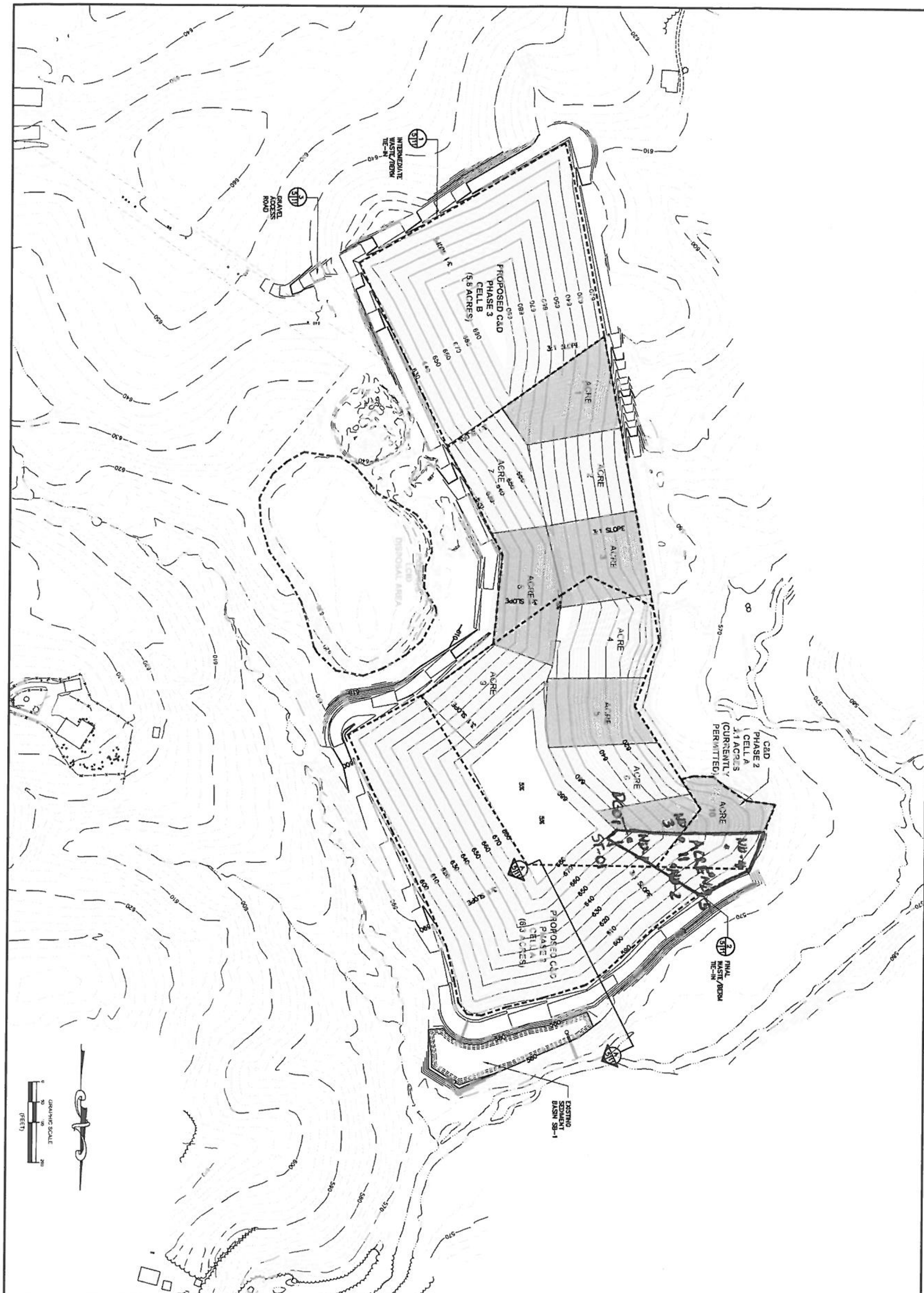

PROJECT NO.	419.20
SCALE	AS SHOWN
DRAWING NO.	01

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

LANDFILL PARTIAL CLOSURE
ACRE MAP

JOYCE ENGINEERING
2211 W. MEADOWVIEW ROAD
GREENSBORO, NC
PHONE: (336) 323-0092
NC CORP LIC

DESIGNED	SC
DRAWN	RB
CHECKED	EA
APPROVED	EA
DATE	6/15/07

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DATE	REVISIONS AND RECORD OF ISSUE	NO	BY	CK	APP
	REVISED CLOSURE GRADES	1		EEA	EEA

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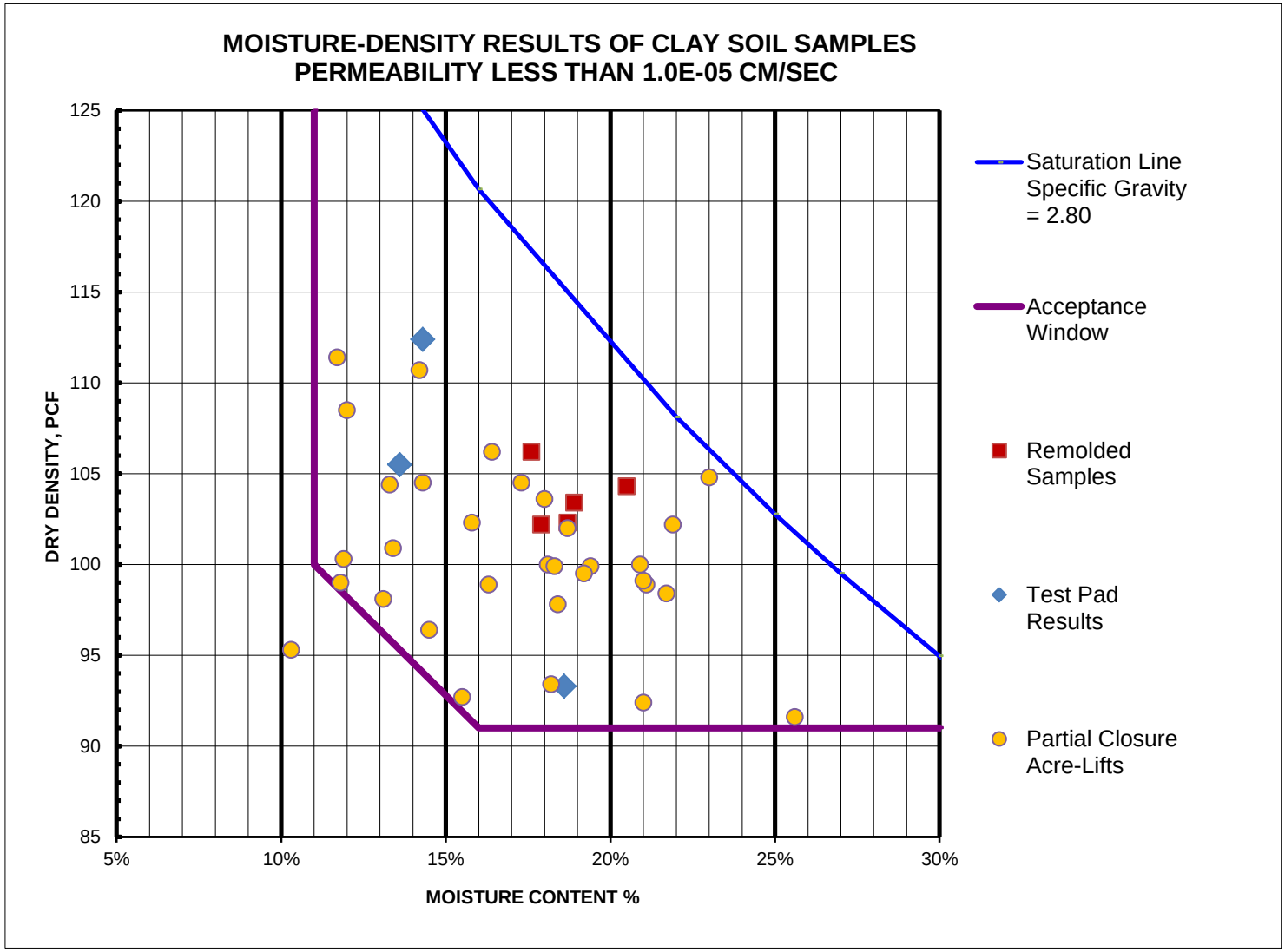
APPENDIX 3 – HYDRAULIC CONDUCTIVITY TEST RESULTS

COBLE'S SANDROCK CDLF PARTIAL CLOSURE CONSTRUCTION 2012-2013
Project 419.1201, Task 02

JOYCE ENGINEERING



PRE-CONSTRUCTION TESTING			Standard Proctor		Remolded Lab Samples				Perm	Atterberg Limits			
Lab ID	Sample	USCS	OMC	MDD	MC	OMC-MC	DD	DD/MDD	(cm/sec)	Fines	LL	PL	PI
2012-656-01-01	Lowperm	ML	18.2%	105.6	20.5%	2.3%	104.3	98.8%	1.1E-06	66.7%	37	30	7
2012-656-01-02	Intermed	CL	15.1%	112.8	17.6%	2.5%	106.2	94.1%	4.7E-07	56.0%	39	25	14
CONSTRUCTION TESTING			Standard Proctor		Remolded Lab Samples				Perm	Atterberg Limits			
Lab ID	Sample	USCS	OMC	MDD	MC	OMC-MC	DD	DD/MDD	(cm/sec)	Fines	LL	PL	PI
2012-656-12-01	P-1	ML	16.0%	107.1	17.9%	1.9%	102.2	95.4%	4.7E-06	66.7%	39	30	9
12-02	P-2	ML	17.6%	106.5	18.7%	1.1%	102.3	96.1%	1.1E-06	56.0%	41	27	14
12-03	P-3	SM	16.8%	108.8	18.9%	2.1%	103.4	95.0%	4.6E-06	56.0%	38	28	10
TEST PAD			Standard Proctor		Test Pad Lab Samples				Perm				
Lab ID	Sample	USCS	OMC	MDD	MC	OMC-MC	DD	DD/MDD	(cm/sec)				
2012-656-02-01	ST-TP-01	ML	18.2%	105.6	18.6%	0.4%	93.3	88.4%	1.7E-06				
03-01	ST-TP-02	ML	18.2%	105.6	13.6%	-4.6%	105.5	99.9%	5.0E-06				
04-01	ST-TP-03	CL	15.1%	112.8	14.3%	-0.8%	112.4	99.6%	3.8E-07				
CLOSURE CAP			Standard Proctor		Shelby Tube Samples				Perm				
Lab ID	Sample	USCS	OMC	MDD	MC	OMC-MC	DD	DD/MDD	(cm/sec)				
2012-656-02-01	A1 L1	ML	18.2%	105.6	18.6%	0.4%	93.3	88.4%	1.7E-06				
03-01	A1 L2	ML	16.0%	107.1	13.6%	-2.4%	105.5	98.5%	5.0E-06				
04-01	A1 L3	CL	15.1%	112.8	14.3%	-0.8%	112.4	99.6%	3.8E-07				
2012-656-03-02	A2 L1	ML	18.2%	105.6	21.1%	2.9%	98.9	93.7%	3.7E-08				
03-05	A2 L2	ML	18.2%	105.6	11.8%	-6.4%	99.0	93.8%	6.1E-07				
04-02	A2 L3	ML	18.2%	105.6	23.0%	4.8%	104.8	99.2%	6.3E-08				
2012-656-02-03	A3 L1	ML	18.2%	105.6	11.9%	-6.3%	100.3	95.0%	2.2E-06				
03-03	A3 L2	ML	18.2%	105.6	18.1%	-0.1%	100.0	94.7%	2.1E-06				
04-03	A3 L3	ML	18.2%	105.6	21.9%	3.7%	102.2	96.8%	3.1E-08				
2012-656-02-04	A4 L1	ML	18.2%	105.6	14.3%	-3.9%	104.5	99.0%	3.5E-06				
03-04	A4 L2	ML	18.2%	105.6	18.0%	-0.2%	103.6	98.1%	4.6E-08				
04-04	A4 L3	ML	16.0%	107.1	16.4%	0.4%	106.2	99.2%	1.9E-07				
2012-656-05-01	A5 L1	ML	18.2%	105.6	10.3%	-7.9%	95.3	90.2%	5.5E-06				
06-01	A5 L2	ML	18.2%	105.6	16.3%	-1.9%	98.9	93.7%	3.7E-06				
07-01	A5 L3	ML	18.2%	105.6	25.6%	7.4%	91.6	86.7%	3.9E-07				
2012-656-05-02	A6 L1	ML	18.2%	105.6	18.4%	0.2%	97.8	92.6%	1.1E-06				
06-02	A6 L2	ML	18.2%	105.6	13.4%	-4.8%	100.9	95.5%	1.5E-06				
07-02	A6 L3	ML	18.2%	105.6	21.7%	3.5%	98.4	93.2%	1.5E-06				
2012-656-11-02	A7 L1	ML	18.2%	105.6	14.5%	-3.7%	96.4	91.3%	5.3E-06				
13-02	A7 L2	ML	18.2%	105.6	19.4%	1.2%	99.9	94.6%	2.4E-06				
14-01	A7 L3	ML	18.2%	105.6	18.3%	0.1%	99.9	94.6%	2.4E-05				
15-01	A7 L3R	ML	18.2%	105.6	18.7%	0.5%	102.0	96.6%	1.7E-07				
2012-656-11-01	A8 L1	ML	18.2%	105.6	15.5%	-2.7%	92.7	87.8%	4.3E-06				
13-01	A8 L2	ML	18.2%	105.6	19.2%	1.0%	99.5	94.2%	2.9E-06				
14-02	A8 L3	ML	18.2%	105.6	20.9%	2.7%	100.0	94.7%	7.1E-07				
2012-656-07-03	A9 L1	ML	18.2%	105.6	13.1%	-5.1%	98.1	92.9%	1.7E-06				
08-02	A9 L2	ML	18.2%	105.6	18.2%	0.0%	93.4	88.4%	8.4E-06				
09-01	A9L3	ML	18.2%	105.6	21.0%	2.8%	99.1	93.8%	1.1E-06				
2012-656-08-01	A10 L1	ML	18.2%	105.6	13.3%	-4.9%	104.4	98.9%	5.6E-06				
09-02	A10 L2	CL	15.1%	112.8	14.2%	-0.9%	110.7	98.1%	6.1E-06				
10-01	A10 L3	CL	15.1%	112.8	11.7%	-3.4%	111.4	98.8%	1.5E-06				
2012-656-16-01	A11L1	ML	18.2%	105.6	21.0%	2.8%	92.4	87.5%	9.0E-06				
2013-606-01-01	A11L2	ML	18.2%	105.6	15.8%	-2.4%	102.3	96.9%	2.5E-05				
01-01	A11L2R	ML	15.1%	112.8	12.0%	-3.1%	108.5	96.2%	1.3E-06				
02-01	A11L3	ML	18.2%	105.6	17.3%	-0.9%	104.5	99.0%	3.3E-07				

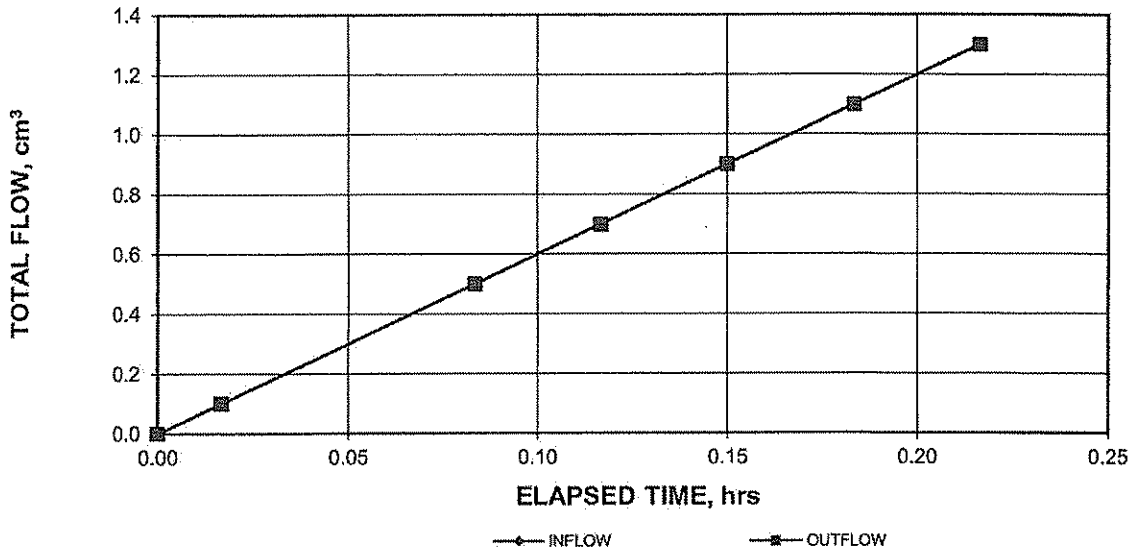
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

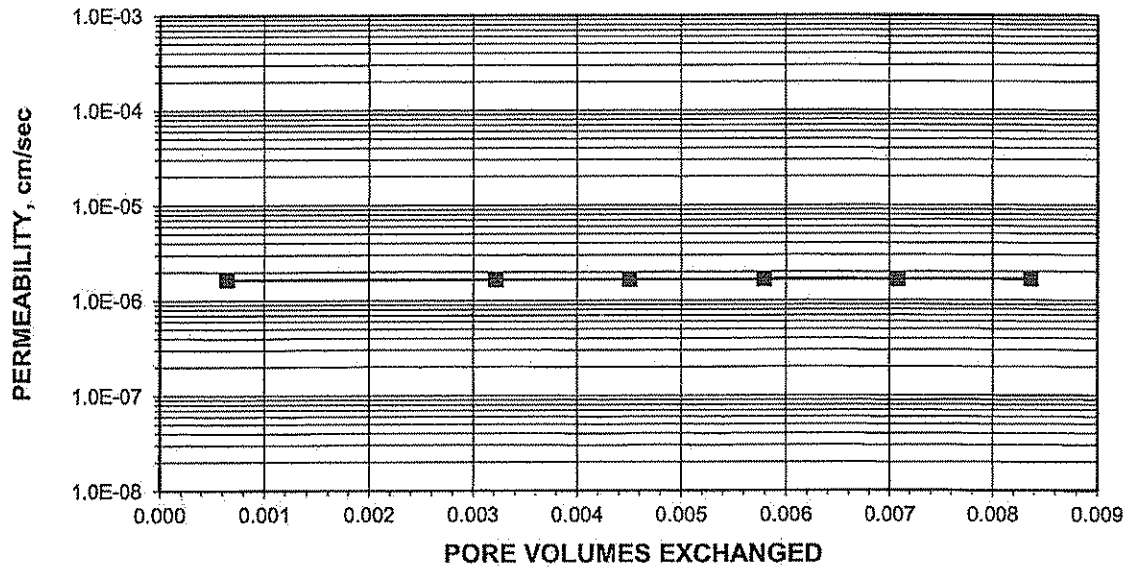
Client	JOYCE ENGINEERING	Boring No.	TEST PAD / ACRE 1
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-TP-01
Lab ID No.	2012-656-02-01		

AVERAGE PERMEABILITY = 1.7E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 4/16/2012 Checked By: GEM Date: 4-19-12

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	TEST PAD / ACRE 1
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-TP-01
Lab ID No.	2012-656-02-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: RED SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	8010	823
Wt. of Tare & WS (gm.)	358.88	426.98
Wt. of Tare & DS (gm.)	323.90	368.86
Wt. of Tare (gm.)	135.81	136.85
Wt. of Water (gm.)	34.98	58.12
Wt. of DS (gm.)	188.09	232.01
Moisture Content (%)	**18.6**	**25.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	651.94	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	651.94	687.41
Length 1 (in.)	3.601	3.526
Length 2 (in.)	3.566	3.466
Length 3 (in.)	3.504	3.416
Top Diameter (in.)	2.835	2.830
Middle Diameter (in.)	2.835	2.840
Bottom Diameter (in.)	2.835	2.836
Average Length (in.)	3.56	3.47
Average Area (in.^{2})	6.31	6.31
Sample Volume (cm^3)	367.94	358.96
Unit Wet Wt. (gm./ cm^3)	1.77	1.92
Unit Wet Wt. (pcf)	110.6	119.5
Unit Dry Wt. (pcf)	93.3	95.6
Unit Dry Wt. (gm./ cm^3)	1.49	1.53
Void Ratio, e	0.81	0.76
Porosity, n	0.45	0.43
Pore Volume (cm^3)	164.3	155.4
Total Wgt. Of Sample After Test		685.03

Tested By: BW Date: 4/16/2012 Checked By: GEM Date: 4-19-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-02-01 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	TEST PAD / ACRE 1
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-TP-01
Lab ID No.	2012-656-02-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	37.5	Sample Length (cm), L	8.81
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.20
Cell (psi)	45.0	Sample Area (cm^2), A	40.73
Total Pressure Head (cm)	175.8	Inflow Burette Area (cm^2), a-in	0.888
Hydraulic Gradient	19.94	Outflow Burette Area (cm^2), a-out	0.890
		B Parameter (%)	95

AVERAGE PERMEABILITY = 1.7E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
4/17/2012	12	35	0.00	0.0	0.0	197.0	0	24.4	NA
4/17/2012	12	36	0.02	0.1	0.1	196.8	0	24.4	1.6E-06
4/17/2012	12	40	0.08	0.5	0.5	195.9	0	24.4	1.7E-06
4/17/2012	12	42	0.12	0.7	0.7	195.4	0	24.4	1.7E-06
4/17/2012	12	44	0.15	0.9	0.9	195.0	0	24.4	1.7E-06
4/17/2012	12	46	0.18	1.1	1.1	194.5	0	24.4	1.7E-06
4/17/2012	12	48	0.22	1.3	1.3	194.1	1	24.4	1.7E-06

Tested By: BW Date: 4/16/2012 Checked By: GEM Date: 4-19-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-02-01 PERMflow w header.xls]Sheet1

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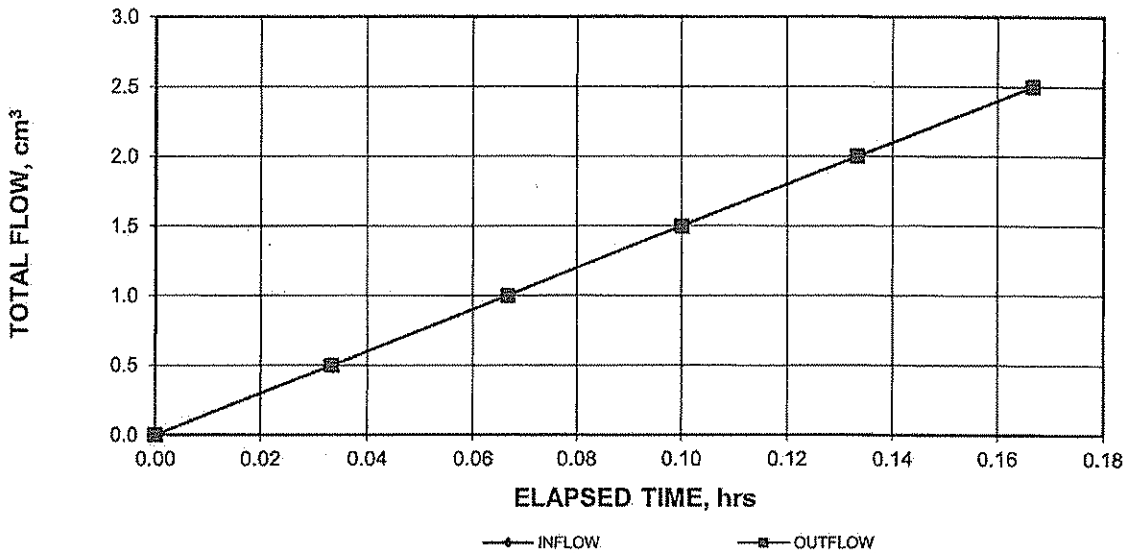
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

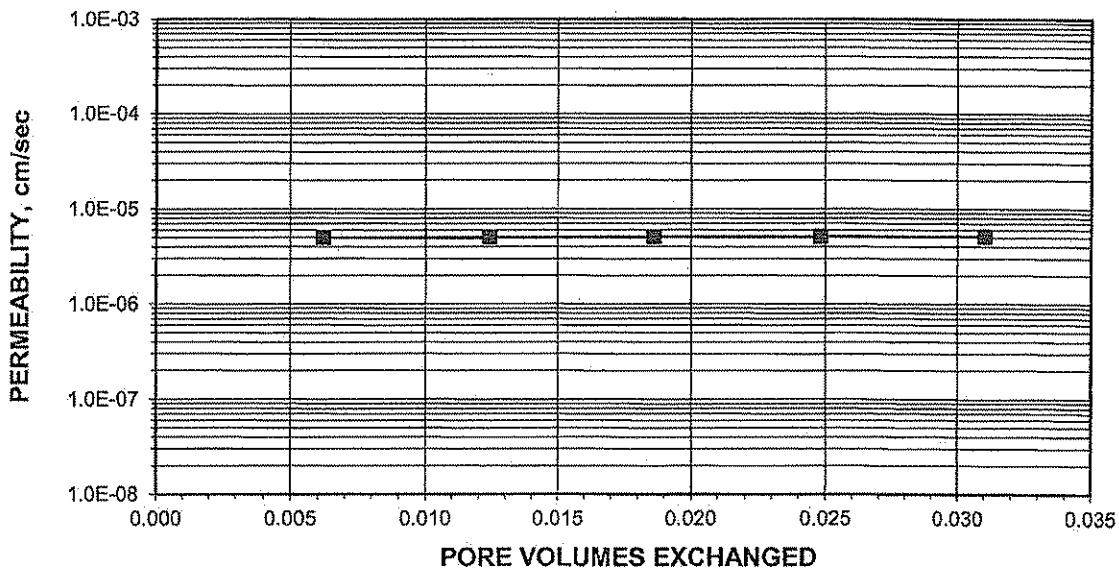
Client	JOYCE ENGINEERING	Boring No.	ND-4
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A1 / TP
Lab ID No.	2012-656-03-01		

AVERAGE PERMEABILITY = 5.0E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.0E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 5/4/2012 Checked By: BW Date: 5/8/12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 PROJECTS\2012-656 JOYCE\[2012-656-03-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ND-4
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A1
Lab ID No.	2012-656-03-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	B-4	810
Wt. of Tare & WS (gm.)	436.93	311.94
Wt. of Tare & DS (gm.)	396.43	290.55
Wt. of Tare (gm.)	98.40	114.64
Wt. of Water (gm.)	40.50	21.39
Wt. of DS (gm.)	298.03	175.91
Moisture Content (%)	**13.6**	**12.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	584.50	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	584.50	577.14
Length 1 (in.)	2.932	2.659
Length 2 (in.)	2.932	2.584
Length 3 (in.)	2.932	2.715
Top Diameter (in.)	2.840	2.808
Middle Diameter (in.)	2.840	2.818
Bottom Diameter (in.)	2.840	2.828
Average Length (in.)	2.93	2.65
Average Area (in.^{2})	6.33	6.24
Sample Volume (cm^3)	304.36	271.12
Unit Wet Wt. (gm./ cm^3)	1.92	2.13
Unit Wet Wt. (pcf)	119.9	132.9
Unit Dry Wt. (pcf)	105.5	118.5
Unit Dry Wt. (gm./ cm^3)	1.69	1.90
Void Ratio, e	0.60	0.42
Porosity, n	0.37	0.30
Pore Volume (cm^3)	113.8	80.5
Total Wgt. Of Sample After Test		581.71

Tested By: BW Date: 5/4/2012 Checked By: BW Date: 5/8/12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-01 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ND-4
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A1
Lab ID No.	2012-656-03-01		
121044			

41

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	6.74
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.16
Cell (psi)	45.0	Sample Area (cm^2), A	40.24
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.977
Hydraulic Gradient	15.65	Outflow Burette Area (cm^2), a-out	0.868
		B Parameter (%)	99

AVERAGE PERMEABILITY = 5.0E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.0E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
5/7/2012	2	1	0.00	0.0	0.0	126.7	0	24.4	NA
5/7/2012	2	3	0.03	0.5	0.5	125.6	0	24.4	5.0E-06
5/7/2012	2	5	0.07	1.0	1.0	124.5	0	24.4	5.0E-06
5/7/2012	2	7	0.10	1.5	1.5	123.5	0	24.4	5.1E-06
5/7/2012	2	9	0.13	2.0	2.0	122.4	0	24.4	5.1E-06
5/7/2012	2	11	0.17	2.5	2.5	121.3	1	24.4	5.2E-06

Tested By: BW Date: 5/4/2012 Checked By: BW Date: 5/8/12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-01 PERMflow w header.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

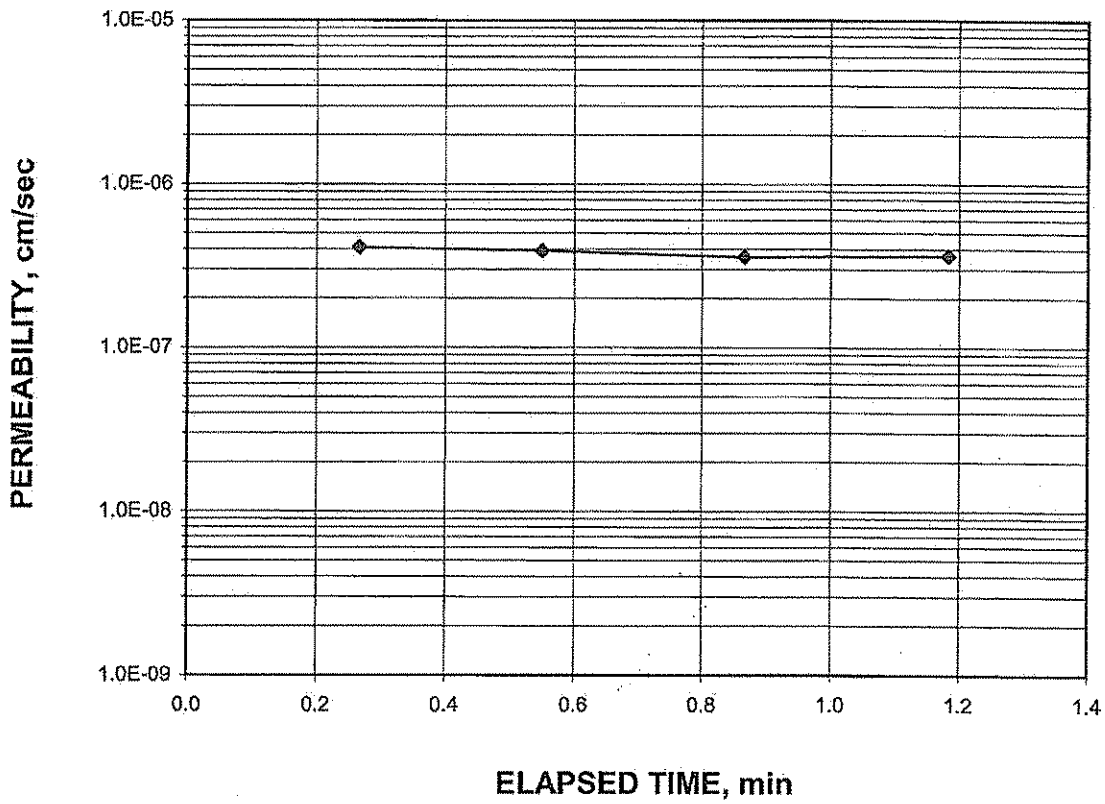
ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 1/TEST PAD
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A1/TP-03
Lab ID No.	2012-656-04-01		

Visual Description: REDDISH BROWN SANDY SILT

AVERAGE PERMEABILITY = 3.8E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.8E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 5/22/2012 Checked By: [illegible] Date: 5/24

DCN: CT-22A DATE: 2/27/2012 REVISION: 2 G:\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-04-01 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 1/TEST PAD
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A1/TP-03
Lab ID No.	2012-656-04-01		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: REDDISH BROWN SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	SS-1	820
Wt. of Tare & WS (gm.)	261.06	334.30
Wt. of Tare & DS (gm.)	240.04	308.35
Wt. of Tare (gm.)	93.01	136.14
Wt. of Water (gm.)	21.02	25.95
Wt. of DS (gm.)	147.03	172.21
Moisture Content (%)	**14.3**	**15.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	535.65	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	535.65	539.27
Length 1 (in.)	2.491	2.448
Length 2 (in.)	2.513	2.461
Length 3 (in.)	2.513	2.470
Top Diameter (in.)	2.852	2.849
Middle Diameter (in.)	2.832	2.847
Bottom Diameter (in.)	2.838	2.805
Average Length (in.)	2.51	2.46
Average Area (in.^{2})	6.34	6.31
Sample Volume (cm^3)	260.23	254.19
Unit Wet Wt. (gm./ cm^3)	2.058	2.121
Unit Wet Wt. (pcf)	128.5	132.4
Unit Dry Wt. (pcf)	112.4	115.1
Unit Dry Wt. (gm./ cm^3)	1.801	1.844
Void Ratio, e	0.499	0.464
Porosity, n	0.333	0.317
Pore Volume (cm^3)	86.7	80.6
Total Wt. Of Sample After Test		543.58

Tested By: BW Date: 5/22/2012 Checked By: RMS Date: 5/24

DCN: CT-22A DATE: 5/16/2012 \\SERVER\DATA\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-04-01 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 1/TEST PAD
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A1/TP-03
Lab ID No.	2012-656-04-01		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	6.25
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.69
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	98	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.8E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.8E-09 m/sec @ 20°C

DATE	TIME				ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
5/23/2012	10	54	58	54.97	0.000	6.1	10.7	24.8	NA
5/23/2012	10	55	14	55.23	0.267	6.0	10.5	24.8	4.1E-07
5/23/2012	10	55	31	55.52	0.550	5.9	10.2	24.8	3.9E-07
5/23/2012	10	55	50	55.83	0.867	5.8	10.0	24.8	3.6E-07
5/23/2012	10	56	9	56.15	1.183	5.7	9.8	24.8	3.7E-07

Tested By: BW Date: 5/22/2012 Checked By: MDS Date: 5/24

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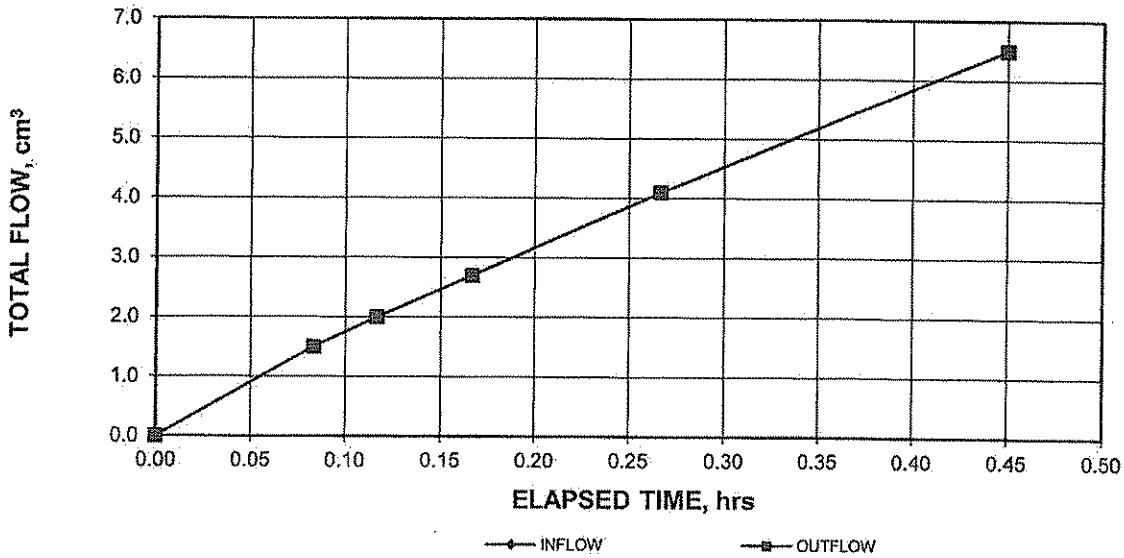
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

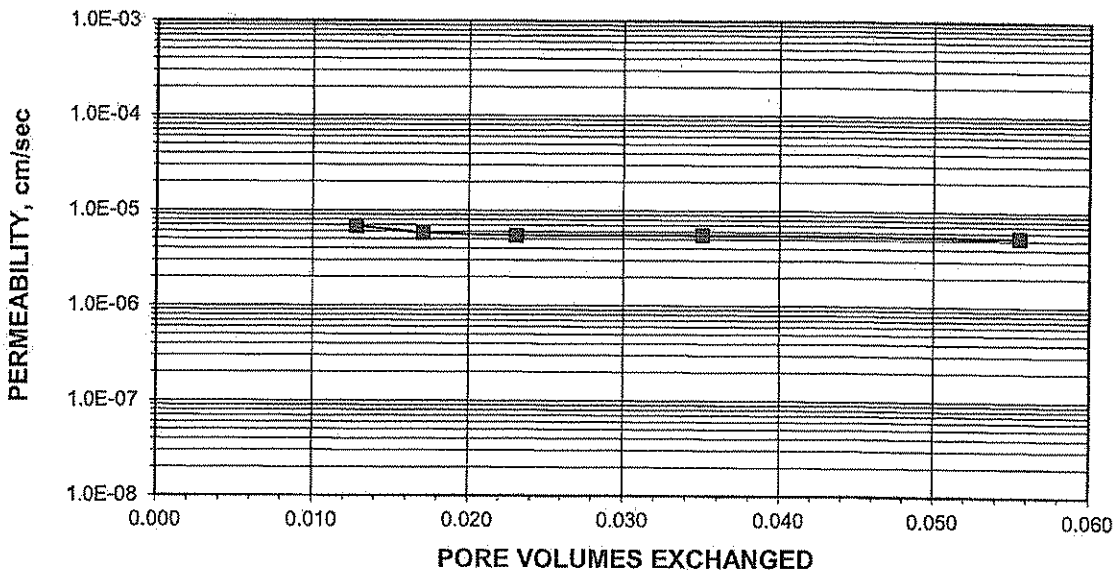
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT ~~2~~ 1
Project No.	2012-656-08	Sample No.	ST-A10-L1
Lab ID No.	2012-656-08-01		

AVERAGE PERMEABILITY = 5.6E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.6E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/20/2012 Checked By: GDM Date: 8-22-12

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT ~~2~~ 1
Project No.	2012-656-08	Sample No.	ST-A10-L1
Lab ID No.	2012-656-08-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	813	811
Wt. of Tare & WS (gm.)	339.24	357.93
Wt. of Tare & DS (gm.)	312.62	315.48
Wt. of Tare (gm.)	111.96	106.12
Wt. of Water (gm.)	26.62	42.45
Wt. of DS (gm.)	200.66	209.36
Moisture Content (%)	**13.3**	**20.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	583.72	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	583.72	619.85
Length 1 (in.)	3.030	2.967
Length 2 (in.)	3.036	3.022
Length 3 (in.)	3.034	3.034
Top Diameter (in.)	2.809	2.824
Middle Diameter (in.)	2.807	2.821
Bottom Diameter (in.)	2.814	2.816
Average Length (in.)	3.03	3.01
Average Area (in.^{2})	6.20	6.25
Sample Volume (cm^3)	308.26	307.91
Unit Wet Wt. (gm./ cm^3)	1.89	2.01
Unit Wet Wt. (pcf)	118.2	125.7
Unit Dry Wt. (pcf)	104.4	104.5
Unit Dry Wt. (gm./ cm^3)	1.67	1.67
Void Ratio, e	0.62	0.61
Porosity, n	0.38	0.38
Pore Volume (cm^3)	117.4	117.0
Total Wgt. Of Sample After Test		621.57

Tested By: BW Date: 8/20/2012 Checked By: GM Date: 8-22-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-08-01 PERMflow w header.xls]Sheet1
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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT ~~2~~ 1
Project No.	2012-656-08	Sample No.	ST-A10-L1
Lab ID No.	2012-656-08-01		

Pressure Heads (Constant)

Top Cap (psi)	38.5
Bottom Cap (psi)	40.0
Cell (psi)	45.0
Total Pressure Head (cm)	105.5
Hydraulic Gradient	13.80

Final Sample Dimensions

Sample Length (cm), L	7.64
Sample Diameter (cm)	7.16
Sample Area (cm^2), A	40.30
Inflow Burette Area (cm^2), a-in	0.852
Outflow Burette Area (cm^2), a-out	0.972
B Parameter (%)	96

AVERAGE PERMEABILITY = 5.6E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.6E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/21/2012	10	13	0.00	0.0	0.0	127.4	0	23.8	NA
8/21/2012	10	18	0.08	1.5	1.5	124.1	0	23.8	6.9E-06
8/21/2012	10	20	0.12	2.0	2.0	123.0	0	23.9	5.8E-06
8/21/2012	10	23	0.17	2.7	2.7	121.5	0	23.9	5.5E-06
8/21/2012	10	29	0.27	4.1	4.1	118.4	0	24.0	5.6E-06
8/21/2012	10	40	0.45	6.5	6.5	113.1	1	24.1	5.4E-06

Tested By: BW Date: 8/20/2012 Checked By: GEM Date: 8-22-12

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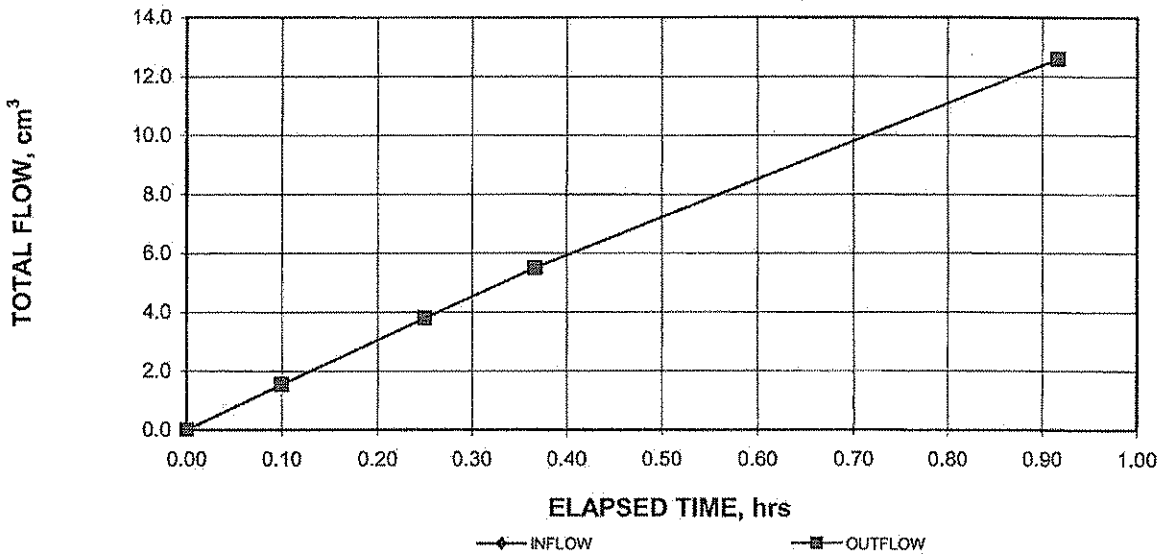
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

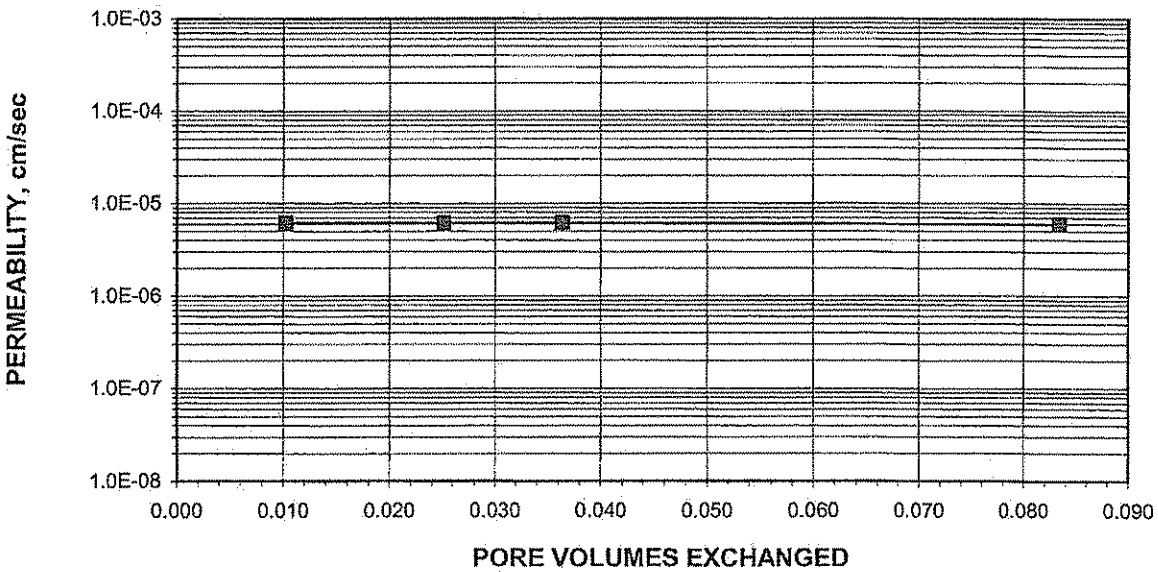
Client	JOYCE ENGINEERING	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-09	Sample No.	ST-A10-L2
Lab ID No.	2012-656-09-02		

AVERAGE PERMEABILITY = 6.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

DCN: CT-22 DATE: [illegible] PROJECTS\2012-656 JOYCE - Cobles\[2012-656-09-02 PERM flow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-09	Sample No.	ST-A10-L2
Lab ID No.	2012-656-09-02		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: REDDISH BROWN SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	802	802
Wt. of Tare & WS (gm.)	372.65	366.78
Wt. of Tare & DS (gm.)	324.30	316.92
Wt. of Tare (gm.)	103.58	103.77
Wt. of Water (gm.)	48.35	49.86
Wt. of DS (gm.)	220.72	213.15
Moisture Content (%)	**21.9**	**23.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	634.86	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	634.86	642.60
Length 1 (in.)	3.279	3.272
Length 2 (in.)	3.311	3.290
Length 3 (in.)	3.273	3.270
Top Diameter (in.)	2.872	2.858
Middle Diameter (in.)	2.845	2.851
Bottom Diameter (in.)	2.846	2.856
Average Length (in.)	3.29	3.28
Average Area (in.^{2})	6.40	6.40
Sample Volume (cm^3)	344.74	343.81
Unit Wet Wt. (gm./ cm^3)	1.84	1.87
Unit Wet Wt. (pcf)	115.0	116.7
Unit Dry Wt. (pcf)	94.3	94.6
Unit Dry Wt. (gm./ cm^3)	1.51	1.51
Void Ratio, e	0.79	0.78
Porosity, n	0.44	0.44
Pore Volume (cm^3)	151.9	150.9
Total Wgt. Of Sample After Test		658.69

Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-09	Sample No.	ST-A10-L2
Lab ID No.	2012-656-09-02		
121044			

41

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	8.32
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.25
Cell (psi)	45.0	Sample Area (cm^2), A	41.30
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	12.67	Outflow Burette Area (cm^2), a-out	0.972
		B Parameter (%)	98

AVERAGE PERMEABILITY = 6.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/29/2012	11	35	0.00	0.0	0.0	128.6	0	24.6	NA
8/29/2012	11	41	0.10	1.6	1.6	125.2	0	24.6	6.1E-06
8/29/2012	11	50	0.25	3.8	3.8	120.2	0	24.6	6.1E-06
8/29/2012	11	57	0.37	5.5	5.5	116.5	0	24.6	6.2E-06
8/29/2012	12	30	0.92	12.6	12.6	100.9	0	24.6	5.9E-06

Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

DCN: CT-22 DATE\SERVER\DISK D\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-09-02 PERMflow w header.xls]Sheet1

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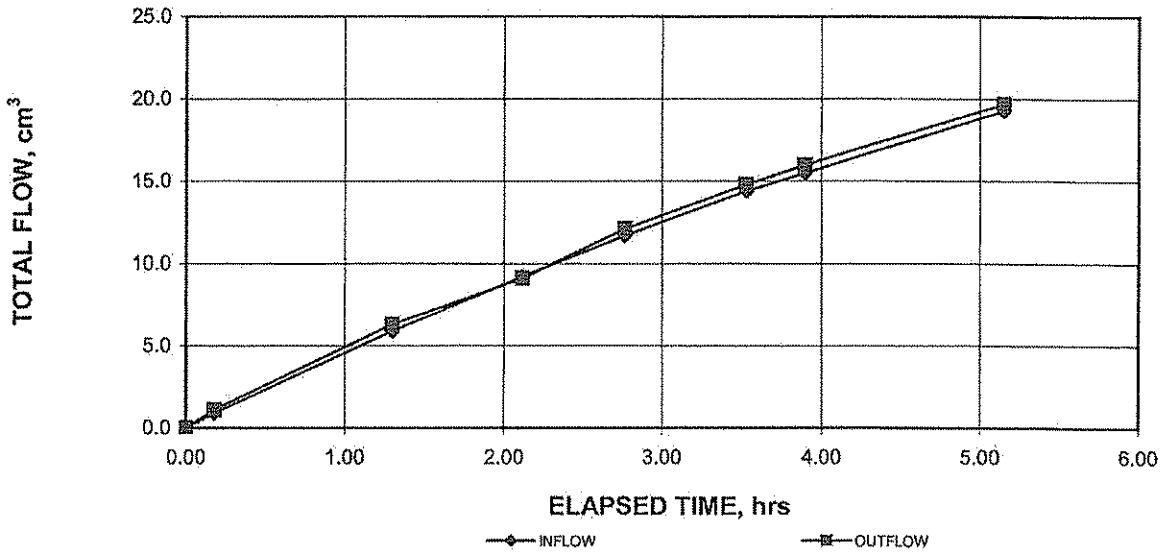
PERMEABILITY TEST

ASTM D 5084-03

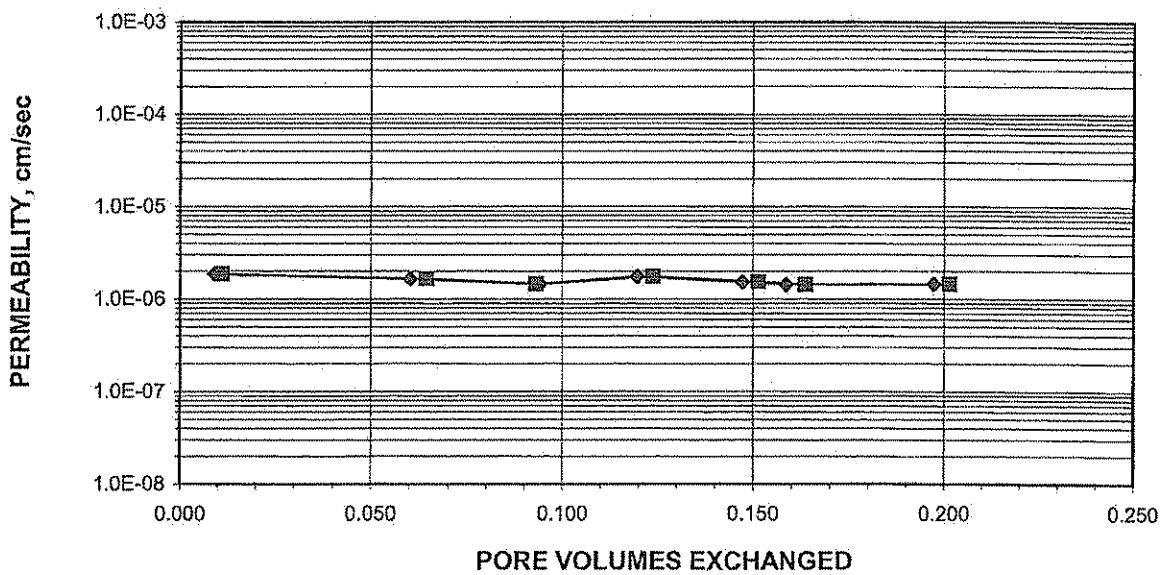
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-10	Sample No.	ST-A10-L3
Lab ID No.	2012-656-10-01		

AVERAGE PERMEABILITY = 1.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.5E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 9/6/2012 Checked By: MMS Date: 9/7

DCN: CT-22 DATE: [illegible] \2012-656 JOYCE - Cobles\[2012-656-10-01 PERMflow w header..xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-10	Sample No.	ST-A10-L3
Lab ID No.	2012-656-10-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: ORANGE YELLOW SANDY CLAY WITH ROCKS

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	804	806
Wt. of Tare & WS (gm.)	322.82	398.92
Wt. of Tare & DS (gm.)	300.11	350.18
Wt. of Tare (gm.)	105.22	102.05
Wt. of Water (gm.)	22.71	48.74
Wt. of DS (gm.)	194.89	248.13
Moisture Content (%)	**11.7**	**19.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	614.27	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	614.27	658.23
Length 1 (in.)	2.988	2.962
Length 2 (in.)	3.001	2.956
Length 3 (in.)	2.938	2.922
Top Diameter (in.)	2.849	2.825
Middle Diameter (in.)	2.844	2.859
Bottom Diameter (in.)	2.817	2.775
Average Length (in.)	2.98	2.95
Average Area (in.^{2})	6.32	6.24
Sample Volume (cm^3)	308.17	301.52
Unit Wet Wt. (gm./ cm^3)	1.99	2.18
Unit Wet Wt. (pcf)	124.4	136.3
Unit Dry Wt. (pcf)	111.4	113.9
Unit Dry Wt. (gm./ cm^3)	1.79	1.82
Void Ratio, e	0.51	0.48
Porosity, n	0.34	0.32
Pore Volume (cm^3)	104.4	97.8
Total Wgt. Of Sample After Test		639.05

Tested By: SFS Date: 9/6/2012 Checked By: [illegible] Date: 9/7

DCN: CT-22 DATE: 8/2/2011 REVISION: 1 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-10-01 PERMflow w header..xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-03

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-10	Sample No.	ST-A10-L3
Lab ID No.	2012-656-10-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.48
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.16
Cell (psi)	45.0	Sample Area (cm^2), A	40.29
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.865
Hydraulic Gradient	14.09	Outflow Burette Area (cm^2), a-out	0.865
		B Parameter (%)	97

AVERAGE PERMEABILITY = 1.5E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.5E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
9/6/2012	12	37	0.00	0.0	0.0	133.0	0	25.5	NA
9/6/2012	12	48	0.18	0.9	1.1	130.7	0	25.5	1.9E-06
9/6/2012	13	55	1.30	5.9	6.3	119.0	0	25.5	1.6E-06
9/6/2012	14	44	2.12	9.2	9.1	112.0	0	25.5	1.5E-06
9/6/2012	15	23	2.77	11.7	12.1	105.7	0	25.5	1.7E-06
9/6/2012	16	9	3.53	14.4	14.8	99.5	0	25.5	1.5E-06
9/6/2012	16	31	3.90	15.5	16.0	96.9	0	25.5	1.4E-06
9/6/2012	17	46	5.15	19.3	19.7	88.3	1	25.5	1.5E-06

Tested By: SFS Date: 9/6/2012 Checked By: [illegible] Date: 9/7

DCN: CT-22 DATE: 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-10-01 PERMflow w header..xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

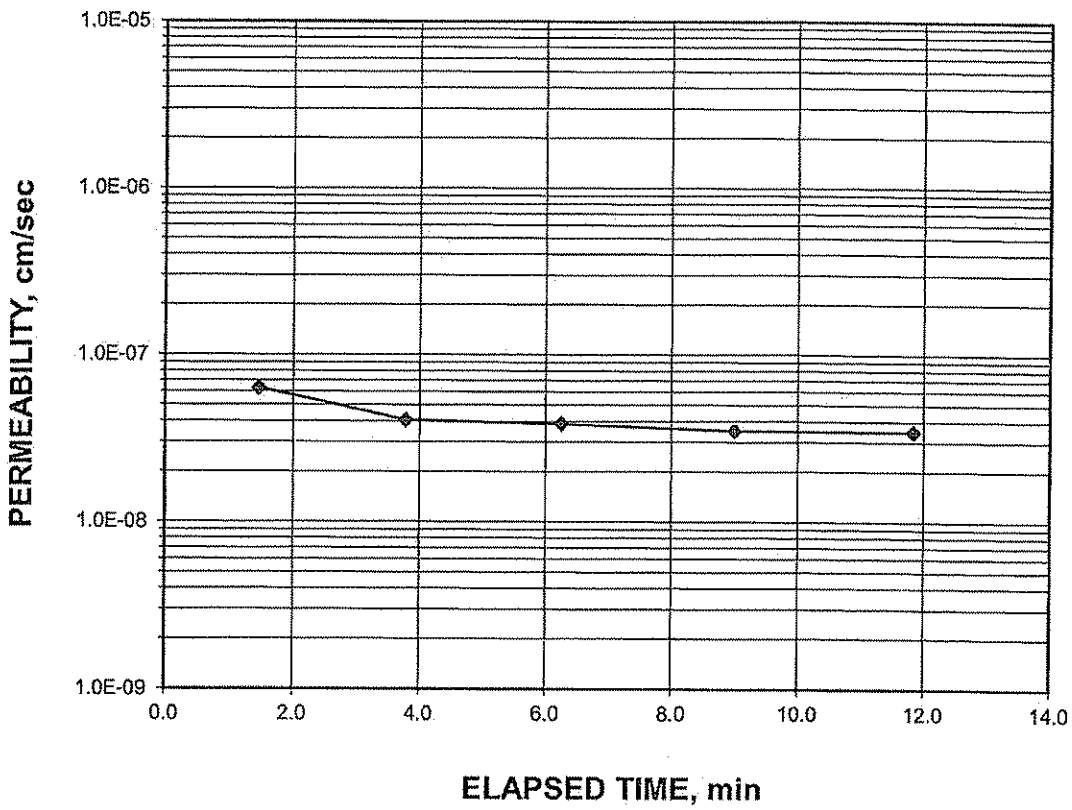
ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ND-9
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-03	Sample No.	A2
Lab ID No.	2012-656-03-02		

Visual Description: BROWN SANDY CLAY

AVERAGE PERMEABILITY = 3.7E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.7E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 5/4/2012 Checked By: GEM Date: 5-10-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-02 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ND-9
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-03	Sample No.	A2
Lab ID No.	2012-656-03-02		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	SS-5	809
Wt. of Tare & WS (gm.)	362.28	389.82
Wt. of Tare & DS (gm.)	316.09	332.92
Wt. of Tare (gm.)	97.36	114.88
Wt. of Water (gm.)	46.19	56.90
Wt. of DS (gm.)	218.73	218.04
Moisture Content (%)	**21.1**	**26.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	570.89	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	570.89	594.36
Length 1 (in.)	2.819	2.850
Length 2 (in.)	2.872	2.879
Length 3 (in.)	2.883	2.879
Top Diameter (in.)	2.842	2.804
Middle Diameter (in.)	2.837	2.827
Bottom Diameter (in.)	2.851	2.863
Average Length (in.)	2.86	2.87
Average Area (in.^{2})	6.35	6.30
Sample Volume (cm^3)	297.38	296.04
Unit Wet Wt. (gm./ cm^3)	1.920	2.008
Unit Wet Wt. (pcf)	119.8	125.3
Unit Dry Wt. (pcf)	98.9	99.4
Unit Dry Wt. (gm./ cm^3)	1.585	1.592
Void Ratio, e	0.703	0.696
Porosity, n	0.413	0.410
Pore Volume (cm^3)	122.8	121.5
Total Wt. Of Sample After Test		593.87

Tested By: BW Date: 5/4/2012 Checked By: GEM Date: 5-10-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-02 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ND-9
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-03	Sample No.	A2
Lab ID No.	2012-656-03-02		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	7.29
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.62
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	99	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.7E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.7E-10 m/sec @ 20°C

DATE		TIME			ELAPSED TIME t	PIPETTE READING R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
5/7/2012	4	51	0	51.00	0.000	8.0	12.5	24.7	NA
5/7/2012	4	52	28	52.47	1.467	7.9	12.4	24.7	6.3E-08
5/7/2012	4	54	47	54.78	3.783	7.8	12.2	24.7	4.1E-08
5/7/2012	4	57	15	57.25	6.250	7.7	12.0	24.7	3.9E-08
5/7/2012	5	0	0	0.00	9.000	7.6	11.8	24.7	3.5E-08
5/7/2012	5	2	50	2.83	11.833	7.5	11.6	24.7	3.5E-08

Tested By: BW Date: 5/4/2012 Checked By: GEM Date: 5-10-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-02 Permometer wHeader.xls]Sheet1

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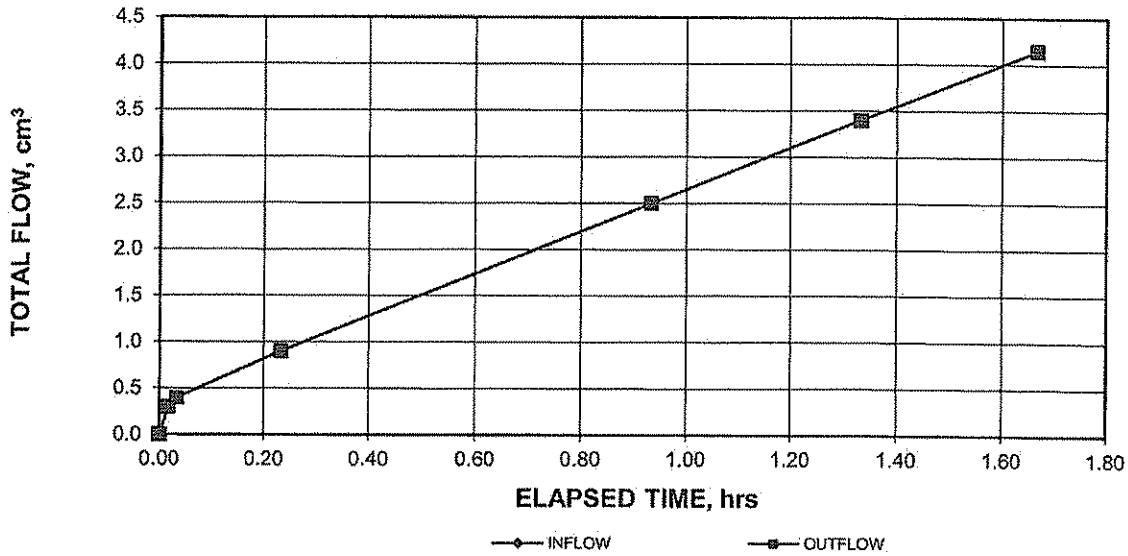
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

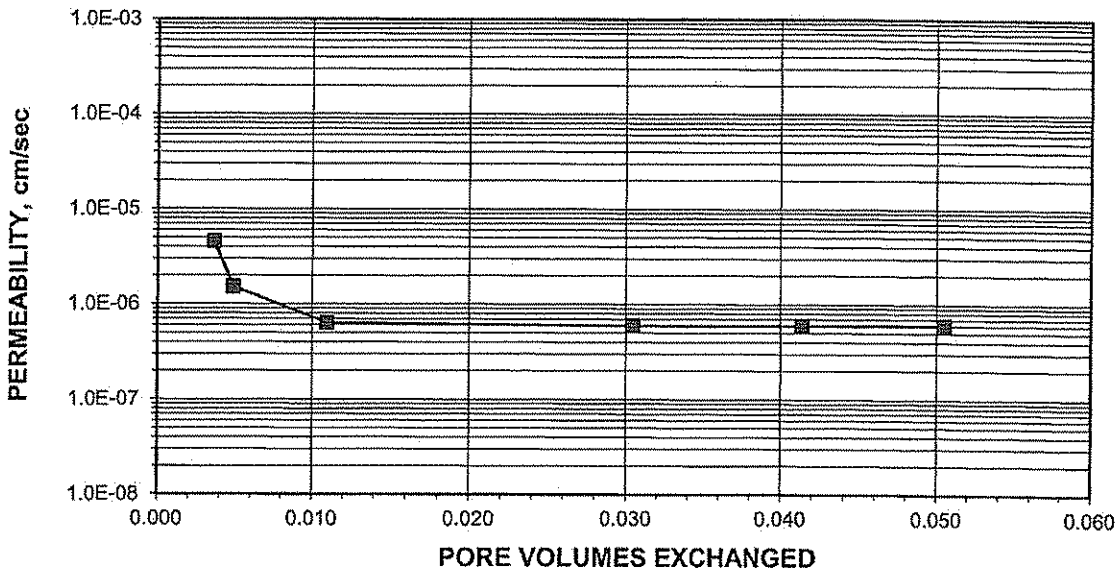
Client	JOYCE ENGINEERING	Boring No.	ND-21
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A2
Lab ID No.	2012-656-03-05		

AVERAGE PERMEABILITY = 6.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 5/13/2012 Checked By: GZM Date: 5-15-12

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ND-21
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A2
Lab ID No.	2012-656-03-05		

Specific Gravity 2.70 Assumed
Sample Condition Remolded

Visual Description: TAN SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	816	804
Wt. of Tare & WS (gm.)	306.95	494.61
Wt. of Tare & DS (gm.)	288.91	414.02
Wt. of Tare (gm.)	135.93	105.08
Wt. of Water (gm.)	18.04	80.59
Wt. of DS (gm.)	152.98	308.94
Moisture Content (%)	**11.8**	**26.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	367.33	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	367.33	414.30
Length 1 (in.)	2.004	2.012
Length 2 (in.)	2.001	1.996
Length 3 (in.)	2.006	1.996
Top Diameter (in.)	2.835	2.794
Middle Diameter (in.)	2.835	2.814
Bottom Diameter (in.)	2.835	2.831
Average Length (in.)	2.00	2.00
Average Area (in.^{2})	6.31	6.21
Sample Volume (cm^3)	207.26	203.82
Unit Wet Wt. (gm./ cm^3)	1.77	2.03
Unit Wet Wt. (pcf)	110.6	126.9
Unit Dry Wt. (pcf)	99.0	100.6
Unit Dry Wt. (gm./ cm^3)	1.59	1.61
Void Ratio, e	0.70	0.67
Porosity, n	0.41	0.40
Pore Volume (cm^3)	85.6	82.1
Total Wgt. Of Sample After Test		391.39

Tested By: BW Date: 5/13/2012 Checked By: GZM Date: 5-15-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-05 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ND-21
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A2
Lab ID No.	2012-656-03-05		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	5.08
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.15
Cell (psi)	45.0	Sample Area (cm^2), A	40.10
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	20.74	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	95

AVERAGE PERMEABILITY = 6.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
5/14/2012	2	30	0.00	0.0	0.0	126.3	0	24.2	NA
5/14/2012	2	31	0.02	0.3	0.3	125.7	0	24.2	4.6E-06
5/14/2012	2	32	0.03	0.4	0.4	125.5	0	24.2	1.5E-06
5/14/2012	2	44	0.23	0.9	0.9	124.5	0	24.2	6.4E-07
5/14/2012	3	26	0.93	2.5	2.5	121.2	0	24.2	5.9E-07
5/14/2012	3	50	1.33	3.4	3.4	119.3	0	24.2	6.0E-07
5/14/2012	4	10	1.67	4.2	4.2	117.8	1	24.2	6.0E-07

Tested By: BW Date: 5/13/2012 Checked By: GEM Date: 5-15-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-05 PERMflow w header.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

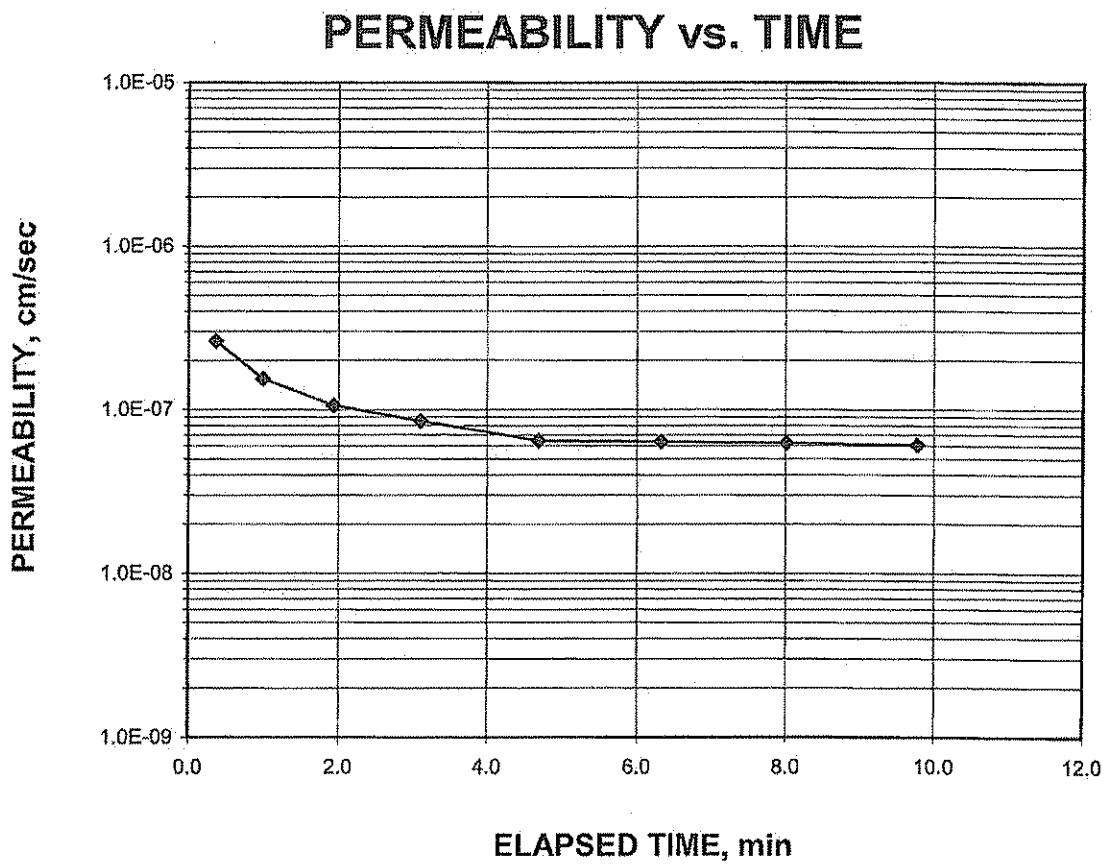
PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 2
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A2-03
Lab ID No.	2012-656-04-02		

Visual Description: BROWN SANDY CLAY

AVERAGE PERMEABILITY = 6.3E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.3E-10 m/sec @ 20°C



Tested By: BW Date: 5/22/2012 Checked By: MPS Date: 5/24

DCN: CT-22A DATE: 2/13/2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-04-02 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 2
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A2-03
Lab ID No.	2012-656-04-02		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	Z-12	813
Wt. of Tare & WS (gm.)	338.42	364.77
Wt. of Tare & DS (gm.)	292.83	319.12
Wt. of Tare (gm.)	94.66	112.2
Wt. of Water (gm.)	45.59	45.65
Wt. of DS (gm.)	198.17	206.92
Moisture Content (%)	**23.0**	**22.1**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	639.29	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	639.29	634.38
Length 1 (in.)	3.014	2.998
Length 2 (in.)	2.993	2.995
Length 3 (in.)	3.004	3.002
Top Diameter (in.)	2.832	2.831
Middle Diameter (in.)	2.832	2.835
Bottom Diameter (in.)	2.826	2.837
Average Length (in.)	3.00	3.00
Average Area (in.^{2})	6.29	6.31
Sample Volume (cm^3)	309.61	310.01
Unit Wet Wt. (gm./ cm^3)	2.065	2.046
Unit Wet Wt. (pcf)	128.9	127.7
Unit Dry Wt. (pcf)	104.8	104.6
Unit Dry Wt. (gm./ cm^3)	1.679	1.676
Void Ratio, e	0.608	0.611
Porosity, n	0.378	0.379
Pore Volume (cm^3)	117.1	117.5
Total Wt. Of Sample After Test		646.00

Tested By: BW Date: 5/22/2012 Checked By: MPS Date: 5/24

DCN: CT-22A DATE: 2/17/2011 REVISION: 2 \\SERVER\GEOTECHNICAL\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-04-02 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 2
Client Project	COBLE SR.	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A2-03
Lab ID No.	2012-656-04-02		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	7.62
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.71
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	97	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 6.3E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.3E-10 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	(min)	(sec)	(min)	ELAPSED TIME t (min)	PIPETTE READING R_p (cm)	INCREMENT GRADIENT i (cm/cm)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
5/23/2012	10	33	8	33.13	0.000	8.0	12.0	24.8	NA
5/23/2012	10	33	30	33.50	0.367	7.9	11.8	24.8	2.6E-07
5/23/2012	10	34	8	34.13	1.000	7.8	11.7	24.8	1.5E-07
5/23/2012	10	35	4	35.07	1.933	7.7	11.5	24.8	1.1E-07
5/23/2012	10	36	15	36.25	3.117	7.6	11.3	24.8	8.5E-08
5/23/2012	10	37	50	37.83	4.700	7.5	11.1	24.8	6.5E-08
5/23/2012	10	39	28	39.47	6.333	7.4	11.0	24.8	6.4E-08
5/23/2012	10	41	9	41.15	8.017	7.3	10.8	24.8	6.3E-08
5/23/2012	10	42	55	42.92	9.783	7.2	10.6	24.8	6.1E-08

Tested By: BW Date: 5/22/2012 Checked By: MMS Date: 5/24

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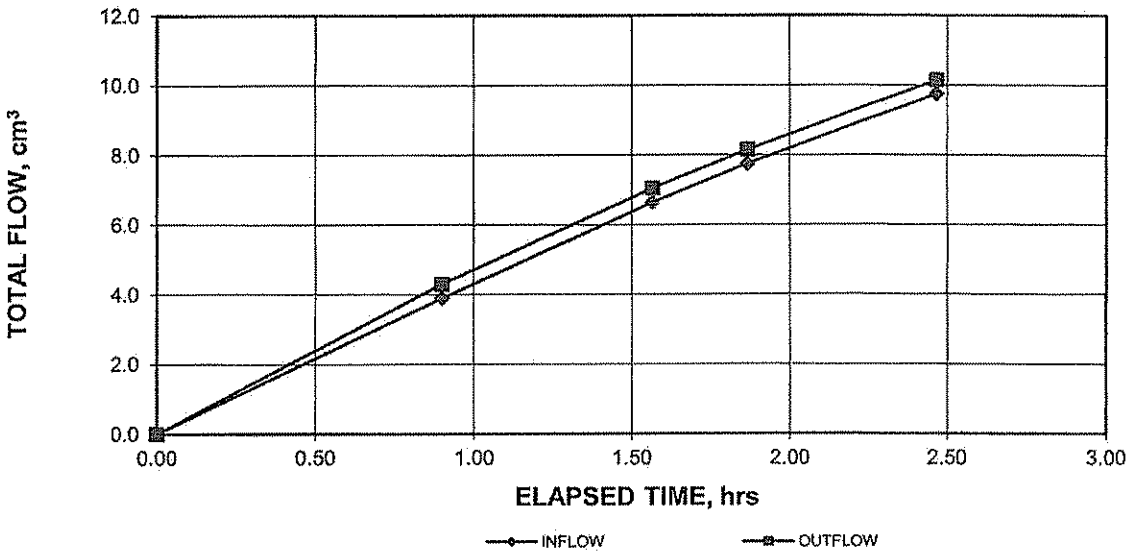
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

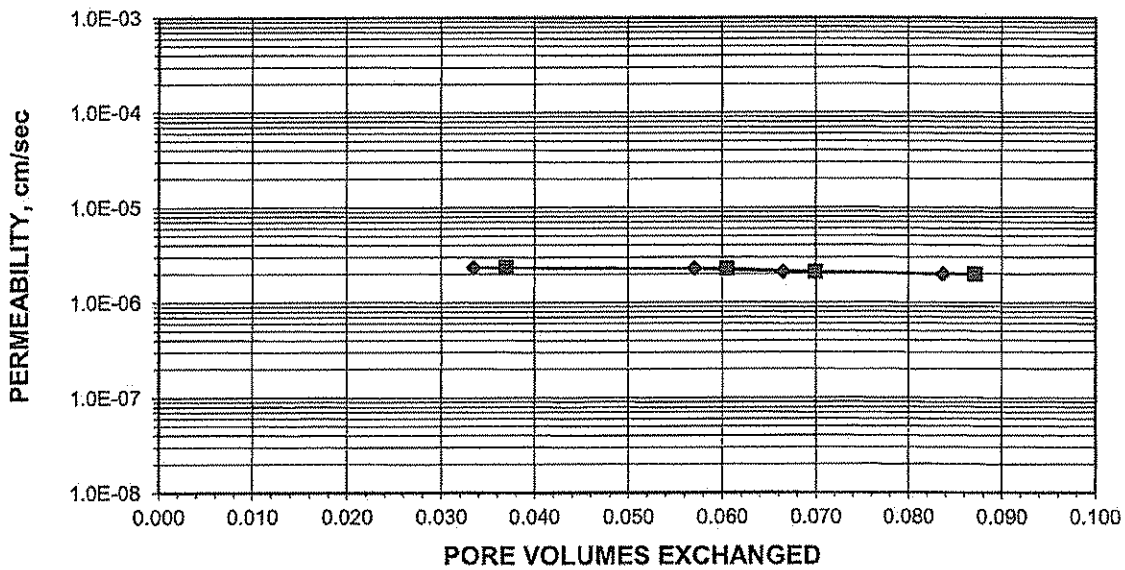
Client	JOYCE ENGINEERING	Boring No.	ACRE 3
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-03-01
Lab ID No.	2012-656-02-03		

AVERAGE PERMEABILITY = 2.2E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.2E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 4/20/2012 Checked By: GEM Date: 4-24-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 PROJECTS\2012-656 JOYCE\[2012-656-02-03 PERMflow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 3
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-03-01
Lab ID No.	2012-656-02-03		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	804	801
Wt. of Tare & WS (gm.)	351.82	326.51
Wt. of Tare & DS (gm.)	325.59	288.10
Wt. of Tare (gm.)	105.07	107.25
Wt. of Water (gm.)	26.23	38.41
Wt. of DS (gm.)	220.52	180.85
Moisture Content (%)	**11.9**	**21.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	629.25	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	629.25	681.80
Length 1 (in.)	3.466	3.265
Length 2 (in.)	3.328	3.230
Length 3 (in.)	3.355	3.228
Top Diameter (in.)	2.835	2.783
Middle Diameter (in.)	2.835	2.803
Bottom Diameter (in.)	2.835	2.785
Average Length (in.)	3.38	3.24
Average Area (in.^{2})	6.31	6.12
Sample Volume (cm^3)	349.94	324.77
Unit Wet Wt. (gm./ cm^3)	1.80	2.10
Unit Wet Wt. (pcf)	112.2	131.0
Unit Dry Wt. (pcf)	100.3	108.1
Unit Dry Wt. (gm./ cm^3)	1.61	1.73
Void Ratio, e	0.68	0.56
Porosity, n	0.40	0.36
Pore Volume (cm^3)	141.7	116.5
Total Wgt. Of Sample After Test		660.70

Tested By: BW Date: 4/20/2012 Checked By: GAM Date: 4-24-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-02-03 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 3
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-03-01
Lab ID No.	2012-656-02-03		
121044			

41

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	8.23
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.09
Cell (psi)	45.0	Sample Area (cm^2), A	39.45
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	12.81	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	95

AVERAGE PERMEABILITY = 2.2E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.2E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
4/21/2012	12	34	0.00	0.0	0.0	106.9	0	24.0	NA
4/21/2012	13	28	0.90	3.9	4.3	98.5	0	23.9	2.3E-06
4/21/2012	14	8	1.57	6.7	7.1	92.8	0	24.0	2.3E-06
4/21/2012	14	26	1.87	7.8	8.2	90.6	0	24.0	2.1E-06
4/21/2012	15	2	2.47	9.8	10.2	86.5	1	24.0	2.0E-06

Tested By: BW Date: 4/20/2012 Checked By: GAM Date: 4-24-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-02-03 PERMflow w header.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

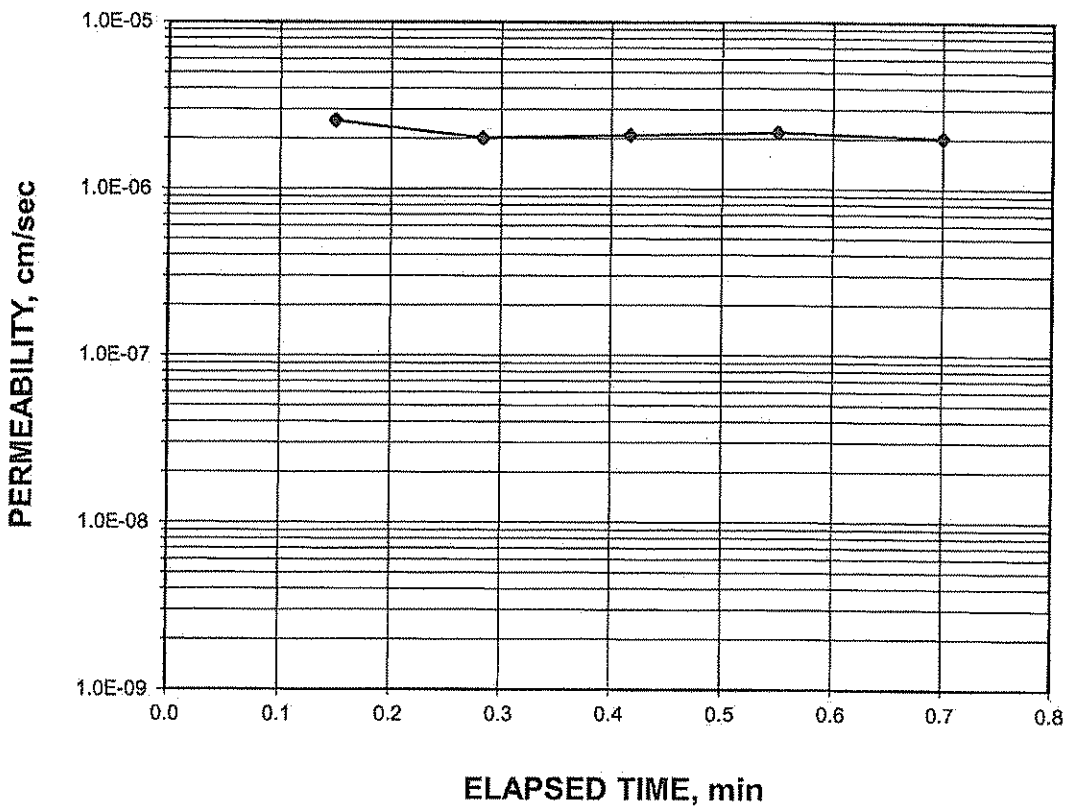
ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING	Boring No.	ND-13
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A3
Lab ID No.	2012-656-03-03		

Visual Description: ORANGE SANDY SILT

AVERAGE PERMEABILITY = 2.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.1E-08 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 5/10/2012 Checked By: GEM Date: 5-14-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-03 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING	Boring No.	ND-13
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A3
Lab ID No.	2012-656-03-03		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: ORANGE SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	802	Z-14
Wt. of Tare & WS (gm.)	371.35	307.85
Wt. of Tare & DS (gm.)	330.36	266.6
Wt. of Tare (gm.)	103.61	98.15
Wt. of Water (gm.)	40.99	41.25
Wt. of DS (gm.)	226.75	168.45
Moisture Content (%)	**18.1**	**24.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	587.61	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	587.61	619.51
Length 1 (in.)	3.006	3.004
Length 2 (in.)	3.009	3.045
Length 3 (in.)	3.029	3.050
Top Diameter (in.)	2.841	2.842
Middle Diameter (in.)	2.828	2.840
Bottom Diameter (in.)	2.820	2.835
Average Length (in.)	3.01	3.03
Average Area (in.^{2})	6.29	6.33
Sample Volume (cm^3)	310.67	314.63
Unit Wet Wt. (gm./ cm^3)	1.891	1.969
Unit Wet Wt. (pcf)	118.1	122.9
Unit Dry Wt. (pcf)	100.0	98.7
Unit Dry Wt. (gm./ cm^3)	1.602	1.582
Void Ratio, e	0.686	0.707
Porosity, n	0.407	0.414
Pore Volume (cm^3)	126.4	130.3
Total Wt. Of Sample After Test		620.00

Tested By: BW Date: 5/10/2012 Checked By: Date:

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PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING	Boring No.	ND-13
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A3
Lab ID No.	2012-656-03-03		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	7.70
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.84
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	98	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 2.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.1E-08 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
5/13/2012	1	27	1	27.02	0.000	6.5	9.3	24.2	NA
5/13/2012	1	27	10	27.17	0.150	6.2	8.8	24.2	2.6E-06
5/13/2012	1	27	18	27.30	0.283	6.0	8.5	24.2	2.0E-06
5/13/2012	1	27	26	27.43	0.417	5.8	8.1	24.2	2.1E-06
5/13/2012	1	27	34	27.57	0.550	5.6	7.8	24.2	2.2E-06
5/13/2012	1	27	43	27.72	0.700	5.4	7.5	24.2	2.0E-06

Tested By: BW Date: 5/10/2012 Checked By: Date:

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

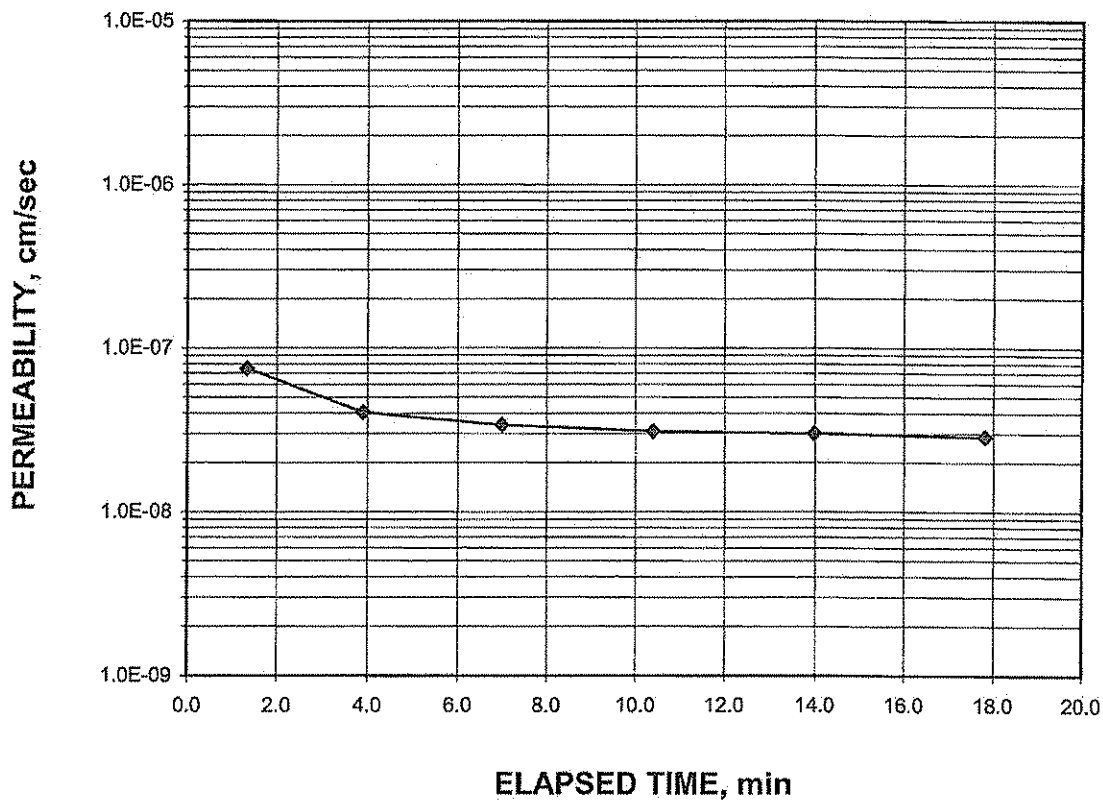
ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 3
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A3-03
Lab ID No.	2012-656-04-03		

Visual Description: REDDISH BROWN SANDY SILT

AVERAGE PERMEABILITY = 3.1E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.1E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 5/22/2012 Checked By: MPS Date: 5/24

DCN: CT-22A DATE: 2/1/2012 REVISION: 2 \\SERVER\DATA\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-04-03 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 3
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A3-03
Lab ID No.	2012-656-04-03		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: REDDISH BROWN SANDY SILT

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	Y-11	809
Wt. of Tare & WS (gm.)	344.85	382.28
Wt. of Tare & DS (gm.)	300.22	334.33
Wt. of Tare (gm.)	96.58	115.03
Wt. of Water (gm.)	44.63	47.95
Wt. of DS (gm.)	203.64	219.30
Moisture Content (%)	**21.9**	**21.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	651.43	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	651.43	651.16
Length 1 (in.)	3.125	3.144
Length 2 (in.)	3.136	3.182
Length 3 (in.)	3.138	3.164
Top Diameter (in.)	2.842	2.841
Middle Diameter (in.)	2.837	2.836
Bottom Diameter (in.)	2.856	2.841
Average Length (in.)	3.13	3.16
Average Area (in.^{2})	6.36	6.33
Sample Volume (cm^3)	326.37	328.22
Unit Wet Wt. (gm./ cm^3)	1.996	1.984
Unit Wet Wt. (pcf)	124.6	123.8
Unit Dry Wt. (pcf)	102.2	101.6
Unit Dry Wt. (gm./ cm^3)	1.637	1.628
Void Ratio, e	0.649	0.659
Porosity, n	0.394	0.397
Pore Volume (cm^3)	128.5	130.3
Total Wt. Of Sample After Test		671.02

Tested By: BW Date: 5/22/2012 Checked By: MJS Date: 5/24

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 3
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A3-03
Lab ID No.	2012-656-04-03		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	8.03
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.85
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	95	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 3.1E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.1E-10 m/sec @ 20°C

DATE	TIME				ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
5/23/2012	11	22	56	22.93	0.000	8.0	11.4	24.7	NA
5/23/2012	11	24	17	24.28	1.350	7.9	11.2	24.7	7.5E-08
5/23/2012	11	26	50	26.83	3.900	7.8	11.1	24.7	4.0E-08
5/23/2012	11	29	55	29.92	6.983	7.7	10.9	24.7	3.4E-08
5/23/2012	11	33	20	33.33	10.400	7.6	10.7	24.7	3.1E-08
5/23/2012	11	36	55	36.92	13.983	7.5	10.6	24.7	3.0E-08
5/23/2012	11	40	45	40.75	17.817	7.4	10.4	24.7	2.9E-08

Tested By: BW Date: 5/22/2012 Checked By: MMS Date: 5/24

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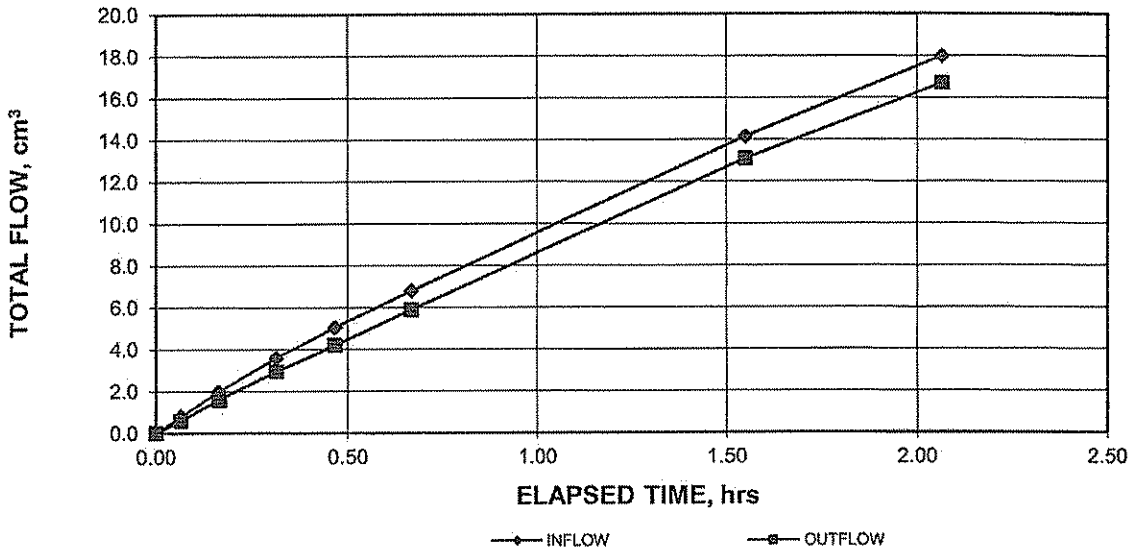
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

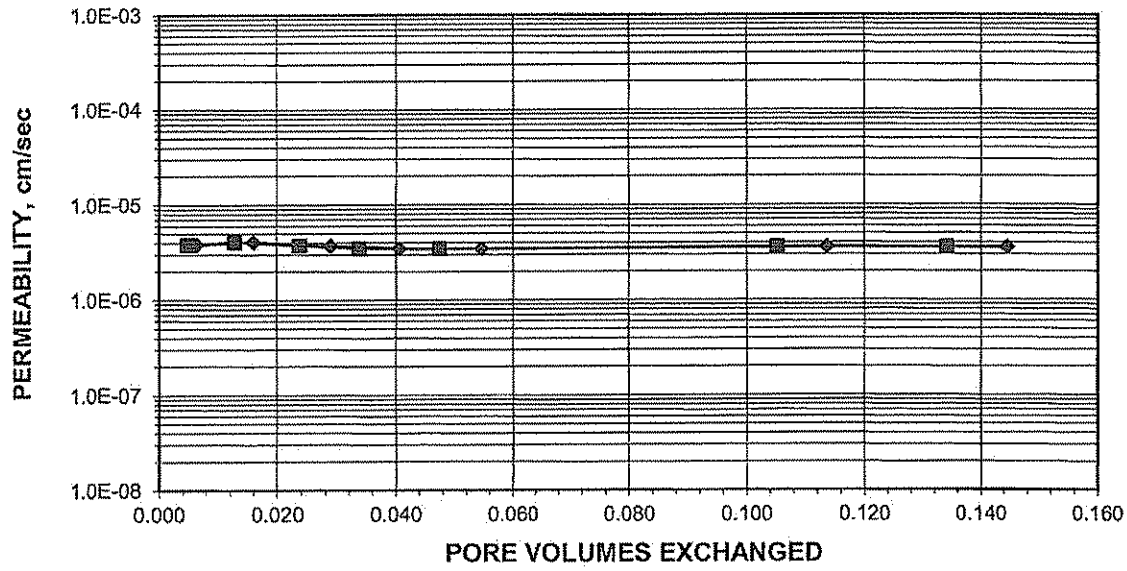
Client	JOYCE ENGINEERING	Boring No.	ACRE 4
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-04-01
Lab ID No.	2012-656-02-04		

AVERAGE PERMEABILITY = 3.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.5E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 4/20/2012 Checked By: Date:

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 4
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-04-01
Lab ID No.	2012-656-02-04		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	801	809
Wt. of Tare & WS (gm.)	384.19	371.21
Wt. of Tare & DS (gm.)	349.63	317.65
Wt. of Tare (gm.)	107.31	114.90
Wt. of Water (gm.)	34.56	53.56
Wt. of DS (gm.)	242.32	202.75
Moisture Content (%)	**14.3**	**26.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	603.80	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	603.80	668.03
Length 1 (in.)	3.040	3.031
Length 2 (in.)	3.023	3.058
Length 3 (in.)	3.019	3.010
Top Diameter (in.)	2.844	2.863
Middle Diameter (in.)	2.849	2.862
Bottom Diameter (in.)	2.845	2.867
Average Length (in.)	3.03	3.03
Average Area (in.^{2})	6.36	6.44
Sample Volume (cm^3)	315.59	320.19
Unit Wet Wt. (gm./ cm^3)	1.91	2.09
Unit Wet Wt. (pcf)	119.4	130.2
Unit Dry Wt. (pcf)	104.5	103.0
Unit Dry Wt. (gm./ cm^3)	1.67	1.65
Void Ratio, e	0.61	0.64
Porosity, n	0.38	0.39
Pore Volume (cm^3)	119.9	124.5
Total Wgt. Of Sample After Test		623.07

Tested By: BW Date: 4/20/2012 Checked By: GEM Date: 4-23-12

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-02-04 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 4
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-02	Sample No.	ST-04-01
Lab ID No.	2012-656-02-04		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.70
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.27
Cell (psi)	45.0	Sample Area (cm^2), A	41.56
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.888
Hydraulic Gradient	13.69	Outflow Burette Area (cm^2), a-out	0.890
		B Parameter (%)	99

AVERAGE PERMEABILITY = 3.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.5E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
4/21/2012	10	30	0.00	0.0	0.0	129.7	0	23.7	NA
4/21/2012	10	34	0.07	0.8	0.6	128.2	0	23.7	3.8E-06
4/21/2012	10	40	0.17	2.0	1.6	125.7	0	23.7	4.1E-06
4/21/2012	10	49	0.32	3.6	3.0	122.4	0	23.7	3.7E-06
4/21/2012	10	58	0.47	5.1	4.2	119.4	0	23.8	3.5E-06
4/21/2012	11	10	0.67	6.8	5.9	115.5	0	23.8	3.5E-06
4/21/2012	12	3	1.55	14.2	13.1	99.1	0	23.9	3.6E-06
4/21/2012	12	34	2.07	18.0	16.7	90.8	1	24.0	3.6E-06

Tested By: BW Date: 4/20/2012 Checked By: Date:

DCN: CT-22 DATE: 2/2/10 REVISION: 9 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-02-04 PERMflow w header.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

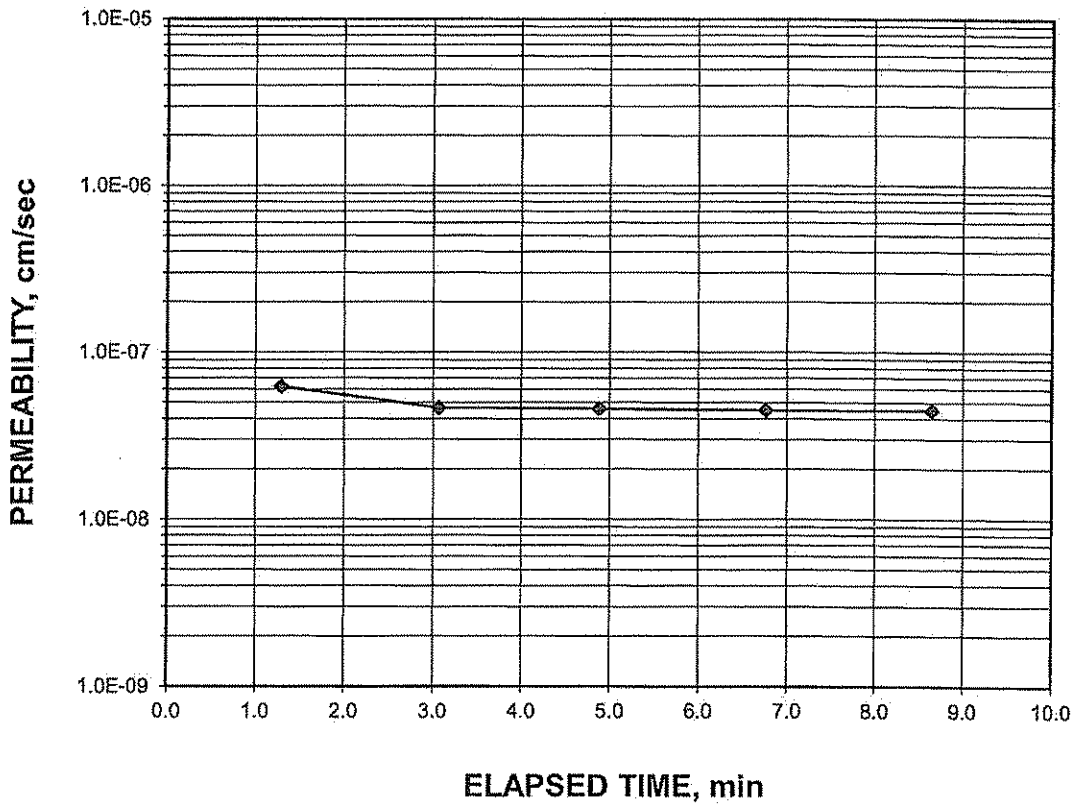
ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING	Boring No.	ND-18
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A4
Lab ID No.	2012-656-03-04		

Visual Description: BROWN SANDY CLAY

AVERAGE PERMEABILITY = 4.6E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.6E-10 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: BW Date: 5/8/2012 Checked By: GEM Date: 5-10-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-04 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING	Boring No.	ND-18
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A4
Lab ID No.	2012-656-03-04		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	818	806
Wt. of Tare & WS (gm.)	390.61	337.89
Wt. of Tare & DS (gm.)	351.98	297.72
Wt. of Tare (gm.)	137.51	102.05
Wt. of Water (gm.)	38.63	40.17
Wt. of DS (gm.)	214.47	195.67
Moisture Content (%)	**18.0**	**20.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	499.63	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	499.63	510.29
Length 1 (in.)	2.413	2.347
Length 2 (in.)	2.469	2.341
Length 3 (in.)	2.492	2.314
Top Diameter (in.)	2.839	2.829
Middle Diameter (in.)	2.843	2.822
Bottom Diameter (in.)	2.836	2.810
Average Length (in.)	2.46	2.33
Average Area (in.^{2})	6.33	6.25
Sample Volume (cm^3)	255.04	238.94
Unit Wet Wt. (gm./ cm^3)	1.959	2.136
Unit Wet Wt. (pcf)	122.3	133.3
Unit Dry Wt. (pcf)	103.6	110.6
Unit Dry Wt. (gm./ cm^3)	1.660	1.772
Void Ratio, e	0.626	0.524
Porosity, n	0.385	0.344
Pore Volume (cm^3)	98.2	82.1
Total Wt. Of Sample After Test		505.41

Tested By: BW Date: 5/8/2012 Checked By: GEM Date: 5-10-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-04 Permometer w-Header.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING	Boring No.	ND-18
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-03	Sample No.	A4
Lab ID No.	2012-656-03-04		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	50.0	Sample Length (cm), L	5.93
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.30
Eff. Cons. Pressure(psi)	10.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	96	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 4.6E-08 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.6E-10 m/sec @ 20°C

DATE		TIME			ELAPSED TIME t	PIPETTE READING R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
5/8/2012	8	20	29	20.48	0.000	7.7	14.8	23.8	NA
5/8/2012	8	21	47	21.78	1.300	7.6	14.5	23.8	6.2E-08
5/8/2012	8	23	33	23.55	3.067	7.5	14.3	23.8	4.7E-08
5/8/2012	8	25	22	25.37	4.883	7.4	14.1	23.8	4.6E-08
5/8/2012	8	27	15	27.25	6.767	7.3	13.9	23.8	4.5E-08
5/8/2012	8	29	8	29.13	8.650	7.2	13.7	24.7	4.5E-08

Tested By: BW Date: 5/8/2012 Checked By: GEM Date: 5-10-12

DCN: CT-22A DATE:2-2-10 REVISION: 5 Z:\2012 PROJECTS\2012-656 JOYCE\[2012-656-03-04 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

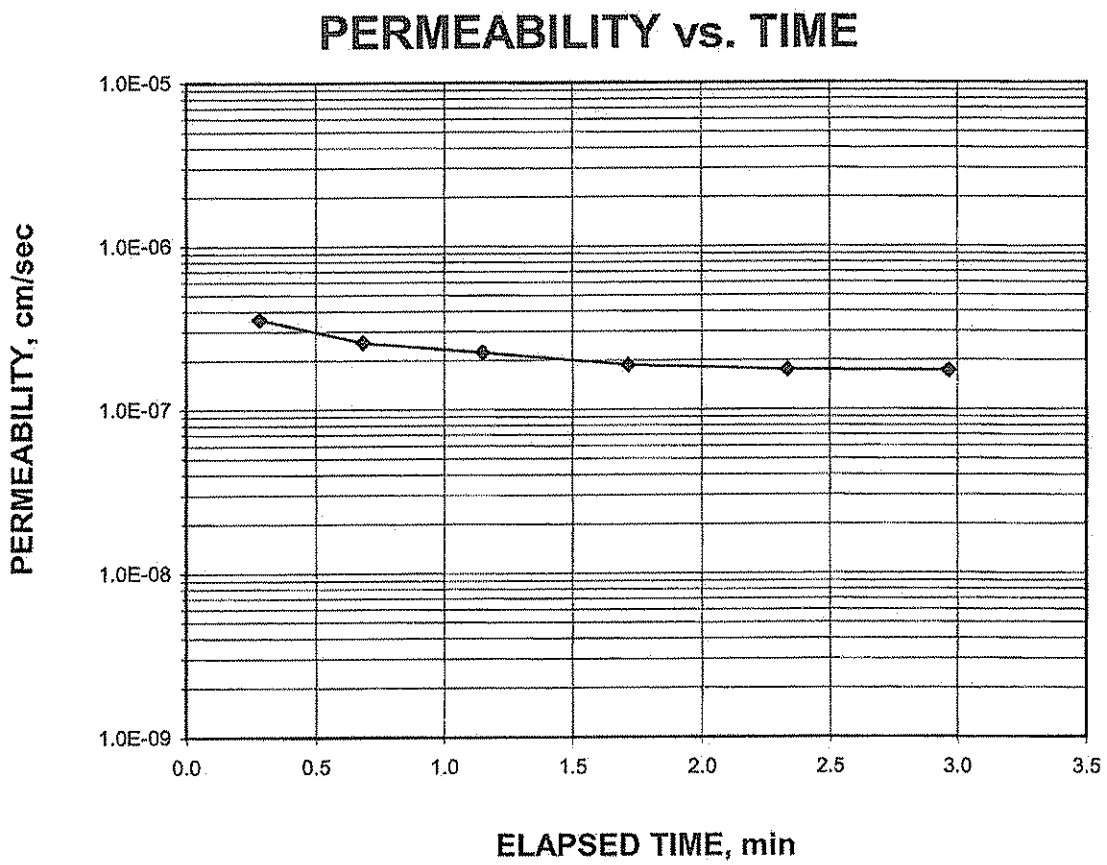
PERMOMETER METHOD

ASTM D 5084-03
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 4
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A4-03
Lab ID No.	2012-656-04-04		

Visual Description: BROWN SANDY CLAY

AVERAGE PERMEABILITY = 1.9E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.9E-09 m/sec @ 20°C



Tested By: BW Date: 5/22/2012 Checked By: MMS Date: 5/24

DCN: CT-22A DATE: 2/27/2012 REV: 10/2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-04-04 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 4
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A4-03
Lab ID No.	2012-656-04-04		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	802	807
Wt. of Tare & WS (gm.)	300.28	341.92
Wt. of Tare & DS (gm.)	272.52	301.05
Wt. of Tare (gm.)	103.73	104.81
Wt. of Water (gm.)	27.76	40.87
Wt. of DS (gm.)	168.79	196.24
Moisture Content (%)	**16.4**	**20.8**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	663.45	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	663.45	688.41
Length 1 (in.)	3.182	3.128
Length 2 (in.)	3.142	3.184
Length 3 (in.)	3.179	3.169
Top Diameter (in.)	2.880	2.841
Middle Diameter (in.)	2.856	2.827
Bottom Diameter (in.)	2.864	2.853
Average Length (in.)	3.17	3.16
Average Area (in.^{2})	6.45	6.34
Sample Volume (cm^3)	335.03	328.14
Unit Wet Wt. (gm./ cm^3)	1.980	2.098
Unit Wet Wt. (pcf)	123.6	131.0
Unit Dry Wt. (pcf)	106.2	108.4
Unit Dry Wt. (gm./ cm^3)	1.701	1.736
Void Ratio, e	0.588	0.555
Porosity, n	0.370	0.357
Pore Volume (cm^3)	124.0	117.1
Total Wt. Of Sample After Test		677.47

Tested By: BW Date: 5/22/2012 Checked By: [illegible] Date: 5/24

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD

ASTM D 5084-10
(SOP-S22C)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 4
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-04	Sample No.	ST-A4-03
Lab ID No.	2012-656-04-04		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	8.03
Back Pressure(psi)	40.0	Sample Area (cm^2), A	40.88
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	95	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1

AVERAGE PERMEABILITY = 1.9E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.9E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	(min)	(sec)	(min)	ELAPSED TIME t (min)	PIPETTE READI NG R_p (cm)	INCREMENT GRADIENT i (cm/cm)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
5/23/2012	11	5	57	5.95	0.000	8.0	11.4	24.7	NA
5/23/2012	11	6	14	6.23	0.283	7.9	11.2	24.7	3.6E-07
5/23/2012	11	6	38	6.63	0.683	7.8	11.1	24.7	2.6E-07
5/23/2012	11	7	6	7.10	1.150	7.7	10.9	24.7	2.2E-07
5/23/2012	11	7	40	7.67	1.717	7.6	10.7	24.7	1.9E-07
5/23/2012	11	8	17	8.28	2.333	7.5	10.6	24.7	1.7E-07
5/23/2012	11	8	55	8.92	2.967	7.4	10.4	24.7	1.7E-07

Tested By: BW Date: 5/22/2012 Checked By: MMS Date: 5/24

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INTEGRITY IN TESTING

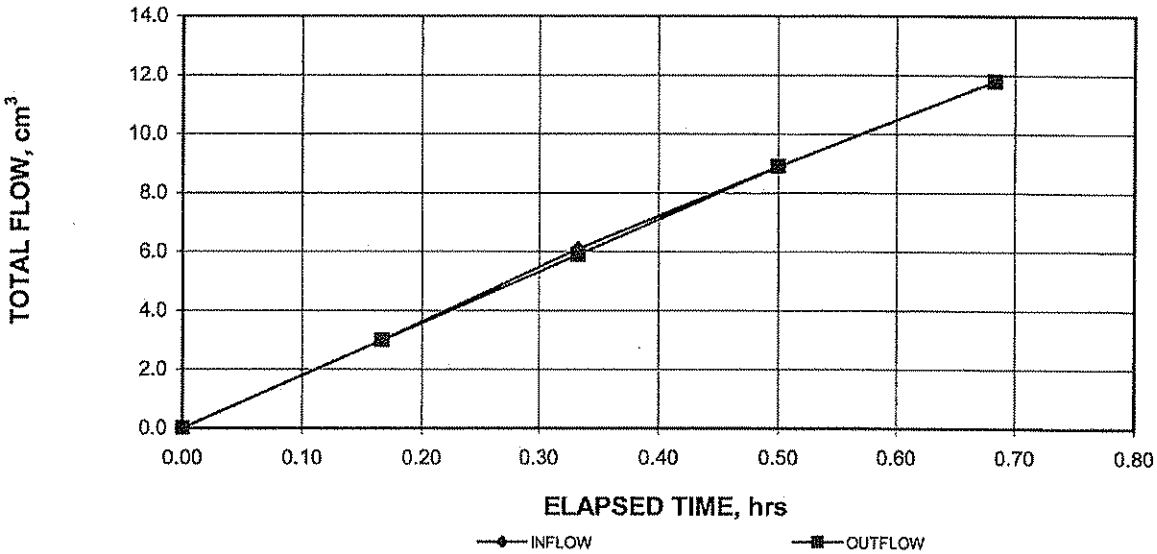
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

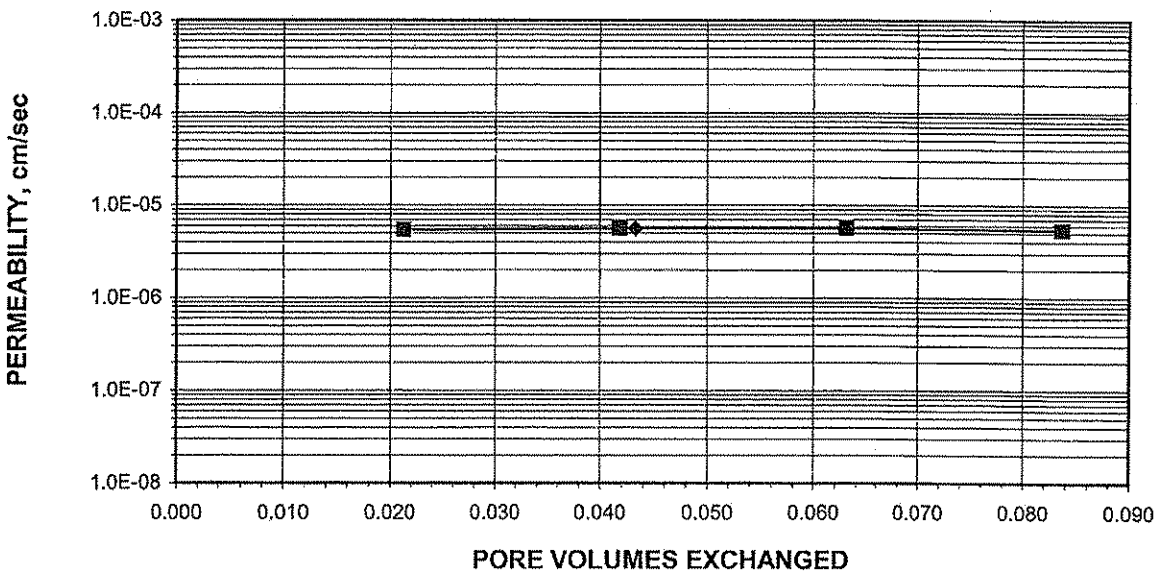
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-05	Sample No.	ST-A5-01
Lab ID No.	2012-656-05-01		

AVERAGE PERMEABILITY = 5.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.5E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 7/9/2012 Checked By: MHS Date: 7/23

DCN: CT-22 DATE: 2/16/2012 REV: PROJECTS\2012-656 JOYCE - Cobles\[2012-656-05-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-05	Sample No.	ST-A5-01
Lab ID No.	2012-656-05-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: TAN SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	814	810
Wt. of Tare & WS (gm.)	370.05	417.16
Wt. of Tare & DS (gm.)	345.88	355.69
Wt. of Tare (gm.)	112.14	114.97
Wt. of Water (gm.)	24.17	61.47
Wt. of DS (gm.)	233.74	240.72
Moisture Content (%)	**10.3**	**25.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	590.73	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	590.73	672.08
Length 1 (in.)	3.224	3.227
Length 2 (in.)	3.232	3.208
Length 3 (in.)	3.284	3.23
Top Diameter (in.)	2.910	2.873
Middle Diameter (in.)	2.896	2.863
Bottom Diameter (in.)	2.884	2.845
Average Length (in.)	3.25	3.22
Average Area (in.^{2})	6.59	6.43
Sample Volume (cm^3)	350.61	339.24
Unit Wet Wt. (gm./ cm^3)	1.68	1.98
Unit Wet Wt. (pcf)	105.2	123.7
Unit Dry Wt. (pcf)	95.3	98.5
Unit Dry Wt. (gm./ cm^3)	1.53	1.58
Void Ratio, e	0.77	0.71
Porosity, n	0.43	0.42
Pore Volume (cm^3)	152.3	141.0
Total Wgt. Of Sample After Test		661.91

Tested By: BW Date: 7/9/2012 Checked By: [illegible] Date: 7/23

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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-05	Sample No.	ST-A5-01
Lab ID No.	2012-656-05-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.0	Sample Length (cm), L	8.18
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.27
Cell (psi)	45.0	Sample Area (cm^2), A	41.46
Total Pressure Head (cm)	140.6	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	17.18	Outflow Burette Area (cm^2), a-out	0.972
		B Parameter (%)	99

AVERAGE PERMEABILITY = 5.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.5E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/11/2012	4	27	0.00	0.0	0.0	164.9	0	25.0	NA
7/11/2012	4	37	0.17	3.0	3.0	158.3	0	25.0	5.4E-06
7/11/2012	4	47	0.33	6.1	5.9	151.7	0	25.0	5.6E-06
7/11/2012	4	57	0.50	8.9	8.9	145.4	0	25.0	5.7E-06
7/11/2012	5	8	0.68	11.8	11.8	139.0	1	25.0	5.4E-06

Tested By: BW Date: 7/9/2012 Checked By: [illegible] Date: 7/23

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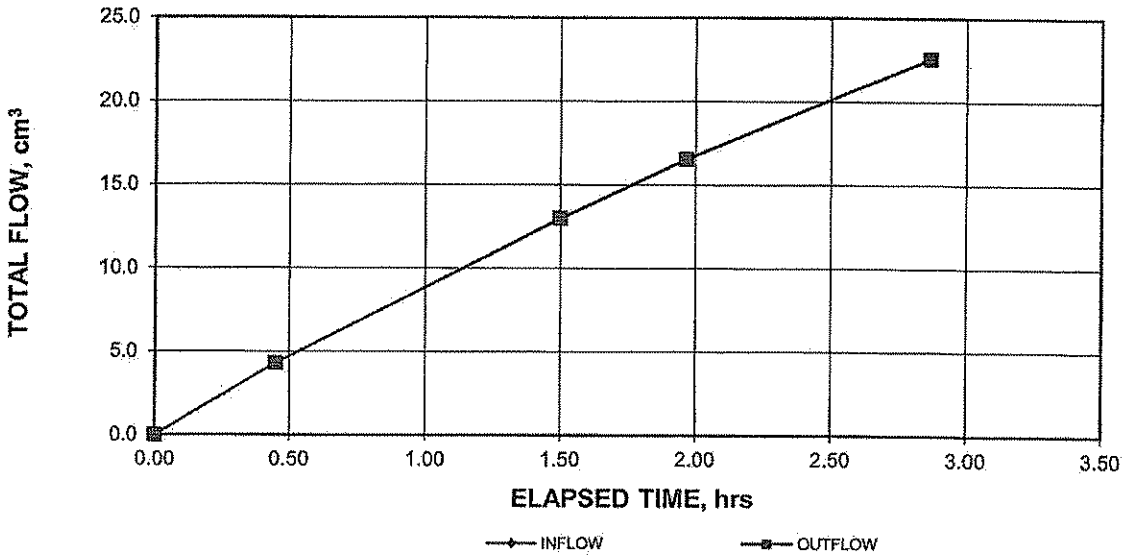
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

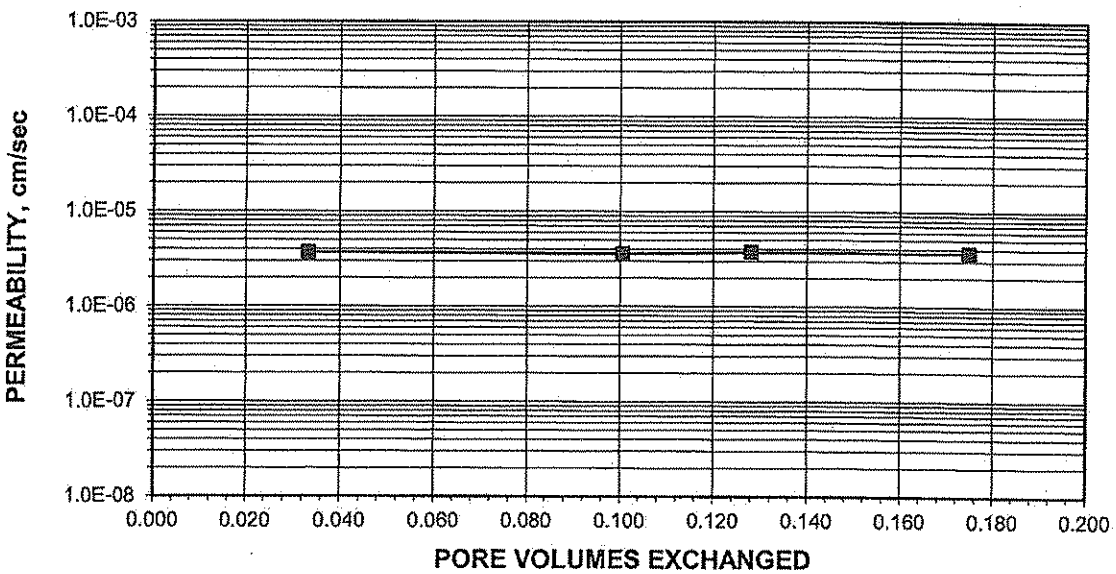
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR.	Depth (ft.)	LIFT 2
Project No.	2012-656-06	Sample No.	ST-A5-02
Lab ID No.	2012-656-06-01		

AVERAGE PERMEABILITY = 3.7E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.7E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 7/23/2012 Checked By: GEM Date: 7-26-12

DCN: CT-22 DATE: 2/2/20 REVISION: 3 S:\2012-656 JOYCE - Cobles\[2012-656-06-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-06	Sample No.	ST-A5-02
Lab ID No.	2012-656-06-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: LIGHT BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	811	818
Wt. of Tare & WS (gm.)	355.83	318.96
Wt. of Tare & DS (gm.)	320.84	283.85
Wt. of Tare (gm.)	106.14	137.35
Wt. of Water (gm.)	34.99	35.11
Wt. of DS (gm.)	214.70	146.50
Moisture Content (%)	**16.3**	**24.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	604.48	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	604.48	644.34
Length 1 (in.)	3.140	3.157
Length 2 (in.)	3.130	3.125
Length 3 (in.)	3.105	3.082
Top Diameter (in.)	2.858	2.83
Middle Diameter (in.)	2.856	2.84
Bottom Diameter (in.)	2.854	2.82
Average Length (in.)	3.13	3.12
Average Area (in.^{2})	6.41	6.29
Sample Volume (cm^3)	328.06	321.74
Unit Wet Wt. (gm./ cm^3)	1.84	2.00
Unit Wet Wt. (pcf)	115.0	125.0
Unit Dry Wt. (pcf)	98.9	100.8
Unit Dry Wt. (gm./ cm^3)	1.58	1.62
Void Ratio, e	0.70	0.67
Porosity, n	0.41	0.40
Pore Volume (cm^3)	135.6	129.2
Total Wgt. Of Sample After Test		636.83

Tested By: BW Date: 7/23/2012 Checked By: GEM Date: 7-26-12

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-06	Sample No.	ST-A5-02
Lab ID No.	2012-656-06-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.93
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.19
Cell (psi)	45.0	Sample Area (cm^2), A	40.58
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	13.30	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	96

AVERAGE PERMEABILITY = 3.7E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.7E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/25/2012	13	52	0.00	0.0	0.0	126.3	0	25.9	NA
7/25/2012	14	19	0.45	4.3	4.3	117.5	0	25.9	3.7E-06
7/25/2012	15	22	1.50	13.0	13.0	99.6	0	25.9	3.6E-06
7/25/2012	15	50	1.97	16.6	16.6	92.2	0	25.9	3.7E-06
7/25/2012	16	44	2.87	22.6	22.6	79.8	1	25.9	3.7E-06

Tested By: BW Date: 7/23/2012 Checked By: GEM Date: 7-26-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 \\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-06-01 PERMflow w header.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

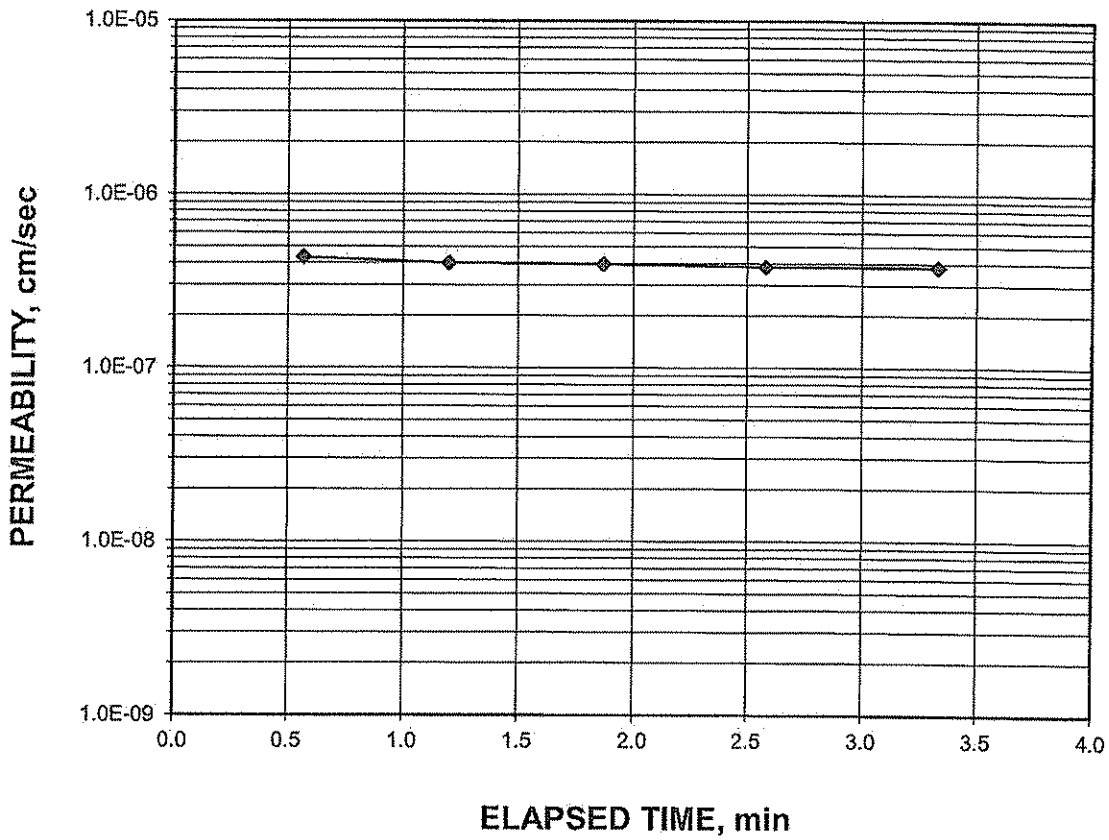
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-07	Sample No.	ST-05-03
Lab ID No.	2012-656-07-01		

Visual Description: YELLOW ORANGE SANDY CLAY

AVERAGE PERMEABILITY = 3.9E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.9E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: SFS Date: 7/31/2012 Checked By: GM Date: 8-3-12

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-07	Sample No.	ST-05-03
Lab ID No.	2012-656-07-01		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: YELLOW ORANGE SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	820	804
Wt. of Tare & WS (gm.)	305.72	346.1
Wt. of Tare & DS (gm.)	271.21	292.32
Wt. of Tare (gm.)	136.22	105.1
Wt. of Water (gm.)	34.51	53.78
Wt. of DS (gm.)	134.99	187.22
Moisture Content (%)	**25.6**	**28.7**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	611.98	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	611.98	627.38
Length 1 (in.)	3.210	3.219
Length 2 (in.)	3.194	3.209
Length 3 (in.)	3.210	3.221
Top Diameter (in.)	2.837	2.866
Middle Diameter (in.)	2.837	2.867
Bottom Diameter (in.)	2.838	2.874
Average Length (in.)	3.20	3.22
Average Area (in.^{2})	6.32	6.46
Sample Volume (cm^3)	332.04	340.73
Unit Wet Wt. (gm./ cm^3)	1.843	1.841
Unit Wet Wt. (pcf)	115.0	114.9
Unit Dry Wt. (pcf)	91.6	89.3
Unit Dry Wt. (gm./ cm^3)	1.468	1.430
Void Ratio, e	0.839	0.888
Porosity, n	0.456	0.470
Pore Volume (cm^3)	151.5	160.2
Total Wt. Of Sample After Test		644.74

Tested By: SFS Date: 7/31/2012 Checked By: GM Date: 8-3-12

DCN: CT-22A DATE:2-2-10 REVISION:0 \\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-07-01 Permometer wHeader.xls]Sheet1

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INTEGRITY IN TESTING

FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 5
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-07	Sample No.	ST-05-03
Lab ID No.	2012-656-07-01		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	8.17
Back Pressure(psi)	40.0	Sample Area (cm^2), A	41.71
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	97	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1.3

AVERAGE PERMEABILITY = 3.9E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.9E-09 m/sec @ 20°C

DATE			TIME		ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
8/2/2012	15	32	2	32.03	0.000	7.0	9.1	25.7	NA
8/2/2012	15	32	36	32.60	0.567	6.8	8.8	25.7	4.3E-07
8/2/2012	15	33	14	33.23	1.200	6.6	8.5	25.7	4.0E-07
8/2/2012	15	33	54	33.90	1.867	6.4	8.2	25.7	4.0E-07
8/2/2012	15	34	37	34.62	2.583	6.2	7.8	25.7	3.8E-07
8/2/2012	15	35	22	35.37	3.333	6.0	7.5	25.7	3.8E-07

Tested By: SFS Date: 7/31/2012 Checked By: GEM Date: 8-3-12

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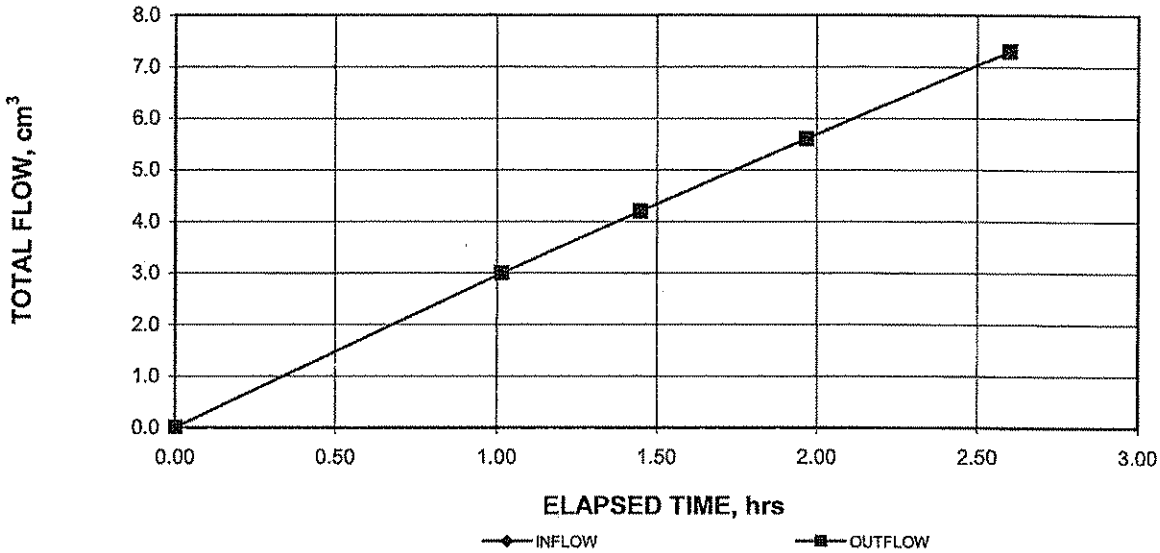
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

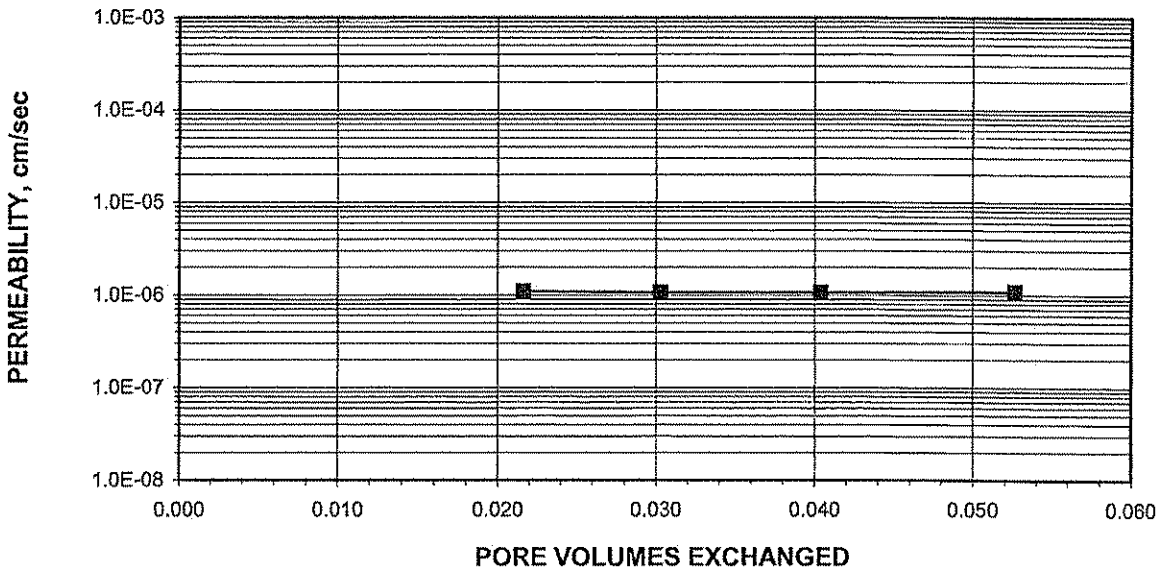
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE-6
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-05	Sample No.	ST-A6-01
Lab ID No.	2012-656-05-02		

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 7/9/2012 Checked By: MM Date: 7/23

DCN: CT-22 DATE: 2/26/2012 REVISION: 0 C:\PROJECTS\2012-656 JOYCE - Cobles\[2012-656-05-02 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE-6
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-05	Sample No.	ST-A6-01
Lab ID No.	2012-656-05-02		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: TAN SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	813	811
Wt. of Tare & WS (gm.)	364.26	354.6
Wt. of Tare & DS (gm.)	325.21	296.56
Wt. of Tare (gm.)	112.97	106.64
Wt. of Water (gm.)	39.05	58.04
Wt. of DS (gm.)	212.24	189.92
Moisture Content (%)	**18.4**	**30.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	588.61	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	588.61	649.07
Length 1 (in.)	3.031	3.058
Length 2 (in.)	3.033	3.047
Length 3 (in.)	3.034	3.045
Top Diameter (in.)	2.854	2.874
Middle Diameter (in.)	2.852	2.868
Bottom Diameter (in.)	2.849	2.86
Average Length (in.)	3.03	3.05
Average Area (in.^{2})	6.39	6.46
Sample Volume (cm^3)	317.40	322.74
Unit Wet Wt. (gm./ cm^3)	1.85	2.01
Unit Wet Wt. (pcf)	115.8	125.5
Unit Dry Wt. (pcf)	97.8	96.2
Unit Dry Wt. (gm./ cm^3)	1.57	1.54
Void Ratio, e	0.72	0.75
Porosity, n	0.42	0.43
Pore Volume (cm^3)	133.3	138.6
Total Wgt. Of Sample After Test		639.60

Tested By: BW Date: 7/9/2012 Checked By: [illegible] Date: 7/23

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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE-6
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-05	Sample No.	ST-A6-01
Lab ID No.	2012-656-05-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.75
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.28
Cell (psi)	45.0	Sample Area (cm^2), A	41.66
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	13.61	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	97

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/11/2012	1	36	0.00	0.0	0.0	127.3	0	24.9	NA
7/11/2012	2	37	1.02	3.0	3.0	121.2	0	24.9	1.1E-06
7/11/2012	3	3	1.45	4.2	4.2	118.7	0	24.9	1.1E-06
7/11/2012	3	34	1.97	5.6	5.6	115.8	0	24.9	1.1E-06
7/11/2012	4	12	2.60	7.3	7.3	112.3	1	24.9	1.1E-06

Tested By: BW Date: 7/9/2012 Checked By: [illegible] Date: 7/23

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INTEGRITY IN TESTING

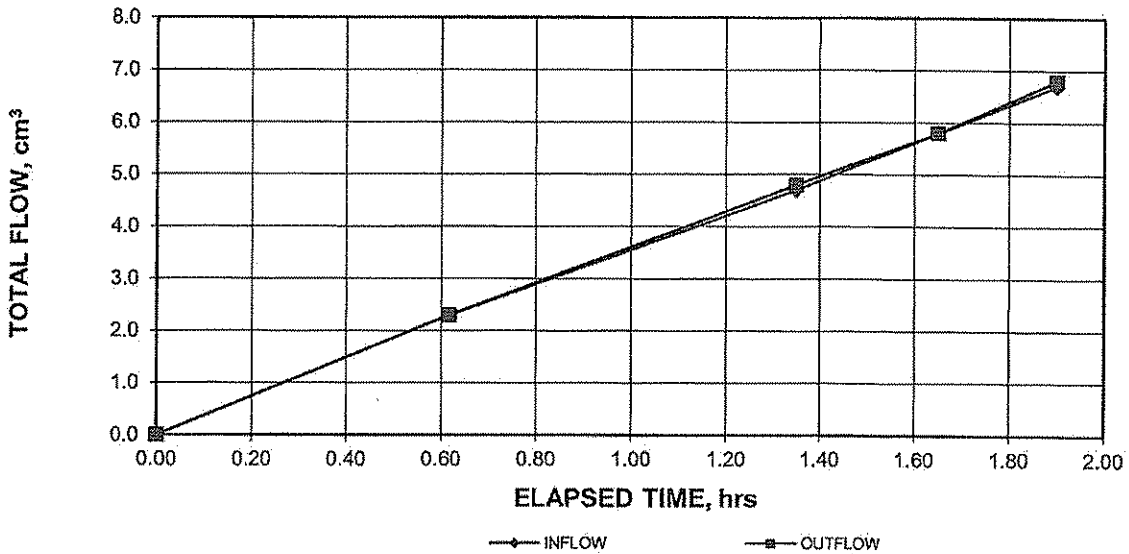
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

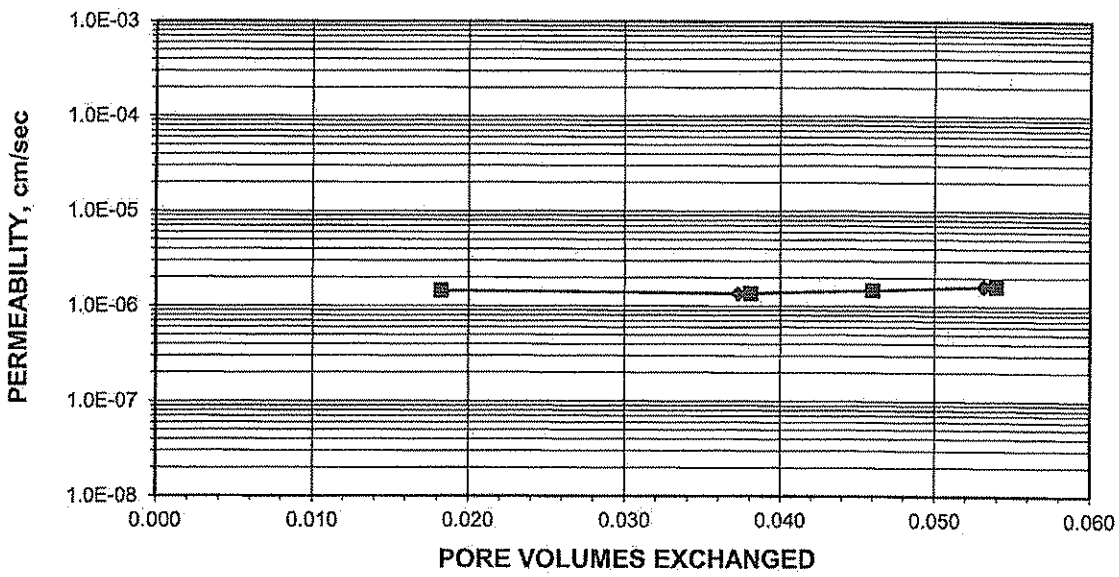
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 6
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-06	Sample No.	ST-A6-02
Lab ID No.	2012-656-06-02		

AVERAGE PERMEABILITY = 1.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.5E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 7/23/2012 Checked By: GEM Date: 7-27-12

DCN: CT-22 DATE: 2/2/2010 REVISION: 5 FILE: S:\2012-656 JOYCE - Cobles\[2012-656-06-02 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 6
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-06	Sample No.	ST-A6-02
Lab ID No.	2012-656-06-02		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: LIGHT TAN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	801	828
Wt. of Tare & WS (gm.)	347.70	321.12
Wt. of Tare & DS (gm.)	319.35	288.54
Wt. of Tare (gm.)	107.11	136.07
Wt. of Water (gm.)	28.35	32.58
Wt. of DS (gm.)	212.24	152.47
Moisture Content (%)	**13.4**	**21.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	589.91	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	589.91	631.60
Length 1 (in.)	3.095	3.054
Length 2 (in.)	3.052	3.07
Length 3 (in.)	3.089	3.048
Top Diameter (in.)	2.858	2.845
Middle Diameter (in.)	2.850	2.852
Bottom Diameter (in.)	2.842	2.842
Average Length (in.)	3.08	3.06
Average Area (in.^{2})	6.38	6.36
Sample Volume (cm^3)	321.84	318.79
Unit Wet Wt. (gm./ cm^3)	1.83	1.98
Unit Wet Wt. (pcf)	114.4	123.7
Unit Dry Wt. (pcf)	100.9	101.9
Unit Dry Wt. (gm./ cm^3)	1.62	1.63
Void Ratio, e	0.67	0.65
Porosity, n	0.40	0.40
Pore Volume (cm^3)	129.1	126.1
Total Wgt. Of Sample After Test		637.81

Tested By: BW Date: 7/23/2012 Checked By: GEM Date: 7-27-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-06-02 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 6
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-06	Sample No.	ST-A6-02
Lab ID No.	2012-656-06-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.6	Sample Length (cm), L	7.77
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.23
Cell (psi)	45.0	Sample Area (cm^2), A	41.05
Total Pressure Head (cm)	98.4	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	12.67	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	97

AVERAGE PERMEABILITY = 1.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.5E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
7/25/2012	8	7	0.00	0.0	0.0	121.3	0	25.3	NA
7/25/2012	8	44	0.62	2.3	2.3	116.6	0	25.3	1.5E-06
7/25/2012	9	28	1.35	4.7	4.8	111.6	0	25.3	1.4E-06
7/25/2012	9	46	1.65	5.8	5.8	109.4	0	25.3	1.5E-06
7/25/2012	10	1	1.90	6.7	6.8	107.4	1	25.3	1.6E-06

Tested By: BW Date: 7/23/2012 Checked By: GEM Date: 7-27-12

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FLEXIBLE WALL PERMEABILITY TEST

PERMOMETER METHOD

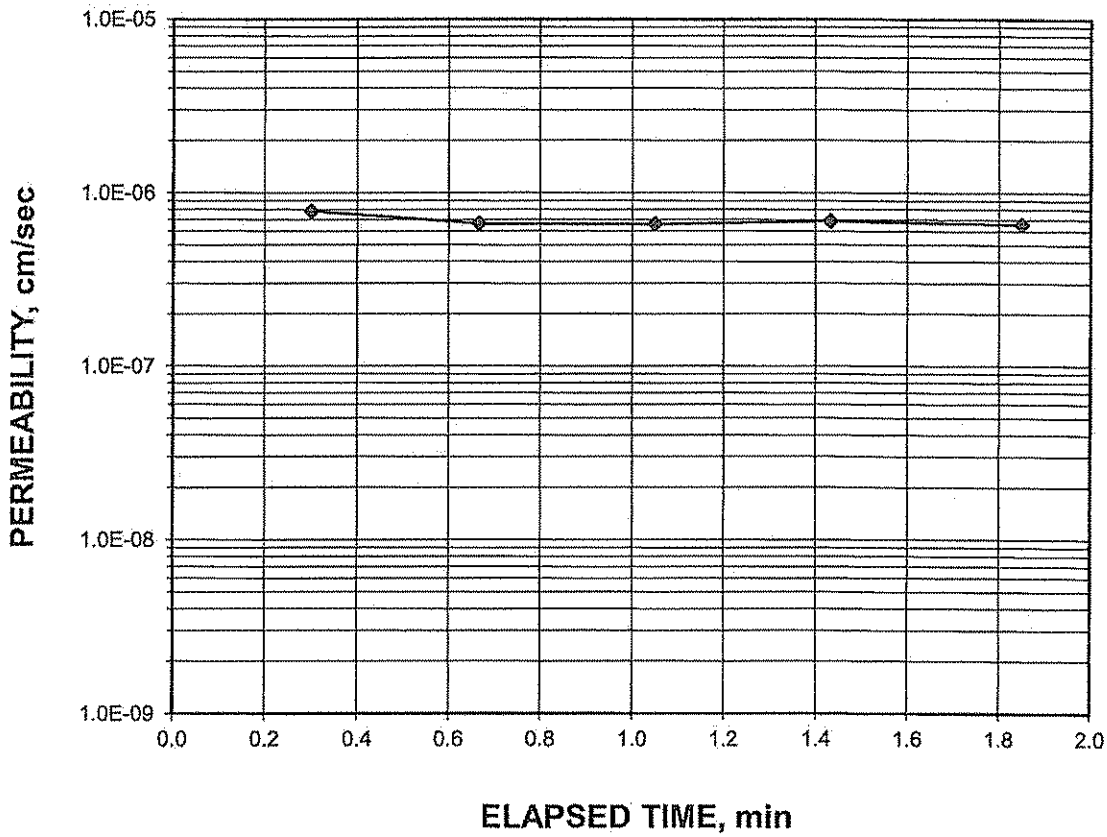
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 6
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-07	Sample No.	ST-06-03
Lab ID No.	2012-656-07-02		

Visual Description: YELLOW ORANGE SANDY CLAY

AVERAGE PERMEABILITY = 6.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.7E-09 m/sec @ 20°C

PERMEABILITY vs. TIME



Tested By: SFS Date: 7/31/2012 Checked By: GEM Date: 8-3-12

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 6
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-07	Sample No.	ST-06-03
Lab ID No.	2012-656-07-02		

Specific Gravity	2.70	Assumed
Sample Condition		Undisturbed

Visual Description: YELLOW ORANGE SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	825	807
Wt. of Tare & WS (gm.)	344.48	348.47
Wt. of Tare & DS (gm.)	307.50	298.76
Wt. of Tare (gm.)	136.96	104.72
Wt. of Water (gm.)	36.98	49.71
Wt. of DS (gm.)	170.54	194.04
Moisture Content (%)	**21.7**	**25.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	608.55	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.) (gm.)	608.55	628.23
Length 1 (in.)	3.044	3.069
Length 2 (in.)	3.064	3.048
Length 3 (in.)	3.064	3.039
Top Diameter (in.)	2.842	2.851
Middle Diameter (in.)	2.838	2.852
Bottom Diameter (in.)	2.839	2.856
Average Length (in.)	3.06	3.05
Average Area (in.^{2})	6.33	6.39
Sample Volume (cm^3)	317.30	319.73
Unit Wet Wt. (gm./ cm^3)	1.918	1.965
Unit Wet Wt. (pcf)	119.7	122.7
Unit Dry Wt. (pcf)	98.4	97.6
Unit Dry Wt. (gm./ cm^3)	1.576	1.564
Void Ratio, e	0.713	0.726
Porosity, n	0.416	0.421
Pore Volume (cm^3)	132.1	134.5
Total Wt. Of Sample After Test		631.76

Tested By: SFS Date: 7/31/2012 Checked By: GBM Date: 8-3-12

DCN: CT-22A DATE:2-2-10 REVISION:0 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-07-02 Permometer wHeader.xls]Sheet1

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FLEXIBLE WALL PERMEABILITY TEST
PERMOMETER METHOD
ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 6
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-07	Sample No.	ST-06-03
Lab ID No.	2012-656-07-02		

Test Pressures		Final Sample Dimensions	
Cell Pressure(psi)	45.0	Sample Length (cm), L	7.75
Back Pressure(psi)	40.0	Sample Area (cm^2), A	41.24
Eff. Cons. Pressure(psi)	5.0	Pipette Area (cm^2), a_p	0.03142
Response (%)	95	Annulus Area (cm^2), a_a	0.76712
		Equilibrium Level (cm), R_{eq}	1.3

AVERAGE PERMEABILITY = 6.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.7E-09 m/sec @ 20°C

DATE		TIME			ELAPSED TIME t	PIPETTE READI NG R_p	INCREMENT GRADIENT i	TEMP.	INCREMENTAL PERMEABILITY @ 20°C
(mm/dd/yy)	(hr)	(min)	(sec)	(min)	(min)	(cm)	(cm/cm)	(°C)	(cm/sec)
8/2/2012	15	4	42	4.70	0.000	7.0	9.6	25.8	NA
8/2/2012	15	5	0	5.00	0.300	6.8	9.3	25.8	7.8E-07
8/2/2012	15	5	22	5.37	0.667	6.6	8.9	25.8	6.6E-07
8/2/2012	15	5	45	5.75	1.050	6.4	8.6	25.8	6.6E-07
8/2/2012	15	6	8	6.13	1.433	6.2	8.3	25.8	6.9E-07
8/2/2012	15	6	33	6.55	1.850	6.0	7.9	25.8	6.6E-07

Tested By: SFS Date: 7/31/2012 Checked By: GEM Date: 8-3-12

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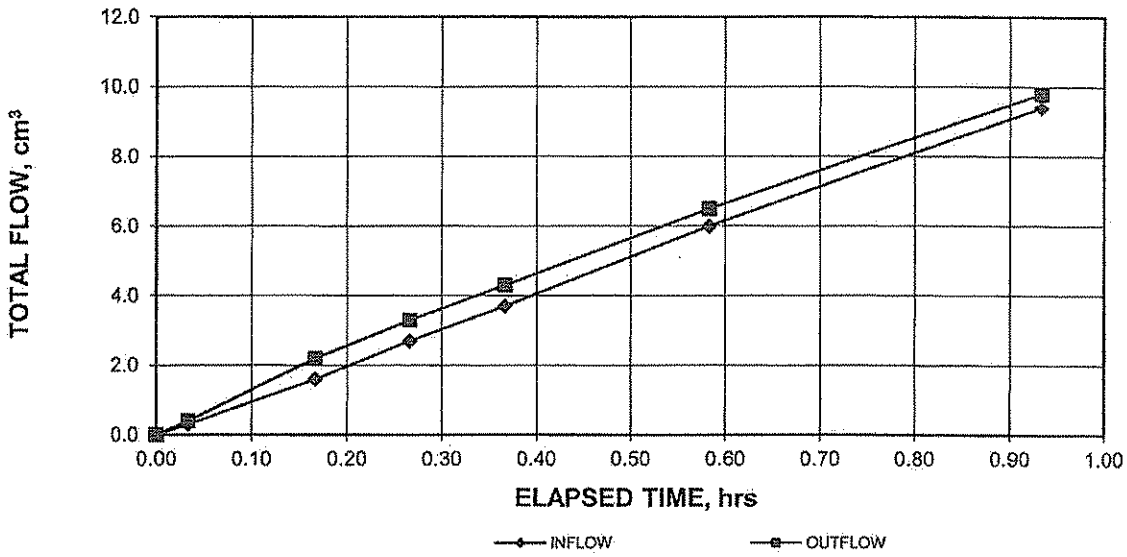
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

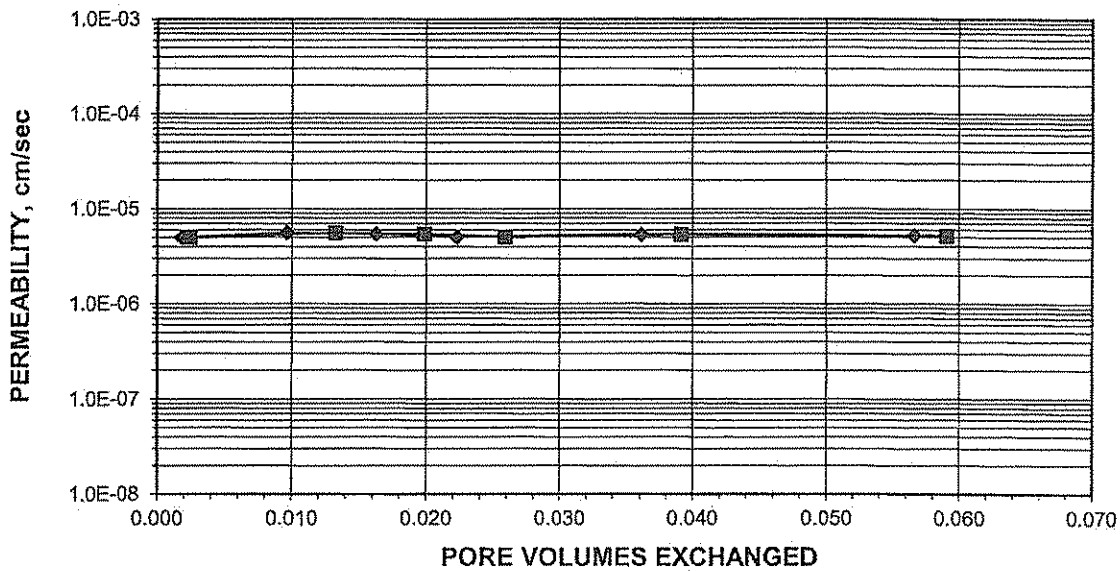
Client	JOYCE ENGINEERING, INC.	Boring No.	ST-A7-L1
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-11	Sample No.	ST-02
Lab ID No.	2012-656-11-02		

AVERAGE PERMEABILITY = 5.3E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.3E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 9/14/2012 Checked By: GEM Date: 9-18-12

DCN: CT-22 DATE: 2/2/2010 REVISION: 0 S:\2012-656 JOYCE - Cobles\[2012-656-11-02 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ST-A7-L1
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-11	Sample No.	ST-02
Lab ID No.	2012-656-11-02		
		Specific Gravity	2.70 Assumed
		Sample Condition	Undisturbed

Visual Description: RED / LIGHT BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	820	8010
Wt. of Tare & WS (gm.)	404.82	641.88
Wt. of Tare & DS (gm.)	370.72	543.43
Wt. of Tare (gm.)	136.17	135.84
Wt. of Water (gm.)	34.10	98.45
Wt. of DS (gm.)	234.55	407.59
Moisture Content (%)	**14.5**	**24.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	778.45	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	778.45	843.80
Length 1 (in.)	4.244	4.133
Length 2 (in.)	4.313	4.120
Length 3 (in.)	4.257	4.029
Top Diameter (in.)	2.834	2.819
Middle Diameter (in.)	2.835	2.793
Bottom Diameter (in.)	2.820	2.834
Average Length (in.)	4.27	4.09
Average Area (in.^{2})	6.29	6.23
Sample Volume (cm^3)	440.17	417.64
Unit Wet Wt. (gm./ cm^3)	1.77	2.02
Unit Wet Wt. (pcf)	110.4	126.1
Unit Dry Wt. (pcf)	96.4	101.6
Unit Dry Wt. (gm./ cm^3)	1.54	1.63
Void Ratio, e	0.75	0.66
Porosity, n	0.43	0.40
Pore Volume (cm^3)	188.5	165.9
Total Wgt. Of Sample After Test		832.74

Tested By: SFS Date: 9/14/2012 Checked By: GEM Date: 9-18-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 \2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-11-02 PERMflow w header.xls]Sheet1
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ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ST-A7-L1
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-11	Sample No.	ST-02
Lab ID No.	2012-656-11-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	10.40
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.15
Cell (psi)	45.0	Sample Area (cm^2), A	40.16
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.865
Hydraulic Gradient	10.14	Outflow Burette Area (cm^2), a-out	0.865
		B Parameter (%)	96

AVERAGE PERMEABILITY = 5.3E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.3E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
9/17/2012	15	10	0.00	0.0	0.0	133.0	0	25.3	NA
9/17/2012	15	12	0.03	0.3	0.4	132.2	0	25.3	5.0E-06
9/17/2012	15	20	0.17	1.6	2.2	128.6	0	25.3	5.6E-06
9/17/2012	15	26	0.27	2.7	3.3	126.1	0	25.3	5.4E-06
9/17/2012	15	32	0.37	3.7	4.3	123.8	0	25.3	5.0E-06
9/17/2012	15	45	0.58	6.0	6.5	118.6	0	25.4	5.4E-06
9/17/2012	16	6	0.93	9.4	9.8	111.0	1	25.4	5.2E-06

Tested By: SFS Date: 9/14/2012 Checked By: GEM Date: 9-18-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-11-02 PERMflow w header.xls]Sheet1

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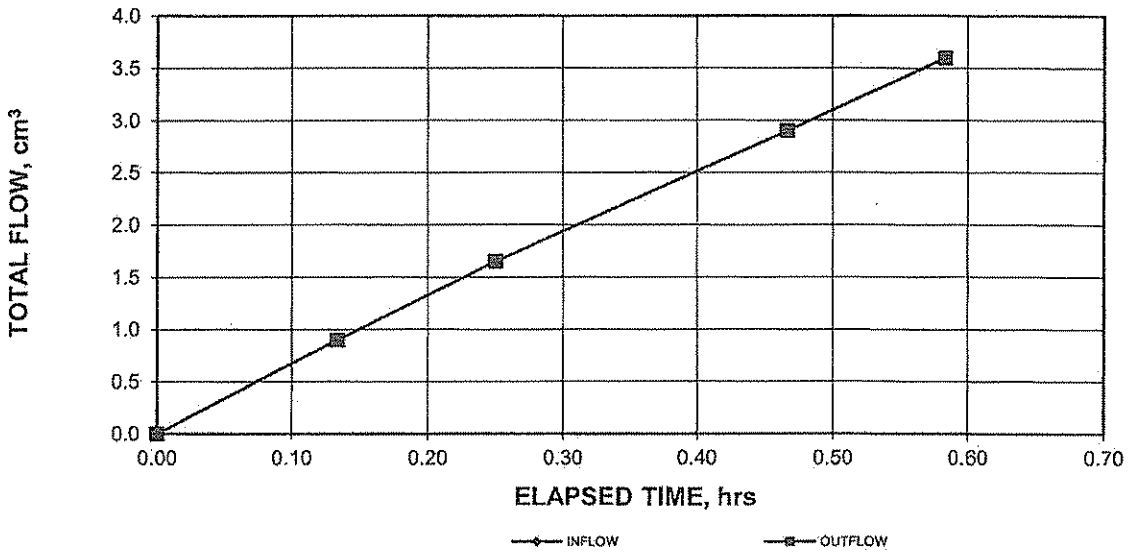
PERMEABILITY TEST

ASTM D 5084-03

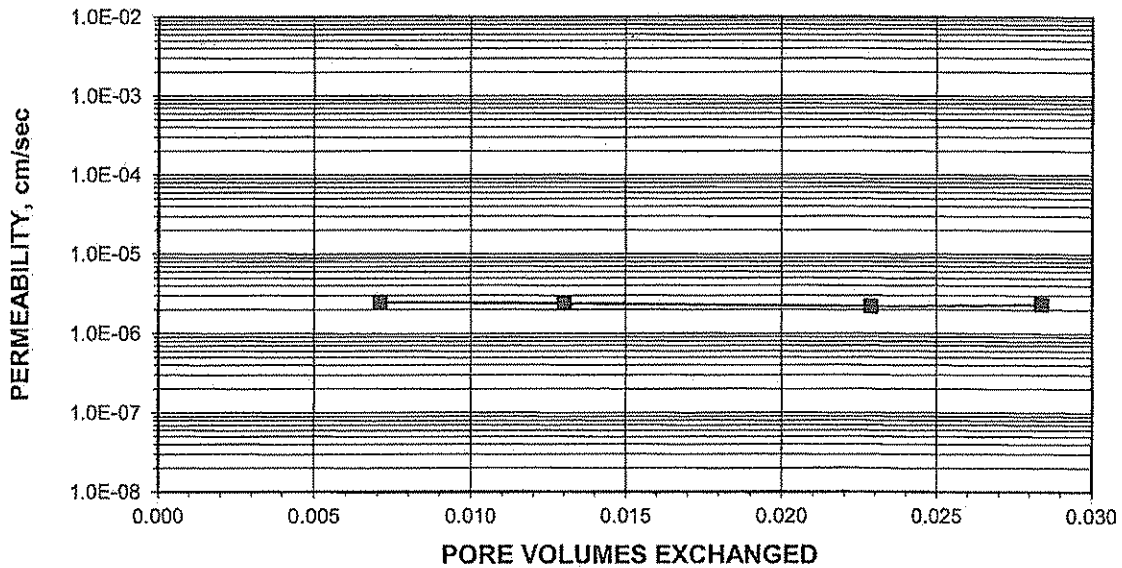
Client	JOYCE ENGINEERING	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-13	Sample No.	ST-A7-L2
Lab ID No.	2012-656-13-02		

AVERAGE PERMEABILITY = 2.4E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.4E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 9/27/2012 Checked By: JBD Date: 10-2-12

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-13	Sample No.	ST-A7-L2
Lab ID No.	2012-656-13-02		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: ORANGE SANDY CLAY WITH ROCKS

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	814	808
Wt. of Tare & WS (gm.)	417.12	351.62
Wt. of Tare & DS (gm.)	367.39	304.92
Wt. of Tare (gm.)	111.39	104.45
Wt. of Water (gm.)	49.73	46.70
Wt. of DS (gm.)	256.00	200.47
Moisture Content (%)	**19.4**	**23.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	615.63	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	615.63	635.58
Length 1 (in.)	3.121	3.044
Length 2 (in.)	3.084	3.081
Length 3 (in.)	3.094	3.093
Top Diameter (in.)	2.841	2.834
Middle Diameter (in.)	2.839	2.837
Bottom Diameter (in.)	2.844	2.833
Average Length (in.)	3.10	3.07
Average Area ($in.^2$)	6.34	6.31
Sample Volume (cm^3)	322.07	317.77
Unit Wet Wt. ($gm./cm^3$)	1.91	2.00
Unit Wet Wt. (pcf)	119.3	124.9
Unit Dry Wt. (pcf)	99.9	101.3
Unit Dry Wt. ($gm./cm^3$)	1.60	1.62
Void Ratio, e	0.69	0.66
Porosity, n	0.41	0.40
Pore Volume (cm^3)	131.1	126.8
Total Wgt. Of Sample After Test		636.48

Tested By: SFS Date: 9/27/2012 Checked By: JBD Date: 10-2-12

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-13	Sample No.	ST-A7-L2
Lab ID No.	2012-656-13-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	40.5	Sample Length (cm), L	7.80
Bottom Cap (psi)	42.0	Sample Diameter (cm)	7.20
Cell (psi)	47.0	Sample Area (cm^2), A	40.72
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.877
Hydraulic Gradient	13.51	Outflow Burette Area (cm^2), a-out	0.886
		B Parameter (%)	97

AVERAGE PERMEABILITY = 2.4E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
9/28/2012	9	41	0.00	0.0	0.0	129.0	0	24.5	NA
9/28/2012	9	49	0.13	0.9	0.9	127.0	0	24.5	2.5E-06
9/28/2012	9	56	0.25	1.7	1.7	125.3	0	24.5	2.4E-06
9/28/2012	10	9	0.47	2.9	2.9	122.5	0	24.6	2.2E-06
9/28/2012	10	16	0.58	3.6	3.6	120.9	0	24.6	2.3E-06

Tested By: SFS Date: 9/27/2012 Checked By: JBD Date: 10-2-12

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PERMEABILITY TEST

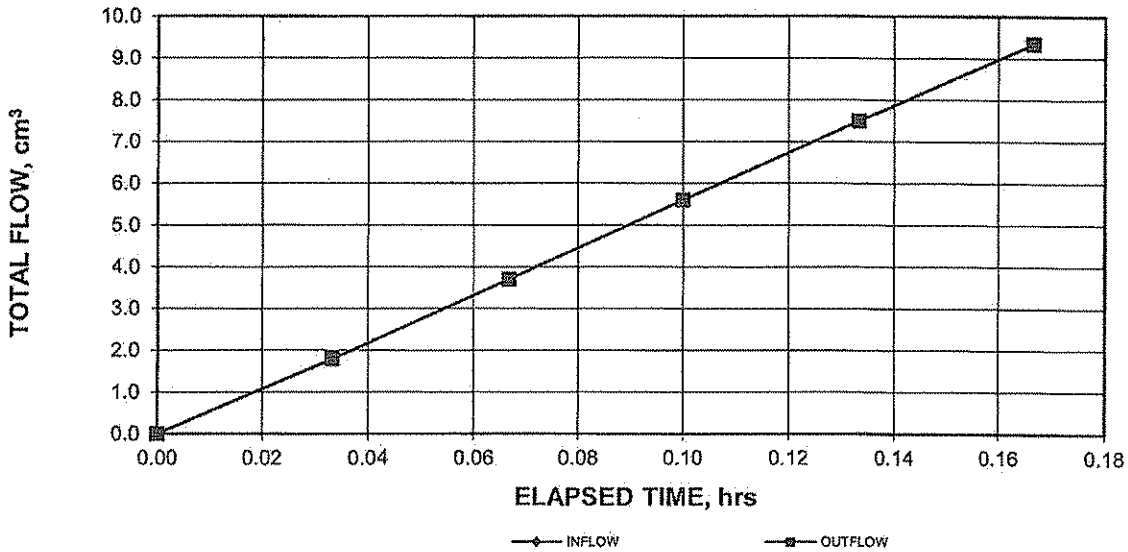
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-14	Sample No.	ST-A7-L3
Lab ID No.	2012-656-14-01		

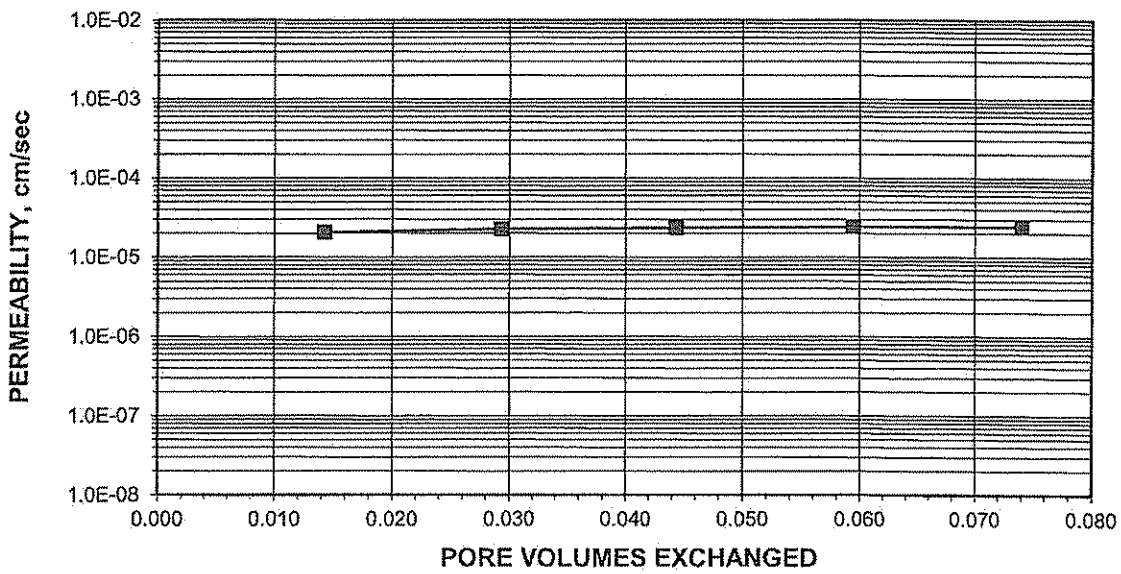
AVERAGE PERMEABILITY = 2.4E-05 cm/sec @ 20°C
AVERAGE PERMEABILITY = 2.4E-07 m/sec @ 20°C

fair

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 10/18/2012 Checked By: GEM Date: 10-22-12

DCN: CT-22 DATE: 2/2/10 REVISION: 3 S:\2012-656 JOYCE - Cobles\[2012-656-14-01 PERM flow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-14	Sample No.	ST-A7-L3
Lab ID No.	2012-656-14-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	816	827
Wt. of Tare & WS (gm.)	336.64	329.55
Wt. of Tare & DS (gm.)	305.56	284.68
Wt. of Tare (gm.)	135.77	136.4
Wt. of Water (gm.)	31.08	44.87
Wt. of DS (gm.)	169.79	148.28
Moisture Content (%)	**18.3**	**30.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	612.35	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	612.35	674.23
Length 1 (in.)	3.094	3.085
Length 2 (in.)	3.112	3.099
Length 3 (in.)	3.120	3.082
Top Diameter (in.)	2.849	2.829
Middle Diameter (in.)	2.840	2.836
Bottom Diameter (in.)	2.841	2.819
Average Length (in.)	3.11	3.09
Average Area (in.^{2})	6.35	6.28
Sample Volume (cm^3)	323.46	317.92
Unit Wet Wt. (gm./ cm^3)	1.89	2.12
Unit Wet Wt. (pcf)	118.2	132.4
Unit Dry Wt. (pcf)	99.9	101.6
Unit Dry Wt. (gm./ cm^3)	1.60	1.63
Void Ratio, e	0.69	0.66
Porosity, n	0.41	0.40
Pore Volume (cm^3)	131.8	126.2
Total Wgt. Of Sample After Test		628.79

Tested By: BW Date: 10/18/2012 Checked By: GJM Date: 10-22-12

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-14	Sample No.	ST-A7-L3
Lab ID No.	2012-656-14-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.85
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.18
Cell (psi)	45.0	Sample Area (cm^2), A	40.52
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.877
Hydraulic Gradient	13.44	Outflow Burette Area (cm^2), a-out	0.886
		B Parameter (%)	96

AVERAGE PERMEABILITY = 2.4E-05 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.4E-07 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/19/2012	11	10	0.00	0.0	0.0	129.0	0	23.5	NA
10/19/2012	11	12	0.03	1.8	1.8	125.0	0	23.5	2.1E-05
10/19/2012	11	14	0.07	3.7	3.7	120.7	0	23.5	2.3E-05
10/19/2012	11	16	0.10	5.6	5.6	116.4	0	23.5	2.4E-05
10/19/2012	11	18	0.13	7.5	7.5	112.2	0	23.5	2.4E-05
10/19/2012	11	20	0.17	9.4	9.4	108.0	1	23.5	2.5E-05

Tested By: BW Date: 10/18/2012 Checked By: GEM Date: 10-22-12

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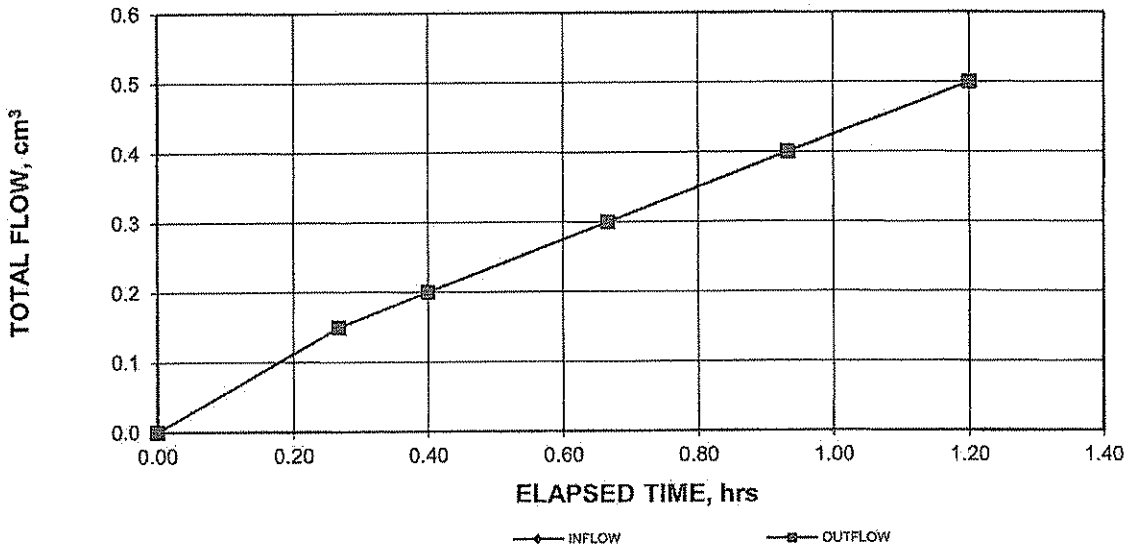
PERMEABILITY TEST

ASTM D 5084-03

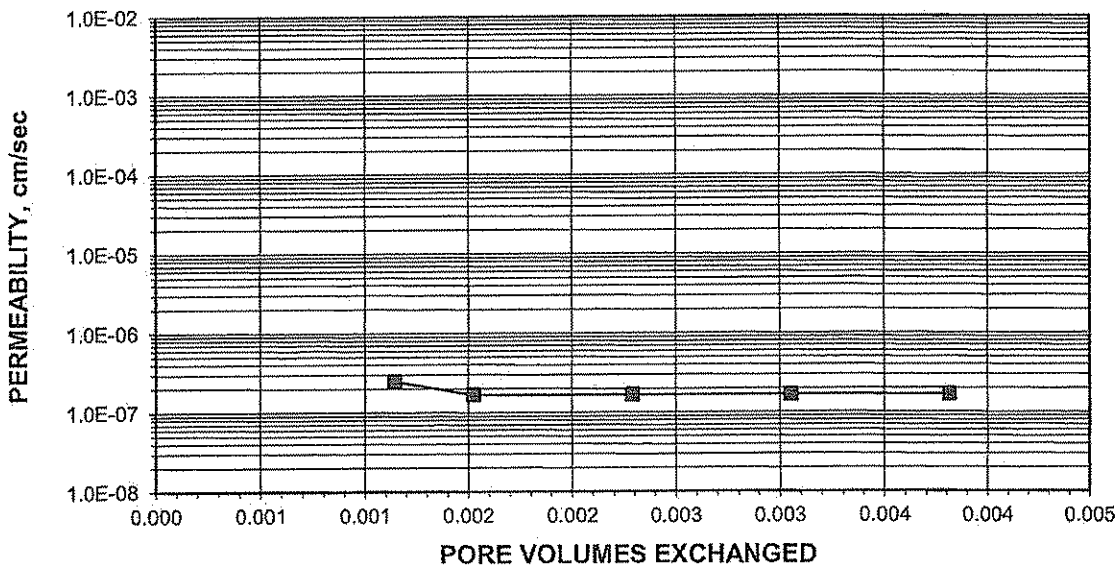
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-15	Sample No.	ST-A7-L3 RETEST
Lab ID No.	2012-656-15-01		

AVERAGE PERMEABILITY = 1.7E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 10/25/2012 Checked By: Gem Date: 10-30-12

DCN: CT-22 DATE: 2/2/2012 REVISION: 0 [2012-656 JOYCE - Cobles\[2012-656-15-01 RETEST PERMflow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-15	Sample No.	ST-A7-L3 RETEST
Lab ID No.	2012-656-15-01		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: ORANGE SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	SSR	823
Wt. of Tare & WS (gm.)	436.47	334.67
Wt. of Tare & DS (gm.)	383.32	293.91
Wt. of Tare (gm.)	99.43	136.71
Wt. of Water (gm.)	53.15	40.76
Wt. of DS (gm.)	283.89	157.20
Moisture Content (%)	**18.7**	**25.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	628.34	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	628.34	666.48
Length 1 (in.)	3.093	3.112
Length 2 (in.)	3.110	3.139
Length 3 (in.)	3.106	3.123
Top Diameter (in.)	2.845	2.854
Middle Diameter (in.)	2.848	2.855
Bottom Diameter (in.)	2.849	2.846
Average Length (in.)	3.10	3.12
Average Area (in.^{2})	6.37	6.39
Sample Volume (cm^3)	323.78	327.03
Unit Wet Wt. (gm./ cm^3)	1.94	2.04
Unit Wet Wt. (pcf)	121.1	127.2
Unit Dry Wt. (pcf)	102.0	101.0
Unit Dry Wt. (gm./ cm^3)	1.63	1.62
Void Ratio, e	0.65	0.67
Porosity, n	0.39	0.40
Pore Volume (cm^3)	127.8	131.0
Total Wgt. Of Sample After Test		648.23

Tested By: BW Date: 10/25/2012 Checked By: GEM Date: 10-30-12

DCN: CT-22 DATE: 2/2/10 REVISED BY: [illegible]\PROJECTS\2012-656 JOYCE - Cobles\[2012-656-15-01 RETEST PERM flow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 7
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-15	Sample No.	ST-A7-L3 RETEST
Lab ID No.	2012-656-15-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.94
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.24
Cell (psi)	45.0	Sample Area (cm^2), A	41.21
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.897
Hydraulic Gradient	13.29	Outflow Burette Area (cm^2), a-out	0.878
		B Parameter (%)	99

AVERAGE PERMEABILITY = 1.7E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.7E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/19/2012	9	42	0.00	0.0	0.0	114.5	0	21.9	NA
10/19/2012	9	58	0.27	0.1	0.1	114.2	0	21.9	2.5E-07
10/19/2012	10	6	0.40	0.2	0.2	114.0	0	21.9	1.7E-07
10/19/2012	10	22	0.67	0.3	0.3	113.8	0	21.9	1.7E-07
10/19/2012	10	38	0.93	0.4	0.4	113.6	0	21.9	1.7E-07
10/19/2012	10	54	1.20	0.5	0.5	113.4	1	21.9	1.7E-07

Tested By: BW Date: 10/25/2012 Checked By: GEM Date: 10-30-12

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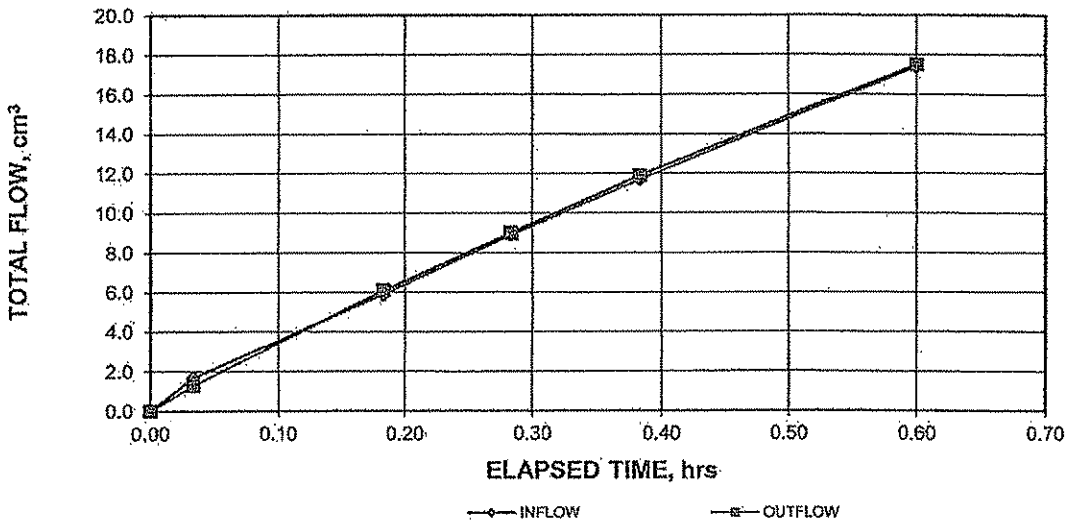
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

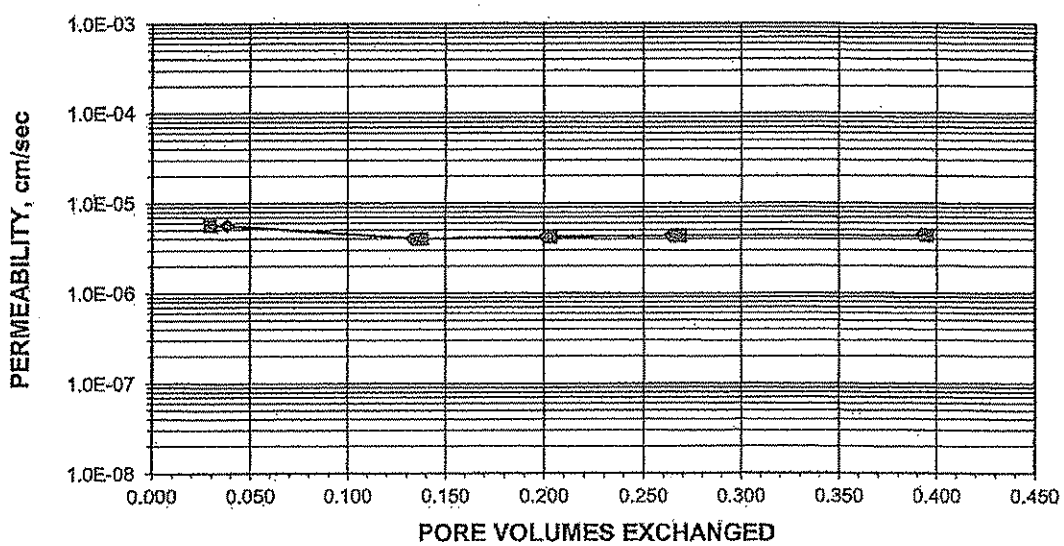
Client	JOYCE ENGINEERING, INC.	Boring No.	ST-A8-L1
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-11	Sample No.	ST-01
Lab ID No.	2012-656-11-01		

AVERAGE PERMEABILITY = 4.3E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.3E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 9/14/2012 Checked By: GEM Date: 9-18-12

DCN: CT-22 DATE: 2/2/120 REVISION: C:\S\2012-656 JOYCE - Cobles\[2012-656-11-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ST-A8-L1
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-11	Sample No.	ST-01
Lab ID No.	2012-656-11-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: RED SANDY CLAY WITH GRAY SAND

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	818	820
Wt. of Tare & WS (gm.)	359.33	359.28
Wt. of Tare & DS (gm.)	329.58	313.47
Wt. of Tare (gm.)	137.33	136.29
Wt. of Water (gm.)	29.75	45.81
Wt. of DS (gm.)	192.25	177.18
Moisture Content (%)	**15.5**	**25.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	204.82	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	204.82	223.23
Length 1 (in.)	1.200	1.089
Length 2 (in.)	1.159	1.111
Length 3 (in.)	1.161	1.045
Top Diameter (in.)	2.823	2.794
Middle Diameter (in.)	2.824	2.816
Bottom Diameter (in.)	2.791	2.823
Average Length (in.)	1.17	1.08
Average Area (in.^{2})	6.21	6.21
Sample Volume (cm^3)	119.47	110.00
Unit Wet Wt. (gm./ cm^3)	1.71	2.03
Unit Wet Wt. (pcf)	107.0	126.7
Unit Dry Wt. (pcf)	92.7	100.7
Unit Dry Wt. (gm./ cm^3)	1.48	1.61
Void Ratio, e	0.82	0.67
Porosity, n	0.45	0.40
Pore Volume (cm^3)	53.8	44.3
Total Wgt. Of Sample After Test		223.68

Tested By: SFS Date: 9/14/2012 Checked By: GEM Date: 9-18-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-11-01 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ST-A8-L1
Client Project	COBLE SR	Depth (ft.)	NA
Project No.	2012-656-11	Sample No.	ST-01
Lab ID No.	2012-656-11-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	2.75
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.14
Cell (psi)	45.0	Sample Area (cm^2), A	40.04
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.865
Hydraulic Gradient	38.38	Outflow Burette Area (cm^2), a-out	0.865
		B Parameter (%)	100

AVERAGE PERMEABILITY = 4.3E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 4.3E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
9/17/2012	15	9	0.00	0.0	0.0	133.0	0	25.3	NA
9/17/2012	15	11	0.03	1.7	1.3	129.5	0	25.3	5.7E-06
9/17/2012	15	20	0.18	5.9	6.1	119.2	0	25.3	4.0E-06
9/17/2012	15	26	0.28	8.9	9.0	112.4	0	25.3	4.3E-06
9/17/2012	15	32	0.38	11.7	11.9	105.9	0	25.3	4.4E-06
9/17/2012	15	45	0.60	17.4	17.5	93.0	1	25.3	4.4E-06

Tested By: SFS Date: 9/14/2012 Checked By: GEM Date: 9-18-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-11-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

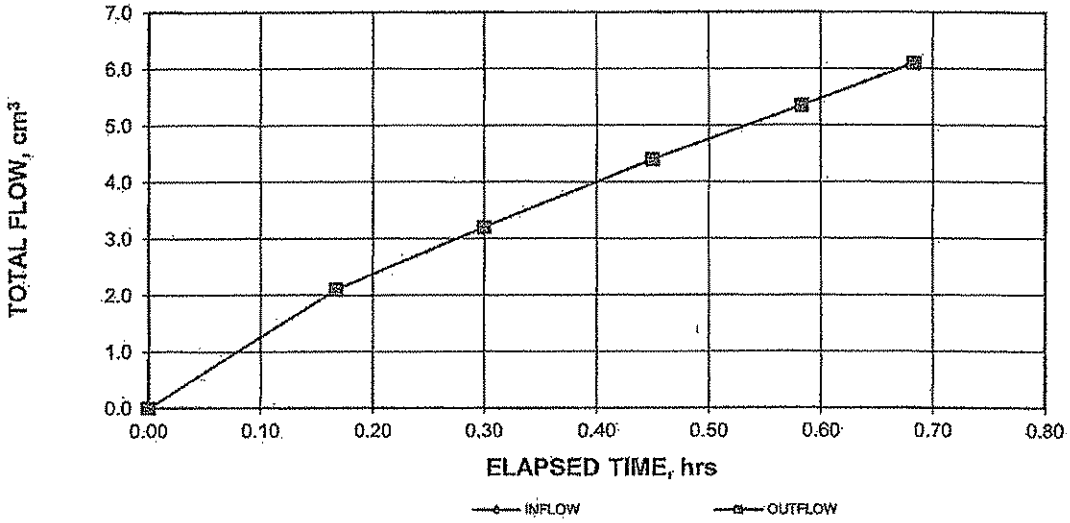
ASTM D 5084-03

Client	JOYCE ENGINEERING	Boring No.	ACRE 8
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-13	Sample No.	ST-A8-L2
Lab ID No.	2012-656-13-01		

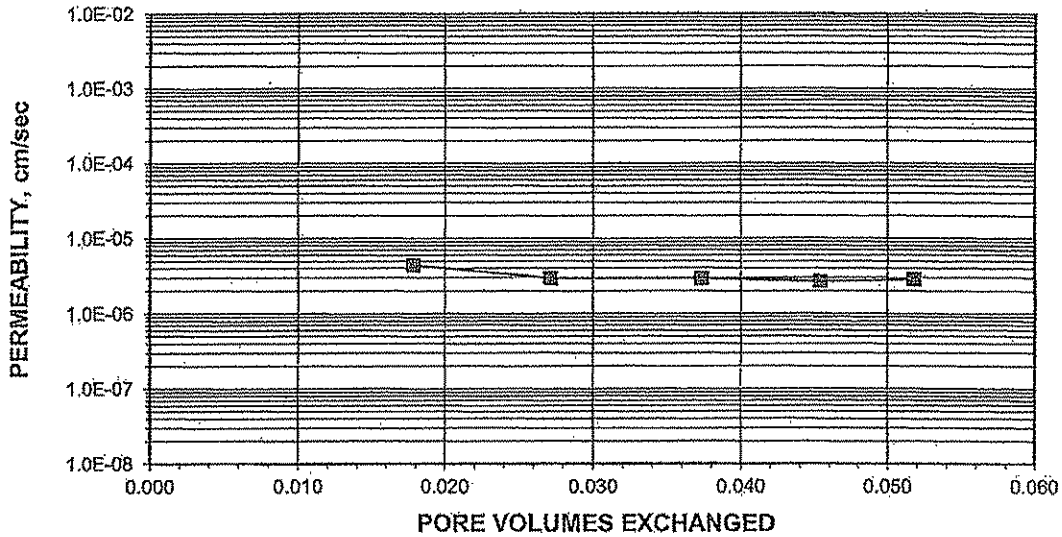
AVERAGE PERMEABILITY = 2.9E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.9E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 9/27/2012 Checked By: JBD Date: 10-2-12

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ASTM D 5084-10

Client	JOYCE ENGINEERING	Boring No.	ACRE 8
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-13	Sample No.	ST-A8-L2
Lab ID No.	2012-656-13-01		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: ORANGE SANDY CLAY WITH ROCKS

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	805	810
Wt. of Tare & WS (gm.)	439.07	318.41
Wt. of Tare & DS (gm.)	385.32	278.21
Wt. of Tare (gm.)	105.84	114.46
Wt. of Water (gm.)	53.75	40.20
Wt. of DS (gm.)	279.48	163.75
Moisture Content (%)	**19.2**	**24.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	584.34	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	584.34	610.40
Length 1 (in.)	2.972	2.875
Length 2 (in.)	2.973	2.889
Length 3 (in.)	2.965	2.902
Top Diameter (in.)	2.843	2.835
Middle Diameter (in.)	2.831	2.838
Bottom Diameter (in.)	2.835	2.839
Average Length (in.)	2.97	2.89
Average Area (in.^{2})	6.32	6.32
Sample Volume (cm^3)	307.51	299.30
Unit Wet Wt. (gm./ cm^3)	1.90	2.04
Unit Wet Wt. (pcf)	118.6	127.3
Unit Dry Wt. (pcf)	99.5	102.2
Unit Dry Wt. (gm./ cm^3)	1.59	1.64
Void Ratio, e	0.69	0.65
Porosity, n	0.41	0.39
Pore Volume (cm^3)	126.0	117.8
Total Wgt. Of Sample After Test		595.04

Tested By: SFS Date: 9/27/2012 Checked By: JBD Date: 10-2-12

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING	Boring No.	ACRE 8
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-13	Sample No.	ST-A8-L2
Lab ID No.	2012-656-13-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.34
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.21
Cell (psi)	45.0	Sample Area (cm^2), A	40.79
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	14.37	Outflow Burette Area (cm^2), a-out	0.972
		B Parameter (%)	100

AVERAGE PERMEABILITY = 2.9E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.9E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
9/28/2012	9	21	0.00	0.0	0.0	129.7	0	24.4	NA
9/28/2012	9	31	0.17	2.1	2.1	125.1	0	24.4	4.4E-06
9/28/2012	9	39	0.30	3.2	3.2	122.7	0	24.4	3.0E-06
9/28/2012	9	48	0.45	4.4	4.4	120.1	0	24.5	2.9E-06
9/28/2012	9	56	0.58	5.4	5.4	118.0	0	24.5	2.7E-06
9/28/2012	10	2	0.68	6.1	6.1	116.4	1	24.5	2.9E-06

Tested By: SFS Date: 9/27/2012 Checked By: JBD Date: 10-2-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-13-01 PERM flow w header.xls]Sheet1

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INTEGRITY IN TESTING

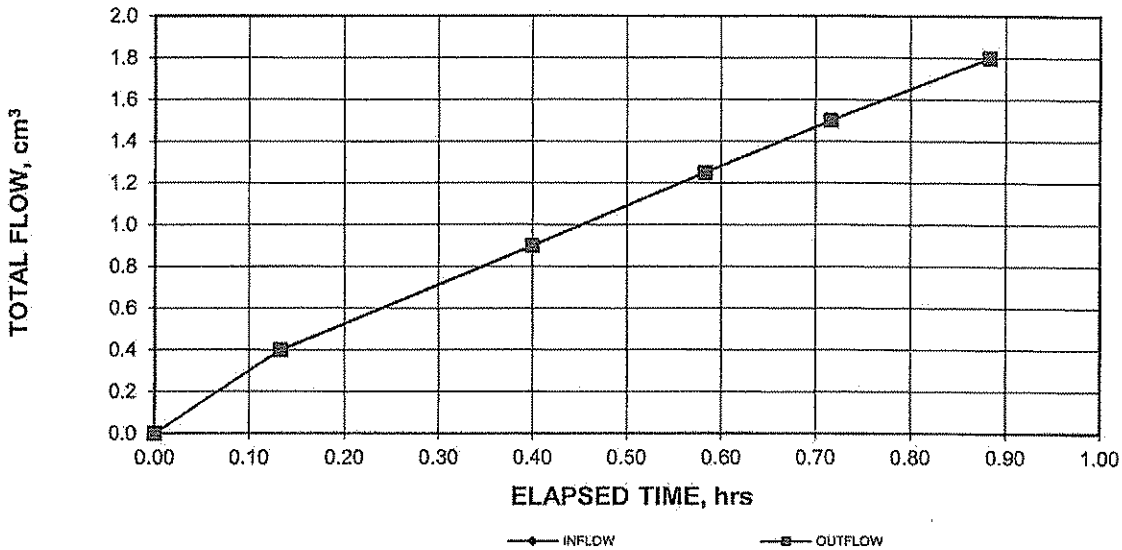
PERMEABILITY TEST

ASTM D 5084-03

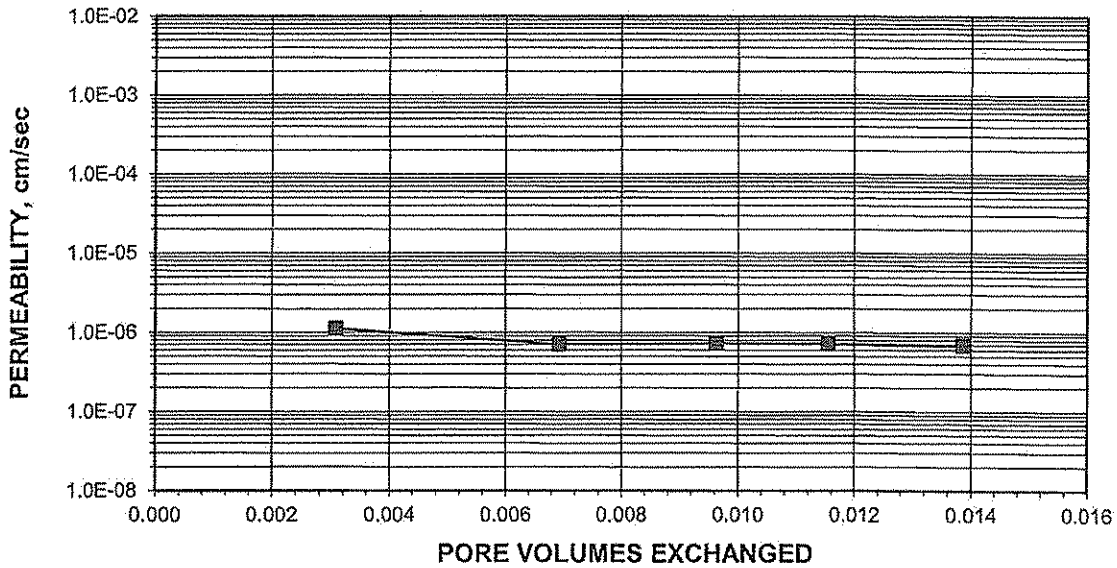
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 8
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-14	Sample No.	ST-A8-L3
Lab ID No.	2012-656-14-02		

AVERAGE PERMEABILITY = 7.1E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 7.1E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 10/18/2012 Checked By: GEM Date: 10-22-12

DCN: CT-22 DATE: 2/2/2010 REVISION: 3 S:\2012-656 JOYCE - Cobles\[2012-656-14-02 PERMflow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 8
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-14	Sample No.	ST-A8-L3
Lab ID No.	2012-656-14-02		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	815	8010
Wt. of Tare & WS (gm.)	353.07	353.92
Wt. of Tare & DS (gm.)	315.49	309.22
Wt. of Tare (gm.)	135.85	135.87
Wt. of Water (gm.)	37.58	44.70
Wt. of DS (gm.)	179.64	173.35
Moisture Content (%)	**20.9**	**25.8**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	626.60	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	626.60	651.82
Length 1 (in.)	3.080	3.078
Length 2 (in.)	3.066	3.085
Length 3 (in.)	3.084	3.073
Top Diameter (in.)	2.860	2.851
Middle Diameter (in.)	2.855	2.84
Bottom Diameter (in.)	2.861	2.858
Average Length (in.)	3.08	3.08
Average Area (in.^{2})	6.42	6.38
Sample Volume (cm^3)	323.59	321.77
Unit Wet Wt. (gm./ cm^3)	1.94	2.03
Unit Wet Wt. (pcf)	120.9	126.5
Unit Dry Wt. (pcf)	100.0	100.5
Unit Dry Wt. (gm./ cm^3)	1.60	1.61
Void Ratio, e	0.69	0.68
Porosity, n	0.41	0.40
Pore Volume (cm^3)	131.7	129.8
Total Wgt. Of Sample After Test		641.61

Tested By: BW Date: 10/18/2012 Checked By: GEM Date: 10-22-12

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 8
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-14	Sample No.	ST-A8-L3
Lab ID No.	2012-656-14-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.82
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.24
Cell (psi)	45.0	Sample Area (cm^2), A	41.15
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.877
Hydraulic Gradient	13.49	Outflow Burette Area (cm^2), a-out	0.886
		B Parameter (%)	96

AVERAGE PERMEABILITY = 7.1E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 7.1E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
10/18/2012	9	43	0.00	0.0	0.0	129.0	0	23.3	NA
10/18/2012	9	51	0.13	0.4	0.4	128.1	0	23.3	1.1E-06
10/18/2012	10	7	0.40	0.9	0.9	127.0	0	23.3	7.1E-07
10/18/2012	10	18	0.58	1.3	1.3	126.2	0	23.3	7.3E-07
10/18/2012	10	26	0.72	1.5	1.5	125.6	0	23.3	7.2E-07
10/18/2012	10	36	0.88	1.8	1.8	125.0	1	23.3	6.9E-07

Tested By: BW Date: 10/18/2012 Checked By: GDM Date: 10-22-12

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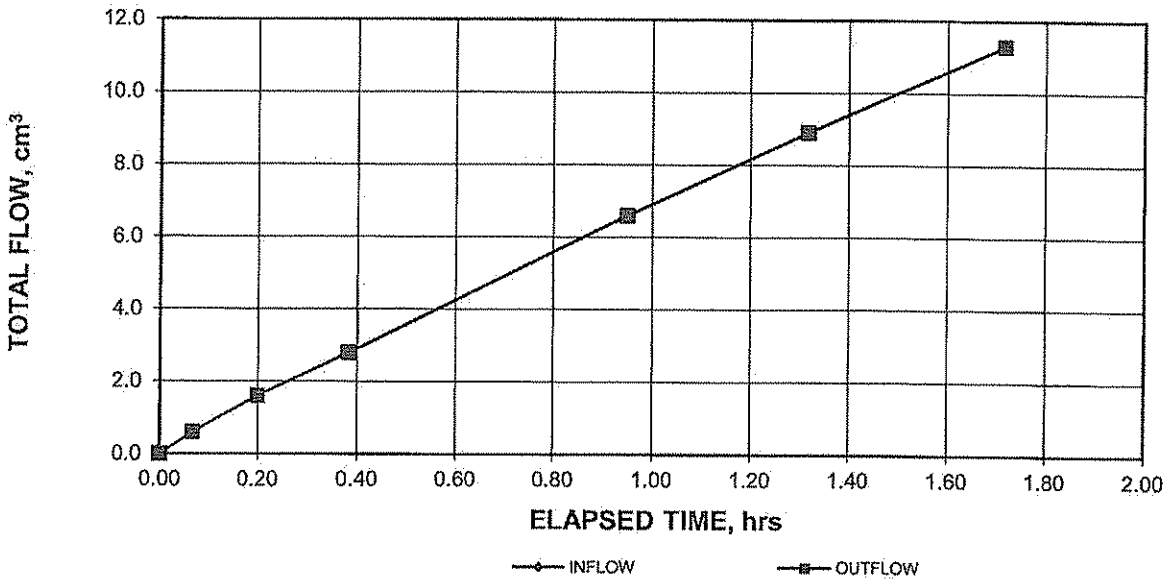
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

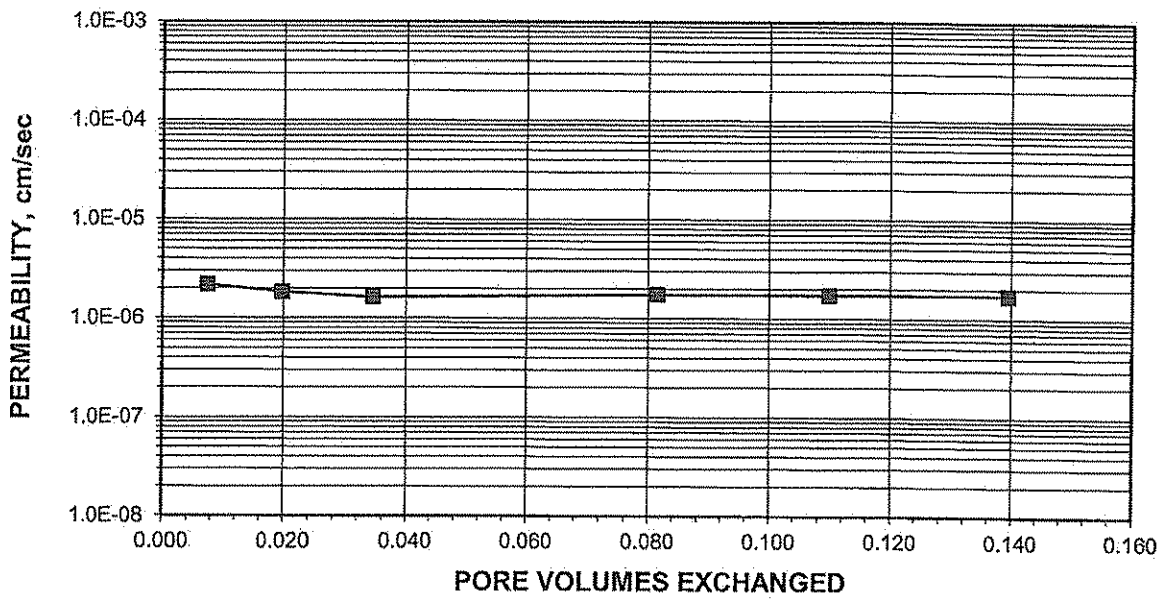
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-07	Sample No.	ST-09-01
Lab ID No.	2012-656-07-03		

AVERAGE PERMEABILITY = 1.7E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 7/31/2012 Checked By: GM Date: 8-2-12

DCN: CT-22 DATE: 2/22/20 REVISION: 5 S:\2012-656 JOYCE - Cobles\[2012-656-07-03 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-07	Sample No.	ST-09-01
Lab ID No.	2012-656-07-03		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: ORANGE YELLOW SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	803	823
Wt. of Tare & WS (gm.)	345.58	331.32
Wt. of Tare & DS (gm.)	317.22	292.22
Wt. of Tare (gm.)	103.77	136.8
Wt. of Water (gm.)	28.36	39.10
Wt. of DS (gm.)	213.45	155.42
Moisture Content (%)	**13.3**	**25.2**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	367.70	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	367.70	406.23
Length 1 (in.)	2.003	1.982
Length 2 (in.)	1.974	1.987
Length 3 (in.)	2.000	1.967
Top Diameter (in.)	2.844	2.81
Middle Diameter (in.)	2.840	2.803
Bottom Diameter (in.)	2.829	2.82
Average Length (in.)	1.99	1.98
Average Area (in.^{2})	6.32	6.21
Sample Volume (cm^3)	206.48	201.23
Unit Wet Wt. (gm./ cm^3)	1.78	2.02
Unit Wet Wt. (pcf)	111.2	126.0
Unit Dry Wt. (pcf)	98.1	100.7
Unit Dry Wt. (gm./ cm^3)	1.57	1.61
Void Ratio, e	0.72	0.67
Porosity, n	0.42	0.40
Pore Volume (cm^3)	86.3	81.0
Total Wgt. Of Sample After Test		403.94

Tested By: BW Date: 7/31/2012 Checked By: GEM Date: 8-2-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 \2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-07-03 PERMflow w header.xls]Sheet1

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ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-07	Sample No.	ST-09-01
Lab ID No.	2012-656-07-03		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	5.03
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.14
Cell (psi)	45.0	Sample Area (cm^2), A	40.04
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.959
Hydraulic Gradient	20.98	Outflow Burette Area (cm^2), a-out	0.983
		B Parameter (%)	95

AVERAGE PERMEABILITY = 1.7E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.7E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/1/2012	15	44	0.00	0.0	0.0	127.3	0	25.5	NA
8/1/2012	15	48	0.07	0.6	0.6	126.1	0	25.5	2.2E-06
8/1/2012	15	56	0.20	1.6	1.6	124.0	0	25.5	1.8E-06
8/1/2012	16	7	0.38	2.8	2.8	121.6	0	25.5	1.6E-06
8/1/2012	16	41	0.95	6.6	6.6	113.7	0	25.5	1.7E-06
8/1/2012	17	3	1.32	8.9	8.9	109.0	0	25.5	1.7E-06
8/1/2012	17	27	1.72	11.3	11.3	104.1	1	25.5	1.7E-06

Tested By: BW Date: 7/31/2012 Checked By: GJM Date: 8-2-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-07-03 PERMflow w header.xls]Sheet1

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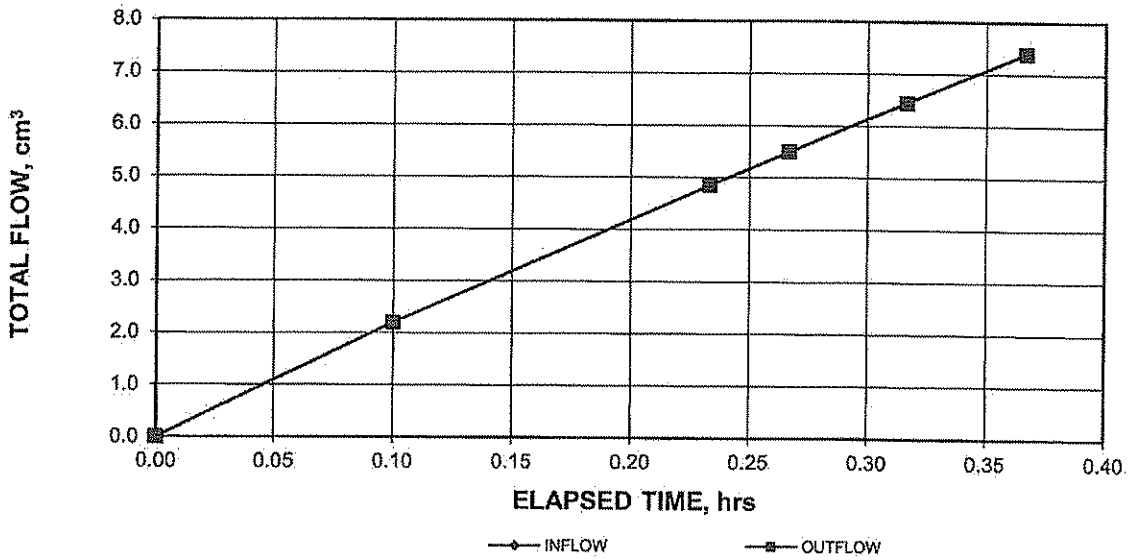
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

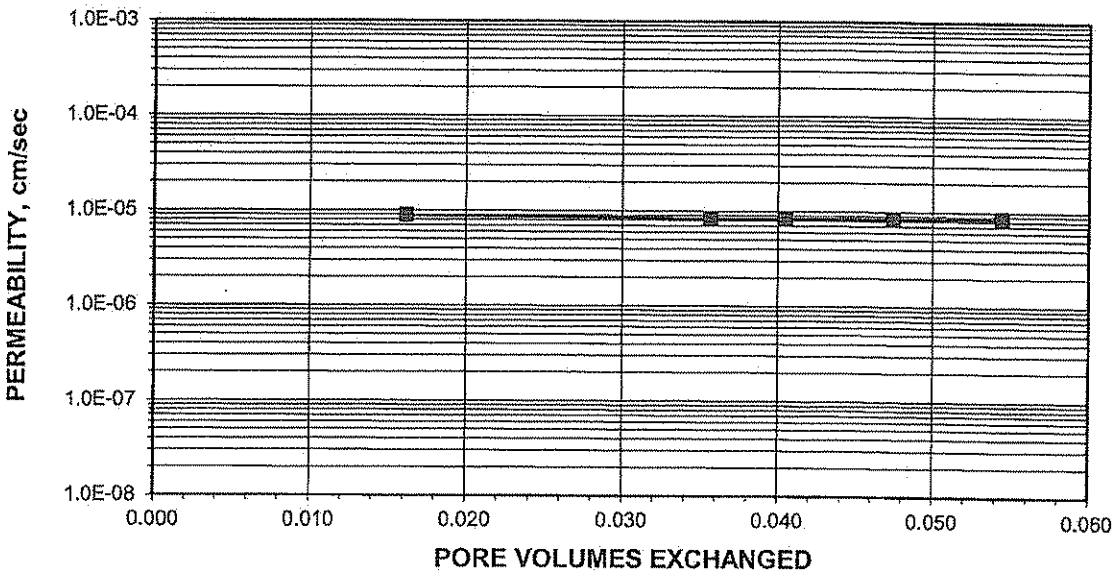
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-08	Sample No.	ST-A9-L2
Lab ID No.	2012-656-08-02		

AVERAGE PERMEABILITY = 8.4E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 8.4E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/20/2012 Checked By: GEM Date: 8-22-12

DCN: CT-22 DATE: 2/2/120 REVISION: 3 S:\2012-656 JOYCE - Cobles\[2012-656-08-02 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-08	Sample No.	ST-A9-L2
Lab ID No.	2012-656-08-02		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: LIGHT BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	809	810
Wt. of Tare & WS (gm.)	405.64	351.67
Wt. of Tare & DS (gm.)	360.97	307.27
Wt. of Tare (gm.)	115.18	114.55
Wt. of Water (gm.)	44.67	44.40
Wt. of DS (gm.)	245.79	192.72
Moisture Content (%)	**18.2**	**23.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	583.01	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	583.01	607.01
Length 1 (in.)	3.196	3.086
Length 2 (in.)	3.218	3.140
Length 3 (in.)	3.178	3.150
Top Diameter (in.)	2.828	2.805
Middle Diameter (in.)	2.834	2.816
Bottom Diameter (in.)	2.829	2.823
Average Length (in.)	3.20	3.13
Average Area (in.^{2})	6.29	6.22
Sample Volume (cm^3)	329.65	318.67
Unit Wet Wt. (gm./ cm^3)	1.77	1.90
Unit Wet Wt. (pcf)	110.4	118.9
Unit Dry Wt. (pcf)	93.4	96.6
Unit Dry Wt. (gm./ cm^3)	1.50	1.55
Void Ratio, e	0.80	0.74
Porosity, n	0.45	0.43
Pore Volume (cm^3)	146.9	135.9
Total Wgt. Of Sample After Test		612.59

Tested By: BW Date: 8/20/2012 Checked By: GEM Date: 8-22-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-08-02 PERMflow w header.xls]Sheet1
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ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-08	Sample No.	ST-A9-L2
Lab ID No.	2012-656-08-02		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.94
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.15
Cell (psi)	45.0	Sample Area (cm^2), A	40.14
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.977
Hydraulic Gradient	13.28	Outflow Burette Area (cm^2), a-out	0.868
		B Parameter (%)	96

AVERAGE PERMEABILITY = 8.4E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 8.4E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/21/2012	10	54	0.00	0.0	0.0	126.6	0	23.9	NA
8/21/2012	11	0	0.10	2.2	2.2	121.8	0	23.9	8.9E-06
8/21/2012	11	8	0.23	4.9	4.9	116.0	0	23.9	8.4E-06
8/21/2012	11	10	0.27	5.5	5.5	114.6	0	23.9	8.5E-06
8/21/2012	11	13	0.32	6.5	6.5	112.6	0	23.9	8.4E-06
8/21/2012	11	16	0.37	7.4	7.4	110.5	1	23.9	8.5E-06

Tested By: BW Date: 8/20/2012 Checked By: GM Date: 8-22-12

DCN: CT-22 DATE: 2/2/10 REVISION: 0 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-08-02 PERMflow w header.xls]Sheet1

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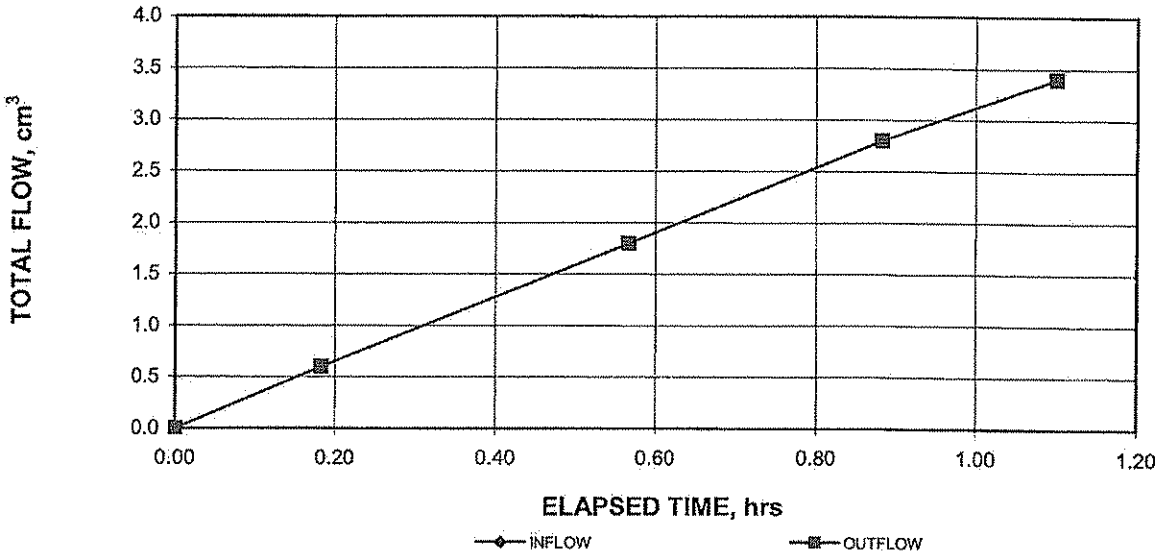
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

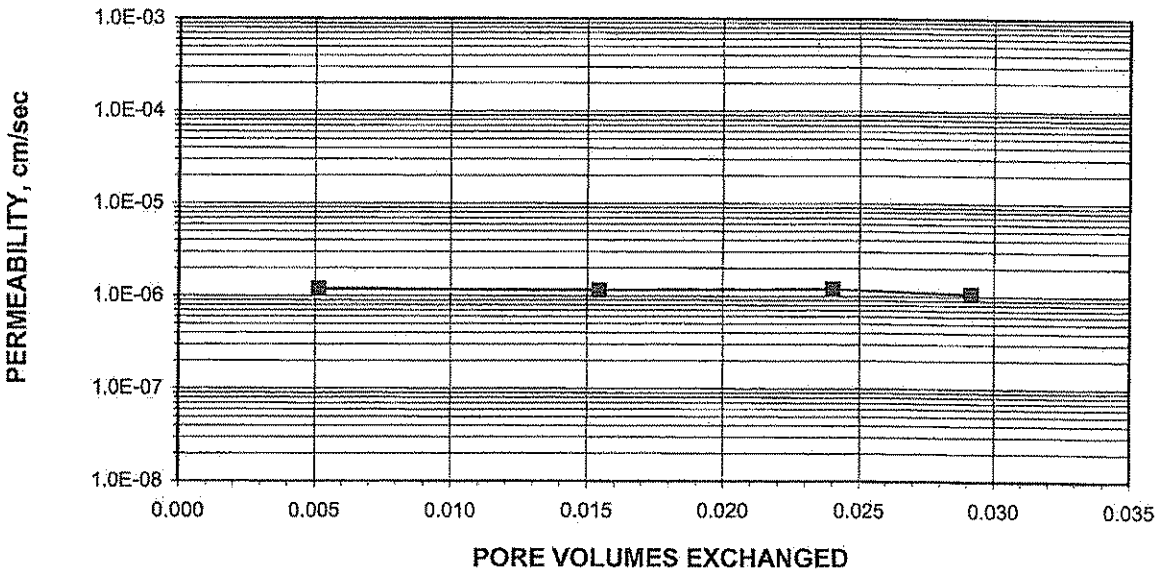
Client	JOYCE ENGINEERING	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-09	Sample No.	ST-A9-L3
Lab ID No.	2012-656-09-01		

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/28/2012 Checked By: MPS Date: 8/31

DCN: CT-22 DATE: 2/16/2012 REVISION: 0 C:\PROJECTS\2012-656 JOYCE - Cobles\[2012-656-09-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-09	Sample No.	ST-A9-L3
Lab ID No.	2012-656-09-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	800	804
Wt. of Tare & WS (gm.)	391.40	360.03
Wt. of Tare & DS (gm.)	353.29	318.49
Wt. of Tare (gm.)	103.91	105.28
Wt. of Water (gm.)	38.11	41.54
Wt. of DS (gm.)	249.38	213.21
Moisture Content (%)	**15.3**	**19.5**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	636.06	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	636.06	659.24
Length 1 (in.)	3.109	3.116
Length 2 (in.)	3.067	3.097
Length 3 (in.)	3.046	2.965
Top Diameter (in.)	2.848	2.851
Middle Diameter (in.)	2.852	2.867
Bottom Diameter (in.)	2.851	2.846
Average Length (in.)	3.07	3.06
Average Area (in.^{2})	6.38	6.40
Sample Volume (cm^3)	321.43	320.87
Unit Wet Wt. (gm./ cm^3)	1.98	2.05
Unit Wet Wt. (pcf)	123.5	128.2
Unit Dry Wt. (pcf)	107.1	107.3
Unit Dry Wt. (gm./ cm^3)	1.72	1.72
Void Ratio, e	0.57	0.57
Porosity, n	0.36	0.36
Pore Volume (cm^3)	117.1	116.5
Total Wgt. Of Sample After Test		657.10

Tested By: BW Date: 8/28/2012 Checked By: RMS Date: 8/31

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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING	Boring No.	ACRE 9
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-09	Sample No.	ST-A9-L3
Lab ID No.	2012-656-09-01		
121044			

41

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.77
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.25
Cell (psi)	45.0	Sample Area (cm^2), A	41.29
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	13.57	Outflow Burette Area (cm^2), a-out	0.972
		B Parameter (%)	95

AVERAGE PERMEABILITY = 1.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/29/2012	10	16	0.00	0.0	0.0	129.7	0	24.4	NA
8/29/2012	10	27	0.18	0.6	0.6	128.4	0	24.4	1.2E-06
8/29/2012	10	50	0.57	1.8	1.8	125.8	0	24.4	1.2E-06
8/29/2012	11	9	0.88	2.8	2.8	123.6	0	24.4	1.2E-06
8/29/2012	11	22	1.10	3.4	3.4	122.3	0	24.4	1.1E-06

Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

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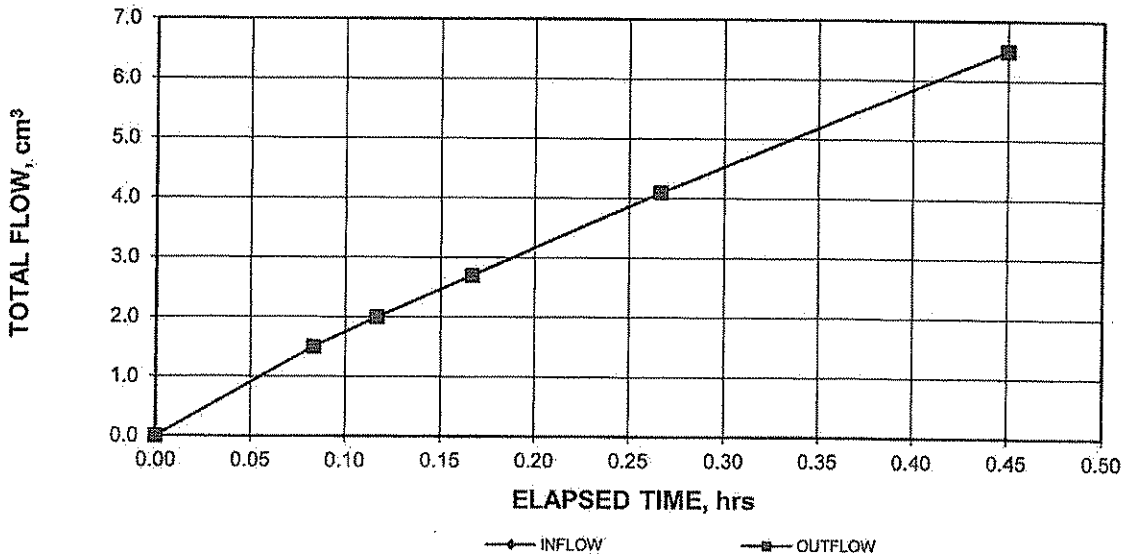
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

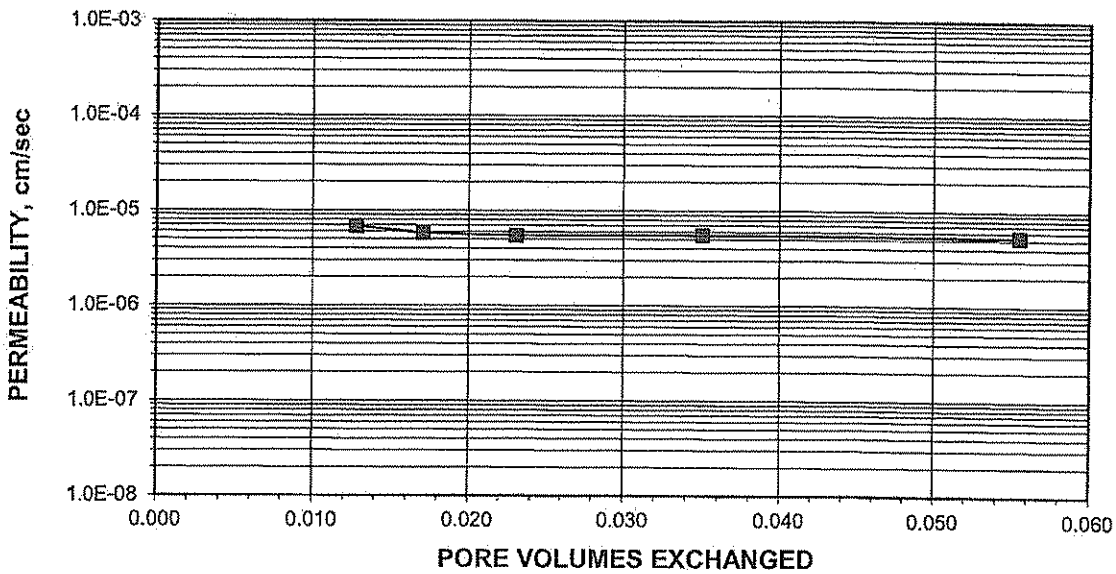
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT ~~2~~ 1
Project No.	2012-656-08	Sample No.	ST-A10-L1
Lab ID No.	2012-656-08-01		

AVERAGE PERMEABILITY = 5.6E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.6E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/20/2012 Checked By: GDM Date: 8-22-12

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT ~~2~~ 1
Project No.	2012-656-08	Sample No.	ST-A10-L1
Lab ID No.	2012-656-08-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: BROWN SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	813	811
Wt. of Tare & WS (gm.)	339.24	357.93
Wt. of Tare & DS (gm.)	312.62	315.48
Wt. of Tare (gm.)	111.96	106.12
Wt. of Water (gm.)	26.62	42.45
Wt. of DS (gm.)	200.66	209.36
Moisture Content (%)	**13.3**	**20.3**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	583.72	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	583.72	619.85
Length 1 (in.)	3.030	2.967
Length 2 (in.)	3.036	3.022
Length 3 (in.)	3.034	3.034
Top Diameter (in.)	2.809	2.824
Middle Diameter (in.)	2.807	2.821
Bottom Diameter (in.)	2.814	2.816
Average Length (in.)	3.03	3.01
Average Area (in.^{2})	6.20	6.25
Sample Volume (cm^3)	308.26	307.91
Unit Wet Wt. (gm./ cm^3)	1.89	2.01
Unit Wet Wt. (pcf)	118.2	125.7
Unit Dry Wt. (pcf)	104.4	104.5
Unit Dry Wt. (gm./ cm^3)	1.67	1.67
Void Ratio, e	0.62	0.61
Porosity, n	0.38	0.38
Pore Volume (cm^3)	117.4	117.0
Total Wgt. Of Sample After Test		621.57

Tested By: BW Date: 8/20/2012 Checked By: GM Date: 8-22-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-08-01 PERMflow w header.xls]Sheet1
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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT ~~2~~ 1
Project No.	2012-656-08	Sample No.	ST-A10-L1
Lab ID No.	2012-656-08-01		

Pressure Heads (Constant)

Top Cap (psi)	38.5
Bottom Cap (psi)	40.0
Cell (psi)	45.0
Total Pressure Head (cm)	105.5
Hydraulic Gradient	13.80

Final Sample Dimensions

Sample Length (cm), L	7.64
Sample Diameter (cm)	7.16
Sample Area (cm^2), A	40.30
Inflow Burette Area (cm^2), a-in	0.852
Outflow Burette Area (cm^2), a-out	0.972
B Parameter (%)	96

AVERAGE PERMEABILITY = 5.6E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 5.6E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/21/2012	10	13	0.00	0.0	0.0	127.4	0	23.8	NA
8/21/2012	10	18	0.08	1.5	1.5	124.1	0	23.8	6.9E-06
8/21/2012	10	20	0.12	2.0	2.0	123.0	0	23.9	5.8E-06
8/21/2012	10	23	0.17	2.7	2.7	121.5	0	23.9	5.5E-06
8/21/2012	10	29	0.27	4.1	4.1	118.4	0	24.0	5.6E-06
8/21/2012	10	40	0.45	6.5	6.5	113.1	1	24.1	5.4E-06

Tested By: BW Date: 8/20/2012 Checked By: GEM Date: 8-22-12

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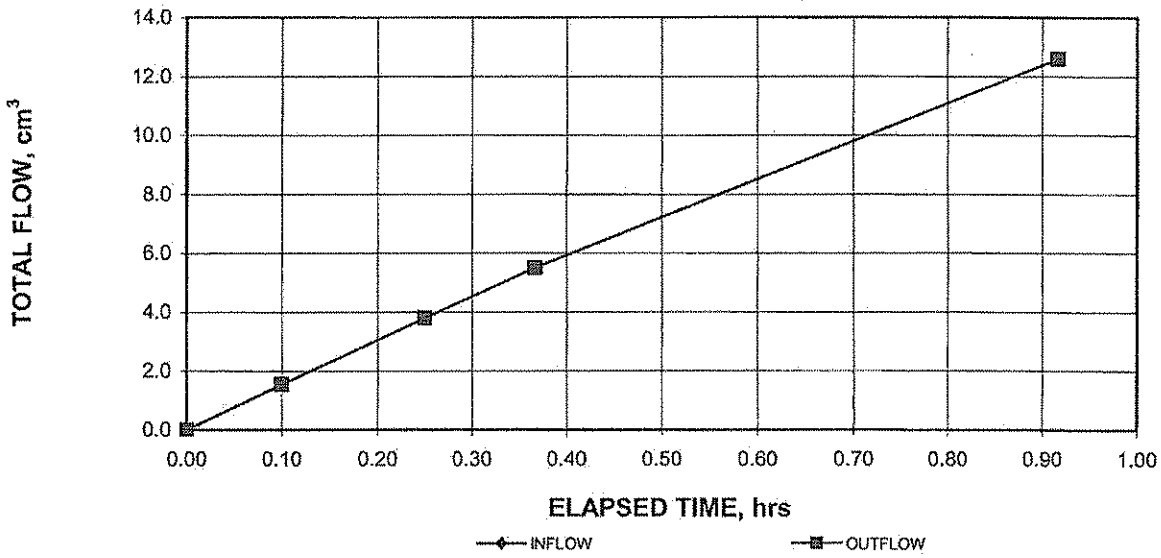
PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

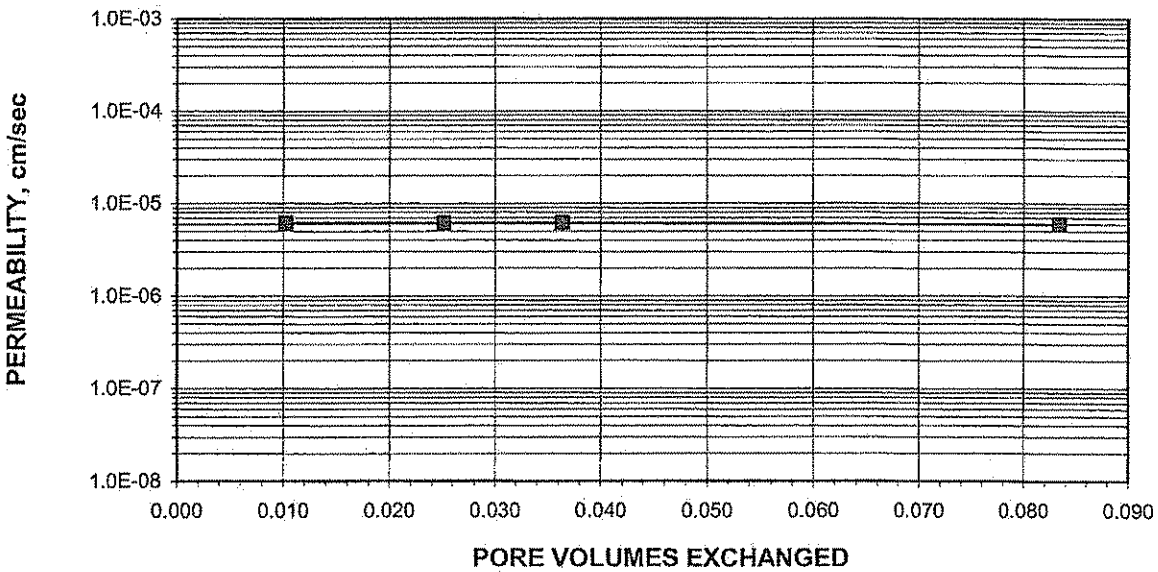
Client	JOYCE ENGINEERING	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-09	Sample No.	ST-A10-L2
Lab ID No.	2012-656-09-02		

AVERAGE PERMEABILITY = 6.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

DCN: CT-22 DATE: [illegible] PROJECTS\2012-656 JOYCE - Cobles\[2012-656-09-02 PERM flow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-10
(SOP-S22A & S22B)

Client	JOYCE ENGINEERING	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-09	Sample No.	ST-A10-L2
Lab ID No.	2012-656-09-02		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: REDDISH BROWN SILTY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	802	802
Wt. of Tare & WS (gm.)	372.65	366.78
Wt. of Tare & DS (gm.)	324.30	316.92
Wt. of Tare (gm.)	103.58	103.77
Wt. of Water (gm.)	48.35	49.86
Wt. of DS (gm.)	220.72	213.15
Moisture Content (%)	**21.9**	**23.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	634.86	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	634.86	642.60
Length 1 (in.)	3.279	3.272
Length 2 (in.)	3.311	3.290
Length 3 (in.)	3.273	3.270
Top Diameter (in.)	2.872	2.858
Middle Diameter (in.)	2.845	2.851
Bottom Diameter (in.)	2.846	2.856
Average Length (in.)	3.29	3.28
Average Area (in.^{2})	6.40	6.40
Sample Volume (cm^3)	344.74	343.81
Unit Wet Wt. (gm./ cm^3)	1.84	1.87
Unit Wet Wt. (pcf)	115.0	116.7
Unit Dry Wt. (pcf)	94.3	94.6
Unit Dry Wt. (gm./ cm^3)	1.51	1.51
Void Ratio, e	0.79	0.78
Porosity, n	0.44	0.44
Pore Volume (cm^3)	151.9	150.9
Total Wgt. Of Sample After Test		658.69

Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

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PERMEABILITY TEST

ASTM D 5084-03
(SOP-S22A & S22B)

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INTEGRITY IN TESTING

Client	JOYCE ENGINEERING	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 2
Project No.	2012-656-09	Sample No.	ST-A10-L2
Lab ID No.	2012-656-09-02		
121044			

41

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	8.32
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.25
Cell (psi)	45.0	Sample Area (cm^2), A	41.30
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.852
Hydraulic Gradient	12.67	Outflow Burette Area (cm^2), a-out	0.972
		B Parameter (%)	98

AVERAGE PERMEABILITY = 6.1E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 6.1E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
8/29/2012	11	35	0.00	0.0	0.0	128.6	0	24.6	NA
8/29/2012	11	41	0.10	1.6	1.6	125.2	0	24.6	6.1E-06
8/29/2012	11	50	0.25	3.8	3.8	120.2	0	24.6	6.1E-06
8/29/2012	11	57	0.37	5.5	5.5	116.5	0	24.6	6.2E-06
8/29/2012	12	30	0.92	12.6	12.6	100.9	0	24.6	5.9E-06

Tested By: BW Date: 8/28/2012 Checked By: [illegible] Date: 8/31

DCN: CT-22 DATE\SERVER\DISK D\2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-09-02 PERMflow w header.xls]Sheet1

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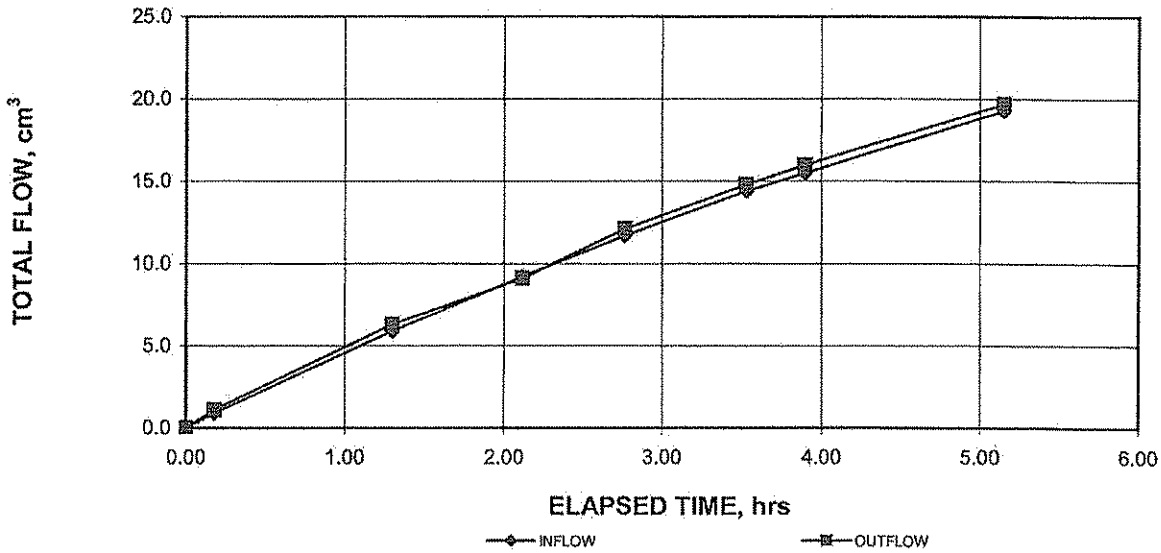
PERMEABILITY TEST

ASTM D 5084-03

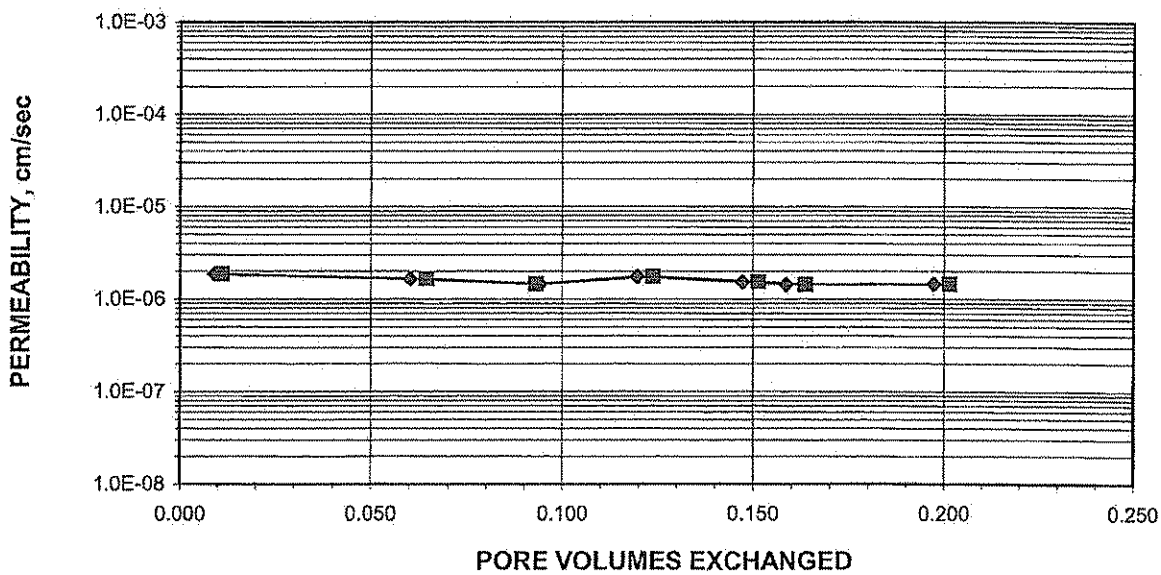
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-10	Sample No.	ST-A10-L3
Lab ID No.	2012-656-10-01		

AVERAGE PERMEABILITY = 1.5E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.5E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 9/6/2012 Checked By: MMS Date: 9/7

DCN: CT-22 DATE: [illegible] \2012-656 JOYCE - Cobles\[2012-656-10-01 PERMflow w header..xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-10	Sample No.	ST-A10-L3
Lab ID No.	2012-656-10-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: ORANGE YELLOW SANDY CLAY WITH ROCKS

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	804	806
Wt. of Tare & WS (gm.)	322.82	398.92
Wt. of Tare & DS (gm.)	300.11	350.18
Wt. of Tare (gm.)	105.22	102.05
Wt. of Water (gm.)	22.71	48.74
Wt. of DS (gm.)	194.89	248.13
Moisture Content (%)	**11.7**	**19.6**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	614.27	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	614.27	658.23
Length 1 (in.)	2.988	2.962
Length 2 (in.)	3.001	2.956
Length 3 (in.)	2.938	2.922
Top Diameter (in.)	2.849	2.825
Middle Diameter (in.)	2.844	2.859
Bottom Diameter (in.)	2.817	2.775
Average Length (in.)	2.98	2.95
Average Area (in.^{2})	6.32	6.24
Sample Volume (cm^3)	308.17	301.52
Unit Wet Wt. (gm./ cm^3)	1.99	2.18
Unit Wet Wt. (pcf)	124.4	136.3
Unit Dry Wt. (pcf)	111.4	113.9
Unit Dry Wt. (gm./ cm^3)	1.79	1.82
Void Ratio, e	0.51	0.48
Porosity, n	0.34	0.32
Pore Volume (cm^3)	104.4	97.8
Total Wgt. Of Sample After Test		639.05

Tested By: SFS Date: 9/6/2012 Checked By: [illegible] Date: 9/7

DCN: CT-22 DATE: 8/2/2011 REVISION: 1 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-10-01 PERMflow w header..xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-03

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Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 10
Client Project	COBLE SR	Depth (ft.)	LIFT 3
Project No.	2012-656-10	Sample No.	ST-A10-L3
Lab ID No.	2012-656-10-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.48
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.16
Cell (psi)	45.0	Sample Area (cm^2), A	40.29
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.865
Hydraulic Gradient	14.09	Outflow Burette Area (cm^2), a-out	0.865
		B Parameter (%)	97

AVERAGE PERMEABILITY = 1.5E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.5E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
9/6/2012	12	37	0.00	0.0	0.0	133.0	0	25.5	NA
9/6/2012	12	48	0.18	0.9	1.1	130.7	0	25.5	1.9E-06
9/6/2012	13	55	1.30	5.9	6.3	119.0	0	25.5	1.6E-06
9/6/2012	14	44	2.12	9.2	9.1	112.0	0	25.5	1.5E-06
9/6/2012	15	23	2.77	11.7	12.1	105.7	0	25.5	1.7E-06
9/6/2012	16	9	3.53	14.4	14.8	99.5	0	25.5	1.5E-06
9/6/2012	16	31	3.90	15.5	16.0	96.9	0	25.5	1.4E-06
9/6/2012	17	46	5.15	19.3	19.7	88.3	1	25.5	1.5E-06

Tested By: SFS Date: 9/6/2012 Checked By: [illegible] Date: 9/7

DCN: CT-22 DATE: 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-10-01 PERMflow w header..xls]Sheet1

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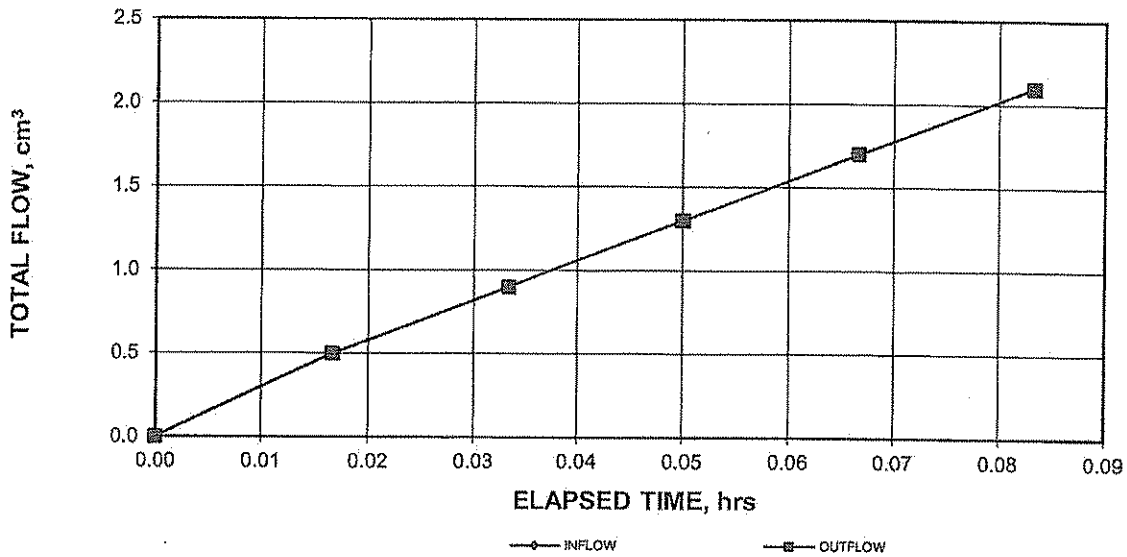
PERMEABILITY TEST

ASTM D 5084-03

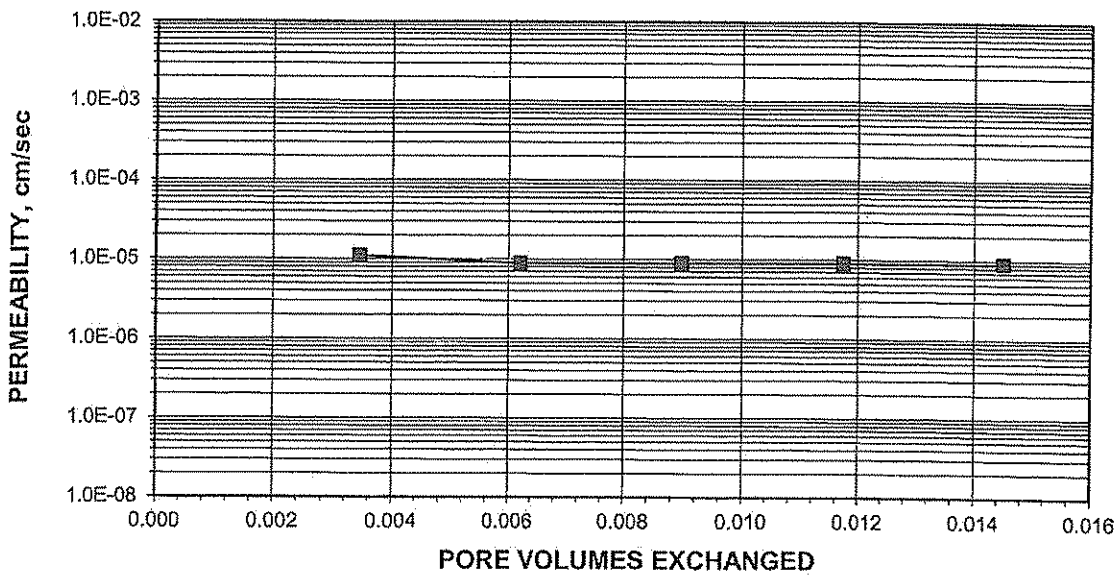
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-16	Sample No.	ST-A11-01
Lab ID No.	2012-656-16-01		

AVERAGE PERMEABILITY = 9.0E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 9.0E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 12/11/2012 Checked By: GJM Date: 12-14-12

DCN: CT-22 DATE: 2/2/2012 FILE: G:\DOCS\2012-656 JOYCE - Cobles\[2012-656-16-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-16	Sample No.	ST-A11-01
Lab ID No.	2012-656-16-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: RED SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	802	Y-1
Wt. of Tare & WS (gm.)	356.83	356.84
Wt. of Tare & DS (gm.)	313.05	300.41
Wt. of Tare (gm.)	104.10	94.41
Wt. of Water (gm.)	43.78	56.43
Wt. of DS (gm.)	208.95	206.00
Moisture Content (%)	**21.0**	**27.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	572.19	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	572.19	602.66
Length 1 (in.)	3.031	3.036
Length 2 (in.)	3.049	3.013
Length 3 (in.)	3.033	3.044
Top Diameter (in.)	2.871	2.863
Middle Diameter (in.)	2.851	2.871
Bottom Diameter (in.)	2.855	2.858
Average Length (in.)	3.04	3.03
Average Area (in.^{2})	6.42	6.44
Sample Volume (cm^3)	319.57	319.98
Unit Wet Wt. (gm./ cm^3)	1.79	1.88
Unit Wet Wt. (pcf)	111.8	117.6
Unit Dry Wt. (pcf)	92.4	92.3
Unit Dry Wt. (gm./ cm^3)	1.48	1.48
Void Ratio, e	0.82	0.83
Porosity, n	0.45	0.45
Pore Volume (cm^3)	144.4	144.8
Total Wgt. Of Sample After Test		604.90

Tested By: BW Date: 12/11/2012 Checked By: GEM Date: 12-14-12

DCN: CT-22 DATE: 2/2/10 REVISION: 2 2012 PROJECTS\2012-656 JOYCE - Cobles\[2012-656-16-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLE SR	Depth (ft.)	LIFT 1
Project No.	2012-656-16	Sample No.	ST-A11-01
Lab ID No.	2012-656-16-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.70
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.27
Cell (psi)	45.0	Sample Area (cm^2), A	41.56
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.897
Hydraulic Gradient	13.70	Outflow Burette Area (cm^2), a-out	0.878
		B Parameter (%)	96

AVERAGE PERMEABILITY = 9.0E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 9.0E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
12/13/2012	11	27	0.00	0.0	0.0	129.0	0	23.2	NA
12/13/2012	11	28	0.02	0.5	0.5	127.9	0	23.2	1.1E-05
12/13/2012	11	29	0.03	0.9	0.9	127.0	0	23.2	8.9E-06
12/13/2012	11	30	0.05	1.3	1.3	126.1	0	23.2	9.0E-06
12/13/2012	11	31	0.07	1.7	1.7	125.2	0	23.2	9.0E-06
12/13/2012	11	32	0.08	2.1	2.1	124.3	1	23.2	9.1E-06

Tested By: BW Date: 12/11/2012 Checked By: GEM Date: 12-14-12

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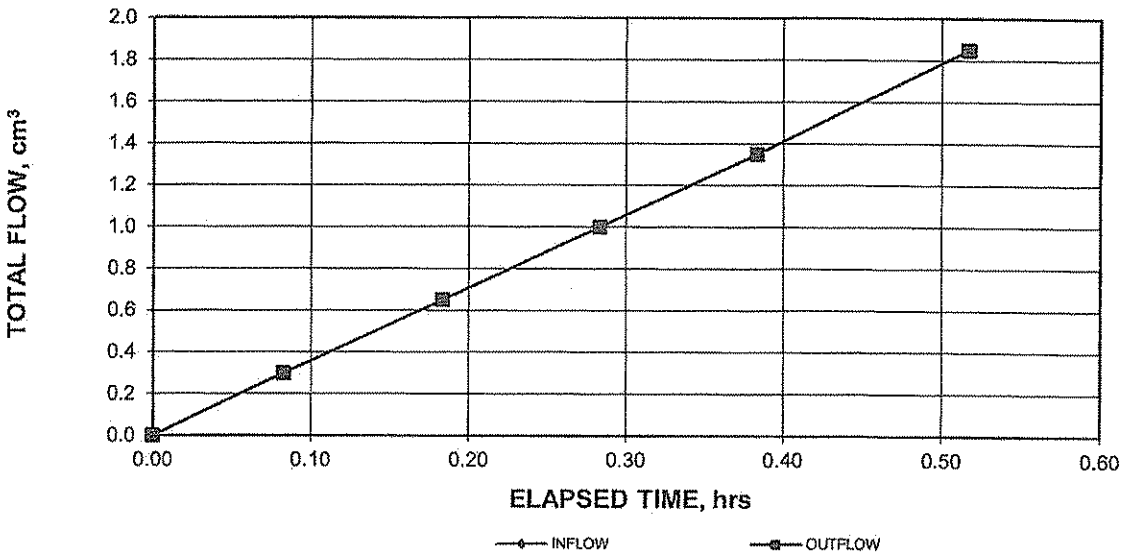
ASTM D 5084-03

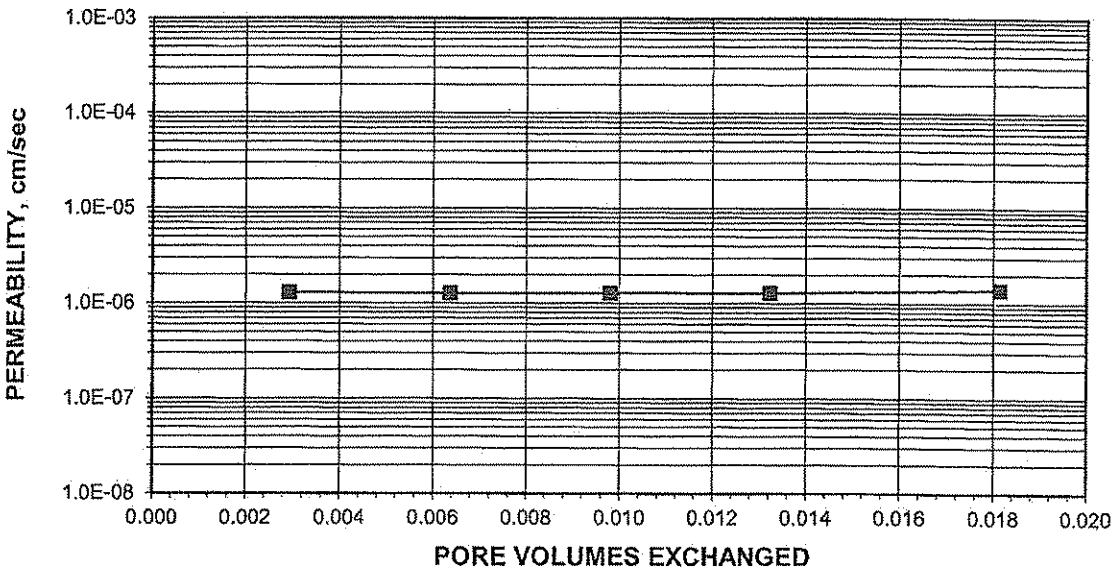
Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLES LF	Depth (ft.)	LIFT 2
Project No.	2013-606-01	Sample No.	ST-A11-L2R
Lab ID No.	2013-606-01-01		

AVERAGE PERMEABILITY = 1.3E-06 cm/sec @ 20°C
AVERAGE PERMEABILITY = 1.3E-08 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 1/11/13 Checked By: GZM Date: 1-15-13

DCN: CT-22 DATE: 03/07/2011 REVISION: 13 2013-606 JOYCE - COBLES LF\[2013-606-01-01B PERM flow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLES LF	Depth (ft.)	LIFT 2
Project No.	2013-606-01	Sample No.	ST-A11-L2R
Lab ID No.	2013-606-01-01		

Specific Gravity 2.70 Assumed
Sample Condition Undisturbed

Visual Description: ORANGE SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	806	B-1
Wt. of Tare & WS (gm.)	345.69	308.16
Wt. of Tare & DS (gm.)	319.62	273.78
Wt. of Tare (gm.)	101.94	100.73
Wt. of Water (gm.)	26.07	34.38
Wt. of DS (gm.)	217.68	173.05
Moisture Content (%)	**12.0**	**19.9**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	594.88	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	594.88	636.80
Length 1 (in.)	2.987	2.953
Length 2 (in.)	2.953	2.946
Length 3 (in.)	2.981	2.918
Top Diameter (in.)	2.826	2.801
Middle Diameter (in.)	2.831	2.809
Bottom Diameter (in.)	2.822	2.821
Average Length (in.)	2.97	2.94
Average Area (in.^{2})	6.27	6.20
Sample Volume (cm^3)	305.72	298.75
Unit Wet Wt. (gm./ cm^3)	1.95	2.13
Unit Wet Wt. (pcf)	121.5	133.1
Unit Dry Wt. (pcf)	108.5	111.0
Unit Dry Wt. (gm./ cm^3)	1.74	1.78
Void Ratio, e	0.55	0.52
Porosity, n	0.36	0.34
Pore Volume (cm^3)	109.0	102.0
Total Wgt. Of Sample After Test		610.03

Tested By: SFS Date: 1/11/13 Checked By: GM Date: 1-15-13

DCN: CT-22 DATE: 2/2/10 REVISION: 0 PROJECTS\2013-606 JOYCE - COBLES LF\[2013-606-01-01B PERMflow w header.xls]Sheet1

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INTEGRITY IN TESTING

PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLES LF	Depth (ft.)	LIFT 2
Project No.	2013-606-01	Sample No.	ST-A11-L2R
Lab ID No.	2013-606-01-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.47
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.14
Cell (psi)	45.0	Sample Area (cm^2), A	40.02
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.865
Hydraulic Gradient	14.13	Outflow Burette Area (cm^2), a-out	0.892
		B Parameter (%)	97

AVERAGE PERMEABILITY = 1.3E-06 cm/sec @ 20°C

AVERAGE PERMEABILITY = 1.3E-08 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
1/14/13	12	56	0.00	0.0	0.0	128.9	0	23.8	NA
1/14/13	13	1	0.08	0.3	0.3	128.2	0	23.8	1.3E-06
1/14/13	13	7	0.18	0.7	0.6	127.4	0	23.8	1.3E-06
1/14/13	13	13	0.28	1.0	1.0	126.7	0	23.8	1.3E-06
1/14/13	13	19	0.38	1.4	1.4	125.9	0	23.8	1.3E-06
1/14/13	13	27	0.52	1.9	1.9	124.8	1	23.8	1.4E-06

Tested By: SFS Date: 1/11/13 Checked By: GEM Date: 1-15-13

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PERMEABILITY TEST

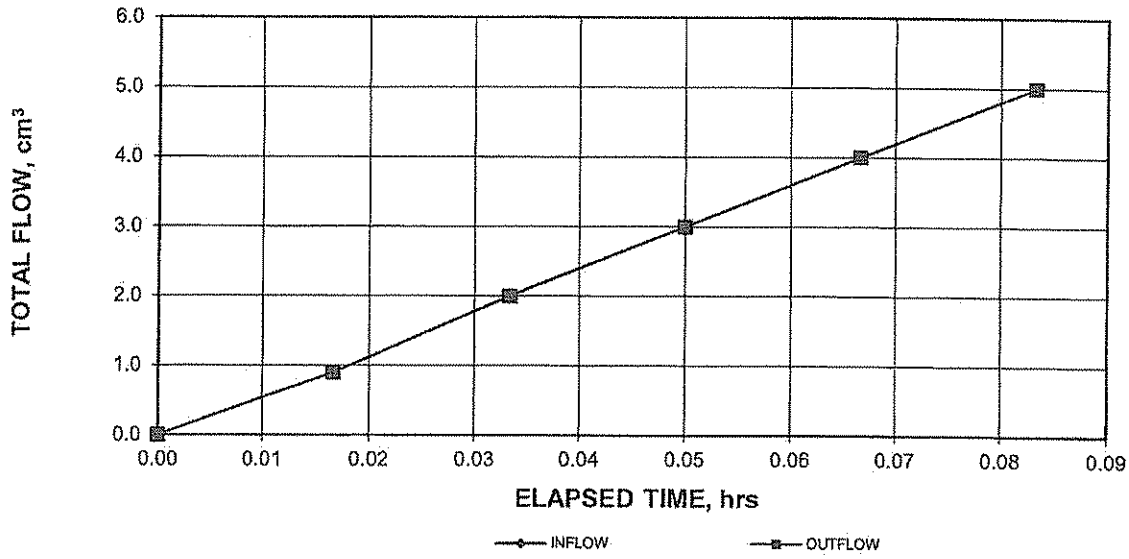
ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLES LF	Depth (ft.)	LIFT 2
Project No.	2013-606-01	Sample No.	ST-A11-L2
Lab ID No.	2013-606-01-01		

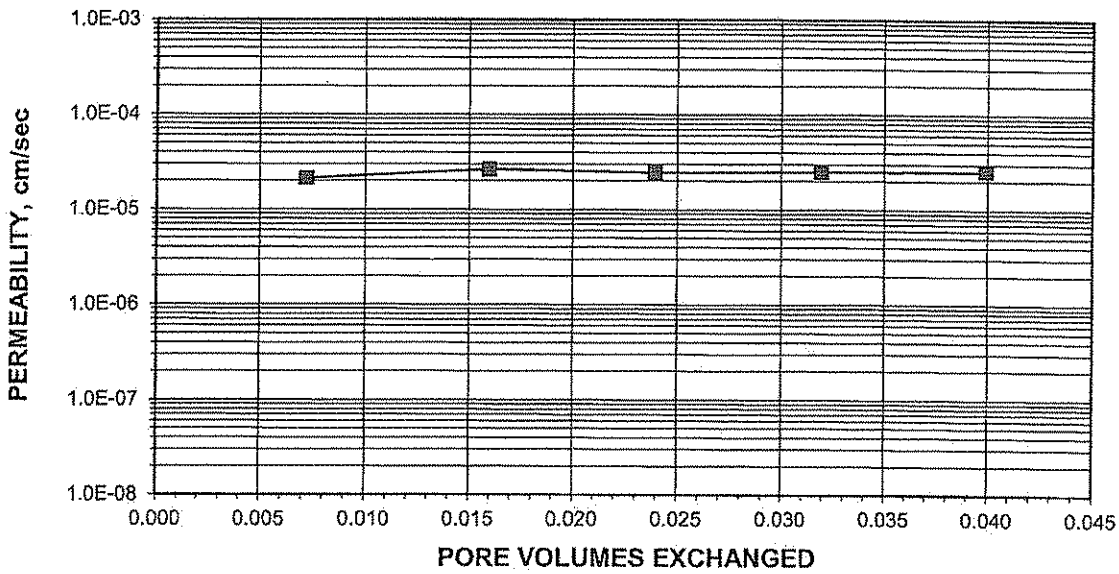
AVERAGE PERMEABILITY = 2.5E-05 cm/sec @ 20°C FAIL

AVERAGE PERMEABILITY = 2.5E-07 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: BW Date: 1/10/13 Checked By: GEM Date: 1-14-13

DCN: CT-22 DATE: 2/23/2012 FILE: S:\2013-606 JOYCE - COBLES LF\[2013-606-01-01 PERMflow w header.xls]Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLES LF	Depth (ft.)	LIFT 2
Project No.	2013-606-01	Sample No.	ST-A11-L2
Lab ID No.	2013-606-01-01		

Specific Gravity 2.70 Assumed

Sample Condition Undisturbed

Visual Description: RED ORANGE SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	825	814
Wt. of Tare & WS (gm.)	457.96	338.19
Wt. of Tare & DS (gm.)	414.13	297.36
Wt. of Tare (gm.)	136.97	111.71
Wt. of Water (gm.)	43.83	40.83
Wt. of DS (gm.)	277.16	185.65
Moisture Content (%)	**15.8**	**22.0**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	630.45	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	630.45	664.09
Length 1 (in.)	3.162	3.127
Length 2 (in.)	3.148	3.078
Length 3 (in.)	3.140	3.121
Top Diameter (in.)	2.867	2.850
Middle Diameter (in.)	2.858	2.835
Bottom Diameter (in.)	2.861	2.890
Average Length (in.)	3.15	3.11
Average Area (in.^{2})	6.43	6.42
Sample Volume (cm^3)	332.08	326.88
Unit Wet Wt. (gm./ cm^3)	1.90	2.03
Unit Wet Wt. (pcf)	118.5	126.8
Unit Dry Wt. (pcf)	102.3	104.0
Unit Dry Wt. (gm./ cm^3)	1.64	1.67
Void Ratio, e	0.65	0.62
Porosity, n	0.39	0.38
Pore Volume (cm^3)	130.5	125.3
Total Wgt. Of Sample After Test		645.60

Tested By: BW Date: 1/10/13 Checked By: GM Date: 1-14-13

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PERMEABILITY TEST

ASTM D 5084-03

Client	JOYCE ENGINEERING, INC.	Boring No.	ACRE 11
Client Project	COBLES LF	Depth (ft.)	LIFT 2
Project No.	2013-606-01	Sample No.	ST-A11-L2
Lab ID No.	2013-606-01-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	38.5	Sample Length (cm), L	7.90
Bottom Cap (psi)	40.0	Sample Diameter (cm)	7.26
Cell (psi)	45.0	Sample Area (cm^2), A	41.40
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.905
Hydraulic Gradient	13.36	Outflow Burette Area (cm^2), a-out	0.865
		B Parameter (%)	95

AVERAGE PERMEABILITY = 2.5E-05 cm/sec @ 20°C

AVERAGE PERMEABILITY = 2.5E-07 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
1/11/13	11	4	0.00	0.0	0.0	123.9	0	22.9	NA
1/11/13	11	5	0.02	0.9	0.9	121.9	0	22.9	2.1E-05
1/11/13	11	6	0.03	2.0	2.0	119.4	0	22.9	2.7E-05
1/11/13	11	7	0.05	3.0	3.0	117.2	0	23.0	2.5E-05
1/11/13	11	8	0.07	4.0	4.0	115.0	0	23.0	2.5E-05
1/11/13	11	9	0.08	5.0	5.0	112.8	1	23.0	2.6E-05

Tested By: BW Date: 1/10/13 Checked By: GEM Date: 1-14-13

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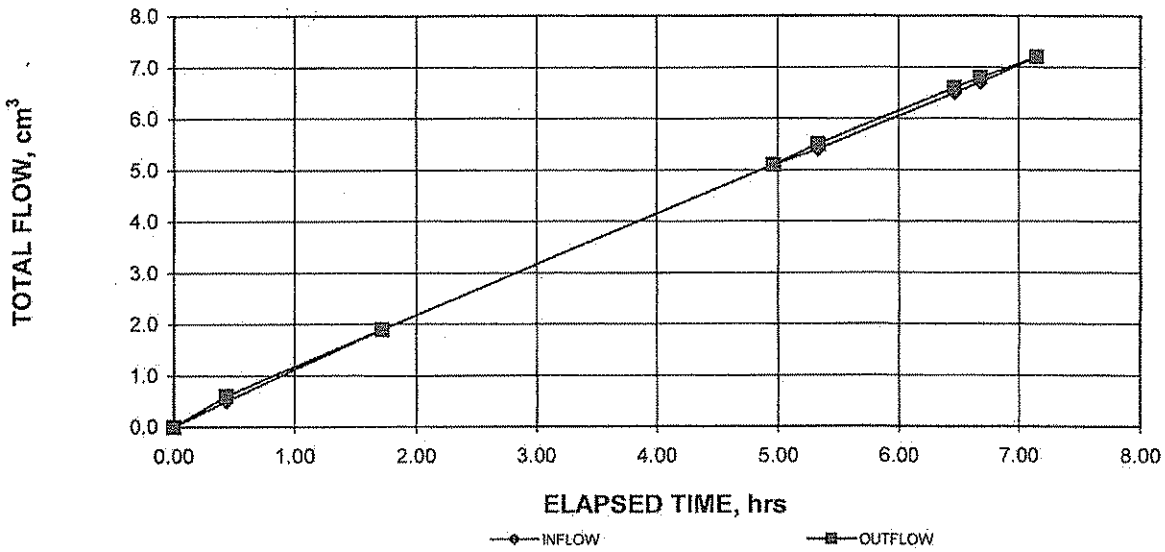
PERMEABILITY TEST

ASTM D 5084-03

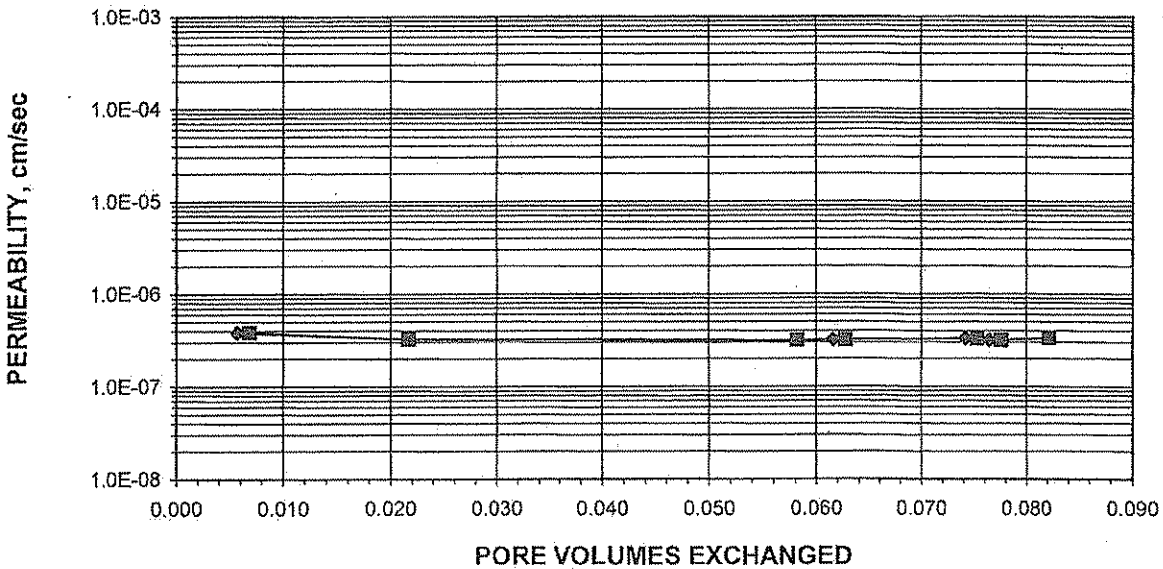
Client	JOYCE ENGINEERING, INC.	Boring No.	N/A
Client Project	COBLES LF	Depth (ft.)	N/A
Project No.	2013-606-02	Sample No.	ST-A11-L3
Lab ID No.	2013-606-02-01		

AVERAGE PERMEABILITY = 3.3E-07 cm/sec @ 20°C
AVERAGE PERMEABILITY = 3.3E-09 m/sec @ 20°C

TOTAL FLOW vs. ELAPSED TIME



PORE VOLUMES EXCHANGED vs. PERMEABILITY



Tested By: SFS Date: 3/18/13 Checked By: MMB Date: 3/21/13

DCN: CT-22 DATE: 6/27/18 REVISIONS: 2013-606 JOYCE - COBLES LF\[2013-606-02-01 PERM(flow w header.xls)Sheet1

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PERMEABILITY TEST

ASTM D 5084-10

Client	JOYCE ENGINEERING, INC.	Boring No.	N/A
Client Project	COBLES LF	Depth (ft.)	N/A
Project No.	2013-606-02	Sample No.	ST-A11-L3
Lab ID No.	2013-606-02-01		

Specific Gravity	2.70 Assumed
Sample Condition	Remolded

Visual Description: ORANGE SANDY CLAY

MOISTURE CONTENT:	BEFORE TEST	AFTER TEST
Tare Number	814	800
Wt. of Tare & WS (gm.)	316.12	577.94
Wt. of Tare & DS (gm.)	285.93	479.01
Wt. of Tare (gm.)	111.80	103.58
Wt. of Water (gm.)	30.19	98.93
Wt. of DS (gm.)	174.13	375.43
Moisture Content (%)	**17.3**	**26.4**

SPECIMEN:	BEFORE TEST	AFTER TEST
Wt. of Tube & WS (gm.)	471.41	NA
Wt. of Tube (gm.)	0.00	NA
Wt. of WS (calc.)(gm.)	471.41	507.62
Length 1 (in.)	2.336	2.272
Length 2 (in.)	2.345	2.291
Length 3 (in.)	2.328	2.313
Top Diameter (in.)	2.824	2.834
Middle Diameter (in.)	2.826	2.836
Bottom Diameter (in.)	2.826	2.823
Average Length (in.)	2.34	2.29
Average Area (in.^{2})	6.27	6.29
Sample Volume (cm^3)	240.03	236.42
Unit Wet Wt. (gm./ cm^3)	1.96	2.15
Unit Wet Wt. (pcf)	122.6	134.0
Unit Dry Wt. (pcf)	104.5	106.1
Unit Dry Wt. (gm./ cm^3)	1.67	1.70
Void Ratio, e	0.61	0.59
Porosity, n	0.38	0.37
Pore Volume (cm^3)	91.2	87.6
Total Wgt. Of Sample After Test		474.60

Tested By: SFS Date: 3/18/13 Checked By: [illegible] Date: 3/21/13

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PERMEABILITY TEST

ASTM D 5084-03

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Client	JOYCE ENGINEERING, INC.	Boring No.	N/A
Client Project	COBLES LF	Depth (ft.)	N/A
Project No.	2013-606-02	Sample No.	ST-A11-L3
Lab ID No.	2013-606-02-01		

Pressure Heads (Constant)		Final Sample Dimensions	
Top Cap (psi)	28.5	Sample Length (cm), L	5.82
Bottom Cap (psi)	30.0	Sample Diameter (cm)	7.19
Cell (psi)	35.0	Sample Area (cm^2), A	40.61
Total Pressure Head (cm)	105.5	Inflow Burette Area (cm^2), a-in	0.854
Hydraulic Gradient	18.11	Outflow Burette Area (cm^2), a-out	0.862
		B Parameter (%)	100

AVERAGE PERMEABILITY = 3.3E-07 cm/sec @ 20°C

AVERAGE PERMEABILITY = 3.3E-09 m/sec @ 20°C

DATE (mm/dd/yy)	TIME (hr)	TIME (min)	ELAPSED TIME t (hr)	TOTAL INFLOW (cm^3)	TOTAL OUTFLOW (cm^3)	TOTAL HEAD h (cm)	FLOW (0 flow) (1 stop)	TEMP. (°C)	INCREMENTAL PERMEABILITY @ 20°C (cm/sec)
3/20/13	8	37	0.00	0.0	0.0	123.1	0	22.9	NA
3/20/13	9	3	0.43	0.5	0.6	121.8	0	22.9	3.8E-07
3/20/13	10	20	1.72	1.9	1.9	118.7	0	22.9	3.2E-07
3/20/13	13	35	4.97	5.1	5.1	111.3	0	22.9	3.2E-07
3/20/13	13	57	5.33	5.4	5.5	110.5	0	22.9	3.2E-07
3/20/13	15	5	6.47	6.5	6.6	107.9	0	22.9	3.3E-07
3/20/13	15	18	6.68	6.7	6.8	107.4	0	22.9	3.2E-07
3/20/13	15	46	7.15	7.2	7.2	106.4	1	22.9	3.3E-07

Tested By: SFS Date: 3/18/13 Checked By: MDS Date: 3/21/13

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APPENDIX 4 – PHOTOGRAPHIC RECORD

1. Coble's C&D Landfill entrance.

2. Intermediate cover graded and compacted for landfill closure.

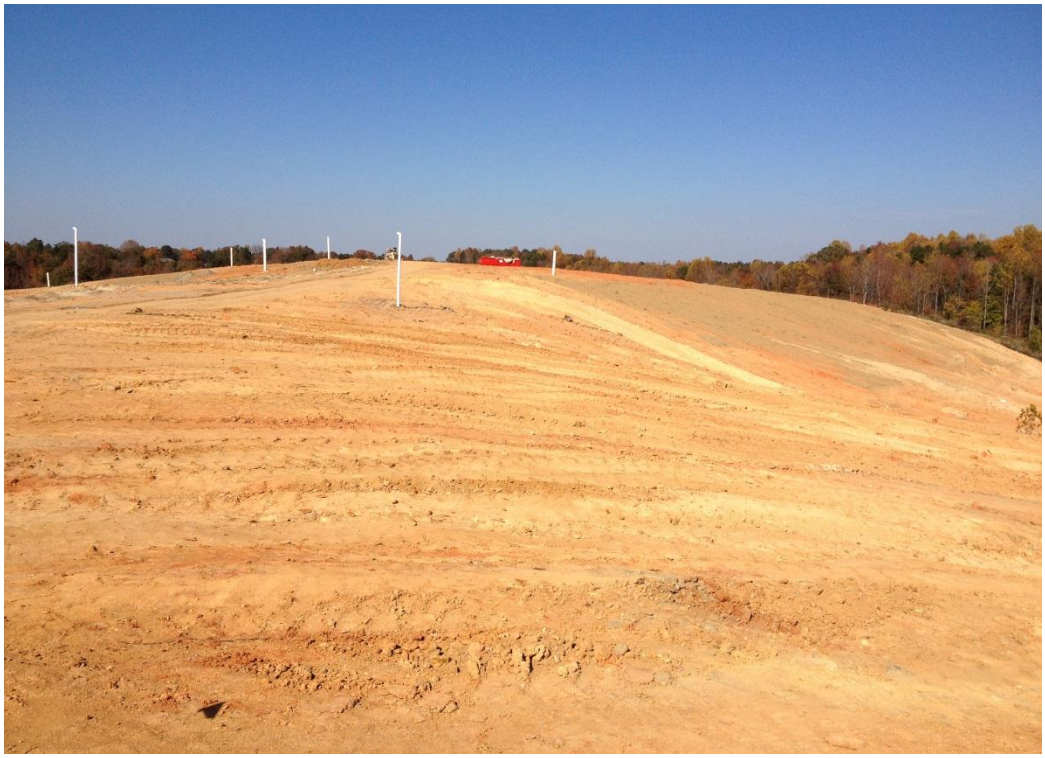
3. Infiltration layer of landfill west slope, looking south.

4. Infiltration layer of landfill west slope, looking north.

5. East side infiltration layer completed. Cover soil stockpiled at top of slope.

6. Landfill gas vent pipe installation.

7. Gas vent excavation filled with gravel.



8. Landfill gas passive vent pipes in the closed section.

APPENDIX 5 – RECORD SURVEY DRAWINGS

NORTH CAROLINA PROFESSIONAL SEAL L-3492 LAND SURVEYOR MICHAEL R. STOUT

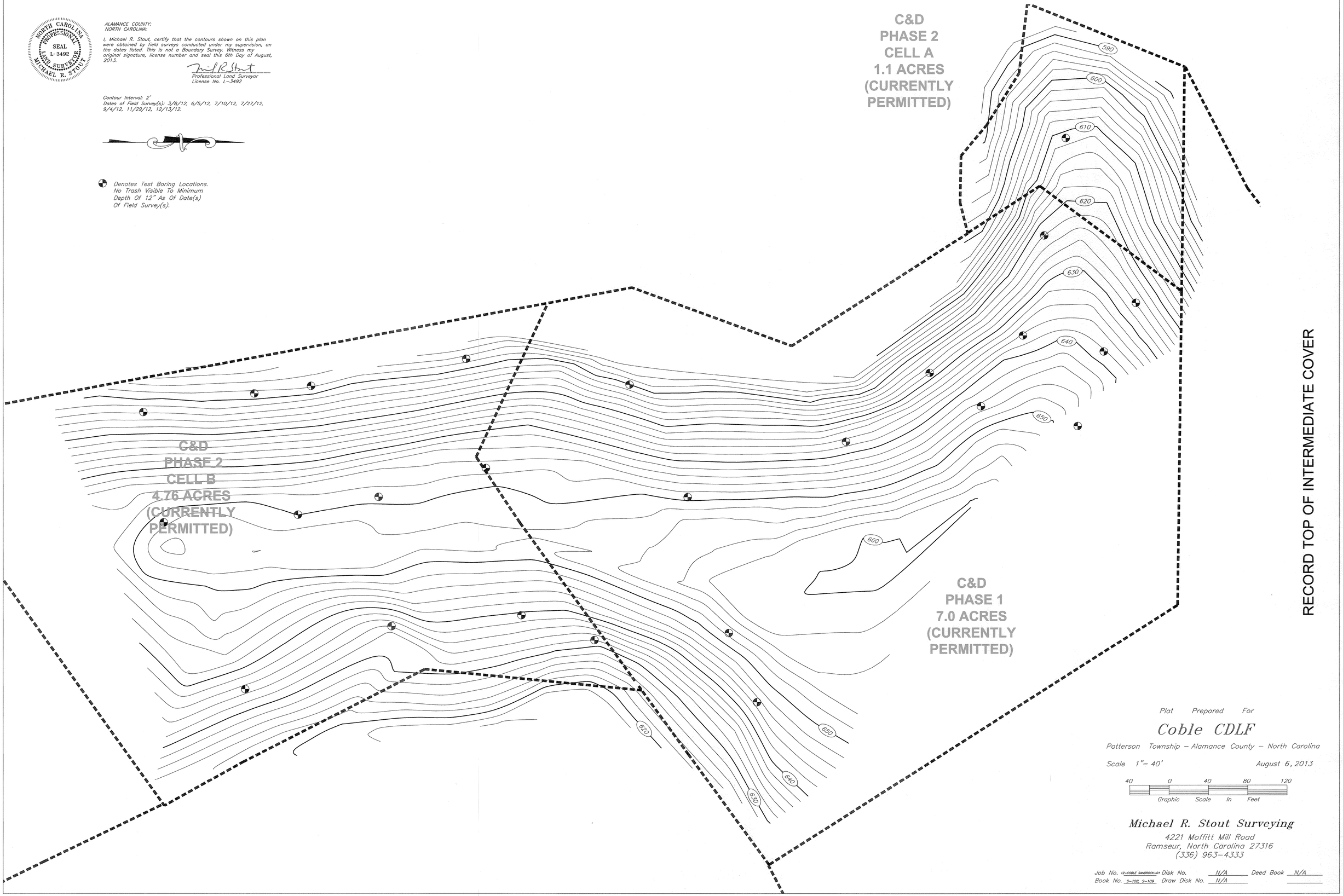
ALAMANCE COUNTY:
NORTH CAROLINA:

I, Michael R. Stout, certify that the contours shown on this plan were obtained by field surveys conducted under my supervision, on the dates listed. This is not a Boundary Survey. Witness my original signature, license number and seal this 6th Day of August, 2013.

Professional Land Surveyor
License No. L-3492

Contour Interval: 2'
Dates of Field Survey(s): 3/8/12, 6/5/12, 7/10/12, 7/27/12, 9/4/12, 11/29/12, 12/13/12.

Denotes Test Boring Locations. No Trash Visible To Minimum Depth Of 12" As Of Date(s) Of Field Survey(s).



Plat Prepared For

Coble CDLF

Patterson Township – Alamance County – North Carolina

Scale 1"= 40' August 6, 2013

40 0 40 80 120
Graphic Scale In Feet

Michael R. Stout Surveying
4221 Moffitt Mill Road
Ramseur, North Carolina 27316
(336) 963-4333

Job No. 12-COBLE SANDRICK-01 Disk No. N/A Deed Book N/A
Book No. S-108, S-109 Draw Disk No. N/A

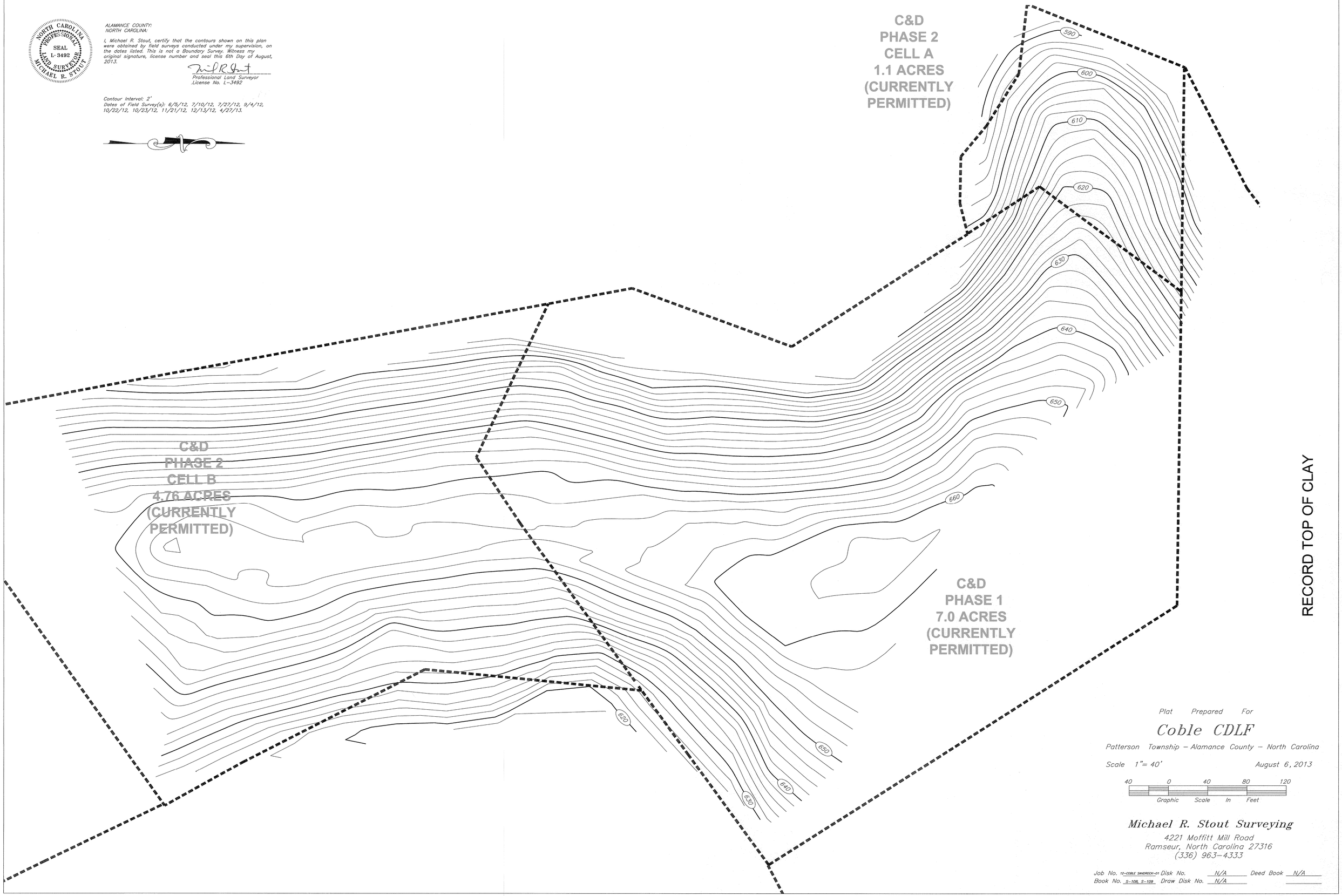
NORTH CAROLINA PROFESSIONAL SEAL L-3492 LAND SURVEYOR MICHAEL R. STOUT

ALAMANCE COUNTY:
NORTH CAROLINA:

I, Michael R. Stout, certify that the contours shown on this plan were obtained by field surveys conducted under my supervision, on the dates listed. This is not a Boundary Survey. Witness my original signature, license number and seal this 6th Day of August, 2013.

Professional Land Surveyor
License No. L-3492

Contour Interval: 2'
Dates of Field Survey(s): 6/5/12, 7/10/12, 7/27/12, 9/4/12, 10/22/12, 10/23/12, 11/21/12, 12/13/12, 4/27/13.



Plat Prepared For

Coble CDLF

Patterson Township – Alamance County – North Carolina

Scale 1"= 40' August 6, 2013

40 0 40 80 120
Graphic Scale In Feet

Michael R. Stout Surveying
4221 Moffitt Mill Road
Ramseur, North Carolina 27316
(336) 963-4333

Job No. 12-COBLE SANDROCK-01 Disk No. N/A Deed Book N/A
Book No. S-108, S-109 Draw Disk No. N/A

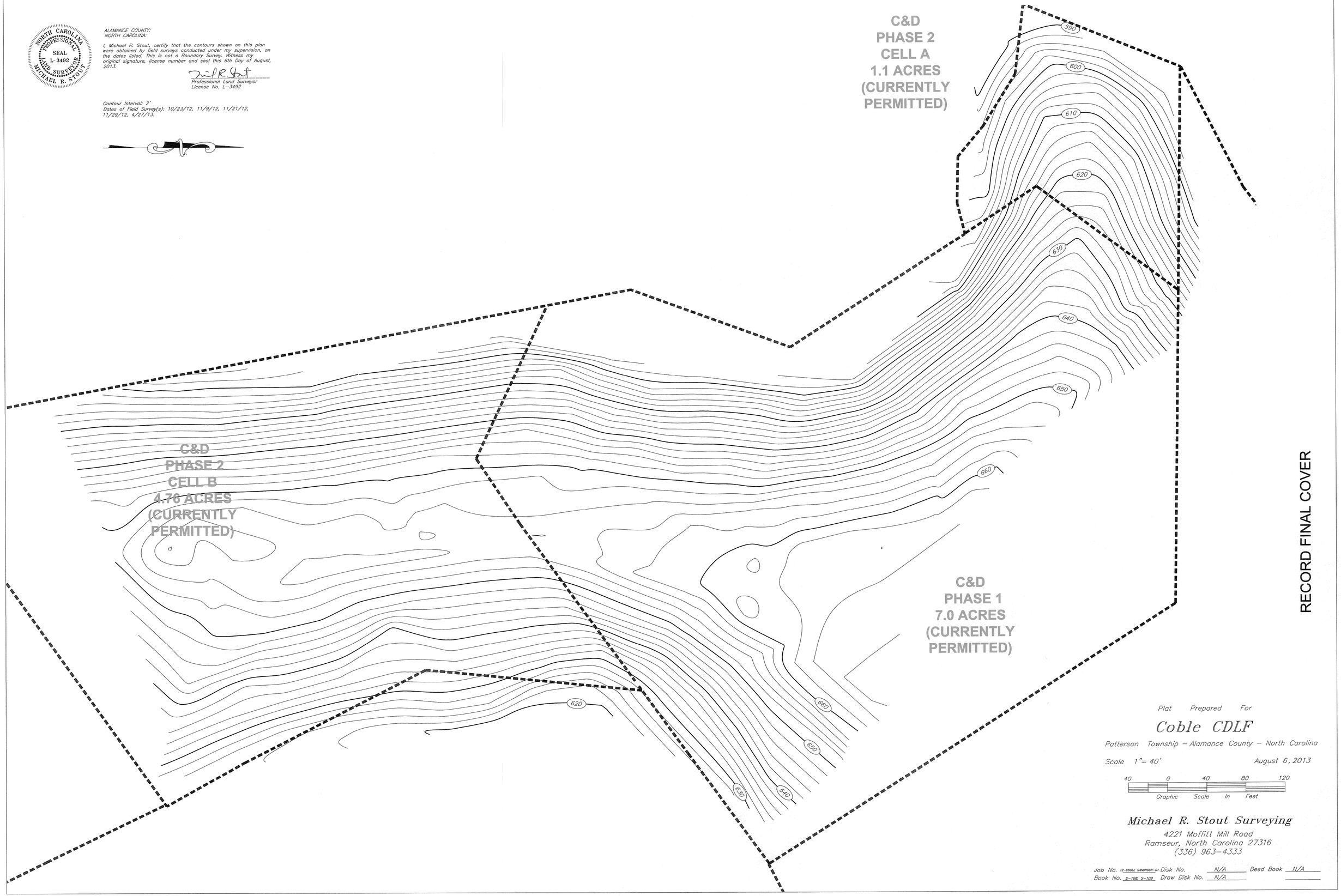
NORTH CAROLINA PROFESSIONAL SEAL L-3492 LAND SURVEYOR MICHAEL R. STOUT

ALAMANCE COUNTY:
NORTH CAROLINA:

I, Michael R. Stout, certify that the contours shown on this plan were obtained by field surveys conducted under my supervision, on the dates listed. This is not a Boundary Survey. Witness my original signature, license number and seal this 6th Day of August, 2013.

Professional Land Surveyor
License No. L-3492

Contour Interval: 2'
Dates of Field Survey(s): 10/23/12, 11/9/12, 11/21/12, 11/29/12, 4/27/13.



Plat Prepared For

Coble CDLF

Patterson Township – Alamance County – North Carolina

Scale 1"= 40'

August 6, 2013

40 0 40 80 120

Graphic Scale In Feet

Michael R. Stout Surveying

4221 Moffitt Mill Road
Ramseur, North Carolina 27316
(336) 963-4333

Job No. 12-COBLE SANDROCK-01 Disk No. N/A Deed Book N/A
Book No. S-108, S-109 Draw Disk No. N/A

COBLE SANDROCK C&D LANDFILL PARTIAL CLOSURE 2012-2013
Surveyor: Michael R. Stout Surveying, Ramseur, NC 27316

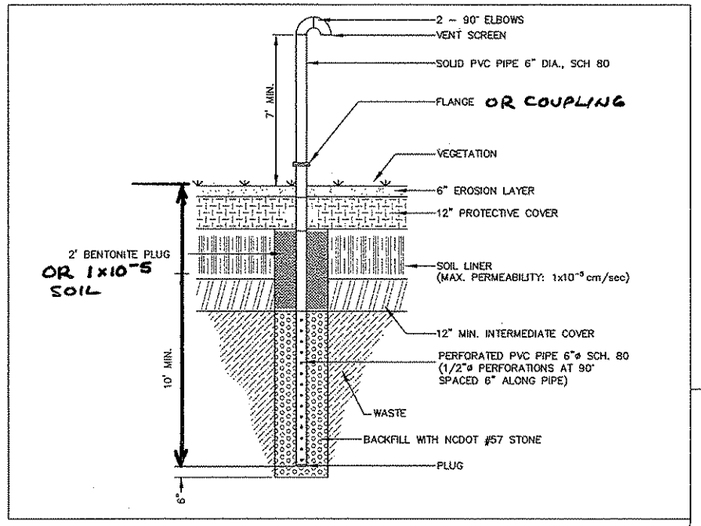
SURVEY POINT	INTERM. COVER ELEV.	LAYER THICKNESS (Ft.)	CLAY SOIL ELEV.	LAYER THICKNESS (Ft.)	FINAL COVER ELEV.	TOTAL THICKNESS
AREA 1						
1001	650.50	**1.70**	**652.2**	**1.77**	**653.97**	**3.47**
1002	653.15	**1.58**	**654.73**	**1.62**	**656.35**	**3.20**
1003	654.04	**1.62**	**655.66**	**1.58**	**657.24**	**3.20**
1004	653.84	**1.68**	**655.52**	**1.56**	**657.08**	**3.24**
1005	651.86	**1.87**	**653.73**	**1.59**	**655.32**	**3.46**
1006	651.00	**1.65**	**652.65**	**1.59**	**654.24**	**3.24**
1007	650.82	**1.53**	**652.35**	**1.63**	**653.98**	**3.16**
1008	650.22	**1.62**	**651.84**	**1.64**	**653.48**	**3.26**
1009	649.10	**1.84**	**650.94**	**1.29**	**652.23**	**3.13**
1010	647.78	**1.88**	**649.66**	**1.36**	**651.02**	**3.24**
1011	645.83	**1.84**	**647.67**	**1.27**	**648.94**	**3.11**
1012	634.14	**1.73**	**635.87**	**1.64**	**637.51**	**3.37**
1013	622.23	**2.00**	**624.23**	**1.52**	**625.75**	**3.52**
1014	619.00	**1.74**	**620.74**	**1.55**	**622.29**	**3.29**
1015	613.32	**1.86**	**615.18**	**1.40**	**616.58**	**3.26**
1016	611.22	**1.67**	**612.89**	**1.56**	**614.45**	**3.23**
1017	608.83	**1.61**	**610.44**	**1.57**	**612.01**	**3.18**
1018	607.76	**1.64**	**609.4**	**1.61**	**611.01**	**3.25**
1019	606.88	**1.57**	**608.45**	**1.61**	**610.06**	**3.18**
1020	605.38	**1.59**	**606.97**	**1.51**	**608.48**	**3.10**
1021	604.79	**1.58**	**606.37**	**1.53**	**607.90**	**3.11**
1022	604.51	**1.74**	**606.25**	**1.33**	**607.58**	**3.07**
1023	610.53	**1.56**	**612.09**	**1.56**	**613.65**	**3.12**
1024	612.18	**2.60**	**614.78**	**0.47**	**615.25**	**3.07**
1025	614.00	**1.56**	**615.56**	**1.72**	**617.28**	**3.28**
1026	616.96	**2.46**	**619.42**	**0.61**	**620.03**	**3.07**
1027	616.93	**3.17**	**620.10**	**0.59**	**620.69**	**3.76**
1028	619.76	**1.88**	**621.64**	**1.67**	**623.31**	**3.55**
1029	622.15	**2.58**	**624.73**	**1.42**	**626.15**	**4.00**
1030	625.56	**1.67**	**627.23**	**1.59**	**628.82**	**3.26**
1031	631.17	**2.24**	**633.41**	**0.93**	**634.34**	**3.17**
1032	644.41	**1.87**	**646.28**	**1.57**	**647.85**	**3.44**
1033	640.94	**1.54**	**642.48**	**2.51**	**644.99**	**4.05**
1034	637.31	**1.70**	**639.01**	**1.55**	**640.56**	**3.25**
1035	633.68	**1.68**	**635.36**	**1.62**	**636.98**	**3.30**
1036	631.92	**2.72**	**634.64**	**2.66**	**637.30**	**5.38**
1037	631.19	**1.56**	**632.75**	**1.63**	**634.38**	**3.19**
1038	628.66	**2.72**	**631.38**	**2.08**	**633.46**	**4.80**
1039	627.73	**1.92**	**629.65**	**1.33**	**630.98**	**3.25**
1040	626.41	**2.25**	**628.66**	**0.89**	**629.55**	**3.14**
1041	640.78	**1.71**	**642.49**	**1.53**	**644.02**	**3.24**
1042	643.34	**1.58**	**644.92**	**1.53**	**646.45**	**3.11**
1043	644.68	**1.58**	**646.26**	**1.66**	**647.92**	**3.24**
1044	645.76	**1.53**	**647.29**	**1.59**	**648.88**	**3.12**
1045	646.45	**1.60**	**648.05**	**1.51**	**649.56**	**3.11**
1046	647.72	**1.54**	**649.26**	**1.93**	**651.19**	**3.47**
1047	650.82	**1.73**	**652.55**	**1.42**	**653.97**	**3.15**
1048	653.09	**1.66**	**654.75**	**1.45**	**656.20**	**3.11**

SURVEY POINT	INTERM. COVER ELEV.	LAYER THICKNESS (Ft.)	CLAY SOIL ELEV.	LAYER THICKNESS (Ft.)	FINAL COVER ELEV.	TOTAL THICKNESS
1049	654.91	**1.66**	**656.57**	**1.59**	**658.16**	**3.25**
ACRE 2						
1079	659.25	**1.50**	**660.75**	**1.65**	**662.40**	**3.15**
1080	658.68	**3.41**	**662.09**	**-0.15**	**661.94**	**3.26**
1081	658.72	**1.62**	**660.34**	**1.57**	**661.91**	**3.19**
1082	658.96	**1.54**	**660.5**	**1.73**	**662.23**	**3.27**
1090	659.33	**1.53**	**660.86**	**1.63**	**662.49**	**3.16**
1091	657.87	**3.15**	**661.02**	**-0.02**	**661.00**	**3.13**
1092	651.70	**3.44**	**655.14**	**-0.23**	**654.91**	**3.21**
1093	647.47	**2.59**	**650.06**	**2.22**	**652.28**	**4.81**
1094	645.60	**2.22**	**647.82**	**4.03**	**651.85**	**6.25**
1095	647.47	**1.84**	**649.31**	**3.68**	**652.99**	**5.52**
1096	650.53	**1.45**	**651.98**	**3.91**	**655.89**	**5.36**
1097	653.48	**1.55**	**655.03**	**1.84**	**656.87**	**3.39**
1098	655.23	**1.54**	**656.77**	**1.59**	**658.36**	**3.13**
1099	650.45	**1.94**	**652.39**	**1.61**	**654.00**	**3.55**
1100	645.34	**2.56**	**647.9**	**2.32**	**650.22**	**4.88**
1101	640.99	**1.67**	**642.66**	**3.92**	**646.58**	**5.59**
1102	637.50	**1.60**	**639.1**	**1.78**	**640.88**	**3.38**
1103	633.85	**2.00**	**635.85**	**1.12**	**636.97**	**3.12**
1104	632.96	**2.17**	**635.13**	**1.02**	**636.15**	**3.19**
1105	635.75	**1.65**	**637.4**	**1.51**	**638.91**	**3.16**
1106	640.62	**4.30**	**644.92**	**-0.12**	**644.80**	**4.18**
1107	625.54	**1.83**	**627.37**	**1.34**	**628.71**	**3.17**
1108	619.14	**1.54**	**620.68**	**1.47**	**622.15**	**3.01**
1109	611.73	**1.67**	**613.4**	**1.76**	**615.16**	**3.43**
1110	615.49	**1.73**	**617.22**	**1.43**	**618.65**	**3.16**
1111	624.08	**1.53**	**625.61**	**1.49**	**627.10**	**3.02**
1112	628.75	**2.14**	**630.89**	**2.40**	**633.29**	**4.54**
1113	632.02	**1.79**	**633.81**	**4.01**	**637.82**	**5.80**
1114	639.34	**2.04**	**641.38**	**3.56**	**644.94**	**5.60**
1115	646.21	**1.83**	**648.04**	**1.30**	**649.34**	**3.13**
1116	634.51	**1.70**	**636.21**	**2.41**	**638.62**	**4.11**
1117	627.01	**1.65**	**628.66**	**1.50**	**630.16**	**3.15**
1118	617.94	**1.71**	**619.65**	**2.19**	**621.84**	**3.90**
1119	613.76	**2.05**	**615.81**	**1.09**	**616.90**	**3.14**
1120	612.10	**1.51**	**613.61**	**1.76**	**615.37**	**3.27**
1121	623.02	**1.65**	**624.67**	**1.46**	**626.13**	**3.11**
ACRE 9						
1177	621.60	**1.68**	**623.28**	**1.44**	**624.72**	**3.12**
1178	621.40	**1.88**	**623.28**	**1.28**	**624.56**	**3.16**
1179	624.44	**1.70**	**626.14**	**1.41**	**627.55**	**3.11**
1180	629.22	**1.65**	**630.87**	**1.48**	**632.35**	**3.13**
1181	640.04	**1.53**	**641.57**	**1.75**	**643.32**	**3.28**
1182	639.65	**1.98**	**641.63**	**1.35**	**642.98**	**3.33**
1183	633.81	**1.54**	**635.35**	**3.55**	**638.90**	**5.09**
1184	632.93	**1.67**	**634.60**	**1.81**	**636.41**	**3.48**
1185	633.04	**2.60**	**635.64**	**0.63**	**636.27**	**3.23**
1186	648.14	**1.56**	**649.70**	**1.99**	**651.69**	**3.55**
1187	647.07	**2.19**	**649.26**	**1.21**	**650.47**	**3.40**
1188	647.85	**2.41**	**650.26**	**1.55**	**651.81**	**3.96**
1189	648.72	**2.15**	**650.87**	**0.99**	**651.86**	**3.14**

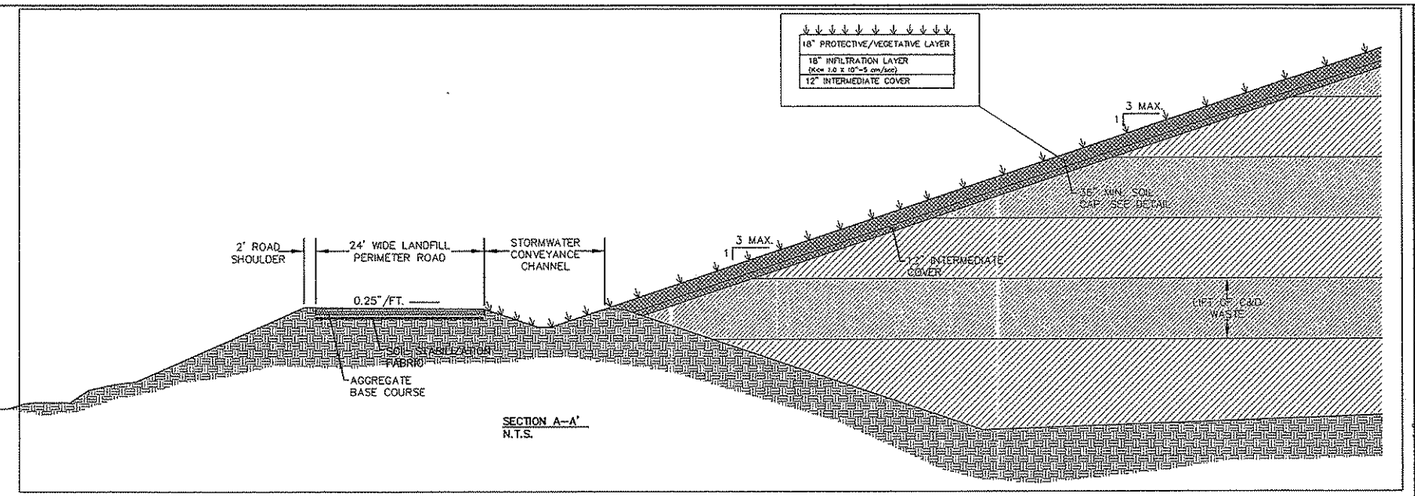
SURVEY POINT	INTERM. COVER ELEV.	LAYER THICKNESS (Ft.)	CLAY SOIL ELEV.	LAYER THICKNESS (Ft.)	FINAL COVER ELEV.	TOTAL THICKNESS
1190	646.01	**1.53**	**647.54**	**2.60**	**650.14**	**4.13**
1191	653.00	**1.55**	**654.55**	**1.63**	**656.18**	**3.18**
1192	655.75	**1.66**	**657.41**	**1.53**	**658.94**	**3.19**
1193	655.90	**1.58**	**657.48**	**2.53**	**660.01**	**4.11**
1194	657.72	**1.62**	**659.34**	**1.46**	**660.80**	**3.08**
1195	658.32	**1.63**	**659.95**	**1.39**	**661.34**	**3.02**
NW AREA						
1236	660.20	**1.65**	**661.85**	**1.71**	**663.56**	**3.36**
1237	656.25	**1.63**	**657.88**	**1.65**	**659.53**	**3.28**
1238	649.93	**1.58**	**651.51**	**1.64**	**653.15**	**3.22**
1239	643.92	**1.62**	**645.54**	**1.60**	**647.14**	**3.22**
1240	635.75	**1.78**	**637.53**	**1.44**	**638.97**	**3.22**
1241	624.63	**1.59**	**626.22**	**1.73**	**627.95**	**3.32**
1242	611.37	**1.65**	**613.02**	**1.46**	**614.48**	**3.11**
1243	600.33	**1.64**	**601.97**	**1.50**	**603.47**	**3.14**
1244	586.81	**1.54**	**588.35**	**3.10**	**589.91**	**3.10**
1245	589.60	**1.52**	**591.12**	**3.19**	**592.79**	**3.19**
1246	591.08	**1.55**	**592.63**	**3.16**	**594.24**	**3.16**
1247	586.09	**1.52**	**587.61**	**2.97**	**589.06**	**2.97**
1248	586.52	**1.55**	**588.07**	**3.25**	**589.77**	**3.25**
1249	586.28	**1.57**	**587.85**	**3.48**	**589.76**	**3.48**
1250	591.44	**1.59**	**593.03**	**3.26**	**594.70**	**3.26**
1251	595.84	**1.61**	**597.45**	**3.35**	**599.19**	**3.35**
1252	600.39	**1.55**	**601.94**	**3.18**	**603.57**	**3.18**
1253	603.98	**1.50**	**605.48**	**3.07**	**607.05**	**3.07**
1254	622.17	**1.67**	**623.84**	**2.76**	**626.60**	**4.43**
1255	639.91	**1.68**	**641.59**	**1.38**	**642.97**	**3.06**
1256	652.48	**1.81**	**654.29**	**1.36**	**655.65**	**3.17**
1257	636.42	**2.84**	**639.26**	**1.42**	**640.68**	**4.26**
1258	632.43	**2.78**	**635.21**	**1.88**	**637.09**	**4.66**
1259	618.05	**1.91**	**619.96**	**3.13**	**623.09**	**5.04**
1260	626.77	**2.17**	**628.94**	**2.18**	**631.12**	**4.35**
1261	619.47	**1.59**	**621.06**	**1.61**	**622.67**	**3.20**
1262	608.16	**1.55**	**609.71**	**1.71**	**611.42**	**3.26**
1263	620.25	**1.66**	**621.91**	**1.66**	**623.57**	**3.32**
1264	618.24	**2.16**	**620.40**	**1.25**	**621.65**	**3.41**
1265	605.89	**1.70**	**607.59**	**3.31**	**610.90**	**5.01**
1266	608.96	**1.73**	**610.69**	**1.46**	**612.15**	**3.19**
1267	612.52	**1.64**	**614.16**	**1.48**	**615.64**	**3.12**
1268	606.37	**2.77**	**609.14**	**1.33**	**610.47**	**4.10**
1269	594.80	**1.60**	**596.40**	**1.66**	**598.06**	**3.26**
1270	597.25	**1.86**	**599.11**	**1.30**	**600.41**	**3.16**
1271	602.07	**2.03**	**604.10**	**1.12**	**605.22**	**3.15**
1272	596.15	**1.52**	**597.67**	**1.75**	**599.42**	**3.27**
ACRE 7 & 8						
1322	616.38	**1.61**	**617.99**	**1.55**	**619.54**	**3.16**
1323	618.16	**1.57**	**619.73**	**1.58**	**621.31**	**3.15**
1324	617.13	**1.60**	**618.73**	**1.64**	**620.37**	**3.24**
1325	615.78	**1.82**	**617.6**	**1.21**	**618.81**	**3.03**
1326	616.38	**1.67**	**618.05**	**1.47**	**619.52**	**3.14**
1327	617.19	**1.57**	**618.76**	**1.54**	**620.30**	**3.11**
1328	619.90	**1.66**	**621.56**	**1.57**	**623.13**	**3.23**

SURVEY POINT	INTERM. COVER ELEV.	LAYER THICKNESS (Ft.)	CLAY SOIL ELEV.	LAYER THICKNESS (Ft.)	FINAL COVER ELEV.	TOTAL THICKNESS
1329	621.31	1.54	622.85	1.70	624.55	3.24
1330	622.27	1.63	623.9	1.55	625.45	3.18
1331	622.62	1.61	624.23	1.63	625.86	3.24
1332	623.66	1.51	625.17	1.61	626.78	3.12
1333	632.75	1.56	634.31	1.54	635.85	3.10
1334	641.50	1.66	643.16	1.49	644.65	3.15
1335	647.40	1.51	648.91	1.62	650.53	3.13
1336	652.13	1.62	653.75	1.55	655.30	3.17
1337	654.21	1.62	655.83	1.60	657.43	3.22
1338	653.52	1.58	655.10	1.58	656.68	3.16
1339	653.25	1.70	654.95	1.46	656.41	3.16
1340	652.52	1.56	654.08	1.79	655.87	3.35
1341	651.40	1.56	652.96	1.68	654.64	3.24
1342	652.78	1.58	654.36	1.53	655.89	3.11
1343	655.24	1.56	656.8	1.61	658.41	3.17
1344	656.40	1.78	658.18	1.37	659.55	3.15
1345	645.55	1.65	647.20	1.41	648.61	3.06
1346	643.02	2.21	645.23	1.13	646.36	3.34
1347	640.26	1.55	641.81	1.56	643.37	3.11
1348	641.66	2.23	643.89	0.91	644.80	3.14
1349	644.28	1.89	646.17	1.21	647.38	3.10
1350	644.24	1.62	645.86	1.48	647.34	3.10
1351	645.02	1.50	646.52	1.70	648.22	3.20
1352	647.15	1.81	648.96	1.33	650.29	3.14
1353	647.29	1.69	648.98	1.39	650.37	3.08
1354	643.68	1.56	645.24	1.56	646.80	3.12
1355	630.22	2.34	632.56	1.52	634.08	3.86
1356	631.76	1.78	633.54	1.23	634.77	3.01
1357	631.63	1.64	633.27	1.52	634.79	3.16
1358	630.63	2.01	632.64	1.87	634.51	3.88
1359	632.58	1.62	634.20	1.60	635.80	3.22
1360	633.12	2.05	635.17	1.01	636.18	3.06
1361	631.91	1.53	633.44	1.64	635.08	3.17
1362	628.98	1.76	630.74	1.35	632.09	3.11
1363	630.20	2.40	632.60	1.26	633.86	3.66
1364	624.10	1.68	625.78	1.42	627.20	3.10
1365	623.20	1.75	624.95	1.40	626.35	3.15
1366	624.32	1.65	625.97	1.52	627.49	3.17
1367	623.65	1.55	625.20	1.55	626.75	3.10
NORTH-1 AREA						
1758	650.68	1.61	652.29	1.52	653.81	3.13
1759	645.08	3.10	648.18	1.46	649.64	4.56
1760	637.21	3.56	640.77	1.48	642.25	5.04
1761	637.27	2.10	639.37	1.75	641.12	3.85
1762	625.45	1.88	627.33	1.73	629.06	3.61
1763	625.07	1.69	626.76	1.33	628.09	3.02
1764	625.03	1.81	626.84	1.39	628.23	3.20
1765	612.51	1.30	613.81	1.86	615.67	3.16
1766	611.61	1.81	613.42	1.33	614.75	3.14
1767	609.12	1.66	610.78	1.51	612.29	3.17
1768	608.68	1.46	610.14	1.62	611.76	3.08
1769	599.09	1.61	600.70	1.44	602.14	3.05

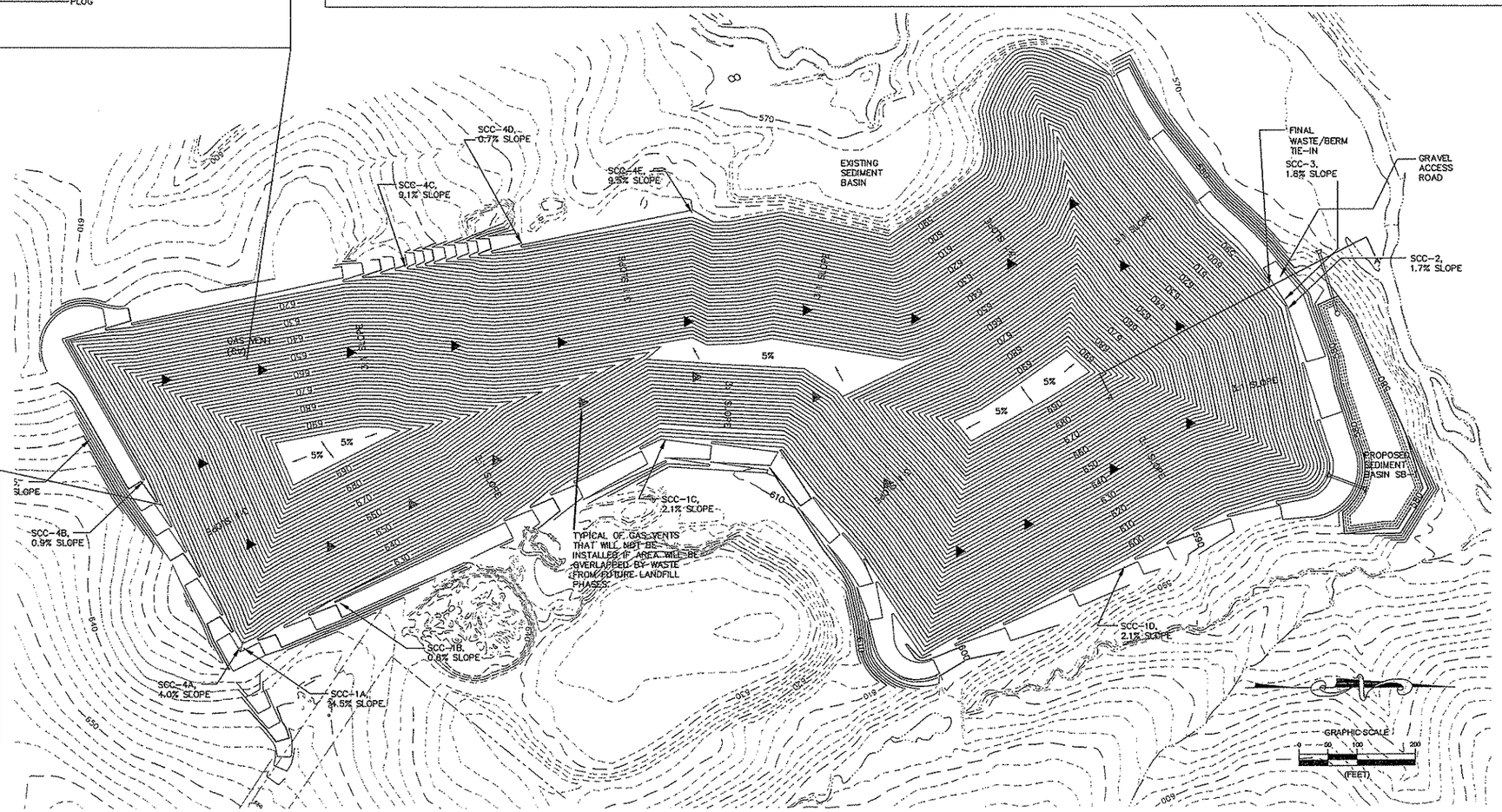
SURVEY POINT	INTERM. COVER ELEV.	LAYER THICKNESS (Ft.)	CLAY SOIL ELEV.	LAYER THICKNESS (Ft.)	FINAL COVER ELEV.	TOTAL THICKNESS
1770	600.61	**1.70**	**602.31**	**1.66**	**603.97**	**3.36**
1771	603.42	**1.67**	**605.09**	**1.37**	**606.46**	**3.04**
1772	606.19	**1.76**	**607.95**	**1.44**	**609.39**	**3.20**
HAUL ROAD						
1780	644.43	**1.85**	**646.28**	**1.31**	**647.59**	**3.16**
1782	644.28	**1.87**	**646.15**	**1.36**	**647.51**	**3.23**
1784	649.05	**1.92**	**650.97**	**1.18**	**652.15**	**3.10**
1786	650.08	**1.95**	**652.03**	**1.57**	**653.60**	**3.52**
1788	651.97	**1.94**	**653.91**	**1.21**	**655.12**	**3.15**
1790	651.33	**1.94**	**653.27**	**1.04**	**654.31**	**2.98**
1792	652.90	**1.93**	**654.83**	**1.23**	**656.06**	**3.16**
1794	652.83	**2.00**	**654.83**	**1.09**	**655.92**	**3.09**
1796	652.03	**1.92**	**653.95**	**1.09**	**655.04**	**3.01**
1798	652.74	**2.00**	**654.74**	**1.23**	**655.97**	**3.23**
1800	652.59	**1.99**	**654.58**	**1.04**	**655.62**	**3.03**
1802	652.59	**2.02**	**654.61**	**1.36**	**655.97**	**3.38**
1804	652.87	**2.00**	**654.87**	**1.26**	**656.13**	**3.26**
1806	651.45	**1.97**	**653.42**	**1.39**	**654.81**	**3.36**
1808	650.63	**1.94**	**652.57**	**1.04**	**653.61**	**2.98**
1810	652.66	**1.98**	**654.64**	**1.20**	**655.84**	**3.18**
1812	652.15	**1.98**	**654.13**	**1.10**	**655.23**	**3.08**
1814	651.69	**1.99**	**653.68**	**1.08**	**654.76**	**3.07**
1816	652.22	**2.00**	**654.22**	**1.05**	**655.27**	**3.05**
1818	650.75	**2.10**	**652.85**	**1.15**	**654.00**	**3.25**
1820	652.31	**2.06**	**654.37**	**1.32**	**655.69**	**3.38**
1822	652.61	**1.98**	**654.59**	**1.28**	**655.87**	**3.26**
1824	651.98	**1.95**	**653.93**	**1.51**	**655.44**	**3.46**
1826	654.27	**2.01**	**656.28**	**1.59**	**657.87**	**3.60**
1828	654.13	**2.04**	**656.17**	**1.64**	**657.81**	**3.68**
1730	653.14	**1.92**	**655.06**	**1.25**	**656.31**	**3.17**
1832	655.96	**2.10**	**658.06**	**1.07**	**659.13**	**3.17**
1834	656.10	**2.05**	**658.15**	**1.47**	**659.62**	**3.52**
1836	658.65	**2.11**	**660.76**	**1.04**	**661.80**	**3.15**
1838	658.34	**2.17**	**660.51**	**0.85**	**661.36**	**3.02**
1840	659.40	**2.15**	**661.55**	**0.95**	**662.50**	**3.10**
1842	660.42	**2.14**	**662.56**	**0.96**	**663.52**	**3.10**
1844	660.68	**2.15**	**662.83**	**1.05**	**663.88**	**3.20**
1846	660.44	**2.28**	**662.72**	**1.29**	**664.01**	**3.57**
1848	659.04	**2.13**	**661.17**	**1.00**	**662.17**	**3.13**

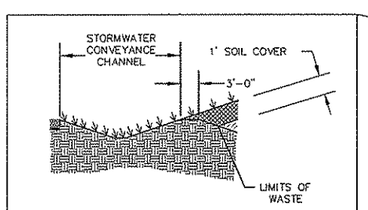


GAS VENT DETAIL



SECTION A–A'
N.T.S.





INTERMEDIATE COVER TIE-IN ALONG SOUTH PORTION OF PHASE 3A AND SOUTH AND EAST PORTION OF PHASE 3B.

NOTE:

DESIGN OF INTERMEDIATE COVER TIE-IN WILL ACCOMODATE POTENTIAL FUTURE LANDFILL EXPANSION.

NO	BY	CK	APP
2	SC	EA	EA
1	SC	EA	EA

DATE	REVISIONS AND RECORD OF ISSUE
5/19/08	MODIFIED GAS VENT DETAIL
3/10/08	VENT LOCATIONS REVISED, SHOWED GRASS ON CHNLS

NORTH CAROLINA PROFESSIONAL SEAL 27446 ENGINEER EDWARD ANTHONY 8/4/08

DESIGNED SC
DRAWN RB
CHECKED EA
APPROVED EA
DATE 06/27/07

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JOYCE ENGINEERING, INC.
2211 WEST WENDOVER AVE ROAD
GREENSBORO, NC 27407
PHONE: (336) 553-0092

COBLE'S SANDROCK, INC.
KIMESVILLE, NORTH CAROLINA

FINAL GRADING PLAN

PROJECT NO.
419.22

SCALE
1"=100'

DRAWING NO.
EP–06

L:\Coble Sandrock\dwg\look 22 response to comments\Engineering RTC\LEP-06 - FINAL GRADING PLAN.dwg